TECHNICAL MANUAL

for

LOW FREQUENCY
LINEAR POWER AMPLIFIER
GPT 10KLF

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

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NOTICE

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

Warranty

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

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

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

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

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

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

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

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

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

1. Model Number of Equipment.
2. Serial Number of Equipment.
3. TMC Part Number.
4. Nature of defect or cause of failure.
5. The contract or purchase order under which equipment was delivered.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

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

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

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

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

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

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

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont)

TABLE OF CONTENTS (Cont)

LIST OF ILLUSTRATIONS

LIST OF TABLES

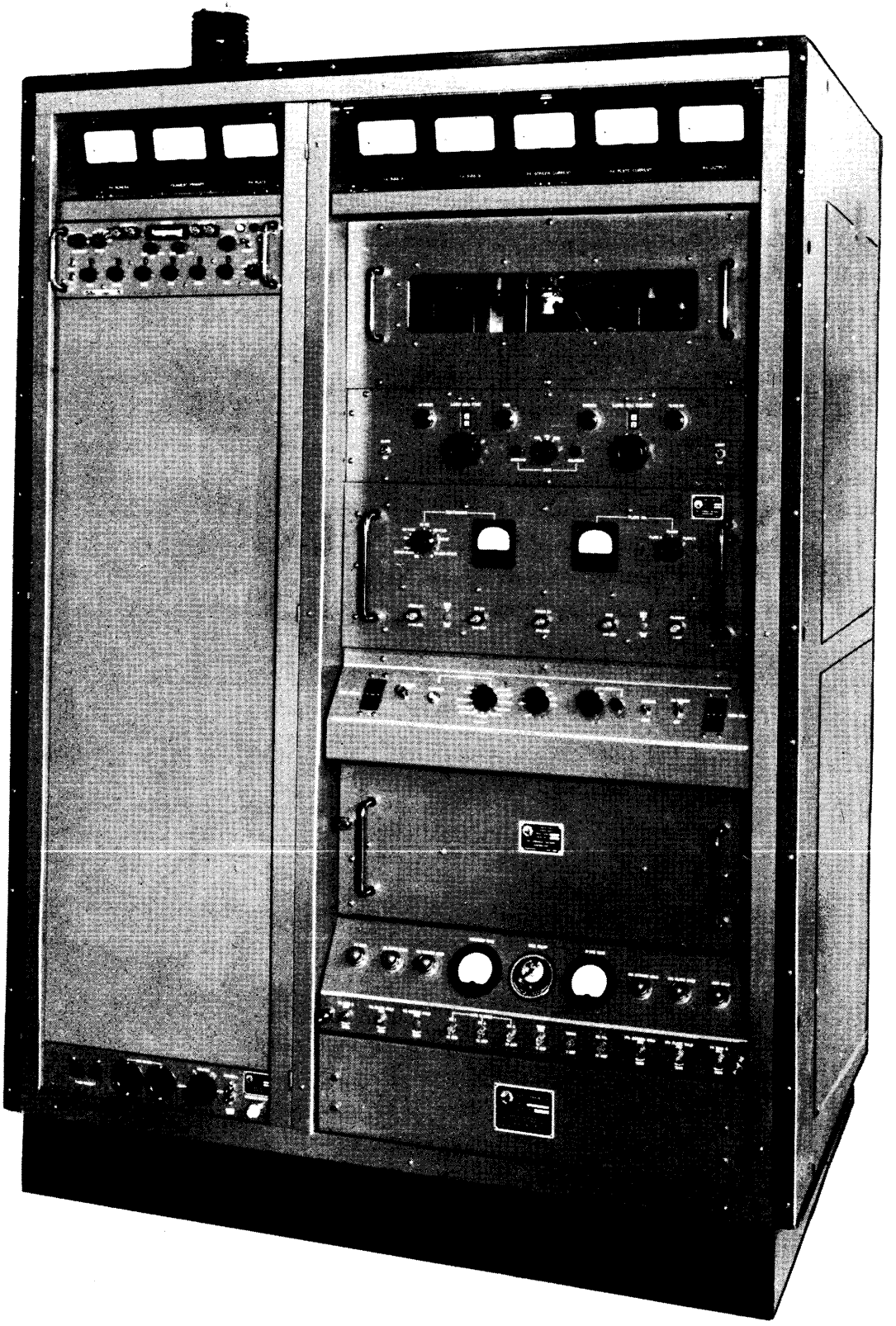


Figure 1-1. Low Frequency General Purpose Transmitter, Model GPT-10KLF

SECTION 1

GENERAL INFORMATION

1-1. PURPOSE OF EQUIPMENT.

The GPT-10KLF Transmitter (figure 1-1) is a conservatively-rated general purpose transmitter that delivers up to 10,000 watts peak envelope power (PEP), or 5,000 watts average power, throughout the 5-kHz to 500-kHz range. Operation between 500-kHz and 540-kHz is possible with 5,000 watts PEP or 2,500 watts average power output. The transmitter is designed to accept a variety of exciter types to provide many types of operating modes, as follows:

(1) Single sideband (SSB) with suppressed or any degree of carrier (this mode includes amplitude modulation equivalent (AME) operation).

(2) Double sideband (DSB) with suppressed or any degree of carrier (this mode includes amplitude modulation (AM) operation).

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

(4) Frequency-shift telegraphy (FSK).

(5) Keyed-carrier telegraph (CW).

(6) Keyed-tone telegraphy (MCW).

(7) Facsimile (FAX).

1-2. DESCRIPTION OF EQUIPMENT.

a. GENERAL. - As shown in figure 1-1, the transmitter consists of two frames. The two frames house all the components of the transmitter and are equipped with protective front doors. Primary power and control line connections are made through the base assembly. The rf output connection is made at a coaxial connector on the upper right side of the second frame.

b. FIRST FRAME. - The first frame houses the exciter components of the transmitter. The frame is divided into a front and rear section by a partition which supports miscellaneous controls, connectors, and terminal boards. An AUXILIARY FRAME MAIN POWER circuit breaker, located on the rear of the inner partition, controls the application of power to the exciter circuits. A fan in the upper front portion of the first frame provides air cooling of the exciter components. A red lamp on the roof of the frame lights when high voltage is applied to the transmitter. A meter panel, mounted at the top of the first frame, contains three meters. These monitor the PA tubes screen grid voltage, filament circuit primary voltage, and PA tubes plate voltage.

c. SECOND FRAME. - The second frame houses the linear rf amplifier stages of the transmitter and associated power supply and power control circuits.

(1) Second Frame Meter Panel. - The meter panel, mounted at the top of the second frame, contains five meters. These monitor the PA tubes grid bias voltages, PA tubes screen grid voltage, PA tubes plate current, and transmitter power output or transmission line VSWR.

(2) 10-KW PA. - The 10-kw PA, occupying the upper portion of the second frame, contains the two tubes used in the final amplifier stage of the transmitter and associated output impedance-matching components.

(3) Linear Amplifier. - The linear amplifier drawer VLLA, slide-mounted below the 10-kw PA, contains the first two amplifier stages of the transmitter, filament, screen, and plate supplies for these stages, and the bias supply for all of the rf amplifiers.

(4) Main Power Panel. - The main power panel, mounted in the center-front portion of the second frame, contains controls for applying primary power to all second frame circuits, an interlock circuit monitor, and dc voltage controls.

(5) 10-KW High Voltage Rectifier. - The 10-kw high voltage rectifier, slide-mounted below the main power panel, receives high-voltage, 3-phase, ac power from a transformer in the main frame, and provides B+ potential for the 10-kw PA tubes. The 10-kw high voltage rectifier also provides rectification for the 3200-volt section of the transmitter main power supply. Either a solid-state rectifier, High Voltage Rectifier, Model HVRC-2, or a gaseous-tube rectifier, High Voltage Rectifier AX-103 is provided.

(6) Indicator Control and Relay Panel. - The relay panel, mounted at the lower front section of the second frame, contains overload and other protective relays associated with the 10-kw PA tubes, second stage amplifier tubes, and the PA tubes screen voltage supply.

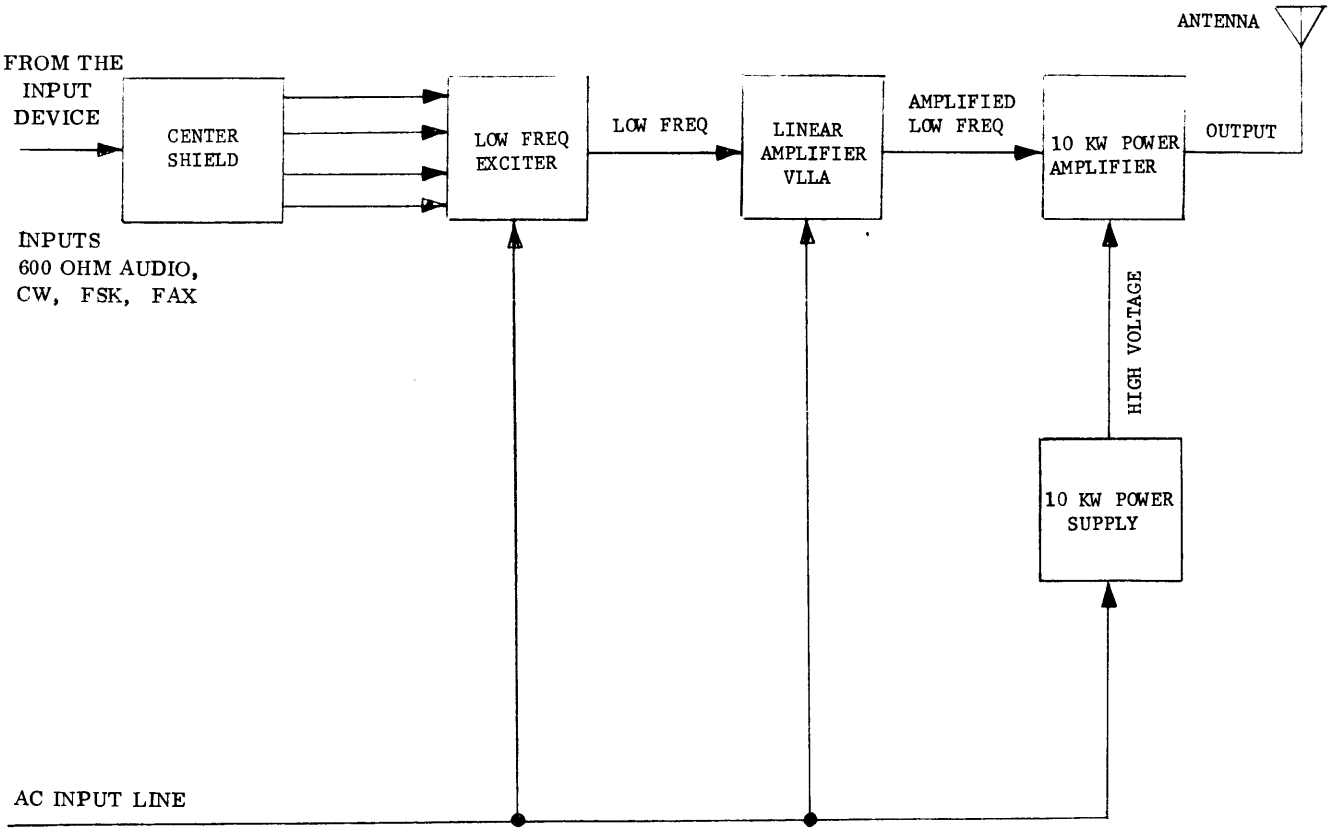


Figure 1-2. Simplified Block Diagram, GPT-10KLF Transmitter

1-3. FUNCTIONAL DESCRIPTION. (Refer to figure 1-2.)

The low frequency exciter's output is fed to the driver amplifier, a Broadband Linear Amplifier TMC Model VLLA (commonly called the linear amplifier or VLLA). The amplified low-frequency output is applied to the 10-kw PA stage, further amplified and applied to the output device (an antenna in this case). Operating voltages for the 10-kw PA are supplied by the 10-kw PS.

A more detailed subdivision of the transmitter is made by assigning formal nomenclature and part numbers to assemblies, subassemblies, components and piece-parts. In addition to formal nomenclature and part numbers, common names are used and simplified reference symbol numbers are assigned. For example, the second frame and assemblies shown in figure 1-3 are assigned simplified symbol numbers; so that high voltage rectifier tube V600 is installed and the 10-kw high voltage rectifier drawer 600.

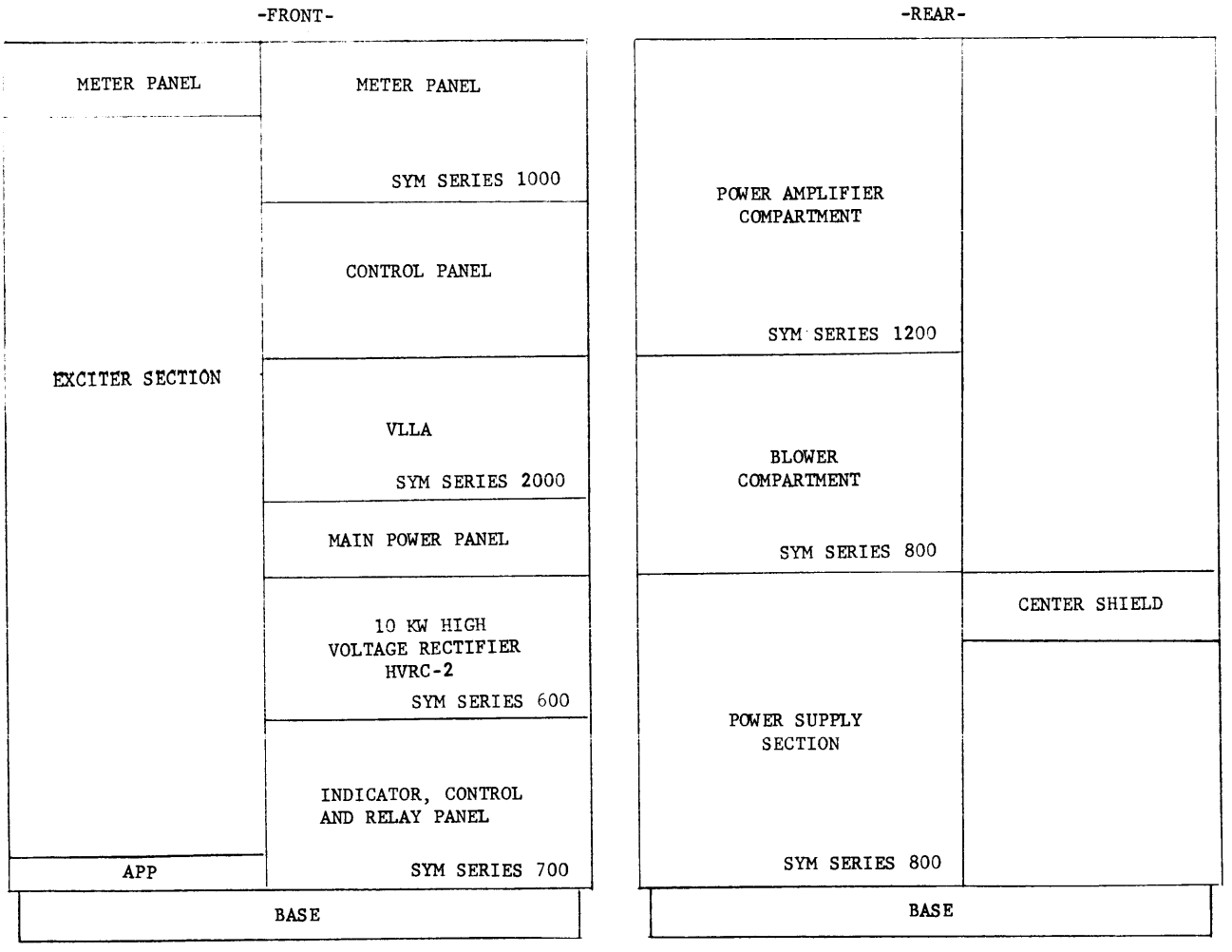


Figure 1-3. General Component Identification, Front and Rear Views

1-4. LEADING PARTICULARS.

Table 1-1 lists logistic type leading particulars of the GPT-10KLF transmitter and its major subassemblies. Characteristics listed cover nomenclature, input power, dimensions, weight, and air cooling. Some of the data reprsents approximate or nominal values. Blank spaces indicate unavailable values; in which case, the value indicated for the next highest assembly incorporates the missing value(s).

TABLE 1-1. LEADING PARTICULARS

General Purpose Transmitter, Model GPT-10KLF	
POWER REQUIREMENTS:	230/380 volts, approximately 25,000 watts, 3 phase, 50-60 Hz
OVERALL DIMENSIONS:	86 inches H by 55-3/4 inches W by 43-1/2 inches D
WEIGHT:	2800 pounds approximate uncrated weight; approximate crated weight is 4300 pounds
FORCED-AIR COOLING:	2500 cfm
Frame Assembly, Electrical Equipment	
POWER REQUIREMENTS:	115/230 volts, 1 phase, 50-60 Hz
WEIGHT:	385 pounds
Low Frequency Exciter	
Auxiliary Power Panel Model APP	
POWER REQUIREMENTS:	115 volts (must be independently wired to an external 115 vac breaker), 5 amps, 1 phase, 50-60 Hz
DIMENSIONS:	3-1/2 inches H by 19 inches W by 4 inches D
WEIGHT:	5 pounds
Frame Assembly, Electrical Equipment	
POWER REQUIREMENTS:	230 volts, 3 phase, 50-60 Hz
DIMENSIONS:	72 inches H by 32 inches W by 33-5/8 inches D
WEIGHT:	835 pounds, approximate weight as shipped
Broadband Linear Amplifier Model VLLA	
DIMENSIONS:	11-1/4 inches H by 28-3/4 inches W by 21 inches D
WEIGHT:	120 pounds
10-KW High Voltage Rectifier	
NOTE	
Some of the data represents approximate values.	
POWER REQUIREMENTS:	3400 volts, 3 phase, 50-60 Hz
DIMENSIONS:	10-3/4 inches H by 28-3/4 inches W by 16-3/4 inches D
WEIGHT:	80 pounds

1-5. TECHNICAL SPECIFICATIONS.

Table 1-2 lists Technical Specifications of the GPT-10KLF transmitter.

TABLE 1-2. TECHNICAL SPECIFICATIONS

Frequency range	5 to 500 kHz; 500 to 540 kHz at half power CAUTION Below 50 kHz, caution should be observed in broadband modes of operation.
Output power	Up to 10 kw PEP on a standard two tone test
Output impedance	50 ohms; will match a load of 25 to 120 ohms, resulting in a vswr (voltage standing wave ratio) of not more than 2:1
Signal/Distortion ratio	Distortion products are at least 35 db (decibel) below PEP
Spurious signals	Spurious signals greater than 60 Hz removed from the carrier are at least 60 db below full PEP output
Noise level	At least 70 db down from either tone of a two tone test
Harmonic suppression	Push-pull output tends to cancel even harmonics. Third harmonic at least 50 db below full PEP output when properly loaded.
Hum level	At least -60 db below full PEP
Heat dissipation	Approximately 15 kw
Operating temperature	0° to 50°C (32° to 122°F)
Humidity	Up to 95%
Cooling	Forced-air cooled
Temperature extremes	-65° to +50°C (-85° to 122°F)
Humidity	0 to 95%

1-6. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

Table 1-3 lists equipment required to install and maintain the GPT-10KLF transmitter. These non-specialized items are not supplied, since an equipped maintenance shop should contain them. Maintenance and test equipment listed are for isolating a fault to a specific equipment in the transmitter. Additional maintenance and test equipment are listed in supporting manuals.

TABLE 1-3. EQUIPMENT REQUIRED BUT NOT SUPPLIED

EQUIPMENT	PURPOSE
1. Box Wrenches, assorted sizes	Fastening mounting hardware
2. Open End Wrenches, assorted sizes	Same as item 1
3. Spin Tights, sizes: 3/16, 1/4, 5/16, 3/8, 7/16, 1/2, 9/16	Same as item 1
4. Socket Wrench Set, socket sizes to 1-1/8	Same as item 1

TABLE 1-3. EQUIPMENT REQUIRED BUT NOT SUPPLIED (Cont)

EQUIPMENT	PURPOSE
5. Screw Drivers, Flat Blade, assorted sizes	Same as item 1
6. Screw Drivers, Phillips-Blade, assorted sizes	Same as item 1
7. Crowbar	Opening packing crates
8. Fork-Lift or equivalent	Moving heavy objects (e.g., packing crates and voltage transformers)
9. Low-Speed Electric Drill and carborundum bit or equivalent	Drilling equipment anchoring holes
10. Case cutter	Open cardboard packing cases
11. Nail puller	Open packing crates
12. Pair of snips	Cutting strap bands
13. Standard QDL series connector plug	Connector plug for connecting one end of output transmission line to the transmitter
14. Coaxial transmission line[a]	Output transmission line
15. AC input cabling[a]	a. Main ac input for transmitter b. Auxiliary ac input (115V at 5A) for auxiliary power panel
16. 100-watt soldering gun or equivalent and resin-core solder	Miscellaneous connections
17. VOM (volt-ohm-meter)	Testing
18. Spectrum Analyser TMC Model PTE-4 or equivalent	Same as item 17

[a]Length of cabling determined by transmitter location

SECTION 2

INSTALLATION

2-1. INTRODUCTION.

This section presents four sub-sections of installation information on the GPT-10KLF transmitter. Paragraph 2-2 discusses typical problems that may be encountered during pre-installation. Paragraph 2-3 presents logistic data for personnel involved in or with equipment handling, storing, and unpacking. Paragraph 2-4, the installation procedure, instructs totally unfamiliar personnel on how to completely install the transmitter with minimum technical-electronic supervision. Paragraph 2-5 is a pre-operational checkout procedure that a technician must perform before attempting to operate the transmitter.

2-2. PRE-INSTALLATION.

a. SCOPE. - This section presents pre-installation considerations that warrant planning before undertaking transmitter assemblage. In most instances, the information presented is for a typical GPT-10KLF transmitter land installation, although it may be applicable to a mobile-van or shipboard installattion.

b. ENVIRONMENT. - The GPT-10KLF transmitter operates under a broad range of environmental conditions (refer to table 1-2). Criteria for ambient operating conditions might be the same as that used for personnel habitibility. Locating the transmitter in or near heat zones should be avoided to maintain stable and efficient operation. Low humidity ventilation should be provided to dissipate internally generated heat. Either an air duct system or adequate size room air-conditioning system may be employed to provide ventilation. If the former method of ventilation is selected, an air duct system can be fabricated using intake and exhaust port dimensions. If the latter method is selected, the conditions outlined in paragraph 2-4 must be considered.

c. PERIPHERAL AIR-CONDITIONING. - The transmitter cabinets are semi-pressurized and forced-air cooled, refer to tables 1-1 and 1-2, by self-contained blowers. Approximately 90 percent of the internally generated heat will be dissipated through exhaust ports. The remaining 10 percent is radiated by the surface area of the transmitter. If an air duct system is used, only the radiated surface heat will impose a load on the room air-conditioner. Without air ducting, the heat loading effects on the room air-conditioner, and subsequently room temperature, should be taken into consideration.

d. DIMENSIONS. - Figure 2-1 illustrates dimensions of the GPT-10KLF transmitter; additional clearance considerations are discussed in following paragraphs. Additional dimensions are given in table 1-1.

Physically, the largest single part of the transmitter is an uncrated frame assembly, measuring three feet wide, three and a half feet deep, and six and a half feet high (approximately). These dimensions necessitate entrance door(s) sizes, leading to the intended installation point, that will allow adequate frame passage.

After selecting transmitter location, it may be practical to outline overall dimensions on the floor with a piece of soft chalk or a plumb-line, before starting installation. After using this outline as a guide to position the base assembly, these lines could be removed.

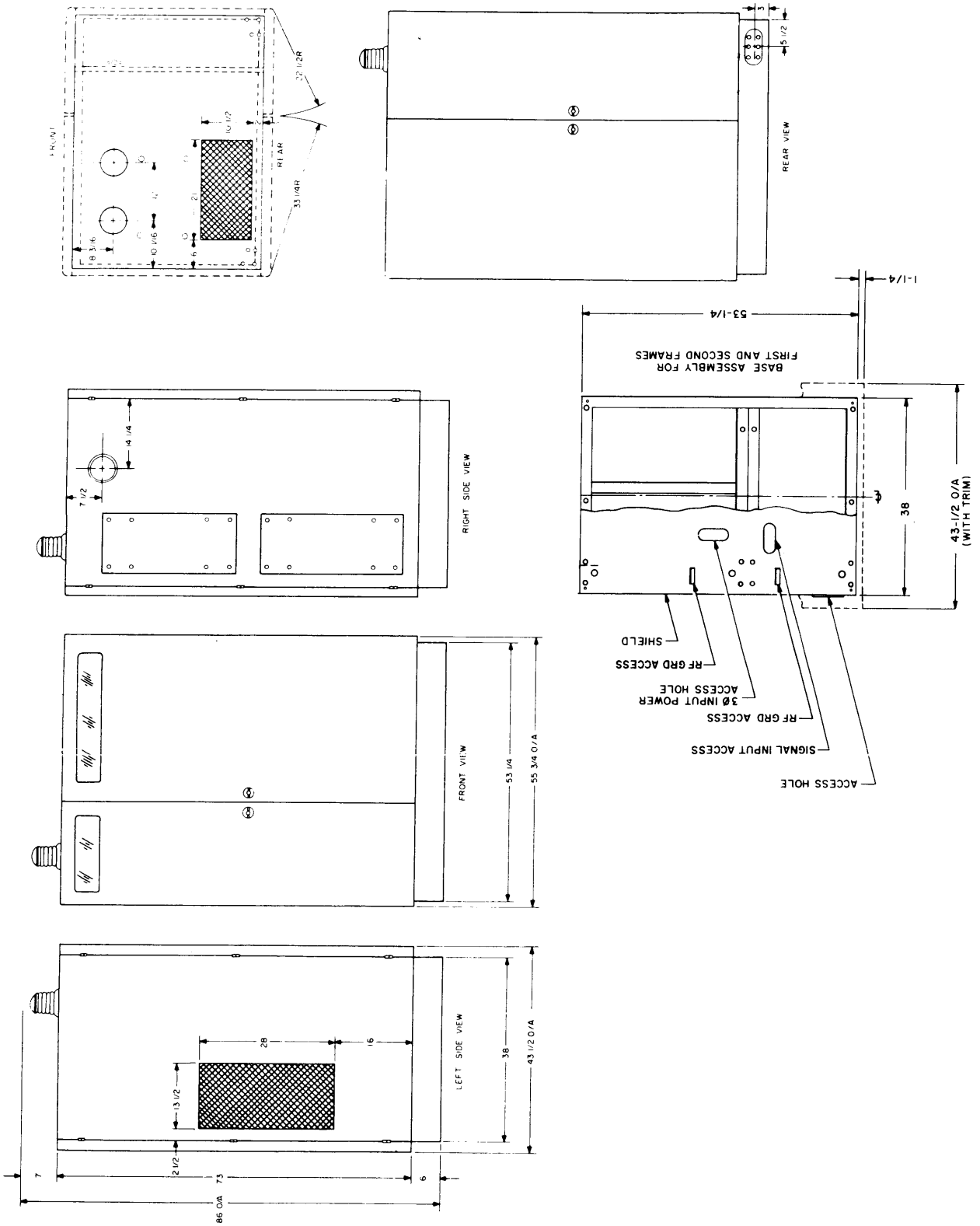


Figure 2-1. Dimensions of GPT-10KLF Transmitter, Installation Diagram

Another consideration is positioning in relationship to front, rear, and side walls. A minimum five-foot clearance, measured from the front and rear of the transmitter to the corresponding wall, should be provided. A minimum three-foot clearance from both sides of the transmitter to the walls should be provided. These dimensions permit operating and maintenance personnel room to work; transmitter swing-out doors to be opened; and habitibility in the case of co-located equipments.

After planning final transmitter location, the air intake and exhaust port dimensions, figure 2-1, can be used as a reference in and for fabricating the desired air duct system. If transmitter air ducts are not connected to a central room system, location and sizes of exterior wall cut-outs must be considered.

The type of output transmission line is a clearance consideration. Construction of necessary hole sizes in the exterior walls between transmitter and terminating device (an antenna) will have to be considered.

e. LOCATION OF PERIPHERAL EQUIPMENT AND CABLING. - There is no distance limitation governing the location of peripheral equipment (i.e., facsimile and teletype machines, microphones, keys, etc.) other than providing compatible interequipment operation (refer to table 1-2).

Consideration should be given to the routing and length of input signal cables before assembling the transmitter. Signal input cable entry is through the base assemblies of the transmitter during installation; irrespective of exterior cabling methods. All signal inputs are spade lug connections terminating inside the rear of the first frame. This point can be used as a reference in determining exact input signal cable lengths.

f. AC INPUT CABLING AND POWER REQUIREMENTS. - Three methods of laying out input power cables can be used. The sub-floor-level cable raceway method, figure 2-2, requires provisioning for troughs during building construction. If these provisions have not been made, removable access plates, on the base assembly, permit cable entry in the floor-level and over-head routing methods.

In fulfilling adequate ac input power requirements, consider the transmitter to draw approximately 25.0 kw at 230-volts ac, 50-60 hertz three phase. These requirements can be used in providing the appropriate size ac input feeder line, switch or breaker box, and etcetera for the transmitter. For personnel safety, it is suggested that the switch box be equipped with a keylocking device that can be locked in the off position during maintenance.

In addition, a separate 115-volt, 50 to 60 hertz, single-phase box and line rated at 5 amps should be provided for the auxiliary power panel in the first frame. These provisions are not mandatory; just a convenience for obtaining 115-volts power for monitor and test equipments.

g. EQUIPMENT GROUND CONNECTION. - The GPT-10KLF transmitter must be grounded to station ground. Accordingly, a nut has been vertically centered and welded to the inside of the base assembly of the transmitter. The exact location of the nut is 11-1/4 inches in from the rear corner of the base, under the first frame. If a station ground has not been established, locate an appropriate station ground cable in this vicinity before starting the installation procedure. Complementary hardware for connecting the station ground cable to the transmitter is provided, and will be connected during the procedure.

h. ANCHORING. Anchoring the transmitter to the floor in a land installation should not be necessary to maintain stability, since gross equipment weight is approximately 2,800 pounds. However, in a shipboard or mobile-van, anchoring the transmitter may be employed. Using the base assemblies drilled holes as a template during assembly, the desired anchor techniques (including shock mounting) may be used.

i. OUTPUT IMPEDANCE, CONNECTION, AND TRANSMISSION LINE. - The output impedance or load for the GPT-10KLF transmitter is nominally 50 ohms, although adjustable transmitter matching circuits permit loads between 25 and 120 ohms. The output jack, a standard QDL (quick disconnect large) series female connector, is located on the side of the second frame. Any compatible connector plug may be used on the end of a flexible coaxial transmission line. After determining length (transmitter to terminating device), the transmission line must be fabricated; the plug and coax line are not supplied.

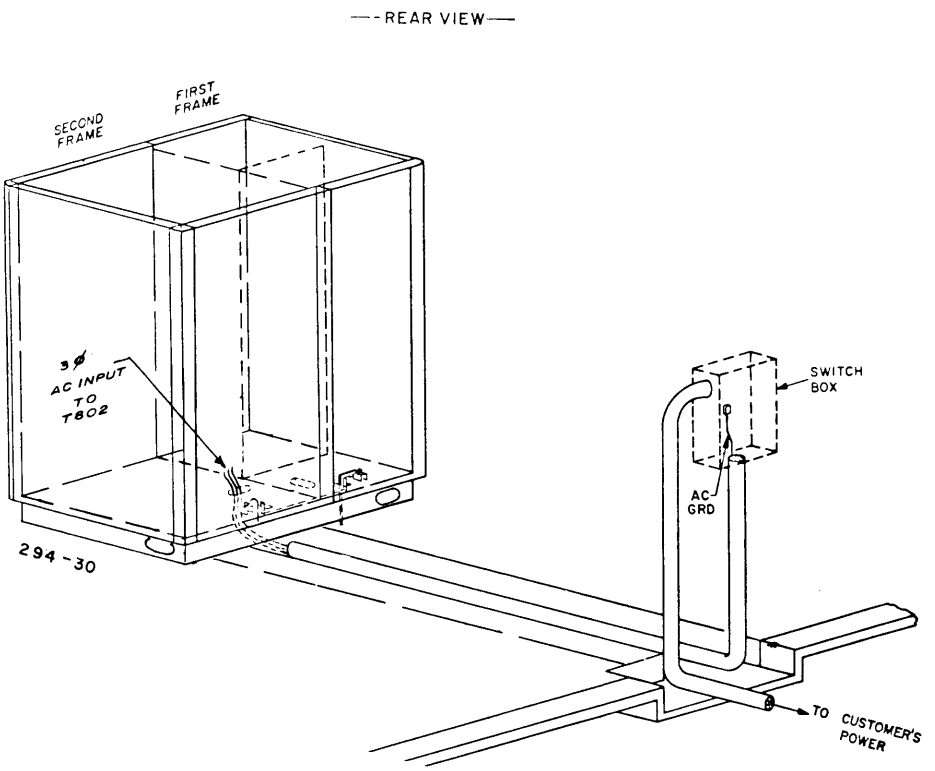


Figure 2-2. Typical Input Power Cabling, Installation Diagram

j. PERSONNEL REQUIREMENTS. - Installation personnel must be able to handle all of the installation tools listed in table 1-3. Also, they should be capable of identifying various electronic components associated with a high-power transmitter. Approximately six to eight people will be required; more people does not mean the job will be done faster.

k. APPROXIMATE ASSEMBLY TIME. - Qualified personnel, totally unfamiliar with the transmitter, working with minimum supervision under a qualified electro-mechanical supervisor, should be able to assemble the transmitter in two days. This time is based on the assumption that the procedure is followed.

2-3. LOGISTICS.

a. SCOPE. - This section presents information for logistic personnel. Information covered includes material handling, packaging data, inspection and damage, and uncrating methods.

b. MATERIAL HANDLING. - Whether an equipment is crated or uncrated, various precautions must be observed in material handling to prevent personnel injury and/or damage to the equipment.

Weight alone is not an indication that equipment can be moved safely by personnel. Size is also an important consideration. A light-weight, large, and bulky item cannot easily be handled by one man. When personnel are involved in handling, a good rule-of-thumb is: 50 pounds for one man, or 100 pounds for two men. Weight in excess of 100 pounds should be handled by a moving or lifting device. Before handling material, refer to tables 1-1 and 2-1 for crated and uncrated weights and dimensions.

c. PACKAGING DATA. The GPT-10KLF transmitter is packed in 9 crates (not including spares). Each crate is assigned a number from 1 to 9 and appears on the crate. Now that crate one has been opened and before starting the actual installation procedure, physically locate crate one closest to the intended point of installation, locate the other crates in numerical sequence such that crate 9 ends up placed farthest away

from crate one. Arranging crates in this manner facilitates unpacking and assembling the transmitter.

The transmitter is cleaned, preserved, packaged, and marked in accordance with MIL-P-116, PMD-40, and MIL-STD-29. Figure 2-3 illustrates typical equipment packing methods.

Table 2-1 lists the crated weights and dimensions of the GPT-10KLF transmitter. Additional reference can be obtained from table 1-1.

TABLE 2-1. CRATED WEIGHTS AND DIMENSIONS[a]

Crate No.	Gross Weight In Lbs.	Dimensions In Inches		
		HGT	W	D
1	188	30-3/4	23-7/8	32
2	234	8	40-1/8	56-3/4
3	768	82-1/8	32-1/4	50-1/4
4	1298	81-3/8	42	51-1/2
5	536	28-3/4	19-3/4	24
6	92	22-1/4	16-7/8	22
7	233	22	30-3/4	40
8	265	22	30-3/4	40
9	643	44-1/4	27-1/2	77-5/8

[a]Approximate

d. INSPECTION AND DAMAGE. The GPT-10KLF transmitter has been assembled, calibrated, and tested at the factory before shipment. Inspect the outside of all crates for possible transit damage. While following the procedural installation instructions, carefully unpack each crate as indicated. Inspect all packing material for parts which may have been shipped as loose items or come loose during transit.

With respect to equipment damage for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts.

e. UNCRATING METHODS. - The following information briefly outlines general uncrating methods. They must be adhered to when unpacking the transmitter to prevent damage. Keeping in mind previously discussed information on material handling, packaging data, and inspection and damage, proceed as follows:

(1) Remove wire straps or bands from around the crate with a pair of snips.

(2) Unless otherwise specified, remove nails from three sides of the crate with a nail puller. Do not use a claw hammer, pinch bar, etc.

(3) When the sides have been removed, rip off the moisture-proof paper. If a knife is used, care should be exercised not to mar equipment.

(4) If equipment is not packed in a cardboard carton, remove it from the crate.

(5) If after removing moisture-proof paper a cardboard carton is encountered, carefully open with a case cutter or remove tape.

(6) Where applicable, remove the following:

(a) Creased cardboard blocking pieces

(b) Barrier bags

(c) Tape

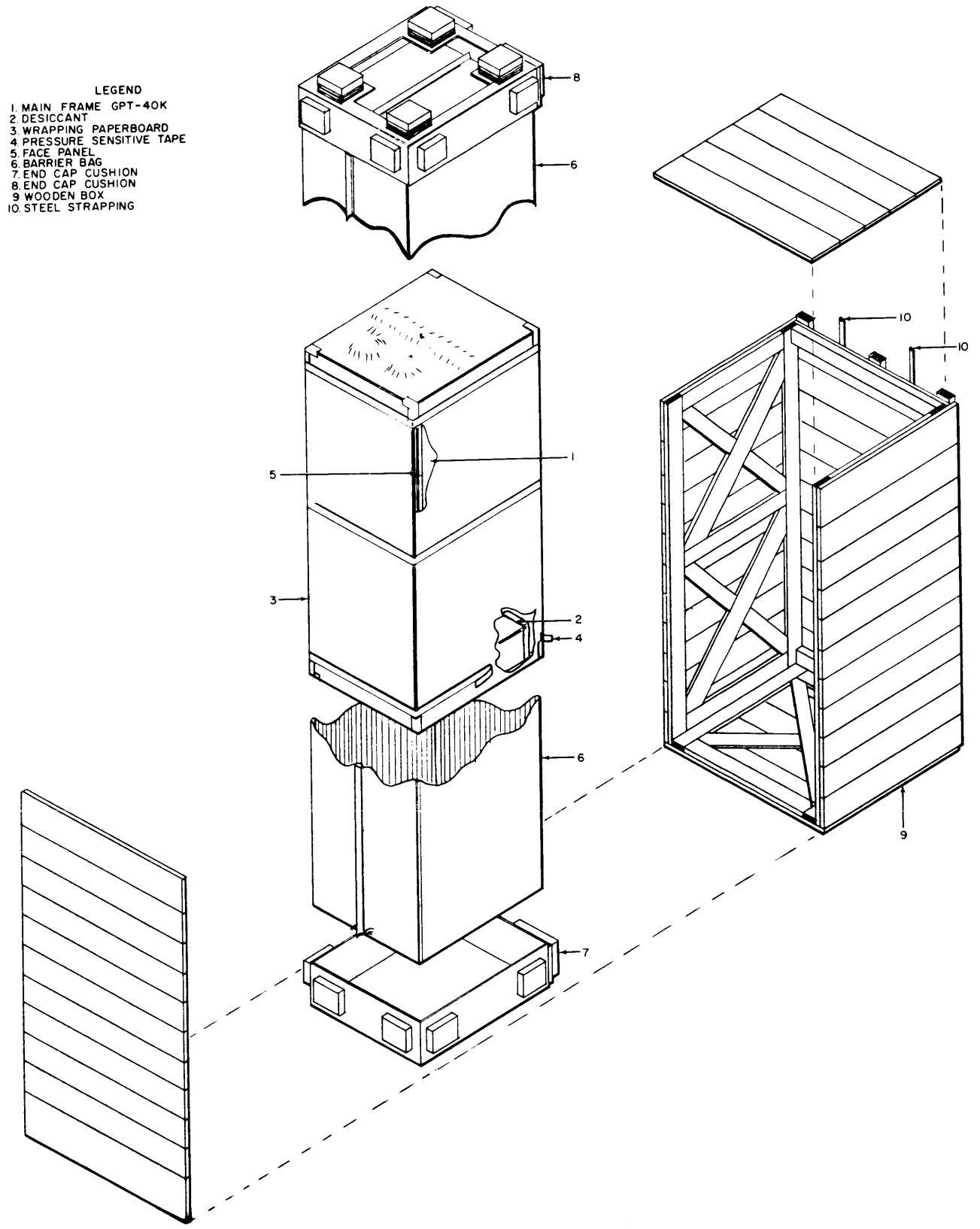


Figure 2-3. Typical Equipment Packaging (Sheet 1 of 3)

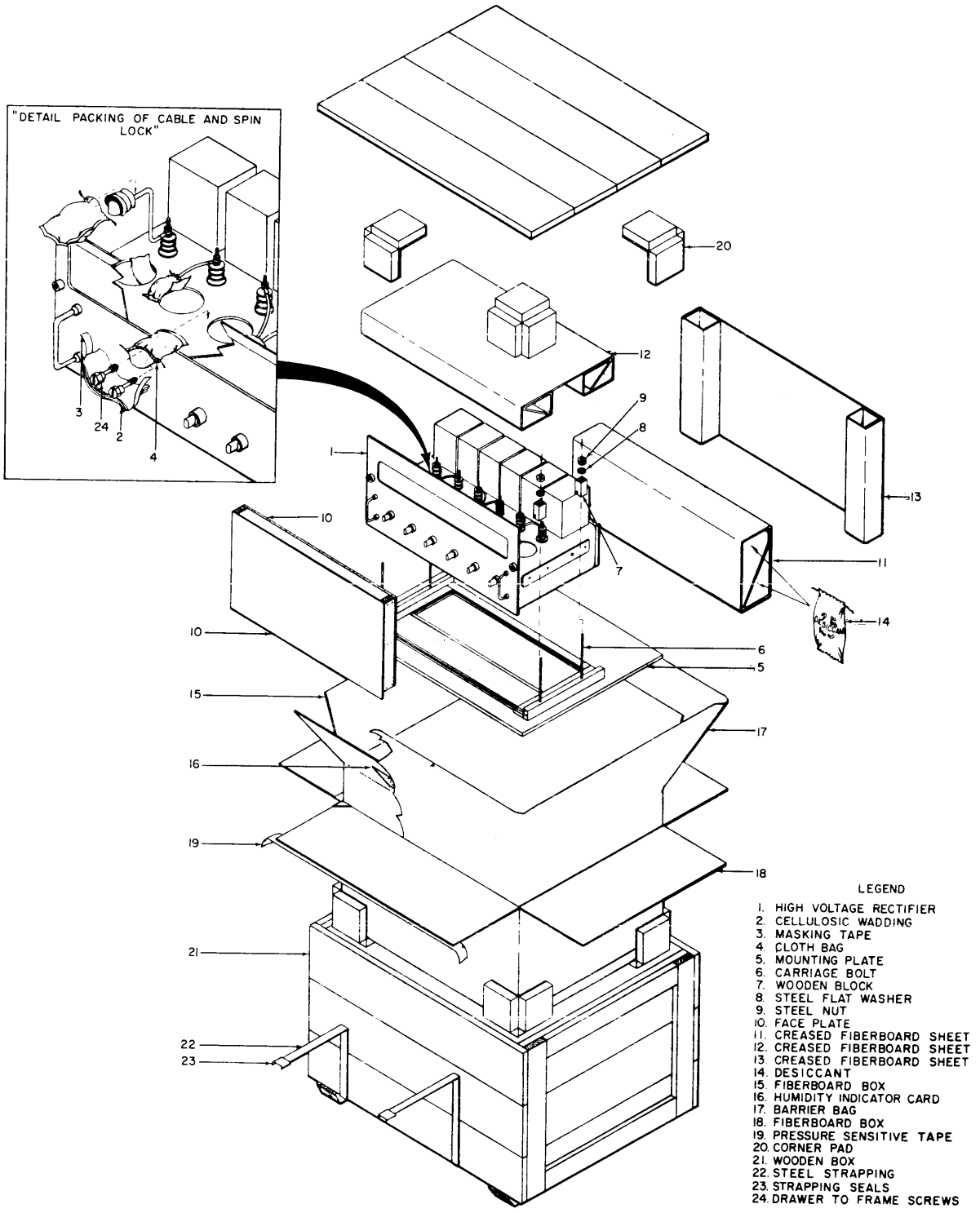


Figure 2-3. Typical Equipment Packaging (Sheet 2 of 3)

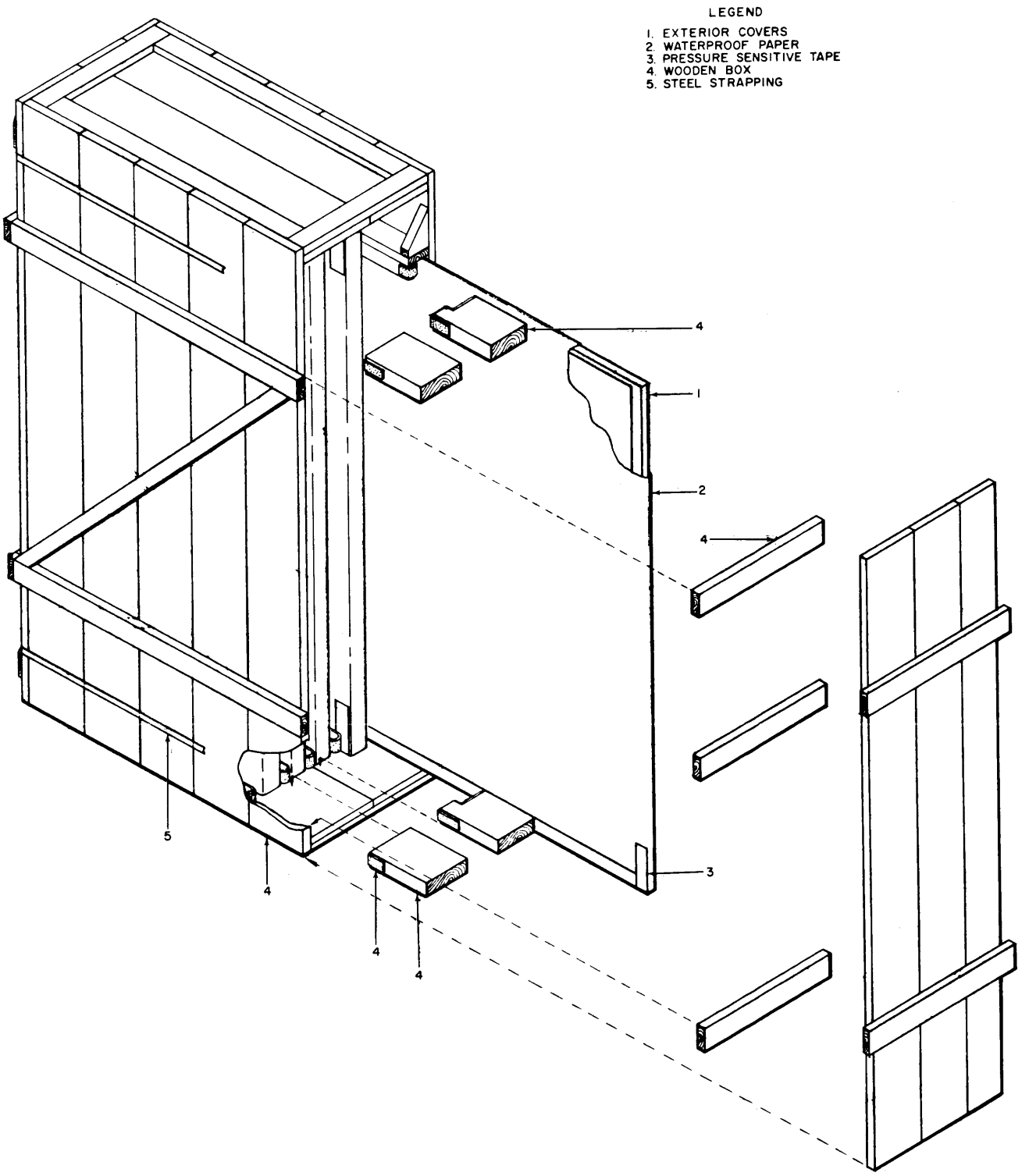


Figure 2-3. Typical Equipment Packaging (Sheet 3 of 3)

(d) Molded cushioning

(e) Cellulose wadding

(f) Tissue paper

(7) Check off items unpacked on the packing list or equipment supplied list. If anything is damaged, refer to paragraph 2-3 d.

NOTE

Anticipating the possibility of re-packing the transmitter for relocation, it is suggested that all packing crates and materials be saved. Total storage area required can be calculated using dimensions in table 2-1.

Should re-packing the transmitter be necessary, several methods may be employed: 1. Use the original shipping crates and materials; or, 2. Fabricate new shipping containers. In the first case, three requirements are necessary: 1. Avoiding needless damage to crates and materials during uncrating; 2. Making notes on equipment packaging during uncrating, essentially reversing the uncrating and installation procedure; 3. Dry storage of crates and materials until re-use. In the second case, detailed crating plans and materials, capable of withstanding shock, vibration, and moisture, are required. In either case, a decision must be made prior to uncrating the transmitter.

2-4. INSTALLATION PROCEDURE.

a. SCOPE. - A minimum number of assemblies, subassemblies, components, and hardware have been disassembled from the GPT-10KLF transmitter and separately packaged, thus reducing the possibility of equipment damage in transit. The method of disassembly and separate packing also makes equipment handling easier. This section presents logical step-by-step instructions for sequentially unpacking the shipping crates and assembling the transmitter.

b. GENERAL INSTRUCTIONS. - Carefully read the instructions in each step. After reading, consider the complexity involved in doing the instruction(s). In some instances, it may be advisable to simulate a complex step before actually doing it. Make sure each step has been completed before proceeding to the next. Where instructions may not be readily obvious, illustrations are provided to complement the procedure.

Cables, wires, and other miscellaneous items disconnected during transmitter disassembly are tagged and taped to attached equipment. To properly assemble the transmitter, this tape must be removed as encountered. The information on a given tag indicates the designated terminal on a component that the tagged item must be connected to. Make sure cables and wires have been connected before sealing-up a frame or section of a frame with an rf shield, front panel, drawer, or piece of exterior trim (a door, cover, etc.). If any confusion arises regarding necessary cable or wire connections, cable connection diagrams are provided in Section 7 of this manual.

Temporary removal and replacement of panels, rf shields, and component mounting assemblies are specifically called out in the procedure in order to install various items. To prevent unnecessary removal and replacement, follow the installation instructions. Do not anticipate instructions.

A complete list of equipment required to assemble the transmitter is presented in table 1-3. These non-specialized tools are not supplied since items should be contained in an equipped maintenance shop. Make sure all personnel adhere to previously outlined techniques on material handling and uncrating.

c. PROCEDURE. - The following procedure is for installing the GPT-10KLF transmitter. If any damage is encountered, refer to paragraph 2-3 d; do not continue until trouble is corrected.

(1) Unpack assorted loose items from crate 1, and check each item contained against equipment supplied list.

(2) Unpack crate 2, and remove shield from base assembly (refer to figure 2-4) for the first and second frames. Shield will be replaced later.

(3) Position base assembly in accordance with pre-installation planning.

NOTE

Make sure the base assembly is correctly positioned. This can be determined by locating access hole on the long side of the base assembly toward the intended rear side of the transmitter.

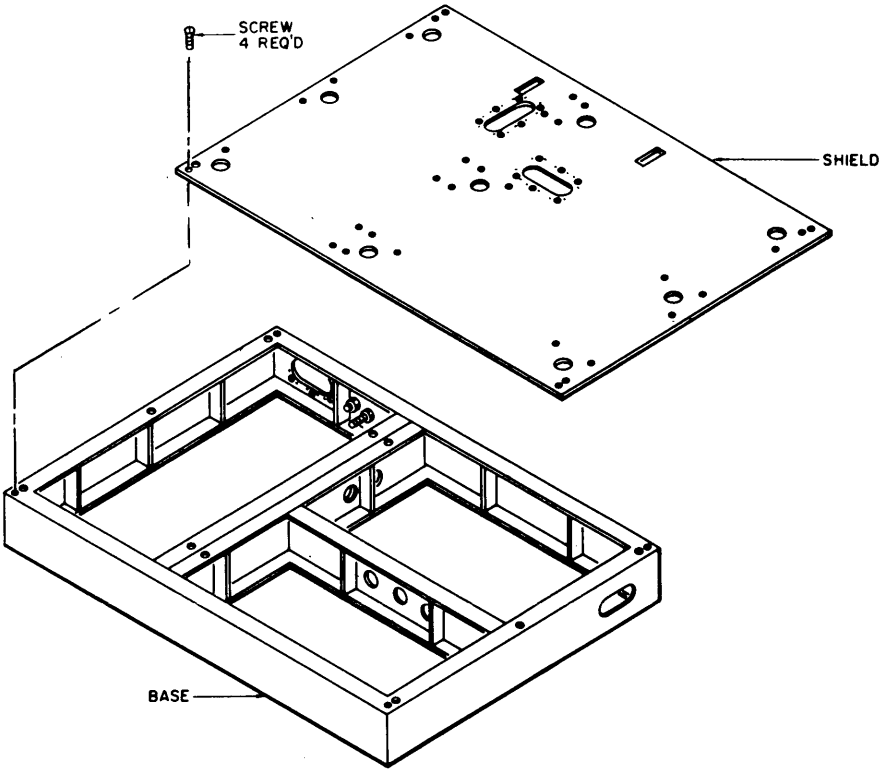


Figure 2-4. Base Assembly, First and Second Frames, Installation Diagram

(4) Using hardware from crate 1 (bag-ground strip mounting kit), bolt grounding straps (contained in crate 1) as indicated in figure 2-5 to the base assembly.

NOTE

Physically bending and routing grounding strips up through the shield to respective frame studs and then mounting must be performed as transmitter assemblage progresses.

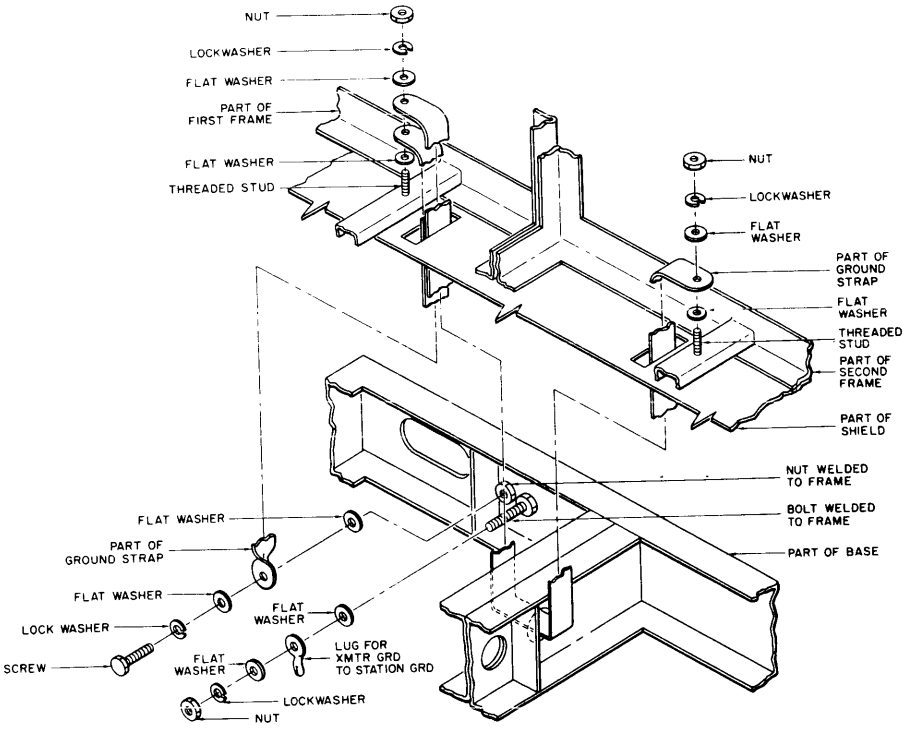


Figure 2-5. Ground Straps, Installation Diagram

WARNING

DO NOT CONNECT AC INPUT POWER CABLES TO THE AC INPUT SWITCH BOXES.

(5) Physically route ac input power and signal cables into base assembly (refer to figure 2-2).

(6) Properly position shield (refer to figure 2-4) on base assembly, and using hardware previously removed, tightly bolt shield to base assembly.

NOTES

1. Grounding straps connected in step (4) must be bent and routed through small rectangular access holes in shield (figure 2-5). Ground straps coming through shield will be connected later.
2. Ac input power and input signal cables must be routed through appropriate access holes in shield (figure 2-1).

(7) Unpack crate 3.

(8) Position first frame on the base assembly (refer to figure 2-6).

(9) Unpack crate 4.

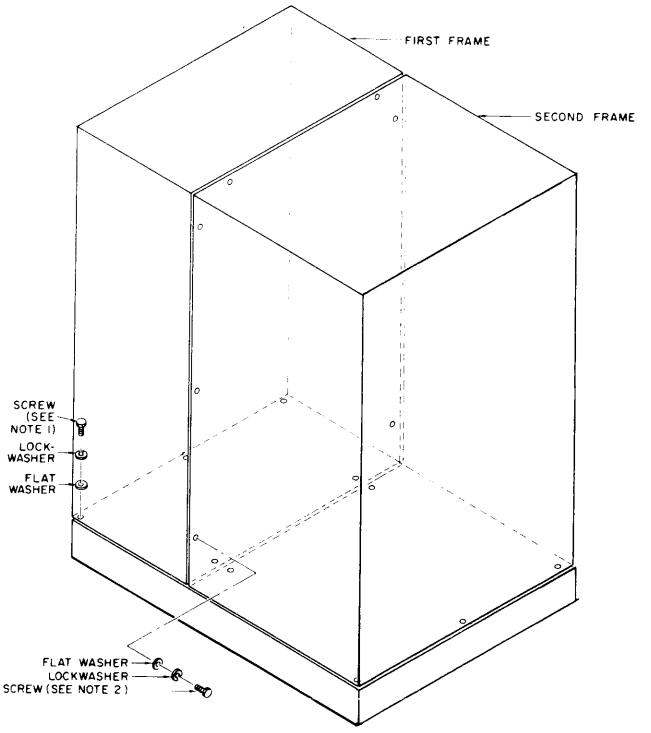
(10) Position second frame on base assembly (refer to figure 2-6).

(11) Temporarily remove the indicator control and relay panel from the bottom front of the second frame. To remove panel:

(a) Unscrew large slotted hex-head screws on the front panel.

(b) Pull panel forward to clear frame; do not disconnect wires or cables.

(12) Temporarily remove the safety cover from the ac input box in the bottom rear compartment of the second frame.



NOTES

1. Five sets of hardware are required to mount each frame to the base assembly.
2. Ten sets of hardware are required to bolt frames together.

Figure 2-6. First and Second Frames, Installation Diagram

(13) Using hardware from crate 1 (bag-frame to base mounting kit), loosely bolt first and second frame to the base assembly (refer to figure 2-6).

(14) Line filterboard installation:

NOTE

The plastic cable clamp around line filterboard to ac input box cable must be mounted to the shield inside second frame. Hardware is provided in line filterboard mounting kit.

(a) Using hardware from crate 1 (bag-line filterboard mounting kit), tightly bolt the line filterboard (contained in crate 1) to shield (first and second frame shield) inside the bottom rear of the first frame, under the fan.

(b) Using remaining line filterboard hardware used in previous step, tightly bolt the line filterboard cover support brackets (contained in crate 1) to the frame shield, one bracket above and below the filterboard.

(c) Connect wires to the filterboard as indicated in figure 7-1.

(d) Position and secure the line filterboard cover (contained in crate 1) to line filterboard cover support brackets.

(e) Route ac input cable, coming through access hole in base shield, to ac input box in bottom rear compartment of second frame, and connect wires. After connecting each wire, mark the corresponding end with the phase indicated on the ac input box terminal; this is very important.

(f) Replace safety cover on the ac input box.

(g) Using the remaining hardware from step (4), bend and mount the ground straps to threaded studs in bottom rear of frames (refer to figure 2-5).

(15) Route 115-volt ac input cable through the first frame to the auxiliary power panel, and connect cable to auxiliary power panel as indicated in figure 7-1.

(16) Connect interframe cables as indicated in diagram in figure 7-1.

(17) Temporarily loosen second frame glass-window and meter panel and fold-up to open position.

(18) Using hardware from crate 1 (bag-first and second frame mounting kit), loosely bolt frames together (refer to figure 2-6) so that frames mechanically align, and tighten all frame-to-base and frame-to-frame hardware.

CAUTION

Make sure each resistor is placed in its designated position.

(19) Mount fixed resistors R802 through R816, R819, and R820 on the resistor board (refer to figure 2-7) in the bottom rear compartment of the second frame.

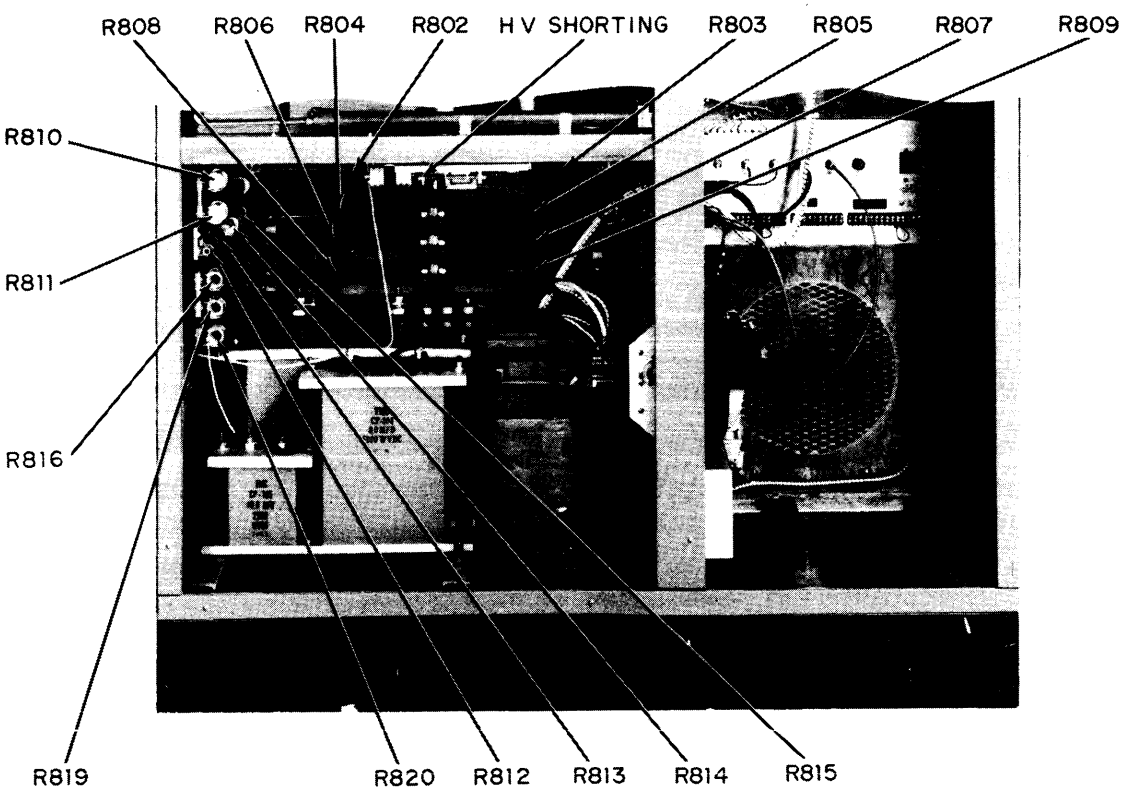


Figure 2-7. Lower Rear Compartment, Second Frame, Installation Diagram

(20) Temporarily remove hardware holding the rear plate to the tube base in the second frame, and remove the plate. Mount (referring to figure 2-8) fixed grid resistors R1204 and R1205 (contained in crate 1) between each set of snap-clips (one resistor per set of clips). Re-position plate and secure with hardware.

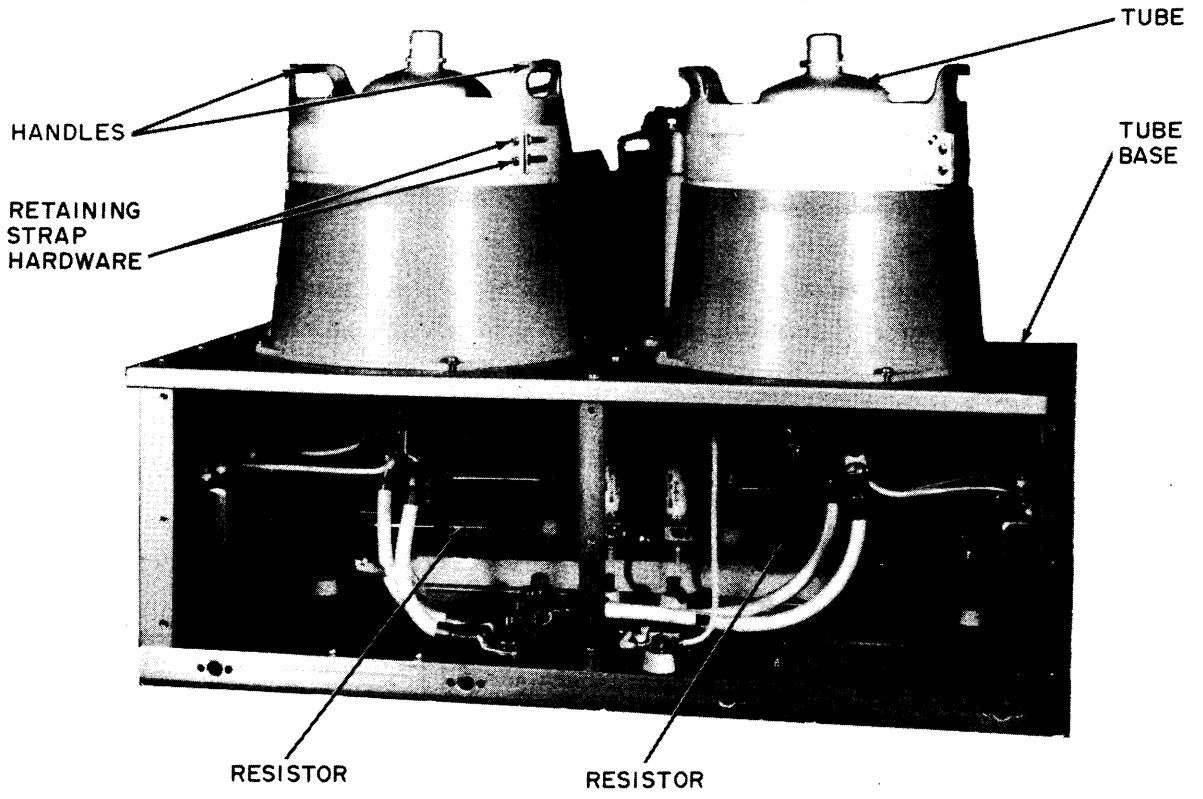


Figure 2-8. Upper Compartment, Second Frame, Rear View

(21) Output tube installation:

(a) Temporarily remove the air duct over the output tube sockets in the top rear of the second frame.

NOTE

The following steps apply to the installation of either output tube. After installing one tube, install the other tube by repeating the procedure.

(b) Loosen hardware on retaining strap (figure 2-8).

CAUTION

Pins located inside tube mounting socket must not be bent. Check pins carefully before attempting to seat the tube.

(c) Observe pins inside the tube socket; carefully straighten bent pins.

(d) Lift the tube (contained in crate 1), handle first, up into the rear of the second frame until tube clears socket.

(e) Slowly lower tube straight down into the tube socket until a slight resistance is encountered. Make sure the tube is centered in the socket.

(f) In one motion while firmly grasping tube handles: rotate tube about a quarter of a turn and push tube firmly down into socket. A slight amount of effort may be required to seat tube; however, applying excessive effort may cause damage. Check the tube seating; it must be all the way down and centered in tube socket.

(g) Tighten retaining strap hardware so that tube is held securely into place.

(22) Using hardware from crate 1 (bag-output jack bracket mounting kit), position and mount (referring to figure 2-9) the output jack J1200 with mounting bracket (contained in crate 1) inside the second frame, toward the upper right rear side. Connect cables as indicated in figure 7-1.

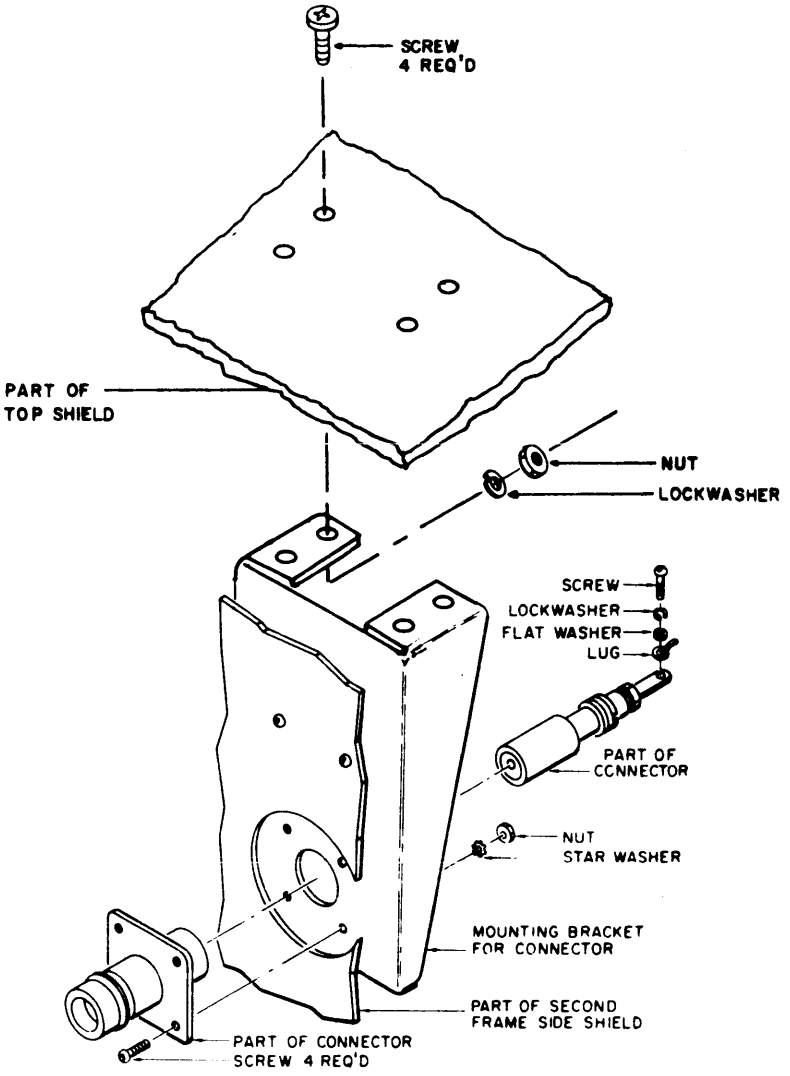


Figure 2-9. Output Jack, Rear View

(23) Temporarily remove safety cover from the filterboard inside the bottom right front of the first frame. Connect wires from relays K3000 and K3001 to the filterboard as indicated in figure 7-1, and replace safety cover on filterboard.

(24) Power transformer installation:

(a) Unpack crate 5.

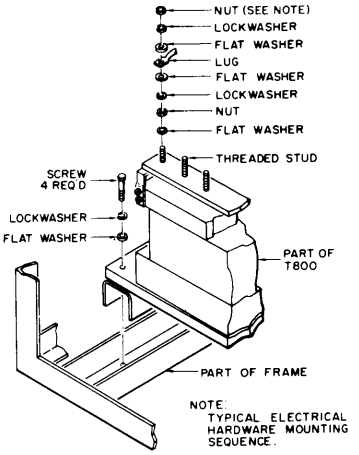


Figure 2-10. Power Transformer T800, Installation Diagram

(b) Position power transformer T800 (refer to figure 2-10) in the bottom front of the second frame, and using hardware from crate 1 (bag-main power transformer mounting kit), tightly bolt T800 to frame.

CAUTION

When connecting wires and cables, make sure adjacent lug connections are not too close to each other.

(c) Connect wires and cables to T800 as indicated in diagram in Section 7.

(d) Replace indicator control and relay panel. Make sure two cables in frame are appropriately connected to jacks J700 and J701 on back of the panel.

(25) Output transformer installation:

(a) Unpack crate 6.

CAUTION

When positioning the output transformer, do not damage the tuning likage shafts.

(b) Position output transformer T1200 (refer to figure 2-11) into the upper front compartment of the second frame, and using hardware from crate 1 (bag-output transformer mounting kit), tightly bolt T1200 to shelf compartment.

CAUTION

When connecting wires, make sure adjacent lug connections are not too close or touching.

(c) Connect wires to T1200 as indicated in diagram in figure 7-1.

(d) Fold-down and secure second frame front glass-window and meter panel.

(e) Replace the output tubes air duct, and the rf shield on the upper rear compartment of the second frame.

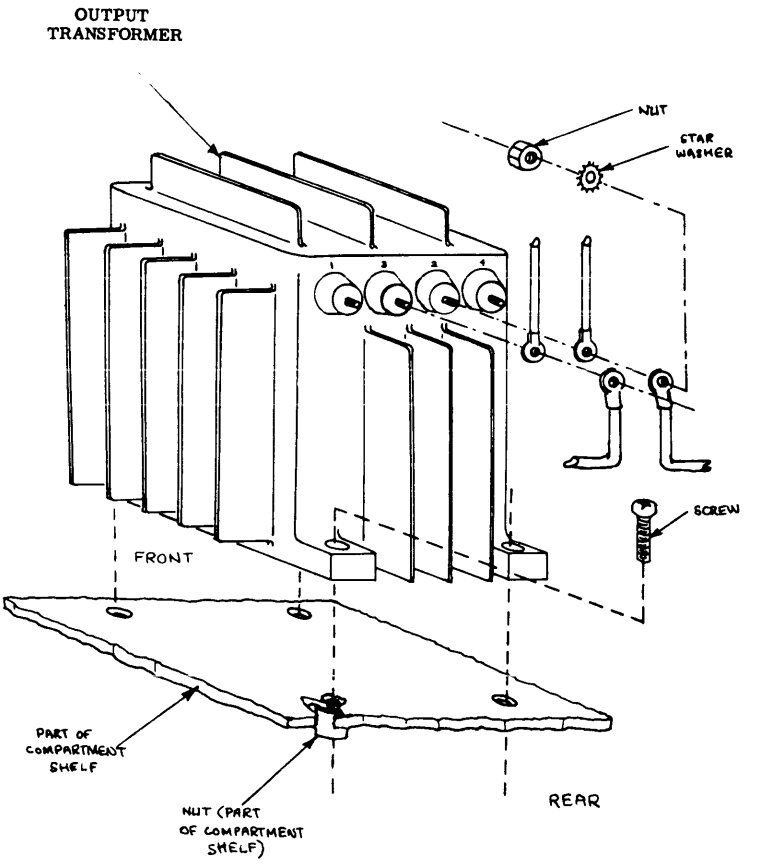


Figure 2-11. Output Transformer T1200, Installation Diagram

(26) Unpack crate 7, and insert high voltage rectifier drawer into open bottom front bay in the second frame, and secure drawer.

CAUTION

When securing drawer to frame, by tightening two large slotted hex-head screws in the front panel, do not strip screw threads by over-tightening.

(27) Installation of Linear Amplifier Drawer:

(a) Unpack crate 8.

(b) Temporarily remove screen cover from top of linear amplifier drawer.

(c) Set TEST/NORMAL switch inside the drawer to NORMAL.

(d) Replace screen cover on top of drawer.

(e) Pull-out center sections of frame drawer tracks in front bay of second frame until they are fully extended.

(f) Mount the drawer in slides and tighten the safety screw in each slide track.

(g) Connect cables to drawer as indicated in figure 7-1.

(h) Push drawer fully into the second frame until drawer to frame locks engage.

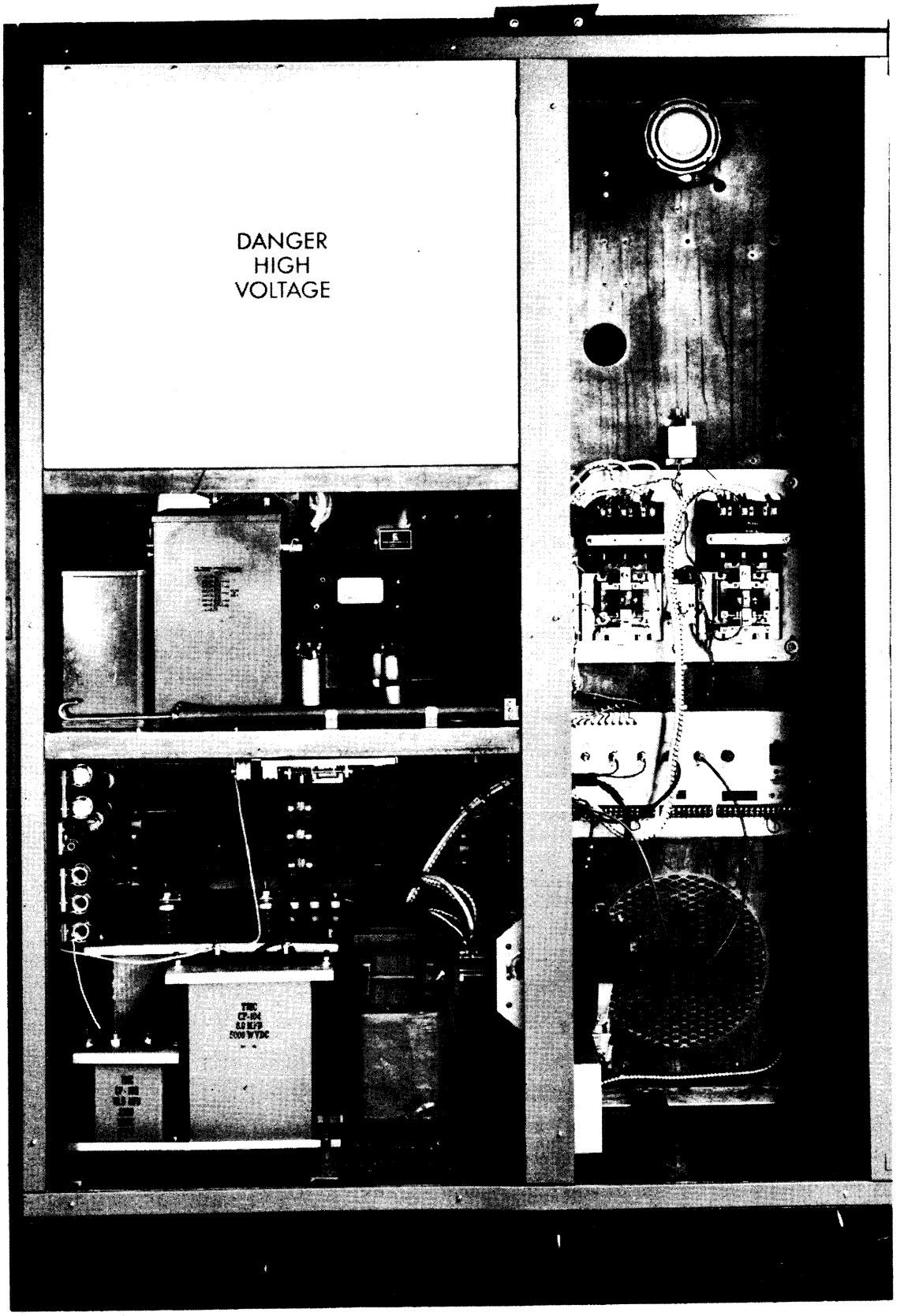


Figure 2-12. GPT-10KLF, Rear View

(28) Installation of high voltage lamp:

(a) Remove top of crate 9 and remove cover top MS1699 on top of the frames (refer to figure 2-13).

(b) Appropriately position cover top MS1699 on top of the frames (refer to figure 2-13).

(c) Using hardware from crate 1 (bag-transmitter top mounting kit), tightly bolt cover top to frames.

(d) Insert appropriate size button plug (contained in crate 1) into cover top to frame mounting holes.

(e) Temporarily remove two sets of mounting hardware from threaded studs on bottom of high voltage lamp socket assembly (contained in crate 1).

(f) Position lamp socket assembly on cover top, above first frame (figure 2-12).

NOTE

1. When mounting the lamp socket, the large rubber washer must be placed between socket base and cover top.
2. The two wires coming from the bottom of the socket must feed through hole in cover top and frame.

(g) Connect the two wires from the lamp socket assembly to terminal board E3003 inside the top of the first frame - the white/red wire to E3003-1 and the white wire to E3003-2.

(h) Using hardware previously removed from the lamp socket assembly, replace on threaded studs inside frame in the following sequence: first, a flat washer; second, a lock washer; and third, a nut. Tighten hardware so that lamp socket is held securely in place.

(29) Install exciter component drawer(s) into front of first frame.

(30) Installation of door latch plates and brackets:

(a) Using hardware from crate 1 (bag-door latch brackets mounting kit) and door latch plates and brackets (contained in crate 1), proceed as follows:

(b) Assemble door latch plates and brackets (refer to figure 2-14).

(c) Mount the resultant assemblies on top and bottom, front and rear, of the transmitter (refer to figure 2-14).

(31) Installation of exterior covers and trim:

(a) Using hardware from crate 1 (bag-trim strip mounting kit), push on the tinnerman type clip-nuts onto small "U" shaped brackets welded to front of the first and second frames.

NOTE

Refer to figure 2-13.

(b) Mount the following items (contained in crate 9) to respective frames as follows:

(1) First and second frame front top trim strip MS 1635

(2) First and second frame front hinged trim strip MS1634.

(3) Second frame right front trim strip MS1633.

(4) First and second frame rear top trim strip MS1672.

(5) First frame rear right side trim strip MS1670.

(6) First and second frame rear trim strip MS1669.

(7) Second frame rear left side trim strip MS1671.

(c) Using hardware from crate 1 (bag-exterior covers to frame mounting kit), mount side panels MS2117 and MS2116 (contained in crate 9) on the side of the first and second frames, respectively.

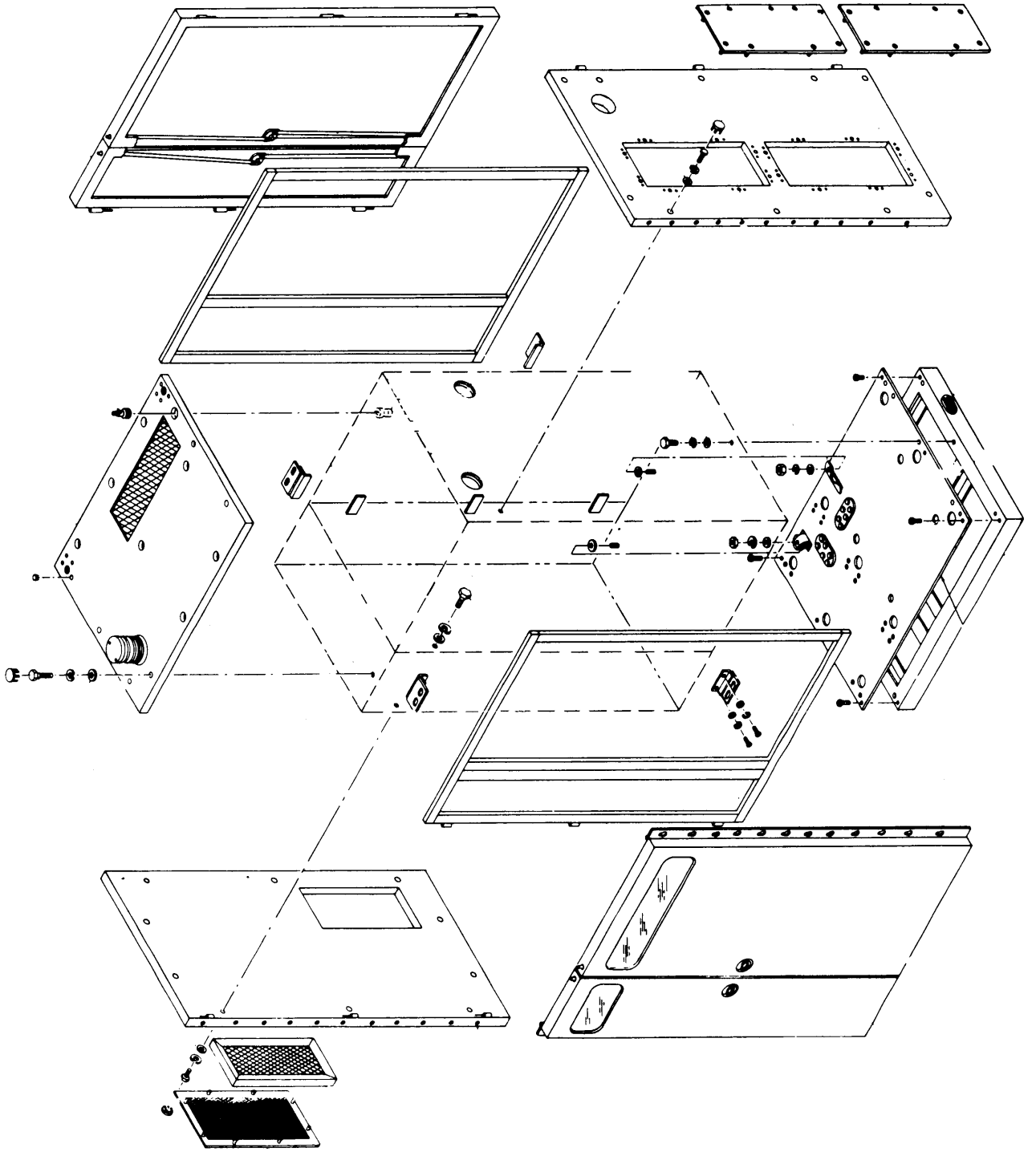


Figure 2-13. Exterior Covers and Trim, Installation Diagram

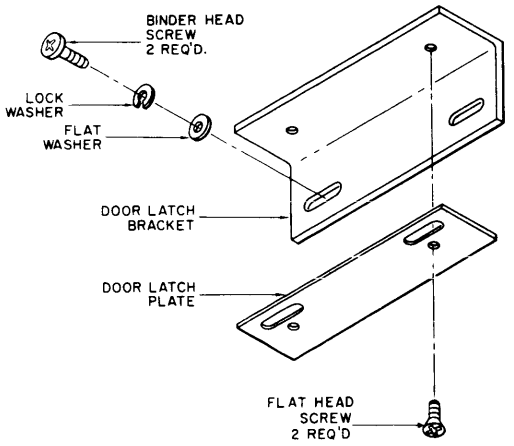


Figure 2-14. Door Latch Plates and Brackets, Installation Diagram

(d) Insert appropriate size button plugs (contained in crate 1) into side panel to frame holes.

(e) Mount first frame hinged front right and left side of trim strips MS1637 and MS1920 (contained in crate 9).

(f) Back-out door mounting screws in sides (front and rear) of both side panels. Then respectively hang the following items (contained in crate 9) on door mounting screws in side panels. Re-tighten screws to hold doors securely.

NOTE

It may be necessary to adjust top and bottom door latch assemblies, so that doors close properly.

(g) Mount the following items (contained in crate 9) to respective frames as follows:

(1) First and second frame front bottom trim strip MS1636.

(2) First and second frame rear bottom trim strip MS1672.

(32) Assemble air ducts and appropriately mount on the transmitter.

(33) Connect the output transmission line to the transmitter. The transmission line is connected to the standard QDL connector on side of the second frame.

(34) Inspect the contents of all packing crates that have been opened. Make sure miscellaneous items (technical manuals, test data, tube warranties, extra hardware, etc.) have been removed before storing or disposing of packing material and shipping crates. Any remaining crates are spare parts for the transmitter; store as desired.

CAUTION

Do not connect the ac line input cable to the line box; power must not be applied to the transmitter until directed to do so in paragraph 2-5.

(35) Proceed to paragraph 2-5.

2-5. PRE-OPERATIONAL CHECKOUT PROCEDURE.

a. SCOPE. This section presents a pre-operational checkout procedure that must be performed by a technician after installation and before operation. The procedure briefly checks for possible equipment-damaging mistakes made during installation. Should a step disclose an abnormal indication, re-check installation wiring and/or refer to Section 5 for maintenance, troubleshooting techniques and corrective measures.

b. CHECKOUT PROCEDURE. - Using necessary test equipment and tools listed in table 1-3, proceed as follows:

(1) Open front doors on the transmitter and place the main power panel MAIN POWER breaker on front of second frame at OFF.

(2) Open the rear doors on the transmitter and place the AUXILIARY FRAME MAIN POWER breaker, mounted on the center partition inside the rear of the first frame, at OFF.

(3) Measure infinite resistance between transmitter ground and each wire on the unconnected end of the ac line input cable.

NOTE

Each wire of the ac line input cable was marked in the installation procedure to indicate proper phase and facilitate connection later in this procedure.

(4) Place all front panel on/off and off/standby switches on units in the first frame at OFF.

(5) Place the AUXILIARY FRAME MAIN POWER breaker at ON.

(6) Repeat step (3).

(7) Place the AUXILIARY FRAME MAIN POWER breaker at OFF.

(8) Open the two shorting contacts of the High Voltage Shorting relay, figure 2-7, and place a sheet of paper between the contacts.

(9) Unfasten and fold-up the glass-window and meter panel on the front of the second frame.

(10) Measure 100,000 ohms between transmitter ground and terminal E1215 mounted inside the power-amplifier compartment of the second frame, at the top.

(11) Fold-down and secure the glass-window and meter panel.

(12) Remove sheet of paper between High Voltage Shorting relay contacts.

WARNING

DANGEROUS VOLTAGES ARE PRESENT.

CAUTION

Make sure the phase (1, 2, and 3) marked on each wire of the ac line input cable is connected to the corresponding phase in the line box.

(13) Connect ac line input cable to the ac input line box.

(14) Remove the main blower air filter located inside the rear of the first frame, on the left wall. To remove filter, twist the retaining clamp and pull the filter slightly up and out of the frame.

NOTE

Observe the position of the air filter before removing; it will be replaced later.

(15) Place the main power panel MAIN POWER breaker ON and after about one minute turn it OFF. Go to the rear of the first frame and observe cw (clockwise) rotation of the main blower blades as they slow down.

(16) Replace and secure the main blower air filter.

(17) Place the AUXILIARY FRAME MAIN POWER breaker at ON.

(18) Observe through the glass-window panel on front of the second frame that the fan in the upper left corner rotates.

(19) Place the AUXILIARY FRAME MAIN POWER breaker at OFF.

(20) Close and lock the rear doors.

(21) Place the MAIN POWER breaker, on the main power panel, at ON; allow a 30-minute warm-up before proceeding to the next step.

(22) Place the HIGH VOLTAGE breaker, on the main power panel, at ON; red light on top of first frame lights (glows dimly for about five seconds, thereafter glows brightly).

(23) Place the HIGH VOLTAGE breaker at OFF; wait five minutes before proceeding to the next step.

(24) Place the MAIN POWER breaker at OFF. This completes the procedure. The operator may now operate the GPT-10KLF transmitter.

SECTION 3

OPERATOR'S SECTION

3-1. INTRODUCTION.

This section provides information for personnel operating the GPT-10KLF transmitter. Paragraph 3-2 presents all of the controls and indicators that operating personnel must be familiar with in order to operate the transmitter. Paragraph 3-3 presents operating procedures. Also, maintenance personnel should be familiar with all the information in paragraph 3-4 in order to effectively diagnose trouble, repair, and test-operate the transmitter.

3-2. CONTROLS AND INDICATORS.

Table 3-1 lists all controls and indicators associated with the first frame. Table 3-2 lists all controls and indicators associated with the second frame. The numbers in the first columns of tables 3-1 and 3-2 correspond to the call-outs on figures 3-1 and 3-2, respectively.

TABLE 3-1. FIRST FRAME CONTROLS AND INDICATORS

NO.	EQUIPMENT	CONTROLS AND INDICATORS	REFERENCE DESIGNATION	FUNCTION
1	Part of first frame	High voltage lamp	DS3000	When lit, indicates high voltage is on.
2	First frame meter panel	PA SCREEN meter	M1001	Indicate power amplifier screen voltage level.
3		FILAMENT PRIMARY meter	M3001	Indicate power amplifier filament transformer primary voltage level.
4		PA PLATE meter	M3002	Indicate power amplifier plate voltage level.
5	Auxiliary power panel	110V jack	J4	A convenience outlet for monitor or test equipment.
6		5A/110V fuse	F1	Protect ac input and equipment connected to 5 and 7. When lit, fuse has blown.
7		110V jack	J5	Same as 5.
8		MONITOR switch	S1	In EXCITER position, Exciter output available at 11. Similarly in IPA or PA positions, respective output available at 11.
9		CHANNEL 1 jack	J2	In conjunction with 10, provides a test input connection for a two tone test signal
10		AUDIO INPUT jack	J3	See 9.

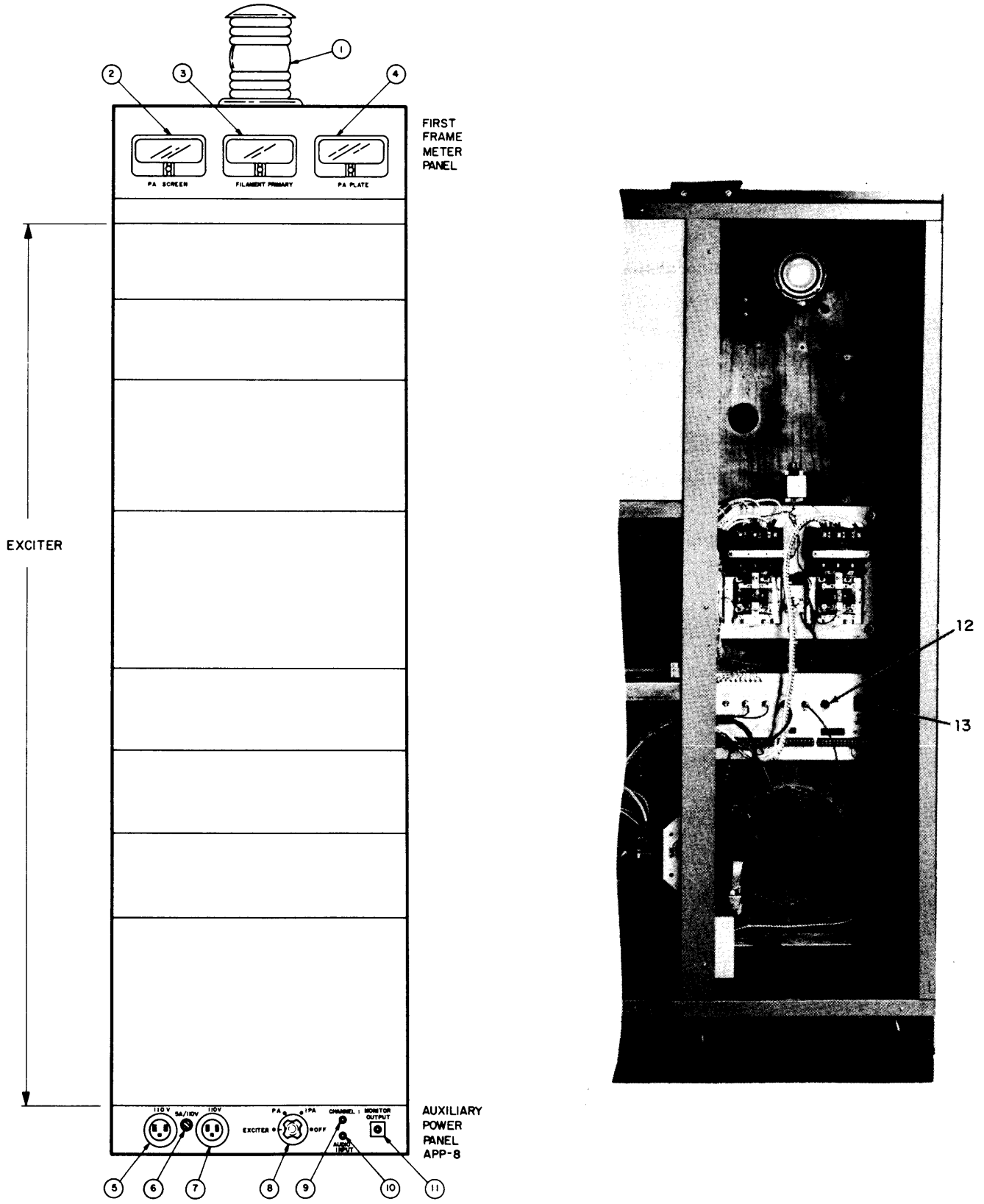


Figure 3-1. First Frame, Controls and Indicators

TABLE 3-1. FIRST FRAME CONTROLS AND INDICATORS (Cont)

NO.	EQUIPMENT	CONTROLS AND INDICATORS	REFERENCE DESIGNATION	FUNCTION
11	Auxiliary power panel (cont)	MONITOR OUTPUT jack	J1	Provides monitor outputs (depending upon position of 8).
12	Part of first frame (rear)	FRONT FAN fuse	F3000	Protect front fan. When lit, fuse has blown.
13		AUXILIARY FRAME MAIN POWER circuit breaker.	CB3000	Protect ac input and drawers in first frame.

TABLE 3-2. SECOND FRAME CONTROLS AND INDICATORS

NO.	EQUIPMENT	CONTROLS AND INDICATORS	REFERENCE DESIGNATION	FUNCTION
1	Second Frame Meter Panel	PA Bias A Meter	M1005	Indicate amplitude of control grid bias voltage applied to control grid of power amplifier tube A V1200.
2		PA Bias B Meter	M1004	Indicate amplitude of control grid bias voltage applied to control grid of power amplifier Tube B V1201.
3		PA Screen Current Meter	M1001	Indicate total screen grid current of power amplifier tubes.
4		PA Plate Current Meter	M1002	Indicate total plate current of power amplifier tubes.
5		PA SWR Meter	M1003	Indicate transmitter power output on standing wave ratio at output of transmitter, dependent on setting of 18.
6	Power Amplifier Compartment Meter Panel (visible through glass-window panel)	Plate Current A Meter	M1200	Indicate plate current of power amplifier tube A V1200.
7		Plate Current B Meter	M1201	Indicate plate current of power amplifier tube B V1201.
8	Power Amplifier Control Panel	AC ON Lamp	DS1000	Lights when primary power is turned on by 32.
9		TUNE Lamp	DS1009	Lights when 39 is set at TUNE.
10		OPERATE	DS1008	Lights when 39 is set at OPERATE.
11		PLATE ON Lamp		Lights when primary power is applied to main power supply.
12		ALARM/OFF Switch	S1017	In ALARM position, turns on buzzer DS3000 if primary power is not applied to main power supply. In OFF position, turns buzzer off.
13		LOAD ADJ FINE Switch	S1202	Fine adjustment for matching output impedance.
14		LOAD ADJ FINE dial		Indicate setting of 13.

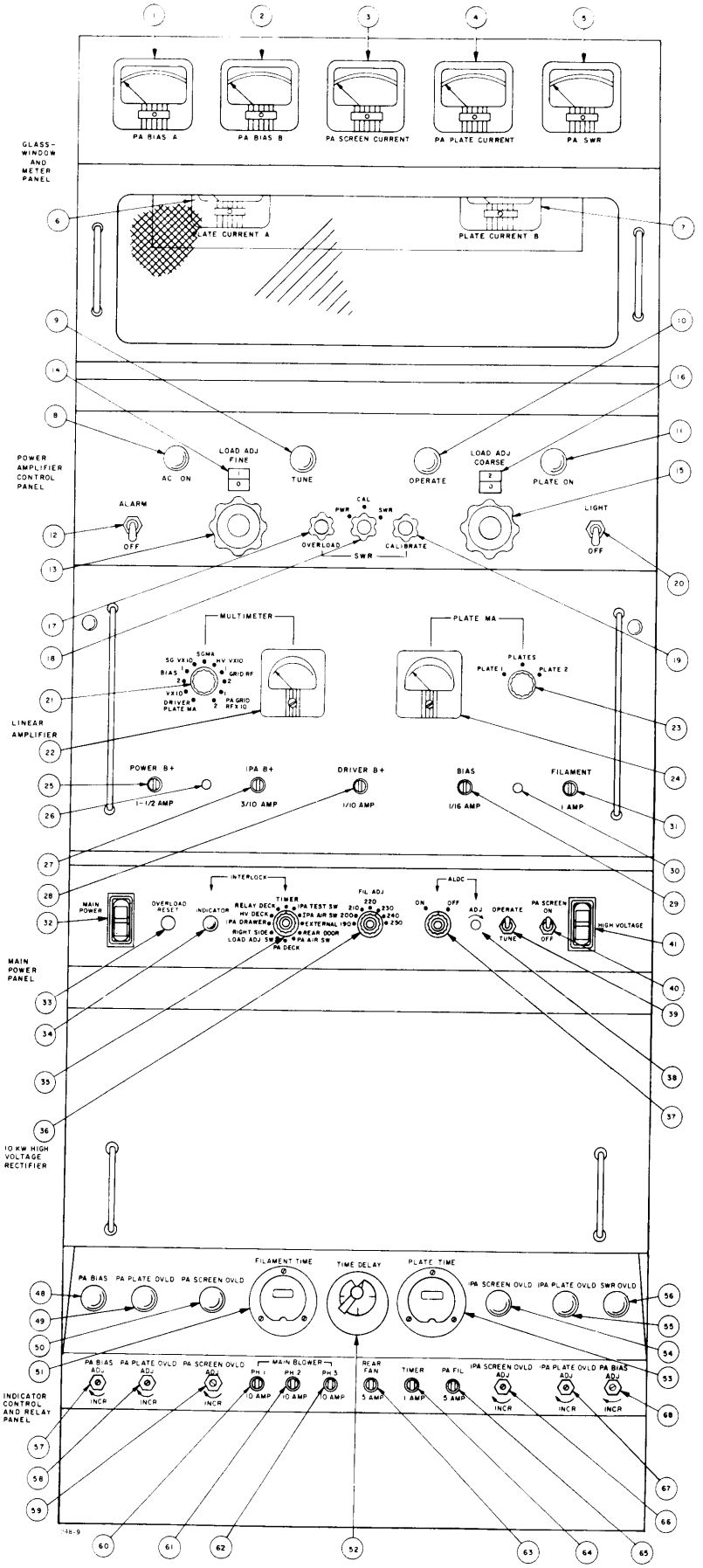


Figure 3-2. Second Frame, Controls and Indicators

TABLE 3-2. SECOND FRAME CONTROLS AND INDICATORS (Cont)

NO.	EQUIPMENT	CONTROLS AND INDICATORS	REFERENCE DESIGNATION	FUNCTION
15	Power Amplifier Control Panel (cont)	LOAD ADJ Coarse Switch	S1201	Fine adjustment for matching output impedance.
16		LOAD ADJ Coarse dial		Indicate setting of 15.
17		SWR OVERLOAD Control	R1010	Control reflected power level that energizes standing wave overload relay K708.
18		PWR/CAL/SWR Switch	S1018	In PWR position, connects 5 to indicate transmitter output power. In CAL position, connects meter to SWR calibration circuit. In SWR position, connects meter to indicate standing wave ratio at output of transmitter.
19		SWR CALIBRATE Control	R1011A	Calibrate 5 when 18 is in CAL position.
20		LIGHT/OFF Switch	S1014	Turn power amplifier compartment light I1007 on and off.
21	Linear Amplifier	MULTIMETER Switch:	S2002	
		DRIVER PLATE MA		Total plate current of linear amplifier tubes V2001 and V2002.
		BIAS 1		Bias applied to control grid of linear amplifier tube V2003.
		BIAS 2		Bias applied to control grid of linear amplifier tube V2004.
		SGVX10		Voltage supplied to the screen grids of linear amplifier tubes. Indicated value must be multiplied by 10.
		SG MA		Total screen grid current of linear amplifier tubes V2003 and V2004.
		HV X10		Plate voltage supplied to linear amplifier tubes V2003 and V2004. Indicated value must be multiplied by 10.
		GRID RF 1		RF drive applied to control grid of linear amplifier tube V2003.
		GRID RF 2		RF drive applied to control grid of linear amplifier tube V2004.
		PA GRID RF X10 1		RF drive applied to control grid of power amplifier tube V1200. Indicated value must be multiplied by 10.
		PA GRID RF X10 2		RF drive applied to control grid of power amplifier tube V1201. Indicated value must be multiplied by 10.
22		MULTIMETER	M2002	Indicate various tube element currents and dc and rf potentials as selected by 21.

TABLE 3-2. SECOND FRAME CONTROLS AND INDICATORS (Cont)

NO.	EQUIPMENT	CONTROLS AND INDICATORS	REFERENCE DESIGNATION	FUNCTION
23	Linear Amplifier (cont)	PLATE MA Switch	S2001	In PLATE 1 position, connects 24 to indicate plate current of linear amplifier tube V2003. In PLATE 2 position, connects 24 to indicate plate current of tube V2004. In PLATES position, connects 24 to indicate total plate current of both tubes V2003 and V2004.
24		PLATE MA Meter	M2001	Indicate plate current of linear amplifier tubes V2003 and V2004 as selected by 23.
25		POWER B+ Fuse	F2002	Protect primary circuit of B+ supply for intermediate power amplifier tubes V2003, V2004, and screen supply for intermediate power amplifier and driver tubes.
26		BIAS ADJ A	R2004	Control bias applied to control grid of linear amplifier tube V2003.
27		IPA B+ Fuse	F2003	Protect plate circuits of linear amplifier tubes V2003 and V2004.
28		DRIVER B+ Fuse	F2005	Protect plate circuits of linear amplifier tubes V2001 and V2002.
29		BIAS Fuse	F2003	Protect bias circuits in linear amplifier.
30		BIAS ADJ B	R2003	Control bias applied to control grid of linear amplifier tube V2004.
31		FILAMENT Fuse	F2001	Protect primary of linear amplifier plate, bias, and filament supplies.
32	Main Power Panel	MAIN POWER Circuit breaker	CB1000	Control primary power application to all circuits of transmitter except those in the first frame.
33		OVERLOAD RESET Switch	S1000	When pressed, resets various overload relays in the indicator, control, and relay panel.
34		INTERLOCK INDICATOR lamp	DS1004	When lit, indicates closure of equipment interlock switches as selected by 35.
35		INTERLOCK switch	S1001	Connects 34 to equipment interlock switches, when switch is rotated in a cw direction, starting from fully ccw position. First position at which lamp is extinguished denotes open interlock.
36		FIL ADJ Switch	S1002	Select tap of filament transformer T801 that primary is applied to. Switch position (190, 200, 210, 220, 230, 240 or 250) should correspond with actual primary voltage used.

TABLE 3-2. SECOND FRAME CONTROLS AND INDICATORS (Cont)

NO.	EQUIPMENT	CONTROLS AND INDICATORS	REFERENCE DESIGNATION	FUNCTION
37	Main Power Panel (cont)	ALDC ON/OFF Switch	S1003	In ON position, connects output of ALDC (automatic load and drive control) circuit to the frequency amplifier.
38		ALDC ADJ control	R1004	Adjusts level that ALDC circuit starts to limit transmitter power output.
39		OPERATE/ TUNE Switch	S1004	In TUNE position, energizes relay K705, so that lower screen grid voltages are applied to power amplifier and linear amplifier tubes during tuning. In OPERATE position, de-energizes relay K705, so that higher screen grid voltages are applied to tubes during normal operation.
40		PA SCREEN ON/OFF Switch	S1005	In OFF position, energizes relay K703, disconnecting power amplifier screen grids from power supply. In ON position, de-energizes relay, connecting power amplifier screen grids to power aupply.
41		HIGH VOLTAGE circuit breaker	CB1002	In ON position, energizes contactor K3001, connecting primary power to main power supply. In OFF position, turns off main power supply.
42 thru 47	Not used			
48	Indicator, Control and Relay Panel	PA BIAS lamp	DS700	Lights when power amplifier bias voltage is not present.
49		PA PLATE OVLD 1 amp	DS701	Lights when overload occurs due to excessive power amplifier plate current.
50		PA SCREEN OVLD 1 amp	DS702	Lights when overload occurs due to excessive power amplifier screen grid current.
51		FILAMENT TIME meter	M700	Indicate total time (in hours) that power is applied to filament circuits of transmitter.
52		TIME DELAY timer	M701	Prevent premature application of high voltage to transmitter by opening interlock circuit for a preset interval after application of primary power.
53		PLATE TIME meter	M702	Indicate total time (in hours) that plate voltage is applied to linear amplifier and power amplifier stages.
55		IPA SCREEN OVLD lamp	DS706	Lights when overload occurs due to excessive linear amplifier screen grid current.

TABLE 3-2. SECOND FRAME CONTROLS AND INDICATORS (Cont)

NO.	EQUIPMENT	CONTROLS AND INDICATORS	REFERENCE DESIGNATION	FUNCTION
56	Indicator, Control and Relay Panel (cont)	SWR OVLD lamp	DS708	Lights when overload occurs due to excessive standing waves at transmitter output.
57		PA BIAS ADJ control B	R712	Control bias applied to control grid of power amplifier tube V1200.
58		PA PLATE OVLD ADJ control	R705	Control dc level that energizes power amplifier overload relay.
59		PA SCREEN OVLD ADJ control	R707	Control dc level that energizes power amplifier screen overload relay.
60		MAIN BLOWER PH 1 fuse	F700	Protect main blower B800. When lit, fuse has blown.
61		MAIN BLOWER PH 2 fuse	F701	Same as 60.
62		MAIN BLOWER PH 3 fuse	F702	Same as 60.
63		REAR FAN fuse	F703	Protect rear fan B3001. When lit, fuse has blown.
64		TIMER fuse	F704	Protect 52. When lit, fuse has blown.
65		PA FIL fuse	F705	Protects power amplifier filament primary circuits. When lit, fuse has blown.
66		IPA SCREEN OVLD ADJ control	R709	Control dc level that energizes linear amplifier screen overload relay.
67		IPA PLATE OVLD ADJ control	R711	Control dc level that energizes linear amplifier plate overload relay.
68		PA BIAS ADJ control A	R703	Control bias applied to control grid of power amplifier tube V1201.

3-3. OPERATING PROCEDURE.

a. GENERAL INSTRUCTIONS. -

CAUTION

Do not be a knob-twister!

Before transmitter operation, make sure you are familiar with the information presented on controls and indicators in paragraph 3-2.

Carefully read each instruction. After reading, consider the complexity involved in executing the instruction(s). In some instances, it may be advisable to simulate a complex instruction before actually doing it. Make sure each instruction has been completed before proceeding to the next; do not skip steps.

If an abnormal indication is observed, the best thing to do is to turn off primary power and call a technician. If a fuse blows or a lamp does not light (or extinguishes), refer to paragraph 3-4. In the event of any malfunction, make sure the trouble has been corrected before proceeding.

Apply power to transmitter by setting AUXILIARY FRAME MAIN POWER circuit breaker (13) on inner rear partition of first frame to ON. Top front fan in first frame should start.

b. EXCITER POWER APPLICATION. - Apply operating power to exciter component(s) as per exciter technical manual.

c. CONSIDERATIONS IN TUNING TRANSMITTER. - Before the transmitter is tuned for any specified mode of operation, it should be initially tuned and loaded on the desired operating carrier frequency. This procedure should be followed even if suppressed carrier operation is desired. After the transmitter is tuned to the carrier, either or both sidebands are generated by applying the desired modulating signals (audio, facsimile, telegraph, teletype, or pulse) to the input of the transmitter and following the respective operating procedure; during this time the carrier may be suppressed or removed or present according to equipment limitations and conventional transmission standards.

d. SET-UP OF SECOND FRAME CONTROLS. -

(1) Set controls as indicated in table 3-3.

TABLE 3-3. SETUP OF SECOND FRAME CONTROLS

CONTROL	POSITION
PA SCREEN (40)	OFF
TUNE-OPERATE (39)	TUNE
HIGH VOLTAGE (41)	OFF
ALDC (37)	OFF
INTERLOCK (35)	TIMER

(2) Set TIME DELAY control (52) at 5.

(3) Set MAIN POWER circuit breaker (32) at ON.

(a) Second frame blower should start.

(b) TUNE lamp (9) should light.

(c) PA BIAS lamp (48) should light; then go OFF after approximately 30 seconds.

(d) PA BIAS meters (1) and (2) should indicate.

(e) FILAMENT PRIMARY meter (3) on first frame should indicate 230 vac. If necessary, rotate FIL ADJ switch (36) for proper meter indication.

(f) After 5-minute delay, INTERLOCK INDICATOR lamp (34) should light. If necessary, rotate INTERLOCK switch (35) clockwise from its extreme counter-clockwise position. First position at which INTERLOCK INDICATOR lamp (34) goes off corresponds with open equipment interlock switch. When open interlock has been closed, return INTERLOCK switch (35) to NORMAL.

(4) Set LOAD ADJ FINE switch (13) and LOAD ADJ COARSE switch (15) to match transmitter output impedance to impedance of load or antenna. See table 3-4.

TABLE 3-4. OUTPUT IMPEDANCE MATCHING

Switch Settings		TRANSMITTER OUTPUT Z (Approx.)
LOAD ADJ FINE (13)	LOAD ADJ COARSE(15)	
20	10	20
10		23

TABLE 3-4. OUTPUT IMPEDANCE MATCHING (Cont)

Switch Settings		Transmitter Output Z (Approx.)
Load Adj Fine (13)	Load Adj Coarse (15)	
20	20	30
10		35
20	30	50
10		60
20	40	70
10		80
20	50	95
10		110
20	60	120
10		140

(5) Set HIGH VOLTAGE circuit breaker (41) on ON. PLATE ON lamp (11) should light and red indicator on roof of first frame (1) should glow dimly at first and should brighten after 20 seconds. PA PLATE meter (4) on the first frame should indicate 7.5 kv.

(6) Set PA SCREEN switch (40) on ON. PA SCREEN meter (3) on first frame should indicate 800 volts.

(7) Set TUNE-OPERATE switch (39) at OPERATE.

(a) PA SCREEN meter (3) on first frame should indicate 1600 volts; PLATE CURRENT A meter (6) and PLATE CURRENT B meter (7) should each indicate 1 ampere. If necessary, adjust PA BIAS ADJ controls, (57) and (68), to obtain correct meter indications.

(b) Set MULTIMETER switch(21) at SGV x 10. MULTIMETER (22) should indicate 800 volts. Set PLATE MA switch (23) successively at PLATE 1 and PLATE 2. PLATE MA meter (24) should indicate 110 milliamperes in both switch positions. If necessary, adjust BIAS ADJ A (26) and BIAS ADJ B (30) to obtain correct meter indications, respectively, in the PLATE 1 and PLATE 2 positions. Set PLATE MA switch (23) at PLATES.

(8) Turn SWR OVERLOAD control (17) fully counterclockwise, and set PWR-CAL-SWR switch (18) at PWR.

(9) Adjust OUTPUT control on exciter for indication of 1 KW on PA SWR meter (5).

(10) Set PWR-CAL-SWR switch at CAL, and adjust SWR CALIBRATE control (19) so that pointer of PA SWR meter (5) is at CAL marker. Set PWR-CAL-SWR switch at SWR; PA SWR meter should indicate no higher than 2. If standing wave ratio is higher than 2 to 1, retuning of antenna is necessary. If standing wave ratio is acceptable, proceed to next step.

CAUTION

When performing step (11), PA PLATE CURRENT meter (4) must indicate no higher than 2.5 amperes and PA SCREEN CURRENT meter (3) must indicate no higher than 70 milliamperes.

(11) Set PWR-CAL-SWR switch at SWR, and adjust exciter OUTPUT control for an indication of 5 kw on the PA SWR meter (4). If 5 kw cannot be obtained, resetting the LOAD ADJ FINE switch (13) and LOAD ADJ COARSE switch (15) may be necessary; to do this, proceed as follows:

(a) Rotate the exciter OUTPUT control fully counterclockwise.

(b) Set the HIGH VOLTAGE circuit breaker (41) at OFF.

(c) Set the TUNE-OPERATE switch (39) at TUNE.

(d) Set the PA SCREEN switch (40) at OFF.

(e) Repeat steps 3-10 (4) through (11).

NOTE

Settings of the LOAD ADJ FINE and LOAD ADJ COARSE switches that yield maximum output power, minimum PA plate current, and acceptable PA screen grid current are correct.

(12) This completes tune-up of transmitter on carrier. Remove excitation by rotating exciter output control fully counterclockwise.

e. CW OPERATION. - For dry contact keying, remove jumper that connects terminals 17 and 18 on terminal board E3002; connect "dry" keying source to these terminals. Tune transmitter on carrier as described; keep key closed during tuning procedure. Adjust exciter output control for desired transmitter power output (up to 5 kw) as indicated on PA SWR meter (5) on second frame.

NOTE

If this method of keying is used, it will be necessary to supply a locked key to the transmitter to facilitate operation in all other modes of transmission.

f. STANDBY AND STOPPING PROCEDURES. -

(1) STANDBY. - When the GPT-10KLF transmitter is to be turned off for a limited interval of time, the temperature control oven circuits should be left on to maintain maximum frequency stability. To place the transmitter in standby, follow steps in table 3-5.

TABLE 3-5. PROCEDURE FOR PLACING TRANSMITTER IN STANDBY

Steps	Equipment	Switch	Position	Reaction
	Second frame:			
1		PA SCREEN (40)	OFF	All indicators on main frame go off and all meters on auxiliary frame meter panel drop to zero.
2		TUNE-OPERATE (39)	TUNE	
3		HIGH VOLTAGE (41)	OFF	
4		MAIN POWER (32)	OFF	
	First frame:			
5		ON/OFF ON/STANDBY	OFF or STANDBY	

(2) COMPLETE STOPPING. - If the transmitter is in standby, simply set AUXILIARY FRAME MAIN POWER circuit breaker on rear of auxiliary frame at OFF. For complete stopping from full on condition, follow steps in table 3-6.

TABLE 3-6. COMPLETE STOPPING PROCEDURE

Steps	Equipment	Control	Position
1	Main power panel:		
1		PA SCREEN (40)	OFF
2		TUNE-OPERATE (39)	TUNE
3		HIGH-VOLTAGE (41)	OFF
4		MAIN POWER (32)	OFF
	First frame:		
5		MAIN POWER (13)	OFF
6		AUXILIARY FRAME	

(3) EMERGENCY STOPPING. - For quick stopping during an emergency, set MAIN POWER circuit breaker at OFF and AUXILIARY FRAME MAIN POWER circuit breaker at OFF.

NOTE

Every attempt should be made to maintain power to the exciter at all times. Indiscriminate interruption of power will result in loss of frequency stability and may require resetting of the 1 MHz frequency standard in primary standard.

3-4. OPERATOR'S MAINTENANCE.

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

b. REPLACEMENT OF SPARE FUSES. - With the exception of the first frame front fan fuse (located at the rear of the first frame), all fuses are located on the front panels.

CAUTION

Never replace a fuse with one of higher rating. If a fuse burns out immediately after replacement, do not replace it a second time until the trouble has been located and corrected.

c. INTERLOCKS AND RELAYS. - If while operating the transmitter any of these devices activate, the operator should do the following in order to restore normal operating conditions:

(1) In case of an overload or misadjustment, reset, reload, and retune the transmitter.

(2) In case a drawer, panel, or door is opened, properly close it and retune the transmitter.

(3) If performing step (1) or (2) does not restore normal operating conditions, call a technician for remedial action.

(4) In all other cases, call a technician for remedial action.

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL.

This section covers the principles of operation of the three rf amplifier stages of the GPT-10KLF transmitter and of the associated protective, control, and power supply circuits.

4-2. OVERALL BLOCK DIAGRAM ANALYSIS. (Refer to figure 4-1.)

As shown in the block diagram, the GPT-10KLF transmitter consists of an exciter, a three-stage linear rf amplifier, power supplies, and control and protective circuits. The exciter is housed in the first frame. The principles of operation of the exciter circuits are not described in this manual; refer to technical manual supplied for the exciter system. The exciter provides a low frequency rf output to the first rf amplifier in the VLLA. The first rf amplifier, a push-pull, broad-band stage, drives the IPA stage; also a push-pull, broad-band amplifier contained in the VLLA. The IPA stage provides excitation for the 10-kw power amplifier.

Bias, filament voltages, screen grid voltages, and plate supply voltages for the first rf amplifier and IPA tubes are provided by power supplies in the VLLA.

The 10-kw PA, also a push-pull, broad-band amplifier, amplifies the rf signal level to 5,000 watts average and 10,000 watts PEP. The output configuration of the 10-kw PA includes an adjustable impedance matching device, allowing the transmitter to be terminated into a variety of loads.

The 10-kw PA receives its filament, screen grid, and plate voltages from the main power supply. Bias for the two power-amplifier tubes is derived from an output of the bias supply in the VLLA.

The SWR circuit, interposed in the rf output line, detects transmitter output power level and SWR (standing wave ratio) on the transmission line connected to the output terminal.

Samples of the rf signals at the output of the IPA and at the output of the 10-kw PA are routed to the auxiliary power panel in the first frame, where they may be conveniently monitored. A sample of the 10-kw PA output signal is also applied to the ALDC (automatic load and drive control) circuit. The ALDC circuit can be adjusted so that a control voltage is applied to the exciter whenever a predetermined PEP level is reached. Excessively high drive peaks and excessive distortion is thus prevented.

The protective circuits in the indicator, control, and relay panel monitor various transmitter operating parameters, and deenergize the high voltage circuits if one or more of the following conditions exist:

a. Excessive IPA tubes screen grid current.
b. Excessive IPA tubes plate current.
c. Insufficient bias voltage for power-amplifier tubes.
d. Excessive power-amplifier tubes plate current.
e. Excessive power-amplifier tubes ~~screen~~ tubes screen grid current.
f. Excessive current through the zener diode regulator in the PA tubes screen voltage supply.
g. Excessive SWR at transmitter output.

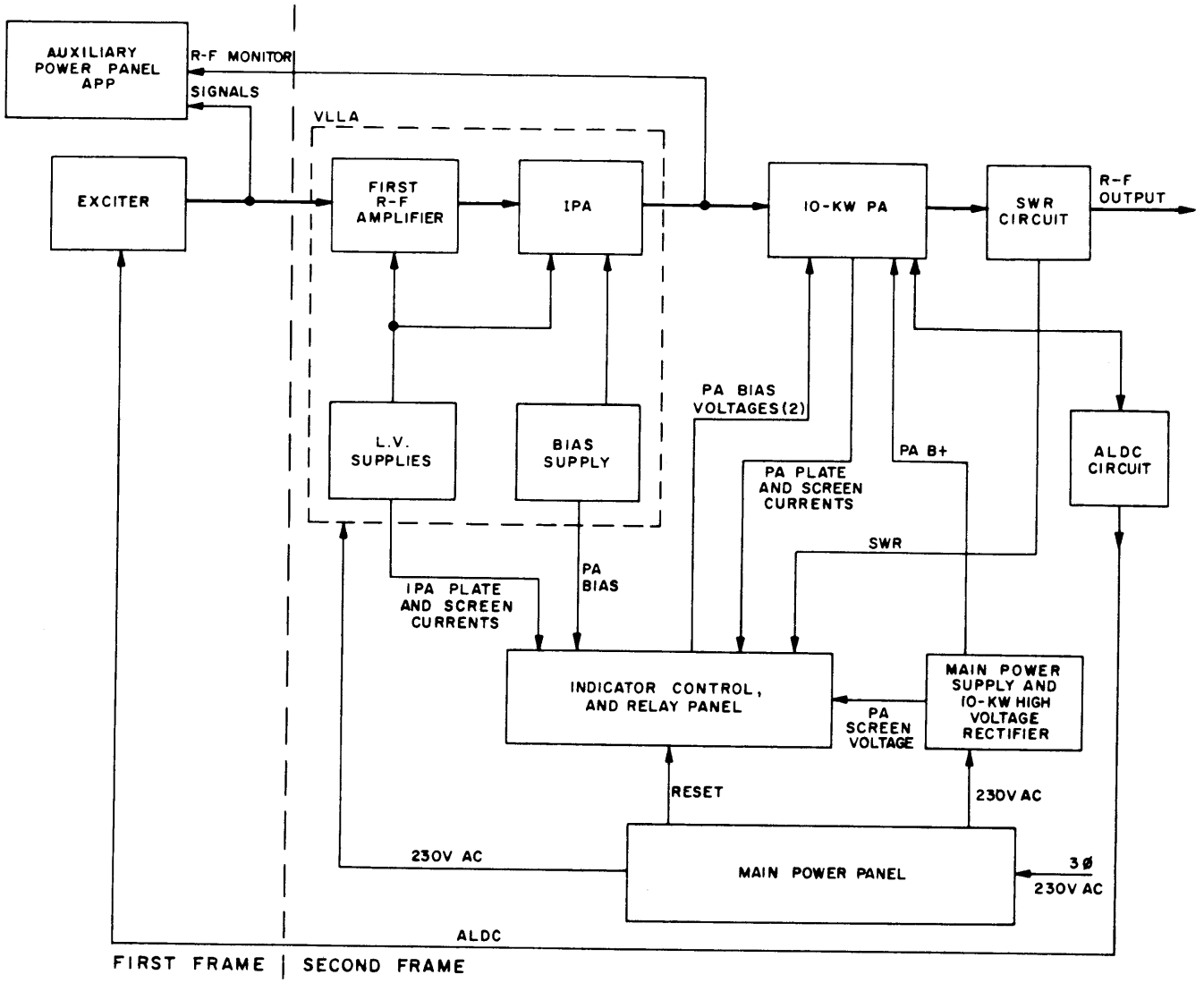


Figure 4-1. Block Diagram, GPT-10KLF

Interlocks, provided at key points throughout the transmitter, afford personnel and equipment protection. If any of these interlocks open, the high voltage circuits are deenergized. The interlocks are located on doors, panels, drawers, and the important ventilating ducts.

4-3. VLLA.

a. FIRST RF AMPLIFIER. (Refer to figure 4-2.) - RF input from the exciter enters the VLLA via jack J2001. A tee pad, comprising resistors R2015, R2012, and R2013, presents the exciter with the correct load impedance. The pi-el network made up of inductors L2008, L2009, L2010, and capacitors C2010, C2011, C2012, and C2013, eliminates possible high frequency components of the excitation. Transformer T2003 converts the unbalanced input signal to a balanced signal for application to the grids of tubes V2001 and V2002. Swamping resistors R2011 and R2014 ensure broad band-pass of the amplifier input circuit. The amplifier tubes V2001 and V2002 are self-biased by cathode resistor R2018. The output signal is coupled to the IPA stage by transformer T2004. Resistor R2028 is a shunt for multimeter M2001 to permit monitoring the first amplifier tubes plate current (see subparagraph c).

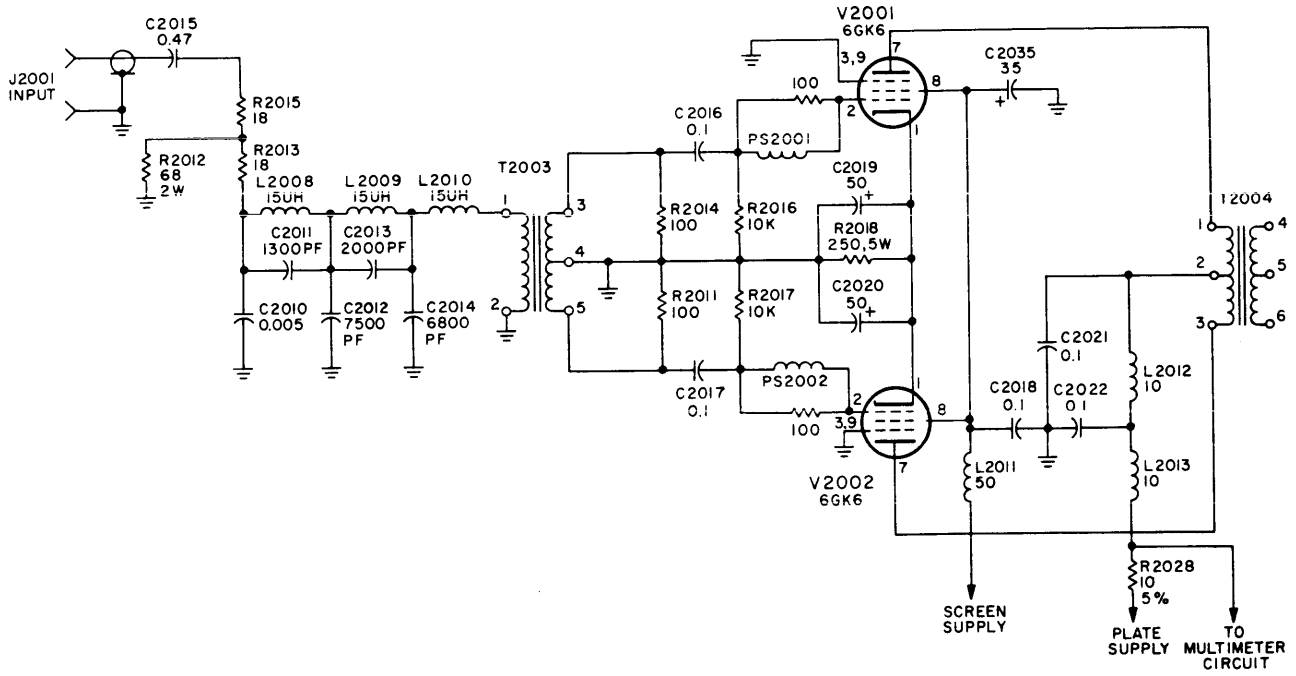


Figure 4-2. Simplified Schematic, First RF Amplifier

b. IPA. (Refer to figure 4-3). - Input transformer T2004 is swamped by resistors R2019 and R2020 to ensure broad bandwidth. A sample of the rf signal at terminal 4 of T2004 (common with grid of V2003) is coupled through resistor R2037 to the multimeter circuit. Resistor R2034 serves the same purpose in the input circuit of V2004. IPA tubes V2003 and V2004 each receive individually controlled bias from the VLLA power supply (see subparagraph d). The IPA output is coupled through transformer T2005 to the 10-kw PA. Resistors R2040 and R2043 couple samples of the rf output signal to the multimeter circuit. Resistor R2048 is a shunt for multimeter M2001 to permit monitoring the IPA tubes screen grid current. Switch S2002 connects meter M2002 to indicate the plate current of V2003, of V2004, or of the combined plate currents. Variable resistor R2025 is adjusted to calibrated M2002 when S2002 is in position (2).

c. MULTIMETER CIRCUIT. (Refer to figure 4-4) - When MULTIMETER switch S2001 is set at position (1), MULTIMETER M2001 is connected across resistor R2028; resistor R2029 is the meter multiplier in this position. Therefore, the indicated voltage drop across R2028 is proportional to the plate current of tubes V2001 and V2002. With S2001 set at position (2), R2030 becomes the multiplier, and R2031 is the shunt. M2001 indicates the voltage at the arm of potentiometer R2004. Note that the positive terminal of the meter is now grounded. Similarly, the meter will indicate the voltage at the arm of R2003 when S2001 is set at position (4). At position (5) of the switch, R2050 becomes the multiplier, and R2051 becomes the meter shunt (negative terminal of meter again grounded); the meter indicates potential applied to the screen grids of V2001 through V2004. At position (6), the operation is similar to that of position (2), and in position (7) the operation is similar to that of position (1) or (5).

When S2001 is set at position (8), the meter indicates the value of rf voltage rectified by diode CR2006. The operation of the metering circuit is similar in positions (9), (10), and (11) to that of position (8).

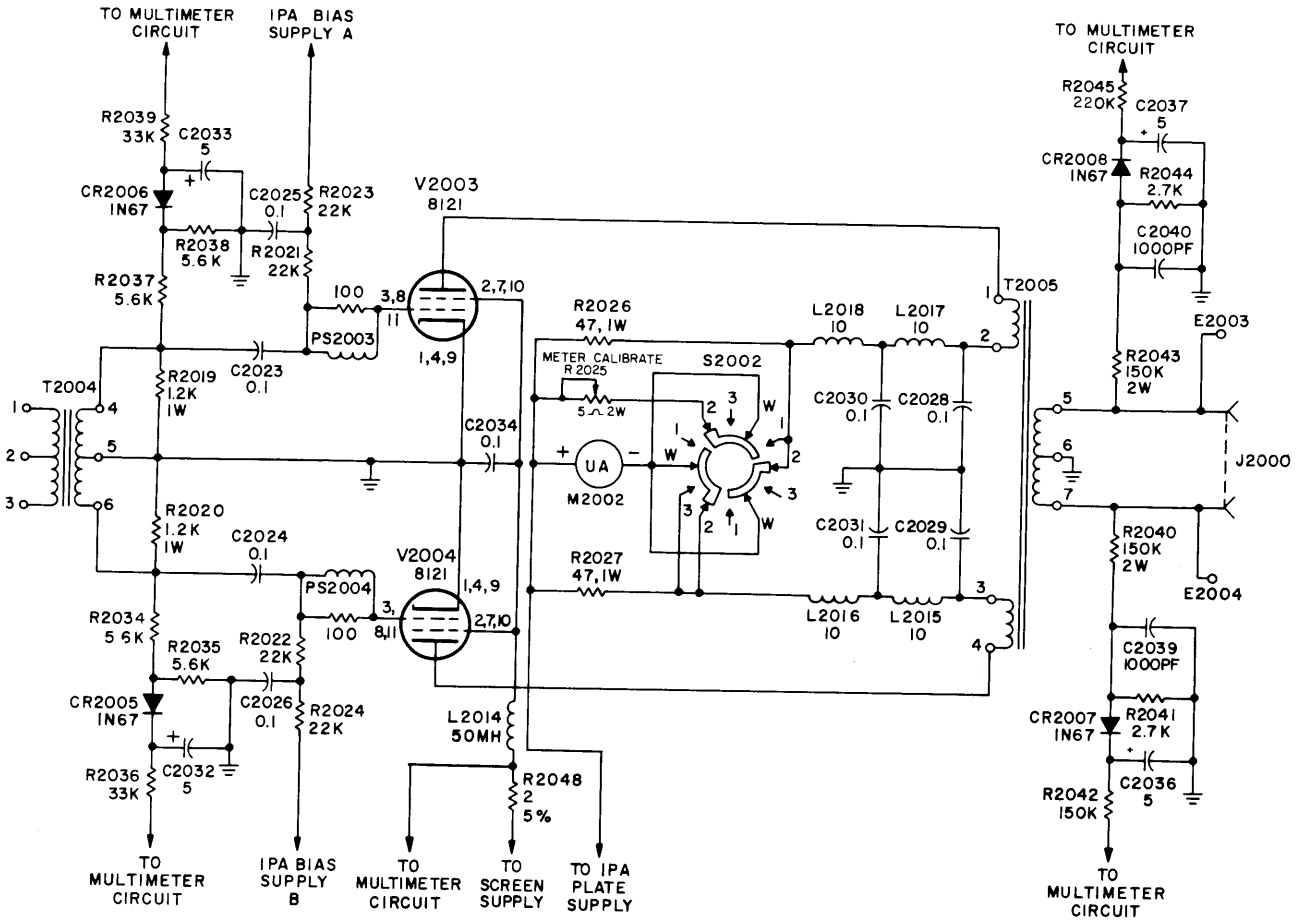


Figure 4-3. Simplified Schematic, IPA

d. POWER SUPPLIES. (Refer to figure 4-5). -

NOTE

Refer to paragraph 4-10 for primary power circuitry for transformers T2001 and T2002.

(1) Bias Supply. - Rectifier V2005 receives 1000 vac from secondary winding 13-15 of transformer T2001; note that the filament of V2005 is grounded. The negative output of the rectifier is taken from terminal 14 of T2001 and applied to two-section, choke-input filter consisting of L2001, L2002, C2001, and C2003. Fuse F2003 protects the chokes and transformer from overloads. Tubes V2007, V2008, and V2009 with dropping resistor R2007 form a shunt regulator circuit. Regulated -390 vdc is taken from the cathode of V2009 and is routed to the bias adjusting networks for the 10-kw power-amplifier tubes. Bias for IPA tube A, V2003, is taken from the voltage divider consisting of resistors R2007, R2004, and R2005. Bias for IPA tube B, V2004, is taken from the voltage divider consisting of resistors R2007, R2003, and R2005.

(2) First RF Amplifier Plate Supply. - Rectifier V2006 receives 635 vac from secondary winding 6-8 of transformer T2001. The positive output of the rectifier is taken from the filament of V2006 and applied to two-section, choke-input filter consisting of L2003, L2004, C2002, and C2004. Bleeder resistor R2006 ensures capacitor discharge for personnel safety. The +265 vdc output of the supply is routed to the plate circuit of the first rf amplifier tubes V2001 and V2002. Relay K2001, energized only when plate voltage is

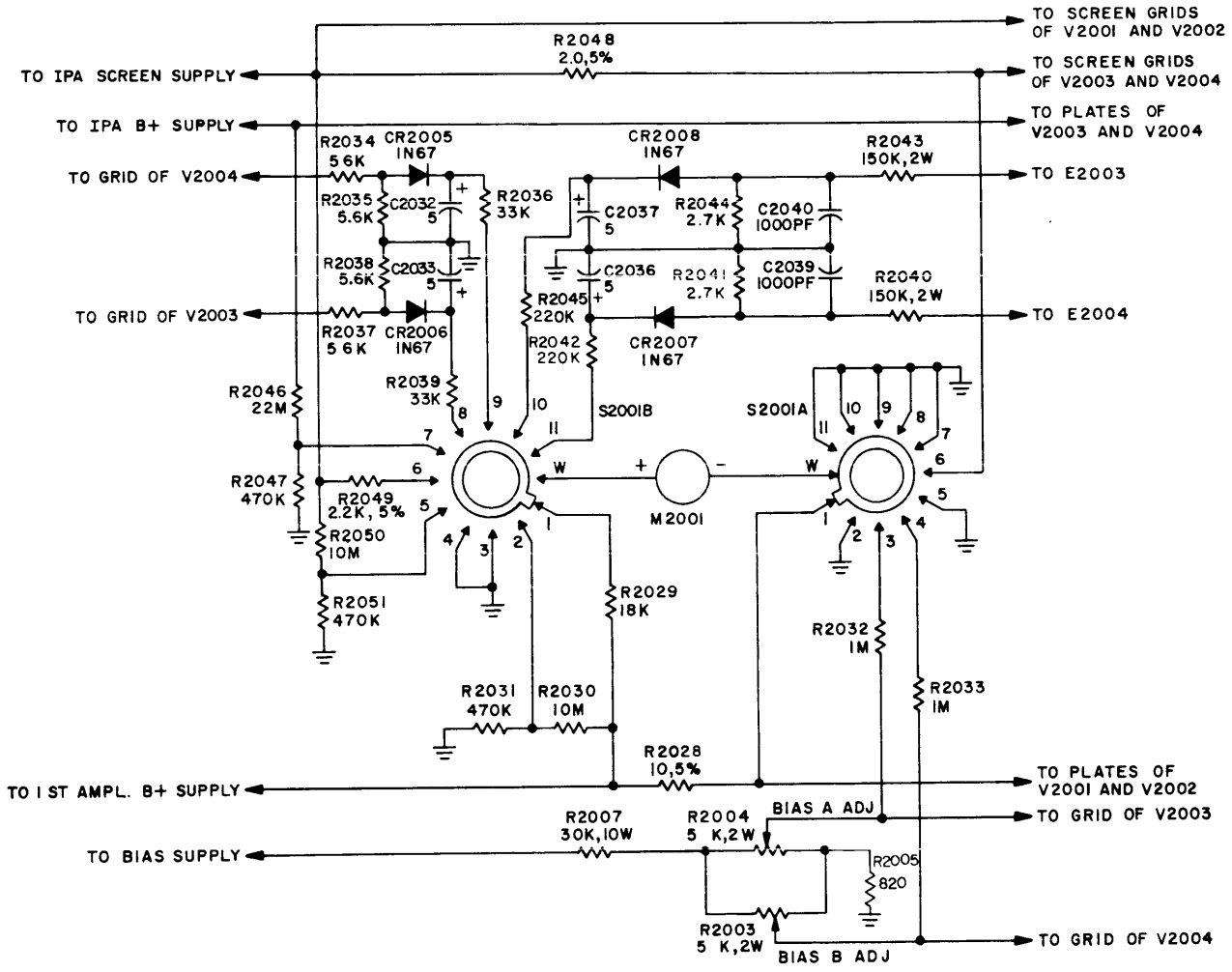


Figure 4-4. Simplified Schematic, Multimeter Circuit

present, ensures that screen supply voltage will not be applied to the rf amplifier tubes in absence of plate voltage (application of screen supply without plate supply would damage the tubes).

(3) Screen Voltage and IPA Plate Supply. - Bridge rectifier consisting of CR2001, CR2002, CR2003, and CR2004 receives 850 vac from the secondary of transformer T2002. The positive output of the rectifier, taken from the cathodes of CR2001 and CR2002, is applied to two-section, choke-input filter consisting of L2005, L2006, C2005, and C2006. Resistor R2000 and fuse F3001 protects against heavy surge currents when the supply is energized. Bleeder resistor R2008 ensures capacitor discharge for personnel safety. The output of this supply, taken from choke L2006, is routed to the plates of the IPA tubes, V2003 and V2004. The negative terminal of the supply is returned to ground through the IPA PLATE OVLD relay.

Diodes CR2003 and CR2004 provide full-wave rectification for the screen voltage supply. The positive output of the rectifier is taken from the center-tap of the secondary of T2002, and is applied to choke-input filter L2007/C2007. Resistor R2010, and tubes V2010 and V2011, constitute a shunt regulator. When the transmitter is in operate condition, positive 255 vdc from the anode of regulator V2010 is routed to the screen grids of the first rf amplifier and IPA tubes. When the transmitter is in tune condition, positive 150 vdc from the junction of V2010 cathode and V2011 anode is routed to the screen grids of the first rf amplifier and IPA tubes.

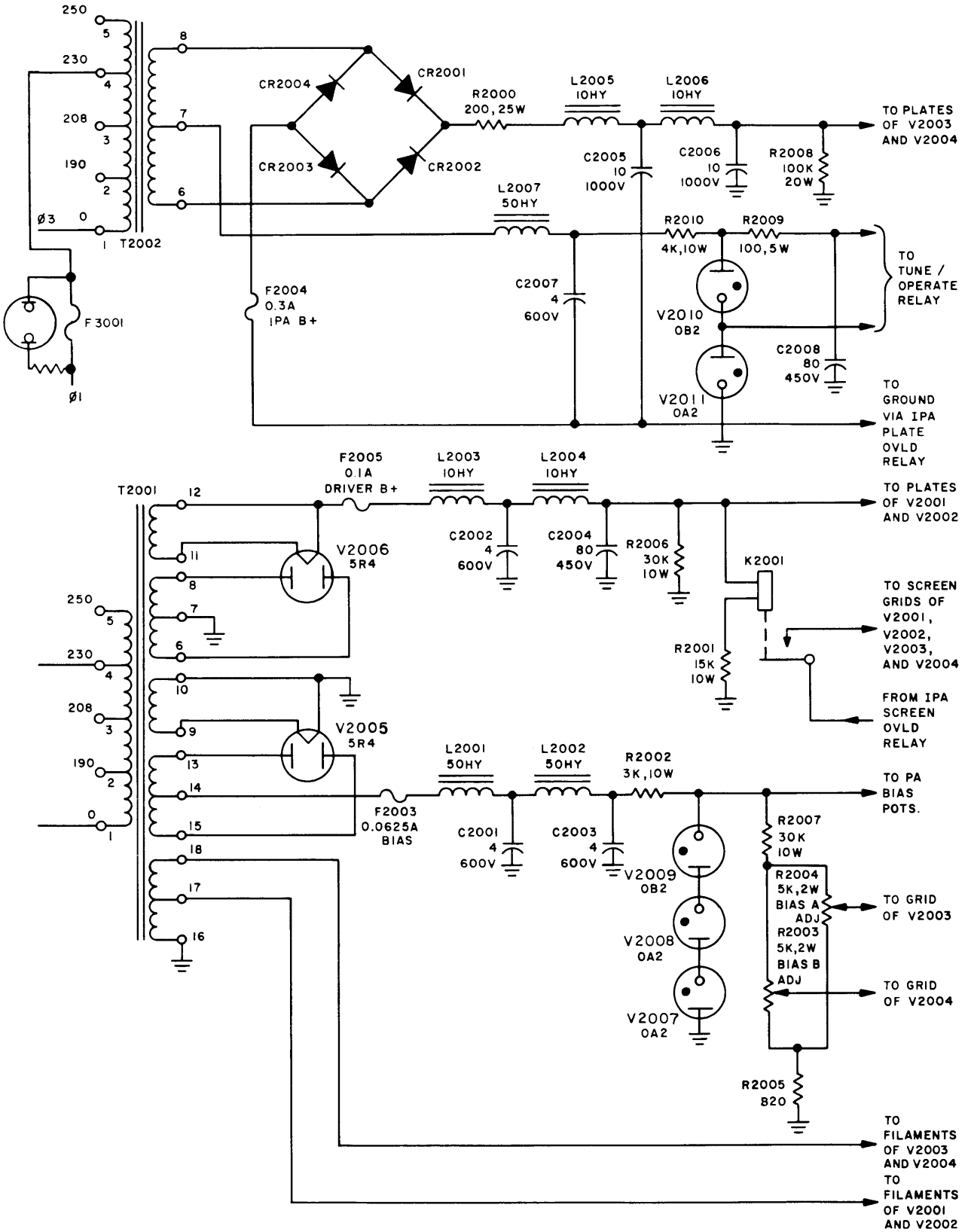


Figure 4-5. Simplified Schematic, Low Voltage Power Supplies

4-4. 10-KW PA. (Refer to figure 4-6.)

The 10-kw PA receives excitation from transformer T2005 (IPA stage) through terminals E1013 and E1014. A sample of the input signal is routed from voltage divider consisting of resistors R1202 and R1203 to the auxiliary power panel in the first frame where it may be conveniently monitored. The balanced input signal is applied to the power-amplifier tubes through parasite suppressors PS1200 and PS1203. The 10-kw PA is a broad-band, push-pull circuit. Note that bias for the two tubes is individually adjustable so that different tube emission levels can be compensated for. The output of the amplifier is taken from transformer T1200 and applied to impedance matching network T1201 through LOAD ADJUST FINE switch S1202. A sample of the rf signal from T1200 is coupled to the ALDC circuit. (See paragraph 4-5.) Also, a sample of the T1200 output signal is routed to the auxiliary power panel in the first frame where it may be conveniently monitored. The output of autotransformer T1201 is routed to J1200 via LOAD ADJUST COARSE switch S1201 and the SWR circuit (see paragraph 4-6). Relay K1200 grounds the 10-kw PA output line whenever the high voltage B+ supply is deenergized.

4-5. ALDC CIRCUIT. (Refer to figure 4-7.)

A portion of the rf signal from the 10-kw PA is applied to diode CR1200 through the voltage divider consisting of capacitors C1220 and C1221. The cathode of CR1200 is biased positive from the voltage divider consisting of resistors R1003 and R1004. When the rf signal at the anode of CR1200 exceeds the bias potential, the diode will conduct and charge capacitors C1224 and C1225 to a negative value. This negative voltage is routed to the exciter circuits where it is used as a gain control. ALDC ADJUST control R1004 is set so that excessively high levels of rf output signals generate a control signal to reduce gain in the exciter equipment. Large transients and excessive distortion are thus prevented.

4-6. SWR CIRCUIT. (Refer to figure 4-8.)

The rf signal applied to diodes CR1250, CR1251 and CR1252 is derived from transformers T1251 and L1250. This signal will be at a maximum when the current and voltage on the rf output line are in phase, and is proportional to transmitter output power. The rf signal applied to diodes CR1253, CR1254, and CR1255 is derived from transformers T1251 and L1251. This signal will be at a maximum when the current and voltage on the rf output line are 180° out of phase and is proportional to power reflected into the transmitter from the load.

SWR OVERLOAD SET control R1010 receives a negative dc signal from CR1250 that is proportional to transmitter output power, and a positive dc signal from CR1253 that is proportional to reflected rf power. When reflected power is too high with respect to transmitter output power (analogus to excessive standing wave ratio), the arm of R1010 becomes positive. This positive voltage turns on transistor Q1250; conduction through Q1250 energizes relay K1250. The contacts of energized K1250 complete the trip circuit for the SWR OVERLOAD relay. Diode CR1257 prevents the possible generation of negative voltage transients by the coil of relay K1250 which might damage transistor Q1250.

When switch S1018 is set at CALIBRATE, positive dc voltage from diode CR1252 is applied to SWR/KW meter M1003 through CAL control R1011A. The CAL control is then adjusted for a predetermined meter indication for the particular value of transmitter output power. The dc voltage from CR1252 is proportional to rf output power. When S1018 is set at SWR, positive voltage from diode CR1255 is applied to M1003 through R1011B. The SWR (standing wave ratio) is read directly from the meter since SWR is a function of incident and reflected power, and R1011B was simultaneously adjusted with R1011A to calibrate the meter for the particular output power level.

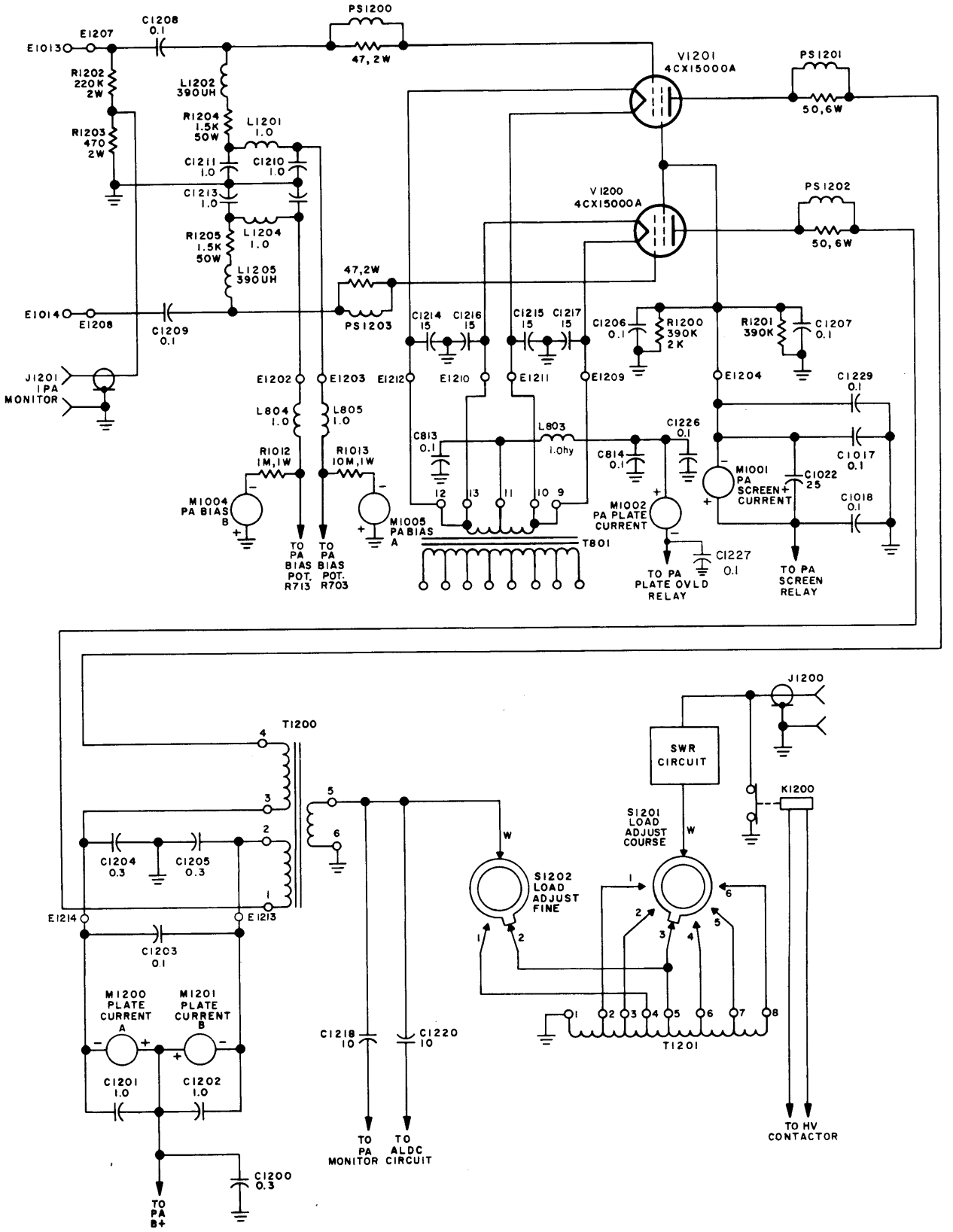


Figure 4-6. Simplified Schematic, 10-KW PA

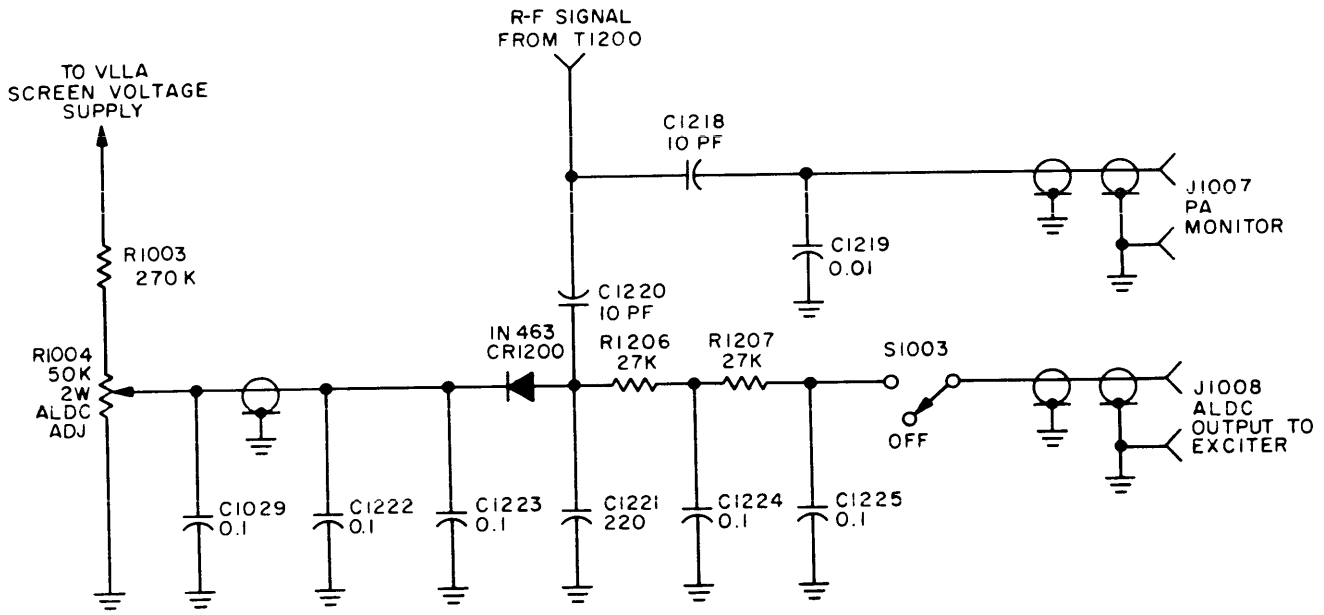


Figure 4-7. Simplified Schematic, ALDC Circuit

When S1018 is set at POWER, 25 vac from transformer T1250 is applied in-phase to both sides of meter M1003. Negative half-cycles of this ac voltage will gate diodes CR1251 and CR1254 on. Negative half-cycles of rf voltage at the anode of CR1251 decreases the diodes conduction, making the left side of M1003 less negative than the right side. Negative half-cycles of rf voltage at the anode of CR1254 will similarly affect its conduction. The meter indication is, then, equal to forward power minus reflected power. The metering circuit indication is a true $\frac{E^2}{Z}$ value.

4-7. MAIN POWER SUPPLY AND 10-KW HIGH VOLTAGE RECTIFIER. (Refer to figure 4-9.)

The main power supply produces the high dc voltages for the plates and screen grids of the 10-kw power-amplifier tubes.

NOTE

Refer to paragraph 2-10 for primary power circuitry for transformers T800 and T600 through T605.

The 7500-volt B+ supply for the 10-kw PA consists of transformer T800, a full wave rectifier, and one-section, choke-input filter. Transformer T800 supplies three-phase, 6222-volt, ac to the full wave rectifier in the 10-kw high voltage rectifier. The positive output of the rectifier, taken from terminal E1001, is applied to filter choke L800. A sequential control circuit in the primary circuitry of T800 places surge-limiting resistors in the ac line to prevent the large charging current of filter capacitor C800 from damaging the choke or transformer. After C800 has partially charged, these resistors are shorted, and full primary voltage is applied to T800. Bleeder resistors R804 through R809 provide the discharge path of C800. The negative output of the rectifier is taken from terminal E1007, and is returned to ground. Resistors R810 and R811 are multipliers for PA PLATE VOLTS meter M3002; resistor R812 is the meter shunt.

Three of the diodes in the high voltage rectifier constitute a three-phase, half wave rectifier; the +3200-volt output of this rectifier is taken from the common terminal of the T800 secondary. Resistors R802, R803, R816, R819 and R820 and diode assembly CR801 form a shunt regulator; the diodes adjust the current

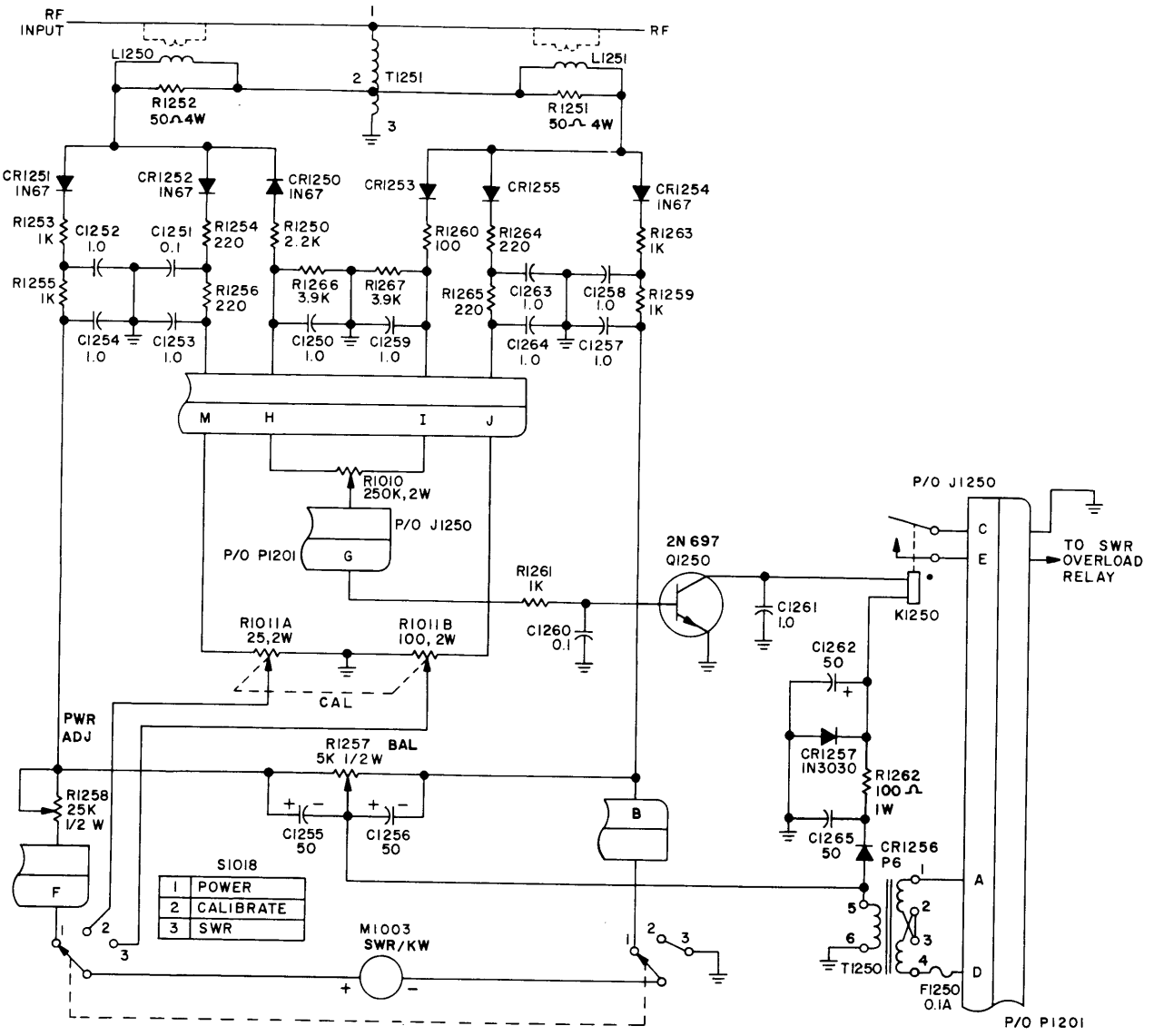


Figure 4-8. Simplified Schematic, SWR Circuit

through the dropping resistors so that the output voltages are constant. The +1600 vdc output is routed to the power-amplifier tube screen grids when the transmitter is in OPERATE condition; the +800 vdc screen supply is used in TUNE condition.

The HV SHORTING relay discharges filter capacitors C800 and C801 whenever a door, drawer, or panel is opened.

4-8. PROTECTIVE INTERLOCK CIRCUIT. (Refer to figure 4-10.)

The protective interlocks and the high voltage supply control circuit are interconnected in such a way that high voltage is removed if a door, panel or drawer is opened, a cooling blower fails, or one of the OUTPUT LOADING switches is rotated.

The interlock circuit comprises eleven switches and one relay, forming a series loop. Six of the switches are closed only when doors, panels, or drawers are properly secured; two of the switches (S2004 and S800) are closed only when the IPA blower B2001 and MAIN BLOWER B800, respectively, are operating.

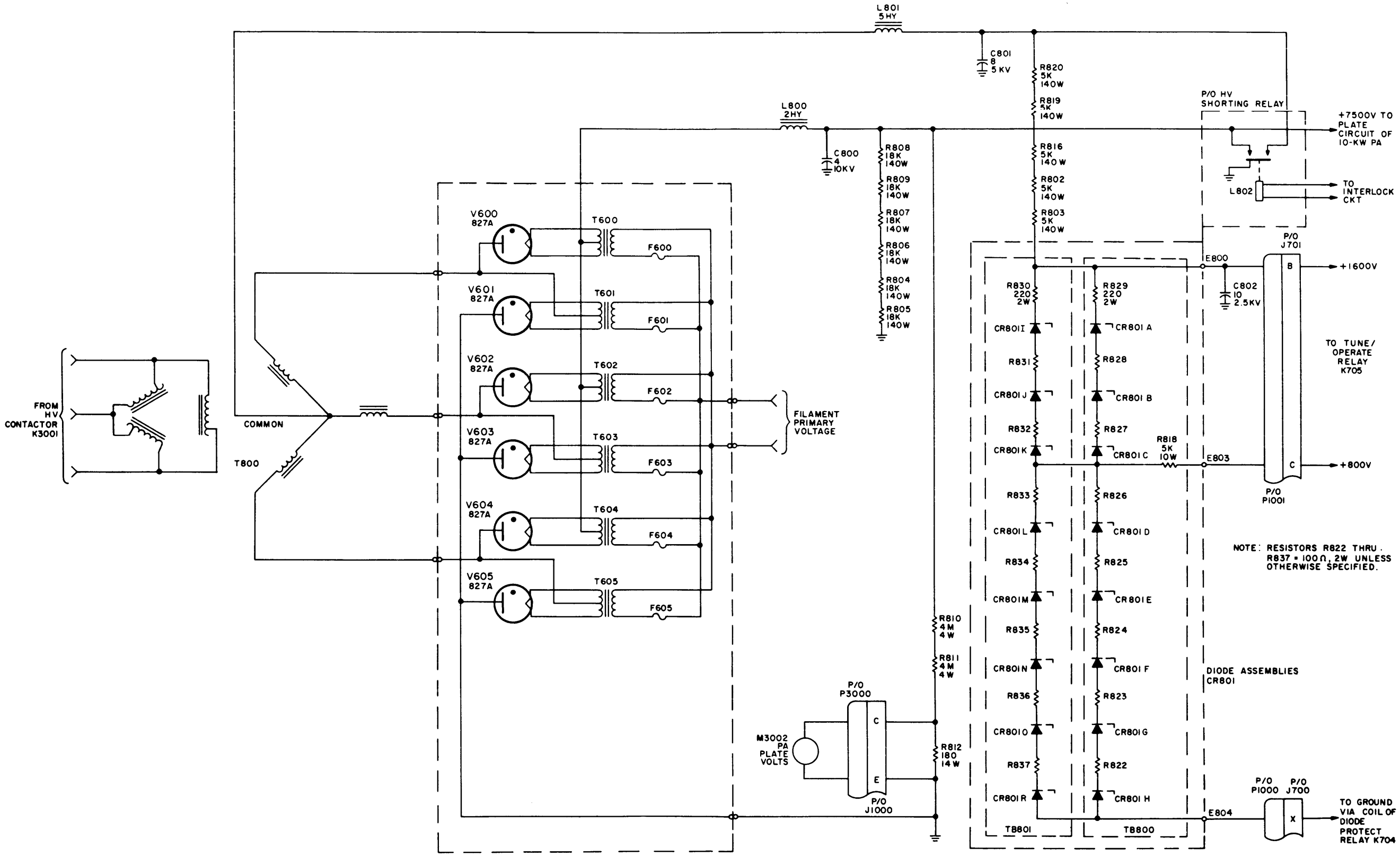


Figure 4-9. Simplified Schematic, Power Supply

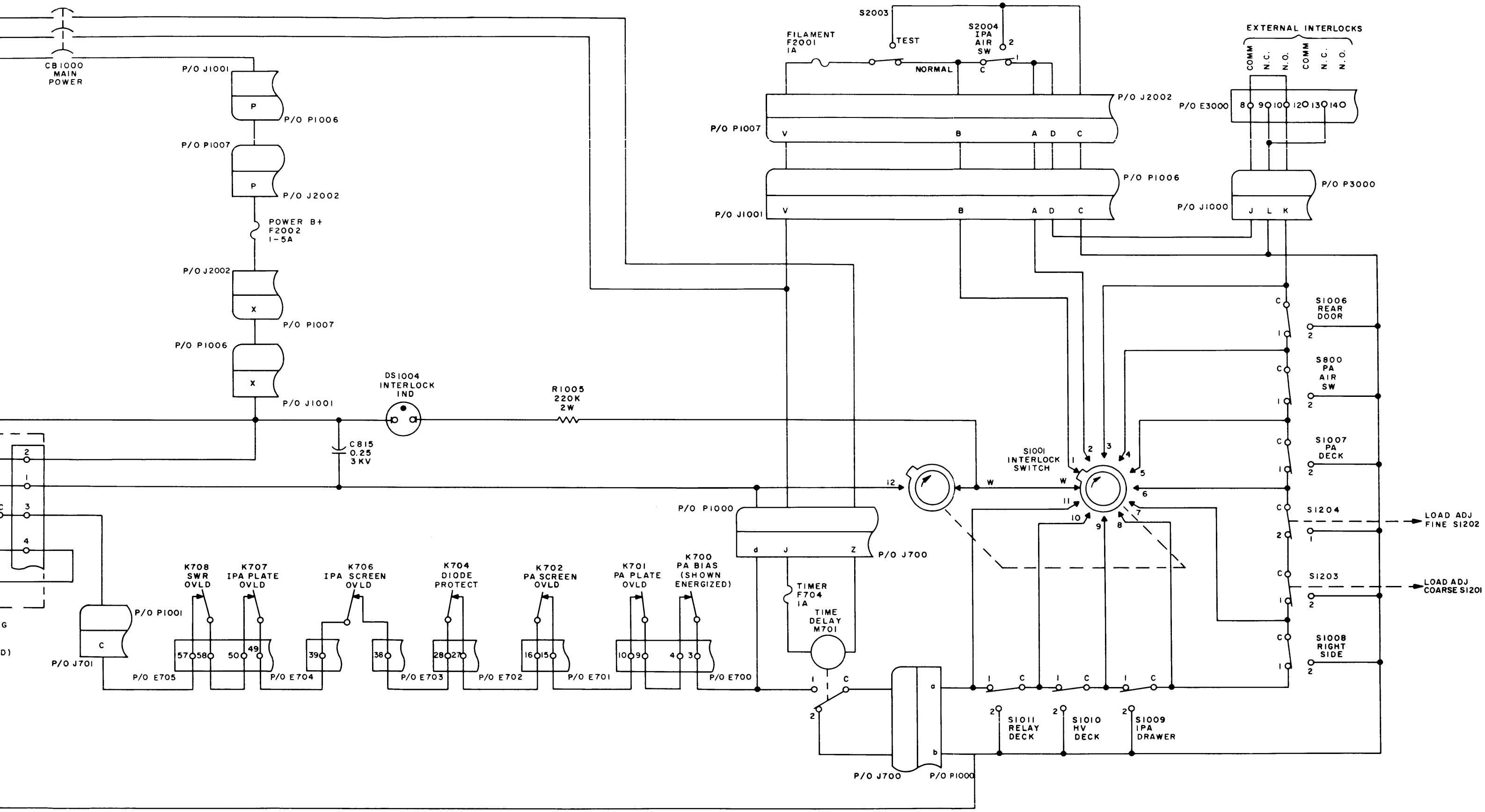
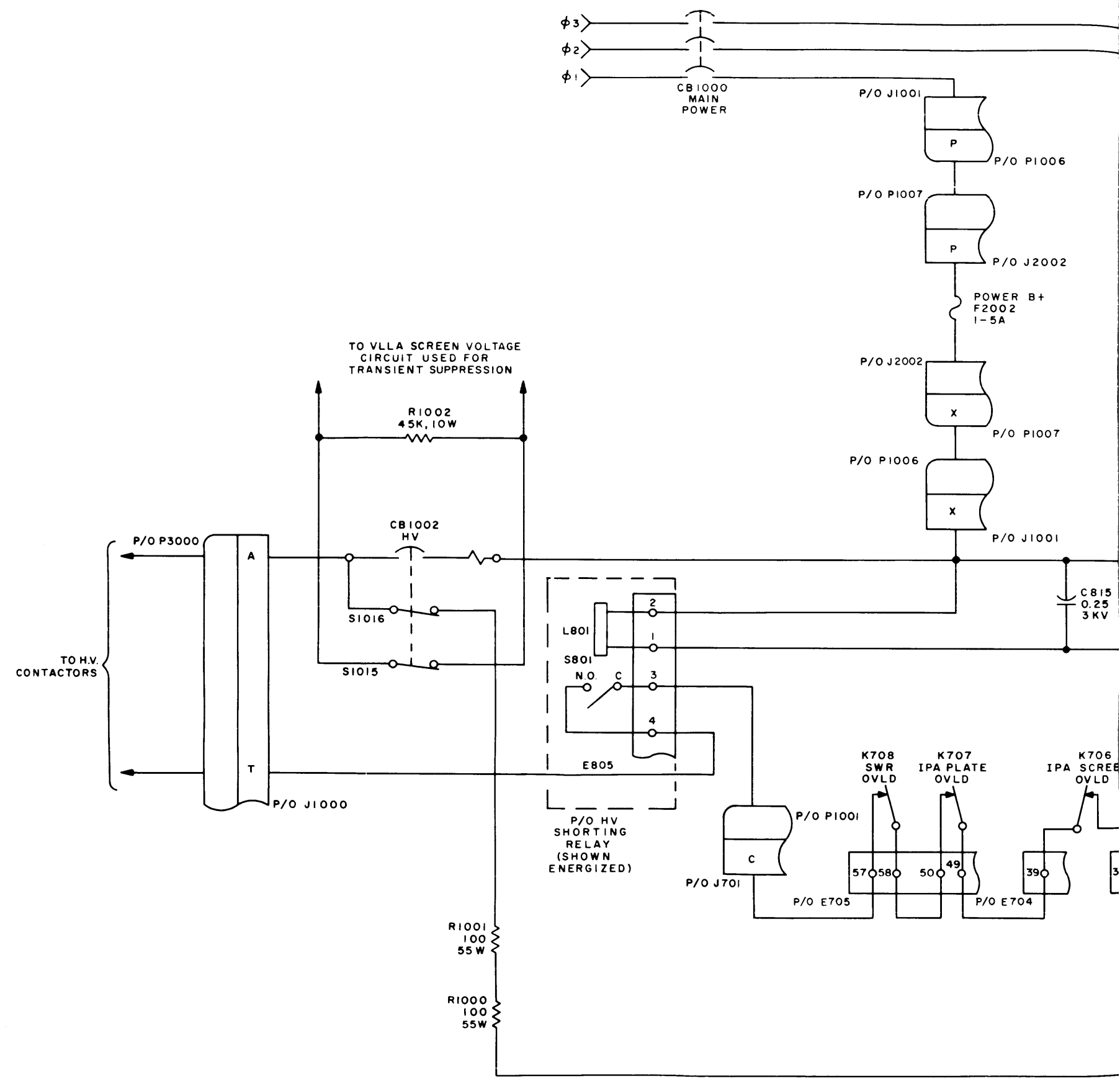


Figure 4-10. Protective Interlock Circuit


φ3
φ2
φ1
CB1000
MAIN
POWER
P/O J1001
P
P/O P1006
P/O P1007
P
P/O J2002
POWER B+
F2002
1-5A
P/O J2002
X
P/O P1007
P/O P1006
X
P/O J1001
TO VLLA SCREEN VOLTAGE
CIRCUIT USED FOR
TRANSIENT SUPPRESSION
R1002
45K, 10W
CB1002
HV
P/O P3000
A
S1016
S1015
C815
0.25
3KV
L801
S801
2
1
N.O.
C
3
4
TO H.V.
CONTACTORS
T
E805
P/O J1000
P/O HV
SHORTING
RELAY
(SHOWN
ENERGIZED)
P/O P1001
C
P/O J701
K708
SWR
OVLD
K707
IPA PLATE
OVLD
K706
IPA SCREE
OVLD
57
58
50
49
39
P/O E705
P/O E704
R1001
100
55W
R1000
100
55W

Two of the switches (S1203 and S1204) are closed only when the OUTPUT LOADING switches in the 10-kw PA are properly set in detent. Auxiliary contacts of TEST/NORMAL switch S2003 in the VLLA are included in the interlock circuit so that the high voltage circuits cannot be energized unless the VLLA Test/Normal switch is set at normal position.

Phase 2 primary voltage is applied to the interlock circuit via MAIN POWER circuit breaker CB1000 and FILAMENT fuse F2001. When all the interlock switches are closed, the phase 2 voltage is applied to the C terminal of TIME DELAY relay M701. The motor section of M701 receives phase 2-3 voltage and will close the contacts after a preset interval (usually 5 minutes). When the contacts of M701 close, phase 2 voltage is applied to solenoid L801 of the HV SHORTING RELAY. L801 receives phase 1 voltage via MAIN POWER circuit breaker CB1000 and POWER B+ fuse F2002. Note that if one of the interlock switches or the contacts of the TIME DELAY relay are open, the HV SHORTING RELAY will not be energized. Also, when any of the interlock switches is open, phase 2 voltage will be routed to switch S1016 through resistors R1000 and R1001. If HV circuit breaker CB1002 is set at ON when this condition exists, the phase 3 to phase 2 circuit path is completed, and the HV circuit breaker will trip due to the phase 3 to phase 2 current through its thermal trip element. The application of high voltage is therefore prevented when an interlock switch is open.

The 12 contacts of INTERLOCK switch S1001 are connected to junctions of switches in the interlock loop. When S1001 is set at its first position (IPA TEST SWITCH), INTERLOCK IND lamp DS1004 is connected between phase 1 voltage and the junction of switches S2003 and S2004. If S2003 is at its NORMAL position, phase 2 voltage will light lamp DS1004. When S1001 is set at its twelfth position (TIMER), lamp DS1004 will be lit only if all switches and relay M701 in the interlock circuit are closed.

The contacts of six overload relays (K701, K702, K704, K706, K707, and K708), PA BIAS relay K700, and switch S801 constitute one branch of the interlock circuit. Phase 2 voltage is applied to the relay contact chain from TIME DELAY relay M701 when all interlock switches are closed. When all relay contacts are closed (no overload condition exists, and normal bias is supplied to PA tubes), phase 2 voltage is routed to the HIGH VOLTAGE contactors in the first frame of the transmitter. Phase 3 voltage is routed to the contactors when HV circuit breaker CB1002 is set at ON.

The physical location of protective interlocks is listed in Table 4-1.

4-9. PROTECTIVE AND CONTROL RELAY CIRCUITS. (Refer to figure 4-11.)

Seven relays in the relay, control and indicator panel are included in the protective interlock circuit (paragraph 4-8). During normal operation, contacts of these seven relays form a series circuit, as shown in figure 4-10. The series circuit permits the HV contactors, part of the main power supply control circuit, to operate. When one of these seven relays detects an excessive current, a deficient voltage, or excessive transmission line standing wave ratio, the high voltage circuits of the main power supply and VLLA power supply are deenergized.

Relay K700 is energized when the -390 vdc output of the VLLA bias supply is present. If the VLLA bias supply fails, relay K700 is deenergized. This action opens the series interlock circuit, and turns on PA BIAS lamp DS700.

Relay K701 is tripped by excessive power-amplifier tubes cathode current. In this condition, the series interlock circuit is opened, and PA PLATE OVLD lamp DS701 is turned on. When a plate current overload occurs, the relay latches in the overload position. To restore high voltage circuit operation, 230 vac is applied to the reset coil of the overload relays, thus closing the interlock chain. The setting of shunt resistor R705 (PA PLATE OVLD ADJ.) determines the trip point of the relay.

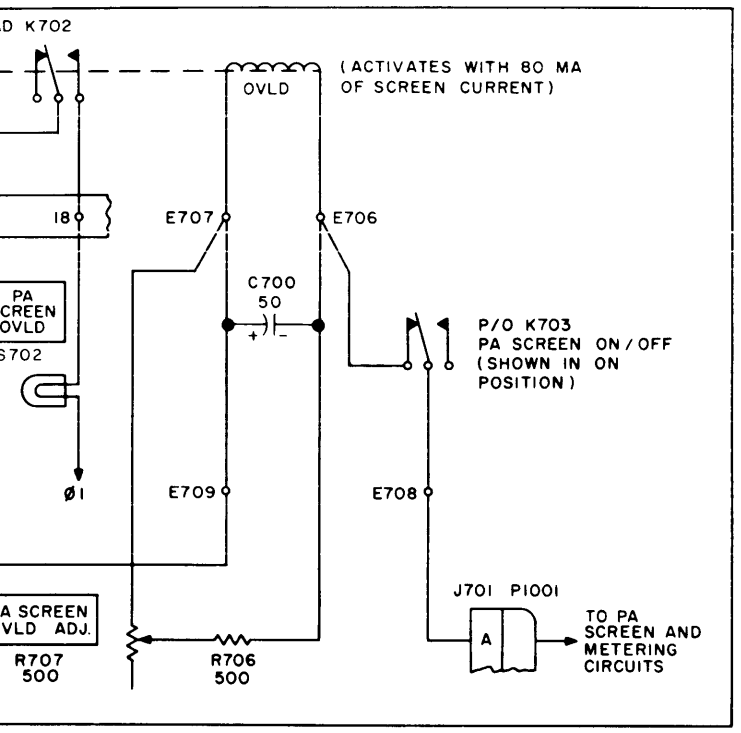
Relay K702 is tripped by excessive power-amplifier tubes screen grid currents. The setting of PA SCREEN OVLD ADJ resistor R707 determines the proportionate amount of screen grid current passing through the relay's trip coil. When a screen current overload occurs, the series interlock circuit is opened, and PA SCREEN OVLD lamp DS702 is turned on; the relay is latched in its tripped position until 230 vac is applied to its reset coil.

TABLE 4-1. LOCATION OF PROTECTIVE INTERLOCKS AND RELAYS

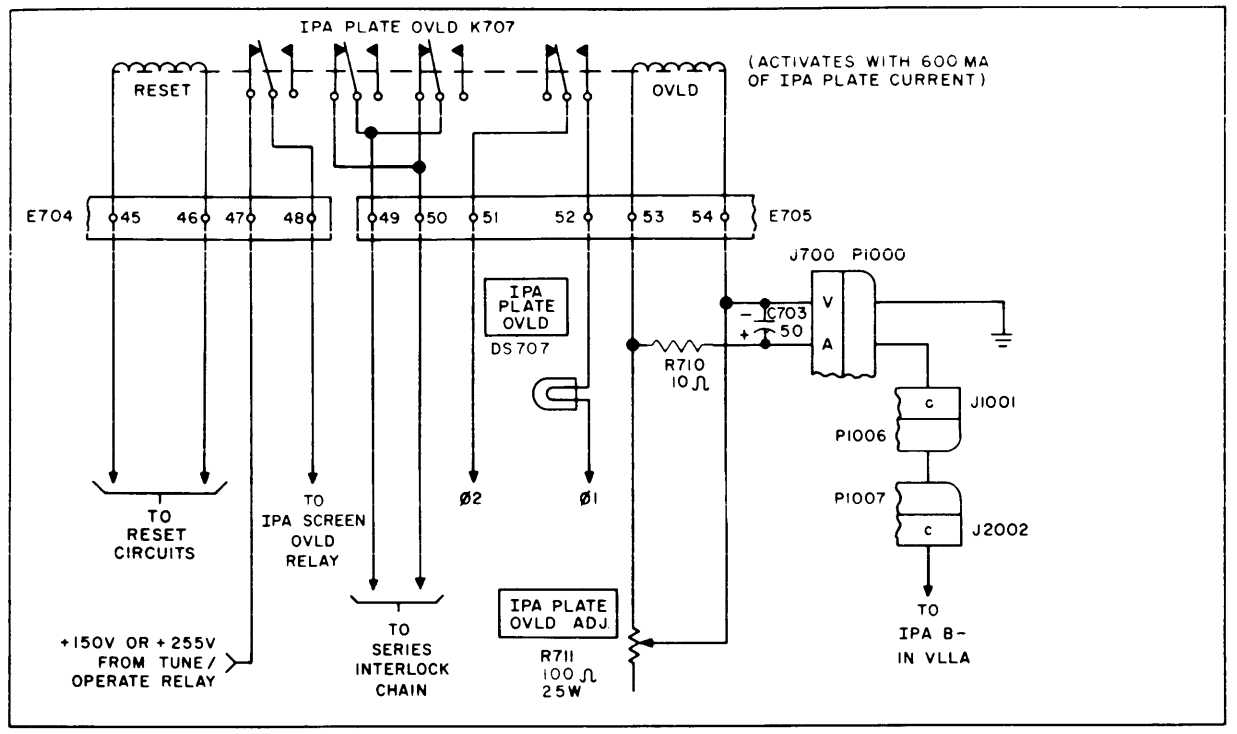
Interlocks and Relays	Location
TEST/NORMAL switch	Second frame, inside top of linear amplifier drawer chassis.
Air switch	Second frame, inside top of linear amplifier drawer on blower.
External	First frame, inside rear, a wire connection on terminal board E3000.
Rear door	Second frame.
Air switch	Second frame, blower compartment on blower.
Glass-window and meter panel	Second frame, behind panel in power amplifier compartment.
Load adjust switches	Second frame, inside power amplifier compartment on LOAD ADJ COARSE and FINE switches.
Right side second frame panel	Second frame.
Linear amplifier	
10-kw high voltage rectifier	
Indicator, control, and relay panel	
Time delay	Second frame, indicator, control, and relay panel.
10-kw PA no bias	
10-kw PA plate overload	
10-kw PA screen overload	
10-kw PA screen on/off	
Diode regulator protect	
Tune/operate	
Linear amplifier screen overload	
Linear amplifier plate overaload	
Standing wave overload	

Relay K704 actuates, and opens the series interlock circuit, whenever excessive current is drawn through the zener diodes in the power-amplifier tubes screen voltage supply. The trip coil of this relay is interposed between the negative terminal of the shunt regulator and ground. There is no indicator lamp associated with this overload relay.

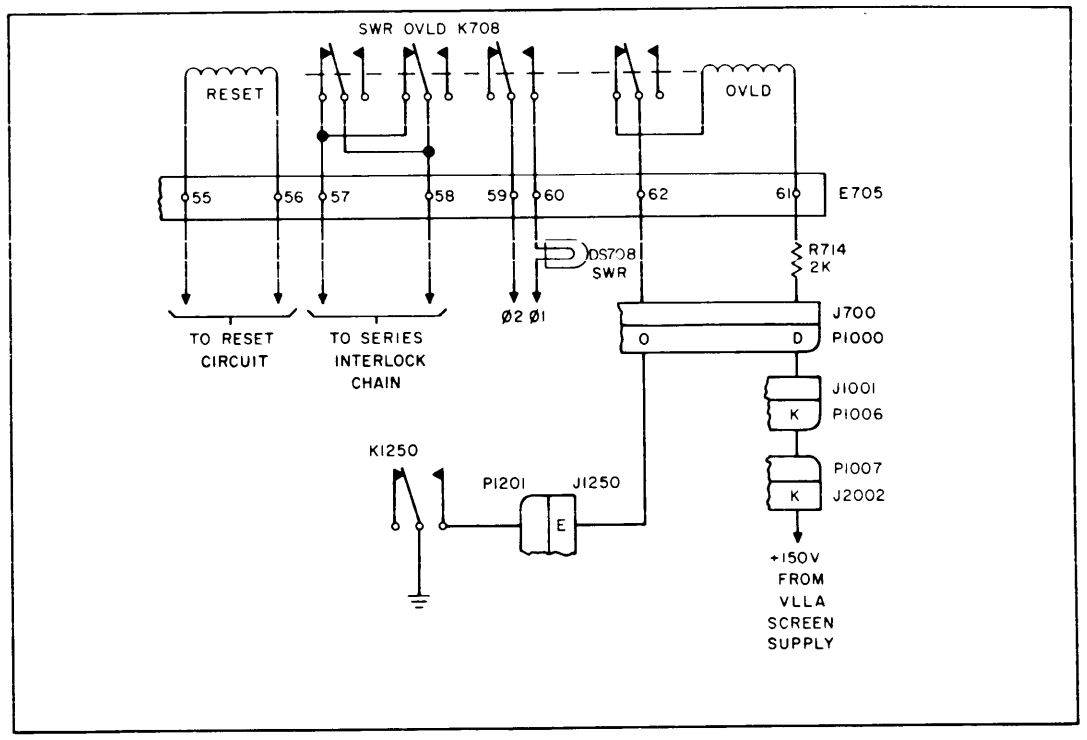
Relay K707 is tripped by excessive IPA tubes plate current. The trip coil of the relay is interposed between ground and the negative terminal of the IPA plate voltage supply. Since this terminal is common to the VLLA screen voltage supply also, IPA tubes and first rf amplifier tubes screen grid currents pass through the relay coil in addition to the IPA tubes plate current. The screen grid currents will, however, always be small relative to the plate currents. The positive supply voltage for the VLLA tubes screen grids is passed



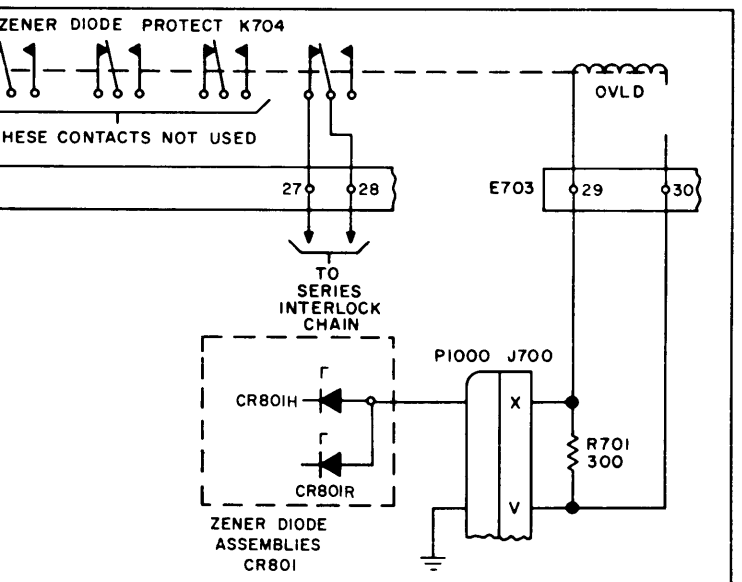
OSITION



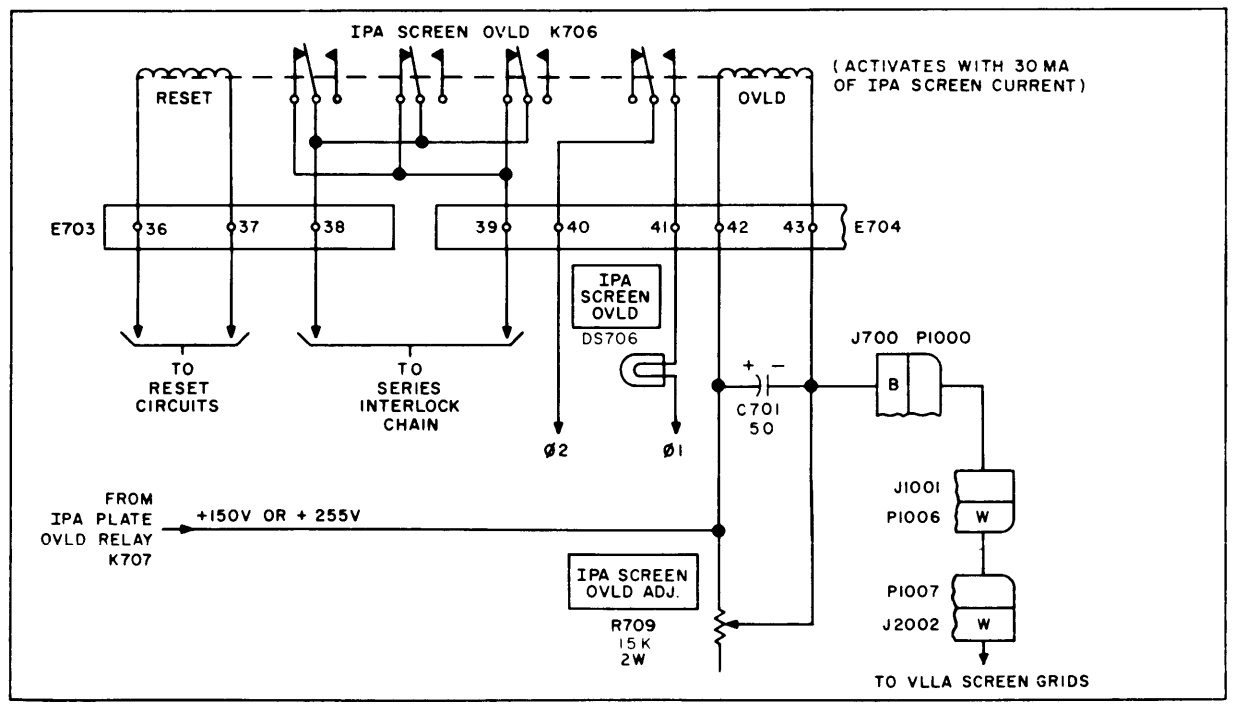
E – IPA PLATE OVERLOAD RELAY, NO OVERLOAD POSITION



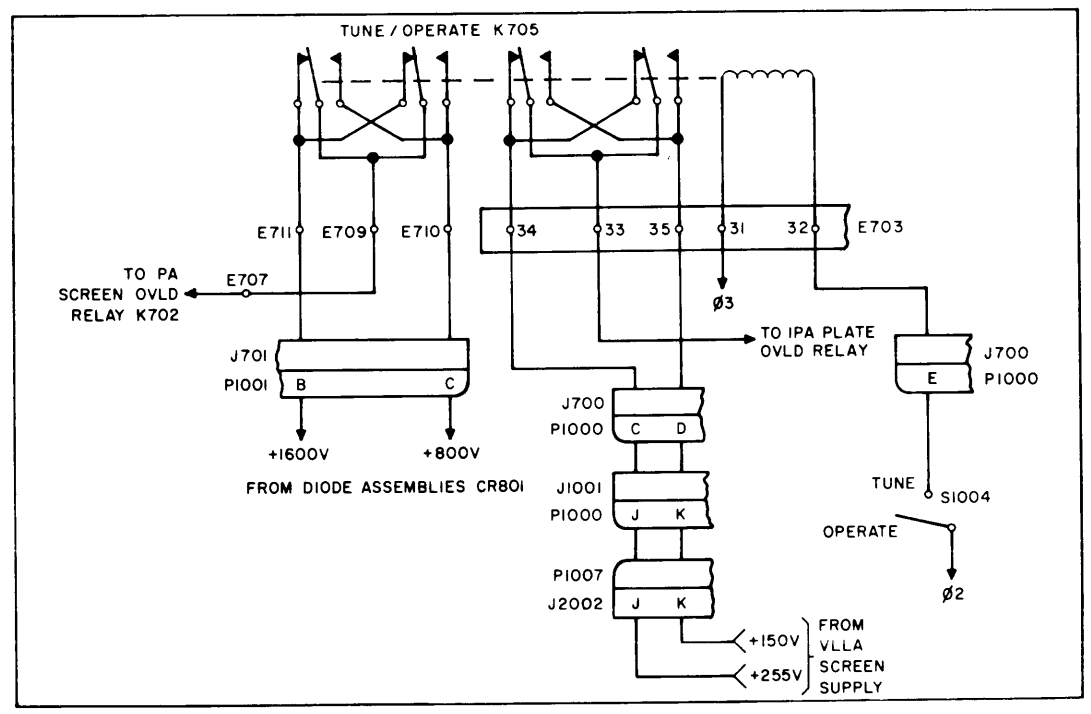
G – SWR OVERLOAD RELAY, NO OVERLOAD POSITION



DIODE CURRENT POSITION

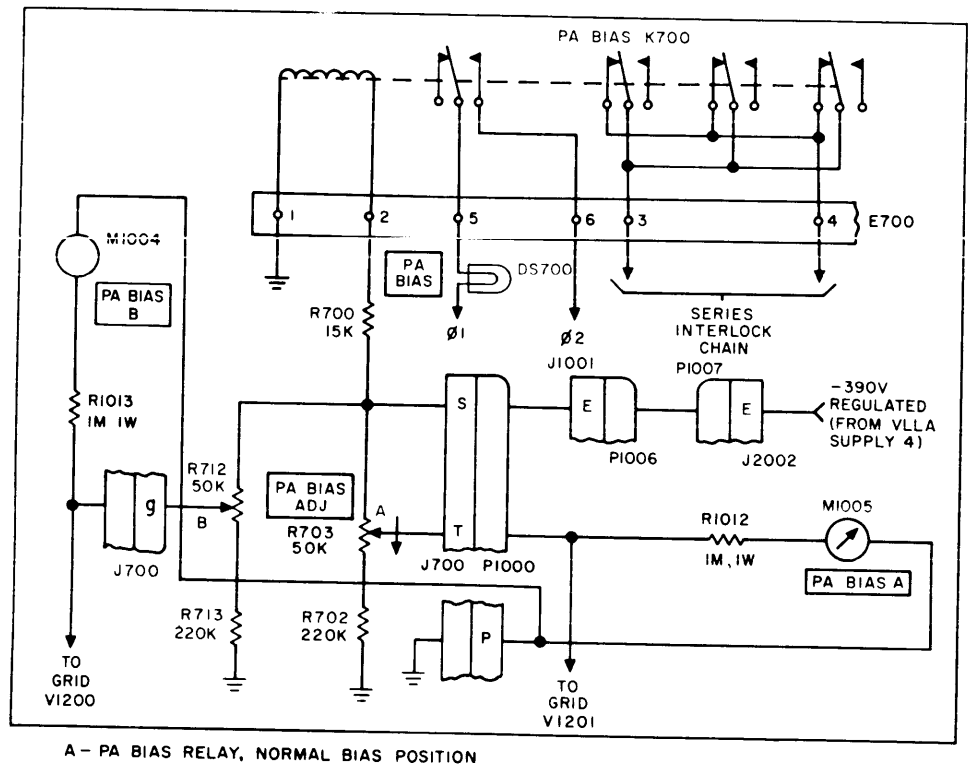


F – IPA SCREEN OVERLOAD RELAY, NO OVERLOAD POSITION

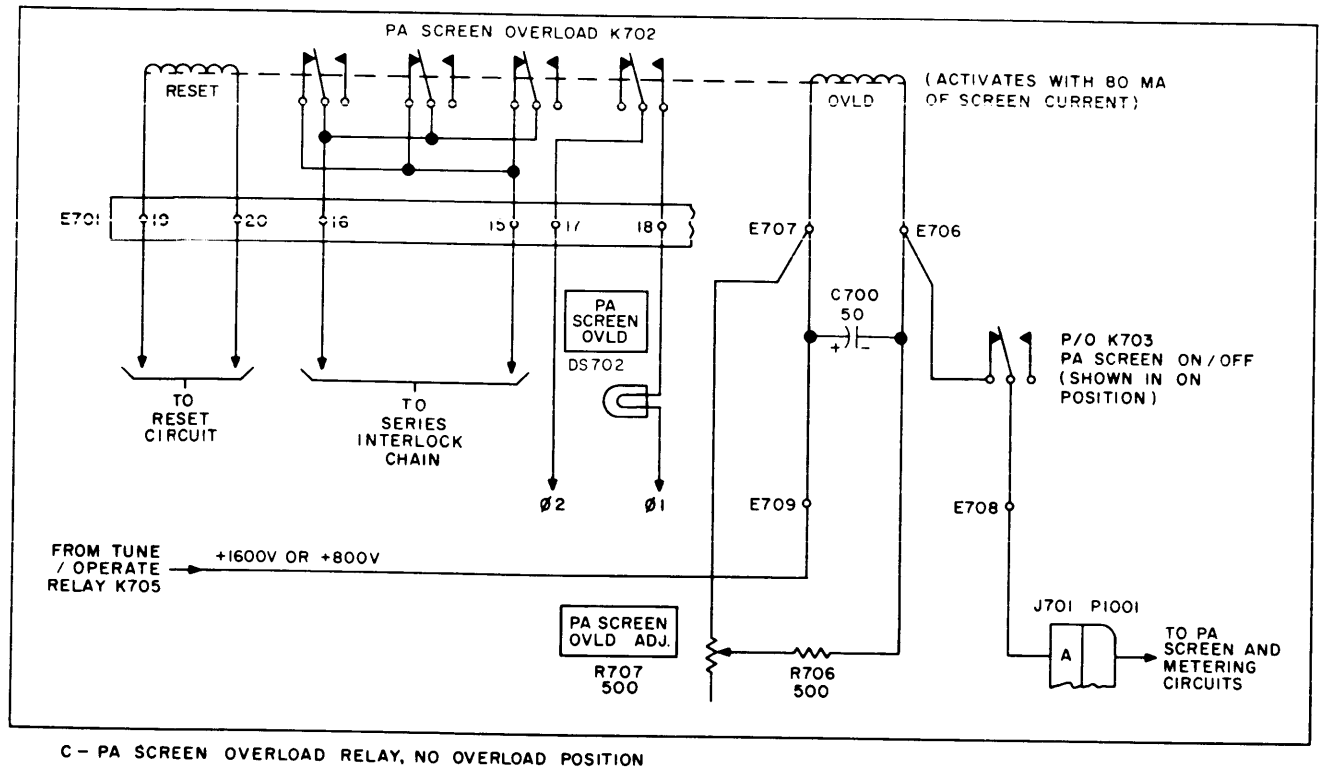


H – TUNE/OPERATE RELAY, OPERATE POSITION

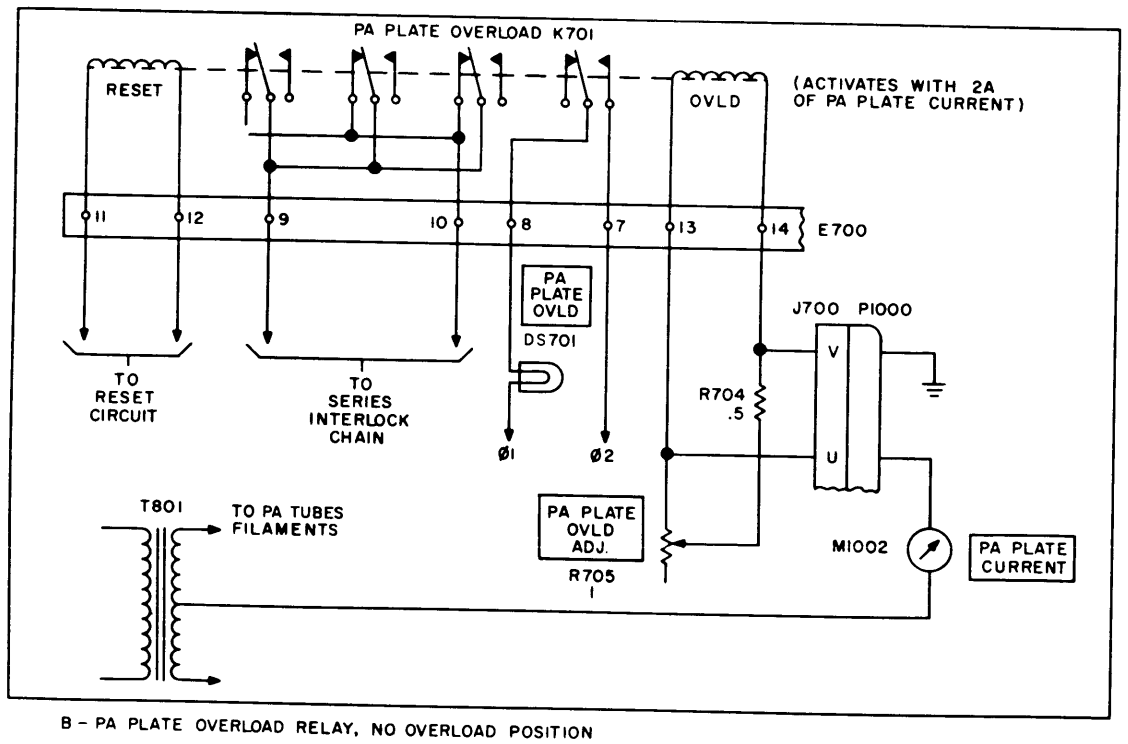
Figure 4-11. Protective and Control Relay Control Circuits



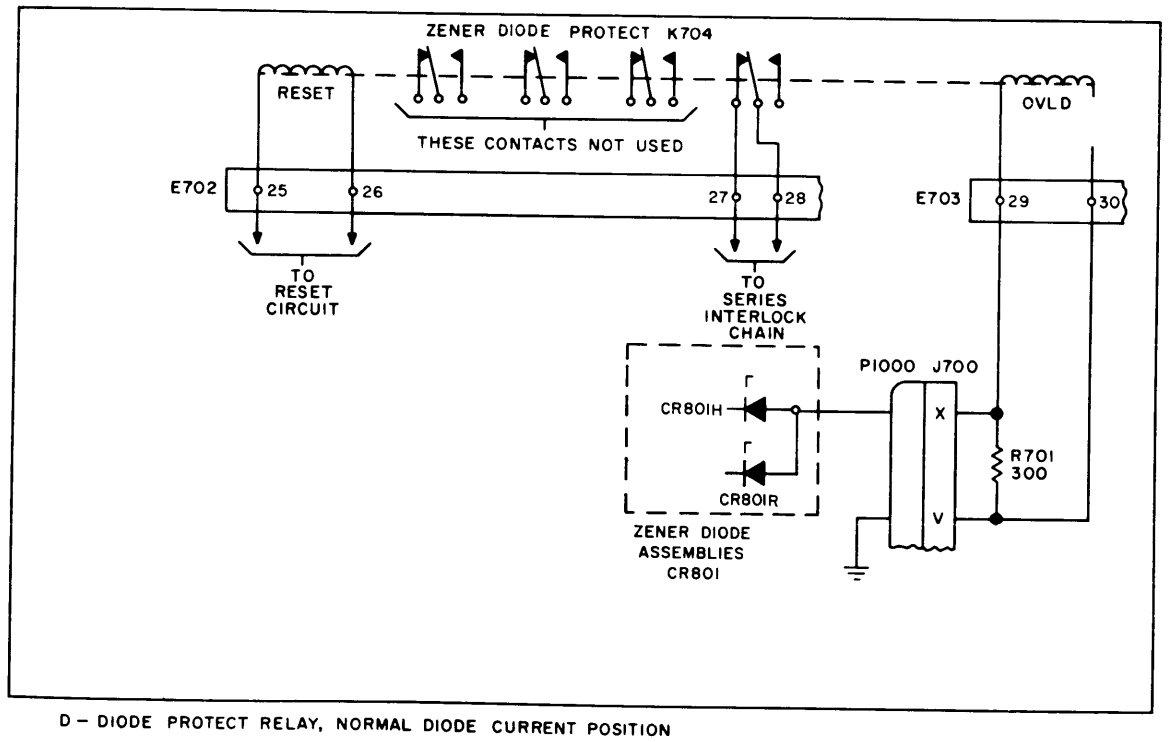
A – PA BIAS RELAY, NORMAL BIAS POSITION



C – PA SCREEN OVERLOAD RELAY, NO OVERLOAD POSITION



B – PA PLATE OVERLOAD RELAY, NO OVERLOAD POSITION



D – DIODE PROTECT RELAY, NORMAL DIODE CURRENT POSITION

through contacts of this relay; this ensures that screen voltage is removed when a plate current overload occurs. IPA PLATE OVLD lamp DS707 is turned on when the relay is tripped.

Relay K706 is tripped by excessive screen grid currents drawn by the first rf amplifier tubes and IPA tubes in the VLLA. First rf amplifier tubes screen grid current will always be small, however, relative to IPA tubes screen grid current. The setting of IPA SCREEN OVLD ADJ resistor R709 determines the trip point of the relay. IPA SCREEN OVLD lamp DS706 is turned on when an overload occurs.

Relay K708 is tripped by +150 vdc through resistor R714 and contacts of relay K1250 whenever an excessive SWR (standing wave ratio) exists at the transmitter output. Refer to paragraph 4-6 and figure 4-7 for control circuitry for relay K1250. SWR lamp DS708 is turned on when the relay is tripped.

When switch S1004 is set at OPERATE, relay K705 is deenergized. In this condition, +1600 vdc is routed from CR801 in the main power supply to the 10-kw PA tubes via contacts of K705, the coil of K702 and contacts of K703; +255 vdc is routed to the first rf amplifier and IPA tubes via contacts of K705, the coil of K706, and contacts of K707. When switch S1004 is set at TUNE, relay K705 is energized. In this condition, +800 vdc is routed from the main power supply to the 10-kw PA tubes; +150 vdc is routed to the first rf amplifier and IPA tubes.

The physical location of protective and control relays is listed in Table 4-1.

4-10. AC POWER DISTRIBUTION. (Refer to figure 4-12.)

Three-phase, ac power is applied to the transmitter via terminals E1008, E1009, and E1010. Phase 2 and phase 3 voltage is routed to the first frame, and thence through AUXILIARY FRAME MAIN POWER circuit breaker CB3000 to TOP FAN B1200 and autotransformer T3002. Transformer T3002 provides 115 vac to power the exciter equipments; TOP FAN B1200 provides ventilation for the exciter equipments. All remaining circuits are protected and controlled by MAIN POWER circuit breaker CB1000.

Three-phase voltage is applied to high voltage transformer T800 through contactor K3001. K3001 is energized by phase 1 voltage through POWER B+ fuse F2002 and HV circuit breaker CB1002, and phase 2 through the interlock circuit and FILAMENT fuse F2001. Also energized by K3001 are PLATE ON lamp DS1003, the high voltage warning lamp DS3000 (located on the roof of the first frame), PLATE TIME meter M702, and PA output shorting relay K1200. Transformer T2002 receives phase 2 voltage via contactor K3001; when it is desired to energize the IPA plate supply and VLLA screen supply exclusive of the main power supply (T800), TEST/NORMAL switch may be set at TEST, applying phase 1 voltage to transformer T2002. Resistors R3000, R3001 and R3002 reduce the voltages initially applied to transformers T800 and T2002. This is done to limit the high surge currents that would be experienced with the associated dc supplies. Approximately 20 seconds after K3001 operates, time delay relay M3003 causes contactor K3000 to operate, shorting the surge limiting resistors, and applying full line voltage to transformers T800 and T2002.

Phase 2 voltage is applied to transformers T2001, IPA BLOWER B2001, and to the interlock circuit via FILAMENT fuse F2001; transformer T2001 and the IPA BLOWER are returned to the phase 3 line.

Phase 3 voltage is applied to REAR FAN B3001 via REAR FAN fuse F703; the REAR FAN is returned to the phase 1 line. The phase 3 voltage from fuse F703 is also applied to the reset coils of all overload relays, TUNE/OPERATE relay K705, PA SCREEN ON/OFF relay K703, and alarm buzzer DS3004. The alarm buzzer is energized only when ALARM switch S1017 is set at ON, and high voltage contactor K3001 is deenergized.

Phase 2 voltage is applied to FILAMENT TIME meter M700, PA FILAMENT transformer T801, PA DECK light DS1007, FILAMENT PRIMARY meter M3001, fluorescent lamp DS1005, and high-voltage rectifier filament transformers (when used). The FILAMENT PRIMARY meter and high voltage rectifier filament

transformers are returned to the 230 vdc tap of T801; phase 3 voltage is applied to one of the primary taps of T801 through FILAMENT ADJUST switch S1002; switch S1002 is set so that the correct voltage (230 vac) is applied to M3001.

Phase 1, 2, and 3 voltages are applied to MAIN Blower B800 through fuses F700, F701, and F702. Phase 1 voltage from F700 is applied to PA DECK light DS1007 through switch S1014, and to fluorescent lamp DS1006. Lamps DS1007 and DS1006(through DS1005)are returned to the phase 2 line. Lamps DS1005 and DS1006 illuminate the second frame meter panel. Fluorescent lamp DS3005, connected across the phase 1 - phase 2 lines, illuminate the first frame meter panel. Transformer T1250 (part of the SWR circuitry) receives phase 1 - phase 2 voltage via fuses F700 and F701.

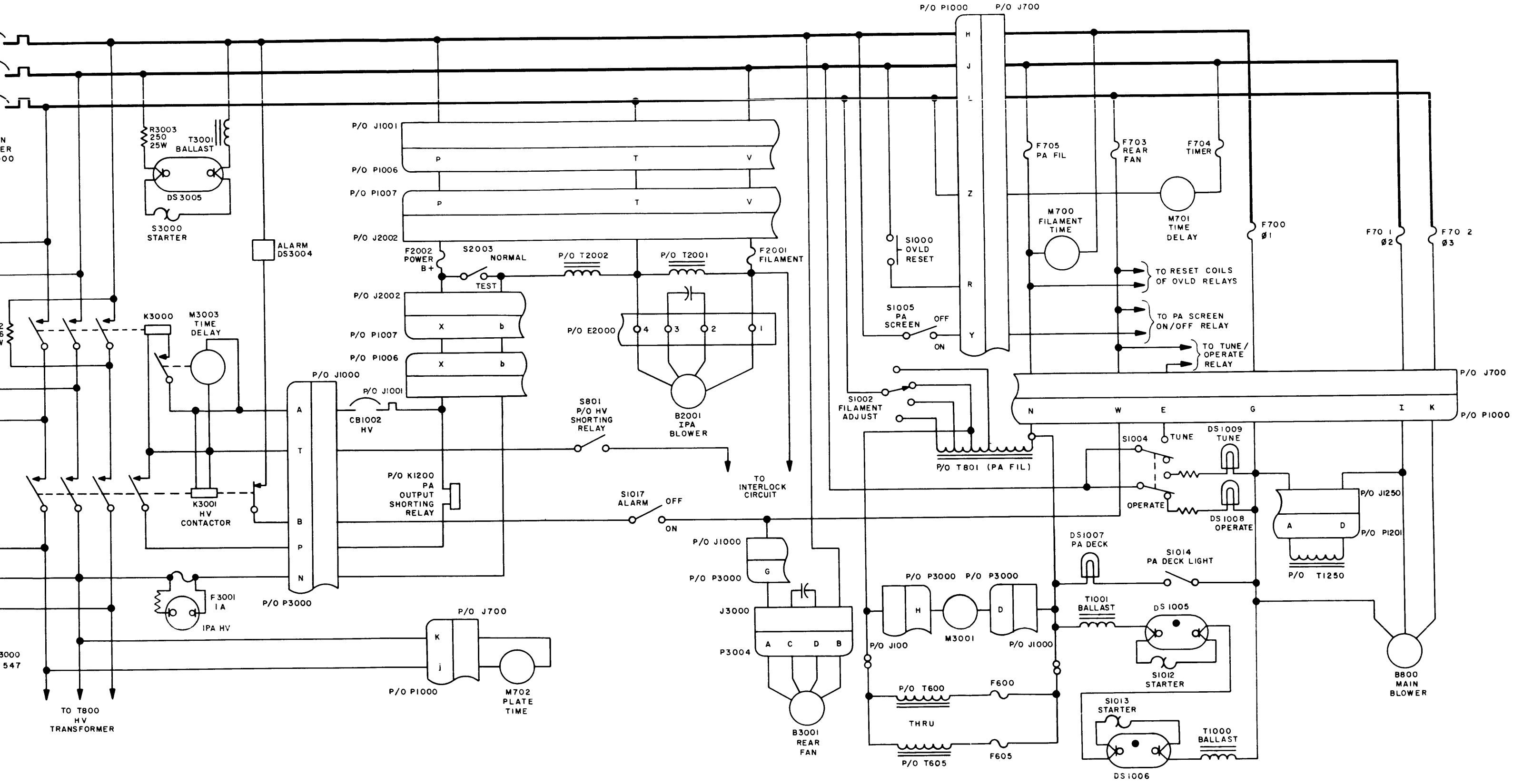
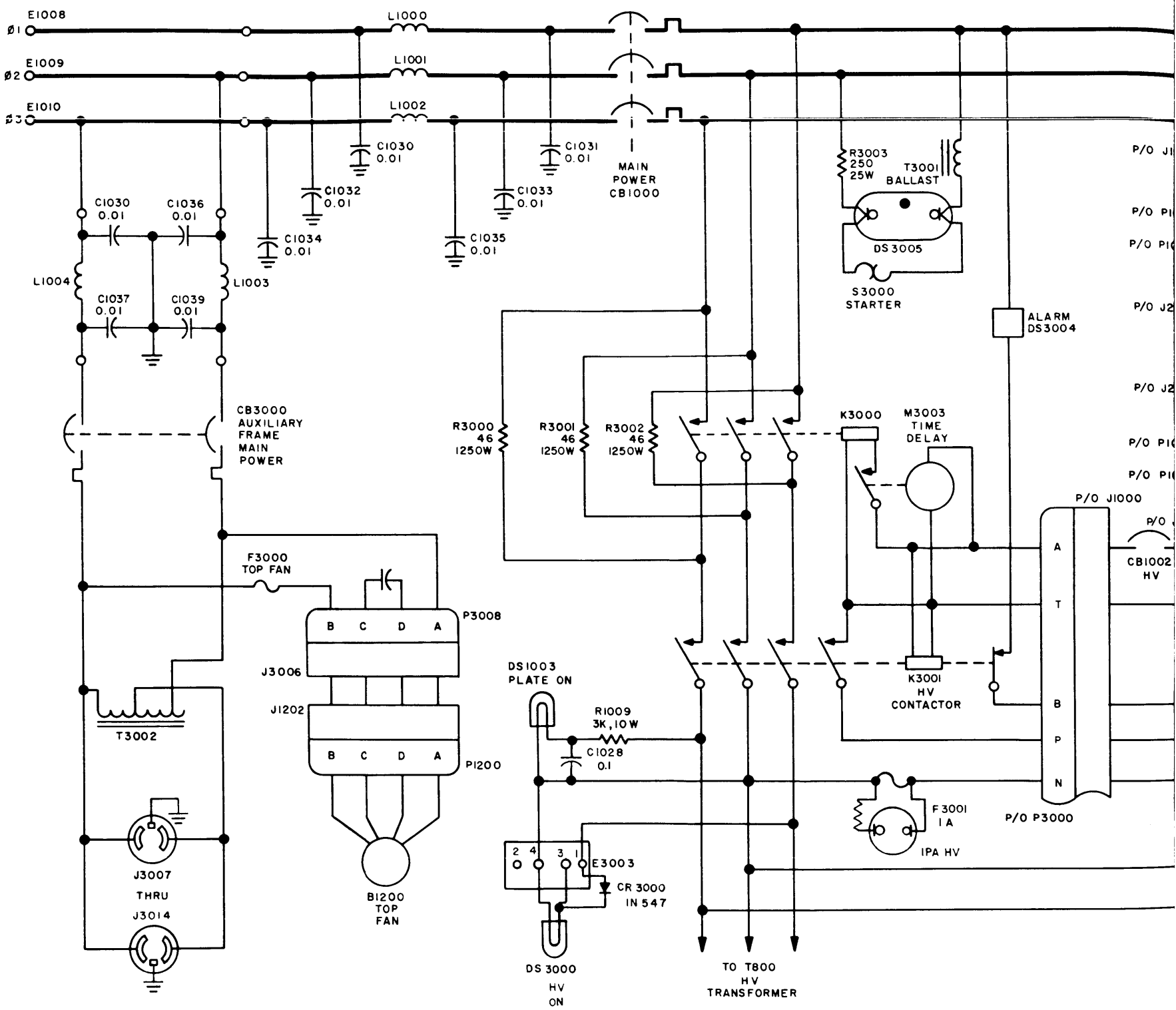


Figure 4-12. AC Power Distribution


E1008
Ø1
E1009
Ø2
E1010
Ø3
L1000
L1001
L1002
C1030 0.01
C1031 0.01
C1032 0.01
C1033 0.01
C1034 0.01
C1035 0.01
MAIN POWER CB1000
C1030 0.01
C1036 0.01
L1004
L1003
C1037 0.01
C1039 0.01
R3003 250 25W
T3001 BALLAST
DS 3005
S3000 STARTER
ALARM DS3004
P/O J1
P/O P1
P/O P1
P/O J2
P/O J2
P/O P1
P/O P1
CB3000 AUXILIARY FRAME MAIN POWER
R3000 46 1250W
R3001 46 1250W
R3002 46 1250W
K3000
M3003 TIME DELAY
P/O J1000
P/O
CB1002 HV
F3000 TOP FAN
P3008
B C D A
J3006
J1202
B C D A
P1200
T3002
J3007 THRU J3014
B1200 TOP FAN
DS1003 PLATE ON
R1009 3K, 10W
C1028 0.1
2 4 3 1
E3003
CR 3000 IN 547
DS 3000 HV ON
TO T800 HV TRANSFORMER
K3001 HV CONTACTOR
A
T
B
P
N
P/O P3000
F 3001 1A
IPA HV

SECTION 5

MAINTENANCE

5-1. GENERAL.

Maintenance in this section is divided into two categories: adjustments and troubleshooting. Maintenance adjustments are presented in paragraphs 5-1 through 5-4. Maintenance troubleshooting procedures are presented in paragraph 5-5.

5-2. OVERLOAD ADJUSTMENTS.

a. IPA SCREEN OVERLOAD. -

(1) Set MAIN POWER circuit breaker at OFF. Extend Linear Amplifier VLLA on its slides. Set TEST/NORMAL switch S2003 at TEST.

(2) Set MAIN POWER circuit breaker at ON. Adjust IPA SCREEN OVLD ADJ rheostat R709 until relay K706 remains latched in its non-overload position after the RESET pushbutton has been depressed.

(3) To check overload, short pin 2 of XV2004 to ground; relay K706 should trip.

(4) Set S2003 at NORMAL and return VLLA to its normal position.

b. IPA PLATE OVERLOAD. -

(1) Set MAIN POWER circuit breaker at ON; set HIGH VOLTAGE circuit breaker at ON. Set TUNE/OPERATE switch at OPERATE.

(2) Set PLATE MA switch at Plate A; adjust BIAS A ADJ potentiometer until PLATE MA meter indicates 150 ma. Set PLATE MA switch at Plate B; adjust BIAS B ADJ potentiometer until PLATE MA meter indicates 150 ma.

(3) Adjust IPA PLATE OVLD ADJ rheostat until relay K707 trips.

(4) Adjust BIAS A ADJ and BIAS B ADJ potentiometers as outlined in paragraph 5-3.

c. PA SCREEN OVERLOAD. -

(1) Connect a 50-ohm, 5000-watt non-reactive dummy load to the transmitter.

(2) Set LOAD ADJ FINE switch at 20; set LOAD ADJ COARSE switch at 30. Tune transmitter to approximately 500 kHz, and increase output until PA SCREEN CURRENT meter indicates 60 ma.

(3) Adjust PA SCREEN OVLD ADJ rheostat R707 until relay K702 trips.

(4) Decrease excitation and depress RESET button.

d. PA PLATE OVERLOAD. -

(1) Set MAIN POWER circuit breaker at ON. Set HIGH VOLTAGE circuit breaker at ON; set TUNE/OPERATE switch at OPERATE.

(2) Adjust PA BIAS ADJ potentiometer R703 (on left side of relay panel) until PA PLATE CURRENT A meter indicates 1.4 ampere. Adjust PA BIAS ADJ potentiometer R712 (on right side of relay panel) until PA PLATE CURRENT B meter indicates 1.4 ampere.

(3) Adjust PA PLATE OVLD ADJ rheostat R705 until relay K701 trips.

(4) Adjust PA BIAS ADJ potentiometers as outlined in paragraph 5-3.

e. SWR OVERLOAD. -

NOTE

The directional coupler must be aligned in accordance with instructions given in paragraph 5-4 before adjusting the SWR overload circuit.

(1) Set MAIN POWER circuit breaker at OFF.

(2) Connect 50-ohm dummy load and 0.01 microfarad 4000-volt capacitor in series to transmitter output as shown in figure 5-1.

NOTE

If an SWR overload sensitivity of 2:1 is desired, use a test frequency of 350 kHz when performing the remainder of this alignment. If an SWR overload sensitivity of 3:1 is desired, use a test frequency of 225 kHz.

(3) Set POWER-CALIBRATE-SWR switch at POWER. Energize transmitter, and tune exciter to desired test frequency. Adjust excitation until PA OUTPUT indicates 1 kw.

(4) Set POWER-CALIBRATE-SWR switch at CALIBRATE; adjust CAL control until pointer on OUTPUT meter rests at CAL marker. Set POWER-CALIBRATE-SWR switch at SWR; OUTPUT meter should indicate between 3.3 and 3.7 (at 225 kHz) or between 2.3 and 2.7 (at 350 kHz).

(5) Adjust SWR OVERLOAD ADJ potentiometer until relay K708 trips.

(6) De-energize transmitter, remove dummy load and capacitor, and replace normal output line.

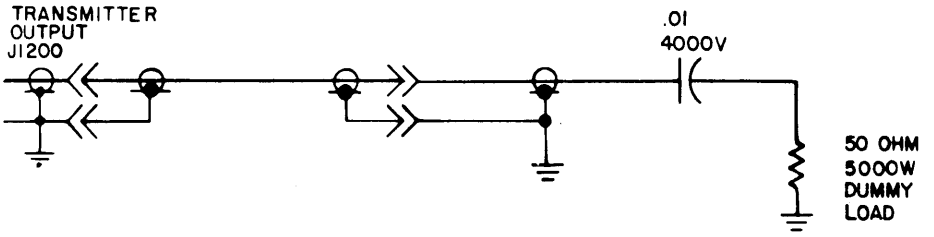


Figure 5-1. Test Setup, SWR Overload

5-3. BIAS ADJUSTMENTS.

a. IPA. -

(1) Set TUNE/OPERATE switch at OPERATE.

(2) Energize transmitter, and set HIGH VOLTAGE circuit breaker at ON. Do not apply excitation.

(3) Set PLATE MA switch at Plate A; adjust BIAS A ADJ potentiometer until PLATE MA meter indicates 100 ma.

(4) Set PLATE MA switch at Plate B; adjust BIAS B ADJ potentiometer until PLATE MA meter indicates 100 ma.

(5) Set HIGH VOLTAGE circuit breaker at OFF.

b. PA. -

(1) Set MAIN POWER switch at ON; set HIGH VOLTAGE circuit breaker at ON. Set PA SCREEN switch at ON; set TUNE/OPERATE switch at OPERATE. Do not apply excitation.

(2) Adjust PA BIAS ADJ potentiometer R703 (on left side of relay panel) until PA PLATE CURRENT A meter indicates 1 ampere.

(3) Adjust PA BIAS ADJ potentiometer R712 (on right side of relay panel) until PA PLATE CURRENT B meter indicates 1 ampere.

(4) Set HIGH VOLTAGE circuit breaker at OFF.

5-4. DIRECTIONAL COUPLER ADJUSTMENTS. (refer to figure 5-2.)

a. Energize transmitter; do not turn on high voltage.

b. Set POWER-CALIBRATE-SWR switch at POWER. Adjust potentiometer R1257 (located in directional coupler) until PA OUTPUT meter indicates zero.

c. Connect at 50-ohm, 5000-watt non-reactive dummy load to the transmitter output. Connect an rf ammeter (10-amp scale or larger) between transmitter and dummy load.

d. Tune transmitter to a frequency on the 5- to 500-kHz range. Adjust excitation to obtain 10 amperes rf current into dummy load.

e. Adjust potentiometer R1258 until PA OUTPUT meter indicates 5 kw.

f. Deenergize transmitter, and disconnect dummy load.

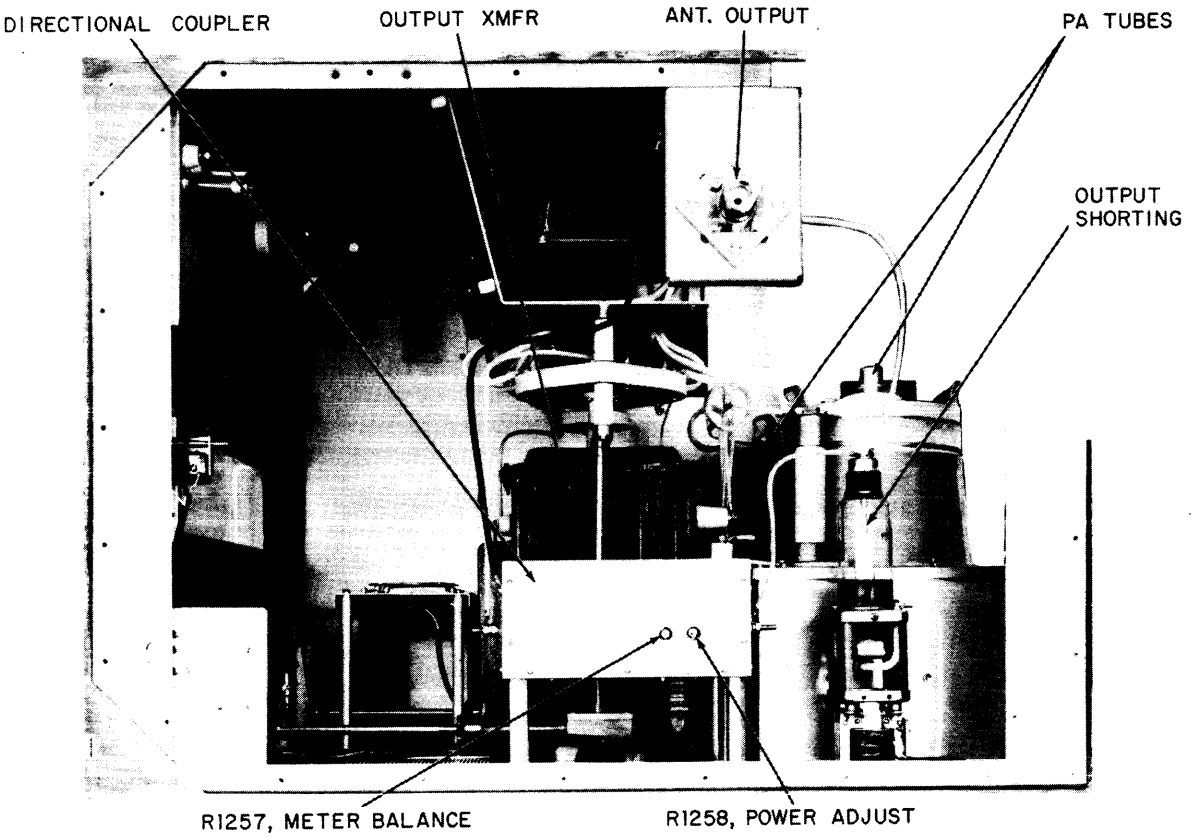


Figure 5-2. Right Side View, PA Section, GPT-10KLF

5-5. TROUBLESHOOTING.

Before pursuing a lengthy troubleshooting procedure, the equipment should be visually inspected as outlined in table 5-1. An equipment performance check (table 5-2) is provided to localize the cause of trouble to a particular circuit or section of the transmitter. When a trouble has been localized to the VLLA drawer, use the voltage and resistance data given in table 5-3 to find the faulty component. If a fuse repeatedly blows, or a circuit breaker continually trips (indicating a fault in the primary power circuitry), use the simplified schematic diagram, figure 4-12, to find the faulty component. Refer to section 7 of this manual for complete schematic diagrams.

TABLE 5-1. PRELIMINARY INSPECTION PROCEDURE

What to Inspect	Defects to Look For	Remedy
All electrical connections at rear of main and auxiliary frames.	Open connections, dirt, frayed cables.	Tighten, replace or clean as necessary.
Antenna connections at top or side of main frame.	Loose connections, dirt, frayed cables.	Tighten, replace or clean as necessary.
Knobs, screws, connections.	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.

TABLE 5-2. EQUIPMENT PERFORMANCE CHECK

Step	Operation	Normal Indication	Probable Cause of Abnormal Indication
1	Connect antenna or dummy load to transmitter and check that all drawers and covers are secured.		
2	Set AUXILIARY FRAME MAIN POWER circuit breaker at ON.	Top fan B1200 operates, power lamps on individual exciter units light when their associated power switches are set at ON.	If exciter units are powered, but top fan fails to operate, TOP FAN fuse F300, capacitor C3018, or fan B1200 is defective. If none of the exciter units can be powered, transformer T3002 is defective. If an individual exciter unit cannot be powered, it is defective. (Refer to appropriate modular-unit manual.)

TABLE 5-2. EQUIPMENT PERFORMANCE CHECK (Cont)

Step	Operation	Normal Indication	Probable Cause of Abnormal Indication
3	Remove P3001 from J3001; terminate J3001 with a 50-ohm dummy load. Tune up exciter at carrier frequency in the 5- to 500-kHz range.	RF output (up to 5 watts PEP) is obtained at J3001.	Defective unit is exciter. Refer to appropriate exciter equipment manual.
4	Set switches on second frame as follows: PA SCREEN - OFF TUNE/OPERATE - TUNE HIGH VOLTAGE - OFF ALDC - OFF INTERLOCK - NORMAL PWR/CAL SW - POWER ALARM - OFF LOAD ADJUST FINE - 20 LOAD ADJUST COARSE - 30		
5	Set TIME DELAY at 5, then set MAIN POWER circuit breaker at ON.	Main frame blower B800 operates.	Open MAIN BLOWER fuse on relay panel or defective blower unit.
		TUNE lamp lights.	Open resistor R1007.
		PA BIAS lamp lights, then goes out after a few seconds.	Defective bias supply in VLLA, defective relay K700.
		PA BIAS meters (A and B) indicate approximately 300V.	Incorrect setting of PA BIAS ADJ controls.
		FILAMENT PRIMARY meter indicates 230V.	Incorrect setting of FIL ADJ switch.
		After 5 minutes, INTERLOCK INDICATOR lamp lights.	Open interlock circuit.
		AC Power lamp	
		Fluorescent lamps (Aux +PA Frame)	
6	Set MULTIMETER switch at V3 BIAS.	MULTIMETER indicates approximately 30V.	Incorrect setting of BIAS A ADJ control.
7	Set MULTIMETER switch at V4 BIAS.	MULTIMETER indicates approximately 30V.	Incorrect setting of BIAS B ADJ control.
8	Set MULTIMETER switch at V1 and V2 PLATE VOLTAGE.	MULTIMETER indicates approximately 250V.	Defective VLLA power supply circuit.
9	Set HIGH VOLTAGE circuit breaker at ON.	PLATE ON lamp and warning lamp on roof of first frame glow dimly.	If PLATE ON lamp does not light, resistor R1009 is defective.
		PA PLATE VOLTS meter indicates 3.5 KV.	Defective contactor K3001.

TABLE 5-2. EQUIPMENT PERFORMANCE CHECK (Cont)

Step	Operation	Normal Indication	Probable Cause of Abnormal Indication
9 (cont)		After approximately 5 seconds, above lamps come to full brightness, and PA PLATE VOLTS meter indicates 7.5 KV.	Defective or misadjusted timer M3003; defective contactor K3000; defective high voltage rectifier tube; defective transformer T800.
10	Set MULTIMETER switch at V3+V4 Plate Voltage.	MULTIMETER indicates approximately 800V.	Defective IPA B+ supply in VLLA.
11	Set PA SCREEN switch at ON.	PA SCREEN VOLTS meter indicates approximately 800V.	Open choke L801, open resistor R802, R816, R819 or R820; defective screen regulator diodes CR800; defective relay K703.
12	Set TUNE/OPERATE switch at OPERATE.	PA SCREEN VOLTS meter indicates approximately 1600V.	Defective relay K705.
		PLATE CURRENT A and PLATE CURRENT B meters each indicate 1 ampere.	Misadjusted PA BIAS ADJ potentiometers R703 and R712; defective tube V1201 or V1200.
13	Set PLATE MA switch at Plate A.	PLATE MA meter should indicate 100 ma.	Misadjusted BIAS A ADJ potentiometer R2004; defective tube V2003.
14	Set PLATE MA switch at Plate B.	PLATE MA meter should indicate 100 ma.	Misadjusted BIAS B ADJ potentiometer R2003; defective tube V2004.
	Connect exciter output J3001 removed in Step 3.		
15	Tune exciter to a frequency between 5- and 500-kHz		
16	Adjust excitation until PA OUTPUT meter indicates approximately 2 kw.		
17	Adjust LOAD ADJUST FINE switch S1202 and LOAD ADJUST COARSE switch S1201 to produce a maximum reading on PA OUTPUT METER.	HIGH VOLTAGE breaker will trip. Reset H.V. breaker and proceed to step 18.	
18	Adjust excitation until PA OUTPUT meter indicates 5 kw.	IPA PLATE METER indicates between 200-250 ma when S2002 is set at "Plates".	Defective tube V2003 or V2006; transformer T2004 or T2005.
		PA Plate current meter indicates not higher than 2.8 amperes.	If PA Plate current meter tends to indicate higher than 2.8 amperes, tube V120 or V1200 is defective; transformer T1200 or T1201 is defective.

TABLE 5-3. VOLTAGE AND RESISTANCE CHART, VLLA

Tube	Pin Number										
	1	2	3	4	5	6	7	8	9	10	11
V2001 6GK6	250	-.25 10K	0 0	0 0	Fil 0		245 10K	160 260 10M	0 0		
V2002 6GK6	250	-.25 10K	0 0	0 0	Fil 0		245 10K	160 260 10M	0 0		
V2003 8121	0 0	160 260 10M	-17 45K	0 0	Fil 0	0 0	160 260 10M	-17 45K	0 0	160 260 10M	-17 45K
V2004 8121	0 0	160 260 10M	-17 45K	0 0	Fil 0	0 0	160 260 10M	-17 45K	0 0	160 260 10M	-17 45K
V2005 5R4		5 ac 0		1010* 40K		1010* 40K		5 0			
V2006 5R4		5 ac 12K		635* 82		635* 82		5 12K			
V2009 OB2	-220 ∞	-390 35K		-390 35K	-220 ∞		-390 35K				
V2008 OA2	-108 ∞	-220 ∞		-220 ∞	-108 ∞		-220 ∞				
V2007 OA2	0 0	-108 ∞		-108 ∞	0 0		-108 ∞				
V2010 OB2	245 150K	145 ∞		145 ∞	245 150K		145 ∞				
V2011 OA2	145 ∞	0 0		0 0	145 ∞		0 0				

* Measure bet ween pins

SECTION 6

PARTS LIST

6-1. INTRODUCTION.

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

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

a. Reference symbol.

b. Description as indicated in parts list.

c. TMC part number.

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

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

The Technical Materiel Corporation
Attention: Sales Department
700 Fenimore Road
Mamaroneck, New York 10543

Ref Symbol	Description	TMC Part Number
	MODEL APP-8	
CP1	ADAPTER, Cable Connector	UG175/U
DS1	PART OF XF1	
F1	FUSE, C & G	FU102-S
J1	ADAPTER, Connector, rf	JJ147
J2	JACK, Telegraph	JJ116-2
J3	SAME AS J2	
J4	CONNECTOR, Receptacle, female	JJ173
J5	SAME AS J4	
P1	CONNECTOR, PLUG, rf, QDS	PL157
P2	CONNECTOR, PLUG, male, ac	PL218
P3	SAME AS P2	
P6	CONNECTOR, PLUG, Uhf	PL259A Tef
P7	CONNECTOR, PLUG, Bnc	UG88/U
R1	PART OF XF1	
S1	SWITCH, Rotary, rf	SW239
XF1	FUSEHOLDER, Indicator	FH104-3
	MODEL AR166	
C700	CAPACITOR, Fixed, electrolytic	CE63F500G
C701	SAME AS C700	
C702	CAPACITOR, Fixed, ceramic	CC100-16
C703	SAME AS C700	
F700	FUSE, Ctg	FU102-10
F701	SAME AS F700	
F702	SAME AS F700	
F703	FUSE, Ctg	FU102-5
F704	FUSE, Ctg	FU102-1
F705	FUSE, Ctg	FU102-15
I700	LAMP, Glow	BI103-2
I701 thru I705	SAME AS I700	
J700	CONNECTOR, Receptacle, male	MS3102A327P
J701	CONNECTOR, Receptacle, male	MS3102A229P
K700	RELAY, Armature, latch	RL126
K701	RELAY, Armature, latch	RL122
K702	RELAY, Armature, latch	RL128
K703	RELAY, Armature, latch	RL124
K704	RELAY, Armature, latch	RL125
K705	SAME AS K703	
K706	RELAY, Armature, latch	RL127
K707	RELAY, Armature, latch	RL123
K708	SAME AS K706	
M700	METER, Time Total, 60 Hz	MR125-2
M700	METER, Time Total, 50 Hz	MR125-2-50
M701	TIMER, Interval, 60 Hz	TI101-5-60
M701	TIMER, Interval, 50 Hz	TI101-5-50
M702	SAME AS M700	
R700	RESISTOR, Fixed, composition	RC42GF153J
R701	RESISTOR, Fixed, composition	RC42GF301J
R702	RESISTOR, Fixed, composition	RC42GF224J
R703	RESISTOR, Variable, composition	RV4LAYSA 503A
R704	RESISTOR, Fixed, wirewound, 5 watt	RW107-54
R705	RESISTOR, Variable, wirewound, 4 watt	RA107TXA1 ROA
R706	RESISTOR, Fixed, wirewound, 10 watt	RW109-19
R707	RESISTOR, Variable, wirewound, 25 watt	RA75ASA501 AK25
R709	RESISTOR, Variable, composition	RV4LAYSA 153A
R710	RESISTOR, Fixed, wirewound, 10 watt	RW109-4
R711	RESISTOR, Variable, wirewound, 25 watt	RA75AXA101 AK25
R712	SAME AS R703	
R713	SAME AS R702	
R714	RESISTOR, Fixed, wirewound, 10 watt	RW109-28
XF700	FUSEHOLDER, Ind	FH104-3
XF701 thru XF705	SAME AS XF700	
XI700	LIGHT, Indicator, clear	TS137-7FB4
XI701 thru XI705	SAME AS XI700	
	MODEL AP125	
B800	FAN ASSEMBLY	BL111
C800	CAPACITOR, Fixed, paper	CP103
C801	CAPACITOR, Fixed,	CP104
C802	CAPACITOR, Fixed, paper	CP105
C813	CAPACITOR, Fixed, plastic	CX109-4
C814	SAME AS C813	
C815	CAPACITOR, Fixed, paper	CP70EIFL 254K
CR801 ABCD	SEMICONDUCTOR DEVICE, Diode	UR100S/8-1600-S

Ref Symbol	Description	TMC Part Number
CR801 EFGH	SAME AS CR801ABCD	
CR801 IJKL	SEMICONDUCTOR DEVICE, Diode	VR100S/8-1600S
CR801 MNPR	SAME AS CR801IJKL	
L800	REACTOR, Fil	TF0280
L801	REACTOR, 5H	TF0199
L802	SOLENOID, Electrical	SZ100
L803	CHOKE ASSEMBLY	A-4099-1
L804	SAME AS L803	
L805	SAME AS L803	
R802	RESISTOR, Fixed, wirewound, 140	RW118F502
R803	SAME AS R802	
R804	RESISTOR, Fixed, wirewound, 140	RW118F183
R805 thru R809	SAME AS R804	
R810	RESISTOR, Fixed, wirewound, 4 watt	RW122-1-405
R811	SAME AS R810	
R812	RESISTOR, Fixed, wirewound, 14 watt	RW119G181
R813	RESISTOR, Fixed, wirewound, 14 watt	RW119G181
R814	RESISTOR, Fixed, wirewound, 6 watt	RW122-3-804
R815	SAME AS R814	
R816	SAME AS R802	
R818	RESISTOR, Fixed, wirewound, 10 watt	RW109-32
R819	SAME AS R802	
R820	SAME AS R802	
R821	RESISTOR, Fixed, wirewound, 20 watt	RW110-43
R822	RESISTOR, Fixed, composition	RC42GF101J
R823 thru R828	SAME AS R822	
R829	RESISTOR, Fixed, composition	RC42GF221J
R830	SAME AS R829	
R831 thru R837	SAME AS R822	
S800	SWITCH, Air	SW243
S801	SWITCH, Push, spst	SW169
T800	TRANSFORMER, power, sd	TF0203
T801	TRANSFORMER, Fil	TF0279
TB800	SEMICONDUCTOR ASSEMBLY, Set	A4309
TB801	SEMICONDUCTOR ASSEMBLY, Set	A4310
C1017	CAPACITOR, Fixed, plastic	CX1C9-5
C1018	SAME AS C1017	
C1022	CAPACITOR, Fixed, electrolytic	CE105-25-50
C1025	CAPACITOR, Fixed, plastic	CX111
C1026 thru C1028	SAME AS C1025	
C1029	CAPACITOR, Fixed, plastic	CN114R104
C1030 thru C1039	CAPACITOR, Fixed, ceramic	CC109-38
CB1000	CIRCUIT BREAKER, 3pst	SW240-2
CB1002	CIRCUIT BREAKER, spst	SW297
I1000	LAMP, Incandescent	BI105-2
I1001 thru I1003	SAME AS I1000	
I1004	LAMP, Glow	BI100-51
I1005	LAMP, Fluorescent, fw	BF107
I1006	SAME AS I1005	
I1007	LAMP, Incandescent	BI106-2
J1000	CONNECTOR, Receptacle, female	MS3102A20-29S
J1001	CONNECTOR, Receptacle, female	MS3102A32-7S
J1002	CONNECTOR, Receptacle, bnc	UG625/U
J1003	SAME AS J1002	
J1005	CONNECTOR, Receptacle, bnc	JJ172
J1006 thru J1008	SAME AS J1005	
L1000 thru L1004	COIL, Rf, fixed	CL155
M1001	AMMETER, PA	MR116
M1002	AMMETER	MR117
M1003	METER, PA	MR174
M1004	VOLTMETER, PC	MR134
M1005	SAME AS M1004	
P1000	CONNECTOR, Receptacle, female	MS3106B32-7S
P1001	CONNECTOR, Receptacle, female	MS3106B22-9S
P1002	CONNECTOR, Plug, rf, bnc	PL244-1
P1003	SAME AS P1002	
P1004	CONNECTOR, Plug, female	PL244-1
P1005	SAME AS P1004	
P1006	CONNECTOR, Plug, male	MS3106B32-7P
P1007	CONNECTOR, Plug, female	MS3106B32-7S
P1008	SAME AS P1004	
R1000	RESISTOR, Fixed, wirewound	RW115-101-55
R1001	SAME AS R1000	
R1002	RESISTOR, Fixed, wirewound, 10 watt	RW109-42

Ref Symbol	Description	TMC Part Number
R1003	RESISTOR, Fixed, composition	RC20GF274J
R1004	RESISTOR, Variable, composition	RV4NAYSD 503B
R1005	RESISTOR, Fixed, composition	RC32GF224J
R1006 thru R1009	RESISTOR, Fixed,	RW109-30
R1010	RESISTOR, Variable, composition	RV4NAYS 0254B
R1011AB	RESISTOR, Variable, composition	RV112
R1012	RESISTOR, Fixed, film	RN75B1004F
R1013	SAME AS R1012	
R1014 thru R1016	RESISTOR, Fixed, composition	RC32GF220J
S1000	SWITCH, Push	SW168SPST 2NOBR
S1001	SWITCH, Rotary	SW250
S1002	SWITCH, Rotary, tap	SW167-7
S1003	SWITCH, Rotary	SW255
S1004	SWITCH, Toggle, dpdt	ST22N
S1005	SWITCH, Toggle, dpst	ST12A
S1006 thru S1011	SWITCH, Push-Pull	SW230
S1012	START, Fluorescent Lamp	PC176
S1013	SAME AS S1012	
S1014	SWITCH, Toggle	ST12A
S1015	SWITCH, Sens., spdt	SW189
S1016	SAME AS S1015	
S1017	SAME AS S1014	
S1018	SWITCH, Rotary	SW112
T1000	BALLAST, Lamp	PC169
T1001	SAME AS T1000	
XI1000	LIGHT, Indicator, amber	TS136-3FS
XI1001	LIGHT, Indicator, green	TS136-2FS
XI1002	LIGHT, Indicator, blue	TS136-4FS
XI1003	LIGHT, Indicator, red	TS136-1FS
XI1004	LIGHT, Indicator, clear	TS106-2
XI1005A	LAMP HOLDER	TS141
XI1005B	SAME AS XI1005A	
XI1006A	SAME AS XI1005A	
XI1006B	SAME AS XI1005A	
XI1007	LAMPHOLDER	TS143
XS1012	SOCKET, Lamp Start	TS140
XS1013	SAME AS XS1012	

Ref Symbol	Description	TMC Part Number
B1200	FAN, Axial	BL123
C1200	CAPACITOR, Fixed, 10 kv	CP119
C1201	CAPACITOR, Fixed, paper	CP117-1
C1202	SAME AS C1201	
C1203	CAPACITOR, Fixed, electrolytic	CX113-1
C1204	SAME AS C1200	
C1205	SAME AS C1200	
C1206	CAPACITOR, Fixed, plastic	CP117-2
C1207	SAME AS C1206	
C1208	CAPACITOR, Fixed, plastic	CX109-4
C1209	SAME AS C1208	
C1210 thru C1213	SAME AS C1201	
C1214 thru C1217	CAPACITOR, Fixed	CP116
C1218	CAPACITOR, Fixed,	CO104-2
C1219	CAPACITOR, Fixed, mica	CM35F103F03
C1220	SAME AS C1218	
C1221	CAPACITOR, Fixed, mica	CM15F221J03
C1222	CAPACITOR, Fixed, ceramic	CC100-37
C1223 thru C1225	SAME AS C1222	
C1226 thru C1229	CAPACITOR, Fixed, paper	CX109-5
C1250	CAPACITOR, Fixed, metalized	CN112A105M2
C1251	CAPACITOR, Fixed, metalized	CN114R104J
C1252 thru C1254	SAME AS C1250	
C1255	CAPACITOR, Fixed, electrolytic	CE107-1
C1256	SAME AS C1255	
C1257 thru C1259	SAME AS C1250	
C1260	SAME AS C1251	
C1261	SAME AS C1250	
C1262	SAME AS C1255	
C1263	SAME AS C1250	
C1264	SAME AS C1250	
C1265	SAME AS C1255	
CR1250 thru CR1255	SEMICONDUCTOR DEVICE, Diode	1N67

Ref Symbol	Description	TMC Part Number
CR1256	SEMICONDUCTOR DEVICE, Diode	1N2071A
CR1257	SEMICONDUCTOR DEVICE, Diode	1N3030
DC1200	DIRECTIONAL COUPLER ASSEMBLY	AX569
F1250	FUSE, Ctg	FU102-.1
J1201	CONNECTOR, Receptacle, bnc	UG625/U
J1250	CONNECTOR, Receptacle, male	MS3102A20-27P
K1200	RELAY, Socket, vac	RL154
L1201	COIL ASSEMBLY, Rf	A-4099-1
L1202	COIL ASSEMBLY, Rf	A-4099-2
L1204	SAME AS L1201	
L1205	SAME AS L1202	
L1250	LOOP ASSEMBLY	A-4105
L1251	SAME AS L1250	
M1200	METER, Output	MR179
M1201	SAME AS M1200	
P1201	CONNECTOR, Plug, female	MS3108B 20275
PS1200	PARA SUP ASSEMBLY	A-4094
PS1201	PARA SUP ASSEMBLY	A-4093
PS1202	SAME AS PS1201	
PS1203	SAME AS PS1200	
Q1250	TRANSISTOR	2N697
R1200	RESISTOR, Fixed, composition	RC42GF394J
R1201	SAME AS R1200	
R1202	RESISTOR, Fixed, composition	RC42GF224J
R1203	RESISTOR, Fixed, composition	RC42GF471J
R1204	RESISTOR, Fixed, film	RR134-152
R1205	SAME AS R1204	
R1206	RESISTOR, Fixed, composition	RC42GF234J
R1207	SAME AS R1206	
R1250	RESISTOR, Fixed, composition	RC20GF222J
R1251	RESISTOR, Fixed, wirewound	RR114-50W2
R1252	SAME AS R1251	
R1253	RESISTOR, Fixed, composition	RC32GF102J
R1254	RESISTOR, Fixed, composition	RC20GF221J
R1255	SAME AS R1253	
R1256	SAME AS R1254	
R1257	RESISTOR, Variable, composition	RV106UX8B 502A
R1258	RESISTOR, Variable, composition	RV106UX8B 253A
R1259	SAME AS R1253	
R1260	RESISTOR, Fixed, composition	RC20GF101J
R1261	SAME AS R1253	
R1262	RESISTOR, Fixed, composition	RC32GF101J
R1263	SAME AS R1253	
R1264	SAME AS R1254	
R1265	SAME AS R1254	
R1266	RESISTOR, Fixed, composition	RC20GF392J
R1267	SAME AS R1266	
S1201	SWITCH, Rotary	SW383
S1202	SWITCH, Rotary	SW382
S1203	SWITCH, Micro	SW189
S1204	SAME AS S1203	
T1200	TRANSFORMER, IF	TF0278
T1201	TRANSFORMER, AF	TF0281
T1250	TRANSFORMER, Power	TF0282
T1251	TRANSFORMER, Auto	TF0321
XV1200	SOCKET TUBE, Electron	TS134
XV1201	SAME AS XV1200	
XZ1200	SOCKET, Octal	TS101P01
Z1200	NW ASSEMBLY, ALDC	A-5453
C1501 thru C1503	CAPACITOR, Fixed	CX115-1-50-202
CR1501 thru CR1503	RECTIFIER, Semiconductor, diode	DD116
	MODEL VLLA-1	
B2001	FAN, Centrifugal	BL124
C2001 thru C2003	CAPACITOR, Fixed, paper	CP41B1FF 405K
C2004	CAPACITOR, Fixed, electrolytic	CE51C8COR
C2005	CAPACITOR, Fixed, paper	CP70B1FG 106K
C2006	SAME AS C2005	
C2007	SAME AS C2001	
C2008	SAME AS C2004	
C2009	SAME AS C2001	
C2010	CAPACITOR, Fixed, mica	CM35F512 G03
C2011	CAPACITOR, Fixed, mica	CM100-9

Ref Symbol	Designation	TMC Part Number
C2012	CAPACITOR, Fixed, mica	CM35F752G03
C2013	CAPACITOR, Fixed, mica	CM100-14
C2014	CAPACITOR, Fixed, mica	CM35F682G03
C2015	CAPACITOR, Fixed, metalized	CM114F47-4J
C2016	CAPACITOR, Fixed, ceramic	CC100-32
C2017	SAME AS C2016	
C2018	SAME AS C2016	
C2019	CAPACITOR, Fixed, electrolytic	CE107-1
C2020	SAME AS C2019	
C2021 thru C2026	SAME AS C2016	
C2028 thru C2031	CAPACITOR, Fixed, plastic	CX109-4
C2032	CAPACITOR, Fixed, electrolytic	CE105-5-50
C2033	SAME AS C2032	
C2034	SAME AS C2016	
C2035	CAPACITOR, Fixed, electrolytic	CE52C350R
C2036	SAME AS C2032	
C2037	SAME AS C2032	
C2038	CAPACITOR, Fixed, paper	CP117-1
C2039	CAPACITOR, Fixed, mica	CM15F101G03
C2040	SAME AS C2039	
CR2001 thru CR2004	RECTIFIER, Semiconductor Device	DD112-1
CR2005 thru CR2008	SEMICONDUCTOR DEVICE, Diode	1N67
EV2001	SHIELD, Electron Tube	TS170-2
EV2002	SAME AS EV2001	
EV2007 through EV2011	SHIELD, Electron Tube	TS102403
F2001	FUSE, Ctg	FU102-1
F2002	FUSE, Ctg	FU102-1.5
F2003	FUSE, Ctg	FU102-.062
F2004	FUSE, Ctg	FU102-.3
F2005	FUSE, Ctg	FU102-.1
J2000	CONNECTOR, Receptacle, twin	UG103/U
J2001	CONNECTOR, Receptacle, bnc	JJ172
J2002	CONNECTOR, Receptacle, male	MS3102A32-7P
K2001	RELAY, Armature	RL126
L2001	REACTOR, Filter	TF0286
L2002	SAME AS L2001	
L2003 thru L2006	REACTOR, Filter	TF0283
L2007	SAME AS L2001	
L2008 thru L2010	COIL, Rf, fixed	CL27C-15
L2011	COIL, Rf, fixed	CL226-5
L2012	COIL, Rf, fixed	CL101-4
L2013	SAME AS L2012	
L2014	SAME AS L2011	
L2016 thru L2018	SAME AS L2012	
M2001	MULTIMETER	MR175
M2002	METER, Arb Scale	MR168
PS2001 thru PS2004	SUPPRESSION PARAS	A-4103
R2000	RESISTOR, Fixed, wirewound, 25 watt	RW111-11
R2001	RESISTOR, Fixed, wirewound, 10 watt	RW109-36
R2002	RESISTOR, Fixed, wirewound, 5 watt	RW109-30
R2003	RESISTOR, Variable, composition	RV4LAYSA 502A
R2004	SAME AS R2003	
R2005	RESISTOR, Fixed, composition	RC20GF821J
R2006	RESISTOR, Fixed, wirewound, 10 watt	RW109-39
R2007	SAME AS R2006	
R2008	RESISTOR, Fixed, wirewound, 20 watt	RW110-43
R2009	RESISTOR, Fixed, wirewound, 5 watt	RW107-18
R2010	RESISTOR, Fixed, wirewound, 10 watt	RW109-31
R2011	RESISTOR, Fixed, composition	RC20GF101J
R2012	RESISTOR, Fixed, composition	RC42GF680J
R2013	RESISTOR, Fixed, composition	RC32GF180J
R2014	SAME AS R2011	
R2015	SAME AS R2013	
R2016	RESISTOR, Fixed, composition	RC20GF103G
R2017	SAME AS R2016	
R2018	RESISTOR, Fixed, wirewound, 5 watt	RW107-23
R2019	RESISTOR, Fixed, composition	RC32GF122J
R2020	SAME AS R2019	
R2021 thru R2024	RESISTOR, Fixed, composition	RC20GF223J

Ref Symbol	Description	TMC Part Number
R2025	RESISTOR, Variable, wirewound, 2 watt	RA101ASN 050A
R2026	RESISTOR, Fixed, composition	RC32GF470J
R2027	SAME AS R2026	
R2028	RESISTOR, Fixed, composition	RC20GF100J
R2029	RESISTOR, Fixed, composition	RC20GF183J
R2030	RESISTOR, Fixed, composition	RC20GF106J
R2031	RESISTOR, Fixed, composition	RC20GF474J
R2032	RESISTOR, Fixed, composition	RC20GF106J
R2033	SAME AS R2032	
R2034	RESISTOR, Fixed, composition	RC20GF563J
R2035	RESISTOR, Fixed, composition	RC20GF562J
R2036	RESISTOR, Fixed, composition	RC20GF333J
R2037	SAME AS R2034	
R2038	SAME AS R2035	
R2039	SAME AS R2036	
R2040	RESISTOR, Fixed, composition	RC42GF154J
R2041	RESISTOR, Fixed, composition	RC20GF272J
R2042	RESISTOR, Fixed, composition	RC20GF224J
R2043	SAME AS R2040	
R2044	SAME AS R2041	
R2045	SAME AS R2042	
R2046	RESISTOR, Fixed, composition	RC20GF226J
R2047	SAME AS R2031	
R2048	RESISTOR, Fixed, wirewound, 1 watt	RB100E2R 000J
R2049	RESISTOR, Fixed, composition	RC20GF222J
R2050	SAME AS R2030	
R2051	SAME AS R2031	
S2001	SWITCH, Rotary	SW350
S2002	SWITCH, Rotary	SW349
S2003	SWITCH, Toggle, dpdt	ST22N
S2004	SWITCH, Air Flow	SW252
T2001	TRANSFORMER, Power	TF0284
T2002	TRANSFORMER, Power	TF0285
T2003	TRANSFORMER, Input	TS0320
T2004	TRANSFORMER, Inter	TF0319
T2005	TRANSFORMER, Output	TF0318
V2001	ELECTRON TUBE	6GK6
V2002	SAME AS V2001	
V2003	ELECTRON TUBE	8121
V2004	SAME AS V2003	
V2005	ELECTRON TUBE	5R4
V2006	SAME AS V2005	
V2007	ELECTRON TUBE	OA2
V2008	SAME AS V2007	
V2009	ELECTRON TUBE	OB2
V2010	SAME AS V2009	
V2011	SAME AS V2007	
XC2004	SOCKET, Electron Tube	TS101P01
XC2008	SAME AS XC2004	
XC2035	SAME AS XC2004	
XF2001 thru XF2005	FUSEHOLDER, Ind	FH1C4-3
XV2001	SOCKET, Electron Tube	TS103P01
XV2002	SAME AS XV2001	
XV2003	SOCKET, Electron Tube	TS170-2
XV2004	SAME AS XV2003	
XV2005	SOCKET, Electron Tube	TS101P01
XV2006	SAME AS XV2005	
XV2007 thru XV2011	SOCKET, Electron Tube	TS102P01
	MODEL AX534	
B3001	FAN, Axial	BL105
C3017	CAPACITOR, Fixed, paper	CP41B1FF 405K
C3018	SAME AS C3017	
C3025	CAPACITOR, Fixed, mica	CM20F102G03
C3027 thru C3038	SAME AS C3025	
CB3000	CIRCUIT BREAKER, DPST	SW251-2
CR3000	SEMICONDUCTOR DEVICE, Diode	1N547
DS3000	BUZZER, 230 Volt	BZ100
F3000	FUSE, Ctg	FU102-.500
J1202	CONNECTOR, Receptacle, female	MS3102A1 452S
J3000	CONNECTOR, Plug, male	MS3106B20-29P
J3001 thru J3004	CONNECTOR, Receptacle, bnc	JJ172
J3006	SAME AS J1202	
J3007	CONNECTOR, Receptacle, female	JJ337
J3008 thru J3014	SAME AS J3007	
J3015	CONNECTOR, Receptacle, bnc	UG625/U
J3016	SAME AS J3015	
J3017	SAME AS J3001	
K3000	CONTACT, HV	RL130-3
K3001	CONTACT, HV	RL130-5
M3003	TIMER, Interval	TI100
P3001 thru P3003	CONNECTOR, Plug, bnc	PL244-1
P3004	CONNECTOR, Plug, male	MS3106A14S 2P
P3005 thru P3007	CONNECTOR, Plug, bnc	PL244-1

Ref Symbol	Description	TMC Part Number
P3008	SAME AS P3004	
P3009	CONNECTOR, Plug, bnc	PL244-1
P3010 thru P3037	SAME AS P3009	
P3038	CONNECTOR, Plug, male	MS3106B20-27P
P3039	CONNECTOR, Plug, female	PL186
P3040	CONNECTOR, Plug, male (used on CAO551-7)	PL186
P3040	CONNECTOR, Plug, male (used on CAO551-5)	PL186
P3041	CONNECTOR, Plug, male (Used on CAO551-7)	PL187
P3041	CONNECTOR, Plug, male (used on CAO551-5)	PL187
P3042	SAME AS P3039	
P3043	SAME AS P3041	
P3046 thru P3053	SAME AS P3009	
P3056	SAME AS P3009	
P3057	SAME AS P3009	
P3058	CONNECTOR, Plug, female	MS3106A14S2S
P3059	CONNECTOR, Plug, male	PL218
P3060	CONNECTOR, Plug, female	PL176

Ref Symbol	Description	TMC Part Number
P3061	SAME AS P3059	
P3062	SAME AS P3060	
R3000	HEATING ELEMENT	RR127-1
R3001	SAME AS R3000	
R3002	SAME AS R3000	
R3005	RESISTOR, Fixed, composition	RC42GF330J
R3006	SAME AS R3005	
R3007	RESISTOR, Fixed, composition	RC42GF470J
T3002	TRANSFORMER, Power, auto	TF275
XF3000	FUSEHOLDER	FH104-3
	MODEL AM125	
C3010	CAPACITOR, Fixed, ceramic	CK70A102M
C3011 thru C3016	SAME AS C3010	
I3001	LAMP, Fluorescent	B1107
M3000	METER	MR173
M3001	VOLTMETER	MR118
M3002	VOLTMETER, KV	MR121
R3003	RESISTOR, Fixed, wirewound, 25 watt	RW102
S3000	STARTER, Filament lamp	P0170
T3001	BALLAST, Lamp	P0169
XI3001A	LAMPHOLDER	TS141
XI3001B	SAME AS XI3001A	
XS3000	SOCKET, Lamp starter	TS140

S2001A,B MULTIMETER		
POS	FUNCTION	FULL SCALE
1	V_1+V_2 PLATE CURRENT	100 MA
2	V_1+V_2 PLATE VOLTAGE	500V
3	V_3 BIAS	-50V
4	V_4 BIAS	-50V
5	V_3+V_4 SCREEN VOLTAGE	500V
6	V_3+V_4 SCREEN CURRENT	100MA
7	V_3+V_4 PLATE VOLTAGE	1000V
8	IPA GRID 1 ST RF	50V PK
9	IPA GRID 2 ND RF	50V PK
10	PA GRID A RF	500V PK
11	PA GRID B RF	500V PK

S2003 TEST SWITCH	
POS	FUNCTION
1	NORMAL
2	TEST

S2002 PLATE, MA		
POS	FUNCTION	FULL SCALE
1	PLATE A	150 MA
2	PLATES	300 MA
3	PLATE B	150 MA

S1201 LOAD COARSE ADJ		
POS	COUNTER READING	RESISTANCE (Ω)
1	10	25
2	20	35
3	30	50
4	40	70
5	50	100
6	60	120

S1202 LOAD FINE ADJ		
POS	COUNTER READING	RESISTANCE (Ω)
1	10	43
2	20	50

S1018	
POS	FUNCTION
1	POWER
2	CALIBRATE
3	SWR

NOTE:

1. ALL READINGS TAKEN WITH SIMPSON MODEL 260A OR EQUIV
2. VOLTAGE READINGS TAKEN WITH ALL PLUGS EXCEPT DRIVE CONNECTED
3. RESISTANCE READINGS ALL TO GROUND (CHASSIS) ALL ARE TAKEN WITH UNIT COMPLETELY DISCONNECTED AT REAR
4. WHERE 0 VOLTS AND 0 OHMS ARE OBVIOUS, SUCH AS GROUNDED CATHODE, NO READINGS ARE INDICATED

Figure 7-1. Schematic Diagram, GPT-10K (Sheet 1 of 3)

cK870 SH1

RF AMPLIFIER

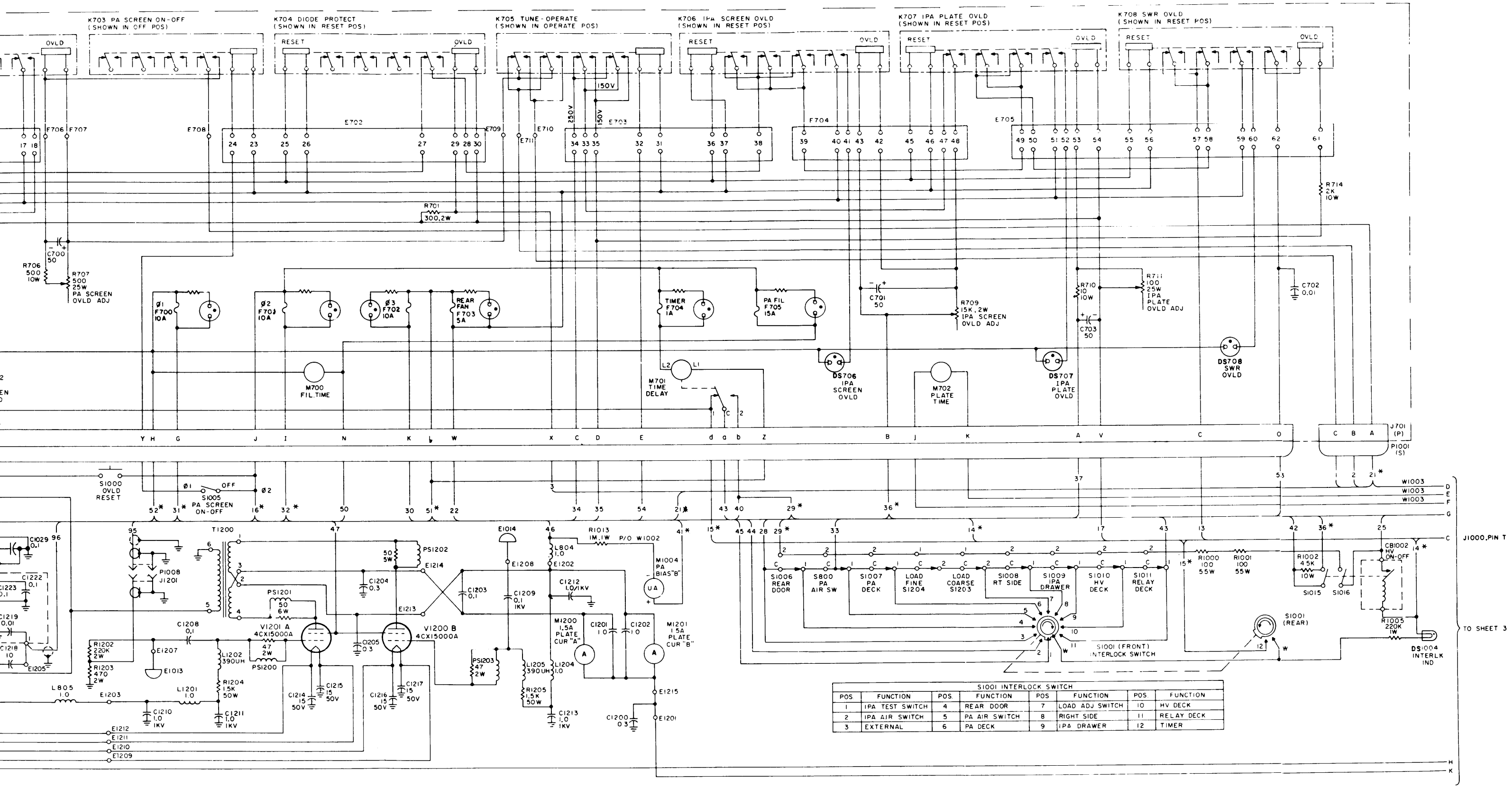
POS	FUNCTION	FULL SCALE
1	V1 + V2 PLATE CURRENT	100 MA
2	V1 + V2 PLATE VOLTAGE	500V
3	V3 BIAS	−50V
4	V4 BIAS	−50V
5	V3 + V4 SCREEN VOLTAGE	500V
6	V3 + V4 SCREEN CURRENT	100MA
7	V3 + V4 PLATE VOLTAGE	1000V
8	IPA GRID 1 ST RF	50V PK
9	IPA GRID 2 ND RF	50V PK
10	PA GRID A RF	500V PK
11	PA GRID B RF	500V PK

S2001A,B MULTIMETER

POS	
1	
2	
3	

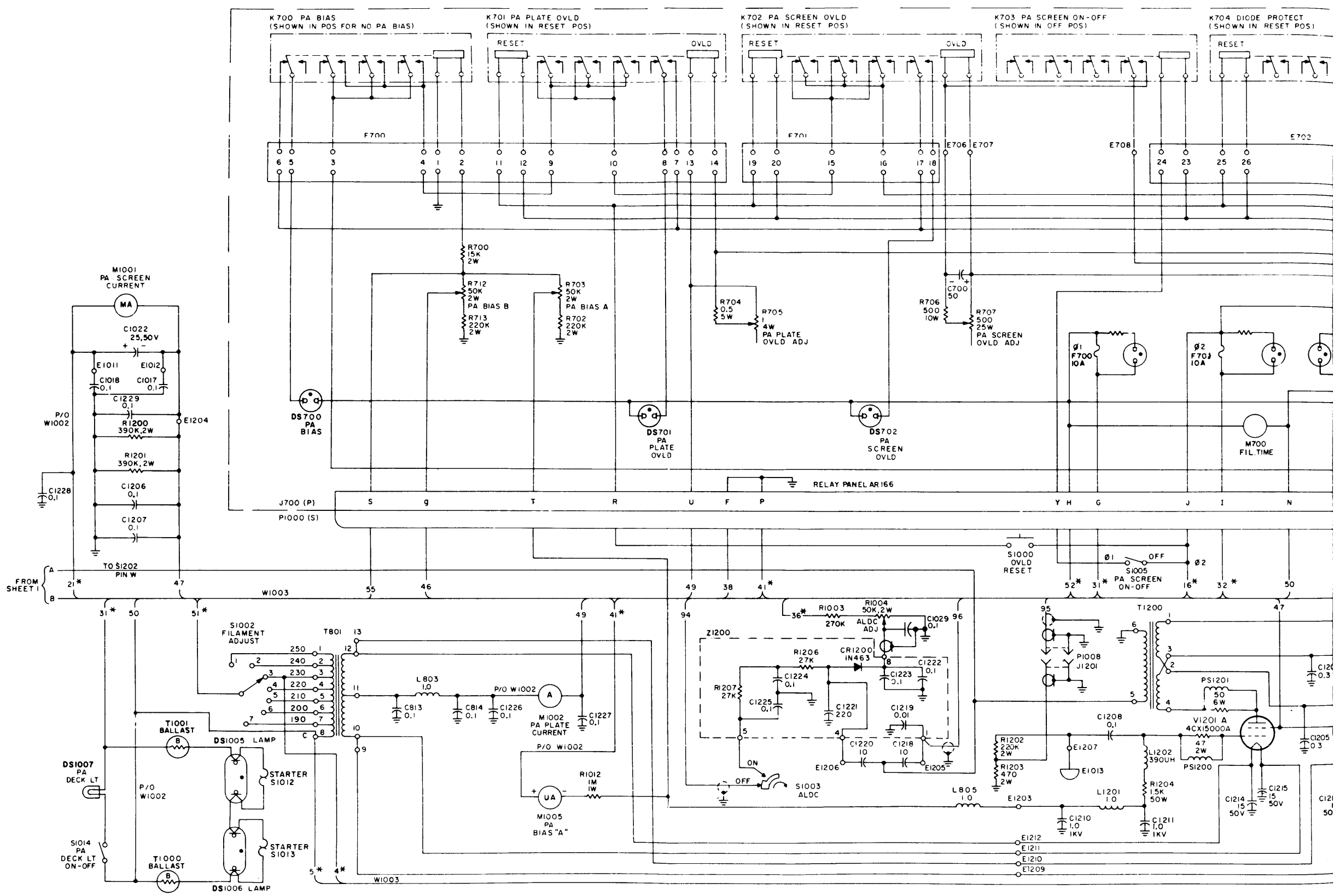
POS	
1	NO
2	
3	TE

S2002

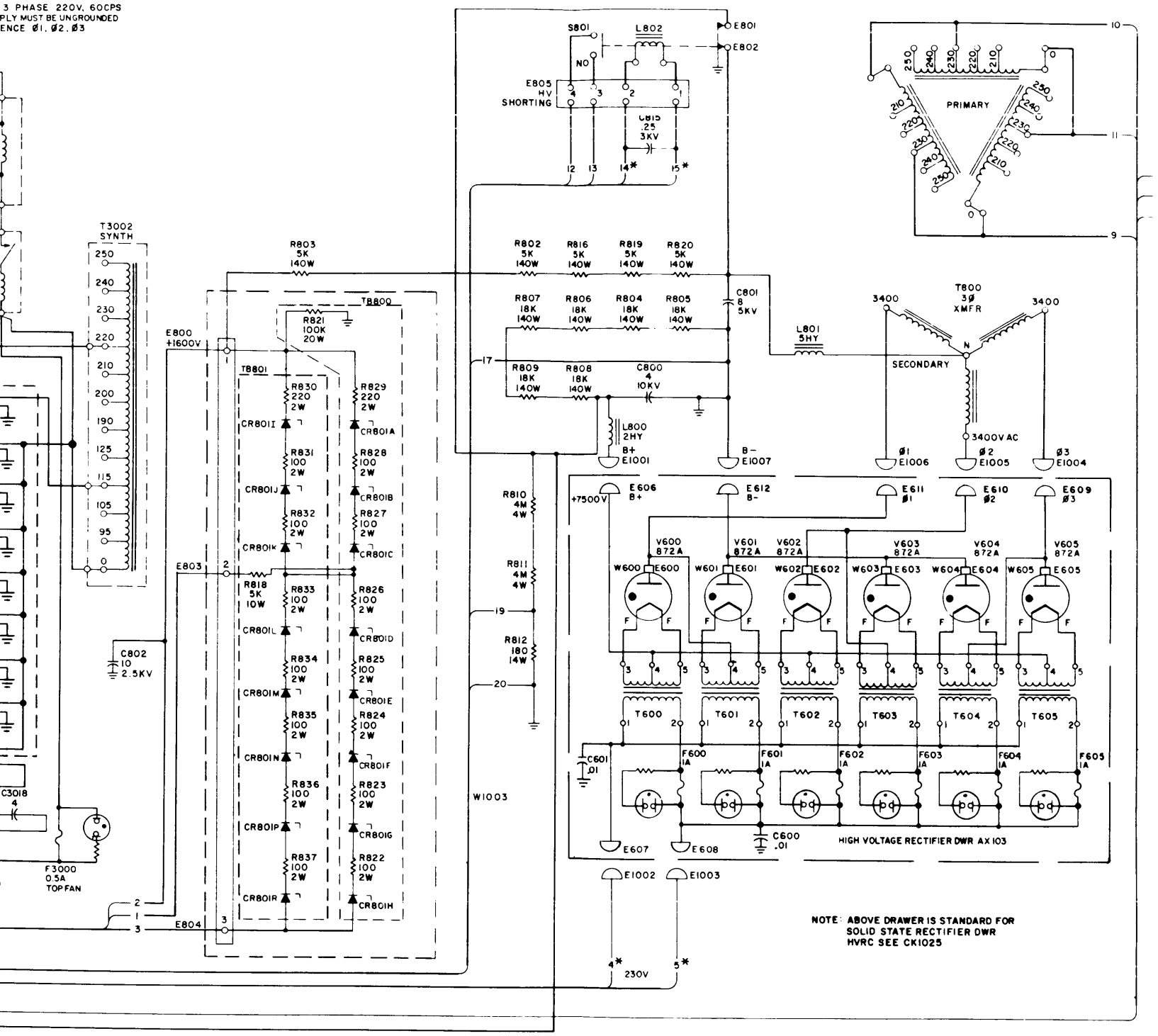


S1001 INTERLOCK SWITCH							
POS.	FUNCTION	POS.	FUNCTION	POS	FUNCTION	POS.	FUNCTION
1	IPA TEST SWITCH	4	REAR DOOR	7	LOAD ADJ SWITCH	10	HV DECK
2	IPA AIR SWITCH	5	PA AIR SWITCH	8	RIGHT SIDE	11	RELAY DECK
3	EXTERNAL	6	PA DECK	9	IPA DRAWER	12	TIMER

Figure 7-1. Schematic Diagram, GPT-10K, (Sheet 2 of 3)


K700 PA BIAS
(SHOWN IN POS FOR NO PA BIAS)
K701 PA PLATE OVLD
(SHOWN IN RESET POS)
K702 PA SCREEN OVLD
(SHOWN IN RESET POS)
K703 PA SCREEN ON-OFF
(SHOWN IN OFF POS)
K704 DIODE PROTECT
(SHOWN IN RESET POS)
RESET
OVLD
E700
E701
E706
E707
E708
E702
R700 15K 2W
R712 50K 2W PA BIAS B
R713 220K 2W
R703 50K 2W PA BIAS A
R702 220K 2W
R704 0.5 5W
R705 1 4W PA PLATE OVLD ADJ
R706 500 10W
C700 50
R707 500 25W PA SCREEN OVLD ADJ
DS700 PA BIAS
DS701 PA PLATE OVLD
DS702 PA SCREEN OVLD
Ø1 F700 10A
Ø2 F703 10A
M700 FIL. TIME
RELAY PANEL AR166
J700 (P)
P1000 (S)
M1001 PA SCREEN CURRENT
MA
C1022 25,50V
E1011
E1012
C1018 0.1
C1017 0.1
C1229 0.1
P/O W1002
R1200 390K 2W
E1204
R1201 390K, 2W
C1206 0.1
C1228 0.1
C1207 0.1
TO S1202 PIN W
FROM SHEET 1
W1003
S1000 OVLD RESET
S1005 PA SCREEN ON-OFF
OFF
S1002 FILAMENT ADJUST
T801
250
240
230
220
210
200
190
L803 1.0
C813 0.1
C814 0.1
C1226 0.1
M1002 PA PLATE CURRENT
C1227 0.1
P/O W1002
R1012 1M 1W
M1005 PA BIAS "A"
T1001 BALLAST
DS1005 LAMP
STARTER S1012
DS1007 PA DECK LT
S1014 PA DECK LT ON-OFF
T1000 BALLAST
STARTER S1013
DS1006 LAMP
Z1200
R1003 270K
R1004 50K, 2W ALDC ADJ
C1029 0.1
R1206 27K
CR1200 IN463
C1222 0.1
C1224 0.1
C1223 0.1
R1207 27K
C1225 0.1
C1221 220
C1219 0.01
C1220 10
C1218 10
E1206
E1205
ON
OFF
S1003 ALDC
L805 1.0
E1203
C1210 1.0 1KV
L1201 1.0
C1211 1.0 1KV
E1212
E1211
E1210
E1209
T1200
P1008 J1201
PSI201 50 6W
C1208 0.1
R1202 220K 2W
R1203 470 2W
E1207
E1013
L1202 390UH
R1204 1.5K 50W
V1201 A 4CX15000A
47 2W
PSI200
C1214 15 50V
C1215 15 50V
C1205 0.3

CK870 SH2



SYMBOL SERIES IDENTIFICATION		
SERIES	DESCRIPTION	MODEL
600	HIGH VOLTAGE RECTIFIER	AX-103
700	RELAY PANEL	AR-166
800	MAIN POWER SUPPLY	AP-125
1000	MAIN FRAME ASSEMBLY	AX-530
1200	POWER AMPLIFIER SECTION	AX-531
2000	R F AMPLIFIER	VLLA
3000	AUXILIARY FRAME ASS'Y	AX-534
1250	DIRECTIONAL COUPLER	AX-569

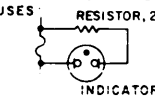
600 SERIES		700 SERIES	
LAST SYMBOLS	MISSING SYMBOLS	LAST SYMBOLS	MISSING SYMBOLS
C601		C703	R708
E612		E711	
DS605		DS705	
F605		F705	
T605		DS708	DS703–DS705
V605		J701	
W605		K708	
		M702	
		R714	

800 SERIES		1000 SERIES	
LAST SYMBOLS	MISSING SYMBOLS	LAST SYMBOLS	MISSING SYMBOLS
B800			
C815	C803, 804, 805, 806, 807, 808, 809, 810, 811, 812	C1039	C1000, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 23, 24
CR801R	CR800	CB1002	CB1001
E805	E800	E1014	E1000
L805		DS1009	DS1001, 1002
R837	R800, 801, 817	J1008	
S801		L1004	
T801		M1005	M1000
TB801		P1008	
		R1016	
		S1018	
		T1001	
		W1003	
		Z1000	

1200 SERIES		2000 SERIES	
LAST SYMBOLS	MISSING SYMBOLS	LAST SYMBOLS	MISSING SYMBOLS
B1200		B2001	B2000
C1229		C2040	C2000, 2027
CR1200		CR2008	CR2000
E1215	E1200	E2004	
J1202		F2005	F2000
K1200		J2002	
L1205	L1200, L1203	K2001	K2000
M1201		L2018	L2000
P1201		M2002	M2000
PS1203		PS2004	PS2000
R1207		R2051	
S1204	S1200	S2004	S2000
T1201		T2005	T2000
OC1200		V2011	V2000
V1201			
Z1200			

1250 SERIES	
LAST SYMBOLS	MISSING SYMBOLS
C1265	
CR1257	
E1251	
F1250	
J1250	
K1250	
L1251	
Q1250	
R1267	
T1251	

NOTES
UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE IN OHMS, 1/2 WATT. K-1000=MILLION
2. ALL CAPACITORS ARE IN MICROFARADS UUF=MICRO MICROFARADS
3. ALL COILS ARE IN MILLI HENRY UH=MICRO HENRY
4. ALL ROTARY SWITCHES ARE SHOWN IN POSITION ONE
5. FUSES:

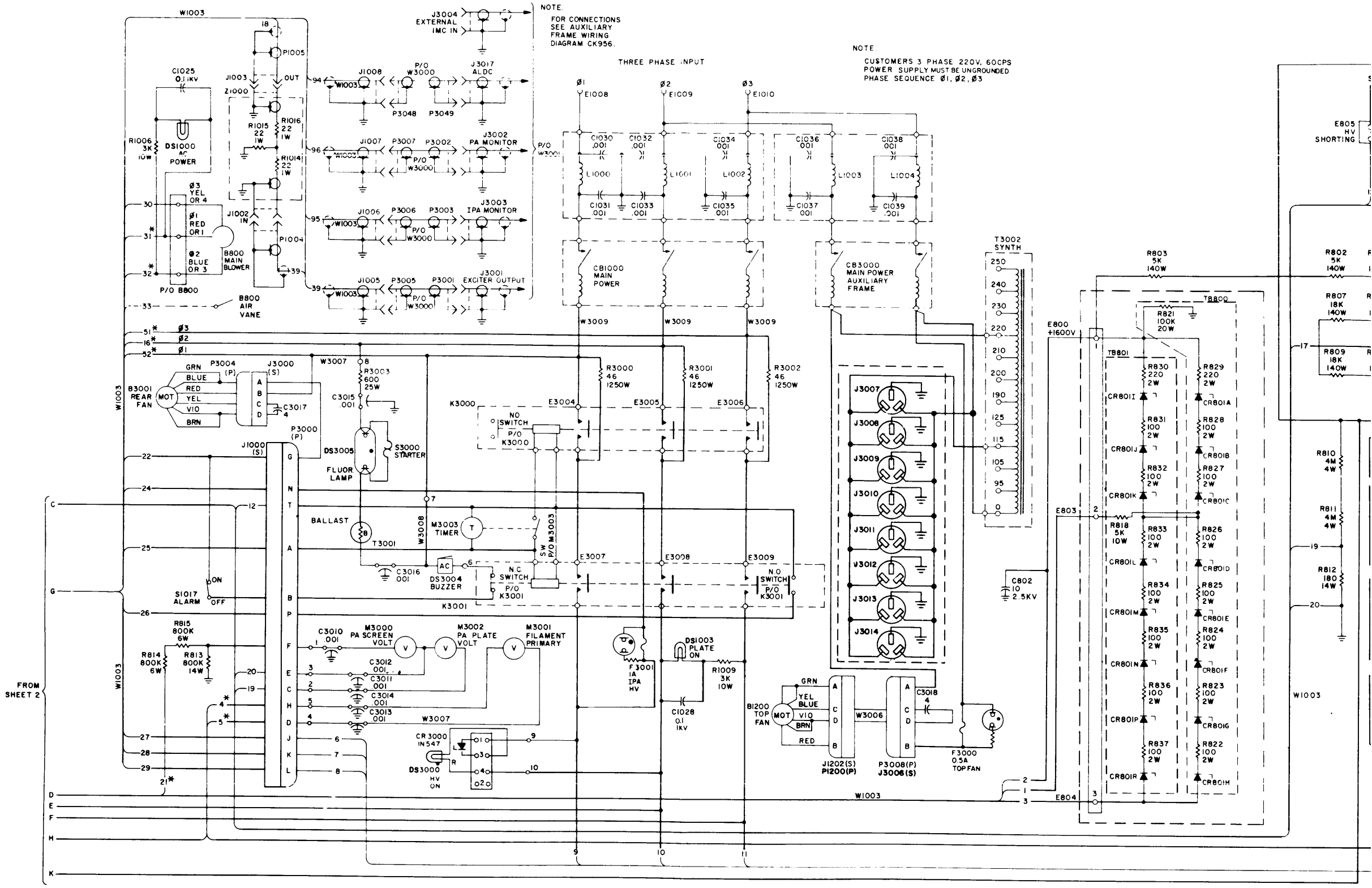


6. ON S2004, S800, S1006, S1007, S1008, S1009, S1010, S1011 S1012, S1203, AND S1204 OF INTERLOCK CIRCUIT TERMINAL NO.1 DESIGNATES SWITCH TERMINAL MARKED "NO" TERMINAL NO. 2 DESIGNATES SWITCH TERMINAL MARKED "NC" TERMINAL NO. 3 DESIGNATES SWITCH TERMINAL MARKED "NC" ALL ABOVE SWITCHES ARE SCHEMATICALLY SHOWN IN THE NORMALLY OPERATED POSITION.
7. * DENOTES MORE THAN ONE CONNECTION ON THE LINE

3000 SERIES		CONNECTIONS	
LAST SYMBOLS	MISSING SYMBOLS	LAST LINE	MISSING LINE
B3001	B3000	97	74
C3038	C3000, 1, 2, 3, 4, 5, 6, 7, 8, 9		
CR3000			
W3010			
CB3000, DS3005	DS3001–DS3003		
E3009, F3001			
J3017	J3001		
K3001			
M3003			
P3053			
R3003			
S3000			
T3002	T3000		

SOME 3000 SYMBOLS APPEAR ON AUXILIARY WIRING DIAGRAM CK956

Figure 7-1. Schematic Diagram, GPT-10K (Sheet 3 of 3)


NOTE.
FOR CONNECTIONS SEE AUXILIARY FRAME WIRING DIAGRAM CK956.
NOTE
CUSTOMERS 3 PHASE 220V, 60CPS POWER SUPPLY MUST BE UNGROUNDED PHASE SEQUENCE Ø1, Ø2, Ø3
THREE PHASE INPUT
W1003
J3004 EXTERNAL IMC IN
J3017 ALDC
J3002 PA MONITOR
J3003 IPA MONITOR
J3001 EXCITER OUTPUT
P3048
P3049
C1025 0.1 IKV
R1006 3K 10W
DS1000 AC POWER
R1015 22 1W
R1016 22 1W
R1014 22 1W
Ø3 YEL OR 4
Ø1 RED OR 1
Ø2 BLUE OR 3
B800 MAIN BLOWER
P/O B800
B800 AIR VANE
Ø1 E1008
Ø2 E1009
Ø3 E1010
C1030 .001
C1032 .001
C1034 .001
C1036 .001
C1038 .001
L1000
L1001
L1002
L1003
L1004
C1031 .001
C1033 .001
C1035 .001
C1037 .001
C1039 .001
CB1000 MAIN POWER
CB3000 MAIN POWER AUXILIARY FRAME
W3009
T3002 SYNTH
E800 +1600V
R803 5K 140W
R821 100K 20W
TB800
TB801
R802 5K 140W
R807 18K 140W
R809 18K 140W
R810 4M 4W
R811 4M 4W
R812 180 14W
E805 HV SHORTING
B3001 REAR FAN
GRN
BLUE
RED
YEL
VIO
BRN
P3004 (P)
J3000 (S)
C3017 4
W3007
R3003 600 25W
C3015 .001
DS3005 FLUOR LAMP
S3000 STARTER
K3000
NO SWITCH P/O K3000
E3004
E3005
E3006
R3000 46 1250W
R3001 46 1250W
R3002 46 1250W
J3007
J3008
J3009
J3010
J3011
J3012
J3013
J3014
C802 10 2.5KV
J1000 (S)
P3000 (P)
BALLAST
T3001
M3003 TIMER
W3008
SW P/O W3003
E3007
E3008
E3009
N.O. SWITCH P/O K3001
C3016 .001
DS3004 BUZZER
N.C. SWITCH P/O K3001
K3001
S1017 ALARM
ON
OFF
R815 800K 6W
R814 800K 6W
R813 800K 14W
C3010 .001
M3000 PA SCREEN VOLT
M3002 PA PLATE VOLT
M3001 FILAMENT PRIMARY
C3012 .001
C3011 .001
C3014 .001
C3013 .001
CR 3000 IN547
DS3000 HV ON
F3001 1A IPA HV
DS1003 PLATE ON
C1028 0.1 IKV
R1009 3K 10W
B1200 TOP FAN
J1202(S) P1200(P)
P3008(P) J3006(S)
C3018 4
F3000 0.5A TOP FAN
R830 220 2W
R829 220 2W
R831 100 2W
R828 100 2W
R832 100 2W
R827 100 2W
R818 5K 10W
R833 100 2W
R826 100 2W
R834 100 2W
R825 100 2W
R835 100 2W
R824 100 2W
R836 100 2W
R823 100 2W
R837 100 2W
R822 100 2W
CR801I
CR801A
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FROM SHEET 2
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