TECHNICAL MANUAL

for

HIGH FREQUENCY
LINEAR POWER AMPLIFIER
HFLM 10 K

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

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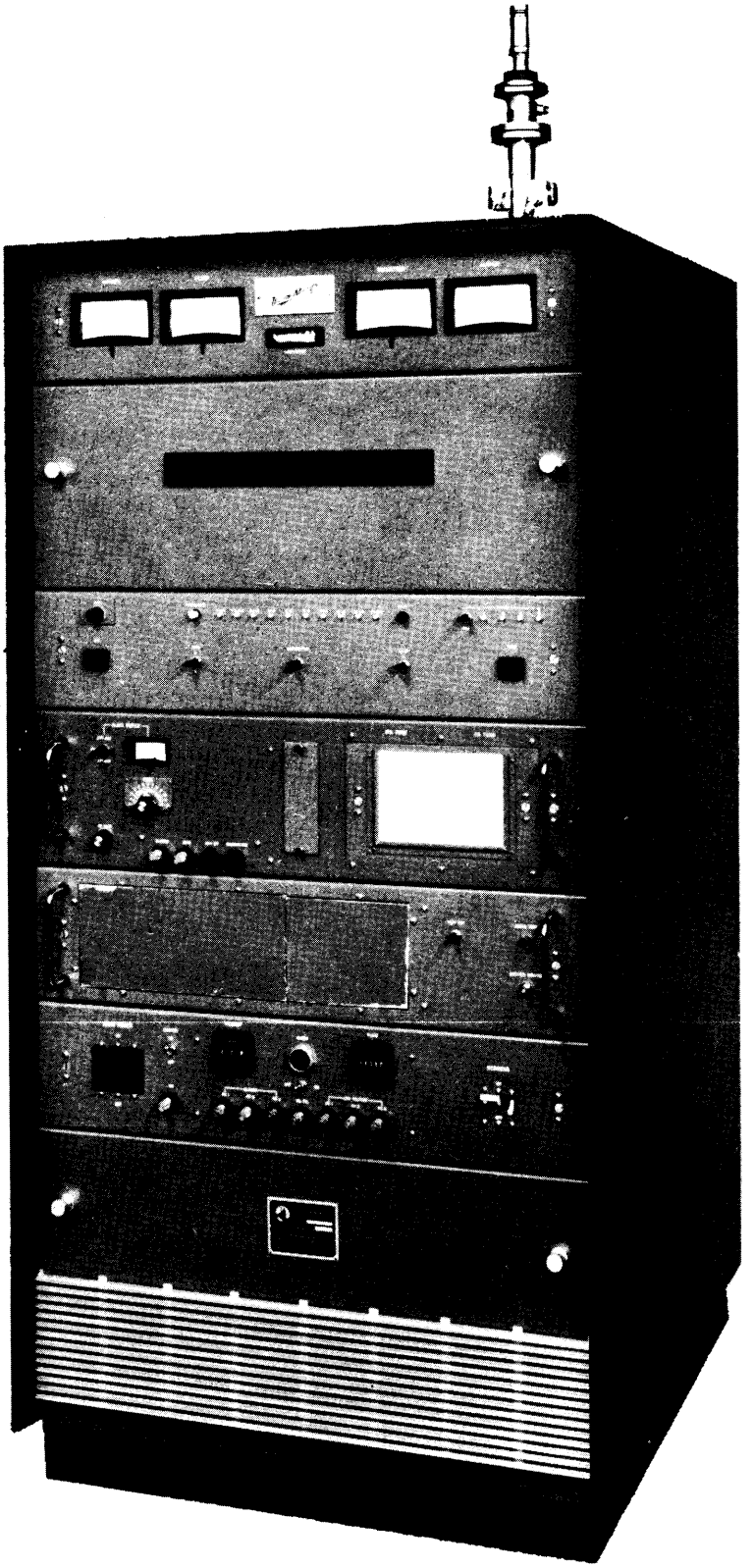


Figure 1-1. High Frequency Linear Power Amplifier HFLM-10K

SECTION 1

GENERAL INFORMATION

1-1. PURPOSE OF EQUIPMENT.

The HFLM-10K (hereinafter referred to as HFLM or linear amplifier) is a conservatively rated high powered linear amplifier and when used with a suitable exciter delivers up to 10 kilowatts peak envelope power (PEP) or average power throughout the frequency range of 2 MHz to 30 MHz.

1-2. EQUIPMENT MAKE-UP.

Table 1-1 lists the major components of the transmitter.

TABLE 1-1. MAJOR COMPONENTS

TMC Designation	Assembly No.
Main Frame Sub-Assembly	AX5112
Meter Panel	AX5083-2
PA Section	AX5114-2
IPA Drawer	AX5113-2
Exciter Drawer	AX5110-2
Main Control Panel	AX5082
Main Power Supply	AP-148
Harmonic Filter	AF-110

1-3. DESCRIPTION OF MAJOR COMPONENTS.

a. General - As shown in figure 1-1, the Linear Amplifier consists of a single frame, housing all the components of the transmitter. Primary power connections are made through the access hole on the base assembly. Linear amplifier RF power is routed through a directional coupler mounted in the opening located on the top of the frame. The frame houses an exciter drawer, a two-stage broadband linear amplifier, an intermediate power amplifier, a 10 kw power amplifier, and associated power supplies and control circuits. The rf components are distributed through the upper portion of the frame, and the heavy power supply components are bolted to the base channels of the frame.

b. Main Meter Panel - The main meter panel contains five meters. These meters monitor PA PLATE current, PA SCREEN current, LOAD SENSE, REFLECTED power, and PA OUTPUT power. The PA OUTPUT meter is calibrated in kilowatts (average power).

c. Power Amplifier (PA) - The power amplifier section mounted directly below the main meter panel contains the variable TUNE and LOAD capacitors, PA BANDSWITCH and the power amplifier tube. The power amplifier tube is a high powered tetrode, Model 8794, connected in an rf grounded grid configuration, operating class AB1, and delivers up to 10 kilowatts of power. The output circuit is a modified parallel L circuit designed to match an unbalanced antenna of 50 ohms with a VSWR to 3:1.

d. IPA Drawer - The IPA is slide mounted directly below the main control panel and serves as the intermediate power amplifier between exciter and power amplifier. The IPA drawer contains two broadband rf amplifiers and a final rf amplifier which provides drive to the PA section. The final IPA tube (8576) is

aircooled by a self contained blower within the IPA drawer. IPA bandswitching is accomplished via the BAND-SWITCH control on the main control panel. HFLM bias supply and 24 vdc supply are located in the IPA drawer.

e. Exciter Drawer - The exciter drawer is slide mounted directly below the IPA drawer and houses the sideband exciter used to drive the linear amplifier in the HFTM-10K.

A TEST KEY, AUDIO TEST input jack and EXCITER MONITOR jack are mounted on the exciter drawer front panel for monitoring and testing purposes.

f. Main Power Panel - The main power panel mounted directly below the exciter drawer controls the application of transmitter primary power. The MAIN POWER breaker, when ON, applies the required voltages to the IPA and PA sections of the HFLM. Other front panel controls include a high voltage aural ALARM with its associated ON/OFF switch, PLATE and FILAMENT time meters, which monitor plate and filament elapsed time, EXCITER ON/OFF switch, which applies ac power to an exciter (in HFTM-10K configuration) and SCREEN breakers which apply screen voltage to the HFLM-10K.

g. Main Power Supply - The main power supply is mounted on the bottom of the transmitter frame. The power supply contains a high voltage transformer and associated circuitry to provide plate and screen voltages to the rf amplifiers within the transmitter.

h. Harmonic Filter - The harmonic filter is a fixed low pass filter supplying additional harmonic suppression from the 17 MHz second harmonic and higher. The filter is mounted in the front of the PA section directly behind the PA window.

1-4. TECHNICAL SPECIFICATIONS.

FREQUENCY RANGE:	2 to 30 MHz standard.
OPERATING MODES:	SSB, ISB, CW, AM, FSK and FAX (depends on exciter used).
POWER OUTPUT:	10, 000 watts
OUTPUT IMPEDANCE:	50 ohms unbalanced with VSWR to 3:1 EIA flange for 1-5/8" coax.
TUNING:	Manual with TUNE and LOAD control
SPURIOUS SIGNALS:	At least 60 db below full PEP output.
HARMONIC SUPPRESSION:	Harmonics at least 50 db down from PEP output.
HARMONIC FILTER:	Low pass suppression of all harmonic frequencies above 34 MHz.
METERING:	Meters with special illuminated overload protection.
HUM and NOISE:	Hum and noise 55 db down from full PEP output.
COOLING:	Filtered forced air cooling semi-pressurized cabinet.
ENVIRONMENTAL:	Designed to operate in any ambient temperature between the limits of 0 and 50°C. for any value of humidity to 90%.

SPECIAL FEATURES:	Adjustable overload protection, bias protection and alarm. Controlled and adjustable ALDC. Safety interlocks at all high voltage points. Shorting relay.
PRIMARY POWER:	230 vac, 50/60 Hz, 3 phase.
POWER REQUIREMENTS:	Maximum 25,000 watts. All solid state power supply.
SIZE:	33-1/2" w. x 38" d. x 69" h. standard.
INSTALLED WEIGHT:	Approximately 1300 pounds.
SHIPPING WEIGHT:	Approximately 1660 pounds.
SIZE OF LARGEST SHIPPING CONTAINER:	43" w. x 49" l. x 81" h.
COMPONENTS AND CONSTRUCTION:	Manufactured in accordance with JAN/MIL wherever practicable.

TABLE 1-2. TUBE COMPLEMENT

Reference Designation	Part No. or Type	Function
V1301	8233	1st Amp
V1302	4CX359A	2nd Amp
V1401	8576	IPA
V701	8794	PA

TABLE 1-3. PRINTED CIRCUIT CARD COMPLEMENT

Reference Designation	Part No. or Type	Function
A707	A4822	ALDC Rectifier
A705	A4843	Remote Pwr Assy
A4003	A4802	Main Overload Bd.
A4001	A4800	PA Plate Overload
A4002	A4800	PA Screen Overload
A5001	A4791	Bandswitch Indicator
A3001	A4809	External Input Bd.
A3002	A4810	External Input Bd.
A1006	A4801	IPA Plate Overload
A1007	A4833-2	Bias Control
A702A1	A4830	PA Tune Control
A703A1	A4831	PA Load Control

SECTION 2

INSTALLATION

2-1. EQUIPMENT INSPECTION.

The HFLM-10K Linear Power Amplifier hereafter referred to as HFLM-10K was assembled, calibrated and tested at the factory before shipment. Inspect all packages for possible damage during transit. Carefully unpack each crate as indicated by the packing list provided with the transmitter shipment. Inspect all packing materials for parts that may have been shipped as LOOSE ITEMS (connectors, Technical Manuals, hardware, etc.).

2-2. EQUIPMENT PACKAGING.

The equipment is shipped in boxes as shown by figure 2-1 (typical equipment packaging). The box number and contents are stenciled on the outside of each box. Whether an equipment is crated or uncrated, various precautions must be observed in handling to prevent personnel injury and/or damage to the equipment.

2-3. PACKAGING DATA.

The HFLM-10K is packed in six crates, including LOOSE ITEMS crate (refer to Table 2-2). Each crate is assigned a number which appears on the crate. Table 2-1 lists the crated weights and dimensions of the HFLM-10K. Figure 2-3 illustrates the outline dimensions. Figure 2-5 shows typical packaging.

TABLE 2-1. CRATED WEIGHTS, DIMENSIONS AND CONTENTS

Crate No.	Contents	Gr. Wt.	Cu. Ft.	Dimensions in Inches		
				D	W	H
1	Loose Items	130	13.4	32	23-7/8	30-3/4
2	Frame	947	96.8	48	42-3/8	80-1/4
3	Exterior Covers	280	20.7	73-3/8	45-3/8	14-1/8
4	TF 203	536	7.9	28-3/4	19-3/4	24
5	Driver Drawer	195	14.9	41	31	19-3/8
6	Exciter Drawer	190	14.9	41	31	19-3/8

TABLE 2-2. LOOSE ITEMS

1. Shorting Stick, 1 each, TMC P/N A-1990-6
2. Connector, 1 each, TMC P/N MS3106B32-7P
3. Connector, 2 each, TMC P/N UG88/U
4. Connector, Holder, 1 each, TMC P/N MS3057-20
5. Rubber Bushing, 1 each, TMC P/N MS3420-8
6. Lug, 3 each, TMC P/N TE-197-6-25
7. Lug, 1 each, TMC P/N TE-197-6-37
8. Phone Jack, 1 each, TMC P/N PJ051R
9. Phone Jack, 1 each, TMC P/N PJ055B
10. Phone Jack, 1 each, TMC P/N PJ068B
11. Screw, 8 each, TMC P/N SCHH3118BN20
12. Washer, 16 each, TMC P/N FW31HBN
13. Washer, 8 each, TMC P/N LWS31HBN
14. Washer, 8 each, TMC P/N NTH3118BN16
15. Screw, 20 each, TMC P/N SCHH2520-SS12
16. Washer, 20 each, TMC P/N FW25HBN
17. Washer, 20 each, TMC P/N LWS25MRN
18. Screw, 4 each, TMC P/N SCBP1032BN10

TABLE 2-2. LOOSE ITEMS (CONT)

19. Washer, 4 each, TMC P/N FW10HBN
20. Washer, 4 each, TMC P/N LWE10MRN
21. Screw, 4 each, TMC P/N SCHH5013BN48
22. Washer, 4 each, TMC P/N LWS50LBN
23. Washer, 4 each, TMC P/N FW50HBN
24. Output Connector, 1 each, TMC PN/ DC-104 removed from top of frame.
25. Tube Electron, 1 each TMC P/N 8794 removed from PA Section.
26. Resistor, 1 each, TMC P/N RW118F502 ref./ syms. R801 removed from PS section.
27. Resistor, 1 each, TMC P/N RW118F252 ref./syms. R802 removed from PS section.
28. Resistor, 1 each TMC P/N RW118F310 ref./ syms. R803 removed from PS section.
29. Relays, 4 each TMC P/N RL168-3C-10-24DC ref./ syms. K2001, K2002, K2004 and K2005 removed from Exciter Drawer.
30. Relays, 1 each, TMC P/N RL168-2C-10-24DC ref./sym. K2003 removed from exciter drawer.
31. Tube Electron, 1 each, TMC P/N 8576 removed from driver drawer.
32. Warranty, for TMC P/N 8576 Tube Electron.
33. Test Data, 1 set.
34. Instruction Manual, 1 each.

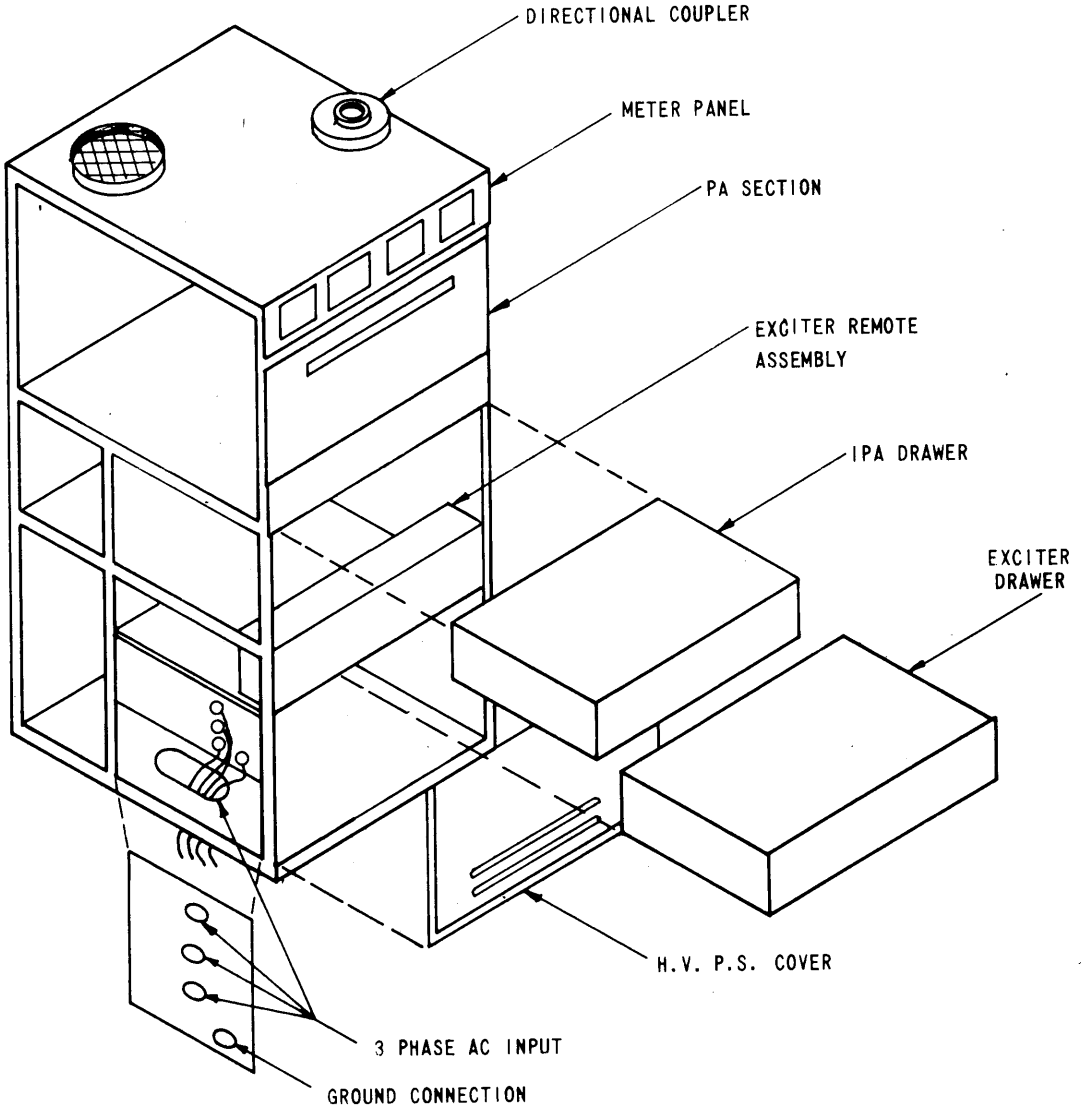


Figure 2-1. Typical Installation

2-4. INSPECTION AND DAMAGE.

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.

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

2-5. 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, inspection and damage, proceed as follows:

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

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

c. 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.

d. If equipment is not packed in a cardboard carton, remove it from crate.

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

Where applicable, remove the following:

(1) Creased cardboard blocking pieces

(2) Barrier bags

(3) Tape

(4) Molded cushioning

(5) Cellulose wadding

(6) Tissue paper.

f. Check off items unpacked on the packing list or equipment supplied list.

NOTE

Anticipating the possibility of repacking 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.

2-6. INSTALLATION OF MODULAR UNITS.

(Refer to figure 2-1, HFLM-10K installation for information regarding cabinet location of all modular units.) The following modular units are slide mounted.

IPA Drawer

Exciter Drawer

To install any slide-mounted unit in its compartment, proceed as described below for each modular unit.

a. Untape or unstrap cable assemblies and all other components secured to the rack frame for shipment.

b. Pull center section of associated track out until it locks in an extended position.

c. Position slide mechanisms of modular unit in tracks, and ease modular unit forward into rack until release buttons engage hole in track.

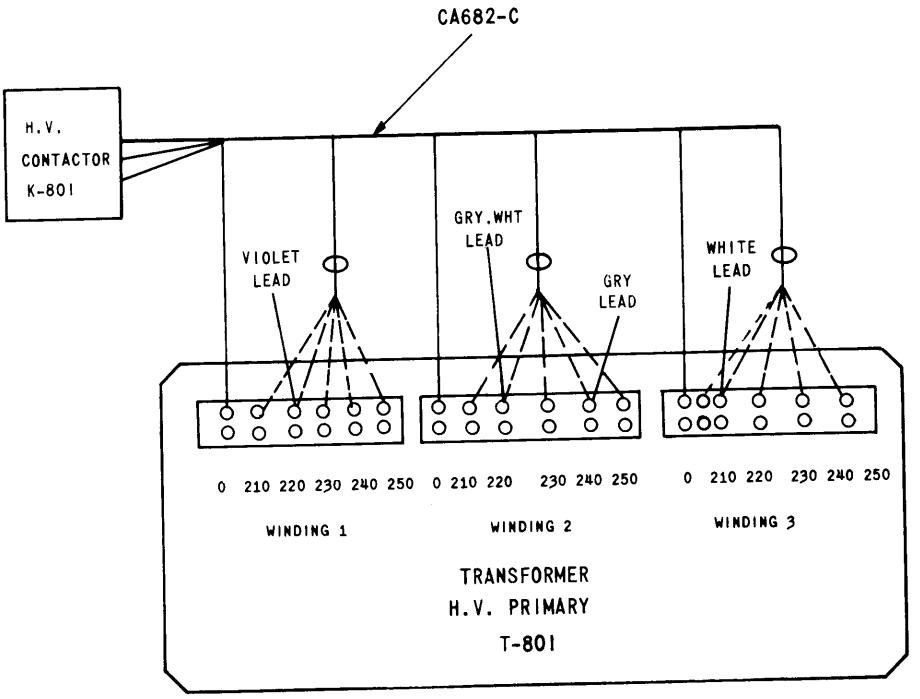


Figure 2-2. Transformer HV Primary Connections

d. Start at the bottom and proceed up to prevent the rack from tipping over.

e. Make the necessary cable and electrical connections to the modular unit.

f. Depress release buttons and slide modular unit completely into compartment.

g. Secure front panel of modular unit to the rack with screws.

2-7. PRIMARY POWER REQUIREMENTS.

The Transmitter requires a three phase source voltage of 230 vac 50/60 cps. The maximum power requirement is 25,000 watts. (380 vac and 440 vac inputs utilizing an externally mounted autotransformer are available on customer request.)

2-8. PRIMARY AC INPUT CONNECTIONS.

Refer to figure 2- 1 Primary power cables and station ground cables enter the HFLM through an access hole located in the bottom of the high voltage power supply compartment. To connect the primary power and ground to their respective lugs, proceed as follows:

CAUTION

Insure PRIMARY THREE PHASE AC IS OFF AND
TAGGED before making connections to HFLM.

a. Loosen panel locks on the cover of the high voltage power supply, and temporarily remove cover. (Place cover in safe place to avoid damaging or scratches.)

b. Loosen and remove lockwashers and nuts on primary ac input board. (Do not discard.)

c. Connect primary three phase ac cables to ac input board and secure with hardware removed in step b.

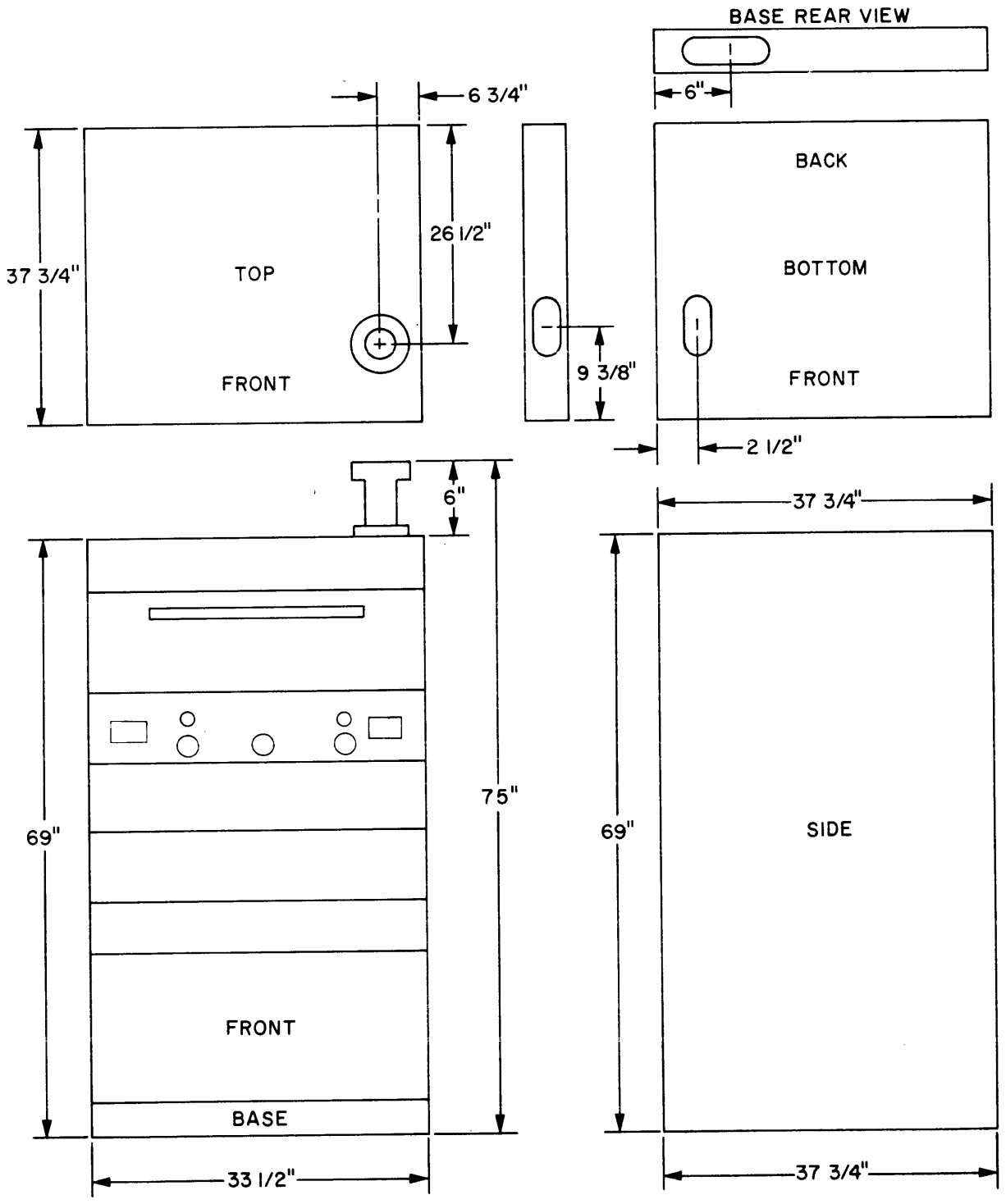


Figure 2-3. Outline Dimensional

d. Measure the dc resistance to ground of each ac input terminal to insure that no short circuits or low resistance to ground have occurred.

e. Remove test instrument from HFLM and replace high voltage power supply cover.

2-9. HIGH VOLTAGE TRANSFORMER INSTALLATION (PRIMARY AC POWER MUST BE OFF).

CAUTION

The High Voltage Transformer is extremely heavy, use fork-lift or some lifting device when attempting installation.

a. Remove transformer from crate, position transformer in such a manner that when installed in the bottom of frame, the front or primary terminals of transformer will be facing the front of the HFLM. (Transformer should enter frame from the rear of the power supply section.)

b. Move all leads aside that may be in the path of the transformer prior to actual installation.

c. Refer to figure 5-12 and position transformer in frame accordingly. Connect transformer leads in the following manner: Refer to figure 2-2 and connect CA-682 to transformer primary terminals. Each of the three primary sections will have three heavy insulated black leads that must be connected between terminal "0" and the corresponding primary ac input voltage tap (210, 220, 230, 240 and 250).

Additionally, there are small insulated leads that must be connected to the primary sections. (Refer to figure 2-2.) Connect:

Violet lead to 220v terminal of first primary winding
Gray-white lead to 220v terminal of second primary winding
Gray lead to 240v terminal of second primary winding
White lead to 220v terminal of third primary winding

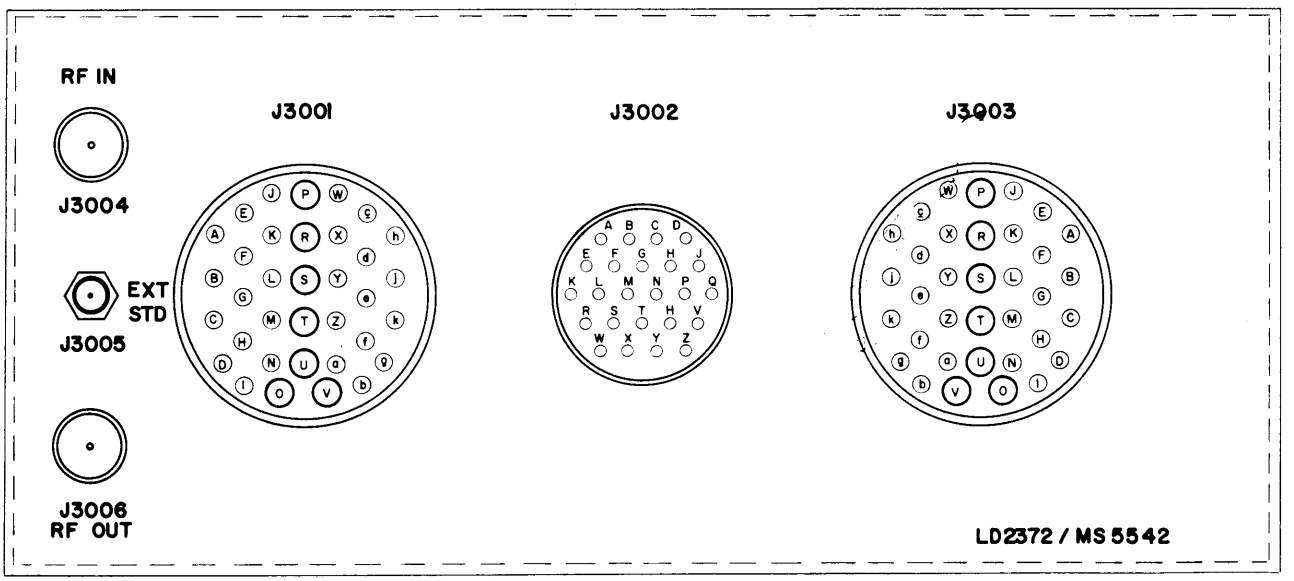


Figure 2-4. Input Chassis (As Viewed from Rear of Transmitter)

2-10. TRANSFORMER SECONDARY CONNECTIONS.

The secondary terminals of transformer T801 are located in the rear of transmitter, connect secondary leads in the following manner. (Refer to figure 5-12 HFLM Overall Rear View.)

CONNECT FROM	CONNECT TO
Top rectifier (CR802)	right 3400v terminal on T801
Middle rectifier (CR802)	middle 3400v terminal on T801
Bottom rectifier (CR802)	left 3400v terminal on T801

Connect heavy teflon insulated lead from "N" terminal to L802.

WARNING

INSURE THAT ALL PERSONNEL ARE CLEAR FROM TRANSMITTER BEFORE PROCEEDING.

2-11. PRIMARY PHASE ROTATION CHECK.

a. Apply primary ac voltage to HFLM and place MAIN POWER breaker to ON position. The main blower should operate. Operate BANDSWITCH control and observe that band indicators light from left to right as BANDSWITCH control is operated.

b. Place MAIN POWER breaker OFF, check rotation of main blower as follows: In the rear of frame between the power amplifier tube and PA bandswitch, the main blower hub and air fins can be seen; when the blower is rotating in the right direction, the hub and air fin will be rotating counterclockwise as viewed from the rear of the HFLM-10K transmitter PA deck. Additionally the band indicators must light from left to right as viewed from HFLM front panel.

NOTE

If blower rotation or band indicator lighting sequence is incorrect, place MAIN POWER breaker OFF. INSURE PRIMARY AC IS OFF and reverse any two ac input phase leads. Blower rotation and band switch indicator lighting sequence should be correct.

2-12. HIGH VOLTAGE CHECK.

Once transformer T801 has been installed and wired according to paragraphs 2-9 and 2-10, it is recommended that a high voltage check be performed. To do this, carefully read the instructions below and proceed with extreme caution.

WARNING

WHEN MEASURING AC VOLTAGE, USE EXTREME CAUTION. DO NOT TOUCH METER OR LEADS WHEN VOLTAGE IS ON. AFTER MEASURING VOLTAGE, PLACE PRIMARY BREAKER OFF BEFORE MOVING METER LEADS.

a. Insure PRIMARY AC BREAKER IS OFF AND TAGGED.

b. Place MAIN POWER breaker and SCREEN breakers to OFF position.

c. Place an ac voltmeter across two of the three phase ac input lines to measure the primary ac voltage. Measure ac voltage (DO NOT TOUCH METER OR LEADS) and note the value of the measured voltage. Place primary breaker off and remove test meter.

d. Transformer primary leads should be connected to the appropriate transformer tap that corresponds to the primary ac input voltage measured in paragraph c. (220 vac, 230 vac, 240 vac or 250 vac.)

e. Clear personnel from HFLM and apply primary ac.

f. Place MAIN POWER breaker and SCREEN breakers to the ON position.

g. Wait approximately 10 to 15 minutes for all IPA tube filaments to warm up and INTERLOCK indicator to light (indicating completion of interlock circuit).

h. Press HIGH VOLTAGE pushbutton to apply high voltage and HIGH VOLTAGE indicator should light.

i. Press HIGH VOLTAGE pushbutton to OFF (HIGH VOLTAGE indicator must go out). Place MAIN POWER breaker to OFF position. Short out all high voltage points to ground with high voltage shorting stick provided.

2-13. POWER AMPLIFIER TUBE INSTALLATION (V701).

CAUTION

Finger contacts located inside mounting socket for tube V701 must not be bent. Check contacts carefully before attempting to install tube in socket.

a. Observe finger contacts inside the tube socket.

b. Carefully lift tube V701 (contained in crate no. 1) up into air duct in PA section of frame (raise top portion of air duct) until base of tube clears socket.

c. Carefully lower tube straight down into socket until slight resistance is encountered. Make sure tube is centered in socket.

d. In one motion while firmly grasping tube, 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. Caution should be observed in seating tube so as not to damage finger contacts in socket. Check tube seating; it must be all the way down and centered in tube socket.

e. Tighten retaining strap so that tube is held securely in place.

2-14. PA FILAMENT VOLTAGE CHECK. (Refer to figure 5-12 and figure 7-1.)

a. Once the power amplifier tube has been installed in tube socket, perform the following filament voltage check:

(1) Place ac voltmeter leads across the secondary winding of T804 for the purpose of measuring the filament voltage.

(2) Place meter in such a manner that it can easily be seen a safe distance from the HFLM.

(3) Insure that personnel are clear and place primary power breaker and MAIN BREAKER to the ON positions. (HIGH VOLTAGE AND SCREEN BREAKERS MUST BE OFF.)

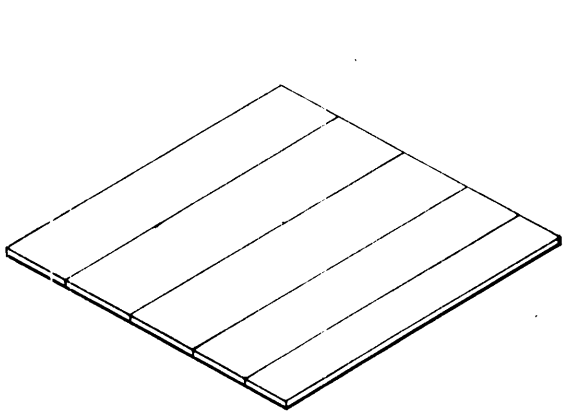
(4) Measure the filament voltage; it should be between 5.7 to 6.0 vac.

(5) If measured voltage is not within specified limits, place MAIN POWER BREAKER OFF.

(6) Relocate the connection on terminal No. 2 of T804 to a terminal (3, 4, 5, 6, 7) that will provide a secondary output of 5.7 to 6 vac. (Repeat steps (3) through (5) as necessary to obtain the proper filament voltage requirement.)

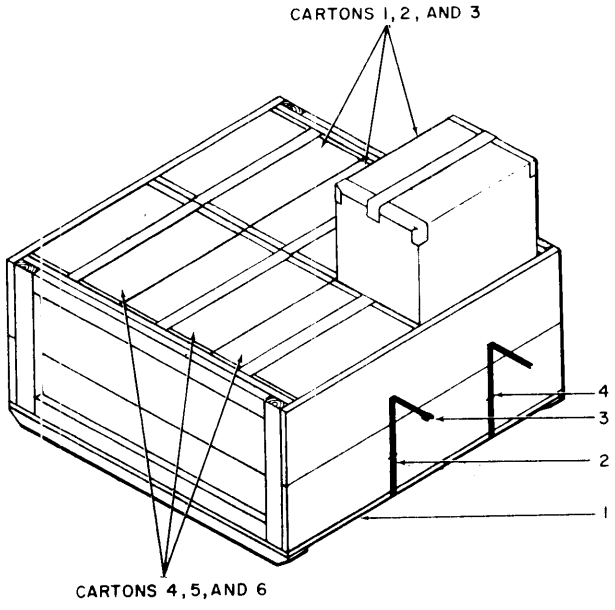
(For a schematic diagram reference refer to Figure 7-1, Sheet 5.)

(7) After the correct value has been obtained, place MAIN BREAKER to OFF position and remove test meter and leads.

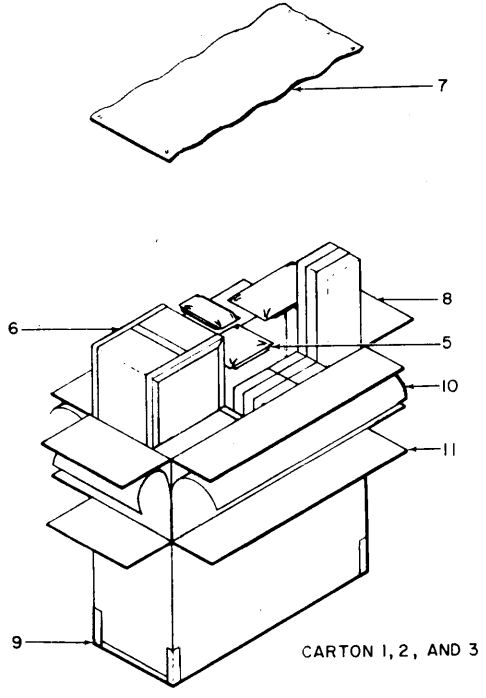


LEGEND

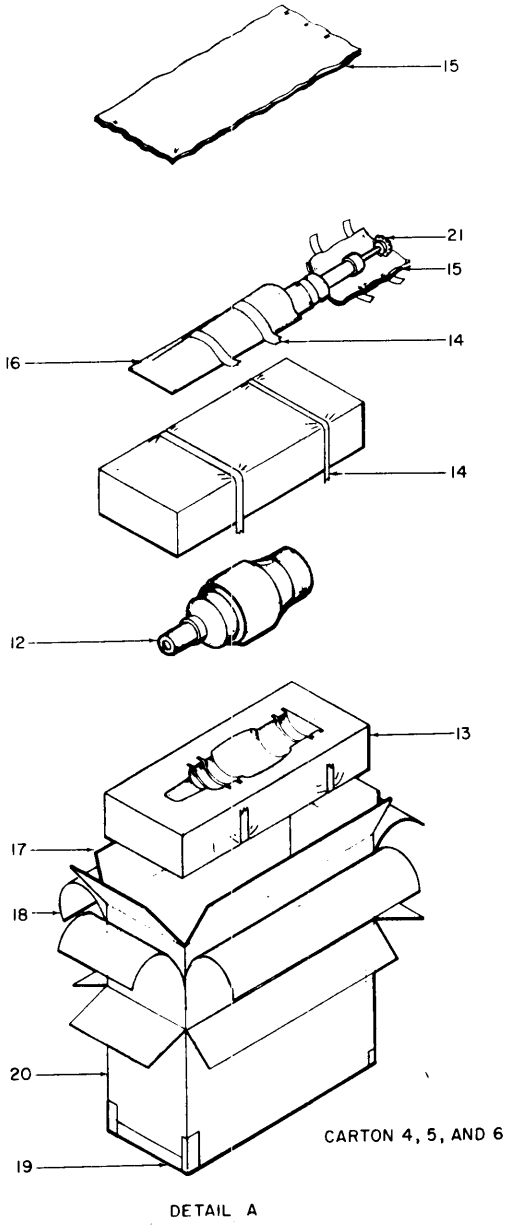
1. WOODEN BOX
2. STEEL STRAPPING
3. STRAPPING SEALS
4. STEEL STAPLES
5. BARRIER BAG
6. FIBERBOARD BOX
7. CELLULOSIC WADDING
8. FIBERBOARD BOX
9. PRESSURE SENSITIVE TAPE
10. BARRIER BAG
11. FIBERBOARD BOX
12. CAPACITOR
13. MOULDED CUSHIONING
14. MARKING TAPE
15. TISSUE PAPER
16. BARRIER BAG
17. FIBERBOARD BOX
18. BARRIER BAG
19. PRESSURE SENSITIVE TAPE
20. FIBERBOARD BOX
21. SHAFT AND GEAR



DETAIL A AND B IN SHIPPING CRATE



DETAIL B



DETAIL A

Figure 2-5. Typical Equipment Packaging

2-15. LOW VOLTAGE TRANSFORMER T803 CONNECTIONS. (Refer to figure 5-12 for location of transformer.)

The low voltage transformer T803 is a three phase transformer with multi-tapped primary windings. Once the primary ac voltage value has been measured, the measured value should coincide with the appropriate tap on the low voltage transformer T803. Example: Primary ac voltage value 230 vac, the connections should then be on the 230v taps on T803. DO NOT REMOVE THE CONNECTION MARKED "0".

a. To change T803 primary taps proceed as follows:

(1) Place MAIN POWER BREAKER to OFF position.

(2) On each of the primary windings of T803, relocate the connection to coincide with the measured Primary ac voltage value. DO NOT CHANGE THE CONNECTION ON THE TERMINAL MARKED "0".

(3) Secure hardware on transformer terminal.

2-16. INPUT CHASIS. (figure 2-4)

External input connections are made at the Input Chassis Assembly located in the rear portion of the transmitter directly below the exciter drawer. Audio intelligence CW, FSK and FAX input connections are made at jack J3001 on the input chassis assembly. The mating plug for J3001 is supplied as a loose item. Make the external signal input connections to mating plug, MS3106B32-7P prior to connecting to J3001.

NOTE

The HFTM-10KJ leaves the factory wired for local control operation. Mating plugs that connect to Input Chassis Jacks J3002 and J3003 are supplied as loose items, and are prewired with connections between pins on each plug for local transmitter operation. These mating plugs supplied as loose items must be connected to J3002 and J3003 on the Input Chassis.

SECTION 3

OPERATOR'S SECTION

3-1. SCOPE.

This section gives detailed operating instructions for the HFLM-10K amplifier.

3-2. GENERAL.

The operator should become thoroughly familiar with the location and function of each control of the HFLM. Bear in mind that, although an extensive interlock and overload system is designed into the unit, a single incorrect control setting might still overload certain components, inviting early failure and consequently transmitter "downtime", not to mention improper and illegal emission.

A definite operating sequence (as outlined by operating instructions) should be strictly followed; the operator should establish a proccdural pattern, thus ensuring consistent operation.

Before applying power to the transmitter, check that antenna or dummy load connections are properly made.

3-3. CONSIDERATIONS IN TUNING TRANSMITTER.

a. General - Before the transmitter is tuned for any specified mode of operation, it should be initially tuned and loaded on a carrier frequency.

This procedure should be followed even if suppressed carrier operation is desired. After the transmitter is tuned to carrier frequency, either or both sidebands are generated by applying the proper modulating signals required by the particular mode of operation. The carrier level may then be re-inserted or by-passed, as desired.

b. Carrier Frequency Versus Assigned Frequency - A brief description of "carrier" versus "assigned" frequency is presented at this point since these may be significantly different when operating in certain modes and will affect the choice of frequency to be selected in the exciter. "Carrier" frequency may be defined as that position in the rf spectrum reserved for the "carrier" whether the carrier is present or not. The "assigned" frequency is a reference frequency designed to identify or reserve a given portion of the rf spectrum. Most government agencies define the "assigned" frequency as the "center of a frequency band assigned to a station". The "assigned" frequency and the "carrier" frequency may or may not be the same. In practice, the assigned frequency is frequently suffixed by the carrier frequency in parenthesis for clarification.

Example 1 - For an upper sideband transmission, with the carrier completely suppressed and with a total rf bandpass extending from 300 Hz above Fc to 3 KHz, the assigned frequency is 1650 Hz above the non-existent carrier frequency.

Example 2 - For an independent sideband (ISB) transmission, with audio intelligence covering 350-7500 Hz per sideband, with or without carrier suppression, the assigned frequency and the carrier frequency are one and the same; both occupy the center of the transmitted spectrum.

c. Peak Envelope Power Versus Average Power Indication - A common misapprehension continues to exist over the ratio between average and PEP in high power transmitters, particularly when multichannel (multitone) transmissions are used. Bear in mind that the peak envelope power (PEP) during modulation can be many times that of the average power indicated on the PA OUTPUT METER. Thus, the transmitter

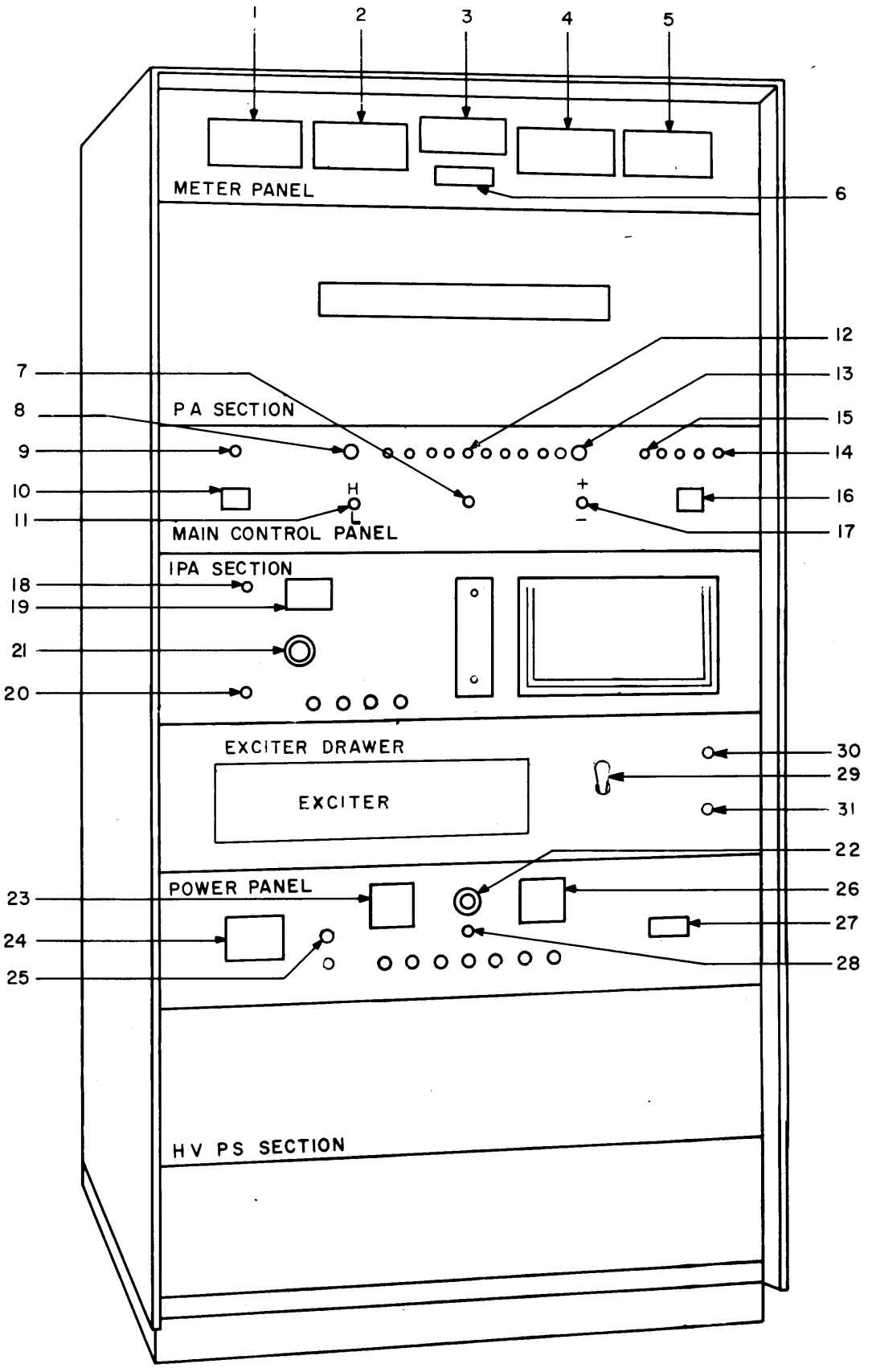


Figure 3-1. Controls and Indicators

average power must be reduced sufficiently to avoid a serious peak overload to the transmitter, with consequent "flat topping" and possible damage.

The ALDC controls should always be used for any type of transmission to avoid the overdriving and flat topping conditions. (refer to para 5-6 for adjustment)

d. Transmitter Carrier Tuning Procedure - The operational procedure presented on the following pages will be for MANUAL TUNING, wherein all operating controls are adjusted by the operator.

Controls and Indicator Location Chart, Table 3-1, has been prepared in conjunction with Control and Indicator Location Drawing, Figure 3-1 to assist in the location and function of operating controls during tuning and operating of the HFLM.

TABLE 3-1. CONTROLS AND INDICATORS

Item No. (Fig. 3-1)	Panel Designation	Function
1	PA SCREEN current meter	Indicates PA screen current of 10 kw amplifier and PA screen overload. (Meter illuminates to indicate screen current overload.)
2	PA PLATE current meter	Indicates PA plate current of 10 kw amplifier and PA plate overload. (Meter illuminates to indicate plate current overload.)
3	TECHNIMATIC light	When lit indicates primary power is applied and MAIN POWER breaker is ON. (LOAD SENSE meter adjustment behind Technimatic light cover.)
4	REFLECTED power meter	Indicates reflected power on upper meter scale and SWR on lower meter scale. (Meter illuminates to indicate SWR overload.)
5	PA OUTPUT meter	Indicates average PA output power.
6	LOAD SENSE meter	Monitors minimum and maximum position of the load capacitor (Scale from 0 - 100).
7	BANDSWITCH control	Operates PA bandswitch. Lateral movement of control will cause the PA and IPA bandswitch to rotate to next higher band position.
8	INTERLOCK indicator lamp	When lit indicates all interlocks closed and interlock circuit complete.
9	ALDC adjustment	Adjust amount of desired ALDC (clockwise maximum ALDC).
10	HIGH VOLTAGE ON/OFF	When pressed to ON position HIGH VOLTAGE is applied to PA and IPA plate circuits and switch indicator lights. When depressed to OFF position High Voltage is removed and switch indicator goes out.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

Item No. (Fig. 3-1)	Panel Designation	Function
11	PA TUNE control	Operates PA tune capacitor (Motor driven).
12	PA band indicators	When lit indicates PA bandswitch selection, from 2 MHz to 30 MHz divided into 10 separate positions: 2-2.3, 2.3-2.6, 2.6-3, 3-4, 4-5, 5-8, 8-12, 12-16, 16-24, and 24-30. There is one lamp for each position.
13	FAULT indicator	Not Used.
14	POWER level indicators	Not Used.
15	POWER ADJUST switch	Not Used.
16	TUNE/READY switch	Not Used.
17	PA LOAD control	Operates PA loading capacitor.
18	IPA METER SELECT switch	When down, IPA PLATE current meter indicates 1st AMP PLATE current. When up, IPA PLATE current meter indicates 2nd AMP PLATE current. When left in horizontal position, the PLATE meter indicates the IPA PLATE current.
19	IPA PLATE current meter	Indicates 1st, and 2nd IPA PLATE currents. (Meter illuminates to indicate current overload.)
20	RF GAIN control	Adjusts HFLM power output during tuning operation.
21	IPA TUNE control	Tunes IPA section to resonance during operation.
22	ALARM	Audible alarm to indicate failure of High Voltage.
23	FILAMENT time meter	Registers the time (in hours and minutes) voltage has been applied to the PA filaments.
24	MAIN POWER breaker	When placed in ON position applies primary power to HFLM.
25	EXCITER ON/OFF	In the ON position supplies ac power to exciter.
26	PLATE time meter	Registers total time dc plate voltage applied to PA PLATE circuit.
27	SCREEN breakers	In ON position provides screen voltage to PA and IPA tubes.
28	ALARM ON/OFF switch	When placed in ON position, activates high voltage ALARM.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

Item No. (Fig. 3-1)	Panel Designation	Function
29	TEST KEY	When placed in up position, TEST KEY closes exciter cw key line. In neutral position exciter key line is open, unless external keying device is used.
30	AUDIO TEST jack	The Audio Test jack is used for exciter audio input and test purposes.
31	EXCITER MONITOR	Monitor jack for external test equipment to monitor exciter output.

3-4. TUNING PROCEDURE (Carrier Only).

STEP	OPERATION	NORMAL INDICATIONS
1	Place MAIN POWER breaker (24) to the ON position.	Main blower and IPA blower must operate. Technimatic light (3) and Band Indicator (12) must illuminate. INTERLOCK LAMP (8) will light if all safety interlocks are closed and the time delay cycle has been completed.
2	Place SCREEN breakers (27) to ON position.	No indications.
3	Place ALARM ON/OFF switch (28) to the OFF position.	Should alarm switch have been in the ON position with High Voltage removed, the audible high voltage ALARM would be on.
4	Set RF OUTPUT from associated exciter to minimum.	No indications.

NOTE

The HFLM is equipped with protective overload circuitry incorporated in meters on the meter panel. Should an overload occur in either the PA PLATE CURRENT, PA SCREEN CURRENT, IPA PLATE CURRENT or at the transmitter output in the form of excessive VSWR, the corresponding meter face will illuminate to indicate an overload has occurred in that circuit of the HFLM. Additionally, each of the aforementioned meters have an overload indicator which can be adjusted to trip at a value set by the operator.

5 Adjust the Overload Indicator (adjustment screw located directly below the meter face on each meter) on each meter for values listed:

PA PLATE current	3-1/2 amps max.
PA SCREEN current	80 ma.
IPA PLATE current	800 ma.
REFLECTED POWER	Set to desired value.

STEP	OPERATION	NORMAL INDICATIONS
6	Select bandswitch Position by holding BANDSWITCH control (7) first to left until band indicator lights, then holding BANDSWITCH control to the right until the next band indicator lights.	Band Indicator (12) will illuminate to indicate frequency band selected.

NOTE

The indicated quiescent values stated below are for the best sideband distortion; however, when operating cw readjust quiescent value to lower limits as stated below.

7	Remove bias control cover on IPA drawer to expose bias adjustment controls, adjust PA BIAS, IPA BIAS, 1ST and 2ND AMP BIAS controls for max bias.	PA Bias adjusted to max clockwise. IPA BIAS adjusted to max clockwise. 1ST & 2ND AMP BIAS adjustment to max clockwise.
8	Press HIGH VOLTAGE pushbutton (10) to light indicator. (It may be necessary to press HIGH VOLTAGE pushbutton twice in case one of the overloads tripped.)	HIGH VOLTAGE indicator will illuminate RED when High Voltage is ON.
9	Adjust PA BIAS control for an indication of .75 amps on the PA PLATE current meter (2).	PA PLATE current meter indicates quiescent current of .75 amperes (.5 to .75 amperes).
10	Adjust IPA bias control for an indication of 200 ma on PLATE meter (19).	IPA PLATE meter (19) indicates quiescent current of 200 ma (150 to 200 ma).
11	Press IPA METER SELECT switch (18) up. Hold and adjust 2ND AMP BIAS for indication of 250 ma on IPA PLATE meter (19).	IPA PLATE meter will indicate 250 ma when METER SELECT switch is pressed up (150 to 250 ma).
12	Press IPA METER SELECT switch (18) down. Holding the switch down adjust 1ST AMP BIAS for control indication of 60 ma on IPA PLATE meter.	IPA PLATE meter will indicate 60 ma when METER SELECT Switch is pressed down (40 to 60 ma).

STEP	OPERATION	NORMAL INDICATIONS
13	Rotate RF GAIN control (2) to Maximum counterclockwise position. Apply (output from external exciter) the desired operating frequency, unmodulated at an RF level of approximately 100 milliwatts to the RF input jack (J3004).	For controls on exciter, refer to the exciter Technical Manual.

NOTE

During initial tuning of HFLM, RF OUTPUT POWER will be increased or decreased with the RF GAIN control (20) on the HFLM.

14	Adjust RF GAIN control (20) clockwise slightly to cause an increase in IPA PLATE current indication on PLATE meter (19) not to exceed 250 ma.	PLATE meter (19) will indicate increase in meter reading not to exceed 250 ma.
15	Adjust IPA TUNE control (21) for a PA PLATE current peak on PA PLATE current meter (2).	The rotation of IPA TUNE control will cause IPA output to be applied to PA indicating resonance. At this time the PA PLATE current meter (2) will indicate an increase from quiescent.

CAUTION

Initially set PA LOAD control to minimum (-). During Tuning of Power Amplifier do not exceed PA PLATE current reading of 1.5 amperes. Should an overload occur, High Voltage indicator will go out. To reset HIGH VOLTAGE, decrease RF drive and press to light HIGH VOLTAGE indicator. (HIGH VOLTAGE push-button must be pressed twice to energize High Voltage.)

16	Operate the PA TUNE Control (11) (Press control down or up) as necessary to cause a noticeable resonant dip in PA PLATE current meter (2) indicator.	PA PLATE current meter will indicate resonant dip and OUTPUT METER will indicate power output.
17	Operate PA LOAD control (17) (Press control + or -) as necessary to produce a maximum reading on PA OUTPUT meter (5).	PA OUTPUT meter (5) will indicate a further increase in Power Output during loading process. LOAD SENSE meter will indicate relative position of load capacitor.

STEP	OPERATION	NORMAL INDICATIONS

NOTE

STEPS 16 and 17 have to be repeated until HFLM is properly loaded into antenna or 50 ohm dummy load.

18	Readjust IPA TUNE control (21) for peak indication on the PA OUTPUT meter indication.	PA OUTPUT meter may indicate a slight increase in meter reading.
19	Rotate RF GAIN control (20) clockwise to increase PA Output Power Level to desired power level.	PA OUTPUT meter indicates desired output level.
20	Rotate RF GAIN control (20) counterclockwise and press HIGH VOLTAGE switch to OFF.	PA OUTPUT meter will indicate zero and HIGH VOLTAGE lamp will go out indicating the removal of High Voltage.

NOTE

The above outlined procedure has presented a logical sequence for manually tuning the HFLM-10K on a selected CARRIER frequency at the desired or rated AVERAGE power output level. Modulating techniques will depend upon the exciter that is used. Refer to paragraph 3-5 for POWER OUTPUT indications under multitone multichannel transmissions, before the reapplication of excitation to the transmitter.

3-5. AVERAGE POWER OUTPUT INDICATIONS.

When two tones of equal amplitude are applied to an SSB system, the ratio of peak to average power is 2:1. This relationship is valid for two tones only. Thus, it is apparent that when the unit output meter indicates 5.0 with two tones of equal amplitude applied to the transmitter, peak envelope power will be 10KW under that condition only.

NOTE

PA OUTPUT Meter indicates average power ONLY.

In Multichannel, multitone transmission modes where more than two tones are used, a definite relationship exists between the average power as read on the OUTPUT meter and the peak envelope power developed. A chart in graphic form (figure 3-2) indicates the ratio of average power to PEP as a function of tones, for reference in determining peak to average power ratios on this (HFLM) power output meter, which indicates true average power for CW (one tone) only.

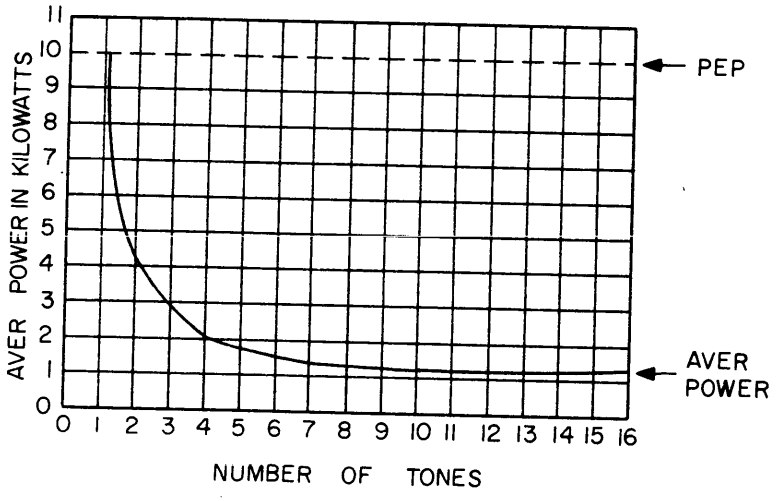


Figure 3-2. Ratio Average Power and PEP as a Function of Tones

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL.

The HFLM-10K is functionally divided into three sections as follows: rf amplifier, power supply and control circuitry. The following paragraphs describe each section on a functional level and shows the interrelationship between each section. References are made to simplified drawings and schematic diagrams contained in Section 7.

4-2. RF AMPLIFIER CIRCUIT ANALYSIS.

a. Block Diagram Description (Refer to figure 4-1) - Figure 4-1 shows the path of the rf signal from an exciter routed through the amplifier stages, the harmonic filter, output metering circuits and finally to the 50 ohm transmitting antenna or dummy load. Tuning capacitors are used to resonate the intermediate power amplifier and power amplifier stages.

b. Detailed Circuit Analysis (Refer to figure 7-2, sheet 2.)- The rf output from an exciter (at least 100 milliwatts) is applied to RF GAIN potentiometer R1301 (which controls transmitter power output), and coupled through C1303 to the grid of the 1ST RF AMPLIFIER, V1301.

(1) The 1ST RF AMP operates as a broadband class A amplifier providng an amplification of approximately 5. The rf output appearing at the plate of V1301 is routed through coupling capacitor C1308, broadband transformer L1303, and capacitor C1310 to the input grid of 2nd amplifier V1302.

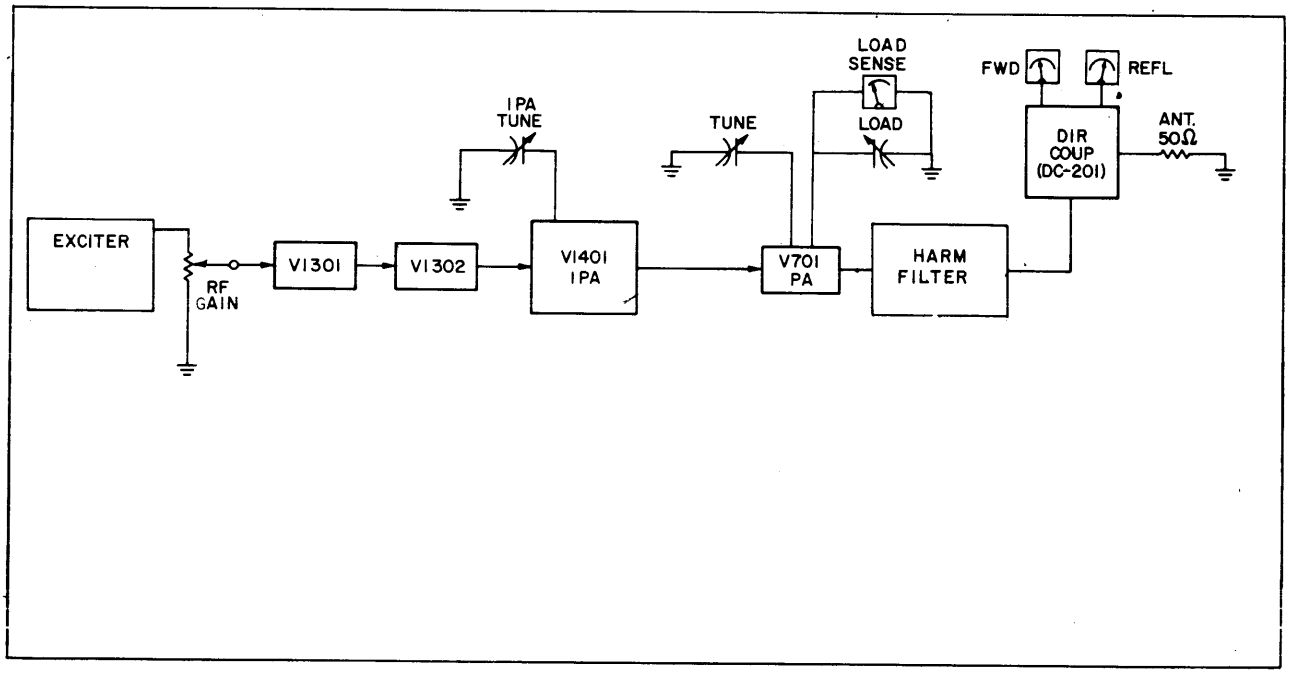


Figure 4-1. Block Diagram

(2) 2ND AMPLIFIER, V1302, operates as a class A amplifier providing further rf amplification. The amplified signal appearing at the plate of V1302 is routed through inductor L1307, capacitor C1318, inductor L1401 and coupled through capacitor C1404 to the grid of intermediate power amplifier (IPA) V1401. The 1st and 2nd rf amplifiers being broadband amplifiers require no resonate tuning to obtain output from their respective plate circuits. Note the relay K1401 provides a ground to the center tap at broadband transformer L1401 when energized. Relay K1401 is energized only in bandswitch positions above the 12-16 MHz position; in any position below 12-16 MHz, K1401 deenergizes and inserts R1402 in series with the center tap of transformer L1401. This arrangement provides impedance matching throughout the frequency range of the HFLM.

(3) The IPA operating as a class AB_1 amplifier provides the required drive input power to the final power amplifier (PA). When an rf signal amplified by the preceding stages is applied to grid of the IPA, rf will appear at the plate circuit when the variable IPA TUNE capacitor has been adjusted to resonate the IPA plate circuit to the frequency that appears at the grid circuit. When the IPA TUNE capacitor is adjusted and the IPA plate circuit approaches resonance, IPA plate current will decrease from quiescence, rf will be amplified in the plate circuit and routed through the nine position IPA BANDSWITCH (preset to a band that corresponds to exciter frequency), to RF OUT jack E1001. Plate meter M1001 monitors IPA plate current. A dip on the meter indicates IPA resonance and maximum transfer of rf power from the IPA to the input of the final power amplifier, V701.

(4) POWER AMPLIFIER, V701, operates as a class AB_1 final amplifier providing 10 kilowatts of power to a 50 ohm antenna or dummy load. The rf power developed in the IPA stage is routed through IPA RF OUT jack E1001 to E817 via P801 and J801, and coupled through capacitor C713 to the filament cathode of V701. The PA tube input is connected in an rf grounded grid, cathode-fed configuration. PA output circuit consists of Bandswitch Assembly A704, TUNE Capacitor Assembly A701, LOAD Capacitor Assembly A703, and Harmonic Filter Assembly AF110.

When rf power from the IPA is applied to the PA input, with BANDSWITCH and TUNE and LOAD capacitors adjusted to resonate PA plate circuit, rf output appearing at the plate will be routed through inductor L706 via BANDSWITCH and inductor L707 to the harmonic filter (figure 7-8) for harmonic attenuation. The rf power then passes through the harmonic filter and directional coupler DC701 to 50 ohm antenna or dummy load.

The TUNE and LOAD capacitors serve to match the output impedance of the 50 ohm antenna up to a maximum VSWR of 3:1.

c. RF Tuning Indicators -

(1) PLATE METER M1001 on the IPA monitors IPA plate current, 1st rf amplifier plate current and 2nd rf amplifier plate current. When all transmitter operating dc voltages are applied, M1001 will monitor the cathode current of IPA tube V1401. Also during the tuning of the IPA, M1001 will indicate a dip at resonance. M1001 will also indicate increases in IPA plate current as the input grid is being driven from a preceding stage.

(2) Plate current of the 1st rf amp is monitored only when PLATE METER switch S1001 is pressed down. When current is drawn through the cathode of V1301, cathode current is monitored through resistors R1306, R1304, capacitor C1205 to wiper of S1001; the wiper of S1001 is normally grounded. Depressing S1001 down removes the ground connection and connects the cathode to the plate meter via terminal A1006-E1.

(3) Plate current of the 2nd rf amp is monitored only when PLATE METER switch S1001 is pressed in the up position. When current is drawn through the cathode of V1301, cathode current is monitored through capacitor C1206 and resistor R1202 to the wiper, on the second section of S1001; second wiper of S1001 is

normally grounded. Pressing S1001 up removes the ground connection and connects V1302 cathode to PLATE METER via terminal A1006-E2.

(4) PA PLATE current meter monitors the cathode current for:

(a) Quiescence (determined by setting on PA bias potentiometer A1007R4).

(b) Resonance (indicated by a dip in meter indication as PA TUNE capacitor is adjusted to the point of resonance).

(c) Total PA plate current drawn at rated output.

Filament transformer T804 supplies filament voltage and current to the filament cathode of V701. The center tap of T804 secondary (pin) connected to filter network consisting of capacitors C805, C806, inductor L804 and resistor R813 is connected to PLATE current meter M4002 via A4002 pin L2. As drive and/or bias voltage is increased or decreased the PLATE current meter will indicate a corresponding change.

(5) LOAD SENSE meter M4002 indicates minimum and maximum loading. The variable LOAD capacitor A703C1 is initially adjusted for minimum capacitance and minimum voltage across M4002. LOAD capacitor is then adjusted to maximum capacitance and R1 (A705) is adjusted until LOAD SENSE meter indicates 100, therefore a zero indication on the LOAD SENSE meter will indicate minimum loading and an indication of 100 will represent maximum loading. This becomes a helpful tuning aid when tuning into reactive antennas.

4-3. POWER SUPPLY ANALYSIS (Refer to Figure 4-2.)

a. AC Power Distribution -

(1) General - Three-phase power is supplied to three input terminals located at the bottom rear of the transmitter. Safety and protective interlocks are employed throughout the transmitter to prevent application of high voltage until specific requirements are met to prevent injury to personnel and damage to the Transmitter.

(2) Detailed Circuit Analysis - Phases 1 and 2 at the input terminals E805 and E806 are routed through the EXCITER ON/OFF switch S3002 to supply ac input to an exciter. AC input to the exciter is present when EXCITER ON/OFF switch is in ON position, independent of the position of the MAIN POWER breaker, CB3001. AC input can be controlled via a remote circuit breaker to remove primary power from the HFLM.

Closure of the MAIN POWER breaker provides 3 phase input to the PA blower, B801 and phases 1 and 3 to the IPA blower, B1401. The air switches for the PA and IPA blowers are normally closed when the blowers are not operating. When the blowers commence operating their respective air switches open, preventing a closure of phase 1 to the filament relay, K802. Should one of the blowers fail to operate, the contact closure of the air switch energizes the filament relay, opening its normally closed contacts, removing the ac to the primaries of the filament transformers T803 and T804.

With the blowers operating properly, ac input power is applied to the PA filament transformer T804 and the IPA filament transformer (Low Voltage) T803. The FILAMENT elapse meter records total filament time on the PA tube. The contacts of the time delay prevent a closure of the series interlock chain until the 5-minute delay has expired. The PA filament transformer supplies approximately 6.0 vac to the PA filament. The low voltage transformer T803 supplies 3 phase ac to the IPA filament rectifier CR805, and the +24 vdc rectifier, CR1103. The output of the IPA filament rectifier provides 6.3 vdc filament voltage to the IPA tubes.

*Option

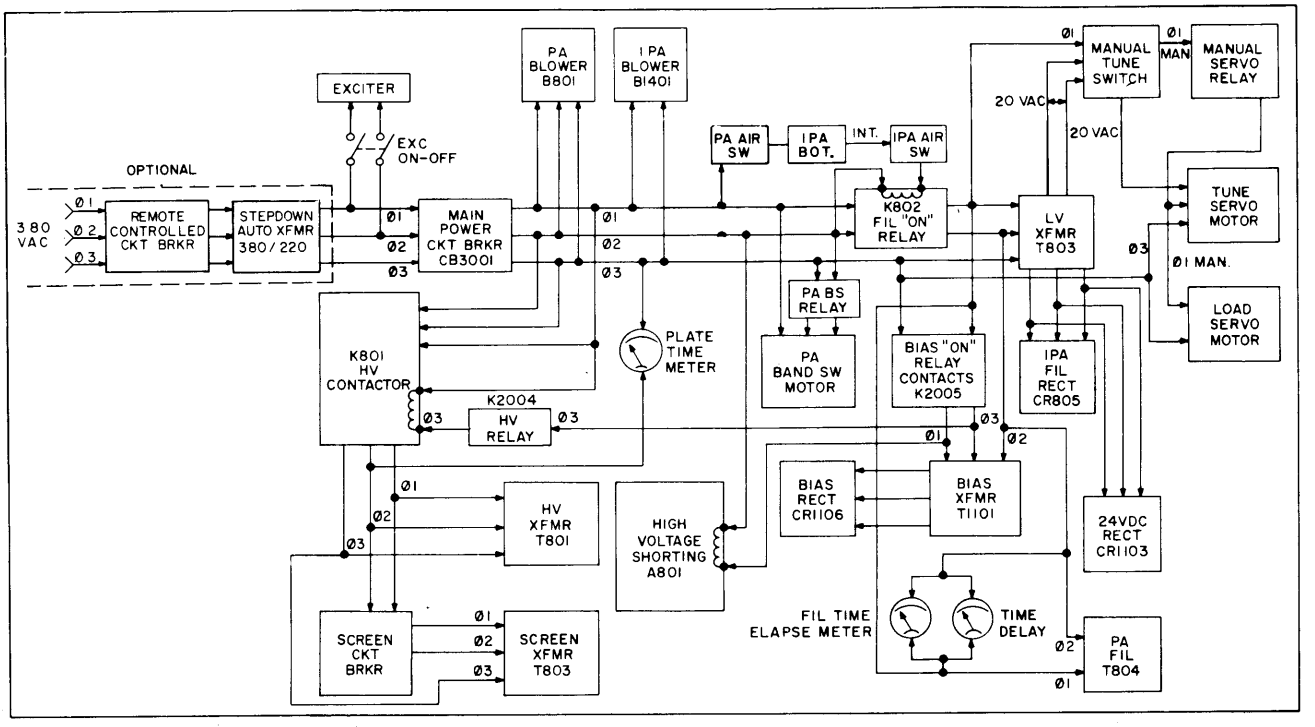


Figure 4-2. AC Power Distribution

The series interlock chain carries 24 vdc to the filament timer interlock, whereupon closure will route the 24 vdc to the bias on relay, K2005. Contacts 1 and 3 of the bias on relay route phase 1 to the HV shorting coil, A801, removing the shorting ground to the HV power supply. The HV shorting relay also routes the 24 vdc interlock voltage to one side of the HV on/off relay, K2004.

AC input voltage to the tune and load assemblies consists of a constant phase 2 application and a switched phase 1 arriving from the PA TUNE and PA LOAD controls.

b. DC Power Distribution. (Refer to Figure 7-1, sheet 5 and Figure 4-3)

(1) Plate Voltage - Application of 3 phase power input to the high voltage transformer, T801 provides plate voltage for the IPA and PA tubes. The PA plate voltage of 7500 vdc is derived from a full wave bridge rectifier circuit, CR802A thru CR802F, then filtered by C801 and L801 before application to the PA plate. Resistors R803 thru R807 are bleeders for the supply. One half of the value of the PA plate voltage (3750 vdc) is available at the neutral tap of T801 secondary. This 3750 vdc is the plate voltage for the IPA tube and is filtered by L802 and C802 before application to the IPA plate.

Full wave bridge rectifier circuit CR804 provides the 2000 vdc plate voltage for the 2nd RF amplifier tube. The dc return for this power supply is through the screen circuit breaker contacts (C and D) which will open in the event of excessive current drain.

The voltage divider consisting of R810 and R809 provides plate and screen voltages for the 1st rf amplifier tube, which is derived from the neutral leg of transformer T802. (Screen voltage is regulated by zener diodes CR807A and CR807B).

(2) Screen Voltage - Closure of the screen circuit breakers provide 2 of the 3 phase input to the screen transformer, T802. The output of the full wave bridge rectifier CR803 is 2000 vdc and regulated by

200V zener diodes, CR801A thru CR801H. The top of the zener stack provides 1600 vdc for the PA screen. The 800 vdc required for the IPA section is developed at the junction of zener diode CR801D and resistor R825. The 400 vdc required for the screen of V1302 is developed at the junction of zener diode CR801F and resistor R823. The dc return for this supply is through the screen overload circuitry on screen overload board PC529 to protect against excessive current drain should an overload occur.

(3) Bias Voltage (Refer to figure 7-3, sheet 3) - When the Bias ON relay K2005 energizes, two of three phase input is applied to the bias transformer T1101 located in the IPA drawer. The secondary output of T1101 is applied to full wave bridge rectifier CR1106. The output of CR1106 (approximately -400 vdc) is filtered by L1101 and C1104 before application to the zener diode regulators through R1105. The dc return for the bias supply is through F1002 to protect the circuit against overloads.

Regulated bias voltage is tapped from the zener diodes CR1107, CR1108, CR1109 for application to the four bias potentiometers (PA, IPA, 2ND AMP and 1ST AMP). The ground necessary for voltage drop across the bias potentiometers is supplied by contacts (1) and (3) of PTT relay K1101 (when K1101 is energized). The bandswitch interlock circuit prevents 24 vdc from reaching the PTT relay during band changes to keep the amplifier stages at maximum bias, or close to cut-off.

The bias supply provides -360 vdc to the PA BIAS potentiometer before application to the grid of the PA tube. The PA BIAS potentiometer is adjusted to provide approximately 750 ma of idle current as indicated on the PA PLATE current meter. The junction of CR1107 and CR1108 provides -240 vdc to the IPA BIAS adjust potentiometer. The IPA BIAS potentiometer is adjusted to provide approximately 200 ma of idle current of the IPA PLATE current meter when the meter switch is in its normal position. The junction of CR1108 and CR1109 provides -120 vdc to the 2ND AMP BIAS adjust potentiometer before application to the 2ND amp grid. The 2ND AMP BIAS potentiometer is adjusted to provide approximately 250 ma of idle current as observed on the IPA PLATE current meter when the METER switch is pressed UP. The 1ST AMP BIAS potentiometer is adjusted to provide approximately 60 ma of idle current as observed on the IPA PLATE current meter when the METER switch is pressed DOWN.

(4) 24 VDC Supply - The secondary of low voltage filament and control transformer T803 provides 20 vac 3 phase input to 24 volt rectifier CR1103 in the IPA drawer. The output of the full wave bridge rectifier, CR1103, is filtered by C1101 and C1102 and regulated at +24 vdc by zener diode CR1104. This regulated 24 vdc is used as control voltage for the HFLM. The DC return of the supply is through 24v fuse F1003 to protect against overloads.

4-4. CONTROL CIRCUITRY.

a. Protective Overloads and Interlocks. (Refer to Figure 4-4.) -

(1) General - The interlock and overload circuitry of the HFLM provides protection for the equipment and operating personnel. An open interlock or overload condition will de-enrgize K2004, the HV ON/OFF relay.

(2) Simplified Circuit Analysis - The regulated 24 vdc interlock voltage is routed through the mechanically closed interlocks to the filament timer interlock. When the time delay of the Filament Timer has expired it's contacts close and the 24 vdc energizes the bias on relay which in turn energizes the HV shorting relay. Contacts on the HV shorting relay route the 24 vdc to one side of the HV on/off relay through the normally closed contacts of the heat overload and external interlocks. The HV on/off relay is energized when the $\overline{\text{HV ON/OFF}}$ switch is depressed, providing a path thru the reset contacts of the Main Overload relay and thru the Remote HV on/off provision to ground. The HV on/off relay provides phase 3 to K801, the HV contactor coil. When K801 energizes, a ground is provided for the remote and local HV lights. The normally

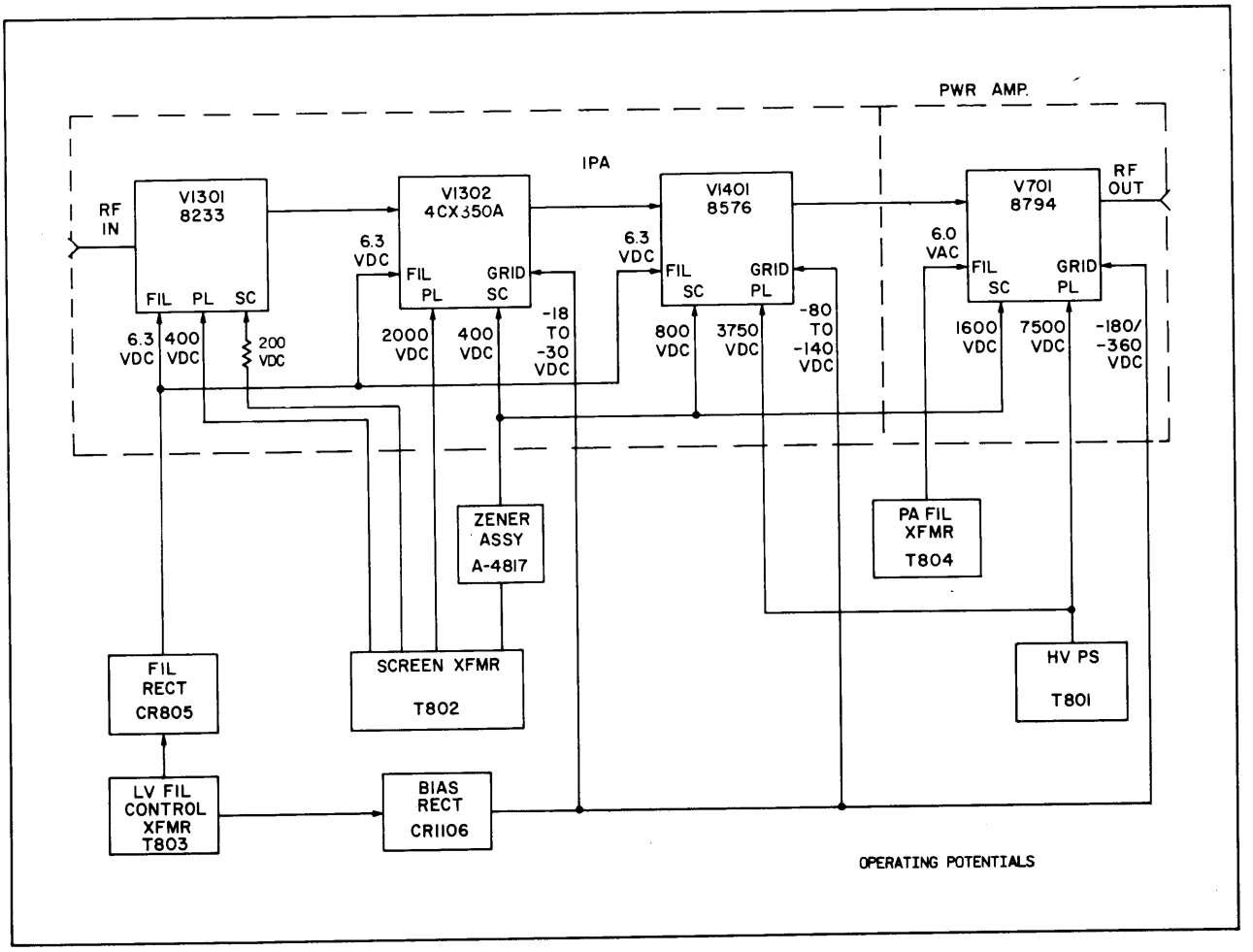


Figure 4-3. HFLM-10K Operating Potentials

closed contacts of K801 open removing the ground on the ALARM ON/OFF switch, disabling the HV ALARM when high voltage is on and the ALARM switch is in the ON position. An indication on the IPA PLATE current meter, PA PLATE current meter, PA SCREEN current meter, or REFLECTED power meter, which is equivalent to the red overload pointer setting, provides a contact closure on the associated meter sensing circuit. The contact closure supplies a gating pulse to trigger an overload SCR, providing a path for the 24 vdc to the associated overload lamp on the meter, and 24 vdc to the main overload relay causing it to energize. The energized overload relay opens the ground path to the HV ON/OFF relay K2004. To restore high voltage, the HV ON/OFF switch is depressed so that its contacts open, removing the 24 vdc applied to the meter contact coils. The open meter contacts no longer provide a gating pulse to the specific overload SCR opening the voltage path to the overload lamp and removing the 24 vdc to the main overload relay. The main overload relay de-energizes, keeping its contacts to the overload position. Depressing the HV ON/OFF switch again will place its contacts in the closed (reset) position, restoring high voltage and resetting the overload relay.

Should any of the interlocks open when the high voltage is on, the 24 vdc applied to the HV on/off relay is diverted to a line connecting all the normally closed contacts of the interlocks to the input of the main overload relay. An open interlock therefore places the HFLM in an overload condition, preventing the potentially dangerous application of high voltage when the open interlock is closed. In either condition, overload or opened interlock the HV switch must be pressed twice to restore high voltage.

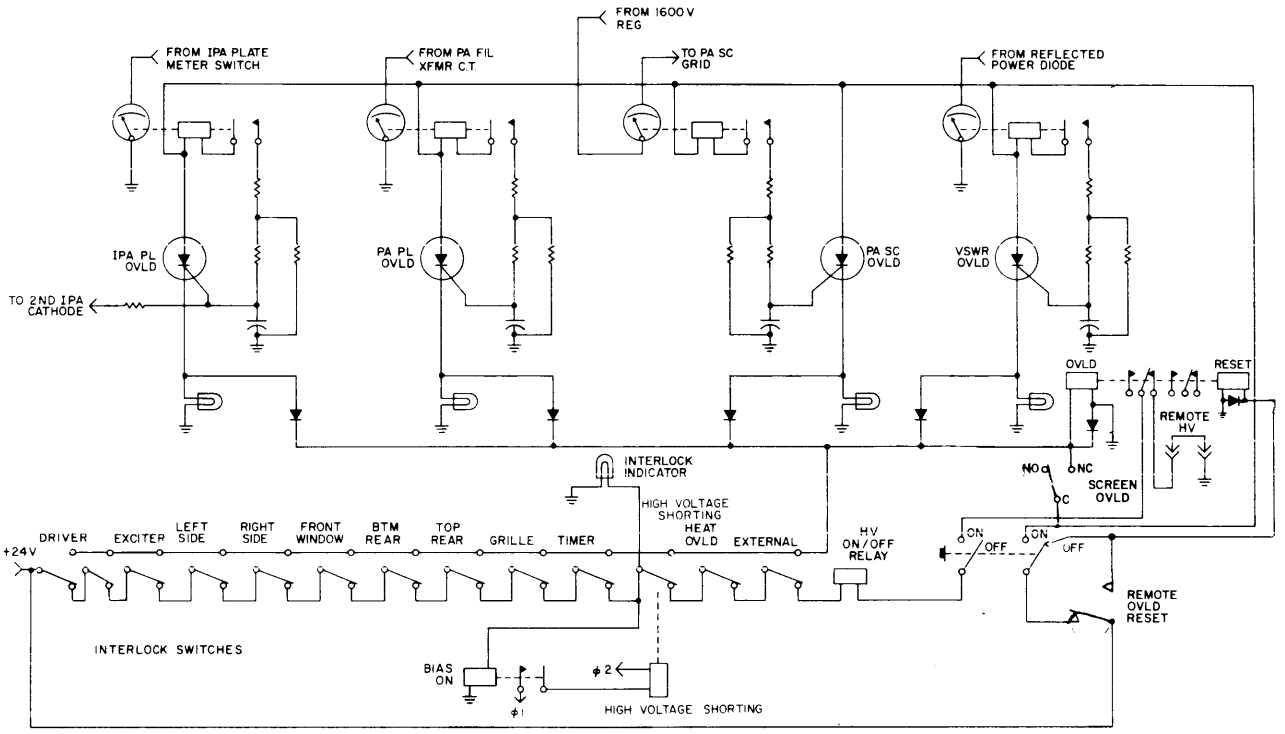


Figure 4-4. Protective Overloads and Interlocks

b. ALDC (Automatic Load and Drive Control). (Refer to figure 7-7 and 7-1.) - The ALDC circuit provides a negative feedback voltage to an exciter to prevent excessive rf output from the HFLM. R5001 is the ALDC threshold potentiometer. The negative ALDC voltage is derived from RF sampling capacitors (C21 and C22) located in the output section of Harmonic Filter AF110. This sampled rf voltage is routed to ALDC assembly A707. The sampled rf voltage is rectified in assembly A707 and routed to ALDC adjust potentiometer and rerouted to ALDC jack J2002 for application to the ALDC input of an associated exciter. The ALDC adjustment is normally adjusted at the desired carrier power level (not to exceed rated power).

c. Power Output Meter. (Refer to figure 7-1, sheet 1.) - The forward power output of detecting diode CR701 (located on directional coupler, DC701) is routed thru the normally closed contacts of the remote meter relay K1. The application of a ground to the remote meter relay from a remote control console would divert the forward power voltage to a remote power meter. After passing through the remote meter provision the forward power is routed through Remote Power Assembly A705 to pin (c) to the OUTPUT meter, M4005. Diode CR701 and it's companion meter M4005 are calibrated to indicate average power in kilowatts.

d. Bandswitch Control. (Refer to figure 4-5 and 7-6.) -

(1) General - Bandswitching within the HFLM is performed with the PA BANDSWITCH control.

(2) Detailed Circuit Analysis - Bandswitching is accomplished by providing a ground to the PA bandswitch. The ground thus provided will then be routed to the PA bandswitch relay which supplies ac voltage to the PA bandswitch motor.

(3) Manual Control - Pin (X) on XA2001 provides ground to the common arm of the bandswitch control lever (S5004). The two poles of this switch are connected to pins (i) and (j) of J1 (Bandswitch Control Assembly). When the neutral arm is moved to the right, the ground picked up at pin (i) is routed through PA bandswitch manual control rear wafer to pin (2) of the PA Bandswitch relay K1. Pin 10 of the PA bandswitch

relay has a fixed +24 vdc applied. The PA bandswitch relay energizes, routing phase 1 and 2 from pins (A) and (B) of J2 to the PA Bandswitch motor A704B1. With phase 3 already present on the motor from pin (C) of J2, the motor moves the switches coupled to it, one position. The PA bandswitch manual control, rear wafer having moved one position in a counterclockwise direction, has moved into an open position (2.3-2.6 band) therefore removing the ground to the PA bandswitch relay. To move the PA bandswitch motor further, the ground on the common arm must now be supplied to pin (j), or the arm must be moved to the left. Moving the neutral arm to the left will now supply a ground to the PA Bandswitch relay through the PA bandswitch control, front wafer moving the PA bandswitch motor one more position. Therefore, the PA bandswitch manual control lever must be moved to the left and right to move the PA bandswitch in a stepping manner.

The PA bandswitch indicator wafer receives 24 vdc to its wiper from pin (N). With the control switches as shown schematically in band 1, the 24 vdc will be routed through the wafer to pin (M) which is connected to the 2-2.3 PA band indicator light.

With the PA BANDSWITCH at rest in the 2-2.3 MHz position the 24 vac that supplies pin (10) of the PA bandswitch relay is routed thru normally closed contacts (11) and (8) to pin (R) of A204J2. This voltage may be considered IPA and filter bandswitch interlock voltage. It is routed through the IPA bandswitch interlock wafers to one side of the PTT relay K1101. It can be seen that unless all bandswitch relays and interlock wafers are in the same position at rest, the PTT relay will not be energized resulting in the HFLM being biased at or close to cut-off.

Refer to figure 7-2, sheet 1 and note that a ground provided at pin (B) A704J is routed through the IPA bandswitch control, front wafers to the notch homing control wafer on the IPA bandswitch. When a ground is seen at pin (2) of K1, 28 vdc present at pin (22) of J1 will energize K1, routing 28 vdc to the IPA bandswitch ledex motor. The IPA bandswitch ledex motor will rotate until the notch opens the ground connection to K1.

e. Harmonic Filter. (Refer to figure 7-7.) - The output from the PA tuning circuit is applied to Harmonic Filter, AF110 which provides up to 25 db harmonic rejection at the HFLM output. The Harmonic Filter is a low pass, fixed filter supplying harmonic suppression (with minimum insertion loss) from the second harmonic of 17 MHz and up.

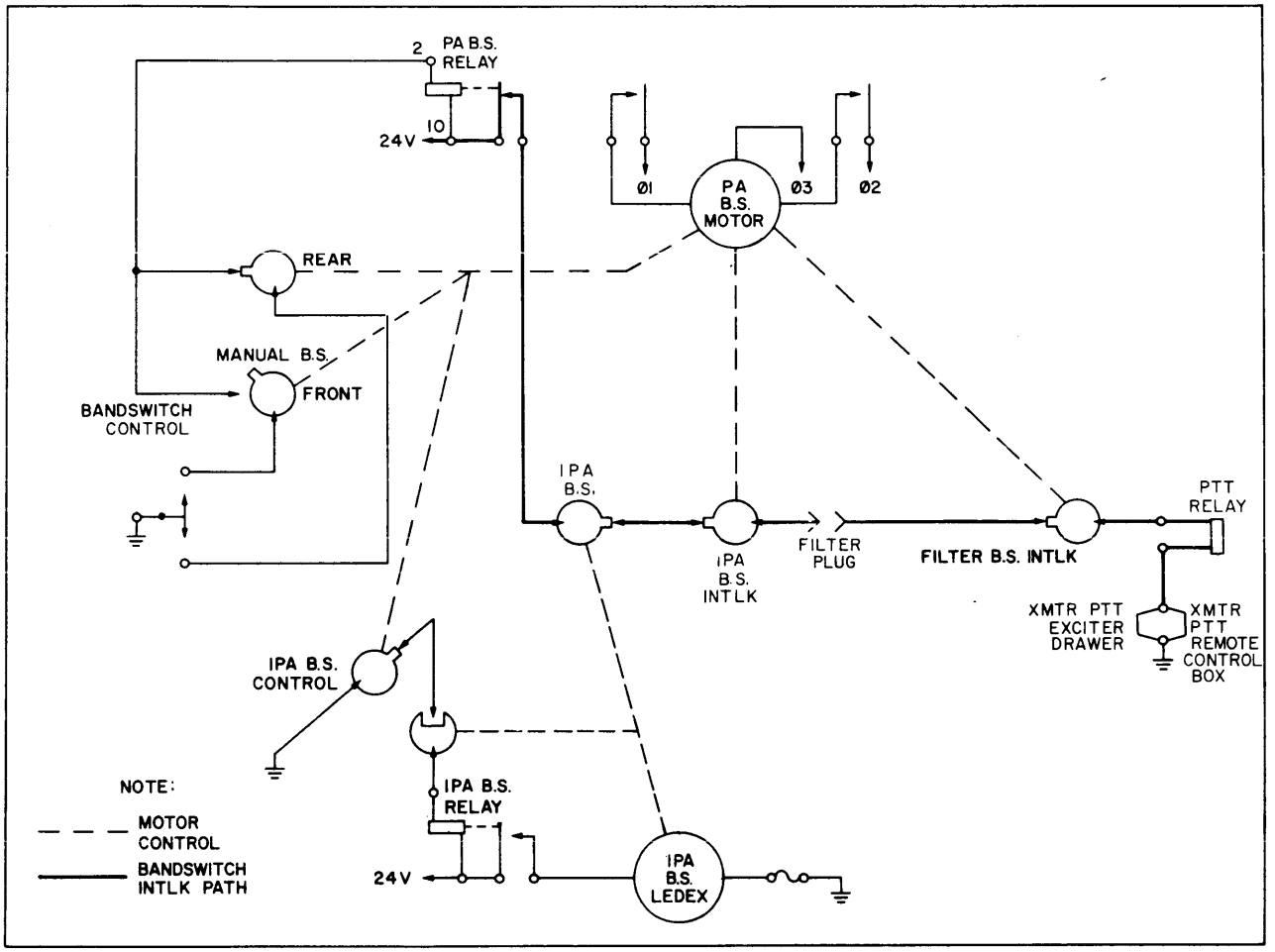


Figure 4-5. Bandswitch Control

SECTION 5

MAINTENANCE

5-1. INTRODUCTION.

The HFLM-10K is designed for long term trouble free operation. When it becomes necessary to perform alignment and/or adjustments to the equipment, it is recommended that technicians perform the necessary operations outlined under FIELD MAINTENANCE.

a. The following maintenance aids are provided for troubleshooting, and alignment:
   (1) System Block Diagram (Section 4, Figure 4-1)
   (2) Fuse Location Drawing (Figure 5-1)
   (3) Fuse Functions (Table 5-3)
   (4) System Overload and Bias Setting Procedure
   (5) ALDC Adjustment Procedure
   (6) Maintenance Programs (for troubleshooting).

5-2. LIST OF TEST EQUIPMENT REQUIRED.

Signal Generator:	Hewlett Packard Model 606A, or equivalent
VTVM:	Hewlett Packard Model 410B, or equivalent
Multimeter:	Simpson Model 260, or equivalent

5-3. OPERATOR'S MAINTENANCE PROCEDURE.

a. Refer to operational checkout procedures (Paragraph 3-4).

b. Operator's troubleshooting chart (Table 5-1).

5-4. PREVENTIVE MAINTENANCE.

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

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

WARNING

WHEN USING TOXIC SOLVENTS, MAKE CERTAIN THAT ADEQUATE VENTILATION EXISTS. AVOID PROLONGED OR REPEATED BREATHING OF THE VAPOR. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. FLAMMABLE SOLVENTS SHALL NOT BE USED ON ENERGIZED EQUIPMENT OR NEAR ANY EQUIPMENT FROM WHICH A SPARK MAY BE RECEIVED. SMOKING, "HOT WORK", ETC. IS PROHIBITED IN THE IMMEDIATE AREA.

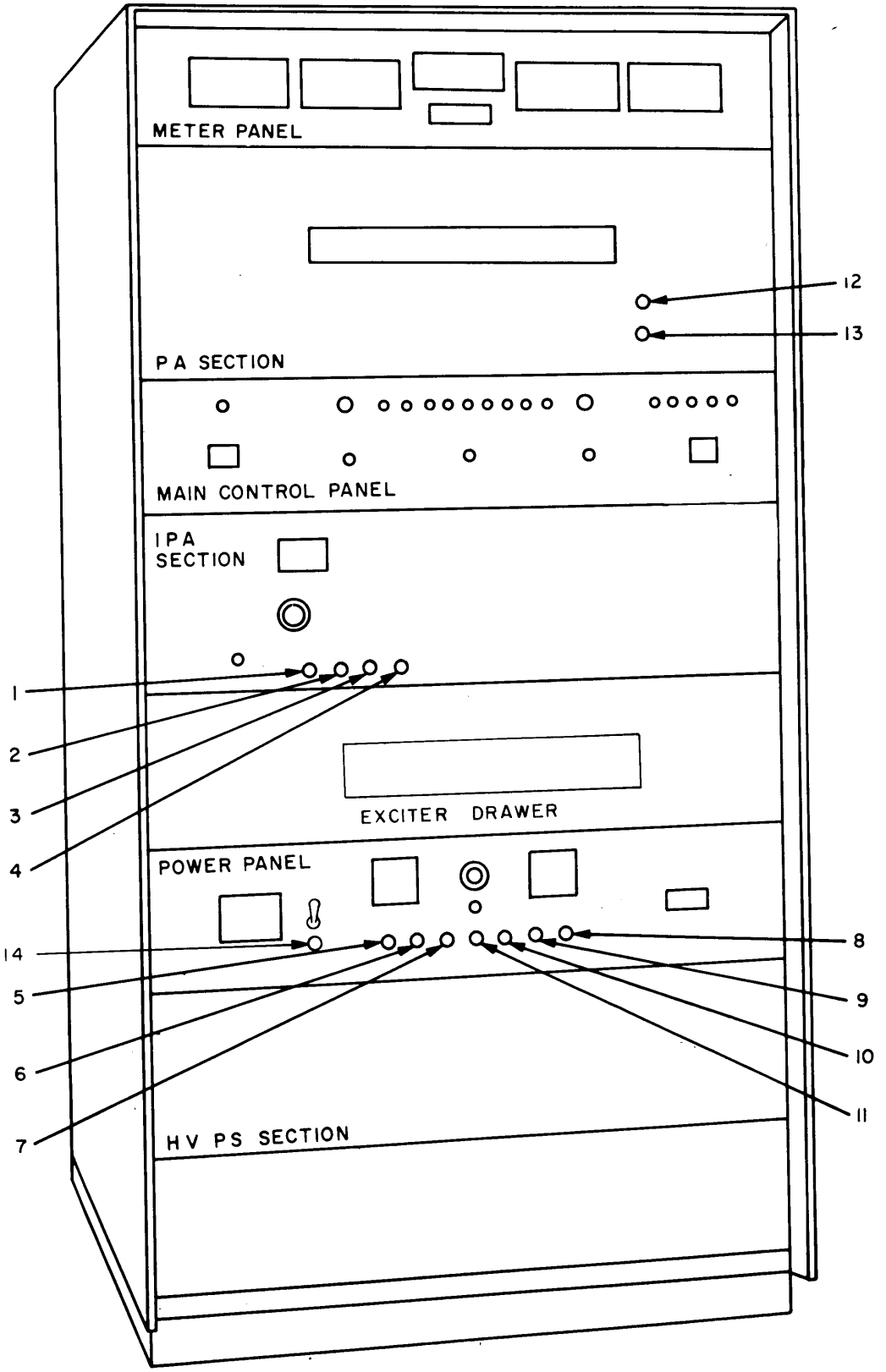


Figure 5-1. Fuse Location

CAUTION

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

5-5. TROUBLESHOOTING.

The first step in troubleshooting the HFLM is as follows:

a. Observations - Observe the operation of equi pment and determine whether the indications are normal or abnormal. (Refer to operator's section.)

b. Fuse Checks - Should a malfunction occur a visual check of protection fuses on the equipment must be performed. (All fuses are indicating type.) (Refer to Figure 5-1 and Table 5-3 for fuse location and function.)

c. Voltage Checks - At this time voltage checks are not necessary until localization of the malfunction has taken place.

d. Localization of Malfunction - Perform the operational check-out procedure outlined in Paragraph 3-4. Use of this procedure will help localize the particular fault at hand.

Troubleshooting charts have been specially prepared to assist you in localization of a malfunction, should one occur. The manner in which the table has been written gives a sequential order for localizing malfunctions.

e. Field Maintenance - Procedures presented on the following pages give instructions for qualified personnel to maintain, align, and/or troubleshoot the HFLM-10K.

WARNING

WHEN IT BECOMES NECESSARY TO MEASURE TRANSMITTER VOLTAGES, USE EXTREME CAUTION. HAZARDOUS VOLTAGE POTENTIALS ARE PRESENT ALTHOUGH THE MAIN POWER BREAKER MAY BE OFF. IT IS RECOMMENDED THAT THE FOLLOWING PRECAUTION BE STRICTLY ADHERED TO.

(1) CHECK TO ASCERTAIN MAIN PRIMARY POWER IS OFF AND TAGGED OR REMOVED FROM EQUIPMENT.

(2) SHORT OUT ALL HV POINTS WITH SHORTING STICK PROVIDED.

(3) ATTACH TEST METER TO POINT OF TEST DESIRED, RE-APPLY VOLTAGE TO TRANSMITTER.

(4) WHEN MEASURING HIGH VOLTAGE POTENTIALS, DO NOT TOUCH TEST METER OR LEADS ONCE VOLTAGE HAS BEEN APPLIED.

(5) ESTABLISH TEST CONDITIONS AND OBSERVE READING ON TEST METER.

(6) REMOVE PRIMARY POWER, SHORT OUT ALL HIGH VOLTAGE POINTS, REMOVE TEST METER.

TABLE 5-1. OPERATOR'S TROUBLESHOOTING CHART

No.	Malfunction	Probable Cause of Malfunction
1	IPA Blower will not operate. INTERLOCK indicator will not light.	REPLACE DEFECTIVE IPA BLOWER FUSE (2 AMPS).
2	PA PLATE CURRENT exeessive, IPA PLATE CURRENT excessive, overloads continue to trip.	REPLACE DEFECTIVE BIAS FUSE (1/10 AMP).
3	PA TUNE Control will not operate. PA LOAD Control will not operate. BANDSWITCH Control will not operate.	REPLACE DEFECTIVE 24 VDC FUSE (8 AMPS).
4	IPA Bandswitch will not change frequency bands.	REPLACE DEFECTIVE IPA BAND-SWITCH FUSE (5 AMPS).
5	Main Blower will not operate. INTERLOCK lamp will not light. HIGH VOLTAGE Indicator will not light when switch has been pressed.	REPLACE. Ø1 BLOWER OR - (3 AMPS) FUSE Ø2 BLOWER OR - (3 AMPS) FUSE Ø3 BLOWER OR - (3 AMPS) FUSE
6	PA SCREEN Meter indicates NO reading with High Voltage on.	REPLACE.
7	PA and IPA Plate Meters indicate NO reading with High Voltage ON.	Ø LOW VOLTAGE - (2.5 AMPS) FUSE Ø LOW VOLTAGE - (2.5 AMPS) FUSE
8	HFLM Output Power suddenly drops to ZERO.	Ø3 LOW VOLTAGE - (2.5 AMPS) FUSE
9	PA TUNE Control inoperative. PA LOAD Control inoperative. Filament Time Meter inoperative. HIGH VOLTAGE indicator will not light when High Voltage switch is pressed. INTERLOCK indicator will not light.	REPLACE PA FIL FUSE (5 AMPS)

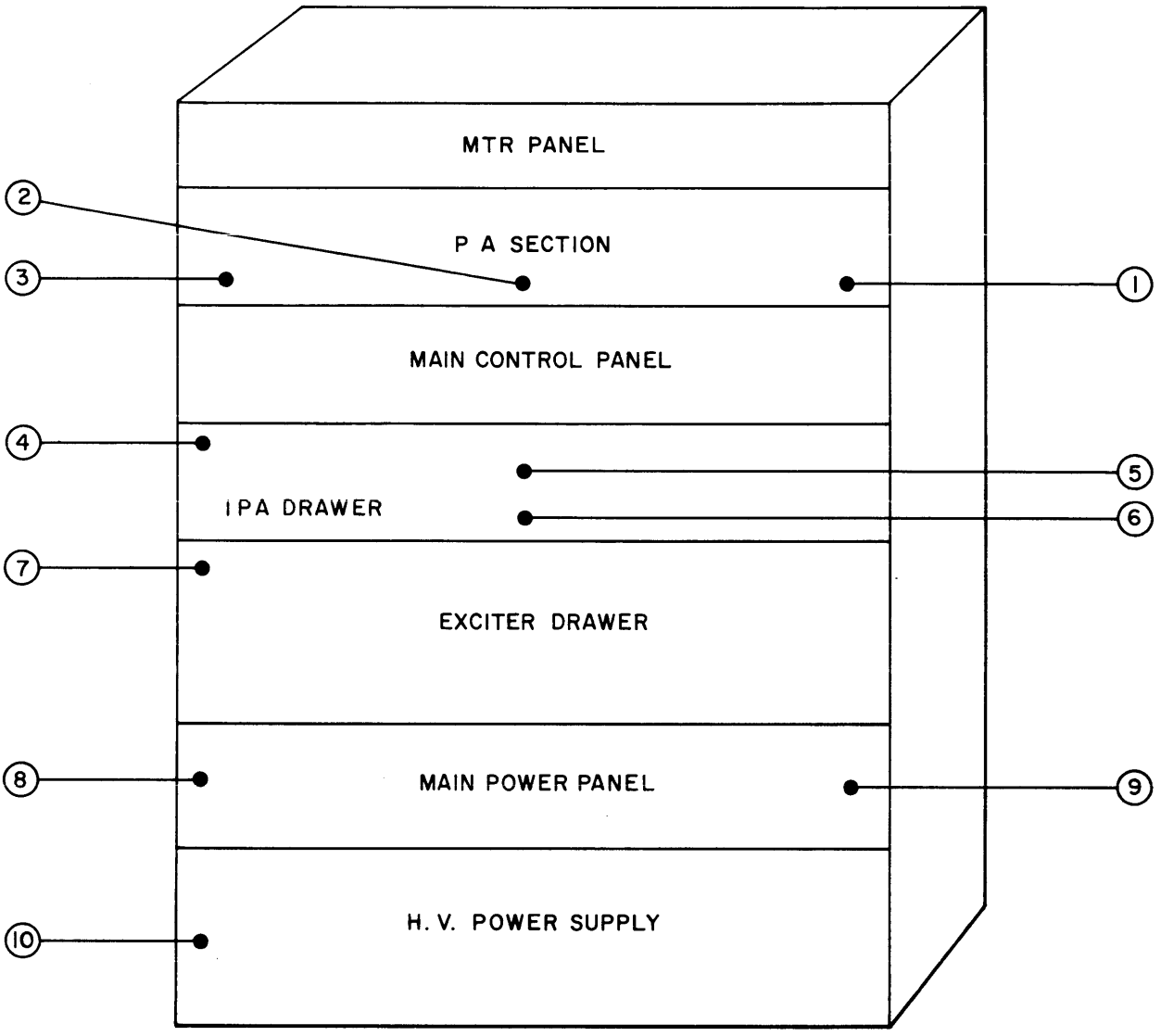


Figure 5-2. Interlock Location

TABLE 5-2. INTERLOCK LOCATION

Modular Unit	Item No. Ref. Fig. (5-2)	Designation	Function
PA SECTION	1	PA Window	When PA window opened, interlock circuit opens removing HV. Interlock lamp goes out.
	2	PA Rear Cover	Interlock opens when rear cover removed; HV relay opens removing HV. Interlock lamp goes out.
	3	Rear P.S. Cover	Interlock opens when P.S. cover removed. HV relay opens removing HV. Interlock lamp goes out.

TABLE 5-2. INTERLOCK LOCATION (CONT)

Modular Unit	Item No. Ref. Fig. (5-2)	Designation	Function
IPA DRAWER	4	IPA Drawer	Interlock opens when IPA drawer not properly closed. HV relay opens removing HV. Interlock lamp goes out.
	5	IPA Top Cover (located on top of chassis)	Interlock opens when top cover removed; HV relay opens removing HV. Interlock lamp goes out.
	6	IPA Bottom Cover (located on bottom chassis directly above bottom cover)	Interlock opens when bottom cover removed. Filaments and 24 vdc circuits open removing HV. All front panel indicators go out.
EXCITER DRAWER	7	Exciter Drawer	Interlock opens when exciter drawer extended from frame. HV relay de-energizes removing HV. Interlock lamp goes out.
MAIN POWER PANEL	8	Left Side	Interlock opens when left side shield is removed. HV relay de-energizes removing HV and interlock lamp goes out.
	9	Right Side	Interlock opens when right side shield is removed. HV relay de-energizes removing HV and interlock lamp goes out.
HIGH VOLTAGE POWER SUPPLY	10	HV Power Supply	Interlock opens when HV power supply cover is removed. HV relay de-energizes removing HV and interlock lamp goes out.

5-6. ALDC ADJUSTMENT PROCEDURE.

a. Purpose - The ALDC adjustments outlined are for the purpose of maintaining a constant peak power reference during modulating emission modes. The HFLM provides a negative dc voltage which is adjustable and proportional to the transmitter output. This voltage is made available at the ALDC output jack to interface an associated exciter.

The exciter accepts this voltage to control the rf drive. Thus, a peak to average relationship is established in the exciter as a result of an ALDC control voltage. (Note: Exciter is not included in HFLM-10K.)

(1) Adjust ALDC potentiometer counterclockwise (No ALDC).

(2) Tune and Load transmitter to any carrier frequency between 2 MHz and 30 MHz.

(3) Adjust RF GAIN control for a PA OUTPUT indication of 12 KW.

(4) Adjust ALDC control until the Power OUTPUT indication commences to decrease.

REF SYM	TUBE TYPE	TUBE FUNCTION	STATIC PLATE CURRENT ADJ TO	MAX AVAILABLE BIAS VOLTAGE
V1301	8233	1 ST IPA. AMP.	60 MA	-18VDC
V1302	4CX350	2ND IPA AMP	200MA	-30 VDC
V1401	8576	3RD IPA AMP	150 MA	-80 VDC
V701	8794	PA	0.75A	-360 VDC

NOTE:

1. MAX BIAS VOLTAGE WILL BE PRESENT IF:
   A. BANDSWITCH NOT IN PROPER POSITION.
   B. PTT RELAY NOT ENERGIZED.
   C. BIAS CONTROLS ARE AT MAX CLOCKWISE.

2. WHEN MAX BIAS VOLTAGE IS PRESENT AT V1302, V1401, V701, THE STATIC PLATE CURRENT IS REDUCED TO ZERO WHICH PLACES THE AMPLIFIERS AT OR NEAR CUTOFF.

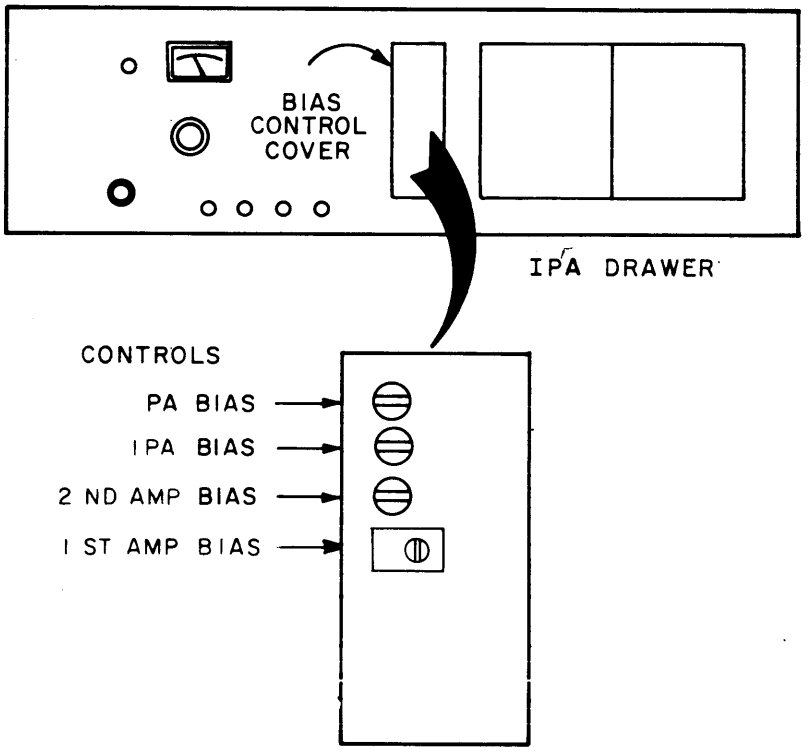


Figure 5-3. Bias Control Location

(5) Continue to adjust ALDC control for a PA OUTPUT indication of 10 KW.

*(6) Increase RF GAIN; (to check ALDC capture) PA OUTPUT should remain constant.

(7) Reduce RF drive to minimum. This completes ALDC adjustment procedure. The ALDC adjustment may be set for values lower than specified in procedure if desired.

5-7. BIAS ADJUSTMENT PROCEDURE.

The bias adjustments outlined below are to obtain quiescent plate current values. Before bias adjustments can be made, the Bias Control Cover must be removed to expose the bias adjustment controls. Refer to figure 5-3 for location of bias controls.

NOTE

Static plate current values indicated in the procedure are normal operating values, however, should an abnormal condition exist, refer to figure 5-4, (Simplified Bias Control Diagram).

Step 1 Set bias controls to maximum clockwise position. (Bias voltage will be at max value.)

Step 2 Place MAIN POWER breaker to ON position.

Step 3 Place SCREENS breaker to ON.

NOTE

Insure that dummy load or antenna is connected to transmitter output and RF drive is at minimum.

Step 4 Press HIGH VOLTAGE pushbutton indicator to light indicator and apply HIGH VOLTAGE. (HV indicator lights when HV is on.)

Step 5 Observe PA PLATE current meter and adjust PA BIAS control for an indication of .75 amperes as read on PA PLATE current meter.

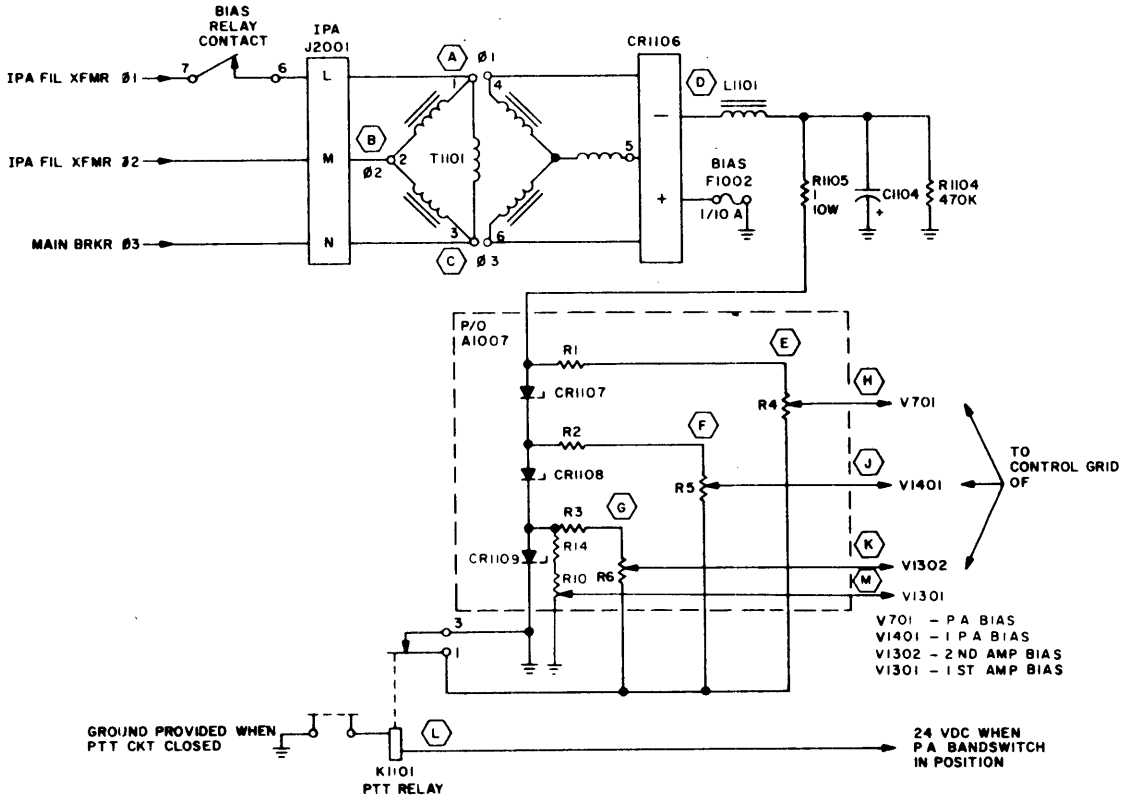
Step 6 Observe PLATE meter on IPA drawer and adjust DRIVER BIAS control for an indication of 200 ma as read on PLATE meter.

Step 7 Put IPA PLATE meter switch in the 2ND AMP position (up); note PLATE meter indication and adjust 2ND AMP bias control for an indication of 200 ma as read on the PLATE meter. (METER switch must be held in the 2ND AMP position when making bias adjustment.)

Step 8 Put IPA PLATE meter switch in the 1ST AMP position (down); note PLATE meter indication and adjust 1ST AMP bias control for an indication of 60 ma as read on PLATE meter. (Meter switch must be held in the 1ST AMP position when making bias adjustment.)

Step 9 Press HIGH VOLTAGE button to OFF and replace BIAS CONTROL COVER.

* Should the ALDC capture voltage be insufficient, resulting in an INCREASE in PA OUTPUT when RF drive is increased, further adjustment of the ALDC potentiometer may be necessary to hold the PA OUTPUT constant.



BIAS SUPPLY VOLTAGE (PTT RELAY CLOSED)

POINT OF TEST	VOLTAGE	REFERENCE DESIGNATION	POINT OF TEST	VOLTAGE	REFERENCE DESIGNATION
A	230 VAC Ø1	T1101	G	-120 VDC	R6
B	230 VAC Ø2	T1101	H	-210 VDC	V701
C	230 VAC Ø3	T1101	J	-80 VDC	V1401
D	-420 VDC	L1101	K	-22 VDC	V1302
E	-360 VDC	R4	L	24 VDC	K1101
F	-240 VDC	R5	M	-18 VDC	V1301

BIAS SUPPLY VOLTAGE (PTT RELAY OPEN)

POINT OF	VOLTAGE	REFERENCE DESIGNATION	POINT OF	VOLTAGE	REFERENCE DESIGNATION
A	230 VAC Ø1	T1101	G	-120 VDC	R6
B	230 VAC Ø2	T1101	H	-360 VDC	V701
C	230 VAC Ø3	T1101	J	-240 VDC	V1401
D	-420 VDC	L1101	K	-120 VDC	V1302
E	-360 VDC	R4	L	0 VDC	K1101
F	-240 VDC	R5	M	-18 VDC	V1301

Figure 5-4. Simplified Bias Control Circuit

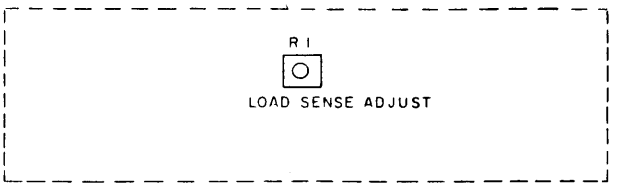


Figure 5-5. Load Sense

LOAD SENSE ADJUSTMENT - Place MAIN POWER breaker to ON position and press PA LOAD down (-) and hold for approximately one minute. Slide Technimatic Cover up to expose LOAD SENSE adjustment control and adjust control until LOAD SENSE meter indicates zero. Press LOAD control up (+) at maximum "C". The LOAD SENSE meter should read 100 on meter face.

5-8. OVERLOAD CIRCUIT TEST. (Refer to Figure 5-6 for Control Location.)

a. Purpose - The Overload Circuitry functions to protect the HFLM against excessive currents and VSWR. Each current meter has a built-in overload indicator. An adjustment control is located directly below the meter face on each meter. To set the overloads, perform the following:

(1) Energize transmitter (MAIN POWER breaker ON, SCREENS breaker ON).
(2) Press HIGH VOLTAGE pushbutton to apply high voltage.
(3) Apply rf (11 MHz) to HFLM.
(4) Adjust HFLM's operating controls for rated power output.
(5) Reduce rf drive to min. (RF GAIN control counterclockwise.)

NOTE

When an overload occurs, the HIGH VOLTAGE pushbutton must be pressed twice to reapply High Voltage. Press to reset overload and press to apply High Voltage.

5-9. PA PLATE OVERLOAD ADJUSTMENT.

Step 1 Adjust Overload indicator (adjustment screw located directly below meter face) for 2 amperes as indicated on PA PLATE current meter.

Step 2 Increase drive until PLATE current meter indicates 2 amperes. Observe the following:

a. When meter indicator reaches the value of overload indicator setting, the High voltage will trip OFF.
b. PLATE current meter face will illuminate indicating overload in Plate current.
c. Meter indicator will remain at the overload value to indicate value which caused overloaded condition.

Step 3 Reduce rf drive to minimum and press HIGH VOLTAGE pushbutton to reset HIGH VOLTAGE. (HV Switch may have to be pressed twice.)

Step 4 To fruther check operation of plate overload, increase rf drive again noting that HIGH VOLTAGE tripped as in Step 2. Set overload indicator for indication of 3.5 amps as read on the PLATE current meter.

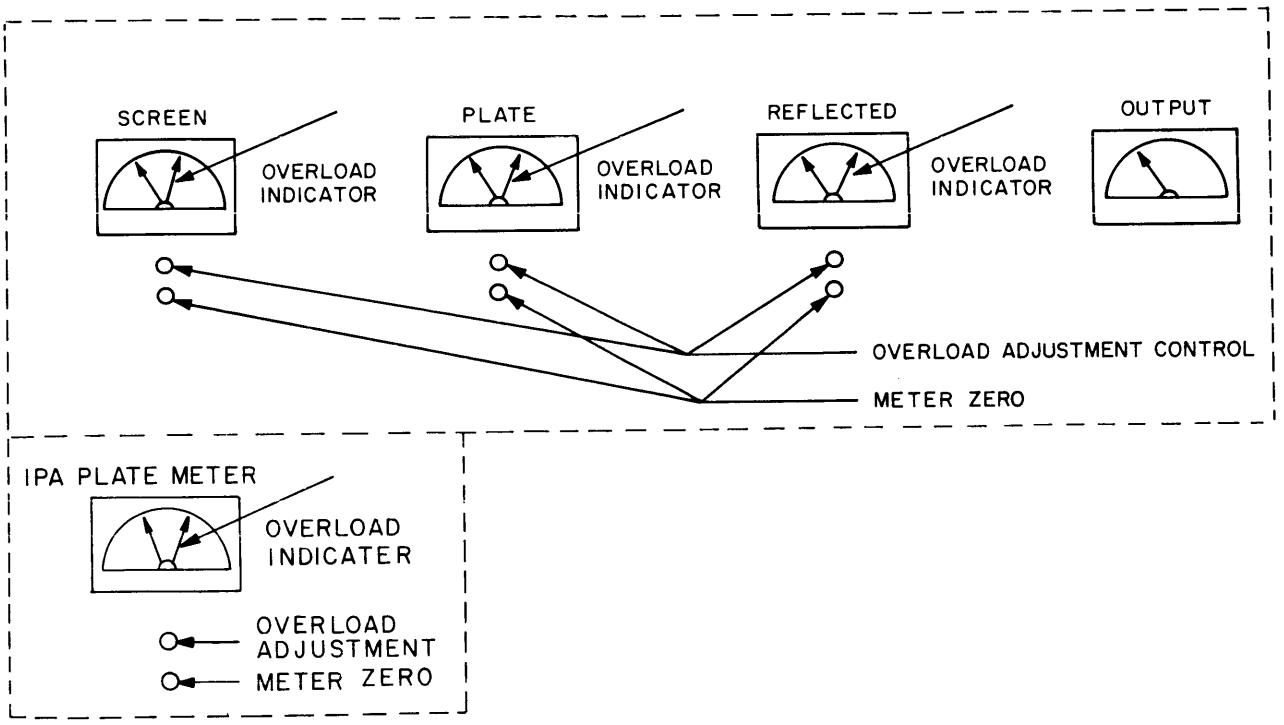


Figure 5-6. Overload Adjustments

5-10. PA SCREEN OVERLOAD ADJUSTMENT.

Step 1 Repeat paragraph 5-8 and proceed to Step 2.

Step 2 Reduce rf drive, set PA SCREEN overload indicator to 30 milliamps as indicated on the PA SCREEN current meter.

Step 3 Increase rf drive and operate PA TUNE and PA LOAD controls to draw SCREEN current. (Unload HFLM.)

Step 4 Further increase the RF drive until meter indicator reaches value set on overload indicator.

Step 5 Observe the following:

a. High Voltage should trip OFF (indicated by HV indicator OFF).

b. PA SCREEN meter face will illuminate and meter indicator will remain at the overloaded value.

c. PA PLATE current and IPA PLATE current meters will indicate zero.

Step 6 To further check operation of PA Screen Overload, reduce rf drive, press HV button to light indicator, and increase drive until overload trips at overload indicator value.

Step 7 Reset overload indicator to 80 ma.

5-11. SWR OVERLOAD ADJUSTMENT.

Step 1 Repeat paragraph 5-8 and proceed to Step 2.

Step 2 Press HV button to REMOVE HIGH VOLTAGE. (HIGH VOLTAGE INDICATOR MUST BE OFF.)

Step 3 Rotate 5KW reflected POWER diode element (located in directional coupler DC-104) 180°. (ARROW on DIODE element should be in direction of RF output from transmitter to antenna after it has been rotated 180°).

Step 4 Press HV button to apply HIGH VOLTAGE. Set Reflected power overload indicator to 2.0:1 as indicated on the bottom scale on REFLECTED power meter.

Step 5 Increase rf drive until REFLECTED power indicator reaches overload indicator value and observe the following:

a. HV will trip OFF; HV indicator will go out.
b. REFLECTED power meter will illuminate.
c. REFLECTED power indicator will remain at the overloaded value to further indicate overload.
d. PA and IPA PLATE current meters will indicate zero.
e. To further check operation of SWR overload, reduce rf drive, press HV button to ON, and increase rf drive again until overload trips HV OFF.
f. Restore 5 KW (Reflected Power) diode element to original position (Arrow on diode element facing direct opposite of 20 KW forward power diode).
g. Set SWR overload indicator to desired value.

5-12. IPA PLATE CURRENT OVERLOAD ADJUSTMENT.

Step 1 Insure rf drive is at minimum setting.

Step 2 Energize transmitter, (MAIN POWER and SCREEN breaker to ON position, HV pushbutton pressed ON.)

Step 3 Set IPA PLATE overload indicator to 300 ma as read on IPA PLATE meter.

Step 4 Remove bias control cover and adjust IPA Bias control counterclockwise noting PLATE meter indication. When PLATE current meter indicates 300 ma (value of IPA PLATE overload setting), observe the following indications:

a. HV will trip to OFF (HV indicator OFF).
b. IPA PLATE meter will illuminate.
c. IPA PLATE meter indicator will remain at overloaded value.
d. PA PLATE current meter will indicate ZERO.
e. Restore bias control to original setting.
f. Reset overload indicator to indicate 800 ma as read on the IPA PLATE Current meter.

5-13. TROUBLESHOOTING TRANSMITTER OVERLOAD CIRCUITRY.

The overload circuit is designed to remove High Voltage in the event of excessive current conditions. Paragraphs 5-8 through 5-12 provided information for checking and setting overloads. However, if the overload circuitry does not function in accordance with Paragraphs 5-8 through 5-12, troubleshoot the overload circuitry in the following manner:

a. Temporarily remove PA window.

b. Loosen Meter panel locks and lower Meter Panel on its hinges to expose rear side.

c. Place MAIN POWER breaker and SCREEN breaker (dual section) to ON position. SINGLE SECTION OF SCREEN BREAKER MUST BE IN OFF POSITION.

d. Press HV button to ON (HV indicator will "NOT" illuminate). Adjust Overload pointer counterclockwise to make contact with meter pointer, overload lamps should light.

NOTE

If overload lamp on associated meter board does not light, temporarily place a jumper across switch controls on meter board. (Refer to Assembly Drawing on associated schematic diagram for parts location.) If overload lamps do not light with jumper check Q 1 and the presence of 24 vdc on the associated board inputs. The voltage that lights the overload lamp also energizes the overload relay.

e. Observe OVERLOAD relay K1; (located on PC board A4802) when the overload lamps light on any meter board K1 should energize to an overload condition. If K1 does not energize, check E8 on A4802 for the presence of 24 vdc. (Refer to Assembly Drawing for parts location.)

NOTE

When an overload condition exists the associated meter overload lamp should light, however, should more than one set of overload lamps light, check isolation diode CR1 on each overload board.

f. When overload relay K1 is latched in the overload condition, it must be reset to enable a High Voltage ON condition. Remove temporary jumper or adjust overload pointer clockwise and press HV button.

Observe overload relay K1. It should latch into the rest position and associated overload lamps should go out. If overload relay K1 does not reset, check for the presence of 24 vdc on E11 of A4802.

Reference	Assembly No.	Schematic Diagram
PA PLATE OVERLOAD BOARD	A4800	Figure 7-1, Sheet 3
PA SCREEN OVERLOAD BOARD	A4800	Figure 7-1, Sheet 3
REFLECTED POWER & MAIN OVERLOAD BOARD	A4802	Figure 7-1, Sheet 1
IPA PLATE OVERLOAD BOARD	A4801	Figure 7-2, Sheet 3

TABLE 5-3. FUSE FUNCTIONS (figure 5-1)

Item No.	Panel Designation	Function
1	IPA BLOWER	Protective fuse for IPA blower. Lights to indicate fuse defective. (2 Amps)
2	BIAS	Protective fuse for bias circuit. Lights to indicate fuse defective. (1/10 Amp)
3	24 VDC	Protective fuse for 24 vdc supply. Lights to indicate fuse defective. (8 Amps).
4	BANDSWITCH	Protective fuse for PA and IPA Bandswitches. Lights to indicate fuse defective. (5 Amps)
5	Ø1 BLOWER	Protective fuse for PA Blower Lights to indicate defective fuse. (3 Amps).

TABLE 5-3. FUSE FUNCTIONS (CONT)

Item No.	Panel Designation	Function
6	Ø2 BLOWER	SAME AS ITEM NO. 5.
7	Ø3 BLOWER	SAME AS ITEM NO. 5.
8	Ø1 LOW VOLTAGE	Protective fuse for IPA FILAMENT 24V Supply and TUNE CONTROL. (2.5 Amps)
9	Ø2 LOW VOLTAGE	SAME AS ITEM NO. 8.
10	Ø3 LOW VOLTAGE	SAME AS ITEM NO. 8.
11	PA FIL	Protective fuse for PA Filaments. Lights to indicate defective fuse. (5 Amps)
12	PRIMARY AC (INTERIOR FUSE LOCATED ON PA LOAD ASSEMBLY)	Protective fuse for PA Load Servo Motor. Lights to indicate defective fuse.
13	DC (INTERIOR FUSE LOCATED ON PA LOAD ASSEMBLY)	Protective fuse for 24 vdc circuit within the PA LOAD Assembly. Lights to indicate defective fuse.
14	EXCITER FUSE	Protective fuse for Exciter. Lights to indicate defective fuse.

TABLE 5-4. HIGH VOLTAGE CONTROL VOLTAGE CHART (Refer to figure 5-7)

Point of Test	Measured Values	Reference Symbol
A	20 vac	T803
B TO GROUND	+24 vdc	CR1103
C TO GROUND	+24 vdc	K2005 Pin 2
D	GROUND ALWAYS	K2005 Pin 10
E TO GROUND	115 vac (Ø2)	K2005 Pin 9
F TO GROUND	115 vac (Ø2)	K2004 Pin 1
G TO GROUND	+24 vdc	K2004 Pin 2
H	GROUND (HV BUTTON PRESSED)	K2004 Pin 10
I TO GROUND	115 vac Ø	K801
J TO GROUND	115 vac Ø	K801
I TO J	230 vac	K801
K	GROUND (HV BUTTON PRESSED)	

TEST EQUIPMENT

Simpson 260 Multimeter, or equivalent

TEST CONDITIONS

1 - Main power breaker on

2 - Screens breaker on

3 - Interlock circuit complete

OBJECT

To energize High Voltage contactor.

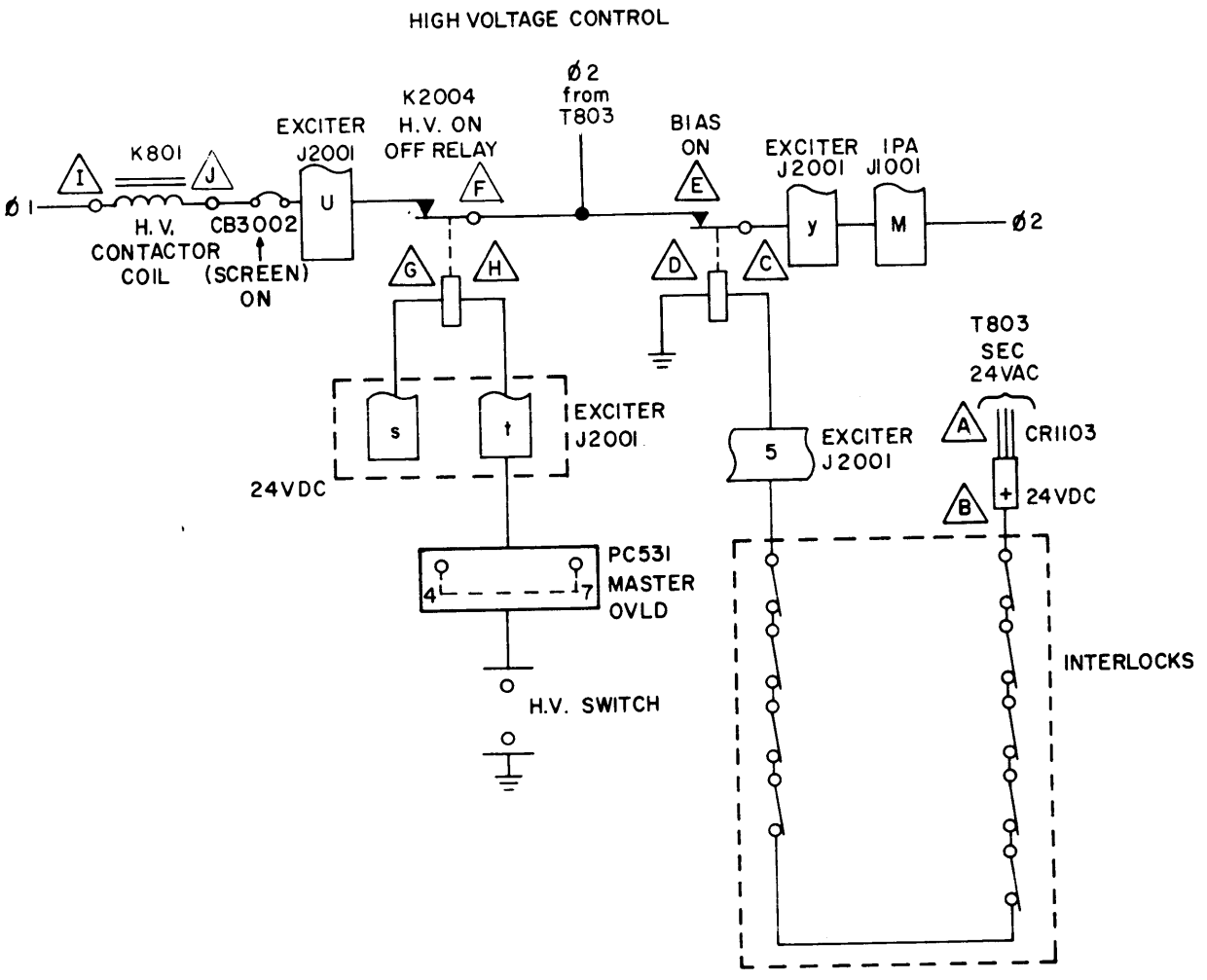


Figure 5-7. High Voltage Control

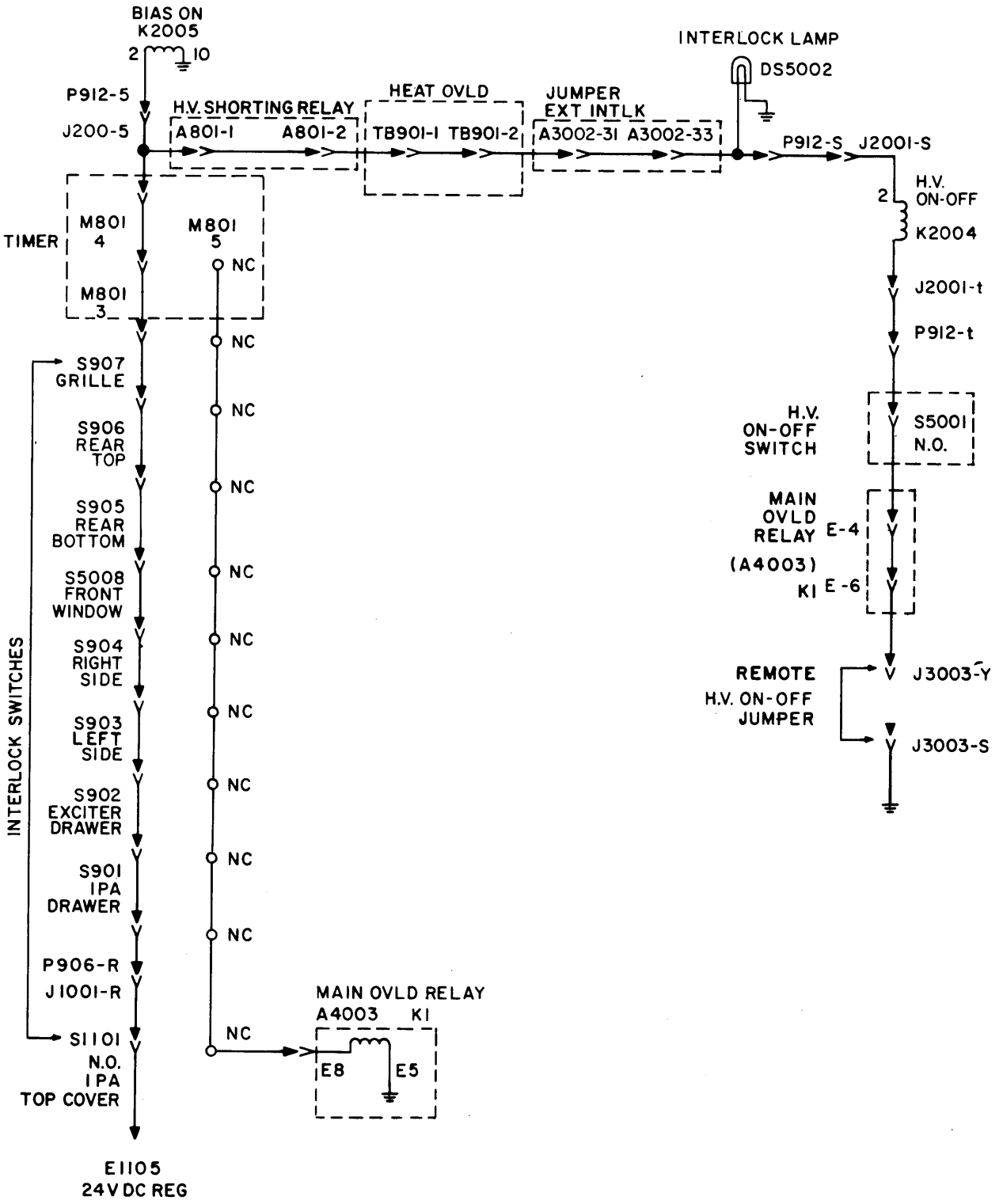


Figure 5-8. Simplified Interlock Circuit

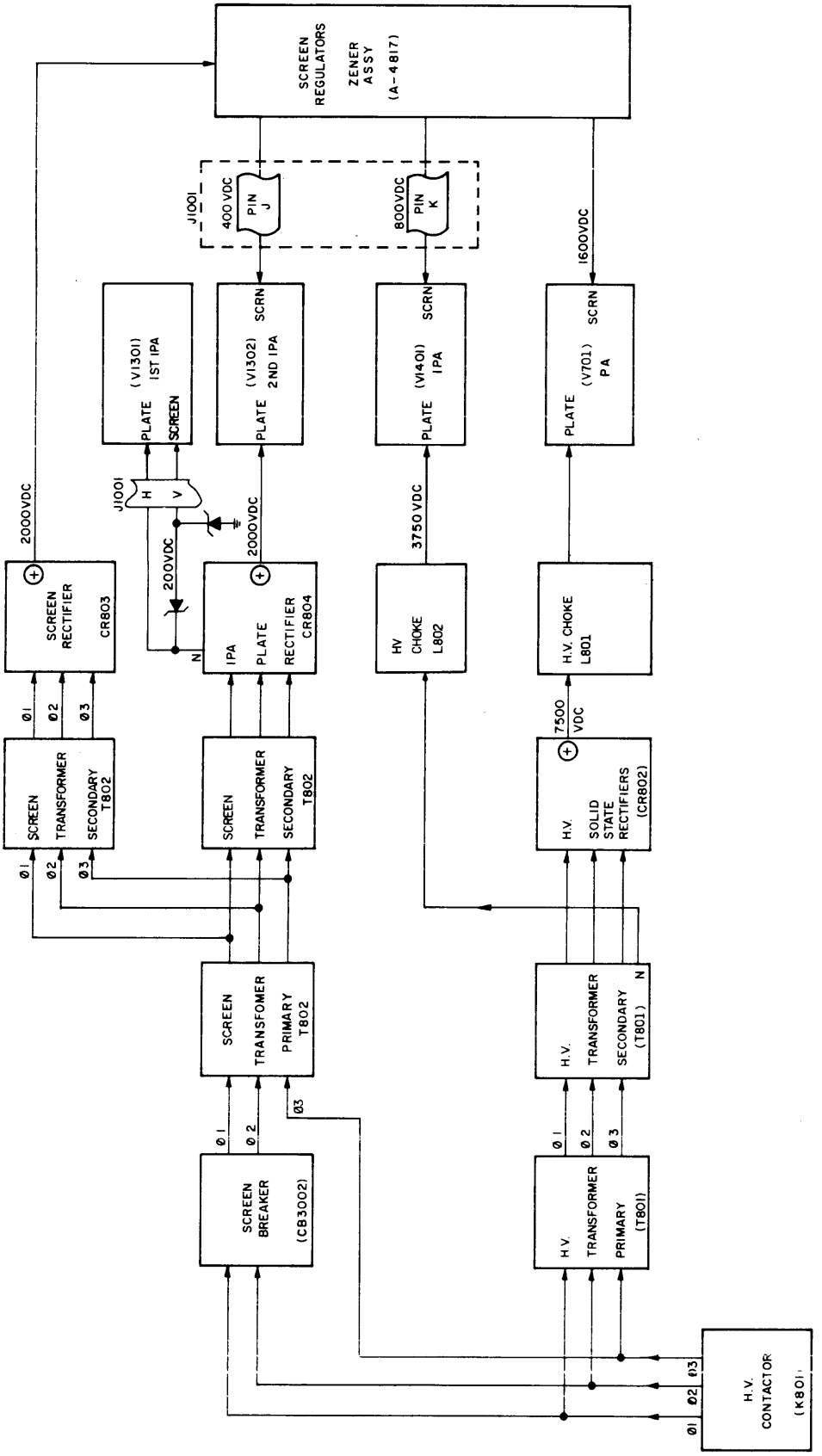


Figure 5-9. Simplified Plate and Screen Circuits

TABLE 5-5. TROUBLESHOOTING CHARTS

The Maintenance programs listed are for the purpose of assisting in troubleshooting and maintenance of the Transmitter.

These charts or programs do not list all possible difficulties, however, they can be used as a starting point to isolate a particular malfunction. To use the charts, follow these instructions.

1. Determine the nature of the trouble.
2. Find the programs which describes it most completely (refer to program list).
3. Follow the arrow from that block to the first suggested fault. INVESTIGATE.
4. If no trouble is found, follow the arrow to the next fault suggested. INVESTIGATE.
5. If trouble is only partially corrected, find the block which most nearly describes the remaining trouble. INVESTIGATE.
6. Proceed as in Line 3 above.

MAINTENANCE PROGRAM LIST

Maintenance Program "A" IPA Plate Meter reading abnormal.

Maintenance Program "B" 2nd IPA Plate meter reading abnormal.

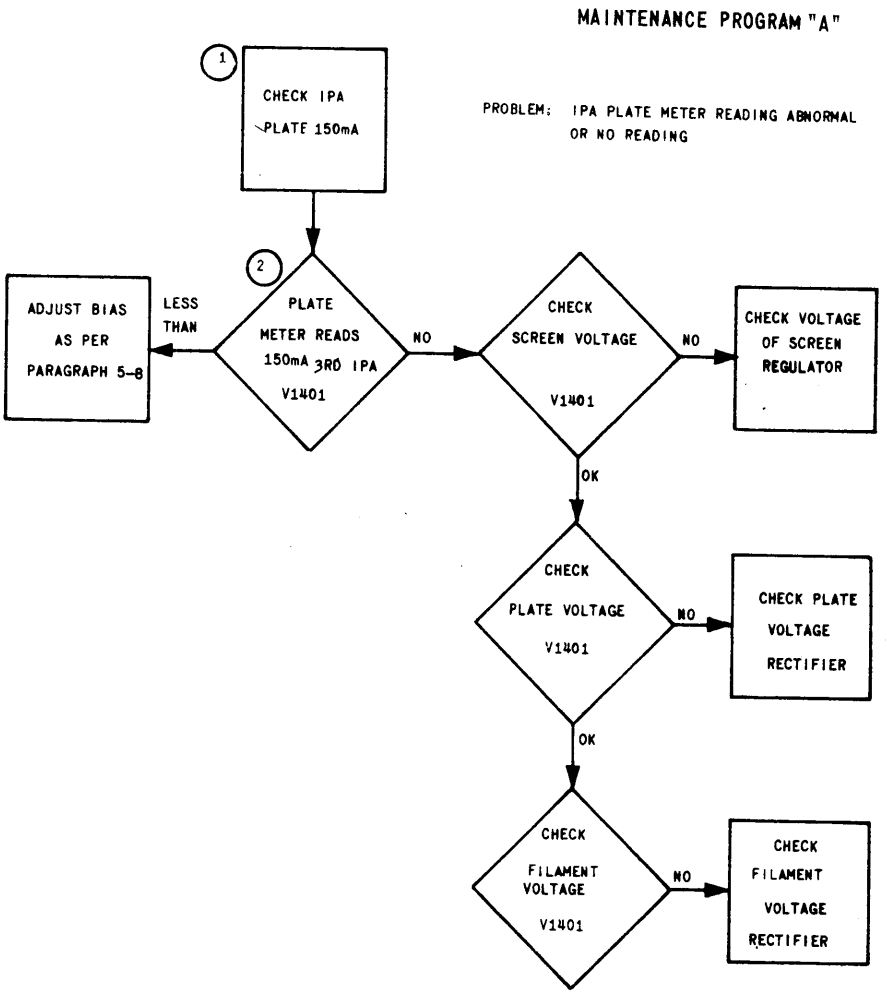
Maintenance Program "C" No. HV.

Maintenance Program "D".

1. Main Blower does not operate.
2. Bandswitch and Interlock lamps out.

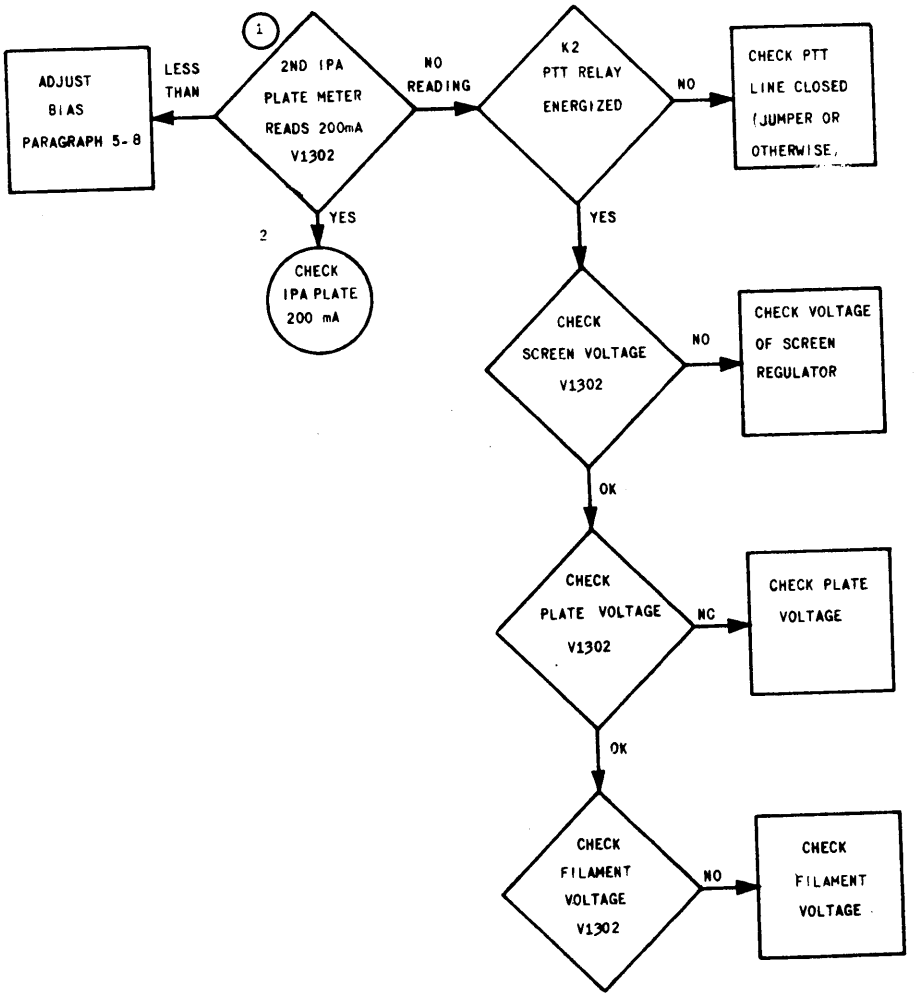
Maintenance Program "E" Interlock Lamp does not light.

TABLE 5-5. TROUBLESHOOTING CHART (CONT)



MAINTENANCE PROGRAM B

PROBLEM. 2ND IPA READING ABNORMAL OR NO READING



USE CAUTION WHEN MEASURING VOLTAGES

TABLE 5-5. TROUBLESHOOTING CHART (CONT)

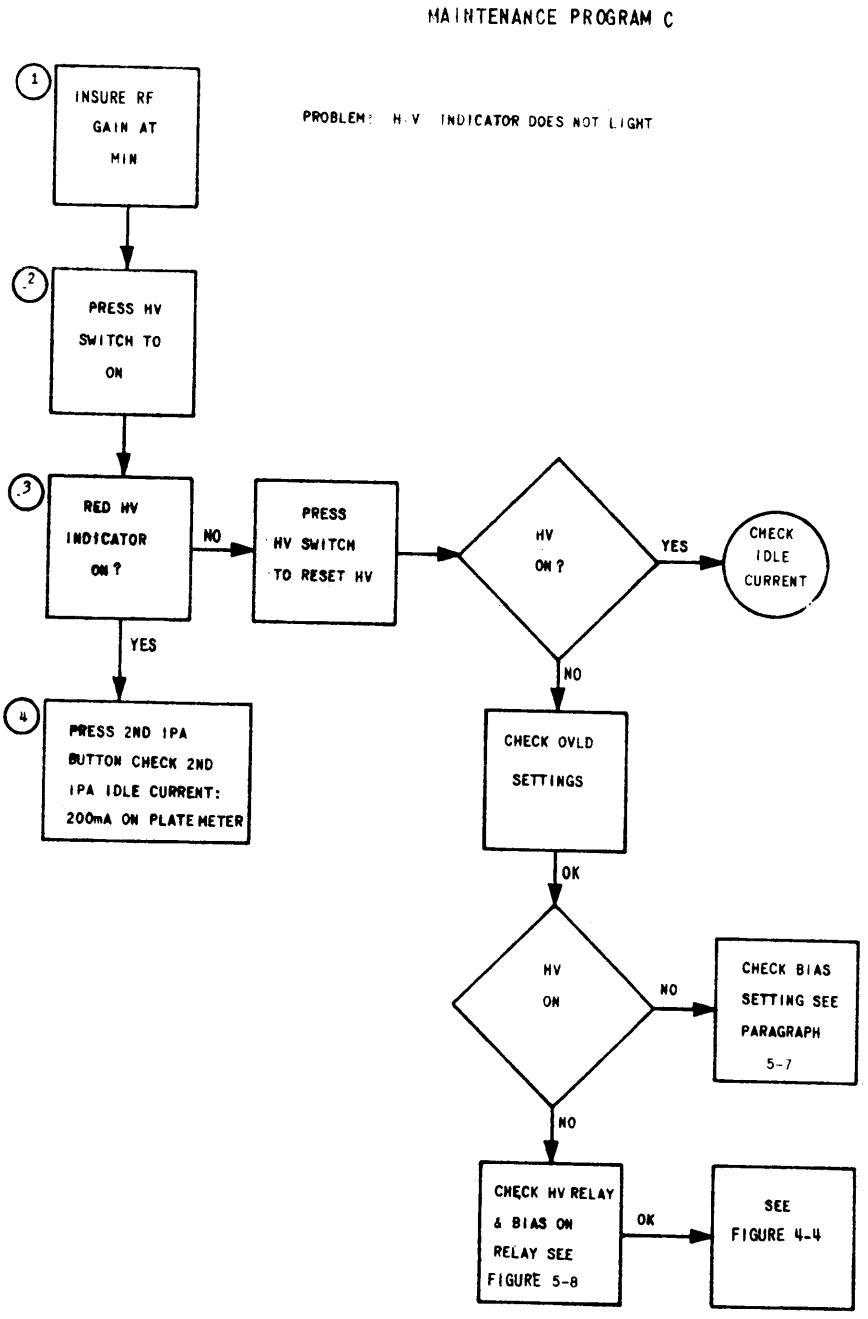


TABLE 5-5. TROUBLESHOOTING CHART (CONT)

MAINTENANCE PROGRAM "D"

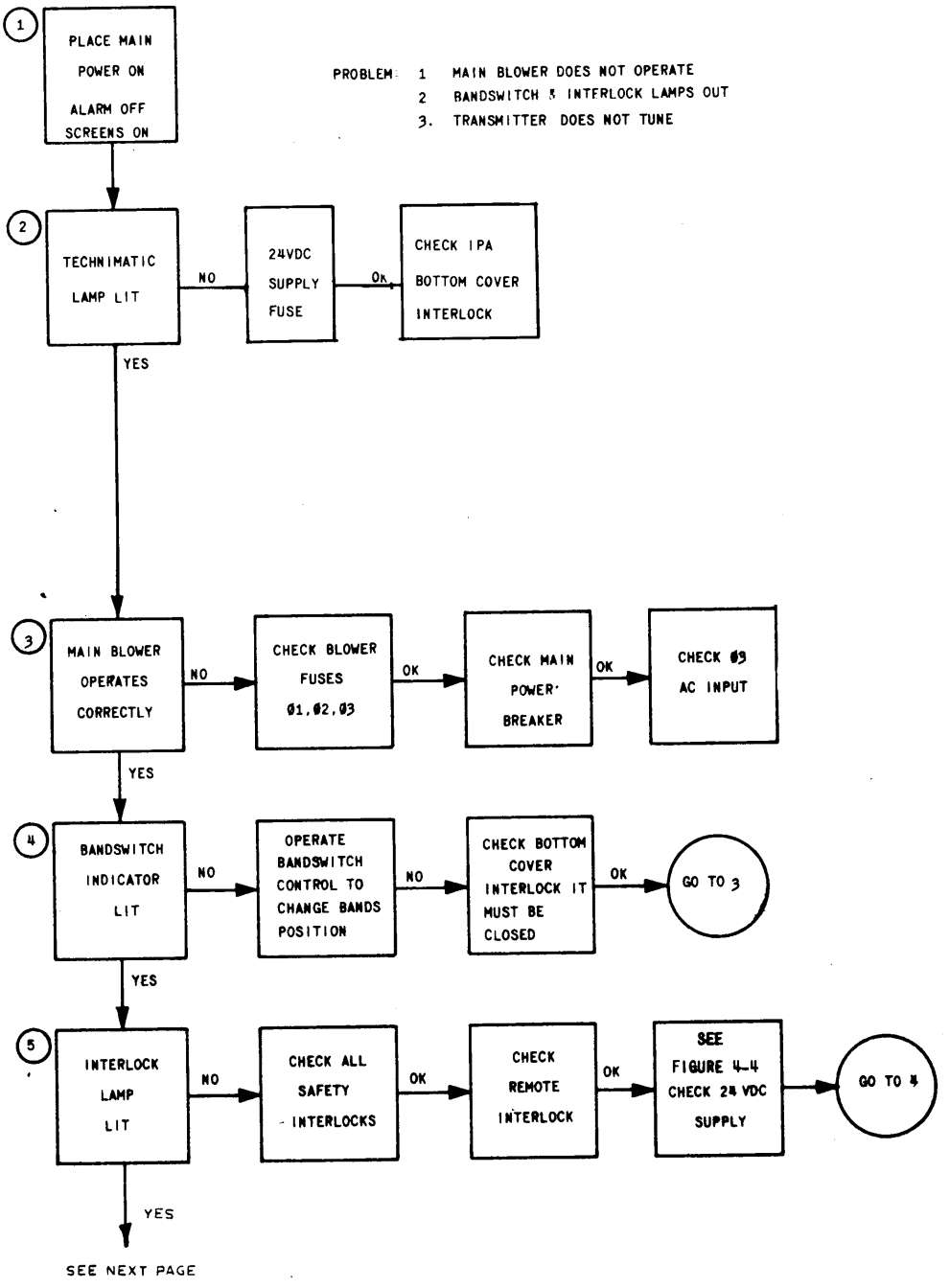


TABLE 5-5. TROUBLESHOOTING CHART (CONT)

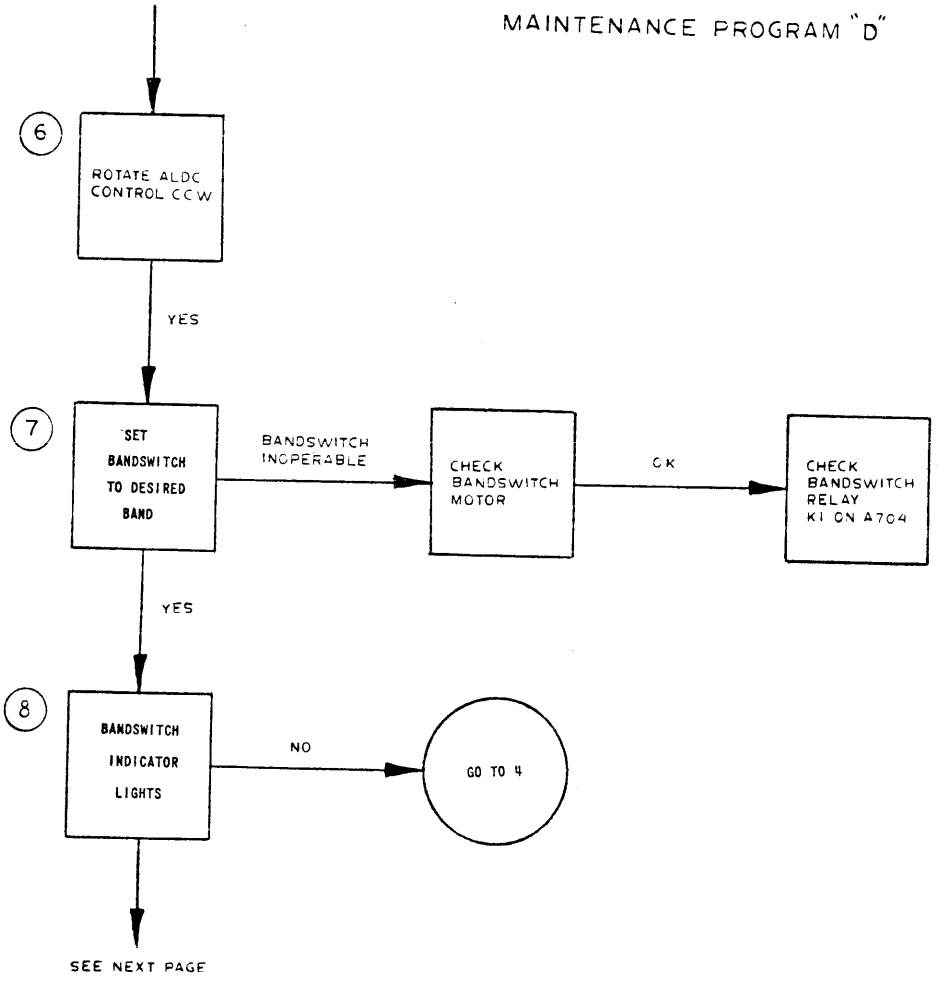


TABLE 5-5. TROUBLESHOOTING CHART (CONT)

MAINTENANCE PROGRAM "D"

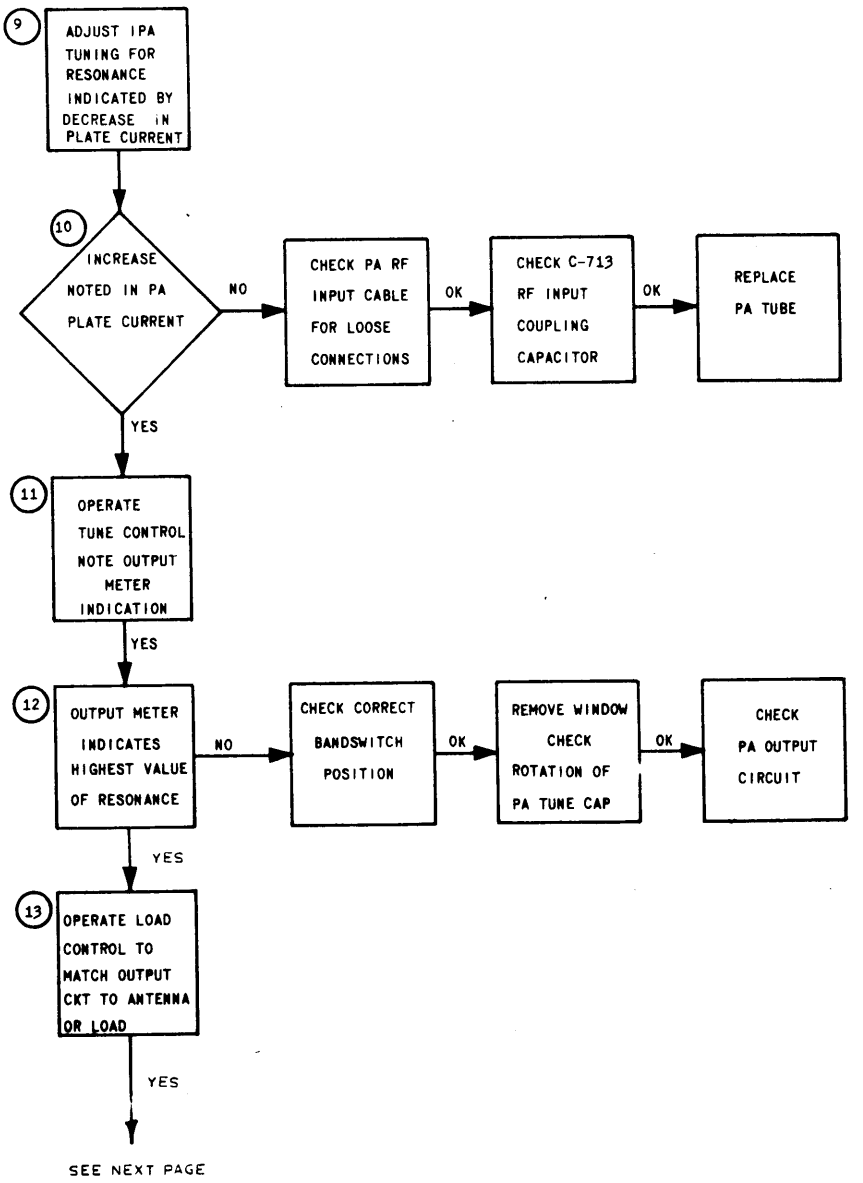


TABLE 5-5. TROUBLESHOOTING CHART (CONT)

MAINTENANCE PROGRAM "D"

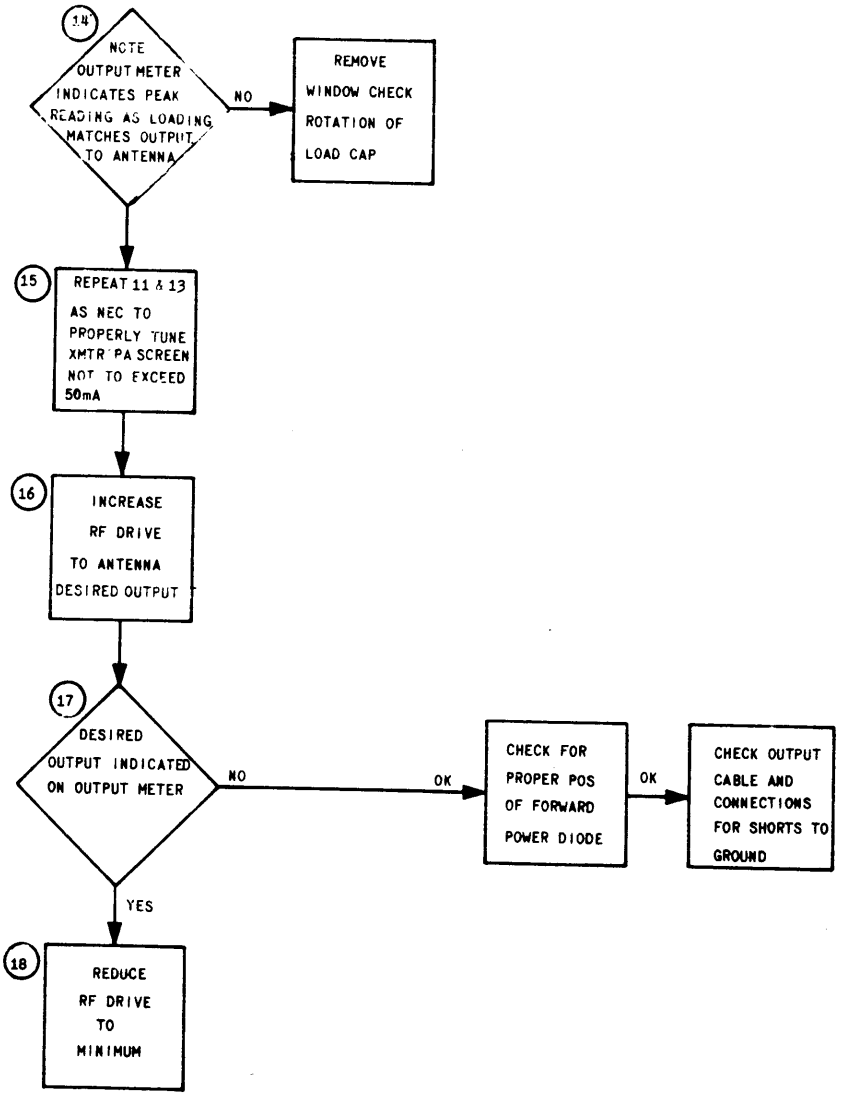
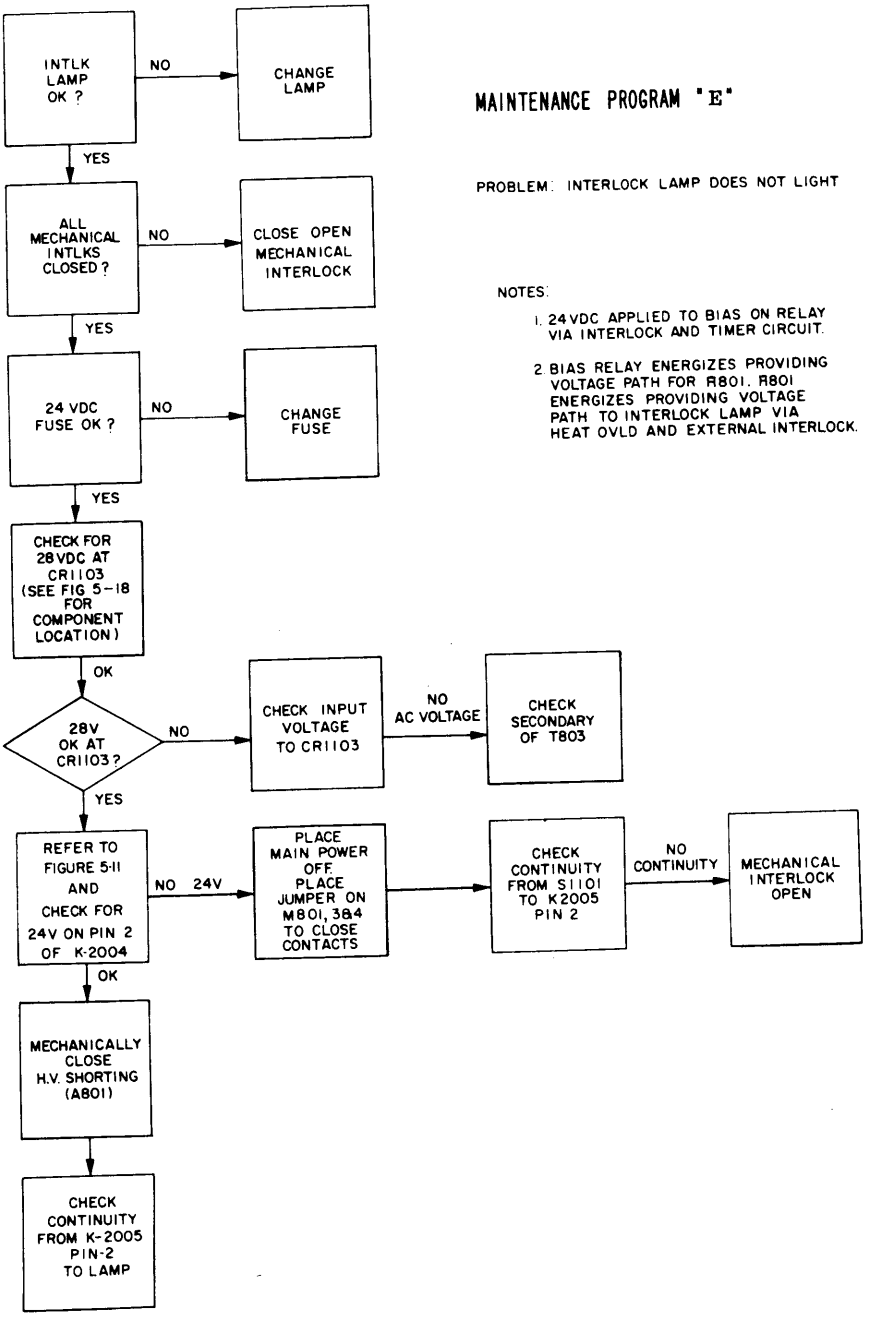


TABLE 5-5. TROUBLESHOOTING CHART (CONT)



MAINTENANCE PROGRAM "E"

PROBLEM: INTERLOCK LAMP DOES NOT LIGHT

NOTES:

1. 24 VDC APPLIED TO BIAS ON RELAY VIA INTERLOCK AND TIMER CIRCUIT.
2. BIAS RELAY ENERGIZES PROVIDING VOLTAGE PATH FOR R801. R801 ENERGIZES PROVIDING VOLTAGE PATH TO INTERLOCK LAMP VIA HEAT OVLD AND EXTERNAL INTERLOCK.

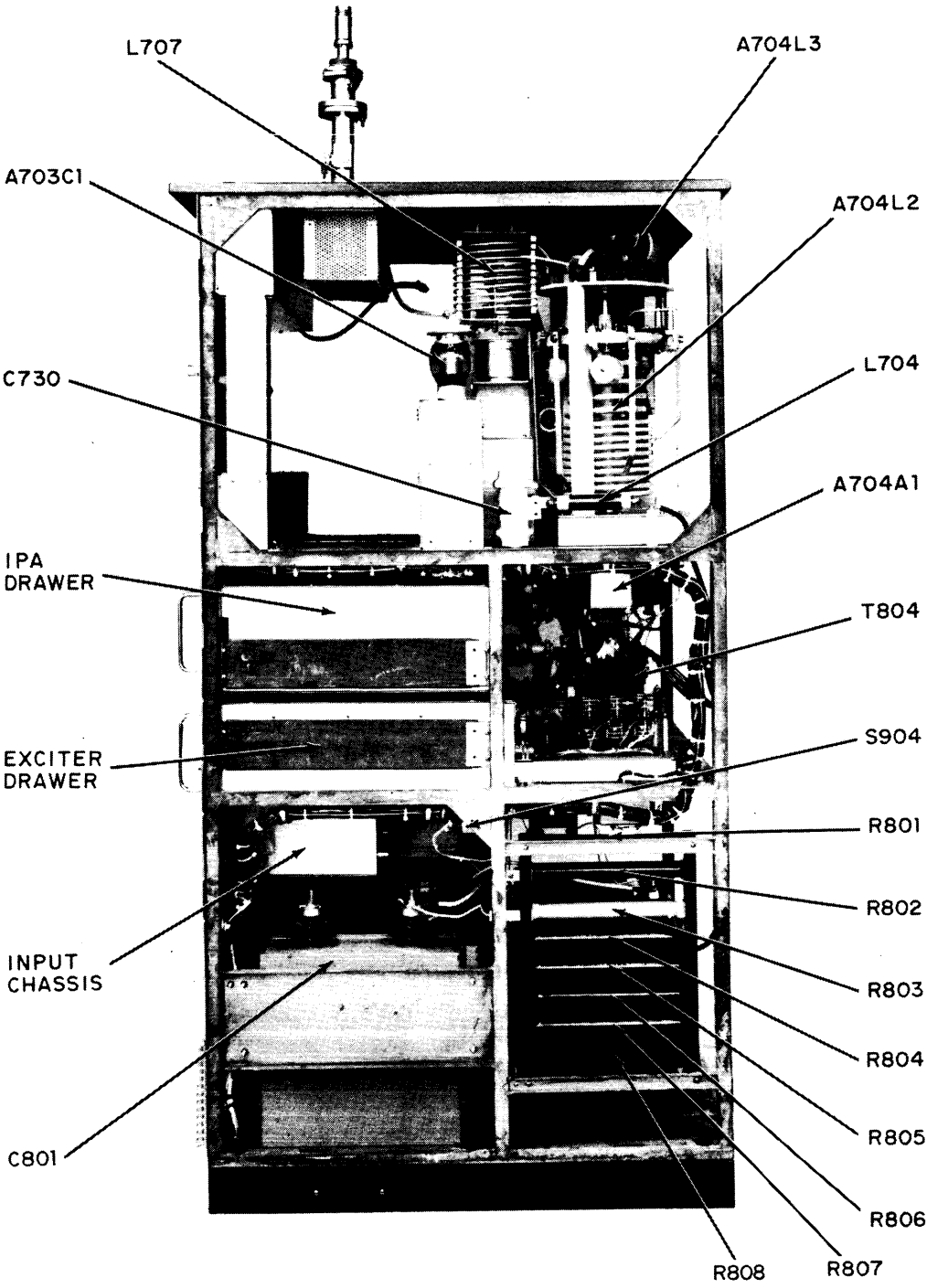


Figure 5-10. Overall Transmitter Right Side View

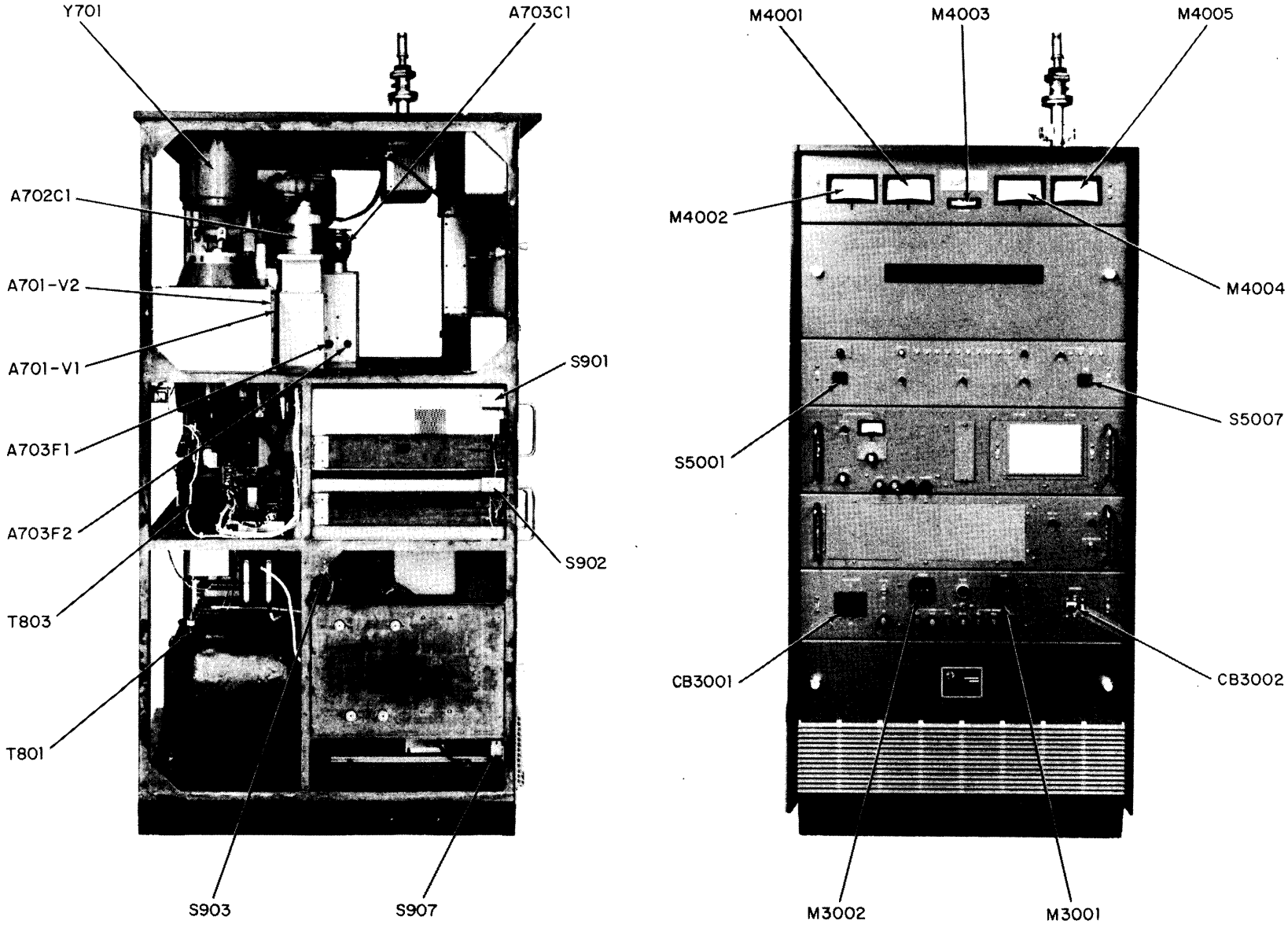


Figure 5-11. Transmitter Front and Left Views

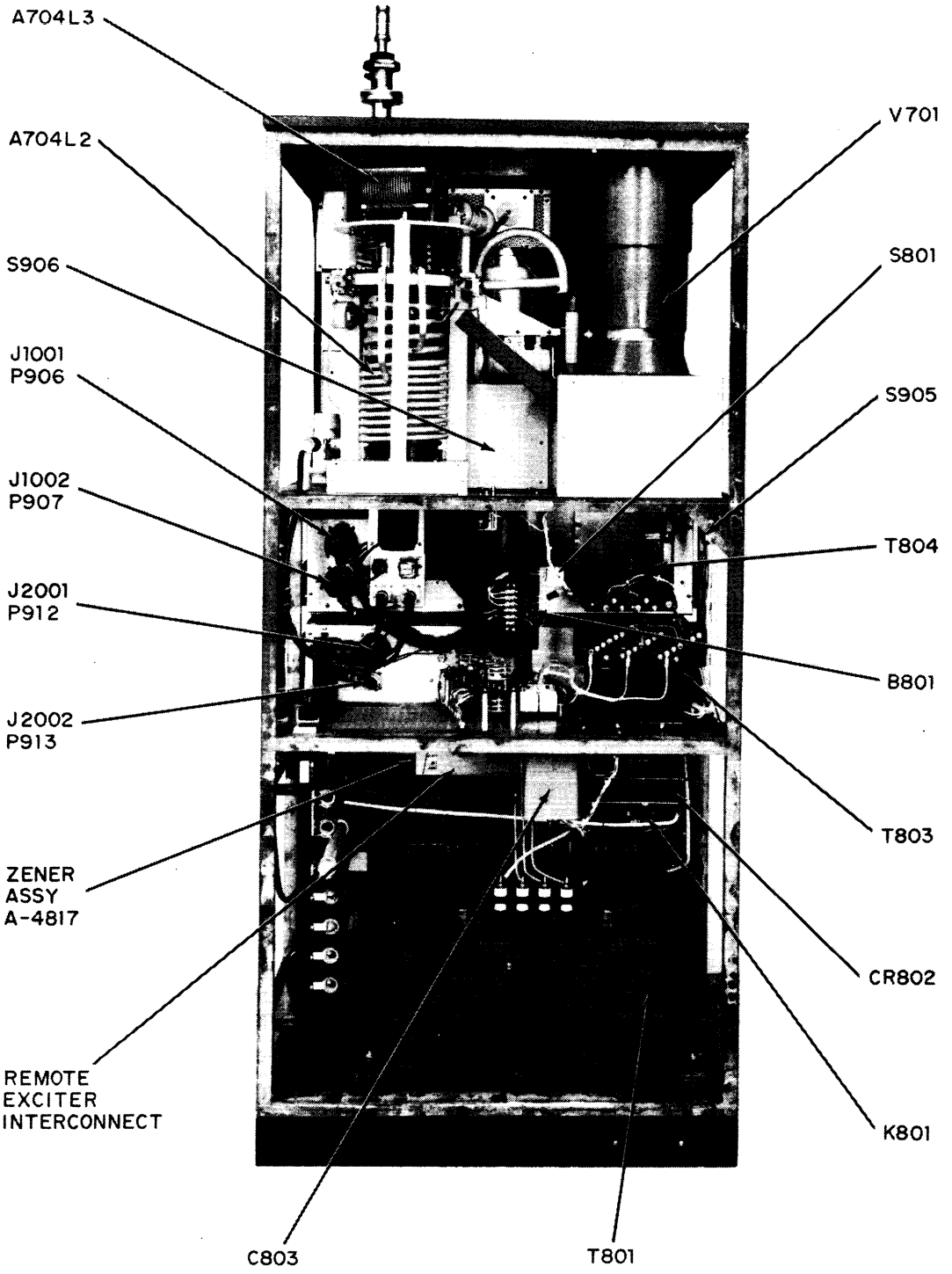


Figure 5-12. Transmitter Overall Rear View

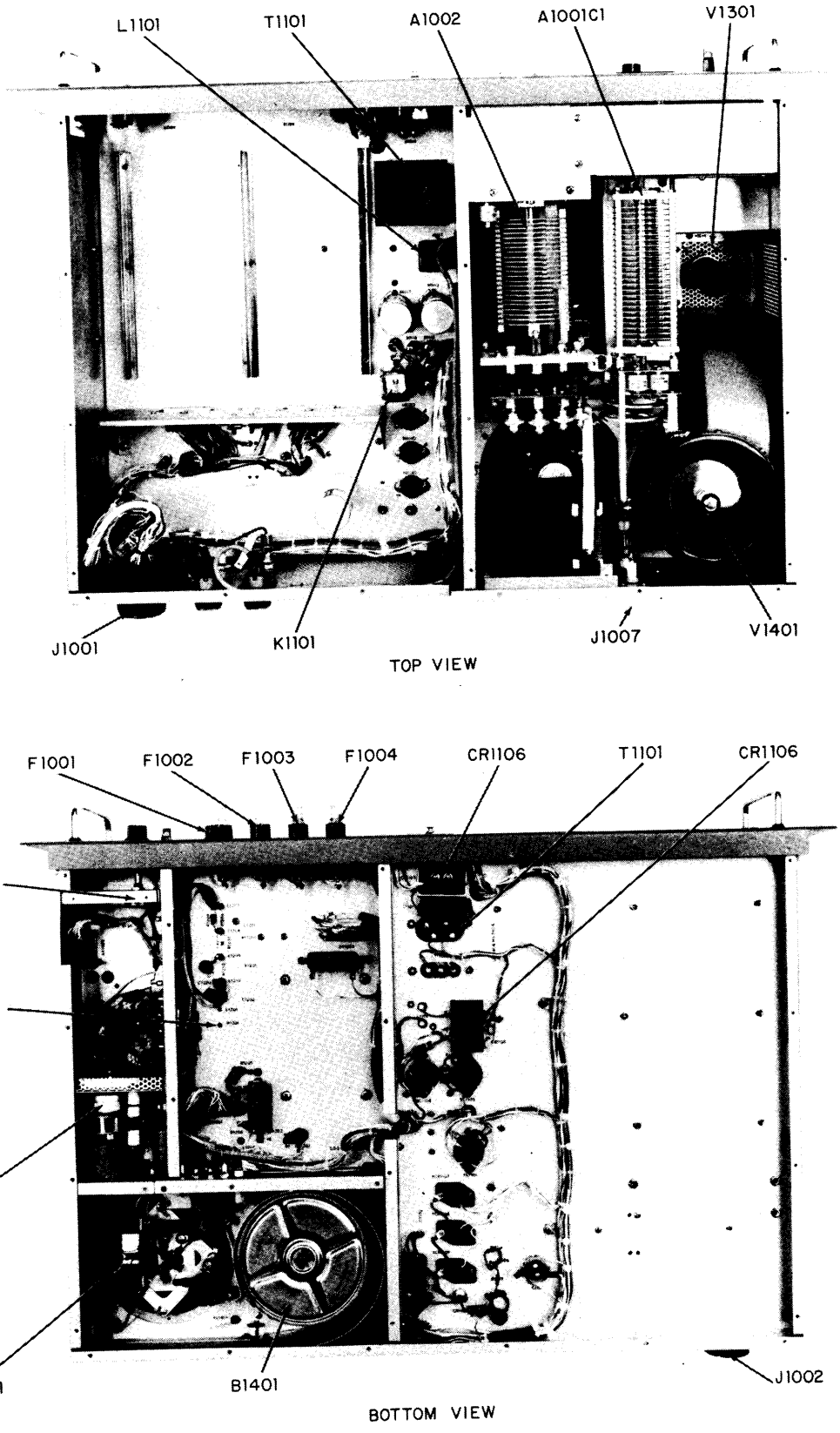


Figure 5-13. IPA Drawer Top and Bottom Views

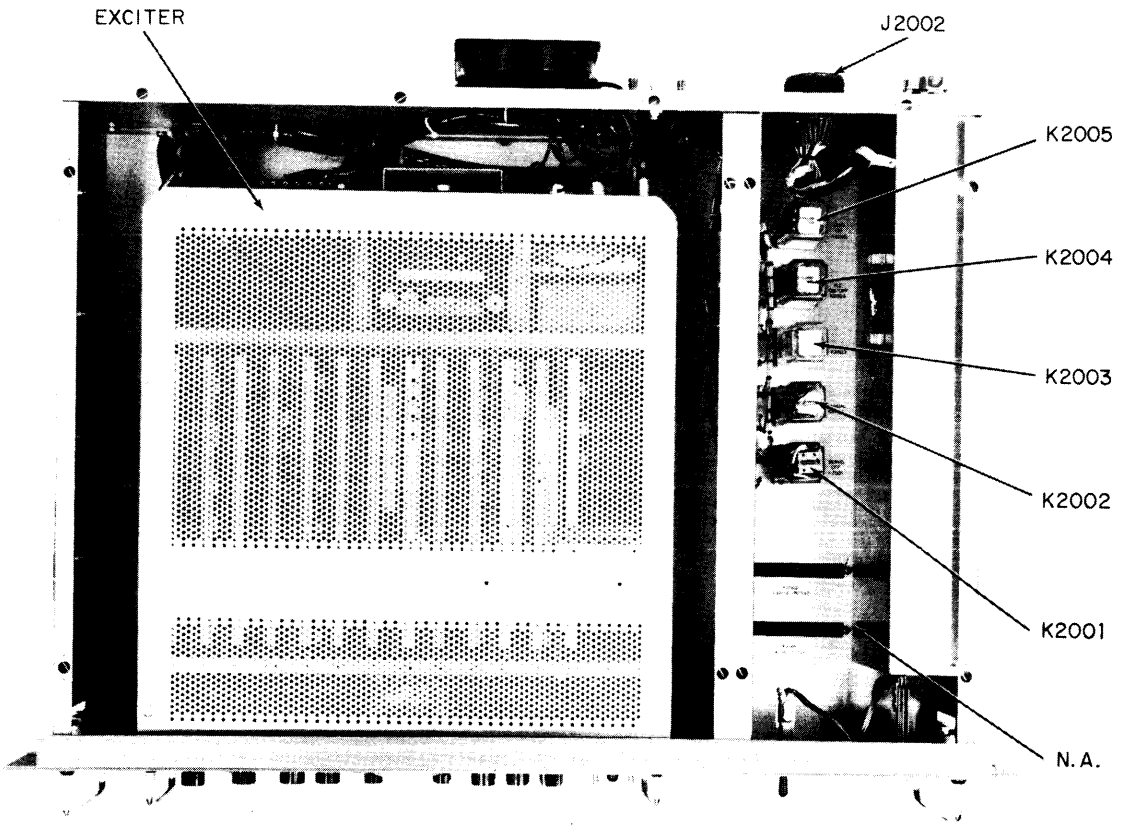


Figure 5-14. Exciter Drawer Top View

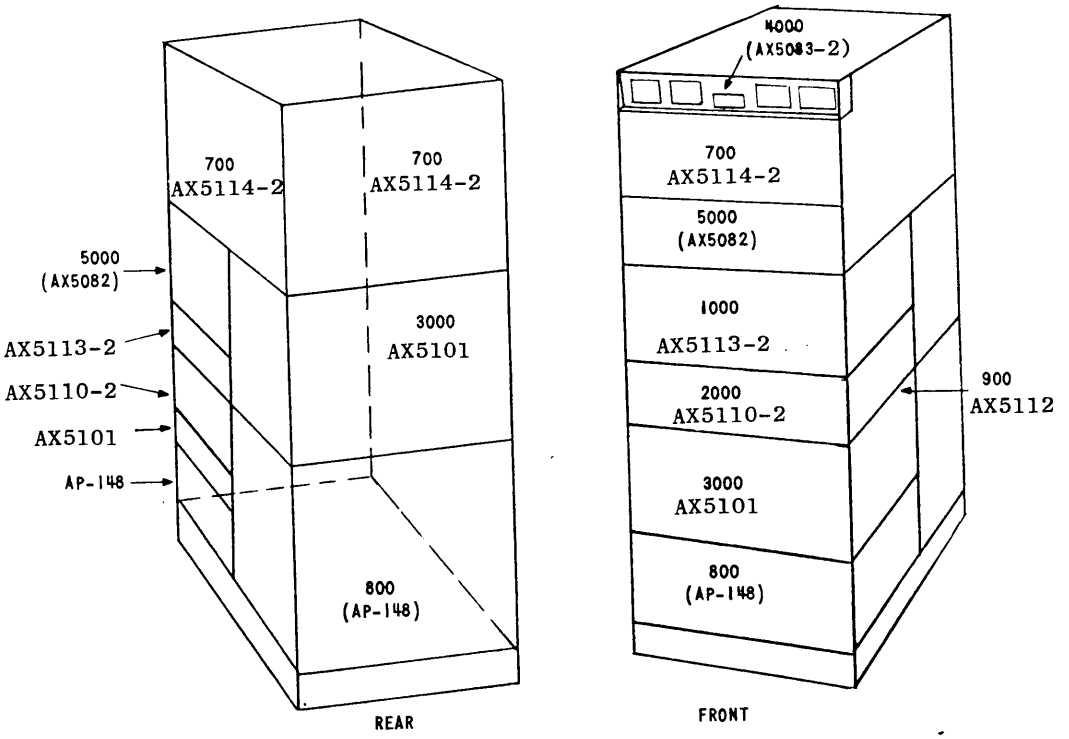
SECTION VI

PARTS LIST

6-1. INTRODUCTION.

Reference designations have been assigned to identify all electrical parts of the equipment. These designations are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams and the parts list. The letters of a reference designation indicate the kind of part (generic group), such as resistor, capacitor, transistor, etc. The number differentiates between parts of the same generic group. Sockets associated with a particular plug-in device, such as transistor or fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for relay K2001 is designated XK2001. The assemblies and/or sub-assemblies that are a part of a major assembly are suffixed with an asterisk; parts list breakdown for these assemblies are located in the rear of the parts section. For example, in parts list for Power Amplifier, the Reference Symbol A701 shows a TMC part number A4783*, the parts list breakdown for A4783 is located in the rear of parts list section. Refer to figure 6-1 for location of assemblies and symbol series on transmitter. To expedite delivery when ordering replacement parts, specify the TMC part number and the model number of the equipment. See example below.

To order C1 of A4789, order as follows:
A4789 C1, TMC Part No. CC100-16.



ASSEMBLY NO.	NAME	SYMBOL SERIES
AX5114-2	PA SECTION	700
AP-148	PWR SUPPLY	800
AX5112	MAIN FRAME SUB ASSY	900
AX5113-2	IPA DRAWER	1000
AX5110-2	EXCITER DRAWER	2000
AX5101	INPUT CHASSIS	3000
AX5083-2	METER PANEL	4000
AX5082-2	MAIN CONTROL PANEL	5000

Figure 6-1. Assembly Location Drawing HFLM-10K

Ref. Symbol	Description	TMC Part No.
	2 MHz to 30 MHz Power Amplifier	AX5114-2
A702	CAP., ASSY Tune	BMA421
A702A1	BD. ASY, PC	A-4830
A702A1C1 thru C20	CAP., FXD, CER	CC100-16
A702A1K1	REL, ARM. -4PDT	RL156-1
A702A1L1 thru L13	COIL, RF, FXD	CL240-120
A702A1XK1	SOC, REL-W/RET	TS171-4
A702A2	MOT, ASY, TUNE	A-4820
A702A2B1	MOTOR	M0140
A702A2J1	CONN. RECP, FML	JJ310-2
A702C1	CAP., VAR, VAC	CB176
A702S1, A702S2	SW, SENS-W/ACTR	SW353-3
A702W1P1	CONN, PL, ML	JJ313-2H
A703	CAP., ASY, Load	BMA422-2
A703A1	BD ASY, PC	A-4831
A703A1CR1	SCOND, DEV. DIO	1N3029
A703A1CR2	RECT, SCOND, DEV	DD130-100-1.5
A703A1CR3	SCOND, DEV, DIO	1N3070
A703A1C1 thru C3	Same as A702A1C1	
A703A1C4	CAP., FXD, MTLZ	CN114-1RO-4J
A703A1C5	CAP., FXD, ELEC	CE105-75-50
A703A1C6 thru C17	Same as A702A1C1	
A703A1C18	Same as A703A1C5	
A703A1K1	Same as A702A1K1	
A703A1K2	REL, ARM., -4PDT	RL156-8
A703A1L1 thru L4	Same as A702A1L1	
A703A1R1	RES, FXD, COMP	RC32GF181J
A703A1XK1	Same as A702A1XK1	
A703A1XK2	SOC, REL-W/RET	TS171-5
A703A2	MOT, ASY, LOAD	A-4819
A703A2B1	MOTOR	M0139
A703A2J1	CONN, RECP, ML	JJ313-1
A703C1	CAP., VAR, VAC	CB147
A703C2	CAP, FXD, MTLZ	CP121-25M 150T
A703C3	Same as A702A1C1	
A703F1	FUSE, CTG	FU102-.2
A703F2	FUSE, CTG	FU102-.062
A703R1	RES, VAR, PREC	RV118-1-102
A703S1	Same as A702S1	
A703S2	Same as A702S1	
A703T1	XFMR, PWR, SD	TF0245
A703W1P1	CONN, PL, FML	JJ310-1H
A703W1 XA1	CONN, RECP, FML	JJ293-15 DFE
A703XF1	FUSEHOLDER	FH104-3
A703XF2	FUSEHOLDER	FH104-11
A704	BANDSW ASY	AS145
A704A1	SW ASY, CONTROL	AX5103
A704A1CR1	SCOND, DEV, DIO	1N914
A704A1CR2	Same as A704A1CR1	

Ref. Symbol	Description	TMC Part No.
A704A1J1	CONN, RECP, FML	JJ200-9
A704A1J2	CONN, RECP, ML	JJ200-10
A704A1K1	REL, ARM	RL168-3C10-24DC
A704A1R1, R2	RES, FXD, COMP	RC20GF102J
A704A1R3, R4	RES, FXD, COMP	RC20GF152J
A704A1S1	SW, ROTARY	SW526
A704A1XK1	SOC, REL	TS100-6
A704B1	MOTOR	M0129
A704C1	CAP., FXD, CER	CC119-151-15K
A704C2	CAP., FXD, CER	CC119-351-12K
A704L1	COIL, RF, HI, FRE	CL441
A704L2	COIL, MN TANK	CL445
A704L3	COIL, ASY	CL440
A704P1	CONN, PL, ML	MS3106A14S-7P
A704S1A, B	MN TANK SW ASY	BMA409
A704S1C, D	OUTPUT SW ASY	BMA411
A705	REMOTE PWR ASY	AX5095-2
A705A1	BD ASY, PC	A-4843
A705A1CR1	SCOND DEV, DIO	1N746A
A705A1C1	CAP., FXD, CER	CC100-28
A705A1DS1, DS2	LAMP, INCAND	BI101-1820
A705A1K1	REL, ARM.-2PDT	RL156-1
A705A1R1	RES, VAR, COMP	RV111U-502A
A705A1R2	RES, FXD, COMP	RC32GF122J
A705A1 XDS1, DS2	LAMPHOLDER	TS107-2
A705A1XK1	SOC, REL-W/RET	TS171-5
A706	FIL ASY, HARM	AF110
A706C1	CAP., FXD, CER	CC109-28
A706C2	CAP., FXD, CER	CC109-13
A706C3	Same as A706C1	
A706C4	Same as A706C2	
A706C5 thru C8	Same as A706C1	
A706C9	Same as A706C2	
A706C10 thru C13	Same as A706C1	
A706C14, C15	Same as A706C2	
A706C16	Same as A706C1	
A706C17	CAP., FXD, CER	CC109-5
A706C18	CAP., FXD, CER	CC109-19
A706C19	Same as A706C1	
A706J1	JACK, TIP	JJ114-2
A706L1	COIL, RF	CL449-3
A706L2	COIL, RF	CL449-1
A706L3, L4	COIL, RF	CL449-2
A706L5	Same as A706L2	
A706L6	Same as A706L1	
A707	ALDC CAN	A-4856
A707A1	PC ASY	A-4855
A707A1CR1	SCOND, DEV, DIO	IN277

Ref. Symbol	Description	TMC Part No.
A707A1C1	CAP., FXD, ELEC	CE105-75-25
A707A1C2, C3, C4	CAP., FXD, CER	CC100-9
A707A1C5	Same as A707A1C1	
A707A1C6 thru C10	Same as A707A1C2	
A707A1C11	CAP., FXD, ELEC	CE105-6-15
A707A1C12, C13	Same as A707A1C2	
A707A1C14	CAP., FXD, ELEC	CE105-1-15
A707A1C15	Same as A705A1C1	
A707A1R7	RES, FXD, COMP	RC07GF471J
A707A1R8	RES, FXD, COMP	RC07GF221J
A707A1R9	RES, FXD, COMP	RC07GF682J
A707A1R10	RES, FXD, COMP	RC07GF101J
A707A1R11	RES, FXD, COMP	RC07GF223J
A707A1R12	RES, FXD, COMP	RC07GF181J
A707A1R13	RES, FXD, COMP	RC07GF474J
A707A1R14	RES, FXD, COMP	RC07GF102J
A707A1R15	RES, FXD, COMP	RC07GF224J
A707A1R16	RES, FXD, COMP	RC07GF152J
A707A1R17	RES, FXD, COMP	RC07GF333J
A707A1R18	RES, VAR	RV124-502K
A707A1R19	RES, FXD, COMP	RC07GF153J
A707A1R20	RES, FXD, COMP	RC07GF562J
A707A1R21	RES, FXD, COMP	RC07GF103J
A707A1R22	Same as A707A1R14	
A707A1R23	Same as A707A1R19	
A707A1R24	Same as A707A1R18	
A707A1R25	Same as A707A1R17	
A707A1R26	Same as A707A1R16	
A707A1R27	RES, FXD, COMP	RC07GF183J
A707A1R28	RES, FXD, COMP	RC07GF472J
A707A1R29	Same as A707A1R14	
A707A1R30	Same as A707A1R9	
A707A1VR1, VR2	SCOND, DEV, DIO	IN759A
A707A1Z1, Z2	AMP. OPERATIONAL	NW156
A707R1	Same as A707A1R8	
A707R2	Same as A707A1R13	
A707R3	Same as A707A1R10	
A707R4	Same as A707A1R9	
A707R5	Same as A707A1R8	
A707R6	Same as A707A1R7	
CR701	DET, ELEM	DD119-10
CR702	DET, ELEM	DD119-9
C701 thru C703	CAP., FXD, CER	CC109-38
C704 thru C708	CAP., FXD, CER	CC109-36
C711, C712	CAP., FXD, CER	CK70AW 102M
C713 thru C715	CAP., FXD, CER	CC115-2-6800
C716 thru C719	Same as A706C18	

Ref. Symbol	Description	TMC Part No.
C728, C729	Same as A706C1	
C730 thru C732	CAP., FXD, CER	CC120-202A25
C733 thru C736	Same as A705A1C1	
C739	Same as C730	
C740	CAP., FXD, MICA	CM15C050 J03YY
C741	CAP., FXD, MICA	CM15D150 J03YY
C742 thru C747	Same as C733	
DC701	COUP., DIR	DC104-3
J701	CONN, RECP-HN	UG560
J704	CONN, RECP, ML	MS3102A24-28P
L701	COIL, RF, FXD	CL178
L702	COIL, RF, FXD	CL100-5
L703	COIL, FIL	CL444
L704, L705	COIL, RF, FXD	CL166
L706	COIL, RF	CL442
L707	COIL, ASY, OUT.	CL443
L708, L709	Same as A702A1L1	
L711	Same as L701	
P701, P702	CONN, PL, RF	PL254
P703	PLUG, TIP	PL163-2
R701	RES, FXD, COMP	RC42GF471J
R702	RES, FXD, WW	RC32GF103J
S701	SW, THERMO	SS104-2
V701	TUBE, Elec	8794
XA707	SOC, EL TUBE	TS101-P01
XV701	SOC, EL TUBE	89-088
A801	POWER SUPPLY	AP-148
A801L1	SHRTG REL ASY	AX5096
A801S1	SOL., ELEC	SZ100-60
A801TB1	SW, SENS-SPDT	SW260
B801	TERM., BD-BARR	TM102-5
CR801A thru CR801H	FAN, CENT., 3PH	BL132
CR802A thru CR802F	SCOND, DEV, DIO	1N2846A
CR803, CR804	RECT SCOND, DEV	DD128-3
CR805	RECT, SCOND, DEV	DD129
CR806	RECT, SCOND, DEV	DD147
CR807A, CR807B	SCOND, DEV, DIO	1N3022B
C801	Same as CR801A	
C802	CAP., FXD, P	CP103
C803, C804	CAP., FXD, PLST	CX113-2
C805, C806, C807	CAP., FXD, P	CP105
K801	CAP., FXD, CER	CC109-38
	REL, SOL.-3P	RL130-3

Ref. Symbol	Description	TMC Part No.
K802	REL, ARM.	RL184-1
L801	REACTOR-2H	TF5035
L802	REACTOR-5H	TF5034
L803	REACTOR-7H	TF5013
L804	COIL, RF, FXD	CL178
M801	TIMER, Interval	TI105-1
P801	CONN, PL, HN	PL253-1
R801, R802	RES, FXD, WW	RW118F502
R803	RES, FXD, WW	RW118F310
R804 thru R807	RES, FXD, WW	RW116-603B
R808	RES, FXD, WW	RW109-42
R809, R810	RES, FXD, WW	RW105-29
R811, R812	RES, FXD, WW	RW110-7
R813	RES, FXD, WW	RW110-3
R814	RES, FXD, COMP	RC42GF331J
R815	RES, FXD, COMP	RC42GF102J
R816	Same as R814	
R818	Same as R813	
R819, R820	RES, FXD, COMP	RC42GF101J
R821	RES, FXD, WW	RW110-43
R822 thru R831	Same as R819	
R832	Same as R811	
R833 thru R838	RES, FXD, WW	RW109-7
S801	SW, SENS	SW252
T801	XFMR, PWR, SU	TF203
T802	XFMR, PWR, SU	TF386
T803	XFMR, PWR-SD	TF384
T804	XFMR, FIL. SD	TF383
XK802	SOCKET, Rel	TS196-1
	MAIN FRAME ASSEMBLY	AX5112
S901 thru S906	SW PUSH-PULL	SW230
S907	SW, Roller LVR, SPDT	SW260
TB901	TERM. BD-BARR	TM102-4
	DRIVER DRAWER	AX5113-2
A1001	CAP., TUNE ASY	BMA433-2
A1001C1	CAP., VAR, Air	CB175
A1001C2 thru A1001C5	CAP., FXD, CER	CC109-38
A1002	BD SW ASY	AS146-2
CR1	SCOND, DEV, DIOD	IN547
C1 thru C6	CAP., FXD, CER	CC109-38
C7	CAP., FXD, CER	CC109-19
C8, C9	CAP, FXD, CER	CC116-9
C10, C11	CAP., FXD, CER	CC116-8
K1	REL, ARM, DPDT	RL168-2C10-24DC

Ref. Symbol	Description	TMC Part No.
L1	COIL, RF, Freq.	CL447
L2	COIL, MN Tank	CL446
L3	COIL, RF	CL292
L4	COIL, IND	CL448
S2	SW, LEDEX	SW429
XK1	SOC, TUB, ELEC	TS100-3
A1005C1 thru A1005C3	CAP., FXD, CER	CC100-28
A1006	BD ASY, PC	A-4801
CR1	SCOND, DEV, DIO	IN2484
C1	CAP., FXD, ELEC	CE105-50-15
C2 thru C4	CAP., FXD, CER	CC100-28
DS1, DS2	LAMP, Incand	BI101-1820
Q1	TRANSISTOR	2N1595
R1	RES, FXD, COMP	RC20GF122J
R2	RES, FXD, COMP	RC20GF121J
R3	RES, FXD, COMP	RC20GF821J
R4	RES, FXD, COMP	RC20GF332J
XDS1, XDS2	LAMPHOLDER	TS107-4
A1007	BD ASY, PC	A-4833-2
R1	RES, FXD, COMP	RC42GF472J
R2	RES, FXD, COMP	RC42GF123J
R3	RES, FXD, COMP	RC42GF822J
R4 thru R6	RES, VAR, COMP	RV4NAYSA 103AY
R7	RES, FXD, COMP	RC42GF223J
R8	Same as R3	
R9	RES, FXD, COMP	RC42GF182J
R10	RES, VAR, COMP	RV119-1-502C
R14	RES, FXD, COMP	RC42GF562J
C1001	CAP., Fxd, Cer	CC109-6
F1001	FUSE, Ctg	FU102-2
F1002	FUSE, Ctg	FU102-.1
F1003	FUSE, Ctg	FU102-8
F1004	FUSE, Ctg	FU102-5
J1004	CONN, Recp, Ml	MS3102A18-16P
J1005, J1006	ADAPT, Conn, Rf	UG492*/U
J1007	CONN, Recp, Rf	UG560*/U
L1001	XFMR, Out. Match	TR192
M1001	MTR	MR216-1
S1001	SW, Lever	SW523-3
XA1001	CONN, Recp, Fml	JJ287-20
XF1001, XF1002	FUSE HOLDER	FH104-3
XF1003, XF1004	FUSE HOLDER	FH104-11
CR1101	SCOND, Dev, Dio	IN547
CR1103	RECT, Scond Dev	DD146-2
CR1104	SCOND, Dev, Dio	IN3321B

Ref Symbol	Description	TMC Part Number
CR1105	SCOND, Dev, Dio	IN2976B
CR1106	RECT, Scond Dev	DD124
CR1107 thru CR1109	SCOND, Dev, Dio	IN2841R
C1101, C1102	CAP., Fxd, Elec	CE116-10VN
C1104, C1105	CAP., Fxd, Elec	CE51C800R
C1106	CAP., Fxd, Paper	CP41B1EF 405K
C1107 thru C1112	CAP., Fxd, Cer	CC100-37
C1113	Same as C1103	
K1101	REL., Arm., 3 Pdt	RL168-3C10-24DC
L1101	COIL, Choke	TF5028
R1101	RES, Fxd, WW, 10 W	RW108-2
R1102	RES, Fxd, Comp	RC42GF 181J
R1103	RES, Fxd, Comp	RC20GF 272J
R1104	RES, Fxd, Comp	RC42GF474J
R1105	RES, Fxd, WW, 10 W	RW109-24
R1106	RES, Fxd, WW, 10 W	RW109-14
R1107	RES, Fxd, WW, 10 W	RW109-9
R1108	Same as R1104	
R1109	RES, Fxd, Comp	RC20GF 102J
S1101	SW, Intlk	SW219
TB1102	TERM., Bd, Barr	TM102-6
T1101	XFMR, Pwr	TF375
XCR1107 thru XCR1109	SOC, Scond, Dev	TS166-1
XC1104, XC1105	SOC, El, Tube	TS100-3
XF1101	SOC, El, Tube	TS100-6
CR1203	SCOND, Dev, Dio	IN34A
C1203	CAP., Fxd, Cer	CK70AW 202M
C1204	CAP., Fxd, Cer	CK70AW 102M
C1205 thru C1209	Same as C1203	
C1210 thru C1212	CAP., Fxd, Cer	CK70AW 202M
C1213	CAP., Fxd, Cer	CC108-4P 1000M
C1214, C1215	Same as C1210	
C1216	Same as C1213	
C1217	Same as C1203	
C1218	CAP., Fxd, Elec	CE105-25-25
C1219, C1220	CAP., Fxd, Elec	CC100-16

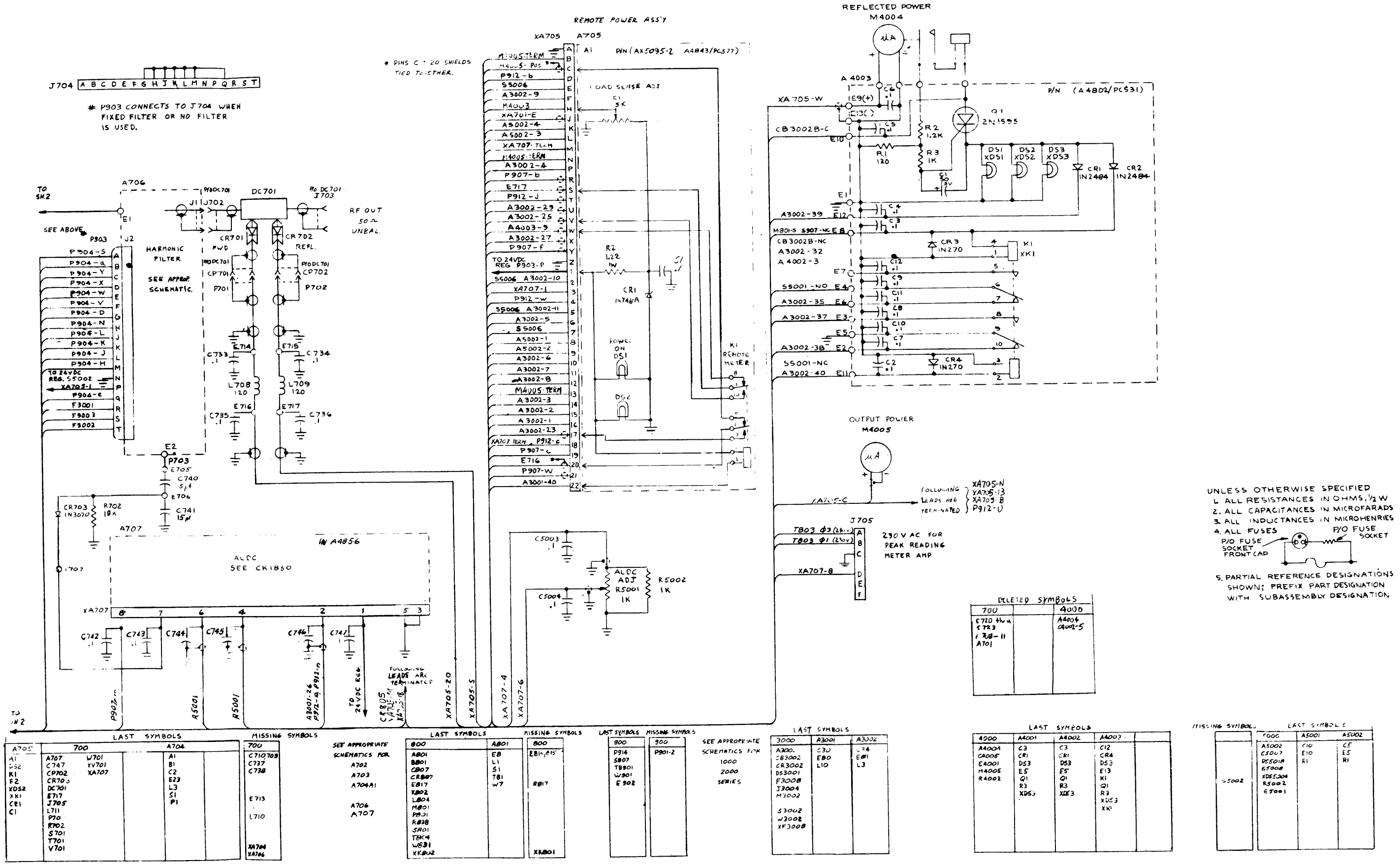
Ref Symbol	Description	TMC Part Number
C1221	CAP., Fxd, Cer	CC100-37
R1202, R1203	RES, Fxd, Comp	RR114-5W
R1204	RES, Fxd, WW, 20 W	RW111-5
R1205	RES, Fxd, Comp	RC42GF 100J
R1207	RES, Fxd, WW, 20 W	RW110-1
R1208	RES, Fxd, Comp	RC20GF 471J
R1209	RES, Fxd, Comp	RC20GF 223J
R1211	Same as R1202	
S1201	Same as S1101	
XK1201	SOC, Rel	TS171-1
C1302	CAP., Fxd, Cer	CC100-43
C1303	CAP., Fxd, Cer	CC100-35
C1304, C1305	CAP., Fxd, Cer	CC100-44
C1306, C1307	CAP., Fxd, Cer	CC100-32
C1308	CAP., Fxd, Cer	CC100-31
C1309	CAP., Fxd	CM111E220 J5S
C1310	CAP., Fxd	CM112F222 F3S
C1311	CAP., Fxd, Cer	CC100-37
C1312	Same as C1304	
C1313, C1314	Same as C1311	
C1315, C1316	Same as C1306	
C1317	CAP., Fxd, Mica	CM50B222 G03
C1318	CAP., Fxd, Cer	CC109-38
C1322	Same as C1306	
L1301	COIL, Rf	CL101-2
L1302	COIL, Rf	CL140-2
L1303	COIL, Rf, Adj	CL460
L1304 thru L1306	Same as L1302	
L1307	INDUCTOR, Fxd	CL459
L1308	COIL, Rf	CL178
R1301	RES, Var	RV4NAYSK 500A
R1304	RES, Fxd, Comp	RC42GF120J
R1305	RES, Fxd, Comp	RC20GF102J
R1306	RES, Fxd, Comp	RC20GF100J
R1307	RES, Fxd, Comp	RC42GF222J
R1308	RES, Fxd, Comp	RC20GF333J
R1309	RES, Fxd, Comp	RC42GF331J
R1310	RES, Fxd, Comp	RC42GF472J
V1301	TUBE, El	8233
V1302	TUBE, El	4CX350A
XV1301	SOC, El Tube	TS198
XV1302	SOC, El Tube	TS197
Z1301	SUPP, Parasitic	A-1546-2
Z1302	SUPP, Parasitic	A-1546-4
B1401	BLOWER, Cent	BL126
C1401	CAP., Fxd	CM111C301 J5S

Ref. Symbol	Description	TMC Part No.
C1404	CAP., Fxd	CM112F562 J5S
C1407, C1408	CAP., Fxd, Mica	CM35F103F 03
C1409	CAP., Fxd, Cer	CC100-32
C1410 thru C1413	CAP., Fxd, Cer	CC109-36
C1414	CAP., Fxd, Cer	CC109-38
C1422	Same as C1409	
K1401	REL, Arm	RL185-1
L1401	XFMR, Instg	TR193
L1403, L1404	COIL, Rf	CL140-6
L1405	COIL, Rf	CL138
R1401	RES, Fxd, Comp	RR116-1400W
R1402	RES, Fxd, Comp	RR116-300W
R1403	RES, Fxd, Comp	RR116-1400W
R1404, R1405	RES, Fxd, Comp	RR114-SW
R1406	RES, Fxd, Comp	RC42GF 430J
S1401	SWITCH	SW252
V1401	TUBE, El	8576/PL 264J
XV1401	SOC, El Tube	TS182
Z1401	SUPP, Parasitic	A-1546-3
	EXCITER DRAWER	AX5110-2
	FNL, ASSY, EXT DRAWER	BMA440
B2001	FAN, VENT	BL106-2
TB2001	TERM., STRIP, BARR	TM102-4
	SUB ASSEMBLY, EXT, DW	BMA424
C2001 thru C2011	CAP., FXD, CER	CK70AW 202M
L2001	COIL, RF, FXD	CL101-3
R2001, R2002	RES, FXD, WW	RW110-21
	PNL ASY, FRONT	BMA425
J2005	JACK, TEL	JJ116-10
S2001	SW, LEVER	SW186-3
	CHAS ASY, REL	BMA426
K2001, K2002	REL, GEN PURP	RL168-3C-10-24DC
K2003	REL, GEN PURP	RL168-2C-10-24DC
K2004, K2005	Same as K2001	
XA2001, XA2002	CONN, RECP, FML	JJ319-22DFE

Ref. Symbol	Description	TMC Part No.
XK2001, XK2002	SOC, EL TUBE	TS100-6
XK2003	SOC, EL TUBE	TS101-P01
XK2004, XK2005	Same as XK2001	
	INPUT CHAS ASY	AX5101
A3001	BD ASSY, INPUT	A-4809
C1 thru C30	CAP., FXD, CER	CC100-42
L1 thru L10	COIL, RF, FXD	CL240-120
A3002	BD ASSY, INPUT	A-4810
C1 thru C34	CAP., FXD, CER	CC100-42
CR1, CR2	SCOND, DEV, DIO	IN914
L1 thru L3	COIL, RF, FXD	CL240-120
CB3001	CKT BKR-3PST	SW448
CB3002A, B	CKT BKR-DPST	SW527
CB3002C	CK BKR-SPST	SW525
DS3001	GEN, Audio Sig	BZ101-2
F3001 thru F3003	FUSE, CTG	FU102-3
F3004, F3006	FUSE, CTG	FU102-5
F3005, F3007	FUSE, CTG	FU102-2.5
F3008	FUSE, CTG	FU102-1
J3001	CONN, RECP, FML	MS3102A 32-7S
J3002	CONN, RECP, ML	MS3102A 24-28P
J3003	CONN, RECP, ML	MS3102A 32-7P
M3001, M3002	IND, ELAP TIME	MR198
S3001	SW, TOGGLE-SPST	ST103-5-62
S3002	SW, TOGGLE-DPDT	ST103-24-62
XF3001 thru XF3008	FUSEHOLDER, IND	FH104-3
	METER PANEL ASSEMBLY	AX5083-2
A4001, A4002	BD ASY, PC	A-4800
CR1	SCOND, DEV, DIO	IN2484
C1	CAP., FXD, ELEC	CE105-50-15
C2, C3	CAP., FXD, CER	CC100-28
DS1 thru DS3	LAMP, Incan	B1101-1820
Q1	TRANSISTOR	2N1595
R1	RES, FXD, COMP	RC20GF121J

Ref. Symbol	Description	TMC Part No.
R2	RES, FXD, COMP	RC20GF122J
R3	RES, FXD, COMP	RC20GF102J
XDS1 thru XDS3	LAMPHOLDER	TS107-4
A4003	BD ASY, PC	A-4802
CR1, CR2	SCOND, DEV, DIO	IN2484
CR3, CR4	SCOND, DEV, DIO	IN270
C1	CAP., FXD, ELEC	CF105-50-15
C2 thru C12	CAP., FXD, CER	CC100-28
DS1 thru DS3	LAMP, Incand	B1101-1820
K1	SOC, ARM, DPDT	RL156-9
Q1	TRANSISTOR	2N1595
R1	RES, FXD, COMP	RC20GF121J
R2	RES, FXD, COMP	RC20GF122J
R3	RES, FXD, COMP	RC20GF102J
XDS1 thru XDS3	LAMPHOLDER	TS107-4
XK1	SOC, REL - W/RET	TS171-5
C4001	CAP., FXD, CER	CC100-28
M4001	AMMETER	MR215-2
M4002	AMMETER	MR215-1
M4003	AMMETER	MR191-3
M4004	AMMETER	MR214
M4005	AMMETER	MR213
R4001	RES, FXD, COMP	RC20GF102J
R4002	RES, FXD, COMP	RC20GF101J

Ref. Symbol	Description	TMC Part No.
	CONTROL PANEL, MAIN	AX5082-2
A5001	BD ASY, BAND IND	A4791
C1 thru C10	CAP., FXD, CER	CC100-28
R1	RES, FXD, COMP	RC42GF311J
A5002	BD ASY, LOW LEV	A-4806
C1 thru C5	CAP., FXD, CER	CC100-28
R1	RES, FXD, COMP	RC42GF331J
C5001 thru C5007	CAP., FXD, CER	CC100-28
DS5001 thru DS5004	LAMP, Incand	BI110-7
DS5005 thru DS5018	LAMP, Incand	BI116-1-5
R5001	RES, VAR, COMP	RV4NAYSA 102A
R5002	RES, FXD, COMP	RC20GF102J
S5001	SW PUSH-SPST	SW522-1
S5003	SW, LEVER	SW523-3
S5004	SW, LEVER	SW523-1
S5005	Same as S5003	
S5006	SW, LEVER	SW523-2
S5007	SW PUSH-SPST	SW522-2
S5008	SW, PUSH-PULL	SW230
XDS2	LIGHT, Ind	TS153-13
XDS3	LIGHT, Ind	TS153-8



DELETED SYMBOLS

700		4000
C710 thru C723 E728-11 A701		A4004 CR002-5

LAST SYMBOLS / MISSING SYMBOLS

A705	700		A706	MISSING 700
A1 DS2 K1 F2 XDS2 XK1 CR1 C1	A707 C747 CP702 CR703 DC701 E717 J705 L711 P70 R702 S701 T701 V701	W701 XV701 XA707	A1 B1 C2 E23 L3 S1 P1	C710-703 C737 C738 E713 L710 XA704 XA706

SEE APPROPRIATE SCHEMATICS FOR A702, A703, A704-A1, A706, A707

800	A801	MISSING 800
A801 B801 CR807 CR817 E817 K802 L804 M801 P831 R838 SA01 T8C4 W831 XK802	E8 L1 S1 T81 W7	E814,815 R817 XK801

900	MISSING 900
P914 S807 T8801 W801 E902	P901-2

SEE APPROPRIATE SCHEMATICS FOR 1000 2000 SERIES

3000	A3001	A3002
A300- CB3002 CR3002 DS3001 F3008 J3004 M3002 S3002 W3002 XF3008	C30 E80 L10	E34 E81 L3

4000	A4001	A4002	A4003
A4004 CR005 E4001 M4005 R4002	C3 CR1 DS3 E5 Q1 R3 XDS3	C3 CR1 DS3 E5 Q1 R3 XDS3	C12 CR4 DS3 E13 K1 Q1 R3 XDS3 XK1

MISSING SYMBOL	5002	A5001	A5002
	A5002 C5007 DS5018 F5008 XDS5004 R5002 E5001	C10 E10 R1	C5 E5 R1

CK1777 SH5

Figure 7-1. Schematic Diagram, HFLM-10K (Sheet 1 of 5)

C717 50PF 7.5KV
C718 60PF 7.5KV
C719 50PF 7.5KV

C732 2000PF 10KV

PA TUNE

XA702 A702

SEE CK 1757

S5003 TB03-15V
S5003
S5003 TB03-15V
S5003
P907-V
P907-U
P907-H
S5003
E5001
TO 24VDC REG
P912-Q
P912-I
P907-D
TB03 ϕ3 (.05)
P912-P
P907-F
P907-G
S5003

TO 24VDC REG. P905-N

L706 .2

TUNE C1 20-750PF 10KV

C731 2000PF 10KV

A704 BANDSWITCH ASS'Y

P/N (AS145)

C1 150PF 10KV
C2 35PF 10KV

S1A S1B S1C S1D

L1 .35

SEE CHART

L2 15

L3 22

L707 9

TO SH 1

XA703 PA LOAD A703

P907-k
P912-n, P907-l
E4001
S5005
S5005
S5005
S5005
P912-F
TB03 ϕ3 (.05)
P907-S
F5001
S5005
S5005
M4003

SEE CK 1778

C1 PA LOAD 5-750PF 5KV

BANDSWITCH CONTROL ASS'Y (A704)A1

P/N(AX510J)

P/O AS145

SEE CK1646

P905

P906-p
P906-g
P906-h
P906-j
P906-k
P906-l
P906-m
P906-n
P906-w
A5001-10
TO 24VDC REG P904-x
XA702-10
A5001-1
A5001-2
A5001-3
A5001-4
A5001-5
A5001-6
A5001-7
A5001-9
P913-A
A3001-2
P913-L
A3001-11
P913-K
A3001-10
P913-J
A3001-9
P913-H
A3001-8
P913-F
A3001-7
P913-E
A3001-6
P913-D
A3001-5
P913-B
A3001-3
S5004
S5004
P913-C
A3001-4
A5001-8
XA701-L
P906-y
P906-r

J1

P904

J2

F3002
F3001
F3003
P903-G
P906-s
P903-M
P903-L
P903-K
P903-J
P903-H
P906-b
P903-A
P903-F
P903-E
P903-D
P903-C
P907-A
P903-B
P905-N
TO 24VDC REG P906-P
P906-a
P903-Q
P906-c
P906-d
P906-e
P906-f
P906-w
P906-x
P906-y
P906-z
P906-x
XA701-B

C739 2000PF 10KV

L705 35

L704 35

C730 2000PF 10KV

E712

L801

B D E L J F

P904-g
P907-M
XA705-J
P907-B P905-r
CR805-POS

A704S1 SHOWN IN BAND 1

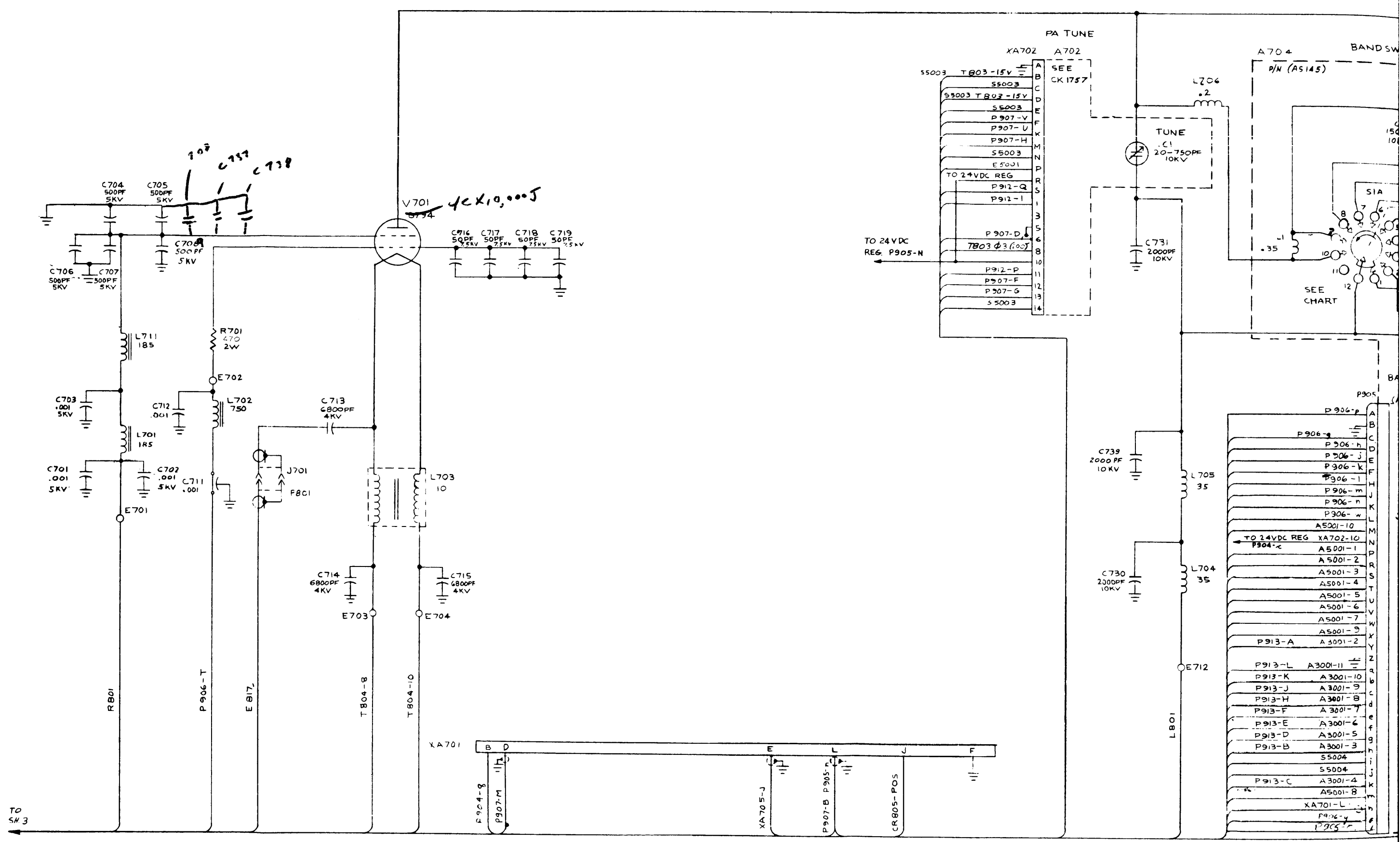
A704S1	
POS	BAND MHz
1	2 — 2.3
2	2.3 — 2.6
3	2.6 — 3
4	3 — 4
5	4 — 5
6	5 — 8
7	8 — 12
8	12 — 16
9	16 — 24
10	24 — 30

A704S1 SYMBOLS		
WAFER	POS	SYMBOL
A	1	A704E1
A	2	A704E2
A	3	A704E3
A	4	A704E4
A	5	A704E5
A	6	A704E6
A	7	A704E7
A	8	A704E8
A	9	A704E9
A	10	A704E10
A	12	A704E11
B	6	A704E12
B	12	A704E13
C	10	A704E14
C	11	A704E15
C	12	A704E16
D	1	A704E17
D	2	A704E18
D	3	A704E19
D	9	A704E20
D	10	A704E21
D	11	A704E22
D	12	A704E23

E4001 XA703-E
R4001 1K
LOAD SENSE M4003
XA703-9
XA705-H
R4002 10Ω
C4001

TO SH 1

Figure 7-1. Schematic Diagram, HFLM-10 (Sheet 2 of 5)


PA TUNE
XA702
A702
SEE CK 1757
S5003
T803-15V
P907-V
P907-U
P907-H
E5001
TO 24VDC REG
P912-Q
P912-1
P907-D
T803 Ø3 (100J
P912-P
P907-F
P907-G
TO 24VDC REG. P905-N
TUNE
C1
20-750PF 10KV
L706
.2
A704
BAND SW
P/N (AS145)
SEE CHART
C731
2000PF 10KV
C739
2000 PF 10KV
L705
35
C730
2000PF 10KV
L704
35
E712
L801
P905
P906-p
P906-g
P906-h
P906-j
P906-k
P906-l
P906-m
P906-n
P906-w
A5001-10
TO 24VDC REG P904-x
XA702-10
A5001-1
A5001-2
A5001-3
A5001-4
A5001-5
A5001-6
A5001-7
A5001-9
P913-A
A3001-2
P913-L
A3001-11
P913-K
A3001-10
P913-J
A3001-9
P913-H
A3001-8
P913-F
A3001-7
P913-E
A3001-6
P913-D
A3001-5
P913-B
A3001-3
S5004
P913-C
A3001-4
A5001-8
XA701-L
P906-y
P905-r
V701
6CX10,000J
C704 500PF 5KV
C705 500PF 5KV
C706 500PF 5KV
C707 500PF 5KV
C708 500PF 5KV
C716 50PF 7.5KV
C717 50PF 7.5KV
C718 50PF 7.5KV
C719 50PF 7.5KV
L711 185
L701 185
R701 470 2W
E702
C703 .001 5KV
C712 .001
L702 750
C713 6800PF 4KV
J701
FBC1
C701 .001 5KV
C702 .001 5KV
C711 .001
L703 10
E701
C714 6800PF 4KV
C715 6800PF 4KV
E703
E704
R801
P906-T
E817
T804-8
T804-10
XA701
P904-8
P907-M
XA705-J
P907-B
P905-n
CR805-POS
TO SH 3

CK1777 SH. 2

TO 24 VDC REG
XDS5001

5001
XDS5001 (SEE NOTE)
HV

KS

DS5014
24.0-30.0
DS5013
16.0-24.0
DS5012
12.0-16.0
DS5011
8.0-12.0
DS5010
5.0-8.0
DS5009
4.0-5.0
DS5008
3.0-4.0
DS5007
2.6-3.0
DS5006
2.3-2.6
DS5005
2.0-2.3

HT
S5004
NDSWITCH
FT

DS5003
FAULT
P912-E
C5006 .1
XDS5001
TO 24 VDC
REG P906-P

DS5004
READY
P/O S5007
P912-d
C5007 .1

S5007
TUNE
A3002-16
NO NC
NO NC
NO NC

A5002
P/N (A4B04/PC534)
XA705-8
XA705-9
XA705-L
XA705-K
E1
E2
E3
E4
E5
C1 .1
C2 .1
C3 .1
C4 .1
C5 .1
R1 330 2W
DS5018
4
DS5017
3
DS5016
2
DS5015

XA705-5
XA705-7
XA705-2
XA705-E
S5006
POWER
ADJ

XA702-E
XA702-B
P912-k
T803 Φ2 (200)
XA702-14
XA702-D
XA702-N
XA702-C
H
L
S5003
TUNE

XA703-K
XA703-B
P912-m
T803 Φ2 (200)
XA703-7
XA703-J
XA703-F
XA703-H
+
−
S5005
LOAD

M4001
SCREEN CURRENT
MA
A4001
E2(+)
E4(-)
E1
E5
E3
E804
A4002-1
A4002-3
P/N (A4B00/PC529)
R2 1.2K
R3 1K
R1 120
C1 50 15V
C3 .1
C2 .1
Q1 2N1595
DS1 XDS1
DS2 XDS2
DS3 XDS3
CR1 IN2484

M4002
PLATE CURRENT
A
A4002
E2(+)
E4(-)
E1
E5
E3
C807
A4001-1
CB3002B-C
A4001-3
A4003-8
P/N (A4B00/PC529)
R2 1.2K
R3 1K
R1 120
C1 50 15V
C3 .1
C2 .1
Q1 2N1595
DS1 XDS1
DS2 XDS2
DS3 XDS3
CR1 IN2484

TO SH.2

Figure 7-1. Schematic Diagram, HFLM-10K (Sheet 3 of 5)

P906-U

P9 6-R

S901 IPA DRVR — NO / NC

S902 EXC DWR — NO / NC

S903 LEFT SIDE — NO / NC

S904 RIGHT SIDE — NO / NC

S5008 FRONT WINDOW — NO / NC

S905 REAR BOTTOM — NO / NC

S906 REAR TOP — NO / NC

S907 GRILLE — NO / NC

MSW-B

OVLD A4003-B

S701 HEAT OVLD

TB901 1 2 3 4

AB01 TB1-2

A3002-31

TO SH4

P912-E XA702-P XA703-C

E5001

P903-P — TO 24 VDC REG XDS5001

P912-H — C5002 .1

A4003-4 NO

P912-t NO

A3002-36 NO

CB3002B-C NO

A4003-11 NO

S5001 XDS5001 (SEE SH 5) HV

DS5002 INTERLOCKS

A3002-33 — C5005 .1

A5001

R1 330 2W P/N (A4791/RC521)

P905-P E1 C1 .1 — DS5014 24.0-30.0

P905-R E2 C2 .1 — DS5013 16.0-24.0

P905-S E3 C3 .1 — DS5012 12.0-16.0

P905-T E4 C4 .1 — DS5011 8.0-12.0

P905-U E5 C5 .1 — DS5010 5.0-8.0

P905-V E6 C6 .1 — DS5009 4.0-5.0

P905-W E7 C7 .1 — DS5008 3.0-4.0

P905-m E8 C8 .1 — DS5007 2.6-3.0

P905-Y E9 C9 .1 — DS5006 2.3-2.6

P905-M E10 C10 .1 — DS5005 2.0-2.3

P905-j — RIGHT S5004 BANDSWITCH LEFT

P912-f

P905-J

P912-E — C5006 .1 — XDS5001 — TO 24 VDC REG P906-P

DS5003 FAULT

P912-d — C5007 .1

DS5004 READY P/O S5007

A3002-16

S5007 TUNE — NO / NC

A5002

P/N (A4806/PC534)

XA705-8 E1 C1 .1 — DS5018 4

XA705-9 E2 C2 .1 — DS5017 3

XA705-L E3 C3 .1 — DS5016 2

XA705-K E4 C4 .1 — DS5015

E5 R1 330 2W

XA705-5

XA705-7

XA709-2

S5006 POWER — ADJ

XA705-E

XA702-E

XA702-B

S5003 TUNE — H / L

P912-k

T803 Φ2 (2:0)

XA702-14

XA702-D

XA702-N

XA702-C

XA703-K

XA703-B

P912-m

T803 Φ2 (2:0)

XA703-7

XA703-J

XA703-F

XA703-H

CK1777 SH3

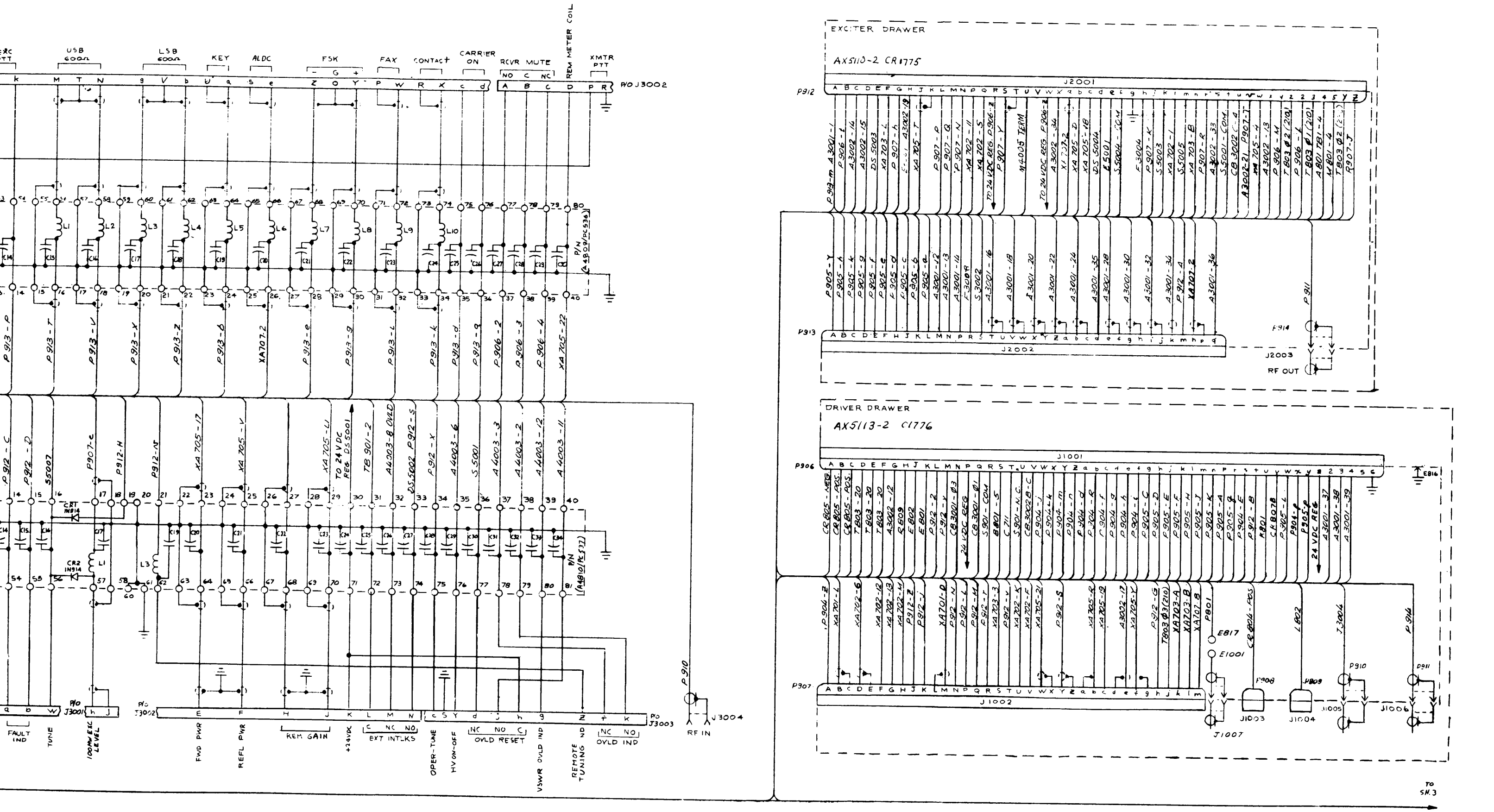
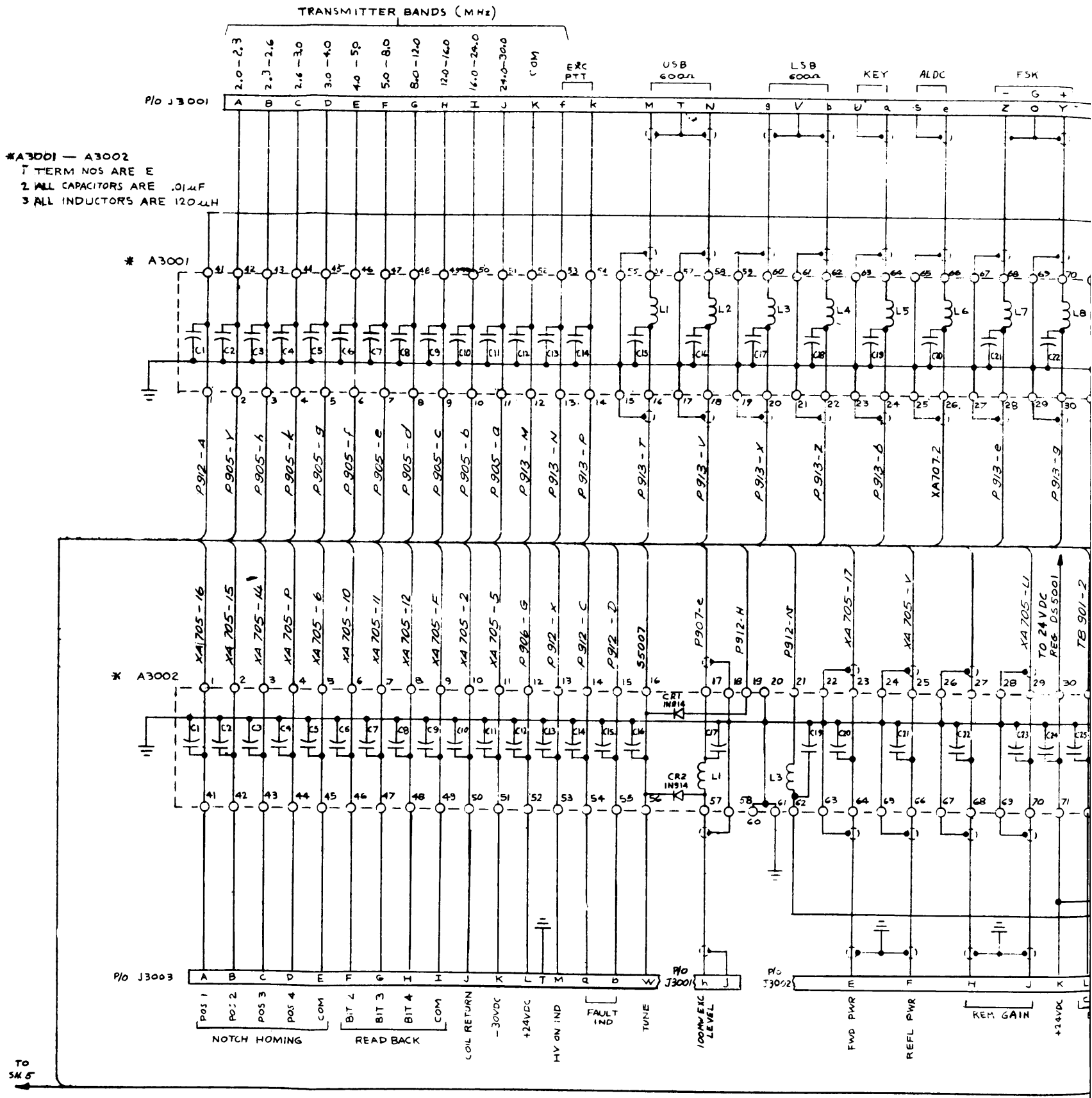


Figure 7-1. Schematic Diagram, HFLM-10K (Sheet 4 of 5)

004711052


TRANSMITTER BANDS (MHz)
2.0 - 2.3
2.3 - 2.6
2.6 - 3.0
3.0 - 4.0
4.0 - 5.0
5.0 - 8.0
8.0 - 12.0
12.0 - 16.0
16.0 - 24.0
24.0 - 30.0
COM
EXC PTT
USB 600Ω
LSB 600Ω
KEY
ALDC
FSK
P/O J3001
*A3001 — A3002
1 TERM NOS ARE E
2 ALL CAPACITORS ARE .01μF
3 ALL INDUCTORS ARE 120μH
* A3001
* A3002
P/O J3003
P/O J3001
P/O J3002
NOTCH HOMING
READ BACK
COIL RETURN
-30VDC
+24VDC
HV ON IND
FAULT IND
TUNE
100W EXC LEVEL
FWD PWR
REFL PWR
REM GAIN
+24VDC
TO 24 V DC REG. DS5001
TB 901-2
TO SH 5

CK1777 SH 4

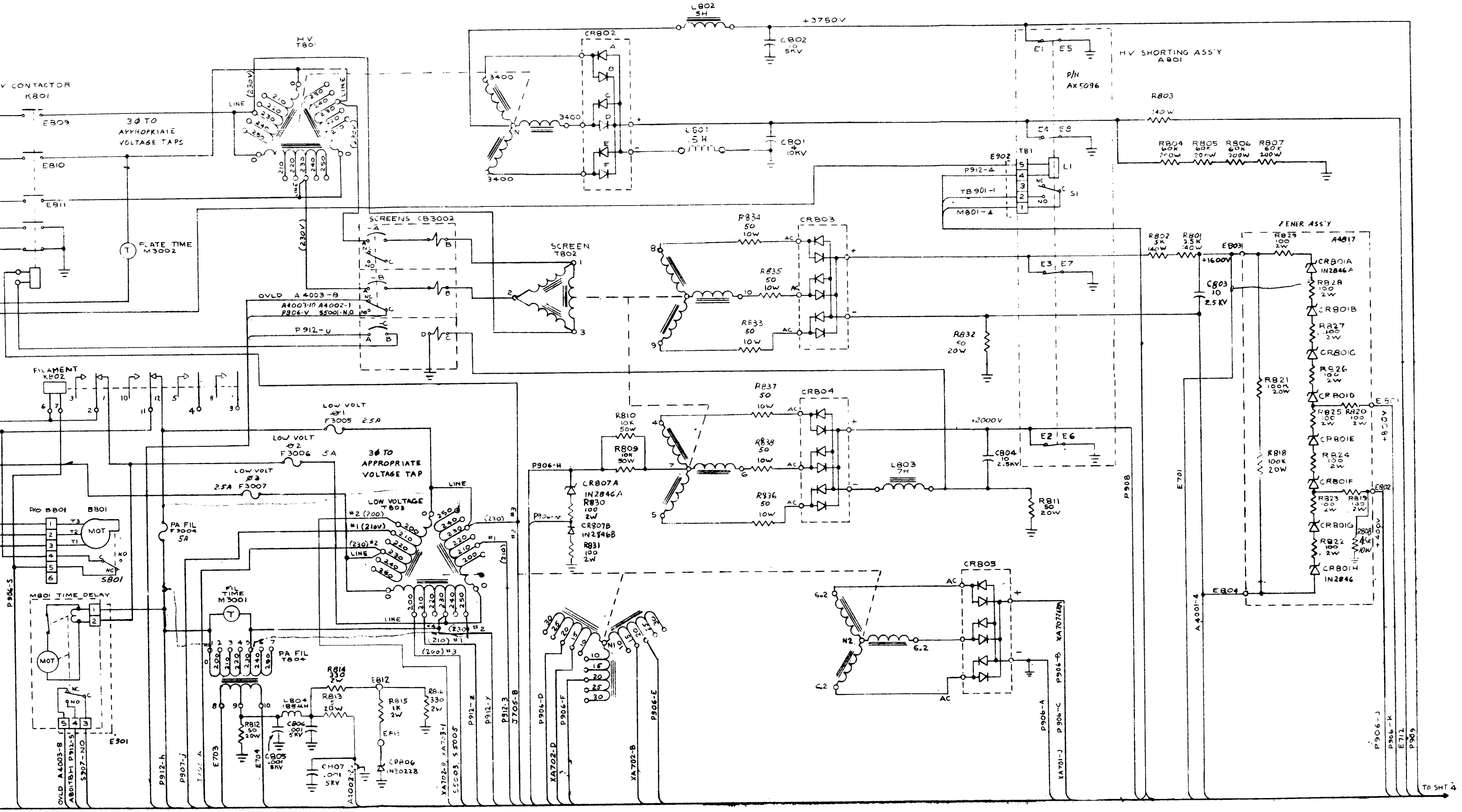
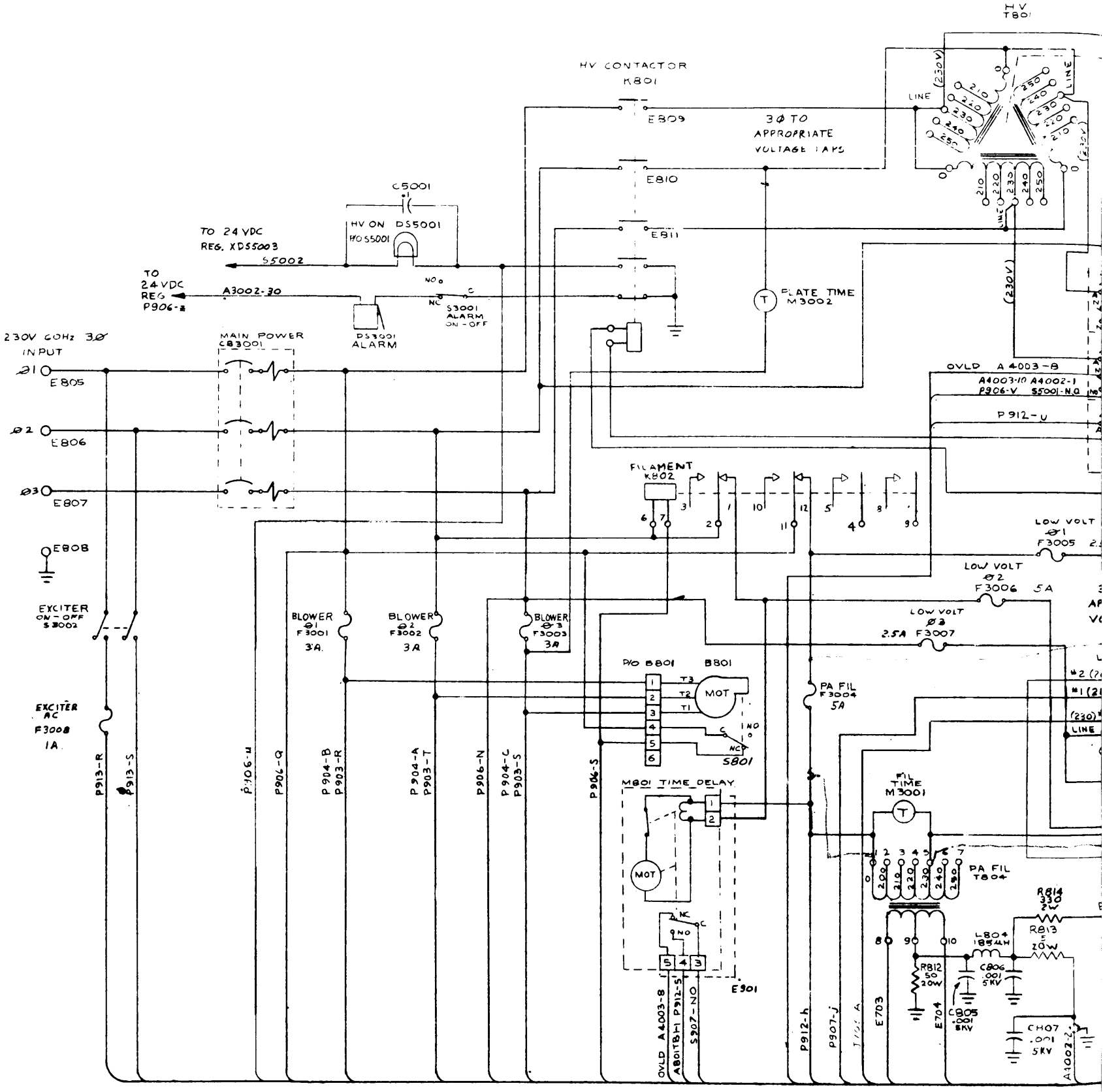
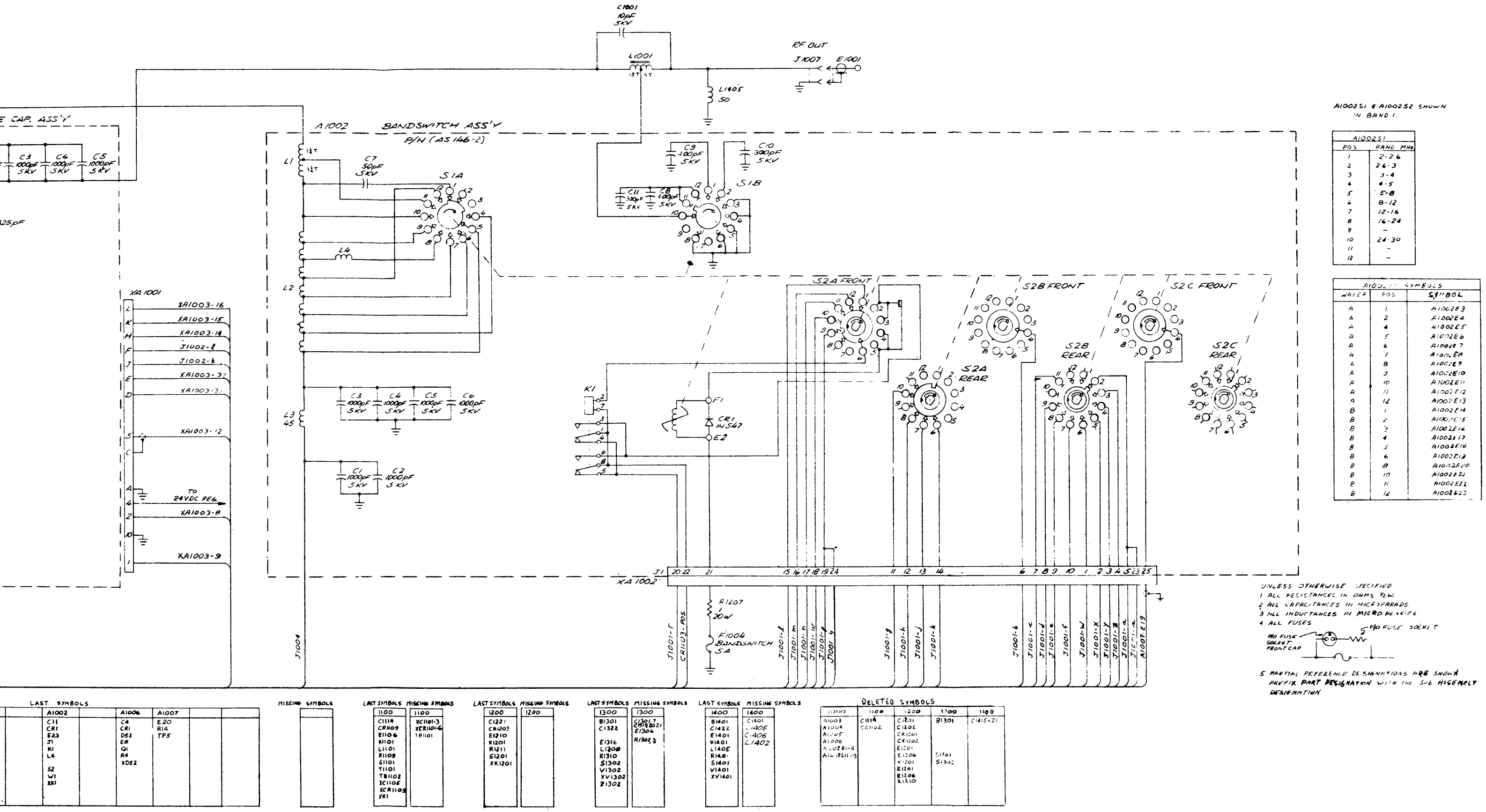


Figure 7-1. Schematic Diagram, HFLM-10 (Sheet 5 of 5)


HV
T801
HV CONTACTOR
K801
E809
3Ø TO
APPROPRIATE
VOLTAGE TAPS
LINE
(230V)
210
220
230
240
250
E810
E811
C5001
HV ON DS5001
HV OFF S5001
TO 24 VDC
REG. XDS5003
S5002
TO
24 VDC
REG
P906-a
A3002-30
NO
NC
C
S3001
ALARM
ON - OFF
DS3001
ALARM
PLATE TIME
M3002
230V 60Hz 3Ø
INPUT
MAIN POWER
CB3001
Ø1
E805
Ø2
E806
Ø3
E807
E808
OVLD A4003-B
A4003-10 A4002-1
P906-V S5001-NO
P912-U
FILAMENT
K802
LOW VOLT
Ø1
F3005
LOW VOLT
Ø2
F3006 5A
LOW VOLT
Ø3
2.5A F3007
EXCITER
ON-OFF
S3002
EXCITER
AC
F3008
1A
BLOWER
Ø1
F3001
3A
BLOWER
Ø2
F3002
3A
BLOWER
Ø3
F3003
3A
P/O B801
B801
MOT
T3
T2
T1
S801
PA FIL
F3004
5A
M801 TIME DELAY
FIL
TIME
M3001
MOT
E901
PA FIL
T804
RB14
330
2W
RB13
1K
10W
RB12
50
20W
L804
1854H
C806
.001
5KV
C805
.001
5KV
CH07
.001
5KV
A1002-2
E703
E704
P913-R
P913-S
P906-U
P906-Q
P904-B
P903-R
P904-A
P903-T
P906-N
P904-C
P903-S
P906-S
P912-h
P907-j
OVLD A4003-8
A8178H1 P912-S
S3207-NO

CK1777 SH5



A100251 & A100252 SHOWN IN BAND 1.

A100251	
POS	BAND MHz
1	2-2.6
2	2.6-3
3	3-4
4	4-5
5	5-8
6	8-12
7	12-16
8	16-24
9	–
10	24-30
11	–
12	–

A100251 SYMBOLS		
WAFER	POS	SYMBOL
A	1	A1002E3
A	2	A1002E4
A	4	A1002E5
A	5	A1002E6
A	6	A1002E7
A	7	A1002E8
A	8	A1002E9
A	9	A1002E10
A	10	A1002E11
A	11	A1002E12
A	12	A1002E13
B	1	A1002E14
B	2	A1002E15
B	3	A1002E16
B	4	A1002E17
B	5	A1002E18
B	6	A1002E19
B	8	A1002E20
B	10	A1002E21
B	11	A1002E22
B	12	A1002E23

UNLESS OTHERWISE SPECIFIED
1. ALL RESISTANCES IN OHMS, ½W.
2. ALL CAPACITANCES IN MICROFARADS.
3. ALL INDUCTANCES IN MICROHENRIES
4. ALL FUSES.

5. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX PART DESIGNATION WITH THE SUB ASSEMBLY DESIGNATION.

LAST SYMBOLS					
	A1002		A1006	A1007	
	C11		C4	E20	
	CR1		CR1	R14	
	E23		DS2	TP5	
	J1		E8		
	K1		Q1		
	L4		R4		
			XDS2		
	S2				
	W1				
	XK1				

MISSING SYMBOLS

LAST SYMBOLS	MISSING SYMBOLS
1100	1100
C1114	XC1101-3
CR1109	XCR1101-6
E1106	TB1101
K1101	
L1101	
R1109	
S1101	
T1101	
TB1102	
XC1106	
XCR1103	
XK1	

LAST SYMBOLS	MISSING SYMBOLS
1200	1200
C1221	
CR1203	
E1210	
K1201	
R1211	
S1201	
XK1201	

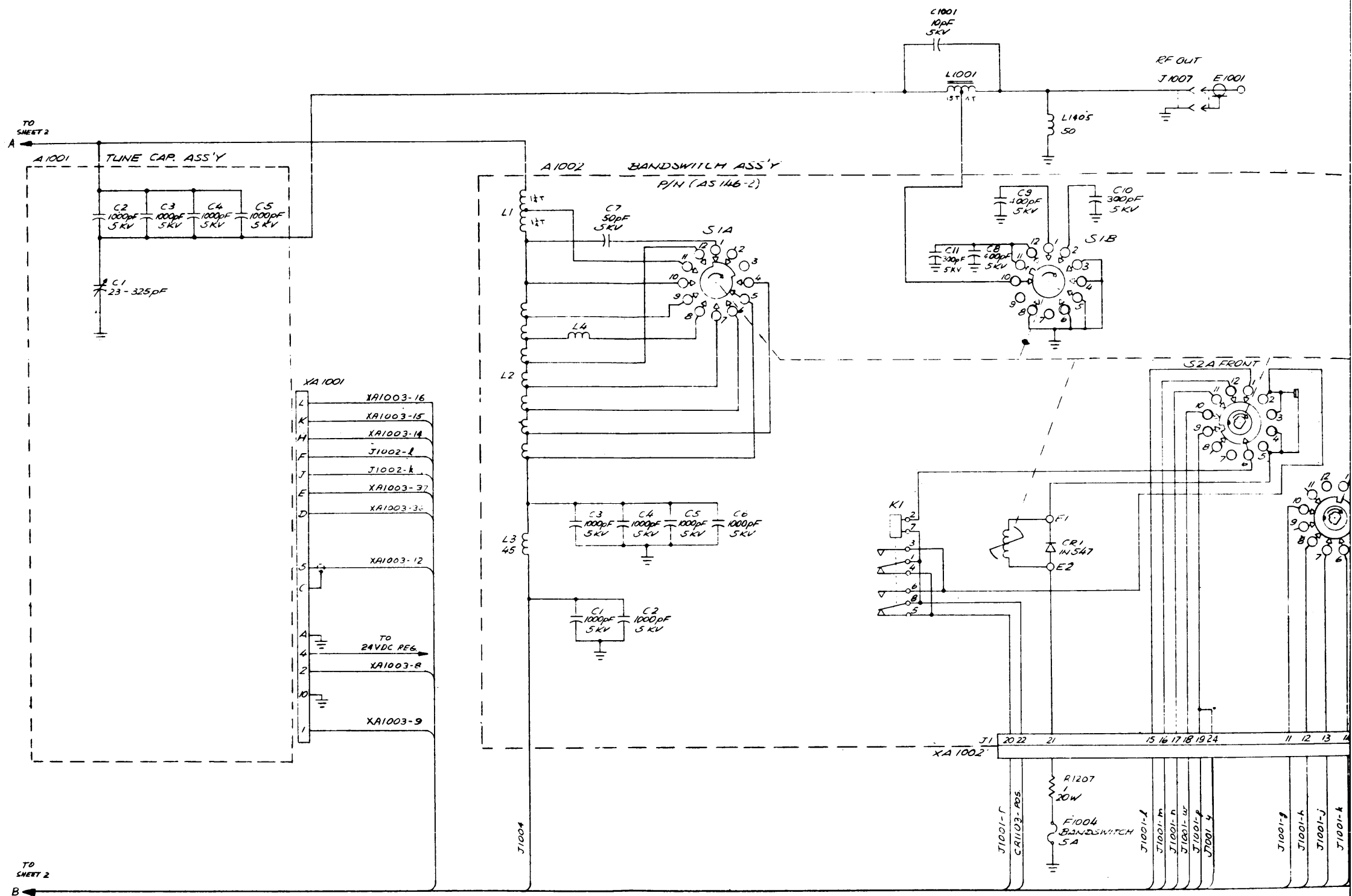
LAST SYMBOLS	MISSING SYMBOLS
1300	1300
B1301	C1324-7
C1322	C1328-1321
	E1306
E1316	R1302-3
L1308	
R1310	
S1302	
V1302	
XV1302	
Z1302	

LAST SYMBOLS	MISSING SYMBOLS
1400	1400
B1401	C1401
C1422	C1405
E1401	C1406
K1401	L1402
L1405	
R1410	
S1401	
V1401	
XV1401	

DELETED SYMBOLS				
1000	1100	1200	1300	1400
A1003	C1114	C1201	B1301	C1415-21
A1004	CR1102	C1202		
A1005		CR1201		
A1006		CR1202		
A1007R1-4		E1201		
A1007E11-13		E1206	S1301	
		X1201	S1302	
		R1201		
		R1206		
		R1210		

H 1

Figure 7-2. Schematic Diagram, HFLM-10K IPA Drawer (Sheet 1 of 4)



LAST SYMBOLS

1000	A1001		A1002		A1006	A1007		
A1008			C11		C4	E20		
C1001			CR1		CR1	R14		
E1001	C6		E23		DS2	TP5		
F1004			J1		E8			
J1007			K1		Q1			
L1001			L4		R4			
M1001					XDS2			
P1001			S2					
S1001			W1					
XA1004			XK1					
XF1004								

MISSING SYMBOLS

LAST SYMBOLS / MISSING SYMBOLS

1100	1100
C1114	XC1101-3
CR1109	XCR1101-6
E1106	TB1101
K1101	
L1101	
R1109	
S1101	
T1101	
TB1102	
XC1105	
XCR1105	
XK1	

LAST SYMBOLS / MISSING SYMBOLS

1200	1200
C1221	
CR1203	
E1210	
K1201	
R1211	
S1201	
XK1201	

LAST SYMBOLS / MISSING SYMBOLS

1300	1300
B1301	C1321,7 C1419,21
C1322	E1306
E1316	R1302,3
L1308	
R1310	
S1302	
V1302	
XV1302	
Z1302	

LAST SYMBOLS / MISSING SYMBOLS

1400	1400
B1401	C1401
C1422	C1405
E1401	C1406
K1401	L1402
L1405	
R1410	
S1401	
V1401	
XV1401	

DELETED SYMBOLS

1000	1100	1200
A1003	C1114	C1201
A1004	CR1102	C1202
A1005		CR1201
A1006		CR1202
A1007R1-4		E1201
A1007E11-13		E1206
		K1201
		R1201
		R1206
		R1210

CK1776 SH 1

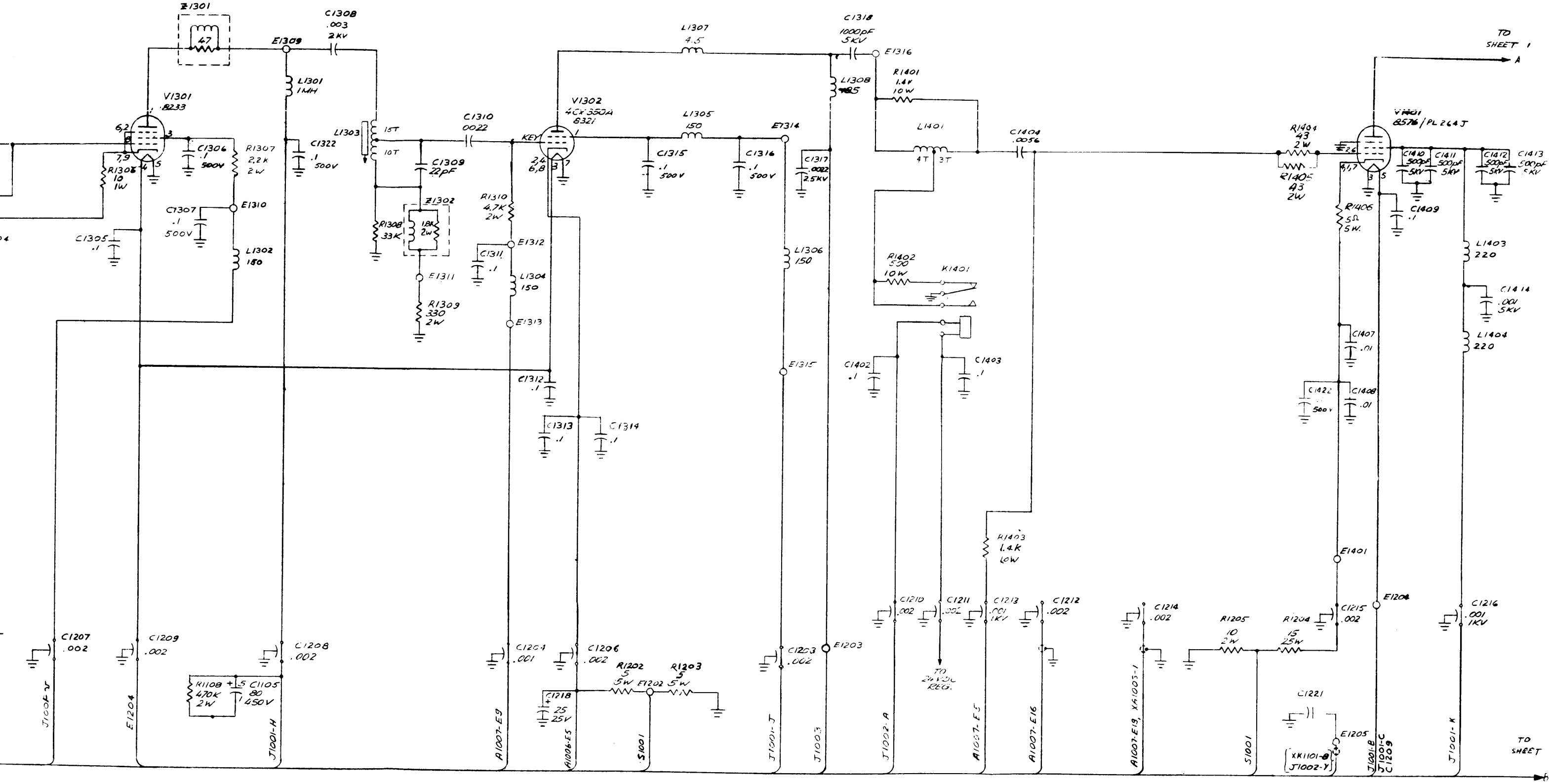
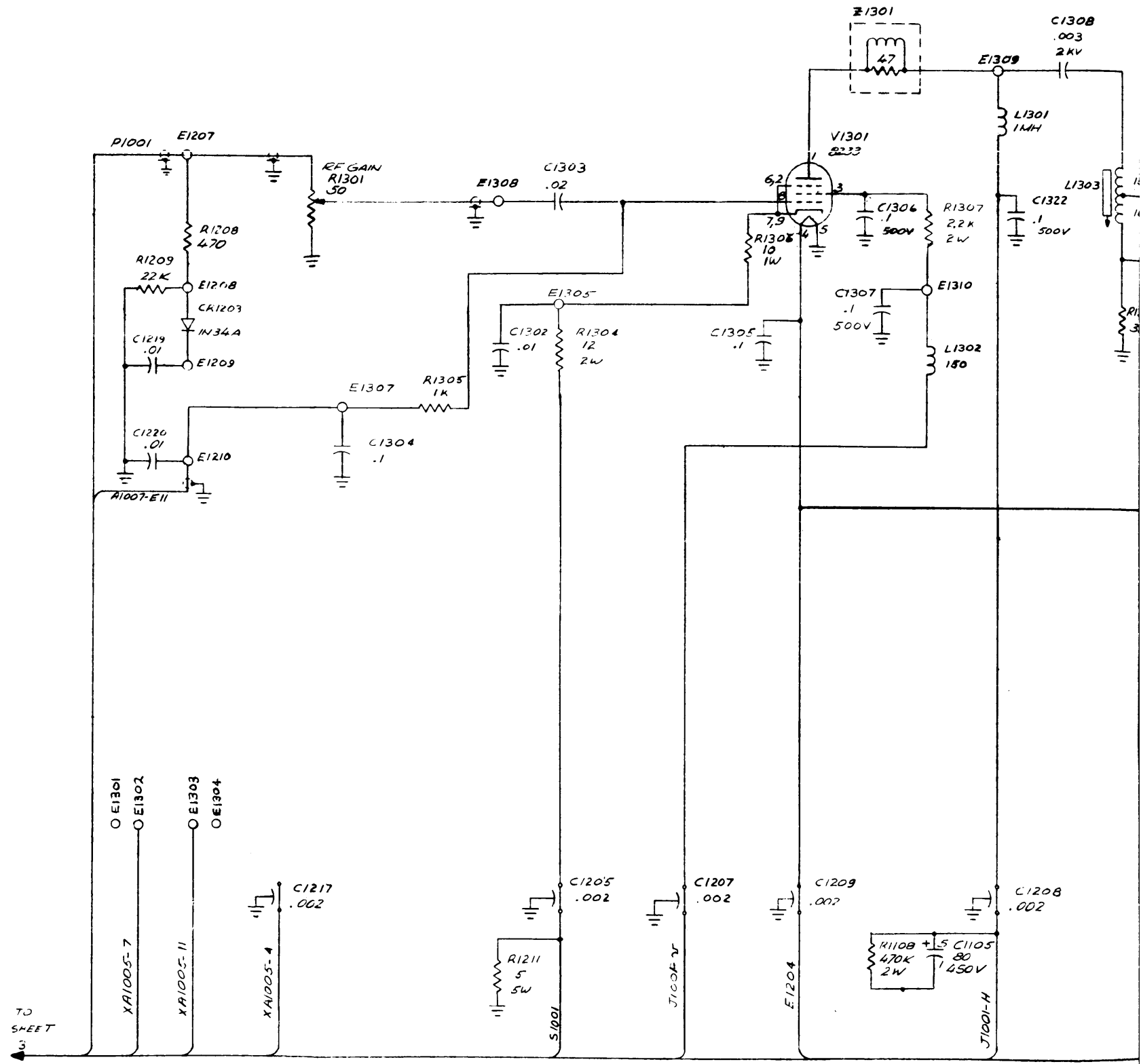


Figure 7-2. Schematic Diagram, HFLM-10K IPA Drawer (Sheet 2 of 4)


Z1301
47
C1308
.003
2KV
E1309
L1301
1MH
V1301
6233
L1303
C1322
.1
500V
P1001
E1207
RF GAIN
R1301
50
E1308
C1303
.02
R1208
470
R1209
22K
E1208
CR1203
IN34A
C1219
.01
E1209
C1306
.1
500V
R1307
2.2K
2W
R1308
10
1W
E1310
C1307
.1
500V
E1305
C1302
.01
R1304
12
2W
C1305
.1
L1302
180
E1307
R1305
1K
C1304
.1
C1220
.01
E1210
A1007-E11
E1301
E1302
E1303
E1304
XA1005-7
XA1005-11
XA1005-4
C1217
.002
C1205
.002
C1207
.002
C1209
.002
C1208
.002
R1108
470K
2W
C1105
80
450V
R1211
5
5W
S1001
J1004-N
E1204
J1001-H
TO
SHEET
3

CK1776 SH2

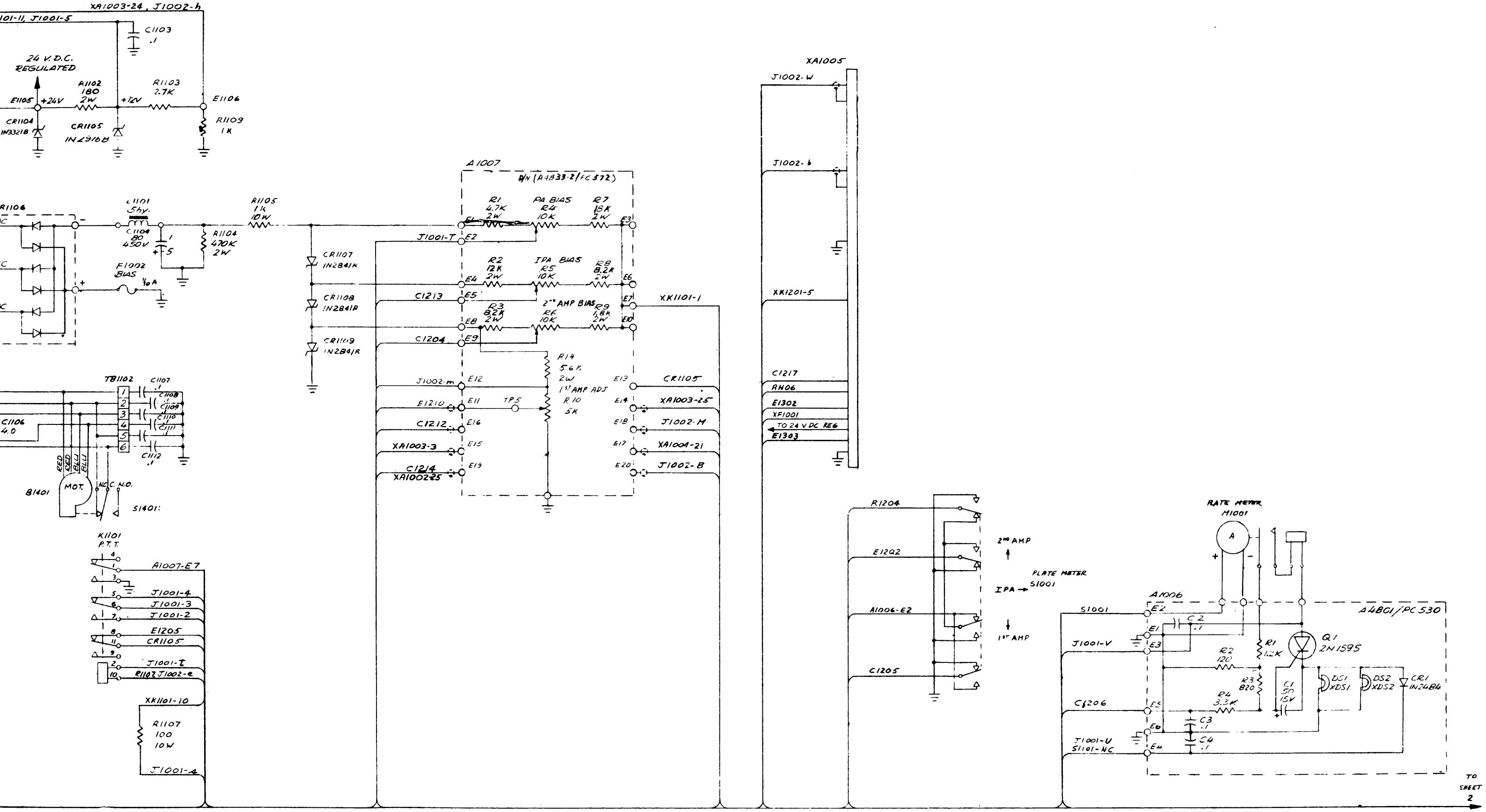
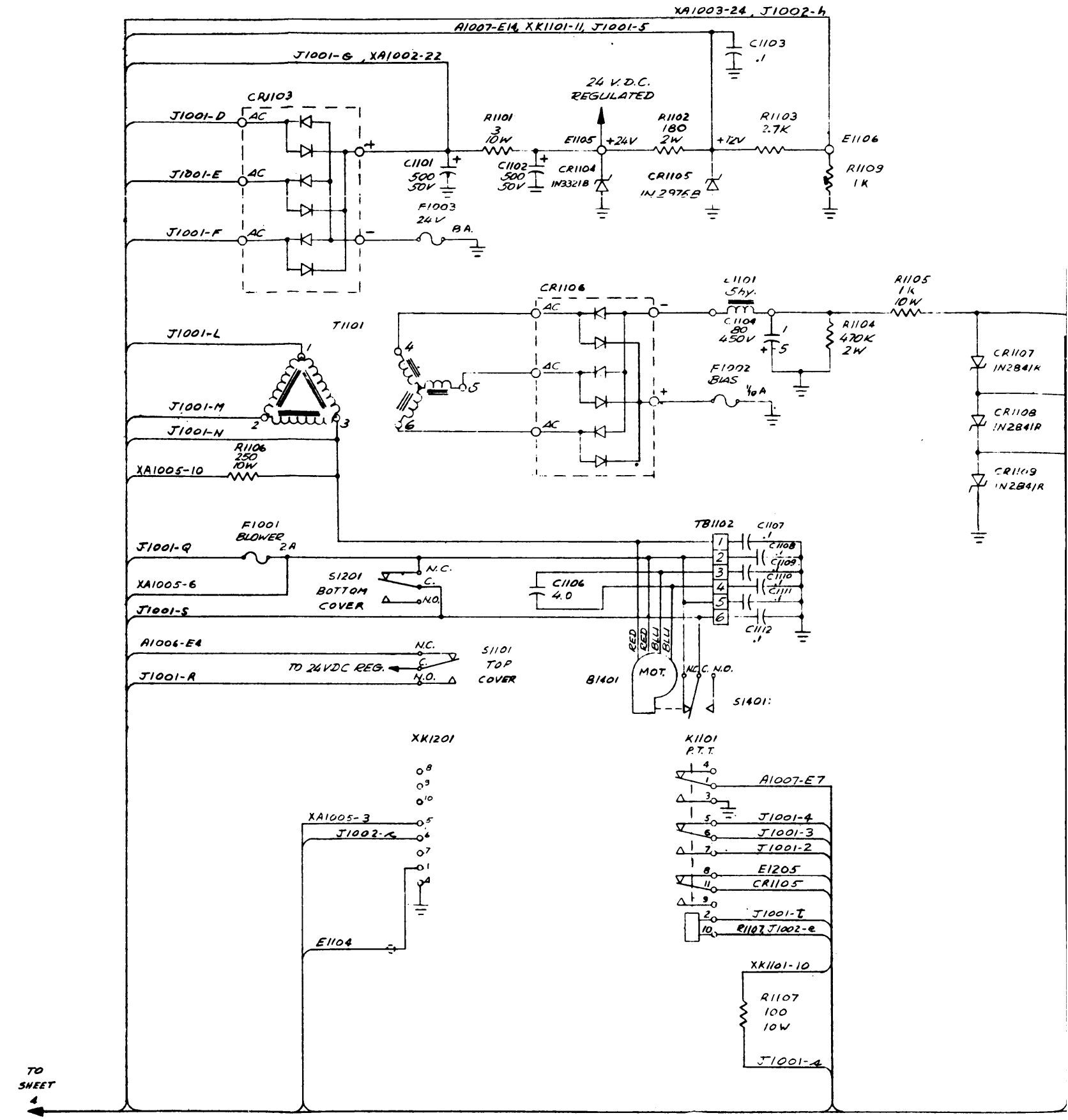


Figure 7-2. Schematic Diagram, HFLM-10K IPA Drawer (Sheet 3 of 4)


XA1003-24, J1002-h
A1007-E14, XK1101-11, J1001-5
J1001-G, XA1002-22
CR1103
J1001-D
J1001-E
J1001-F
AC
C1103 .1
24 V.D.C. REGULATED
R1101 3 10W
R1102 180 2W
R1103 2.7K
E1105
+24V
+12V
E1106
R1109 1K
C1101 500 50V
C1102 500 50V
CR1104 IN3321B
CR1105 IN2976B
F1003 24V
B.A.
CR1106
T1101
J1001-L
J1001-M
J1001-N
C1101 5hy.
C1104 80 450V
R1104 470K 2W
R1105 1K 10W
F1002 BIAS 1/10A
CR1107 IN2841R
CR1108 IN2841R
CR1109 IN2841R
R1106 250 10W
XA1005-10
F1001 BLOWER 2A
J1001-Q
XA1005-6
J1001-S
S1201 BOTTOM COVER
N.C.
C.
N.O.
C1106 4.0
TB1102
C1107 .1
C1108 .1
C1109 .1
C1110 .1
C1111 .1
C1112 .1
A1006-E4
J1001-R
TO 24VDC REG.
S1101 TOP COVER
B1401
MOT.
RED
RED
BLU
BLU
S1401:
XK1201
K1101 P.T.T.
A1007-E7
J1001-4
J1001-3
J1001-2
E1205
CR1105
J1001-T
R1107 J1002-e
XA1005-3
J1002-c
E1104
XK1101-10
R1107 100 10W
J1001-4
TO SHEET 4

CK1776 SH3.

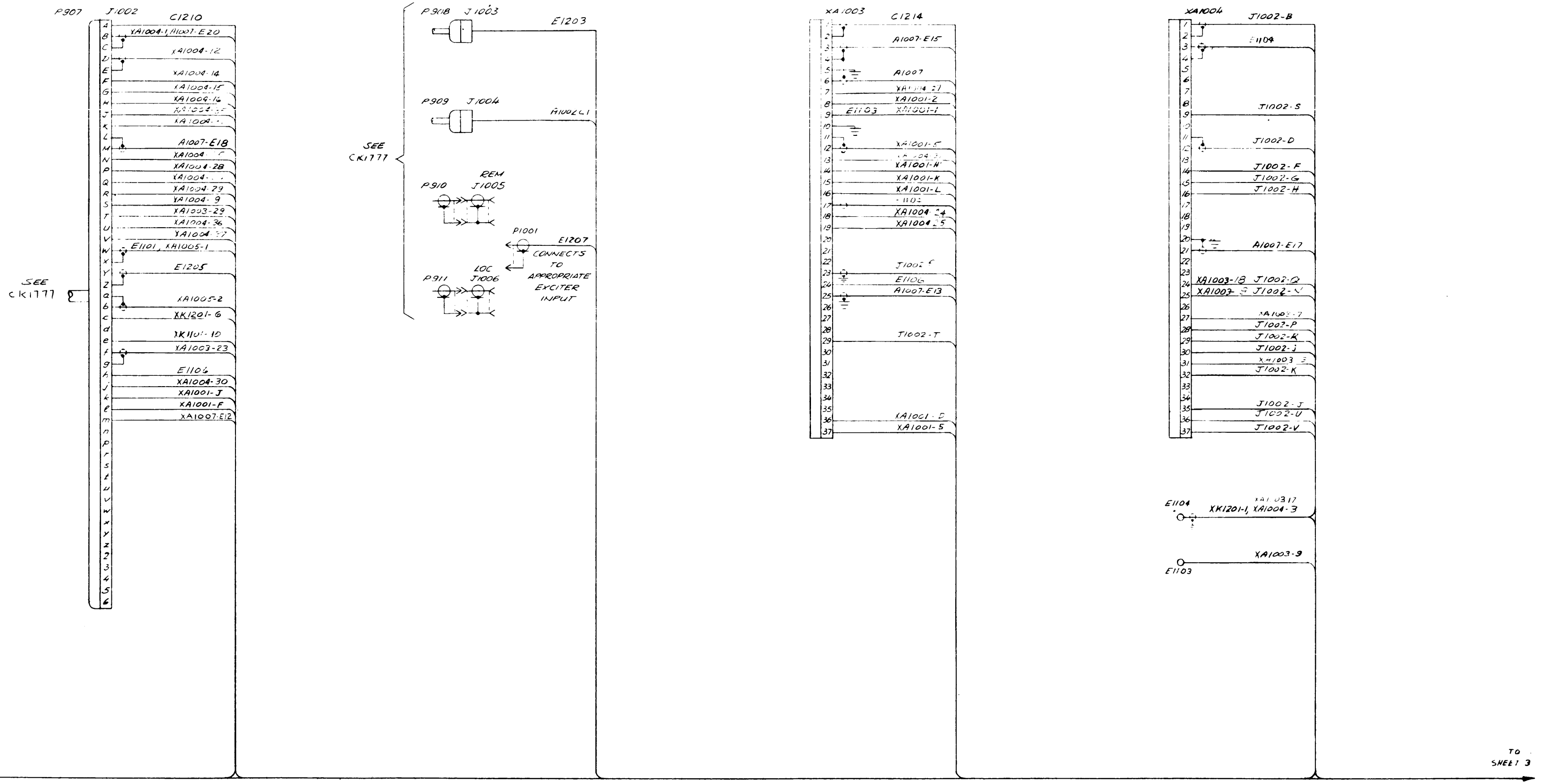
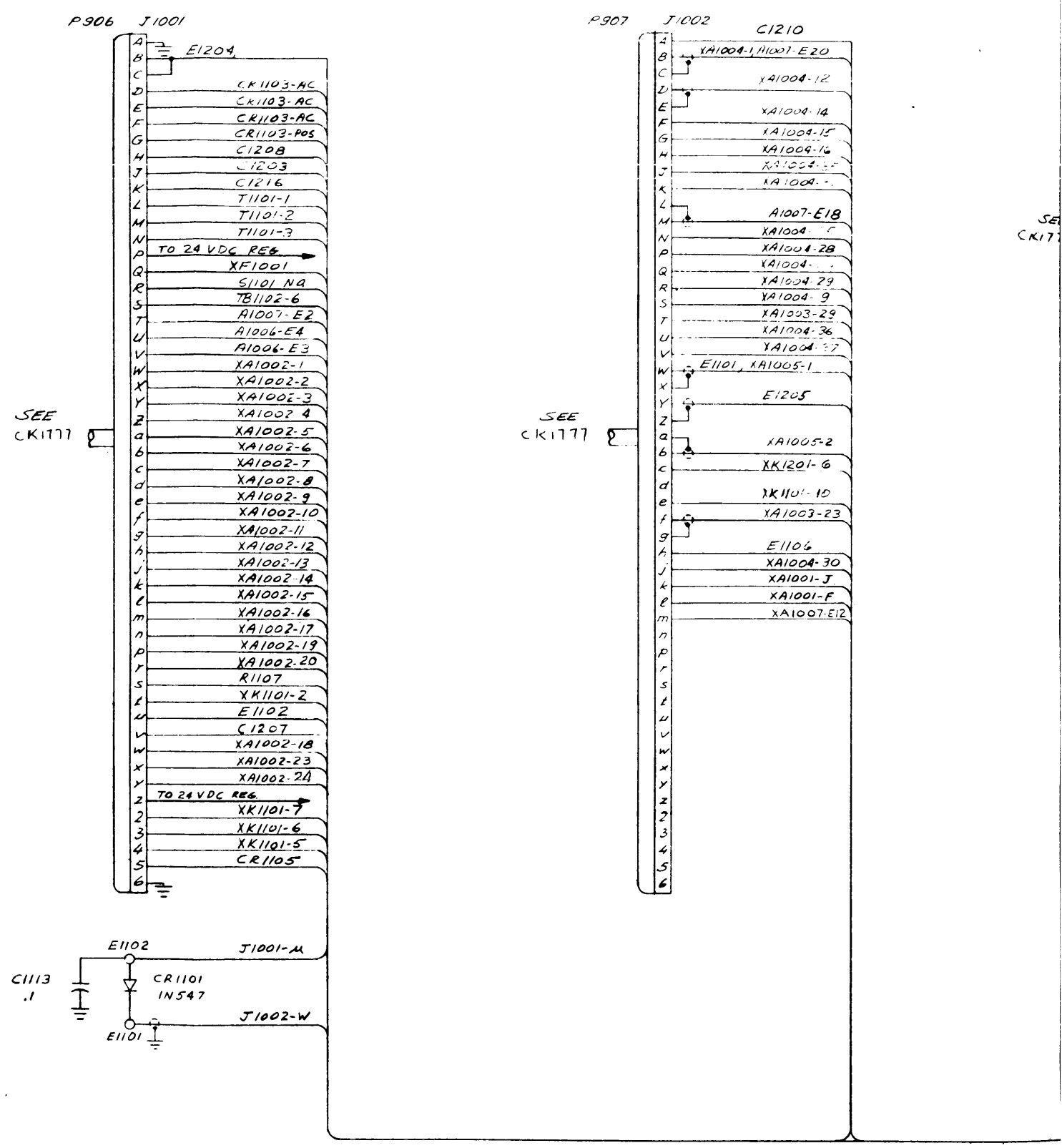


Figure 7-2. Schematic Diagram, HFLM-10K IPA Drawer (Sheet 4 of 4)


P906
J1001
P907
J1002
C1210
E1204
CK1103-AC
CK1103-AC
CK1103-AC
CR1103-POS
C1208
C1203
C1216
T1101-1
T1101-2
T1101-3
TO 24 VDC REG
XF1001
S1101 NA
TB1102-6
A1007-E2
A1006-E4
A1006-E3
XA1002-1
XA1002-2
XA1002-3
XA1002-4
XA1002-5
XA1002-6
XA1002-7
XA1002-8
XA1002-9
XA1002-10
XA1002-11
XA1002-12
XA1002-13
XA1002-14
XA1002-15
XA1002-16
XA1002-17
XA1002-19
XA1002-20
R1107
XK1101-2
E1102
C1207
XA1002-18
XA1002-23
XA1002-24
TO 24 VDC REG
XK1101-7
XK1101-6
XK1101-5
CR1105
SEE CK1777
SEE CK1777
XA1004-1, A1007-E20
XA1004-12
XA1004-14
XA1004-15
XA1004-16
A1007-E18
XA1004-28
XA1004-29
XA1004-9
XA1003-29
XA1004-36
E1101, XA1005-1
E1205
XA1005-2
XK1201-6
XK1101-10
XA1003-23
E1106
XA1004-30
XA1001-J
XA1001-F
XA1007-E12
E1102
J1001-M
C1113
.1
CR1101
IN547
J1002-W
E1101

CK1776 SH4

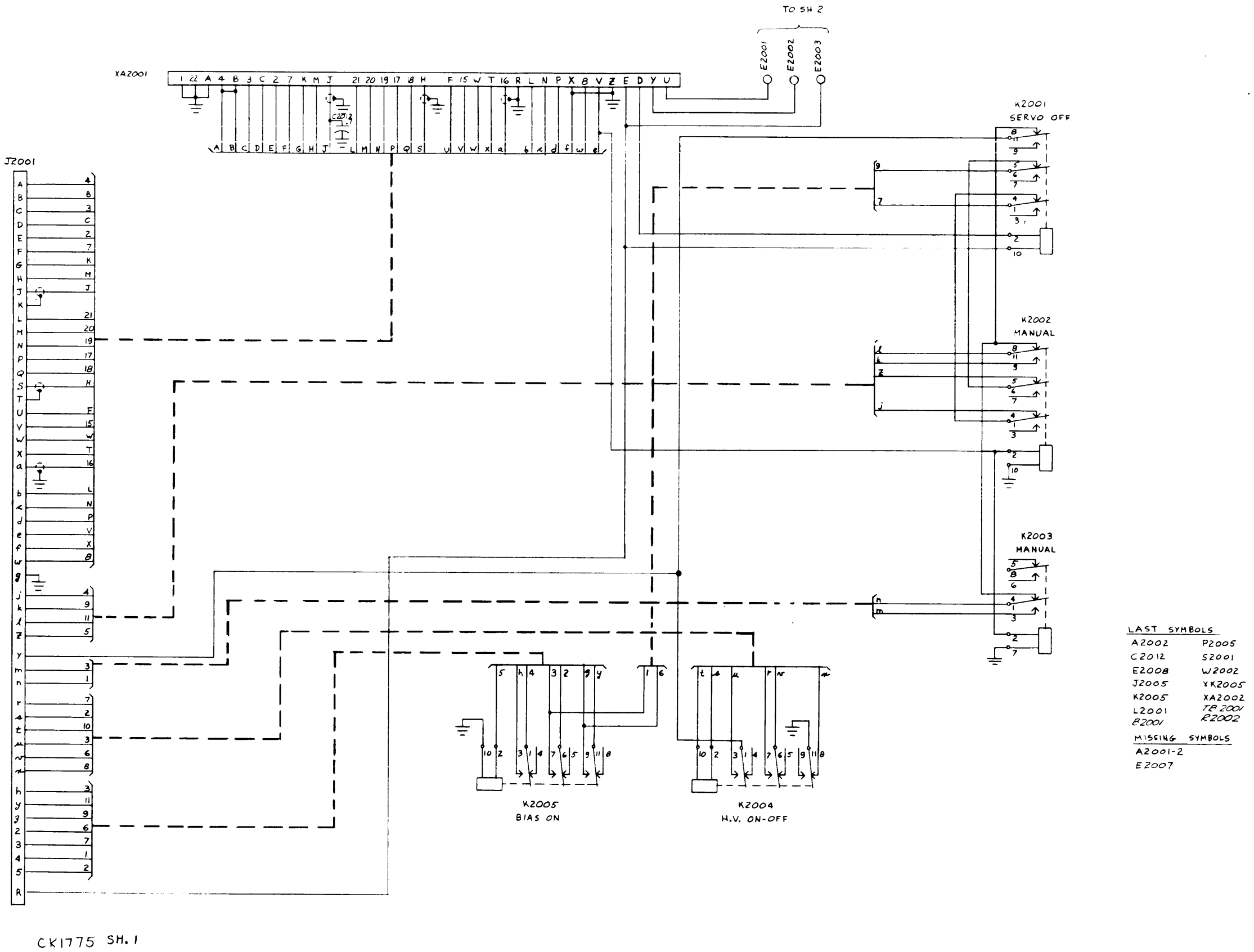
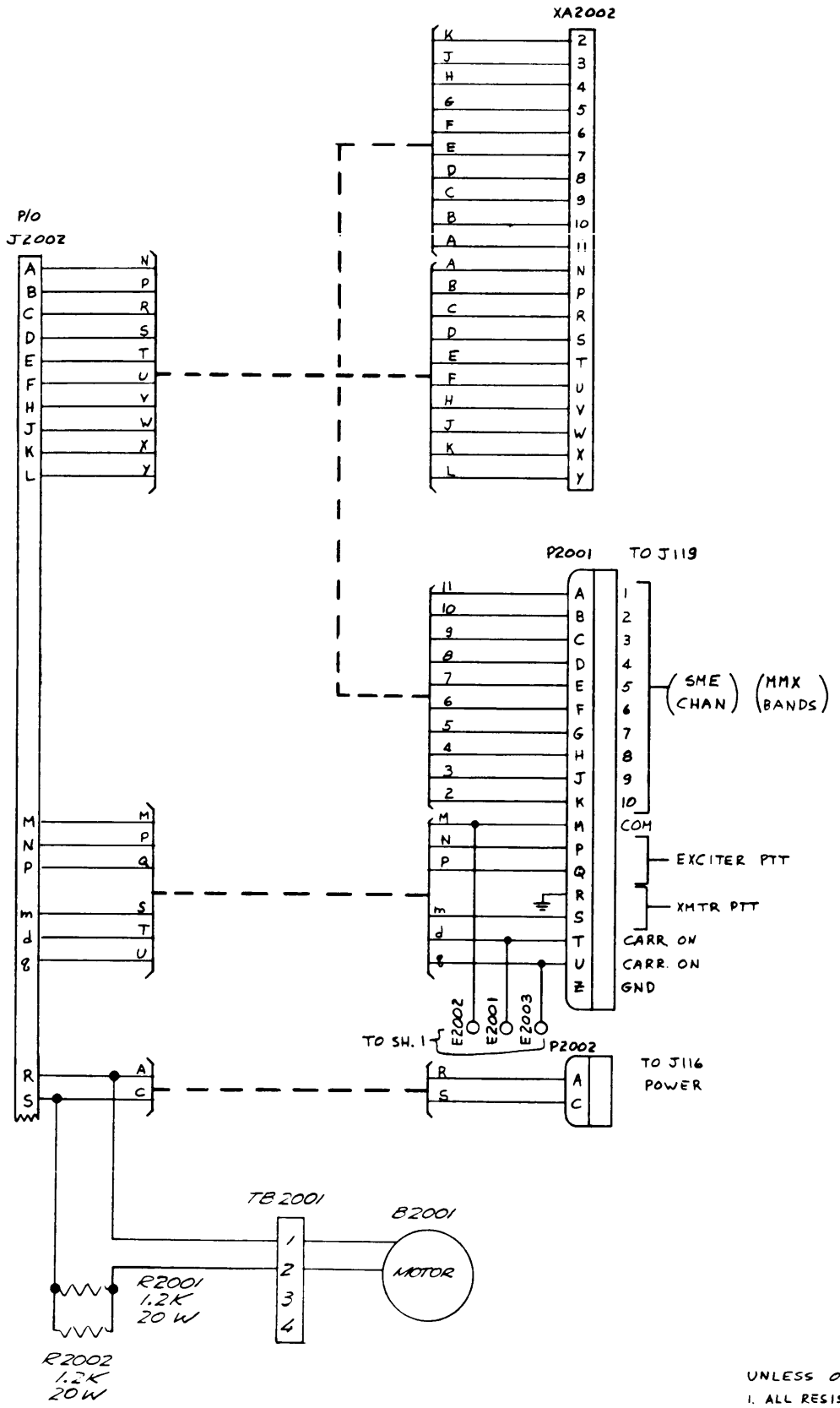
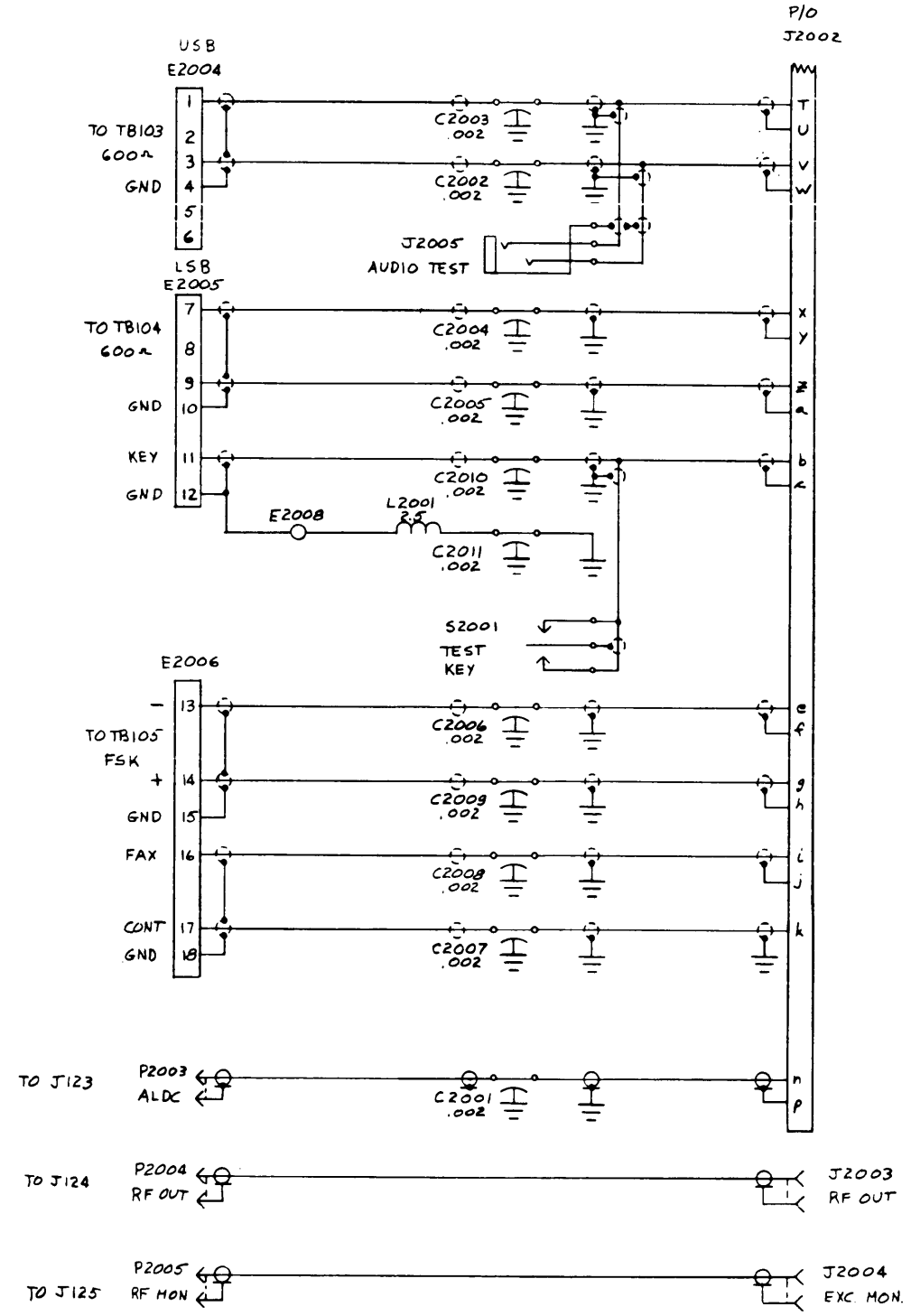


Figure 7-3. Schematic Diagram, HFLM-10K Exciter Drawer (Sheet 1 of 2)

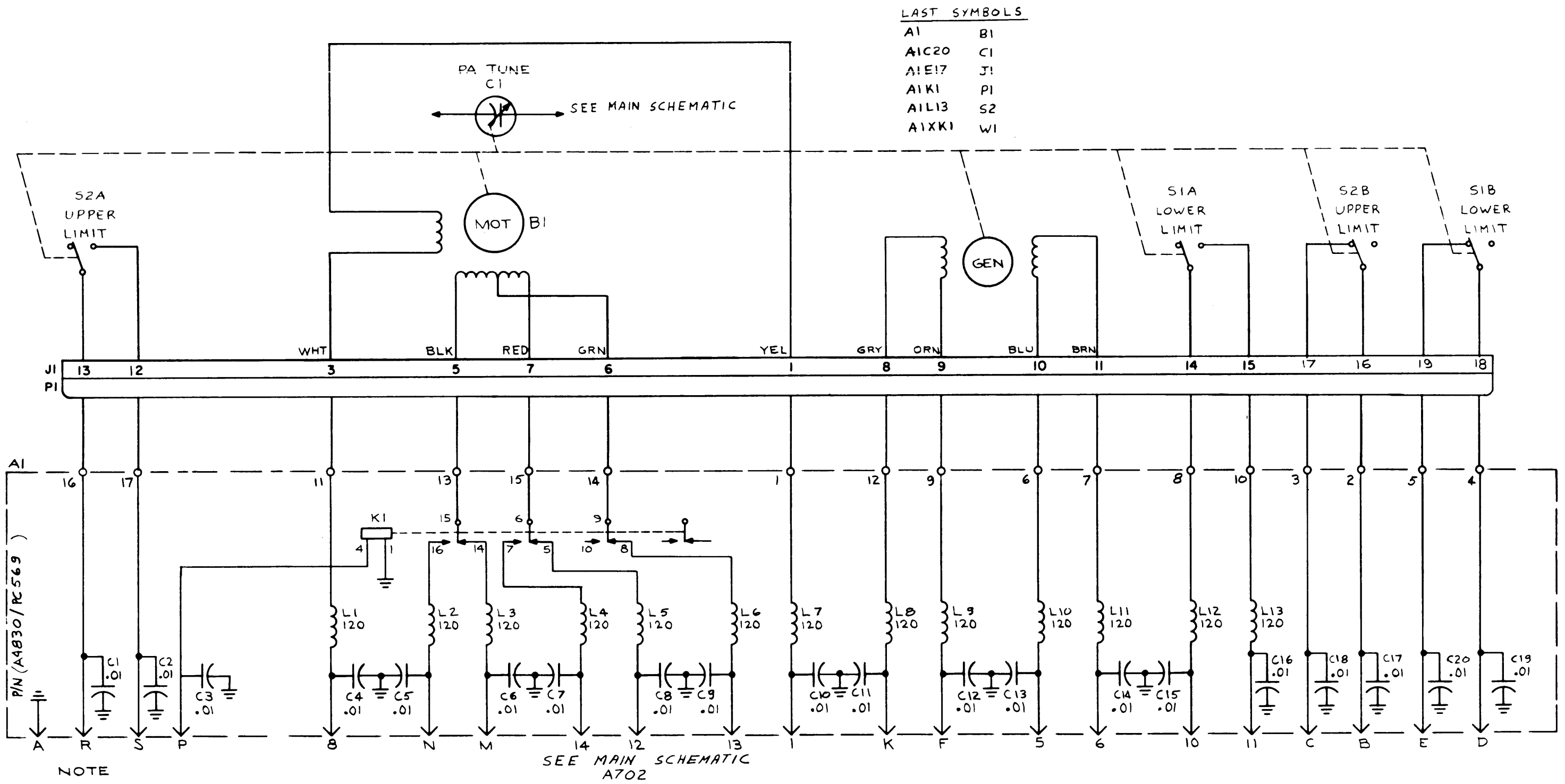




UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTANCE VALUES IN OHMS, ½W
2. ALL CAPACITANCE VALUES IN MICROFARADS.
3. ALL INDUCTANCE VALUES IN MILLIHENRIES.

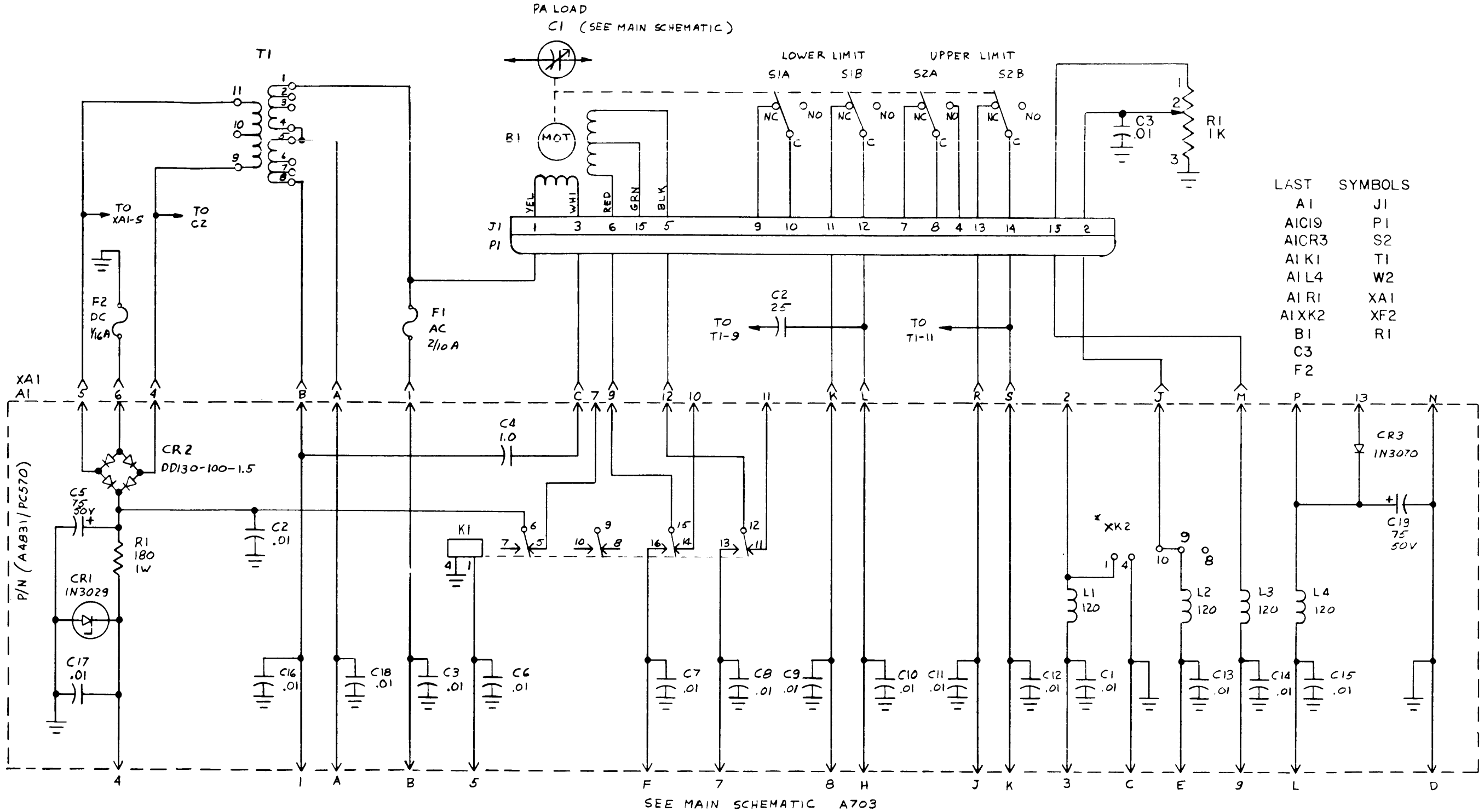
CK1775 SH. 2

Figure 7-3. Schematic Diagram, HFLM-10K Exciter Drawer (Sheet 2 of 2)



NOTE
PARTIAL REFERENCE DESIGNATIONS SHOWN, FOR COMPLETE DESIGNATION PREFIX WITH SUBASSEMBLY DESIGNATION.
ALL CAPACITORS ARE IN μF.
ALL INDUCTORS ARE IN μH.
CK1757

Figure 7-4. Schematic Diagram, HFLM-10K Tune Capacitor Assy



LAST	SYMBOLS
A1	J1
A1C19	P1
A1CR3	S2
A1K1	T1
A1L4	W2
A1R1	XA1
A1XK2	XF2
B1	R1
C3	
F2	

NOTE:

PARTIAL DESIGNATIONS ARE SHOWN. PREFIX WITH SUB-ASSEMBLY DESIGNATION.

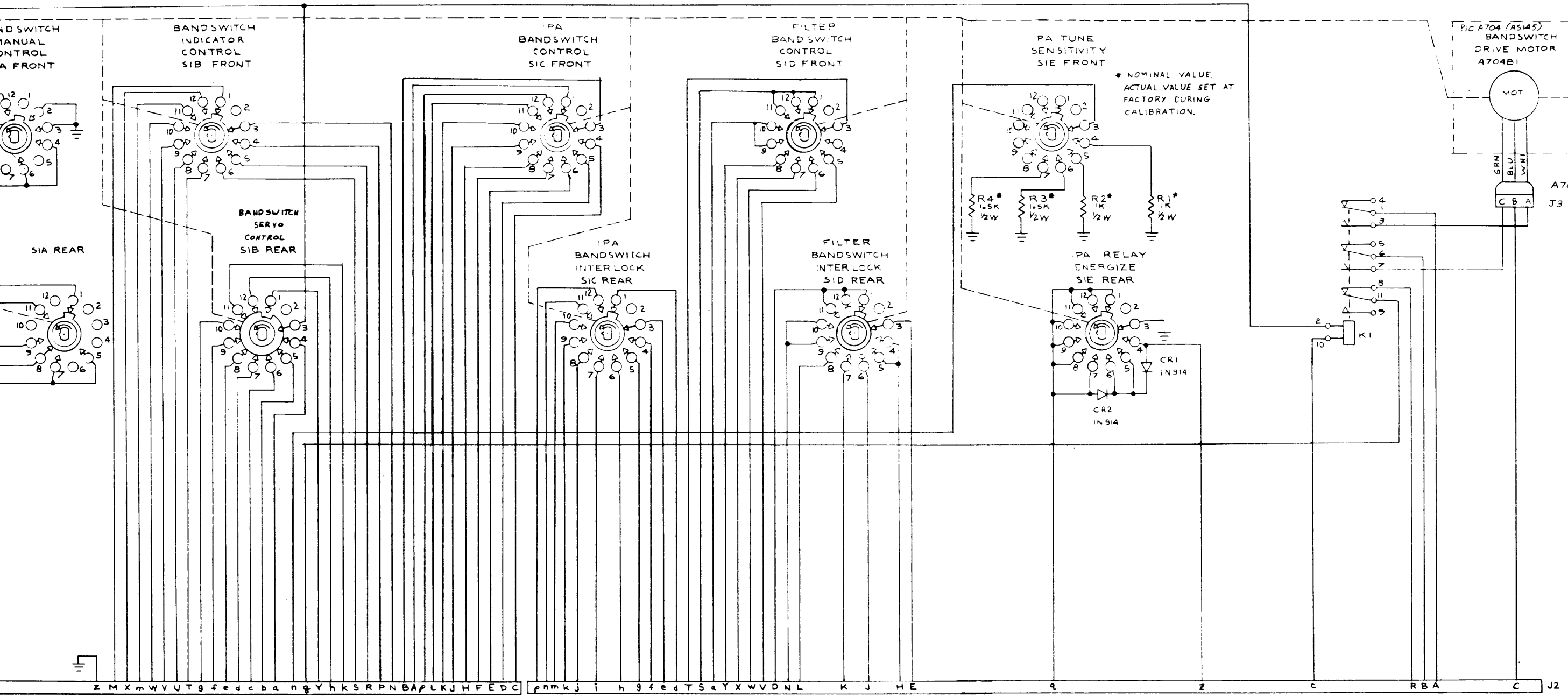
*K2 REMOVED

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, ¼ WATT.
2. ALL CAPACITOR VALUES ARE IN μfd.
3. ALL INDUCTOR VALUES ARE IN μh.

CK1778

Figure 7-5. Schematic Diagram, HFLM-10K Load Capacitor Assy



SEE MAIN SCHEMATIC

A70451	
POS	BAND-MHz
1	2 — 2.3
12	2.3 - 2.6
11	2.6 - 3
10	3 — 4
9	4 — 5
8	5 — 8
7	8 — 12
6	12 — 16
5	16 — 24
4	24 — 30

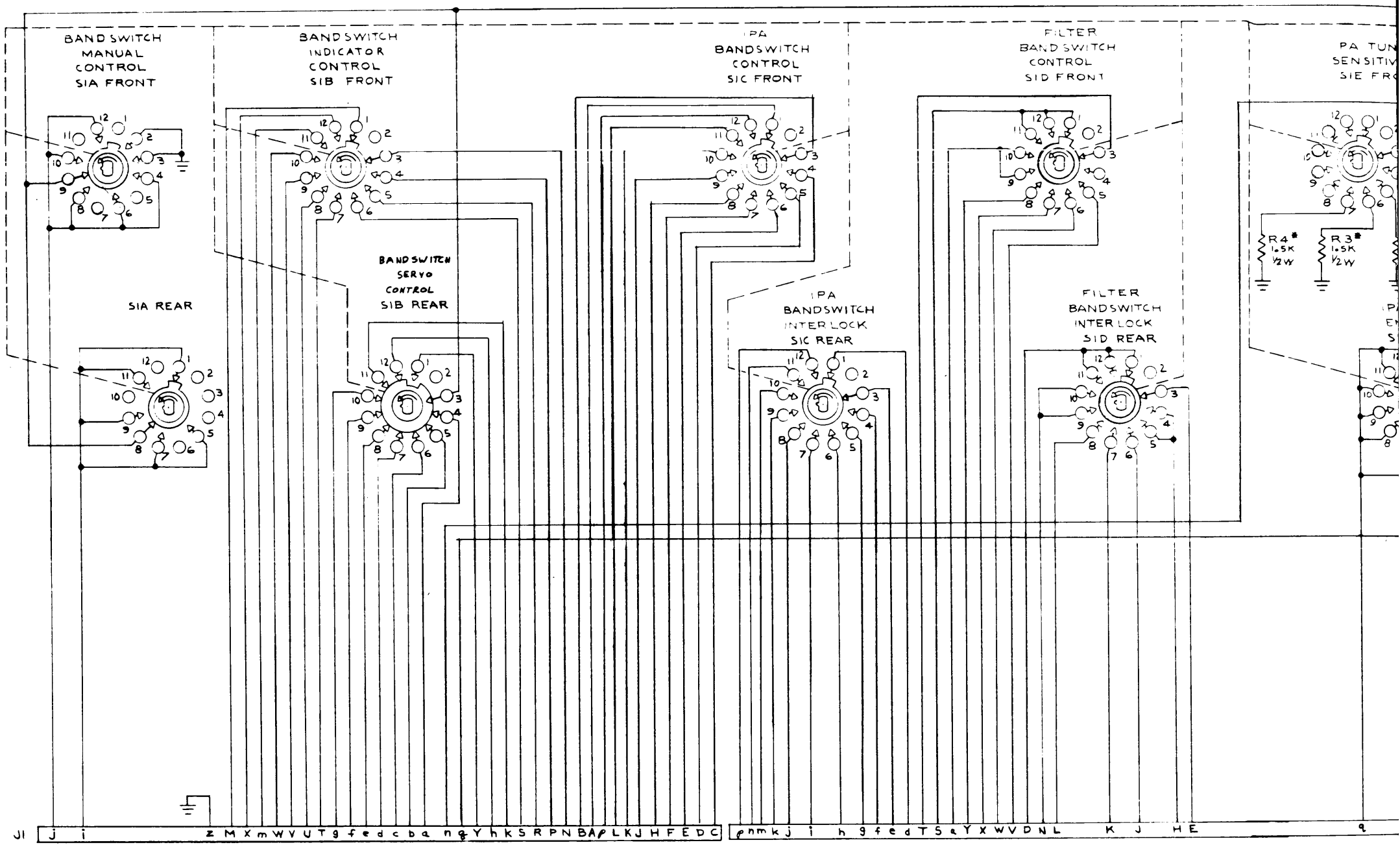
SWITCH SHOWN IN POSITION 1

PARTIAL REFERENCE DESIGNATIONS ARE SHOWN PREFIX PART DESIGNATIONS WITH SUBASSEMBLY DESIGNATION. A704A1

LAST SYMBOLS	MISSING SYMBOLS
CR2	
J3	
K1	
R4	
S1	
TB1	
W1	
XK1	

CK1646

Figure 7-6. Schematic Diagram, HFLM-10K PA Bandswitch Control



SEE MAIN SCHEMATIC

A70451	
POS	BAND- MHz
1	2 — 2.3
12	2.3 - 2.6
11	2.6 - 3
10	3 — 4
9	4 — 5
8	5 — 8
7	8 — 12
6	12 — 16
5	16 — 24
4	24 — 30

SWITCH SHOWN IN POSITION 1

PARTIAL REFERENCE DESIGNATIONS ARE SHOWN PREFIX PART DESIGNATIONS WITH SUBASSEMBLY DESIGNATION. A704A1

LAST SYMBOLS	MISSING SYMBOLS
CR2	
J3	
K1	
R4	
S1	
TB1	
W1	
XK1	

CK1646