

UNCLASSIFIED

VOLUME IV

MAINTENANCE MANUAL

for

SYNTHESIZED

GPT-200K TRANSMITTER



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

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IN- 321

Issue Date: 16 Aug 1965

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THE TECHNICAL MATERIEL CORPORATION

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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.

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*Electron tubes also include semi-conductor devices.

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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.

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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

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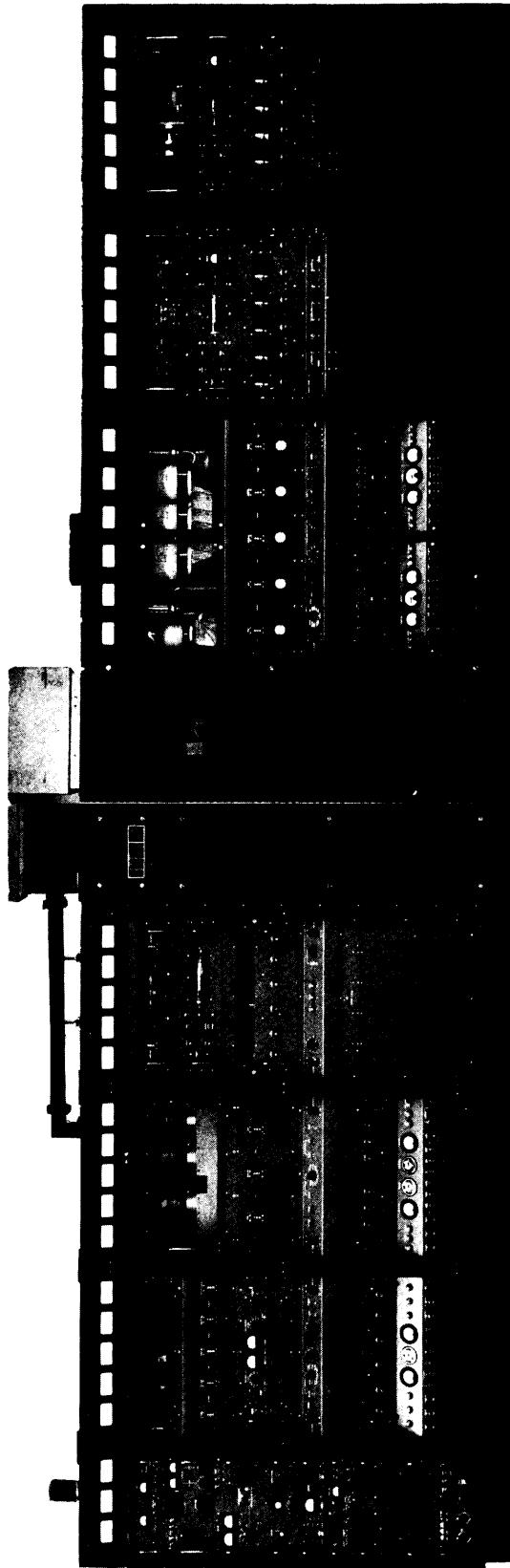
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FOREWORD

This instruction manual covers the theory and maintenance of the last five frames of the GPT-200K transmitter. The GPT-200K frames are the buffer frame, the tube frame, the 200K PA frame, the PS A frame, and the PS B frame. Those circuits in the preceding frames of the transmitter that are modified specifically for use with the GPT-200K are also covered. To facilitate troubleshooting of the GPT-200K transmitter as an integral unit, an overall transmitter block diagram analysis as well as system troubleshooting data is included in this manual. System description, operating instructions, and maintenance instructions applicable to the transmitter are covered in the following TMC publications:

Overall Transmitter Description	Technical Manual for GPT-200K Transmitter Volume IS
Operating Procedures for Synthesized GPT-200K Transmitter	Operator's Manual for Synthesized GPT-200K Transmitter
Theory and Maintenance of GPT-10K Transmitter	Maintenance Manual for Transmitting Set, Radio Model GPT-10K, Volume II
Theory and Maintenance of GPT-40K Transmitter	Maintenance Manual for GPT-40K Transmitter, Volume III
Maintenance of Synthesized Exciter	Technical Manual for Sideband Generator, SBG-1B or SBG-2B



304-1

Figure 1-1. General Purpose Transmitter, Model GPT-200K

SECTION 1

GENERAL INFORMATION

1-1. PURPOSE OF EQUIPMENT.

The GPT-200K transmitter (figure 1-1) is a conservatively rated general purpose transmitter that delivers 200,000 watts PEP (peak envelope power), or 100,000 watts average power, throughout the 2- to 28-mc range. The operating modes of the transmitter are:

- a. Single sideband (SSB) with suppressed or any degree of carrier.
- b. Double sideband (DSB) with suppressed or any degree of carrier (This mode includes AM (amplitude modulation) operation.)
- c. Independent sideband (ISB) (separate intelligence on each sideband) with suppressed or any degree of carrier.
- d. Frequency-shift telegraphy (FSK).
- e. Facsimile (FAX).
- f. Keyed carrier telegraphy (CW).

1-2. EQUIPMENT SUPPLIED.

Table 1-1 lists all the major components of the GPT-200K transmitter. Corresponding common nomenclature is also indicated.

1-3. DESCRIPTION OF EQUIPMENT.

a. GENERAL. - The GPT-200K Transmitter (figure 1-1) consists of nine frame assemblies: From left to right these frame assemblies are: auxiliary, main, PA, PS, buffer, tube, 200K PA, PSA, and PSB. The frames are bolted together and to four base assemblies (two frames per base): the buffer frame rests on the floor. Primary power lines are fed through the base assemblies.

b. 40-KW SECTION FRAMES. - The first four frames of the transmitter are identical in appearance to the frames that constitute the GPT-40K transmitter. When used as part of the GPT-200K, several interconnections are made from the 40-kw section to the final frames of the transmitter.

c. BUFFER COMPARTMENT ASSEMBLY, AX-392 (BUFFER FRAME). - The buffer frame contains coaxial-switching and loading circuits for the 40-kw output. The 40-kw r-f output is coupled through a coaxial line connected from the PA frame to a fitting at the top of the buffer frame. Three coaxial switches in the upper inside of the frame route the r-f signal to either: a dummy load (three high-wattage resistors) mounted vertically in the lower portion of the frame; or a broad-

band transformer mounted at the top of the frame; or, directly through a coaxial line to a link that connects to a directional coupler in the PSA frame. The dummy load resistors are air-cooled; air flow is discussed in the following paragraph.

d. FINAL TUBE COMPARTMENT ASSEMBLY AX-393 (TUBE FRAME). - The tube frame houses two power-amplifier tubes. These tubes are mounted on shelves that divide the frame in half. The tube input circuits are located above the shelves. Part of the cooling blower, a blower delay relay, a contactor, and a spare-parts box occupy the lower half of the frame.

The cooling blower, mounted in the lower half of the tube and 200K PA frames, provides air cooling for the dummy load and the two power amplifier tubes. The blower draws air in through the intake air ducts at the top of the buffer frame and exhausts it through air ducts at the top of the tube frame.

The spare-parts box contains tubes and fuses. The box is reached by opening the tube frame front door.

e. FINAL PA FRAME ASSEMBLY AX-394 (200K PA frame). - The 200K PA frame houses the 200-kw r-f output tuning circuit, a meter panel, two bias supply drawers, two relay panels, power supply and power control circuits, and part of the cooling blower (described in preceding paragraph). The 200-kw r-f output tuning components occupy the upper half of the frame. Transformers that provide filament voltage for the power-amplifier tubes occupy the lower half of the frame. Four fans provide air cooling for 200-kw r-f output tuning components.

(1) METER PANEL AM-118 (200K PA FRAME METER PANEL). - The 200K PA frame meter panel, mounted at the top of the 200K PA frame, contains six meters that monitor r-f input drive voltage, power amplifier tube plate currents, r-f plate voltage, r-f load voltage, and r-f power output.

(2) FINAL AMPLIFIER AND CONTROL PANEL AX-395 (200KW PA). - The 200-KW PA, located below the 200K PA frame meter panel, contains all r-f tuning components and controls for the 200-kw power amplifier. The upper front of the 200K PA frame has two swing-out plexiglass doors that facilitate access to the 200-kw r-f output tuning components. Operating controls and their associated counter-type dials, indicator lamps that indicate the operating mode, and high-voltage indicators for the power amplifier tubes are located on the front panel.

TABLE 1-1. EQUIPMENT SUPPLIED

TMC DESIGNATION	COMMON NAME
Auxiliary Frame Assemble (AX-575)	Auxiliary frame
Auxiliary Meter Panel AX-107	Auxiliary meter panel
Sideband Generator, Model SBG-1 or SBG-2	Sideband Generator SBG
Sideband Exciter, Model CBE-1 (see note 1)	Sideband Exciter CBE
Sideband Exciter, Model CBE-2 (see note 2)	
Frequency Amplifier, Model CHG-2B	Frequency Amplifier CHG
Controlled Master Oscillator, Model CMO-1	Controlled Master Oscillator CMO
Primary Standard, Model CSS-1C	Primary Standard CSS
or	
Primary Standard, Model CSS-2	
Divider Chain, Model CHL-1	Divider Chain CHL
Controlled Oscillator, Model CHL-1	Controlled Oscillator CLL
Power Supply, Model CPP-5	Power Supply CPP-5
Power Supply, Model CPP-2	Power Supply CPP-2
Tone Intelligence Unit, Model TIS-3A (see note 3)	Tone Intelligence Unit TIS
Auxiliary Power Panel, Model APP-10	Auxiliary power panel
Standing Wave Control Unit, Model SWCU-1	Standing Wave Control Unit SWCU
Keyer Monitor Control Unit, Model KMCU-1 (see note 3)	Keyer Monitor Control Unit KMCU
Main Frame Assembly AX-557	Main frame
Main Meter Panel AM-122	Main meter panel
Power Amplifier Section AX-510	10-kw PA
Rf amplifier Drawer AX-104	Rf amplifier drawer
Rf Amplifier, Model RFC-1A	1-kw IPA or RFC
Main Power Panel AX-504	Main power panel
High Voltage Rectifier AX-103	10-kw high-voltage rectifier
Relay Panel AR-161	10-kw relay panel
Main Power Supply AX-138	10-kw main power supply
PA Frame Assembly AP-116	PA frame
PA Frame Meter Panel AM-115	PA frame meter panel

NOTES:

1. Part of Sideband Generator SBG-1.
2. Part of Sideband Generator SBG-2.
3. Tone Intelligence Unit TIS and Keyer Monitor Control Unit KMCU are optional items.

TABLE 1-1. EQUIPMENT SUPPLIED (CONT)

TMC DESIGNATION	COMMON NAME
Power Amplifier AX-511	40-kw PA
PA Control Panel AX-210	PA frame control panel
Bias Supply Drawer AP-117	Bias supply drawer
PA Frame Relay Panel AR-116	PA frame relay panel
PS Frame Assembly AP-118	PS frame
Antenna Tuning Unit AT-106	Antenna tuning unit
Crowbar Drawer AX-212	Crowbar drawer
12-kv High Voltage Rectifier AP-105	40-kw high voltage rectifier
PS Control Panel AX-213	PS frame control panel
Buffer Compartment Assembly AX-392	Buffer frame
Final Tube Compartment Assembly AX-393	Tube frame
Final PA Frame Assembly AX-394	200-K PA frame
Meter Panel AM-118	200-K PA frame meter panel
Final Amplifier and Control Panel AX-395	200-kw PA
Final PA Control Panel AX-396	200-K PA frame control panel
Bias Supply AP-108 (see note 4)	Bias supply A or B (see note 5)
Relay and Indicator Panel AR-137	Relay and indicator panel A
Relay and Indicator Panel AR-138	Relay and indicator B
Power Supply A Frame AP-109	PSA frame
Meter Panel AM-119	PSA frame meter panel
Antenna Switching Deck and Retune and SWR Panels AX-397	Antenna switching unit
Crowbar Drawer AX-398	PSA crowbar drawer
HV Rectifier AP-110	100-kw high-voltage rectifier A
PS A Control Panel AX-399	PSA frame control panel
Power Supply B Frame AP-111	PSB frame
Meter Panel AM-120	PSB frame meter panel
Antenna Tuner Deck AT-105	Antenna tuner deck

NOTES:

4. Two bias supplies are provided.
5. Bias supply A located at left and B at right.

TABLE 1-1. EQUIPMENT SUPPLIED (CONT)

TMC DESIGNATION	COMMON NAME
Crowbar Drawer AX-398	PSB crowbar drawer
HV Rectifier AP-110	100-kw high-voltage rectifier B
PS B Control Panel AX-399	PSB frame control panel
Miscellaneous:	
Coaxial transmission line	
Air ducts	
Mating Connectors	

(3) FINAL PA CONTROL PANEL AX-396 (200K PA FRAME CONTROL PANEL). — The 200K PA frame control panel controls the application of plate voltage to the power amplifier tubes. Power for the cooling blower and all fans in the 200K PA frame is also controlled by a circuit breaker on this panel. Primary power adjustments for the A and B power amplifier tube are individually controlled by selector switches. The panel also monitors all interlock circuits and includes RESET pushbuttons associated with the A and B protective relays in the 200K PA frame. Other controls on this panel include an EMERGENCY/TUNE/OPERATE switch, a remote r-f drive control, and band-switch release pushbuttons.

(4) BIAS SUPPLY (BIAS SUPPLY A OR B). - Two identical bias supplies are rack-mounted side-by-side in the lower front portion of the 200K PA frame. These supplies provide bias for the two power amplifier tubes (nominal +450 volts regulated output to the cathode of each tube). Each bias supply has an a-c power switch, a bias adjustment control, indicators, and fuses.

(5) RELAY AND INDICATOR PANELS AR-137 AND AR-138 (RELAY AND INDICATOR PANELS A AND B). - Relay and indicator panels A and B are rack-mounted side-by-side at the bottom of the 200K PA frame. Relay and indicator panel A is located to the left of relay and indicator panel B and services power amplifier tube A circuits. Relay and indicator panel B is used primarily in conjunction with power amplifier tube B circuits. Each relay and indicator panel contains nine relays that protect the associated power amplifier tube against overloads and other damaging conditions. The relays and associated terminal boards are mounted under a front panel cover plate for quick accessibility. The upper portion of the relay and indicator panels are similar in appearance except for one indicator lamp. Each panel contains FILAMENT TIME and PLATE TIME meters, a TIME DELAY control, and overload indicator lamps. In addition, each panel contains screwdriver adjustments for plate, grid, bias, and tube protect relays. Included on each panel are fuses for circuits in the 200K PA frame.

f. POWER SUPPLY A FRAME AP-109 (PSA FRAME). - The PSA frame houses the high-voltage power supply components and control circuits associated with power amplifier tube A. The PSA frame contains a meter panel, an antenna switching unit, a crowbar drawer, a 100-kw high-voltage rectifier and a power-supply control panel. The frame is divided into a front and rear section by a partition that supports many of the components. Behind the partition on the upper section of the frame, is a motorized circuit breaker. Other components in this section include high-voltage resistors and a shorting relay switch and indicator lamp (used to indicate that bias voltage is present). The lower section of the frame contains high-voltage capacitors and transformers. Behind the antenna switching unit front panel, mounted on a horizontal platform, is the retune and SWR (standing wave ratio) chassis, which contains protective circuits for the power amplifier. A directional coupler and coaxial link segment located directly above the SWR chassis are used for transmission of r-f output power. When operating into an unbalanced load a right angle segment is used, with r-f power routed through a fitting at the top of the frame. For balanced output operation, the right-angle coaxial segment is replaced with a straight feedthrough segment that routes r-f to the PSB frame.

(1) METER PANEL AM-119 (PSA FRAME METER PANEL). - The PSA frame meter panel mounted at the top of the PSA frame contains five meters. Four of these meters monitor power amplifier tube A grid current, bias, plate voltage, and filament primary voltage. The fifth meter measures VSWR on the transmission line.

(2) ANTENNA SWITCHING DECK AND RETUNE AND SWR PANELS AX-397 (ANTENNA SWITCHING UNIT). - The antenna switching unit is located directly below the PSA frame meter panel. It contains controls and indicators for the output switching circuit, controls associated with the retune and SWR protective overload relays, and calibration controls for the SWR metering circuit.

(3) CROWBAR DRAWER AX-398 (PSA CROWBAR DRAWER). - The crowbar drawer, a slide-

mounted unit, is located directly below the antenna switching unit. This drawer contains a high voltage thyatron tube, visible behind a plexiglass window, that protects final power-amplifier tube A from excessive arcing. The front panel contains a RESERVOIR meter that indicates the voltage applied to the reservoir filament of the thyatron tube. Adjustments for the trigger level and reservoir voltage are accessible on the front panel.

(4) HIGH VOLTAGE RECTIFIER AP-110 (100-KW HIGH-VOLTAGE RECTIFIER A). - The 100-kw high-voltage rectifier A, a slide-mounted unit below the PSA frame crowbar drawer, contains six high-voltage rectifier tubes and their associated filament transformers. This unit provides 20,000 volts dc for the plate of power amplifier tube A. A plexiglass window on the front panel permits observation of the rectifier tubes. Heavy insulated button connectors at the rear of the unit provide connections for 3-phase input and dc output voltages. Each filament circuit is protected by a fuse on the front panel.

(5) POWER SUPPLY A CONTROL PANEL AX-399 (PSA FRAME CONTROL PANEL). - The PSA frame control panel, mounted below 100-kw high voltage rectifier A, contains the circuit breaker for applying primary and filament power to the circuits associated with power amplifier tube A. The panel also contains fault indicator lamps associated with the 100-kw high-voltage rectifier blower and top fan.

g. POWER SUPPLY B FRAME AP-111 (PSB FRAME). - The PSB frame houses the high-voltage components and power-control circuits associated with power amplifier tube B. The equipment in the PSB frame is similar to that in the PSA frame except that an antenna tuner unit is substituted for the antenna switching unit; connections are provided for 600-ohm balanced output.

The antenna tuner deck, located directly below the PSB frame meter panel, contains circuits for matching the output of the power amplifier stage to a 600-ohm balanced transmission line. Located behind the front panel and mounted on a platform is a balanced load matching transformer and its related components. Connections from the balanced secondary of the transformer are made to two antenna terminal posts that are located at the top of the frame. The front panel has a plexiglass window that permits observation of the components. Two controls on the panel adjust the matching and balancing of the antenna system.

1-4. TECHNICAL CHARACTERISTICS.

Frequency Range: 2-28 mc

Output Power: 200,000 watts, 2-tone PEP, 3rd order distortion products down at least 35 db below tone level.

Operating Modes: SSB, ISB, DSB, FSK, FAX, CW, and AM.

Harmonic Suppression: Second harmonic at least 50 db below PEP. third harmonic at least 65 db below PEP.

Primary Power Requirements: (with exciter)

40K section 3-phase, 220 volts, 50/60 cps, 200 amperes per leg (No. 1/0 wire).

200K section 3-phase, 220 volts, 50/60 cps, 75 amperes per leg (No. 6 wire).

3-phase, 480 volts, 50/60 cps, 200 amperes per leg (No. 4/0 wire).

Frequency Stability: 1 part in 10^8 (using CCS-1) or 10^9 (using CCS-2), at any 100-cycle increment from 2 to 28-mc.

Carrier Insertion: -55 db to full output.

Environment: Between 0°C (32°F) and 50°C (122°F) for humidity as high as 90% .

Output Impedance: 50 or 70 ohms unbalanced; 600 ohms balanced. Double PI network will match load with VSWR of 2:1 maximum.

Audio Inputs: Two independent 600-ohm channels, balanced or unbalanced; -20 dbm input level for full RF output.

Audio Response per Sideband: CBE-1: Within 3.0 db from 350 to 7500 cps for each sideband. CBE-2: Within 3.0 db from 250 to 3500 cps for each sideband.

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

The electron tubes, diodes, and fuses contained in the 200 K PA frame, and the PSA and PSB frames (including final tube frame) are listed in tables 1-2 through 1-4.

TABLE 1-2. ELECTRON TUBE COMPLEMENT

REFERENCE SYMBOL	TYPE	FUNCTION
V5001	ML8317	Power amplifier
V5002	ML8317	Power amplifier
V5501 (2)	6AU6A	Control amplifier
V5502 (2)	7241	Series regulator
V5503 (2)	7241	Series regulator

REFERENCE SYMBOL	TYPE	FUNCTION
V6201	12AU7	Relay amplifier
V6202	12AU7	Relay amplifier
V6301 (2)	7568	HV crowbar
V6401-V6406 (2)	CH1167	High-voltage rec-tifier

TABLE 1-3. DIODE COMPLEMENT

REFERENCE SYMBOL	TYPE
CR5501	DD110
CR6201	DD107
CR6202, CR6204	1N750A

REFERENCE SYMBOL	TYPE
CR6203	1N3027
CR6901, CR6902	DD106
CR6903, CR6904	1N547

TABLE 1-4. FUSE COMPLEMENT

REFERENCE SYMBOL	TYPE
F5001-F5004	MDL-1/4
F5005, F5006	MDL-1
F5501	MDL-3
F5502	MDL-5
F5601-F5605	MDL-1
F5701-F5705	MDL-1
F6001	MDL-1/2

REFERENCE SYMBOL	TYPE
F6301	MDL-1-1/2
F6401-F6406	MDL-1
F6501, F6506	MDL-5
F6502-F6505	MDL-2
F6601	MDL-1/2
F6901, F6902	MDL-2
F6903	MDL-1/4
F6904	MDL-1/2

SECTION 2

PRINCIPLES OF OPERATION

2-1. GENERAL.

This section contains the principles of operation of the fifth through the ninth frames (buffer, tube, 200K PA, PSA and PSB frames) of the GPT-200K transmitter. Also covered are all circuits in the preceding four frames that differ from those in the GPT-40K transmitter. For the principles of operation of the GPT-40K circuits, refer to Maintenance Manuals for GPT-10K and GPT-40K Transmitters.

2-2. OVERALL BLOCK DIAGRAM ANALYSIS. (See figure 2-1.)

As shown in figure 2-1, the transmitter exciter circuits are contained in the auxiliary frame, the 1-kw IPA and 10-kw PA are in the main frame, the 40-kw PA circuits are in the third and fourth frames, and the 200-kw power amplifier circuits are in the fifth through the ninth frames.

An r-f signal from the exciter circuits in the auxiliary frame is applied to the input of RF Amplifier RFC, the 1-kw IPA. The r-f input signal must be within the frequency range of 2 to 28 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 PA, a linear power amplifier operating class AB₁, provides an r-f output as high as 10 kw PEP. This signal is applied through the OPER contacts of OUTPUT LOADING switch S903 to the 40-kw PA. The 40-kw PA, operating class AB₂, provides excitation as high as 40-kw PEP for the 200-kw power amplifier through a coaxial switching matrix in the buffer frame. The coaxial switching matrix consists of three relays that are controlled by the EMERGENCY/TUNE/OPERATE switch in the 200K PA frame control panel. The relays route the output of the 40-kw PA either to a dummy load in the buffer frame, antenna links, or directly into the 200-kw power amplifier. The 200-kw power amplifier, also operating class AB₂, raises the r-f signal level as high as 200-kw PEP. The output of the 200-kw power amplifier is routed through the antenna switching unit and then to a coaxial connector on top of the PSA frame or through the antenna tuning deck to balanced output terminals on top of the PSB frame.

OUTPUT LOADING switch S903 in the main frame and EMERGENCY/TUNE/OPERATE switch S5407 in the 200K PA frame permit flexibility in transmitter operation. When S903 is set at TUNE, it connects the output of the 10-kw PA to a dummy load, permitting this stage to be tuned independently of the succeeding stages. When EMERGENCY/TUNE/OPERATE switch S5407 is set at TUNE, the output of the 40-kw PA is connected to a dummy load so that the 40-kw stage may be tuned independently of the 200-kw power amplifier.

When the EMERGENCY/TUNE/OPERATE switch is set at EMERGENCY, the output of the 40-kw PA is routed to an antenna link. When the link is strapped for emergency operation, the 40-kw signal is applied to the antenna circuits, completely bypassing the 200-kw power amplifier and permitting transmission at this reduced power level (i. e. 40 kw). When the OUTPUT LOADING and EMERGENCY/TUNE/OPERATE switches are both set at EMER and EMERGENCY respectively, the r-f output of the 10-kw PA is routed to two antenna links. When both links are strapped for emergency operation, the 10-kw signal is applied to the antenna circuit completely bypassing both the 40-kw PA and 200-kw power amplifier. (Another possible emergency mode permits the output of the 1-kw IPA to be applied to the antenna circuit, bypassing the 10-kw PA, 40-kw PA, and 200-kw power amplifier circuits.) When the OUTPUT LOADING and EMERGENCY/TUNE/OPERATE switches are set at OPER and OPERATE respectively, the r-f output of the 10-kw PA is connected directly to the input of the 40-kw PA and the 40-kw PA output is connected directly to the input of the 200-kw power amplifier for normal operation. R-f drive is controlled at the 200K PA frame by OUTPUT INCR control R5402 which feeds a control voltage to the exciter circuits in the auxiliary frame. This voltage controls the amplitude of the exciter output. R-f output samples of the exciter, 40-kw PA, and 200-kw PA are cabled to Auxiliary Power Panel APP in the auxiliary frame where any one signal may be selected for monitoring by means of a coaxial switch and an output connector.

A portion of the 10-kw r-f signal is rectified and applied to an ALDC (automatic load and drive control) circuit. When this circuit is switched on, a control voltage is applied to the exciter whenever any preset r-f signal level is exceeded. The ALDC circuit limits high drive peaks which can be developed during multiple signal transmission thus suppressing unwanted transmission products.

A voltage proportional to reflected power at the output of the 10-kw PA is applied to Standing Wave Control Unit SWCU in the auxiliary frame. When a preset level of reflected power is exceeded, an SWR overload relay in the SWCU automatically removes high voltage from the transmitter.

The 10-kw high-voltage rectifier and the main power supply produce high d-c voltages required by the 1-kw IPA and 10-kw PA.

The 10-kw relay panel contains protective circuits that automatically cut off high voltages of the main frame circuits when overloads or damaging conditions exist. The protective circuits sample the 1-kw IPA and 10-kw PA plate and screen currents, bias (for both

stages), and current in the 10-kw PA screen regulator. When any of these currents is excessive or if a voltage is out of tolerance, the associated protective relay operates and removes screen voltage from the 1-kw IPA and the 10-kw high-voltage rectifier (this action automatically removes high voltage from the 1-kw IPA and 10-kw PA). If the DRIVER INTERLOCK switch located on the PA frame relay panel is set at OFF, the protective circuits in the main frame will also remove power from the 40-kw high voltage rectifier.

High voltage for the 40-kw PA is supplied by the 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 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 circuit breaker CB8101 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 the bias supply drawer via the PA frame relay panel. The bias supply drawer contains an unregulated +350-volt supply and electronic circuits associated with the SWR and retune protective circuits. A d-c voltage proportional to the r-f plate voltage in the 40-kw PA is supplied to the retune dc amplifier in the bias supply drawer. A positive d-c voltage is supplied to the SWR d-c amplifier through contacts in the SWR meter relay whenever a preset level of reflected power is exceeded.

Protective relay circuits similar to those described for the 1-kw IPA and 10-kw PA stages are used to remove high voltage from the 40-kw PA when a malfunction occurs in an associated circuit. These circuits, contained in the PA frame relay panel, sample bias (+600 volts), SWR, and retune signals, 40-kw PA 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. If the 40 K INTERLOCK switch on the relay and indicator panel B (located in 200 K PA frame) is set at OFF, the protective circuits in the main frame, PA frame, and PS frame will remove power from the 100-kw high-voltage rectifiers.

Transformer T8104 is an autotransformer that receives 220-volt 3-phase power from the PA frame control panel and supplies 230 volts ac (single phase) to the primary windings of the filament transformers in the bias supply drawer, crowbar drawer, and the 40-kw PA. The transformer also supplies 3-phase 230 volts ac to the filament transformers in the 40-kw high-voltage rectifier. The 3-phase output of the PS frame control panel is used for operation of the blowers in the PA frame.

The final power amplifier of the transmitter consists of two tubes operating in parallel, and feeding a common output tuning circuit. Each tube is supplied from separate bias, plate, and control circuits and therefore may be operated independently of the other. The power out-

put is then proportionally lower. In normal operation, the combined outputs of the two power amplifier tubes are applied to a tuned double pi network and then coupled through antenna switching and matching circuits to the selected antenna.

High voltage for the two tubes in the 200-kw power amplifier is supplied by two 100-kw high-voltage rectifiers (A and B). Each rectifier is turned on by a HIGH VOLTAGE circuit breaker in the 200K PA frame control panel. The B+ and B- outputs of the 100-kw high-voltage rectifiers (A and B) are connected directly across circuits in the crowbar drawers (PSA and PSB, respectively). The crowbar drawers, protective devices for the power-amplifier tubes, detect sharp changes in the grid currents. If a sharp rise in grid current occurs (as a result of arcing), the associated crowbar drawer shorts the output of the corresponding 100-kw high-voltage rectifier in power supply A or B, causing HIGH VOLTAGE MAIN A circuit breaker CB6001 or HIGH VOLTAGE MAIN B circuit breaker CB6601, respectively, to trip. This action removes the power input to the associated high-voltage rectifier.

Bias voltages for the two power amplifier tubes are supplied by two +450 volt, regulated bias supplies, (A and B). Each bias supply is turned on by a circuit breaker in the associated control panel (PSA frame or PSB frame).

The SWR and retune circuits, located on a chassis which is part of antenna switching unit, contains the power supply and d-c amplifiers associated with the protective circuits. A portion of the self-contained power supply provides negative dc voltage to OUTPUT INCR control R5402. Two dc amplifiers are used to provide retune and SWR voltages to relay and indicator panel A when insufficient r-f plate voltage or excessive transmission line SWR, respectively, is detected.

Protective relay circuits are used to remove high voltage from the 200-kw power amplifier when a malfunction occurs in the PA circuit. The protective circuits, contained in relay and indicator panels (A and B) sample the bias voltage, SWR and retune signals, power amplifier tube filament and crowbar filament voltages, and plate and grid currents of each power amplifier tube. If one of these currents is excessive or if a voltage is deficient, the associated relay operates and removes power from the corresponding 100-kw high-voltage rectifier.

Switching of the unbalanced antenna to a 100-kw load is provided by circuits in the antenna switching unit and coaxial switches S1 and S2. (The switches and dummy load are optional equipment specifically designed for the transmitter.)

The transmitter also contains interlock circuits that are provided for personnel and equipment safety. Whenever one of these interlocks opens, high voltage 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.

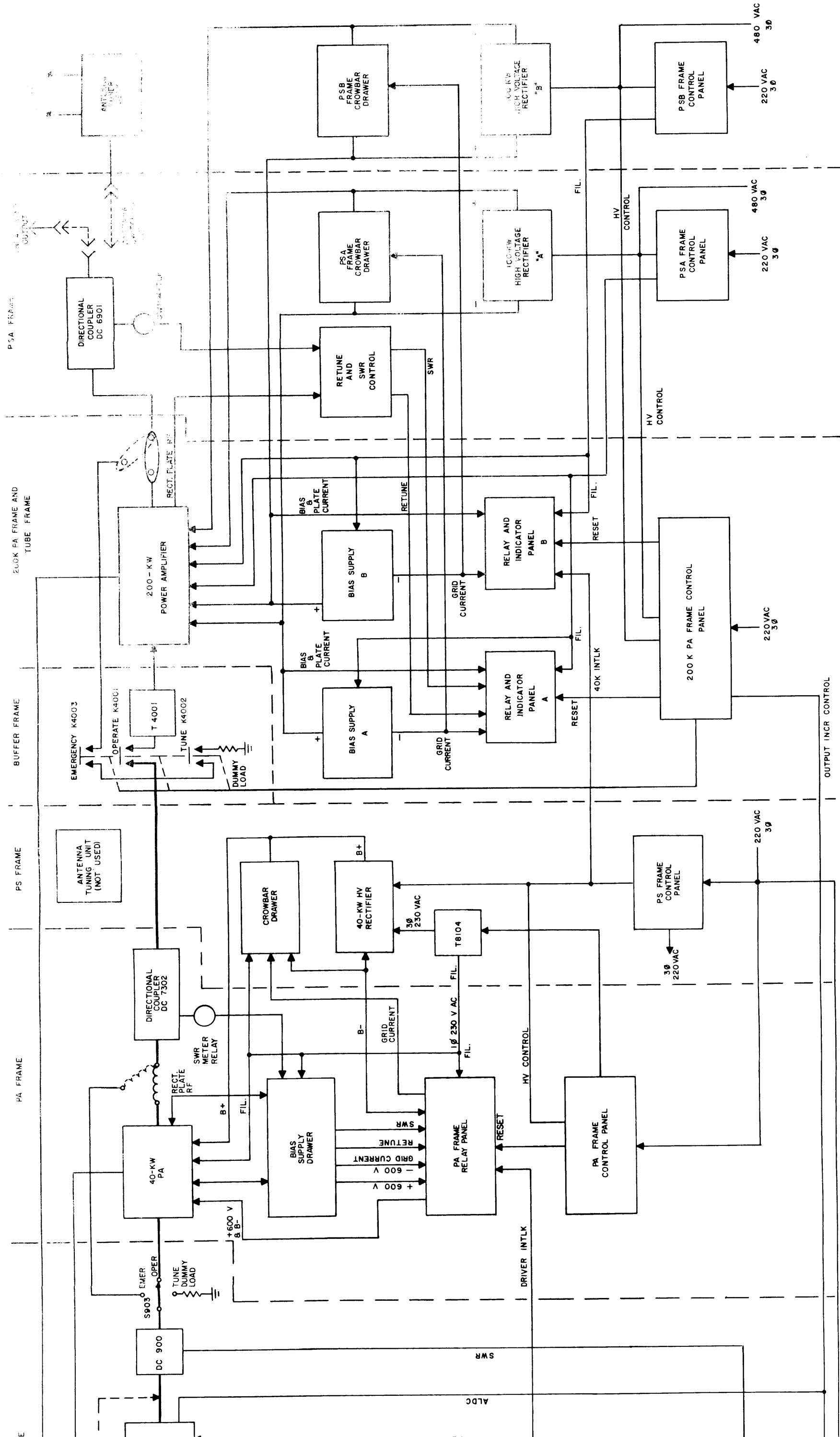
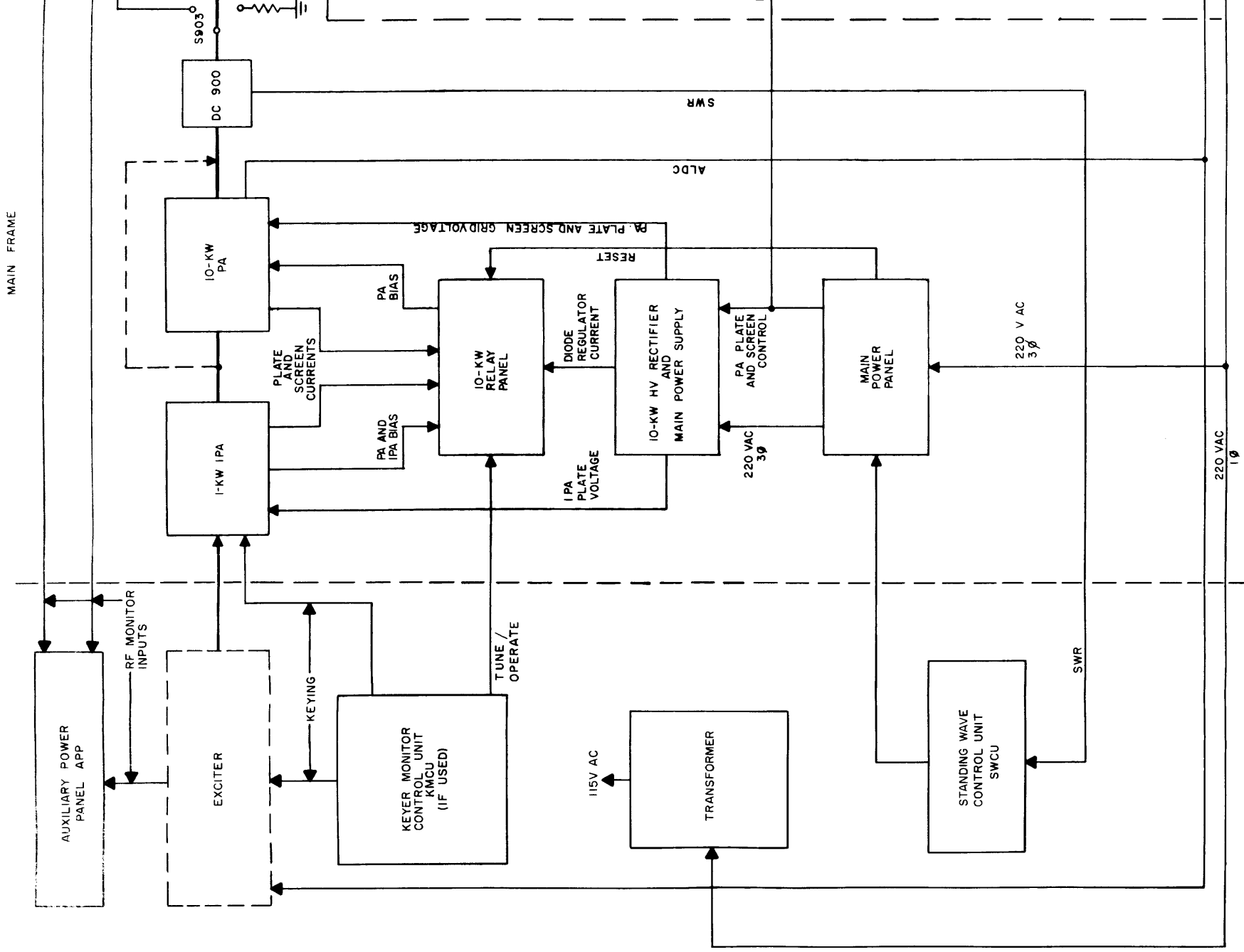


Figure 2-1. GPT-200K Transmitter, Block Diagram



2-3. 40-KW TRANSMITTER SECTION. (See figure 6-1.)

The first four frames of the GPT-200K transmitter constitute the GPT-40K transmitter. The mating circuits and other minor differences in the first four frames are described in paragraph a, b, c and d below.

a. **OUTPUT CIRCUIT OF 40-KW PA.** - The output circuit of the 40-kw PA is unchanged except for a coaxial link connection which has been added from the unbalanced output on top of the PA frame to the input circuits of the 200-kw power amplifier.

b. **INTERLOCK CIRCUIT.** - The fused connections at the primary of transformer T8103, at E8119-1 and -2 in the PS frame, not used in the GPT-40K transmitter, are routed to the coil of 40K INTERLOCKS relay K5706 located in relay and indicator panel B of the 200K PA frame. The interlock relay insures that high voltage is removed from the 200-kw power amplifier when an overload occurs in the 40-kw PA stage.

The jumper connected between E8119-5 and -6 in the PS frame (a series element in the GPT-40K interlock circuits) is removed and the interlock is completed through the 200-kw circuits. This feature prevents premature or improper power application to the 40-kw circuits. The interlock circuits are described in detail in paragraph 2-12.

c. **R-F MONITOR.** - R-f monitor networks in the plate circuits of the 200-kw power amplifier and the 40-kw PA provide samples of 200-kw r-f and 40-kw r-f in exactly the same manner as in the GPT-40K transmitter. In the GPT-200K, the 40-kw sample is cabled to the IPA position of the MONITOR switch. The PA position of MONITOR switch (64) receives a sample from the 200-kw power amplifier.

d. **R-F DRIVE CONTROL.** - A negative voltage d-c signal is routed from jack J4004 in the buffer frame to jack J1008 in the auxiliary frame (ALDC line). This negative d-c signal, connected in parallel with the ALDC input to Frequency Amplifier CHG, controls the output level of the exciter. The negative d-c level is set by the OUTPUT INCR control on the 200K PA frame control panel. The ALDC circuit operation is unaffected, except that the OUTPUT INCR control should be set at its operating point before the ALDC attack point is selected by adjustment of the ALDC control.

2-4. 200-KW POWER AMPLIFIER AND ANTENNA CIRCUITS.

a. **GENERAL.** - Power amplifier V5001/V5002 uses type ML8217 triodes, operating in parallel as class AB2 grounded-grid amplifiers, to amplify the r-f output of the 40-kw PA. Nominal output is approximately 200,000 watts PEP. Provisions are included to match the output to either a 600-ohm balanced load or a 50-ohm unbalanced load.

b. **DETAILED CIRCUIT ANALYSIS.** (See figure 2-2.)

(1) **POWER AMPLIFIER.** - The r-f signal from the 40-kw PA is applied through coaxial contacts of OPER-

ATE relay K4001 to the primary of step-down transformer T4001. The secondary of T4001 is tuned by INPUT SWR capacitor C4023. The signal from the secondary of T4001 is coupled by capacitors C5014 and C5015 to the cathodes of power amplifier tubes V5001 and V5002. Bifilar chokes T5001 and T5002 make up the load impedance for T4001. A portion of the signal at the secondary of T4001 is applied through a capacitive voltage divider network (C4001 and C4002) to r-f detector network Z4001. The d-c output of Z4001 is connected to DRIVE meter M5206.

Power for the filaments of V5001 and V5002 is supplied from secondary windings of transformers T5101 and T5102, respectively. Primary input voltage (phase 2 to phase 3) is supplied to the transformers from PA FIL (A) circuit breaker CB6501 and PA FIL (B) circuit breaker CB6501 through r-f decoupling networks and PRIMARY ADJ switches S5413 and S5414. (See figure 2-12.)

The cathodes of tubes V5001 and V5002 are biased approximately +450 volts dc with respect to their grids. Bias voltage for V5001 is supplied from bias supply A; the negative return for bias supply A is completed through GRID CURRENT meter M6101, trigger transformer T6302 in the PSA frame crowbar drawer; and GRID OVLD relay K5604. Bias voltage for V5002 is supplied from bias supply B, the negative return of which is completed through GRID CURRENT meter M6701, trigger transformer T6302 (in PSB frame crowbar drawer), and GRID OVLD relay K5704. Meters M6101 and M6701 monitor the grid current in each tube. The GRID OVLD relays are protective relays that sample the grid current in each tube for excessive amplitude; if grid current exceeds a predetermined level (1 amp.), the relay is energized and opens the high voltage interlock circuit associated with the tube. (Refer to paragraph 2-12.) GRID OVLD ADJ controls R5307 and R5705 set the grid-current trip points of the associated relays.

PLATE CURRENT A and PLATE CURRENT B meters M5201 and M5202, in the d-c cathode returns of the power-amplifier tubes, measure the plate current drawn by each tube. PLATE OVLD relay K5603 and TUBE PROTECT relay K5607 in the d-c return path of V5001, and PLATE OVLD relay K5703 and TUBE PROTECT relay K5707 in the dc return path of tube V5002 are protective relays. The PLATE OVLD relays sample the cathode circuits for excessive current; if there is excessive current, the associated relay is energized and opens the high-voltage interlock circuit (refer to paragraph 2-12). PLATE OVLD adjustments R5601 and R5701 set the sensitivities of the associated PLATE OVLD relays. TUBE PROTECT relays K5607 and K5707 are used in conjunction with the retune circuits. When energized by a preset value of plate current (3 amperes), the TUBE PROTECT relays permit the associated RETUNE relay (a protective relay) to function (refer to paragraph 2-10). TUBE PROTECT ADJ controls R5603 and R5703 set the sensitivity of the corresponding relays. Shunting resistors R5413 and R5713 bypass excessive currents from the relay coils after the relays are energized.

The plate circuit of power-amplifier V5001/V5002 forms a double-pi network. The first pi network con-

sists of TUNE capacitors C5323 through C5326, inductor L5314, LOAD capacitors C5327, C5328, and C5329 and BAND SWITCH S5311. The second pi network consists of the LOAD capacitors that are common to both networks, inductors L5315 and L5316, OUTPUT LOAD capacitors C5330, C5331 and C5332 and OUTPUT BANDSWITCH S5312. Switches S5311 and S5312 successively short out larger portions of inductors L5314 and L5316, respectively, as the signal frequency is increased. For protection against switch arcing, the band switches cannot be operated unless associated BAND SWITCH RELEASE switch S5415 or OUTPUT BANDSWITCH RELEASE switch S5404 are momentarily depressed. When either switch is depressed, associated solenoid L5311 or L5317 is energized, releasing a locking pawl on the associated band switch assembly. This action allows the band switch to be turned. Simultaneously, a microswitch (S5307 or S5310), actuated by the solenoid, opens the high-voltage interlock circuit. This prevents switch arcing by removing high voltage from the tubes. After the band switches have been set in detent and the solenoid de-energized, the high-voltage interlock is again closed.

The double-pi network provides high rejection of harmonic components of the r-f output signal and also provides proper matching of plate impedance to antenna load impedance.

NOTE

For balanced output operation, additional impedance matching is accomplished in the antenna tuner deck.

The TUNE capacitors and inductor L5314 provide fine tuning for the power amplifier. Inductor L5316 and OUTPUT LOAD capacitors provide additional tuning for the output load circuit (antenna). Impedance matching of the plate and output circuits is provided primarily by LOAD capacitors. When all components are properly set, the amplifier produces maximum power output at a particular frequency.

Plate voltage of approximately 20 KV for tubes V5001 and V5002 is supplied by the 100-kw high-voltage rectifiers of power supply A and B, respectively. The output voltage of each power supply is applied to the power-amplifier tubes through associated r-f decoupling networks.

R-f voltage developed across inductor L5314 is applied to a meter circuit (r-f detector network Z5202 and PLATE RF meter M5204) through divider capacitors C5304A and C5304B. The PLATE RF meter measures the level of r-f voltage at the plates of power-amplifier tubes V5001 and V5002. Terminal 8 on the detector network is used to supply d-c input to the retune d-c amplifier (refer to paragraph 2-10).

PLATE RF MONITOR pick-up coil L5301 provides the means of monitoring the r-f signal developed in the output circuit of the power amplifier. The signal is applied through coaxial connector J4005 to the PA position of the MONITOR switch on the auxiliary frame of the transmitter.

R-f voltage developed across the LOAD capacitors (C5327, C5328, and C5329) is applied to a meter circuit through divider capacitors C5308A, C5308B, and C5309 through C5312. The meter circuit consists of RF detector network Z5201 and LOADRF meter M5202. The LOAD RF meter measures the r-f voltage at the junction of the two sections of the double-pi network. The ratio of this voltage to the plate r-f voltage indicates the degree of matching from plate to load. The proper ratio for a particular frequency is specified in tuning charts that accompany the transmitter.

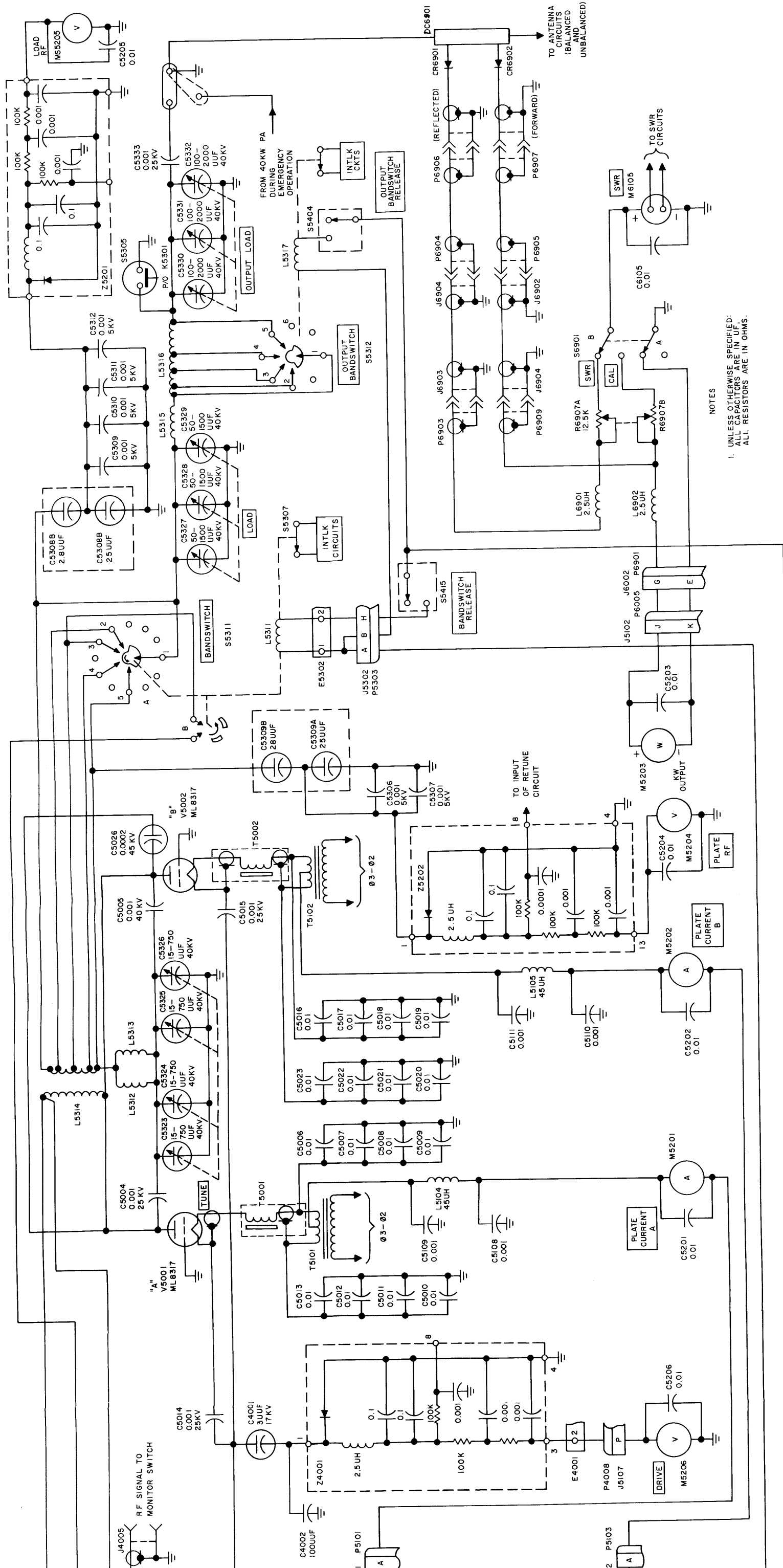
The r-f output of the 200-kw power amplifier is applied through a link to directional coupler DC6901. The output of the coupler may be routed to either the antenna tuner deck or the unbalanced output connector by appropriate coaxial link connections.

Diodes CR6902 and CR6901, connected to directional coupler DC6901, rectify the forward and reflected r-f signals of the antenna transmission line. Resulting positive d-c signals are used for indicating transmitter power output and voltage standing wave ratio.

When SWR-CAL switch S6901 is at its SWR position, the rectified forward power voltage is applied to OUTPUT meter M5203 which measures the output power to the antenna. The rectified reflected power voltage is applied to SWR meter M6105 which measures the SWR of the antenna transmission line (refer to paragraph 2-10). The SWR meter is calibrated by momentarily depressing SWR-CAL switch S6901, which is spring-loaded (normally maintained in the SWR position), and adjusting CAL control R6907 until the pointer on the SWR meter aligns with the CAL mark on the meter. Closure of contacts in the SWR meter relay M6105 couple a positive d-c voltage to the input of the SWR d-c amplifier. The closing point of the contacts in the meter relay may be adjusted with a knob on the front of the meter. The output of the SWR d-c amplifier energizes SWR relay K5606.

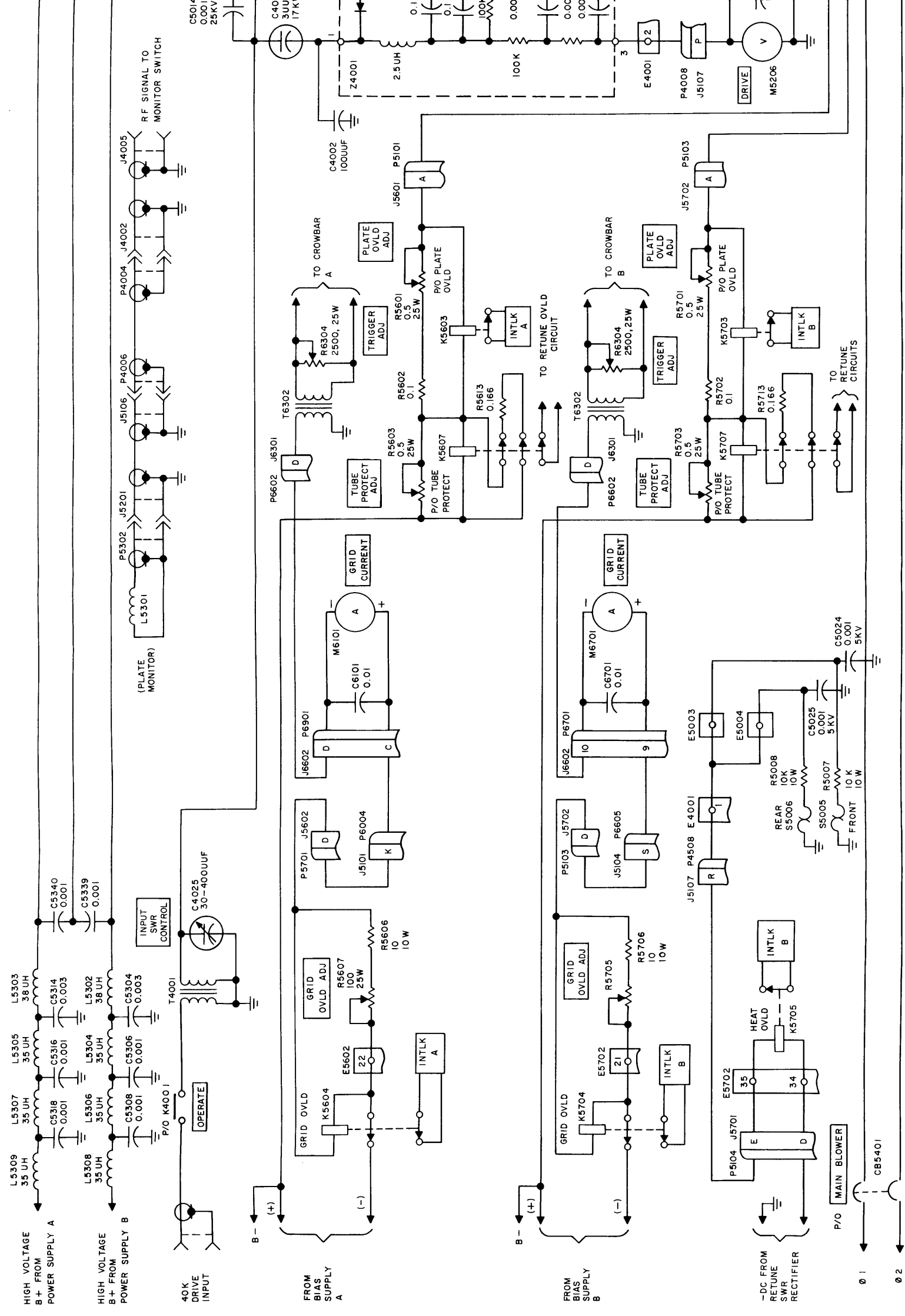
(2) ANTENNA CIRCUITS (see figure 2-3). - When a balanced antenna is used with the GPT-200K, the output of directional coupler DC6901 is connected to a horizontal coaxial link interposed between coaxial lines running through the PSA frame. The link connections terminate at the input of transformer T6801 which is in the antenna tuner deck of the PSB frame. The transformer matches the output impedance of the power amplifier (50 ohms) to the 600-ohm impedance of the balanced antenna. The balanced output from the transformer secondaries is routed through terminals E6801 and E6802 located on top of the PSB frame.

The output to the antenna may be adjusted for finer balance by adjustment of BALANCE capacitors C6802 and C6803. A meter circuit consisting of network Z6801, resistors R6801 through R6806, and BAL OUT meter M6705 indicates the degree of balance of transmission line voltages. The two r-f voltages are detected by reverse-connected diodes, and the resulting dc voltages of opposite polarity are added algebraically. When the two r-f voltages are exactly balanced, the d-c voltages become equal, producing a null indication on the BAL OUT meter.



NOTES
 1. UNLESS OTHERWISE SPECIFIED:
 ALL CAPACITORS ARE IN UF.
 ALL RESISTORS ARE IN OHMS.

Figure 2-2. Power Amplifier V5001/V5002, Simplified Schematic



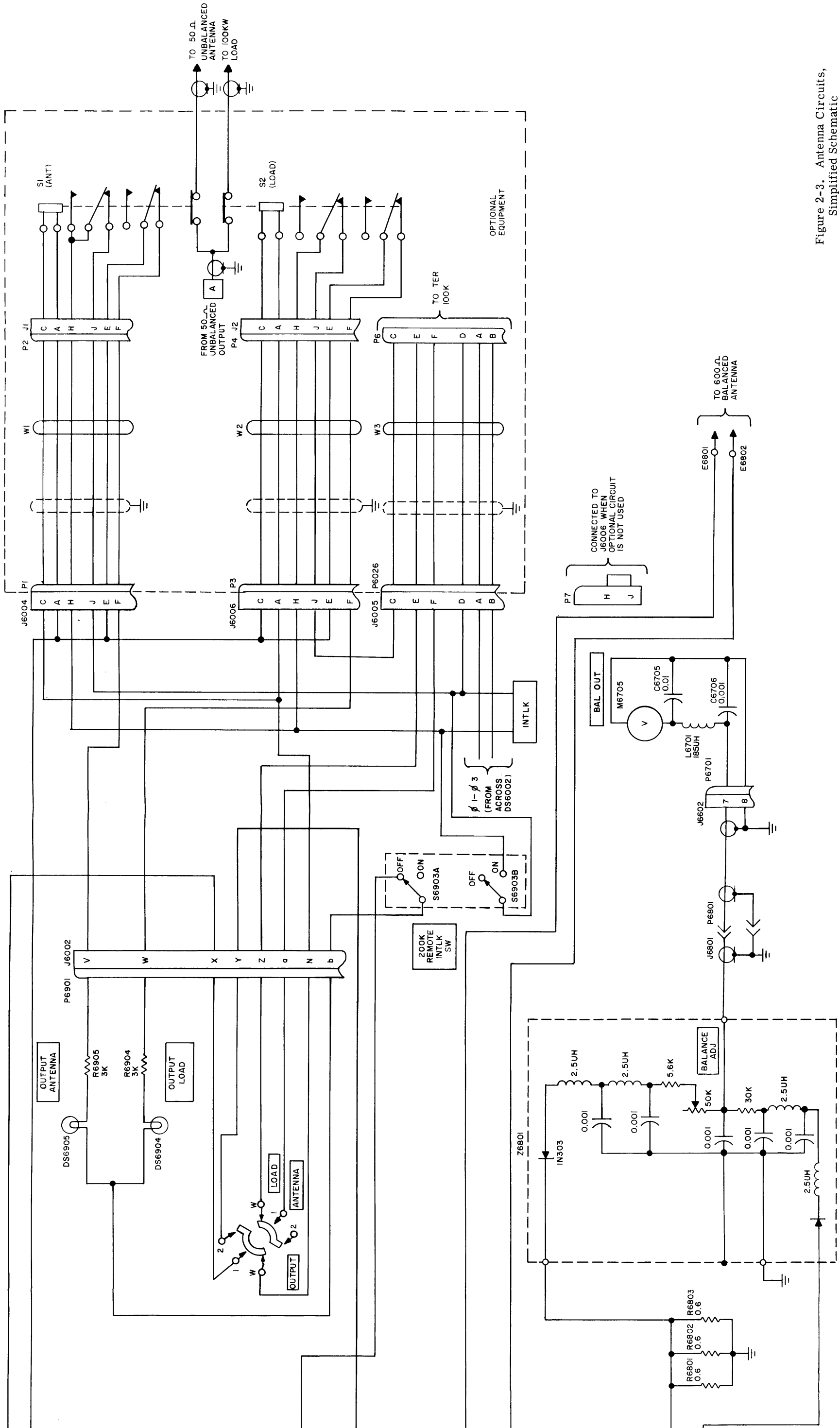
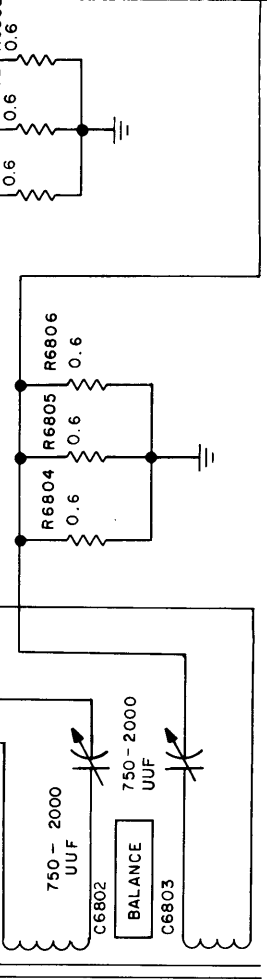
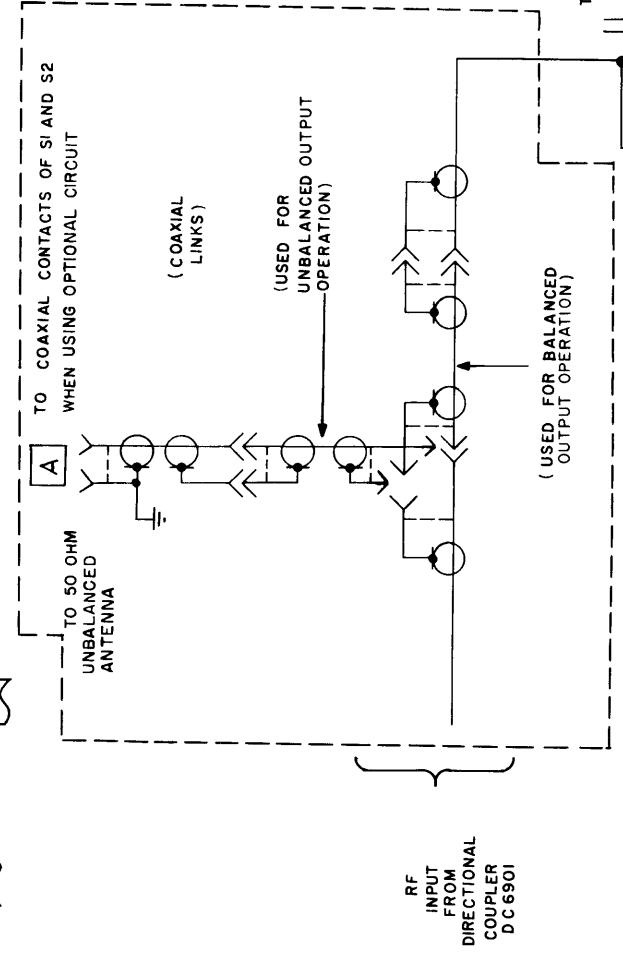
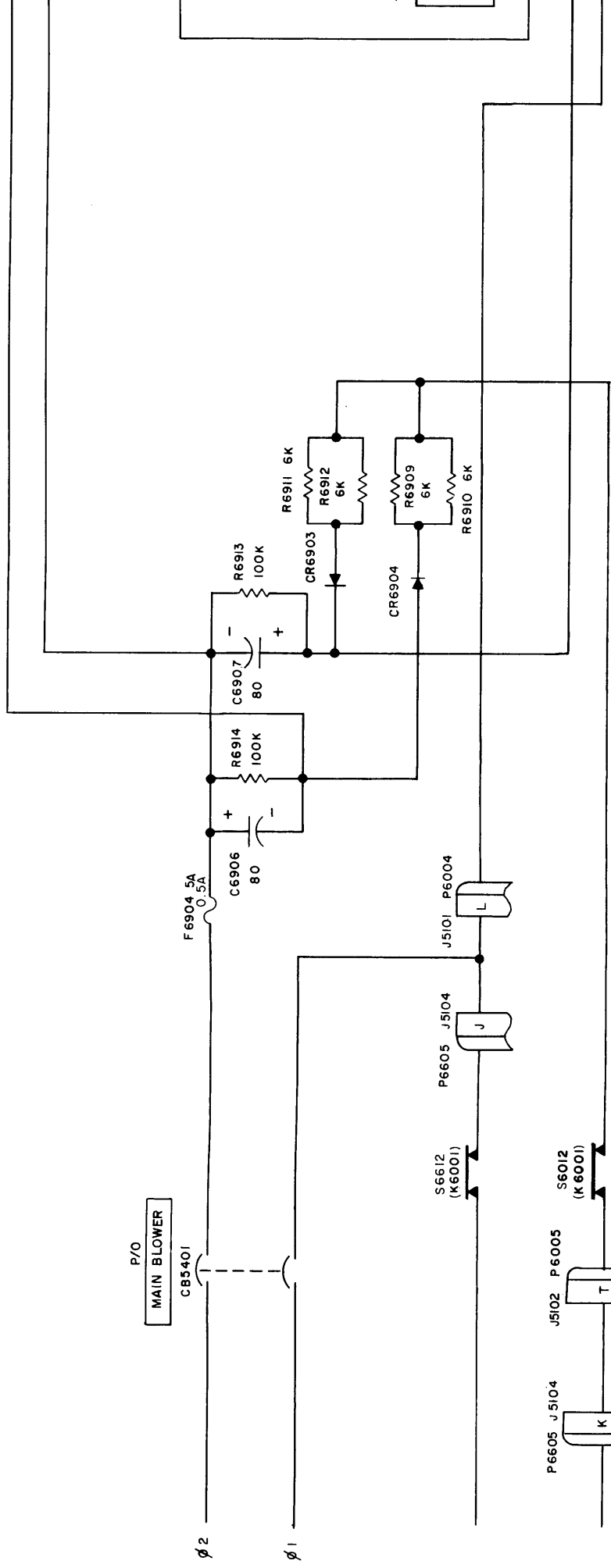


Figure 2-3. Antenna Circuits, Simplified Schematic



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When an unbalanced 50-ohm antenna is used with the GPT-200K, the output of directional coupler DC6901 is connected by means of a vertical coaxial link interposed between a coaxial line from the coupler and an antenna connector located on the top of the PSA frame. An optional control circuit may be used in conjunction with the transmitter for enabling switching between an unbalanced antenna and a 100-kw dummy load. This is shown in the dashed box and consists of two coaxial switches and wiring to connectors J6004, J6005 and J6006. Switching of the loads is controlled by OUTPUT switch S6902. In the ANTENNA position of S6902, the dc voltage developed by half wave rectifier elements CR6903, C6907, and R6913 is applied to the solenoids of coaxial switches S1 and S2 so that the polarity across J1-C and J1-A is + to - and across J2-C and J2-A is - to +. Switch S1 now closes and S2 opens. This causes the output of directional coupler DC6901 to be routed through the coaxial contacts of S1 to the antenna. OUTPUT ANTENNA indicator lamp DS6905 lights through closed contacts of S1 and remote interlock switch S6903A. The interlock circuit is closed by a set of contacts on S1. When OUTPUT switch S6902 is set at LOAD, the dc voltage developed by half wave rectifier elements CR6904, C6906 and R6914 is applied to the solenoids of S1 and S2 in opposite polarity. Switch S1 now opens, and switch S2 closes. This causes the output of the directional coupler to be routed through the coaxial contacts of S2 to the TER-100K dummy load. OUTPUT LOAD indicator lamp DS6904 lights through a closed contact of switch S2 to indicate this load connection.

If the optional circuit is not used, connector P7 must be connected to J6006 and switch S6903 set at ON position. The jumper on connector P7 completes the GPT-200K interlock circuit through an interlock in the TER-100K assembly.

2-5. EMERGENCY OPERATION. (See figure 2-4.)

Although the nominal output of the GPT-200K transmitter is 200-kw PEP, it can be readily adapted for emergency 40-kw, 10-kw, or 1-kw operation. Figure 2-4 compares the r-f signal path of 1-kw, 10-kw, 40-kw, and 200-kw operation, both for balanced and unbalanced operation.

The particular mode of operation is determined by the setting of OUTPUT LOADING switch S903 in the main frame, EMERGENCY/TUNE/OPERATE switch S5407 in the 200K PA frame, and the connections of links 1 and 2. The circuit configuration shown in figure 2-4 is for normal 200-kw operation of the transmitter. Switches S903 is set at OPER, S5407 is set at OPERATE, and links 1 and 2 are both set at positions A. The r-f signal path is routed through the 10-kw PA, the 40-kw PA and the 200-kw PA.

For 40-kw emergency operation, EMERGENCY/TUNE/OPERATE switch S5407 is set at EMERGENCY, and link 1 is set at position B. This action routes the output of the 40-kw PA directly to the antenna circuits through directional coupler DC6901, completely bypassing the 200-kw power amplifier.

For 10-kw emergency operation, EMERGENCY/TUNE/OPERATE switch S5407 is set at EMERGENCY,

OUTPUT LOADING switch S903 is set at EMER, and link 1 and link 2 are set at positions B. This action routes the output of the 10-kw PA directly to the antenna circuits to directional coupler DC6901, completely bypassing the 40-kw PA and 200-kw power amplifier.

When desired, the 10-kw PA, 40-kw PA and the 200-kw power amplifier can be completely bypassed for 1-kw emergency operation. For this mode of operation, the connection between the EMER contacts of OUTPUT LOADING switch S903 and emergency output jack J905 is opened and the output of the 1-kw IPA is connected to J905 via P1009, CP901 (a feed-thru connector), P902, and W901. EMERGENCY/TUNE/OPERATE switch S5407 is set at EMERGENCY, and links 1 and 2 are set at positions B. This action routes the output of the 1-kw IPA directly to the antenna circuits through directional coupler DC6901, completely bypassing the 10-kw PA, 40-kw PA and 200-kw power amplifier.

2-6. 40-KW RF INPUT CONTROL CIRCUITS.

a. GENERAL. - The coaxial relays in the buffer frame and EMERGENCY/TUNE/OPERATE switch on the 200K PA frame control panel route the output of the 40-kw PA either directly into the input circuit of the 200-kw power amplifier, to a dummy load for tuning purposes, or to the antenna circuits. The r-f switching circuits are also included in the 40-kw PA and 200-kw power amplifier interlock circuits.

b. CIRCUIT ANALYSIS. (See figure 2-5.) - When EMERGENCY/TUNE/OPERATE switch S5407 is turned to its OPERATE position, a negative voltage from the Retune and SWR chassis is applied through contacts of microswitches S6014 and S6614 to OPERATE relay K4001. The coaxial contacts of OPERATE relay K4001 complete the rf input circuit to the 200-kw power amplifier. The OPEN coils of TUNE relay K4002 and EMERGENCY relay K4003 are simultaneously energized by the same negative voltage, thus opening the coaxial contacts of these relays. The contact arrangement and wiper configuration of the three wafer sections of EMERGENCY/TUNE/OPERATE switch S5407 produce a voltage pulse when the switch is rotated. Another set of contacts of energized relay K4001 closes the 200-kw high voltage interlock circuits (refer to paragraph 2-11) to permit the high voltage control circuits to function. A third set of contacts of relay K4001 applies phase 1 and 2 voltage across OPERATE lamp DS5303.

Microswitches S6014 and S6614 (part of contactors K6002 and K6602), respectively, are shown in their normally de-energized position. When contactors K6002 and K6602 are energized (to apply high voltage to the 200-kw power amplifier) microswitches S6014 and S6614 open. This breaks the dc voltage path to EMERGENCY/TUNE/OPERATE switch S5407, preventing the switch from further energizing the relays. Simultaneously, microswitches S6015 and S6615 close, completing the interlock circuit in the 40-kw PA

through switches S4001, S4002 and S4003. This permits the 40-kw PA to function normally and apply its output to connector J4001.

In order that the 40-kw rf input control circuits may operate, high-voltage contactors K6602 and K6002 must be de-energized (removing high voltage from the 200-kw), thereby closing microswitches S6014 and S6614. EMERGENCY/TUNE/OPERATE switch S5407 may then be used to switch to another mode of operation.

When EMERGENCY/TUNE/OPERATE switch S5407 is turned to its TUNE position, a dc voltage pulse is applied to the close coil of TUNE relay K4002 and, simultaneously, to the open coils of OPERATE relay K4001 and EMERGENCY relay K4003. This disconnects the 40-kw r-f from the 200-kw power amplifier and connects a dummy load consisting of resistors R4001 through R4003 to the 40-kw PA output.

Another set of contacts of TUNE relay K4002 closes the interlock circuit to the 40-kw PA while a third set of contacts applies phase 1 and 2 voltage to TUNE indicator lamp DS5302. The 40-kw PA circuits can now be tuned while its r-f output is dissipated by the dummy load resistors.

When the EMERGENCY/TUNE/OPERATE switch S5407 is turned to its EMERGENCY position, a dc voltage pulse is applied to the close coil EMERGENCY relay K4003 and, simultaneously, to the open coils of OPERATE relay K4001 and TUNE relay K4002. This causes the dummy load to be disconnected from the rf input circuit and completes the rf input circuit through the coaxial contacts of EMERGENCY relay K4003 to a link. When the link is properly strapped, the output of the 40-kw PA bypasses the 200-kw power amplifier and is applied to the antenna circuit of the transmitter.

Another set of contacts of EMERGENCY relay K4003, closes the interlock circuit to the 40-kw PA while a third set of contacts applies phase 1 and 2 voltage to EMERGENCY indicator lamp DS5301.

2-7. BIAS SUPPLY CIRCUITS.

a. GENERAL. - Separate bias supply circuits are used to supply bias voltages for the 200-kw power amplifier tubes V5001 and V5002. Each of these circuits, designated bias supply A and bias supply B, provide a nominal +450 volts dc, regulated voltage to the cathodes of tubes V5001 and V5002, respectively. Each bias supply includes a voltage-regulated circuit, a control relay, and a protective relay. Since the two bias supply circuits are identical, only the theory for bias supply A circuits is presented in the following paragraphs.

b. CIRCUIT ANALYSIS. (See figure 2-6.) - When AC switch S5501 is turned on, phase 2 and 3 voltage is applied to the primary of filament transformer T5502, which provides filament voltage for tubes V5501 through V5503. Simultaneously, phase 2 and 3 voltage is applied to TIME DELAY meter M5602, energizing the meter. After an elapsed period of time

as set by the time delay meter (usually 5 minutes), the contacts of TIME DELAY meter M5602 close, causing phase 1 and 2 voltage to be applied to relay K5501 through the high voltage interlock circuit. (Refer to paragraph 2-11.) AC voltage is now applied across the primary of transformer T5502 through the closed contacts of energized relay K5501. Capacitor C5510 and resistors R5517 and R5518 suppress arcing at the contacts of the relay.

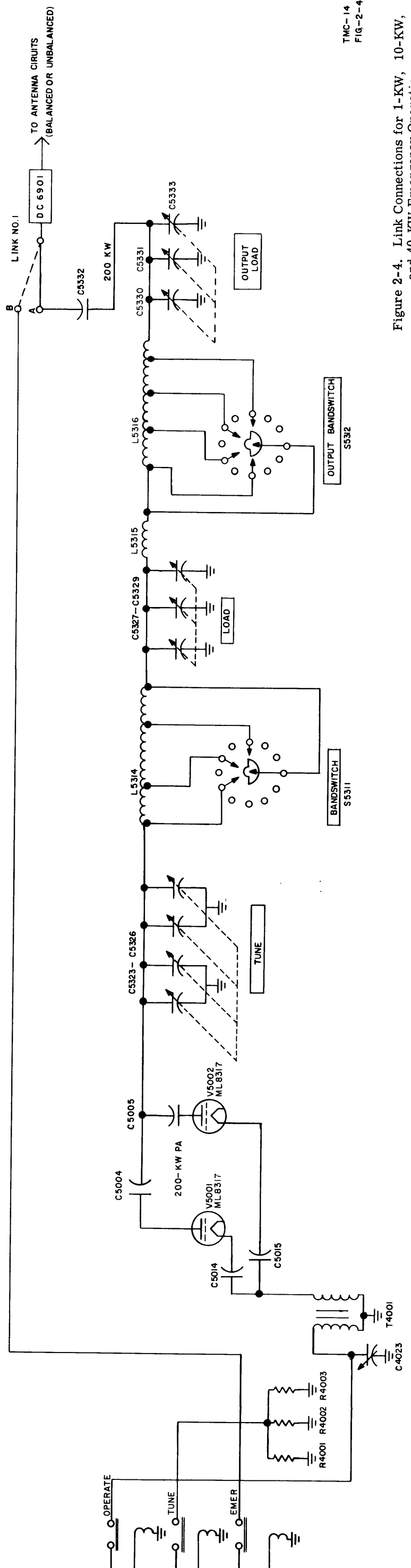
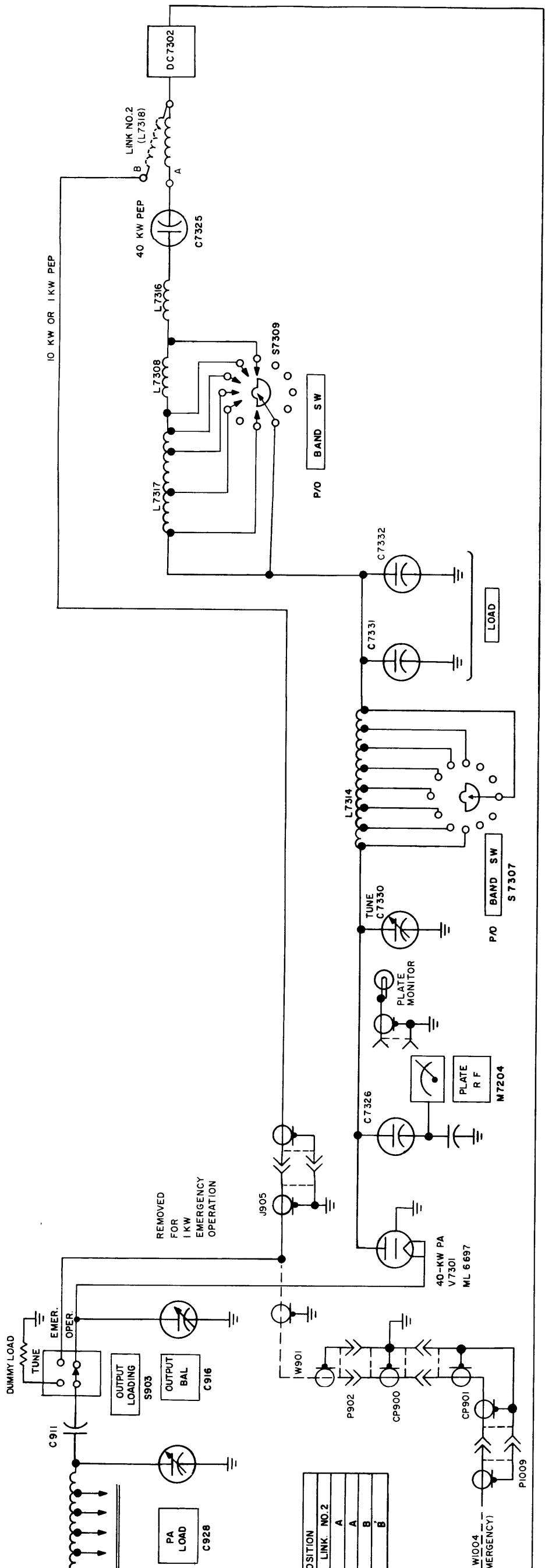
Full-wave rectification of the ac voltage from the secondary of transformer T5501 is provided by rectifier CR5501. The rectified voltage, filtered by inductor L5504 and capacitor C5509 is applied to the plates of triodes V5502 and V5503. Parallel connected tubes V5502 and V5503 function as a series regulator which obtains its control voltage from voltage regulator V5501. The combined action of these tubes provides a regulated +450-volt nominal output in the common cathode circuit of V5502 and V5503, across resistors R5101 through R5105. The voltage is fed to the cathode of power-amplifier tube V5001 through connectors J5502 and P5107.

BIAS ON indicator DS5502 lights to indicate that the bias supply drawer is functioning normally. Instantaneous load surges in the +450-volt line are bypassed by capacitors C5507 and C5508.

Output voltage variations in the regulated +450 volt dc line are developed across a voltage divider consisting of resistors R5511, R5512 and BIAS ADJ control R5501. A portion of the voltage variations is tapped from BIAS ADJ control R5501 and applied to the control grid of voltage regulator V5501. The amplified variations are developed across plate resistor R5503 and fed to the control grids of voltage regulators V5502 and V5503. The change in the grid voltages on tubes V5502 and V5503 varies their plate impedance and acts to maintain a constant +450-volt output level. For example, if the output voltage at connector J5502 (P5107) tends to rise, the increase in voltage developed across the voltage divider (R5510, R5512 and BIAS ADJ R5511) appears at the control grid of V5501 as a positive-going signal. This produces a negative-going signal at the plate of V5501. This signal is applied to the grids of regulator tubes V5502 and V5503, causing a decrease in conduction in the tubes. The increased series regulator plate impedance restores the voltage level at the connector output. When the output voltage decreases, the reverse action takes place.

BIAS relay K5609 is a protective relay which prevents application of high voltage to tube V5001 if the output voltage of the bias supply is below normal. Under normal conditions the output voltage is sufficient to energize BIAS relay K5609. The contacts of the relay close the high-voltage A interlock circuits allowing the high-voltage control circuits to function normally (refer to paragraph 2-8). If the bias voltage decreases below a preset value, the relay is de-energized, opening the high-voltage interlock circuits. BIAS RELAY ADJ potentiometer R5608 controls the voltage level at which relay K5609 is energized.

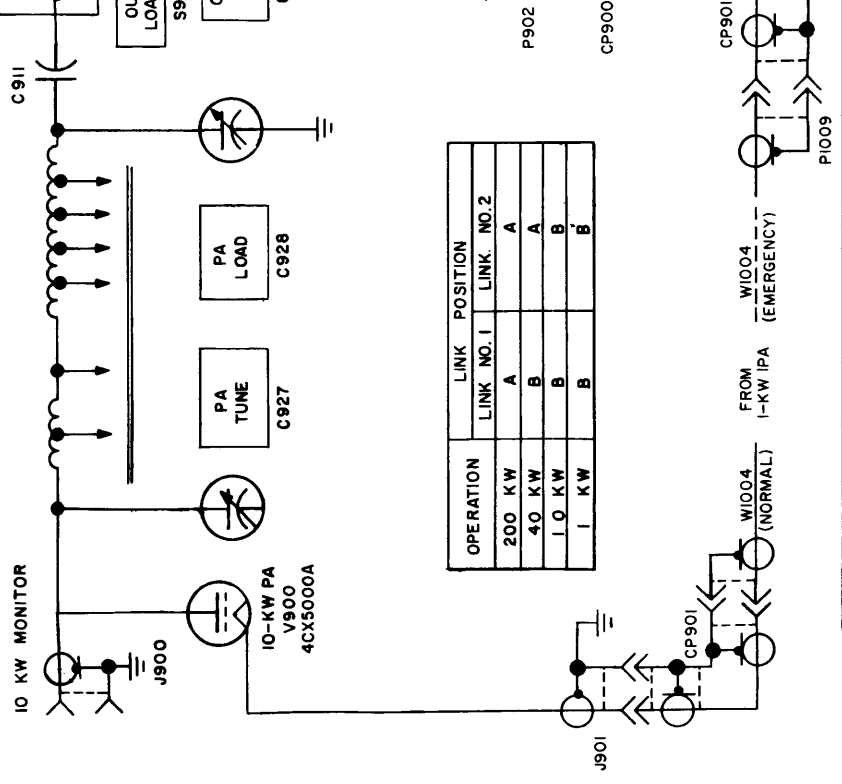
Cathode, screen grid and suppressor voltages for voltage-control tube V5501 are supplied by voltage



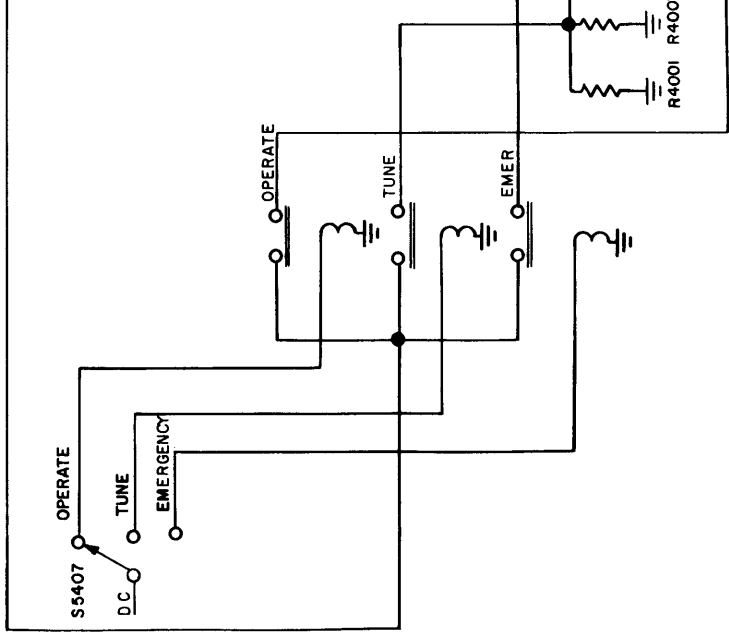
TMC-14
FIG-2-4

Figure 2-4. Link Connections for 1-KW, 10-KW, and 40-KW Emergency Operation

2-13/2-14



OPERATION	LINK POSITION	
	LINK NO. 1	LINK NO. 2
200 KW	A	A
40 KW	B	A
10 KW	B	B
1 KW	B	B



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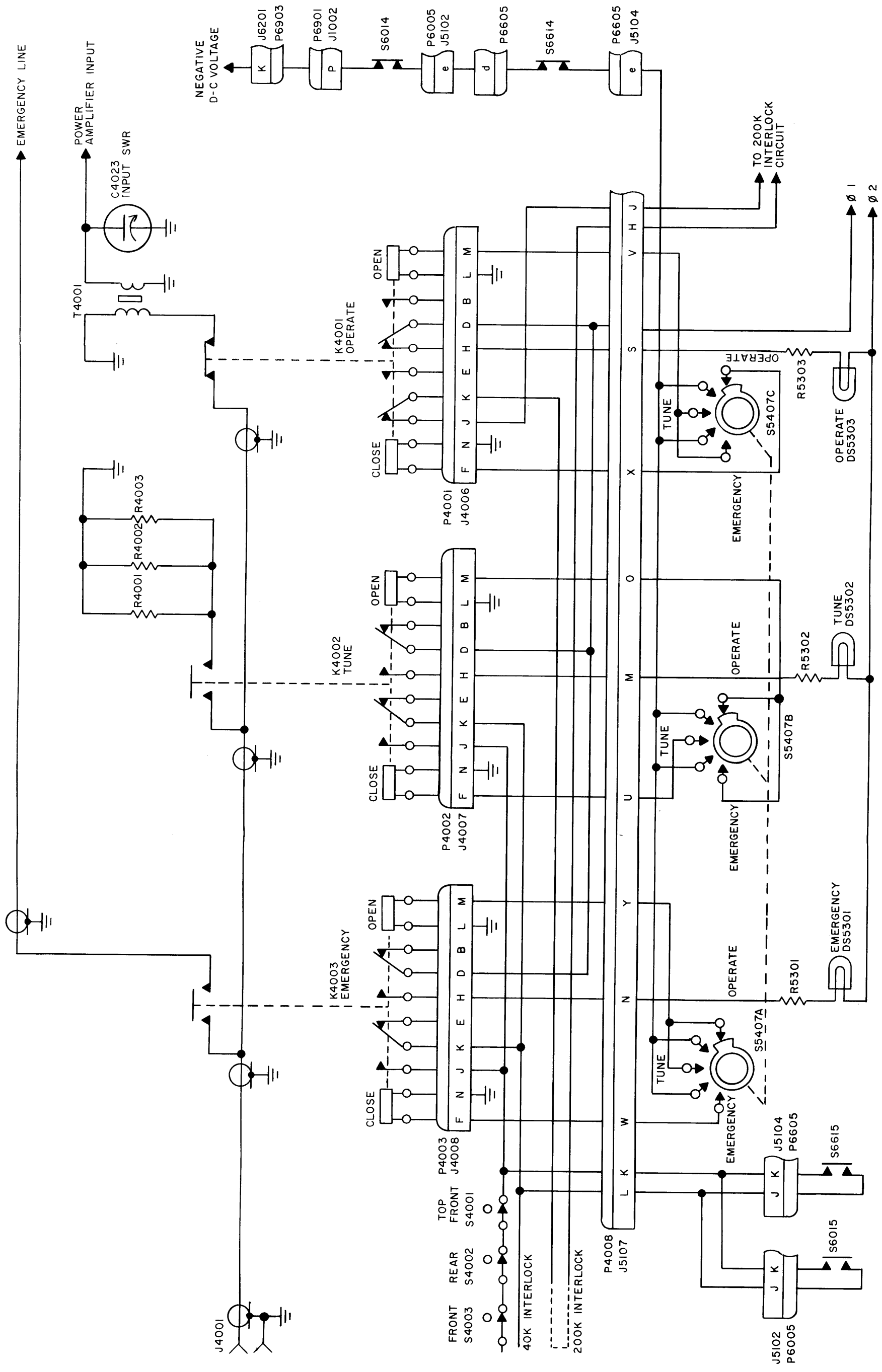


Figure 2-5. 40-KW RF Input Control Circuits, Simplified Schematic

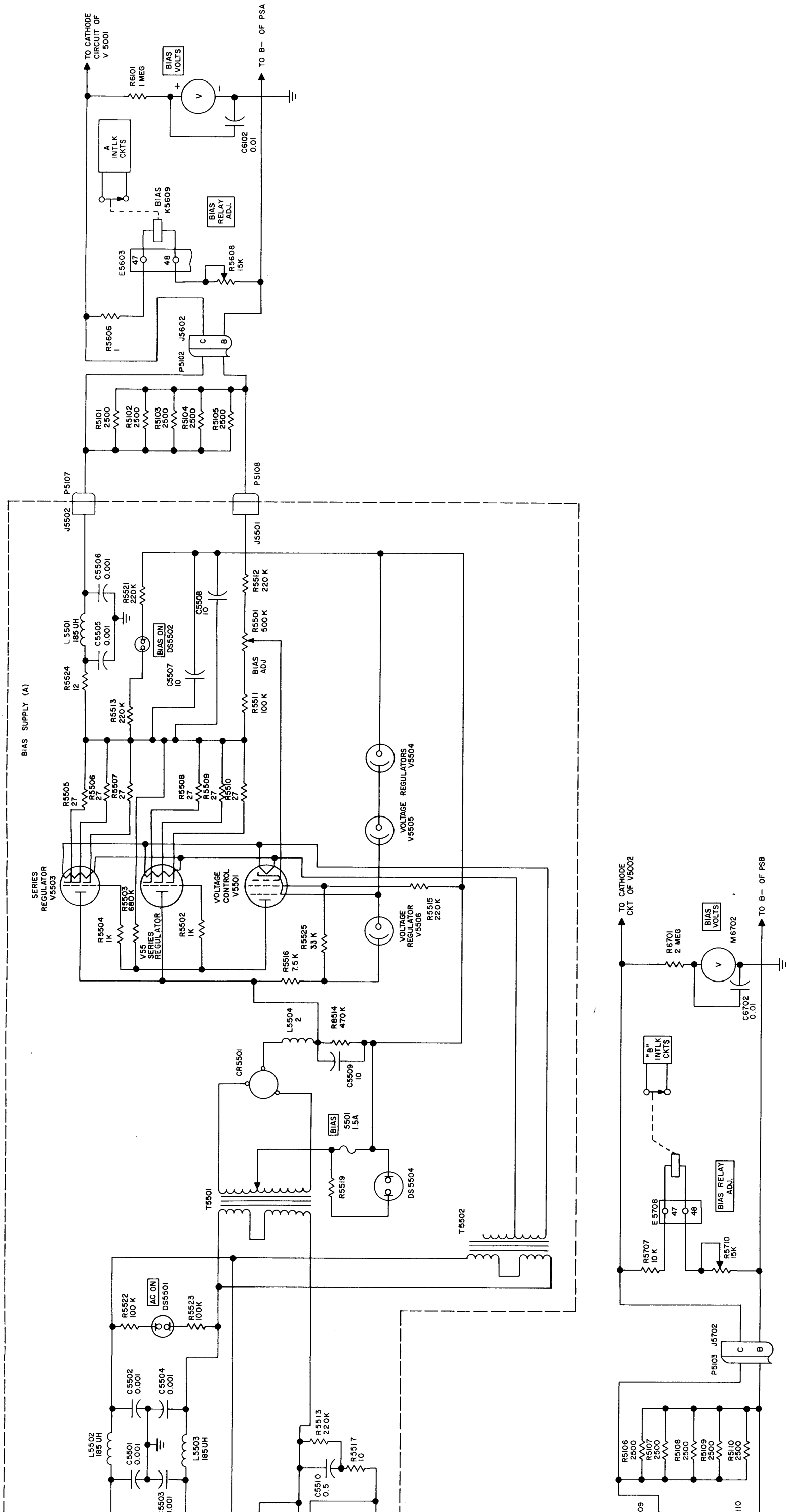
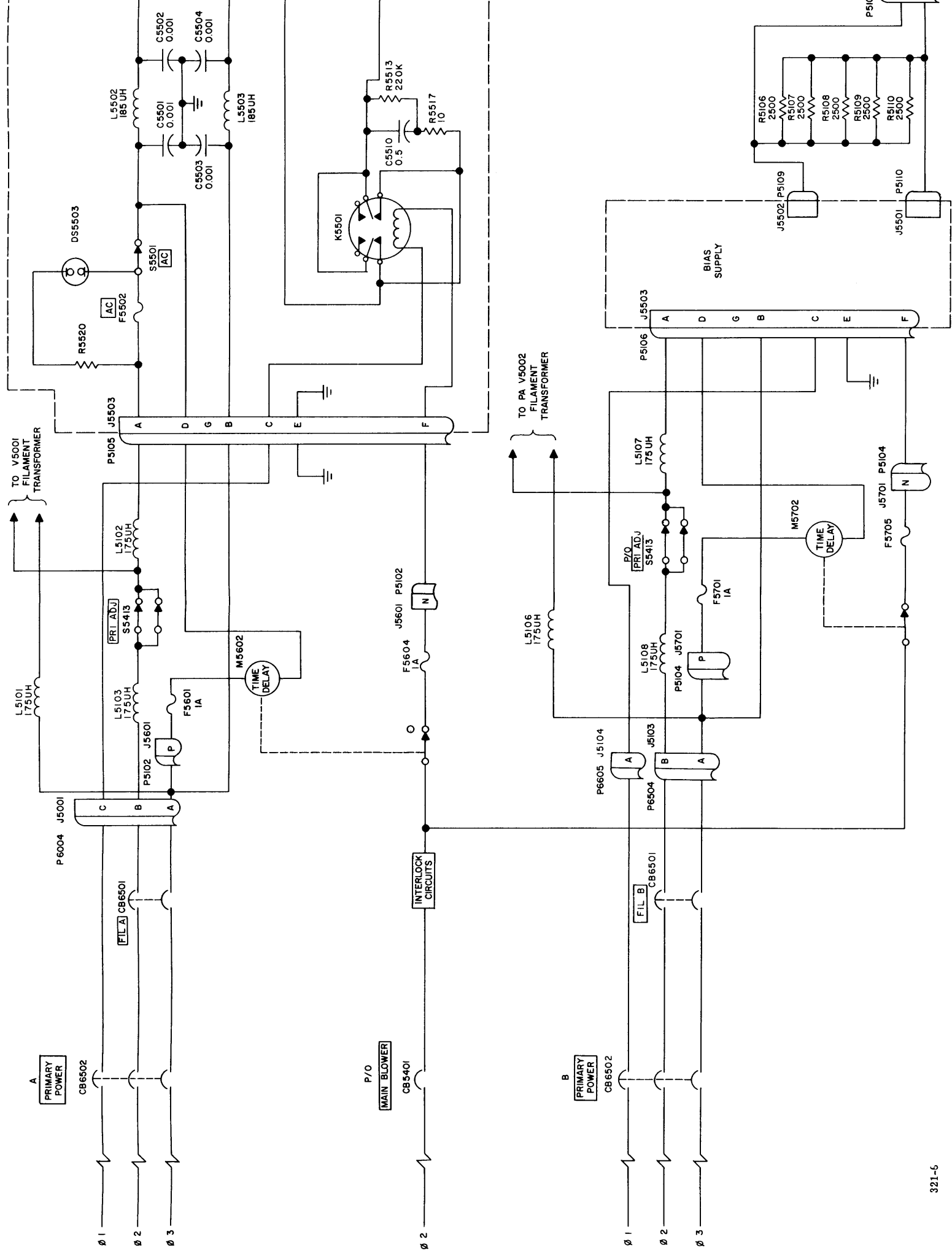


Figure 2-6. Bias Supply Circuits, Simplified Schematic



dividers consisting of resistors R5515, R5516, R5525 and gas-type voltage regulators V5504, V5505 and V5506. Resistor R5516 is the series resistor for the voltage regulators. Regulators V5504 and V5505 are used to stabilize the dc cathode voltage of V5501 so that only r-f voltage variations will affect the plate circuit. Regulators V5506, V5504 and V5505 stabilize the voltage across resistors R5515 and R5525, the junction of which is applied to the screen grid.

2-8. HIGH VOLTAGE CIRCUITS.

a. GENERAL. - Separate high voltage power supplies are used to provide the B+ plate voltages required by the 200-kw power amplifier tubes. The power supplies, designated 100-kw high voltage rectifier A and 100-kw high voltage rectifier B, are similar and supply plate voltage for tubes V5501 and V5502, respectively. Each power supply contains a 20-kv rectifier circuit and associated control circuits for applying primary ac power to the rectifier circuit. These circuits include a motor operated circuit breaker, three high voltage transformers, six gas type rectifier tubes and associated filament transformers. Also included is a time meter which functions as part of the control circuits. Since both power supplies are similar, the theory of operation is presented only for high voltage supply A.

b. CIRCUIT ANALYSIS.

(1) High Voltage Control Circuits. (See figure 2-7.) - The control circuits are used for applying the required dc potential to the plate of power amplifier V5001 by applying primary 480-volt 3-phase power to the high voltage transformers. Protection to personnel and the equipment is afforded by the inter-connections of the control circuit with the interlock circuits. When the GPT-200K is secured, the interlocks function normally, allowing the control circuits to function. If all parameters are normal after application of high voltage to the power amplifier, the interlocks circuits continue to function normally. The high voltage control circuits include a motor-controlled circuit breaker, which connects to the primary 3-phase input, and a time delay meter which controls the sequence of operation of two high voltage contactors, so that power to the high voltage rectifier circuits is applied at a reduced level first and then, after a time delay, at full value.

When PRIMARY POWER circuit breaker CB6502 is closed, microswitch S6502 closes and phase 1 and phase 2 voltage is applied to BREAKER MOTOR B6003. The energized motor turns on HV MAIN circuit breaker CB6001 which applied 3-phase power to contactor K6602 through resistors R6001, R6002 and R6003. If the interlock circuits are functioning normally, INTLK READY relay K5608 is energized (after a preset time delay to allow for filament heating of the power amplifier tubes) by phase 1 and 2 voltage through the closed circuit of the interlock A circuits. This action permits phase 2 voltage to be applied to one side of HV TIME DELAY meter M6001 and to the coils of contactors

K6601 and K6602 through switch S6005. This switch, part of shorting relay K6003, closes when relay K5608 is energized. When HV A circuit breaker CB5402 is turned on, phase 1 voltage is applied to the other side of the time delay meter and to the coil of contactor K6602. The timer and the contactor are energized, causing 3-phase power to be applied to the primaries of transformers T6001, T6002 and T6003. Since contactor K6601 is still de-energized at this time, the 3-phase current passes through the surge limiting resistors causing the voltage at the primaries of the transformers to be lower than normal. It should be noted at this point that relay K5708, whose function in high voltage supply B corresponds to that of relay K5608 in high voltage supply A, must be energized, indicating that the interlocks in high voltage supply B are normal. Power supply A and B interlocks are connected to a common cabinet interlock circuit and are largely independent of each other (refer to paragraph 2-12). If the power supply B interlock circuit is open, relay K5708 will open, preventing contactor K6602 from closing. In this case HV B circuit breaker CB5403 of power supply B must be turned off, thereby shunting the contacts of relay K5708. This cross connection also applies to the control circuits of high voltage supply B, using corresponding relay K5608 and CB5402 as shown in the figure.

After a preset time delay (20 seconds), the contacts on time delay meter M6001 operate. Phase 1 voltage is now applied to the coil of contactor K6602. The contacts of energized contactor K6602 short out the surge limiting resistors, permitting full primary voltage to be applied to transformers T6001, T6002 and T6003. If an overload occurs in the primary power circuit, HV MAIN circuit breaker CB6001 will open. When the overload condition is momentary, primary power can be restored by operating RESET A switch S5411A. This applies phase 2 voltage to the REV terminal of the breaker motor, returning it to its original position. When the RESET switch is released, phase 2 is again applied to the FWD terminal of the breaker motor, causing it to turn on the HV MAIN circuit breaker.

(2) 100-kw - H. V. Rectifier Circuit - The 100-kw high-voltage rectifier develops the required high dc potential required for tube V5001. The rectifier receives 3-phase high voltage from the wye-connected secondaries of transformers T6001, T6002 and T6003. The rectifiers are connected in a three-phase full-wave circuit. Filament voltages for rectifiers V6401 through V6406 are supplied by transformers T6401 through T6406 respectively. Primary voltage for the transformers is supplied by phase 2 and 3 voltage through the closed contacts of circuit breakers CB6502 and CB6501.

The output of the 100-kw high voltage rectifier is filtered by the network consisting of capacitors C6003 and C6004, and inductor L6001 and is applied through series resistors R6019 through R6021 to the plate circuit of tube V5001 (refer to paragraph 2-4). Resistors R6004 through R6018, used primarily for bleeder resistors, provide minimum load for the high voltage dc output. PLATE VOLTS meter, connected

across R6004, provides an indication of dc plate voltage applied to power amplifier tube A. The dc output is also applied across a crowbar circuit which protects the power amplifier tube (V5001) from excessive grid current surges. (Refer to paragraph 2-9.)

HV TOP indicator lamp DS6002, PLATE ON indicator lamp DS5305 and PLATE TIME meter M5601 are energized through microswitch S6013 of contactor K6602. The meter indicates the total elapsed time of high voltage being applied to the power amplifier tube.

2-9. PROTECTIVE CROWBAR CIRCUITS.

a. GENERAL. - The crowbar circuits function as protective devices for the power amplifier tubes V5001 and V5002 by removing the high voltage when arcing within the tubes produces excessive grid current surges. Separate crowbar circuits, designated PSA PSB, are used for tubes V5001 and V5002, respectively. High voltage is removed from the power amplifier tube by shorting the high voltage B+ to B- through a thyatron in the crowbar circuit, thus opening the H. V. MAIN circuit breaker of the power supply associated with the tube. (Refer to paragraph 2-8.) Since the two crowbar circuits are identical, the theory of operation is presented only for crowbar circuit A.

b. CIRCUIT ANALYSIS.-(See figure 2-8.) - The 20-kv output of the 100-kw high voltage rectifier A is applied across the plate and cathode of thyatron V6301 through series resistors R6301, R6302 and R6303. During normal operation, the grid of the thyatron is at the same potential as the cathode thereby preventing the thyatron from conducting.

Power-amplifier tube grid current is fed through the primary of transformer T6302 which is phased so that grid current surges will induce positive voltages in the secondary of the transformer. These positive voltages appear at the grid of the thyatron, causing the tube to fire. When this occurs, the thyatron acts as a short across B+ and B-. Variable resistor R6304 sets the surge level at which the thyatron will fire. This resistor varies the secondary loading on transformer T6302 and thus varies the voltage developed across the transformer.

Crowbar relay K5601 which is in the primary circuit of filament transformer T6301 is a protective relay. It keeps the high voltage A interlock open until full primary filament current flows.

Reservoir voltage for the thyatron is obtained through RESERVOIR ADJ control R6305. This control is used to set the reservoir voltage to the level indicated on the thyatron tube. RESERVOIR meter M6301 indicates the level of the reservoir voltage applied to the tube.

2-10. RETUNE AND SWR PROTECTIVE CIRCUITS.

a. GENERAL. - The return and SWR circuits protect the 200-kw power amplifier during periods of ex-

cessive standing wave ratio or insufficient r-f plate voltage. Included in the circuits are two dc amplifiers, a power supply and two protective relays.

b. CIRCUIT ANALYSIS.-(See figure 2-9.) - The retune circuit uses dc amplifier V6201 to energize RETUNE relay K5605 when the r-f voltage in the power amplifier plate circuit falls below a preset level (2 kv). A portion of the detected r-f signal is fed from terminal 8 of rf plate network Z5202 (refer to paragraph 2-4) to the grid of V6201A through pin G of J6201, rf filter network L6201 and C6207, and RETUNE OVLD ADJ control R6210. The plate of V6201A is direct coupled to the grid of V6201B. DC amplifier V6201A operates at fixed cathode bias which is produced by the dc voltage developed across Zener diode CR6204. Bias for V6201B is obtained from a voltage divider consisting of resistors R6212 and R6214, and RETUNE OVLD SET control R6213 connected across the B+ line. With normal rf voltage at the plate circuit of the power amplifier, the positive input at the grid of V6201A produces a high voltage drop across plate resistor R6207 and the resulting grid voltage of V6201B is sufficient to prevent the plate current of V6201B from energizing the overload coil of RETUNE relay K5605.

If the r-f voltage at the plates of the power amplifier tubes decreases, the positive dc voltage on the grid of tube V6201A also decreases. This causes an increase of voltage at the plate of V6201A and the grid of V6201B. This grid voltage rise causes an increase in plate current of V6201B. If the r-f plate voltage of the PA drops below a predetermined level, the plate current through V6201B rises sufficiently to energize retune relay K5605 through the closed contacts of TUBE PROTECT relays K5607 and K5707. This action opens the high-voltage A interlock circuits. The contacts of the TUBE PROTECT relays do not close until plate current in the associated power amplifier tubes exceeds a pre-set value (3 amperes). This insures that the RETUNE relay (which would normally be energized before the power amplifier tubes draw plate current since there would be no r-f output) will not become operational until there is at least three amperes of power amplifier tube plate current.

The SWR circuit uses a dc amplifier to control the operation of SWR relay K5606 when the reflected power at the output of the transmitter exceeds a predetermined level. The operation of this circuit is similar to that of the retune circuit except that a voltage proportional to reflected power is applied to SWR meter M6105. When the reflected power level exceeds a predetermined manual setting of a second pointer on the SWR meter, a set of contacts in the meter closes and applies a dc voltage to the cathode of dc amplifier V6202B.

In normal operation, the SWR meter switch is open. The cathode bias on V6202A is adjusted to prevent the plate current from energizing the overload coil of the SWR relay at this time. This cathode voltage is obtained from a voltage divider consisting of resistors R6216, R6218 and SWR OVLD SET control R6217 connected across the B+ line.

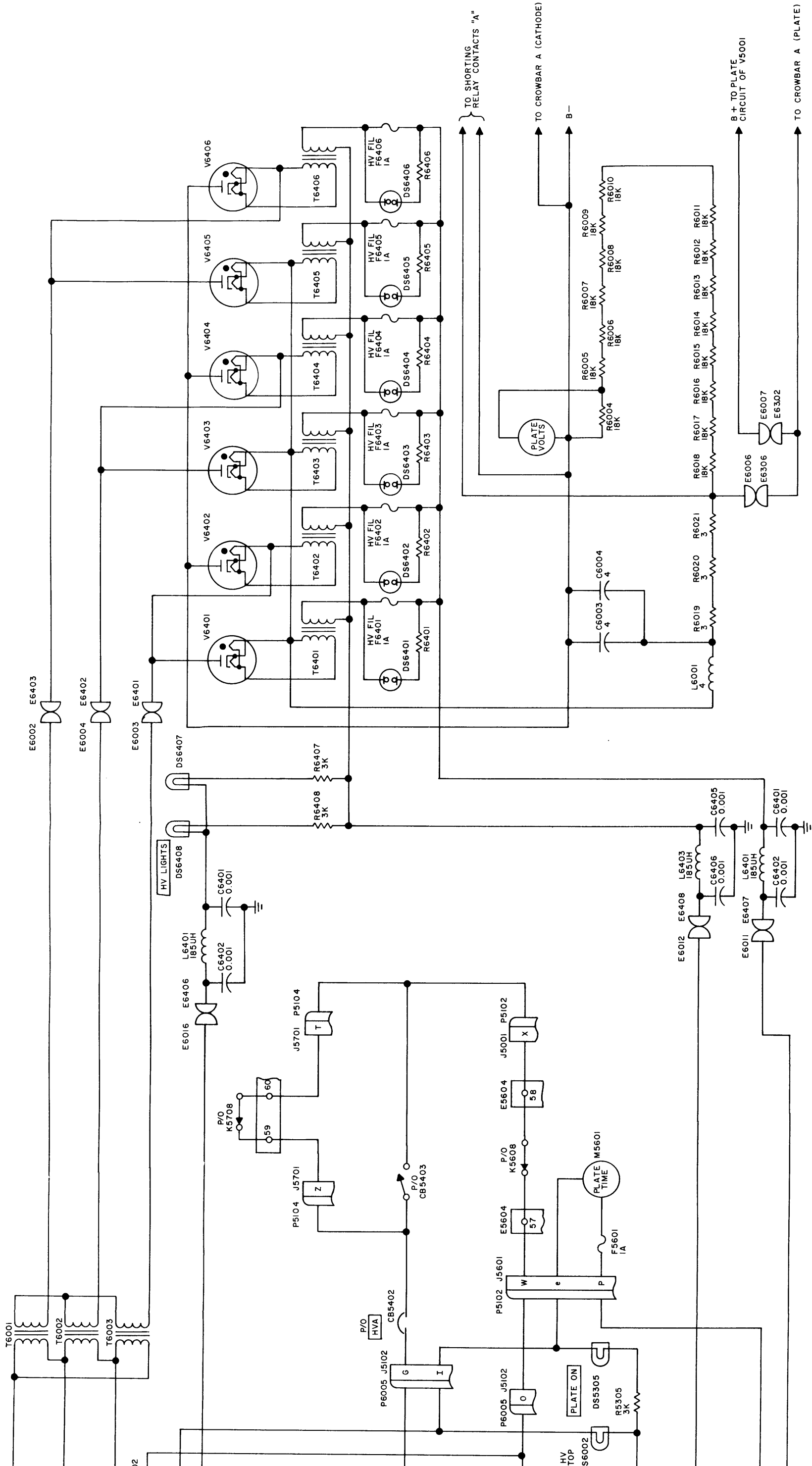
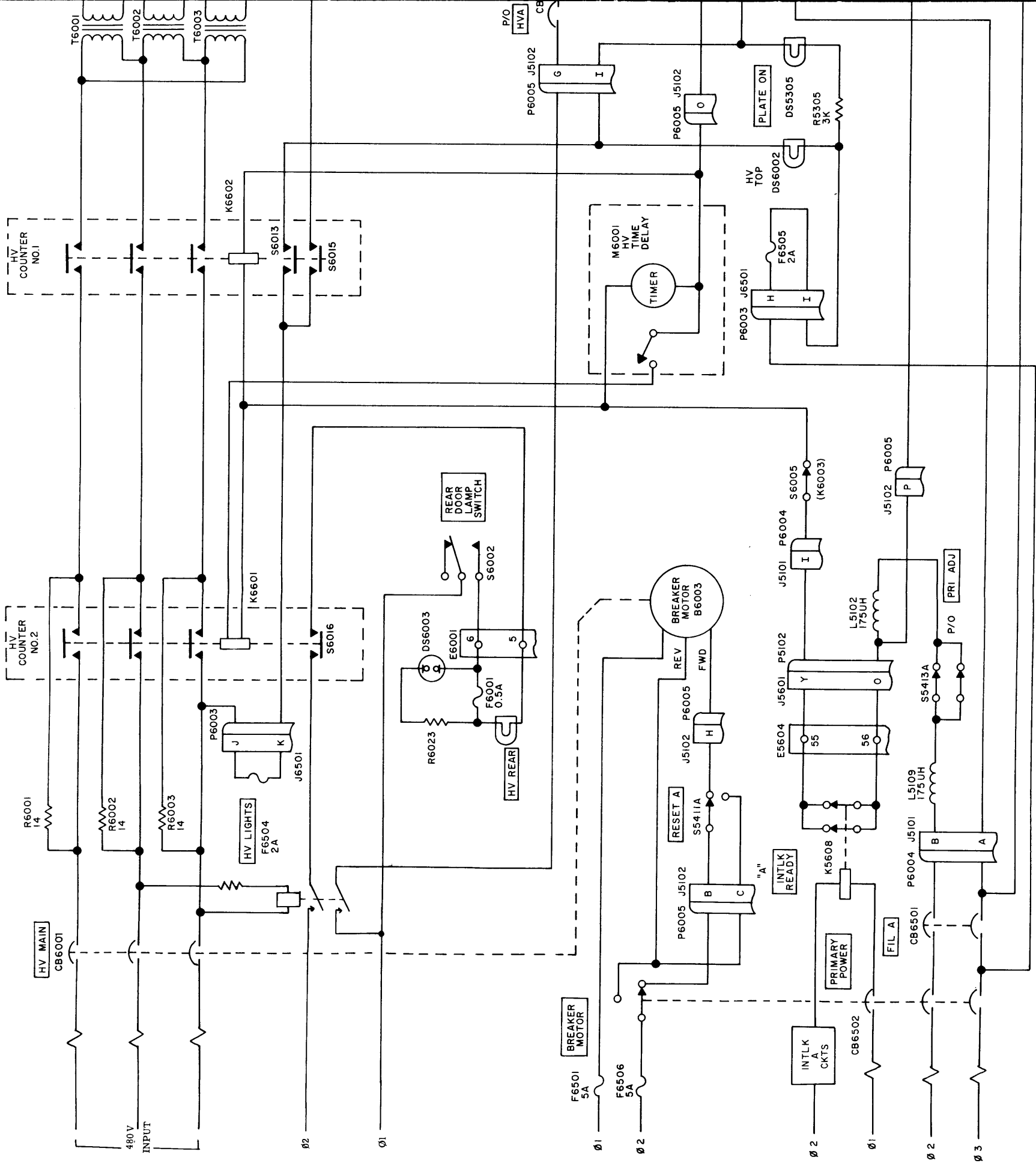


Figure 2-7. High-Voltage Circuits,
Simplified Schematic



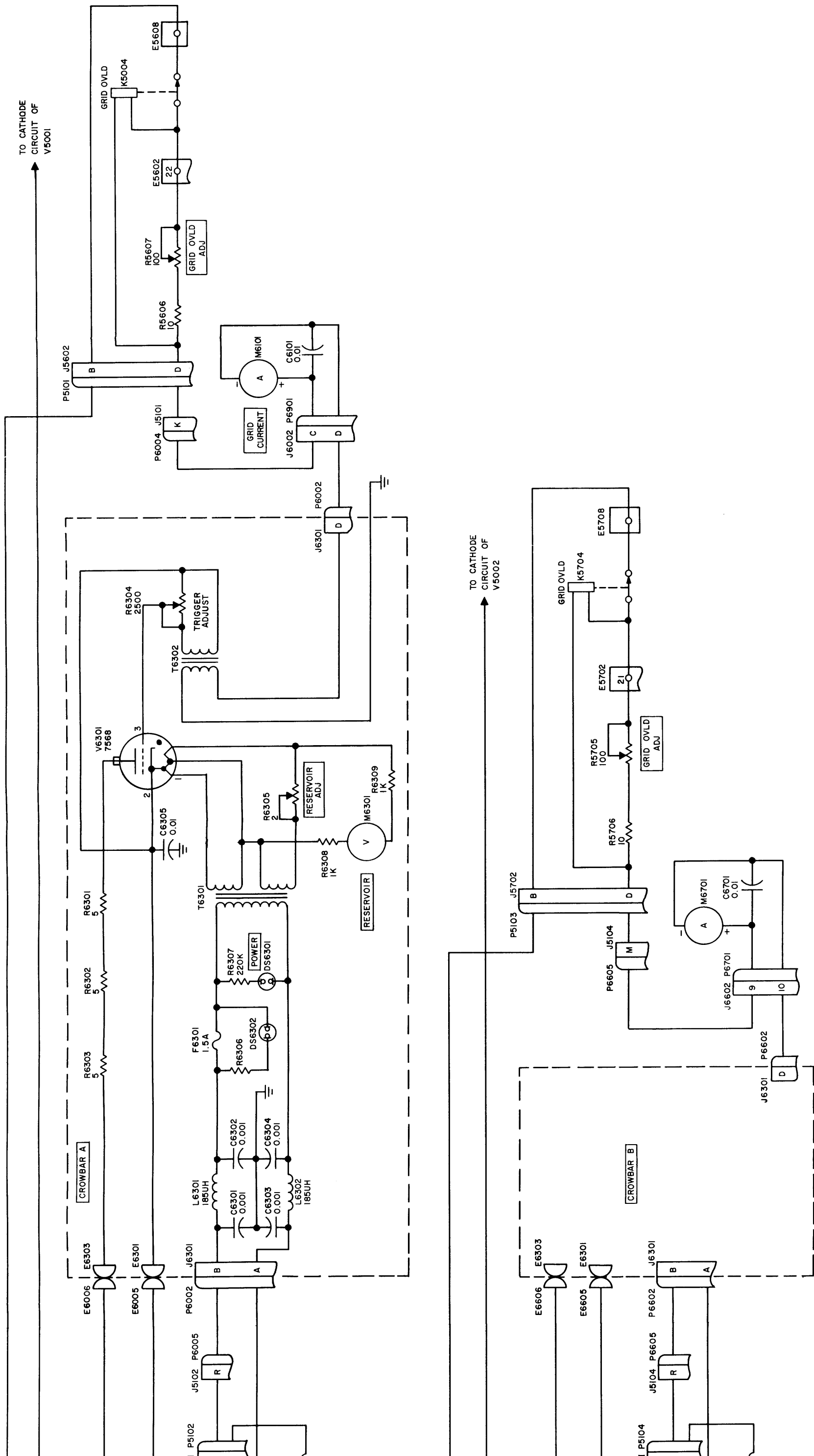
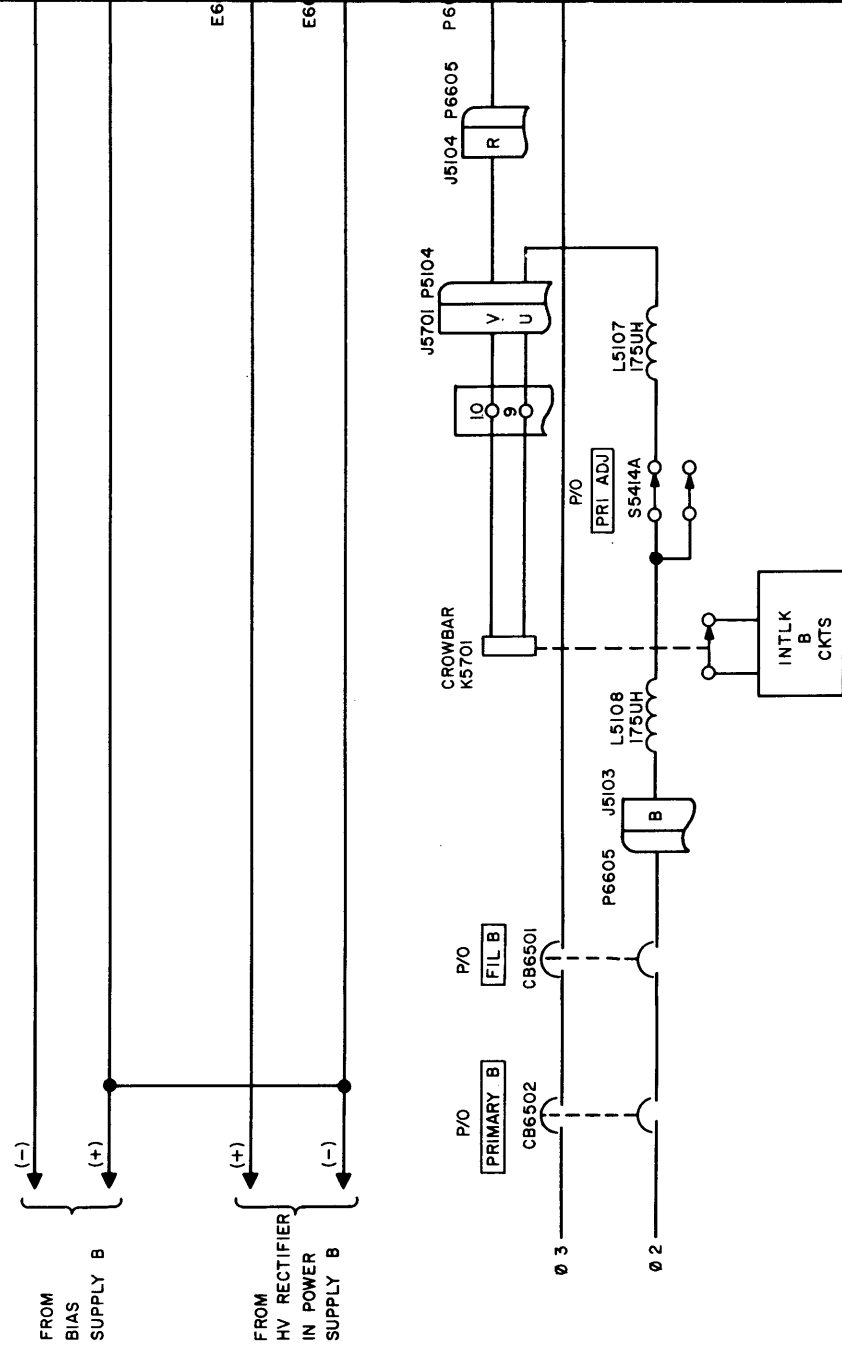
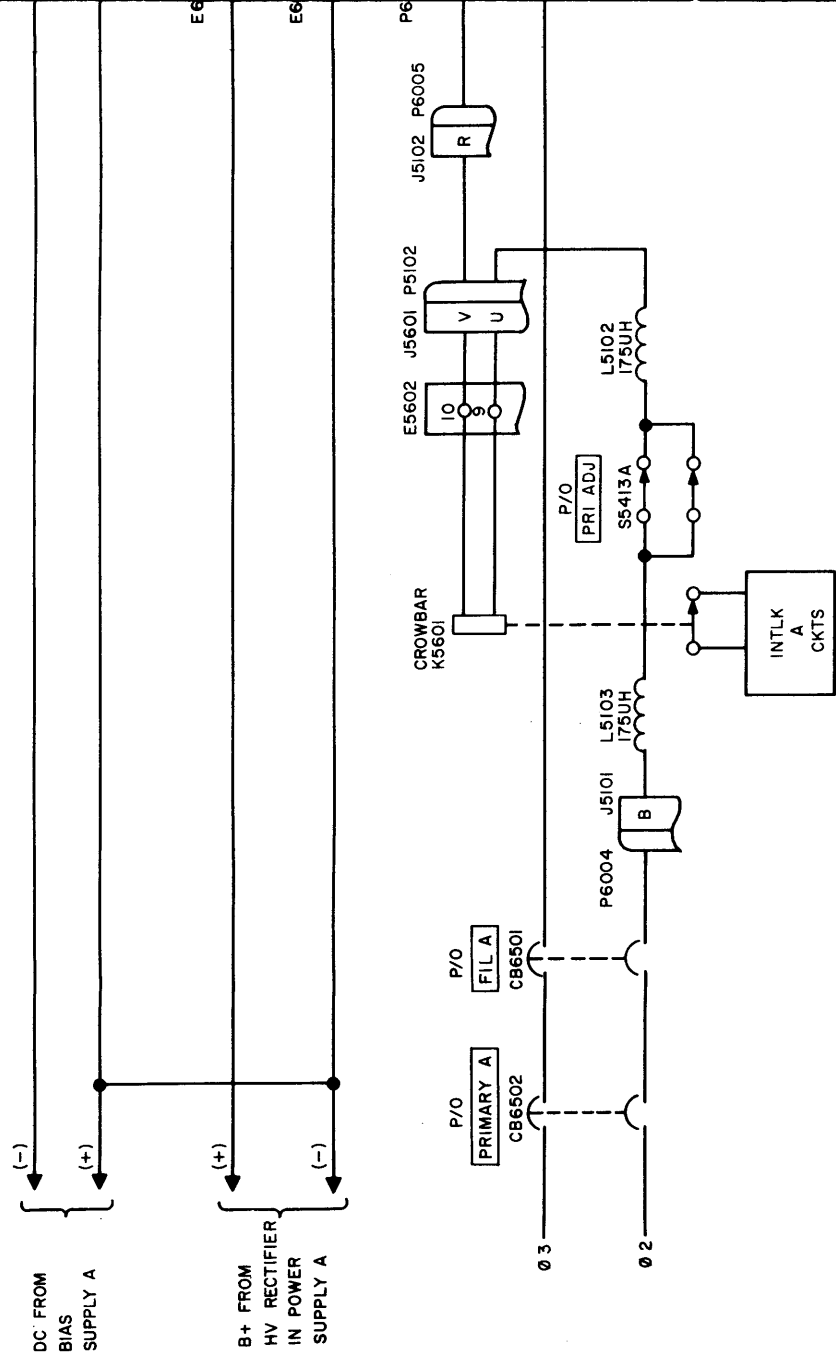


Figure 2-8. Protective Crowbar Circuits, Simplified Schematic



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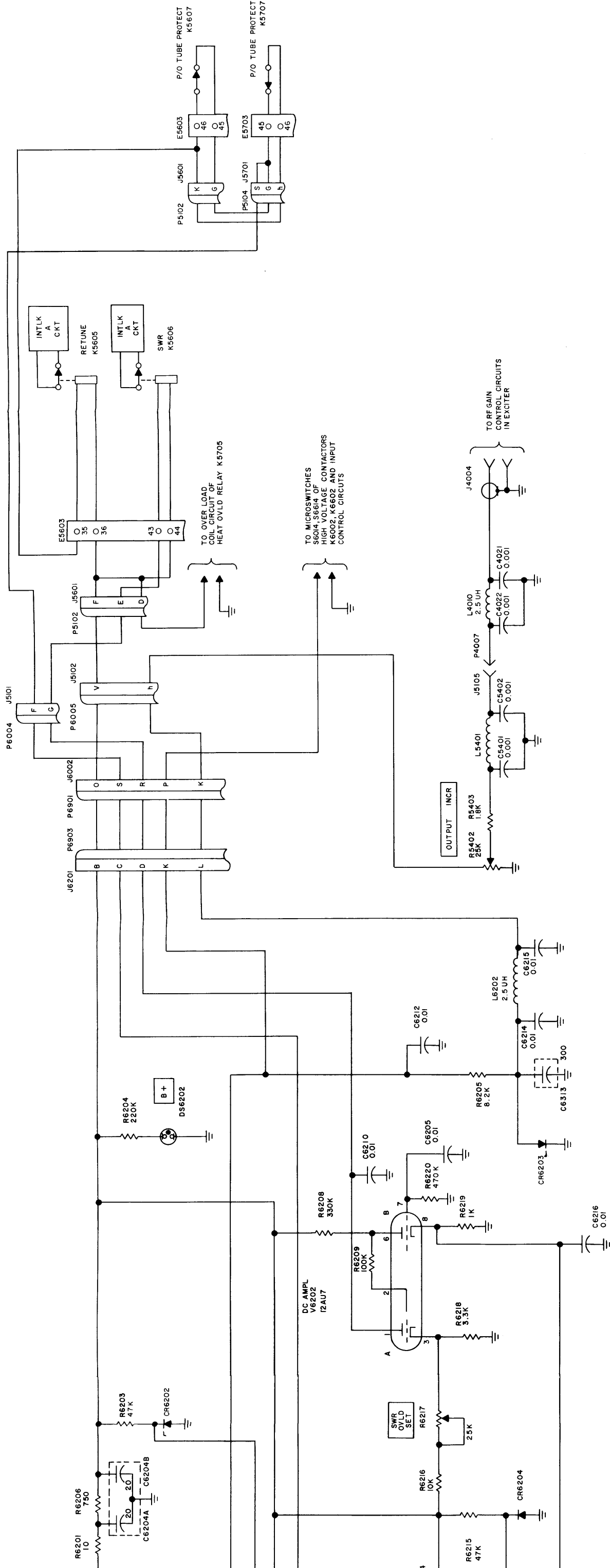
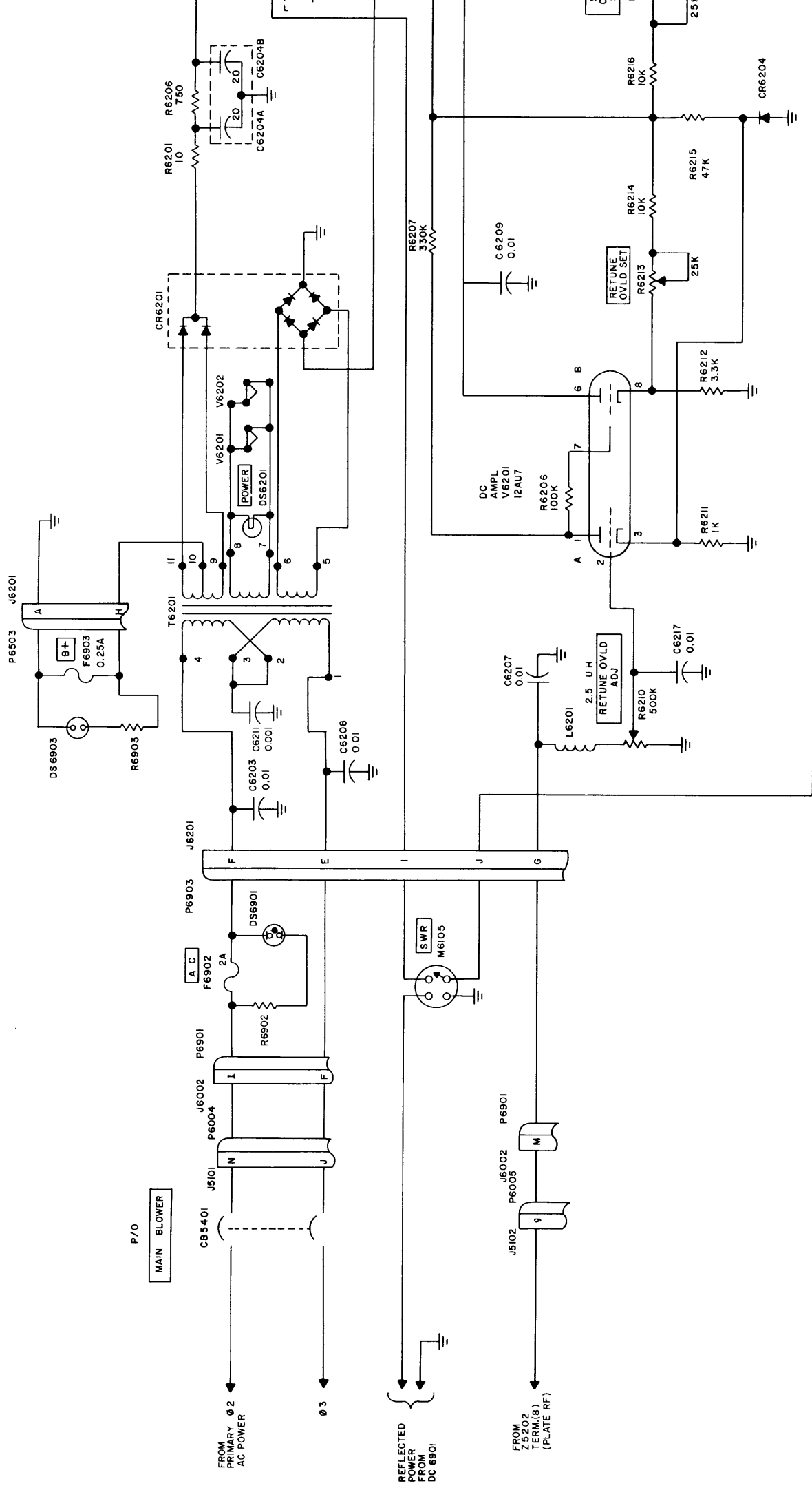


Figure 2-9. Retune and SWR Protective Circuits, Simplified Schematic



If the reflected power at the output of the transmitter exceeds a predetermined level, the SWR meter reading rises sufficiently to close the SWR meter switch. A 3-volt dc level, developed across Zener diode CR6202 is then applied through the switch to the cathode of V6202B. The plate current of V6202B decreases, causing its plate voltage to rise. This rise is coupled to the grid of V6202A, and plate current in V6202A rises sufficiently to energize the overload coil of SWR relay K5606.

The retune and SWR control circuits operate from a self-contained power supply. One portion of the power supply consists of plate winding 9-11 of power transformer T6201, two of the diodes in bridge rectifier CR6201, resistors R6201 and R6202, and dual capacitor C6204. This full wave rectifier provides plate voltage for dc amplifiers V6201 and V6202.

The B+ voltage taken from pin D of connectors P5102 and J5601 is used to supply operating voltage for HEAT OVLD relay K5705.

The four diodes in the lower section of rectifier CR6201, in conjunction with secondary winding 5-6 of transformer T6201, operates in a full-wave bridge circuit producing a negative dc voltage. This voltage is applied to external circuits for operating the coaxial switches in the 40-kw r-f input control circuits. (Refer to paragraph 2-6.) The negative voltage is also applied through filter elements R6205, R6202, and capacitors C6213 through C6215 to OUTPUT INCR control R5402. The negative dc output of this control is further filtered and applied to connector J4004. This voltage is cabled back to a control input of the exciter, in the auxiliary frame, permitting remote control of exciter rf gain. In practice, the OUTPUT control of the CHG is turned up, then rf drive is controlled remotely by OUTPUT INCR control R5402.

2-11. RELAY AND INDICATOR PANELS, INDICATOR AND RESET CIRCUITS.

a. GENERAL. - Figure 2-10 shows the indicator and reset circuits associated with the Relay and Indicator Panels (A & B). The functions of the relays are described in the theory of operation of associated circuits. When a fault or overload occurs in any of these circuits, the associated relay operates to disable the high voltage interlock circuits, thus preventing the high voltage power supplies from functioning. The relay also provides a visual indication of the trouble by applying power to an indicator lamp. When the trouble is corrected, the relay is reset by a RESET switch.

b. CIRCUIT ANALYSIS. - Relays K5601 through K5606 and K5609 of Relay and Indicator Panel A comprise the protective relays for power amplifier tube A. Relays K5603 through K5606 include the overload relays which must be reset after an overload occurs. The contacts of relays K5603 through K5607 are shown in the normally open position. If an overload occurs, the contacts of the affected relay closes and energizes an associated indicator lamp from the phase

1-3 voltage. The relay is reset (after the overload is cleared) by momentarily operating RESET A switch S5411B. This switch applies phase 2 voltage to the reset coils of relays K5603 through K5606.

Relays K5601, K5602 and K5609 are energized during normal conditions. The contacts of these relays are shown in the energized position. Contacts of relays K5601 and K5602 provide phase 1 and phase 2 voltage to energize FIL. TIME meter M5603, thus indicating the elapsed time that filament power is applied to the power amplifier. (These relays are energized when the FIL. A circuit breaker (figure 2-12) is closed.) If insufficient current flows in relay K5601, K5602 or K5609, indicating a fault in the associated circuit, the relay is deenergized and applies phase 1 and phase 3 voltage to a corresponding indicator lamp until the fault is cleared.

The circuits of relay panel B (figure 6-1) are similar to relay panel A, except that retune and SWR relays are not used, and heat overload relay K5705 is added. The operation of the heat overload relay in panel B is similar to that described for the overload relays above, and is used to warn of excessive temperature in the tube frame.

2-12. INTERLOCK CIRCUITS.

a. GENERAL. - Interlock circuits are distributed throughout the frames of the GPT-200K transmitter. The interlock circuits function in conjunction with the protective relay circuits for protection of equipment and personnel.

b. 40-KW SECTION. - The interlock circuits associated with the 40-kw section (the first four frames of the transmitter) are described in detail in Maintenance Instructions for GPT-40K transmitter. When mated with the other five frames of the GPT-200K transmitter, the jumper across terminals 5 and 6 of E8119 are removed and the GPT-40K interlock circuit is extended into the r-f input control circuits of the GPT-200K. These circuits are shown in figure 2-5 and described in paragraph 2-6.

c. 200-KW SECTION. (See figure 2-11.) - Twenty-five interlock switches forming a series circuit are included in the last five frames of the GPT-200K transmitter. Twenty-two of these switches insure that band switches, doors, and equipment are in normal operating positions. OPERATE relay K4001 insures that the r-f input circuit is set for normal operation; switch S5306 insures that power-amplifier shorting relay K5301 is functioning; 200K REMOTE INTERLOCK switch S6903 completes the interlock circuit when an external coaxial output switch is not used (refer to paragraph 2-4b). As shown in figure 2-11, the twenty-five interlock switches provide a common series circuit for the paralleled protective relay interlock circuits of power amplifier tubes A and B. When closed, the relay interlock circuits connect phase 2 voltage to INTERLOCK READY relays K5608 and

K5708. When these relays are energized, associated contacts close, permitting the high voltage control circuits in power supply A and B, respectively, to function. (Refer to paragraph 2-8.) The circuit arrangement allows either of these relays to be energized independently of the other.

When all of the interlock switches are closed, phase 2 voltage is applied through terminals 12 and W of INTERLOCK switch S5410 to INTERLOCK IND lamp DS5402. When lit, the lamp indicates that all of the cabinet interlock switches are closed. The phase 2 voltage also energizes relay K5301 at this time. Switch S5305 opens, removing the short to ground from the output circuit of the power amplifier. Refer to paragraph 2-4.) Switch S5306 simultaneously connects phase 2 voltage through contacts of time delay meters M5602 and M5702 to shorting relays K6003 and K6603 respectively. Relays K6003 and K6603 operate and remove the shorts from the outputs of power supplies A and B respectively.

Phase 2 voltages from closed contacts of the time delay meters are also applied to protective relay interlock circuits of power supply A and B when 40K INTLKS relay K5706 is energized. Relay K5706 is energized by 230 volts ac from the fourth (PS) frame of the transmitter when high voltage is applied to the 40-kw PA. Relay K5706 can be initially bypassed during power turn-on by the operation of 40K INTERLOCK switch S5701. If the protective relays in the two relay panels (A and B) are operating normally, phase 2 voltage is applied to INTERLOCK READY relays K5608 and K5708 of the power supply A and B interlock circuits, respectively. If a protective relay contact is open in one of the protective relay interlocks, only the INTLKS READY relay of that interlock circuit will be deenergized, thereby shutting off the associated high-voltage power supply.

When one of the interlock switches is not in its normal operating position, the phase 2 voltage path through the common interlock switch circuit is broken. INTERLOCK IND lamp DS5402 will then go out. INTERLOCK switch S5410 can be used to quickly locate the open interlock switch. When S5410 is rotated clockwise through its positions, INTERLOCK IND lamp DS5402 lights for all positions up to the open circuit and is off for all remaining positions. Each of the contacts of the INTERLOCK switch is connected to a junction of two interlock switches. When the INTERLOCK switch reaches the position corresponding to the open interlock switch, the open circuit prevents phase 2 voltage from being applied to the INTERLOCK IND lamp. In all higher positions, the INTERLOCK IND lamp is off because of the open circuit.

If, during operation of the equipment, an interlock switch opens, the open interlock circuit deenergizes relay K5301, INTLKS READY relays K5608 and K5708, and shorting relays K6003 and K6603. When the high voltage shorting relays are deenergized, their contacts short the high-voltage outputs of power supplies A and B. This action provides personnel protection. A similar function is accomplished by relay K5301, which grounds the output of the power amplifier, discharging the high-voltage capacitors in the out-

put circuit. In addition, phase 2 voltage is applied through the "N. O." contact of the open interlock switch to trip the HIGH VOLTAGE circuit breakers. The phase 2 voltage is first applied to the coil of HIGH VOLTAGE A circuit breaker CB5402, tripping the circuit breaker. When circuit breaker CB5402 is tripped, phase 2 voltage is applied to the coil of HIGH VOLTAGE B circuit breaker CB5403 through the "N. C." contacts of switch S5405. HIGH VOLTAGE B circuit breaker CB5403 is then tripped.

Phase 1 and phase 2 voltage is also applied to HIGH VOLTAGE A and HIGH VOLTAGE B circuit breakers during the warm-up time provided by TIME DELAY meters A and B. During this time, the phase 2 voltage is connected to the circuit breakers through interlock switches and the "N. C." contacts of the TIME DELAY meters. If either circuit breaker is set at ON during this warmup time, phase 2 voltage trips the circuit breaker.

2-13. AC POWER DISTRIBUTION. (See figure 2-12.)

Three phase 230V primary power, routed to the 200-kw section of the transmitter through rear terminal connectors, is applied to the PRIMARY POWER A and PRIMARY POWER B circuit breakers (CB6502) and MAIN BLOWER circuit breaker CB5401. Three phase 480V primary power is connected to HV MAIN "A" and HV MAIN "B" circuit breakers CB6001 and CB6601. Except for 230V primary phase 1 voltage applied to breaker motors B6003 and B6603, all primary power input to the 200-kw section is controlled by the above circuit breakers.

PRIMARY POWER (A) circuit breaker CB6502 supplies 230V, 3-phase voltage to a blower, a fan, and two fluorescent lamps all of which are located in the PSA frame. When closed, the circuit breaker provides primary power to PA FIL (A) circuit breaker CB6501. Control voltages for a breaker motor, relays, and indicator lamps are also provided via PRIMARY POWER (A) circuit breaker.

When PRIMARY POWER (A) circuit breaker CB6502 is closed, primary voltage is applied to the above circuits as follows: phase 1 and 2 voltage is applied to blower B6002 and fan B6001. Phase 1 and 2 voltage is also applied to fluorescent lamps DS6101 and DS6102 in the PSA frame for illumination of the meter panel. Phase 2 and 3 power is supplied to PA FIL (A) circuit breaker CB6501. This circuit breaker supplies filament power for power-amplifier tube A, 100-kw high-voltage rectifier A, and the bias supply A and PSA frame crowbar drawer. PA FIL (A) circuit breaker CB6501 also supplies power to a fan and control voltages for meters and a relay.

When PA FIL (A) circuit breaker CB6501 is closed, primary power is applied to the circuits as follows: phase 2 and 3 voltage is applied to the filament transformers of 100-kw high voltage rectifier A, bias supply A, power-amplifier tube A, PSA frame crowbar drawer, and to ANT SW DECK fan B6901. FIL PRI meter M6104 indicates the voltage at the 230 volt tap of the filament transformer for the power - amplifier tube A. Phase 3 voltage is applied to TIME DELAY

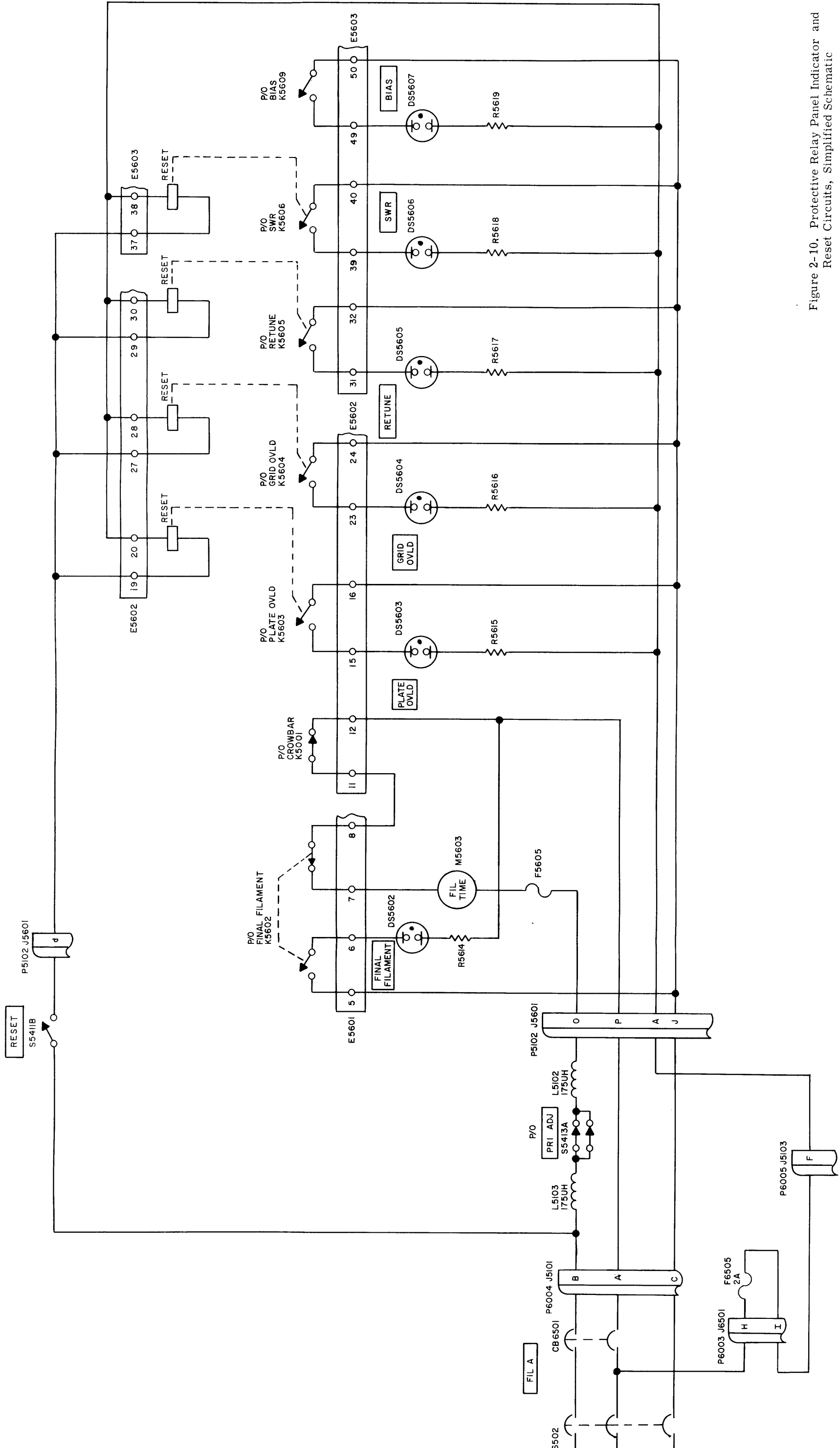
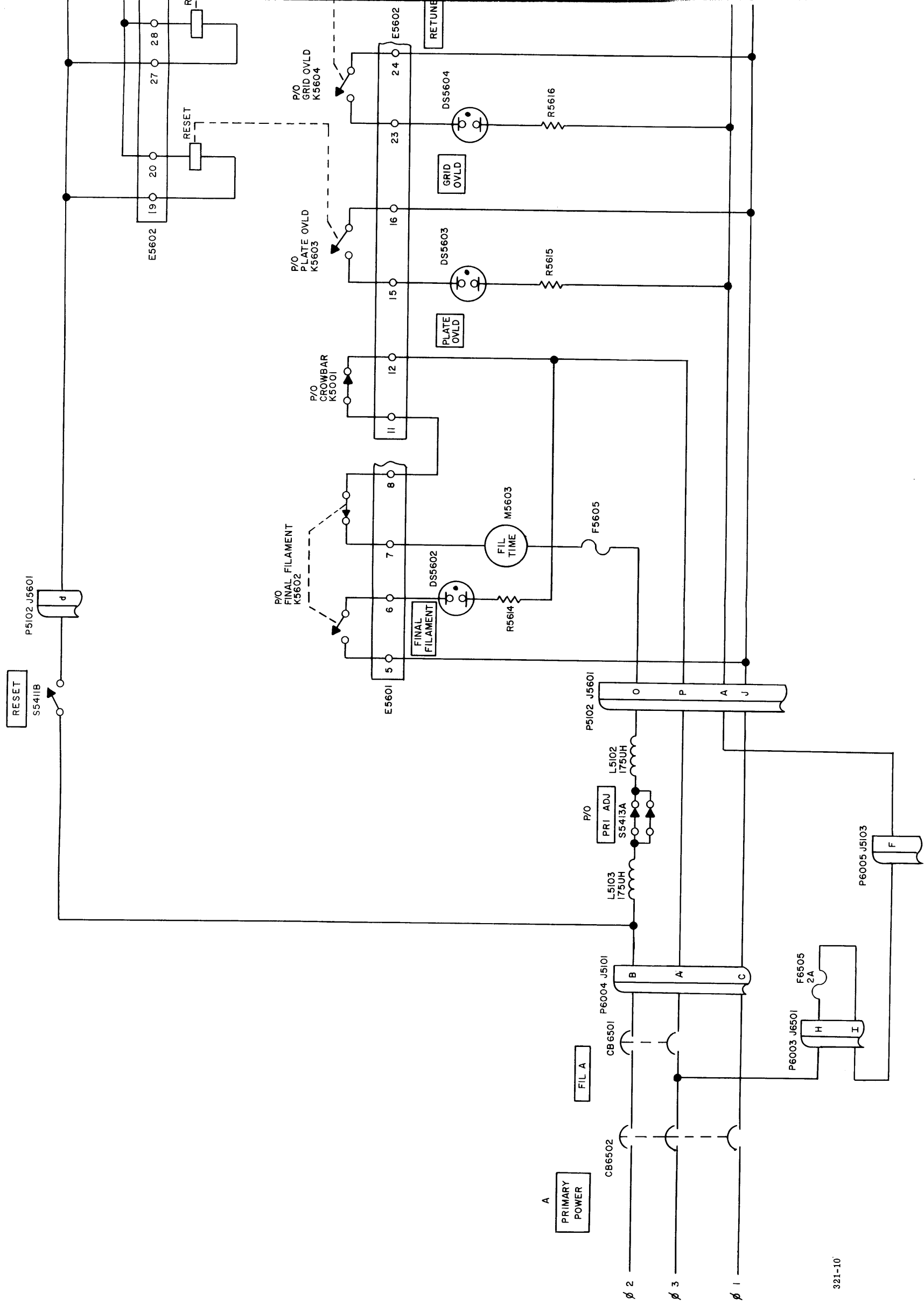


Figure 2-10. Protective Relay Panel Indicator and Reset Circuits, Simplified Schematic



321-10

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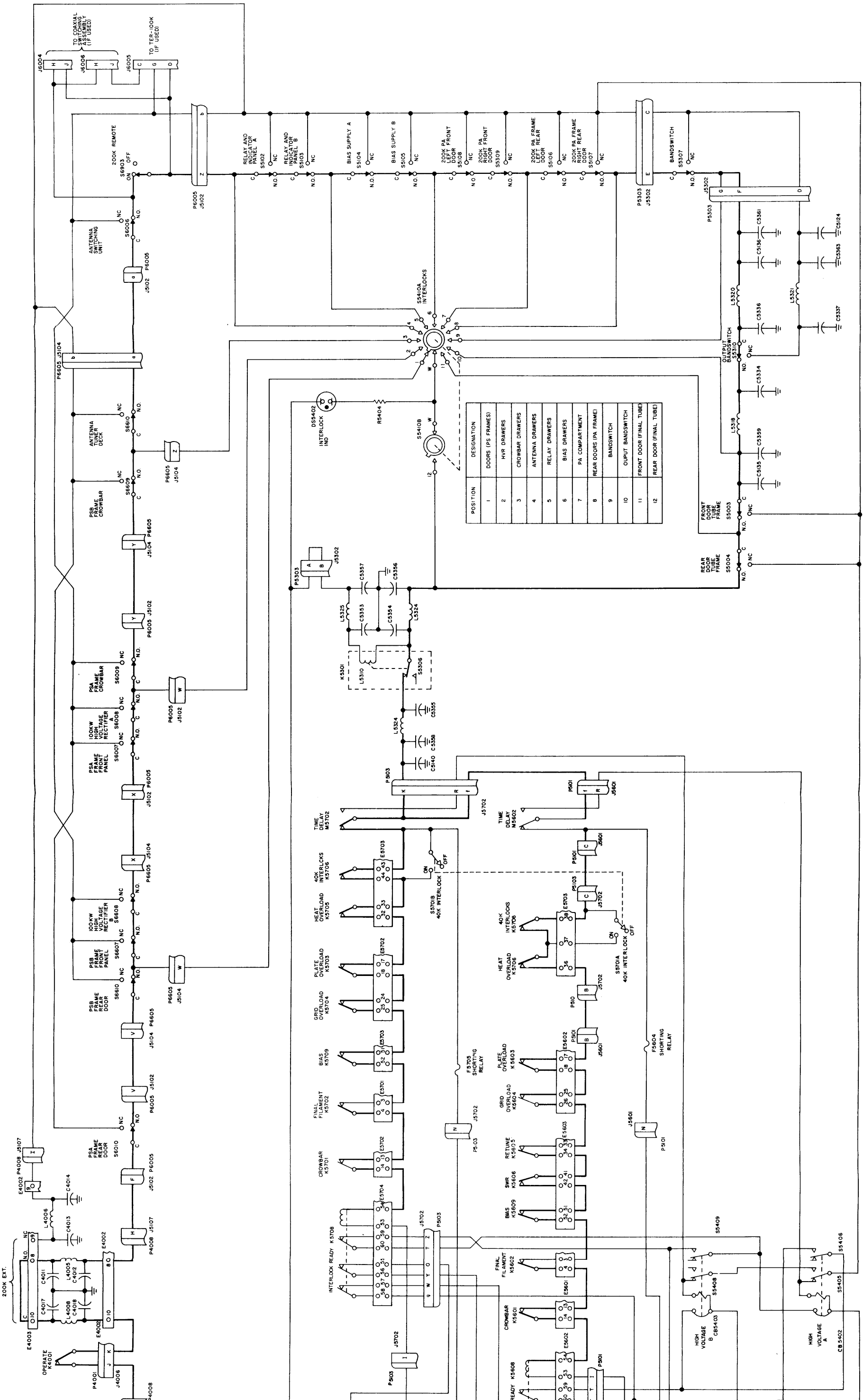
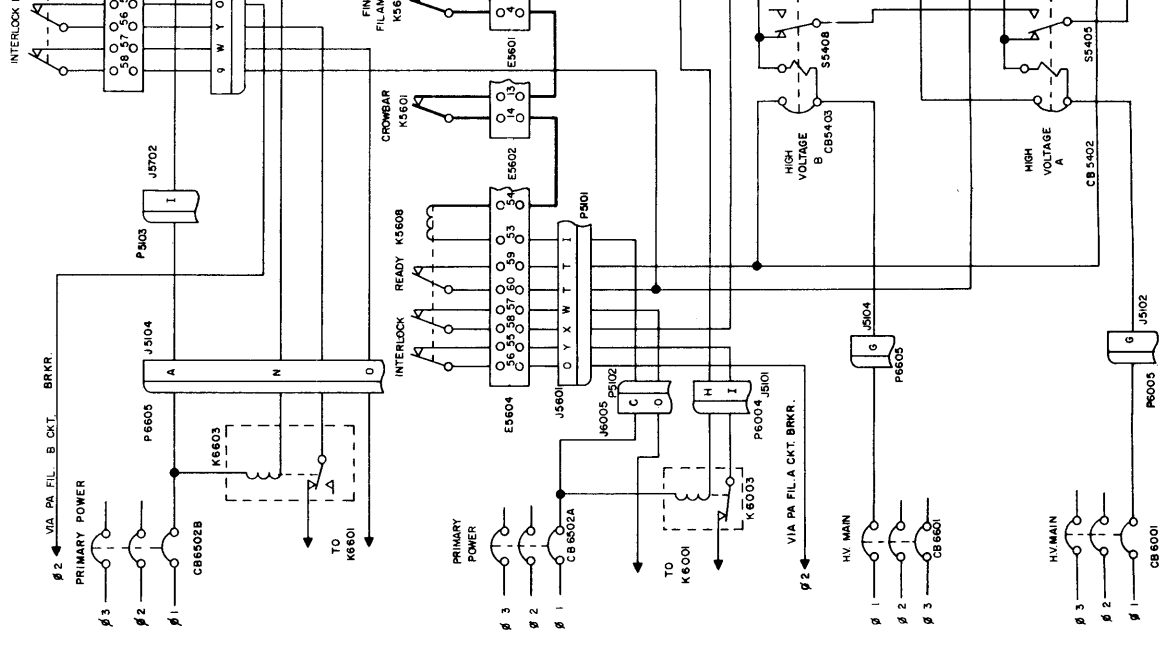
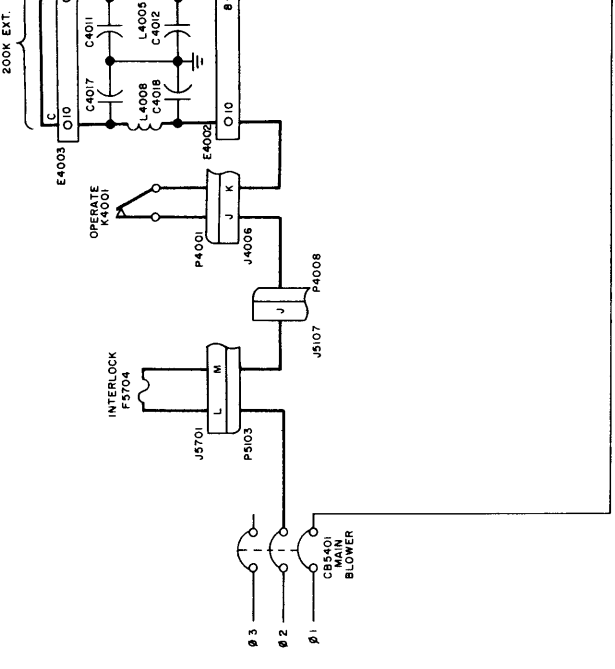
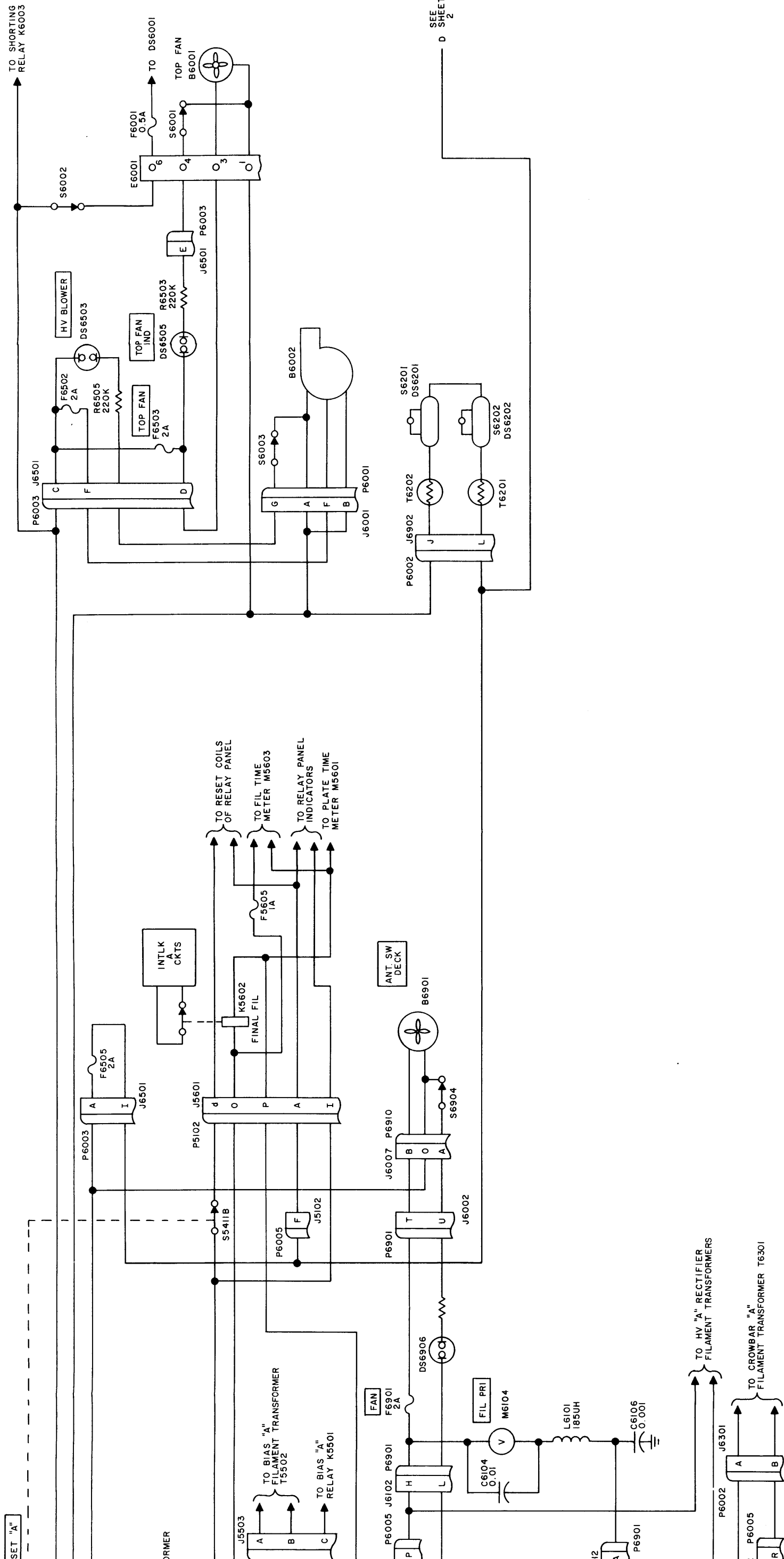


Figure 2-11. Interlock Circuits, Simplified Schematic

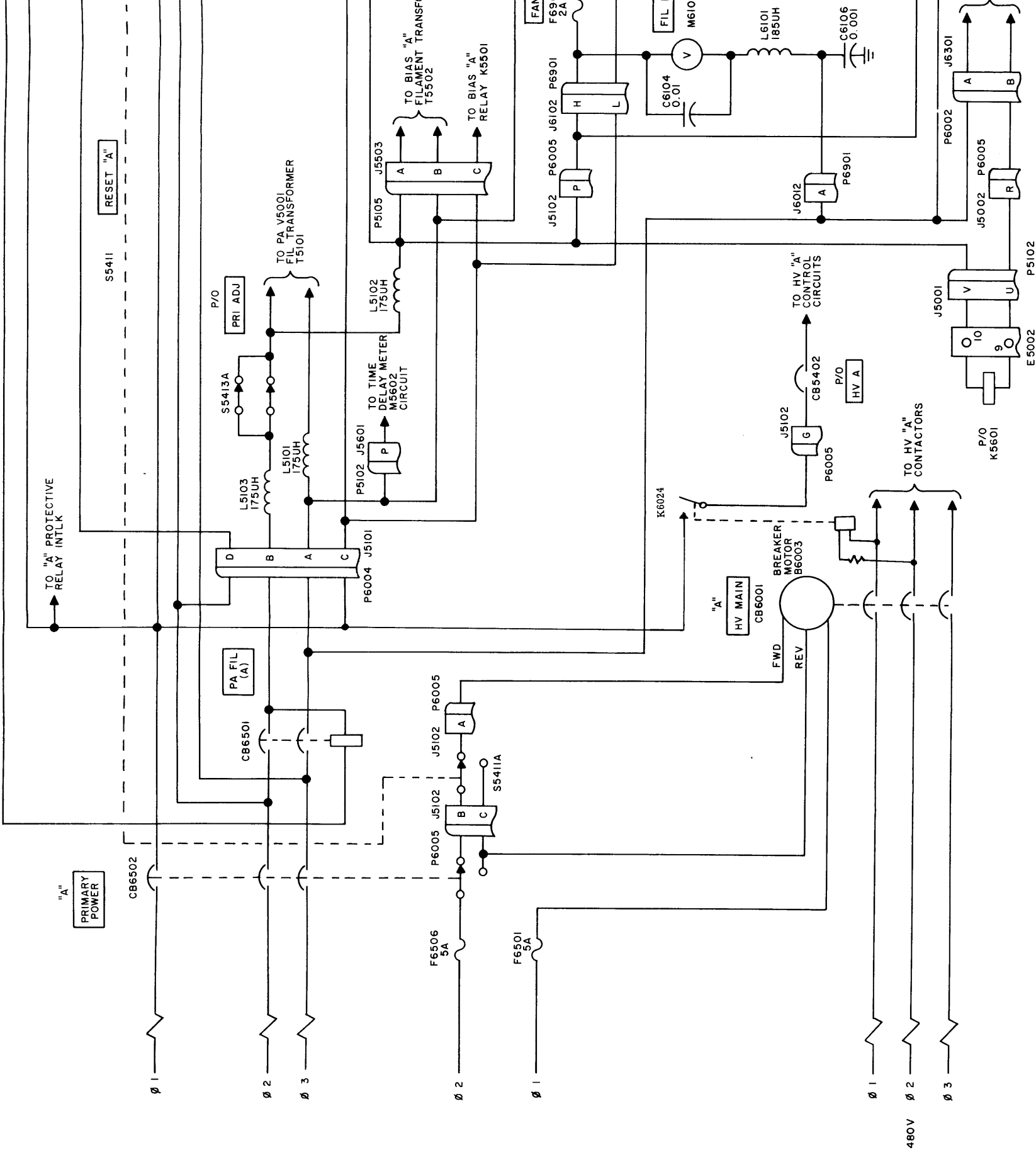


SEE SHEET 2



SEE SHEET 2

Figure 2-12. AC Power Distribution, Simplified Schematic (Sheet 1 of 2)



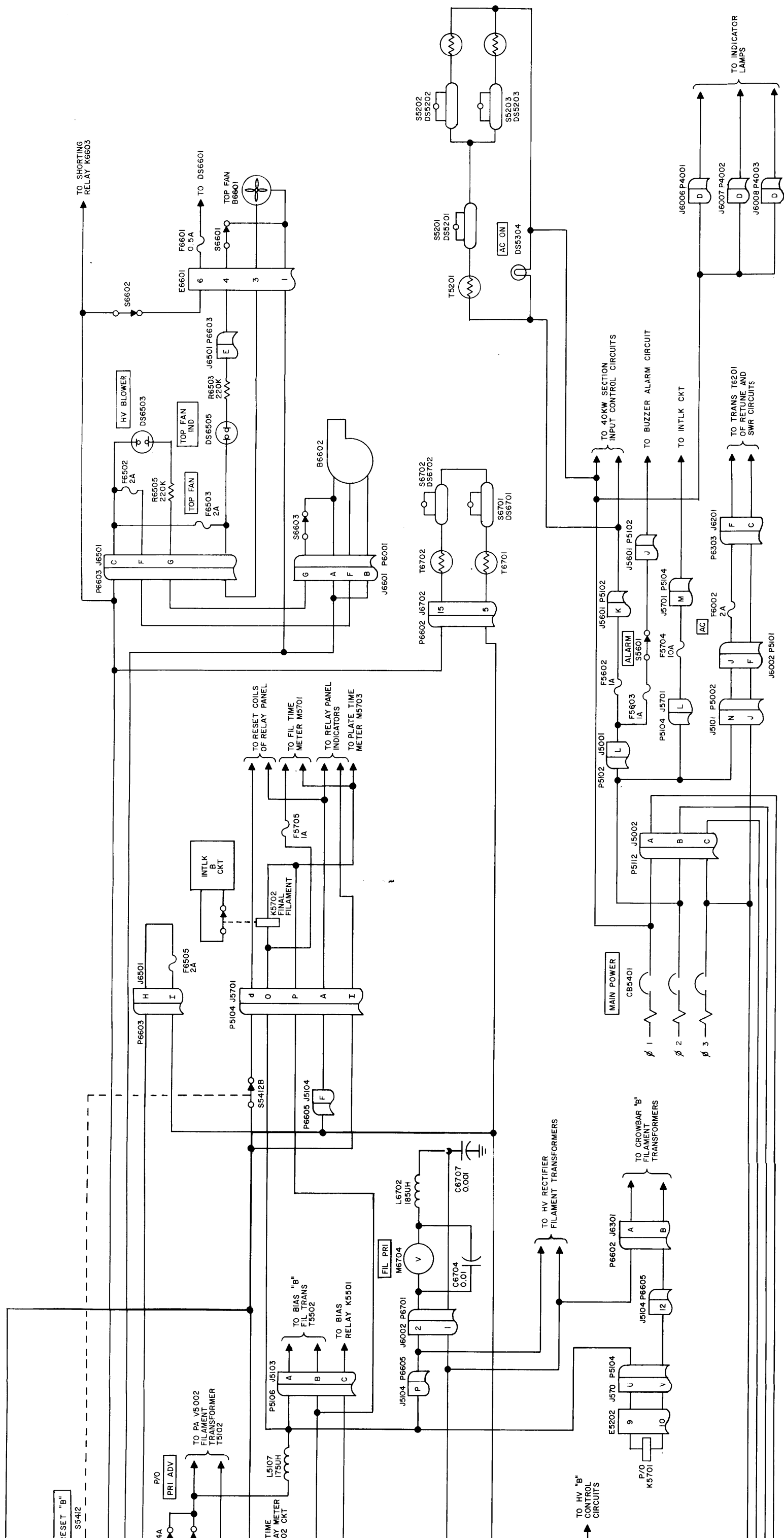
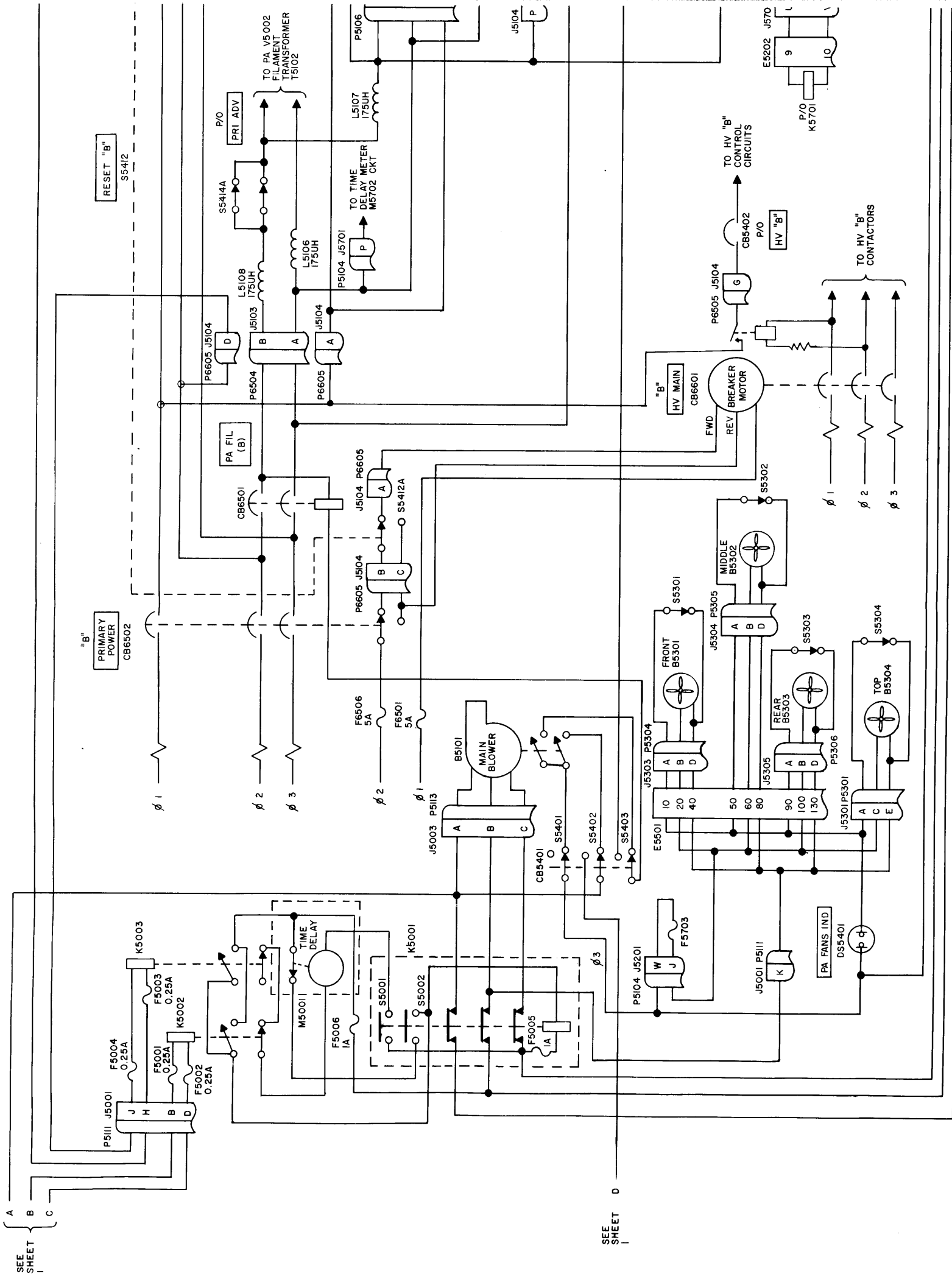


Figure 2-12. AC Power Distribution, Simplified Schematic (Sheet 2 of 2)



SEE SHEET 1

SEE SHEET D

meter M5602 and PLATE TIME meter M5601. Phase 2 and 3 voltages are applied to FINAL FIL relay K5602 and FIL TIME meter M5603. When FINAL FIL relay K5602 is energized, it closes the power supply A interlock circuits.

Phase 1 voltage from PRIMARY POWER (A) circuit breaker CB6502 is applied to BIAS (A) relay K5501, shorting relay K6003 and to the protective relay interlock circuit A. Phase 2 voltage is applied through microswitch S5411A to the FWD terminal of Breaker Motor B6003. Phase 1 and phase 2 voltages are applied to relay K5002 of the main-blower delay circuit, and to the indicator lamps associated with B6001 and B6002. Air switches associated with the blowers and fans are shown in the "N. C." position. When the blower or fan is operating normally, the associated air switch opens, thus extinguishing a corresponding indicator lamp. Phase 1 and phase 3 voltages are applied to the reset coils of relays in Relay and Indicator Panel A and to the relay panel indicators.

HV MAIN "A" circuit breaker CB6001 when operated, applies three-phase voltage to the power supply A high voltage contactors. Phase 1 voltage is applied to the control circuits of high-voltage power supply A.

The circuits of PRIMARY POWER (B) and HV MAIN (B) circuit breakers CB6502 and CB6601, respectively, are similar to those described in the above paragraphs, except that no antenna switching deck fan is used. When closed, the circuit breakers (including PA FIL (B) circuit breaker CB6501) supply power and control voltages to high voltage supply B, bias supply B, power amplifier-tube B and PSB frame crowbar drawer, in a manner similar to that described above. In this case, relay K5003 in the blower delay circuits is energized.

MAIN BLOWER circuit breaker CB5401 supplies primary power to an indicator lamp, three fluorescent lamps, a blower, and fans located in the 200K PA frame, and primary power to the retune and SWR circuits. It also feeds voltages to a buzzer alarm circuit, a contactor in the main blower circuit, indicators in the 40-kw input and blower and fan circuits, a time delay meter in the main blower circuits and the high voltage cabinet interlock circuits.

When MAIN BLOWER circuit breaker CB5401 is closed, primary power is applied to the above circuits as follows: three-phase primary power is applied to MAIN BLOWER B5101 through contactor K5001 when the contactor is energized. Phase 2 and 3 voltages are applied to FRONT fan B5301, MIDDLE fan B5302, REAR fan B5303 and TOP FAN B5304, AC ON indicator lamp DS5304 and fluorescent lamps DS5201, DS5202 and DS5203 in the 200K PA frame. Phase 2 and 3 voltages are also applied to input transformer T6201 in the retune and SWR circuits.

In normal operation, main blower B5101 causes air switches S5101 and S5108 to open, thereby opening the trip coil circuits of the PA FIL A and PA FIL B circuit breakers. This permits the circuit breakers to be closed and supply filament power to the power amplifier tubes. The switches are located at the rear and front of the tube frame and are used to insure ventilation of the power-amplifier tubes. If a defect causes the blower to fail, both air switches close, causing phase 3 voltage to trip the PA FIL (A) and PA FIL (B) circuit breakers through microswitches S5401, S5402, and S5403 located on the MAIN BLOWER circuit breaker. If either the front switch, S5102, which protects power-amplifier tube A or the rear switch, S5101, which protects power-amplifier tube B, is closed because of air obstruction, the corresponding circuit breaker, PA FIL (A) or PA FIL (B), respectively, is tripped. If for any reason, the MAIN BLOWER circuit breaker is opened, phase 3 voltage is applied through normally closed switches S5402 and S5403 to open the PA FIL (A) and PA FIL (B) circuit breakers. This prevents the filaments of the power amplifier tubes from being energized further.

When the MAIN BLOWER circuit breaker is closed, phase 1 and 2 voltages are applied to the EMERGENCY, TUNE or OPERATE indicator lamp (DS5301, DS5302 or DS5303) through a corresponding relay in the buffer frame. Phase 2 voltage is applied to the buzzer circuits through ALARM switch S5601, and is also routed to the high voltage cabinet interlock circuits. Phase 3 voltage is applied to the coil of contactor K5001 and to TIME DELAY meter M5001 when contactor K5001 is energized.

Contactors K5001 is used in conjunction with TIME DELAY meter M5001 and relays K5002 and K5003 in a blower delay circuit to keep main blower B5101 in operation for a preset period of time after both PRIMARY POWER (A) and PRIMARY POWER (B) circuit breakers are opened. This is done to insure rapid dissipation of heat from the power amplifier tubes.

When either relay K5002 or K5003 (or both) is energized, contactor K5001 is energized by phase two and phase three voltage through the closed contacts of TIME DELAY meter M5001. Contactor K5001 then locks it through its closed microswitch S5002, and the MAIN BLOWER B5101 operates normally. When both relays K5002 and K5003 are deenergized (when shutting off the equipment), TIME DELAY meter M5001 becomes energized by phase 2 and phase 3 voltages applied through closed microswitch S5001 and closed contacts of relays K5002 and K5003. After a preset time delay, the switch contacts of TIME DELAY meter M5001 open, breaking the holding circuit of contactor K5001 and thus opening the contactor and shutting off power to the main blower. Microswitch S5001 now opens, returning the TIME DELAY meter to its original position, but contactor K5001 remains off because of open microswitch S5002.

SECTION 3 TROUBLESHOOTING

3-1. INTRODUCTION.

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 3-1, is included as a visual aid to determine obvious conditions that may have caused equipment breakdown. This is followed by an equipment performance checklist, table 3-2, a procedure which systematically checks equipment performance in terms of actual operating procedures. Table 3-3 provides additional troubleshooting data based on specific trouble symptoms in the 200-kw section of the transmitter. The combined data of tables 3-1 through 3-3 will permit sectionalization of troubles to specific drawers in the transmitter. If trouble is suspected in the first four frames of the transmitter, refer to the troubleshooting procedures provided in the GPT-10K and GPT-40K maintenance manuals.

NOTE

It is assumed in this section that the trouble symptoms listed are produced by a malfunction rather than by improper operating 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.

3-2. EQUIPMENT PERFORMANCE CHECK.

Table 3-2 is a procedure that systematically checks equipment performance in terms of actual operating procedures. Perform each step in the order given.

NOTE

Numbers in parenthesis identify locations of operating controls and indicators. Refer to the GPT-200K operator's manual for front-panel location diagrams.

WARNING

Exercise extreme caution when working on the transmitter. Lethal voltages exist. No repair work should be done while a-c power

is applied, except that the auxiliary frame may be in standby.

3-3. SYSTEM TROUBLESHOOTING.

Table 3-3 provides additional troubleshooting data for the 200-kw section of the transmitter based on specific transmitter trouble symptoms. When a trouble has been sectionalized to a specific unit or circuit, refer to the applicable paragraph in this section which applies to that unit for additional troubleshooting data.

3-4. BIAS SUPPLY.

When system troubleshooting (tables 3-2 and 3-3) indicates that a trouble exists in one of the bias supplies, use the voltage and resistance data in table 3-4, in conjunction with the overall schematic diagram in section 6 to locate the defective part. Parts location is shown in figures 3-1 and 3-2.

3-5. RETUNE AND SWR CHASSIS.

When system troubleshooting indicates that a fault exists in the retune and SWR chassis, use the voltage and resistance data in table 3-5, in conjunction with the overall schematic diagram in section 6, to locate the defective part. Parts location is shown in figures 3-3 and 3-4.

3-6. 200-KW POWER AMPLIFIER.

Troubles such as faulty tubes will be easily discernible by use of procedures outlined in tables 3-2 and 3-3. Usually, malfunctions within the 200-kw power amplifier will be easily detected by observing front-panel meters. Serious defects will usually be evident by overheating or arcing. Refer to figure 3-5 to locate components in the tube frame. Refer to figures 3-6 and 3-7 for component location in the 200K PA.

3-7. ANTENNA TUNER DECK.

If systematic troubleshooting or symptoms indicate a failure within the antenna tuner deck, refer to the schematic diagrams in section 6 and figure 3-8 to locate the defective part.

3-8. HIGH-VOLTAGE POWER SUPPLIES.

If systematic troubleshooting or symptoms indicate a failure within one of the high-voltage power supplies, refer to the schematic diagrams in section 6 and figure 3-9 to locate the defective part.

TABLE 3-1. PRELIMINARY INSPECTION PROCEDURE

WHAT TO INSPECT	DEFECTS TO LOOK FOR	REMEDY
All electrical connections at rear of transmitter frames.	Open connections, dirt, frayed cables.	Tighten, replace or clean as necessary.
Antenna connection at top of transmitter.	Loose connections, dirt, frayed cables.	Tighten, replace or clean as necessary.
Intake and exhaust air ducts.	Obstructions.	Clear as necessary.
Knobs, fuse holders, connectors.	Loose or missing hardware.	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.
Shields, covers, panels, doors.	Looseness.	Secure as necessary.

TABLE 3-2. EQUIPMENT PERFORMANCE CHECK

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
1	Set 40K interlock switch at OFF. Set MAIN BLOWER circuit breaker (323) at ON. Set TIME DELAY meters (349 and 363) for 5-minute delays.	Fluorescent lamps DS5201 through DS5203, and AC ON lamp (307) light. INTERLOCK INDICATOR lamp (325) lights. B+ and POWER lamps (379 and 378) light.	PA LIGHTS fuse F5602 is open. If a fluorescent lamp does not light, check lamp, starter, and ballast. Open interlock switch, open INTERLOCK fuse F5702, or INTERLOCK switch S5410 is defective or improperly set. AC fuse F6902 is open; transformer T6201 is defective. If B+ lamp does not light, check B+ fuse; check rectifier and filter circuit in retune and SWR deck.
2	Rotate EMERGENCY-TUNE-OPERATE switch (326) to OPERATE.	OPERATE lamp lights.	Open resistor R5303, defective contacts on OPERATE relay K4001, defective contacts on switch S5407.
3	Set PRIMARY POWER A circuit breaker (393) at ON.	Main blowers and fans in the 200K PA and PS A frames operate.	If blowers and fans in the 200K PA frame do not operate, BLOWER CONTACTOR fuses F5005 or TIME DELAY fuse F5006 is open; TIME DELAY meter M5001, contactor K5001 or relay K5002 is defective; fuse F5001 or F5002 is open.

TABLE 3-2. EQUIPMENT PERFORMANCE CHECK (CONT)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
3 (CONT)			<p>If a fan in 200K PA frame does not start, it is defective; TOP FAN fuse F5603 is open.</p> <p>If blower in PS A frame does not start, HVR BLOWER fuse F5602 is open; blower is defective.</p>
4	Set PRIMARY POWER B circuit breaker at ON.	Blower and fan in PS B frame operate.	<p>If blower does not start, HVR BLOWER fuse F6502 is open, blower is defective.</p> <p>If fan does not start, TOP FAN fuse F6503 is open; fan is defective.</p>
5	Momentarily turn PRIMARY POWER A circuit breaker to OFF.	Main blower and fans in 200K and PS B frames remain on.	Fuse F5003 or F5004, is open, relay K5003 is defective.
6	Set PA FIL A circuit breaker (396) at ON.	<p>Fan in antenna switching unit operates.</p> <p>FILAMENT PRIMARY meter (376) indicates 230 volts.</p> <p>Rectifier tubes in 100-kw high voltage rectifier A glow.</p> <p>Power-amplifier tube A (front) glows.</p> <p>POWER lamp (389) lights.</p> <p>RESERVOIR meter (409) indicates voltage, and thyatron in PS A frame crowbar glows.</p> <p>FILAMENT TIME A meter (348) operates.</p>	<p>FAN fuse F6901 is open; fan B6901 is defective.</p> <p>Incorrect setting of PRIMARY ADJUST A SWITCH switch (328), meter (376) is defective.</p> <p>Defective rectifier tube or associated filament transformer; associated HV FIL fuse is open.</p> <p>Defective power amplifier tube V5001; defective transformer T5001 or T5101.</p> <p>In PS A frame crowbar drawer, FILAMENT fuse F6301 is open; CROWBAR relay K5601 is defective.</p> <p>Transformer T6301 is defective.</p> <p>If meter indication is normal, tube V6301 is defective. If tube glows, meter or resistor R6308 is defective.</p> <p>If meter does not indicate proper voltage, RESERVOIR ADJUST control R6305 is misadjusted or defective.</p> <p>ELAPSE METER fuse F5605 is open; meter is defective.</p>
7	Set PA FIL B circuit breaker (413) at ON.	FILAMENT PRIMARY meter (400) indicates 230 volts.	Incorrect setting of PRIMARY ADJUST B SWITCH switch (329); meter or circuit breaker is defective.

TABLE 3-2. EQUIPMENT PERFORMANCE CHECK (CONT)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
7 (CONT)		<p>Rectifier tubes in 100-kw high voltage rectifier B glow.</p> <p>Power-amplifier tube B (rear) glows.</p> <p>RESERVOIR meter (392) indicates voltage and thyatron in PS B frame crowbar glows.</p>	<p>Defective rectifier tube or associated filament transformer; associated HV FIL fuse is open.</p> <p>Defective power amplifier tube V5002; defective transformer T5002 or T5102.</p> <p>Transformer T6301 is defective.</p> <p>If meter indication is normal, tube V6301 is defective. If tube glows, meter or resistor R6308 is defective.</p> <p>If meter does not indicate proper voltage, RESERVOIR ADJUST control R6305 is misadjusted or defective.</p>
8	Set AC switch (338) to ON.	<p>FILAMENT TIME B meter (362) operates.</p> <p>AC ON lamp (337) lights.</p> <p>After delay of 5 minutes, BIAS ON lamp (339) lights and BIAS VOLTS meter (374) indicates 450 volts.</p>	<p>ELAPSE METER fuse F5702 is open; meter is defective.</p> <p>AC fuse F5502 in bias supply A drawer is open.</p> <p>BIAS fuse F5501 in bias supply A is open.</p> <p>If the filaments of voltage regulators V5502 and V5503, and control tube V5501 do not glow, transformer T5502 is defective.</p> <p>If gas regulator tubes V5504 and V5505 do not glow, TIME DELAY fuse F5601 is open, gas tube is defective; TIME DELAY meter M5602 is defective; SHORTING RELAY fuse F5604 is open; relay K5501 or transformer T5501 is defective; full wave rectifier is defective.</p> <p>If BIAS VOLTS meter indicates abnormal voltage, BIAS ADJUST control (340) is misadjusted or defective.</p> <p>If no reading is obtained on BIAS VOLTS meter, meter is defective.</p>
9	Set AC switch (342) at ON.	<p>AC ON lamp (341) lights.</p> <p>After 5-minute delay, BIAS ON lamp (343) lights and BIAS VOLTS meter (398) indicates 450 volts.</p>	<p>AC fuse F5502 in bias supply B is open.</p> <p>BIAS fuse F5501 in bias supply B is open.</p>

TABLE 3-2. EQUIPMENT PERFORMANCE CHECK (CONT)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
9 (CONT)			<p>If the filaments of voltage regulators V5502 and V5503, and control tube V5501 do not glow, transformer T5502 is defective.</p> <p>If gas regulator tubes V5504 and V5505 do not glow, TIME DELAY fuse F5701 is open; gas tube is defective; TIME DELAY meter M5702 is defective; SHORTING RELAY fuse F5705 is open; relay K5501 or transformer T5501 is defective; full wave rectifier unit is defective.</p> <p>If BIAS VOLTS meter indicates abnormal voltage, BIAS ADJUST control (344) is misadjusted or defective.</p> <p>If no reading is obtained on BIAS VOLTS meter, meter is defective.</p>
10	Set HIGH VOLTAGE A circuit breaker (335) to ON.	<p>The following lamps light:</p> <p>HV TOP PLATE A ON (319) HV LIGHTS</p> <p>PLATE TIME A meter (350) operates.</p> <p>High voltage rectifier A tubes glow slightly.</p> <p>After approximately 20 seconds, PLATE VOLTS meter (375) indicates 20 kilovolts.</p>	<p>In PS A frame, BREAKER MOTOR fuse F6501 or F6506 is open; circuit breaker CB5402, CB6001 or microswitch on contactor relay K6002 is defective.</p> <p>If HV LIGHTS lamps does not light, PA LIGHTS fuse F6505 is open.</p> <p>Meter is defective.</p> <p>Contactor relay K6002 is defective; series resistor R6001, R6002, or R6003 is defective.</p> <p>If a rectifier tube does not glow, tube or associated transformer is defective.</p> <p>TIMER M6001 or contactor relay K6001 is defective.</p>
11	Set HIGH VOLTAGE B circuit breaker (336) at ON.	<p>The following lamps light:</p> <p>HV TOP PLATE B ON (322) HV LIGHTS</p> <p>PLATE TIME B meter (364) operates.</p>	<p>In PS B frame, BREAKER MOTOR fuse F6501 or F6506 is open; circuit breaker CB5403, CB6601 or microswitch on contactor relay K6602 is defective.</p> <p>If HV LIGHTS lamps do not light, PA LIGHTS fuse F6505 is open.</p> <p>Meter is defective.</p>

TABLE 3-2. EQUIPMENT PERFORMANCE CHECK (CONT)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
11 (CONT)		High voltage rectifier B tubes glow slightly. After approximately 20 seconds, PLATE VOLTS meter (399) indicates 20 kilovolts.	Contactory relay K6602 is defective, series resistor R6601, R6602, or R6603 is defective. If a rectifier does not glow, rectifier tube or associated transformer is defective. TIMER M6001 or contactory relay - K6001 is defective.

TABLE 3-3. SYSTEM TROUBLESHOOTING

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
1	MAIN BLOWER circuit breaker CB5401 trips continually.	Short circuit in main blower B5101.	Check B5101.
2	LIGHTS fuse F6502 is open.	Short in fluorescent lamp circuit of 200K PA frame.	Check DS5201 through DS5203 lamp circuit.
		Short in lamp circuits of 40-kw input control section.	Check DS5301 through DS5303 lamp circuit.
3	INTERLOCK fuse F5704 is open.	Short in relay K5301.	Check relay K5301.
		Short circuit in interlock path.	Check connections in high voltage interlock.
4	AC fuse F6902 is open.	Transformer T6201 in retune and SWR chassis is shorted.	Check transformer T6201.
		Shorted rectifier CR6201.	Check rectifier CR6201.
		Shorted coil in coaxial relays K4001, K4002, or K4003.	Check coaxial relays K4001, K4002, and K4003.
5	B+ fuse F6903 is open.	Short in retune chassis power supply.	Check capacitor C6204, diode CR6202, and rectifier CR6201.
		Short circuit in dc amplifier V6201 or V6202.	Check amplifiers V6201 and V6202.
6	PRIMARY POWER A circuit breaker CB6502 trips continually.	Short in PS A frame primary power load.	Check loads controlled by circuit breaker CB6502. (See figure 2-12).
7	PRIMARY POWER B circuit breaker CB6502 trips continually.	Short in PS B frame primary power load.	Check loads controlled by circuit breaker CB6502. (See figure 2-12).

TABLE 3-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
8	BLOWER CONTACTOR fuse F5005 is open.	Short in coil of contactor K5001.	Check coil of contactor K5001.
9	TIME DELAY fuse F5006 is open.	Short in TIME DELAY meter M5001.	Check TIME DELAY meter M5001.
10	RELAY A fuse F5001 or F5002 is open.	Short in relay K5002.	Check relay K5002.
11	TOP FAN fuse F6503 in PS A frame is open.	Short in top fan.	Check fan B6001.
12	TOP FAN fuse F6503 in PS B frame is open.	Short in top fan.	Check fan B6601.
13	HVR BLOWER fuse F6502 in PS A frame is open.	Short in blower.	Check blower B6002.
14	HVR BLOWER fuse F6502 in PS B frame is open.	Short in blower.	Check blower B6602.
15	RELAY B fuse F5003 or F5004 is open.	Short in relay K5003.	Check relay K5003.
16	PA FIL A circuit breaker CB6501 trips continually.	Shorted filament in V5001.	Check V5001.
		Shorted filament transformer T5101.	Check transformer T5101.
		Shorted FINAL FILAMENT relay K5602.	Check relay K5602.
		MAIN BLOWER B5101 does not operate.	Check blower B5101.
		Air switch S5108 (front) is defective.	Check switch S5108.
17	PA FIL B circuit breaker CB6501 trips continually.	Shorted filament in V5002.	Check V5002.
		Shorted filament transformer T5102.	Check transformer T5102.
		Shorted FINAL FILAMENT relay K5702.	Check relay K5702.
		MAIN blower B5101 is in-operative.	Check blower B5101.
		Air switch S5101 (rear) is defective.	Check switch S5101.
18	FAN fuse F6901 is open.	Shorted fan in antenna switching unit.	Check fan B6901.
19	HV FIL fuse (one of fuses F6401 through F6406) is open, in either 100-kw high voltage rectifier.	Shorted filament transformer.	Check associated transformer (T6401 through T6406).

TABLE 3-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
20	FILAMENT fuse F6301 in crowbar drawer PS A or PS B frame.	Shorted filament in thyatron V6301.	Check V6301.
		Shorted filament transformer T6301.	Check transformer T6301.
21	ELAPSE METER fuse F5605 is open.	Shorted FILAMENT TIME meter M5603.	Check meter M5603.
22	ELAPSE METER fuse F5702 is open.	Shorted FILAMENT TIME meter M5701.	Check meter M5701.
23	AC fuse F5502 in bias supply A or B is open.	Shorted transformer T5501 or T5502.	Check transformers T5501 and T5502.
24	BIAS fuse F5501 in bias supply A or B is open.	Short in rectifier or filter circuit of bias supply.	Check rectifier CR5501 and capacitor C5509.
		Defective component in voltage regulator circuit.	Check tubes V5501 through V5506 and associated components.
		Short circuit in output of bias supply.	Check output load for short circuit.
25	TIME DELAY fuse F5601 is open.	Shorted TIME DELAY meter M5602.	Check meter M5602.
26	SHORTING RELAY fuse F5604 is open.	Shorted coil of shorting relay K6003.	Check relay K6003.
		Shorted relay K5501 in bias supply A.	Check relay K5501.
27	TIME DELAY fuse F5701 is open.	Shorted TIME DELAY meter M5702.	Check meter M5702.
28	SHORTING RELAY fuse is open.	Shorted coil in shorting relay K6603.	Check relay K6603.
		Shorted coil of relay K5501 in bias supply B.	Check relay K5501.
29	BREAKER MOTOR fuse K6501 or BREAKER MOTOR fuse F6506 in PS A frame is open.	Short in breaker motor B6003.	Check breaker motor B6003.
30	HV MAIN A circuit breaker in PS A frame trips continually.	Short in high voltage transformer T6001, T6002, or T6003.	Check transformers T6001 through T6003.
		Short in rectifier circuit of high voltage power supply.	Check tubes V6401 through V6406 in power supply A frame.
		Short in filter circuit of high voltage rectifier.	Check capacitors C6003 and C6004.
31	LIGHTS fuse F6505 in PS A frame is open.	Short in fluorescent lamp circuit of power supply A frame.	Check connections to lamps DS6101 and DS6102.

TABLE 3-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
31 (CONT)		Short in indicator lamp reset circuit in relay panel A.	Check connections to lamps DS5601 through DS5607.
32	LIGHTS fuse F6505 when RESET A switch is depressed.	Short in coil of reset relay.	Check reset coils of K5603 through K5606.
33	BREAKER MOTOR fuse F6501 or BREAKER MOTOR fuse F6506 in PS B frame is open.	Short in breaker motor B6603.	Check breaker motor B6603.
34	HV MAIN B circuit breaker in PS B frame trips continually.	Short in high voltage transformer T6601, T6602, or T6603. Short in rectifier circuit of high voltage power supply. Short in filter circuit of high voltage power supply.	Check transformers T6601, T6602, and T6603. Check tubes V6401 through V6406 in power supply B frame. Check capacitors C6603 and C6604.
35	LIGHTS fuse F6505 in PS B frame is open.	Short in fluorescent lamp circuit of PS B frame. Short in indicator lamp reset circuit of relay panel B.	Check connections to lamps DS6201 and DS6202. Check connections to lamps DS5707 through DS5711.
36	PLATE OVLD A lamp is lit.	Defective power amplifier tube V5001.	Check amplifier V5001.
37	PLATE OVLD B lamp is lit.	Defective power amplifier V5002.	Check amplifier V5002.
38	HIGH VOLTAGE A or HIGH VOLTAGE B circuit breaker continually trips.	Defective interlock switch.	Check interlock circuit for open switch. (See figure 2-11.)
39	ALARM fuse F5603 is open.	Shorted buzzer DS5101.	Check buzzer DS5101.
40	BIAS VOLTS meter A indicates abnormally low voltage, but high voltage remains on.	Protective relay circuit is defective or misadjusted	Check BIAS relay K5609 and resistor R5605 in relay panel A. Adjust BIAS RELAY ADJ control R5608. (Refer to par. 4-3.)
41	BIAS VOLTS meter B indicates abnormally low voltage, but high voltage remains on.	Protective relay circuit is defective or misadjusted.	Check BIAS relay K5709 and resistor R5707. Adjust BIAS RELAY ADJ control R5710. (Refer to par. 4-3.)
42	PLATE RF meter indicates abnormally low r-f voltage (plate current is high), but high voltage remains on.	RETUNE OVLD SET control is misadjusted. Protective relay circuit is defective. TUBE PROTECT control R5603 is misadjusted or relay is defective (when on power amplifier tube A is on).	Adjust RETUNE OVLD set control R6213. (Refer to par. 4-3.) Check RETUNE relay K5605. Adjust TUBE PROTECT control R5603. (Refer to par. 4-3.) Check relay K5607.

TABLE 3-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
42 (CONT)		TUBE PROTECT control R5703 is misadjusted or relay is defective (when only power amplifier tube B is on).	Adjust TUBE PROTECT control R5703. (Refer to par. 4-4.) Check relay K5707.
43	SWR meter indicates excessive level, but high voltage remains on.	Defective dc amplifier in retune and SWR chassis.	Check dc amplifier V6201.
44	GRID CURRENT meter A indicates excessive current, but high voltage remains on.	SWR OVLD SET control is misadjusted.	Adjust SWR OVLD SET control R6217. (Refer to par. 4-4.)
45	SWR meter indicates excessive level, but high voltage remains on.	Switch on SWR meter is misadjusted or defective.	Check switch on SWR meter.
46	GRID CURRENT meter A indicates excessive current, but high voltage remains on.	Protective relay circuit is defective.	Check SWR relay K5606.
47	GRID CURRENT meter B indicates excessive current, but high voltage remains on.	Defective dc amplifier in retune and SWR chassis.	Check dc amplifier V6202.
48	GRID CURRENT meter B indicates excessive current, but high voltage remains on.	GRID OVLD ADJ control R5607 is misadjusted.	Adjust GRID OVLD ADJ control R5607. (Refer to par. 4-4.)
49	High voltage interlock A circuit is open, but FILAMENT PRIMARY meter A indicates normal voltage.	Protective relay circuit is defective.	Check GRID OVLD relay K5704 and resistor R5606.
50	High voltage interlock B circuit is open, but FILAMENT PRIMARY meter B indicates normal voltage.	GRID OVLD ADJ control R5705 is misadjusted.	Adjust GRID OVLD ADJ control R5705.
51	High voltage arcing occurs in PA but high voltage remains on.	Protective relay circuit is defective.	Check GRID OVLD relay K5704 and resistor R5706.
52	TUNE lamp DS5302 does not light when switch S5407 is set at TUNE.	Protective relay circuit is defective.	Check FINAL FILAMENT relay K5602.
53	EMERGENCY lamp DS5301 does not light when switch S5407 is set at EMERGENCY.	Protective relay circuit is defective.	Check FINAL FILAMENT relay K5702.
54	Buzzer DS5101 does not operate and high voltage is off in either power supply A or B.	Defective thyatron V6301.	Check V6301.
55		Defective trigger transformer T6302.	Check T6302.
56		TUNE relay K4002 is defective.	Check relay K4002.
57		EMERGENCY relay K4003 is defective.	Check relay K4003.
58		Defective ALARM switch S5601.	Check switch S5601.

TABLE 3-3. SYSTEM TROUBLESHOOTING (CONT)

ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
51 (CONT)		Defective buzzer DS5101.	Check buzzer DS5101.
52	TUNE lamp lights but dummy load is not connected across driver output.	Coaxial contacts of TUNE relay K4002 are defective.	Check relay K4002.
53	EMERGENCY lamp lights but no indication appears on KW OUTPUT meter (transmitter set up for emergency operation).	Coaxial contacts of EMERGENCY relay are defective.	Check relay K4003.
54	TUNE lamp does not go out when S5407 is turned away from TUNE position.	OPEN coil of TUNE relay K4002 is defective.	Check OPEN coil of relay K4002.
55	EMERGENCY lamp does not go out when S5407 is turned away from EMERGENCY position.	OPEN coil of EMERGENCY relay K4003 is defective.	Check OPEN coil of relay K4003.
56	No 40K interlock connection is made, OPERATE lamp lights, and high voltage A is on.	Microswitch S6011 on contactor K6001 is defective.	Check microswitch S6011.
57	No 40K interlock connection is made, OPERATE lamp lights, and high voltage B is on.	Microswitch S6611 on contactor K6601 is defective.	Check microswitch S6611.
58	No 40K interlock connection is made, OPERATE lamp lights, and either or both high voltage supplies is on.	Buffer compartment interlock switch S4004, S4005, or S4006 is defective.	Check switches S4004, S4005, and S4006.
59	Tube frame is overheating, but high voltage interlock remains closed.	Thermostat S5005 or resistor R5007 is defective.	Check S5005 and R5007.
60	BANDSWITCH S5311 cannot be operated.	Thermostat S5006 or resistor R5008 is defective.	Check S5006 and R5008.
61	OUTPUT BANDSWITCH S5312 cannot be operated.	HEAT OVLD relay K5705 is defective.	Check relay K5705.
62	BANDSWITCH S5311 cannot be operated.	BANDSWITCH RELEASE switch S5415 is defective.	Check switch S5415.
63	OUTPUT BANDSWITCH S5312 cannot be operated.	Solenoid L5311 is defective.	Check solenoid L5311.
64	40K INTERLOCKS fuse is open.	OUTPUT BANDSWITCH RELEASE switch S5404 is defective.	Check switch S5404.
65	40K INTERLOCKS fuse is open.	Solenoid L5317 is defective.	Check solenoid L5317.
66	40K INTERLOCKS fuse is open.	Shorted 40K INTERLOCK relay K5706.	Check relay K5706.

TABLE 3-3. SYSTEM TROUBLESHOOTING (CONT)

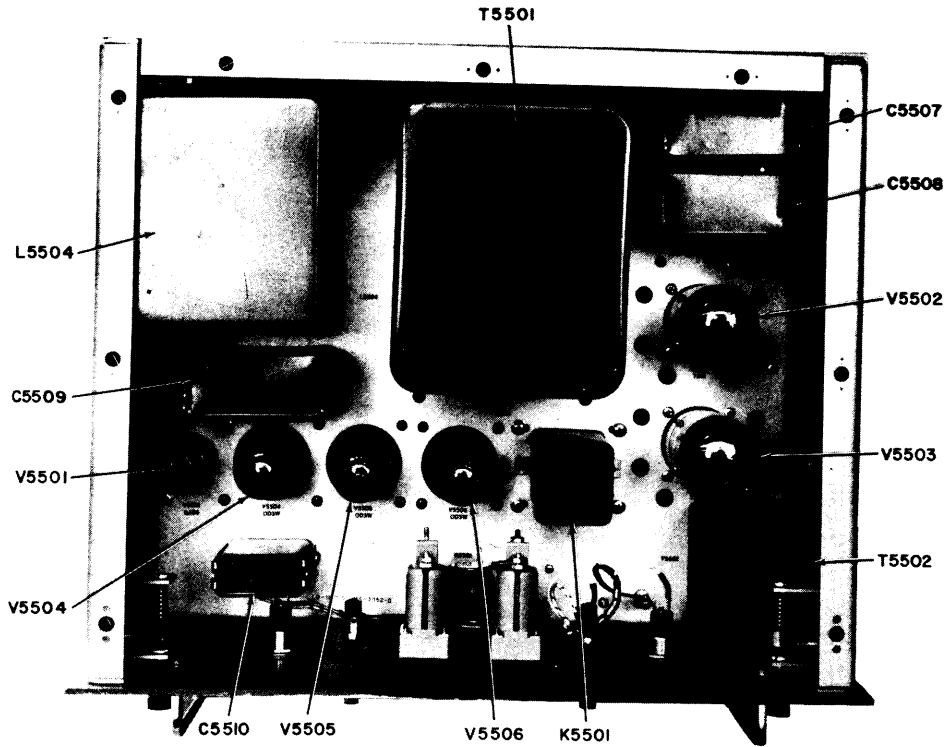
ITEM	INDICATION	PROBABLE TROUBLE	PROCEDURE
63	Null cannot be obtained on BALANCE meter when BALANCE control is rotated (balanced output operation only).	Meter or associated rectifier is defective. Antenna tuner deck component defective.	Check BALANCE meter M6705 and meter rectifier Z6801. Check T6801, C6802, and resistors R6801 through R6806.

TABLE 3-4. BIAS SUPPLY AP-108, VOLTAGE AND RESISTANCE DATA

(To Be Supplied)

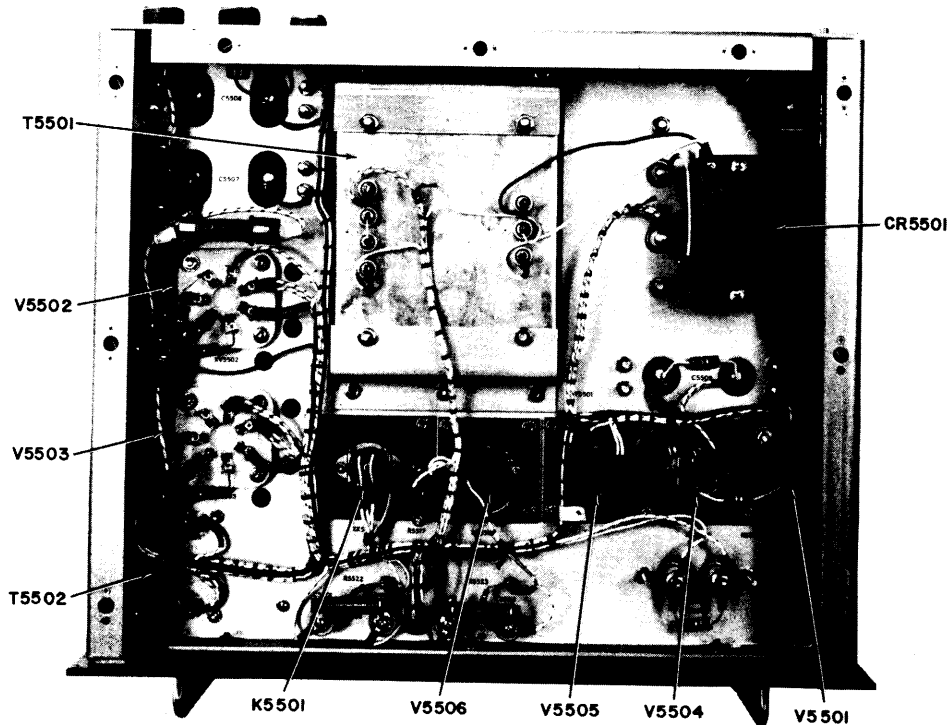
TABLE 3-5. RETUNE AND SWR CHASSIS, VOLTAGE AND RESISTANCE DATA

(To Be Supplied)



321-14

Figure 3-1. Top View, Bias Supply



321-15

Figure 3-2. Bottom View, Bias Supply

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658.13-10

658.13-11

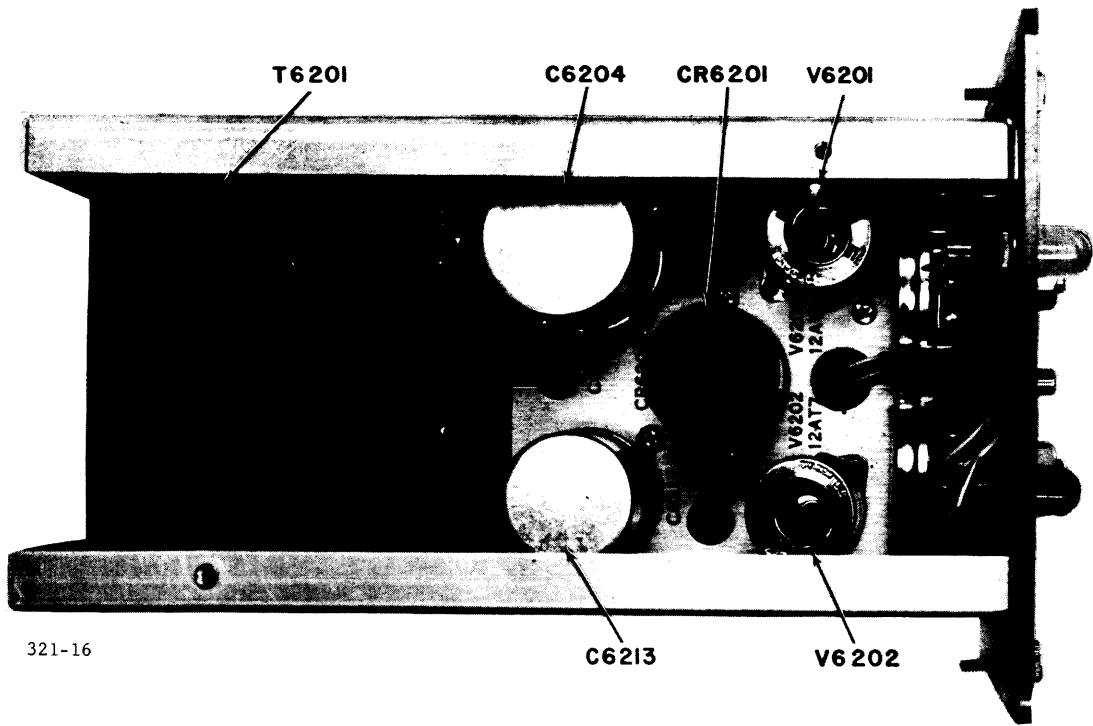


Figure 3-3. Top View, Retune and SWR Chassis

658.13-12

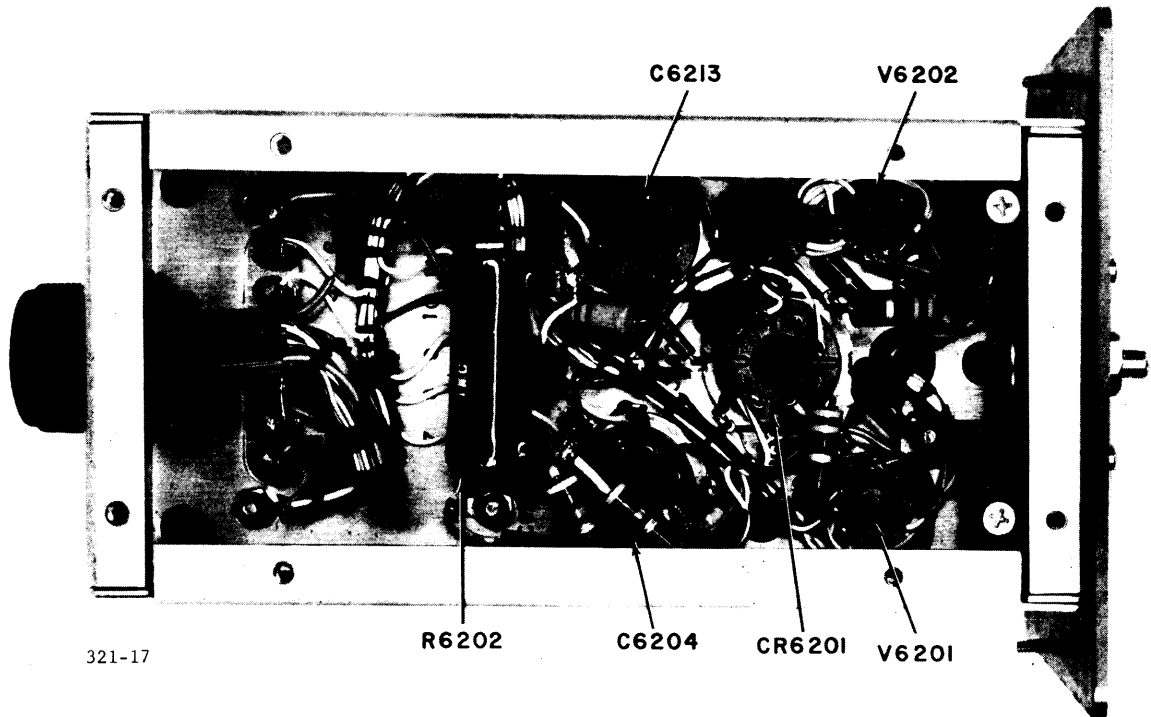
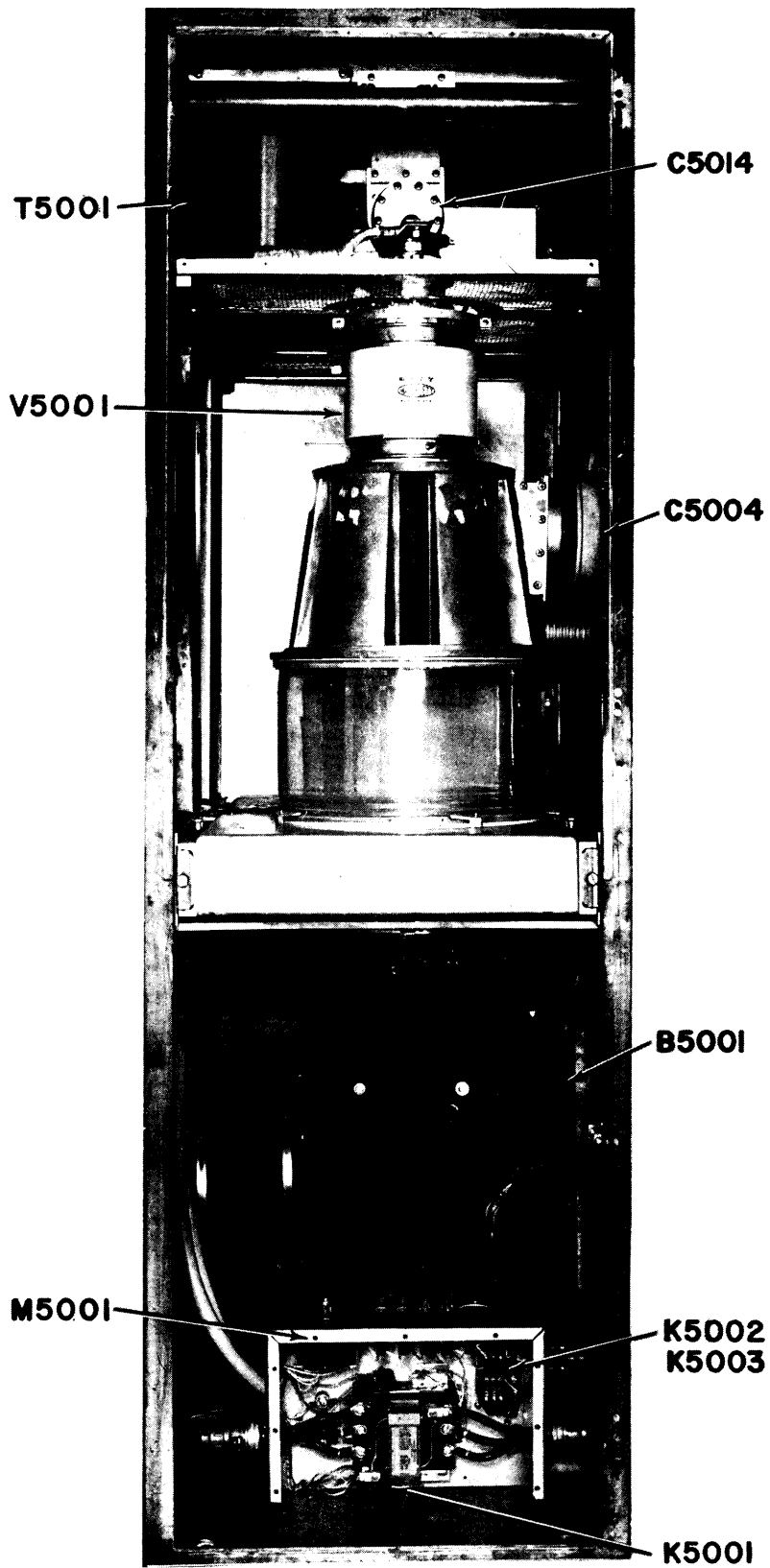


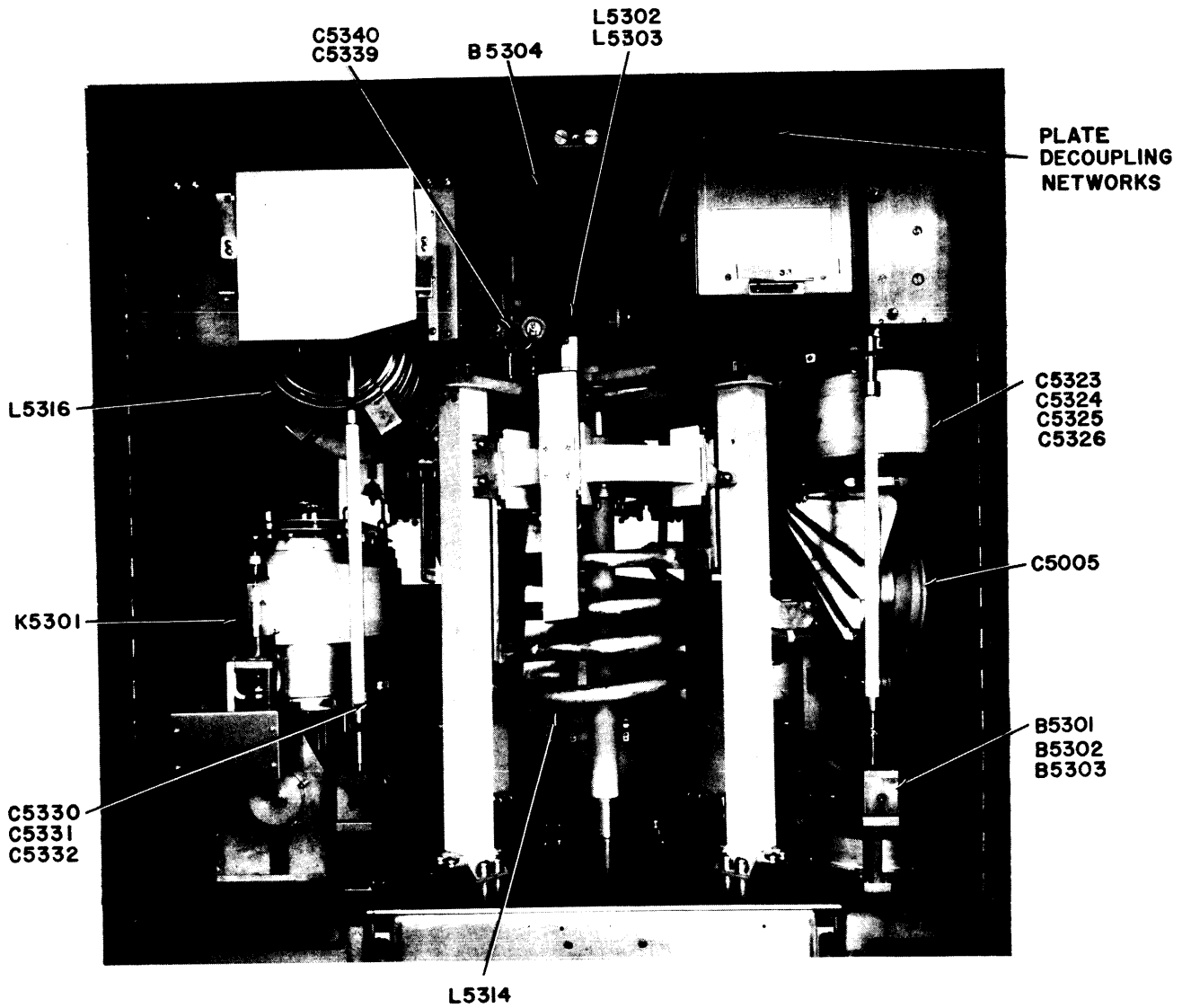
Figure 3-4. Bottom View, Retune and SWR Chassis



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321-18

Figure 3-5. Tube Frame



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321-19

Figure 3-6. Rear View, 200K PA

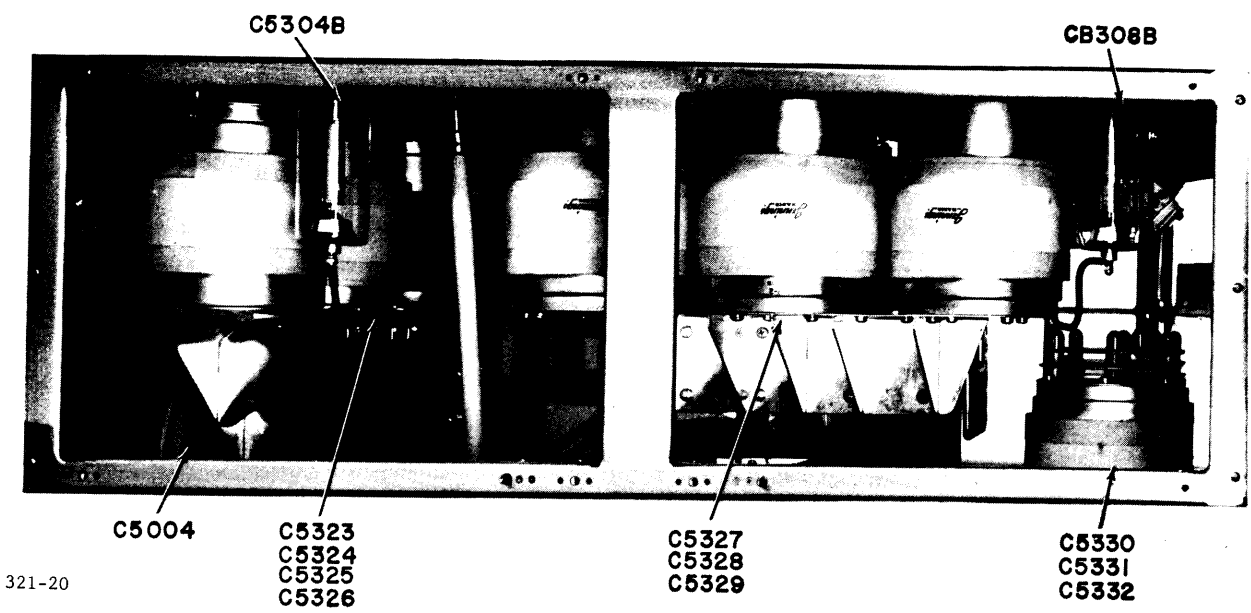


Figure 3-7. Front View, 200K PA

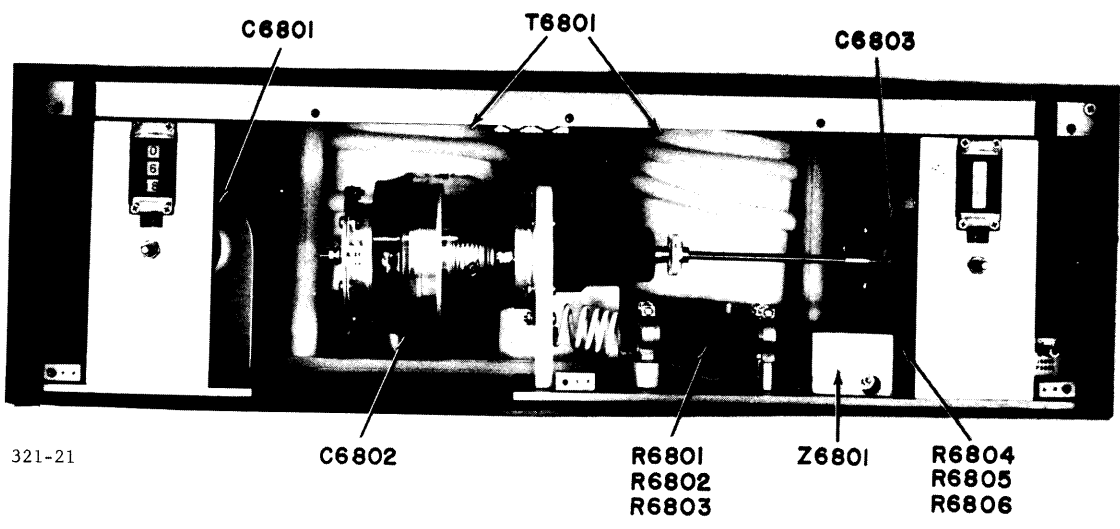
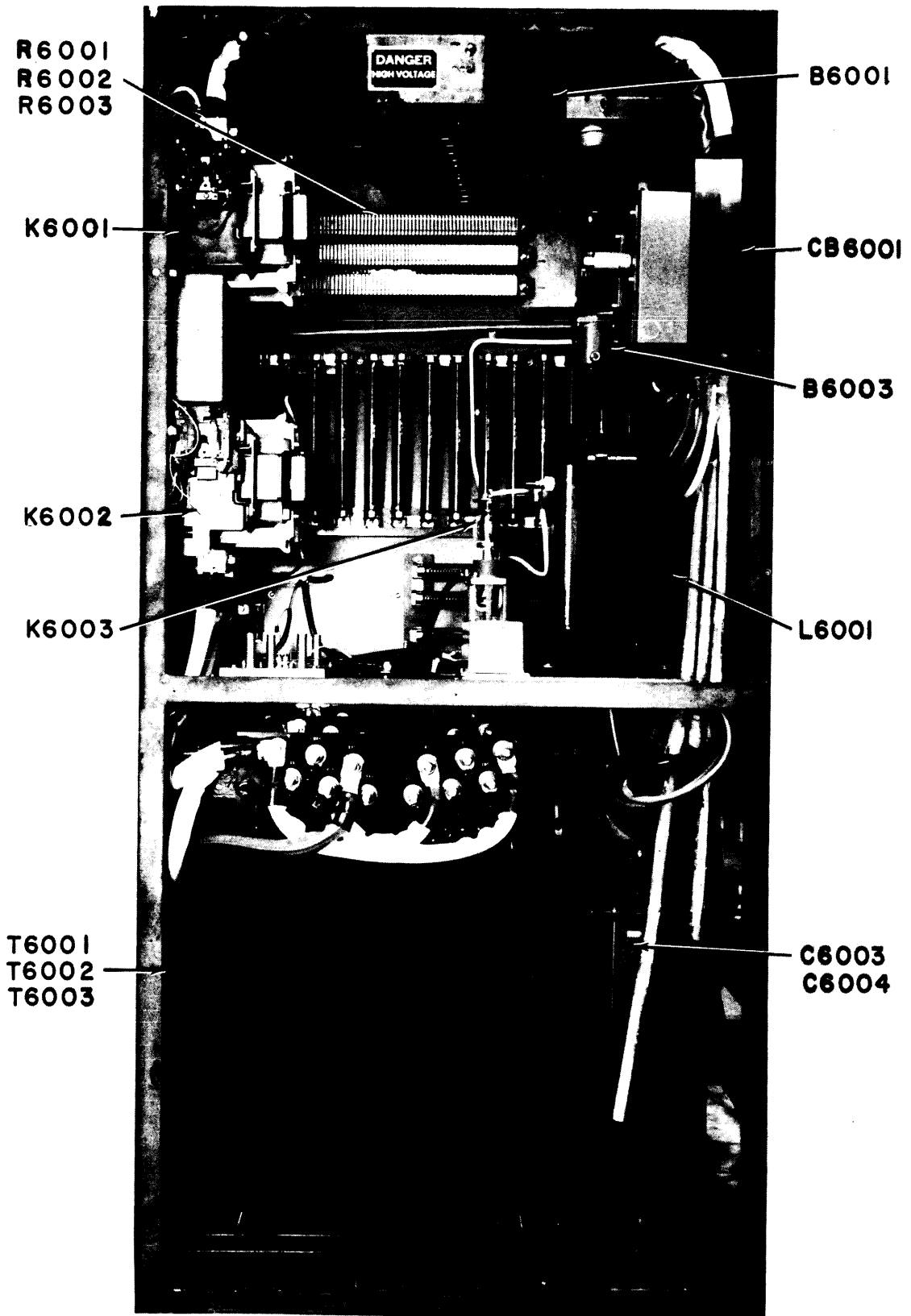


Figure 3-8. Front View, Antenna Tuner Deck

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321-22

Figure 3-9. Rear View, PSA or PSB Frame

SECTION 4 MAINTENANCE

4-1. GENERAL.

Maintenance is divided into three categories: operator's maintenance, preventive maintenance, and corrective maintenance. The operator's maintenance, normally performed by the operator as he works with the equipment, is confined to visual inspection, cleaning, and fuse replacement. Operator's maintenance for the GPT-200K transmitter is included in the associated operating manual. Preventive and corrective maintenance procedures are given 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. Some trouble-producing conditions 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 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" PERIODS. Recondition rotary and switch contacts as necessary. Use crocus cloth and trichlorethylene or ethylenedichloride for cleaning. Inspect and clean the transmitter. Check the condition of the 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. Note the condition of gear trains; those 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. ADJUSTMENTS.

NOTE

Control and indicator reference numbers (numbers enclosed in parenthesis) are callouts located on figures 2-1 through 2-7 of the GPT-200K Operator's Manual.

a. PLATE OVERLOAD.

- (1) Tune transmitter to full output at 8 mc.
- (2) Overload transmitter output by decreasing setting of LOAD control (312), or detuning TUNE control (309).

(3) When PLATE CURRENT A meter (302) indicates 7.5 amperes, adjust PLATE OVLD ADJ control until PLATE OVERLOAD relay K5603 trips. Depress RESET A switch (332) to reset relay.

(4) With a reading of 7.5 amperes on PLATE CURRENT B meter (303), adjust PLATE OVLD ADJ control (368) until PLATE OVERLOAD relay K5603 trips. Depress RESET B switch (333) to reset relay.

b. GRID OVERLOAD.

- (1) Tune transmitter to full output at 8 mc.
- (2) Unload transmitter output by increasing setting of LOAD control (312). The readings on the GRID CURRENT meters (373 and 393) should increase.

(3) Adjust GRID OVLD ADJ control (355) so that GRID OVERLOAD relay K5604 trips at a reading of 1 ampere on GRID CURRENT meter (373). Depress RESET A switch (332) to reset relay.

(4) Adjust GRID OVLD ADJ control (369) so that GRID OVERLOAD relay K5704 trips at reading of 1 ampere on GRID CURRENT meter (397). Depress RESET B switch (333) to reset relay.

c. RETUNE OVERLOAD.

- (1) Tune transmitter to 8 mc.
- (2) Adjust drive so that PLATE RF meter (304) indicates 3 kv.
- (3) Adjust RETUNE OVLD SET control (381) so that RETUNE relay K5605 trips. Bring control back slightly, then depress RESET A switch (332) to reset relay.

(4) Recheck operation by misadjusting TUNE control (309), so that PLATE RF meter reading drops to 2 kv with 3 amperes of plate current. RETUNE relay K5605 should trip again. Depress RESET A switch (332) to reset relay.

d. BIAS.

(1) Adjust BIAS ADJUST control (340) so that a minimum reading is produced on BIAS VOLTS meter (374).

(2) Adjust BIAS RELAY ADJ control (356) so that BIAS relay K5609 trips.

(3) Reset BIAS ADJ control (340) so that reading on BIAS VOLTS meter (374) is 450 volts dc.

(4) Adjust BIAS ADJUST control (344) so that a minimum reading is produced on BIAS VOLTS meter (398).

(5) Adjust BIAS RELAY ADJ control (370) so that BIAS relay K5709 trips.

(6) Reset BIAS ADJUST control so that reading on BIAS VOLTS meter (398) is 450 volts dc.

e. TUBE PROTECT.

(1) Adjust plate current of PA tube A so that PLATE CURRENT A meter (302) reads 3 amperes.

(2) Adjust TUBE PROTECT control (358) until TUBE PROTECT relay K5607 operates, causing RETUNE relay K5605 to trip. Depress RESET A switch (332) to reset relay.

(3) Adjust plate current of PA tube B so that PLATE CURRENT B meter (303) reads 3 amperes.

(4) Adjust TUBE PROTECT control (372) until TUBE PROTECT relay K5707 operates, causing RETUNE relay K5605 to trip. Depress RESET A switch (332) to reset relay.

f. SWR.

(1) Open SWR overload coil line by removing wire at terminal 44 on E5603 in relay panel A.

(2) Connect a milliammeter in series with terminal 44 and opened wire.

(3) Adjust SWR OVLD SET control (380) for a reading of 1.5 ma on meter. Connect wire to terminal 44 of E5603.

(4) To check, adjust black and red pointers on SWR meter (337) so that the pointers touch. SWR relay K5606 should trip. Readjust pointers on SWR meter for normal operation, and depress RESET A switch (332) to reset relay.

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. Generic name.

- b. Reference designation.
- 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 Subassembly	Page
Buffer Frame (Symbol Series 4000)	5-2
Tube Frame (Symbol Series 5000)	5-3
200K PA Frame (Symbol Series 5100)	5-7
200K PA Frame Meter Panel (Symbol Series 5200)	5-8
200-KW PA (Symbol Series 5300)	5-9
200K PA Frame Control Panel (Symbol Series 5400)	5-14
Bias Supply A and B (Symbol Series 5500)	5-16
Relay and Indicator Panel A (Symbol Series 5600)	5-18
Relay and Indicator Panel B (Symbol Series 5700)	5-21
PSA Frame (Symbol Series 6000)	5-23
PSA Frame Meter Panel (Symbol Series 6100)	5-27
Retune and SWR Chassis (Symbol Series 6200)	5-28
PSA Frame and PSB Frame Crowbar Drawers (Symbol Series 6300)	5-30
100-KW High Voltage Rectifier A and B (Symbol Series 6400)	5-31
PSA Frame and PSB Frame Control Panels (Symbol Series 6500)	5-33
PSB Frame (Symbol Series 6600)	5-34
PSB Frame Meter Panel (Symbol Series 6700)	5-37
Antenna Tuner Deck (Symbol Series 6800)	5-38
Antenna Switching Unit (Symbol Series 6900)	5-39

BUFFER FRAME

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C4001	CAPACITOR, FIXED, VACUUM: 3 uuf; 17,000 volts peak; 7 amp current rating.	CO102-3
C4002	CAPACITOR, FIXED, MICA DIELECTRIC: 100 uuf, $\pm 10\%$; 500 WVDC; char. B.	CM20B101K
C4003	CAPACITOR, FIXED, MICA DIELECTRIC: 10,000 uuf, $\pm 10\%$; 500 WVDC; char. B.	CM35B103K
C4004 thru C4022	Same as C4003.	
C4023	CAPACITOR, VARIABLE, VACUUM: capacitance range from 35 uuf, $\pm 5\%$ to 270 uuf, $\pm 5\%$; peak voltage 7.5 Kv; current rating 42 amps.	CB170
E4001	TERMINAL BOARD, BARRIER: 2 terminals; 6-32 thd x 1/4" long binder head screws; phenolic body.	TM102-2
E4002	TERMINAL BOARD, BARRIER: 14 terminals; 6-32 thd x 1/4" long binder head screws; phenolic body.	TM100-14
E4003	Same as E4002.	
J4001	ADAPTER: flang-unflanged type; 3-1/8" dia.; 5-3/16" OD dia. x 2-1/2" long.	PO274-1
J4002	CONNECTOR, RECEPTACLE, ELECTRICAL: RF; 1 round female contact, straight type; 52 ohms; series BNC to BNC.	UG625B/U
J4003 thru J4005	Same as J4002.	
J4006	CONNECTOR, RECEPTACLE, ELECTRICAL: 14 female socket type contacts. Part of W4001.	MS3102A20-27S
J4007	Same as J4006. Part of W4001.	
J4008	Same as J4006. Part of W4001.	
K4001	RELAY, SWITCH: DPDT; frequency range 0-100 mc; impedance 50 ohms, operating voltage 115/230 VAC, 60 cycles; 7 amps resistive; 3 watts average.	RL155
K4002	Same as K4001.	
K4003	Same as K4001.	
L4001	COIL, RADIO FREQUENCY: fixed; 35 uh, $\pm 5\%$; 1 ohm DC resistance.	CL292
L4002 thru L4010	Same as L4001.	
MP4001	COUNTER, PRECISION: rotating; 3 wheel, 0-9 each wheel.	CY108
P4001	CONNECTOR, PLUG, ELECTRICAL: 14 male contacts, pin type.	MS3106B20-27P
P4002	Same as P4001.	

BUFFER FRAME (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P4003	Same as P4001.	
P4004	CONNECTOR, PLUG, ELECTRICAL: RF; dielectric-teflon; used with RG174/U coaxial wire. Part of W4001.	PL169
P4005 thru P4007	Same as P4004. Part of W4001.	
P4008	CONNECTOR, PLUG, ELECTRICAL: 35 male contacts, pin type. Part of W4001.	MS3106B32-7P
R4001	RESISTOR, FIXED, FILM DIELECTRIC: 140 ohms, $\pm 5\%$; 3,000 watts.	RR120-140
R4002	Same as R4001.	
R4003	Same as R4001.	
S4001	SWITCH, PUSH-PULL: SPDT; total travel push operation 0.312"; total travel pull operation 0.312"; 5 amps at 120/250 VAC; 0.2 amp resistive at 250 VDC.	SW230
S4002	Same as S4001.	
S4003	Same as S4001.	
T4001	TRANSFORMER, RADIO FREQUENCY: primary impedance 50 ohms, unbalanced; secondary impedance 15 ohms, unbalanced; 20 Kw output.	TR180
W4001	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of various lengths and colors of MWC wire; connectors J4006, J4007, J4008, P4004, P4005, P4006, P4007 and P4008.	CA762
XZ4001	SOCKET, ELECTRON TUBE: octal, high crown.	TS101P01
Z4001	NETWORK, DETECTOR METERING CIRCUIT: frequency range 4 to 28 mc; input -55 volts RF (pin 1), 200 ua max.; output 3 VDC (pin 3); octal base.	AX219

TUBE FRAME

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B5001	FAN, CENTRIFUGAL: current rating 37.4 amps at 220 VAC, 18.7 amps at 440 VAC, 40.0 amps at 208 VAC; 15 HP motor, 3520 RPM.	BL113
C5001	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 uuf, $\pm 20\%$, 5000 WVDC; 6-32 tapped studs each end; 13/16" dia. x 7/8" long o/a.	CC109-38
C5002	Same as C5001.	
C5003	Same as C5001.	
C5004	CAPACITOR, FIXED, VACUUM: capacitance 1000 uuf; cont. current 200 amp; volts peak 45 Kv.	CO108-1
C5005	Same as C5004.	

TUBE FRAME (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C5006	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.1 mf, $\pm 5\%$, 4000 WVDC; 1-1/8" dia. x 2-7/8" long o/a.	CX102J103M
C5007 thru C5013	Same as C5006.	
C5014	CAPACITOR, FIXED, VACUUM: capacitance 1000 uuf, $\pm 5\%$, peak volt rating 25 Kv, current rating 130 WVDC.	CO109-1
C5015	Same as C5014.	
C5016 thru C5023	Same as C5006.	
C5024	Same as C5001.	
C5025	Same as C5001.	
C5026	CAPACITOR, FIXED, VACUUM: capacitance 200 uuf, $\pm 5\%$, peak volt rating 55 Kv, current rating 150 WVDC.	CO109-2
DS5001	Non-replaceable item. Part of XF5001.	
DS5002	Non-replaceable item. Part of XF5002.	
DS5003	Non-replaceable item. Part of XF5003.	
DS5004	Non-replaceable item. Part of XF5004.	
DS5005	Non-replaceable item. Part of XF5005.	
DS5006	Non-replaceable item. Part of XF5006.	
E5001	INSULATOR, FEEDTHRU: 1-5/8" dia., 2-3/4" long.	NS107
E5002	Same as E5001.	
E5003	TERMINAL BOARD, BARRIER: 2 terminals; 6-32 thd screws by 1/4" long, phenolic body.	TM102-2
E5004	Same as E5003.	
F5001	FUSE, CARTRIDGE: 1/4 amp, 1/4" x 1-1/4" long, slow blow.	FU102-.250
F5002 thru F5004	Same as F5001.	
F5005	FUSE, CARTRIDGE: 1 amp; 1-1/4" lg. x 1/4" dia.; slow blow.	FU102-1
F5006	Same as F5005.	
J5001	CONNECTOR, RECEPTACLE, ELECTRICAL: male; 14 contacts, pin type.	MS3102A20-27P
J5002	CONNECTOR, RECEPTACLE, ELECTRICAL: male.	MS3102A32-17P
J5003	CONNECTOR, RECEPTACLE, ELECTRICAL: female.	MS3102A32-17S
K5001	RELAY, SOLENOID: consists of S5001, S5002, max. volts 600 AC; max. amps 50 open, 45 closed; control volts 208/220, 60 cycles.	RL152

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K5002	RELAY, ARMATURE: contacts DPDT, rated at 15 amps, operating voltage 180- 250 VAC max, 8 pin plug.	RL153
K5003	Same as K5002.	
M5001	TIMER, INTERVAL: time cycle 5 min., dial div. 5 sec., 3-3/16" dia, 15 watt operation.	TI101-5
P5001	CONNECTOR, PLUG, ELECTRICAL: male.	MS3106B32-17P
R5001	Non-replaceable item. Part of XF5001.	
R5002	Non-replaceable item. Part of XF5002.	
R5003	Non-replaceable item. Part of XF5003.	
R5004	Non-replaceable item. Part of XF5004.	
R5005	Non-replaceable item. Part of XF5005.	
R5006	Non-replaceable item. Part of XF5006.	
R5007	RESISTOR, FIXED, WIREWOUND: 10 watts, 20,000 ohms resistance, current 22 ma.	RW109-37
R5008	Same as R5007.	
S5001	Non-replaceable item. Part of K5001.	
S5002	Non-replaceable item. Part of K5002.	
S5003	SWITCH, PUSH-PULL: total travel approx. 0.321"; 15 amp, 120, 250 VAC; 2 amp resistive at 250 VDC.	SW230
S5004	Same as S5003.	
S5005	SWITCH, THERMO: 6.6A resistive, 240 VAC, thermostat closes at 230°F ±6°; opens at 185°F ±6°.	SS107
S5006	Same as S5005.	
S5007	SWITCH, AIRFLOW	SW243-2
S5008	Same as S5007.	
T5001	COIL ASSEMBLY, FILTER	CL313
T5002	Same as T5001.	
V5001	TUBE, ELECTRON	ML8317
V5002	Same as V5001.	
XF5001	FUSEHOLDER: extractor post type; 100-250 volts, 20 amps; neon indicator lamp; 220K ohm lamp resistor. Consists of DS5001, R5001.	FH104-3
XF5002	Same as XF5001. Consists of DS5002, R5002.	
XF5003	Same as XF5001. Consists of DS5003, R5003.	
XF5004	Same as XF5001. Consists of DS5004, R5004.	
XF5005	Same as XF5001. Consists of DS5005, R5005.	

TUBE FRAME (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XF5006	Same as XF5001. Consists of DS5006, R5006.	TS165P01
XK5001	NOT USED	
XK5002	SOCKET, ELECTRON TUBE: ceramic molded.	
XK5003	Same as XK5002.	

200K PA FRAME

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C5101	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 uuf, $\pm 20\%$, 5000 WVDC; 6-32 tapped studs each end; 13/16" dia. x 7/8" long o/a.	CC109-38
C5102 thru C5143	Same as C5101.	
DS5101	BUZZER: 230 VAC; 5-1/2 inch mtg. centers.	BZ100
E5101	INSULATION, FEEDTHRU	NS109
E5102	STUD, CONTINUOUS THREAD: 2-1/8-16 thd; casted machine finish.	SM1032BN1.625
E5103 thru E5107	Same as E5102.	
E5108 thru E5111	Same as E5101.	
E5112 thru E5117	Same as E5102.	
E5118	Same as E5101.	
J5101	CONNECTOR, RECEPTACLE, ELECTRICAL: male.	MS3102A32-9P
J5102	CONNECTOR, RECEPTACLE, ELECTRICAL: female, 35 contacts.	MS3102A32-7S
J5103	CONNECTOR, RECEPTACLE, ELECTRICAL: male.	MS3102A24-9P
J5104	CONNECTOR, RECEPTACLE, ELECTRICAL: male 35 contacts.	MS3102A32-7P
J5105	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 female contact; 52 ohms, BNC type.	UG625B/U
J5106	Same as J5105.	
J5107	Same as J5102.	
L5101	COIL, RADIO FREQUENCY: line filter; L-nominal 177 uh (175-179) Q greater than 10; F-2 mc.	CL155

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L5102	Same as L5101.	
L5103	Same as L5101.	
L5104	COIL ASSEMBLY, RADIO FREQUENCY: fixed; 45 uh, resistance, .018 ohms; frequency, 2.5 mc.	AC111
L5105	Same as L5104.	
L5106 thru L5108	Same as L5101.	
P5101	CONNECTOR, PLUG, ELECTRICAL: male; pin type, 4 contacts.	MS3106B22-10P
P5102	CONNECTOR, PLUG, ELECTRICAL: male; pin type, 35 contacts.	MS3106B32-7P
P5103	CONNECTOR, PLUG, ELECTRICAL: female; socket type, 4 contacts.	MS3106B22-10S
P5104	CONNECTOR, PLUG, ELECTRICAL: female; socket type, 35 contacts.	MS3106B32-7S
P5105	CONNECTOR, PLUG, ELECTRICAL: female.	MS3106B16S1S
P5106	Same as P5105.	
P5107	CONNECTOR, PLUG, ELECTRICAL: male; pin type, 1 contact.	MS3106B18-16P
P5108	CONNECTOR, PLUG, ELECTRICAL: female.	MS3106B18-16S
P5109	Same as P5107.	
P5110	Same as P5108.	
P5111	CONNECTOR, PLUG, ELECTRICAL: female, pin type.	MS3106B20-27S
P5112	CONNECTOR, PLUG, ELECTRICAL: female.	MS3106B32-17S
P5113	Same as P5111.	
R5101	RESISTOR, FIXED, WIREWOUND: 140 watts resistance 2,500 ohms; max. milli-amps 236; temp range 275°C.	RW118F252
R5102 thru R5110	Same as R5101.	
R5111	RESISTOR, FIXED, WIREWOUND: 20 watt resistance 20,000; current 32 ma.	RW110-44
R5112	Same as R5111.	
S5101	NOT USED	
S5102	SWITCH, PUSH-PULL: SPDT total travel approx. 0.321"; 15 amp 120, 250 VAC; 2 amp resistive at 250 amp.	SW230
S5103 thru S5107	Same as S5102.	

200K PA FRAME (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
T5101	TRANSFORMER, POWER, STEP-DOWN: primary adj. 190 to 250 VAC, 50/60 cps, one phase; secondary 15.5 VAC; secondary current 450 amps; insulation 6 Kv min; open frame, black; 9-1/16" x 12-5/8" x 16-1/2" high.	TF252
T5102	Same as T5101.	

200K PA FRAME METER PANEL

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C5201	CAPACITOR, FIXED, MICA DIELECTRIC: .01 uuf, $\pm 10\%$; 300 WVDC; char. B.	CM35B103K
C5202 thru C5206	Same as C5201.	
DS5201	LAMP, FLUORESCENT: standard cool white; 1/2" dia. x 11-1/4" long.	BI107
DS5202	Same as DS5201.	
DS5203	Same as DS5201.	
J5201	CONNECTOR, RECEPTACLE, ELECTRICAL: series uhf, teflon dielectric.	SO239A
M5201	AMMETER, DC: movement 0-10 amps; approx. resistance .005 ohms; 4-1/2" standard rectangular case, black.	MR129
M5202	Same as M5201.	
M5203	WATTMETER, KW: movement 0-100 micro-amps DC; approx. resistance .825 ohms; 4-1/2" standard rectangular case, black.	MR169
M5204	VOLTMETER, KV, RF: movement 0-200 micro-amps DC; approx. resistance 1000 ohms; 4-1/2" standard rectangular case, black.	MR164
M5205	Same as M5204.	
M5206	VOLTMETER, KV, RF: 0-1 kilo volts; 4-1/2" rectangular case.	MR135
S5201	STARTER, FLUORESCENT LAMP: 8 watts; 3/16" dia. x 1-1/2" long o/a.	PO170
S5202	Same as S5201.	
S5203	Same as S5201.	
T5201	BALLAST, LAMP: 8 watt, 118 volts, 0.17 amp, 60 cps.	PO169
T5202	Same as T5201.	
T5203	Same as T5201.	

200K PA FRAME METER PANEL (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XDS5201	SOCKET, STARTER, FLUORESCENT: 660 watts, 250 volts; 1-13/16" long x 1-11/16" wide x 7/16" thk o/a; 8-3/4" leads.	TS140
XDS5201A	SOCKET, FLUORESCENT LAMP: 75 watts, 250 volts; 1-1/32" high x 5/8" wide x 5/16" thk o/a; 6" leads.	TS141
XDS5201B	Same as XDS5201A.	
XDS5202	Same as XDS5201.	
XDS5202A	Same as XDS5201A.	
XDS5202B	Same as XDS5201A.	
XDS5203	Same as XDS5201.	
XDS5203A	Same as XDS5201A.	
XDS5203B	Same as XDS5201A.	
XZ5201	SOCKET, ELECTRON TUBE: octal; high crown.	TS101P01
XZ5202	Same as XZ5201.	
Z5201	NETWORK, METER CIRCUIT: RF; range 2 to 28 mc; meters to 30 Kv RF; converting RF to DC for metering circuit.	AX219
Z5202	Same as Z5201.	

200-KW PA

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A5301	BANDSWITCH ASSEMBLY: PI-1, consists of symbols C5339, C5340, E5302 thru E5314, L5311, L5314, MP5301 thru MP5305, S5307, S5311A, S5311B.	AS123
A5302	BANDSWITCH ASSEMBLY: PI-2, consists of symbols C5333 thru C5338, C5360 thru C5363, E5315 thru E5322, L5316 thru L5322, MP5306 thru MP5309, S5310, S5312.	AS124
B5301	FAN, VANEAXIAL: AC motor; 230 volts, $\pm 10\%$, one phase, 50/60 cps; one 4 uf 400 VAC capacitor; 2800/3300 RPM; current rating 0.85/0.6 amps.	BL117
B5302	Same as B5301.	
B5303	Same as B5301.	
B5304	FAN, TUBEAXIAL: ccw rotation, 230 VAC; 50/60 cps, single phase, 2500 RPM at 50/60 cps, capacitance 8 uf, 330 VAC.	BL118
C5301	CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uf, $\pm 10\%$; 600 WVDC; char. E.	CP41B1EF405K
C5302	Same as C5301.	
C5303	CAPACITOR, FIXED, PAPER DIELECTRIC: 8 uf, $\pm 10\%$; 220 WVDC.	CP114-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C5304A, B	CAPACITOR, FIXED, VACUUM: 2.8 uuf to 22 uuf; 12.5 RMS amp, 60 Kv.	CO110
C5305	Same as C5301.	
C5306	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 uuf, $\pm 20\%$; 5000 WVDC; 6-32 tapped studs each end; 13/16" dia. x 7/8" long o/a.	CC109-38
C5307	Same as C5306.	
C5308A, B	Same as C5304A, B.	
C5309 thru C5312	Same as C5306.	
C5313	CAPACITOR, FIXED, TEFLON: 003 uf, $\pm 10\%$; 30 Kv; operating temp. range -60°C to $+85^{\circ}\text{C}$.	CX108-2
C5314	Same as C5313.	
C5315	CAPACITOR, FIXED, TEFLON: .001 uf, $\pm 10\%$; 25 Kv; operating temp. range -60°C to $+85^{\circ}\text{C}$.	CX108-3
C5316 thru C5318	Same as C5315.	
C5319 thru C5322	Same as C5306.	
C5323	CAPACITOR, VARIABLE, VACUUM DIELECTRIC: 25 to 750 uf; 40 Kv peak, current rating 125 WVDC, ceramic case.	CB167-1
C5324 thru C5326	Same as C5323.	
C5327	CAPACITOR, VARIABLE, VACUUM DIELECTRIC: 100 to 1500 uf; 40 Kv peak, current rating 135 WVDC, ceramic case.	CB167-2
C5328 thru C5332	Same as C5327.	
C5333	CAPACITOR, FIXED, VACUUM: 3 uufd, $\pm 10\%$, 5000 WVDC (Used on Bandswitch Assembly A5302).	CO109-1
C5334 thru C5338	Same as C5306. (Used on Bandswitch Assembly A5302)	
C5339	Same as C5315. (Used on Bandswitch Assembly A5301)	
C5340	Same as C5315. (Used on Bandswitch Assembly A5301)	
C5341	Same as C5306.	
C5342	CAPACITOR, FIXED, MICA DIELECTRIC: 10,000 uuf, $\pm 10\%$, 300 WVDC, char. B.	CM35B103K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C5343	Same as C5306.	
C5344	Same as C5342.	
C5345	Same as C5342.	
C5346	Same as C5306.	
C5347	Same as C5342.	
C5348	Same as C5306.	
C5349	Same as C5342.	
C5350	Same as C5306.	
C5351	Same as C5342.	
C5352 thru C5359	Same as C5306.	
C5360 thru C5363	Same as C5306. (Used on Bandswitch Assembly A5302)	
DS5301	LAMP, INCANDESCENT: screw base; 230 volts, 10 watts; S6 type bulb.	BI105-1
DS5302 thru DS5306	Same as DS5301.	
E5301	TERMINAL BOARD, BARRIER: 12 terminals; 6-32 thd x 1/4" long screws, phenolic body.	TM102-12
E5302	TERMINAL BOARD, BARRIER: (Used on Bandswitch Assembly A5301) 5 terminals; 6-32 thd x 1/4" long screws, phenolic body.	TM102-5
E5303	CONTACT ASSEMBLY, ELECTRICAL: Part of symbol S5311B. (Used on Bandswitch Assembly A5301)	AX500
E5304	Same as E5303. Part of symbol S5311B. (Used on Bandswitch Assembly A5301)	
E5305	ROTOR, ELECTRICAL: SW-1. Part of symbol S5311B. (Used on Bandswitch Assembly A5301)	PM1007
E5306	CONTACT ASSEMBLY, ELECTRICAL: (Used on Bandswitch Assembly A5301)	AX447
E5307	Same as E5306. (Used on Bandswitch Assembly A5301)	
E5308	Same as E5306. (Used on Bandswitch Assembly A5301)	
E5309	CONTACT ASSEMBLY, ELECTRICAL: (Used on Bandswitch Assembly A5301)	AX448
E5310	Same as E5306. (Used on Bandswitch Assembly A5301)	
E5311	Same as E5309. (Used on Bandswitch Assembly A5301)	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E5312	ROTOR, ELECTRICAL: SW-1 (Used on Bandswitch Assembly A5301)	RO104
E5313	WIPER ASSEMBLY: (Used on Bandswitch Assembly A5301)	AX449
E5314	Same as E5313. (Used on Bandswitch Assembly A5301)	
E5315	CONTACT ASSEMBLY, ELECTRICAL: (Used on Bandswitch Assembly A5302)	AX442
E5316 thru E5319	Same as E5315. (Used on Bandswitch Assembly A5302)	
E5320	WIPER ASSEMBLY: (Used on Bandswitch Assembly A5302)	AX443
E5321	Same as E5320. (Used on Bandswitch Assembly A5302)	
E5322	ROTOR, ELECTRICAL: SW-2 (Used on Bandswitch Assembly A5302)	RO105
J5301	CONNECTOR, RECEPTACLE, ELECTRICAL: female; 7 contacts.	MS3102A16S-1S
J5302	CONNECTOR, PLUG, ELECTRICAL: male; 14 contacts, pin type.	MS3102A20-27P
J5303	CONNECTOR, PLUG, ELECTRICAL: female; 4 contacts.	MS3102A14S-2S
J5304	Same as J5303.	
J5305	Same as J5303.	
K5301	RELAY, SHORTING: peak test voltage 50 Kv; 100 amps RMS; solenoid voltage 230 AC; SPDT, 230V, 15 amp, consists of symbols L5310, S5305, S5306.	RL154
L5301	COIL, RADIO FREQUENCY: fixed; 2 turns #12 magnet wire.	CL183
L5302	COIL, RADIO FREQUENCY: fixed; 40 uhy inductance.	CL314
L5303	Same as L5302.	
L5304	COIL, RADIO FREQUENCY: fixed; 35 uhy inductance.	CL339
L5305	Same as L5304.	
L5306	COIL, RADIO FREQUENCY: fixed; 35 uhy inductance.	CL338
L5307	Same as L5306.	
L5308	Same as L5304.	
L5309	Same as L5304.	
L5310	Non-replaceable item. Part of K5301.	
L5311	SOLENOID, RELAY: with plunger; coil rated at 230V, 60 ohms AC; 0.2 amp, 78.2 ohms continuous; adjustable stroke. (Used on Bandswitch Assembly A5301)	SZ100
L5312	PLATE, CONNECTOR	PM880
L5313	Same as L5312.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L5314	COIL, ELECTRICAL, BANDSWITCH: 3.8 uh inductance; $\pm 10\%$ resistance. (Used on Bandswitch Assembly A5301)	CL310
L5315	COIL, LOOP: HP	PM885
L5316	COIL ASSEMBLY: (Used on Bandswitch Assembly A5302)	CL311
L5317	Same as L5311. (Used on Bandswitch Assembly A5302)	
L5318	COIL, RADIO FREQUENCY: fixed; 35 uh inductance; $\pm 10\%$ resistance. (Used on Bandswitch Assembly A5302)	CL292
L5319 thru L5322	Same as L5318. (Used on Bandswitch Assembly A5302)	
L5323 thru L5325	Same as L5318.	
MP5301	WAFER, PA BANDSWITCH: (Used on Bandswitch Assembly A5301)	WS129
MP5302	SUPPORT ASSEMBLY, BANDSWITCH: (Used on Bandswitch Assembly A5301)	A2680
MP5303 thru MP5305	Same as MP5302. (Used on Bandswitch Assembly A5301)	
MP5306	WAFER: (Used on Bandswitch Assembly A5302)	WS130
MP5307	SUPPORT, COIL: (Used on Bandswitch Assembly A5302)	PX708
MP5308	Same as MP5307. (Used on Bandswitch Assembly A5302)	
MP5309	LEG, SUPPORT: (Used on Bandswitch Assembly A5302)	PX792
P5301	CONNECTOR, RECEPTACLE, ELECTRICAL: male; 7 contacts.	MS3106B16S-11
P5302	CONNECTOR, PLUG, ELECTRICAL: uhf; 1 male contact; teflon insulation.	PL259A-TEF
P5303	CONNECTOR, RECEPTACLE, ELECTRICAL: female 14 number 16 contacts.	MS3106B20-27S
P5304	CONNECTOR, RECEPTACLE, ELECTRICAL: male.	MS3106B14S-2P
P5305	Same as P5304.	
P5306	Same as P5304.	
R5301	RESISTOR, FIXED, WIREWOUND: 3000 ohms, $\pm 5\%$, 10 watts.	RW109-30
R5302 thru R5306	Same as R5301.	
S5301	SWITCH, AIRFLOW: low torque micro; counterclockwise rotation; SPDT; 5 amps at 125 or 250 VAC.	SW252

200-KW PA (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S5302 thru S5304	Same as S5301.	
S5305	Non-replaceable item. Part of K5301.	
S5306	Non-replaceable item. Part of K5301.	
S5307	SWITCH, MICRO: push; 10 amps at 125/250 VAC; 1/2 amp at 125 VDC. (Used on Bandswitch Assembly A5301)	SW189
S5308	SWITCH, PUSH-PULL: total travel approx. 0.321"; 15 amp, 120, 250 VAC; 2 amp resistive at 250 VDC.	SW230
S5309	Same as S5308.	
S5310	Same as S5307. (Used on Bandswitch Assembly A5302)	
S5311A	WAFER ASSEMBLY: (Used on Bandswitch Assembly A5301)	AX446
S5311B	PI SECTION, BANDSWITCH: consists of symbols E5303, E5304, E5305. (Used on Bandswitch Assembly A5301)	
S5312	WAFER ASSEMBLY: (Used on Bandswitch Assembly A5302)	AX441
XDS5301	LIGHT, INDICATOR: w/frosted red lens; screw type socket.	TS136-1FS
XDS5302	LIGHT, INDICATOR: w/frosted amber lens; screw type socket.	TS136-3FS
XDS5303	LIGHT, INDICATOR: w/frosted blue lens; screw type socket.	TS136-4FS
XDS5304	LIGHT, INDICATOR: w/frosted green lens; screw type socket.	TS136-2FS
XDS5305	Same as XDS5301.	
XDS5306	Same as XDS5301.	

200K PA FRAME CONTROL PANEL

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C5401	CAPACITOR, FIXED, CERAMIC DIELECTRIC: capacitance 1000 uuf at 25°C; voltage rating 500 VDC.	CC100-29
C5402	Same as C5401.	
CB5401	CIRCUIT BREAKER: 3 PST; (consists of S5401, S5402, S5403) 50 amps; 250 VAC, 50/60 cycles; curve one; series trip.	SW324
CB5402	CIRCUIT BREAKER: DPDT (consists of S5405, S5406) first coil 120V, 50/60 cps AC; second coil 10 amp. 250V, 50/60 cps AC; curve three.	SW326
CB5403	Same as CB5402. (consists of S5408, S5409)	
DS5401	LAMP, GLOW: miniature bayonet base; 105-125 volts; 1/25 watt.	BI100-51

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS5402	Same as DS5401.	
L5401	COIL, RADIO FREQUENCY: fixed; 2.5 mh $\pm 10\%$; current carrying capacity 100 milli-amps; iron core.	CL140-1
R5401	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF224K
R5402	RESISTOR, VARIABLE, COMPOSITION: resistance 25,000 ohms, $\pm 20\%$ rated at 3.0 amps at 117 VAC.	RV4NAYS253A
R5403	RESISTOR, FIXED, COMPOSITION: 1,800 ohms, $\pm 10\%$; 2 watts.	RC42GF182K
R5404	Same as R5401.	
S5401	Non-replaceable item. Part of CB5401.	
S5402	Non-replaceable item. Part of CB5401.	
S5403	Non-replaceable item. Part of CB5401.	
S5404	SWITCH, PUSHBUTTON: SPST black bakelite snap on button 1 amp at 250V; 3 amps at 125V.	SW168SPST2 0BB
S5405	Non-replaceable item. Part of CB5402.	
S5406	Non-replaceable item. Part of CB5402.	
S5407A, B, C	SWITCH, ROTARY: 3 sections; 3 positions; 60° angle of throw.	SW329
S5408	Non-replaceable item. Part of CB5403.	
S5409	Non-replaceable item. Part of CB5403.	
S5410A, B	SWITCH, ROTARY: 1 section; 12 positions, 30° angle of throw.	SW250
S5411A, B	SWITCH, PUSH: DPDT 125 volts, 6 amps, pushbutton	SW360-1
S5412A, B	Same as S5411A, B.	
S5413A, B	SWITCH, ROTARY: 7 tap rating 300V, 25 amps.	SW267-7T2
S5414A, B	Same as S5413A, B.	
S5415	Same as S5404.	
XDS5401	LIGHT, INDICATOR: red frosted lens; for miniature bayonet base, T-3-1/4 bulb.	TS106-1
XDS5402	LIGHT, INDICATOR: clear white lens; for miniature base T-3-1/4 bulb.	TS106-2

BIAS SUPPLY A AND B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C5501	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 uuf, $\pm 20\%$, 5000 WVDC; 6-32 tapped studs each end; 13/16" dia. x 7/8 long o/a.	CC109-38
C5502 thru C5506	Same as C5501.	
C5507	CAPACITOR, FIXED, PAPER DIELECTRIC: 10 uf; $\pm 10\%$, 1000 volts, char. F.	CP70B1FG106K
C5508	Same as C5507.	
C5509	Same as C5507.	
C5510	CAPACITOR, FIXED, PAPER DIELECTRIC: 5 uf, $\pm 10\%$, 2000 WVDC; char. E.	CP70E1EJ504K
CR5501	RECTIFIER, SEMICONDUCTOR DEVICE: peak voltage 8 Kv; 1.6 amps DC; center tapped.	DD110
DS5501	LAMP, NEON: miniature; 110 volts, 1/25 watt; T-3-1/4 clear bulb; bayonet base.	BI100-51
DS5502	Same as DS5501.	
DS5503	Non-replaceable item. Part of XF5502.	
DS5504	Non-replaceable item. Part of XF5501.	
EV5501	SHIELD, ELECTRON TUBE: 7 pin miniature socket.	TS102U02
F5501	FUSE, CARTRIDGE: 3 amps; 1/4" x 1-1/4" long, slow blow.	FU104-3
F5502	FUSE, CARTRIDGE: 5 amps; 1/4" x 1-1/4" long, slow blow.	FU102-5
J5501	CONNECTOR, RECEPTACLE, ELECTRICAL: female; one contact.	MS3102A18-16S
J5502	CONNECTOR, RECEPTACLE, ELECTRICAL: male; one contact.	MS3102A18-16P
J5503	CONNECTOR, RECEPTACLE, ELECTRICAL: male	MS3102A16S-1P
K5501	RELAY, ARMATURE: DPDT arrangement, 250 VAC max, rated at 15 amps, 8 pin plug.	RL153
L5501	COIL, RADIO FREQUENCY: fixed; 35 uh, frequency 2.5 mcs.	CL292
L5502	Same as L5501.	
L5503	Same as L5501.	
L5504	REACTOR: 2 h inductance; 1.2 amp, rectangular steel case.	TF250
R5501	RESISTOR, VARIABLE, COMPOSITION: resistance 500,000 ohms; $\pm 20\%$.	RV4ATXA504D
R5502	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF102K
R5503	RESISTOR, FIXED, COMPOSITION: 680,000 ohms, $\pm 10\%$; 2 watts.	RC42GF684K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R5504	Same as R5502.	
R5505	RESISTOR, FIXED, COMPOSITION: 27 ohms, $\pm 5\%$; 2 watts.	RC42GF270J
R5506 thru R5510	Same as R5505.	
R5511	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 10\%$; 2 watts.	RC42GF104K
R5512	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, $\pm 10\%$; 2 watts.	RC42GF224K
R5513	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF224K
R5514	RESISTOR, FIXED, COMPOSITION: 470,000 ohms, $\pm 10\%$; 2 watts.	RC42GF474K
R5515	Same as R5512.	
R5516	RESISTOR, FIXED, WIREWOUND: 20 watts, 75,000 ohms; current 50 ma.	RW110-32
R5517	RESISTOR, FIXED, WIREWOUND: 10 ohms, $\pm 5\%$; current rating 1,000 ma; 10 watts.	RW109-4
R5518	Same as R5514.	
R5519	Non-replaceable item. Part of XF5501.	
R5520	Non-replaceable item. Part of XF5502.	
R5521	Same as R5513.	
R5522	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF104K
R5523	Same as R5522.	
R5524	RESISTOR, FIXED, WIREWOUND: 14 watts, resistance 12 ohms; max. milli-amps 1,077; temp range 275°C.	RW119F120
R5525	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, $\pm 10\%$; 1 watt.	RC32GF333K
S5501	SWITCH, PUSH-PULL: SPDT total travel approx. 0.321"; 15 amp, 120, 250 VAC; 2 amp resistive at 250 VDC.	SW230
T5501	TRANSFORMER, POWER, STEP-UP: primary 230 VAC 50/60 cycles; secondary 1320 VAC at 1.5 amps; rectangular steel case; 6" x 7-1/2" x 8" high.	TF251
T5502	TRANSFORMER, POWER, STEP-DOWN: primary 115/230 VAC, 50/60 cps, single phase; secondary 6.3V/2 amps and 6V 14 amps; rectangular steel case.	TF202
V5501	TUBE, ELECTRON: beam power; 7 pin miniature.	6AQ5
V5502	TUBE, ELECTRON:	7241
V5503	Same as V5502.	

BIAS SUPPLY A AND B (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
V5504	TUBE, ELECTRON:	OD3W
V5505	Same as V5504.	
V5506	Same as V5504.	
W5501	WIRING HARNESS, BRANCHED, ELECTRICAL	CA727
XCR5501	SOCKET, ELECTRON TUBE: octal, high crown.	TS101P01
XDS5501	LIGHT, INDICATING: clear white lens, for miniature bayonet base T-3-1/4 bulb.	TS106-2
XDS5502	LIGHT, INDICATING: red frosted lens, for miniature bayonet base, T-3-1/4 bulb.	TS106-1
XF5501	FUSEHOLDER: consists of DS5504, R5519, circuit rating 90-500 VDC; max. amp rating 30; neon lamp type; lamp resistor 220,000 ohms.	FH106
XF5502	FUSEHOLDER: extractor post type 100-250 volts, 20 amps; neon indicator lamp; 220K ohm lamp resistor.	FH104-3
XK5501	Same as XCR5501.	
XV5501	SOCKET, ELECTRON TUBE: 7 pin miniature.	TS102P01
XV5502	SOCKET, ELECTRON TUBE: 7 pin giant.	TS162-2
XV5503	Same as XV5502.	
XV5504 thru XV5506	Same as XCR5501.	

RELAY AND INDICATOR PANEL A

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS5601	Non-replaceable item. Part of XF5601.	
DS5602	LAMP, GLOW: 110 volt; bayonet base; neon	BI103-2
DS5603 thru DS5607	Same as DS5602.	
DS5608	Non-replaceable item. Part of XF5602.	
DS5609	Non-replaceable item. Part of XF5603.	
DS5610	Non-replaceable item. Part of XF5604.	
DS5611	Non-replaceable item. Part of XF5605.	
E5601	TERMINAL BOARD, BARRIER TYPE: 8 term. 6-32 thd binding hd. screws 1/4" long; phenolic body.	TM100-8
E5602	TERMINAL BOARD, BARRIER TYPE: 22 term. 6-32 thd binding hd. screws 1/4" long; phenolic body.	TM100-22

RELAY AND INDICATOR PANEL A (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E5603	Same as E5602.	
E5604	Same as E5601.	
E5605	INSULATION, FEEDTHRU: 12,000 RMS volts; 45 amps; 7/8" dia. x 2-1/8" long.	NS118-5
E5606 thru E5610	Same as E5605.	
F5601	FUSE, CARTRIDGE: 1 amp; time delay; 1/4" dia. x 1-1/4" long; slow blow.	FU102-1
F5602 thru F5605	Same as F5601.	
J5601	CONNECTOR, RECEPTACLE, ELECTRICAL: female; 35 contacts.	MS3102A327S
J5602	CONNECTOR, RECEPTACLE, ELECTRICAL: female.	MS3102A2210S
K5601	RELAY, ARMATURE: 4 PDT 2.4 ohms $\pm 10\%$; contacts rated at 25 amps; operates 10 volts, 0.5 amp AC coil.	RL134
K5602	RELAY, ARMATURE: latch 1150 ohms $\pm 10\%$; contacts rated at 25 amps; operates at 220V, 50/60 cycles AC.	RL124
K5603	RELAY, ARMATURE: latch relay 1100 ohms $\pm 10\%$; unlatch at 0.93 ohms $\pm 10\%$; contacts rated at 25 amps; 125 VAC resistive.	RL122
K5604	RELAY, ARMATURE: latch 1100 ohms $\pm 10\%$; trip 170 ohms $\pm 10\%$; contacts rated 20 amp.	RL125
K5605	RELAY, ARMATURE: latch, 1000 ohms, $\pm 10\%$; 4 PDT; silver contacts rated at 20 amps non-inductive load; latch operate 220V, 60 cps AC or less.	RL127
K5606	Same as K5605.	
K5607	RELAY, ARMATURE: 4 PDT, 93 ohms $\pm 10\%$; contacts rated at 25 amps; operate 1 amp DC.	RL137
K5608	Same as K5602.	
K5609	RELAY, ARMATURE: 4 PDT 60 ohms; contacts rated at 10A, 125 VAC resistance, operates 110 amps.	RL159
M5601	METER, TIME TOTAL: operating volt 60 cycles AC 220-250V; registers in 1/10 hr; operating temp- 55°C to +85°C; bakelite body dial measure 0 to 6 min; 220 VAC, 60 cycles.	MR125-2
M5602	TIMER, ADJUST:	TI103
M5603	Same as M5601.	
R5601	RESISTOR, VARIABLE, WIREWOUND: 25 watts; resistance, 5 ohms $\pm 10\%$.	RA75ASAOR5 AK25
R5602	RESISTOR, FIXED, WIREWOUND: 10 watts; resistance 1000 ohms; current 100 ma.	RW109-24

RELAY AND INDICATOR PANEL A (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R5603	Same as R5601.	
R5604	Non-replaceable item. Part of XF5601.	
R5605	RESISTOR, FIXED, WIREWOUND: 25 watts; resistance 5000 ohms; current 70 ma.	RW111-29
R5606	RESISTOR ASSEMBLY: shunt.	AR157
R5607	RESISTOR, VARIABLE, WIREWOUND: 25 watts; resistance 100 ohms $\pm 10\%$.	RA75ASA101AK 25
R5608	RESISTOR, VARIABLE, WIREWOUND: 25 watts; resistance 2,500 ohms $\pm 10\%$.	RA75ASD252AK 25
R5609	Non-replaceable item. Part of XF5602.	
R5610	Non-replaceable item. Part of XF5603.	
R5611	Non-replaceable item. Part of XF5604.	
R5612	Non-replaceable item. Part of XF5605.	
R5613	RESISTOR, FIXED, WIREWOUND: resistance, .07 ohms $\pm 5\%$; powdered iron core.	AR128
R5614	Non-replaceable item. Part of XDS5602.	
R5615	Non-replaceable item. Part of XDS5603.	
R5616	Non-replaceable item. Part of XDS5604.	
R5617	Non-replaceable item. Part of XDS5605.	
R5618	Non-replaceable item. Part of XDS5606.	
R5619	Non-replaceable item. Part of XDS5607.	
R5620	Same as R5605.	
S5601	SWITCH, TOGGLE: SPDT; rated at 6 amps; solder lug terminals.	ST12A
XDS5601	NOT USED	
XDS5602	LIGHT, INDICATOR: clear lens; with 30K resistor consists of R5614.	TS137-7FB4
XDS5603	Same as XDS5602. Consists of R5615.	
XDS5604	Same as XDS5602. Consists of R5616.	
XDS5605	Same as XDS5602. Consists of R5617.	
XDS5606	Same as XDS5602. Consists of R5618.	
XDS5607	Same as XDS5602. Consists of R5619.	
XF5601	FUSEHOLDER, INDICATOR: extractor post type 100-250 volts, 20 amps; neon indicator lamp; 220K ohm lamp resistor.	FH104-3
XF5602	Same as XF5601. Consists of DS5608, R5609.	

RELAY AND INDICATOR PANEL A (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XF5603	Same as XF5601. Consists of DS5609, R5610.	
XF5604	Same as XF5601. Consists of DS5610, R5611.	
XF5605	Same as XF5601. Consists of DS5611, R5612.	

RELAY AND INDICATOR PANEL B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS5701	Non-replaceable item. Part of XF5701.	
DS5702	Non-replaceable item. Part of XF5703.	
DS5703	Non-replaceable item. Part of XF5702.	
DS5704	Non-replaceable item. Part of XF5704.	
DS5705	Non-replaceable item. Part of XF5705.	
DS5706	LAMP, GLOW: 110 volt; bayonet base; neon.	BI103-2
DS5707 thru DS5711	Same as DS5706.	
E5701	TERMINAL BOARD, BARRIER TYPE: 8 term. 6-32 thd binding hd. screws; 1/4" long; phenolic body.	TM100-8
E5702	TERMINAL BOARD, BARRIER TYPE: 22 term. 6-32 thd binding hd. screws; 1/4" long; phenolic body.	TM100-22
E5703	Same as E5702.	
E5704	Same as E5701.	
E5705	INSULATION, FEEDTHRU: 12,000 RMS volts; 45 amps; 7/8" dia. x 2-1/8" long.	NS118-5
E5706 thru E5710	Same as E5705.	
F5701	FUSE, CARTRIDGE: 1 amp time delay; 1/4" dia. x 1-1/4" long; slow blow.	FU102-1
F5702 thru F5705	Same as F5701.	
J5701	CONNECTOR, RECEPTACLE, ELECTRICAL: male; 35 contacts.	MS3102A32-7P
J5702	CONNECTOR, RECEPTACLE, ELECTRICAL: male; 4 contacts.	MS3102A22-10P
K5701	RELAY, ARMATURE: 4 PDT 2.4 ohms $\pm 10\%$; contacts rated at 25 amps; operates 10 volt, 0.5 amp. AC coil.	RL134

RELAY AND INDICATOR PANEL B (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K5702	RELAY, ARMATURE: latch 1150 ohms $\pm 10\%$; contacts rated at 25 amps, operates at 220V, 50/60 cycles AC.	RL124
K5703	RELAY, ARMATURE: latch relay 1100 ohms $\pm 10\%$; unlatch at 0.93 ohm $\pm 10\%$; contacts rated at 25 amps 125 VAC resistive.	RL122
K5704	RELAY, ARMATURE: latch 1100 ohms $\pm 10\%$; trip 170 ohms $\pm 10\%$; contacts rated 20 amp.	RL125
K5705	RELAY, ARMATURE: latch, 1000 ohms, $\pm 10\%$; 4 PDT; silver contacts rated at 20 amps non-inductive load; latch operate 220V, 60 cps AC or less.	RL127
K5706	Same as K5702.	
K5707	RELAY, ARMATURE: 4 PDT, 93 ohms $\pm 10\%$; contacts rated at 25 amps; operate 1 amp DC.	RL137
K5708	Same as K5702.	
K5709	RELAY, ARMATURE: 4 PDT 60 ohms; contacts rated at 10A, 125 VAC resistance; operates 110 amps.	RL159
M5701	METER, TIME TOTAL: operating volt 60 cycles AC 220-250V; registers in 1/10 hr; operating temp- 55°C to + 85%; bakelite body.	MR125-2
M5702	Same as M5701.	
M5703	TIMER, INTERVAL: dial measure 0 to 6 min; 220 VAC, 60 cycles.	TI103
R5701	RESISTOR, VARIABLE, WIREWOUND: 25 watts; resistance 5 ohms $\pm 10\%$.	RA75ASAOR5AK 25
R5702	RESISTOR ASSEMBLY, SHUNT	AR157
R5703	Same as R5701.	
R5704	Non-replaceable item. Part of XF5701.	
R5705	RESISTOR, VARIABLE, WIREWOUND: 25 watts; resistance 100 ohms $\pm 10\%$.	RA75ASA101AK 25
R5706	RESISTOR, FIXED, WIREWOUND: 10 watts; resistance 10 ohms; current 1000 ma; 5/16" dia. x 1-3/4" long.	RW109-4
R5707	RESISTOR, FIXED, WIREWOUND: 25 watts; resistance 5000 ohms; current 70 ma.	RW111-29
R5708	Non-replaceable item. Part of XF5702.	
R5709	Non-replaceable item. Part of XF5703.	
R5710	RESISTOR, VARIABLE, WIREWOUND: 25 watts; resistance 2,500 ohms $\pm 10\%$.	RA75ASD252AK 25
R5711	Non-replaceable item. Part of XF5704.	
R5712	Non-replaceable item. Part of XF5705.	
R5713	RESISTOR, FIXED, WIREWOUND: resistance .07 ohms $\pm 5\%$; powdered iron core.	AR128

RELAY AND INDICATOR PANEL B (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R5714	Non-replaceable item. Part of XDS5706.	
R5715	Non-replaceable item. Part of XDS5707.	
R5716	Non-replaceable item. Part of XDS5708.	
R5717	Non-replaceable item. Part of XDS5709.	
R5718	Non-replaceable item. Part of XDS5710.	
R5719	Non-replaceable item. Part of XDS5711.	
R5720	Same as R5707.	
S5701	SWITCH, TOGGLE: SPST; rated at 6 amps; solder lug terminals.	ST12A
XDS5701 thru XDS5705	NOT USED	
XDS5706	LIGHT, INDICATOR: clear lens; with 30K resistor. Consists of R5714.	TS137-7FB4
XDS5707	Same as XDS5706. Consists of R5715.	
XDS5708	Same as XDS5706. Consists of R5716.	
XDS5709	Same as XDS5706. Consists of R5717.	
XDS5710	Same as XDS5706. Consists of R5718.	
XDS5711	Same as XDS5706. Consists of R5719.	
XF5701	FUSEHOLDER, INDICATOR: extractor post type 100-250 volts, 20 amps; neon indicator lamp; 220K ohm 6 amp resistor.	FH104-3
XF5702	Same as XF5701. Consists of DS5703, R5708.	
XF5703	Same as XF5701. Consists of DS5702, R5709.	
XF5704	Same as XF5701. Consists of DS5704, R5711.	
XF5705	Same as XF5701. Consists of DS5705, R5712.	

PSA FRAME

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B6001	FAN, TUBEAXIAL: CCW rotation; 230 VAC, 50/60 cps, 1 phase; 1725 RPM at 50/60 cps.	BL114
B6002	FAN, CENTRIFUGAL: CW rotation; 115/230 VAC, 50/60 cps, 1 phase; 3200 RPM at 50/60 cps; 240 VAC at 5 amps.	BL115
B6003	CONTROL, CIRCUIT BREAKER	MO110
C6001	CAPACITOR, FIXED, PAPER DIELECTRIC: 8 uf, ±10%; 220 VAC; 60 cps.	CP114-1

PSA FRAME (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C6002	CAPACITOR, FIXED, PAPER DIELECTRIC: .4 uf, $\pm 10\%$; 600 WVDC, char. F.	CP41B1FF405K
C6003	CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uf, $\pm 10\%$; 25 Kv WVDC.	CP112
C6004	Same as C6003.	
C6005	CAPACITOR, FIXED, TEFLON: .003 uf, $\pm 10\%$; 30 Kv; operating temperature range -60°C to $+85^{\circ}\text{C}$.	CX108-2
C6006	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, $\pm 20\%$; 5,000 WVDC.	CC109-38
C6007	Same as C6006.	
CB6001	CIRCUIT BREAKER: 3 PST magnetic trip, 3 pole; 600 VAC, 400 amp.	SW328
DS6001	LAMP, INCANDESCENT: 230 to 250 volts, 40 watts; clear type, screw base.	BI106-1
DS6002	Same as DS6001.	
DS6003	Non-replaceable item. Part of XF6001.	
E6001	TERMINAL BOARD, BARRIER TYPE: 6 terminals, 6-32 binding hd. screws, black phenolic body.	TM100-6
E6002	CONTACT, ELECTRICAL: spring loaded, nickel plated beryllium copper; 2-1/4" x 1-1/4" x 1" o/a.	AX153
E6003 thru E6012	Same as E6002.	
F6001	FUSE, CARTRIDGE: 1/2 amp; time lag; 1-1/4" long x 1/4" dia.; slow blow.	FU102-.5
J6001	CONNECTOR, RECEPTACLE, ELECTRICAL: female; 7 contacts.	MS3102A16S-1S
J6002	CONNECTOR, RECEPTACLE, ELECTRICAL: female; 35 contacts.	MS3102A32-7S
J6003	NOT USED	
J6004	CONNECTOR, RECEPTACLE, ELECTRICAL: female; socket type, 14 contacts.	MS3102A20-27S
J6005	Same as J6004.	
J6006	Same as J6004.	
J6007	CONNECTOR, RECEPTACLE, ELECTRICAL: female, 4 contacts.	MS3102A14S-2S
K6001	RELAY, SOLENOID: 3P (consists of S6011, S6012, S6016) max hp. rating 220, 440, 600 volts; 2 and 3 phase 100, 200 volts; 60 cycles; coil data 1.0 amps at 220V; 0.5 amps at 440V, 0.4 amps at 550 and 660 volts.	RL147

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K6002	Same as K6001. Consists of S6013, S6014, S6015.	
K6003	RELAY, SOLENOID: VAL; (consists of S6004, S6005, L6002) peak voltage 50 Kv; 100 amps RMS; contacts 230 volts 15 amps.	RL148
K6004	RELAY, ARMATURE: latch coil 1150 ohms $\pm 10\%$; 4 PDT; contacts rated at 25 amps; operate 220V, 50/60 cycles AC.	RL124
L6001	REACTOR: 4h inductance; current 7 amps DC; working voltage 20 Kv; test voltage 30 Kv; open frame, black	TF254
L6002	Non-replaceable item. Part of K6003.	
M6001	TIMER, INTERVAL: motor voltage 220 VAC, 60 cycles; power input 4 amps; 20 sec. timer.	TI100
P6001	CONNECTOR, PLUG, ELECTRICAL: male; 7 contacts.	MS3106B16S-1P
P6002	CONNECTOR, PLUG, ELECTRICAL: female; 4 contacts.	MS3106B22-10S
P6003	CONNECTOR, PLUG, ELECTRICAL: female; socket type, 14 contacts.	MS3106B20-27S
P6004	CONNECTOR, PLUG, ELECTRICAL: female.	MS3106B32-9S
P6005	CONNECTOR, PLUG, ELECTRICAL: male, pin type.	MS3106B32-7P
R6001	RESISTOR, FIXED, FINSTRIP: 1,900 watts, 230 volts; approx. DC resistance 30 ohms.	RR127-3
R6002	Same as R6001.	
R6003	Same as R6001.	
R6004	RESISTOR, FIXED, WIREWOUND: 14 watts; resistance 1.0 ohms; 3.741 milli-amps max; temp. 275°C.	RW119G1R0
R6005	RESISTOR, FIXED, WIREWOUND: 140 watts; resistance 18,000 ohms; 88 milli-amps max; temp. 275°C.	RW118F183
R6006 thru R6018	Same as R6005.	
R6019	RESISTOR, FIXED, WIREWOUND: 140 watts.	RW118F3R0
R6020	Same as R6019.	
R6021	Same as R6019.	
R6022	RESISTOR, FIXED, WIREWOUND: 14 watts; resistance 130 ohms; 336 milli-amps max; temp. 275°C.	RW119G131
R6023	Non-replaceable item. Part of XF6001.	
R6024	RESISTOR, FIXED, WIREWOUND: 20 watts; resistance 7,500 ohms; current 50 ma.	RW110-32

PSA FRAME (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S6001	SWITCH, AIR FLOW: low torque microswitch; counterclockwise direction of rotation; SPDT, 5 amps, 125 or 250 VAC.	SW252
S6002	SWITCH, PUSH-PULL: momentary contact, NC, SPST; 15 amps at 125, 250 or 460 VAC; 1/2 amp at 125 VDC, 1/4 amp at 250 VDC.	SW169
S6003	Same as S6001.	
S6004	Non-replaceable item. Part of K6003.	
S6005	Non-replaceable item. Part of K6003.	
S6006	SWITCH, PUSH-PULL: total travel approx. 0.312"; 15 amps, 120, 250 VAC; 2 amps resistive at 250 VDC.	SW230
S6007 thru S6010	Same as S6006.	
S6011	Non-replaceable item. Part of K6001.	
S6012	Non-replaceable item. Part of K6001.	
S6013	Non-replaceable item. Part of K6002.	
S6014	Non-replaceable item. Part of K6002.	
S6015	Non-replaceable item. Part of K6002.	
S6016	Non-replaceable item. Part of K6001.	
T6001 thru T6003	NOT USED	
T6004	TRANSFORMER, POWER, STEP-UP: primary adj. 195 to 240/390 to 480 VAC; secondary 9000V RMS; working voltage 20 Kv; open frame, black, 12-1/2" x 24-1/2" x 30-1/4" high.	TF325
T6005	Same as T6004.	
T6006	Same as T6004.	
TB6001	TERMINAL BOARD ASSEMBLY.	A4224
W6001	WIRING HARNESS, BRANCHED, ELECTRICAL:	CA735
XDS6001	LIGHT, INDICATOR ASSEMBLY.	TS163
XDS6002	LIGHT, INDICATOR ASSEMBLY.	TS138
XF6001	FUSEHOLDER: lamp indicating; 90 to 300 volts; resistance 220K consists of DS6003 and R6023.	FH104-2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C6101	CAPACITOR, FIXED, MICA DIELECTRIC: 10,000 uuf, $\pm 10\%$; 300 WVDC; char. B.	CM35B103K
C6102 thru C6105	Same as C6101.	
C6106	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf $\pm 20\%$; 5,000 WVDC.	CC109-38
DS6101	LAMP, FLUORESCENT: standard, cool, white; 8 watts.	BI107
DS6102	Same as DS6101.	
L6101	COIL, RADIO FREQUENCY: fixed; 35 uh; $\pm 5\%$, 1 ohm DC resistance.	CL292
M6101	AMMETER, DC: 1.0-0-1.0 amperes DC movement; approx. resistance 1 ohm; standard 4-1/2" rectangular case.	MR167
M6102	VOLTMETER, DC: 0-1 milli-amps movement; approx. resistance 46 ohms; standard 4-1/2" rectangular case.	MR134
M6103	VOLTMETER, KV DC: 0-1 milli-amps DC movement; approx. resistance 46 ohms; 2% of full scale accuracy; standard 4-1/2" rectangular case.	MR166
M6104	VOLTMETER; filament primary: 0-300 volts, red marker at 230 V; 4-1/2" square case.	MR118
M6105	METER, SWR: 0-100 microamps DC movement; approx. resistance 1,800 ohms; upper contact adjustment; standard 4-1/2" rectangular case.	MR165
R6101	RESISTOR, FIXED, FILM: 1 megohm, $\pm 1\%$; 1 watt, 500 volts at 70°C.	RN75B1004F
S6101	STARTER, FLUORESCENT LAMP: 8 watts; 3/16" dia x 1-1/2" long o/a.	PO170
S6102	Same as S6101.	
T6101	BALLAST, LAMP: 8 watt, 118 volts, 0.17 amp, 60 cps.	PO169
T6102	Same as T6101.	
XDS6101A	LAMPHOLDER: fluorescent bulb, 75 watt, 250 volts; 1-1/32" high x 5/8" wide x 5/16" thk o/a; 6" leads.	TS141
XDS6101B	Same as XDS6101A.	
XDS6102A	Same as XDS6101A.	
XDS6102B	Same as XDS6101A.	
XS6101	SOCKET, LAMP STARTER: 660 watt, 250 volts; 1-13/16" high x 1-11/16" wide x 7/16" thk o/a; 8-3/4" leads.	TS140
XS6102	Same as XS6101.	

RETUNE AND SWR CHASSIS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C6201	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C6202	Same as C6201.	
C6203	Same as C6201.	
C6204A, B	CAPACITOR, FIXED, ELECTROLYTIC: dual section; 20 uf each section; 450 WVDC; polarized; tubular cases; octal plug-in type.	CE52C200R
C6205 thru C6212	Same as C6201.	
C6213	CAPACITOR, FIXED, ELECTROLYTIC: 3000 uf, 500 WVDC, aluminum polarized.	CE51C301G
C6214 thru C6217	Same as C6201.	
CR6201	RECTIFIER, SEMICONDUCTOR: full wave bridge, 100 volts peak inverse volts per leg, 2.2 amps DC; full wave center tap, 1,600 volts peak inverse volts per leg, 500 ma DC.	DD107
CR6202	SEMICONDUCTOR DEVICE, DIODE: silicon; nom. operating voltage 4.7; max. dissipation 40 W at 25°C; rated at 20 ma; max. impedance 19 ohms; max. operating temperature 175°C.	1N750A
CR6203	SEMICONDUCTOR DEVICE, DIODE:	1N3027
CR6204	Same as CR6202.	
DS6201	LAMP, GLOW: circuit voltage 110-125 VAC/VDC, current rating 0.6 ma, 1/15 watt; midjet flange base T-2 bulb.	BI111-1
DS6202	LAMP, INCANDESCENT: 6.3 VAC/VDC, 0.20 amp; single contact, miniature T-3-1/4 bulb.	BI110-8
EV6201	SHIELD, ELECTRON TUBE: socket 10 contact.	TS103U02
EV6202	Same as EV6201.	
J6201	CONNECTOR, RECEPTACLE, ELECTRICAL: male; 14 contacts, pin type.	MS3102A20-27P
L6201	COIL, RADIO FREQUENCY: fixed; 2.5 mh, ±10%; current rated at 100 ma.	CL140-1
L6202	Same as L6201.	
R6201	RESISTOR, FIXED, COMPOSITION: 10 ohms, ±10%; 1/2 watt.	RC20GF100K
R6202	RESISTOR, FIXED, WIREWOUND: 750 ohms, ±5%; current rating 180 ma; 25 watts.	RW111-18
R6203	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, ±10%; 2 watts.	RC42GF473K
R6204	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, ±10%; 1/2 watt.	RC20GF224K

RETUNE AND SWR CHASSIS (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R6205	RESISTOR, FIXED, COMPOSITION: 8,200 ohms, $\pm 5\%$; 1/2 watt.	RC20GF822J
R6206	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF104K
R6207	RESISTOR, FIXED, COMPOSITION: 330,000 ohms, $\pm 10\%$; 2 watts.	RC42GF334K
R6208	Same as R6207.	
R6209	Same as R6206.	
R6210	RESISTOR, VARIABLE, COMPOSITION: 500,000 ohms, $\pm 10\%$; 2 watts; linear taper.	RV4LAYSC504 Ayy
R6211	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, $\pm 10\%$; 1 watt.	RC32GF102K
R6212	RESISTOR, FIXED, COMPOSITION: 3,300 ohms, $\pm 10\%$; 2 watts.	RC42GF332K
R6213	RESISTOR, ADJUSTABLE, WIREWOUND: 25,000 ohms, $\pm 10\%$; 4 watts; linear taper.	RA106ASXA253A
R6214	RESISTOR, FIXED, WIREWOUND: 10,000 ohms, $\pm 5\%$; current rating 32 ma; 10 watts.	RW109-34
R6215	Same as R6203.	
R6216	Same as R6214.	
R6217	Same as R6213.	
R6218	Same as R6212.	
R6219	Same as R6211.	
R6220	RESISTOR, FIXED, COMPOSITION: 470,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF474K
T6201	TRANSFORMER, POWER, STEP-DOWN, STEP-UP: primary-115-220 VAC 50/60 cps, secondary-500 V., 35 ma. DC 33 volts, 1.2 amp; 6.3 volt, 1 amp insulation 1000 volt rectangular steel case.	TF262
V6201	TUBE, ELECTRON: duo-triode; 9 pin miniature.	12AT7
V6202	Same as V6201.	
XCR6201	SOCKET, ELECTRON TUBE: octal high crown.	TS101P01
XDS6201	LIGHT, INDICATOR: with red lens; brass term.	TS153-1
XDS6202	LIGHT, INDICATOR: with white lens; brass term.	TS154-5
XV6201	SOCKET, ELECTRON TUBE: 9 pin miniature.	TS103P01
XV6202	Same as XV6201.	

PSA FRAME AND PSB FRAME CROWBAR DRAWERS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C6301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, $\pm 20\%$; 5,000 WVDC.	CC109-38
C6302 thru C6304	Same as C6301.	
C6305	CAPACITOR, FIXED, PLASTIC DIELECTRIC: resistance 10,000 ohms $\pm 5\%$; current rating 4000 V DC; temp range -55°C to $+125^{\circ}\text{C}$.	CX102J103M
DS6301	LAMP, NEON: 105-125 volts, 1/7 watt; miniature bayonet base T-3-1/4 bulb.	BI100-51H
DS6302	Non-replaceable item. Part of XF6301.	
E6301	CONTACT, FEEDTHRU	AX220
E6302	Same as E6301.	
E6303	Same as E6301.	
E6304	CLIP, ELECTRICAL: 13/16" x 1-1/2" long. ceramic body.	HB102-1
E6305	INSULATOR, FEED THRU: 12,000 RMS volts; 45 amp; 7/8" dia. x 2-1/8" long.	NS118-5
F6301	FUSE, CARTRIDGE: 1-1/2 amp; time lag; 1-1/4" long x 1/4" dia.; slow blow.	FU102-1.5
J6301	CONNECTOR, RECEPTACLE, ELECTRICAL: male; 4 contacts.	MS3102A22-10P
L6301	COIL, RADIO FREQUENCY: fixed; 35 mh; $\pm 5\%$; 1 ohm DC resistance.	CL292
L6302	Same as L6301.	
M6301	VOLTMETER, AC: 0-10 VAC movement; approx. resistance 1,000 ohms per volt; standard case.	MR163
R6301	RESISTOR, FIXED, WIREWOUND: 140 watts resistance 5.0 ohms; max. amps 5.291; temp range 275°C .	RW118F5R0
R6302	Same as R6301.	
R6303	Same as R6301.	
R6304	RESISTOR, ADJUSTABLE, WIREWOUND: 2,500 ohms resistance; 25 watts, 5/8" x 2-5/8" long.	RA108-252-25
R6305	RESISTOR, VARIABLE, WIREWOUND: 75 watts resistance 2 ohms; max. amps 6.120; slotted shaft.	RP101-3S
R6306	Non-replaceable item. Part of XF6301.	
R6307	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, $\pm 5\%$; 1/2 watt.	RC20GF224J
R6308	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF102K
R6309	Same as R6308.	

PSA FRAME AND PSB FRAME CROWBAR DRWERS (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
T6301	TRANSFORMER, POWER, STEP-DOWN: primary 220 VAC, secondary 6.3 V at 25 amps, 5.5 V at 7 amps, rectangular case.	TF268
T6302	TRANSFORMER, POWER, STEP-DOWN: primary 6.3 V at 3 amps, secondary 220 VAC, 50/60 cps, single phase, rectangular steel case.	TF256
V6301	TUBE, ELECTRON: crowbar; hydrogen thyratron.	7568
W6301	WIRING HARNESS, BRANCHED, ELECTRICAL:	CA724
XDS6301	LIGHT, INDICATOR: with red frosted lens; for miniature bayonet base, T-3-1/4 bulb.	TS106-1
XF6301	FUSEHOLDER: consists of DS6302, R6306, bayonet base; 100/250 volts, neon lamp, clear knob, black plastic body, 13/16" x 2-13/16" o/a.	FH104-3
XV6301	SOCKET, ELECTRON TUBE: 5 pin giant.	TS125-2

100-KW HIGH VOLTAGE RECTIFIER A AND B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C6401	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, $\pm 20\%$; 5,000 WVDC.	CC109-38
C6402 thru C6406	Same as C6401.	
DS6401	Non-replaceable item. Part of XF6401.	
DS6402	Non-replaceable item. Part of XF6402.	
DS6403	Non-replaceable item. Part of XF6403.	
DS6404	Non-replaceable item. Part of XF6404.	
DS6405	Non-replaceable item. Part of XF6405.	
DS6406	Non-replaceable item. Part of XF6406.	
DS6407	LAMP, INCANDESCENT: 230 volts, 10 watts; screw base, S6 type bulb.	BI105-1
DS6408	Same as DS6407.	
E6401	CONTACT, FEEDTHRU: 1-1/4" dia x 3-3/4" long.	AX220-2
E6402 thru E6408	Same as E6401.	
E6409	TUBE CAP: heat sink type, 2" dia x 2-1/4" long, aluminum body.	PM903
E6410 thru E6414	Same as E6409.	

100-KW HIGH VOLTAGE RECTIFIER A AND B (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
F6401	FUSE, CARTRIDGE: 1 amp; 1-1/4" long x 1/4" dia.; slow blow.	FU102-1
F6402 thru F6406	Same as F6401.	
L6401	COIL, RADIO FREQUENCY: fixed; 35 uh; $\pm 5\%$, 1 ohm DC resistance.	CL292
L6402	Same as L6401.	
L6403	Same as L6401.	
R6401	Non-replaceable item. Part of XF6401.	
R6402	Non-replaceable item. Part of XF6402.	
R6403	Non-replaceable item. Part of XF6403.	
R6404	Non-replaceable item. Part of XF6404.	
R6405	Non-replaceable item. Part of XF6405.	
R6406	Non-replaceable item. Part of XF6406.	
R6407	RESISTOR, FIXED, WIREWOUND: 3,000 ohms, $\pm 5\%$; current rating 58 ma; 10 watts.	RW109-30
R6408	Same as R6407.	
T6401	TRANSFORMER, POWER, STEP-DOWN: primary 220 VAC, secondary 5 V at 15 amps, working volts 20 Kv; open frame type, size o/a 4-1/4" x 7" x 5-7/8" high, black.	TF249
T6402 thru T6406	Same as T6401.	
V6401	TUBE, ELECTRON	TV101
V6402 thru V6406	Same as V6401.	
W6401	WIRING HARNESS, BRANCHED, ELECTRICAL	CA730
XDS6401	LIGHT, INDICATOR: w/frosted red lens; screw type socket.	TS136-1FS
XDS6402	Same as XDS6401.	
XF6401	FUSEHOLDER: extractor post type 100-250 volts, 20 amps; neon indicator lamp; 220 K ohm lamp resistor.	FH104-3
XF6402	Same as XF6401. Consists of DS6402, R6402.	
XF6403	Same as XF6401. Consists of DS6403, R6403.	
XF6404	Same as XF6401. Consists of DS6404, R6404.	
XF6405	Same as XF6401. Consists of DS6405, R6405.	
XF6406	Same as XF6401. Consists of DS6406, R6406.	

PSA FRAME AND PSB FRAME CONTROL PANELS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CB6501	CIRCUIT BREAKER: DPST 50 amps, 250 VAC 50/60 cycles.	SW325
CB6502	CIRCUIT BREAKER: 3 PST consists of S6501, S6502, S6503, total travel approx. 0.321"; 15 amp, 120, 250 VAC; 2 amp resistive at 250 VDC.	SW320
DS6501	Non-replaceable item. Part of XF6501.	
DS6502	Non-replaceable item. Part of XF6503.	
DS6503	LAMP, NEON: 105-125 volts, 1/25 watt; miniature bayonet base T-3-1/4 bulb.	BI100-51
DS6504	Non-replaceable item. Part of XF6502.	
DS6505	Same as DS6503.	
DS6506	Non-replaceable item. Part of XF6505.	
DS6507	Non-replaceable item. Part of XF6504.	
DS6508	Non-replaceable item. Part of XF6506.	
F6501	FUSE, CARTRIDGE: 5 amps; time lag; 1-1/4" long x 1/4" dia. ; slow blow.	FU102-5
F6502	FUSE, CARTRIDGE: 2 amps; time lag; 1-1/4" long x 1/4" dia. ; slow blow.	FU102-2
F6503 thru F6505	Same as F6502.	
F6506	Same as F6501.	
J6501	CONNECTOR, RECEPTACLE, ELECTRICAL: male, pin type, 14 contacts.	MS3102A20-27P
R6501	Non-replaceable item. Part of XF6501.	
R6502	Non-replaceable item. Part of XF6503.	
R6503	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF224K
R6504	Non-replaceable item. Part of XF6502.	
R6505	Same as R6503.	
R6506	Non-replaceable item. Part of XF6505.	
R6507	Non-replaceable item. Part of XF6504.	
R6508	Non-replaceable item. Part of XF6506.	
S6501	Non-replaceable item. Part of CB6502.	
S6502	Non-replaceable item. Part of CB6502.	
S6503	Non-replaceable item. Part of CB6502.	
W6501	WIRING HARNESS, BRANCHED, ELECTRICAL	CA733

PSA FRAME AND PSB FRAME CONTROL PANELS (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XDS6501	NOT USED	
XDS6502	NOT USED	
XDS6503	LIGHT, INDICATOR: red lens frosted lens; for miniature bayonet base, 7-3/4 bulb.	TS106-1
XDS6504	NOT USED	
XDS6505	Same as XDS6503.	
XF6501	FUSEHOLDER: consists of DS6501, R6501, bayonet base; 100/250 volts, neon lamp, clear knob, black plastic body, 13/16" x 2-13/16" o/a.	FH104-3
XF6502	Same as XF6501. Consists of DS6504, R6504.	
XF6503	Same as XF6501. Consists of DS6502, R6502.	
XF6504	Same as XF6501. Consists of DS6507, R6507.	
XF6505	Same as XF6501. Consists of DS6506, R6506.	
XF6506	Same as XF6501. Consists of DS6508, R6508.	

PSB FRAME

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B6601	FAN, TUBEAXIAL: CCW rotation; 230 VAC, 50/60 cps, single phase; 1725 rpm at 50/60 cps.	BL114
B6602	FAN, CENTRIFUGAL: CW rotation; 115/230 V, 50/60 cps, single phase; 3200 rpm, 110 watts max. load.	BL115
B6603	CONTROL, CIRCUIT BREAKER: 240 VAC at 5 amps.	MO110
C6601	CAPACITOR, FIXED, PAPER DIELECTRIC: 8 uf, ±10%; 220 VAC; 60 cps.	CP114-1
C6602	CAPACITOR, FIXED, PAPER DIELECTRIC: 4,000,000 uf ±10%; 600 WVDC.	CP41B1FF405K
C6603	CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uf, ±10%; 25 Kv WVDC.	CP112
C6604	Same as C6603.	
C6605	CAPACITOR, FIXED, TEFLON: .003 uf, ±10%; 30 Kv; operating temperature range -60°C to +85°C.	CX108-2
C6606	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, ±20%; 5,000 WVDC.	CC109-38
C6607	Same as C6606.	
CB6601	CIRCUIT BREAKER: 3 PST; 600 VAC, 400 amp rating; 11" x 9" x 3-7/8" long, frame "JKL".	SW328

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS6601	LAMP, INCANDESCENT: 230 to 250 volts, 40 watts; clear type, screw base.	BI106-1
DS6602	Same as DS6601.	
DS6603	Non-replaceable item. Part of XF6601.	
E6601	TERMINAL BOARD, BARRIER: 6 terminals, 6-32 thd binding hd. screws, 1/4" long, phenolic body.	TM100-6
E6602	CONTACT, ELECTRICAL: spring loaded, nickel plated beryllium copper; 2-1/4" x 1-1/4" x 1" o/a.	AX153
E6603 thru E6612	Same as E6602.	
E6613	CONTACT, ELECTRICAL: spring loaded, beryllium copper, silver plated; 3/4" x 3/4" x 1-1/8" long.	AX154
E6614	Same as E6613.	
F6601	FUSE, CARTRIDGE: 1/2 amp; time lag; 1-1/4" long x 1/4" dia.; slow blow.	FU102-.5
J6601	CONNECTOR, RECEPTACLE, ELECTRICAL: female.	MS3102A16S-1S
J6602	CONNECTOR, RECEPTACLE, ELECTRICAL: female, 20 contacts.	JJ181
K6601	RELAY, SOLENOID: 3P consists of S6611, S6612, S6616, holding current 1.0 amps at 220 V; 0.5 amps at 440 V; 0.4 amps at 550 V and 600 V.	RL147
K6602	Same as K6601. Consists of S6613, S6614, S6615.	
K6603	RELAY, SOLENOID: 230 VAC; consists of S6604, S6605, L6602, rms amps 100, insulated 25 Kv peak, SPDT.	RL148
K6604	RELAY	RL124
L6601	REACTOR: .4h inductance, current capacity 7 amps DC., working voltage 20 Kv; open frame, black finish; 7-5/8" x 10-5/8" x 14-1/4" high.	TF254
L6602	Non-replaceable item. Part of K6603.	
L6611	Non-replaceable item. Part of K6601.	
S6612	Non-replaceable item. Part of K6601.	
S6613	Non-replaceable item. Part of K6602.	
S6614	Non-replaceable item. Part of K6602.	
S6615	Non-replaceable item. Part of K6602.	
S6616	Non-replaceable item. Part of K6601.	
T6601 thru T6603	NOT USED	

PSB FRAME (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
T6604	TRANSFORMER, POWER, STEP-UP: primary adj. 195 to 240, 390 to 480 VAC, secondary volts 9000 V rms, secondary current 7 amps DC; working voltage 20 Kv; open frame, black; 12-1/2" x 24-1/4" x 30-1/4" high.	TF325
T6605	Same as T6604.	
T6606	Same as T6604.	
TB6601	TERMINAL BOARD ASSEMBLY	A4224
W6601	WIRING HARNESS, BRANCHED, ELECTRICAL:	CA734
XDS6601	LIGHT, INDICATOR ASSY	TS163
XDS6602	LIGHT, INDICATOR ASSY	TS138
XF6601	FUSEHOLDER: consists of DS6603, R6603, extractor post type; 90-300 volts, 20 amps; neon indicator lamp; 220 K ohm lamp resistor.	FH104-2
M6601	TIMER, INTERVAL: motor 220 VAC, 60 cycles; power input 4 volt amps; 20 sec timer.	TI100
P6601	CONNECTOR, PLUG, ELECTRICAL: male	MS3106B16S-1P
P6602	CONNECTOR, PLUG, ELECTRICAL: female; socket type, 4 contacts.	MS3106B22-10S
P6603	CONNECTOR, PLUG, ELECTRICAL: female; 16 contacts.	MS3106B20-27S
P6604	CONNECTOR, PLUG, ELECTRICAL: female	MS3106B24-9S
P6605	CONNECTOR, PLUG, ELECTRICAL: female; socket type, 35 contacts.	MS3106B32-7S
P6606	CONNECTOR, PLUG, ELECTRICAL: RF miniature bayonet socket, one female contact, impedance 48 ohms, freq. range 1 to 500 mc.	PL204
R6601	RESISTOR, FIXED, FINSTRIP: 1,900 watts, 230 volts; approx. DC resistance 30 ohms.	RR127-3
R6602	Same as R6601.	
R6603	Same as R6601.	
R6604	RESISTOR, FIXED, WIREWOUND: 14 watts; resistance 1.0 ohms; max. milli-amps 3.741; temp. range 270°C.	RW119G1R0
R6605	RESISTOR, FIXED, WIREWOUND: 140 watts; resistance 2.5 ohms; max. amps 7.483; temp. range 275°C.	RW118F183
R6606 thru R6618	Same as R6605.	
R6619	RESISTOR, FIXED, WIREWOUND: 140 watts; resistance 3.1 ohms; max. milli-amps 6.715; temp. range 275°C.	RW118F3R0
R6620	Same as R6619.	

PSB FRAME (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R6621	Same as R6619.	
R6622	RESISTOR, FIXED, WIREWOUND: 14 watts; resistance 130 ohms; max. milli-amps 336; temp range 275°C.	RW119G131
R6623	Non-replaceable item. Part of XF6601.	
R6624	RESISTOR, FIXED, WIREWOUND: 20 watts.	RW110-32
S6601	SWITCH, AIR FLOW: low torque micro; counter clockwise rotation; SPDT; 5 amps at 125 or 250 VAC.	SW252
S6602	SWITCH, PUSH-PULL: SPST; SP overthrow; 15 A at 125, 250 or 460 VAC.	SW169
S6603	Same as S6601.	
S6604	Non-replaceable item. Part of K6603.	
S6605	Non-replaceable item. Part of K6603.	
S6606	SWITCH, PUSH-PULL: total travel approx. 0.321"; 15 amp 120, 250 VAC; 2 amp resistive at 250 VDC.	SW230
S6607 thru S6610	Same as S6606.	

PSB FRAME METER PANEL

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C6701	CAPACITOR, FIXED, MICA DIELECTRIC: 10,000 uuf, $\pm 10\%$; 300 WVDC; char. B.	CM35B103K
C6702 thru C6705	Same as C6701.	
C6706	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, $\pm 20\%$; 5,000 WVDC.	CC109-38
C6707	Same as C6706.	
DS6701	LAMP, FLUORESCENT: standard, cool, white; 8 watts; 1/2" dia. x 11-1/4" long.	BI107
DS6702	Same as DS6701.	
E6701	CONTACT, FEEDTHRU: 7/8" OD dia.; 2-3/16" long.	AX241
E6702	Same as E6701.	
L6701	COIL, RADIO FREQUENCY: fixed; 35 uh; $\pm 5\%$; 1 ohm resistance.	CL292
L6702	Same as L6701.	
M6701	AMMETER, DC: 1.0-0-1.0 amperes DC movement; approx. resistance 1 ohm; standard 4-1/2" rectangular case.	MR167

PSB FRAME METER PANEL (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
M6702	VOLTMETER, DC: 0-1 milli-amps movement; approx. resistance 46 ohms; standard 4-1/2" rectangular case.	MR134
M6703	VOLTMETER, KV DC: 0-1 milli-amps DC movement; approx. resistance 46 ohms; 2% full scale accuracy; standard 4-1/2" rectangular case.	MR166
M6704	VOLTMETER, FILAMENT PRIMARY: 0-300 volts, red marker at 230 V; 4-1/2" square case.	MR118
M6705	METER, ARB SCALE: 100-0-100 microammeters movement; approx. resistance 1000 ohms; standard 4-1/2" rectangular case.	MR123
P6701	CONNECTOR, RECEPTACLE, ELECTRICAL: male. Part of W6701.	JJ180
R6701	RESISTOR, FIXED, FILM: 1 megohm, $\pm 1\%$; 1 watt, 500 volts at 70°C.	RN75B1004F
S6701	STARTER, FLUORESCENT LAMP: 8 watts; 13/16" dia. x 1-1/2" long.	PO170
S6702	Same as S6701.	
T6701	BALLAST, LAMP: 8 watt, 118 volts, 0.17 amp, 60 cps.	PO169
T6702	Same as T6701.	
W6701	WIRING HARNESS, BRANCHED, ELECTRICAL	CA752
XDS6701A	LAMPHOLDER: fluorescent bulb, 75 watt, 250 volts.	TS141
XDS6701B	Same as XDS6701A.	
XDS6702A	Same as XDS6701A.	
XDS6702B	Same as XDS6701A.	
XS6701	SOCKET, LAMP STARTER: 60 watt, 250 volt.	TS140
XS6702	Same as XS6701.	

ANTENNA TUNER DECK

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C6801	CAPACITOR, VARIABLE VACUUM: 15 to 1200 uufd, peak voltage 10 Kv; current rating 45 amps rms.	CB146
C6802	CAPACITOR, VARIABLE VACUUM: capacitance 50 to 2000 uufd; voltage 10 Kv; current rating 45 amps rms.	CB155
C6803	Same as C6802.	
C6804	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 50 uuf, $\pm 10\%$, 7500 WVDC, 6-32 tapped studs each end, 13/16" dia. x 7/8" long o/a.	CC109-19
C6805	Same as C6804.	

ANTENNA TUNER DECK (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E6801	INSULATOR, FEEDTHRU ASSY:	AX450
E6802	Same as E6801.	
J6801	CONNECTOR, RECEPTACLE, ELECTRICAL: RF miniature male; one contact; bayonet type.	JJ211
L6801	COIL, RADIO FREQUENCY: .52 \pm 10% micro-henries.	CL312
MP6801	COUNTER, ROTARY: 3 figures, fixed mount.	CY109
MP6802	Same as MP6801.	
R6801	RESISTOR, FIXED, FILM: 0.6 ohms \pm 10% to 20%; 40 watts 1" dia. x 4" long.	RR122-0.6
R6802 thru R6806	Same as R6801.	
R6807	RESISTOR, FIXED, COMPOSITION: 100 ohms, \pm 10%; 1/2 watt.	RC20GF101K
R6808	Same as R6807.	
T6801	TRANSFORMER, RADIO FREQUENCY: impedance primary 50 ohms unbalanced; secondary 600 ohms balanced; 100 Kw output.	TR179
Z6801	NETWORK, BAL.	AX451
XZ6801	SOCKET, ELECTRON TUBE: octal high crown.	TS101P01

ANTENNA SWITCHING UNIT

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
AR6901	RETUNE AND SWR CHASSIS: (See separate parts list for breakdown.)	AZ101
B6901	FAN, VANEAXIAL: AC motor, 230 volts, \pm 10%; 1 phase, 50/60 cps, current rating 0.85/0.6 amps; 2,800-3,300 rpm; consists of one 4 uf, 400 VAC capacitor; 1 flange.	BL117
C6901	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, GMV; 500 WVDC.	CC100-29
C6902 thru C6904	Same as C6901.	
C6905	CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uf, \pm 10%; 600 WVDC; char. E.	CP41B1EF405K
C6906	CAPACITOR, FIXED, ELECTROLYTIC: 80 uf, 450 WVDC; dry electrolytic; polarized; aluminum case, octal plug in type.	CE51C800R
C6907	Same as C6906.	

ANTENNA SWITCHING UNIT (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR6901	DETECTING ELEMENT, DIRECTIONAL COUPLER: frequency range 2-30 mc; power calibrated for 200 Kw average power two tone; gold plated case.	DD106
CR6902	Same as CR6901.	
CR6903	SEMICONDUCTOR DEVICE, DIODE: silicon; 600 V max. peak inverse volts; 0.75 max. DC forward amperes at 150°C.	1N547
CR6904	Same as CR6903.	
DC6901	COUPLER, DIRECTIONAL: frequency range 2-30 mc; power rated at 200 Kw; impedance, 51.5 ohms.	DC103
DS6901	Non-replaceable item. Part of XF6901.	
DS6902	Non-replaceable item. Part of XF6902.	
DS6903	Non-replaceable item. Part of XF6903.	
DS6904	LAMP, INCANDESCENT: 230 volts, 10 watts; screw base, S6 type bulb.	BI105-1
DS6905	Same as DS6904.	
DS6906	LAMP, NEON: 105-125 volts, 1/7 watt; miniature bayonet base bulb.	BI100-51H
DS6907	Non-replaceable item. Part of XF6904.	
F6901	FUSE, CARTRIDGE: 2 amps; time lag; 1-1/4" long x 1/4" dia.; slow blow.	FU102-2
F6902	Same as F6901.	
F6903	FUSE, CARTRIDGE: 1/4 amp; time lag; 1-1/4" long x 1/4" dia.; slow blow.	FU102-.250
F6904	FUSE, CARTRIDGE: 1/2 amp; time lag; 1-1/4" long x 1/4" dia.; slow blow.	FU102-.5
J6901	CONNECTOR, RECEPTACLE, ELECTRICAL: RF; 1 round female contact; straight type; series BNC to BNC.	UG625B/U
J6902	Same as J6901.	
J6903	CONNECTOR, RECEPTACLE, ELECTRICAL: BNC.	UG1104*/U
J6904	Same as J6903.	
J6905	CONNECTOR, RECEPTACLE, ELECTRICAL: 4 female contacts.	MS3102A22-10S
L6901	COIL, RADIO FREQUENCY: fixed; 2.5 mh, ±10%; current rating 100 ma.	CL140-1
L6902	Same as L6901.	
P6901	CONNECTOR, PLUG, ELECTRICAL: male pin type.	MS3106332-7P
P6902	CONNECTOR, PLUG, ELECTRICAL: 4 male contacts.	MS3106B22-10P

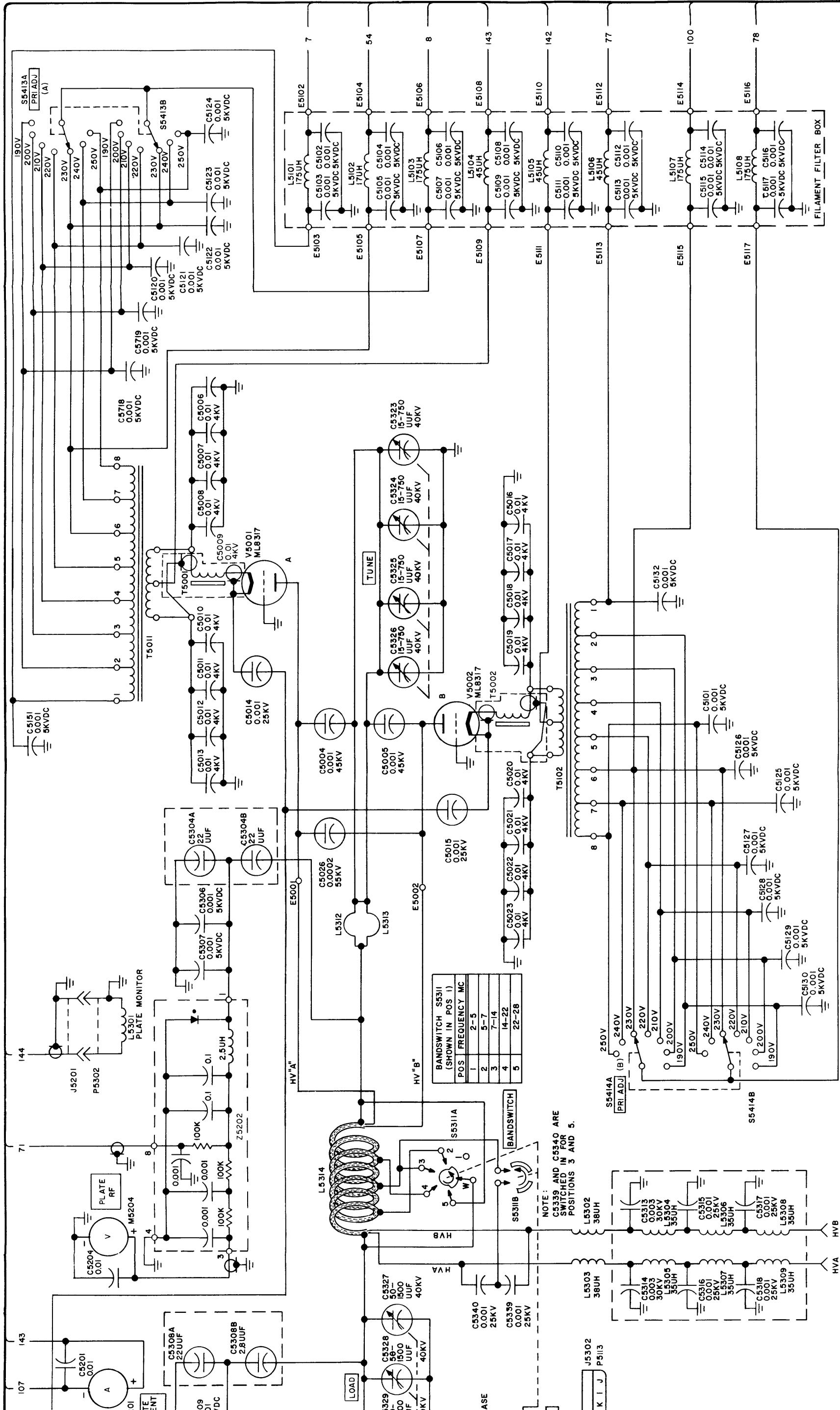
ANTENNA SWITCHING UNIT (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P6903	CONNECTOR, PLUG, ELECTRICAL: 14 number 16 female contacts; straight type.	MS3106B20-27S
P6904	CONNECTOR, PLUG, ELECTRICAL: coaxial; BNC type. Part of W6901.	UG89*/U
P6905	CONNECTOR, PLUG, ELECTRICAL: coaxial; male contact BNC type. Part of W6902.	UG88*/U
P6906	CONNECTOR, PLUG, ELECTRICAL: RF angle type. Part of W6901.	PL192
P6907	Same as P6906. Part of W6902.	
P6908	Same as P6904.	
P6909	Same as P6905.	
P6910	CONNECTOR, PLUG, ELECTRICAL: male.	MS3106B14S-2P
R6901	Non-replaceable item. Part of XF6901.	
R6902	Non-replaceable item. Part of XF6902.	
R6903	Non-replaceable item. Part of XF6903.	
R6904	RESISTOR, FIXED, WIREWOUND: 3,000 ohms; $\pm 5\%$; current rating 58 ma; 10 watts.	RW109-30
R6905	Same as R6904.	
R6906	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, $\pm 10\%$; 1/2 watt.	RG20GF224K
R6907A, B	RESISTOR, VARIABLE, COMPOSITION: dual; section A, 50,000 ohms, section B, 125,000 ohms, $\pm 10\%$; max. ambient temperature 85°C; 2 watts, linear taper.	RV108
R6908	Non-replaceable item. Part of XF6904.	
R6909	RESISTOR, FIXED, WIREWOUND: 6,000 ohms, $\pm 5\%$; current rating 41 ma; 10 watts.	RW109-45
R6910 thru R6912	Same as R6909.	
R6913	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 10\%$; 1/2 watt.	RC20GF104K
R6914	Same as R6913.	
S6901A, B	SWITCH, TOGGLE, DPDT: momentary contact; 3 amps, 250 VAC or 6 amps, 125 VAC; 2 position ON/ON, normally closed.	ST105
S6902	SWITCH, ROTARY: 2 position, 1 section; contacts rated for 5 amps, 28 VDC and 0.5 amps, 110 VAC.	SW150
S6903A, B	SWITCH, TOGGLE: DPDT; 6 amps, 125 VAC; 28° angle of throw; solder lug terminals.	ST22N
S6904	SWITCH, ROTARY: low torque micro; counterclockwise rotation; SPDT; 5 amps at 125 or 250 VAC.	SW252

ANTENNA SWITCHING UNIT (CONT)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
W6901	CABLE ASSEMBLY: RF consists of P6904, P6906.	CA480-113-13.00
W6902	CABLE ASSEMBLY: RF consists of P6905, P6907.	CA480-112-8.50
XC6901 thru XC6905	NOT USED	
XC6906	SOCKET, ELECTRON TUBE: octal, high crown.	TS101P01
XC6907	Same as XC6906.	
XDS6901 thru XDS6905	NOT USED	
XDS6906	LIGHT, INDICATOR: with clear white lens, for miniature bayonet base T-3-1/4 bulb.	TS106-2
XF6901	FUSEHOLDER: extractor post type; 100-250 volts; 20 amps; neon indicator lamp; 220 K ohm lamp resistor. Consists of DS6901, R6901.	FH104-3
XF6902	Same as XF6901. Consists of DS6902, R6902.	
XF6903	Same as XF6901. Consists of DS6903, R6903.	
XF6904	Same as XF6901. Consists of DS6907, R6908.	

SECTION 6
SCHEMATIC DIAGRAMS



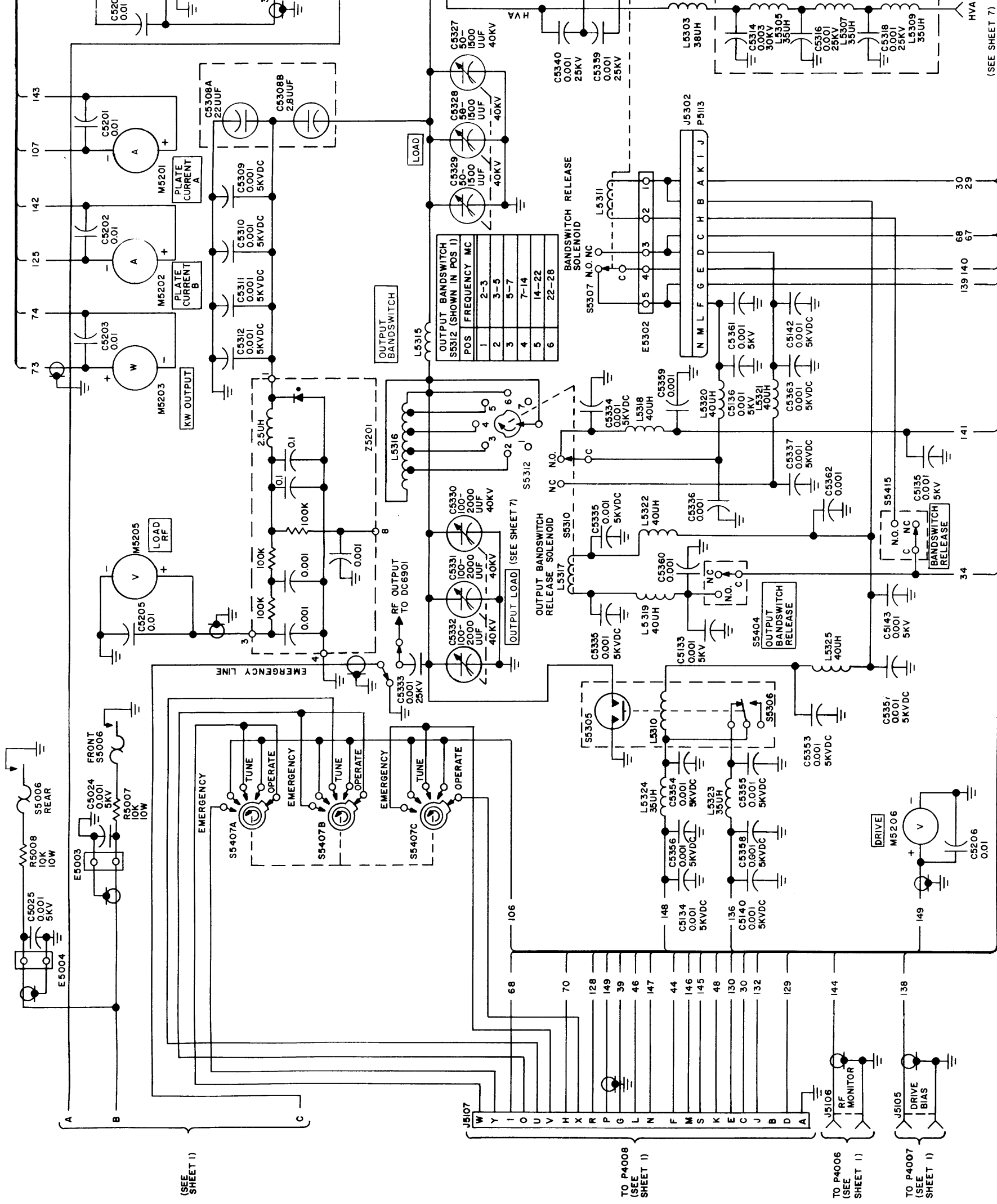
(SEE SHEET 3)

Figure 6-1. GPT-200K, Schematic Diagram (Sheet 2 of 9)

POS	FREQUENCY MC
1	2-5
2	5-7
3	7-14
4	14-22
5	22-28

NOTE:
C5339 AND C5340 ARE SWITCHED IN FOR POSITIONS 3 AND 5.

(SEE SHEET 7) (SEE SHEET 9)



(SEE SHEET 1)

TO P4008
(SEE SHEET 1)

TO P4006
(SEE SHEET 1)

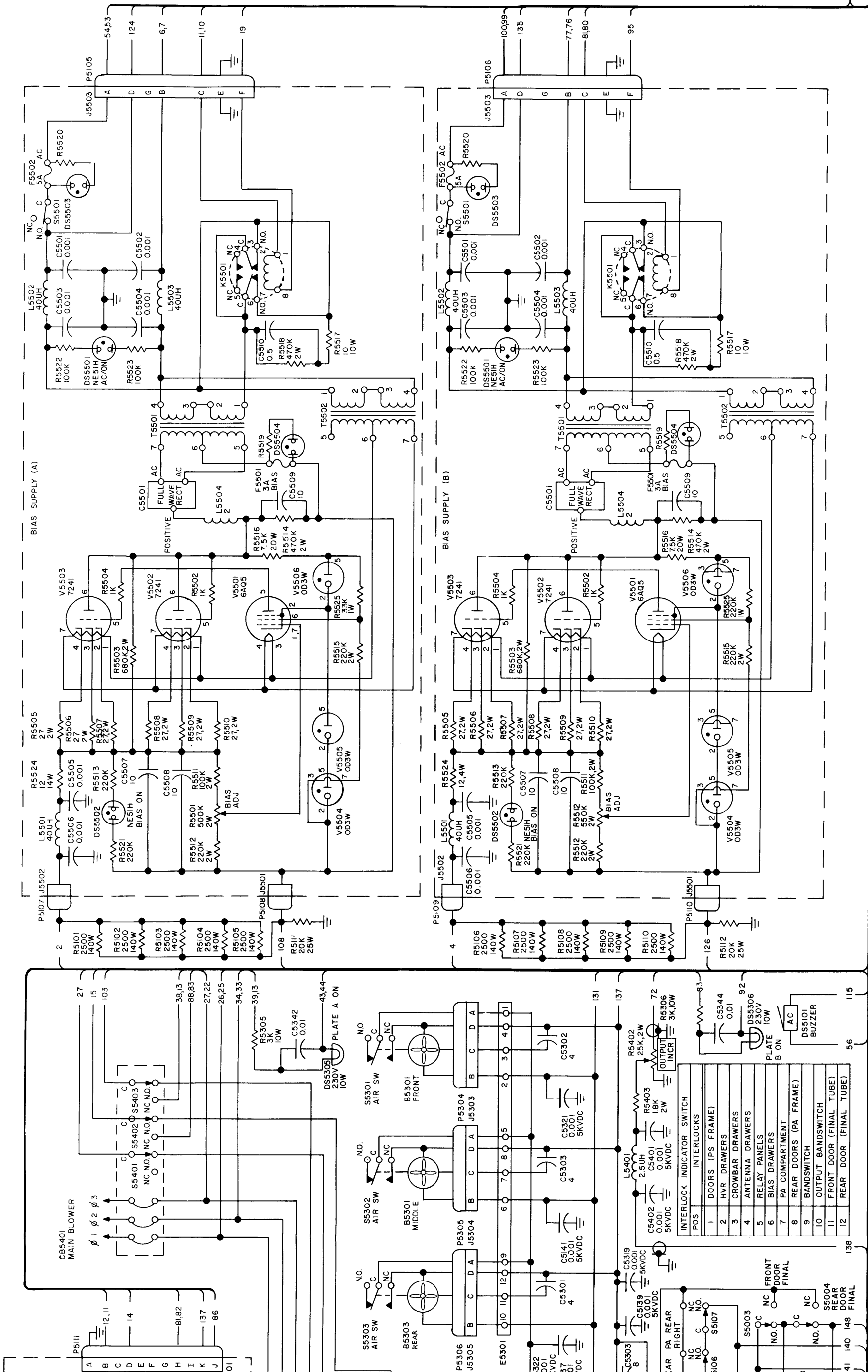
TO P4007
(SEE SHEET 1)

321-24 (CK-630C)

008650321

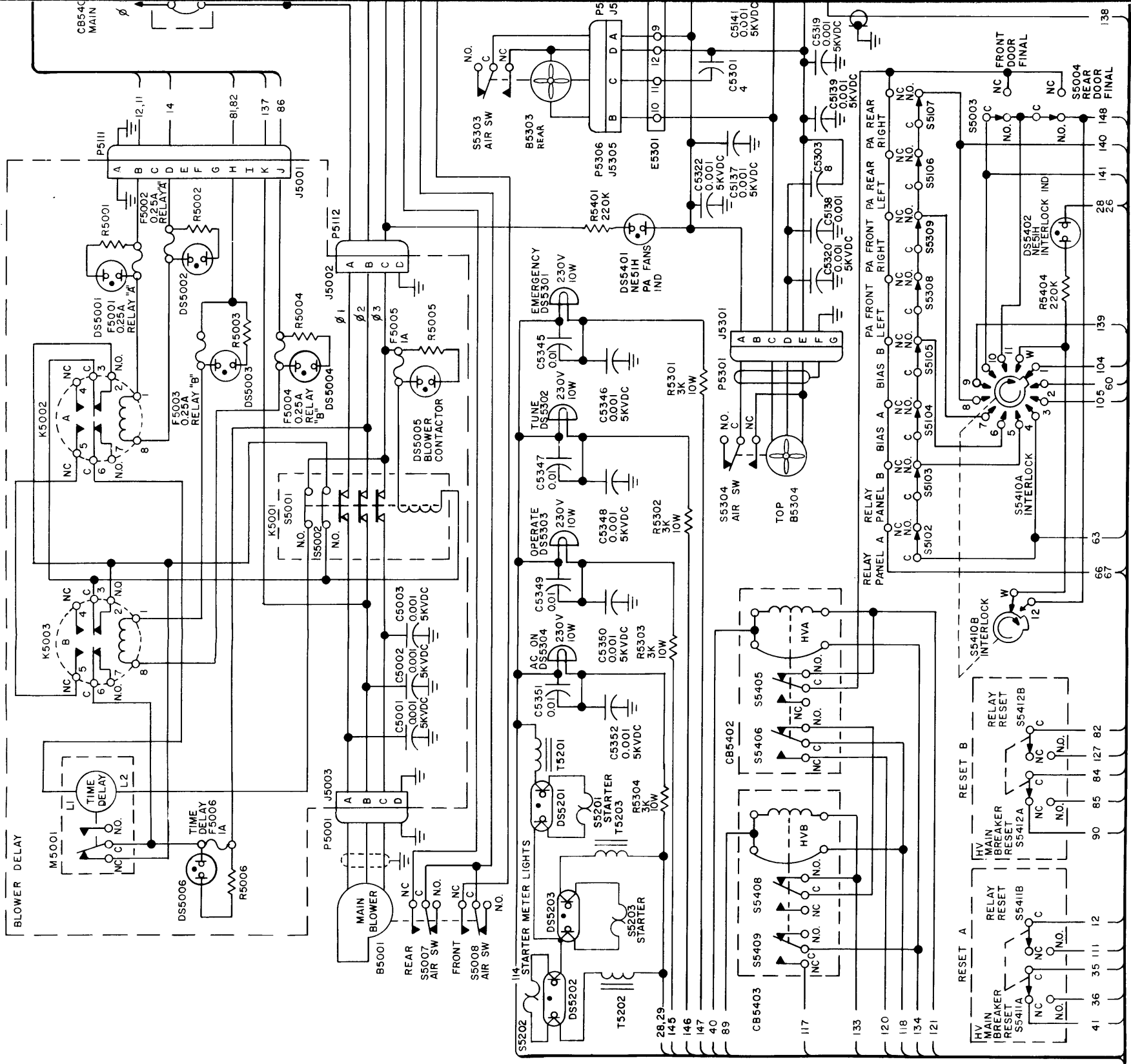
(SEE SHEET 7)

HVA



(SEE SHEET 4)

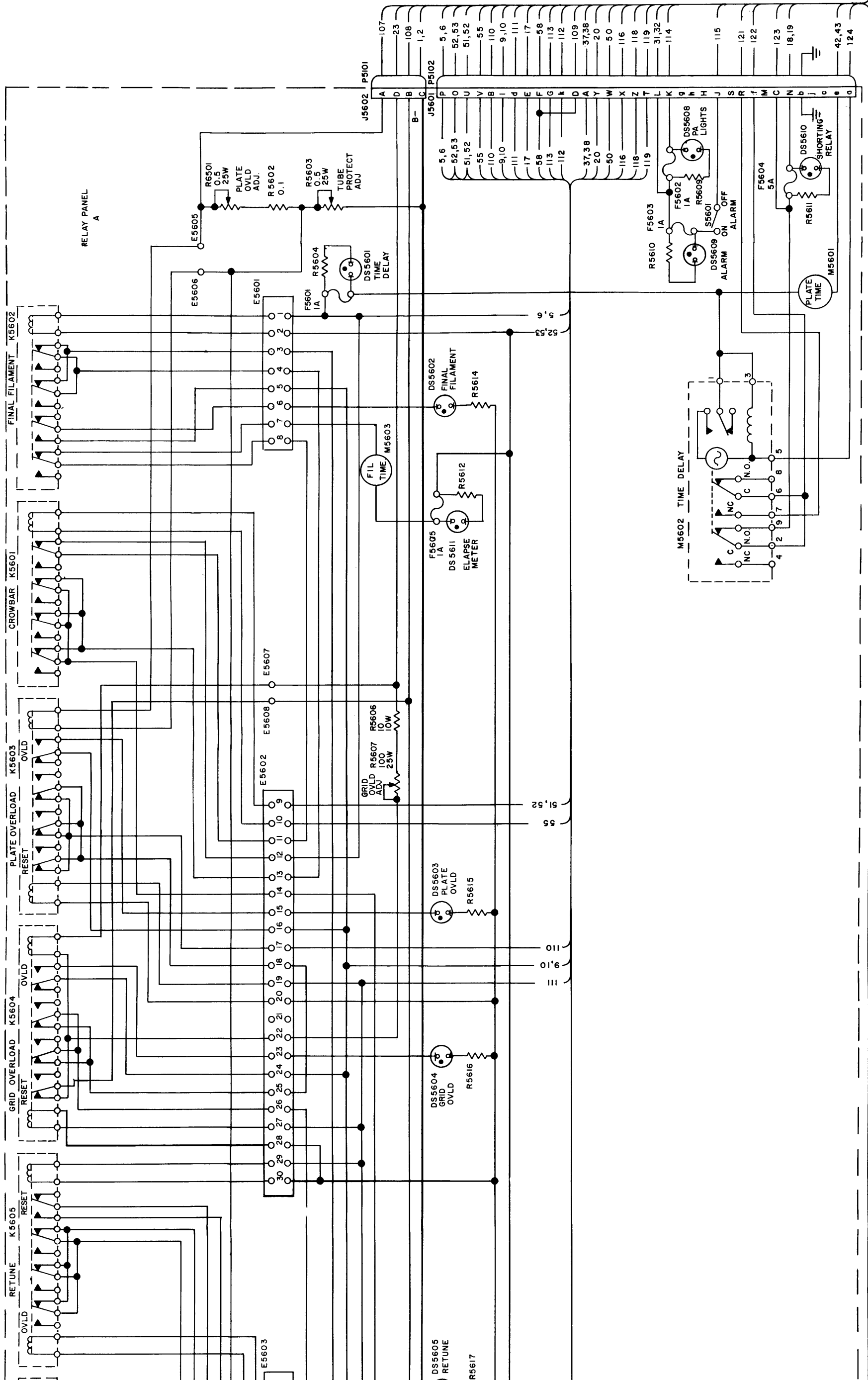
Figure 6-1. GPT-200K, Schematic Diagram (Sheet 3 of 9)



(SEE SHEET 2)

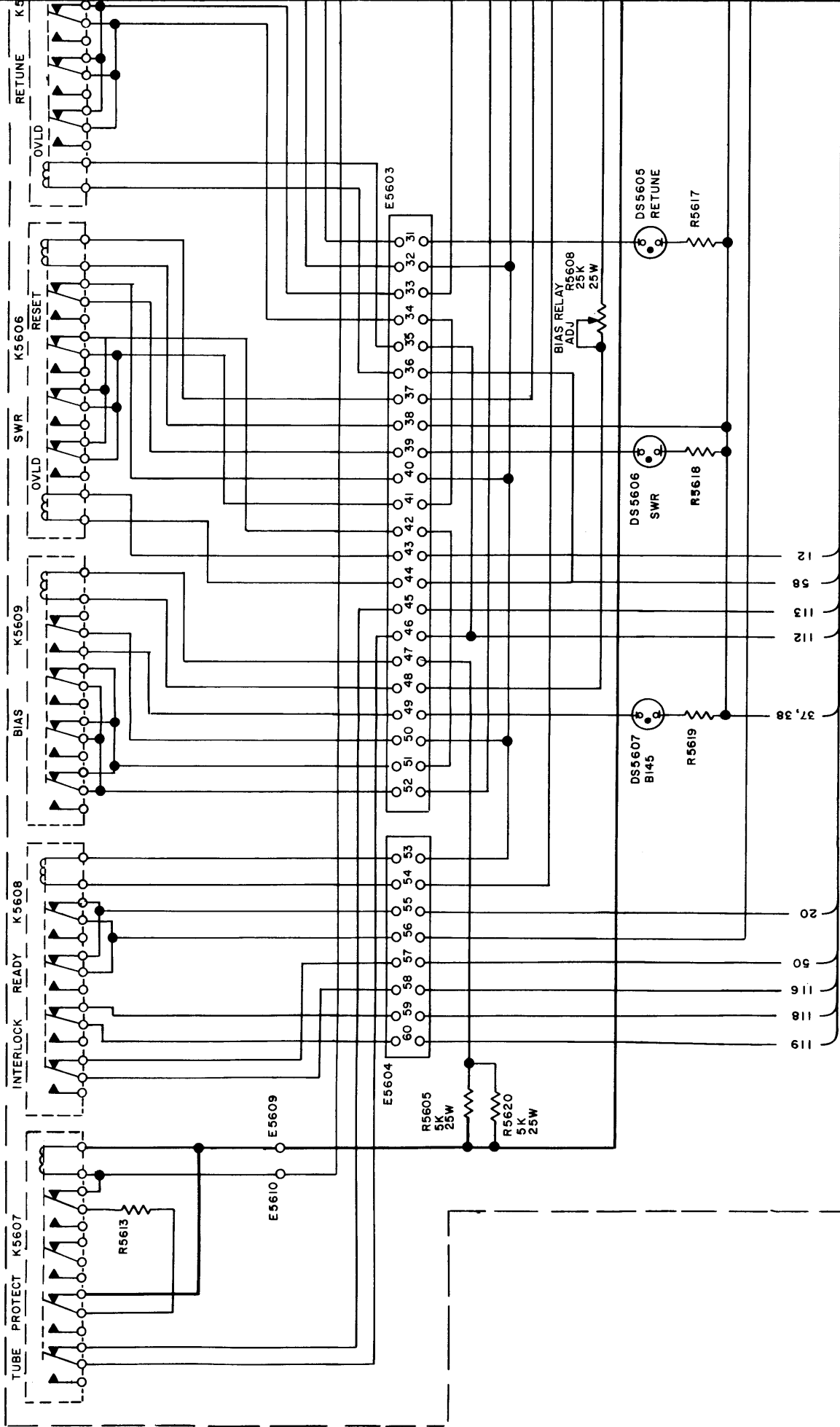
321-25 (CK-830C)

008650321



SEE SHEET 5

Figure 6-1. GPT-200K, Schematic Diagram (Sheet 4 of 9) 6-9/6-10



SEE SHEET 3

321-26 (CK-630C)

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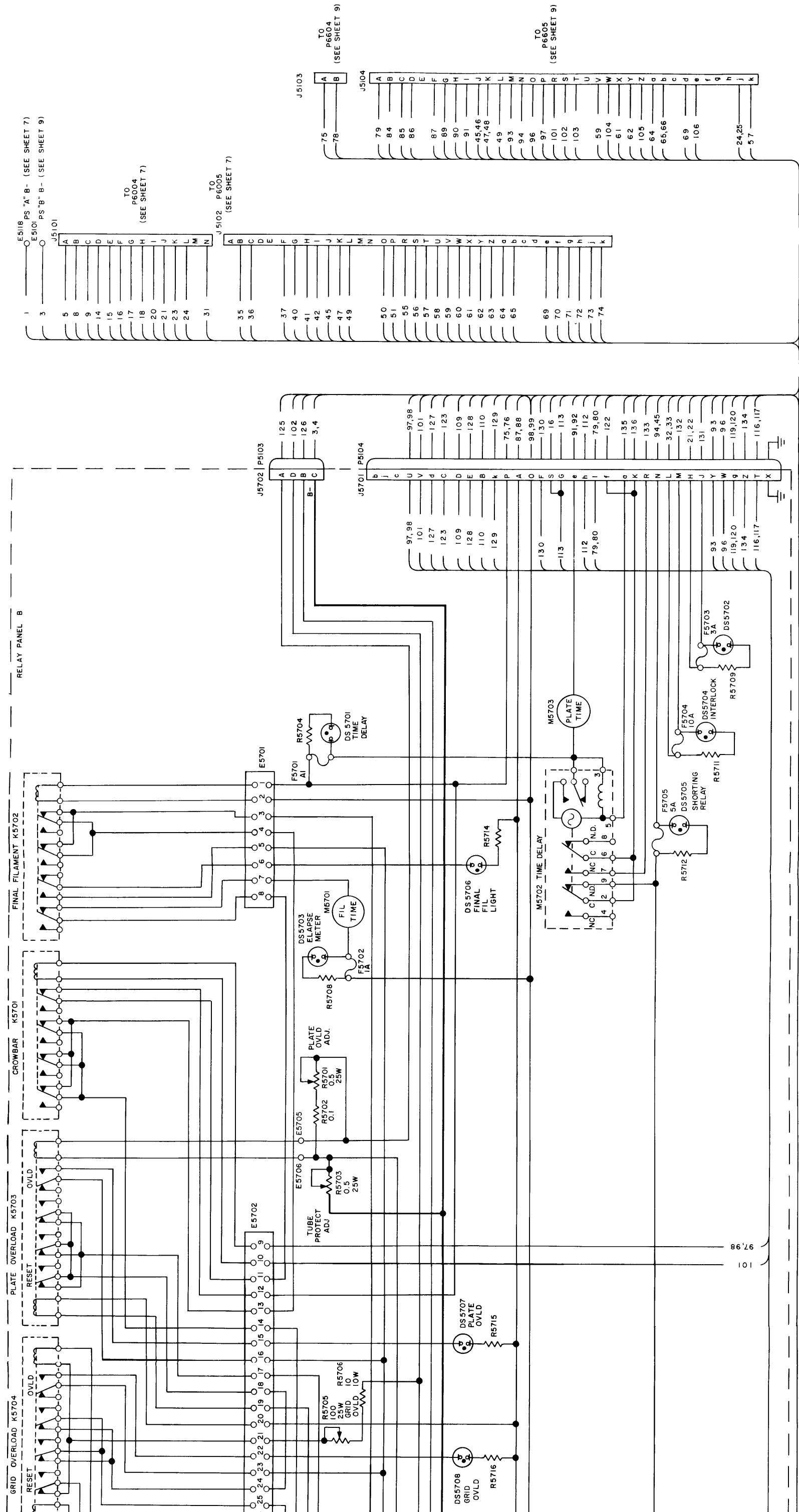
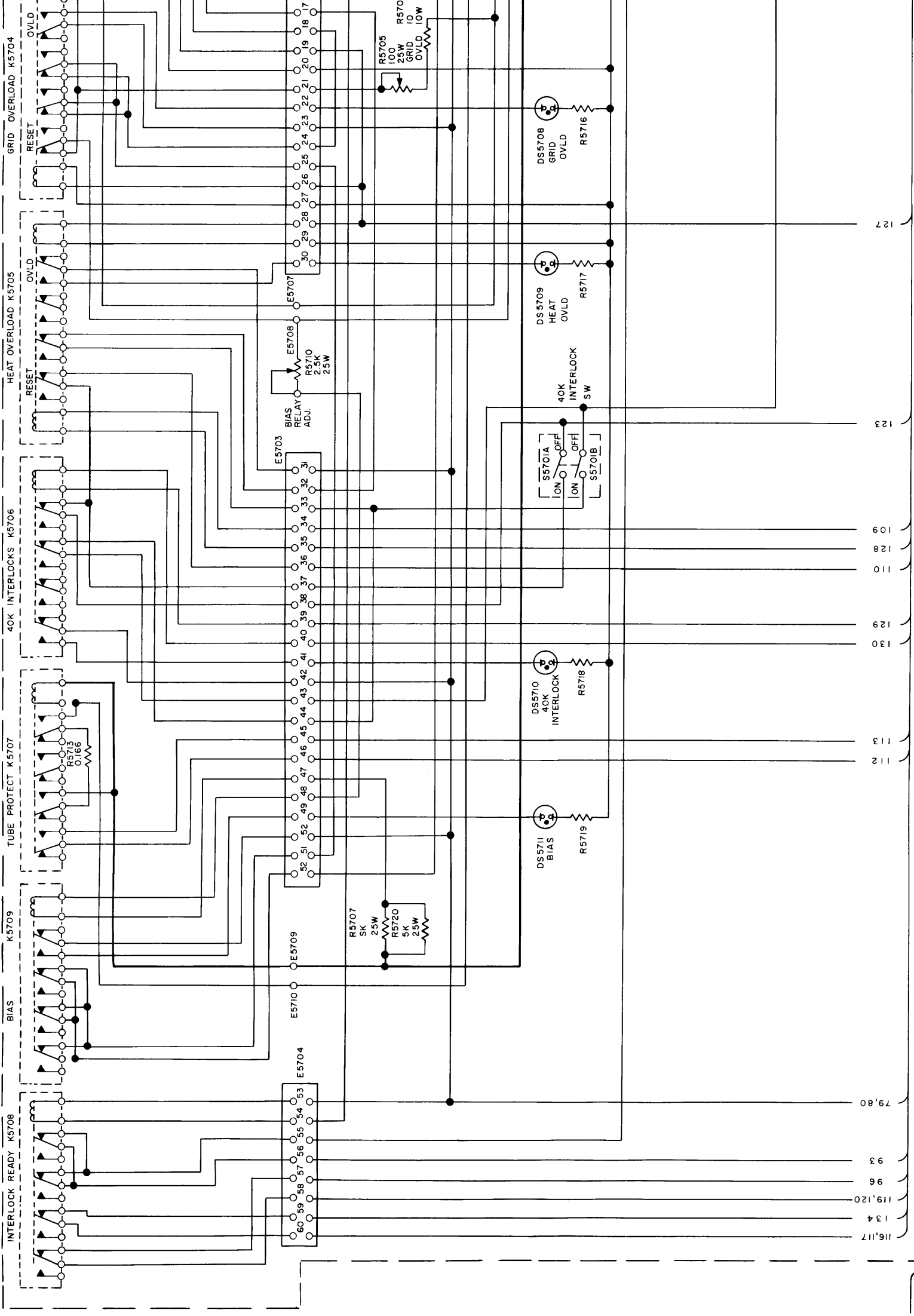


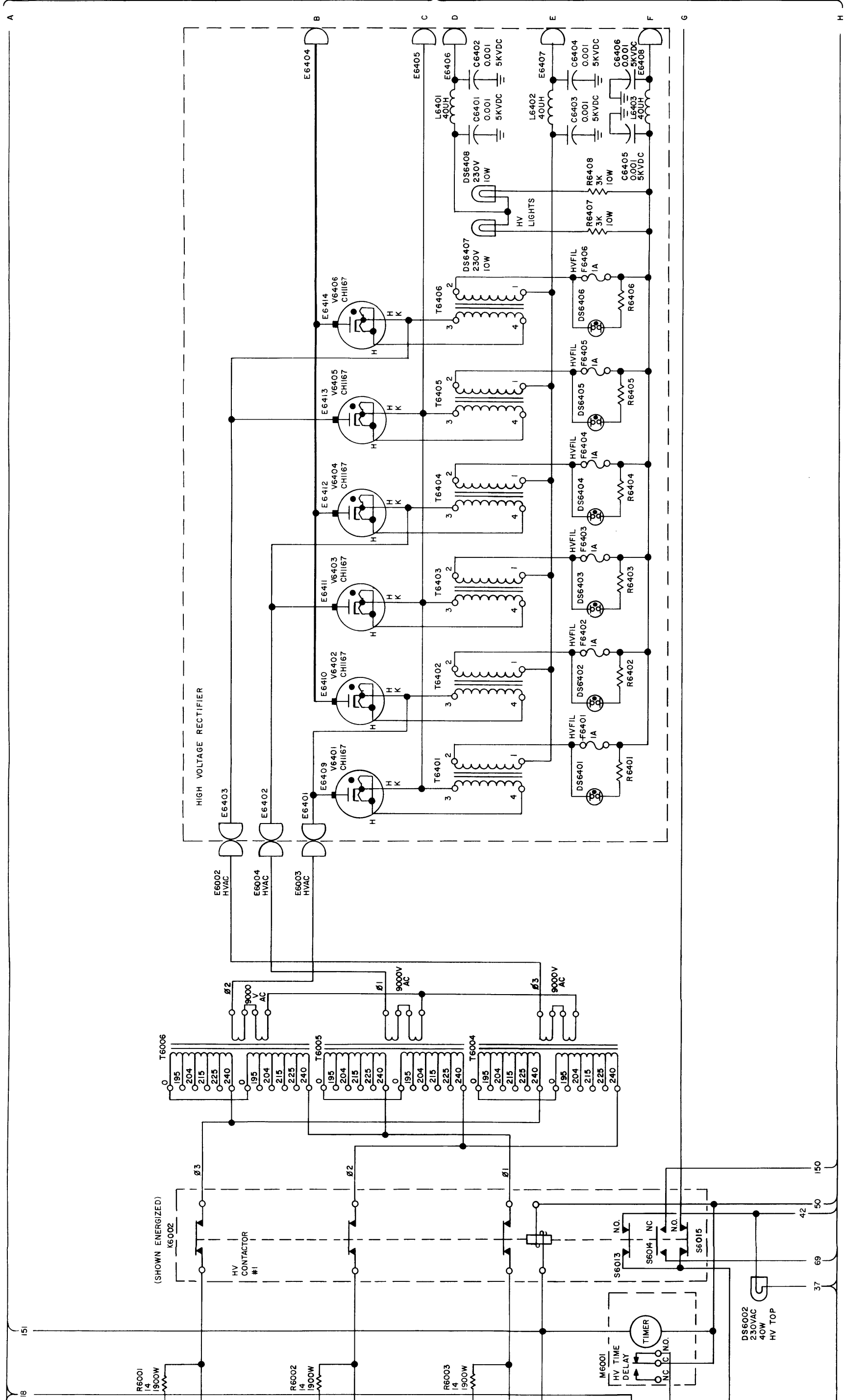
Figure 6-1. GPT-200K, Schematic Diagram (Sheet 5 of 9)



SEE SHEET 4

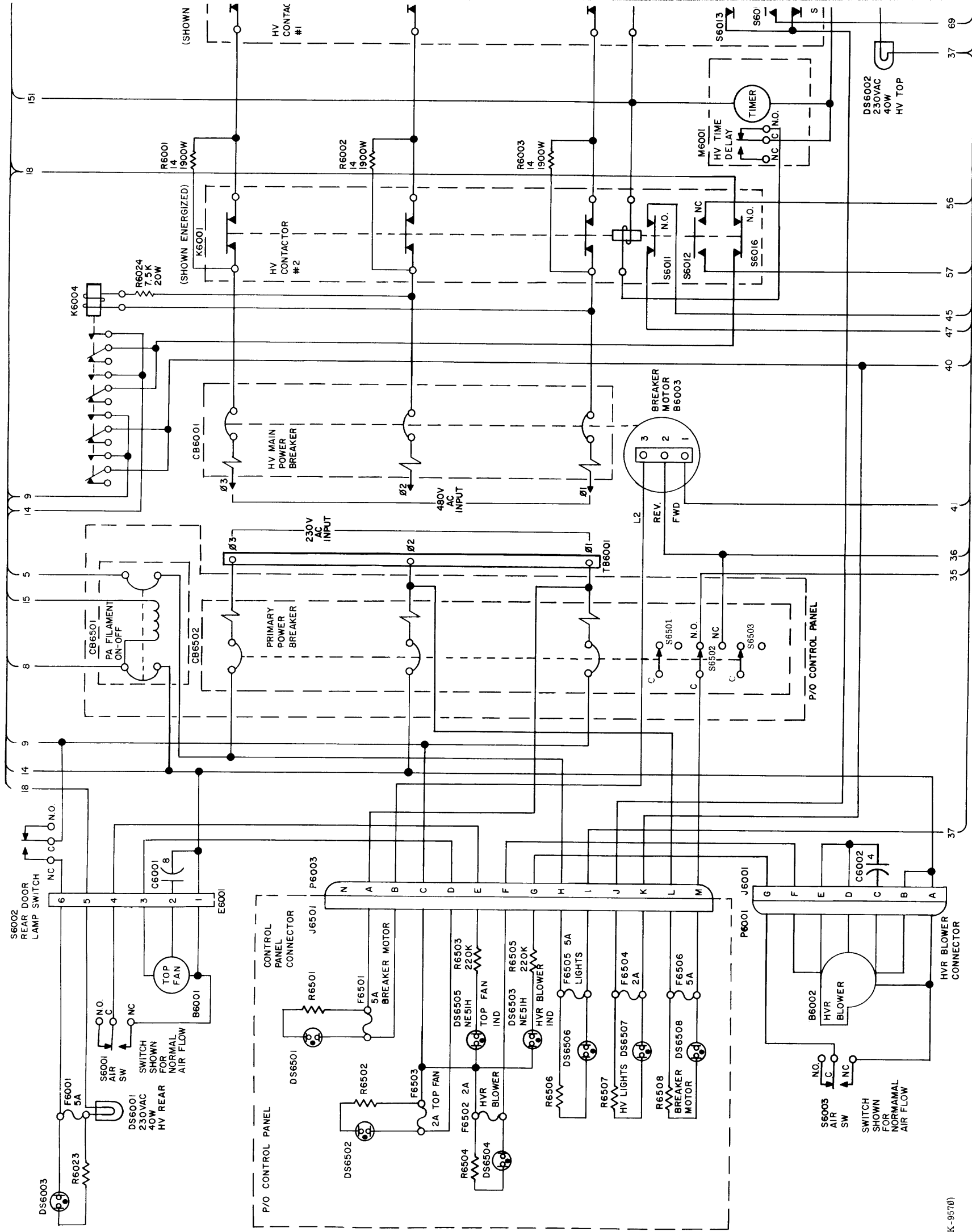
321-2T (CK-630C)

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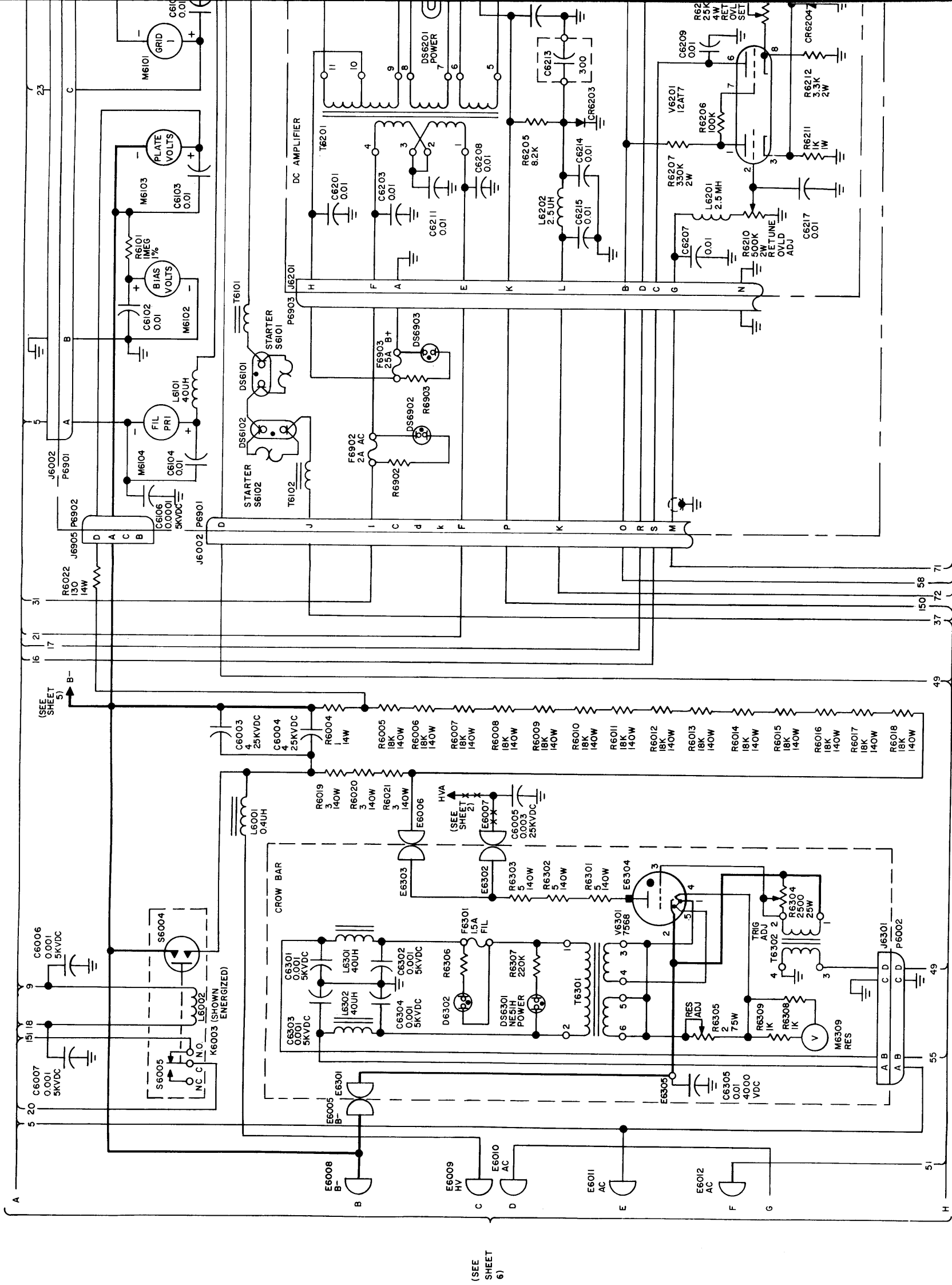
(SEE SHEET 7)

Figure 6-1. GPT-200K, Schematic Diagram (Sheet 6 of 9)



321-28 (CK-9570)

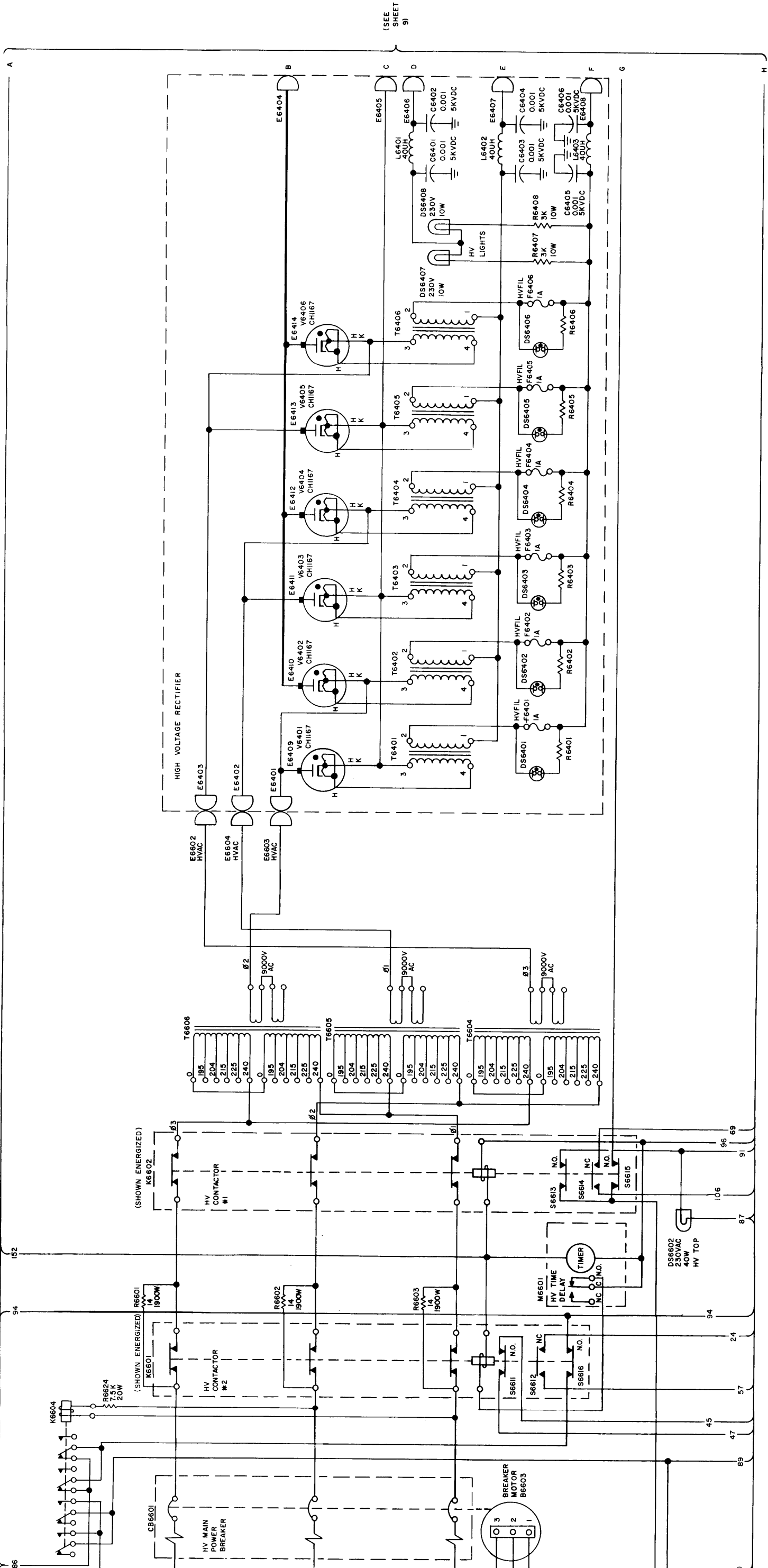
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(SEE SHEET 6)

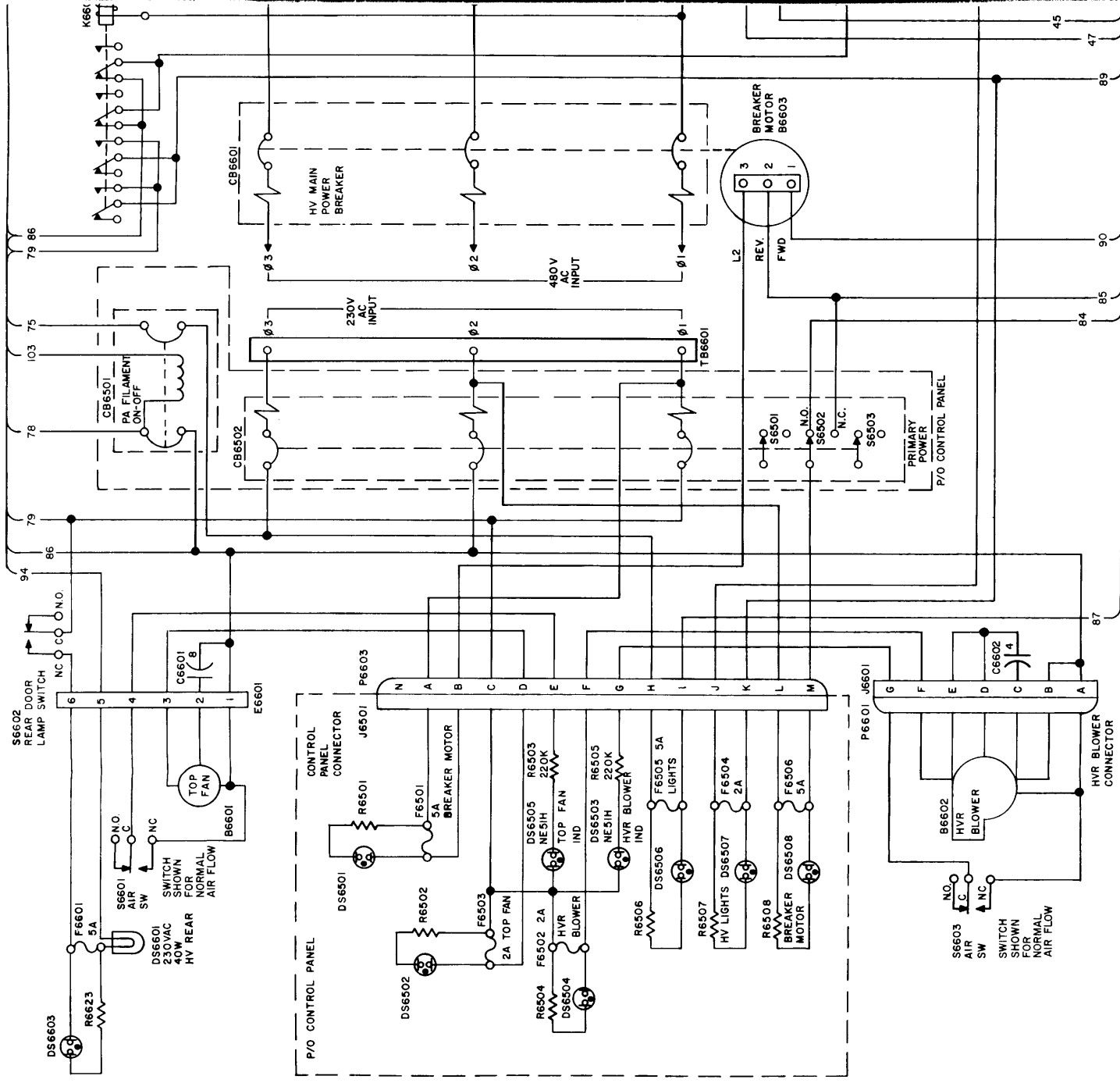
321-29 (CX-9578)

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(SEE SHEET 9)

Figure 6-1. GPT-200K, Schematic Diagram (Sheet 8 of 9)



321-30 (CX-958A)

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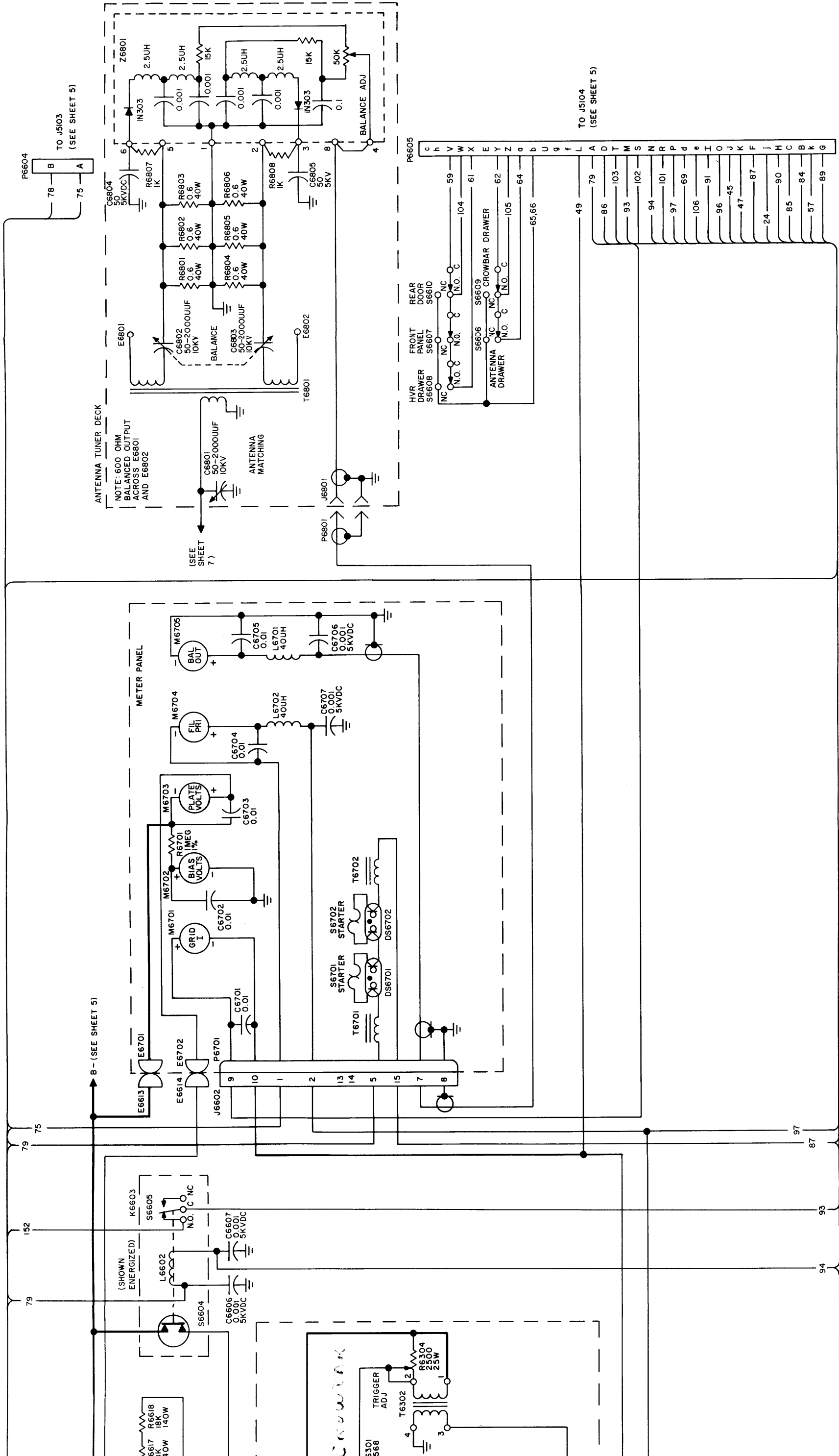


Figure 6-1. GPT-200K, Schematic Diagram (Sheet 9 of 9)

