TECHNICAL MANUAL

FOR

GENERAL PURPOSE TRANSMITTER

MODEL GPT-40KEL

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, CANADA

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MAMARONECK, N.Y. **OTTAWA, CANADA**

IN-1025/EL

ISSUE DATE: MAY 31, 1968

NOTICE

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

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

CHANGE NO. 1

INSTRUCTION BOOK CHANGE NOTICE

Date June 4, 1969

Manual affected: General Purpose Transmitter Model GPT-40KEL IN 1025EL

1. Parts List - Add the following items accordingly:

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C955	Capacitor, Fixed, Vacuum, 3 mmfd, 17 kv, 7 amps rms.	C0102-3
C956	Capacitor, Fixed, Mica, 300 mmfd, 500 vdc, ±5%.	CM15B301J03
R918	Resistor, Fixed, Composition, 150 ohms, 2 watts, ±5%	RC42GF151J
R919	Resistor, Fixed, Composition, 300 ohms, 2 watts, ±5%	RC42GF301J

2. Parts List - Change description of the following:

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S905	Switch, Push-Pull, 15 amps, at 120, 250 vac.	SW-230
M7206	Meter, Kilowatts, RF, 0-60 kw, 200 microamp dc movement.	MR-147
P7310	Connector, Plug, Electrical, Coaxial, Male.	UG-88/U
CB8502	Circuit Breaker, Single Pole, 240 vac, 25 amp, series trip.	SW-270
C7304	Capacitor, Fixed, Ceramic, 1000 uufd, ±20%, 5000 vdc	CC109-38
J904	Connector, Receptacle, BNC.	UG625/U

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

THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamaroneck, New York 10543

Attn.: Head, Documentation Section

CHANGE NO. 2

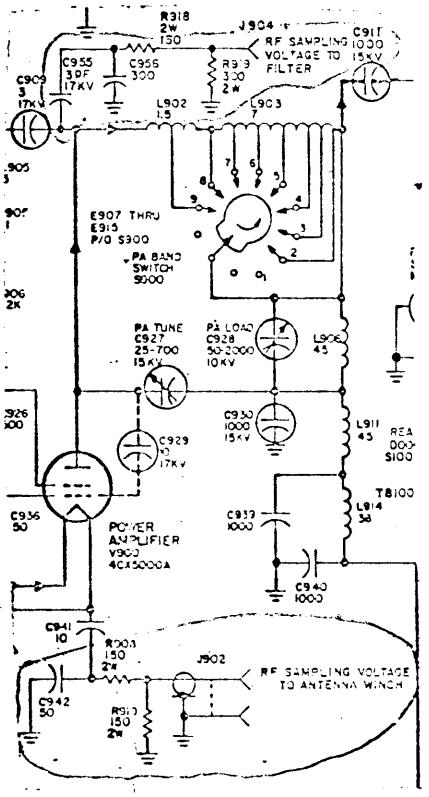
INSTRUCTION BOOK CHANGE NOTICE

Date June 4, 1969

Manual affected: General Purpose Transmitter Model GPT-40KEL IN 1025EL

Figure 6-1, Sheet 3 of 4

Make pen and ink corrections to Figure 6-1 in the areas encircled.



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

THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamaroneck, New York 10543

Attn.: Head, Documentation Section

FORWARD

This instruction manual for the General Purpose Transmitter, model GPT-40KEL, consists of the following modular manuals:

(1) TECHNICAL MANUAL FOR INSTALLING, TRANSMITTER SET RADIO, GPT-10KRL.

(2) TECHNICAL MANUAL FOR OPERATING, TRANSMITTER SET RADIO, GPT-10KRL.

(3) TECHNICAL MANUAL FOR MAINTENANCE OR TRANSMITTER SET RADIO, GPT-10KRL.

(4) TECHNICAL MANUAL FOR MULTIMODE EXCITER, MODEL MMX.

(5) TECHNICAL MANUAL FOR EXCITER DRAWER, MODEL AX688.

(6) TECHNICAL MANUAL FOR OPERATING AND MAINTENANCE FOR TRANSMITTER SET RADIO, MODEL GPT-40KEL.

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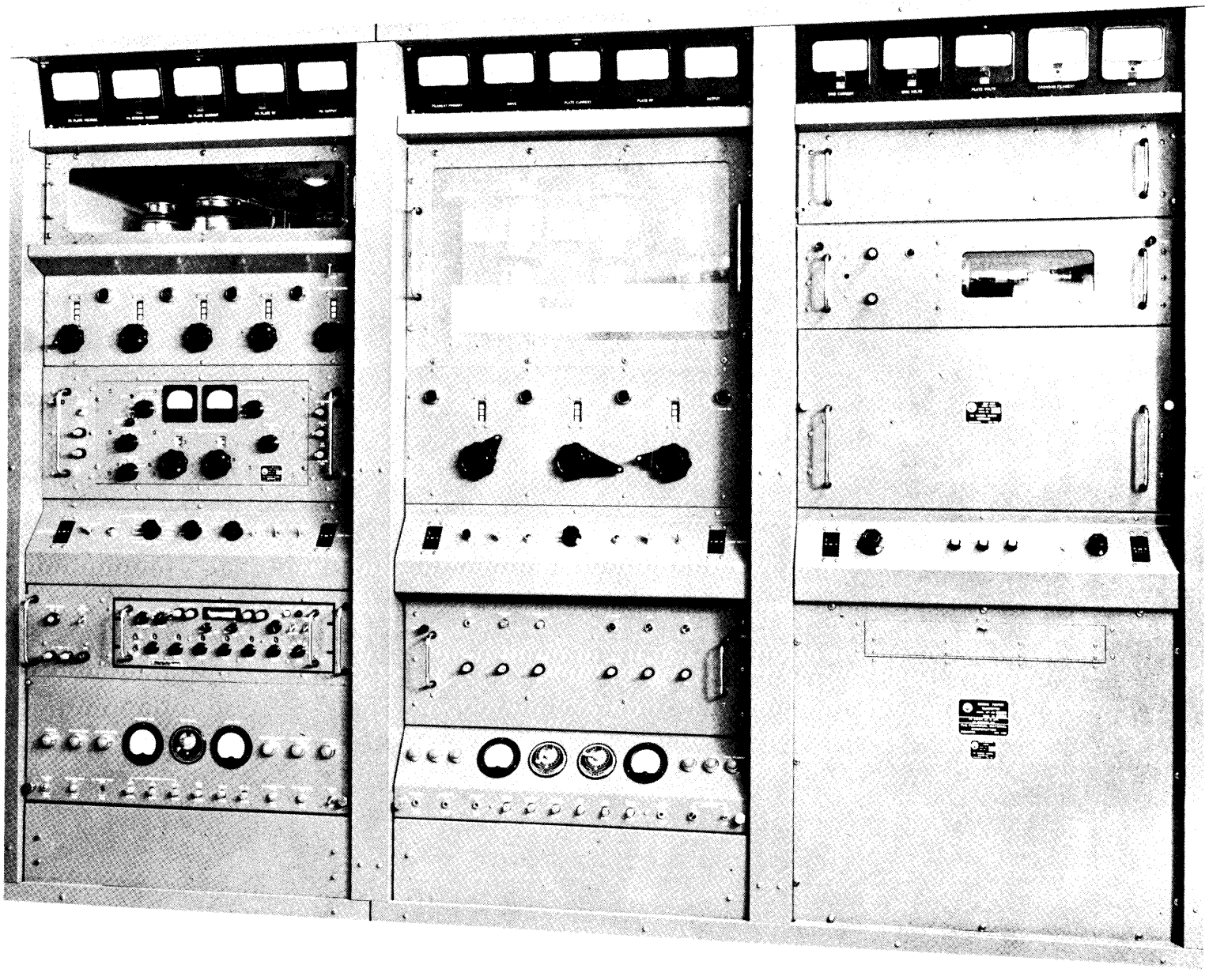

Figure 1-1. Front View, of GPT-40K Transmitter

SECTION 1
GENERAL INFORMATION

1-1. PURPOSE OF EQUIPMENT.

The GPT-40K Transmitter (figure 1-1) is a conservatively-rated general purpose transmitter which delivers 40,000 watts PEP (peak envelope power), or 20,000 watts average power throughout the 2-to-30-mc range. The operating modes of the transmitter are:

(1) SSB (single sideband) with suppressed or any degree of carrier.

(2) DSB (double sideband) with suppressed or any degree of carrier. This mode includes AM (amplitude modulation) operation and AME (AM equivalent).

(3) ISB (independent sideband) (separate intelligence on each sideband) with suppressed or any degree of carrier.

(4) FSK (frequency-shift telegraphy).

(5) FAX (fascimile).

(6) CW (carrier wave) keying (telegraphy).

1-2. EQUIPMENT SUPPLIED.

Table 1-1 lists all the major components of the transmitter (less the exciter units). Corresponding common nomenclature is also indicated.

1-3. DESCRIPTION OF EQUIPMENT.

a. General. As shown in figure 1-1, the transmitter consists of three frames; they are the 10KW driver frame, the 40-KW PA frame, and 40-KW PS frame. The three frames house all components of the transmitter. Primary power connections are made through the base assemblies. A standard 3 1/8 inch connector for unbalanced output operation is located on top of the 40-KW PA frame.

b. 10KW DRIVER FRAME. - The 10-KW driver frame houses a two stage r-f voltage amplifier the 1-KW IPA, the 10-KW PA and associated power supply and power control circuits, an exciter drawer containing overload circuitry, and the exciter unit model MMX.

c. EXCITER DRAWER AX688. - The Exciter Drawer houses the Multi-Mode Exciter model MMX. The MMX is a compact transistorized modular unit that can be easily inserted or removed from the exciter drawer. The exciter drawer also contains a 28 vdc power supply for control circuits, and overload circuits designed to protect personnel and equipment. (Refer to modular manual for detailed description of unit).

d. PA FRAME. - The PA frame houses the 40-kw power amplifier stage of the transmitter. The lower half of the frame is divided into a front and rear section by a partition. The front half houses a filament transformer and removable subassemblies. The rear half houses parts associated with the main power supply and a blower for the power amplifier tube. The upper half of the frame houses the power amplifier tube compartment, associated power amplifier circuit components, and a bandswitch.

(1) PA Frame Meter Panel - The PA frame meter panel, located at the top of the PA frame, contains five meters associated with the 40-kw power amplifier. These meters monitor the voltage to the rf drive voltage, plate current, rf plate voltage, and output power.

(2) Power Amplifier - The 40 kw power amplifier is located below the PA frame meter panel. It contains the 40-kw power amplifier and its associated tuned circuits. A blower motor which provides forced air cooling of the 40-kw power amplifier tube is mounted on the PA frame directly below the tube. The front panel contains a plexiglass window, the power amplifier tuning and loading controls and their associated counter-type dials, and indicator lamps.

(3) PA Control Panel - The PA control panel is located below the 40-kw power amplifier. This panel controls the application of main ac power and the PA high voltage, and monitors the interlock circuits associated with the PA and PS frames. Other controls on this panel are associated with the operation of the 40-kw power amplifier and the PA frame relay panel.

TABLE 1-1. MAJOR COMPONENTS

TMC DESIGNATION	COMMON NAME
Main Meter Panel	Main Meter Panel
Power Amplifier Section	10-KW PA
RF Amplifier Drawer	RF amplifier drawer
RF Amplifier RFC-1	1-KW 1 PA or RFC
Main Power Panel AX504	Main Power Panel
Exciter Drawer	Exciter drawer
Relay Panel	10-KW relay panel
Main Power Supply	10-KW main power supply
PA Frame Meter Panel	PA frame meter panel
Power Amplifier	40-KW PA
PA Control Panel	PA frame control panel
Bias supply drawer	Bias Supply Drawer
PA Frame Relay Panel	PA Frame Relay Panel
Crowbar Drawer	Crowbar Drawer
12-KW High Voltage Rectifier HVRB-2	40-KW High Voltage Rectifier
P.S. Control Panel	PS Frame Control Panel

(4) Bias Supply Drawer - The bias supply, mounted below the PA control panel, contains two power supplies and VSWR (voltage standing wave ratio and retune protection circuits). The protection circuits automatically cause associated relays to trip when VSWR becomes excessive or rf signal

level drops excessively. The front panel contains three potentiometers, three lamps, and three fuses.

(5) PA Frame Relay Panel - The PA frame relay panel, located at the bottom of the PA frame contains nine relays and associated parts. The relays protect various circuits in the PA and PS frames. The upper section of the relay panel contains controls and indicators associated with the relays, All relays and terminal boards are contained in the lower section and are easily accessible upon removal of a cover plate.

e. PS FRAME - The PS frame contains the transmitter high voltage power supply, and a crowbar drawer. The upper front section of the PS frame contains removable drawer assemblies. The main power supply components occupy the remainder of the frame.

(1) Crowbar Drawer - The crowbar drawer, provides protection against excessive discharge currents in the high voltage supply of the 40-kw PA. This unit contains a thyratron that is visible through a window on the front panel. A power lamp, and two fuses are mounted on the front panel.

(2) 40-KW High Voltage Rectifier HVRB-2 - The 40-KW high voltage rectifier drawer mounted below the crowbar drawer is the rectifier portion of the high voltage power supply for the 40-KW power amplifier tube.

The HVRB-2 is a three-phase full wave solid state rectifier. Input and output connections are made with button contacts on the rear panel of the unit.

The high voltage rectifier has no operating controls. Control of high voltage ac input to the unit is accomplished in the transmitters control circuits.

(3) PS Control Panel - The PS control panel, mounted below the 40-kw high voltage rectifier, contains controls for adjusting filament voltages

in several of the drawers and for turning on filament and blower-motor power. The front panel also contains a calibration control and switch for the SWR meter.

1-4. TECHNICAL CHARACTERISTICS

The following data outlines the technical characteristics of the transmitter.

Frequency range:	2-to-30-mc, band switched.
Output power:	40,000 watts, 2-tone PEP, 3rd order distortion product down at least 35db from PEP.
Operating Modes:	SSB, ISB, DSB, FSK, FAX, CW, AME and AM.
Output impedance:	
Unbalanced	50 or 70 ohms
Harmonic Suppression:	Second harmonic down at least 50 db from PEP; third harmonic down at least 65 db from PEP.
Primary power: requirements (with exciter)	3-phase, 200 volts, 50/60 cps, 200 amperes per phase.
Safety features:	Mechanical and electrical interlocks.
Cooling:	Semi-pressurized cabinets that are forced-air cooled.
Operating temperature:	Between 0°C (32°F) and 50°C (112°F) for humidity as high as 90%.

1-5. ELECTRON TUBE, DIODE, AND FUSE COMPLEMENT

The electron tubes, diodes, and fuses contained in the PA and PS frame of the transmitter are listed in tables 1-2 through 1-4, respectively.

TABLE 1-2. ELECTRON TUBE COMPLEMENT

REFERENCE SYMBOL	TYPE	FUNCTION
V7301	ML-6697	40-Kw PA
V7501	6X4	Rectifier

TABLE 1-2. ELECTRON TUBE COMPLEMENT (CONT)

REFERENCE SYMBOL	TYPE	FUNCTION
V7502, V7503	5R4GY	Rectifier
V7504, V7505	OA2	Voltage regulator
V7506	6AU6	Voltage regulator
V7507	6336A	Voltage regulator
V7508, V7509	12AT7	DC amplifier
V8301	1095	Thyratron

TABLE 1-3. DIODE COMPLEMENT

REFERENCE SYMBOL	FUNCTION	
CR7304		
CR8401-CR8403	HV. RECT.	

TABLE 1-4. FUSE COMPLEMENT

REFERENCE SYMBOL	TYPE	
F7501	AGC-1/8	
F7502	MLD-1/2	
F7503	MDL-3	
F7601	MDL-5	
F7602-F7606	MDL-2	
F8101	MDL-3	
F8501-F8502	MDL-5	
F8503	MDL-2	

SECTION 2
OPERATOR'S SECTION

2-1. INTRODUCTION.

This section presents operating procedures for GPT-40K Transmitter. The following paragraphs describe the starting procedures tune up of exciter on carrier, tune up of 1-kw IPA and 10-KW PA on carrier, tune up of 40-KW PA on carrier. All referenced controls and indicators are shown in figures 2-1, 2-2 and 2-3.

2-2. PRELIMINARY PROCEDURE.

Before applying power to any section of the transmitter make sure the audio input cables are connected to their proper jacks on the 10kw frame.

Also make sure the antenna is properly connected. For unbalanced operation, the r-f output of the transmitter is detained at a coaxial connector that is located at the top of the 40-kw frame.

2-3. STARTING PROCEDURES.

a. APPLYING STANDBY POWER TO EXCITER. - The temperature-controlled oven circuits should be energized for at least 24 hours before the exciter is operated to assure optimum frequency stability. If the transmitter is to be operated on a fairly constant basis its exciter should be left in standby during idle periods.

(1) Set the switches listed below at the positions shown.

UNIT	SWITCH	POSITION
10-KW MAIN POWER PANEL	MAIN POWER circuit breaker (32)	ON
MMX	ON/STANDBY Switch (68)	STANDBY
EXCITER DRAWER AX688	ON/OFF Switch (59)	ON

TABLE 2-1 10KW FRAME OPERATING CONTROLS AND INDICATORS

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
1	PA PLATE VLTG meter	Indicates Plate Voltage applied to PA tube.
2	PA SCREEN CURRENT meter	Indicates screen current of 10-kw power amplifier tube.
3	PA PLATE CURRENT meter	Indicates plate current of 10-kw power amplifier tube.
4	PA PLATE RF meter	Indicates rf output voltage of 10-kw PA.
5	PA OUTPUT meter	Normally indicates 10-kw PA output power in kilowatts PEP (upper scale). When operating into unbalanced antenna, and with SWR switch (38) set to SWR, indicates VSWR on lower scale.
6	AC POWER lamp	When lit, indicates that power is applied to main power supply.
7	TUNE lamp	When lit, indicates that TUNE-OPERATE switch (39) on main power panel is in TUNE position.
8	OPERATE lamp	When lit, indicates that TUNE-OPERATE switch (39) on main power panel is is in OPERATE position.
9	PLATE ON lamp	When lit, indicates that ac voltage is applied to 10-kw high voltage rectifier.
10	PA TUNE dial	Indicates setting of PA TUNE control (15).
11	PA LOAD dial	Indicates setting of PA LOAD control
12	BAND SW dial	Indicates setting of BAND SW switch.
13	OUTPUT BAL dial	Indicates setting of OUTPUT LOADING control.
14	OUTPUT LOADING dial	Indicates setting of OUTPUT LOADING control.
15	PA TUNE control	Matches output impedance of 10-kw PA to load, antenna, or 40-kw PA input.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
16	PA LOAD control	Matches output impedance of 10-kw PA to load, antenna, or 40-kw PA input.
17	BAND SW switch	Sets operating frequency range of 10-kw PA.
18	OUTPUT BAL control	Operates in conjunction with OUTPUT LOADING control (19) to match impedance of 10-kw PA to antenna impedance.
19	OUTPUT LOADING control	Control Position — Function TUNE — Connects 10-kw PA output to Switching Matrix relay K7301. OPER — Connects 10-kw PA output to input of 40-kw PA.
20	MULTIMETER	Indicates rf voltage, dc voltage, or dc current as selected by MULTIMETER switch (22).
21	IPA PLATE CURRENT meter	Indicates plate current of 1-kw IPA.
22	MULTIMETER switch	8-position rotary switch: Position — Measures DC IPA BIAS — Bias on 1-kw IPA. DC IPA ESG — Screen voltage of 1-kw IPA. DC IPA EP — Plate voltage of 1-kw IPA. DC IPA ISG — Screen current of 1-kw IPA. RF 1ST AMPL EP — Rf voltage at plate of first rf amplifier in 1-kw IPA. RF IPA EP — Rf voltage at grid of 1-kw IPA. RF PA EG — Rf voltage at input to 10-kw PA.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
23	IPA GRID TUNING CONTROL	Tunes rf input circuit of 1-kw IPA.
24	1ST AMPL TUNING control	Tunes rf output circuit of first rf amplifier in 1-kw IPA.
25	DRIVER BAND switch	Sets operating frequency range of first two rf amplifiers in 1-kw IPA.
26	IPA BAND switch	Sets operating frequency range of 1-kw IPA.
27	IPA LOADING switch	Operates in conjunction with IPA LOADING control (130) to vary impedance at output of 1-kw IPA.
28	IPA TUNING control	Tunes output circuit of 1-kw IPA.
29	IPA TUNING dial	Indicates setting of IPA TUNING control.
30	IPA LOADING control	Operates inconjunction with IPA LOADING switch to vary impedance at output of 1-kw IPA.
31	IPA LOADING dial	Indicates setting of IPA LOADING control.
32	MAIN POWER circuit breaker	In ON position, applies primary power to main frame circuits.
33	OVERLOAD RESET push-button	When depressed after an overload occurs, resets relays in relay panel.
34	INTERLOCK INDICATOR lamp	When lit, indicates interlock circuit selected by INTERLOCK switch is closed.
35	INTERLOCK switch	Selects interlock switch circuit to be checked by INTERLOCK INDICATOR lamp as follows:

Position	Circuit or Condition Checked
NORMAL	Closure of all main frame interlocks.
BAND SW	In-detent status of IPA BAND switch.
IPA AIR SW	Normal operation of blower in 1-kw IPA.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
35 Cont.	INTERLOCK switch	Selects interlock switch circuit to be checked by INTERLOCK INDICATOR lamp as follows: Position — Circuit or Condition Checked EXTERNAL — Continuity of external interlock (terminals 8 and 10 of E3000 in auxiliary frame). REAR DOOR — Closure of rear door. PA AIR SW — Normal operation of blower in 10-kw PA. PA DECK — Closure of door on power amplifier section. PA BAND SW — In-detent status of BAND SW switch. HV DECK — Closure of relay panel in main frame. RELAY DECK — Closure of relay panel in main frame. TIMER — Activation of timer after time interval elapses.
36	FIL ADJ switch	Sets ac input voltage at primary of 10-kw filament transformer.
37	ALDC switch and control	Switch connects ALDC circuit in system. Control sets ALDC voltage level.
38	SWR switch	In SWR position, permits direct reading of VSWR during unbalanced operation.
39	TUNE-OPERATE switch	In TUNE position allows reduced dc voltage to be applied to screen grids of 1-kw and 10-kw power amplifier tubes. In OPERATE position, it causes full screen voltage to be applied to tubes.
40	PA SCREEN switch	In ON position, applies screen voltage to 10-kw PA.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
41	HIGH VOLTAGE circuit	In ON position, turns on 10-kw high voltage rectifier, applying high voltage dc to 10-kw power amplifier plate current.
42	FILAMENT TIME meter	Indicates total operating time of of filament circuit of 10-kw PA.
43	TIME DELAY timer	Delays application of high ac voltage to high voltage rectifier so filaments may heat.
44	PLATE TIME meter	Indicates total operating time of high voltage rectifier.
45	PA BIAS lamp	When lit, indicates that no bias voltage is applied to 10-kw PA.
46	PA PLATE OVLD lamp	When lit, indicates that overload occurred in plate circuit of 10-kw PA.
47	PA SCREEN OVLD lamp	When lit, indicates that overload has occurred in screen circuit of 10-kw PA.
48	IPA SCREEN OVLD lamp	When lit, indicates that overload has occurred in screen circuit of 1-kw IPA.
49	IPA PLATE OVLD lamp	When lit, indicates that overload has occurred in plate circuit of 1-kw IPA.
50	SWR OVLD lamp	When lit, indicates that overload has occurred as a result of excessive VSWR.
51	PA BIAS ADJ control	Sets amplitude of bias voltage applied to 10-kw power amplifier tube.
52	PA PLATE OVLD ADJ control	Controls dc level at which 10-kw PA plate overload relay is energized.
53	PA SCREEN OVLD ADJ control	Controls dc level at which 10-kw PA screen overload is energized.
54	IPA SCREEN OVLD ADJ control	Controls dc level at which 1-kw IPA screen overload relay is energized.
55	IPA PLATE OVLD ADJ control	Controls dc level at which 1-kw IPA plate overload relay is energized.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
56	ALARM switch	When set at ON position, energizes an audible alarm until high voltage is applied to the 10-kw PA.
57	DRAWER INTERLOCK lamp	When lit, indicates that rf amplifier interlock is open.
58	IPA BIAS ADJ control	Adjust amplitude of bias voltage applied 1-kw IPA.
59	EXCITER POWER on/off switch	Controls AC power to Exciter Unit.
60	SWR TRIPOUT 2:1/3:1	Sets point at which SWR will trip ovld relay.
61	RF OUTPUT control	Adjusts level of RF OUTPUT.
62	METER switch	7-position selection switch. Selects circuits in system to be measured.
63	POWER lamp	Indicator lamp lights when unit is in standby condition.
64	STANDBY lamp	Indicator lamp lights when unit is in STANDBY condition.
65	Carrier control	Adjusts amount of carrier to be used.
66	MONITOR meter	Monitors circuits selected by meter switch.
67	EXCITER switch	Set switch at PTT when using the front panel microphone input. Set switch at ON when using USB or LSB line inputs.
68	ON/STANDBY switch	When set at ON applies 12 and 24 VDC to all modules, and when set at STANDBY opens operate 12 and 24 VDC to modules.
69	USB MIKE/LINE gain control	Adjusts level of USB input.
70	LSB/MIKE/LINE gain	Adjusts level of LSB input.
71	MODE switch	Selects the various mode capabilities of the unit.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
72	10MHz, 1MHz, 100KHz 10KHz, 1KHz, 100 Hz	Selects the desired operating frequency in the 2-30 mc (MHz) frequency range. Each switch has a window displaying the numerical value of the frequency.
73	MIKE jack	Accepts a 47,000 ohm impedance microphone.
74	KEY jack	Input for a dry contact keyer used for CW mode of operation.

TABLE 2-2 40KW POWER AMPLIFIER FRAME CONTROLS AND INDICATORS

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
75	FILAMENT PRIMARY meter	Indicates ac voltage applied to filament transformer.
76	DRIVE meter	Indicates rf input applied to 40-kw PA.
77	PLATE CURRENT meter	Indicates dc plate current of 40-kw PA.
78	PLATE RF meter	Indicates rf output voltage of 40kw PA.
79	OUTPUT meter	Indicates rf output current of 40-kw PA during unbalanced output operation.
80	AC POWER lamp	When lit, indicates that MAIN POWER circuit breaker(93) is on.
81	TUNE lamp	When lit, indicates that OUTPUT LOADING switch (19) on 10-kw PA is set at TUNE.
82	OPERATE lamp	When lit, indicates that OUTPUT LOADING switch (19) is set at OPERATE.
83	PLATE ON lamp	When lit, indicates that full ac voltage is applied to 40-kw high voltage rectifier.
84	TUNE control	Tunes output of 40-kw PA to desired frequency.
85	BAND SW switch	Sets operating frequency range of 40-kw PA.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
86	LOAD control	Varies output impedance of 40-kw PA.
87	BANDSWITCH RELEASE switch	When depressed, permits BAND SW switch (85) to be turned. When released, BAND SW is locked in position.
88	OVERLOAD RESET switch pushbutton	When depressed after an overload occurs, resets relays in PA frame relay panel, and ovld reset relay in the exciter drawer.
89	INTERLOCK INDICATOR lamp	When lit, indicates that interlock circuit selected by INTERLOCK switch is closed.
90	HV BREAKER INDICATOR lamp	When lit, indicates that main breaker CB8101 is closed.
91	HV BREAKER RESET switch	When depressed, actuates breaker motor B8101, closing main breaker CB8101.
92	PA LIGHT switch	When set at ON, turns on light in 40-kw PA.
93	MAIN POWER circuit breaker	Applies ac power to PA frame and PA frame.
94	HIGH VOLTAGE circuit	Causes ac voltage to be applied to 40-kw high voltage relay.
95	INTERLOCK switch	Selects interlock switch circuit to be checked by INTERLOCK INDICATOR lamp as follows:

Position	Circuit or Condition Checked
EXTERNAL	OUTPUT LOADING switch (19) is set at OPERATE. HV DECK door and REAR DOOR in position on 10K main frame.
PA DECK	Shield on 40-kw PA is position.
BIAS DRAWER	Bias supply drawer secured.
REAR DOOR (PA FRAME)	Rear door on PA frame secured.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
95 Cont.	INTERLOCK switch	Selects interlock switch circuit to be checked by INTERLOCK INDICATOR lamp as follows: Position — Circuit or Condition Checked AIR SW — Main PA blower operating. BAND SW — BAND SW properly set in detent. HV RECT — 40-kw high voltage rectifier secured. CROWBAR — Crowbar drawer secured. REAR DOOR (PS FRAME) — Rear door on PS frame secured. TIMER — Contacts on TIME DELAY timer (106) closed. Front bottom shield on PS frame in position.
96	BIAS ADJ control	Adjusts output of 600-volt regulated power supply in bias supply.
97	SWR OVLD ADJ control	Sets operating poing of SWR OVLD relay on PA frame relay panel.
98	RETUNE OVLD ADJ control	Sets operating point of RETUNE OVLD relay on PA frame relay panel.
99	AC POWER lamp	When lit, indicates that ac power applied to bias supply drawer.
100	BIAS lamp	When lit, indicates +600 volts dc present in bias supply drawer.
101	LV lamp	When lit, indicates that 350 volts dc is present in bias supply drawer.
102	BIAS lamp	When lit, indicates that bias voltage applied to 40-kw PA.
103	PLATE OVLD lamp	When lit, indicates that overload has occured in plate circuit of 40-kw PA.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
104	GRID OVLD lamp	When lit, indicates that overload has occured in grid circuit of 40-kw PA.
105	FILAMENT TIME meter	Indicates operating time of 40-kw PA filament circuit.
106	TIME DELAY meter	Prevents application of high voltage to 40-kw PA before preset time interval has expired.
107	BLOWER DELAY timer	Allows blower to operate for 5 minutes after the 40-kw PA MAIN POWER breaker is set at OFF.
108	PLATE TIME meter	Indicates operating time of 40-kw PA plate circuit.
109	RETUNE lamp	When lit, indicates that level of PA rf plate voltage is too low with respect to level of dc plate current in 40-kw PA.
110	SWR lamp	When lit, indicates excessive VSWR in unbalanced antenna transmission line.
111	FINAL FILAMENT lamp	When lit, indicates defect in 40-kw PA filament circuit.
112	BIAS RELAY ADJ control	Sets operating point of BIAS relay in PA frame relay panel.

TABLE 2-3 POWER SUPPLY FRAME CONTROLS AND INDICATORS

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
113	PLATE OVLD ADJ control	Sets operating point of PLATE OVLD relay in PA frame relay panel.
114	GRID OVLD ADJ control	Sets operating point of GRID OVLD relay in PA frame relay panel.
115	TUNE PROTECT ADJ control	Sets operating point of TUBE PROTECT relay in PA frame relay panel.
116	DRIVER INTERLOCK IND lamp	When lit, indicates high voltage is not applied to 10-kw PA.
117	DRIVER INTERLOCKS switch	In ON position, permits high voltage to be applied to 10-kw PA.

NUMERICAL DESIGNATION	PANEL DESIGNATION	FUNCTION
	NOTE After the main frame is powered and high voltage is applied to 10-kw PA, DRIVER INTERLOCKS switch should be set at OFF position to insure full interlock protection.	
118	GRID CURRENT meter	Indicates grid current of 40-kw PA tube.
119	GRID VOLTS meter	Indicates bias voltage applied to 40-kw PA.
120	PLATE VOLTS meter	Indicates dc plate voltage of 40-kw PA.
121	CROWBAR FILAMENT meter	Indicates ac voltage applied to filament or reservoir of thyratron in crowbar drawer.
122	SWR meter	Indicates VSWR of unbalanced antenna transmission line.
123	RESERVOIR ADJ control	Adjusts ac voltage applied to reservoir filament of thyraton in crowbar drawer.
124	BLOWER circuit breaker	Applies power to main blower in 40-kw PA.
125	FIL ADJ selector switch	Selects proper primary voltage for application to 40-kw PA filament transformer, 40-kw high voltage rectifier crowbar drawer, and bias supply.
126	CAL-SWR switch	In CAL position, permits calibration of SWR meter circuit. In SWR position, permits SWR meter to measure VSWR.
127	CAL control	Calibrates SWR meter.
128	FINAL FIL circuit breaker	Applies ac power to filament circuit of 40-kw PA.

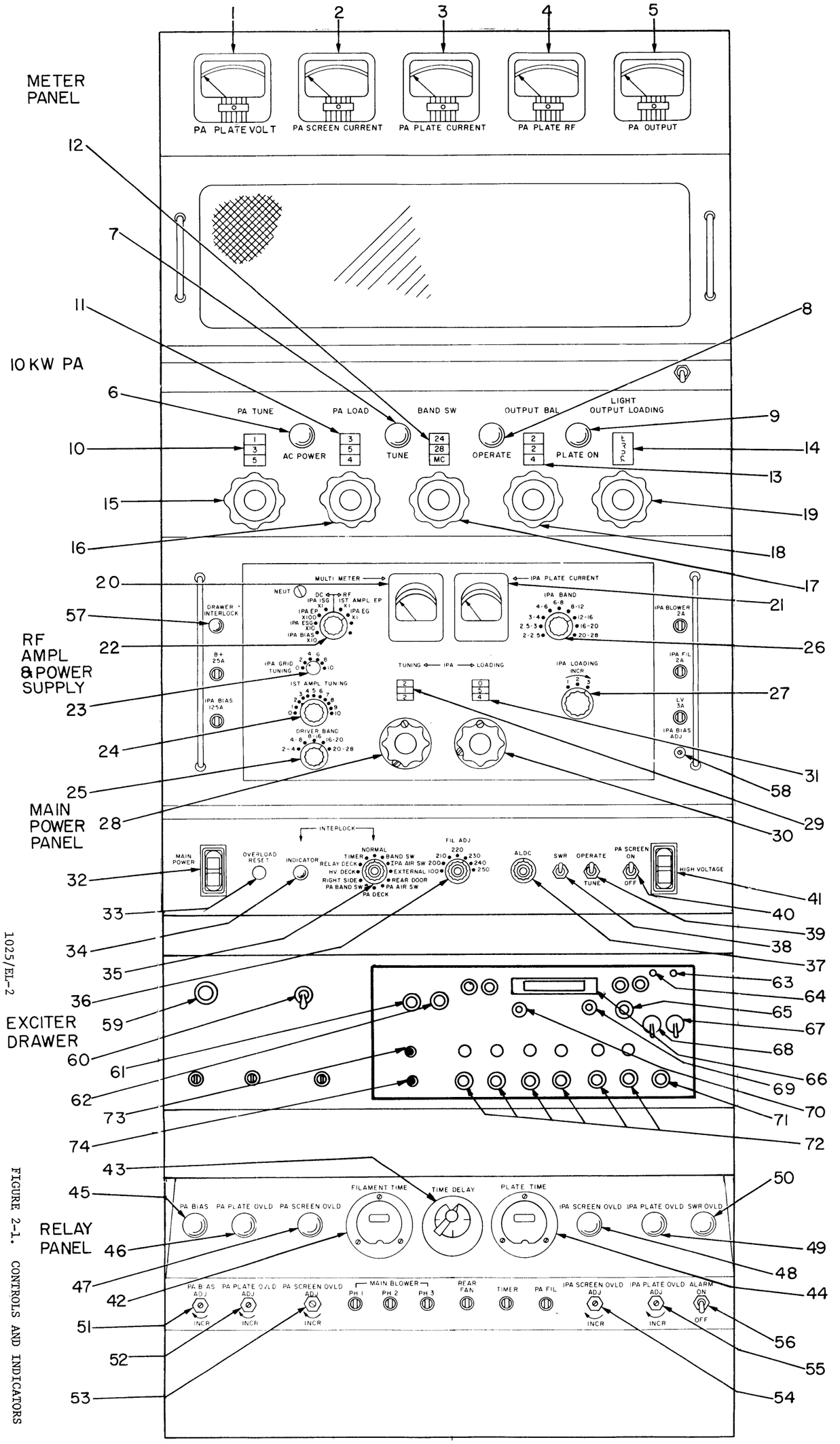

FIGURE 2-1. CONTROLS AND INDICATORS

1025/EL-2

2-13/2-14

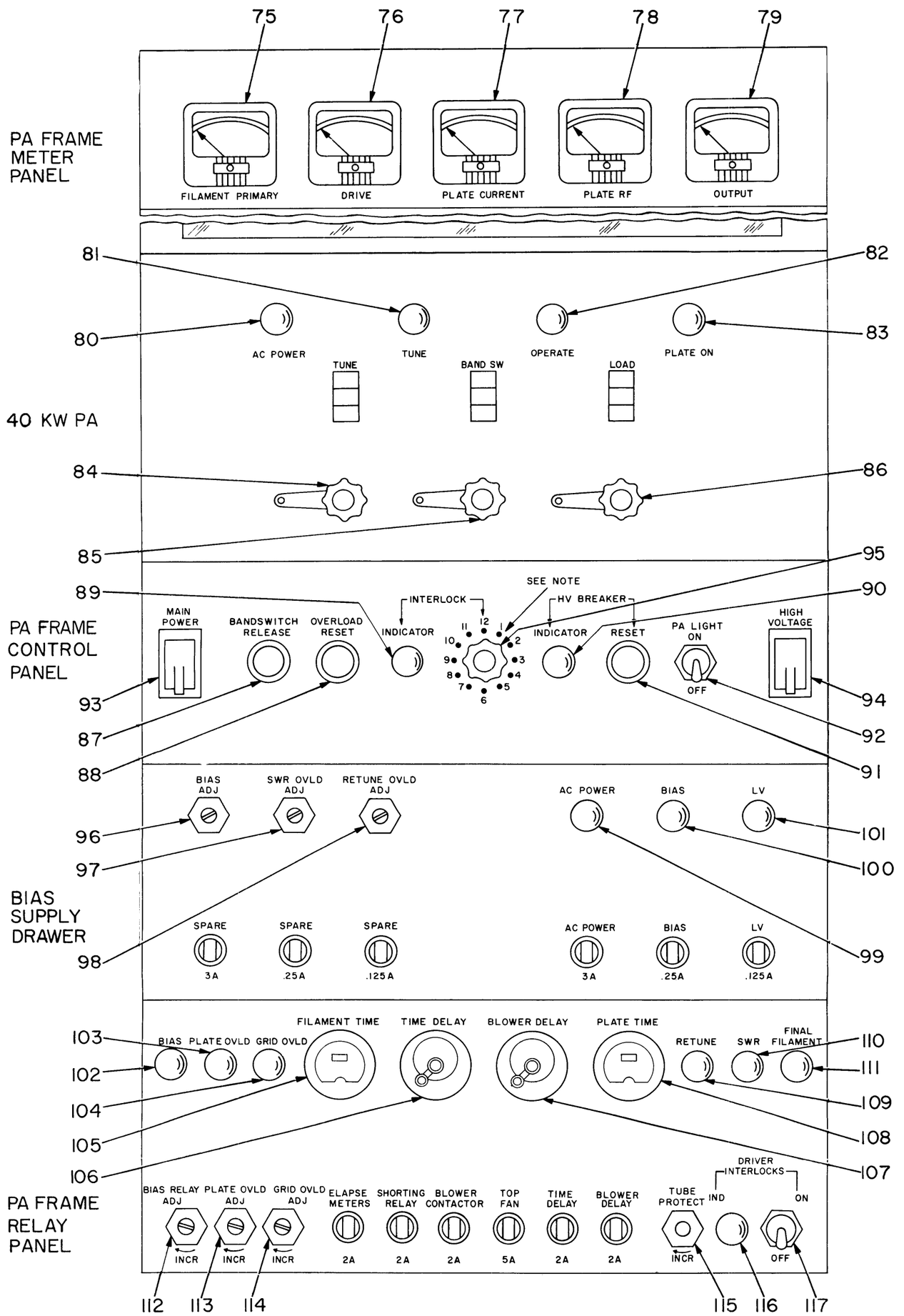

FIGURE 2-2. CONTROLS AND INDICATORS

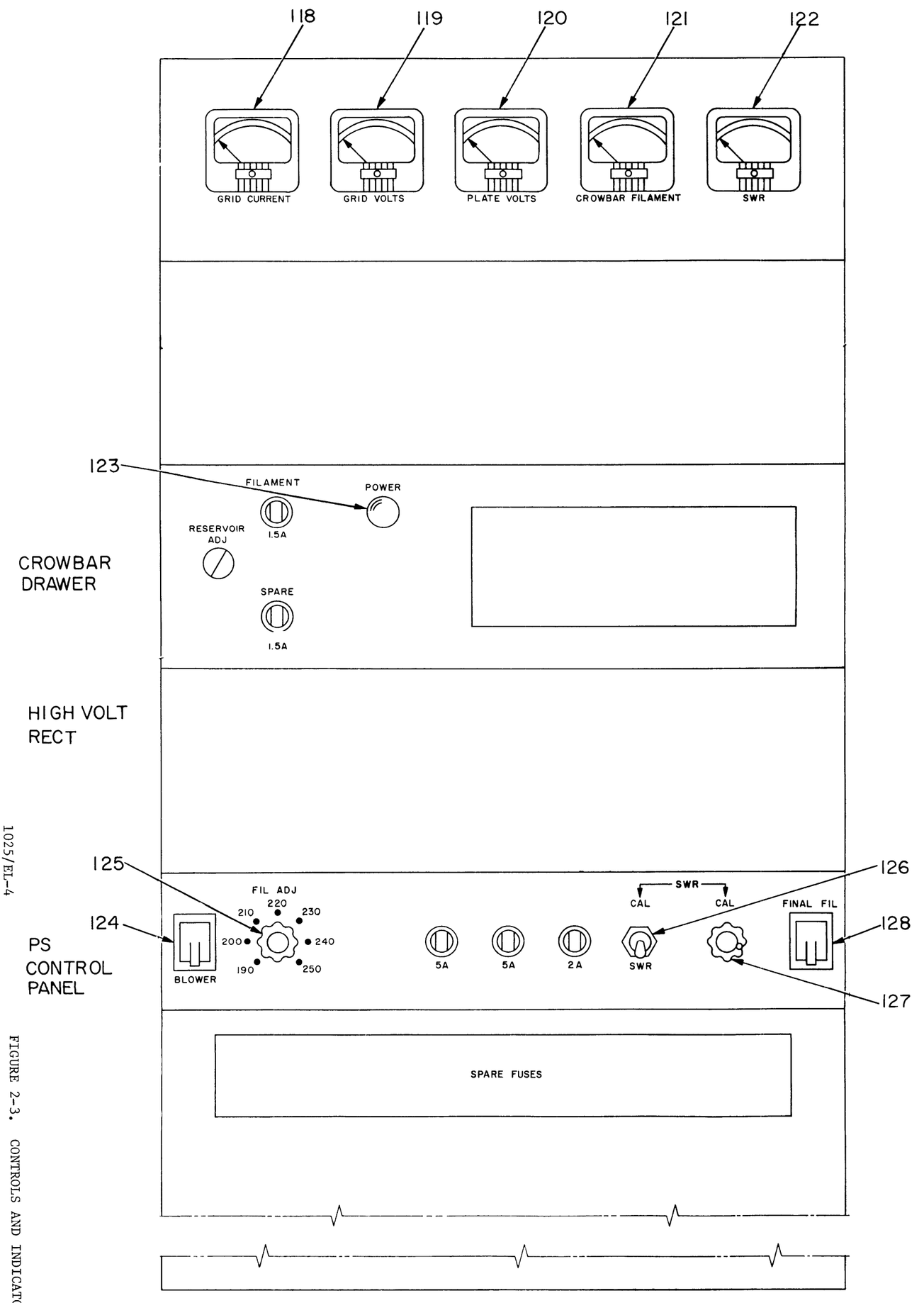

FIGURE 2-3. CONTROLS AND INDICATORS

2-4. PRELIMINARY PROCEDURES.

1. Set EXCITER DRAWER switch (59) at ON.

2. Set POWER switch (68) at ON.

3. Set EXCITER switch (67) at ON when using either the USB or LSB 600 ohm line control (69) or (70). Set EXCITER switch at PTT when using a mike jack.

4. Set MODE switch (71) at AM.

5. Select the desired operating frequency with the FREQUENCY SELECTION switch (72).

6. Turn METER switch (62) to the USB position.

7. Adjust the MIKE or LINE control (69 or 70) of sideband selected, to desired level as indicated by MONITOR (66).

8. Turn Meter switch (62) to the USB position.

9. Adjust the MIKE or LINE control (69 or 70) to desired level as indicated by MONITOR (66).

NOTE

DO NOT EXCEED RED REGION ON MONITOR (66). When mike input is used adjust level so as not to exceed red region with highest input from microphone.

10. Turn METER switch (62) to the RF POSITION and adjust RF output control for the desired level of RF output indicated on monitor (66).

NOTE

Turn RF OUTPUT control (61) fully CCW before selecting different modes of operation.

CAUTION

Turn RF OUTPUT control (61) fully CCW before performing next steps of operation.

2-5. TUNE-UP OF 1-KW IPA, 10-KW PA, AND 40-KW PA ON CARRIER.

a. PRELIMINARY PROCEDURE. - Before applying power to the 10-KW frame, 40-KW frame, and PS frame, set up the tuning controls on these units for selected carrier frequency in accordance with the appropriate factory tuning chart

prepared for your transmitter. This chart was prepared from a typical transmitter at the factory, with the transmitter operating into a dummy load. If control settings are set up as shown, the charts should provide a good starting point for tuning the transmitter. When the transmitter is tuned using an antenna, the tuning will change somewhat. If necessary, modify the tuning charts so that they reflect actual field conditions. Preset the following controls on the transmitter:

UNIT	CONTROL
10-kw PA	PA TUNE (15)
	PA LOAD (16)
	BAND SW (17)
	OUTPUT BAL (18)
	OUTPUT LOADING (19) TO TUNE
RF Amplifier RFC (1-kw IPA)	IPA GRID TUNING (23)
	1ST AMPL TUNING (24)
	DRIVER BAND (25)
	IPA BAND (26)
	IPA LOADING (27)
	IPA TUNING (28)
	IPA LOADING (30)
40-kw PA	TUNE (84)
	BAND SW (85)
	LOAD (86)

On the main power panel (10kw frame), set controls as follows:

CONTROL	POSITION
PA SCREEN (40)	OFF
TUNE-OPERATE (39)	TUNE
HIGH-VOLTAGE (41)	OFF
ALDC (37)	OFF

CONTROL	POSITION
INTERLOCK (35)	NORMAL

1. Set TIME DELAY control (43) at 5 minutes.

2. Set MAIN POWER circuit breaker (32) at ON:

   a. Main frame blowers should start up.

CAUTION

It is possible for a three phase blower to run backward, diminishing the flow of cooling air. To check rotation of main frame 10K PA blower, allow blower to run for a few seconds, then set MAIN POWER circuit breaker at off. As blower slows, observe rotor blade to make sure it is turning in direction indicated by arrow stenciled on blower case. Reversing any pair of three-phase power inputs at rear of 40KW frame will correct blower rotation.

   b. TUNE lamp (7) should light.

   c. PA BIAS lamp (45) should light, then go off when rf amplifier drawer warms up.

   d. Turn PA Bias ADJ (51) completely CCW, and then adjust PA Bias ADJ for .5 amp PLATE current reading on PA plate current meter (77).

   e. Set MULTIMETER switch (22) at DC IPA BIAS.

   f. Adjust IPA BIAS ADJ control (51) so that MULTIMETER (20) indicates -100 volts.

   g. Set FILAMENT ADJ switch (36) to the closest setting of input primary power.

   h. At expiration of 5-minute preset time delay period, INTERLOCK INDICATOR (34) lamp on main power panel should glow.

NOTE

If INTERLOCK INDICATOR lamp (34) does not light, rotate INTERLOCK switch (35) clockwise from its NORMAL position. At first position that INTERLOCK INDICATOR (34) goes out, note switch designation and check interlock at that location. When open interlock has been closed, return INTERLOCK switch to NORMAL position. When NORMAL position of switch lights INTERLOCK INDICATOR, proceed to next step.

3. Set TIME DELAY control (106) at 5 minutes, then set MAIN POWER circuit breaker (93) on 10kw PA frame control panel at ON:

   a. AC POWER lamp (80) and TUNE lamp (81) on 40-kw PA should light.

   b. The top fan in the PA frame should rotate.

   c. The AC POWER lamp (99) on the bias supply drawer should light. After a short delay, the BIAS and LV lamps (100) (and 101), respectively) should also light.)

   d. POWER lamp (123) on the crowbar drawer should light and CROWBAR FILAMENT meter (121) should indicate crowbar filament voltage.

   e. DRIVER INTERLOCK IND lamp (116) on 40-kw PA frame should light.

4. Set BLOWER circuit breaker (125) at ON position. The main blower in the 40-KW PA frame should rotate.

CAUTION

It is possible for a three-phase blower to run backward, diminshing the flow of cooling air. To check rotation of 40kw PA frame main blower, allow blower to run for a few seconds, then set BLOWER circuit breaker at OFF. Observe main blower motor shaft (portruding through case of main blower motor) to make sure it is turning in direction indicated by arrow stenciled on blower case. Reversing any pair of three-phase power in puts are rear of 40kw PA frame will correct blower rotation.

5. Set FINAL FIL circuit breaker (129) at ON position:

   a. FILAMENT TIME meter (105) should start registering elapsed time.

   b. FILAMENT PRIMARY meter (75) should read 230 volts. If necessary adjust FIL ADJ (126) until this reading is obtained.

   c. TUNE-UP OF 1-KW IPA AND 10-KW PA ON CARRIER.

CAUTION

When tuning and loading the 1-kw IPA and 10-kw PA, do not exceed the following meter indications:

PA PLATE CURRENT (3) :

At start of loading	1 amp
At end of loading	1.75 amp
PA SCREEN CURRENT (2) :	50 ma

PA PLATE RF (4) : 6 kv

IPA PLATE CURRENT (21) : 400 ma

IPA screen current (as read on MULTIMETER (20) with MULTIMETER switch (22) set to DC IPA ISG): 25 ma

1. Set MULTIMETER switch (22) at RF 1ST AMPL EP position.

2. Apply rf drive from exciter by slowly advancing RF OUTPUT control (61) on MMX until indication is observed on MULTIMETER (20).

3. Carefully adjust 1ST AMPL TUNING control (23) until peak is obtained on MULTIMETER (20). Adjust OUTPUT control (61) as necessary to keep meter reading on scale.

4. Set MULTIMETER switch (22) at RF IPA EG position.

5. Adjust IPA GRID TUNING control (23) for maximum reading on MULTIMETER (20).

6. Readjust 1ST AMPL TUNING control (23), if necessary, to peak reading on MULTIMETER (20).

7. Reduce rf drive to minimum with RF OUTPUT control (61) on MMX.

8. Depress OVERLOAD RESET push button (33).

9. Set HIGH VOLTAGE circuit breaker (41) at ON position. PLATE ON lamp (9) on power amplifier should light. PA PLATE meter (3) should indicate plate voltage (7.5 kv). DRIVER INTERLOCKS IND lamp (116) 40kw on PA frame should go out. PA PLATE CURRENT METER (3) and IPA PLATE CURRENT METER (21) should indicate zero current.

10. Carefully advance RF OUTPUT control (61) on MMX until increase is noted on IPA PLATE CURRENT meter (21).

11. Rotate IPA TUNING control (28) until dip is obtained on IPA PLATE CURRENT meter (21).

12. Carefully advance RF OUTPUT control (61) until some slight reading is obtained on PA PLATE CURRENT meter (21).

13. Adjust PA TUNE control (15) until a dip is obtained on PA PLATE CURRENT meter (2). The indication on the PA PLATE RF meter (4) should simultaneously maximize at this tuning point.

14. Reduce rf drive to minimum with RF OUTPUT control (61).

15. Set PA SCREEN switch (40) at ON.

NOTE

To prevent energizing PA screen overload circuit in main frame, be careful not to turn on PA SCREEN switch when TUNE-OPERATE switch is set to OPERATE. The proper sequence for applying full screen voltage is as follows:

TUNE-OPERATE switch (39) at TUNE

HIGH VOLTAGE circuit breaker (41) at ON

PA SCREEN switch (40) at ON

TUNE-OPERATE switch (39) at OPERATE

NOTE

If any overload relay becomes energized, high voltage is automatically turned off. If this occurs, reduce rf drive to minimum, set TUNE-OPERATE switch (39) at TUNE AND PA SCREEN switch at OFF and momentarily depress OVERLOAD RESET button. High voltage will be reapplied. Retune high voltage circuits, starting with step (8) above.

16. Set TUNE-OPERATE switch (39) at OPERATE position. Adjust PA BIAS ADJ (51) for reading of 200 ma on IPA PLATE CURRENT meter (3).

17. Retune 1-kw IPA circuits as described in steps (1) through (7) and (10) and (11) above.

18. Alternately load 1-kw IPA with IPA LOADING controls (30 and 27) to give an increased reading on IPA PLATE CURRENT meter (21), and tune 1-kw IPA with IPA TUNING control (28) for a dip on IPA PLATE CURRENT meter. Continue to load and tune IPA, loading in small increments, until IPA PLATE UCRRENT meter reads approximately 300 ma. Set MULTIMER switch (22) to IPA ISG position and check that IPA screen current is approximately 15 ma as displayed on MULTIMETER (22). If IPA screen current is above 15 ma, increase IPA plate loading and retune until proper screen current is obtained.

CAUTION

During IPA loading phase, be careful to limit drive to keep reading on PA PLATE CURRENT meter (3) at a reasonable level (below one amp.).

19. Alternately load the 10-kw PA with PA LOAD control (116) to give an increased reading on PA PLATE CURRENT meter (3), and tune PA with PA TUNE control (15) for a dip on PA PLATE CURRENT meter. Continue to load and tune 10-kw PA, loading in small increments until approximately 1.5 amperes is obtained on PA PLATE CURRENT meter (3) and 2 to 5kv rf is obtained on PA PLATE RF meter (4). Check that the reading on PA SCREEN CURRENT meter (2) is below 50-ma. If PA screen current is excessive, increase the PA plate loading and retune until proper screen current is obtained.

20. Reduce rf drive to minimum with RF OUTPUT control (61) on MMX.

21. Set HIGH VOLTAGE circuit breaker (41) to OFF position. DRIVER INTERLOCKS IND lamp 116 should light.

2-6. TUNE-UP OF 40-KW PA. - UNBALANCED OUTPUT OPERATION.

CAUTION

When tuning and loading the 40-kw PA, do not exceed the following meter indications:

PLATE CURRENT (77):	
At start of loading	2 amperes
At end of loading	6 amperes
PLATE RF (78):	8 kv
GRID CURRENT (118)	200 ma

1. Set OUTPUT LOADING control (19) at OPER. TUNE lamp (81) should go out and OPERATE lamp (82) should light.

2. Set DRIVER INTERLOCKS switch (117) at ON position.

3. Depress OVERLOAD RESET switch (88) and HV BREAKER RESET switch (91). None of the lamps on the 40-kw PA frame relay panel (except DRIVER INTERLOCKS IND light) should be on.

4. Rotate INTERLOCK switch (95) clockwise through its 12 positions. INTERLOCK INDICATOR lamp (95) should light at each position. (When the switch is set at TIMER, the preset time delay interval must first expire before the lamp will light.)

NOTE

If the lamp fails to light in any position, check the drawer, door, or panel that corresponds to the first switch position which INTERLOCK INDICATOR lamp (89) fails to light. CORRECT open interlock condition before proceeding to the next step.

5. Adjust BIAS ADJ (96) on PA frame for an indication of 550 volts on GRID VOLTS meter (119). Set HIGH VOLTAGE circuit breaker (94) at ON. PLATE ON lamp (83) on the 40-kw PA and the red lamp inside the 40-kw PA section should glow after approximately 5 seconds. Adjust BIAS ADJ (96) on PA frame for an indication of 1.8 amperes on PLATE CURRENT meter (77).

6. Set HIGH VOLTAGE circuit breaker (41) on main frame at ON.

7. When DRIVER INTERLOCK IND lamp (116) goes out, set DRIVER INTERLOCKS switch (117) at OFF position.

8. Carefully turn RF OUTPUT control (61) on MMX clockwise until an increase is indicated on PLATE CURRENT meter (77).

9. Adjust TUNE control (84) for a dip on PLATE CURRENT meter (77).

10. Turn OUTPUT control (61) clockwise until PA PLATE CURRENT meter (3) reads approximately 2 amperes.

11. Adjust PA TUNE control (115) for a dip on PA PLATE CURRENT METER (103).

12. Adjust IPA TUNING control (128) for dip on IPA PLATE CURRENT meter (121).

13. Adjust LOAD control (212) for rise on OUTPUT meter (205) reading.

14. Adjust TUNE control (210) for dip on PLATE CURRENT meter (203).

15. Repeat steps (14) and (15) until reading on OUTPUT meter (205) is either 16.6 kw (72 ohm load) or 20 kw (50 ohm load).

16. Adjust PA TUNE control (115) for dip on PA PLATE CURRENT meter (103).

17. Adjust IPA TUNING control (128) for dip on IPA PLATE CURRENT meter (121).

18. Hold the CAL-SWR switch (255) in the CAL position and adjust SWR CAL control (256) until the pointer on SWR meter (248) is aligned with the CAL mark, then release the switch.

19. Repeat steps (14) through (18) until full rated (see NOTE below) is obtained on OUTPUT meter. Note the corresponding reading on PLATE RF meter (224). This reading will be used in setting up the transmitter for full PEP after modulation is applied.

NOTE

At conclusion of tuning procedure, the meter readings on the PA and PS frames should agree approximately with the following values:

DRIVE	300-600 volts
PLATE CURRENT	4-5 amperes

PLATE RF (78)	5-8 kv
OUTPUT (79)	16.6 kw (72 ohm load) (50 ohm load)
GRID CURRENT (118)	0-125 ma
GRID VOLTS (119)	450-550 volts
SWR (112)	Less than 2.5

b. Set up the automatic load and drive control (ALDC) circuit follows:

1. Set ALDC switch (37) at ON. Advance this control until reading on OUTPUT meter (79) just begins to drop.

2. Increase rf drive until reading on PLATE RF meter (79) is the same as in step 8.

2-7. FINAL CARRIER TUNE-UP CHECK.

Recheck setting of TUNE control (84) and PA TUNE control (15) to make sure that interaction has not affected tuning. If necessary touch up control settings. This completes tune-up of transmitter on carrier. Reduce rf drive to minimum with RF OUTPUT control (61) on MMX.

2-8. OPERATING PROCEDURE OF SINGLE SIDEBNAD WITH ANY DEGREE OF CARRIER.

1. Refer to steps 2 thru 4 in the setup of MMX, in setting up for Preliminary operation. (Paragraph 2-4).

2. Select the desired sideband with Mode switch.

3. Select the desired operating frequency with the FREQUENCY SELECTION switch (72).

4. Turn METER switch (62) to the desired sideband.

5. Step five is the same as step 8 described in preliminary operation.

6. Turn METER switch (62) to the CARRIER position and adjust CARRIER control (65) to the desired level as indicated on MONITOR (66).

7. Tune up the transmitter on carrier as described in paragraph 3-5, 3-6 and 3-7.

8. With modulating inputs set up, carefully turn up rf drive with OUTPUT control (11) on MMX until reading on PLATE RF meter indicates the same voltage as when tuned on carrier only. See paragraph 2-6 for unbalanced output operation. When transmitter output is brought up to this point, output level is approximately 40-kw PEP.

NOTE

When multiple tone transmission is employed, some reduction in antenna current will be noticed, as compared with the value obtained with pure carrier power output. This is normal and results because of instantaneous addition and cancellation of tones. Do not increase drive above the previously observed rf plate voltage -- such action may produce excessive distortion.

9. Increase rf drive until reading on PLATE RF meter 78 is the same as in step 8.

10. Apply drive to transmitter as described in paragraph 2-8, steps 6 and 8.

2-9. OPERATING PROCEDURE FOR FACSIMILE.

1. Refer to Steps 2 thru 4 described in Preliminary operation.

2. Turn MODE switch (71) to FAX position.

3. Set FREQUENCY SELECTION switchs (72) to the desired center frequencies.

4. Tune up the transmitter on carrier as described in paragraph 2-5, 2-6, and 2-7.

2-10. OPERATING PROCEDURE FOR FREQUENCY SHIFT KEYING.

1. Refer to steps 2 thru 4 in preliminary operation. Paragraph 2-4.

2. Turn MODE switch (71) to FSK position.

3. Set FREQUENCY SELECTIONS switches (72) to the desired center frequency.

4. Select appropriate FSK operation by setting switches S110 and S111.

5. Place SENSE switch S109 to the desired amount.

6. Tune up the transmitter on carrier as described in paragraph 2-5, 2-6, and 2-7.

2-11. OPERATING PROCEDURE CARRIER WAVE.

1. Refer to steps 2 thru 4 described in preliminary operation.

2. Set MODE switch to the CW position.

3. Tune up the transmitter on carrier as described in paragraph 2-5, 2-6, and 2-7.

NOTE

SSB, DSB, ISB, and CW OPERATION. Perform the applicable procedures described in paragraph 2-8 through 2-11. When applying drive to the transmitter, be careful to limit peak envelope power, as indicated on PA OUTPUT meter 5 to 10 kilowatts.

2-12. STOPPING PROCEDURES.

a. STANDBY. - When the GPT-40K is to be turned off for a limited interval of time, the temperature control oven circuts in the exciter should be left on to maintain maximum frequency stability. To place the transmitter in standby, proceed as follows:

UNIT	CONTROL	POSITION	ACTION
40KW PA frame control panel	HIGH VOLTAGE (94)	OFF	All indicators on PA and PS frames go off and meters drop to zero.
	MAIN POWER (93)	OFF	
PS frame control panel	BLOWER (124)	OFF	
	FINAL FIL (128)	OFF	
10K frame control panel	PA SCREEN (40)	OFF	All indicators on main frame go off.
	TUNE-OPERATE (39)	TUNE	
	HIGH VOLTAGE (41)		
	MAIN POWER (32)	ON	
MMX	STANDBY/ON (68)	STANDBY	Light glows.
40K PA Frame Control	HIGH VOLTAGE (41)	OFF	
	MAIN POWER (32)	OFF	
PS Frame Control Panel	BLOWER (124)	OFF	
	FINAL FIL (129)	OFF	
10KW Power Panel	PA SCREEN (40)	TUNE	
	TUNE-OPERATE (39)	OFF	
	HIGH VOLTAGE (41)	OFF	
	MAIN POWER (32)	OFF	

a. EMERGENCY STOPPING. - For quick stopping during an emergency, set the following circuit breakers at OFF:

UNIT	CONTROL	POSITION	ACTION
10KW Power Panel	MAIN POWER (93)	OFF	
	MAIN POWER (32)	OFF	
	BLOWER (124)	OFF	

NOTE

Every attempt should be made to maintain power to the exciter at all times. Indiscriminate interruption of power will result in lose of frequency stability and may require resetting.

2-13. OPERATOR'S MAINTENANCE.

a. GENERAL. - The operator should observe that transmitter controls, indicator lamps, and meters are functioning properly. During daily operation, all electrical quantities measurable with built-in meters should be observed and compared with established standards. Noticable irregularities should be immediately referred to maintenance personnel.

b. REPLACEMENT of fuses. - Table 2-4 list all fuses in the transmitter, their panel designations, types, and indicate their functions.

CAUTION

Never replace a fuse 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.

TABLE 2-4. 10-KW FRAME, FUSE LOCATIONS AND FUNCTIONS

LOCATION	PANEL MAIN BLOWER	TYPE	CIRCUIT PROTECTED	REFERENCE DESIGNATION
Relay Panel	MAIN BLOWER	MDL 10	Main blower B800	F700 through F702
Relay Panel	PAL FIL	MDL 5	Filaments of PA V900	F705
Relay Panel	TIMER	MDL 1	Timer M701	F704
RF amplifier drawer	B+	MDL 1/4	Plate circuits of V201 and V202 in RFC	F2000

LOCATION	PANEL DESIGNATION	TYPE	CIRCUIT PROTECTED	REFERENCE DESIGNATION
RF amplifier drawer	IPA BIAS	MDL 1/8	Bias circuit of PA V900	F2001
RF amplifier drawer	IPA BLOWER	MDL 2	Blower B201	F2002
RF amplifier drawer	IPA FIL	MDL 2	Filament of IPA V203	F2003
RF amplifier drawer	LV	MDL 1.5	Rf amplifier driver	F2004
MMX	Line		Protects Power Supply circuitry	F101 & F102
Exciter Drawer	Line		Protects Power Supply	F200 & F201
	DC		Protects Bridge rectifier circuit	F202

SECTION 3
PRINCIPLES OF OPERATION

3-1. GENERAL.

This section presents the principles of operation of the 40-kw PA section of the GPT-40K Transmitter. It includes the operation of the Bias Supply, the Relay Panel, Crowbar Drawer, 40-kw High Voltage Rectifier, Interlock Circuits and AC and DC power distribution.

For the principles of operation of the 10-kw driver section, refer to the maintenance manual for the GPT-10K transmitter.

3-2. OVERALL BLOCK DIAGRAM ANALYSIS. (see figure 3-1)

An rf signal from the Multi-Mode exciter MMX is applied to the input of RF Amplifier RFC-1, which is the 1-kw IPA (intermediate power amplifier.) The rf input signal must be within the frequency range of 2 to 30-mc and may be modulated or unmodulated. The linear stages of the RFC raise the level of the input signals as high as 1-kw PEP. This signal is applied to the 10-kw PA. The 10-kw output signal is applied to the 40-kw PA.

When switches S907 and S908 are in the TUNE position relay K900 allows the signal to pass through the TUNE OUTPUT jack J905 in the 10-kw Driver and enter P7301 in the 40-kw section of the transmitter. Relay K7301 positioned to the tune function by switch S907 allows the signal to pass through to the directional coupler DC7302 and out to the antenna. The 10-kw section of the transmitter may now be tuned.

After the 10-kw driver has been tuned switch S907 and S908 are turned to the OPERATE function. Relay K900 then allows the 10-kw signal to feed through to the 40-kw PA tubes. Relay K7302 positioned to the OPERATE function by switch S907 allows the signal to be coupled to the Directional Coupler DC7302 and pass out to the unbalanced antenna.

An adjustable ALDC (automatic load and drive control) signal, developed in the 10kw power amplifier section is fed back to the 1-kw IPA and exciter. The ALDC signal limits high drive peaks developed during multiple signal transmission; and subsequently, suppresses unwanted transmission by-products. This signal is functionally identical to that of an agc (automatic gain control) signal in a receiver.

Detection of voltage standing waves at the output of the 10-kw PA causes an SWR signal to be applied to the overload circuitry in the exciter drawer. When a preset level of standing waves is exceeded, an SWR overload signal causes the high voltage to be removed from the transmitter.

The 10-kw high voltage rectifier functions together with the 10-kw main power panel and main power supply to provide the high dc voltages required by the 1-kw IPA and the 10-kw PA stages.

The 10-kw relay panel contains protective circuits that automatically cut off high voltages to the 1-kw IPA and 10-kw PA when preset overload levels are exceeded in these stages. The protective circuits sample the 1-kw IPA, the bias voltage, the 1-kw IPA and 10-kw PA plate and screen currents, and the current in a voltage regulating diode assembly in the main power supply. When any of these currents are excessive, or if a voltage is out of tolerance, the associated protective relay operates and removes power from 10-kw high voltage rectifier. This action automatically removes high voltage from the 40-kw PA in the PA frame, if the DRIVER INTERLOCK switch located on 40-kw relay panel is set at OFF.

High Voltage for the 40-kw PA is supplied by a 40-kw high voltage rectifier. The B+ and B- outputs of the 40-kw high voltage rectifier are also connected across circuits in the crowbar drawer. The crowbar drawer, a protective device for the 40-kw PA, detects sharp changes in power amplifier grid current. If a sharp rise in grid current occurs (as a result of arcing), the crowbar drawer

shorts the output of the 40-kw high voltage rectifier, causing MAIN POWER breaker CB8010 to trip. This action removes power from the 40-kw high voltage rectifier.

The 40-kw PA receives a 600-volt regulated bias voltage from bias supply via PA frame relay panel. This bias supply contains an unregulated +350-volt supply and circuits associated with the standing wave and retune protective circuits. A dc voltage proportional to the 40-kw PA plate rf voltage is supplied to the retune circuit in the bias supply. A dc voltage proportional to standing waves on the unbalanced output line is supplied from directional coupler DC7302 to the SWR meter.

Protective relay circuits similar to those described for the 1-kw IPA and 10-kw PA are used ro remove high voltage from the 40-kw PA when a malfunction occurs in an associated circuit. These circuits, contained in PA frame relay panel sample bias (+600 volts), voltage standing waves, retune signals, final filament and crowbar filament voltages, and plate and grid currents. If one of these currents is excessive or if a voltage is out of tolerance, an associated relay operates and removes power from the 40-kw high voltage rectifier.

Transformer T8104 is an autotransformer that receives 208-volt 3-phase power from PA frame power amplifier control panel and supplies 230 volts ac (single phase) to the primary windings of the filament transformers in the bias supply, crowbar drawer, and the 40-kw PA. The 3-phase 208 volts ac from the power supply control panel is used for operation of the blower in the PA frame.

The transmitter also contains interlock circuits that are provided for personnel and equipment safety. Whenever one of these interlocks opens, power is removed from the transmitter. Interlock circuits are provided for drawers in which voltages greater than 500 volts are present. Important cooling air ducts are also interlocked for equipment safety.

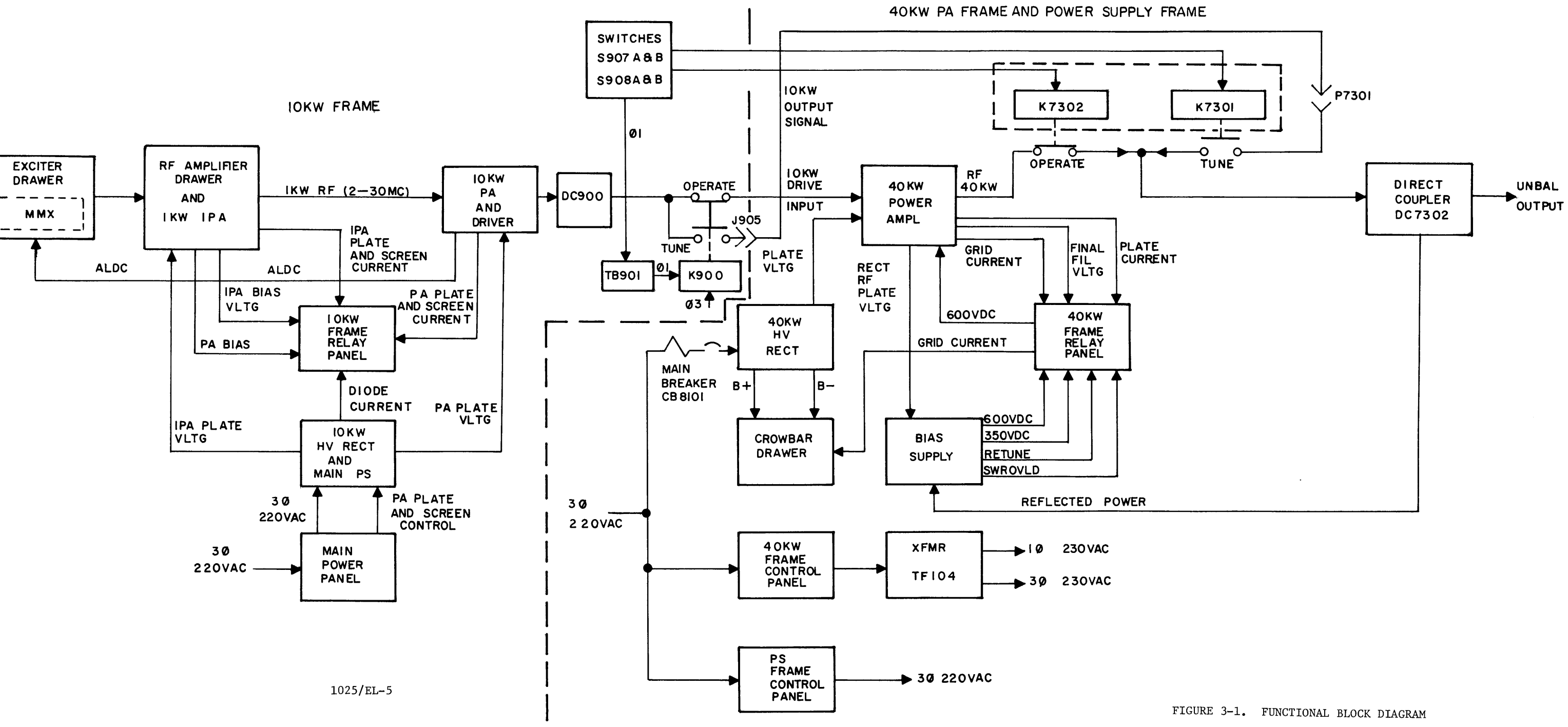

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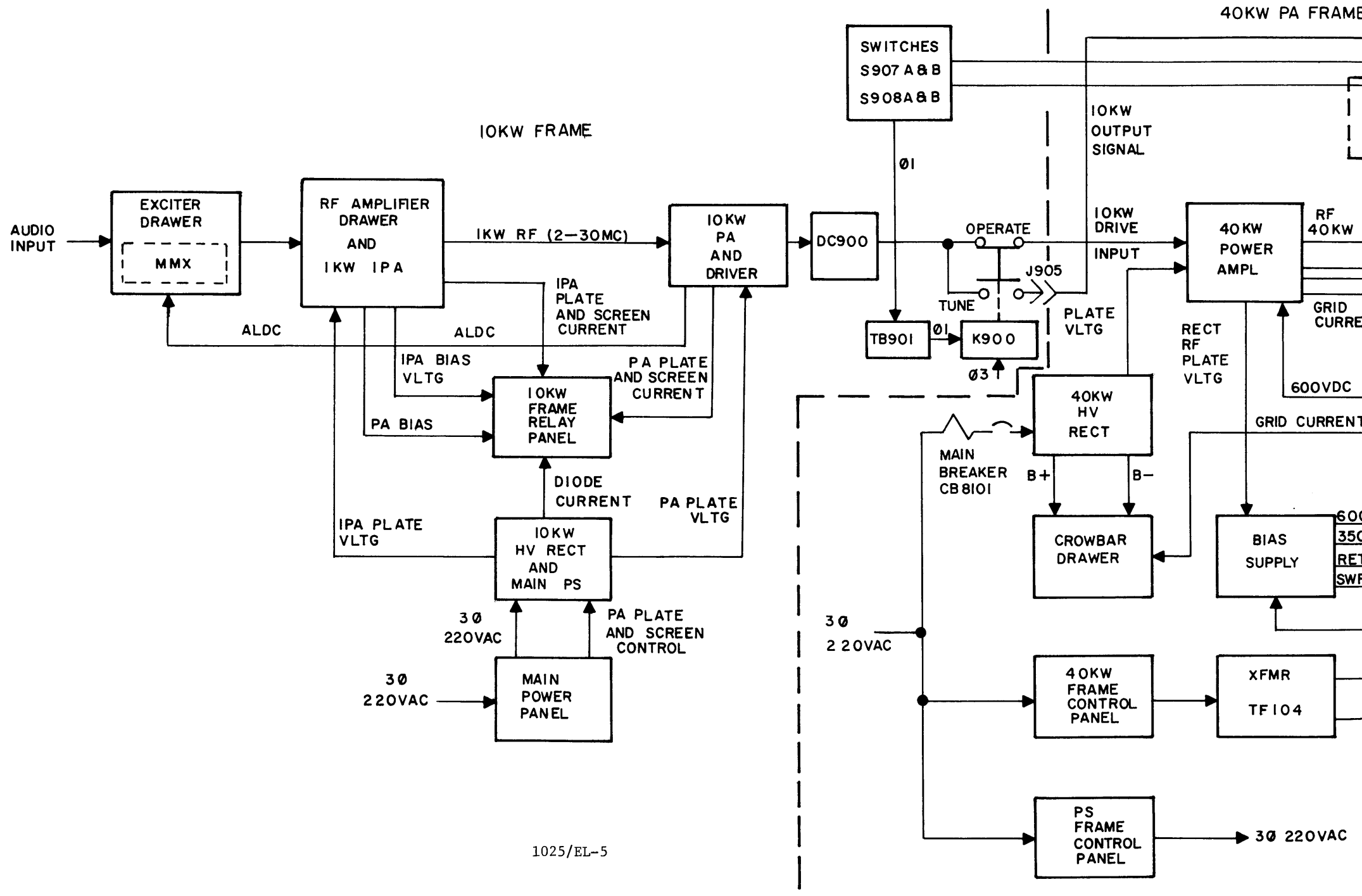
FIGURE 3-1. FUNCTIONAL BLOCK DIAGRAM


10KW FRAME
40KW PA FRAME
AUDIO INPUT
EXCITER DRAWER
MMX
RF AMPLIFIER DRAWER AND 1KW IPA
1KW RF (2–30MC)
10KW PA AND DRIVER
DC900
SWITCHES S907 A&B S908A&B
Ø1
10KW OUTPUT SIGNAL
OPERATE
10KW DRIVE INPUT
40KW POWER AMPL
RF 40KW
J905
TUNE
TB901
Ø1
K900
Ø3
PLATE VLTG
RECT RF PLATE VLTG
600VDC
GRID CURRE
GRID CURRENT
ALDC
ALDC
IPA PLATE AND SCREEN CURRENT
IPA BIAS VLTG
PA PLATE AND SCREEN CURRENT
PA BIAS
10KW FRAME RELAY PANEL
40KW HV RECT
MAIN BREAKER CB8101
B+
B–
DIODE CURRENT
PA PLATE VLTG
IPA PLATE VLTG
10KW HV RECT AND MAIN PS
CROWBAR DRAWER
BIAS SUPPLY
3Ø 220VAC
PA PLATE AND SCREEN CONTROL
3Ø 220VAC
MAIN POWER PANEL
3Ø 220VAC
40KW FRAME CONTROL PANEL
XFMR TF104
PS FRAME CONTROL PANEL
3Ø 220VAC

3-3. CIRCUIT CHANGES IN THE 10-KW AND 40-KW FRAME.

The GPT-40K is comprised of a 10-kw driver section which is the GPT-10K transmitter and a 40-kw PA section. The GPT-10K's output circuitry has been modified to enable the tune function of the 10k driver to be independent from the 40k section while tuning.

a. DRIVER V900. - In the GPT-10K transmitter, V900 serves as the final power amplifier tube. The 10-kw PEP unbalanced output is applied to the antenna through a switching matrix in the 40k section.

In the GPT-40K transmitter, V900 (figure 6-1 Sh. 3 of 4) operates as a 10-kw driver for the 40-kw PA in the PA frame. The rf output of driver V900 is coupled to output relay K900 through capacitor C911 and directional coupler DC900. Directional coupler DC900 provides the means for measuring the output power of the transmitter and VSWR of the transmission line on meter M1006. Forward power from DC900 is rectified by diode CR902, filtered by pi-filter elements C1040, L1005, and C1041, and normally applied through spring-loaded contacts of SWR switch S1017 to PA OUTPUT-SWR M1006. At this time, the meter provides an indication of transmitter output power in kilowatts PEP. Reflected power from DC900 is rectified by diode CR904, filtered by pi-filter elements C1042, L1006, and C1043, and is normally applied through closed contacts on SWR switch S1017 to an SWR protective circuit. When the switch is depressed, input to the protective circuit is opened and meter M1006 reads SWR.

When the switches S907 and S908 are in the TUNE position the output of driver V900 is coupled to TUNE Output jack J905 by relay K900. The signal then enters the 40-kw PA section through plug P7301. In the 40-kw PA section relay K7301 which is in the TUNE, position allows the signal to pass to the antenna. This arrangement permits tuning the driver to the transmitter carrier frequency with just one antenna for both the 10k and 40k sections.

When the switches S907 and S908 are in the Operate position the output of

driver V900 is fed to the driver output jack, by relay K900 which is in the operate position. The driver signal is then able to flow to the 40-kw PA tube. The amplified 40kw signal passes through relay K7302 in the operate position, before passing to the antenna.

b. RF MONITOR. - An rf monitor network in the plate circuit of driver V900 provides a sample of 10-kw rf in exactly the same manner as that in the GPT-10K. In this case, the output at jack J900 is now marked (IPA MONITOR rather than PA MONITOR).

3-4. 40-KW PA AND ANTENNA TUNING UNIT. (See figure 6-2 Sh 1 of 3)

a. GENERAL. - The 40-kw PA V7301, an ML6697 triode operating as a class AB1 grounded grid amplifier, amplifies the output of the 10-kw driver. The input to V7301 is approximately 3200 watts. The output of V7301 is 40,000 watts PEP.

The output signal from the plate of V7301 passes through a pi-network before being coupled to an unbalanced antenna.

b. DETAILED CIRCUIT ANALYSIS. - The rf output of 10kw driver V900 is applied to the cathode of 40-kw PA V7301 via terminal E7304. RF MONITOR jack J7304, provides the means of monitoring this signal. The signal is coupled from the V7301 input circuit to jack J7304 by an rf pickup coil.

Filament power at 13 volts, 205 amperes, is supplied to V7301 through transformer T7101 and rf choke L7303. Rf choke L7303 is the load impedance for the rf input signal applied to V7301. Capacitors C7312 through C7315 maintain the return ends of L7303 at rf ground. The dc path from the cathode of V7301 to B- is through L7303, the secondary of T7101, an rf filter network, PLATE CURRENT meter M7203, and a relay protective circuit. PLATE OVLD relay K7601, paralleled by resistor R7609 in series with PLATE OVLD ADJ control R7601, and TUBE PROTECT relay K7608 paralleled by TUBE PROTECT ADJ control R7606 constitute the relay protective circuit. Relay K7601 samples the V7301 cathode circuit for excessive

current, while relay K7608 operates in conjunction with RETUNE relay K7603 (described in later paragraphs) to protect V7301 from overdissipation. If the cathode current varies above or below operating limits, relay K7601 or K7608 removes the high voltage from the transmitter. Controls R7601 and R7606 set the sensitivity of relays K7601 and K7608, respectively.

The fixed cathode bias on V7301 is +600 volts dc with respect to the grid. The +600-volt dc level from the bias supply is applied to the cathode of V7301 through the normally closed contacts of switch S8106, TUBE PROTECT relay K7608, PLATE OVLD relay K7601, PLATE CURRENT meter M7203, L7112, the secondary winding of T7101, and L7303. The bias return to the grid (in this case, ground) is through contacts of GRID OVLD relay K7602, GRID OVLD relay K7602 paralleled by resistor R7603 in series with GRID OVLD ADJ control R7602, the primary winding of T8106, and GRID CURRENT meter M8202. Control R7602 sets the sensitivity of relay K7602.

The output plate circuit for V7301 is a pi-network consisting of inductor L7314, variable capacitors C7330, C7331, C7332, and switch S7307; and an L network consisting of inductors L7317, L7308, L7316, capacitor C7325, inductor L7307, and switch S7309. Switches S7307 and S7309 successively short out larger inductance as the signal frequency is increased. TUNE capacitor C7330 in the input side of the pi-network and ganged LOAD capacitors C7331 and C7332 in the output side of the pi-network provide fine tuning and loading, respectively, for the power amplifier output circuit. Inductor L7312 blocks rf, and insures that there is no dc potential across C7330, C7331, and C7332. Capacitor C7328 blocks dc and provides an rf return to ground. After the signal passes through the output plate circuit of V7301 the amplified rf output signal is coupled to the unbalanced antenna by first passing through capacitor C7325 and the contactor of relay K7302 in the operate position. The signal is then directed to Directional Coupler DC7302 and then out to the antenna for transmission

The output side of DC7302 is connected to the unbalanced OUTPUT jack. Diodes CR7303 and CR7304, connected to DC7302, rectify the forward and reflected rf signals respectively. The resulting positive dc signals are applied to an OUTPUT meter circuit and SWR meter circuit. The input signal for OUTPUT meter M7206 is coupled from CR7303 through rf filter elements C7209, L7201 and C7208. The ground path is completed through CAL-SWR switch S8502. When S8502 is set in the CAL position, M7206 is removed from the circuit. The reflected power signal is coupled from CR7304 to SWR meter M8207 through rf filter elements C7210, L7202, and C8501, CAL control R8501B and CAL-SWR switch S8502. The forward power signal is coupled to M8206 from CR7303 through filter elements C7209, L7201, and C7208, CAL-control, R8501A, and switch S8502. CAL-SWR switch S8502 is a spring-loaded double-pole doublethrow switch; normally in the SWR position. SWR meter M8207 is calibrated by holding S8502 in the CAL position and adjusting CAL control R8501 until the pointer on M8207 is aligned with the CAL marker on the meter scale (discussed in paragraph 2-6)

The switching matrix has been incorporated into the output network of the 40-kw PA tube so the 10-kw driver may have an antenna for tuning purposes, and also make it possible for the 10-kw driver section to be used as an emergency transmitter should the 40-kw PA fail.

Upon completion of tuning the 10-kw driver, the switching matrix switches the output to operate, by relays K7302 and K7301 being energized by TUNE OPERATE switches S907 and S908.

Plate voltage for V7301 is provided by 40-kw high voltage rectifier. Plate voltage is applied through inductors L7306, L7305, L7304, L7316, L7308, L7317, and L7314. Capacitors C7311, C7310, and C7316 provide plate decoupling.

Drive metering network Z7301 rectifies and filters a portion of the rf driver voltage applied to the cathode of power amplfier V7301. The dc output of drive metering network Z7301, proportional to the rf drive applied to V7301, is applied

to DRIVE meter M7202.

A sample of the rf output of V7301 is applied through a capacitive voltage divider consisting of capacitors C7326, C7304, and C7305 to plate monitor network Z7302. This network rectifies and filters the rf plate voltage and supplies a proportional dc voltage through terminal 3 to PLATE RF meter M7204. Another rectified output of Z7302 to the retune circuit in the bias power supply. The retune circuit is described in paragraph 3-5.

PLATE MONITOR jack J7104 provides means for monitoring the rf signal developed at the plate of V7301. This signal is coupled from an rf pickup coil to J7104. Resistor R7302 provides termination for a 50-ohm coaxial cable.

3-5. BIAS SUPPLY.

a. GENERAL. - The bias supply contains a 600-volt regulated voltage supply used for biasing 40-kw PA tube V7301. It also contains SWR and retune control circuits which protect the power amplifier during periods of excessive SWR or insufficient rf plate voltage, respectively. A separate 250-volt supply in this drawer provides the operating potentials for these control circuits. An associated retune relay in the relay panel also makes use of this 350-volt source.

b. DETAILED CIRCUIT ANALYSIS. - Phase 1 and phase 2 ac power (figure 6-2 sh 2 of 3 is fed to the primary of power transformer T7501. Protective interlock S7501, in series with the phase 2 line, prevents primary power from accidentally being applied to transformer T7501 when the drawer is open (the interlock may be manually closed when the drawer is open for maintenance purposes). AC POWER fuse F7503 provides overload protection. RF filtering of the primary power lines is provided by pi-filters in each ac input phase.

Rectifiers V7502 and V7503 provide full-wave rectification of the ac voltage developed across plate winding 8-10 of transformer T7501. The rectified voltage, filtered by inductor L7503 and capacitor C7506, is developed across resistor R7503,

and applied to the plates of dual-triode series regulator V7507. It is controlled by the voltage from voltage regulator V7506. The combined action of V7506 and V7507 provides a regulated +600-volt dc output in the cathode circuit of V7507 that is fed to 40-kw PA tube V7301 through jack J7502 and plug P7109.

BIAS indicator I7502, connected in series with dropping resistor R7515 across the 600-volt output, is lit when the regulator 600-volt portion of the bias supply is functioning normally. Resistor R7531 serves as a bleeder for the regulated 600-volt supply. Rf filtering is provided by capacitors C7511 and C7512 and inductor L7504. Instantaneous load surges in the +600-volt line are bypassed by capacitors C7509 and C7510.

Output voltage variations in the regulated 600-volt dc line are developed across the voltage divider consisting of resistors R7511 and R7512 and BIAS ADJ control R7513. A portion of these voltage variations are tapped from BIAS ADJ control R7513 and applied to the control grid of voltage regulator V7506. The amplified variations are developed across plate resistor R7509 and fed to the control grids of V7507 through grid resistors R7505 and R7506. The change in bias on tube V7507 acts to maintain a constant 600-volt output level. For example, if the output voltage at jack J7502 or ac input voltage tends to rise, the increase in voltage developed across the voltage divider (R7511, R7512, and BIAS ADJ R7513) appears at the control grid of V7506 as a decrease in bias. As the grid of V7506 becomes more positive, the plate of the tube becomes more negative. This negative-going voltage is applied to the grids of tube V7507 causing an increase in voltage drop across the tube. The increased voltage drop across tube V7507 compensates for the increase at jack J7502 by decreasing the output voltage. When the output voltage tends to decrease, the reverse action takes place.

Cathode, screen grid, and suppressor grid voltages for V7506 are tapped off a voltage divider consisting of resistors R7504 and R7507 and gas-type voltage regulators V7504 and V7505. The gas-type voltage regulators are used to stabilize the

cathode voltage of V7506 so that only grid voltage variation will effect the plate circuit. Capacitors C7507 and C7508 insure constant grid to cathode bias by eliminating noise. Resistors R7508 and R7510 compensate for differences in internal resistances in each half of tube V7507. BIAS fuse F7502 protects the 600-volt bias supply from overloads. Filament voltage for tubes V7506 and V7507 is provided by secondary winding 14-15 of transformer T7501. AC POWER indicator I7503 lights when primary power is applied to the bias supply.

The retune control circuit uses a dc amplifier to control the operation of the retune relay when the rf plate voltage of the 40-kw PA falls below a preset level. A portion of the detected rf signal from rf plate network Z7302 (figure 6-2) is fed to the grid of retune dc amplifier V7508A through pin J of jack J7501, rf filter network L7505 and C7515, and RETUNE OVLD ADJ control R7502. The level of this grid signal, set by RETUNE OVLD ADJ control R7502, is held relatively constant by capacitor C7513. Triode V7508A operates at a fixed cathode bias of +3 volts. This voltage is tapped off across resistor R7521, part of a voltage divider consisting of resistors R7530 and R7521. A 150-volt dc level for this voltage divider is obtained between voltage regulators V7504 and V7505 of the 600-volt portion of the bias supply. Plate voltage for triode V7508A is obtained from the separate +350-volt power supply. The +350-volt dc level is also applied across the voltage divider consisting of resistors R7523 and R7524 and potentiometer R7522, is obtained from across resistor R7524. During normal operation of the transmitter, the bias level prevents the plate current of V7508B from energizing the overload coil of the retune relay.

If the rf plate voltage of the 40-kw PA decreases, the positive dc level at the grid of tube V7508A also decreases (or becomes more negative). This appears as an increase in plate voltage which is, in turn, coupled to the grid of V7508B through resistor R7518. The positive-going grid causes an increase in plate current in V7508B. If the power amplifier rf plate voltage drops below a

predetermined level, the plate current through V5708B rises sufficiently to energize the overload coil of the relay.

The standing wave control circuit uses a dc amplifier to control the operation of the SWR relay when the reflected power on the unbalanced antenna line exceeds a preset level. In this case, the SWR protective circuit is activated by a switch contained in SWR meter M8207. Intially, the transmitter operator sets an adjustable pointer on the SWR meter to a value of SWR (2.5:1). When a level of standing waves causes meter needle deflection to reach or pass the adjustable pointer, the switch in the SWR meter closes. This action causes a positive voltage at the junction of voltage divider resistor R7532 and R7533 in the bias supply to be fed through the meter switch to the SWR input, at pin I of J7501. This positive voltage is applied to the cathode of dc amplifier V7508B, causing the plate voltage of V5709B to rise. This rise is coupled to the grid of V7509B through R7519. The same 350-volt power supply used by the retune control circuit provides plate voltage for V7509 and is also applied across the voltage divider consisting of resistors R7527 and R7525 and SWR OVLD ADJ control R7526. The cathode voltage of V7509A is normally set to prevent the plate current of this triode from energizing the overload coil of SWR relay K7604. However, application of the positive-going input at the grid of V7509A (as a result of switch closure at the SWR meter) causes the plate current to rise sufficiently to energize relay K7604.

The power supply that provides 350 volts for tubes V7505 and V7509 and for operation of the SWR and retune relays obtains its ac power from secondary winding 5-7 of transformer T7501. The ac voltage is rectified by full-wave rectifier V7501 and filtered by resistor R7501 and capacitor C7505. LV indicator I7501, connected in series with dropping resistor R7505, lights when the 350-volt power supply is operating normally. LV fuse F7501, in series with the 350-volt return line, protects the power supply for over-loads.

3-6. PA FRAME RELAY PANEL.

a. PROTECTIVE RELAY CIRCUITS. - Nine relays in the PA frame relay panel figure 6-2 sh 3 of 3 and figure 3-2) sample five currents and four voltages in the PA and PS frames of the transmitter. Contacts on eight of these relays form part of the series interlock circuit for the PA frame and the PS frame. This forms part of the transmitter interlock circuit which is discussed in paragraph 3-9.

The overload windings of PLATE OVLD relay K7601 and TUBE PROTECT relay K7608 are connected in series between the B- line and the cathode circuit of power amplifier V7301. Excess plate current in V7301 operates PLATE OVLD relay K7601 and TUBE PROTECT relay K7608. As a result, PLATE OVLD indicator I7601 lights through the closed indicator contacts of K7601; the series interlock contacts of K7601 open; and the overload winding of K7608 becomes shunted by resistor R7608 to decrease the operating current through the overload windings. In addition, the output of retune dc amplifier V7508 is connected through pin G of J7601, closed contacts of K7608, and through the overload winding of RETUNE relay K7603 to the 350-volt line which enters the PA frame relay panel at pin F of J7601. The plate current of retune dc amplifier V7508 operates the overload coil of RETUNE relay K7603, opening the series interlock contacts and causing RETUNE indicator I7603 to light through closed contacts of K7603. Upon correction of the trouble, operation of OVLD RESET switch S7401 in PA Frame Control Panel applies phase 1 ac power to all reset coils, restoring all relay settings to normal. RETUNE relay K7603 also operates if the contacts of PA TUBE PROTECT thermostat S7305 in 40-kw PA close. The overload winding of PLATE OVLD relay K7601 is shunted by PLATE OVLD ADJ control J7601 in series with resistor R7609, and the overload winding of TUBE PROTECT relay K7608 which is shunted by TUBE PROTECT ADJ control R7606. These controls determine the magnitude of the total plate current at which relays K7601 and K7608 will operate.

GRID OVLD relay K7602 and BIAS relay K7605 sense the regulated output voltage of the bias supply. This voltage enters the PA frame relay panel at pin B of J7602. Insufficent output of the bias supply causes the contacts of BIAS relay K7605 to open; subsequently opening the series interlock circuit, removal of high voltage, and illumination of BIAS lamp I7605 through contacts of K7605. An abnormal grid current level operates the overload winding of Grid OVLD relay K7602. As a result, GRID OVLD indicator 17602 lights through closed indicator contacts of K7602 and the series interlock contacts of K7602 open. Upon correction of the trouble, depressing the PA frame control panel OVLD RESET switch S7401 restores the relay settings to normal. The overload winding of GRID OVLD relay K7602 is shunted by GRID OVLD ADJ control R7602 in series with resistor R7603. The setting of GRID OVLD ADJ control R7602 determines the bias supply current that will operate GRID OVLD relay K7602. The overload winding of K7602 is connected in series with transformer T8106 and GRID CURRENT meter M8202 through contacts 9 and 10 to the output of the bias supply. Bias RELAY ADJ control R7604 and resistor R7605 are connected in series with the coil of BIAS relay K7605. The setting of BIAS RELAY ADJ control R7604 determines the output voltage of the bias supply that will energize relay K7605.

The primary of 40-kw PA filament transformer T7101 is connected in series with the coil of FINAL FILAMENT relay K7608 through pin P of J7601. Similarly, the primary of transformer T8301 in crowbar drawer is connected in series with the winding of CROWBAR relay K7609 through pin U of J7601. Loss of voltage applied to transformer T7101 or an open in the filament circuit of power amplifier V8301 causes relay K7607 to deenergize. When this occurs, the series interlock contacts of K7607 open; FINAL FILAMENT indicator I7607 lights through closed relay contacts, and power is removed from TIME DELAY

relay M7602 through open contacts of K7607. Loss of voltage applied to transformer T8301 or an open in the filament circuit of crowbar tube V8301 causes CROWBAR relay K7609 to deenergize. At this time, K7609 opens the series interlock circuit and removes power from TIME DELAY relay M7602. Contacts of CROWBAR relay K7609 are connected in series with the contacts of FINAL FILAMENT relay K7607 that control the application of power to TIME DELAY relay M7602. Therefore, when either or both relays de-energize, TIME DELAY relay M7602 is de-energized, removing high voltage form the transmitter.

The overload winding of SWR relay K7604 is connected in the plate circuit of SWR dc amplifier V7509 through pins E and F of J7601. An excessive SWR voltage on the unbalanced output transmission line actuates the overload winding of SWR relay K7604, lighting SWR indicator 17604 and opening the series interlock circuit. Upon correction of the trouble, operation of OVLD RESET switch S7401 restores the relay contacts to their operating positions.

DRIVE INTERLOCK relay K7606 is energized by transformer T800 in the main frame. If 208-volt power is removed from transformer T800 in the main frame, relay K7606 is de-energized, opening the series interlock circuit and lighting DRIVE INTERLOCK indicator 17607. To energize the main frame, the series interlock circuit of the PA frame and the PS frame must be completed. Since no power is applied to transformer T800 to energize relay K7607 until after the series interlock circuit is closed, DRIVE INTERLOCK switch S7601 is provided to bypass the open series interlock contacts of relay K7606. When DRIVE INTERLOCK switch S7601 is closed, and the main frame becomes operative, 208-volt power is applied to transformer T800, energizing relay K7606, closing its series interlock contacts and opens its indicator contacts. After the series interlock contacts relay K7606 closes DRIVE INTERLOCK switch

S7601 should be opened to give the equipment the full protection of the protective relay system.

b. TIME METER AND TIME DELAY CIRCUITS. - FILAMENT TIME meter M7601 and PLATE TIME meter M7604 indicate the total time that the filament and plate circuits, respectively, of power amplifier V7301 have been activated. This information is important for both operation and maintenance, since it indicates the expended life of the tube. FILAMENT TIME meter M7601 is connected through pin O of J7601 to the phase 3 ac output of T8104, so that FILAMENT TIME meter M7601 is energized only when filament power is applied to power amplifier V7301. One side of the PLATE TIME meter circuit is connected through contacts of FINAL FILAMENT relay K7607 and CROWBAR relay K7609 to phase 2 ac power. The other side of the PLATE TIME meter circuit is connected through pin e of J7601 to the switch circuit of high-voltage contactor K8012 which is actuated when high voltage is applied to power amplifier V7301.

The TIME DELAY meter and BLOWER DELAY meter circuits are described in paragraph 3-11.

3-7. CROWBAR DRAWER.

a. GENERAL. - The crowbar drawer functions as a protective device for 40-kw PA V7301 by removing high voltage when arcing within the tube produces grid current surges above a predetermined level. The high voltage is removed by shorting B+ to B- through a heavy-duty thyratron in the crowbar drawer thus causing the main high-voltage circuit breaker CB8101 in PS frame to open.

b. DETAILED CIRCUIT ANALYSIS. - The 12-kv output of the 40-kw high voltage rectifier (figure 6-3) is coupled form E8013 to the plate of thyratron V8301 through E8303 and current-limiting resistors R8301, R8302, and R8303. The B- potential is applied from E8101 to the cathode of the thyratron through

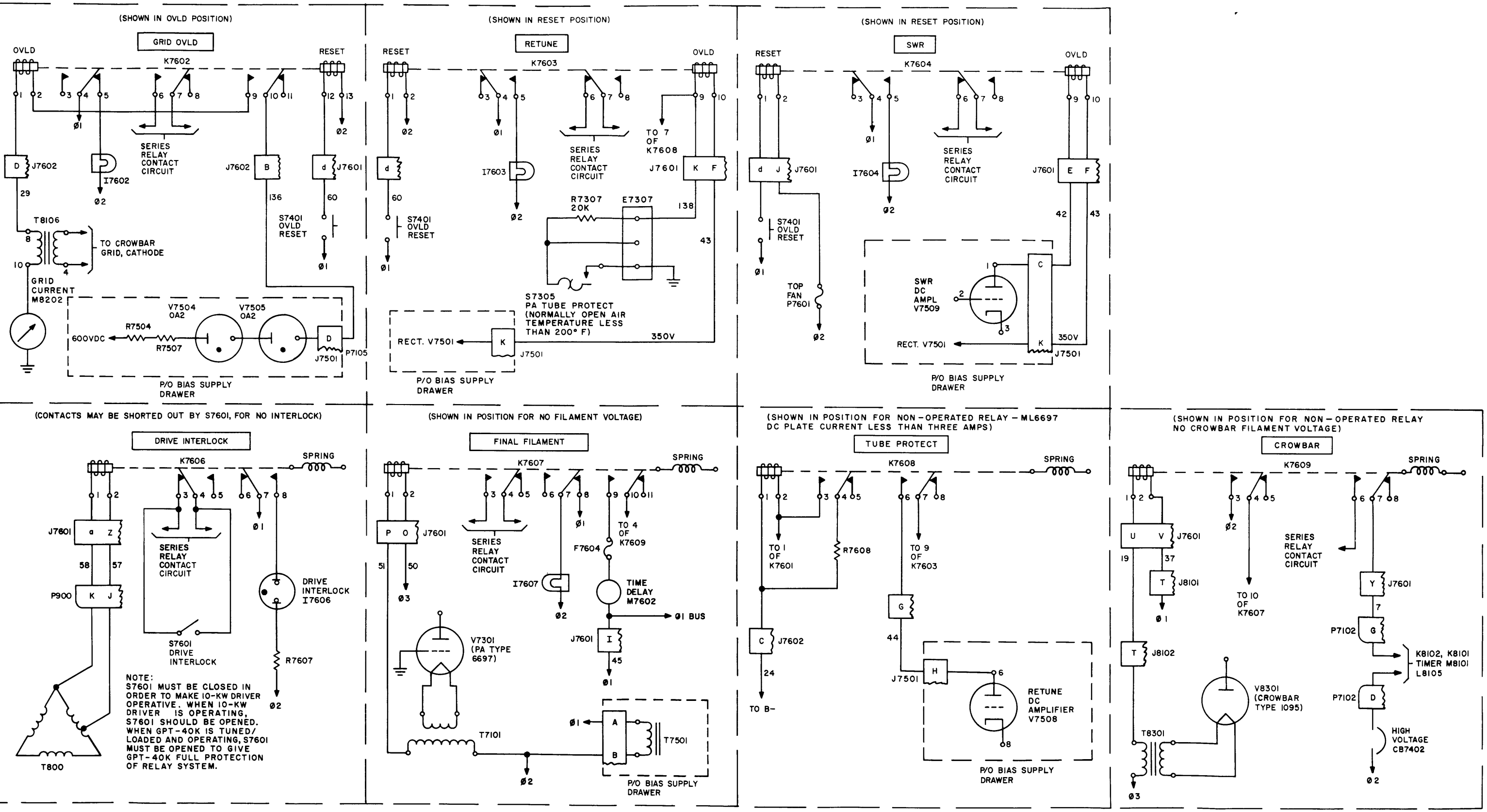


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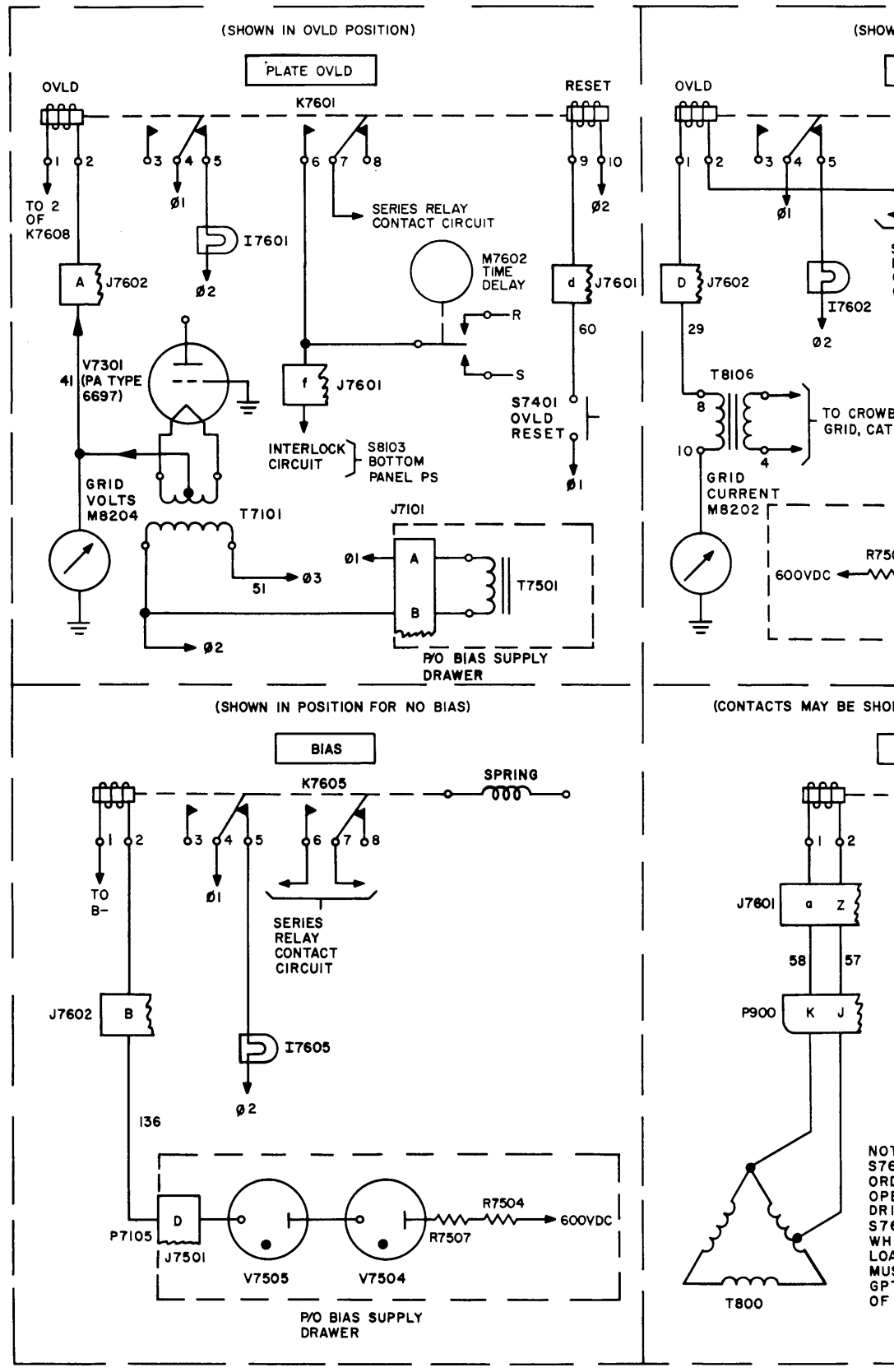
Figure 3-2. PA Frame Relay Panel Protective Relay Circuits, Simplified Schematic Diagram


(SHOWN IN OVLD POSITION)
PLATE OVLD
OVLD
K7601
RESET
TO 2 OF K7608
Ø1
I7601
Ø2
SERIES RELAY CONTACT CIRCUIT
M7602 TIME DELAY
J7602
J7601
R
S
60
41
V7301 (PA TYPE 6697)
S7401 OVLD RESET
INTERLOCK CIRCUIT
S8103 BOTTOM PANEL PS
GRID VOLTS M8204
T7101
J7101
51
Ø3
T7501
P/O BIAS SUPPLY DRAWER
(SHOWN IN POSITION FOR NO BIAS)
BIAS
K7605
SPRING
TO B-
SERIES RELAY CONTACT CIRCUIT
J7602
I7605
136
P7105
J7501
V7505
V7504
R7504
R7507
600VDC
P/O BIAS SUPPLY DRAWER
(SHOW
OVLD
I7602
29
T8106
TO CROWE
GRID, CAT
GRID CURRENT M8202
600VDC
(CONTACTS MAY BE SHO
J7601
58
57
P900
T800
NOT
S76
ORD
OPE
DRI
S76
WH
LOA
MUS
GPT
OF

E8301. B- is also fed to the grid of the thyratron through the secondary winding (1-2) of transformer T8106 and potentiometer R8304. During normal operation of the transmitter, the thyratron is not conducting.

Power amplifier grid current is fed from the 40-kw PA grid circuit through the primary winding (3-4) of transformer T8106 and GRID CURRENT meter M8202 which monitors the grid current. Transformer T8106 is phased so that PA grid current surges which pass through the primary of T8016 induce positive voltages at terminal 1 of the secondary winding. This positive voltage is applied to the grid of the thyratron causing it to conduct and short out the high voltage. Potentiometer R8034 sets the surge level that will fire the thyratron.

Primary power for filament transformer T8301 is fed from the phase 1 and phase 3 lines. RF filtering is provided in both ac lines. Fuse F8301 in the phase 1 line protects that line from overloads due to shorts in the thyratron filament and reservoir circuit. POWER indicator I8301 lights when ac power is applied to the primary of transformer T8301.

Secondary winding 3-4 of transformer T8301 provides filament voltage for the thyratron, while the reservoir voltage is obtained from winding 5-6. RESERVOIR ADJ control R8305 is used to set the reservoir voltage to the proper level as stamped on the thyratron tube by the manfacturer.

3-8. 40-KW HIGH VOLTAGE RECTIFIER. (see figure 6-3).

The 40-kw solid state high voltage rectifier provides the required high voltage for the 40-kw PA. The rectifier input is the three-phase ac output of delta-wye transformer T8101. The three-phase output connections are madeat terminal E8109 and E8110 and E8111. The full wave bridge rectifier consists of diodes CR8401, CR8402, and CR8403.

The high-voltage output of the three-phase full wave bridge rectifier, developed at terminals E8402 and E8401 is applied to a choke input filter consisting of inductor L8101 and capacitors C8107 and C8108. Connected between the high-voltage and B- terminals of the 12-kv high voltage rectifier (and across the filter capacitors) is a voltage divider consisting of resistors R8101 through R8114. High voltage for the 40-kw PA plate circuit is tapped off between resistor R8111 and R8112. The high voltage level is monitored by PLATE VOLTS meter M8203, connnected across resistor R8101.

3-9. INTERLOCK CIRCUITS. (See figure 3-3)

a. GENERAL. - Basically, two separate interlock switch circuits are included in the transmitter. One interlock circuit services the main frame; the other services the PA frame and PS frame. The interlock switch circuits function together with the protective relay circuits for protection of equipment and personnel. If any of the interlock switches are opened, high voltage is removed from the transmitter.

Door and panel interlock switches are included primarily for personnel safety.

b. MAIN FRAME INTERLOCK CIRCUIT, DETAILED CIRCUIT ANALYSIS. - Ten interlock switches forming a series circuit are included in the main frame. Two of these switches, power amplifier air switch S800 and air switch S206, ensure that blower B201 in RF Amplifier RFC-1 and main blower B800 in the main power supply, respectively, are functioning. The other eight interlock switches ensure that bandswitches, doors, and equipment are in their normal operating positions. For example, the detents on front panel IPA BAND switch S202 and PA BAND switch S900 operate bandswitches S205 and S901, respectively, and ensure that these band switches are in operating positions and not between positions.

The interlock switch circuits and the protective circuits provide a series circuit that connects phase 2 voltage to one end of high-voltage shorting coil L802. The control path is through switches S205 and S206, through pins A & B of J1013 and pins 1 and 2 of E1002; switches S1006, S800, S1007, S901, S1009, S1010, and S1011, to the relay panel through pin a of P1000. In the relay panel, the switch on TIME DELAY meter M701 connects this ac voltage to pin d of connector P1000. One end of coil L802 connects to this pin through terminal 1 in terminal block E805. The other end of L802 connects to the phase 1 voltage through terminal 2 of E805. This phase 1 to phase 2 voltage energizes L802.

With L802 energized, switch S801 is closed. The Phase 2 voltage at pin d of P1000 is then coupled through series contacts of protective relays K700, K701, K702, K704, K706, K707, and K708 in the relay panel, through closed switch S801, to pin P of jack J1000 through to one side of the coil of contactor K1000. The phase 1 voltage on the other side of the coil of contactor K1000 is connected to pin J of jack J201 which leads to the contacts of HIGH VOLTAGE ON-OFF relay K200 located in the exciter drawer. The phase 1 voltage then passes out pin K of J201 to HIGH VOLTAGE circuit breaker CB1002, to the wiper of TUNE-OPERATE switch S908A. When switch S908A is set at the TUNE position it simultaneously turns S908B, and S907A and S907B to the TUNE function. In this position phase 1 flows through the following circuitry. Terminal E of P900 terminal E of J7102, through S7306 entering jack J7102 again, through terminal A, and P900 again, through terminal A. Phase 1 then continues on through contacts 9 and 12 of switch S907B, through terminal 4 of E901, and switch S904, out terminal 5 of E901 to the contacts of K7301 and K7302 in the TUNE position, returning to switch S907B through contacts 8 and 5. It then passes through contacts 1 and 4 of S908A to High Voltage Circuit Breaker CB1002.

The 3 phase primary power is now able to flow to HVPS in the 10kw driver section.

When switch S908A is set in the OPERATE position S908B, S907A and S907B simultaneously turn to the OPERATE function. The phase 1 voltage at pin E of P900 and J7103 goes through the following path to circuit breaker CB1002: inductor L7108, pin E of J7102 and P7104, pin I of P7102 and J8102, to pin H of J8012 and P7102. The phase 1 voltage is then applied to pin D of P7104 and J7102, inductor L7107, pin D of J7103 and P900, and contacts 2 and 4 of S908A.

When the interlock switches and the switch on TIME DELAY meter M701 are in their normal operating positions, INTERLOCK INDICATOR lamp I1004 lights. The phase 1 voltage is applied directly to the lamp, while the phase 2 voltage at pin d of P1000 connects to the lamp through terminals 12 and W of the rear section of INTERLOCK switch S1001 and resistor R1005. When one of the interlock switches is not in its normal operating position, the phase 2 voltage path to contactor K1000, coil L802, and INTERLOCK INDICATOR I1004 is open. At this time, the lamp is off and the contactors and coil are de-energized. When high-voltage shorting coil L802 is de-energized, two contacts operated by L802 short the +7,500- and +3,000- volt dc lines in the main power supply to ground. This action discharges the filter capacitors in the +7,500- and +3,000-volt lines, providing a personnel safety feature. In addition, the phase 2 voltage is applied to HIGH VOLTAGE circuit breaker CB1002 through the normally open contact 2 of any open interlock switch and resistors R1000 and R1001, tripping the circuit breaker.

The phase 1 to phase 2 voltage is also applied to circuit breaker CB1002 during the warm-up time provided by meter M701. During this time, the phase 2 voltage is connected to the circuit breaker through contacts C and 2 of M701, the number 2 contacts on the interlock switches, and resistors R1000 and R1001. If circuit breaker CB1002 is set at ON during this warm-up time, this voltage causes the circuit breaker to trip thus preventing premature application of high voltage to the transmitter.

When the transmitter is shut down because of an open interlock switch, INTERLOCK switch S1001 and INTERLOCK INDICATOR lamp I1004 can be used to rapidly localize the trouble to a particular interlock switch circuit. When switch S1001 is rotated clockwise from the NORMAL position, indicator I1004 lights for all positions up to the open circuit and is off for all other positions. For example, assume front panel BAND SW switch is not in a normal operating position (between positions). This causes contacts C and 1 of power amplifier band switch S901 to open and contacts C and 2 to close. With INTERLOCK switch S1001 in the IPA BAND SW position (position 1), the phase 2 voltage is applied to the indicator through switch S205, the front section of S1001 contacts 1 and W and resistor R1005. When switch S1001 is in the IPA AIR SW position, the phase 2 voltage is connected to the indicator through switches S205 and S206, contacts 2 and W of S1001, and resistor R1005. In the EXTERNAL position (position 3), the jumper between terminal A&B of J1013 and 1 and 2 of TB1002 are added to the switches to complete the lamp circuit. Similiarly, in the REAR DOOR position (position 4), switches S1006 is added to this circuit, and in PA AIR SW and PA DECK positions, switches S800 and S1007 are successively added in series with the previously mentioned switches. However, when switch S1001 is turned to the PA BAND SW position (position 7), the indicator lamp does not light because switch S901 interrupts the lamp circuits. The lamp does not light for the succeeding positions of S1001 for the same reason.

Another interlock indicator, DRAWER INTERLOCK indicator lamp I2000, is located on the front panel of the RF amplifier drawer. This lamp lights when 1-kw IPA interlock switch S1009 is not in its normal operating position. This lamp is included because switches S1009 and S1001 are both added to the series circuit for INTERLOCK INDICATOR lamp I1004 when switch S1001 is turned from the PA BAND position (position 7), to the HV DECK position (position 9).

Thus, if lamp I1004 lights with switch S1001 in the PA BAND position and extinguishes with S1001 in the HV DECK position, either interlock switch S1009 or S1010 could be open. However, if DRAWER INTERLOCK lamp I2000 is now lit, switch S1009 is open; if lamp I2000 is now off, switch S1010 is open.

Ten interlock switches forming a series circuit are included in the PA frame of the transmitter. One of these switches, air switch S7101, ensures that the main power amplifier blower B7102 in the PA frame is operating. The remaining interlock switches ensure that doors, panels, bandswitches and equipment are in their normal operating positions.

c. 40KW PA FRAME INTERLOCK CIRCUITRY DETAILED CIRCUIT ANALYSIS. - When switches S908A, S908B, S907A and S907B are placed in the OPERATE position phase 1 passing through CB8101 is able to pass through the series interlock chain to High Voltage Shorting Coil of L8105 through the following path: terminal f of P8101 and J7101 to H of P7104 and J7102 to H of J7103 and P900 through the wiper and contact of S908B to contact 7 and 8 of S907B to the contacts of relay K7301 and K7302 in the OPERATE position, entering E901 at terminal 5 and passing through switch S904 operated by K900 and passing out through terminal 3 of E901 to contact 4 of S907B, passing out contact 3, and continuing on to a terminal F of P900 and J7103 to F of J7102 and P7104 to the series interlock chain consisting of switches S7303, S7102, S7103, S7104, S7101, S7304, S8102, S8104, S8103, the switch on TIME DELAY meter M7602, and SHORTING RELAY fuse F7605, to the coil of shorting relay L8015. The other end of L8105 connects to the phase 2 voltage through MAIN POWER circuit breaker CB7401. This phase 2-to-phase 1 voltage energizes L8105.

The phase 1 voltage is also coupled to one end of high-voltage contactor K8102 through series contacts of protective relays K7601, K7602, K7603, K7604, K7605, K7606, K7607, K7609, and strapped terminals 5 and 6 on E8119. (For remote operation phase 1 will pass thru HV-ON-OFF relay K200 in the exciter drawer before before it is applied to K8102).

With relay K8105 energized, switch S8105 closes, connecting the other end of K8102 to the phase 2 voltage through contacts of HIGH VOLTAGE circuit breaker CB7402 and contacts of MAIN POWER circuit breaker CB7401.

DRIVER INTERLOCKS switch S7601, connected across the interlock contacts of relay K7606, is provided to complete the interlock circuit when the transmitter is initially energized. Note that relay K7606 is energized by transformer T800 after high-voltage contactor K8102 is energized.

During the warm-up time provided by time delay meter M7602, phase 1-to-phase 2 voltage is applied to circuit breaker CB7402. During this time, the phase 1 voltage is connected to the circuit breaker through contacts C and 2 of M7602, the number 2 contacts of the interlock switches, resistors R7403 and R7404 and contacts C and 1 of the switch operated by CB7402. If the circuit breaker is set at ON during the warm-up time, the voltage applied to the circuit breaker causes it to trip. This feature prevents premature application of high voltage to the transmitter. Switch S902, operated by the detent of TUNE/OPER switch S908B, prevents high voltage from being applied to the 40K PA section when S908B is set at TUNE. If S908B is in the TUNE position, S902 is closed and completes the phase 1 voltage path to CB7402 through the C and normally closed contacts of S902, and rf pi filter L7105 and capacitors C7105 and C7112. With the phase 1 voltage thus applied, CB7402 trips.

Switch S7306, actuated when the front panel of the 40-kw PA is removed, prevents personnel from contacting dangerous rf voltage present in the antenna circuits.

When the transmitter shuts down because of the operation of an interlock switch in the 40KW or PS frame, INTERLOCK switch S7404 and INTERLOCK INDICATOR I7401 can be used to localize the trouble to a particular interlock switch circuit. The procedure is the same as that described for the 10KW frame interlock circuit.

3-10. TUNE-OPERATE CIRCUIT (see figure 3-3)

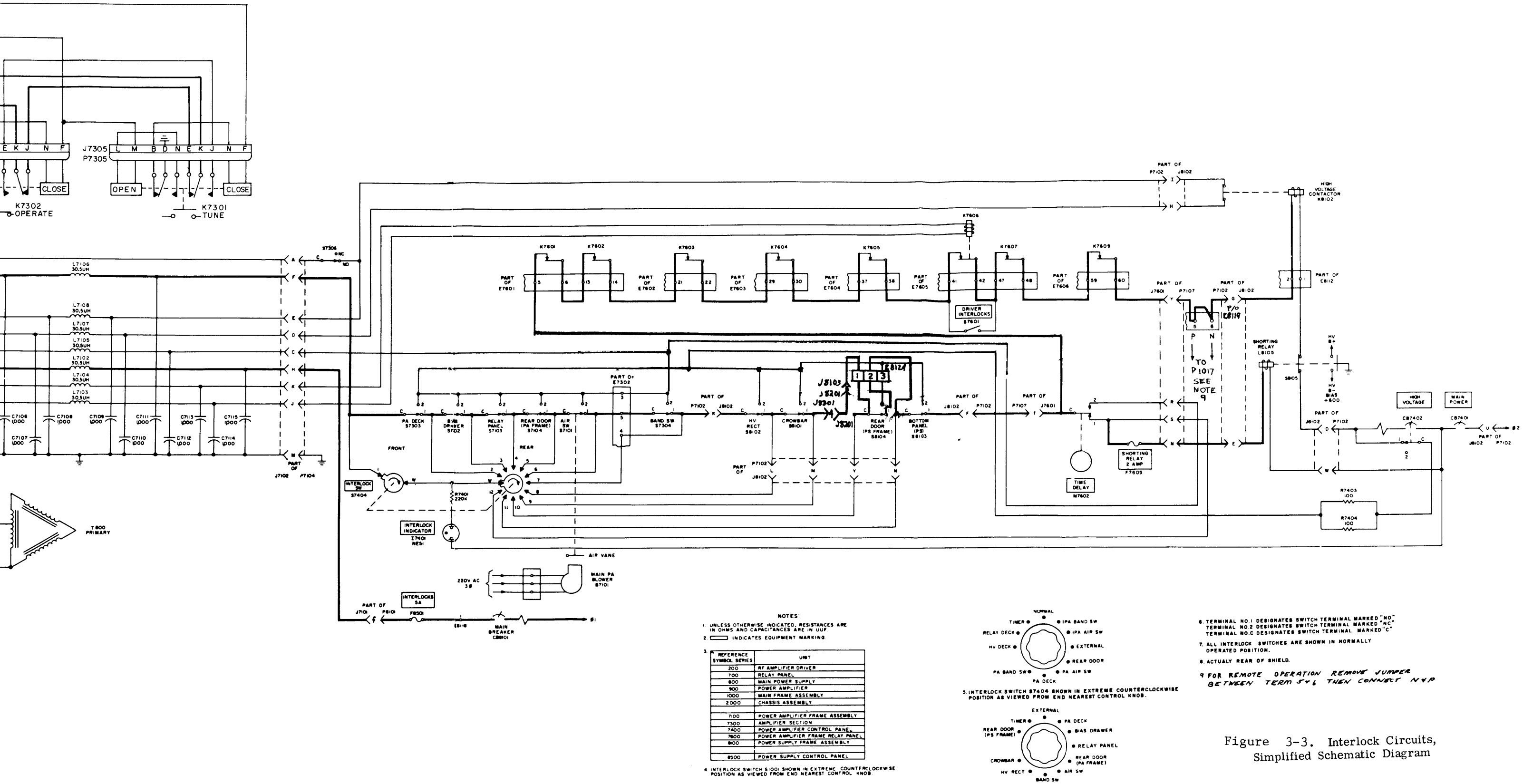
The TUNE-OPERATE circuit for the GPT-40K Transmitter is incorporated to provide an antenna for independent tuning of the 10kw driver section, and the tuning of the 40kw PA in the operate function. This is accomplished by the use of switches and relays isolating the 40kw PA section in the TUNE position, and connecting the antenna to the 10k driver section. The TUNE-OPERATE circuit also functions with the interlock circuits of the transmitter which was discussed in paragraph 3-9 interlock circuits.

The circuit operates in the following manner. When switches S908A, S908B, S907A, and S907B are place in the TUNE position phase 1 is able to pass-through contacts 12 and 9 of switch S907A and enter terminal 2 of E901. It then energizes relay K900, with K900 in the energized position the tune output circuit of jack J905 is closed by the contactor of K900 going across terminals E902 and E903.

A 28 vdc voltage is also passed through contacts 4 and 1 of S907A which is then coupled to the latching type relays K7302 and K7301 which require a pulse to trigger them. When S907A is in the TUNE position relay K7302 will lift the contactor from the 40-kw PA output line. Relay K7301 will place a contactor across the output line to the antenna, enabling the 10k output signal from J905 to pass to P7301 and on out to the antenna.

When switches S908A, S908B, S907A, and S907B, are placed in the OPERATE position the phase 1 voltage to K900 is no longer applied and the relay goes to a deenergized state, placing the contractor across terminals E908, and E905, coupling the output of the 10kw driver to the input of 40kw PA tube V7301 through terminal E7304.

The 28 vdc voltage is passed through contacts 4 and 3 of S907A and triggers relays K7302 and K7301. The contactor of K7302 now drops across the output line of the 40kw PA output circuit and couples the signal to the antenna.



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS AND CAPACITANCES ARE IN UUF.
2. ▭ INDICATES EQUIPMENT MARKING.
3.

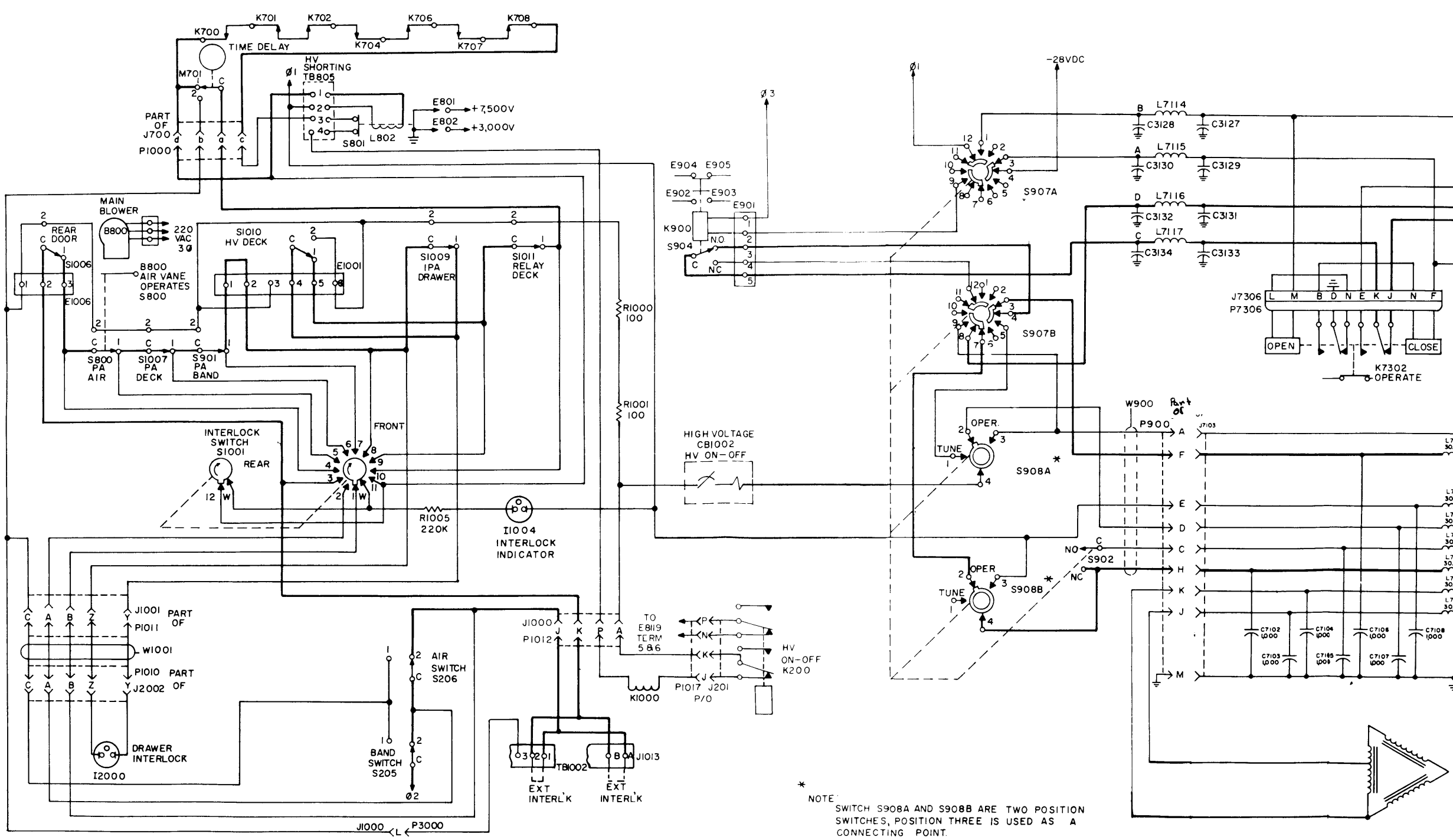
REFERENCE SYMBOL SERIES	UNIT
200	RF AMPLIFIER DRIVER
700	RELAY PANEL
800	MAIN POWER SUPPLY
900	POWER AMPLIFIER
1000	MAIN FRAME ASSEMBLY
2000	CHASSIS ASSEMBLY
7100	POWER AMPLIFIER FRAME ASSEMBLY
7300	AMPLIFIER SECTION
7400	POWER AMPLIFIER CONTROL PANEL
7600	POWER AMPLIFIER FRAME RELAY PANEL
8100	POWER SUPPLY FRAME ASSEMBLY
8500	POWER SUPPLY CONTROL PANEL

4. INTERLOCK SWITCH S1001 SHOWN IN EXTREME COUNTERCLOCKWISE POSITION AS VIEWED FROM END NEAREST CONTROL KNOB.

5. INTERLOCK SWITCH S7404 SHOWN IN EXTREME COUNTERCLOCKWISE POSITION AS VIEWED FROM END NEAREST CONTROL KNOB.

6. TERMINAL NO.1 DESIGNATES SWITCH TERMINAL MARKED "NO"
TERMINAL NO.2 DESIGNATES SWITCH TERMINAL MARKED "NC"
TERMINAL NO.C DESIGNATES SWITCH TERMINAL MARKED "C"
7. ALL INTERLOCK SWITCHES ARE SHOWN IN NORMALLY OPERATED POSITION.
8. ACTUALY REAR OF SHIELD.
9. FOR REMOTE OPERATION REMOVE JUMPER BETWEEN TERM 5 & 6 THEN CONNECT N & P

Figure 3-3. Interlock Circuits, Simplified Schematic Diagram



* NOTE: SWITCH S90BA AND S90BB ARE TWO POSITION SWITCHES, POSITION THREE IS USED AS A CONNECTING POINT.

The contractor of relay K7301 now lifts off the output line, and opens the line to the tune output jack J905 in the 10k driver.

3-11. 40KW PA FRAME AND PS FRAME, AC POWER DISTRIBUTION.

Three-phase power (figure 3-4) is supplied to three power input terminals located at the bottom rear of the PA frame. Power is applied directly to main circuit breaker CB8101 and to a line filter consisting of three pi filters. The line filter connects the three phase power to MAIN POWER circuit breaker CB7401 and BLOWER circuit breaker CB8501. Except for the inputs to transformer T8101, and the main power amplifier blower, three-phase voltage is distributed throughout the PA frame and PS frame when MAIN POWER circuit breaker CB7401 is closed.

AC POWER indicator I7301 is connected directly across the phase 2 and phase 3 ac lines. Phase 3 voltage is applied to top fan B7301 through terminal 1 of terminal block E7306. The phase 1 voltage is applied to B7301 through TOP FAN 5 AMP fuse F7601. Capacitor C7327 is the starting capacitor for B7301. The PA frame and PS frame meter fluorescent lights are powered by the phase 2-to-phase 1 voltage. Phase 2 voltage, from terminal 7 of E7303, is also applied to power amplifier light I7203; phase 1 voltage for I7203 is applied through PA LIGHTS switch S7403 and terminal 9 on terminal block E7303.

Band switch release coil L7310 is energized by the phase 1 to phase 2 voltage. Phase 1 voltage is applied to L7310 through BANDSWITCH RELEASE switch S7405 and E7303 terminal 2. Terminal 7 on terminal block E7303 supplies phase 2 voltage to one end of HV BREAKER INDICATOR I7402, PLATE ON lamp I7304, and high voltage warning lamp I7204. Phase 1 voltage is supplied to the other end of these lamps when contactor K8102 is energized. Phase 1 voltage from pin Y of J8101 and P7101 is also applied to PLATE TIME meter M7604. Phase 2 voltage is applied to M7604 through series contacts of protective relays K7609 and K7607, and TIME DELAY fuse F7604.

The reset coils on protective relays K7601 through K7604 are energized by phase 1 and phase 2 voltages through OVLD RESET switch S7401. TIME DELAY meter M7602 receives phase 1 and phase 2 voltage. Phase 2 voltage is applied to M7602 through series contacts of protective relays K7609 and K7607, and TIME DELAY fuse F7604.

Three-phase ac voltage from MAIN POWER circuit breaker CB7401 is applied to transformer T8104 through FIL ADJ switch S8501. Transformer T8104 matches the three-phase voltage to the primaries of transformers T7101, T7501, T8301. Application of phase 3 voltage from T8104 to T7101 is controlled by FINAL FIL circuit breaker CB8502 and contacts on blower relay K7101. The path for this voltage is through an rf line filter. Phase 3 voltage is applied to the T8301 primary through an rf line filter. Phase 1 voltage for T8301 is applied through protective relay K7609, an rf line filter, and FILAMENT 1.5 A fuse F8301. The POWER lamp, in series with current-limiting resistor R8306, is connected in parallel with the primary of T8301. When FIL ADJ switch S8501 is in the proper position, FILAMENT PRIMARY meter M7201 indicates 230 volts (red line).

Three-phase voltage is applied to the main power amplifier blower B7101 by BLOWER circuit breaker CB8501 and contacts of relay K7101. Relay K7101 is energized by the phase 1-to-phase 2 voltage. Phase 1 voltage is applied to one end of K7101 from CB8501. Phase 2 voltage is applied to the other end of K7101 from CB8501 through normally closed contacts of BLOWER DELAY meter M7603, closed contacts of switch S3 on CB7401, and BLOWER CONTACTOR fuse F7605.

BLOWER DELAY meter M7603 provides a 5-minute delay in shutting down main power amplifier blower B7101 after MAIN POWER circuit breaker CB7401 is set to off. However, the blower may be immediately shut down by setting CB8501 to OFF. M7603 is energized by the phase 1-to-phase 2 voltage when MAIN POWER

circuit breaker CB7401 is set to OFF. With BLOWER DELAY meter M7603 energized, K7101 is held energized by the switch operated by M7603 until the present time delay has expired.

Three-phase voltage from main breaker CB8101 is applied to transformer T8101, through switch contacts on K8102. The transformers supply high voltage to the rectifier circuits in the 40-kw high voltage rectifier. CB8101 is operated by breaker motor B8101 connected to the phase 2 and phase 3 lines. Phase 3 voltage is applied to terminal L1 of B8101 through BREAKER MOTOR fuse F8502. Phase 2 voltage is applied to terminal F of B8101 through switch S1 on CB7401. Closing CB8101 immediately applies power to top fan B8102 connected across the phase 1 and phase 2 lines in the power supply frame. PS TOP FAN fuse F8101 protects the power source from short circuits in the fan motor. Capacitor C8109 is a starting capacitor for the fan motor. When CB8101 is tripped by an overload, it maybe reset by depressing HV BREAKER RESET switch S7402.

When CB8101 closes, power cannot be supplied to transformer T8101, until shorting relay L8105, and high-voltage contactor K8102 are energized. L8105 is energized by the switch contacts operated by TIME DELAY meter M7602, described in connection with the interlock circuit. With L8105 energized, switch S8105 closes, providing a path for phase 2 voltage to K8102. The phase 2 voltage is applied by closing HIGH VOLTAGE circuit breaker CB7402. Phase 1 voltage is applied to K8102 through the interlock circuit. The phase 1 and phase 2 voltages immediately energize K8102, and its contacts close, applying reduced voltages to transformer T8101.

3-12. 10KW FRAME DC POWER DISTRIBUTION.

The dc power distribution in the 10kw frame of the GPT-40K transmitter is

identical to that in the GPT-10K transmitter.

3-13. 40 KW PA FRAME AND PS FRAME, DC POWER DISTRIBUTION.

The 40-kw high voltage rectifier supplies plate voltage (figure 3-5) for the power amplifier tube V7301. A regulated bias voltage of +600 volts for V7301 is supplied by the bias supply. In addition, the bias supply contains an unregulated +350-volt supply for operation of the retune and standing wave dc amplifiers that are part of the relay protective circuit.

The high-voltage output of the 40-kw high voltage rectifier is filtered by choke L8101 and capacitors C8108 and C8107. The filtered dc voltage is applied across a voltage divider consisting of resistors R8101 through R8114. The high B+ voltage at the junction of resistors R8112 and R8111 is applied to the plate of V7301 through inductors L7306, L7304, L7316, L7308, L7317 and L7314. The high B- voltage, from E8104, is connected to the cathode of V7301 through protective relays K7608 and K7601, PLATE CURRENT meter M7203, inductor M7203, inductor L7112 secondary of transformer T7101, and choke L7303.

The high-voltage output is also connected, across V8301 in the crowbar drawer for protective purposes, to terminals E8103 and E8101. The operation of the crowbar drawer is described in paragraph 3-7.

The V7301 plate voltage is measured by PLATE VOLTS meter M8203 connected across resistor R8101. The +600-volt regulated bias voltage from the bias supply is applied to the V7301 cathode from J7502 through switch S8106, protective relays K7609 and K7601, PLATE CURRENT meter M7203, choke L7112, secondary windng of T7101, and choke L7303. The -600 volt is routed from the bias power supply (pin D of J7501) through contacts of protective relay K7602, the coil of K7602, the primary winding of T8106, GRID CURRENT meter M8202, and ground to the grid of C7301. Protective bias relay K7605 is

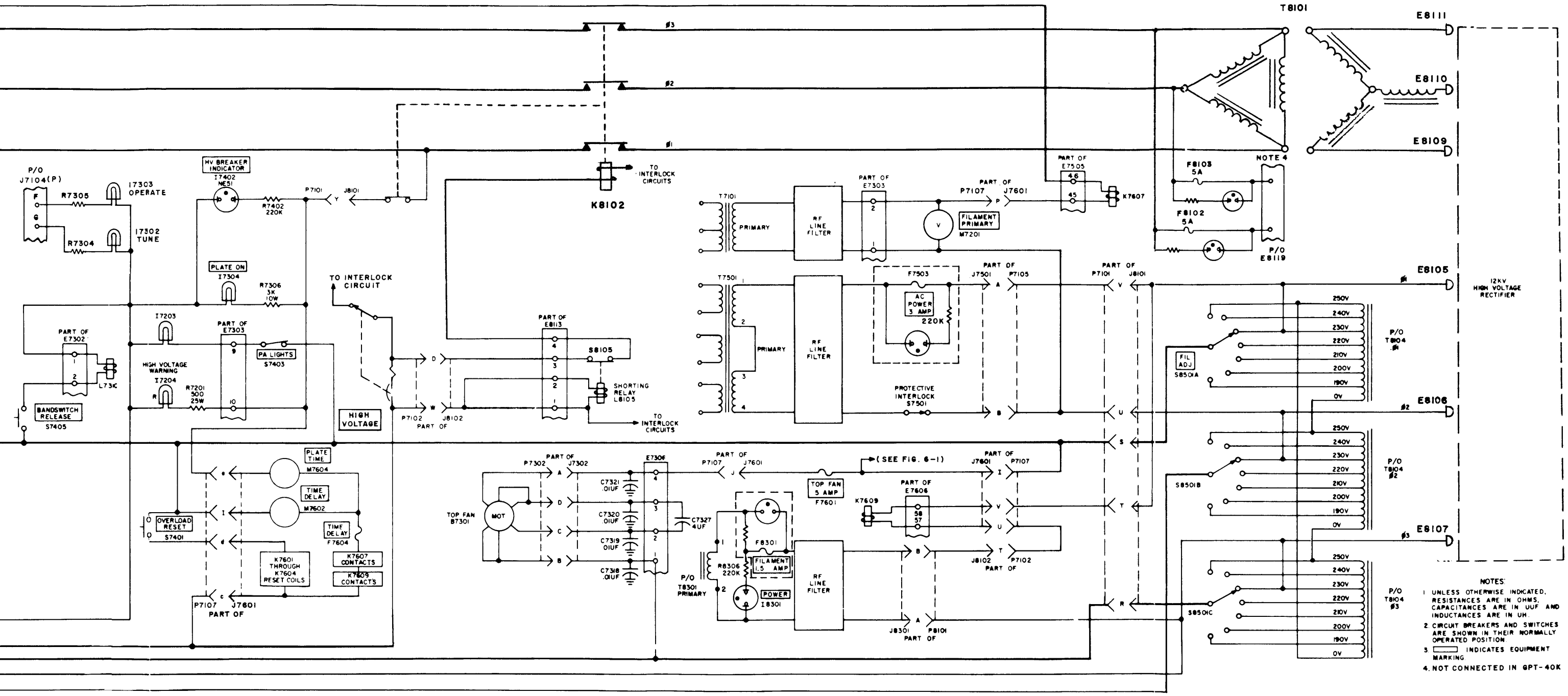


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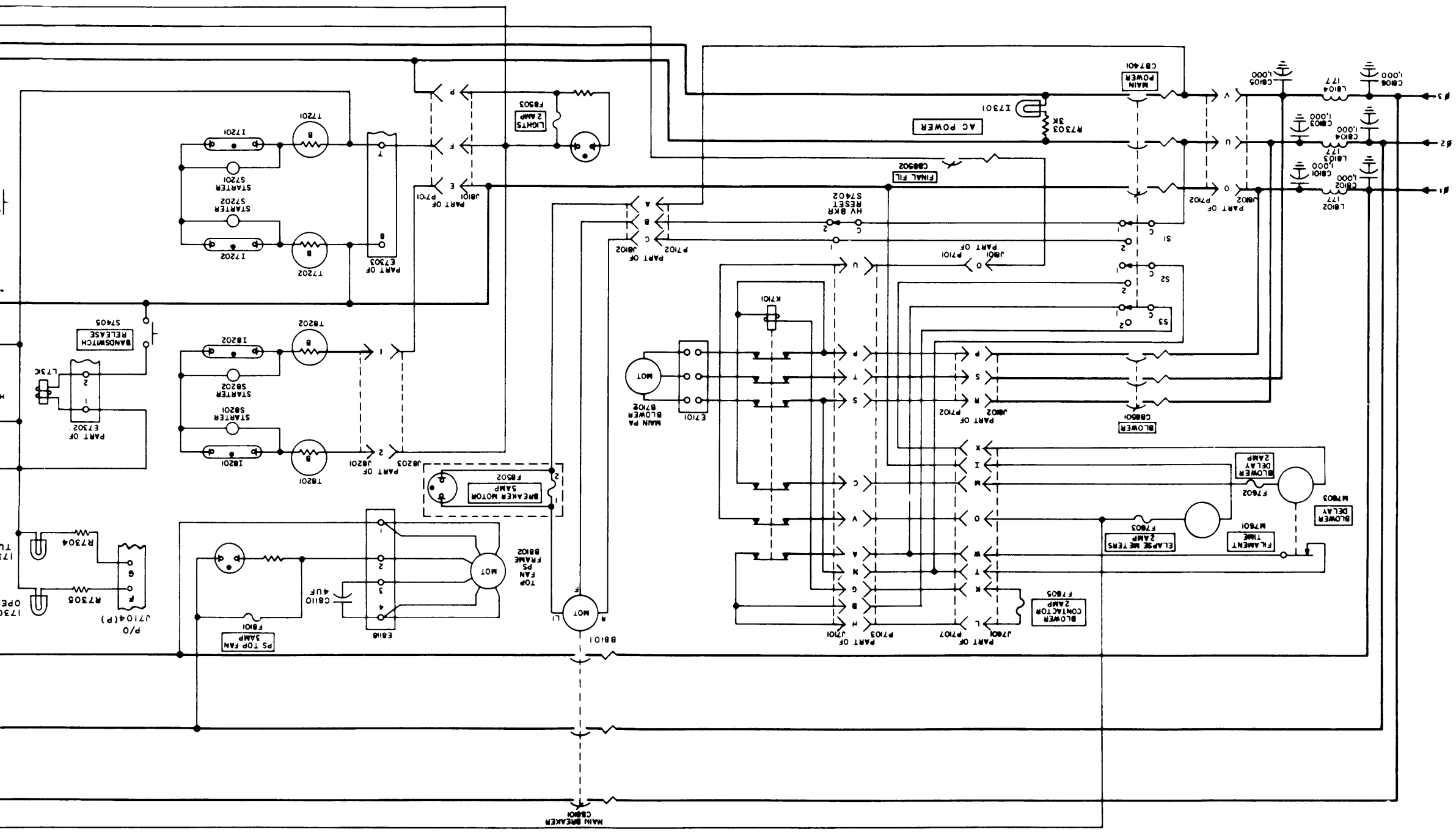
Figure 3-4 PA Frame and PS Frame, AC Power Distribution


AC POWER
MAIN POWER
C87401
I7301
R7303 3K
FINAL FIL C88502
HV BKR RESET S7402
PART OF J8101
PART OF P7102 J8102
PART OF P7102
J8102
C8105 1,000
C8104 1,000
C8103 1,000
C8102 1,000
C8101 1,000
L8104 177
L8103 177
L8102 177
BLOWER C88501
PART OF P7102 J8102
PART OF P7101 J8101
PART OF P7103 J7101
PART OF P7107 J7601
BLOWER CONTACTOR 2 AMP F7805
ELAPSE ME TERS 2 AMP F7803
FILAMENT TIME M7801
BLOWER DELAY F7802
BLOWER DELAY 2 AMP
BLOWER DELAY M7803
LIGHTS 2 AMP F8503
PART OF E7303
I7201
T7201
S7201 STARTER
S7202 STARTER
I7202
T7202
PART OF P7101 J8101
BANDSWITCH RELEASE S7405
PART OF E7302
L73C
I8202
T8202
S8202 STARTER
S8201 STARTER
I8201
T8201
PART OF J8203 J8201
BMEAKER MOTOR 5 AMP F8502
PS TOP FAN 3 AMP F8101
J7104(P)
P/O
R7304
R7305
C8110 4 UF
E8106
TOP FAN PS FRAME B8102
MOT
B8101
MAIN BMEAKER C88101
MAIN PA BLOWER B7902
E7101
MOT
K7101

connected across the 600-volt bias output and is energized when this voltage is present.

GRID VOLTS meter M8204 measures 600-volt grid to cathode voltage of V7301, effectively the output of the bias supply. Meter M8204 is connected between ground and the line supplying the +600 volts to the cathode of V7301.

The 350-volt dc supply in the bias supply provides the plate voltage for retune dc amplifier V7508 and swr dc amplifier V7509 (described in paragraph 3-5).

A personnel safety circuit is included in the 40-kw high voltage rectifier circuit. When MAIN POWER circuit breaker CB7401 is set at OFF, shorting relay L8105 is deenergized and a short circuit is placed between the 12-kv b and B- and to ground through contacts operated by L8105. This action discharges the high-voltage capacitors. This action also shorts the 600 volts on the B- line to ground. Opening S8106 prevents the 600 volt output of the bias supply from being shorted to ground.

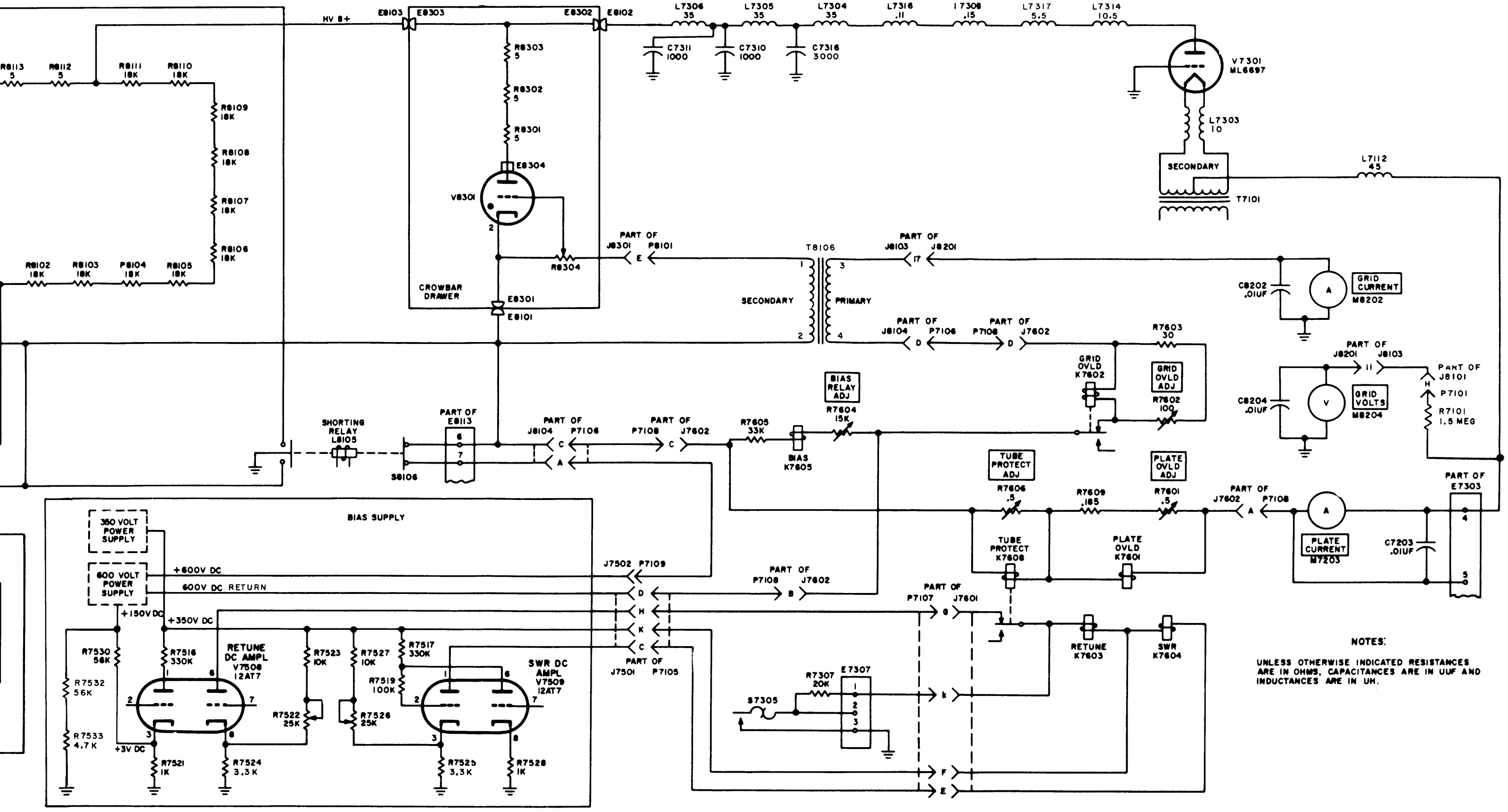


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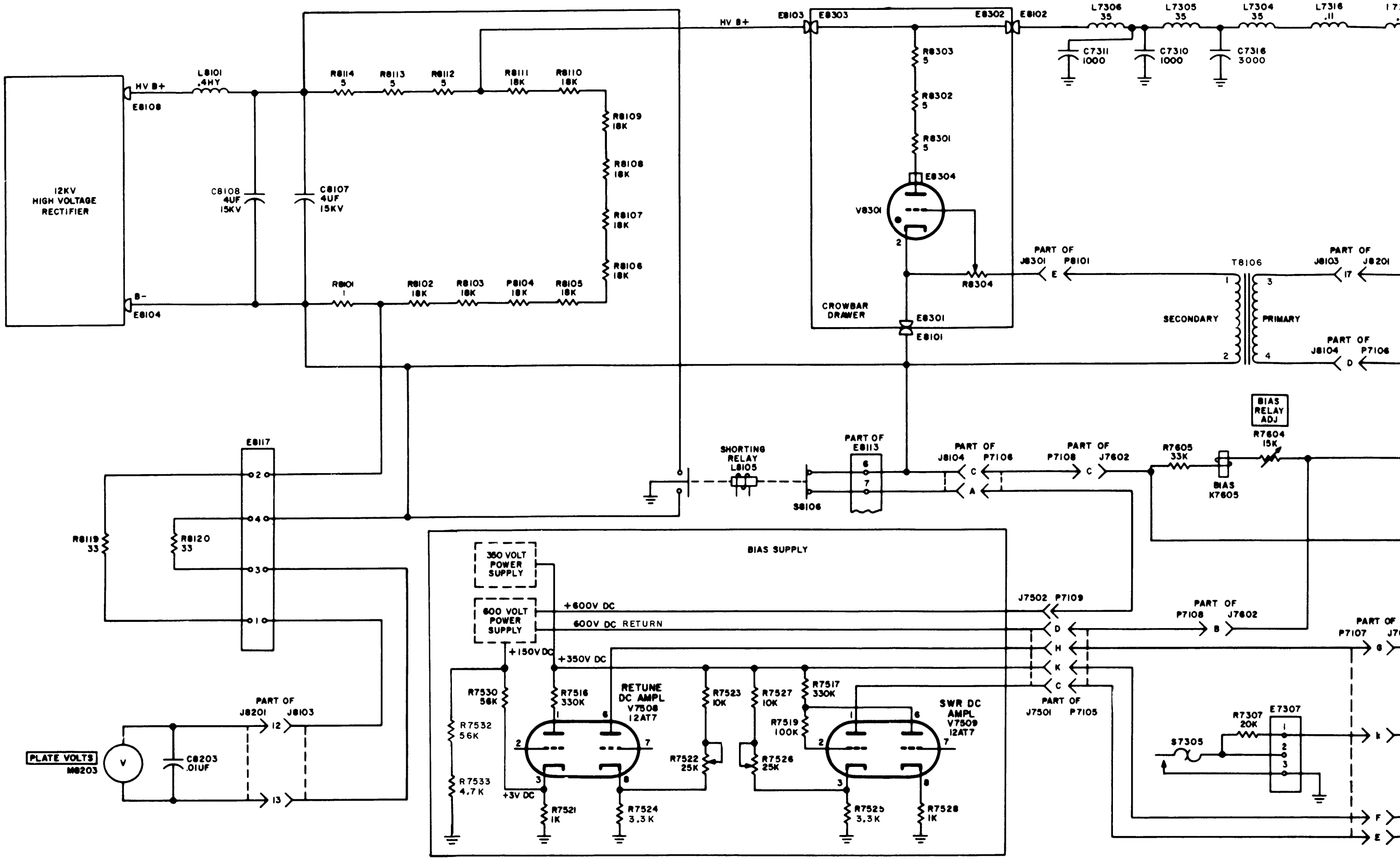
Figure 3-5. PA Frame and PS Frame, DC Power Distribution


12KV
HIGH VOLTAGE
RECTIFIER
HV B+
E8108
B-
E8104
L8101
.4HY
C8108
4UF
15KV
C8107
4UF
15KV
R8114
5
R8113
5
R8112
5
R8111
18K
R8110
18K
R8109
18K
R8108
18K
R8107
18K
R8106
18K
R8101
1
R8102
18K
R8103
18K
P8104
18K
R8105
18K
HV B+
E8103
E8303
E8302
E8102
R8303
5
R8302
5
R8301
5
E8304
V8301
2
R8304
CROWBAR
DRAWER
E8301
E8101
L7306
35
L7305
35
L7304
35
L7316
.11
C7311
1000
C7310
1000
C7316
3000
PART OF
J8301
P8101
E
T8106
SECONDARY
PRIMARY
1
2
3
4
PART OF
J8103
J8201
17
PART OF
J8104
P7106
D
E8117
2
4
3
1
R8119
33
R8120
33
PLATE VOLTS
M8203
V
C8203
.01UF
PART OF
J8201
J8103
12
13
SHORTING
RELAY
L8105
S8106
PART OF
E8113
6
7
PART OF
J8104
P7106
C
A
PART OF
P7108
J7602
C
R7605
33K
BIAS
K7605
BIAS
RELAY
ADJ
R7604
15K
BIAS SUPPLY
350 VOLT
POWER
SUPPLY
600 VOLT
POWER
SUPPLY
+600V DC
600V DC RETURN
+150V DC
+350V DC
+3V DC
R7530
56K
R7532
56K
R7533
4.7K
R7516
330K
RETUNE
DC AMPL
V7508
12AT7
R7521
1K
R7524
3.3K
R7522
25K
R7523
10K
R7527
10K
R7517
330K
R7519
100K
R7526
25K
SWR DC
AMPL
V7509
12AT7
R7525
3.3K
R7528
1K
J7502
P7109
D
H
K
C
PART OF
J7501
P7105
PART OF
P7108
J7602
B
PART OF
P7107
J7
G
S7305
R7307
20K
E7307
1
2
3
k
F
E

SECTION 4
MAINTENANCE

4-1. GENERAL.

Maintenance is divided into three categories: operator's maintenance, preventive maintenance, and corrective maintenance. The operator's maintenance, performed by the operator as he works with the equipment, is confined to visual inspection, cleaning, and fuse replacement. Preventive and corrective maintenance procedures for the PA and PS frames are given in this section.

This section contains detailed troubleshooting techniques and reference data that should be used to quickly locate malfunctions in the transmitter. A preliminary inspection procedure, table 4-1 is included as a visual aid to determine obvious conditions which may have caused equipment breakdown. This is followed by an equipment performance check table 4-2, and a system troubleshooting chart, table 4-3. The combined data of tables 4-1 through 4-3 will permit sectionalization of troubles to specific drawers in the transmitter and in many instances, to specific stages and parts.

NOTE

It is assumed in this section that the trouble symptoms listed are produced by malfunctions rather than by improper overating procedures. Thus, if an overload lamp lights, it is assumed that the operator cannot clear the trouble by normal operating procedures such as reducing the drive, retuning, and reloading. Also, the results of defective front-panel indicator lamps and meters, and the remedial measures concerned are obvious and are not covered in this section.

4-2. PREVENTIVE MAINTENANCE.

Preventive maintenance is maintenance that detects and corrects trouble-producing conditions before they become serious enough to affect equipment operation. Common causes of trouble are dirt and grime, contact erosion,

improper contact pressure, lack of proper lubrication, improper relay adjustment, dirty air filters, overheating unstable power supplies, vacuum tubes with poor emission, and loose parts (due to vibration). Recommended schedules for preventive maintenance are presented below.

a. ONCE EACH SHIFT DURING AN "ON THE AIR" PERIOD. - Check the operator's performance record for irregularities and possible sources of future trouble. Make minor adjustments of tuning controls to verify proper tuning. Observe all electrical quantities measurable with built-in meters and compare observations with established standards (tuning chart and table 4-4) for irregularities. Observe indicator lights and rectifier tubes for abnormal color and signs of internal flashing.

b. DAILY DURING AN "OFF THE AIR" PERIOD. - Visually and manually inspect all parts in the transmitter for overheating and damage. Inspect all sliding or moving coil contacts. Feel blower and fan motors for overheating and observe rotating parts for wear. Note deposits of dust and dirt. Inspect condition of relay contacts. Check operation of all door interlocks.

c. MONTHLY DURING "OFF THE AIR" PERIOD. - Recondition rotary and switch contacts as necessary. Use crocus cloth and trichlorethylene or ethlenedichloride for cleaning. Inspect and clean the transmitter. Check the condition of air filters. Replace or clean dirty filters. Inspect the equipment for loose solder connections or screws, especially in those areas in which appreciable vibration occurs. Gear trains showing signs of becoming dry should be lubricated with a drop or two of any high quality, light machine lubricant. Check the condition of all tubes.

4-3. CORRECTIVE MAINTENANCE.

The corrective maintenance procedures are essentially factory alignment procedures modified for use in the field. Alignment procedures are presented in the following paragraphs.

4-4. ALIGNMENT OF RELAYS IN PA FRAME RELAY PANEL.

Perform the following procedures with the PA frame relay panel installed in the PA frame and the transmitter operating into a dummy load or antenna.

a. ALIGNMENT OF TUBE PROTECT RELAY K7608. -

NOTE

During this alignment only, mechanically prevent the overload contacts of RETUNE relay K7603 from closing.

1. Adjust BIAS ADJ control R7513 (96) on the bias supply drawer for a reading of 3 amperes on PLATE CURRENT meter (77) on the PA frame meter panel.

CAUTION

Do not maintain PA plate current at 3 amperes for more than 2 minutes.

2. Adjust TUBE PROTECT control R7606 (115) so that TUBE PROTECT relay K7608 is energized at 3 amperes.

3. Readjust BIAS ADJ control R7513 for a reading of 18 amperes on the PLATE CURRENT meter.

b. ALIGNMENT OF GRID OVLD RELAY K7602, PLATE OVLD RELAY K7601, RETURN RELAY K7603, BIAS RELAY K7605, AND SWR RELAY K7604.

1. Set RETUNE OVLD ADJ control R7601 (98), GRID OVLD ADJ control R7602 (114), and BIAS RELAY ADJ control R7604 (112) to their maximum counterclockwise positions.

2. Set PLATE OVLD ADJ control R7601 (113), GRID OVLD ADJ control R7602 (114), and BIAS RELAY ADJ control R7604 (112) to their maximum counterclockwise positions.

3. Tune the transmitter to 11 mc.

4. Adjust exciter output for a 200-ma reading on GRID CURRENT meter (118) on the antenna tuning unit.

5. Adjust GRID OVLD ADJ control R7602 (114) so that GRID OVLD relay K7602 is energized at 200 ma as indicated on GRID CURRENT meter (118).

6. Reduce exciter output to zero, then depress OVERLOAD RESET switch S7401 (88) on the PA control panel.

7. Increase exciter output until a reading of 6 amperes is obtained on PLATE CURRENT meter (77).

CAUTION

Do not maintain 6-ampere reading on PLATE CURRENT meter for more than 1 minute.

8. Adjust PLATE OVLD ADJ control R7601 (113) so that PLATE OVLD relay K7601 is energized at 6 amperes as indicated on PLATE CURRENT meter.

9. Reduce exciter output to zero, then depress OVERLOAD RESET switch S7401 (88).

10. Increase exciter output until PLATE CURRENT meter (77) reads 3 amperes. Rotate LOAD control (86) on 40-kw PA until PLATE CURRENT meter reading increases 4 amperes.

11. Adjust exciter output until a reading of 22.0 kilovolts is obtained on PLATE RF meter (78).

12. Turn RETUNE OVLD ADJ control R7520 (118) on bias supply drawer clockwise until RETUNE relay K7603 is energized, then turn control back slightly.

13. Reduce exciter output to zero. Depress overload reset switch S7401 (88). Slowly increase exciter output. RETUNE relay K7603 should be energized when PLATE CURRNET meter (77) indicates 3.0 amperes with less than 2.0 kilovolts indicated on PLATE RF meter (78). If RETUNE relay is not energized when these meter readings are reached, turn RETUNE OVLD slowly clockwise until RETUNE relay is energized. Repeat step (13) until RETUNE relay is energized any time PLATE CURRENT meter (77) indicates 3.0 amperes with less than 2.0 kilovolts indicated on PLATE RF meter (78).

14. Return LOAD control (86) on 40-kw PA to its proper setting as shown in the tuning chart, then depress OVERLOAD RESET switch S7401 (88).

15. Slowly turn BIAS RELAY ADJ control R7604 (112) clockwise until relay K7605 is deenergized.

16. Turn BIAS RELAY ADJ control R7605 (112) slightly counterclockwise and depress OVERLOAD RESET switch S7401. Repeat this step until BIAS relay remains energized.

17. Connect a jumper between terminals 2 and 3 of SWR meter M8207. Adjust SWR OVLD ADJ control R7526 (97) until SWR relay K7604 becomes energized. Remove jumper from meter.

4-5. FAN MOTOR BEARING REPLACEMENT (see figure 4-1)

The following procedure is presented to facilitate replacement of motor bearing on the fans used in the PA and PS frames. To replace motor bearings, proceed as follows:

a. Loosen two setscrews (91-12-1) on fan hub. Slide fan (68-25-7) off shaft.

b. Remove four nuts (94-2-1), four washers (92-5), and four thru bolts (91-10-17) from motor.

c. Remove front end cap (3102B-101) and rotor assembly (4102B168-1) from motor housing.

d. Remove front end cap (3102B-101) from rotor assembly (4102B168-1).

NOTE

If any shim washers should adhere to front bearing, be sure to put them back into end cap. All shim washers and loading springs (83010) must be positioned in their original order when reassembling motor.

e. Press off old bearings from shaft (one at a time), by supporting bearings and applying pressure to shaft at center. Take care not to damage shaft. Discard old bearings.

f. Press new bearings (37-3-31) on shaft by applying pressure to inner race only, keeping bearings square with shaft.

CAUTION

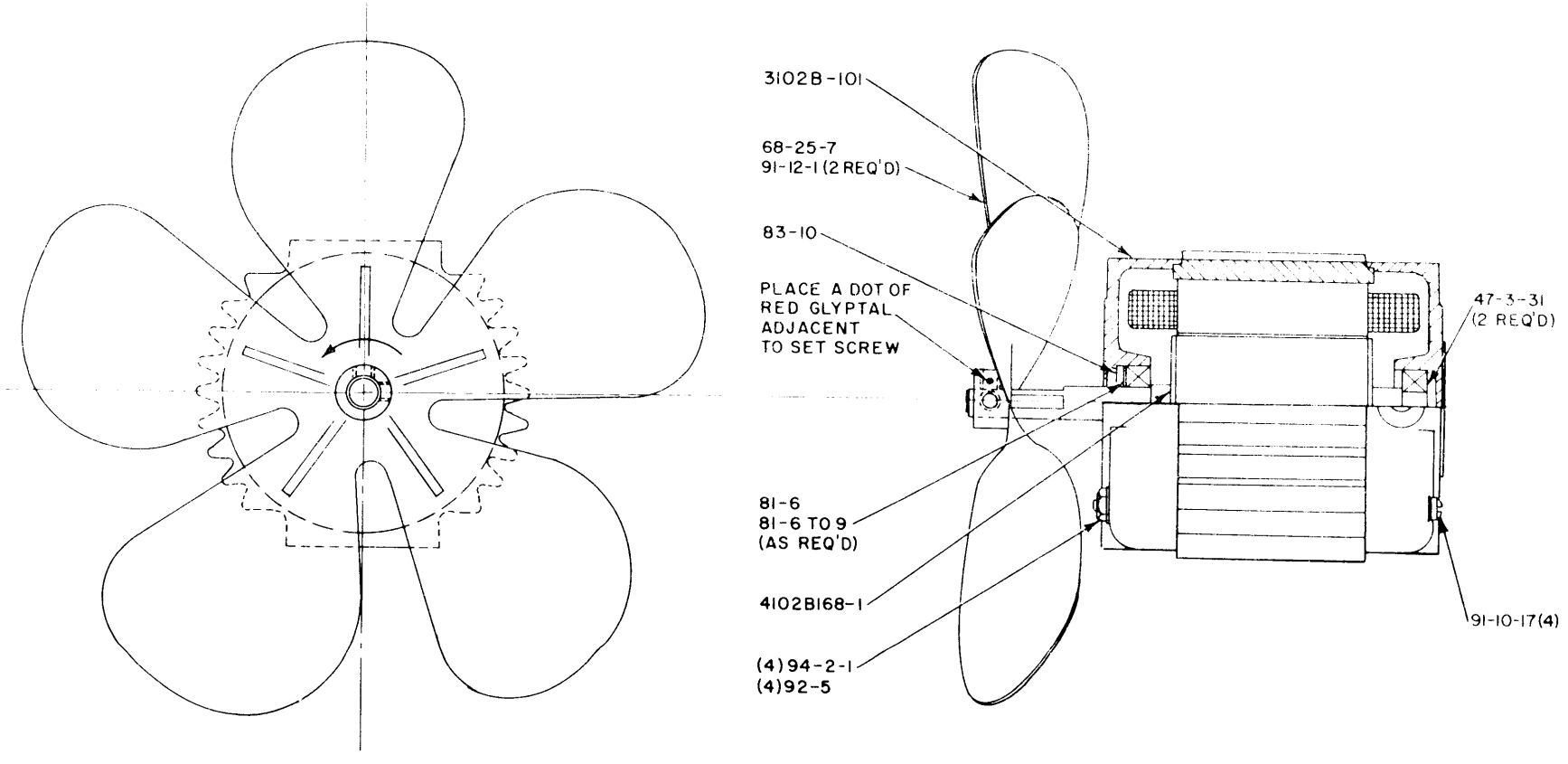
DO NOT APPLY PRESSURE TO OUTER RACE OF BEARINGS.

g. Replace rotor assembly (4102B168-1) in front end cap (3102B101). Place rotor assembly with front end cap in motor housing. Secure front end cap to motor housing using four thru bolts (91-10-17), four nuts (94-2-1) and four washers (92-5).

h. Slide fan (68-25-7) on shaft. The two setscrews (91-12-1) should line up with flats on shaft to prevent raising burr on shaft which would interfere with future disassembly. Tighten setscrews and stake with Glyptol.

4-6. EQUIPMENT PERFORMANCE CHECK.

Table 4-2 is a procedure that systematically check equipment performance in terms of operating procedures. Perform each step in the order given.



1025/EL-10

Figure 4-1. PA and PS Frame Fan

NOTE

Numbers in parentheses identify locations of operating controls and indicators. Refer to the operator's manual for front panel location diagrams. Normal, proper, or correct meter indications are those given in the GPT-40K tuning chart and table 4-4.

4-7. SYSTEM TROUBLESHOOTING.

Table 4-3 provides additional troubleshooting data based on specific transmitter trouble symptoms. When a trouble has been sectionalized to a specific unit or circuit, refer to the applicable table and figure in this section which applies to that unit for additional troubleshooting data.

Normal, proper, or correct meter indications are those given in the GPT-40K tuning chart 4-4.

WARNING

Voltages as high as 12,000 volts are present in the transmitter. Before making resistance measurements, make sure the HIGH VOLTAGE and MAIN POWER circuit breakers on main frame and PA frame of the transmitter are set at OFF. Use the shorting rod provided to discharge all filter capacitors in the main frame and PS frame to ground. When taking voltage readings, make sure hands are dry, use test prods insulated for at least 25,000 volts, and take care to keep free hand and body away from electrical ground and clear of equipment.

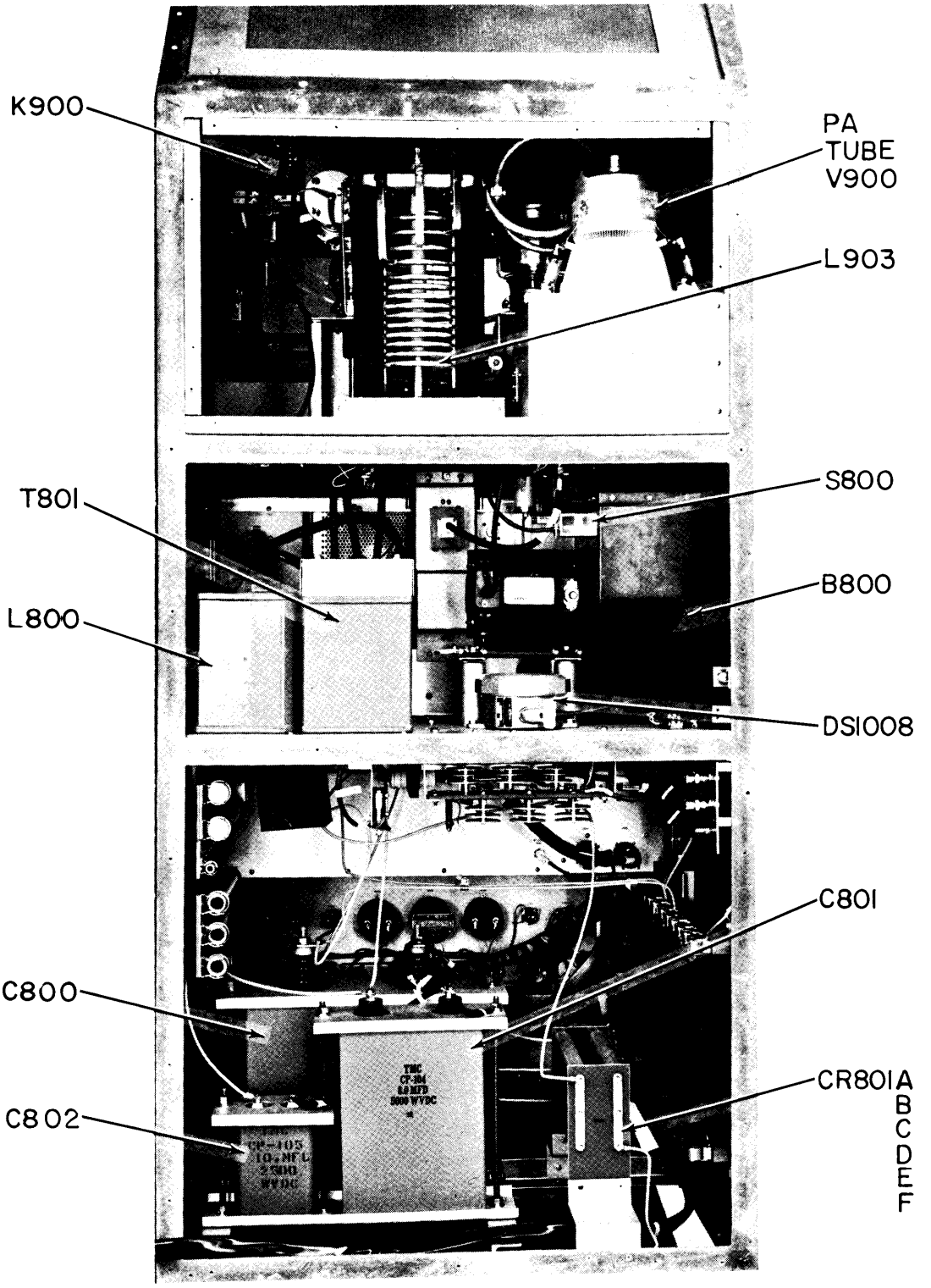
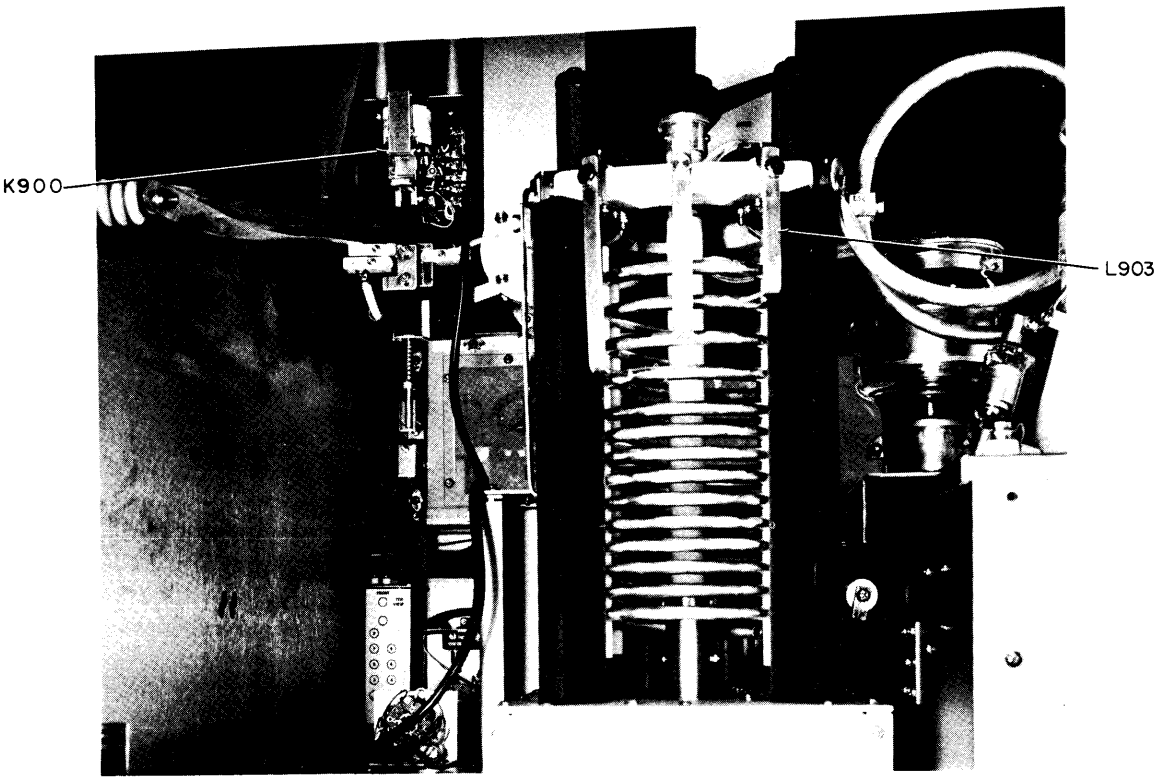


Figure 4-2. Overall Rear View
10KW Section

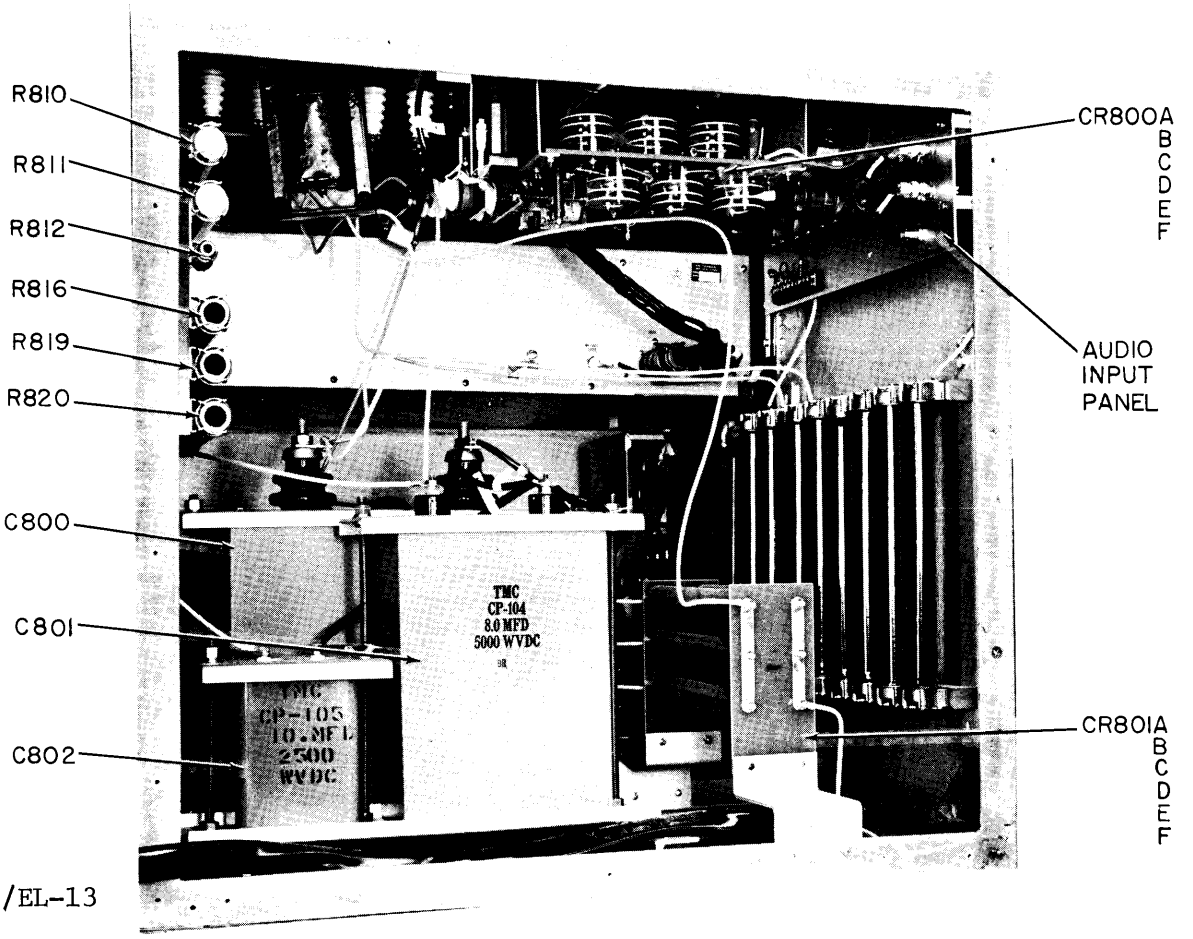
681.5-4



1025/EL-12

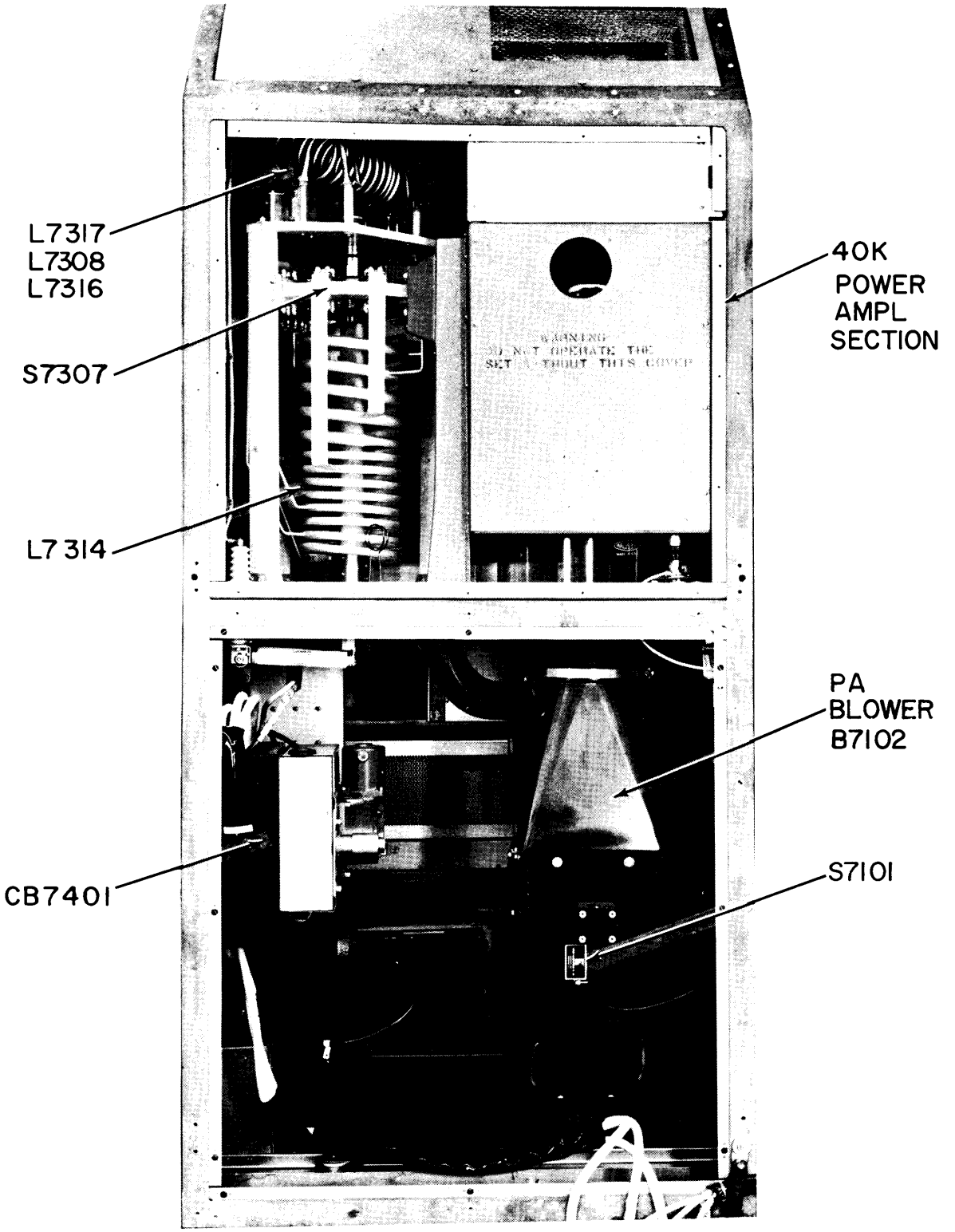
Figure 4-3. Rear View 10KW PA Section, Showing Relay K900

681.29-12



1025/EL-13

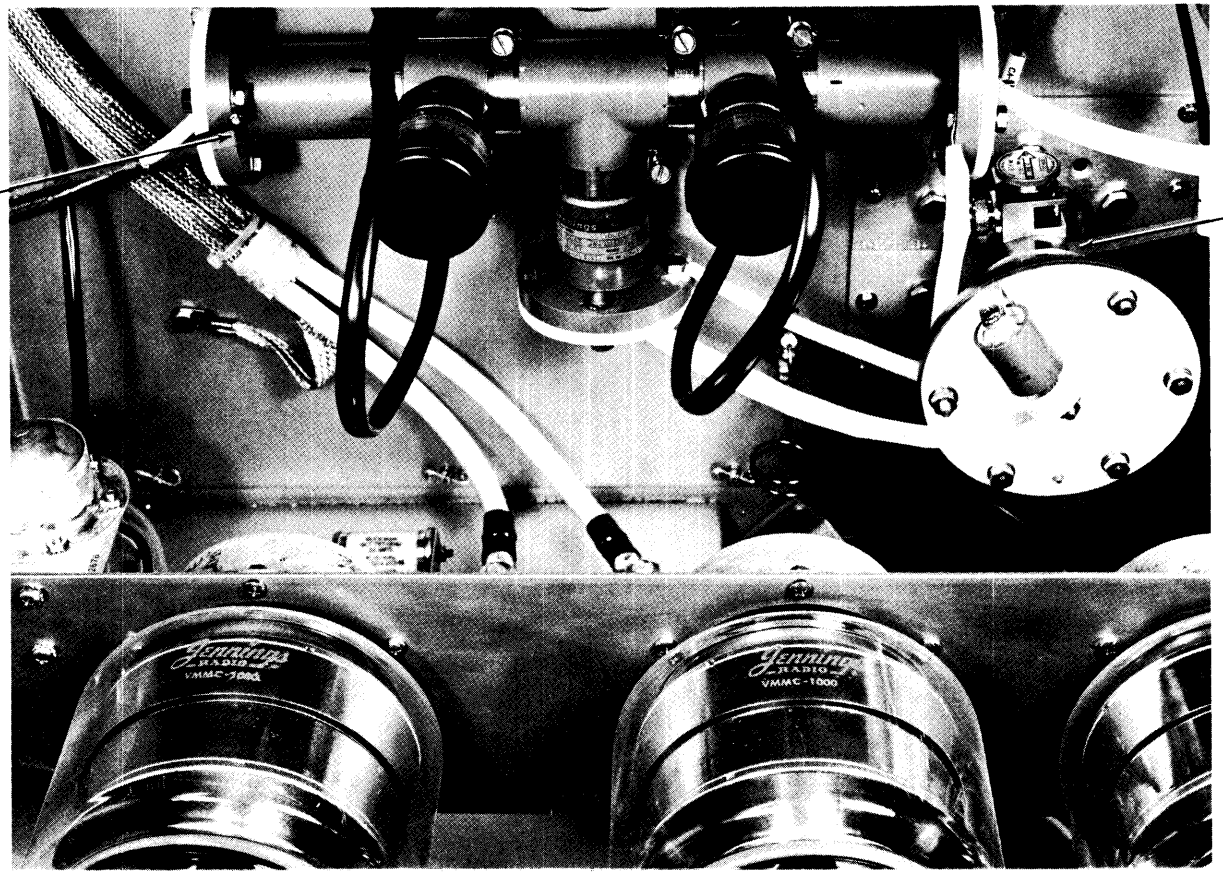
Figure 4-4. Rear View 10KW Power Supply Section



681.29-10

1025/EL-14

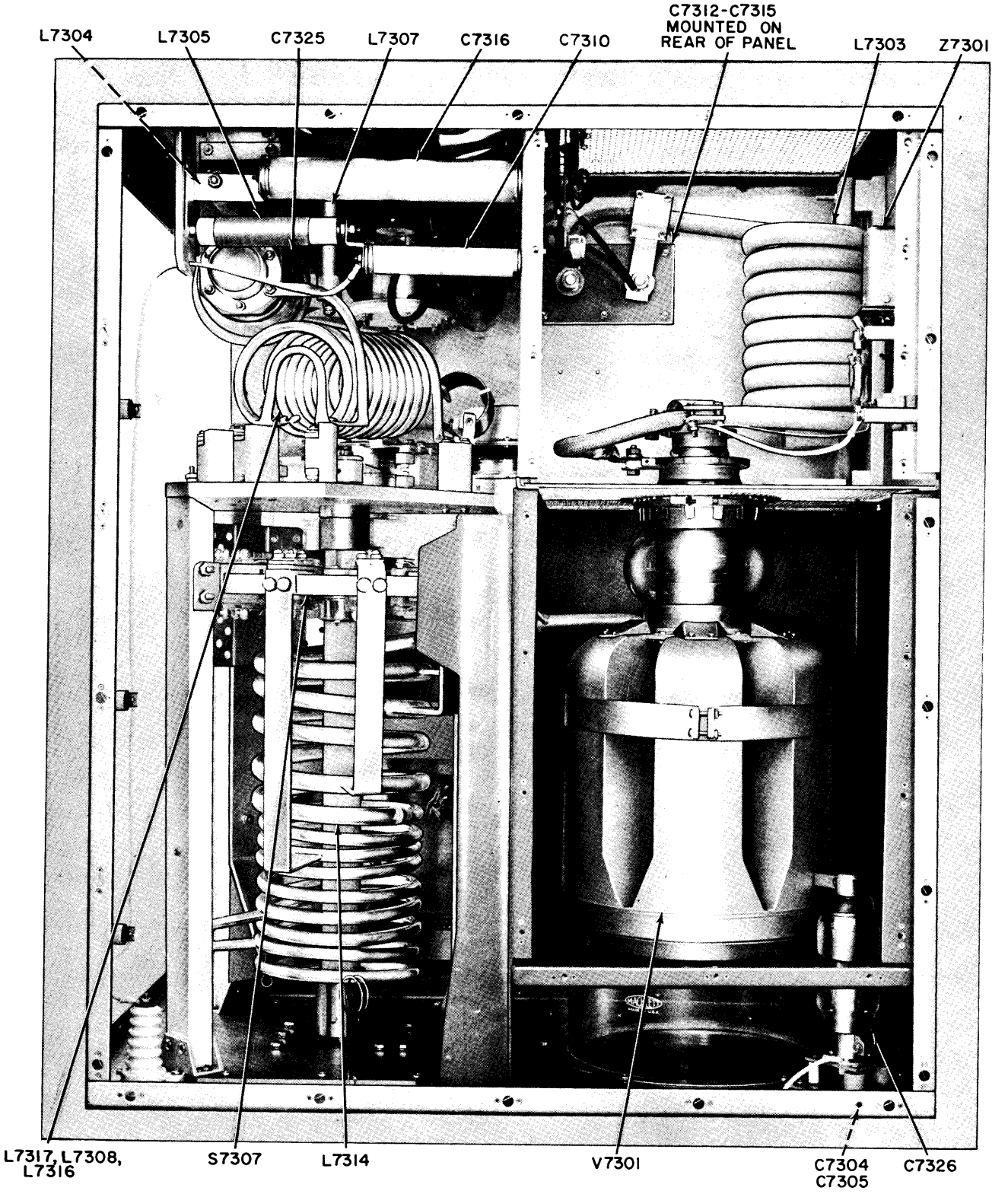
Figure 4-5. Overall Rear View 40KW PA Section



1025/EL-15

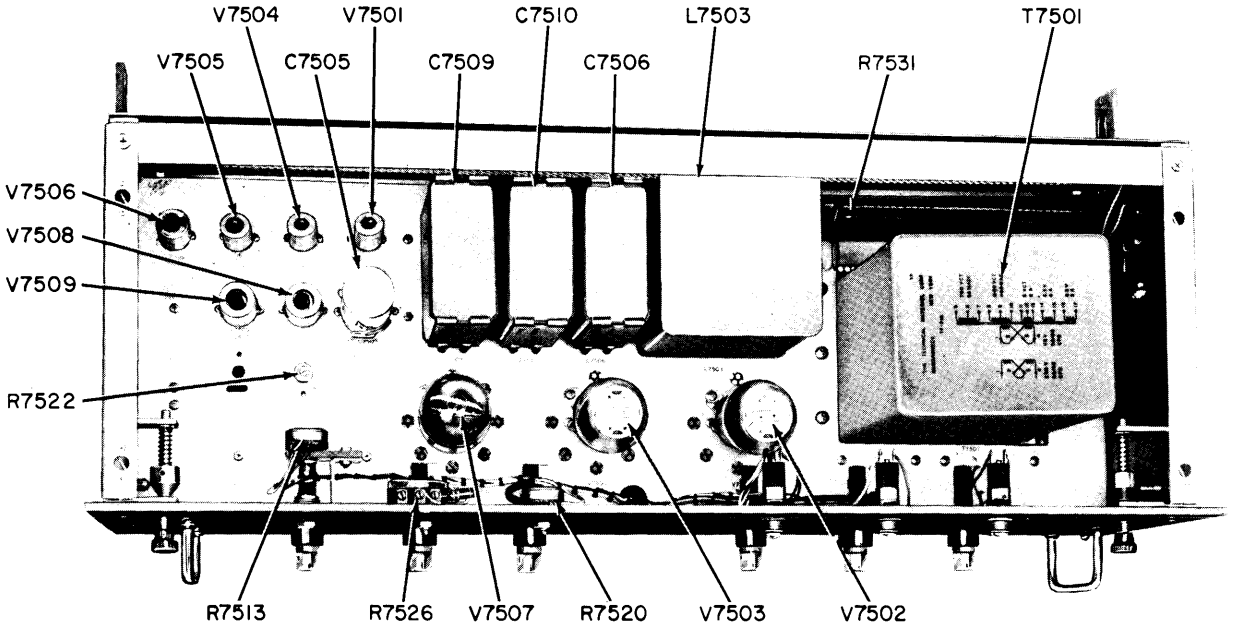
Figure 4-6. Front View Top, 40KW PA

684.26-1



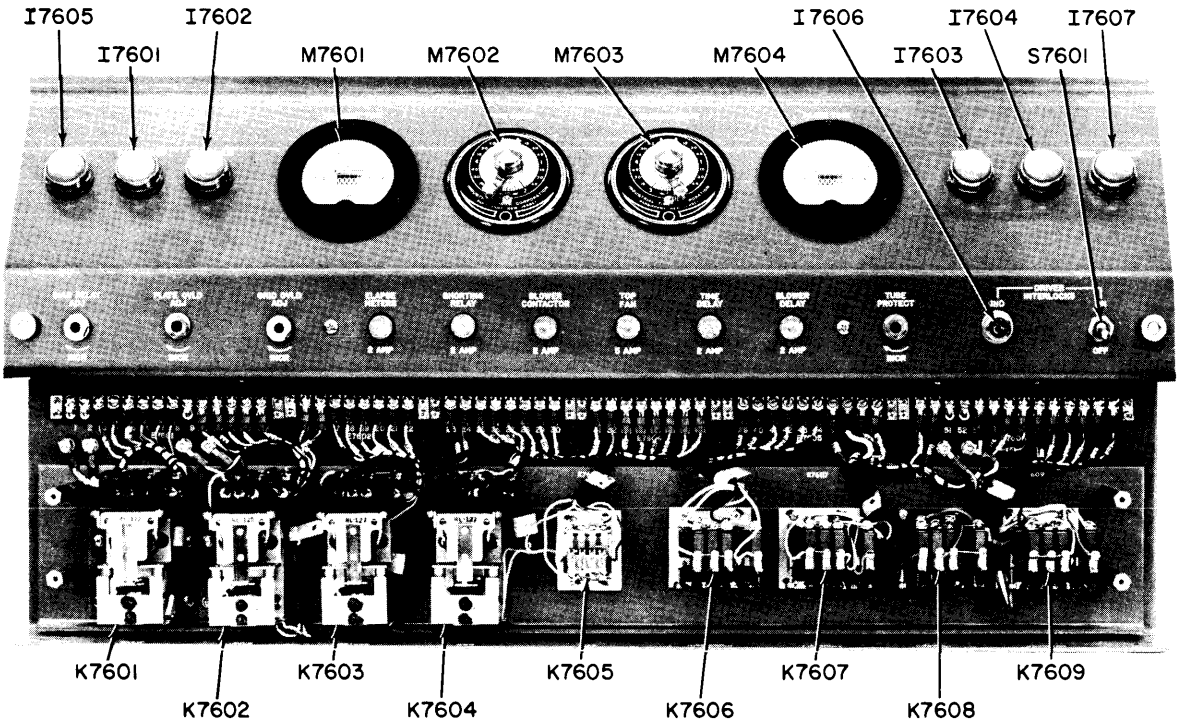
1025/EL-16

Figure 4-7. Rear View Top, 40-KW PA Frame



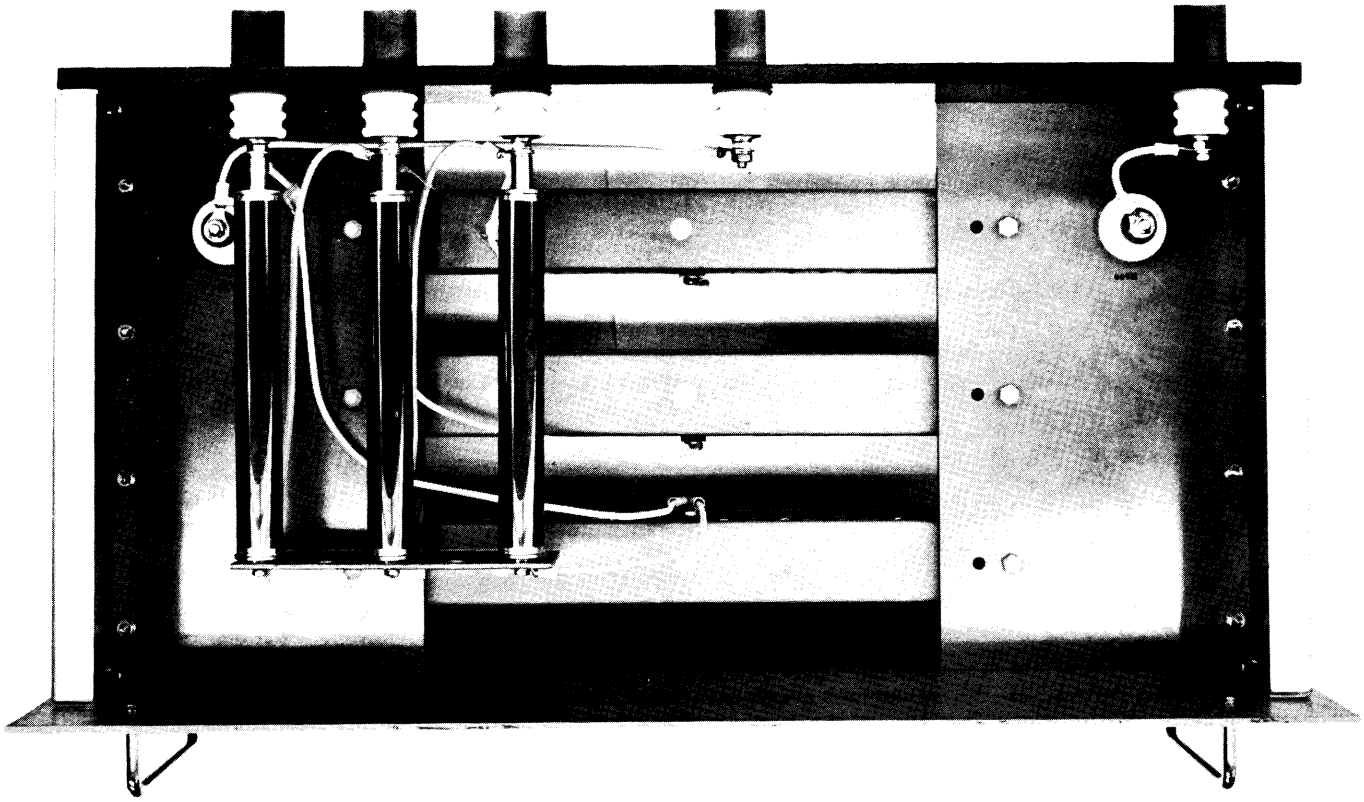
1025/EL-17

Figure 4-8. Top View, Bias Supply



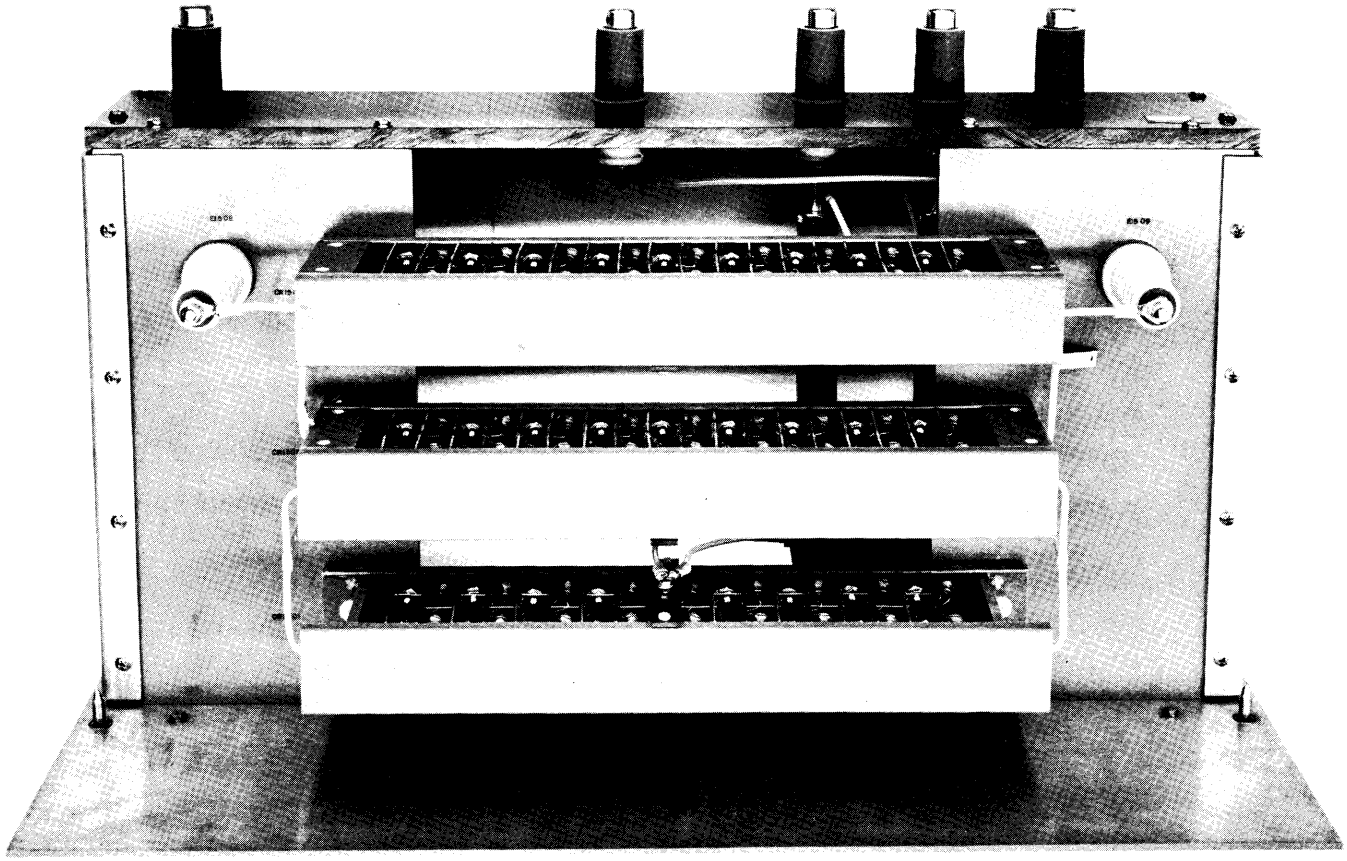
1025/EL-18

Figure 4-9. Front View, 40-KW Frame Relay Panel



1025/EL-19

Figure 4-10. Front View, 40-KW High Voltage Rectifier



1025/EL-20

Figure 4-11. Bottom View 40K High Voltage Rectifier

TABLE 4-1. PRELIMINARY INSPECTION PROCEDURE

WHAT TO INSPECT	DEFECTS TO LOOK FOR	REMEDY
All electrical connections at rear of PA and and PA frames.	Open connections, dirt, frayed cables.	Tighten replace or clean as necessary.
Antenna connections	Loose connections, dirt, frayed cables.	Tighten, replace or clean as necessary.
Knobs, screws, connectors.	Loose or missing hard-	Tighten, or replace.
Wiring	Loose or frayed wires.	Resolder or rewire.
Resistors	Cracks, chipping, blistering, discoloration, and other signs of overheating.	Replace as necessary.
Capacitors	Leaks, bulges, discoloration.	Replace as necessary.
Tubes	Poor seating.	Secure firmly in place.
Meters	Bent needle, cracked case, broken glass.	Replace as necessary.

TABLE 4-2. EQUIPMENT PERFORMANCE CHECK

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL IND.
1	Connect antenna or dummy load to transmitter and check that all doors, covers and components are secured.		
2	Set exciter and Exciter Drawer control to preliminary setting refer to paragraph 2-4.	Exciter Power lamp (63) lights.	Open line fuse in Exciter Drawer or Exciter unit MMX.
3	Set all tuning controls on transmitter at positions specified in transmitter tuning chart, then set switches as follows:		

TABLE 4-2. EQUIPMENT PERFORMANCE CHECK (CONT)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL IND.
3 cont.	PA SCREEN (40) OFF TUNE-OPERATE (39) TUNE HIGH VOLTAGE (41) OFF ALDC (37) OFF INTERLOCK (35) NORMAL OUTPUT LOADING (19) TUNE		
4	Set TIME DELAY Control (43) at 5 min. Set 10kw FRAME MAIN POWER Circuit breaker (32) at ON.	Main frame blower operates. Tune lamp (7) lights. PA BIAS lamp (45) lights After a few seconds it goes off. After 5 minutes INTERLOCK INDICATOR lamp (34) lights.	Open MAIN BLOWER fuse on Relay panel or defective blower unit. Open resistor R1007. Defective circuit rf amplifier Power Supply. Open Interlock Circuit.
5	Set TIME DELAY control (106) at 5 minutes, then set the MAIN POWER circuit breaker (93) at ON.	After 5 minutes, INTERLOCK INDICATOR lamp (34) lights. AC POWER lamp (50) and TUNE lamp (81) on PA frame light. Top fan in PA frame starts. AC POWER lamp (99) on bias supply drawer lights. After a short delay (about 5 seconds), LV lamp (101) on bias supply drawer lights. After a short delay (about 5 seconds), BIAS lamp (100) lights. POWER lamp (123) on crowbar drawer lights.	Open interlock circuit. Resistors R7303 and R7304, respectively, defective. Open TOP FAN fuse F7601. Open AC POWER fuse F7503. Open LV fuse F7501. Open BIAS fuse F7502. Open FILAMENT fuse F8301.
6	Set BLOWER circuit breaker (124) at ON position.	Main blower in PA frame starts.	Open BLOWER CONTACTOR fuse F7606.

TABLE 4-2. EQUIPMENT PERFORMANCE CHECK (CONT)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL IND.
7	Set FINAL FIL circuit breaker (128) at ON.	FILAMENT TIME meter (105) registers elapsed time. FILAMENT PRIMARY meter (75) indicates 230 volts.	Open ELAPSE METERS fuse F7603. Incorrect setting of FIL ADJ selector switch (125).
8	Set MULTIMETER switch (122) at DC IPA BIAS.	MULTIMETER (75) reads 100 volts.	Incorrect setting of IPA BIAS ADJ control on rf amplifier drawer.
9	Set MULTIMETER switch (22) at RF 1ST AMP EP position. Turn OUTPUT control on exciter clockwise slightly, then tune 1 ST AMP TUNING control (23) for peak on MULTIMETER (20).	A peak is obtained.	Defective amplifier V201 is RF Amplifier RFC; defective V2000 in rf amplifier drawer.
10	Set MULTIMETER switch (22) at RF IPA EG position and tune IPA GRID TUNING control (23) for peak on MULTIMETER (20).	A peak is obtained.	Defective amplifier V202 in RFC.
	NOTE At conclusion of step 10, return rf drive to minimum.		
11	Depress OVERLOAD RESET pushbutton (33) then set HIGH VOLTAGE circuit breaker (41) at ON position.	PLATE ON lamp (9) glows dimly. PA PLATE meter (1) indicate plate voltage (7.5 kvdc).	Defective contactor K1000 in auxiliary frame, open TIMER fuse F704. Defective main power supply.
12	Set MULTIMETER switch to DC IPA ESG position.	MULTIMETER (20) reads 200 volts dc.	Defective switch on contactor K1000.
13	Increase drive slightly, then adjust IPA TUNING control (28) for dip (null) on IPA PLATE CURRENT meter (21).	A dip (null) obtained.	Defective amplifier V203 in RFC.

TABLE 4-2. EQUIPMENT PERFORMANCE CHECK (CONT)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL IND.
	NOTE At conclusion of step 14, return rf drive to minimum.		
14	Turn exciter OUTPUT clockwise slightly until some increase is noted on PA PLATE CURRENT meter (3), then tune PA TUNE control (15) for dip on PA PLATE CURRENT meter (3).	A dip is obtained.	Defect in power amplifier V900.
15	Reduce exciter OUTPUT to minimum, then set TUNE-OPERATE switch switch (39) at OPERATE position.	PA PLATE CURRENT meter (3) reads approximately 500 ma. OPERATE lamp (8) lights and TUNE lamp (7) goes out. IPA PLATE CURRENT meter (21) reads approximately 200 ma.	Defect in power amplifier V900. Open resistor R1008. Defective amplifier V203 in RFC.
16	Increase exciter OUTPUT, then tune and load 1-kw IPA and 10-kw PA until PA PLATE current meter (3) reads approximately 1.5 amperes and PA PLATE RF meter (4) reads 2 to 5 kv rf.	Proper indications obtained on meters.	Improper tuning and/or loading or defect in in PA circuit.
17	Reduce exciter OUTPUT to minimum, then set HIGH VOLTAGE circuit breaker (41) at OFF position.		
18	Set OUTPUT LOADING control (19) at OPER.	TUNE lamp (81) goes out and OPERATE lamp (82) lights.	Open contact on TUNE/OPER/switch S908 or S907 Defective relay K900.

TABLE 4-3. SYSTEM TROUBLESHOOTING

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
1	The exciter unit cannot be powered.	Defect in the input to Exciter Drawer or the MMX.	Check line fuses F200, and F201.
2	MAIN POWER circuit breaker (32) trips continually.	Short circuit in 208-volt ac input circuit.	Disconnect P1000 from J700 and P1010 from J2002. If circuit breaker still trips, check for overload in ac input circuit and main power supply. If circuit breaker can now be set at ON without tripping, connect P1010 to J2002. If the circuit breaker trips with P1010 connected to J2002, check the RFC and rf amplifier drawer for shorts. If the circuit breaker remains on, check for a short in the relay panel.
3	Wit MAIN POWER circuit breaker (32) set at ON and HIGH VOLTAGE circuit breaker (41) set at OFF, all lamps on main frame are off and FILAMENT TIME meter (82) does not record elapsed time. Blower motor B800 does not run.	208-volt ac input circuit defective.	Check circuit breaker CB1000 and associated wiring.
4	The fluorescent lamp in the main frame does not light but FILAMENT TIME meter (42) on relay panel records elapsed time.	Fluorescent lamp circuit in main frame defective.	Check lamps I1005 and and associated starters and ballasts.
5	MAIN BLOWER fuse on main frame relay panel opens continously.	Blower motor B800 defective.	Check for short circuit in blower motor B800 and associated wiring.
6	Blower motor in main frame does not operate but FILAMENT TIME meter (42) relay panel records elapsed time.	Blower motor B800 defective.	Check for open circuit in blower motor B800 and associated wiring.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
7	TIMER fuse on 10kw frame relay panel opens continually.	TIME DELAY meter M701 defective.	Check for short circuit in TIME DELAY meter and associated wiring.
8	PA FIL fuse on main frame relay panel opens continually.	Filament transformer T801 is defective.	Check for short circuit in T801.
		Short in filament circuit of power amplifier V900.	Check for short circuit in V900.
		FILAMENT TIME meter M700 is defective.	Check for short circuit in FILAMENT TIME meter M700 and associated wiring.
9	FILAMENT TIME meter (42) does not record elapsed time.	FILAMENT TIME meter M700 is defective.	Check M700 and associated wiring.
10	TIME DELAY meter (43) does not operate but FILAMENT TIME meter (42) records elapsed time.	TIME DELAY meter M701 defective.	Check M701 and associated wiring.
11	On rf amplifier drawer, B+ fuse, IPA BIAS fuse, IPA BLOWER fuse, IPA FIL fuse, or LV fuse opens continually.	Power supply in rf amplifier drawer defective.	Refer to maintenance manual for GPT-10K.
		RF Amplifier RFC defective.	Refer to maintenance manual GPT-10K.
12	Blower motor B201 in RFC does not operate.	B201 is defective.	Check B201 and associated wiring.
13	PA BIAS lamp (45) remains on after MAIN POWER circuit break- (32) is turned on.	Bias rectifier circuit in rf amplifier drawer defective.	Refer to maintenance manual GPT-10K.
14	On RFC, incorrect indictaion obtained on MULTIMETER (20) when MULTIMETER switch (22) set to IPA BIAS.	RFC or rf amplifier drawer defective.	Refer to maintenance manual for GPT-10K.
15	Transmitter remains on although VSWR is excessive.	SWR OVLD circuit defective.	Refer to EXCITER DRAWER manual.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
16	On 10-kw high voltage rectifier, HV FILAMENT fuse opens continually.	10-kw high voltage rectifier defective.	Check the rectifier circuit, transformer, and wiring associated with the open fuse.
17	With INTERLOCK switch (35) set at NORMAL, INTERLOCK INDICATOR lamp (54) does not light although the time delay provided by TIME DELAY meter (43) has expired.	A panel or component improperly positioned. Defective interlock switch circuit.	Check that all panels and components are firmly secured in position. Rotate INTERLOCK switch clockwise from the NORMAL position. The INTERLOCK INDICATOR lamp will go out when the switch is turned to the position corresponding to the open interlock. If this occurs, check switches as follows: INTERLOCK Switch Position — Check Interlock Switch (Figure 3-3). IPA BAND SW — S205 (operated by S202 in RFC) IPA AIR SW — S206 (operated by blower B201 in RFC) EXTERNAL — Jumper between terminals 8 and 10, E3000 REAR DOOR — S1006 PA AIR SW — S800 (operated by main blower B800) PA DECK — S1007 PA BAND SW — S901 (operated by S900) HV DECK — If DRAWER INTERLOCK lamp is lit, check RFC drawer switch S1009 If lamp is off, check HV deck interlock switch S1010.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
17 Cont.			INTERLOCK Switch Position: TIMER — Check Interlock Switch (Figure 3-3). Switch on TIME DELAY meter M701.
18	HIGH VOLTAGE circuit breaker (41) trips continually. (OUTPUT LOADING switch (119) is set to TUNE.)	An interlock switch open.	Refer to item 17 above.
19	With HIGH VOLTAGE circuit breaker (41) set at ON, the PLATE ON lamp (9) does not light, but the six lamps on the relay panel are all off.	DIODE PROTECT relay K704 has detected an overload.	On the main frame relay panel, measure ac voltage between terminals 29 and 30 of E702. If no voltage, relay K704 did not detect an overload. If 230 volts ac is measured, check relay K704, R701, CR800A, through CR800F, and associated wiring.
		High voltage shorting coil L802 defective.	Check L802 and associated wiring.
		AC Power input circuit defective.	Check contactor K1000.
20	PA PLATE OVLD lamp (46) lights.	PA PLATE OVLD ADJ R705 incorrectly set or defective. PA PLATE OVLD relay K701 or associated wiring defective.	Adjust PA PLATE OVLD ADJ control R705. Check relay K701, potentiometer R705, and R704.
		Power amplifier defective.	Check 10-kw power amplifier V900.
		RF amplifier RFC defective.	Check for short or leaky capacitors C253 and C275.
21	PA SCREEN OVLD lamp (47) lights.	PA SCREEN OVLD ADJ R707 incorrectly set or defective. PA SCREEN OVLD relay K702 or associated wiring defective.	Adjust PA SCREEN OVLD ADJ control R707. Check relay K702, PA SCREEN OVLD ADJ control R707, and R706.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATOR	PROBABLE TROUBLE	PROCEDURE
22	IPA SCREEN OVLD lamp (48) lights.	IPA SCREEN OVLD ADJ R709 incorrectly adjusted or defective. IPA SCREEN OVLD relay K706 or associated wiring defective. RFC defective.	Adjust IPA SCREEN OVLD ADJ control R709. Check relay K706, IPA SCREEN OVLD ADJ control R709, and R708. Check V203 and check for short in screen circuit of V203.
23	IPA PLATE OVLD lamp (49) lights.	IPA PLATE OVLD ADJ R711 incorrectly adjusted or defective. IPA PLATE OVLD relay K707 or associated wiring defective. RFC defective.	Adjust IPA PLATE OVLD ADJ control R711. Check relay K707, IPA PLATE OVLD ADJ control R711, and R710. Check amplifier V203.
24	SWR OVLD lamp (50) lights.	SWR OVLD circuit defective.	
25	PLATE ON lamp (9) is on, but PLATE TIME meter (44) does not record elapsed time.	Meter defective.	Check meter M702.
26	Correct readings are obtained on PA PLATE CURRENT and PA OUTPUT meter (3 and 5), but reading on PA PLATE RF meter (4) is abnormal.	Meter rectifier circuit defective.	Check the meter rectifier circuit associated with the PA PLATE RF meter.
27	With ALDC switch (37) set at ON, output power of transmitter does not increase as ALDC control is rotated clockwise.	ALDC circuit in main frame and auxiliary frame defective. ALDC switch (37) defective.	Check ALDC rectifier circuit elements. Check ALDC switch and associated wiring.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
28	MAIN POWER circuit breaker (93) trips continually.	Short circuit in 208-volt ac input line.	Disconnect P7101 from J8101 and P7107 from J7601. Set MAIN POWER circuit breaker (93) at ON. If the circuit breaker trips, check for a short circuit in PA frame. If the circuit breaker remains on, connect P7107 to J7601. Set circuit breaker at ON. If the circuit breaker trips with P7107 and J7601 connected, check for short-circuited wiring in the PA frame relay panel. If the circuit breaker remains on, check for short-circuited wiring in the PS frame.
29	BLOWER circuit breaker (124) trips continually.	Blower motor B7102 defective.	Disconnect P7103 from J7101. Set BLOWER circuit breaker (124) at ON. If the circuit breaker remains on, blower motor B7102 defective. Check B7102 and its associated circuit. If the circuit breaker trips, check for a short in 40KW PA frame wiring.
30	Blower motor B7102 does not operate but FILAMENT TIME meter (105) registers elapsed time.	Blower motor B7102 defective.	Check for an open circuit in blower motor B7102 and and its associated wiring.
31	Main PA blower B7102 stops operating. (MAIN POWER circuit breaker (93) is set at OFF while BLOWER circuit breaker (124) is left ON.)	BLOWER DELAY meter M7604 improperly set or defective. Open BLOWER DELAY fuse F7602.	Set M7603 for a 5-minute delay. If necessary, check M7603 and its associated circuit. Check for a short circuit in the M7603 meter circuit.
	FINAL FIL circuit breaker (128) trips continually.	Short circuit in 40-kw power amplifier V7301 filament circuit.	Check for short circuit in V7301 filament circuit.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
32	FINAL FIL circuit breaker (128) is at ON, but V7301 filament does not light, FILAMENT TIME meter (105) does not register elapsed time, FILAMENT PRIMARY meter (75) does not indicate, and blower motor B7102 does not operate.	Blower contractor K7101 defective. BLOWER CONTACTOR fuse open.	Check contactor K7101 and and its associated circuit. Check K7101 and its associated circuit for a short.
33	With MAIN POWER circuit breaker (93) set at ON and HIGH VOLTAGE circuit breaker (94) set at OFF, all lamps on the PA frame and PS frames are off and FILAMENT PRIMARY meter (75) does not indicate.	208-volt ac input circuit defective.	Check for open circuit breaker CB7401 and associated wiring.
34	Fluorescent lamps on 40kw and PS frames do not light.	Open LIGHT fuse F8503.	Check for short circuit in fluorescent lamp circuit.
35	TOP FAN fuse F7601 on PA frame relay panel opens continually.	Blower motor B7301 defective.	Check for short circuit in blower motor B7301.
36	BLOWER DELAY fuse F7602 on PA frame relay panel opens continually.	BLOWER DELAY meter M7603 (107) defective.	Check for short circuit in meter M7603.
37	TIME DELAY fuse F7604 on PA frame relay opens continually.	TIME DELAY meter M7602 (106) or PLATE TIME meter M7604 (108) defective.	Check for short circuit in meters M7602 and M7604.
38	BLOWER CONTACTOR fuse F7606 on PA frame relay panel opens continually.	Blower contactor K7101 defective.	Check for short circuit in blower contactor K7101.
39	SHORTING RELAY fuse F7605 on PA frame relay panel opens continually.	Shorting relay L8105 defective.	Check for short circuit in meter M7601.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
40	ELAPSE METERS fuse F7603 on PA frame relay panel opens continually.	FILAMENT TIME meter M7601 (105) defective.	Check for short circuit in meter M7601.
41	With OUTPUT LOADING control (19) set at TUNE, TUNE lamp (81) does not light.	OUTPUT LOADING switch S908 and S907 defective.	Check OUTPUT LOADING switch S908 and S907.
42	FILAMENT TIME meter (105) on PA frame relay does not record elapsed time but FILAMENT PRIMARY meter (75) indicates 230 volts (red line).	FILAMENT TIME meter M7601 defective.	Check M7601.
43	PLATE TIME meter on PA frame relay panel does not record elapsed time but PLATE ON lamp (83) lights.	PLATE TIME meter M7604 defective.	Check M7604.
44	BIAS lamp (100) on bias supply does not light, BIAS lamp (102) on PA frame relay panel lights, and LV lamp (101) lights.	600-volt power supply circuit in bias supply defective.	Refer to table 4-5.
45	LV lamp on bias supply does not light but BIAS lamp lights.	350-volt power supply circuit in bias supply defective.	Refer to table 4-5.
46	BIAS lamp (102) on 40kw PA frame relay panel is on.	600-volt power supply in bias supply defective.	Refer to table 4-5.
47	BIAS lamp (102) on 40kw PA frame relay panel is lit, but correct indication is obtained on GRID VOLTS meter (119).	PA frame relay panel defective.	Check BIAS relay K7605, BIAS RELAY ADJ control R7604, resistor R7605, and associated wiring.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
48	FINAL FILAMENT lamp (111) of 40kw PA frame relay panel lit, FILAMENT PRIMARY meter (75) does not indicate correctly and AC POWER lamp (99) on bias supply lit.	PA frame relay panel defective. Transformer T7101 defective.	Check FINAL FILAMENT relay K7606 and associated circuit. Check transformer T7101 and associated wiring.
49	FILAMENT PRIMARY meter (75) indicates incorrectly, CROWBAR FILAMENT meter (121) indicates incorrectly, and AC POWER lamp (99) on bias supply is out.	FIL ADJ switch (125) defective. Transformer T8104 defective.	Check FIL ADJ switch S8501 and associated wiring. Check transformer T8104.
50	Correct indication obtained on FILAMENT PRIMARY meter (75) but incorrect reading obtained on CROWBAR FILAMENT meter (121).	Crowbar drawer defective.	Refer to table 4-8.
51	FILAMENT fuse F8301 on crowbar drawer opens continually.	Crowbar drawer defective.	Refer to table 4-8.
52	INTERLOCK INDICATOR lamp (89) does not light in every position of INTERLOCK switch (95). (OUTPUT LOADING switch (19) set at OPERATE.)	Door or equipment improperly positioned. Defective interlock switch circuit. Defective relays either K900, K7301, or K7302.	Check that all doors and equipment are properly positioned. Rotate INTERLOCK switch clockwise. INTERLOCK INDICATOR lamp (215) lights wherever an interlock switch is closed and goes out if an interlock switch is open. If INTERLOCK INDICATOR lamp goes out in any position of INTERLOCK switch, check appropriate interlock switches as follows:

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
52 (Cont)			INTERLOCK Switch Position / Switch of Circuit to be Checked PA DECK — S7307 BIAS DRAWER — S7102 RELAY PANEL — S7103 REAR DOOR (PA FRAME) — S7104 AIR SW — S7101 BAND SW — S7304 HV RECT — S8102 CROWBAR — S8101 REAR DOOR (PS FRAME) — S8104 TIMER — TIME DELAY meter M7602 and PS bottom panel S8103 EXTERNAL — OUTPUT LOADING switch S908 external interlock switches S905 and S906.
53	HIGH VOLTAGE circuit breaker (94) trips continually.	Interlock switch open.	Refer to item 52 above.
NOTE If S907, S905, or S906 is open, HIGH VOLTAGE circuit breaker will not trip.			
		Contactor K8102 defective.	Check for short circuit in contactor or K8102.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
54	PLATE OVLD lamp (103) on PA frame relay panel lights.	PA frame relay panel misaligned or defective.	Adjust PLATE OVLD ADJ potentiometer R7601. Check relay K7601, potentiometer R7601, and resistor R7609.
		40-kw PA defective.	Check 40-kw PA stage.
55	BIAS lamp (102) on PA frame relay panel lights.	PA frame relay panel misaligned or defective.	Adjust BIAS RELAY ADJ potentiometer R7604. Check relay K7605, potentiometer R7604, and resistor R7605.
		Bias supply defective.	Refer to table 4-5.
56	RETUNE lamp (109) lights.	40-kw PA improperly tuned.	Retune transmitter.
		RETUNE OVLD ADJ potentiometer R7502 misadjusted.	Refer to paragraph 4-4.
		Thermostatically operated 40-kw PA tube protect switch S7305 defective.	Check S7305 and associated wiring.
		Retune amplifier V7508 in bias supply defective.	Check amplifier V7508.
57	SWR lamp (110) on 40-kw PA frame relay panel lights.	SWR OVLD ADJ potentiometer R7529 misadjusted.	Adjust potentiometer R7529.
		SWR amplifier V7509 in bias supply defective.	Refer to maintenance manual for GPT-10K.
		Switch in SWR meter defective.	Check SWR meter.
58	FINAL FILAMENT lamp (111) on PA frame relay panel lights.	Transformer R7101 defective.	Check T7101 primary for open circuit.
59	PLATE TIME meter (108) does not record elapsed time, but PLATE ON lamp (83) is ON.	Defective meter.	Check meter M7604.

TABLE 4-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
60	Incorrect reading obtained on DRIVE meter (76) but correct readings obtained on PLATE CURRENT and PLATE RF meters (77) and (78).	Rf detecter network Z7301 defective.	Check Z7301.
61	When HIGH VOLTAGE circuit breaker (94) is set at ON.	OUTPUT LOADING switch S908 in TUNE position. Door or window improperly positioned on main frame.	Ensure that OUTPUT LOADING switch in OPER position. Ensure that PA DECK window and REAR DOOR are properly positioned on 10-kw frame.

TABLE 4-4. POWER AMPLIFIER V7301, VOLTAGE AND RESISTANCE MEASUREMENTS

TUBE ELEMENT	VOLTAGE	RESISTANCE (TO GROUND)
Plate	+12,000*	**
Grid	0 (to ground)	0
Filament	13V AC (measured across filament)	0
Filament	+600V DC (to ground)	

* Measured to either side of filament
** Measured with shorting relay L8105 held open.

TABLE 4-5. BIAS SUPPLY TROUBLESHOOTING

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
1	AC POWER indicator I7503, BIAS indicator I7502, and LV indicator I7501 do not light when primary power is applied to the bias supply.	AC POWER fuse F7503 open as result of overload.	If blown fuse indicator is lit, check bias supply for shorted circuit.
		Protective interlock S7501 defective.	Check continuity of S7501.
		Transformer T7501 defective.	Check T7501 for open winding.
2	AC POWER indicator I7503 and BIAS indicator I7502 do not light when primary power is applied to the bias supply; LV indicator I7501 lights.	Open secondary winding 14-15 on trans-T7501.	Check continuity of winding 14-15.
3	No 600-volt output (BIAS indicator I7502 does not light); AC POWER indicator I7503 and LV indicator I7501 light normally.	Rectifier or filter defective.	If BIAS blown fuse indication is lit, check for short in 600-volt power supply before replacing fuse F7502.
			If fuse F7502 is good, check rectifier V7502 and V7503; check secondary windings 8-10 and 11-13 of T7501; check continuity of filter choke L7503 and resistor R7503; check for leaky filter capacitor C7506.
		Voltage regulator defective.	Check voltage regulator V7504 through V7507. If tubes are good, take V and R readings at tube sockets to isolate the trouble.
		Inductor L7504 open.	Check continuity of L7504 and replace if defective.
4	Incorrect output voltage measured at jack J7502; reading at pin 2 of tube V7507 is within normal limits.	BIAS ADJ control R7513 not set properly.	Adjust R7513 for +600-volt output between J7502 (+) and pin D of P7105 (-).
			If adjustment of R7513 has no effect on the output voltage, take V and R readings to isolate trouble.

TABLE 4-5. BIAS SUPPLY TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
4 Cont.			If adjusting R7513 varies the output but not sufficiently to obtain a +600-volt output, check for open load resistor R7513.
5	Poor regulation (changes in load or in ac voltage input produce changes in voltage at jack J7502).	Tube V7504, V7505, V7506, or V7507 defective.	Check tubes.
6	No 350-volt output measured between pins K and E of jack J7501 (LV indicator does not light); AC POWER indicator I7503 and BIAS indicator I7502 light normally.	Fuse F7501 open. Rectifier V7501 is defective. Resistor R7501 open. Transformer T7501 defective.	Check for short in 350-volt circuits before replacing fuse. Check V7501. Check continuity of R7501. Check windings 5-7 and 16-17 of T7501.

TABLE 4-6. BIAS SUPPLY, VOLTAGE AND RESISTANCE MEASUREMENTS

NOTE

1. Remove all cable connections to bias supply before making measurements.
2. Resistance measurement for pin 2 of W7508 is taken as R7520 (RETUNE OVLD ADJ) is rotated through its entire range.
3. N.C. = NO CONNECTION: =INFINITY

TUBE	PIN NUMBER	RESISTANCE (IN OHMS TO GROUND)	TUBE	PIN NUMBER	RESISTANCE (IN OHMS TO GROUND)
V7501	1	200	V7503	1	N.C.
	2	N.C		2	
	3			3	N.C
	4			4	
	5	N.C.		5	N.C.
	6	200		6	
	7	10,000		7	N.C.
				8	

TABLE 4-6. BIAS SUPPLY, VOLTAGE AND RESISTANCE MEASUREMENTS (CONT)

TUBE	PIN NUMBER	RESISTANCE (IN OHMS TO GROUND)	TUBE	PIN NUMBER	RESISTANCE (IN OHMS TO GROUND)
V7502	1	N.C.	V7504	1	
	2			2	31,000
	3	N.C.		3	N.C.
	4			4	N.C.
	5	N.C.		5	
	6			6	N.C.
	7	N.C.		7	N.C.
	8				
V7505	1	31,000	V7507 (Cont)	7	
	2	N.C.		8	
	3	N.C.			
	4	N.C.	V7508	1	380,000
	5	N.C.		2	4.7-480,000
	6	N.C.		3	1,000
	7			4	
V7506	1			5	
	2			6	
	3			7	480,000
	4			8	3,300
	5			9	
	6		V7509	1	
	7			2	500,000
V7507	1			3	3,300
	2			4	
	3			5	
	4			6	380,000
	5			7	490,000
	6			8	1,000
				9	

TABLE 4-7. RELAY COIL RESISTANCES

RELAY	TERMINALS	RESISTANCE (OHMS)
K7601	E7607-E7608 (Ovld winding)	Less than 1
	E7601: 7-8	1,100
K7602	E7609-E7610 (Ovld winding)	170
	E7602: 15-16	1,100
L7603	E7602: 17-18	1,000
	E7603: 23-24	10,000
K7604	E7603: 25-26	1,000
	E7604: 31-32	10,000

TABLE 4-7. RELAY COIL RESISTANCES (CONT)

RELAY	TERMINALS	RESISTANCE (OHMS)
K7605	E7604: 33-34	11,000
K7606	E7605: 39-40	1,800
K7607	E7605: 45-46	Less than 1
K7608	E7611-E7612	Less than 1
K7609	E7606: 57-58	2.4

TABLE 4-8. CROWBAR DRAWER TROUBLESHOOTING

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
1	No reading on vtvm	No primary power applied to transformer T8301.	Check fuse F8301. If fuse is open, check for shorts in crowbar drawer before replacing fuse. If fuse is good, check continuity of inductors L8301 and L8302.

TABLE 4-9. CROWBAR DRAWER, TRANSFORMER AND COIL RESISTANCES

TRANSFORMER OR COIL	TERMINALS	RESISTANCE (OHMS)
T8301	1-2	4
	3-4	Less than 1
	5-6	Less than 1
L8301		Less than 1
L8302		Less than 1

TABLE 4-10. 40-KW HIGH VOLTAGE RECTIFIER TROUBLESHOOTING

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
1	No output from H.V. Rectifier indicated by PA PLATE VOLTAGE METER (120).	Failure of input voltage from transmitter supply circuits.	Check transformers and associated circuitry supplying rectifier.
2	Unit overheats shows signs of internal charring.	Possible shorting wiring or components of rectifier.	Visually check wiring and components. IF rectifier assemblies CR8401, CR8402, CR8403 is defective. Remove and replace individual diodes on an assembly.)

TABLE 4-11. 40-KW PA FRAME, TRANSFORMER AND COIL RESISTANCES

TRANSFORMER OR COIL	TERMINALS	RESISTANCE (OHMS)
T7101	Primary (1-2) Secondary (3-4-5)	Less than 1
L7101 thru L7108		Less than 1
T7101	Primary (1-2) Secondary (3-4-5)	Less than 1
L7101 thru L7108		Less than 1
L7111		Less than 1
L7112		Less than 1
L7113		Less than 1
L7201		Less than 1
L7202		Less than 1
K7101		150

SECTION 5
PARTS LIST

SECTION 5
PARTS LIST

5-1. INTRODUCTION.

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

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

a. Reference symbol.

b. Description as indicated in parts list.

c. TMC part number.

d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

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

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

ASSEMBLY or SUB-ASSEMBLY — Page

MODEL AX-5030

MAIN POWER SUPPLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B800	FAN, CENT., 3 PH 220U, 50/60 cps, 2320 watts.	BL111
C800	CAP., FXD, PAPER 4 mf, ±10%, 10,000 WVDC.	CP103
C801	CAP, FXD, PAPER 8mf, ±10%, 5000 WVDC	CP104
C802	CAP., FXD, PAPER 10mf, ±10%, 2000 WVDC.	CP105
C803 thru C810	CAP., FXD, MICA 1,000 uufd, ±10%, 500 WVDC.	CM30F102G3
C813 thru C814	CAP., FXD, PLSTC. 01ufd, ±5%, 4000 WVDC.	CX102J103M
C815	CAP., FXD, PAPER .025ug, ±10%, 3,000 WVDC.	CP70EIFL25K
CR800A	SCOND DEV, DIO Not Replaceable, Part of TB800.	VR100S/6-1150-5
CR800B thru CR800F	Same as CR800A.	
E801	FORTH, SHRTG REL Steatite Insulators, neophrene Gland	AX150
E802	Same as E801.	
E805	TERMINAL BOARD: Barrier type plastic, 4 terminals	TM102-4
E1000	CONT, RF Spring Loaded, Silver Plated,	AX154
E1001 thru E1007	CONT, HV Spring Loaded, Nickle Plated,	AX153
J1004	CONN, RECP, -HN Female; Teflon Insulated	UG560/U
L800	REACTOR 2 Henrys, 1.6 Amps,	TF0200
L801	REACTOR-1.7 Henrys, 1 1/2 Amps	TF5029
L802	SOL ELEC. W Plunger: 230 Volts, 50/60 cps. 0.2 amps.	SZ100-50
R802	RES, FXD, WW, 18,000 Ohms, 140 Watts	RW118F183
R810	RES, FXD, WW, 4 meg Ohms, ±0.5%.	RW122-1-405
R811	Same as R810.	

MAIN POWER SUPPLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R812	RES, FXD, WW-, 180 Ohms, 0.5%, 14 watts	RW119G181
R813	Same as R812.	
R814	RES, FXD, WW; 600,000 Ohms ±0.5%, 6 watts	RW122-3-604
R815	Same as R814.	
R816	RES, FXD, WW; 5000 Ohms, 140 watts.	RW118FS02
R818	RES, FXD, WW; 5000 Ohms, 10 watts.	RW109-32
R819	Same as R816.	
R820	Same as R816.	
R821	RES, FXD, WW: 100,000 ohms, 7 watts	RW110-43
R823 thru R827	RES, FXD, COMP, 100 Ohms, ±5%, 2 watts.	RC42GF101J
R828	RES, FXD, COMP, 220 Ohms, ±5%, 2 watts.	RC42GF221J
S800	SW Airflow, Switch Air	SW243-1
S801	SW Push - SPST, 15 amps At 125, 1/2 Watt, at 125 VDC 1/14 AM Pat 250 VDC.	SW169
TB800	Zener Dio BO Consisting of CR800A, B, C, D, F, R818, R821, R822, R823, R824, R825, R826, R827.	AX126

POWER AMPLIFIER SECTION, 10K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A903	PA BND SW Assy. Final Coil/Switch Assy	AS119
C900 thru C903	CAP, FXD, MICA, 1000 uufd, ±5%, 300 WVDC.	CB21PD102J
C904	CAP, FXD, MICA, 20 uufd, ±2%, 500 WVDC.	CM15C200G03yy
C905	CAP, FXD, CER. 3 uufd, ±25 uufd, 500 WVDC.	CC21SL030C
C907	CAP., FXD., CER.: 10 uufd, ±5 mmf, 500 WVDC.	CC21SL100D
C908	CAP., FXD., MICA.: 5 uufd, ±5%, 500 WVDC.	CM15C050H03yy
C909	CAP., FXD., VAC 3 uufd, 17,000 volts, 17 amps.	C0102-3
C912	CAP., FXD., MICA.: 1000 uufd, ±5%, 300 WVDC.	CB21PD102J
C913	Same as C912.	
C914	CAP., FXD., PLSTC.: .01 ohms, ±5%, 400 volts.	CN108C104J
C915	Same as C912.	
C917	CAP., FXD., CER.: 1000 uufd, ±20%, 5000 WVDC.	CC109-38
C919 thru C926	CAP., FXD., CER.: 500 uufd, ±20%, 5000 WVDC.	CC109-36
C927	CAP., VAR., VAC.: 25-700 uufd, 15 kilo-volts, 45 amps.	AM113
C928	CAP., VAR., VAC.: 50-2000, 10 k/0 Volts, 45 amps.	AM114
C929	CAP., FXD., VAC.: 10 uufd, 17,000 volts.	C0104-2
C930	CAP., FXD., VAC.: 1,000 uufd 15,000 WVDC.	C0101-1000-15C
C931	CAP., FXD., MICA.: 1000 uufd, ±10%, 500 WVDC.	CM20F102G03
C932	Same as C931	
C940	CAP., FXD., PLSTC.: 1,000 uufd, ±10%, 14,000 WVDC.	CX102K102T
C941	CAP., FXD., MICA.: 10 uufd, ±20%, 300 WVDC.	CM15C100J03yy
C942	CAP., FXD., MICA.: 50 uufd, ±5%, 500 WVDC.	CM20C500J03yy

POWER AMPLIFIER SECTION, 10K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C943 thru C945	CAP., FXD., CER.: 1000, uufd, ±20%, 500 WVDC.	CK70A102M
C946	CAP., FXD., PLSTC.: 10,000 uufd, ±10%, 4000 WVDC.	CX102J103M
C947	Same as C946.	
C948	CAP., FXD., CER.: 1,000 uufd, ±20%, 500 WVDC	CK70A102M
C949	CAP., FXD., VAC.: 1000 uufd; 30Kv; 125 amps	C0106-1000-30C
C954	CAP., FXD., MICA.: 20 uufd, ±5%, 500 WVDC.	CM15C200J03
C1003 thru C1010	CAP., FXD., CER.: 1000 uufd; ±20%, 5000 WVDC.	CC109-38
C1025 thru C1028	CAP., FXD., MICA.: .01 uufd, ±10%, 500 WVDC.	CM35F103F03
CR900	SCOND., DEV.: DIO.Diode, Germanium	IN303
CR901	Same as CR900.	
CR904	DET ELEM 1Kw full scale, ±5%, at 500 watts	DD109-2
CR905	DET ELEM 10kw full scale, ±5%, at 5 kw	DD109-1
CR909	ADPT, CONN-HN ADAPTER CONNECTOR, HN TO HV	UG1019/u
DC900	COUP., DIR, 50 ohm, 10kw, frequency 2.30 mc.	DC104
E916	CONT, ASSY, LONG Contact Assembly long.	AX128
E917 thru E919	CONT, ASSY, SHORT Contact Assembly, short.	AX129
I1000	LAMP, INCAND 230V, 10 Watts	BI105-1
I1001 thru I1003	Same as I1000	
J900	CONN, RECP., BNC 520 ohms, BNC type	UG625/U

POWER AMPLIFIER SECTION, 10K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J901	CONN, RECP-HN four 1/8 inch hdeson	UG560/u
J902	Same as J900.	
J904	CONN PROBE ASSY. Connector Probe Assembly	AJ100
J905	CONN, RECP, QDL, 50 ohms, 10Kv.	JJ177
J906	CONN, RECP, BNC, 1 round female contact.	JJ172
L900	COUL, RF, FXD.: 128 microhenries ±10%.	CL177
L901	COIL, RF, FXD.: 750 microhenries, ±20%.	CL100-5
L902	COIL, RF, FXD.: 1 1/2, , microheneries, ±20%.	CL170
L904	Same as L900.	
L905	COIL, RF, FXD.: 1.1 microheneries	CL139
L906	COIL, RF, RXD.: 1-45 microhenries.	CL154
L907	COIL, RF, FXD.: 35 microhenries.	CL166
L908	Same as L901	
L909	COIL, RF, FXD.: 180 microhenries, ±10% m.	CL178
L910	Same as L901.	
L911	Same as L906.	
L914	COIL, RF, FXD.: 38 microhenries, ±5%.	CL179
MP900 thru MP902	CTR, ROT FX MT 3 Wheels, 0 to 9 wheel	CY105
MP903	CTR, MODE SW 3 wheel, tune, operate emergency.	AC108
MP904	CTR, PA BND SW Bandswitch, rotations; 3 wheel.	AC124-2
MP1005 and MP1006	KNOB, no skirt.	MP110

POWER AMPLIFIER SECTION, 10K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
MP1007 thru MP1009	KNOB W/HDL instrument, slip type	MP113
P900	CONN, PL, FML Plug female; an pin type	MS3106B20-27S
P901	CONN, PL, BNC Dielectric Teflon used on W/RG-174/u coaxial wire.	PL-169
P903	CONN., PL., ANG Connector Plug; angle type	PL192
P904	Same as P903.	
R900	RES., FXD., COMP.: 47,000 ohms, ±5%, 1/2 watts	RC20GF473J
R901	RES., FXD., COMP.: 2.200 ohms, ±5%, 1/2 watts.	RC20GF222J
R902	RES., FXD., COMP.: 470 ohms r, ±5%, 1 watt	RC32GF471J
R904	RES., FXD., COMP.: 100,000 ohms ±5%, 1/2 watts	RC20GF104J
R905	Same as R904.	
R906	Same as R901.	
R907	RES., FXD., COMP.: 27,000 ohms, ±5%, 2 watts	RC42GF273J
R908	RES., FXD., COMP.: 150 ohms, ±5%, 2 watts	RC42GF151J
R910	RES., FXD., COMP.: 47 ohms, ±5%, 1 watt	RC32GF470J
R911 thru R913	RES., FXD., COMP.: 140 ohms, ±10%, 900 watts	RR117-140
R914	RES., FXD., COMP.: 100,000 ohms, ±5%, 2 watts	RC42GF104J
R915	Same as R914	
R917	RES., FXD., COMP.: 120 ohms, ±5%, 1/2 watts.	RC20GF121J
R1006 thru R1009	RES., FXD., WW, 3000 ohms; ±5%, 10 watts.	RW109-30
S901	SW, SENS-SPOT 10 amps at 125-250 VAC; 1/2 amp at 125 vdc.	SW189

POWER AMPLIFIER SECTION, 10K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S902	SW PUSH-SPST 15 amp at 125, 2500 460 Vac, 1/2 amp at 250 vdc.	SW169
S903	MODE SW ASSY 3 position single pole, ceramic insulation.	AS117
S905	SW, PUSH-PULL 15 amps, at 120, 250 VAC.	XW230
S906	Same as S905.	
S908 A,B	SW SEC, ROT	WS131
S1014	SW TOGGLE, SPST, 6 amps, 125 VAC	ST12A
V900	Electron Tube	4CX5000A
W900	WRG HARM BRCHD	CA0532
W901	CBL, RF	CA0582-1
W902	WRG HAR, BRCHD	CA9829
XF1000	LIGHT, IND-YEL Socket lamp; frosted amber lens, screw type socket.	TS136-3FS
SI1001	LIGHT, IND-GRN Socket lamp, frosted green lens scw type socket.	TS136-2FS
XI1002	LIGHT, ONE-RED Socket, lamp; frosted red lens.	TS13G6-1FS
XI1003	LIGHT, IND-BLUE Socket lamp; frosted blue lens, screw type socket.	TS136-4FS
XV900	TUBE SOC. ASSY consists of capacitors C919 thru C926 & C933 thru C936.	AX130

MODEL - AX5012

POWER AMPLIFIER FRAME ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B7101	MTR, MAIN BRKR, 240 VAC at 5 AMPS	M0110
B7102	FAN, CENT., 3 PH 50 Cycles, 220 VAC	BL110-50
B7102	FAN, CENT, 3 PH 60 Cycles, 220 VAC	BL110-60
C7101 thru C7134	CAP., FXD., CER 1,000 uufd ±20%, 5000 WVDC	CC109-38
CB7101	CKT BRDR, MAIN 600 VAC, 225 AMP	SW271
C7117	CAP., FXD., PLSTC., .01 uufd, ±10%, 8000 WVDC.	CX102J103M
E7101	Term BD-BARR barrier type; 3 terminals	TM118-3
J7101	CONN, RECP, ML AN Pin, 35 Contacts	MS3102A327P
J7102	CONN RECP FML an SOCKET Type, 14 Contacts	MS3102A20-27S
J7103	CONN RECP ML an Pin Type, 14 Contacts	MS3102A20-27P
J7104	CONN RECP BNC RF: Coaxial	JJ172
K7101	REL ARM-OCT 208-220 Volts, 16 amps 50/60HZ	RL132
L7101 thru L7108 and L7114 thru L7117	Coil, RF, FXD 30.5uh, .025 Ohms	CL222
P7101	CONN PL FML AN Socket Type, 35 Contacts	MS3106B32-7S
P7102	CONN, PL ML AN Pin Tupe 35 Contacts	MS3106B32-7P
P7103	Same as P7101	
P7104	CONN PL, ML AN Pin Type, 14 Contacts	MS3106-B20-27P
P7105	CONN, PL, FML AN Socket Type 114 Contacts	MS3106B20-27S
P7106	CONN PL, ML AN Pin Type, 4 Contacts	MS3106B22-10P

POWER AMPLIFIER FRAME ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P7107	Same as P7101.	
P7108	RELAY PANEL PLUG AN Socket Type, 4 Contacts	MS3106B22-10S
P7109	CONN, PLM, ML AN Pin Type, 1 Contact	MS3106B18-16P
R7101	RES, FXD, COMP 1 meg ohm, ±5%, 1/2 watt	RC20GF105J
S7101	SW, AIR, FLOW	SW-243-2
S7102 thru S7104	SW, PUSH-PULL 15 Amps at 120 VAC	SW230
T7101	XFMR, PWR SD, 230 Volts, 50/60 Cycles,	TF0218

POWER AMPLIFIER METER PANEL ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C7201	CAP., FXD., MICA.: .01 ufd, ±10%, 500 WVDC.	CM35B103J
C7202 thru C7205	Same as C7201.	
C7208	CAP., FXD., MICA.: 1000 uufd, ±10%; 500 WVDC.	CM20B102K
C7209 thru C7211	Same as C7208.	
I7201	LAMP, flourescent: standard cool, 1/2" dia. x 11-1/4" lg.	BI-107
I7202	Same as I7201.	
I7203	LAMP, incandescent: frosted; 230/250 V, 25 watts; standard screw base; 4" x 1-7/8" o/a.	BI-106-2
I7204	LAMP, incandescent: red; 110/115 V, 25 watts; standard screw base: 4" x 1-7/8" o/a.	BI-106-3
J7201	CONN., RECP.: coaxial.	UG-625/u
J7202	Same as J7201.	
L7201	COIL, R.F., FXD.: 2.5 millihenries, 100 ma, molded case.	CL-140-1
L7202	Same as L7201.	
M7201	METER, filament primary: AC voltmeter, 0-300 volts, red marker at 230 V: 4-1/2" square case.	MR-118
M7202	METER, kilovolts, R.F.: 0-1 kilovolts; 4-1/2"	MR-135
M7203	METER, amperes: 0-10 amps; 401/2" rectangular case.	MR-129
M7204	METER, kilovolts, R.F.: 0-10 kilovolts RF scale, 200 microamp DC movement, 4-1/2" square case.	MR-120
M7206	METER, kilovolts, R.F.; 0-60 Kw; 200 microamp DC movement.	MR-147
R7201	RES., FXD., W.W.: 500 ohms, 25 watts	RW-111-17
S7201	STARTER, flourescent lamp, 8 watts; 13/16" dia. x 1-1/2 lg.	PO-170

POWER AMPLIFIER METER PANEL ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S7202	Same as S7201.	
T7201	BALLAST, flourescent lamp; 8 watts 118 volts, 0.17 amps 60 cps.	PO-169
T7202	Same as T7201.	
X17201A	SOCKET, flourescent lamp: 75 watts, 250 volts.	TS-141
X17201B	Same as X17201A.	
X17202A	Same as X17201A	
X17202B	Same as X17201A	
X17203	SOCKET, bulb head mounting: ceramic; for standard base incandescent lamp rated for 660 watts, 250 volts.	TS-143
X17204	Same as X17203	
XS7201	SOCKET, starter: flourescent; 60 watts, 250 volts.	TS-140
XS7202	Same as XS7201	

POWER AMPLIFIER SECTION ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A7307	Bandswitch and Coil Assembly:	AS-125
B7301	Fan, Axial	B1118
C7304	CAP., FXD., CER., 1,000 uufd, ±20%, 500 volts.	CC109-38
C7305	Same as C7304.	
C7310	CAP., FXD., PLSTC.: 1000 uufd, ±10%, 8 KV	CX102K102S
C7311	Same as C7310.	
C7312	CAP., FXD., PLSTC.: 10,000 uufd, ±5%, 4000 V	CX102J103M
C7313 thru C7315	Same as C7312.	
C7316	CAP., FXD., PLSTC.: .003 uufd, 25 Kv	CX108-1
C7317	CAP., FXD., MICA.: 100 uufd; ±2%, 500 V.	CM15F101F13
C7318	CAP., FXD., MICA.: 10,000 uufd, ±2%, 3000 Volts	CM35F103G3
C7319	Same as C7318	
C7320	Same as C7318	
C7322	CAP., FXD., VAC.: 3 uufd; 17,000 volts peak, 7 amp current rating.	CO-102-3
C7323	Same as C7318.	
C7324	CAP., FXD., MICA.: 50 uufd; ±10%; 500 WVDC.	CM15C500J0344
C7325	CAP., FXD., VAC.: 1000 uufd; 30 kv 125 amps.	CO-106-1000-30C
C7326	CAP., FXD., VAC.: 6 uufd; 30 kv; 60 amps.	CO-107-6-30C
C7327	Capacitor, Fixed, Paper Dielectric; 4 ufd; ±10%; 600 WVDC; oil filled and impregnated hermerically sealed cylindrical metal case.	CP41B1FF405K
C7328	Same as C7325.	
C7330	CAP., VAR., VAC.: 50-1000 uufd; + 125 amp rms; 20 kv, glass case.	CB-160

POWER AMPLIFIER SECTION ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C7331	Same as C7330.	
C7332	Same as C7330.	
C7333	CAP., FXD., CER.: Dielectric; 50 uufd; ±10%, 15,000 WVDC.	CC-109-24
C7334	Same as C7333.	
CP7303	Adapter, Connector	UG-273-U
CR7303	Detecting Element Directional Coupler; frequency range; 2-30 mc.	DD-103
CR7304	Same as CR7303.	
DC7302	Coupler, Directional; 60,000 watts 2-30 mc supplied with 2 diodes.	DC-101
E7303	Terminal Board; Barrier Type; 14 Terminals	TM-102-14
E7304	Feed-Thru; Insulated	NS-107
E7305	Insulator, Ceramic; Glazed; Feed-Thru type	AX-228
E7306	Terminal Board; Barrier Type 4 Terminals	TM-102-4
E7307	Terminal Board; Barrier Type; Plastic; 3 Terminals	TM-102-3
E7330	Core; Fixed Type; Ceramic, Type Q2	CI-112-Q2-7L
E7331	Same as E7330.	
E7332	Same as E7330.	
E7333	Same as E7332.	
I7301	Lamp, Incandescent; 230 V; 10 Watts; Screw Base.	BI-105-1
I7302 thru I7304	Same as I7301	
J7302	CON., RECP., ELECT.: Female; 4 Contacts	MS3102A14S-2S
J7303	Probe, Waveguide; Radio Frequency.	AJ-101
J7304	Probe, Waveguide; Radio Frequency.	AJ-100

POWER AMPLIFIER SECTION ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K7301	Relay-Switch:	RL150
K7302	Same as K7301	
L7303	Coil, RF Fixed; 5 uhy; 225 amps maximum	CL-220
L7304	Coil, RF Fixed; 35 uhy; Q=180 at 2.5 mc.	CL-166
L7305 thru L7307	Same as L7304	
MP7305	Counter, Rotating, Fixed Mounting; 3 wheel, non-reset.	CY-105
MP7306	Same as MP7305.	
MP7307	Counter, Rotating, Fixed, Mounting; 3 wheel non-reset.	CY-105
P7301	Connector, Plug, Electrical; QDL Male; Single Connector	PL-136
P7302	Connector, Plug, Electrical; Male; 4 Contacts	MS3106B14S-2P
P7305	Connector, Plug, Electrical, Male	MS3106B20-27P
P7306	Same as P7305	
P7307	Connector, Plug, Electrical; RF: Coaxial.	PL-169
P7308	Connector, Plug, Electrical; Angle Type.	PL-192
P7309	Same as P7308.	
P7310	Connector, Plug, Electrical; Coaxial, Male	IG-88/U
P7311	Same as C7310.	
R7301	RES., FXD., COMP.: 470 ohms; ±5%; 1/2 watt	RC20GF471J
R7302	RES., FXD., COMP.: 47 ohms; ±5%, 1/2 watt	RC20GF470J
R7303	RES., FXD., W.W.: 3000 ohms; ±5%, 10 watts.	RW-109-30
R7304 thru R7306	Same as R7303	
R7307	RES., FXD., W.W.: 20,000 ohms; ±5%; 10 watts	RW109-37

POWER AMPLIFIER SECTION ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S7303	Switch, Interlock; Push to Operate; 0.312"; 15 amp, a 120, 250 VAC; 2 Amps Resistive at 250 VDC.	SW-230
S7305	Switch, Thermostatic; SPST: Closes at 200° ±6°F; Open at 185° ±6°F.	SS-104
S7306	Same as S7303.	
V7301	Electron Tube.	ML-6697
W7301	Cable Assembly.	CA-561
W7302	Cable Assembly.	CA-480-112-8.50

MAIN CONTROL PANEL

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CB7401	Circuit Breaker, triple pole, single throw; 230 VAC, 50 amps, series trip, 3 auxiliary switches mounted on rear.	SW-266
CB8402	Circuit Breaker, single pole, single throw; 230 VAC, 2 amps, series trip, auxiliary SPDT switch mounted on rear.	SW-268
I7401	Lamp, neon, miniature; 105/125 V, 1/25 watt; watt.	BT-100-51
I7402	Same as I7401	
R7401	RES., FXD., COMP.; 220,000 ohms, ±5%, 1/2 watt.	RC20GF224J
R7402	Same as R7401	
R7403	RES., FXD., W.W.: 100 ohms, 55 watts.	RW-115-101-5S
R7404	Same as R7403	
S7401	Switch,push button: momentary contact; SPST; 1 amp at 250 V, 3 amps at 125 V, normally open, red button.	SW-168-SPST-2-NO-BR
S7402	Switch, push button: momentary contact; SPDT, heavy duty, 6 amps at 250 V, 12 amps at 125 V.	SW-272-R
S7403	Switch, toggle: SPST; 6 amps; 125 VAC; 28 angle of throw, solder lug terminals.	ST-12A
S7404	Switch, rotary: 1 section; 12 positions, 30 ° angle of throw.	SW-250
S7405	Switch, push button: momentary contact; SPST; 1 amp at 250 V, 3 amps at 125 V, normally open, black button.	SW-168-SPST-2-NO-BB
X17401	Light, indicator: w/clear white lens; for miniature bayonet base, T-3-i/4 bulb.	TS-106-2
X17402	Same as X17401.	
I7502	Same as I7501.	
I7503	LAMP INCANDESCENT: 6-8 V; 250 ma; T-3-1/4 clear bulb; bayonet base.	BI-101-44

BIAS SUPPLY DRAWER ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C7501	CAP., FXD., CER.: 1000 uufd, ±20%; 5000 WVDC.	CC-109-38
C7502 thru C7504	Same as C7501	
C7505	CAP., FXD., ELECT.: POLARIZED, 80 mfd, 450 WVDC.	CE51C800R
C7506	CAP., FXD., PAPER.: 10 ufd; ±10%; 1000 volts,	CP70B1FG106K
C7508	CAP., FXD., MICA.: 10,000 uufd, ±10%; 500 WVDC.	CM-100-6
C7509	Same as C7506	
C7510	Same as C7506	
C7511	Same as C7501	
C7512	Same as C7501	
C7513	CAP., FXD., PLASTIC.: mylar; .424 ufd, 200 WVDC.	CN108C4243K
C7515	CAP., FXD., MICA.: 1000 uufd, ±10%, char, B; 500 WVDC	CM20B102K
C7516	Same as C7515	
C7517	Same as C7508	
F7501	FUSE CARTRIDGE: 1/8 amp.	FU-102-125
F7502	FUSE CARTRIDGE: 1/2 amp.	FU-102-500
F7503	FUSE CARTRIDGE: time lag; 3 amps	FU-102-3
I7501	LAMP GLOW: neon; miniature; 110 volts, 1/25 watt; T-3-1/4 clear bulb; bayonet base.	BI-100-51
I7502	Same as I7501	
I7503	LAMP, INCANDESCENT: 6-8 V. 250 ma. T-3-1/4 clear bulb bayonet base.	BI-101-44
J7501	CONN., RECP., ELECT.: male, 14 contacts.	MS3102A20-27P
J7502	CONN., RECP., ELECT.: female, 1 contact.	MS3102A18-16S
L7501	COIL, RADIO FREQUENCY: fixed; 185 uhy, ±15uhy;	CL178

BIAS SUPPLY DRAWER ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L7502	Same as L7501	
L7503	REACTOR: filter; 7 hy at 400 ma.	IF-5015
L7504	Same as L7501	
L7505	COIL, RADIO FREQUENCY: fixed 2.5 millhenries.	CL-140-1
L7506	Same as L7505	
R7501	RES., FXD., W.W.: 1000 ohms, ±5%, 10 watts.	RW-109-24
R7502	RES., FXD., COMP.: 470,000 ohms, ±5%, 1/2 watt.	RC20GF474J
R7503	RES., FXD., COMP.: 47 ohms, ±5%, 2 watts.	RC42GF470J
R7504	RES., FXD., W.W.: 7500 ohms, ±10%, 20 watts.	RW-110-32
R7505	RES., FXD., COMP.: 1000 ohms, ±5%, 2 watts.	RC42GF102J
R7506	Same as R7505.	
R7507	RES, FXD., W.W.: 5000 ohms, 10 watts.	RW-109-32
R7508	Same as R7503.	
R7509	RES., FXD., COMP.: 680,000 ohms, ±5%, 2 watts.	RC42GF684J
R7510	Same as R7503.	
R7511	RES., FXD., COMP.: 220,000 ohms, ±5%, 2 watts.	RC42GF224J
R7512	Same as R7511.	
R7513	RES., VAR., COMP.: 500,000 ohms, ±20%, 2 watts.	RV4ATXA504B
R7514	NOT USED.	
R7515	RES., FXD., COMP.: 1 megohm, ±5%, 1/2 watt	RC20GF105J
R7516	RES., FXD., COMP.: 330,000 ohms, ±5%, 2 watts.	RC42GF334J
R7517	Same as R7516.	
R7518	RES., FXD., COMP.: 100,000 ohms, ±5%, 1/2 watt.	RC20GF104J
R7519	Same as R7518.	
R7520	Same as R7513.	

BIAS SUPPLY DRAWER ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R7521	RES., FXD., COMP.: 1000 ohms, ±5%, 1 watt.	RC32GF102J
R7522	RES., VAR., W.W.: 25,000 ohms, ±10%, 4 watts.	RA106ASXA253A
R7523	RES., FXD., W.W.: 10,000 ohms, ±5%, 10 watts.	RW-109-34
R7524	RES., FXD., COMP.: 3300 ohms, ±5%, 2 watts.	RC42GF332J
R7525	Same as R7524.	
R7526	Same as R7522.	
R7527	Same as R7523.	
R7528	Same as R7521.	
R7529	NOT USED.	
R7530	RES., FXD., COMP.: 56,000 ohms, ±5%, 1 watt.	RC32GF563J
R7531	RES., FXD., W.W.: 3000 ohms, ±5%, 160 watts.	RW-117-21
R7532	Same as R7530.	
R7533	RES., FXD., COMP.: 4700 ohms, ±5%, 1 watt.	RC32GF472J
R7534	RES., FXD., COMP.: 470,000 ohms, ±5%, 1 watt.	RC32GF474J
S7501	SWITCH, PUSH-PULL: interlock; total travel approx. 0.312"; 15 amp, 120, 250 VAC; 2 amps resistive at 250 VDC.	SW-230
T7501	TRANSFORMER, POWER, STEP-UP AND STEP-DOWN: primary 1-4 230 VAC; secondary-terminals 5-7 700 V at 50 ma CT; terminals 8-10 1500 V at 400 ma CT; terminals 11-13 5 V at 6 amps CT; terminals 14-156.3 V at 6 amps; terminals 16-17 6.3 V at 2 amps.	TF-216
V7501	ELECTRON TUBE: 7pin miniature.	6X4
V7502	ELECTRON TUBE: octal base.	5R4GY
V7503	Same as V7502.	
V7504	ELECTRON TUBE: 7 pin miniature.	0A2
V7505	Same as V7504.	

BIAS SUPPLY DRAWER ASSY.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
V7506	ELECTRON TUBE: 7 pin miniature.	6AU6
V7507	ELECTRON TUBE:	6336A
V7508	ELECTRON TUBE: 9 pin miniature.	12AT7
V7509	Same as V7508.	
XC7505	SOCKET, ELECTRON TUBE: octal, high crown.	TS101P01
XF7501	FUSEHOLDER: fuse with 220 K resistor and indicator.	FH-104-3
XF7502	Same as XF7501.	
XF7503	Same as XF7501.	
XI7501	LIGHT, INDICATOR: w/clear white lens, for miniature bayonet base, T-3-1/4 bulb.	TS-106-2
XI7502	Same as XI7501.	
XI7503	LIGHT, INDICATOR: w/red frosted lens; for miniature bayonet base, T-3-1/4 bulb.	TS-106-1
XV7501	SOCKET, ELECTRON TUBE: 7 pin miniature.	TS102P01.
XV7502	Same as XC7505.	
XV7503	Same as XC7505.	
XV7504 thru XV7506	Same as XV7501.	
XV7507	Same as XC7505.	
XV7508	SOCKET, ELECTRON TUBE: 9 pin miniature.	TS103P01
XV7509	Same as XV7508.	

AR116

RELAY PANEL

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E7601	BOARD, terminal: barrier type; 14 6-32 x 1/4" binding head machine screws.	TM-100-14
E7602	BOARD, terminal: barrier type; 8 6-32 x 1/4" binding head machine screws.	TM-100-8
E7603	Same as E7602.	
E7604	Same as E7602.	
E7605	BOARD, terminal: barrier type; 10 6-32 x 1/4" binding head machine screws.	RM-100-10
E7606	Same as E7601.	
F7601	FUSE, Cartridge type: time delay, 5 amps.	FU-102-5
F7602	FUSE Cartridge type: time delay, 2 amps.	FU-102-2
F7603	Same as F7602.	
F7604	Same as F7602.	
E7605	Same as F7602.	
E7606	Same as F7602.	
I7601	LAMP, neon: double candlebra; 110 volts, 1/4 watt; T-4-1/2 clear bulb; bayonet base.	BI-103-2
I7602	Same as I7601.	
I7603	Same as I7601.	
I7604	Same as I7601.	
I7605	Same as I7601.	
I7606	LAMP, neon: miniature; 110 volts, 1/25 watt; T-3-1/4 clear bulb; bayonet base.	BI-100-51
I7607	Same as I7601.	
J7601	CONN., RECP.: male; 35 contacts.	MS310A32-7P
J7602	CONN., RECP.: male; 4 contacts.	MS3102A22-10P

RELAY PANEL

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K7601	RELAY ASSEMBLY consists of armature relay with cabling Contacts-silver cadmium rated at 25 amps 125 VAC resistive: latch relay -1100 ohms, ±10%; unlatch relay 0-93 ohms, ±10%; latch operate 220 V, 60 cps AC or less.	AR-117
K7602	RELAY ASSEMBLY, consists of armature relay with cabling. Coil-latch 1100 ohms, ±10%; trip-170 ohms ±L0%; 4 PDT; inductive load: latch operate 220 V, 60 cps AC or less.	AR-119
K7603	RELAY ASSEMBLY, consists of armature relay with cabling. Coil-latch 1000 ohms, ±10%; trip-10,000 ohms, ±10%; 4 PDT; contacts - silver, rated at 20 amps non-inductive load: latch operate 220 V, 60 cps AC or less.	AR-122
K7604	Same as K7603.	AR-121
K7605	RELAY ASSEMBLY,-consists of armature relay with cabling. Coil-11,000 ohms, ±10%; four form pile up: contacts - silver cadmium rated at 10 amps 125 VAC resistive; operate .010 amps, nonoperate .009 amps.	AR-120
K7606	RELAY ASSEMBLY, consists of armature relay with cabling, contacts-silver cadmium rated at 25 amps, coil-1800 ohms; ±10%; operate 220 V, 50/60 cps.	AR-118
K7607	RELAY ASSEMBLY, consists of armature relay with cabling. Contacts-silver plated cadmium rated at 25 amps, coil, .01 ohms, ±10%; operate at 3 VAC 10 amps.	AR-125
K7608	RELAY ASSEMBLY, consists of armature relay with cabl-ing. Contacts - silver plated cadmium; rated at 25 amps; coil - 2.4 ohms, ±10%; operate at 1 amp DC. Consists of R7608.	AR-124
K7609	RELAY ASSEMBLY, consists of armature relay with cabling. Contacts - silver plated cadmium; rated at 25 amps; coil - 2.4 ohms, ±10%, operate at 10 VAC 0.5 amps.	AR-123
M7601	METER, elapsed time: 120 volts, 50/60 cycles; standard ASA/MIL 301/2" (MR-36).	MR-125-2
M7602	TIMER, time delay: 3" dia. panel, mounting bakelite case; contacts rated at 10 amps; time cycle 5 min.; dial division - 5 seconds.	TI-101-4
M7603	Same as M7602.	

RELAY PANEL

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
M7604	Same as M7601.	
R7601	RES, VAR., W.W.: .5 ohms, ±10%, 25 watts.	RA75ASAOR5AK25
R7602	RES., VAR., W.W.: 100 ohms, ±10%, 25 watts.	RA75ASA101AK25
R7603	RES., FXD., W.W.: 30 ohms, ±5%, 10 watts.	RW-109-46
R7604	RES., VAR., W.W.: 15,000 ohms, ±10%, 3 watts.	RA100ASSA153A
R7605	RES., FXD., W.W.: 35,000 ohms, ±5%, 10 watts.	RW-109-40
R7606	Same as R7601.	
R7607	RES., FXD., COMP.: 220,000 ohms, ±5%; 1/2 watt.	RC20GF224J
R7608	RES., FXD., W.W.: .166 ohms, ±5%, (R7608 is p/o K7608).	AR-128
R7609	RES., FXD., W.W.: .185 ohms, ±10%.	AR-130.
S7601	SWITCH, toggle: SPST; 6 amps; 125 VAC; 28 1/4 angle of throw; solder lug terminals.	ST-12A
XI7601	HOLDER, lamp: bayonet base; 105/125 volts, with white frosted lens.	TS-137-7FB4
XI7602	Same as XI7601.	
XI7603	Same as XI7601	
XI7604	Same as XI7601.	
XI7605	Same as XI7601.	
XI7606	LIGHT, indicator: w/clear white lens; for miniature base T-3-1/4 bulb.	TS-106-2
XI7607	Same as XI7601.	

POWER SUPPLY FRAME ASS'Y

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B8102	Fan Axial 3400 RPM, 115-230 VAC	BL108
C8101	CAP., FXD., CER.: 1000 uufd, = ±20%; 5000 WVDC.	CC109-38
C8102 thru C8106	Same as C8101.	
C8107	CAP., FXD., Paper: 40 Fd, 1500 WVDC.	CP107
C8110	CAP., FXD., Paper: 4ufd; ±10% char F 600 WVDC.	CP41B1FF405K
E8101	Contact, HV Assembly: beryllium	AX153
E8102 thru E8111	Same as E8101.	
E8112	Terminal Board: Barrier type 8 Terminals	TM102-8
E8113	Terminal Board Barrier type 8 terminals	TM102-8
E8114	Contact Spring: Wiper Type, beryllium copper	AX221
E8115		AX223
E8116	Same as E8115.	
E8117 thru E8118	Same as E8112.	
E8119	Terminal Board: Barrier Type 6 Terminals	TM100-6
E8120	Same as E8101.	
E8121	Contact Button.	SC165-2
E8122	Same as E8121.	
E8123	Same as E8112.	
E8124	Terminal Board: Barrier Type 3 Terminals	TM102-3
F8101	Fuse Cartridge Time delay 3 amps	FU102-3
F8102	Same as F8101.	
F8103	Fuse, Cartridge Time delay 5 amps.	FU102-5

POWER SUPPLY FRAME ASS'Y

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
I8101	Lamp, Incandescent Red 110/115 V, 25 Watts	BI106-3
J8101	CONN., RECP., Female 35 Contacts	MS3102LA32-7P
J8102	CONN., RECP., Female 35 Contacts	MS3102A32-7S
J8103	RECP., Female Rectangular, 17 Contacts	JJ181
J8104	RECP., Female 4 Contacts.	MS3102A22-10S
K8102	Relay Solenoid: 3 Phase 208.220 Vac, 50/60 KH, 150 AMPS Open.	RL138
L8101	Reactor, Filter: 0.4 hy at 4.5. AMPS DC.	TF5016
L8102	Coil, LINE FILTER; L NOM 177 uh (175-179)	
L8103	Same as L8102.	
L8104	Same as L8102.	
L8105	Solenoid, Relay: with Plunger 230 V 60 KH	SZ100
L8105	Solenoid Relay with plunger 230 V 50 KH	SZ-100-50
R8101	RES., FXD., W.W.: 1.0 ohms 14 watts.	RW119F1RO
R8102	RES., FXD., W.W.: 18,000 ohms, 140 watts.	RW118F183
R8103 thru R8111	Same as R8102.	
R8112	RES., FXD., W.W.: 5.0 ohms, 140 watts.	RW118F5RO
R8113	Same as R8112	
R8114	Same as R8112	
R8119	RES., FXD., COMP.: 33 ohms, $\pm$5%, 1/2 watts.	RC20GF330J
R8120	Same as R8119.	
R8121	RES., FXD., W.W.: 7500 ohms, 25 watts.	RW111-18
S8101	Switch, Interlock: 15 AMP, 120, 250 VAC: 2 Amps, Resistive at 250 VDC.	SW230

POWER SUPPLY FRAME ASS'Y

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S8102 thru S8104	Same as S8101.	
S8105	Switch Push Button SPST: 15 Amp at 125, 250 or 460 VAC.	SW169
S8106	Same as S8105.	
T8101	Transformer, Power Step Up 208 VAC, 50/60 kh, 12kv	TF373
T8104	XFMR, power Auto Transformer 15,000 Volts, 50/60 KHz	TF212
T8106	XFMR, Power Stepdown 6.30 at 3 amps 1000 VAC	TF256
W8102	Wiring, Harness Branched	CA1198
XI8101	Lamp Holder, 660 Watts, 250 Volts	TS143
XF8101	Fuse Holder, 100/250 volts.	FH104-3
thru XF8103	Same as XF8101.	

CROWBAR DRAWER

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C8301	CAP., FXD., CER.: 1000 uufd, ±20%, 5000 WVDC.	CC-109-38
C8302 thru C8304	Same as C8301.	
E8301	FEED-THRU, high voltage: ceramic insulated; nickle plated brass.	AX-220
E8302	Same as E8301.	
E8303	Same as E8301.	
E8304	CLIP,electrical: white ceramic; phosphor bronze spring clip to fit a 9/16" dia. tube cap.	HB-102-1
F8301	FUSE, cartridge type: 1.5 amps.	FU-102-1.5
I8301	LAMP, neon: miniature; 105/125 V, 1/25 watt, T-3-1/4 clear bulb, bayonet base.	BI-100-51
J8301	CONNECTOR, receptacle, male: 5 pins, three #16, A, C, D two #8, B&E; voltage rating 3500 V.	MS3102A22-12P
L8301	COIL, RF: fixed; 180 uhy, ±10 uhy.	
L8302	Same as L8301.	
R8301	RES., FXD., W.W.: glass case; 5 ohms, 140 watts.	RW118F5RO
R8302	Same as R8301.	
R8303	Same as R8301.	
R8304	RES., VAR., W.W.: 2500 ohms, ±10%, 25 watts.	RA75AXA252AK
R8305	RHEOSTAT, sliding contact type; 2 ohms, 75 watts, 6.120 maximum amps; 28 steps; slotted shaft.	RP-101-3-S
R8306	RES., FXD., COMP.: 220,000 ohms, ±5%, 1/2 watts.	RC20GF224J
R8307	RES., FXD., COMP.: 1000 ohm, ±5%, 1/2 watts.	RC20GF102J
R8308	Same as R8307.	
R8309	Same as R8307.	
S8301	SWITCH, toggle: DPDT; 3 amp 250 V, (one pole unused)	ST-22N

CROWBAR DRAWER

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
T8 301	TRANSFORMER, power distributing: step-down; terminals 1-2 primary220 VAC; terminals 3-4 secondary 6.3 V at 25 amps; terminals 5-6 secondary 5.5 V at 7.0 amps. In accordance with MIL-T-27A, Type TFIROLYY.	TF-214
V8301	TUBE, electron: hydrogen thyratron.	7568
XF8301	FUSEHOLDER: bayonet base; 100/250 volts, neon lamp clear knob, black plastic body, 13/16" x 2-13/16" o/a.	FH-104-3
XI8301	SOCKET, lamp: with red frosted lens; for miniature bayonet base, T-3-1/4 bulb.	TS-125-2
XV8301	SOCKET, tube: 5 pin giant.	

POWER SUPPLY CONTROL PANEL

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C8501	CAP., FXD., MICA.: 1000 uufd, ±10%; 500 WVDC.	CM20B102K
C8502	Same as C8501.	
CB8501	CIRCUIT BREAKER: three pole; 230 VAC, 15 amp; series trip.	SW-269
CB8502	CIRCUIT BREAKER: single pole; 240 VAC, 25 amp; trip.	SW-270
F8501	FUSE, cartridge type; time delay; 5 amps.	FU-102-5
F8502	Same as F8501.	
F8503	FUSE, cartridge type: time delay; 2 amps.	FU-102-2
R8501	RES., VAR., DUAL., COMP.: linear, ±10%, 2 watts. R8501A (Front) 50K ohms R8501B (Rear) 12.5K A, B ohms.	RV-108
S8501	SWITCH, tap: rotary; 3 sections, 7 positions; 180° total rotation in steps of 30°; 300 volts, 25 amp AC.	SW-267-7-T3
S8502	SWITCH, toggle: DPDT; normally closed, 125 VAC, 6 amp 6 terminals; base molded phenolic (black) level-bat type, aluminum sleeve-15/32- 32thd, slotted aluminum.	ST-105
XF8501	FUSE HOLDER, bayonet base: 100/250 volts, neon lamp clear knob, black plastic body, 13/16" x 2-13/16" o/a.	FH-104-3
XF8502	Same as XF8501.	
XF8503	Same as XF8501.	

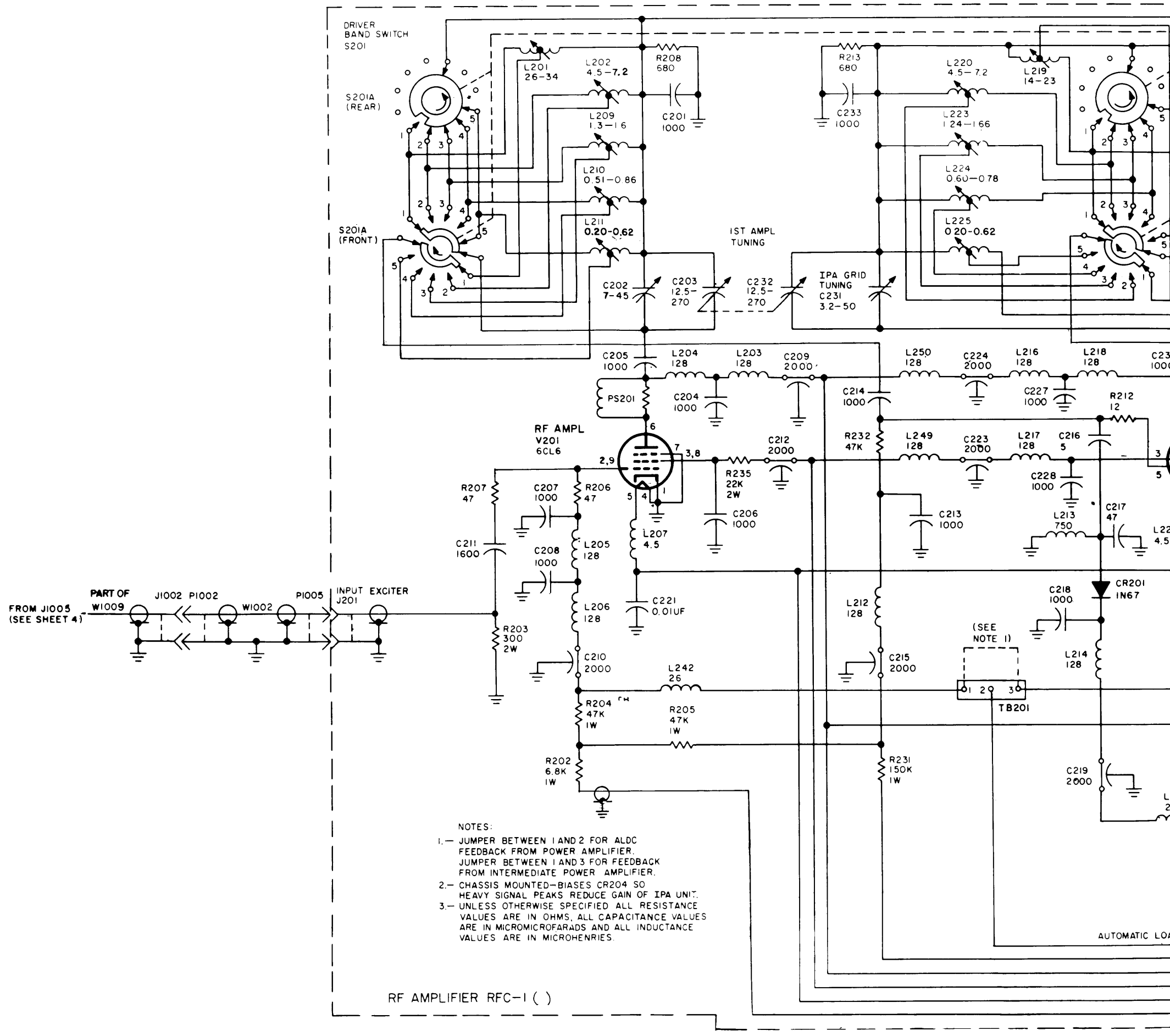
SECTION 6
SCHEMATIC DIAGRAMS

DRIVER BAND SWITCH S201	
POS	FUNCTION
1	2-4 MC
2	4-8 MC
3	8-16 MC
4	16-20 MC
5	20-30 MC

IPA BAND SWITCH S202	
POS	FUNCTION
1	2.0-2.5 MC
2	2.5-3 MC
3	3-4 MC
4	4-6 MC
5	6-8 MC
6	8-12 MC
7	12-16 MC
8	16-20 MC
9	20-30 MC

MULTIMETER SWITCH S204	
POS	FUNCTION
1	IPA BIAS X 10V DC
2	IPA ESG X 10V DC
3	IPA EP X 100V DC
4	IPA ISG X 1MA DC
5	1ST AMPL EP X 1V RF
6	IPA EG X 1V RF
7	IPA EP X 100V RF
8	PA EG X 10V RF

Figure 6-1. Schematic Diagram, GPT-40K RF Amplifier, RFC, (Sheet 1 of 4)



NOTES:

1.— JUMPER BETWEEN 1 AND 2 FOR ALDC FEEDBACK FROM POWER AMPLIFIER. JUMPER BETWEEN 1 AND 3 FOR FEEDBACK FROM INTERMEDIATE POWER AMPLIFIER.
2.— CHASSIS MOUNTED—BIASES CR204 SO HEAVY SIGNAL PEAKS REDUCE GAIN OF IPA UNIT.
3.— UNLESS OTHERWISE SPECIFIED ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

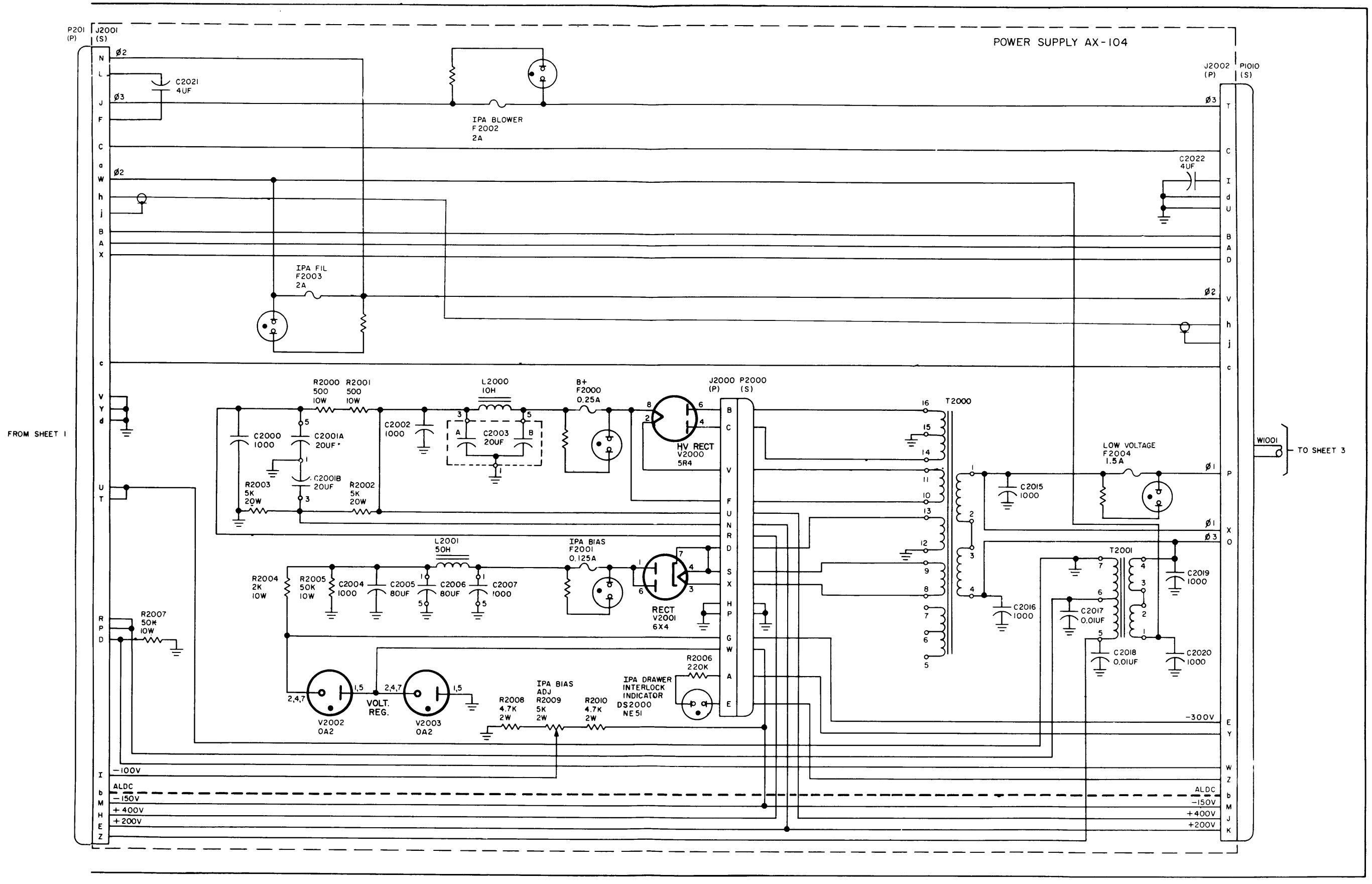


Figure 6-1. Schematic Diagram, GPT-40K Power Supply, AX104, (Sheet 2 of 4)

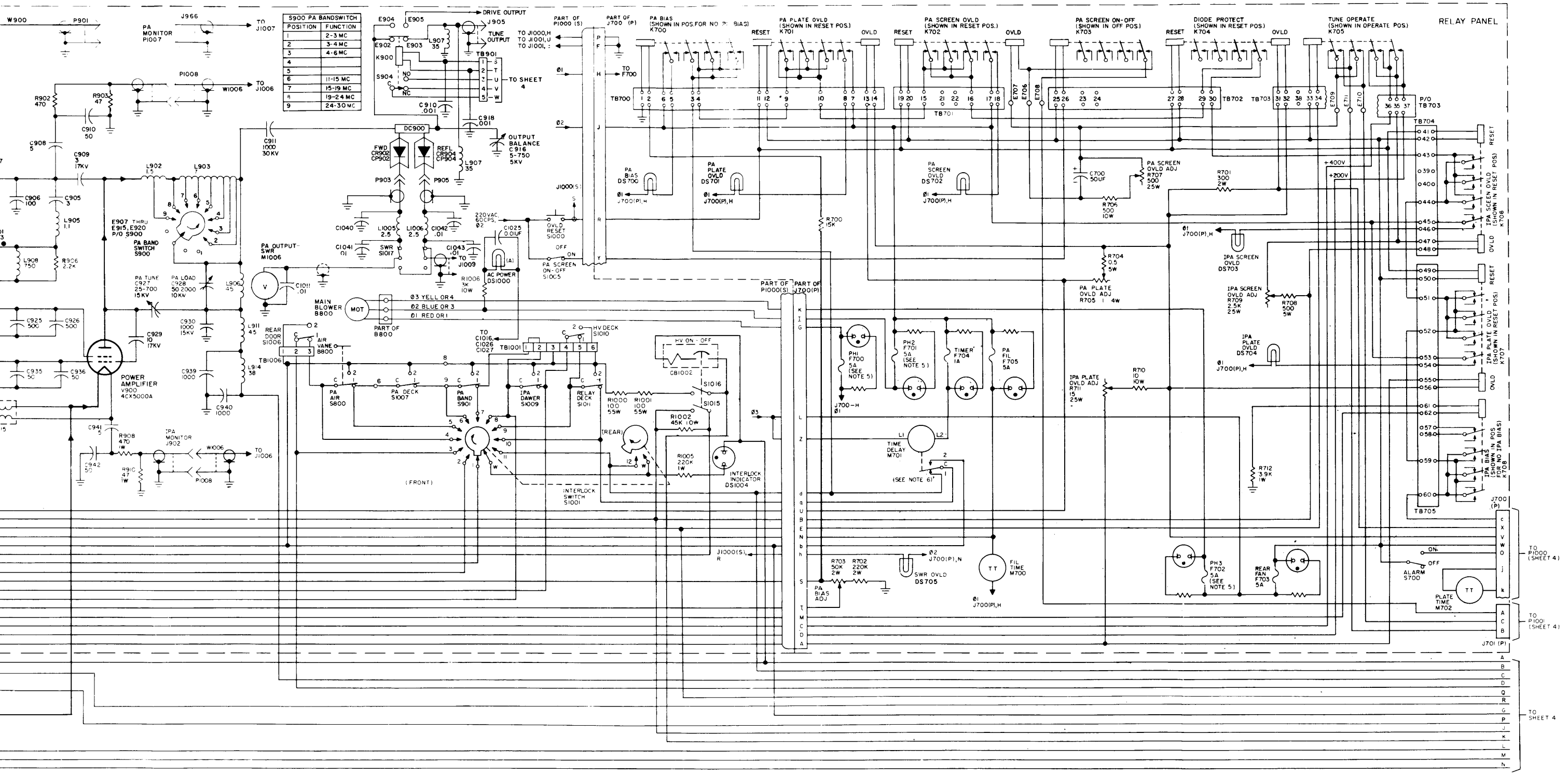
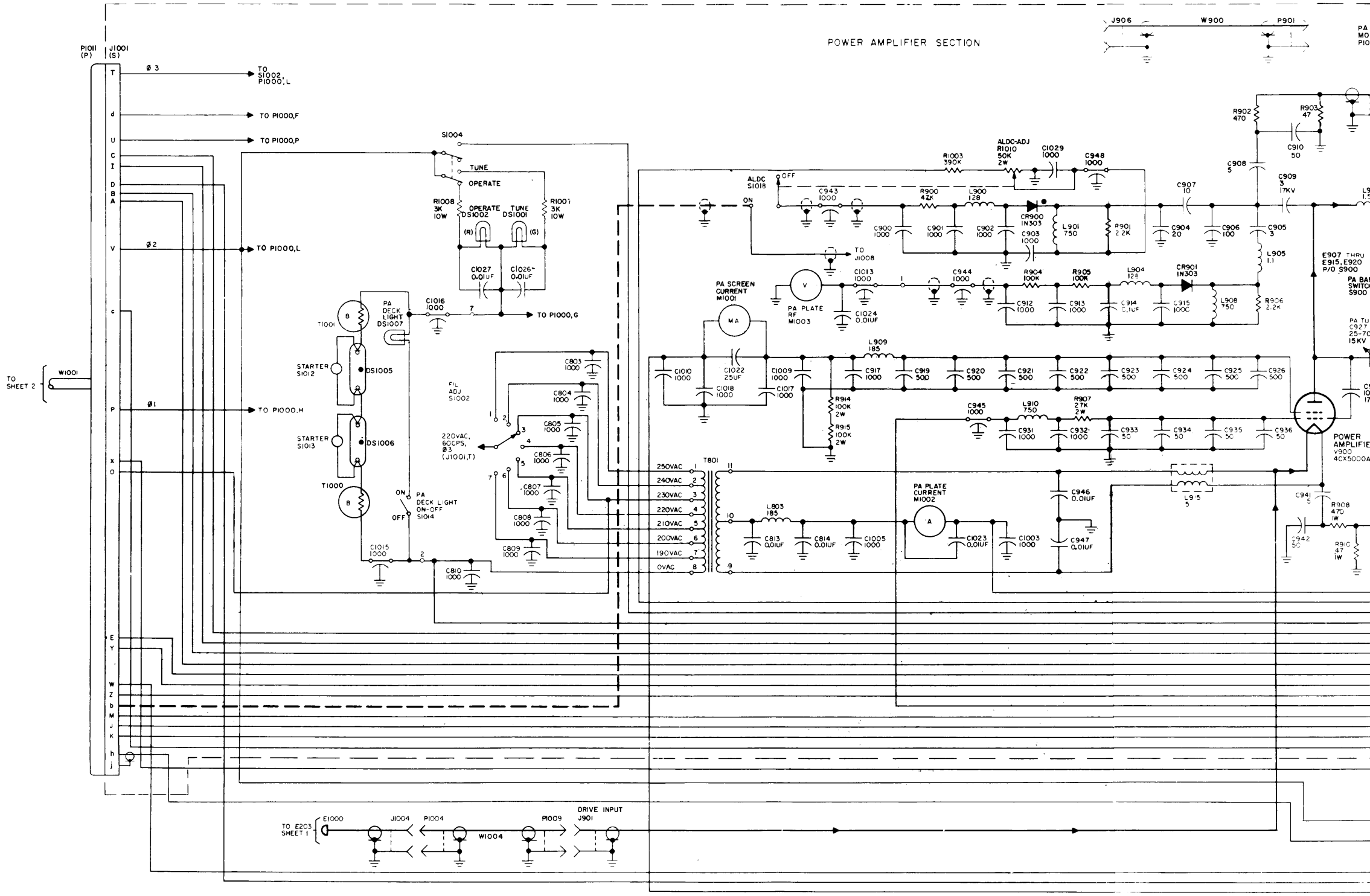


Figure 6-1. Schematic Diagram, GPT-40K 10KW PA and Relay Panel (Sheet 3 of 4)


POWER AMPLIFIER SECTION
P1011 (P)
J1001 (S)
TO SHEET 2
W1001
TO S1002 P1000,L
TO P1000,F
TO P1000,P
TO P1000,L
TO P1000,H
TO P1000,G
S1004
TUNE
OPERATE
R1008 3K 10W
R1007 3K 10W
OPERATE DS1002
TUNE DS1001
C1027 0.01UF
C1026 0.01UF
C1016 1000
PA DECK LIGHT DS1007
T1001
T1000
STARTER S1012
STARTER S1013
DS1005
DS1006
C1015 1000
C810 1000
PA DECK LIGHT ON-OFF S1014
FIL ADJ S1002
220VAC, 60CPS, Ø3 (J1001,T)
C803 1000
C804 1000
C805 1000
C806 1000
C807 1000
C808 1000
C809 1000
T801
250VAC
240VAC
230VAC
220VAC
210VAC
200VAC
190VAC
0VAC
L803 185
C813 0.01UF
C814 0.01UF
C1005 1000
PA PLATE CURRENT M1002
C1023 0.01UF
C1003 1000
C946 0.01UF
C947 0.01UF
ALDC S1018
ON
OFF
C943 1000
R900 42K
L900 12S
CR900 IN303
C900 1000
C901 1000
C902 1000
C903 1000
L901 750
R901 2.2K
R1003 390K
ALDC ADJ R1010 50K 2W
C1029 1000
C948 1000
C907 10
C904 20
C906 100
C908 5
C909 3 17KV
C905 3
L905 1.1
R902 470
R903 47
C910 50
TO J1008
PA SCREEN CURRENT M1001
PA PLATE RF M1003
C1013 1000
C1024 0.01UF
C944 1000
R904 100K
R905 100K
L904 12S
CR901 IN303
C912 1000
C913 1000
C914 0.1UF
C915 1000
L908 750
R906 2.2K
E907 THRU E915, E920 P/O S900
PA BIAS SWITCH S900
L909 185
C1010 1000
C1022 25UF
C1018 1000
C1009 1000
C1017 1000
C917 1000
C919 500
C920 500
C921 500
C922 500
C923 500
C924 500
C925 500
C926 500
R914 100K 2W
R915 100K 2W
C945 1000
L910 750
R907 27K 2W
C931 1000
C932 1000
C933 50
C934 50
C935 50
C936 50
POWER AMPLIFIER V900 4CX5000A
L915 5
C941 5
C942 50
R908 470 1W
R910 47 1W
J906
W900
P901
TO E203 SHEET 1
E1000
J1004
P1004
W1004
P1009
DRIVE INPUT J901

CK1450

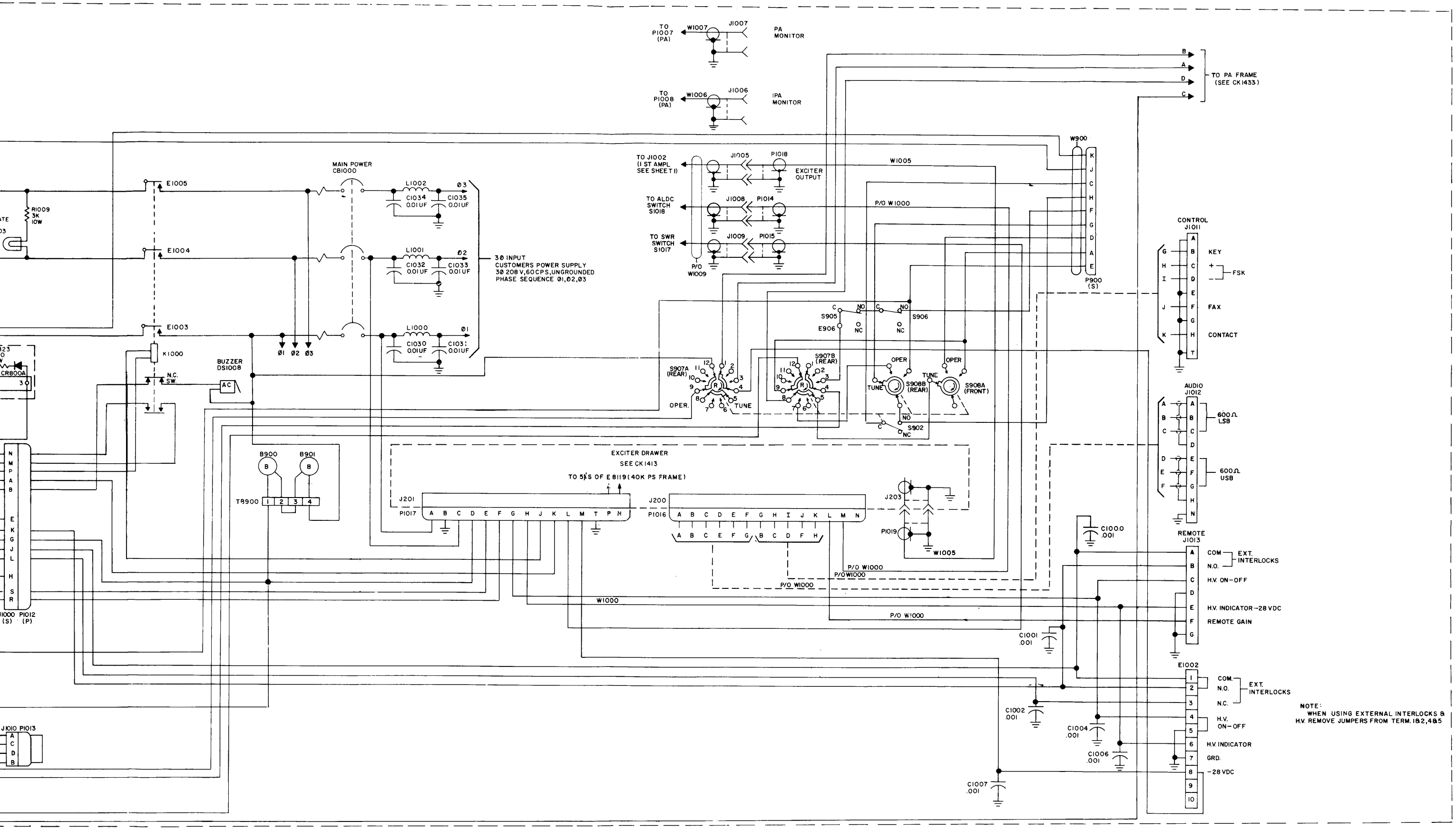
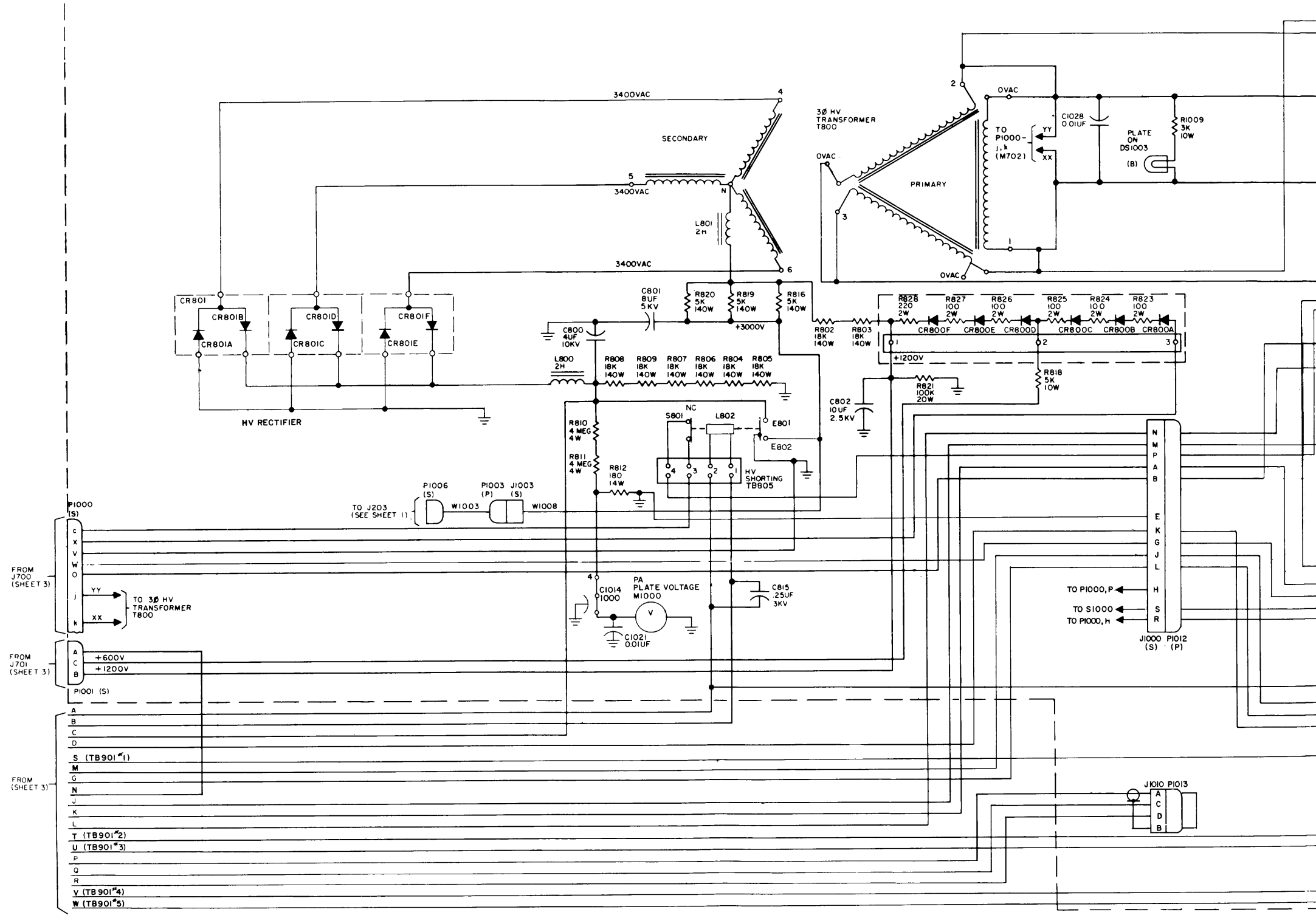
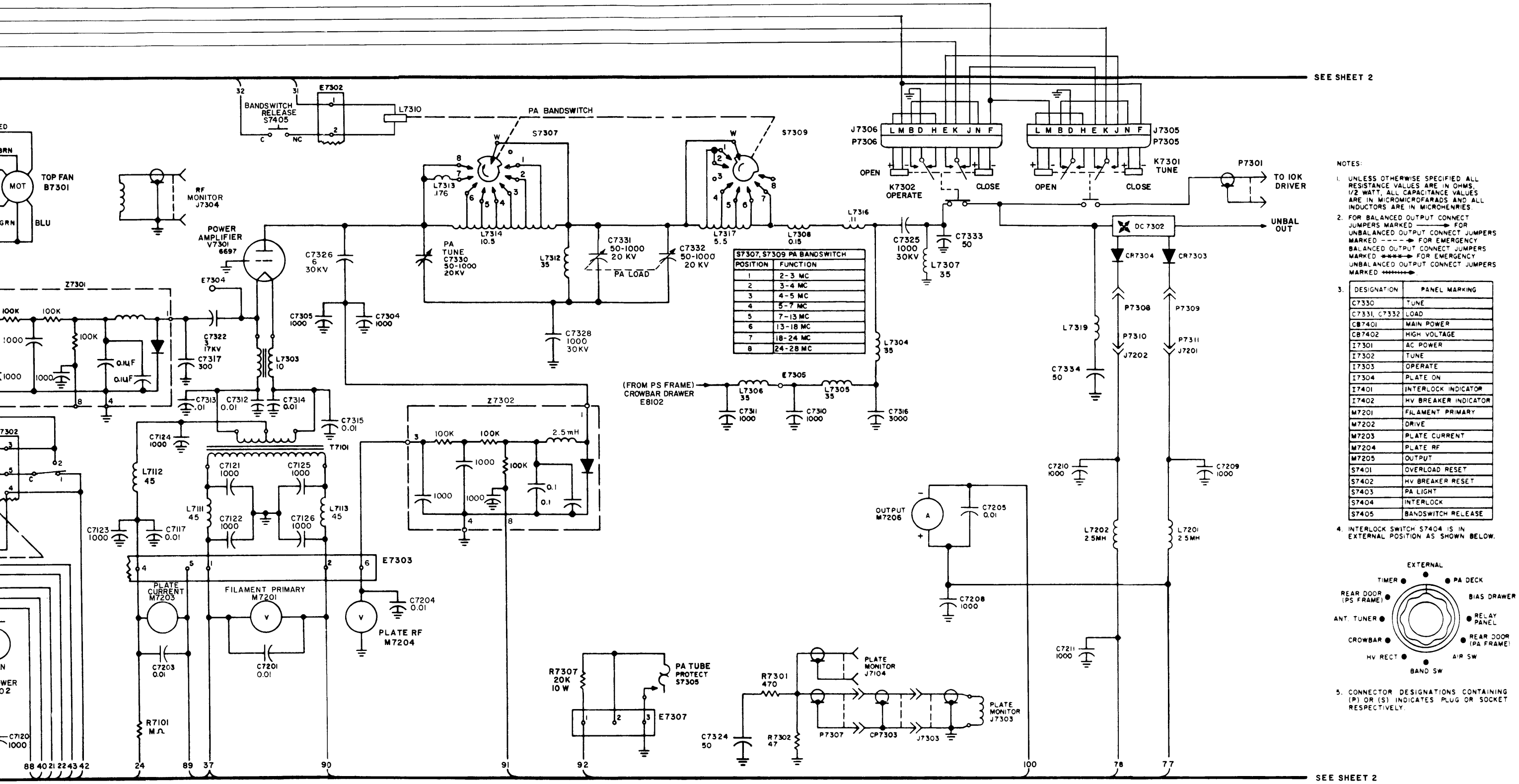


Figure 6-1. Schematic Diagram GPT-40K
HV Power Supply
(Sheet 4 of 4)


3400VAC
SECONDARY
3400VAC
3400VAC
L801
2H
3Ø HV
TRANSFORMER
T800
PRIMARY
OVAC
OVAC
OVAC
TO
P1000-
j,k
(M702)
YY
XX
C1028
0.01UF
PLATE
ON
DS1003
(B)
R1009
3K
10W
CR801
CR801A
CR801B
CR801C
CR801D
CR801E
CR801F
HV RECTIFIER
C801
8UF
5KV
R820
5K
140W
R819
5K
140W
R816
5K
140W
+3000V
C800
4UF
10KV
L800
2H
R808
18K
140W
R809
18K
140W
R807
18K
140W
R806
18K
140W
R804
18K
140W
R805
18K
140W
R802
18K
140W
R803
18K
140W
R828
220
2W
R827
100
2W
R826
100
2W
R825
100
2W
R824
100
2W
R823
100
2W
CR800F
CR800E
CR800D
CR800C
CR800B
CR800A
+1200V
R818
5K
10W
R821
100K
20W
C802
10UF
2.5KV
R810
4 MEG
4W
R811
4 MEG
4W
R812
180
14W
NC
S801
L802
E801
E802
HV
SHORTING
TB805
P1006
(S)
P1003
(P)
J1003
(S)
W1003
W1008
TO J203
(SEE SHEET 1)
P1000
(S)
FROM
J700
(SHEET 3)
TO 3Ø HV
TRANSFORMER
T800
FROM
J701
(SHEET 3)
+600V
+1200V
P1001 (S)
FROM
(SHEET 3)
S (TB901 #1)
T (TB901 #2)
U (TB901 #3)
V (TB901 #4)
W (TB901 #5)
C1014
1000
PA
PLATE VOLTAGE
M1000
C1021
.001UF
C815
.25UF
3KV
TO P1000, P
TO S1000
TO P1000, h
J1000
(S)
P1012
(P)
J1010
P1013

CK1450



NOTES:

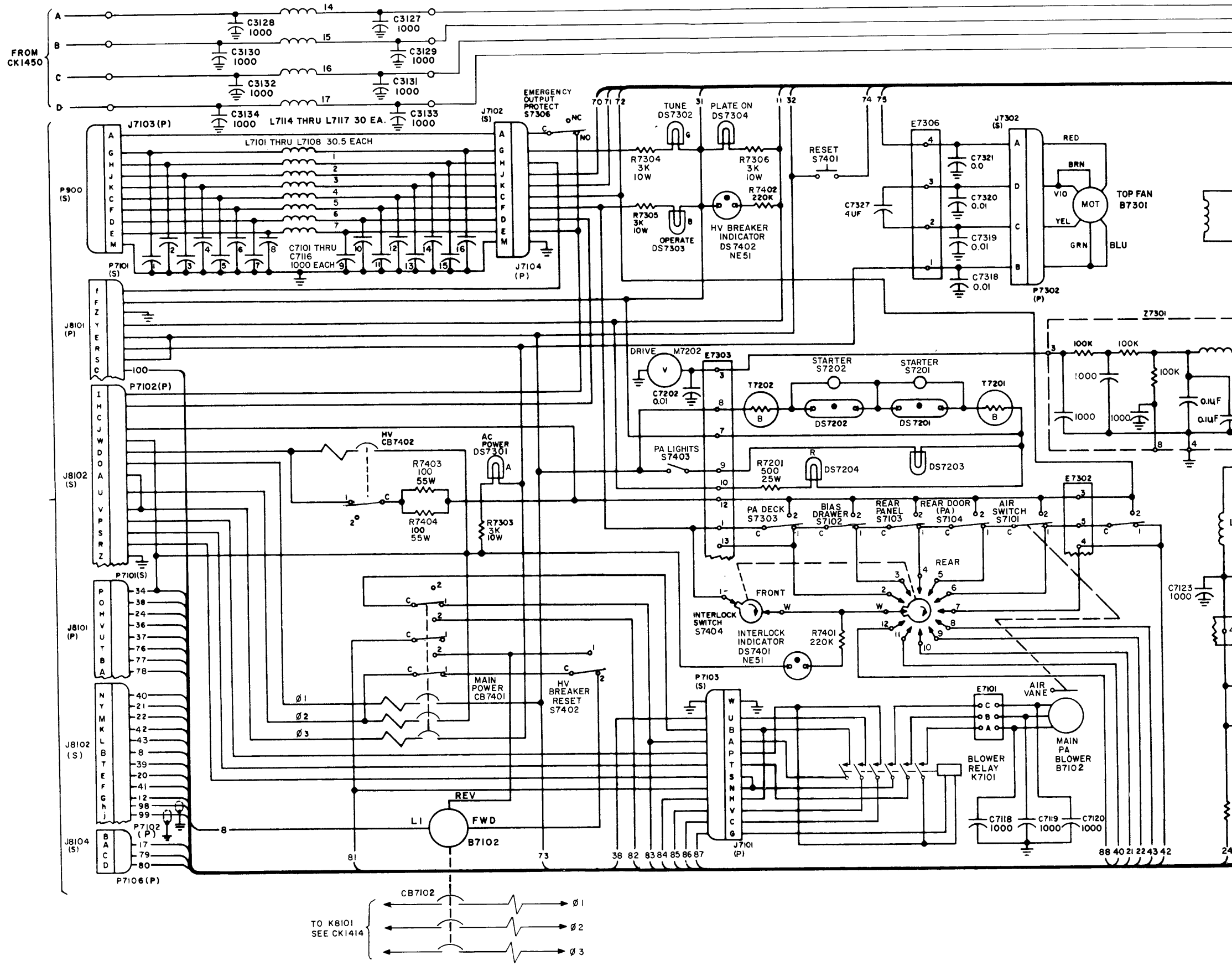
1. UNLESS OTHERWISE SPECIFIED ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS AND ALL INDUCTORS ARE IN MICROHENRIES.
2. FOR BALANCED OUTPUT CONNECT JUMPERS MARKED ——— FOR UNBALANCED OUTPUT CONNECT JUMPERS MARKED - - - - FOR EMERGENCY. BALANCED OUTPUT CONNECT JUMPERS MARKED ✱✱✱✱ FOR EMERGENCY UNBALANCED OUTPUT CONNECT JUMPERS MARKED ++++++++
3.

DESIGNATION	PANEL MARKING
C7330	TUNE
C7331, C7332	LOAD
CB7401	MAIN POWER
CB7402	HIGH VOLTAGE
I7301	AC POWER
I7302	TUNE
I7303	OPERATE
I7304	PLATE ON
I7401	INTERLOCK INDICATOR
I7402	HV BREAKER INDICATOR
M7201	FILAMENT PRIMARY
M7202	DRIVE
M7203	PLATE CURRENT
M7204	PLATE RF
M7205	OUTPUT
S7401	OVERLOAD RESET
S7402	HV BREAKER RESET
S7403	PA LIGHT
S7404	INTERLOCK
S7405	BANDSWITCH RELEASE

4. INTERLOCK SWITCH S7404 IS IN EXTERNAL POSITION AS SHOWN BELOW.

5. CONNECTOR DESIGNATIONS CONTAINING (P) OR (S) INDICATES PLUG OR SOCKET RESPECTIVELY.

Figure 6-2. Schematic Diagram, GPT-40K 40KW PA (Sheet 1 of 3)


FROM CK1450
A
B
C
D
C3128 1000
C3130 1000
C3132 1000
C3134 1000
C3127 1000
C3129 1000
C3131 1000
C3133 1000
14
15
16
17
L7114 THRU L7117 30 EA.
J7103(P)
P900 (S)
L7101 THRU L7108 30.5 EACH
C7101 THRU C7116 1000 EACH
P7101 (S)
J8101 (P)
J8102 (S)
P7102(P)
P7101(S)
J8101 (P)
J8102 (S)
J8104 (S)
P7102 (P)
P7106(P)
J7102 (S)
J7104 (P)
EMERGENCY OUTPUT PROTECT S7306
NC
NO
TUNE DS7302
PLATE ON DS7304
R7304 3K 10W
R7306 3K 10W
R7305 3K 10W
R7402 220K
OPERATE DS7303
HV BREAKER INDICATOR DS7402 NE51
RESET S7401
E7306
C7321 0.0
C7320 0.01
C7319 0.01
C7318 0.01
C7327 4UF
J7302 (S)
P7302 (P)
RED
BRN
VIO
YEL
GRN
BLU
MOT
TOP FAN B7301
Z7301
100K
1000
0.1UF
DRIVE M7202
C7202 0.01
E7303
T7202
T7201
STARTER S7202
STARTER S7201
DS7202
DS7201
PA LIGHTS S7403
R7201 500 25W
DS7204
DS7203
HV CB7402
AC POWER DS7301
R7403 100 55W
R7404 100 55W
R7303 3K 10W
E7302
PA DECK S7303
BIAS DRAWER S7102
REAR PANEL S7103
REAR DOOR (PA) S7104
AIR SWITCH S7101
REAR
FRONT
INTERLOCK SWITCH S7404
INTERLOCK INDICATOR DS7401 NE51
R7401 220K
C7123 1000
MAIN POWER CB7401
HV BREAKER RESET S7402
Ø1
Ø2
Ø3
P7103 (S)
J7101 (P)
E7101
AIR VANE
MAIN PA BLOWER B7102
BLOWER RELAY K7101
C7118 1000
C7119 1000
C7120 1000
REV
L1
FWD
B7102
CB7102
TO K8101 SEE CK1414

CK1433

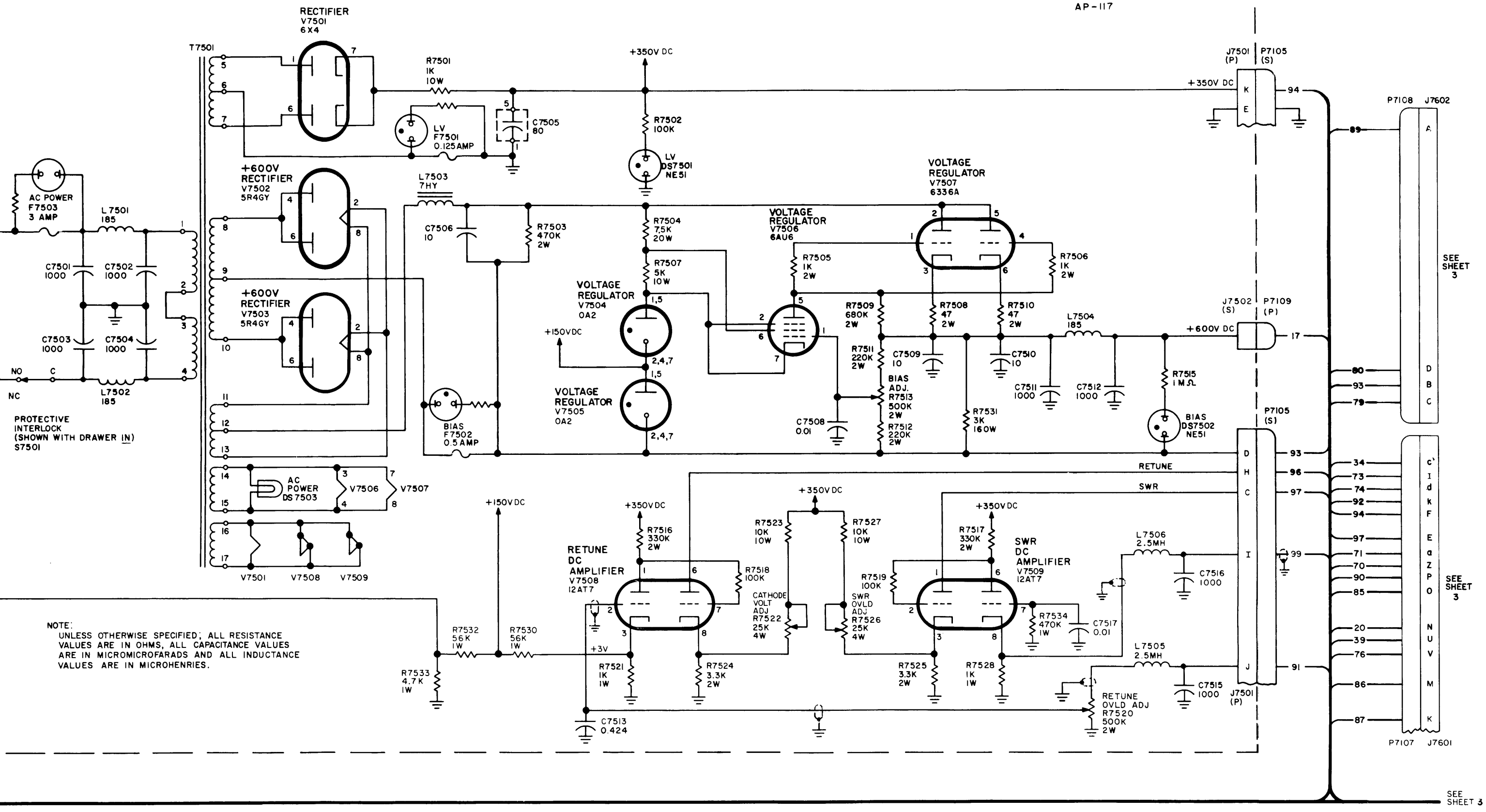
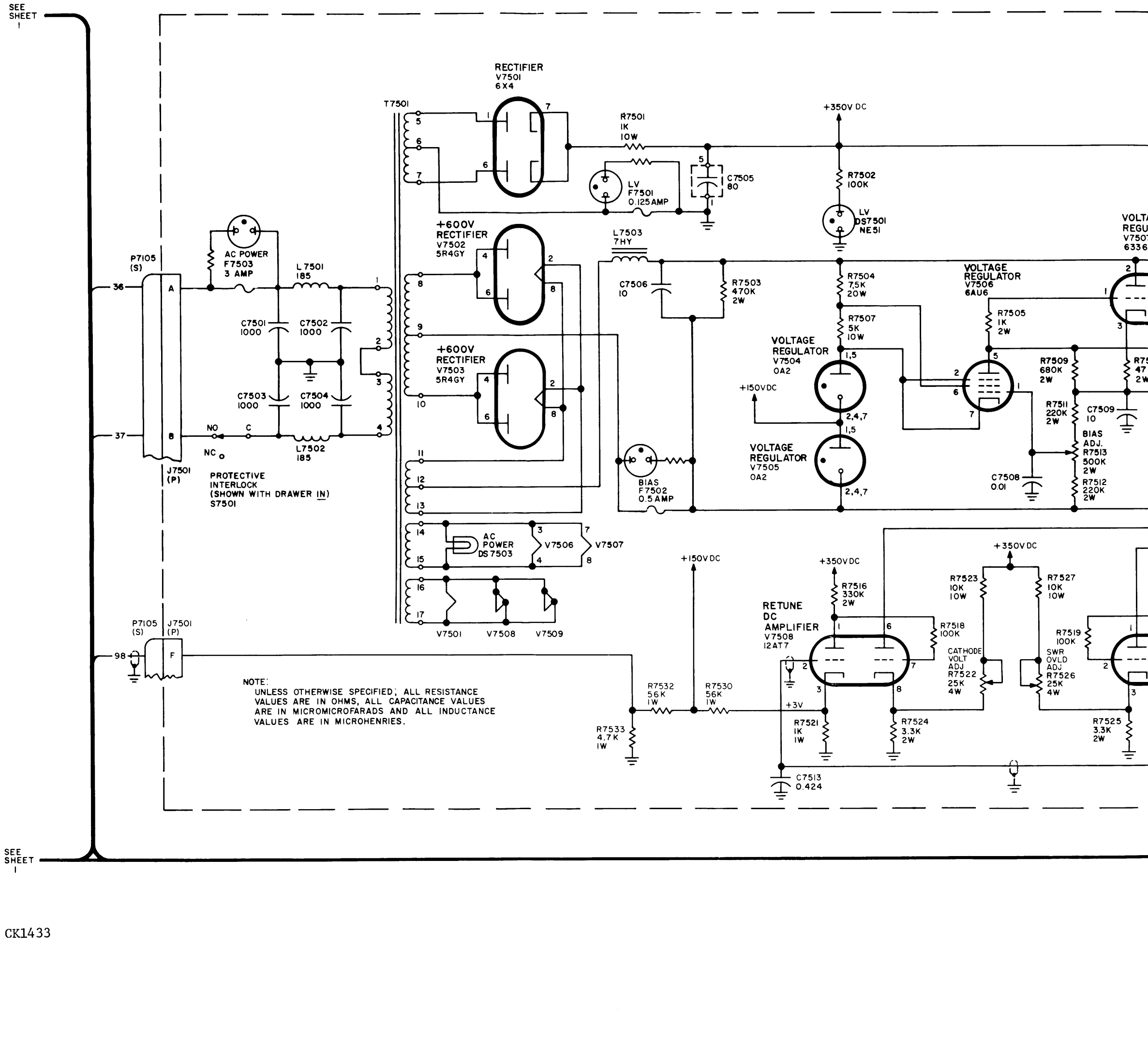


Figure 6-2. Schematic Diagram, GPT-40K Bias Supply Drawer, (Sheet 2 of 3) 6-12/6-13


SEE SHEET 1
RECTIFIER V7501 6X4
T7501
R7501 1K 10W
LV F7501 0.125AMP
C7505 80
+350V DC
R7502 100K
LV DS7501 NE51
+600V RECTIFIER V7502 5R4GY
+600V RECTIFIER V7503 5R4GY
L7503 7HY
C7506 10
R7503 470K 2W
R7504 7.5K 20W
R7507 5K 10W
VOLTAGE REGULATOR V7506 6AU6
R7505 1K 2W
VOLTAGE REGULATOR V7504 0A2
+150VDC
VOLTAGE REGULATOR V7505 0A2
R7509 680K 2W
R7511 220K 2W
C7509 10
BIAS ADJ. R7513 500K 2W
R7512 220K 2W
C7508 0.01
AC POWER F7503 3 AMP
L7501 185
C7501 1000
C7502 1000
C7503 1000
C7504 1000
L7502 185
P7105 (S)
J7501 (P)
NO
C
NC
PROTECTIVE INTERLOCK (SHOWN WITH DRAWER IN) S7501
BIAS F7502 0.5AMP
AC POWER DS7503
V7506
V7507
V7501
V7508
V7509
+150V DC
+350V DC
RETUNE DC AMPLIFIER V7508 12AT7
R7516 330K 2W
R7523 10K 10W
R7527 10K 10W
R7518 100K
R7519 100K
CATHODE VOLT ADJ R7522 25K 4W
SWR OVLD ADJ R7526 25K 4W
R7532 56K 1W
R7530 56K 1W
R7533 4.7K 1W
+3V
R7521 1K 1W
R7524 3.3K 2W
R7525 3.3K 2W
C7513 0.424
NOTE:
UNLESS OTHERWISE SPECIFIED; ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.
SEE SHEET 1

CK1433

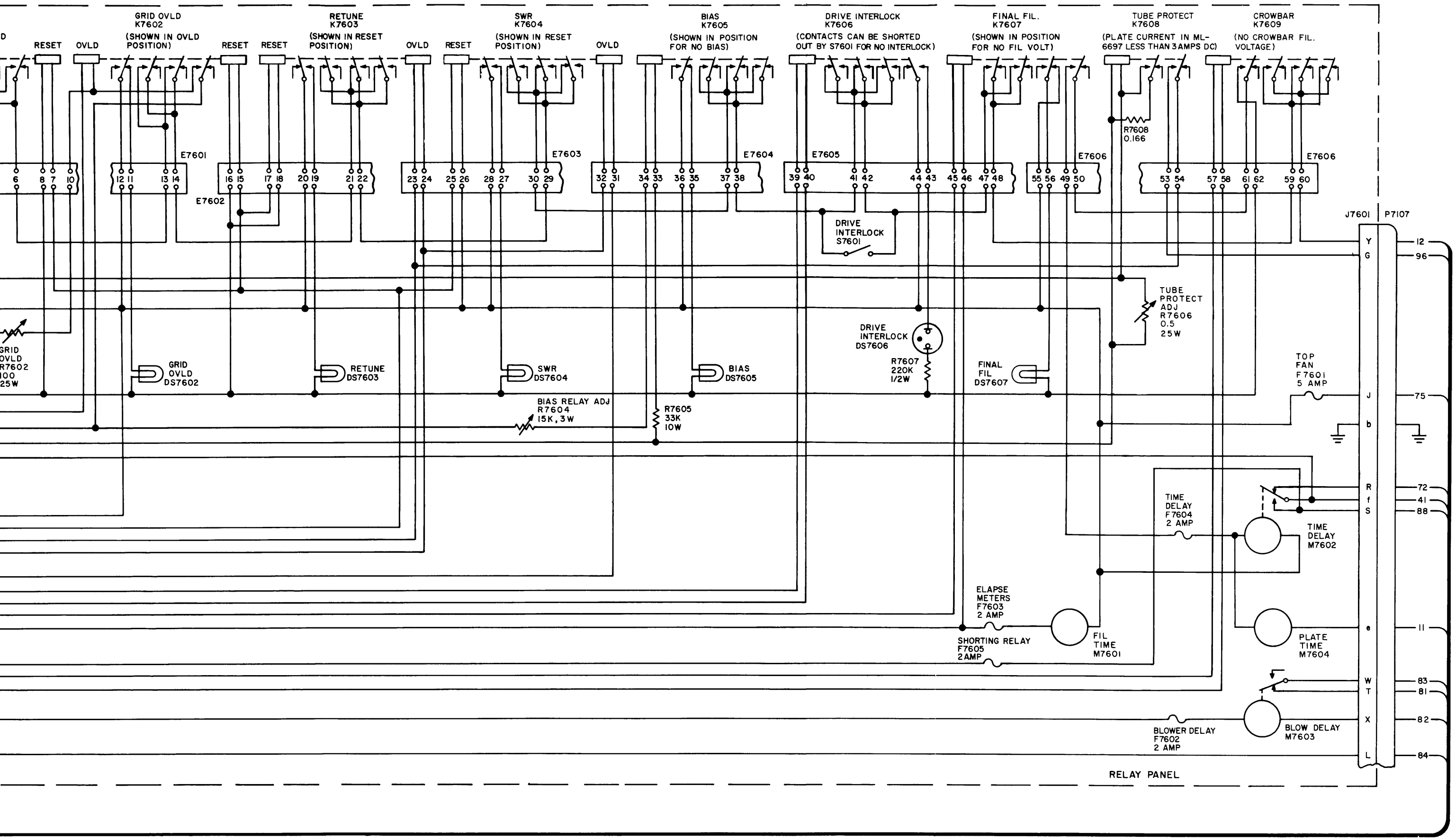


Figure 6-2. Schematic Diagram, GPT-40K Relay Panel (Sheet 3 of 3)

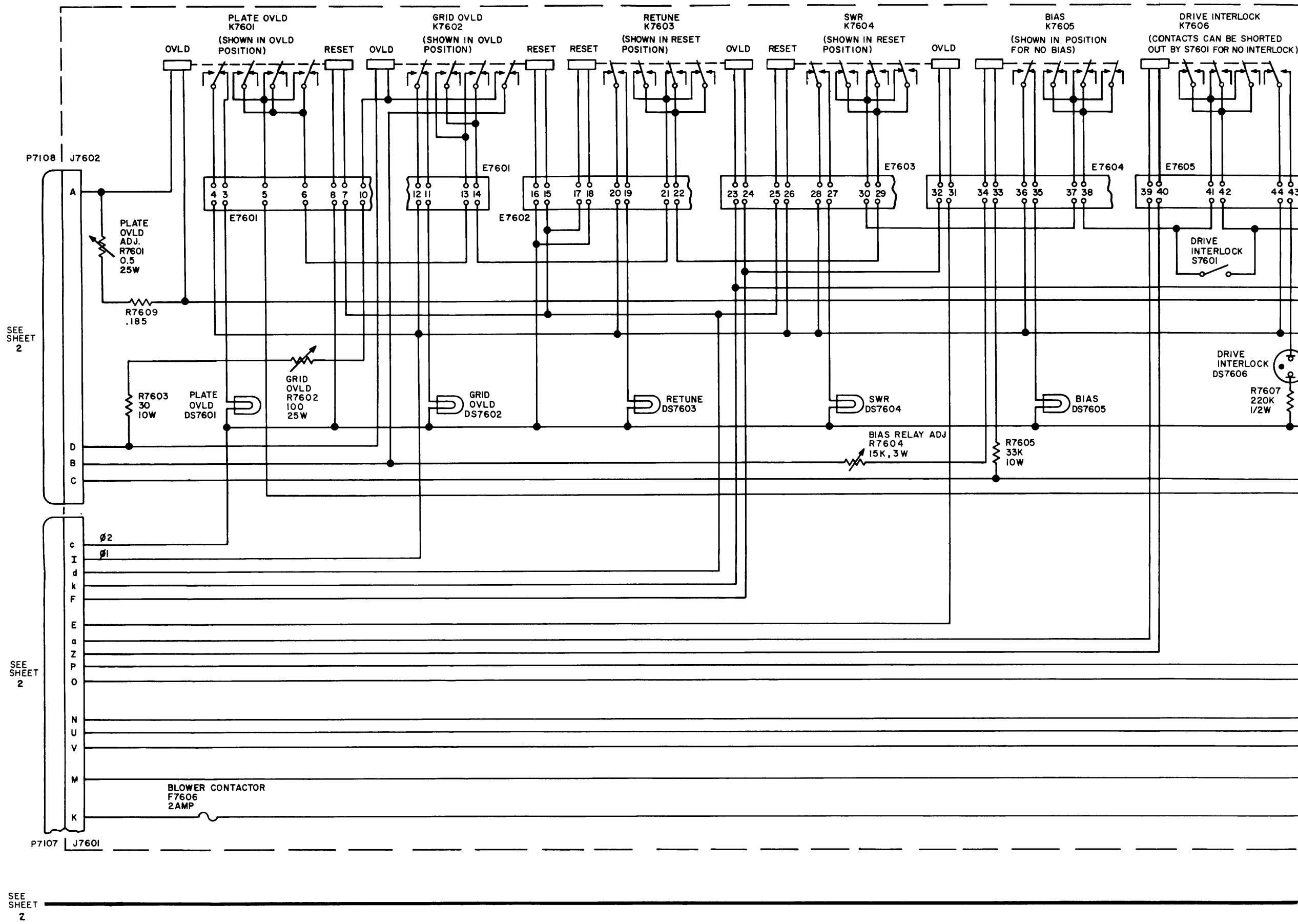


PLATE OVLD K7601
(SHOWN IN OVLD POSITION)
GRID OVLD K7602
(SHOWN IN OVLD POSITION)
RETUNE K7603
(SHOWN IN RESET POSITION)
SWR K7604
(SHOWN IN RESET POSITION)
BIAS K7605
(SHOWN IN POSITION FOR NO BIAS)
DRIVE INTERLOCK K7606
(CONTACTS CAN BE SHORTED OUT BY S7601 FOR NO INTERLOCK)
OVLD
RESET
E7601
E7602
E7603
E7604
E7605
P7108 J7602
SEE SHEET 2
PLATE OVLD ADJ. R7601 0.5 25W
R7609 .185
R7603 30 10W
PLATE OVLD DS7601
GRID OVLD R7602 100 25W
GRID OVLD DS7602
RETUNE DS7603
SWR DS7604
BIAS DS7605
DRIVE INTERLOCK S7601
DRIVE INTERLOCK DS7606
R7607 220K 1/2W
BIAS RELAY ADJ R7604 15K, 3W
R7605 33K 10W
ø2
ø1
BLOWER CONTACTOR F7606 2AMP
P7107 J7601

CK1433

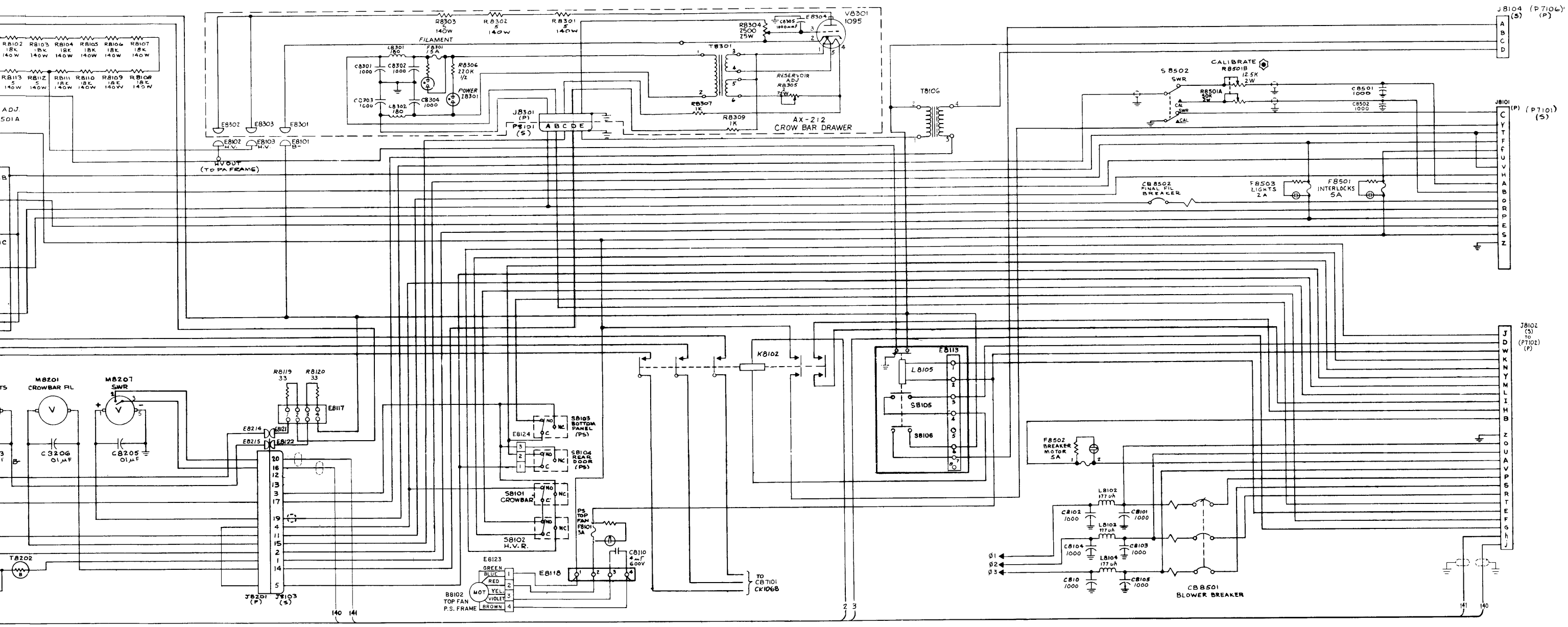
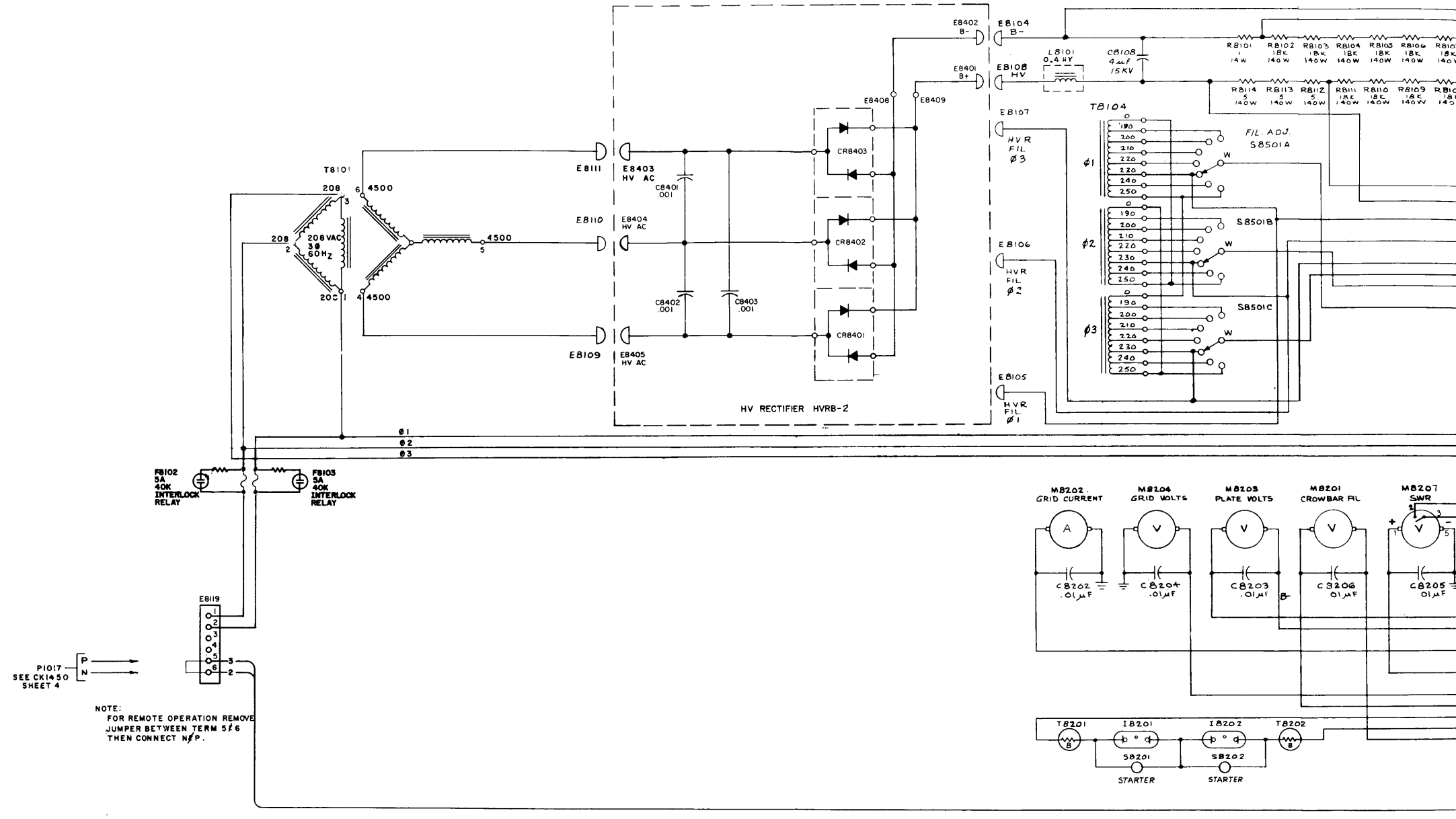


Figure 6-3. Schematic Diagram, GPT-40K 40KW HV Power Supply and Crowbar Drawer

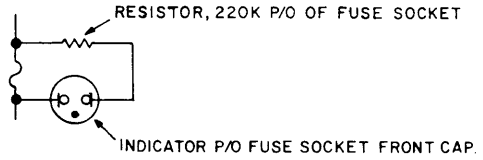

E8104 B-
E8108 HV
E8402 B-
E8401 B+
L8101 0.4 HY
C8108 4 µf 15KV
R8101 1 1W
R8102 18K 140W
R8103 18K 140W
R8104 18K 140W
R8105 18K 140W
R8106 18K 140W
R8114 5 140W
R8113 5 140W
R8112 5 140W
R8111 18K 140W
R8110 18K 140W
R8109 18K 140W
E8408
E8409
E8107
HVR FIL Ø3
TB104
FIL. ADJ. S8501A
S8501B
S8501C
E8106
HVR FIL Ø2
E8105
HVR FIL Ø1
T8101
208
208 VAC 3Ø 60Hz
4500
E8111
E8403 HV AC
E8110
E8404 HV AC
E8109
E8405 HV AC
C8401 .001
C8402 .001
C8403 .001
CR8403
CR8402
CR8401
HV RECTIFIER HVRB-2
Ø1
Ø2
Ø3
FB102 3A 40K INTERLOCK RELAY
FB103 3A 40K INTERLOCK RELAY
E8119
P1017
SEE CK1450 SHEET 4
NOTE: FOR REMOTE OPERATION REMOVE JUMPER BETWEEN TERM 5 & 6 THEN CONNECT N & P.
M8202 GRID CURRENT
M8204 GRID VOLTS
M8203 PLATE VOLTS
M8201 CROWBAR FIL
M8207 SWR
C8202 .01µF
C8204 .01µF
C8203 .01µF
C8206 .01µF
C8205 .01µF
T8201
I8201
I8202
T8202
S8201 STARTER
S8202 STARTER

CK1414

100 SERIES	
LAST SYMBOL	MISSING SYMBOL
J124	J100 TO J118 J120 TO J122
TB105	TB100, 101, 102

200 SERIES	
LAST SYMBOL	MISSING SYMBOL
C221 CR203 E202 F202 J202 K204 L201 P202 Q200 R212 S201 T200	C213, 214, 216

FUSE NOTE



UNLESS OTHERWISE SPECIFIED

1- ALL RESISTANCE VALUES ARE IN OHMS
2- ALL CAPACITANCE VALUES ARE IN MICROFARADS
3- ALL INDUCTANCE VALUES ARE IN MICROHENRIES

Figure 6-4. Schematic Diagram, GPT-40K Exciter Drawer