TECHNICAL MANUAL

for

LINEAR POWER AMPLIFIER

MODEL PALA-2.5K

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

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NOTICE

THE CONTENTS AND INFORMATION CONTAINED IN THIS INSTRUCTION MANUAL IS PROPRIETARY TO THE TECHNICAL MATERIEL CORPORATION TO BE USED AS A GUIDE TO THE OPERATION AND MAINTENANCE OF THE EQUIPMENT FOR WHICH THE MANUAL IS ISSUED AND MAY NOT BE DUPLICATED EITHER IN WHOLE OR IN PART BY ANY MEANS WHATSOEVER WITHOUT THE WRITTEN CONSENT OF THE TECHNICAL MATERIEL CORPORATION.

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

FOREWORD

Model PALA-2.5K is a redesignation of our former model ATLA-2.5K

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SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION

The Linear Power Amplifier, model PALA-2.5K is a general purpose "TechniMatically" tuned 2.5 kilowatt PEP linear power amplifier system.

The system nominally provides 20 second automated tuning in the frequency range of 2-30 MHz.

Manual tuning may also be quickly performed if it should become necessary by use of a single switch.

When a suitable exciter is coupled to the PALA-2.5K, a high quality SSB transmitter system is formed.

The system capabilities are enhanced by an automated band selection when the unit is coupled to TMC Multi-Mode exciter MMX, and a programmed band selection when coupled to TMC Sideband Multi-Channel Exciter model SME.

The operating modes of the PALA-2.5K are dependent on the capabilities of the associated exciter: these modes may include ISB, SSB, AM or AME, FSK, CW, FAX Twinplex telegraphy, or multiple tone telegraphy.

Optional features of the PALA-2.5K are remote control functions, and antenna switching capabilities.

Front panel metering of all critical circuits is provided throughout the system.

The safety features include interlock switches and overload protective circuits for PA bias, plate, screen, and VSWR.

The PALA-2.5K may be used in land-based stations and ships requiring rapid tuning over many bands. The unit serves equally well in commercial or military facilities.

1-2. DESCRIPTION OF EQUIPMENT.

a. RF CONTROL INDICATOR, SWCA-3K - The SWCA is an rf control and indicating unit, used to accept and control the rf excitation input from an external exciter unit. Control circuits are incorporated to preposition associated system bandswitch controls, in the 2 to 30 megacycle (MHz) range, to the corresponding SWCA frequency band setting. A front panel dual-purpose meter, with an associated toggle switch, is used to indicate both forward and reflected power output level readings. The transmission line SWR is continuously monitored by a sensitive dc relay that will deenergize the system should the SWR exceed the preset levels.

b. LINEAR AMPLIFIER, TLAA-2.5K - The TLAA serves as a 2500 watt power amplifier between the exciter and the antenna, containing the loading, tuning, and bandswitching circuits. These circuits are motor-controlled, capable of being automatically tuned by means of an associated servo amplifier assembly (TCSA) in conjunction with associated level control circuits (SWCA).

c. TUNING CONTROL SYSTEM, TCSA - The TCSA is a servo amplifier control assembly, housing three servo amplifier units AZ110, AZ111, and AZ112. The units, when controlled by the sense circuits of an associated linear amplifier unit (TLAA), automatically tune and load the second amplifier and PA portions of the linear amplifier system.

d. TRANSMITTER CONTROL PANEL, TCP-( ) - The TCP is a local control panel providing application control of main power and high voltage to the linear amplifier system. A selector switch control, with an associated indicator lamp, is provided to monitor all system interlock switch conditions. Other controls enable servo activation, manual or auto tuning and an associated tune pushbutton. An overload reset pushbutton, associated with the plate and screen relays in the TCP, and the SWR relay in the SWCA is also provided.

e. POWER SUPPLY, L.V., AP-128 - The AP-128 is a low voltage power supply, providing operating voltages to the linear amplifier system. These voltages include bias, screen, and filament voltages, plus control circuit and system interlock voltages. Front panel indicators include filament and plate time meters, and overload indicator lamps. Overload and bias adjust controls are front panel mounted.

f. ALARM PANEL, AX633 - The AX633 is an alarm and monitor unit, providing connector receptacles for monitoring the PA output and associated exciter rf output. An audio input jack, front panel mounted, provides for insertion of a two-tone test signal. An audio alarm device, with an associated on/off toggle switch, provides an audible alarm when the system high voltage fails.

g. POWER SUPPLY, H.V., AP-129 - The AP-129 is a 5 kv high voltage power supply, mounted at the bottom of the equipment cabinet, containing the high voltage solid-state rectifier stacks, filtering network, and the main power transformer.

The unit generates 5000 volts dc for the plate of the 2.5 kw power amplifier tube. An automatic 60-second time delay circuit is integrated with the unit to delay the application of screen voltages for protection of final PA tube.

h. CABINET, ELECTRICAL EQUIPMENT, RAK-111-2 - The RAK houses all the components comprising the linear amplifier system, measuring 51-inches high by 25-1/4-inches wide by 30-inches deep.

Rear and side access doors permit ease in maintenance and accessibility to hard-to-reach components. The rf output is fed to the directional coupler mounted on the upper rear right-hand side of the cabinet. Heavy power supply components are bolted at the bottom, where primary power input connections are also made.

1-3. TECHNICAL CHARACTERISTICS

FREQUENCY RANGE:	2 to 30 megacycles (MHz), bandswitched.
OUTPUT POWER:	2500 watts PEP
TUNING:	All tuning, loading and bandswitching controls on front panel.
RELATIVE HUMIDITY:	Up to 90%
AMBIENT TEMPERATURE RANGE:	0° to 50°C
METERING:	Front panel meters monitor operation of all critical circuits.
ALDC:	ALDC (automatic load and drive control) circuit provided to improve linearity, limit distortion, and deliver a relatively constant output during high modulation peaks or load changes. Front panel control allows adjustment of ALDC attack point or circuit disabling.
OUTPUT IMPEDANCE:	50 ohms, unbalanced
HARMONIC SUPPRESSION:	Second harmonics at least 50 db below full PEP when measured with standard two-tone test; all other harmonics down at least 55 db.
SIGNAL/DISTORTION RATIO:	Distortion products are at least 35 db below either tone of a standard two-tone test at full PEP output.
HUM AND NOISE LEVEL:	Hum at least 50 db below full PEP; all other noise down at least 70 db.
COOLING:	Forced air
OPERATING TEMPERATURE:	Designed to operate in a 0° to 50°C ambient with relative humidity of up to 90%.
POWER INPUT:	195/208/220/230/380/440 volts ac, 50/60 cps, 3-phase.
HEAT DISSIPATION:	5000 watts
AIR INTAKE:	500 CFM
WEIGHT:	1000 lbs (approx)

TABLE 1-1. MAJOR COMPONENTS

TMC DESIGNATION
RF CONTROL INDICATOR, MODEL SWCA-3K
LINEAR AMPLIFIER, MODEL TLAA-2.5K
TUNING CONTROL SYSTEM, MODEL TSCA
TRANSMITTER CONTROL PANEL, MODEL TCP
POWER SUPPLY, L.V. AP-128
ALARM PANEL, AX633
POWER SUPPLY, H.V., AP-129
CABINET, ELECTRICAL EQUIPMENT, RAK-111-2

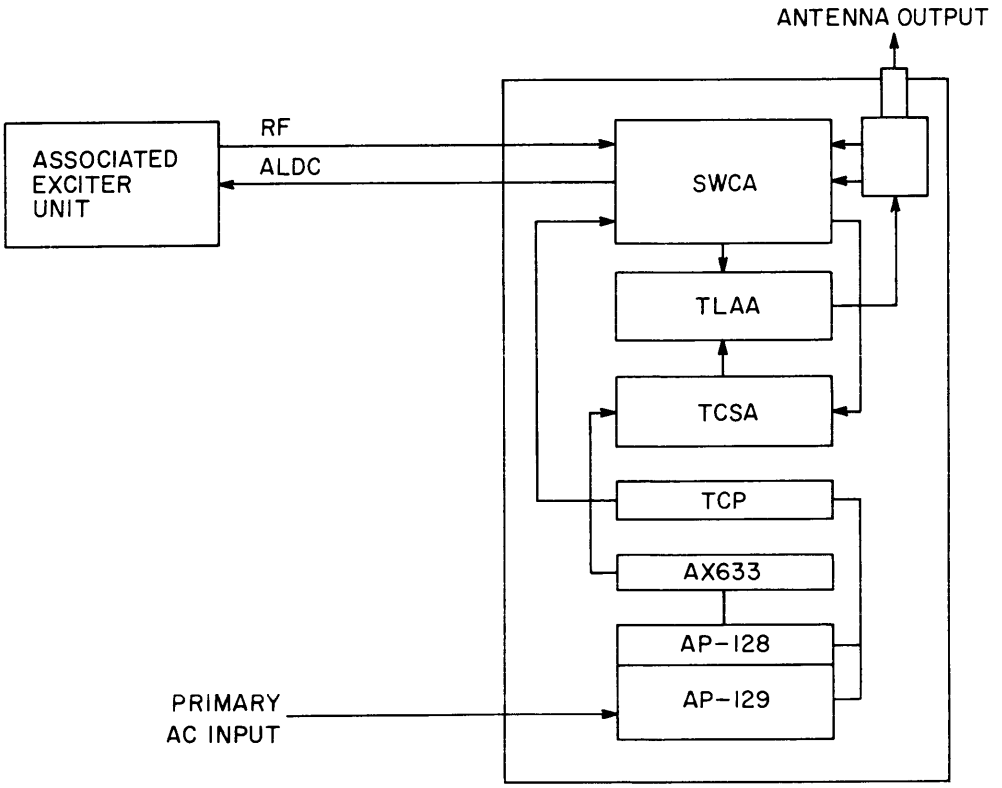


Figure 1-2. Typical System Configuration

SECTION 2

INSTALLATION

2-1. INITIAL INSPECTION

Inspect the equipment packing cases for possible damage when they arrive at the operating site. With respect to equipment damage for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts. Inspect the packing material for parts that may have been shipped as loose items.

2-2. ASSEMBLY

Install the modular unit components into the rack as shown in figure 2-1. Intracomponent cabling is shipped pre-installed in the rack in the form of cable harnesses attached to the rack structure. Connect each free plug-end of the harness to its mating receptacle on the component by matching the "J" number (marked on the cable adjacent to the plug) with the "J" number appearing on the component adjacent to the receptacle. In the same way, connect each free end containing a fanning strip to its mating terminal block by matching "E" numbers. Refer to paragraph 2-4 for installation instructions.

2-3. POWER REQUIREMENTS

The input power transformer provides means of accepting various 3-phase voltage inputs: 195/205/225/380/410/450 vac, 50/60 cps delta or wye source line. Referring to figure 2-10, make appropriate connections at taps of transformer T8000 at the bottom of the rack for the particular power source available.

It is recommended that an external 3-phase circuit breaker interface the transmitter with the main 3-phase supply voltage. The external circuit breaker will allow complete isolation of the transmitter voltage input and therefore provide for safe maintenance and servicing.

The external circuit breaker should be independent from other equipment.

2-4. INSTALLATION PROCEDURES

A minimum number of assemblies, subassemblies, components and hardware have been disassembled from the equipment and separately packaged, thus reducing the possibility of equipment damage in transit. The method of disassembly and separate packaging also permits realistic equipment handling.

Carefully read the instructions for each step. After reading, consider the complexity involved in performing the step; it may be advisable to simulate a complex step before actually doing it. Make sure each step has been completed before proceeding to the next.

Cables, wires, and other miscellaneous items that are disconnected during equipment disassembly are tagged and taped to the equipment. The information on a given tag indicates the designated terminal on a component to which the tagged item must be connected. Make sure all cables and wires have been connected as designated on tags and that all packing material, tags and tape have been removed before sealing-up the frame or section of the frame with a front panel drawer, or piece of exterior trim. If any confusion arises regarding cable or wire connections that must be made, refer to the applicable interconnect wiring diagrams in section 2 of this manual.

Temporary removal and replacement of panels, and component mounting assemblies are specifically called out in the procedure in order to install various items. Do not anticipate instructions; to insure correct installation, perform each step exactly as it is written.

Non-specialized tools are not supplied with the equipment since these items should be contained in an equipped maintenance shop.

NOTE

Refer to the supplied equipment packing list to locate the appropriate crates containing the components, hardware, and units outlined in the following steps.

STEP 1

a. Unpack assorted loose items from crate.

b. Check each item contained against equipment supplied list.

STEP 2

a. Unpack rack from crate.

b. Position rack upright, remove side and rear panels; this can be accomplished by turning the screw-type fastener located at the top-center of each panel. (See figure 2-1.)

c. Remove all packing material from rack and position rack in accordance with pre-installation planning. (See figures 2-1 and 2-2.)

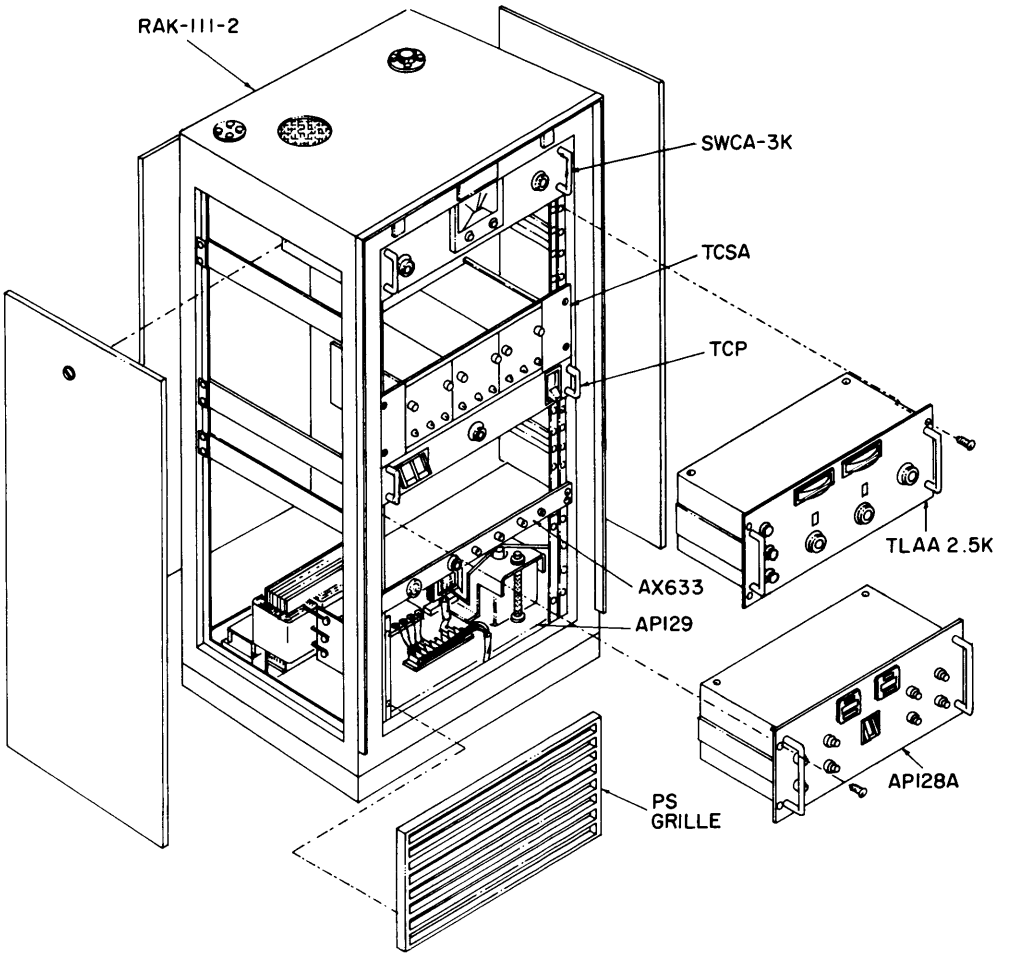


Figure 2-1. Installation Drawing

STEP 3

To secure rack in its permanent position proceed as follows:

a. To gain access to the front-bottom mounting holes, loosen mounting hardware that fastens the high voltage power supply assembly to the rack frame. (See figure 2-3.)

CAUTION

To eliminate any possible damage, remove high voltage lead (1) from C6000 on power supply assembly (2).

b. Slide power supply assembly (2) toward rear of rack.

c. Secure rack (3) in position with four mounting bolts.

d. Replace high voltage power supply assembly (2) and fasten in place. Be sure to replace the high voltage lead (1) to terminal of C6000.

STEP 4

a. Unpack transformer T8000 (4) from crate.

b. Position transformer T8000 (4) on base assembly. (Place transformer with 220 vac taps facing inward.) (See figure 2-4.)

c. Tightly bolt transformer (4) to base assembly.

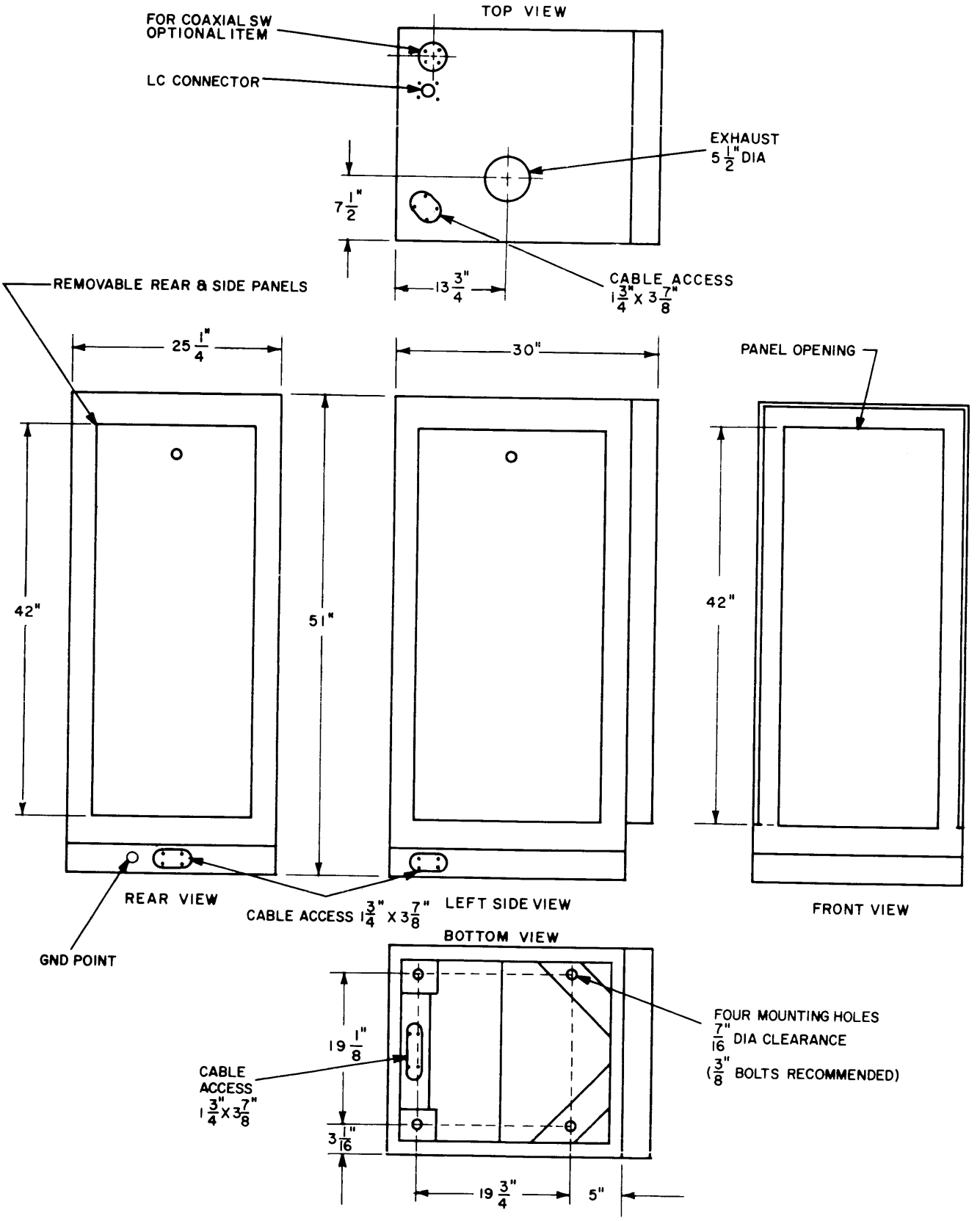


Figure 2-2. Outline Dimensional Diagram

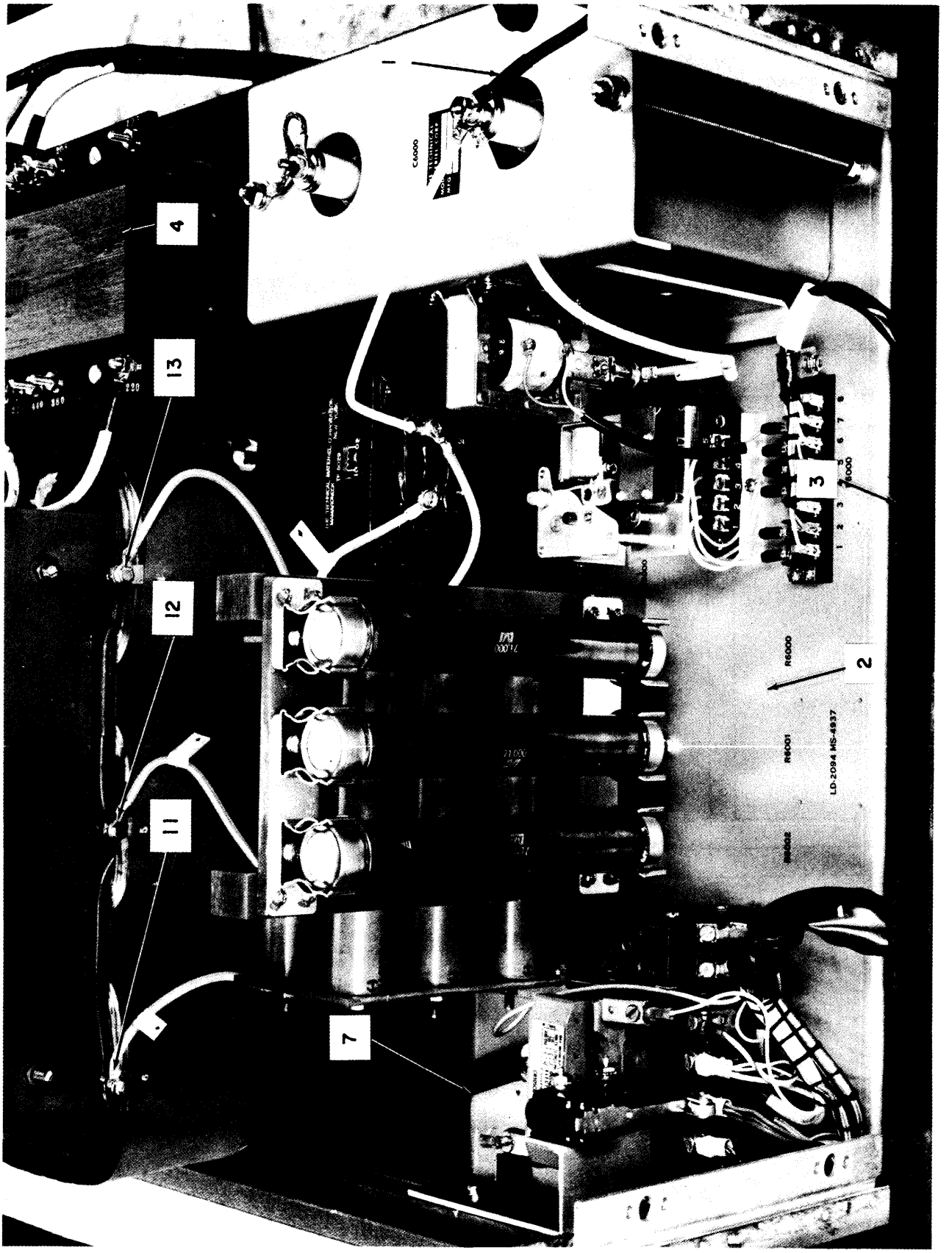


Figure 2-3. Front View of High Voltage Power Supply

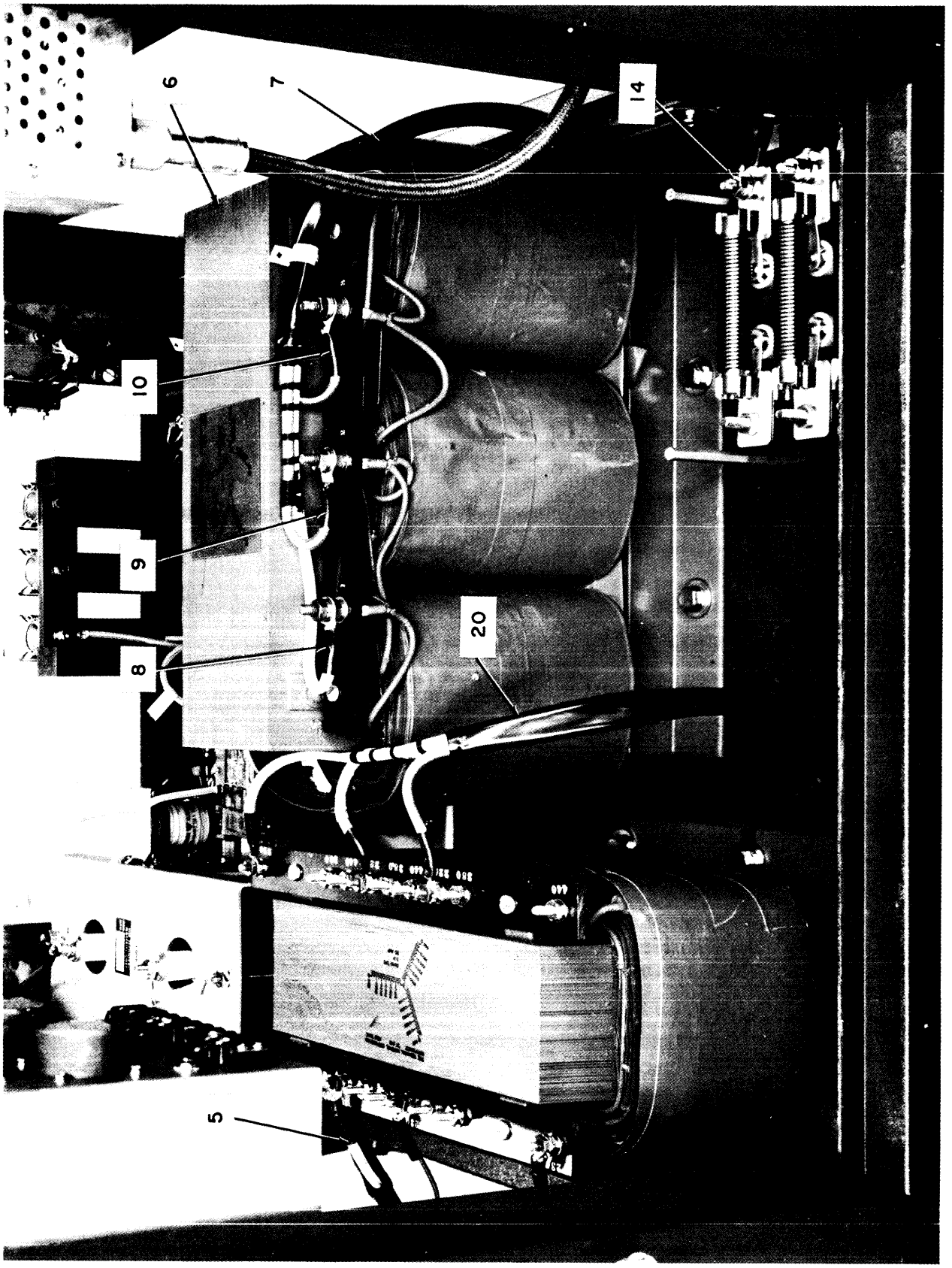


Figure 2-4. Rear View of High Voltage Power Supply

d. Remove filter-out cable, CA1244 (5) from crate and fasten 3-phase input leads to taps corresponding to input line voltage (see figures 2-9 and 2-10).

e. Using cover and hardware, place transformer (4) cover on the ceramic standoffs and secure.

STEP 5

a. Unpack transformer T6000 (6) from crate. (See figure 2-4.)

b. Position transformer T6000 (6) on base assembly (with taps 1, 2 and 3 facing to the rear).

c. Tightly bolt transformer (6) to base assembly. (See figure 2-9.)

d. Connect high voltage transformer cable CA1245 (7), which is attached to relay K6000 on power supply, to transformer as follows: white lead phase 1 terminal 1 (8); grey lead phase 2 terminal 2 (9); violet lead phase 3 terminal 3 (10). (See figure 2-4.)

e. Connect jumper leads between rectifier and transformer as follows (see figure 2-3):

RECTIFIER	TRANSFORMER
From CR6000, 1 (11)	To T6000 terminal 6
From CR6002, 3 (12)	To T6000 terminal 5
From CR6004, 5 (13)	To T6000 terminal 4

STEP 6

a. Remove line filterboard A5586 (14) from crate and remove line filterboard cover.

b. Tightly bolt line filterboard (14) to the base inside the bottom right-rear of the rack. (See figure 2-5.)

c. Using loose end of CA1244 from T8000, connect (15), phase 1 to L8000 (16), phase 2 to L8001 (17), phase 3 to L8002 (17).

d. Connect item 20 to 220 vac taps on transformer T8000 (4). (See figure 2-4.)

e. Route ac input cable into base assembly through access hole (19) and secure to appropriate terminals on line filterboard (14).

f. Position and secure filterboard cover to filterboard (14).

STEP 7

a. Remove relays, tubes, and other plug-in components from loose items crate.

b. Install relays, tubes, and other plug-in components in their respective units; tighten relay and tube clamps where necessary.

STEP 8

Now that each drawer assembly is unpacked, install it in its designated position (see figure 2-1) in the rack. To install any drawer assembly, proceed as follows (see figures 2-6 and 2-8):

NOTE

To insure greater rack stability, start with bottom units first and work up.

a. Untape or unstrap cable assemblies, cable retractors, and all other components secured to the inside of frame for shipment (see figure 2-7).

b. Pull out center section of drawer tracks until they lock in an extended position.

c. Position slide mechanisms in tracks and ease modular unit into track until lock buttons engage holes in tracks.

d. Where applicable, pull tilt handles on sides of drawer vertically.

NOTE

When making cable or wire connections to drawer, secure cables or wires with cable clamps, where applicable.

e. Make necessary cable and electrical connections as indicated by interconnect wiring diagrams in section 2.

f. Pull tilt handles on sides of drawer and reposition drawer horizontally.

g. Press lock buttons on tracks; slide drawer completely into compartment.

h. Secure front panels of drawers to rack frame.

STEP 9

a. Using grounding hardware supplied, secure grounding strap to rear of unit in the threaded hole in rear center of base.

b. Make all necessary connections to transmitter junction box (see figure 2-11).

c. Affix rear and right panels to transmitter and secure in place.

d. Connect 50 ohm antenna, or dummy load to transmitter antenna connector.

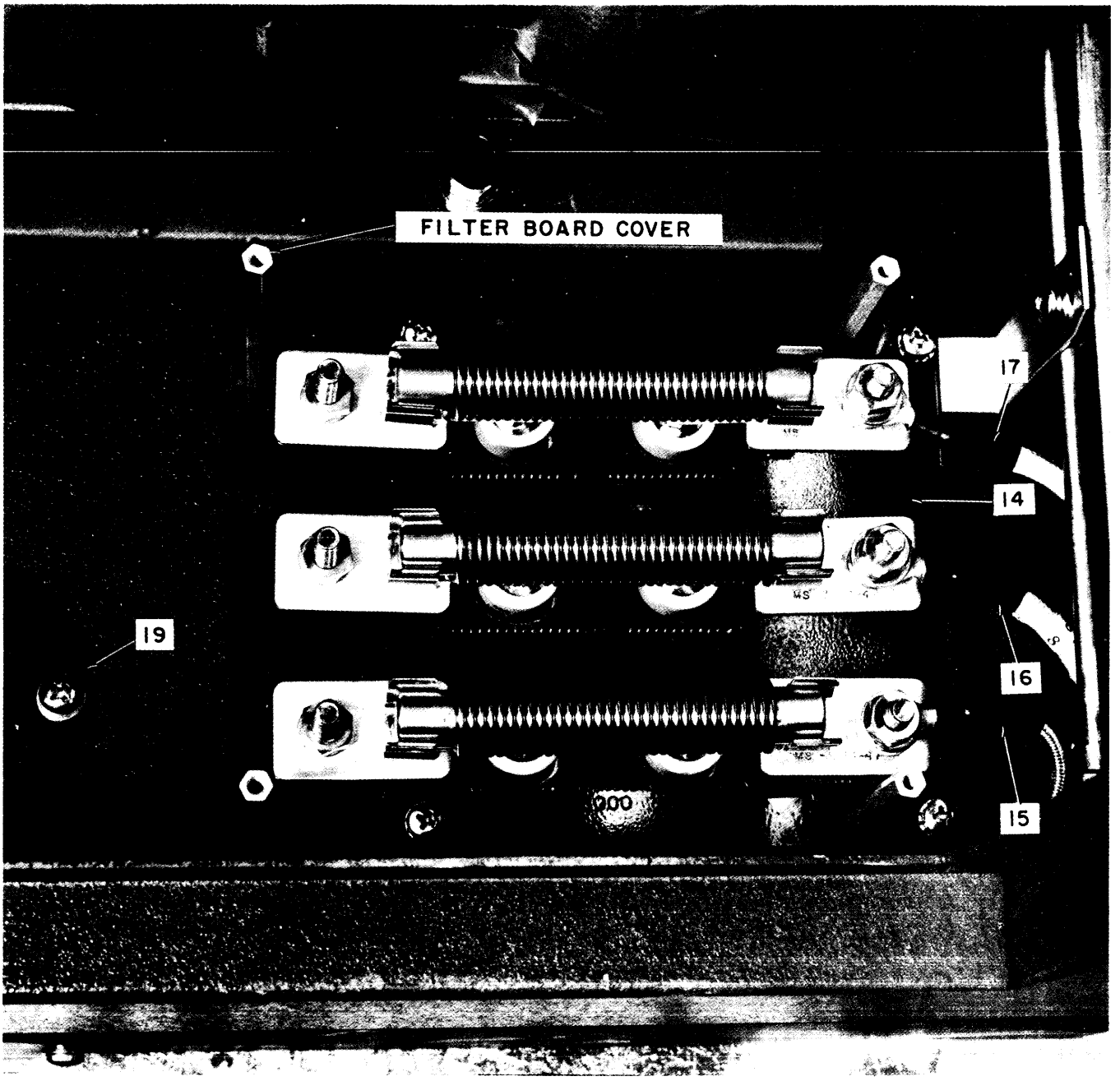


Figure 2-5. Top View of Filter Board A5586

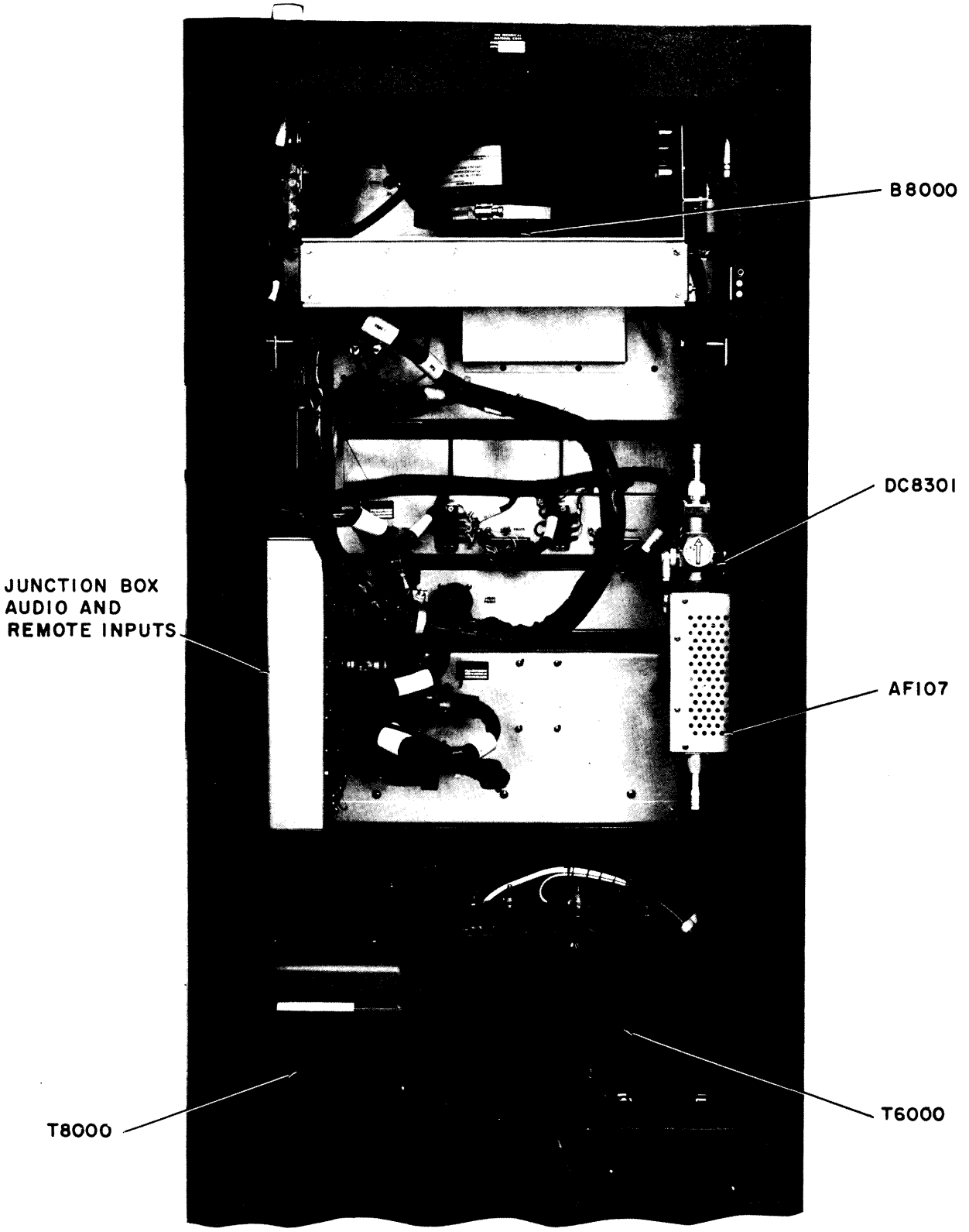


Figure 2-6. Rear View of PALA-2.5K

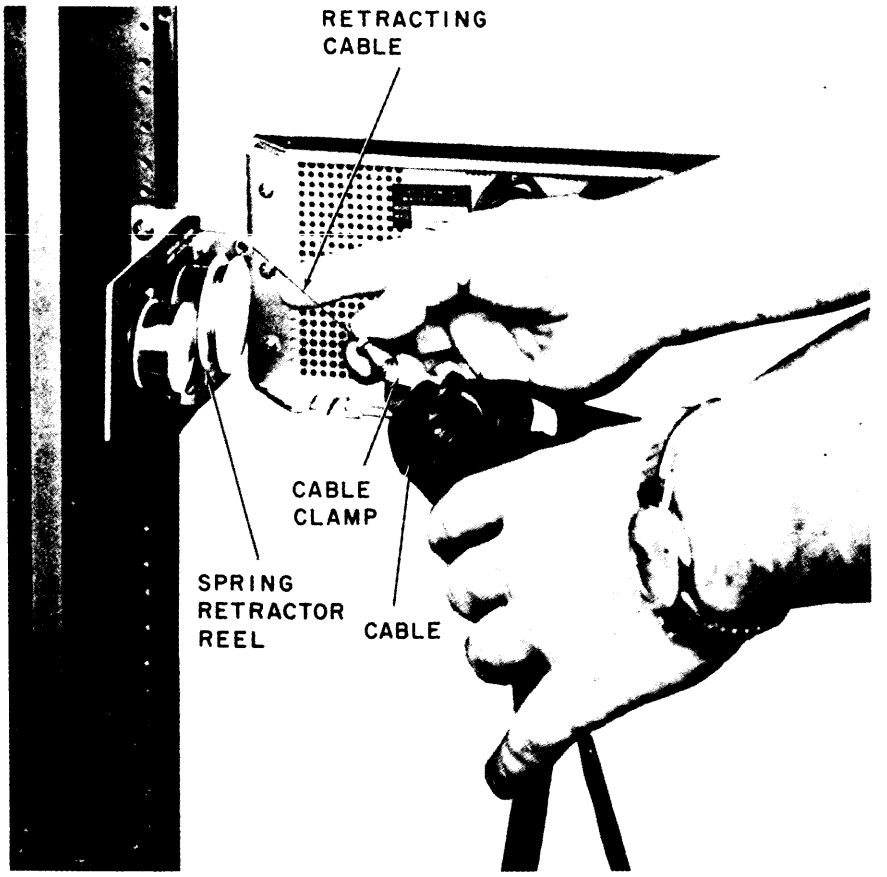
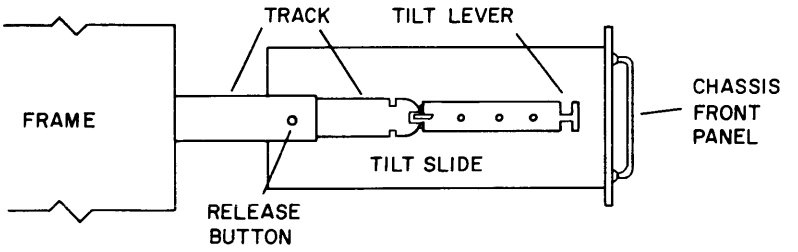


Figure 2-7. Cable Retractor Connection



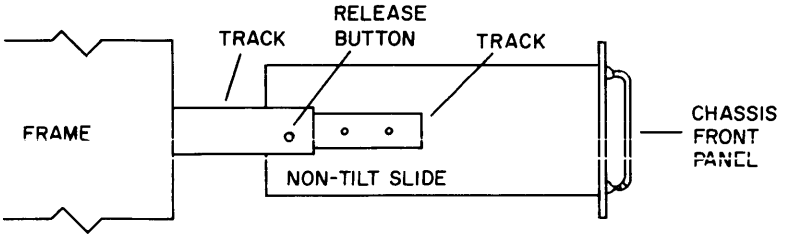


Figure 2-8. Slide Mounting Details

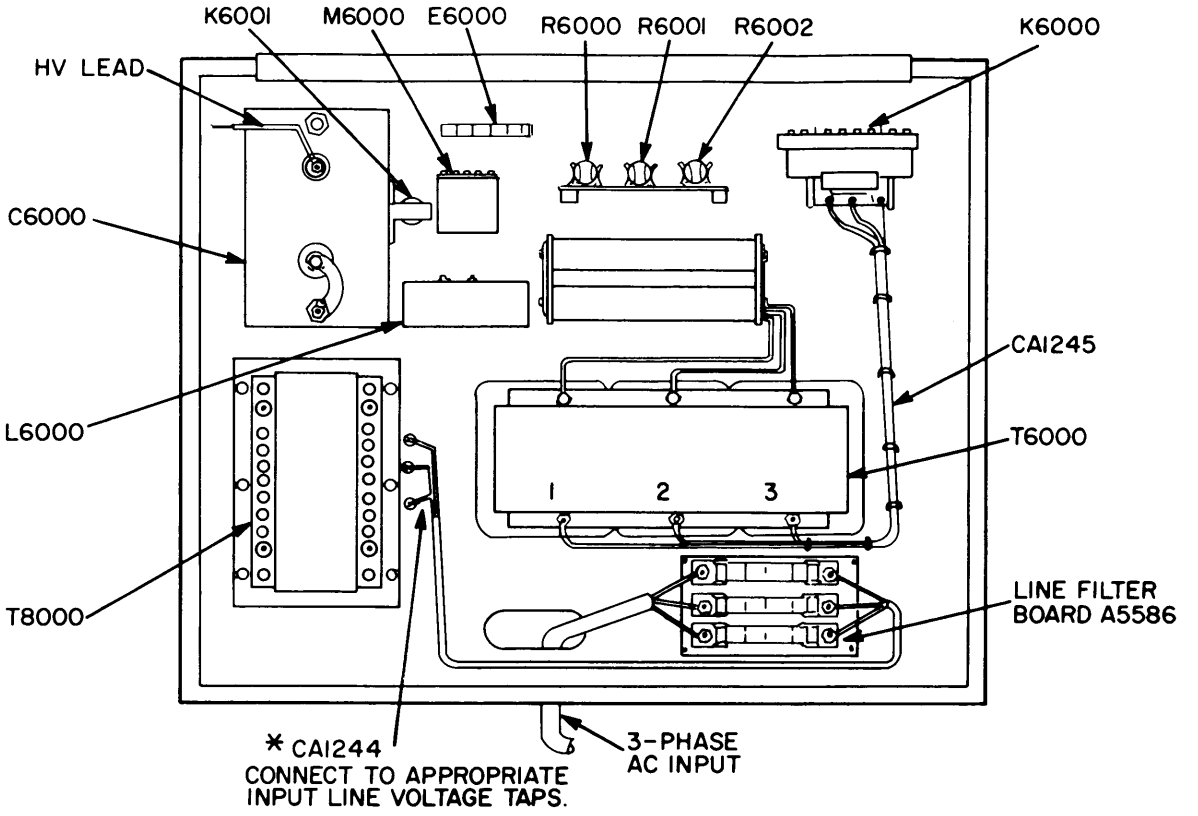


Figure 2-9. Input Component Locations

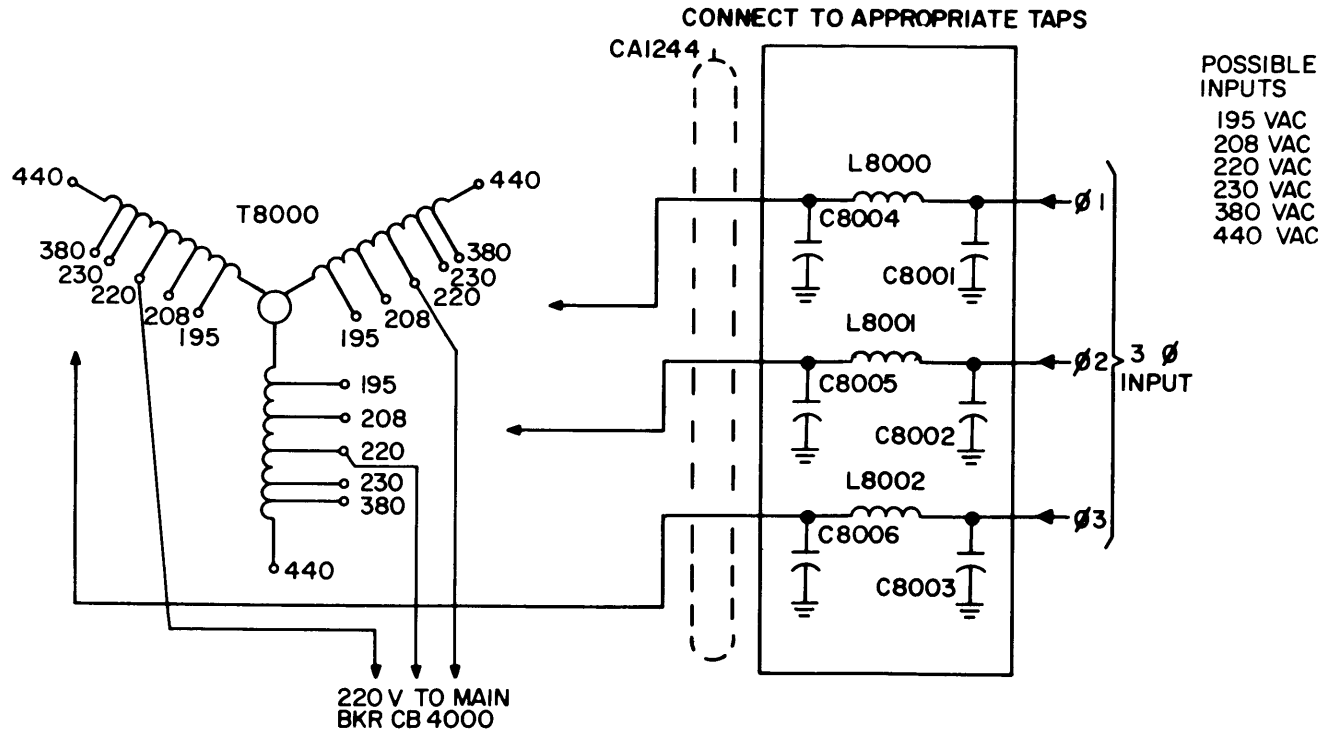
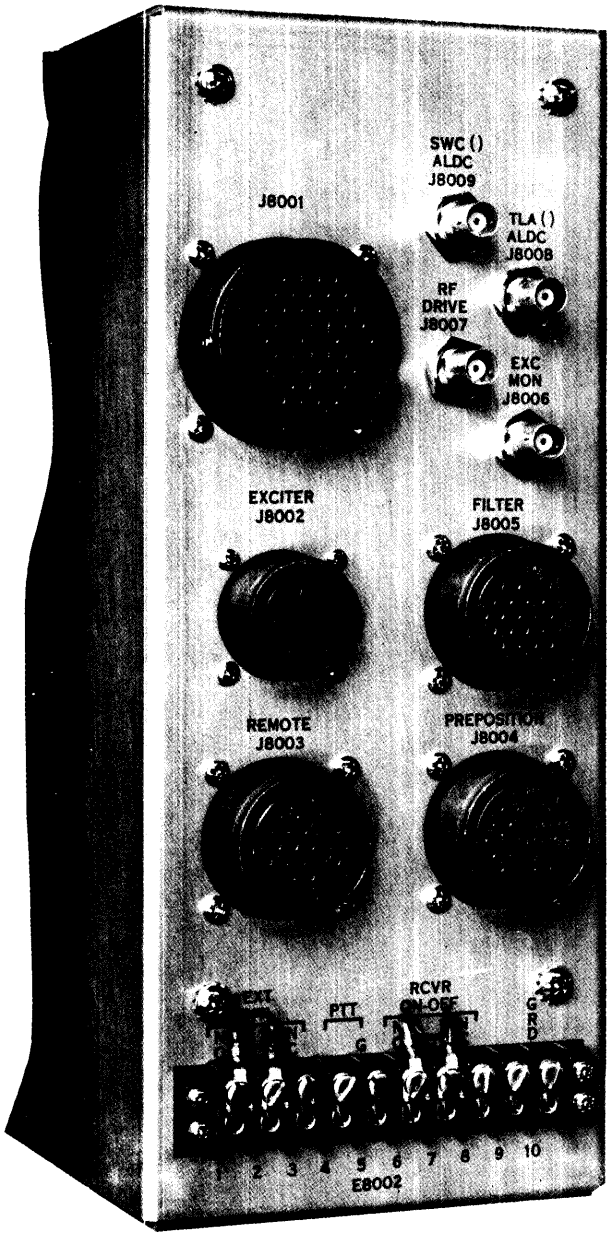


Figure 2-10. Input Power Connections



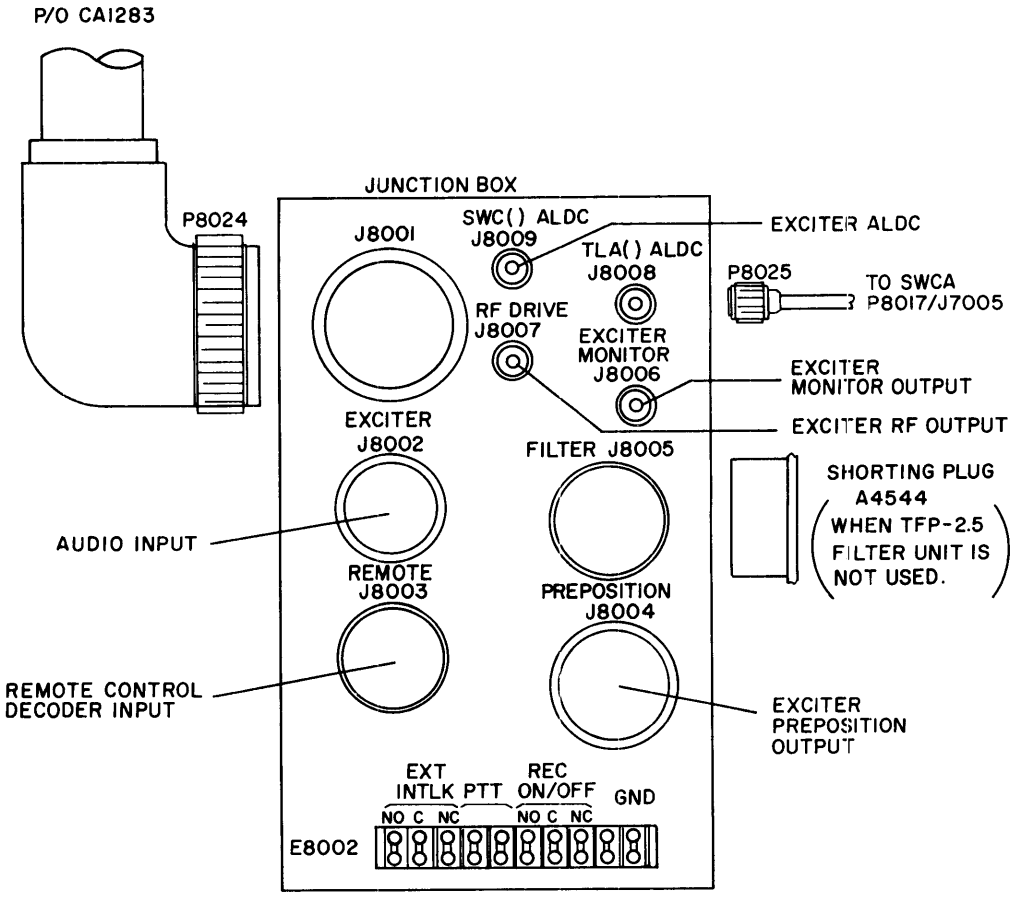


Figure 2-11. View of Junction Box Connectors

2-5. PRE-OPERATIONAL CHECK

After the PALA-2.5K has been installed, a pre-operational check should be performed by a qualified electronics technician.

Before any power is applied to the unit, an electrical check should be made according to the instructions in paragraph 2-6 below. It also should be noted whether an antenna or dummy load is connected to the output of the unit and the grounding connection is properly made.

The bias, tuning, loading, and overload adjustments should be performed when the PALA-2.5K is connected to an exciter with ALDC provisions. Refer to section 5, paragraph 5-11 for ALDC adjustment procedure.

2-6. ELECTRICAL INSPECTION

a. With main power switch set at OFF, check for short circuits to ground.

b. The 3 power input phases should measure not less than 1-megohm.

c. The positive side of the high voltage circuit should measure not less than 100K ohms with the shorting relay contacts open. With the shorting relay contacts closed, this reading should measure zero.

d. Check all system modular units for proper cable terminations.

e. Set main power switches at ON and observe for the following:

(1) TechniMatic indicator should light.

2-7. PRE-OPERATIONAL TUNE-UP CHECK

When all the pre-operational checks have been performed, tune up the PALA-2.5K in a step-by-step procedure, referring to section 3, paragraph 3-2, and check for normal indications as described in paragraph 3-2.

2-8. SENSE JACK READINGS (Refer to figure 3-1)

To check the readings at sense jack (59), tune the PALA-2.5K to a 1 kw level. Connect a zero centered VTVM on the +1 volt scale, and rotate sense switch (58) through each of the six positions:

The reading should be as follows:

100 MW	+0.5
IPA TUNE	0
IPA PLATE	greater than 0.5 off center scale
PA TUNE	0
PA PLATE	-0.5
PA LOAD	0

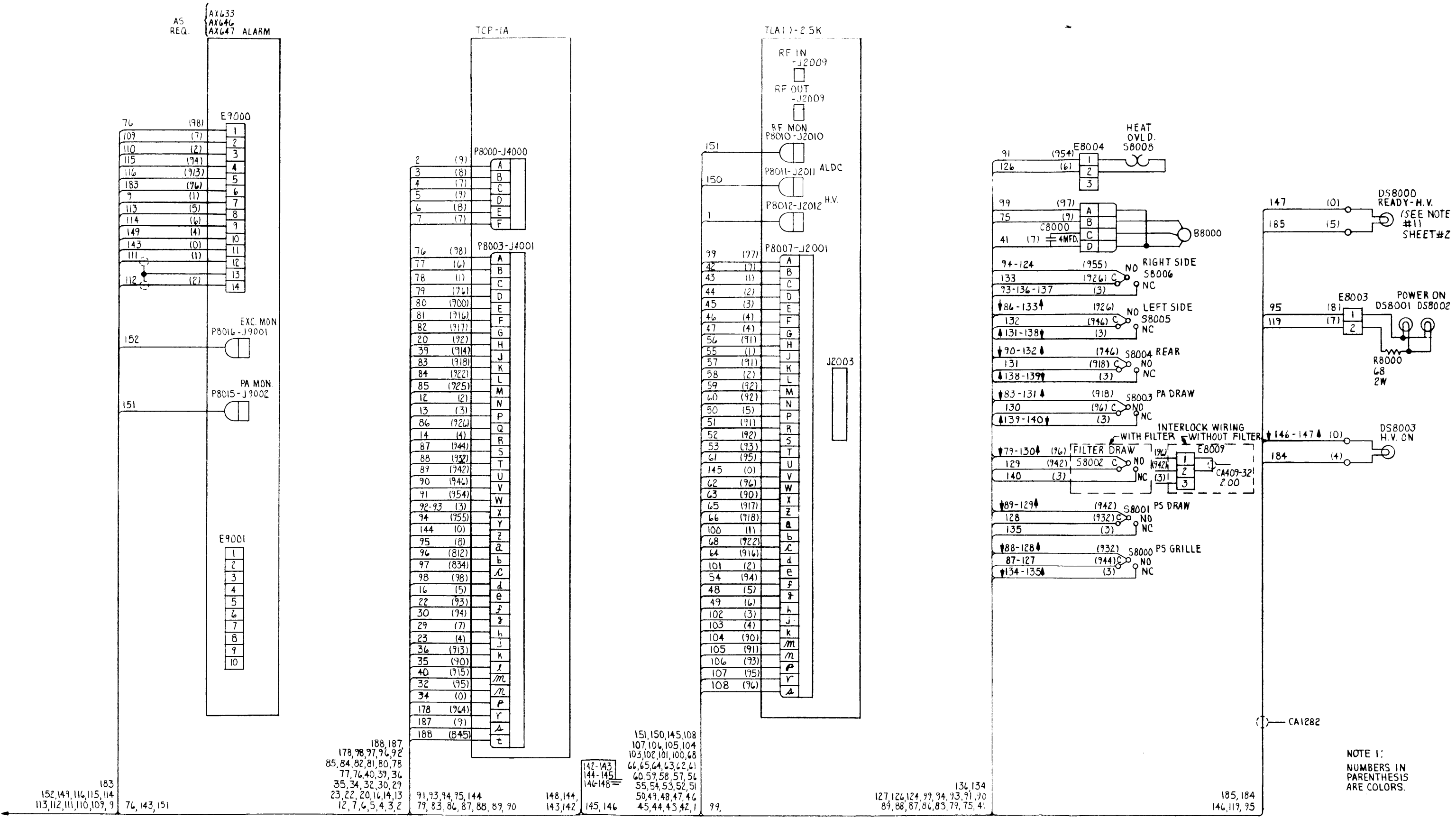


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Figure 2-12. Interconnect Wiring Diagram (Sheet 1 of 3)

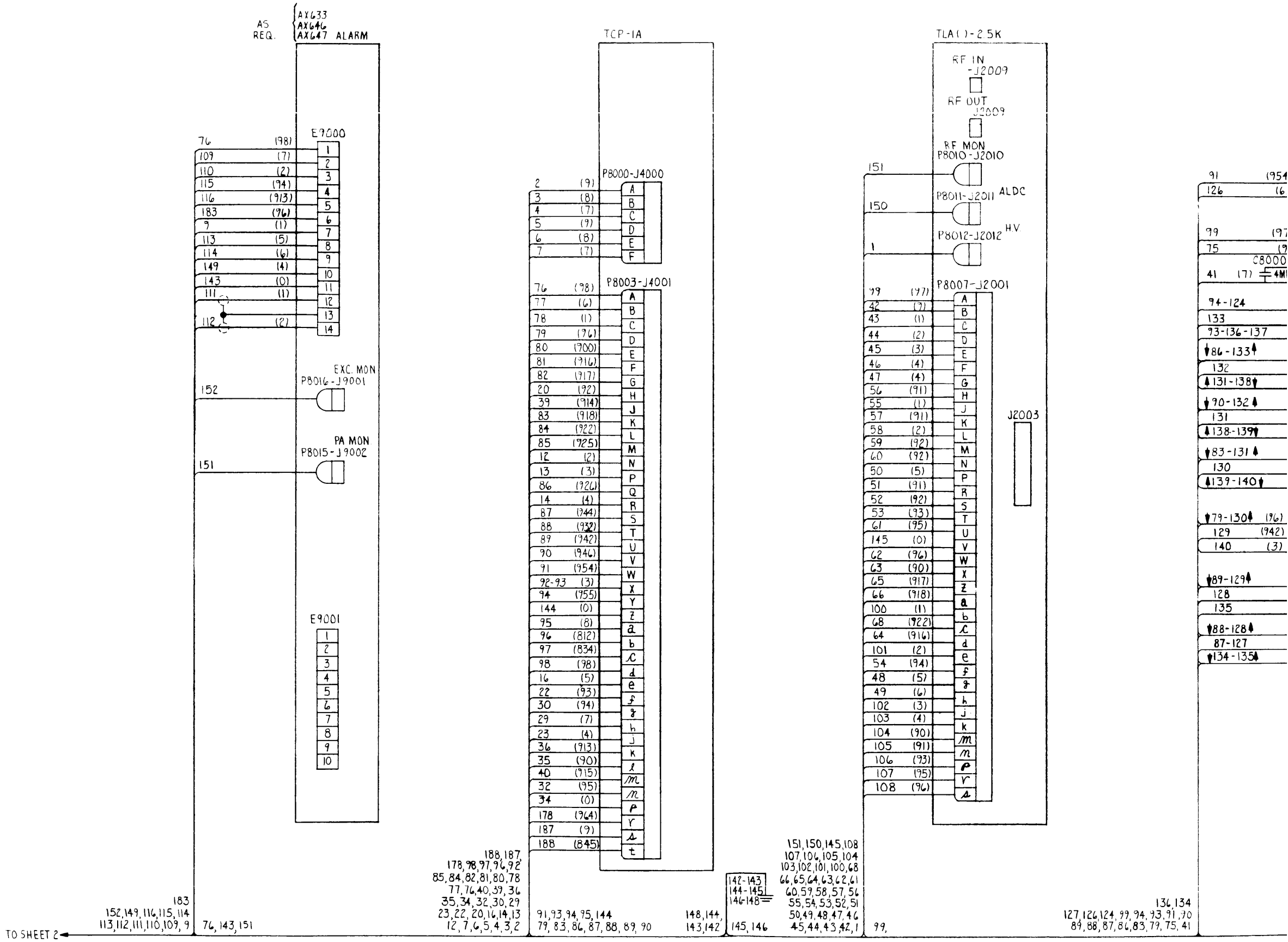

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Figure 2-12. Int

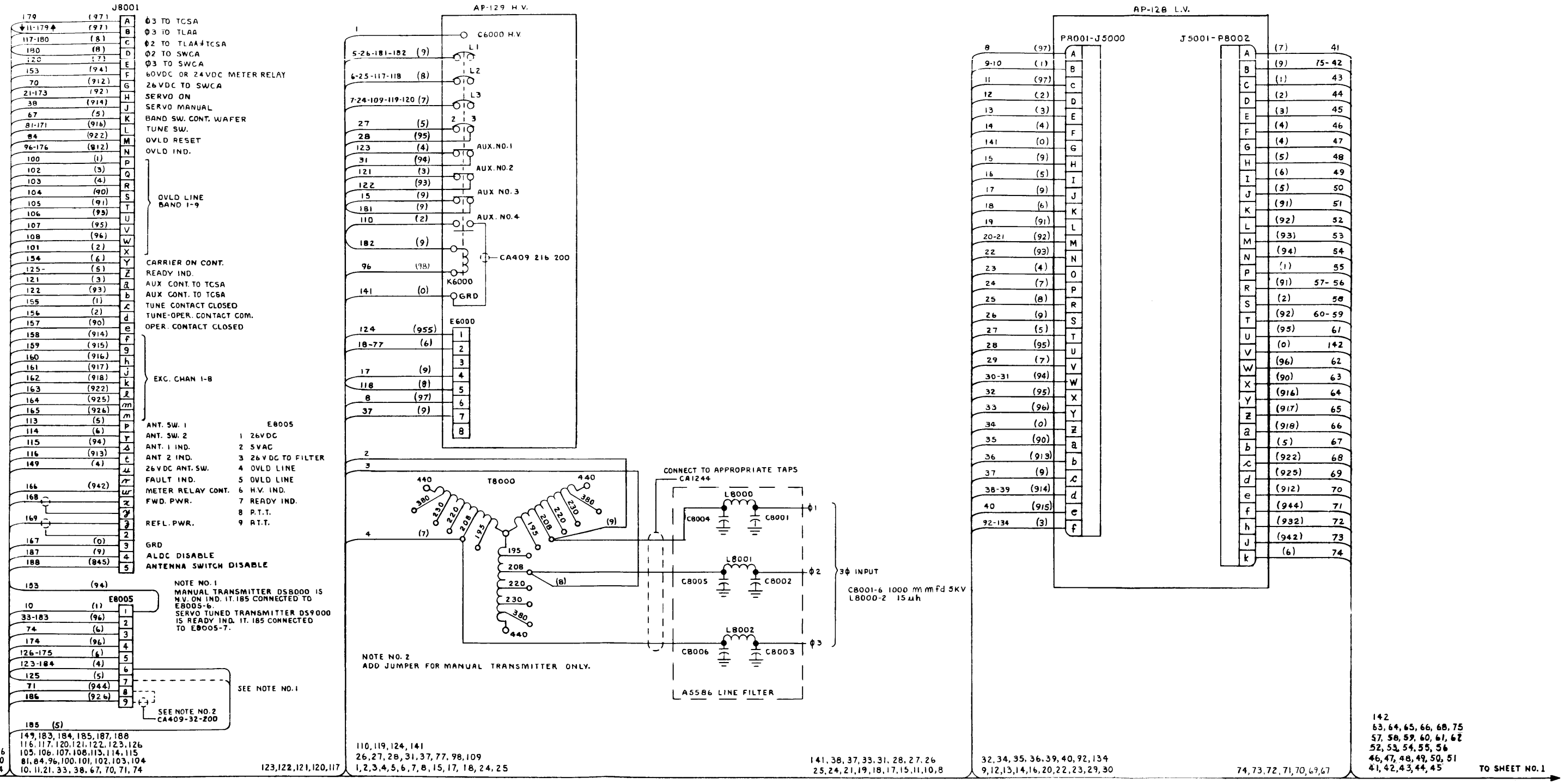

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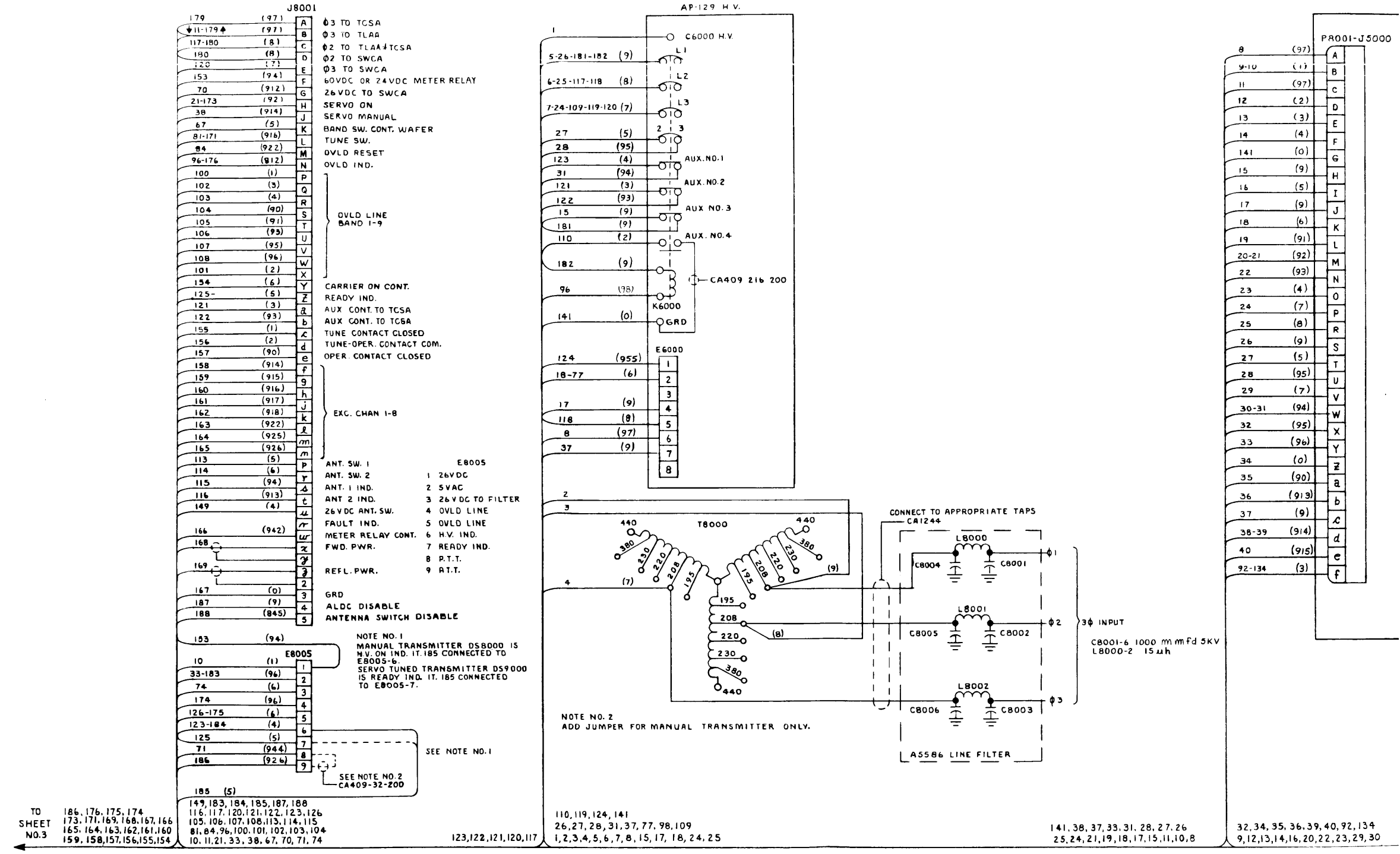
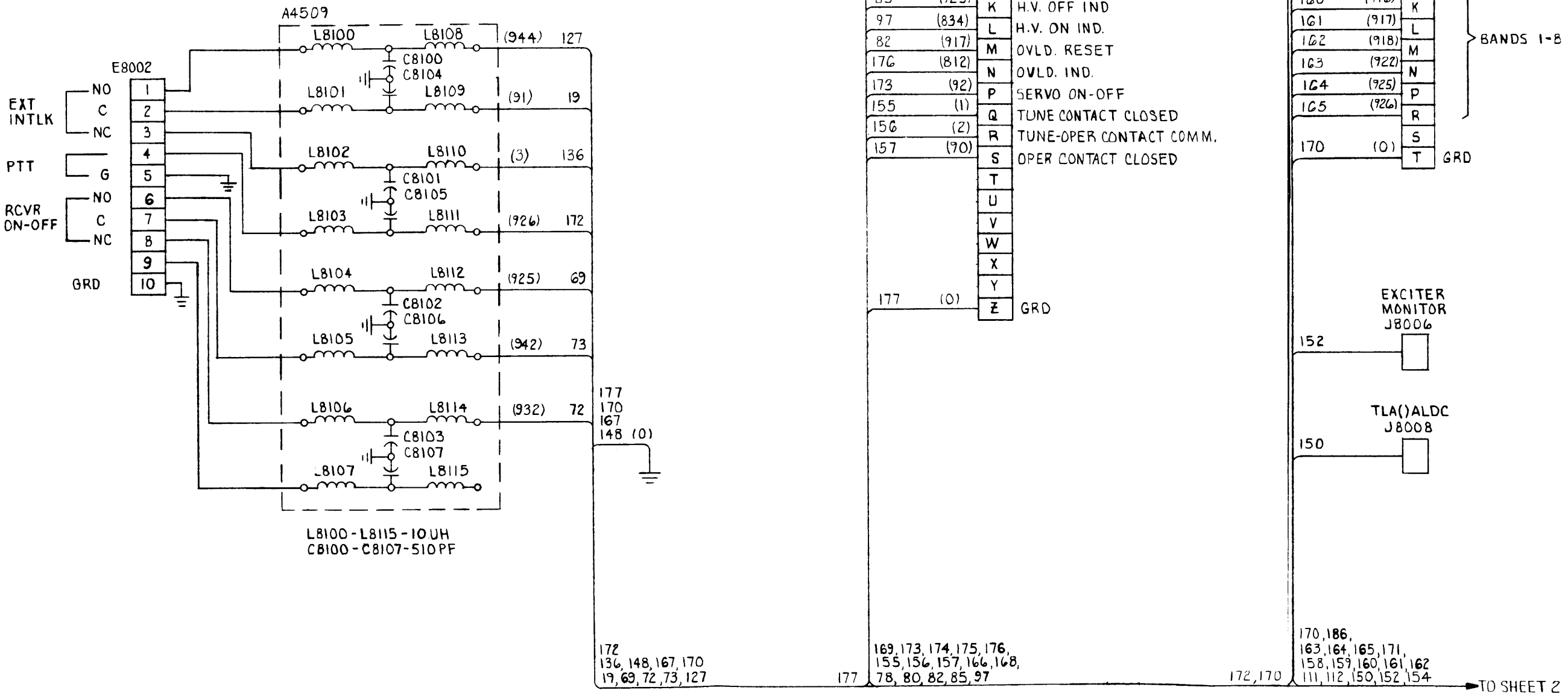
Figure 2-12. Interconnect Wiring Diagram (Sheet 2 of 3)



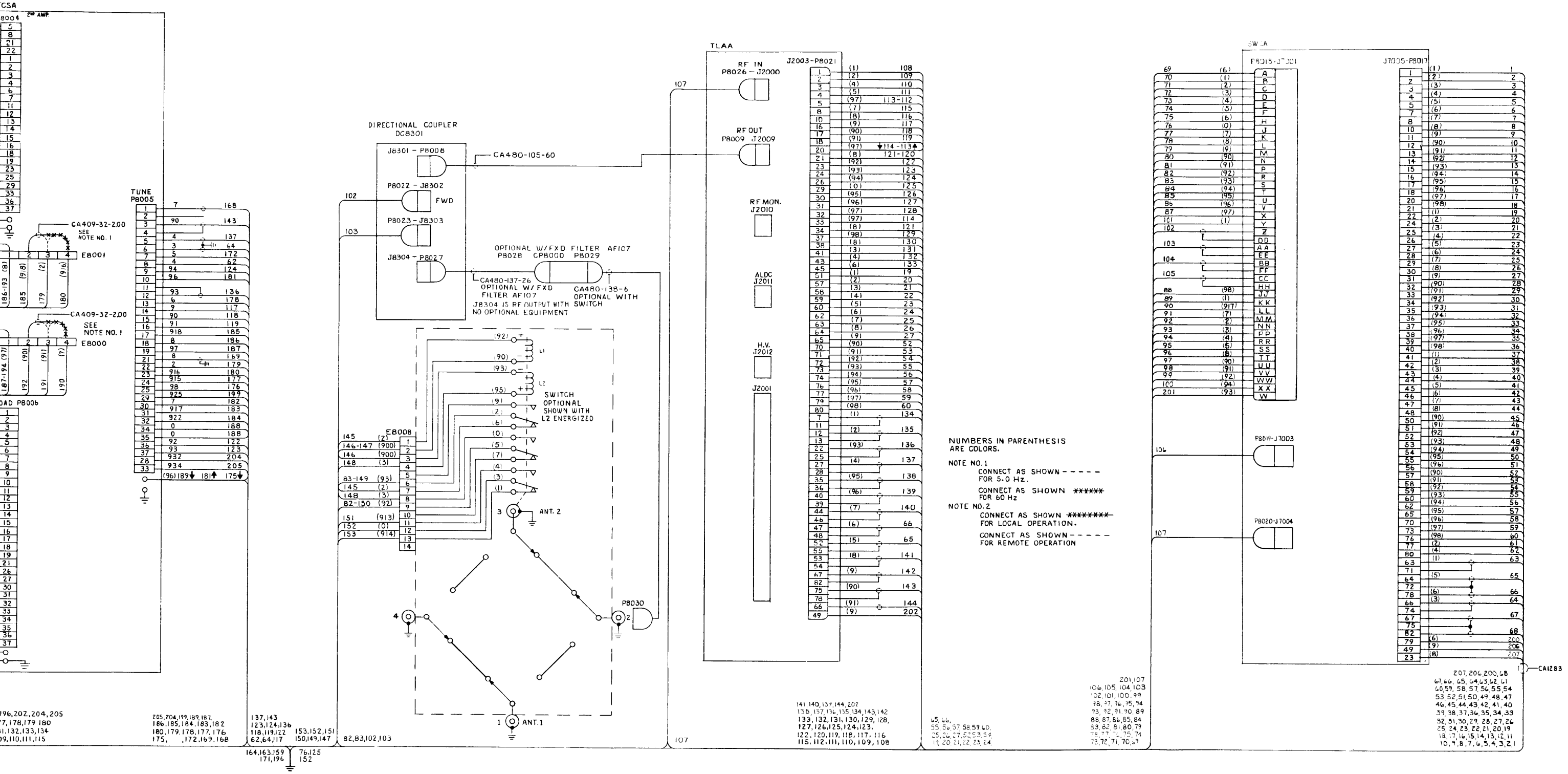
CK1245

Figure 2-12. Inte



CK1245

Figure 2-12. Interconnect Wiring Diagram (Sheet 3 of 3)



CKI244

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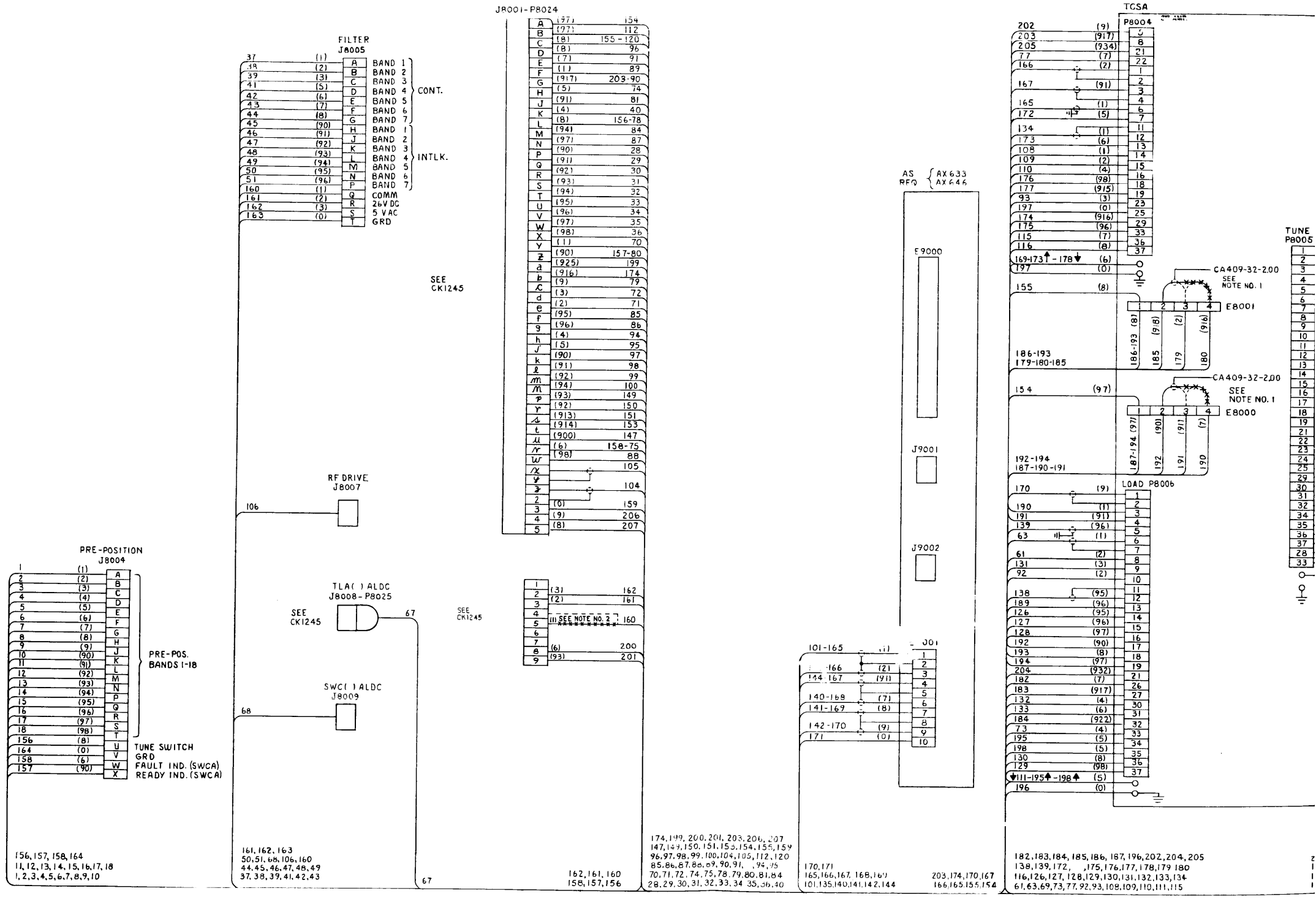
Figure 2-13. Interconnect Wiring Diagram


FILTER
J8005
37 (1) A BAND 1
38 (2) B BAND 2
39 (3) C BAND 3
41 (5) D BAND 4 } CONT.
42 (6) E BAND 5
43 (7) F BAND 6
44 (8) G BAND 7
45 (90) H BAND 1
46 (91) J BAND 2
47 (92) K BAND 3
48 (93) L BAND 4 } INTLK.
49 (94) M BAND 5
50 (95) N BAND 6
51 (96) P BAND 7
160 (1) Q COMM
161 (2) R 26V DC
162 (3) S 5 VAC
163 (0) T GRD
SEE CK1245
RF DRIVE
J8007
106
PRE-POSITION
J8004
1 (1) A
2 (2) B
3 (3) C
4 (4) D
5 (5) E
6 (6) F
7 (7) G
8 (8) H
9 (9) J
10 (90) K
11 (91) L
12 (92) M
13 (93) N
14 (94) P
15 (95) Q
16 (96) R
17 (97) S
18 (98) T
PRE-POS. BANDS 1-18
156 (8) U TUNE SWITCH
164 (0) V GRD
158 (6) W FAULT IND. (SWCA)
157 (90) X READY IND. (SWCA)
156,157,158,164
11,12,13,14,15,16,17,18
1,2,3,4,5,6,7,8,9,10
TLA( ) ALDC
J8008-P8025
SEE CK1245
67
SWC( ) ALDC
J8009
68
161,162,163
50,51,68,106,160
44,45,46,47,48,49
37,38,39,41,42,43
J8001-P8024
A (77) 154
B (77) 112
C (8) 155-120
D (8) 96
E (7) 91
F (1) 89
G (917) 203-90
H (5) 74
J (91) 81
K (4) 40
L (8) 156-78
M (94) 84
N (97) 87
P (90) 28
Q (91) 29
R (92) 30
S (93) 31
T (94) 32
U (95) 33
V (96) 34
W (97) 35
X (98) 36
Y (1) 70
Z (90) 157-80
a (925) 199
b (916) 174
C (9) 79
d (3) 72
e (2) 71
f (95) 85
g (96) 86
h (4) 94
J (5) 95
k (90) 97
l (91) 98
m (92) 99
n (94) 100
p (93) 149
r (92) 150
s (913) 151
t (914) 153
u (900) 147
v (6) 158-75
w (98) 88
x 105
y 104
z 159
1 (0) 206
2 (9) 207
3 (8)
1 (3) 162
2 (2) 161
3
4
5 (1) SEE NOTE NO. 3 160
6
7 (6) 200
8 (93) 201
9
SEE CK1245
67
162,161,160
158,157,156
174,199,200,201,203,204,207
147,149,150,151,152,154,155,159
96,97,98,99,100,104,105,112,120
85,86,87,88,89,90,91,94,95
70,71,72,74,75,78,79,80,81,84
28,29,30,31,32,33,34,35,36,40
AS RFQ { AX633 AX646
E9000
J9001
J9002
J001
101-165 (1)
166 (2)
144-167 (91)
140-169 (7)
141-169 (8)
142-170 (9)
171 (0)
170,171
165,166,167,168,169
101,135,140,141,142,144
203,174,170,167
166,165,155,154
TGSA
P8004
202 (9) 5
203 (917) 6
205 (934) 21
77 (7) 22
166 (2) 1
167 (91) 2
3
165 (1) 4
172 (5) 6
7
134 (1) 11
173 (6) 12
108 (1) 13
109 (2) 14
110 (4) 15
176 (98) 16
177 (915) 18
93 (3) 19
197 (0) 23
174 (916) 25
175 (96) 29
115 (7) 33
116 (8) 36
169-173-178 (6) 37
197 (0)
CA409-32-2.00
SEE NOTE NO. 1
155 (8)
E8001
186-193 (81) (98) (2) (916)
185 179 180
186-193
179-180-185
CA409-32-2.00
SEE NOTE NO. 1
154 (97)
E8000
187-194 (97) (90) (91) (7)
192 191 190
192-194
187-190-191
LOAD P8006
170 (9) 1
190 (1) 2
191 (91) 3
139 (96) 4
63 (1) 5
6
61 (2) 7
131 (3) 8
92 (2) 9
10
138 (95) 11
189 (96) 12
126 (95) 13
127 (96) 14
128 (97) 15
192 (90) 16
193 (8) 17
194 (97) 18
204 (932) 19
182 (7) 21
183 (917) 26
132 (4) 27
133 (6) 30
184 (922) 31
73 (4) 32
195 (5) 33
198 (5) 34
130 (8) 35
129 (98) 36
111-195-198 (5) 37
196 (0)
TUNE P8005
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21 22 23 24 25 29 30 31 32 34 35 36 37 38
182,183,184,185,186,187,196,202,204,205
138,139,172,175,176,177,178,179 180
116,126,127,128,129,130,131,132,133,134
61,63,69,73,77,92,93,108,109,110,111,115

SECTION 3

OPERATOR'S SECTION

3-1. GENERAL

The operator's section contains a manual and auto-tune up procedure and sample tuning chart, table 3-2, to aid in the PALA-2.5K tuning procedure.

A controls and indicators table, 3-1, and illustration, figure 3-1, are provided to help familiarize the operator with the controls.

The tune up procedure refers to only tuning on carrier. For other modes of operation such as SSB, AM or AME, FSK, CW, and FAX, refer to associated exciter manual.

3-2. TUNE UP PROCEDURE FOR PALA-2.5K (MANUAL OPERATION)

STEP	OPERATION	NORMAL INDICATIONS
1	Set main power circuit breaker (34) to the ON position.	The Technimatic light (1) must come on, PA blower and top fan must start running.
2	Set Auto/Manual switch (36) to Manual and Servo ON/OFF switch to OFF (39).	NO INDICATIONS.
3	Place associated exciter ON.	(Refer to exciter manual.)
4	Select the desired exciter operating frequency. Place RF output control to its extreme counterclockwise position.	
5	Determine operating frequency, select proper band position by rotating bandswitch knob on SWCA-3K. (Manual bandswitch selection can only be accomplished with transmitter in manual tuning mode and servos OFF.)	Proper band position on TLAA is selected.
6	Place the Low Voltage breaker (52) (located on the AP-128 Low Voltage Power Supply) to the ON position.	NO INDICATIONS.
7	Place MODE Switch (43) to SSB position.	

NOTE

At this time, it is advisable to check the plate currents of the first and second rf amplifier tubes. They should be checked in the following manner:

(1) Place the multimeter switch (22) to the first Amp Ip position and observe a reading of "10" on multimeter (18). Should the meter reading indicate some other value, adjust the first Amp bias adjust (48) located on the Low Voltage Power Supply, for "10" on multimeter (18).

(2) Place the multimeter switch (22) to the second Amp Ip position and observe a reading of "12" on the multimeter (18). Should the meter reading indicate some other value, adjust the second Amp bias (47) adjust located on the Low Voltage Power Supply, for "12" on the multimeter (18).

STEP	OPERATION	NORMAL INDICATIONS
8	Set Exciter controls to produce at least an RF output of 100 milliwatts between 2 and 30 MHz. (Unmodulated)	Refer to exciter manual.
9	On TLAA, place multimeter switch (22) to the second Amp Ep position.	No indications at this time. (However, when excitation from exciter is applied to RF input of P.A. multimeter will indicate RF drive.)
10	Advance RF Gain control (9) on SWCA-3K clockwise for a slight indication on the multimeter (18).	Indication will be noted on multimeter as RF Gain control (9) has been advanced.
11	Adjust second Ampl, tuning control (20) for a peak indication on multimeter (18).	Peak indication will be noted on multimeter (18).
12	Reduce RF output (rotate RF Gain Control on SWCA (9) to its extreme counterclockwise position).	Indication on multimeter should indicate zero.
13	Place High Voltage breaker (37) to ON position.	High Voltage Lamp (3) must light, PA Plate current meter (12) should indicate 450 ma. (Should some other value be noted, adjust the PA bias adjust (46) located on the Low Voltage Power Supply for a reading of 450 ma on the PA Plate Current meter (12).
14	Advance the RF Gain Control (9) on the SWCA-3K to a point where the PA plate current increases.	PA plate current meter indication increases from original reading.
15	Adjust the PA tuning control (23) until a resonant dip is obtained on the PA Plate current meter (12).	Observe resonant dip in PA Plate current (12).
16	Adjust the PA load control (16) until PA is properly loaded. After each change in loading, the PA Tune control (23) must be returned to resonance.	Proper loading will occur when maximum output is obtained on Output meter (4). At a power level of 2.5 kilowatt, the PA Plate current should be between 0.6 and 0.85 Amperes, depending on the frequency.
17	Advance RF Gain control on SWCA-3K (9) until output meter reaches pre-determined power level.	PA Output meter will indicate desired power output level.
18	Reduce Power output by turning the RF Gain control (9) on the SWCA-3K to its extreme counterclockwise position.	Power output indicates zero.
19	Place H.V. breaker (37) to the OFF position.	High Voltage lamps will go out; PA Plate current meter will indicate zero.

The transmitter at this time has been initially tuned up on a carrier frequency. The desired mode of operation will be determined by control settings of the exciter.

3-3. SERVO TUNING PROCEDURE

STEP	OPERATION	NORMAL INDICATIONS
1	Set Main power circuit breaker (34) to the ON position.	The Technimatic light (1) must come on. PA blower and top fan must start running.

STEP	OPERATION	NORMAL INDICATIONS
2	Set Auto/Manual switch (36) to Auto and Servo ON/OFF switch (39) to ON.	Prepares transmitter circuits for servo tuning.
3	Place associated exciter power switch to ON.	
4	Select desired exciter operating frequency and place RF Output control to its extreme counterclockwise position.	Sets pre-positioning information for automatic bandswitching and Automatic tune and load controls presetting.
5	Place Power level indicator (11) on SWCA-3K to the desired power level.	No indications (power level control operates to control transmitter RF output in the servo-tune mode of operation).
6	Press Tune button (38).	Activates servo circuitry to cause automatic bandswitching, tune and load pre-positioning to take place.
7	Set associated exciter controls to produce an RF output of at least 100 milliwatts between 2 and 30 MHz. (Unmodulated)	With the controls set in this manner, the RF output will be monitored at the end of transmitters tuning cycle.
8	Place High Voltage breaker (37) and Low Voltage breaker (52) ON. Press Tune button (38).	High Voltage indicator lamp (3) will light. Transmitter will servo tune automatically. The tuning sequence is as follows: a. Second Amplifier tuning control will rotate and stop. (Indications are green search and operate lamps come on.) b. PA Tune capacitor will rotate and stop (indications are green search and operate lamps will come on). c. PA load capacitor will rotate stop. (Indications are green search and operate lamps will come on.) d. Transmitter will then automatically drive-up to preset output level and decrease its output to zero. The "Ready" lamp will then come on. This indicates the transmitter has been initially tuned on a pilot carrier, at the desired frequency, to a preset power output level. Mode of operation at this point will be determined by the exciter controls.

NOTE

(1) Automatic Transmitter Operation

All initial exciter control adjustments should be performed with High Voltage OFF. Once the desired mode of emission has been determined and exciter controls adjusted accordingly, place the High Voltage breaker to ON and press the TUNE BUTTON, transmitter will automatically tune to the desired frequency; mode of operation and output level.

(2) Manual Operation

The transmitter must first be tuned manually to the desired frequency and output level as per paragraph 3-2. Exciter controls must be adjusted for the desired mode of emission. The RF Gain Control (located on SWCA-3K) must be adjusted for desired output level.

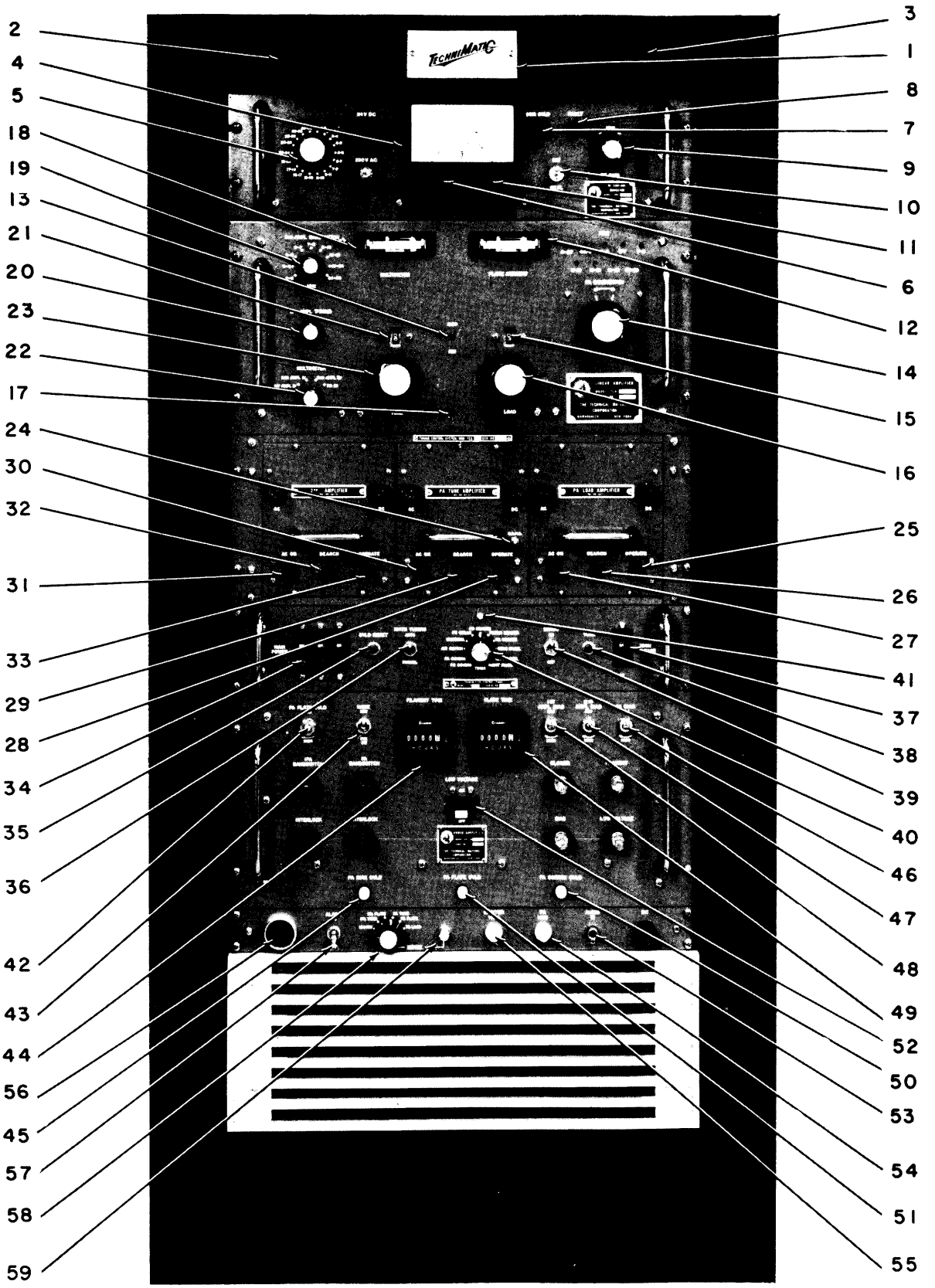


Figure 3-1. Controls and Indicators

3-4. FAULT INDICATION WHEN TUNING

The PALA-2.5K normally takes approximately 20 seconds to tune. If at the end of 60 seconds the FAULT lamp (8) lights, press the tune button (38) and the PALA-2.5K will retune.

After several attempts to retune the unit by pressing the tune button, the FAULT lamp still lights, check for servo voltages at sense jack (59).

TABLE 3-1. CONTROLS AND INDICATORS

Modular Unit	Item No. (Fig. 3-1)	Designation	Function
RAK	1	TECHNIMATIC lamp	Indicates when primary circuit breaker (34) is set at ON position.
	2	READY lamp	Indicates transmitter is ready for operation.
	3	HIGH VOLTAGE lamp	Indicates when high voltage circuit breaker (37) is set at ON position.
Standing Wave Ratio Indicator SWCA	4	Power Meter (no panel designation)	Indicates forward and reflected power (KW).
	5	Frequency Selector switch (no panel designation)	Selects frequencies in the 2- to 30-mc range.
	6	Power Limit Control (no panel designation)	Used for setting minimum rf power output of transmitter.
	7	SWR OVLD lamp	Lights when standing wave ratio is excessive.
	8	FAULT lamp	Lights to indicate transmitter failed to tune in specified time.
	9	RF GAIN control	Adjusts excitation level to the TLAA (higher level in INCR arrow direction).
	10	KW/REFL switch	Activates meter (4) for forward or reflected power indication.
	11	Power Limit Control (no panel designation)	Used for setting maximum rf power output of transmitter.
Linear Amplifier TLAA	12	IPA PLATE CURRENT indicator	Indicates intermediate power amplifier plate current.
	13	ALDC ADJ control	Adjusts level of negative feedback applied to the exciter.
	14	PA BANDSWITCH switch	Selects 2- to 30-mc range in 9 increments.
	15	Indicator (no panel designation)	Veeder indicator for LOAD control.
	16	LOAD control	Adjusts the loading of the final PA.

TABLE 3-1. CONTROLS AND INDICATORS (Cont)

Modular Unit	Item No. (Fig. 3-1)	Designation	Function
Linear Amplifier TLAA (Cont)	17	RF trig control (no panel designation)	PA plate trigger adjustment for sensing circuit (factory adjusted).
	18	MULTIMETER indicator	Indicates first amplifier plate current, second amplifier plate current, second amplifier rf plate voltage, and power amplifier rf plate voltage.
	19	2ND AMPL BAND-SWITCH switch	Selects 2- to 30-mc range in 9 increments.
	20	2ND AMPL TUNING control	Adjusts resonance of the second amplifier.
	21	Indicator (no panel designation)	Veeder indicator for TUNE control.
	22	MULTIMETER switch	Selects circuit for MULTIMETER.
	23	TUNE control	Adjusts resonance of the final PA.
Servo Amplifier TCSA	24	R. F. P. O.	R-F Power On adjustment (factory adjusted).
	25	OPERATE lamp	Lights when PA stage has completed loading.
	26	SEARCH lamp	Lights when PA stage is being loaded.
	27	AC ON lamp	Lights when servo amplifiers are tuning.
	28	OPERATE lamp	Lights when PA has completed tuning.
	29	SEARCH lamp	Lights when final amplifier is tuning.
	30	AC ON lamp	Same as item 27.
	31	AC ON lamp	Same as item 27.
	32	SEARCH lamp	Lights when second amplifier is tuning.
	33	OPERATE lamp	Lights when second amplifier completes tuning.
Linear Amplifier Control Panel TCP	34	MAIN POWER circuit breakers	Controls application of power to all units.
	35	OVLD RESET switch	Resets the overload relays.

TABLE 3-1. CONTROLS AND INDICATORS (Cont)

Modular Unit	Item No. (Fig. 3-1)	Designation	Function
Linear Amplifier Control Panel TCP (Cont)	36	XMTR TUNING AUTO/ MANUAL switch	When set at AUTO, allows automatic operation of transmitter; when set at MANUAL, allows the transmitter to be tuned manually.
	37	HIGH VOLTAGE switch	Control application of power to high voltage power supply AP-129.
	38	TUNE switch	When depressed, initiates automatic tuning and loading.
	39	SERVO ON/OFF switch	When set at ON, enables activation of automatic band switching and tuning circuits.
	40	Interlock switch (no panel deisgnation)	Used to locate open interlock switches.
	41	Interlock Indicator lamp (no panel designation)	When lit, indicates interlock switch is closed.
Low Voltage Power Supply AP-128	42	PA PLATE OVLD ADJ potentiometer	Used to set plate overload.
	43	MODE switch	Changes PA tube bias.
	44	FILAMENT TIME meter	Registers filament operation time.
	45	PA BIAS OVLD lamp	Overload indicator light.
	46	PA BIAS ADJ potentiometer	Adjust PA grid bias.
	47	2ND AMPL BIAS ADJ potentiometer	Adjust second amplifier grid bias.
	48	1ST AMPL BIAS ADJ potentiometer	Adjust first amplifier grid bias.
	49	PLATE TIME meter	Registers final PA plate operation time.
	50	PA SCREEN OVLD lamp	Overload indicator light.
	51	PA PLATE OVLD lamp	Overload indicator light.
	52	LOW VOLTAGE circuit breaker	Controls Low Voltage first and second IPA plate, and PA screen supply.
Alarm Panel AX633	53	AUDIO IN jack	Provides for audio test signal to be applied (during maintenance procedures).

TABLE 3-1. CONTROLS AND INDICATORS (Cont)

Modular Unit	Item No. (Fig. 3-1)	Designation	Function
Alarm Panel AX633 (Cont)	54	PA MON jack	Provides PA monitoring outlet for test purposes.
	55	EXCITER MON jack	Provides exciter monitoring outlet (for test purposes).
	56	Alarm Device (no panel designation)	Alarm sounds if primary power to high voltage power supply is interrupted.
	57	ALARM ON/OFF switch	Activates alarm device circuit when set at ON position.
	58	SENSE switch	Provides for the selection of circuits (as marked) for test purposes.
	59	SENSE jack	Provides monitoring outlet for the sensing positions of SENSE switch (59).

TABLE 3-2. SAMPLE TUNING CHART

	Control Settings			Indicator Readings		
FREQ. OUT mc	PA BAND	PA TUNE	PA LOAD	PA IP ma	P out KW PEP	DIST. dB
2.0	2-2.5	142	168	700	2.5	43
2.5	2-2.5	109	072	780	2.5	42
2.5	2.5-3.0	118	138	750	2.5	41
3.0	2.5-3.0	101	077	840	2.5	43
3.0	3.0-5.0	110	137	720	2.5	39
5.0	3.0-5.0	084	046	780	2.5	40
5.0	5.0-7.0	091	075	750	2.5	45
7.0	5.0-7.0	077	043	750	2.5	37
7.0	7.0-11.0	091	074	750	2.5	37
11.0	7.0-11.0	074	038	660	2.5	37
11.0	11.0-15.0	084	065	720	2.5	36
15.0	11.0-15.0	075	039	750	2.5	35
15.0	15.0-19.0	078°	061	750	2.5	35
19.0	15.0-19.0	069	045	630	2.5	45

TABLE 3-2. SAMPLE TUNING CHART (Cont)

	Control Settings			Indicator Readings		
FREQ. OUT mc	PA BAND	PA TUNE	PA LOAD	PA IP ma	P out KW PEP	DIST. dB
19.0	19.0-24.0	075	050	660	2.5	43
24.0	19.0-24.0	039	043	660	2.5	46
24.0	24.0-30.0	075	056	660	2.5	43
30.0	24.0-30.0	061	039	720	2.5	41

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL

The PALA-2.5K, is a three stage automatically tuned or manually tuned, linear rf amplifier, with associated power supplies and control components. The block diagram description explains the overall system operation, excluding the automated control tuning circuits. A description of the automated control tuning circuits will be described in later paragraphs.

4-2. FUNCTIONAL BLOCK DIAGRAM DESCRIPTION (Refer to figure 4-1)

The rf signal from an associated exciter is applied to the PALA-2.5K through a rack mounted junction box. The signal in the frequency range of 2-30 MHz, must be unmodulated. The rf input from the junction box enters the SWCA first, where it is applied to the rf gain control. It is then routed to the first and second IPA stages with approximately 100 mw of drive. The IPA stages amplify it and increase the drive level, so it may be amplified to a 2.5 kw output, from the final power amplifier tube. The 2.5 kw output signal from the PA enters the directional coupler. Here it is applied to 50 ohm unbalanced antenna. A sample of the rf output forward and reflected power is rectified in the directional coupler and routed to the SWCA where it is metered, for forward and reflected power. If the SWR should exceed the 2:1 or 3:1 setting of the SWR overload circuit the PALA-2.5K will go into an overload condition and shut-off the high voltage by opening the interlock circuit.

The rf output signal from the PA may be monitored through a jack on the front panel of the alarm panel.

A portion of the high level rf output is rectified and applied to an automatic load and drive control circuit. A control voltage is applied to the exciter through the junction box whenever any preset rf signal level is exceeded. The control circuit limits high drive peaks should they occur.

The PA plate voltage from the high voltage power supply is applied to the final power amplifier tube. The screen and bias supply to the PA is produced in the low voltage power supply. The IPA tubes receive plate, screen and grid voltage from the low voltage power supply.

The PA tube, plate, screen, and bias circuits are protected by overload relays located in the transmitter control panel.

The PALA-2.5K system is interlocked throughout for personnel and equipment safety. When one of the interlocks open, power is removed from the transmitter and the High Voltage is automatically shut off, and an audible alarm sounded.

The three phase primary power enters through an ac filter panel and goes to a rack mounted 3 phase delta-wye input transformer. The primary power is then routed to the main power circuit breaker in the transmitter control panel before it is applied to the high voltage and low voltage power supplies.

4-3. POWER AMPLIFIER DRAWER

The power amplifier section may be manually or auto-tuned over a frequency range of 2-30 MHz with an output power of 2.5 kw. The PA drawer contains a class AB1 broadband first IPA tetrode, a tuned plate class AB1 second IPA tetrode driving a class "C" operated final power amplifier pentode type PL-264. The circuit description for the automated circuitry will be described in later paragraphs.

a. FIRST IPA (refer to figure 7-2) - The rf input at about 100 mw level enters the PA drawer through jack J2000, it is then coupled through an impedance matching network consisting of R2007, L2038, and R2000, to the grid of the first IPA tube V2000 through coupling capacitor C2000. The rf signal is then amplified and passed through parasitic suppressor PS2000 where it is coupled to capacitor C2027 and L2009 before passing through the broadband auto-transformer L2011 designed to pass frequencies in the range of 2-30 MHz.

b. SECOND IPA (refer to figure 7-2) - When the signal has passed through auto transformer L2011 it is then routed to the grid of V2001 through series filter trap R2009, C2031, C2043, and L2008, that is tuned in the low band range and coupling capacitor C2021. The signal is amplified in V2001, with the output signal tuned in the 2-30 MHz range by bandswitch S2004C and S2004B, and by tuning capacitor C2038.

Second IPA Bandswitch wafers S2004A, S2004B, S2004C are mechanically linked and all turn at the same time. When a band selection is made, for example 2-3 MHz, the 2-3 MHz coil is selected by S2004C and is ungrounded by switch S2004B. The other tuning coils are shorted to ground at this time, and therefore do not effect the tuning.

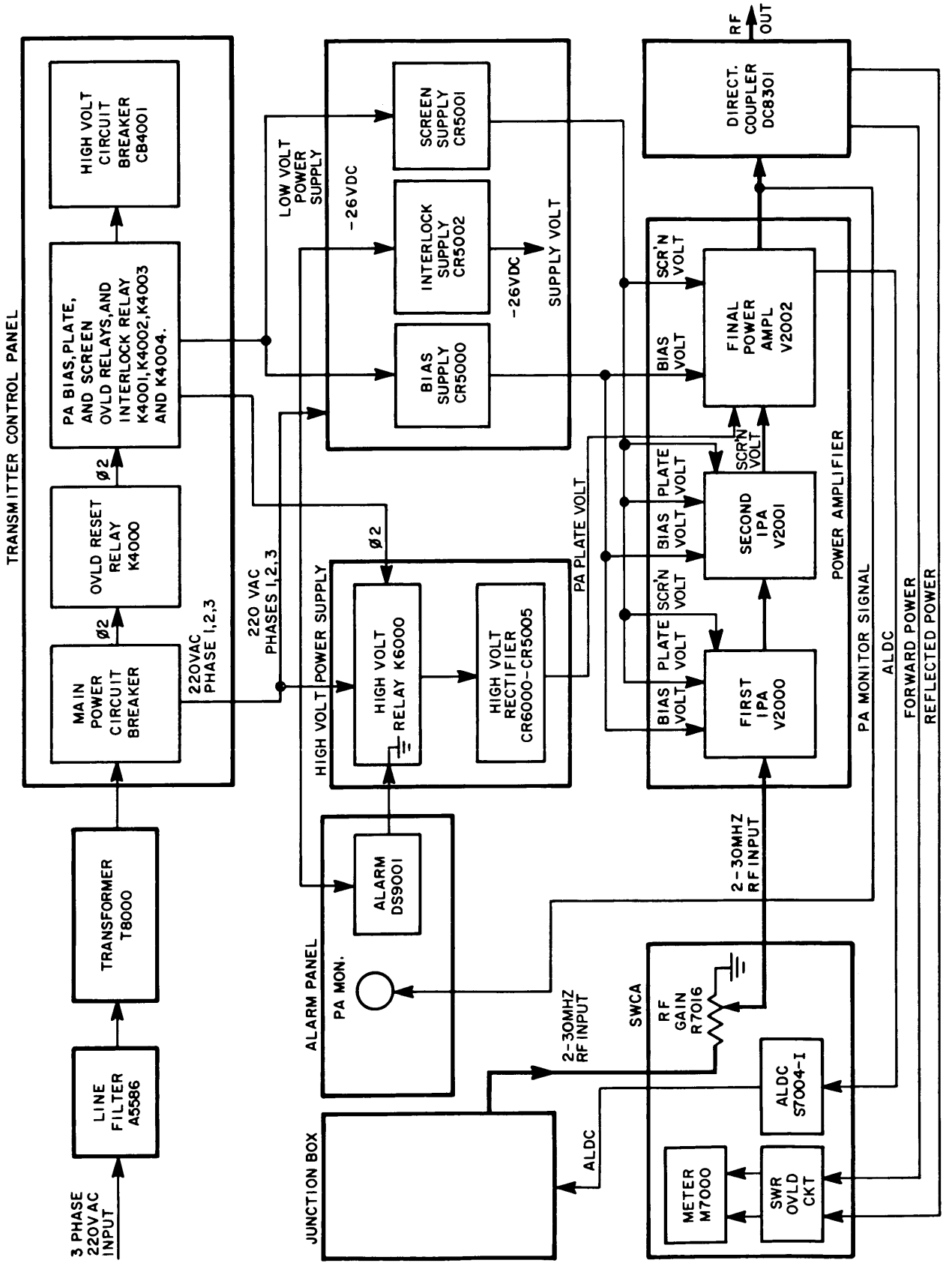


Figure 4-1. Functional Block Diagram

The signal is then passed through parasitic suppressor PS2002, and coupling capacitor C2033, auto sense transformer T2001, and parasitic suppressor PS2003 to the grid of V2002.

c. FINAL POWER AMPLIFIER (refer to figure 7-2) - The rf signal is amplified to a 2.5 kw level in the PA tube and coupled to the output bandswitching, loading and ALDC networks before going out, output jack J2009, to the directional coupler DC8301. A sample of the output signal is also routed out monitoring jack J2010.

d. PLATE, SCREEN, BIAS AND FILAMENT SUPPLY TO IPA AND PA TUBES - The two IPA tubes have indirectly heated cathodes with a filament voltage of about 6.2 vac each. The plate current of the first IPA may be measured by placing switch S2003 in position 1, multimeter M2000 then indicates the voltage drop across cathode resistor R2002. In position 2, the second IPA plate current may be measured by the voltage drop across R2008. In position 3, the second IPA plate voltage is measured by the rectified output from CR2004, which is applied to multimeter M2000. In position 4, the plate voltage of the PA tube V2002 may be measured. A sample of the plate voltage is routed through capacitor network C2072, C2079 and C2080. It is then rectified by CR2008 on PC board PC327 and routed out pin "B" to meter M2000 through position 4 of S2003.

The screen supply for the first IPA tube V2000, is approximately 250 vdc and is connected to pin "E" of J2001 which is connected to the screen grid through L2002, and L2004. The screen supply for the second IPA tube V2001 is approximately 350 vdc and enters the PA section at pin h of J2001 which is connected to the screen grid through L2013 and L2012, and C2028.

The first IPA plate is supplied with about 450 vdc. The second IPA plate is supplied with about 800 vdc. The plate supply for V2000 enters the PA section at pin "F" of J2001. The plate for V2001 enters at pin "G" of J2001. The bias voltage for both IPA tubes is approximately negative 12-20 vdc each.

The PA screen supply of approximately 800 vdc enters the PA drawer through pin "P" of J2001 and is coupled to the PA screen grid circuit.

The PA voltage of approximately 5000 vdc enters the PA drawer from the high voltage power supply through jack J2012, and is coupled to the plate through inductors L2033 and L2035.

The PA tube also has an indirectly heated cathode with a filament voltage of 6.5 vac entering the PA drawer through pins "L" and "K" of J2001. The PA grid bias is set at approximately -150 vdc level with switch S5002 in the SSB mode.

Plate current in the PA tube is measured by the meter M2001 connected to the cathode circuit of the PA tube through L2030, L2049, C2053, C2014 and C2058.

e. PA BANDSWITCHING AND LOADING (refer to figure 7-2) - The plate output circuit for V2002 is a Pi-L network consisting of inductors L2039 and L2040, the PA Bandswitch S2008-A and variable vacuum capacitor C2081. Switch S2008A is a 12 position switch and progressively bypasses larger portions of the inductors as the signal frequency is increased. Fine tuning for the PA tube is provided by variable vacuum capacitor C2081.

The PA load switch S2008-B which is mechanically linked to S2008A consists of inductor L2048. It is also a 12 position switch which progressively bypasses larger sections of inductor L2048 as the frequency is increased. Vacuum-type load capacitor C2089 enables fine tuning of the output network. When a frequency selection is being made through bandswitch S2008-A several other functions are also taking place at the same time. Switch S2008-A is mechanically linked to S2008-B, S2005-A, S2005-B and S2005-C.

As stated previously, S2008-A and S2008-B perform the bandswitching and loading functions of the PA output network. Switch S2005-A is used only under the automated conditions. Switch S2005-B is connected to the 5.2 vac voltage from the filament transformer secondary of T5001 in the low voltage power supply through the wiper. It directs the voltage to the proper front panel indicator showing the frequency selected. For example, when switch S2005-B is in position 2, it will light DS2000, indicating the 2-3 MHz band selection. The other switch positions function in the same way, with each indicator corresponding to a band of frequencies up to 30 MHz. Switch S2005-C is part of the interlock circuit. When a band selection is being performed, the switch opens the interlock circuit for that instant, shutting off the high voltage. When the bandswitching is completed, the high voltage is again turned ON. Each of the nine positions corresponds to a band of frequencies.

The rf voltage developed at the plate of V2002 is coupled through capacitor C2075 to several circuits located on PC board PC327. A sample of the rf voltage is routed through capacitive voltage divider network C2072, C2079, C2078, and C2080, C2063 and C2119. It then enters PC327 at pin 1 with one path going through diode CR2008, and out pin "B" to the plate metering circuit. The other path goes to the rf trigger potentiometer R2028, and then out pin J to Servo RF trigger.

f. ALDC CIRCUIT (refer to figure 7-2) - A sample of the rf output voltage is also routed through capacitive voltage divider C2116, C2117, C2121, and C2118 to pin O of PC327 to the Automatic Load and Drive Control Circuit consisting of C2093, R2031, CR2007, and the filter network. The rf voltage developed across the voltage divider is applied to the cathode of diode rectifier CR2007. The cathode is biased by a positive dc voltage taken

from the wiper arm of ALDC control R2029. When the amplitude of the negative portion of the rf signal applied to the cathode of CR2007 exceeds the bias voltage on the cathode, the diode conducts. The output, a negative voltage proportional to the amplitude of the rf signal peaks, is filtered and coupled to ALDC jack J2011 through pin "H" of PC327 and routed through J8008 to pin 67 of J7005 in the SWCA. The ALDC then goes through switch S7004-I to pin 82 of J7005 to jack J8009 on the junction box.

g. DIRECTIONAL COUPLER AND SWR CIRCUITS (refer to figures 2-13 and 7-6, sheet 1) - The 2.5 kw output signal from J2009 is directed through directional coupler DC8301, where it is fed to a 50 ohm unbalanced antenna. A sample of the rf output is rectified in the directional coupler and is routed to the SWCA where the output is metered for forward and reflected power.

The forward power goes out of the directional coupler through J8302 and enters the SWCA through pin "Z" of J7001, the reflected power goes out of J8303, and enters the SWCA at pin "AA" of J7001.

The forward power is then directed to contact 9 of relay K7000, on PC board PC266, through pin 9 of J7000. In the deenergized state, K7000 directs the forward power out pin 7 of J7000, and passes it through spring loaded switch S7000, where it is metered by M7000. In the energized condition, the forward power is directed out pin 6 of J7000, and pin "C" of J7001, to remote jack J8003 pin "A".

The reflected power is directed to contact 6 of relay K7000, on PC266 through pin 8 of J7000. In the deenergized state, the reflected power is connected to contact 5 of K7000 and routed out through pin 1 of J7000 to switch S7000. In the energized state, relay K7000 routes the reflected power out pin 10 of J7000 to pin "CC" of J7001 to remote jack J8003 pin "C". The coil of K7000 receives a -26 vdc supply voltage from the low voltage power supply through pin "B" of J5000, the other side of the coil goes to pin "E" of remote jack J8003 through pin JJ of J7001.

If a reflected power reading is desired, switch S7000 is depressed and directs the reflected power signal to meter M7000, otherwise the switch directs the signal to SWR sense relay K7007.

One side of K7007 is connected to SWR switch S7001 that enables a selection of either a 2:1 or 3:1 SWR.

The other side of K7007 keeps the transistor stage reverse-biased under normal operating conditions, by opening the base circuit.

When the SWR is exceeded, K7007 closes the base circuit and forward biases the transistor, allowing conduction. When Q7000 conducts, it energizes the overload coil of relay K7001. Relay K7001 then remains in an overload condition until reset.

NPN transistor Q7000 is biased by a -26 vdc supply voltage through pin LL of J7001 from pin "E" of J5001 in the low voltage power supply drawer. It is directed to the emitter base circuit through dropping resistor R7009, diode CR7004, and is regulated by zener diode CR7000.

When relay K7001 is in the overload condition, the -26 vdc supply voltage from pin LL of J7001 is directed through contact 6 of K7001 and lights the SWR overload indicator, through contact 5 and pin "H" of J7000.

In the overload condition contacts 9 and 10 of K7001 open, and remove the High Voltage. Contact 9 is connected to pin 3 of J7000, contact 10 is connected to pin "F" of J7000. Pin 3 is connected to the wiper of PA interlock switch S7004-C. Pin "F" is connected to the wiper of the Filter interlock switch S7004D.

To reset relay K7001, reset button S4003 on the transmitter control panel is depressed, providing a ground. This energizes overload reset relay K7001. The -26 vdc provides the energizing voltage to K7001 reset coil through pin 3. The ground path is from contact 2 to pin K of J7000 to pin "T" of J7001 to pin L of J4001.

4-4. PA SCREEN, PA PLATE, PA BIAS OVERLOAD CIRCUITS (refer to figure 7-1)

The PA screen, PA plate, and PA bias overload relays are contained in the transmitter control panel. They protect the PA tube V2002 from excessive screen current, excessive plate current, and loss of the PA bias voltage. In each instance of an overload condition, the series interlock chain is broken and the high voltage to the transmitter is removed. Overload indicators and an audible alarm is provided on the transmitter to indicate the area of the overload and the loss of high voltage.

a. SCREEN OVERLOAD RELAY (refer to figure 4-2) - The screen overload relay K4003 protects the final PA tube by removing the high voltage when the PA screen grid draws too much current.

The screen current of power amplifier V2002 enters the transmitter control panel at pin "h" of J4001. This current passes through pin "P" of J2001 in the PA drawer, and pin "J" of J5001 and pin "v" of J5000 in the low voltage power supply drawer. In the transmitter control panel, the current is routed to the screen overload relay coil. The overload relay coil is paralleled by resistor R4003 and capacitor C4000. The overload relay is designed to trip at approximately 80 ma of screen current. The screen current returns to the screen supply CR5001 in the low voltage power supply through a set of contacts on relay K6000 in the high voltage power supply. The return path is through pin J of J4001 of the transmitter control panel to pin o jumpered to pin u of J5000 in the low voltage power supply drawer, to relay K6000 in the high

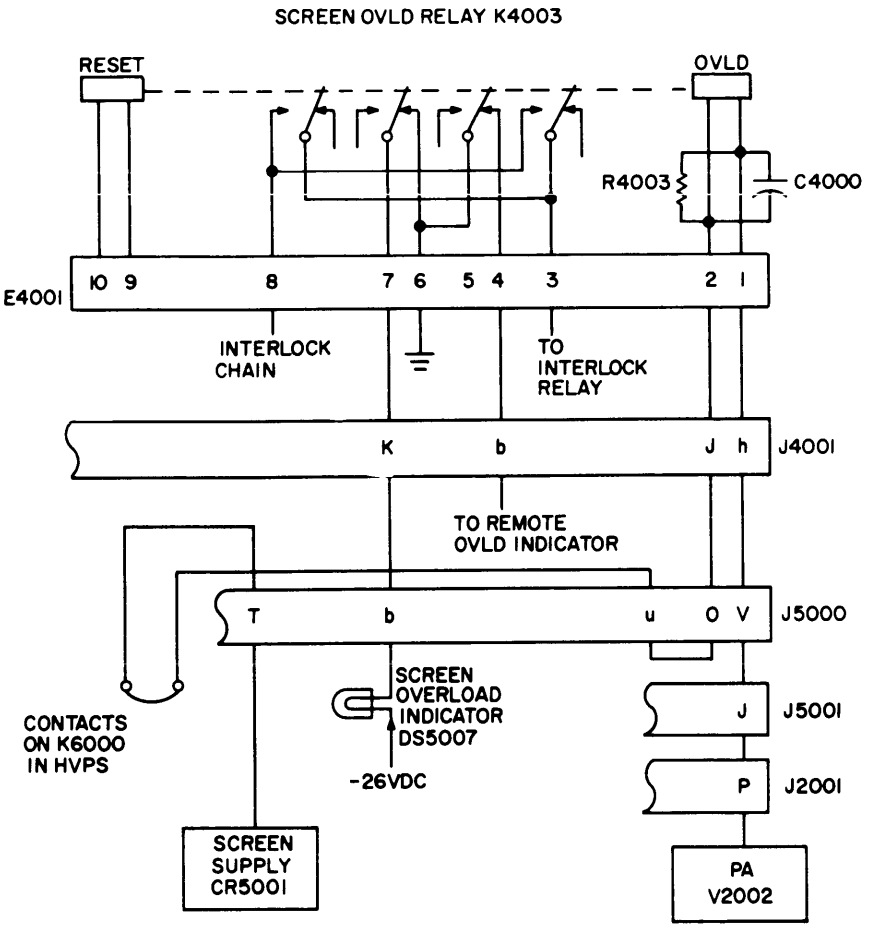


Figure 4-2. Screen Overload Relay K4003

voltage power supply to pin T of J5000 in the low voltage power supply.

In the overload condition, relay K4003 opens the interlock chain, removing the high voltage. Contacts 7 and 6 close, placing a ground on the screen overload indicator DS5007 located in the low voltage power supply drawer enabling the indicator to light.

A remote overload indicator lamp is also provided for, through pin b of J4001.

b. PA PLATE OVERLOAD RELAY (refer to figure 4-3) - The PA plate overload relay K4002 is a protective device for the PA tube V2002. When the PA cathode current in power amplifier V2002 exceeds its normal operating limit, relay K4002 switches to its overload state, and removes the high voltage in the PALA-2.5K.

The PA tube cathode is connected to one side of the overload relay coil through plate current meter M2001, pin "W" of J2001, pin W of J5001 and enters the low voltage power supply. In the low voltage power supply, the current goes across PA plate overload adjust R5018 and R5019, and also continues on to pin "N" of J5000 entering the transmitter control panel at pin "f". PA plate overload adjust R5018 is set to trip the PA plate overload coil at approximately 1-2 amperes.

In the overload condition, relay K4002 opens the interlock chain, removing high voltage. It places a ground on PA plate overload indicator DS5006 located in the low voltage power supply through contacts 12 and 13. An external indicator is provided for by another set of contacts through pin b of J4001.

c. PA BIAS RELAY K4001 (refer to figure 4-4) - The PA Bias relay K4001 is energized when the -400 vdc output from the low voltage power supply is present. Since the voltage is used to supply bias for power amplifier V900, this relay is called the PA Bias relay.

The PA grid is connected to the coil of the Bias relay through the following path. In the PA drawer it is connected to pin "f" of J2001 and then

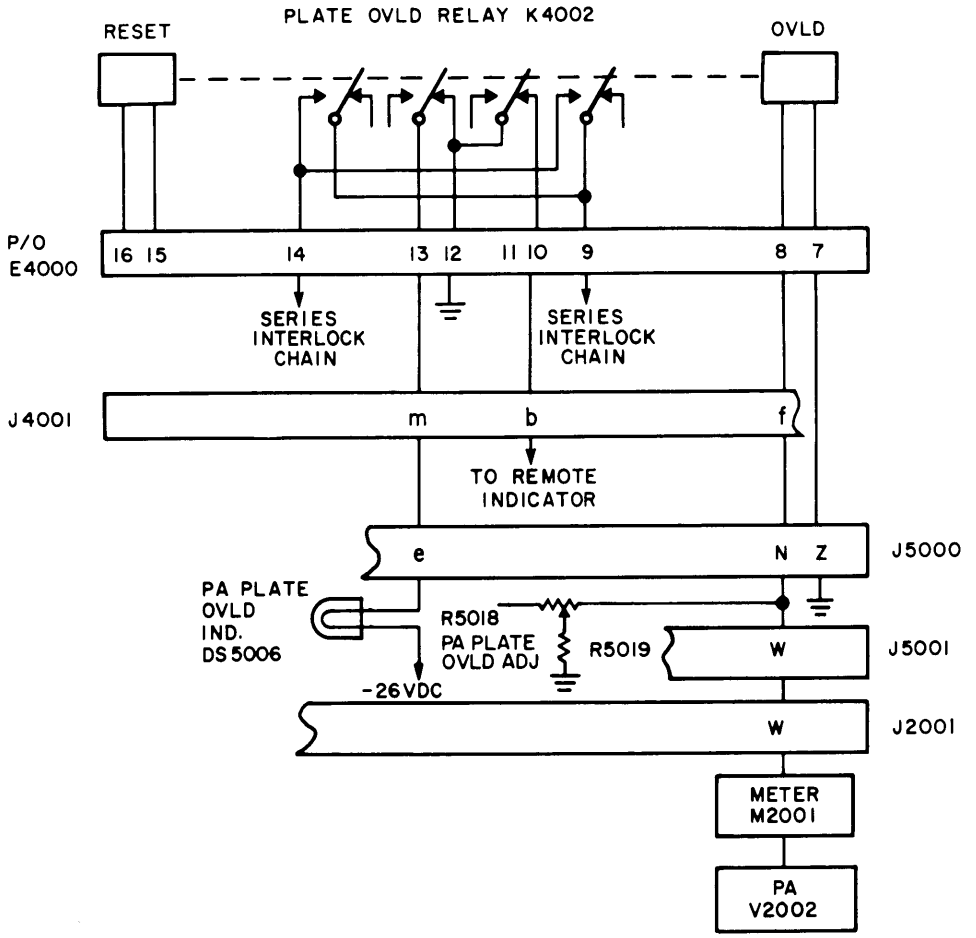


Figure 4-3. Plate Overload Relay K4002

enters the low voltage power supply through pin "N" of J5001 where it goes across PA bias adjust R5001, set for -150 vdc bias. It then passes through the regulator circuit of CR5000 and leaves the low voltage power supply through pin "I" of J5000 and enters the transmitter control panel at pin "e" of J4001 and connects to the coil of relay K4001.

If the PA bias should be removed from the PA tube, the PA bias relay deenergizes and opens the series interlock chain, removing the high voltage. It also lights PA Bias Overload indicator DS5005 located in the low voltage power supply by providing a ground through contacts 4 and 5. Another set of contacts provide a ground for an external overload indicator through pin b of J4001.

d. RESET CIRCUIT OF PA SCREEN AND PLATE OVERLOAD RELAYS (refer to figure 4-5) - The PA screen and plate overload relays are latching type relays, and must be reset after they have gone into the overload condition.

The reset circuit consists of overload reset switch S4003, overload reset relay K4000, the reset coils of K4002, and K4003.

When the overload reset switch S4003 is depressed, a ground is applied to one side of the coil of overload reset relay K4000. The other side of the coil is supplied by a -26 vdc supply from the low voltage power supply drawer. With K4000 energized, phase 2 is able to pass through contacts 8 and 6 of the relay, and go to one side of plate overload relay reset coil, and the screen overload relay reset coil. Since phase 1 is always present at the opposite side of the coils, the relays are then triggered to the reset position. They will remain in the reset position until triggered by an overload condition.

The overload relays may also be reset from a remote position through pin "G", which is connected to remote jack J8003 pin "M".

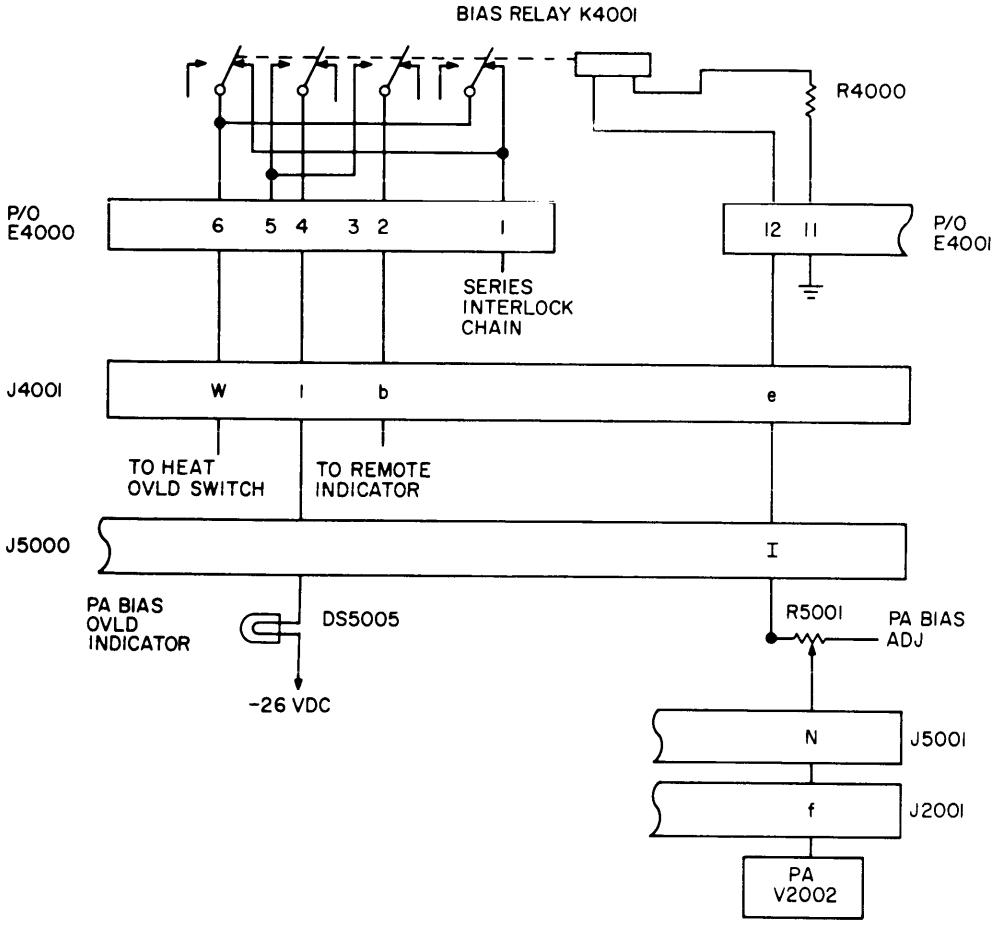


Figure 4-4. Bias Relay K4001

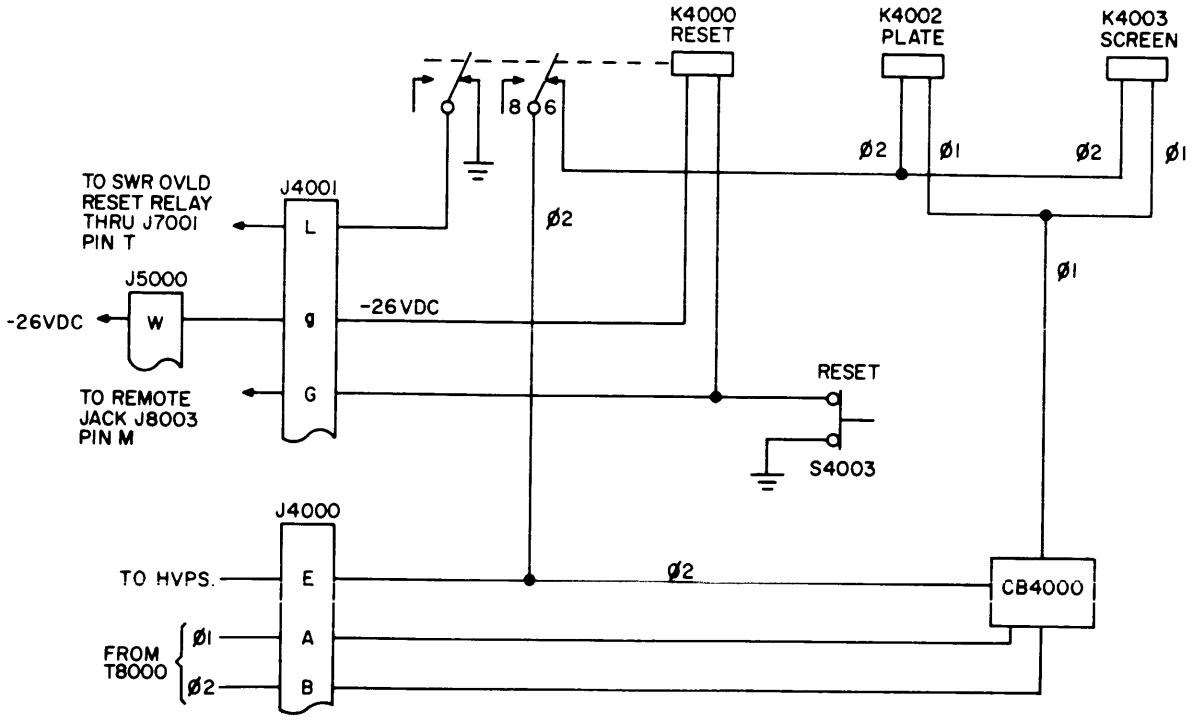


Figure 4-5. PA Plate Screen and SWR Overload Reset Circuit

e. SERIES INTERLOCK CHAIN (refer to figure 4-6) - The series interlock circuit, when opened, removes high voltage from the PALA-2.5K. The overload conditions that will open the circuit are described under PA Plate overload relay K4002, PA Screen overload relay K4003, and PA Bias relay K4001.

The -26 vdc supply voltage enters the Transmitter Control Panel through pin "W" of J4001. It is then routed through contact 6 and 1 of energized PA Bias relay K4001, and is routed through contact 14 and 9 of Plate overload relay K4002, where it is routed to contact 8 of the PA screen relay K4003 and goes out contact 3. From contact 3 it goes through the coil of interlock relay K4004 and passes through CB4001 to ground.

When an overload condition exists, the interlock chain is opened and deenergizes interlock relay K4004.

Under normal operating conditions, phase 2 passes through contacts 1 and 3 of the interlock relay and goes out pin "d" of J4001 to one side of the high voltage contactor K6000 which supplies three phase power to the high voltage power supply.

When phase 2 is removed from K6000, the relay deenergizes, and removes high voltage. In the deenergized condition, a ground is placed on the audible alarm circuit, enabling it to operate.

Under an overload condition, the interlock relay K4004 applies a ground through contact 5. The ground is extended to remote jack J8003 pin "k" through pin "M" of J4001 to light the remote high voltage OFF indicator.

Under normal operating conditions, the interlock relay applies a ground through contact 7 to remote jack J8003 pin "L" to light remote high voltage ON indicator. The ground is extended to remote jack J8003 through pin "c" of J4001.

4-5. PRIMARY AC POWER (refer to figure 4-7)

Three phase primary power enters the PALA-2.5K rack through line filter board A5586. Phase 1 feeds through L8000, C8001, and C8004. Phase 2 feeds through L8001, C8002, and C8005. Phase 3 feeds through L8002, C8003, and C8006. Each of the three phases is then connected to the appropriate input leg of autotransformer T8000. The three phases at 220 vac each, enter the transmitter control

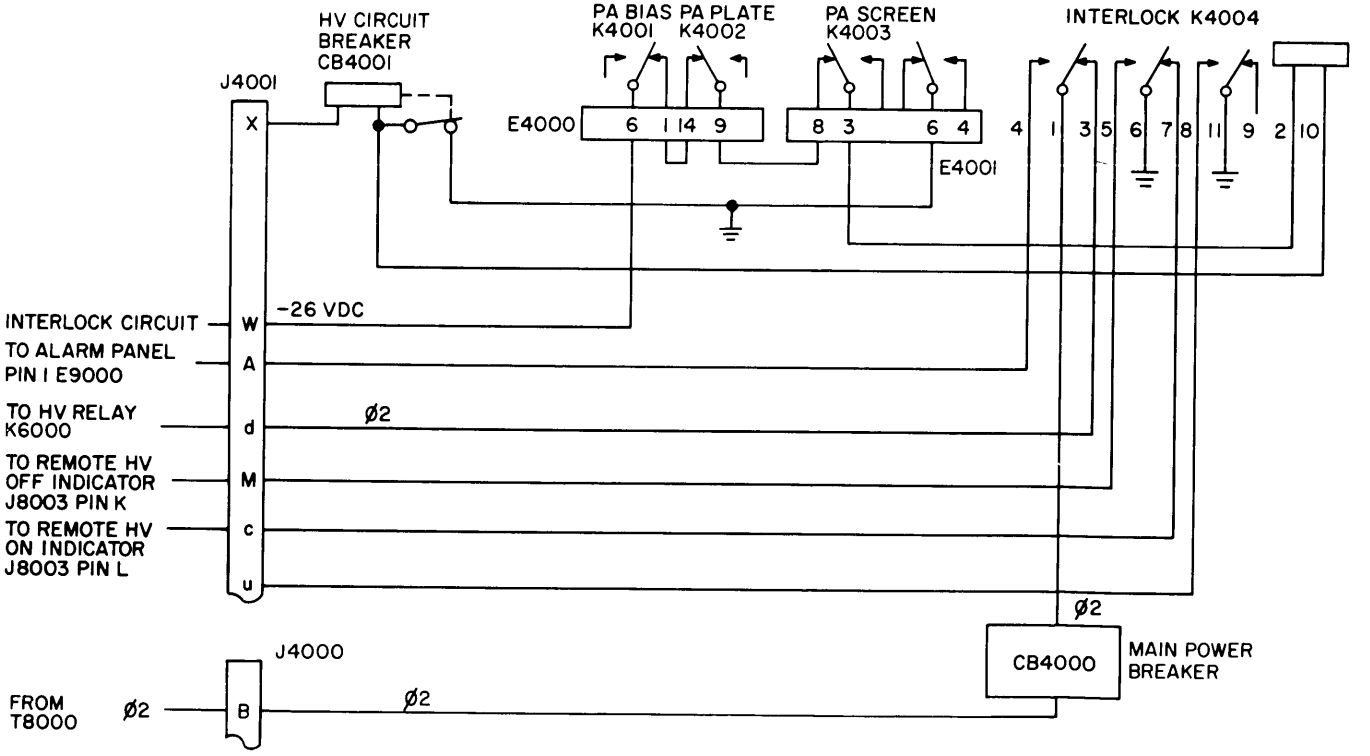


Figure 4-6. Series Interlock Chain

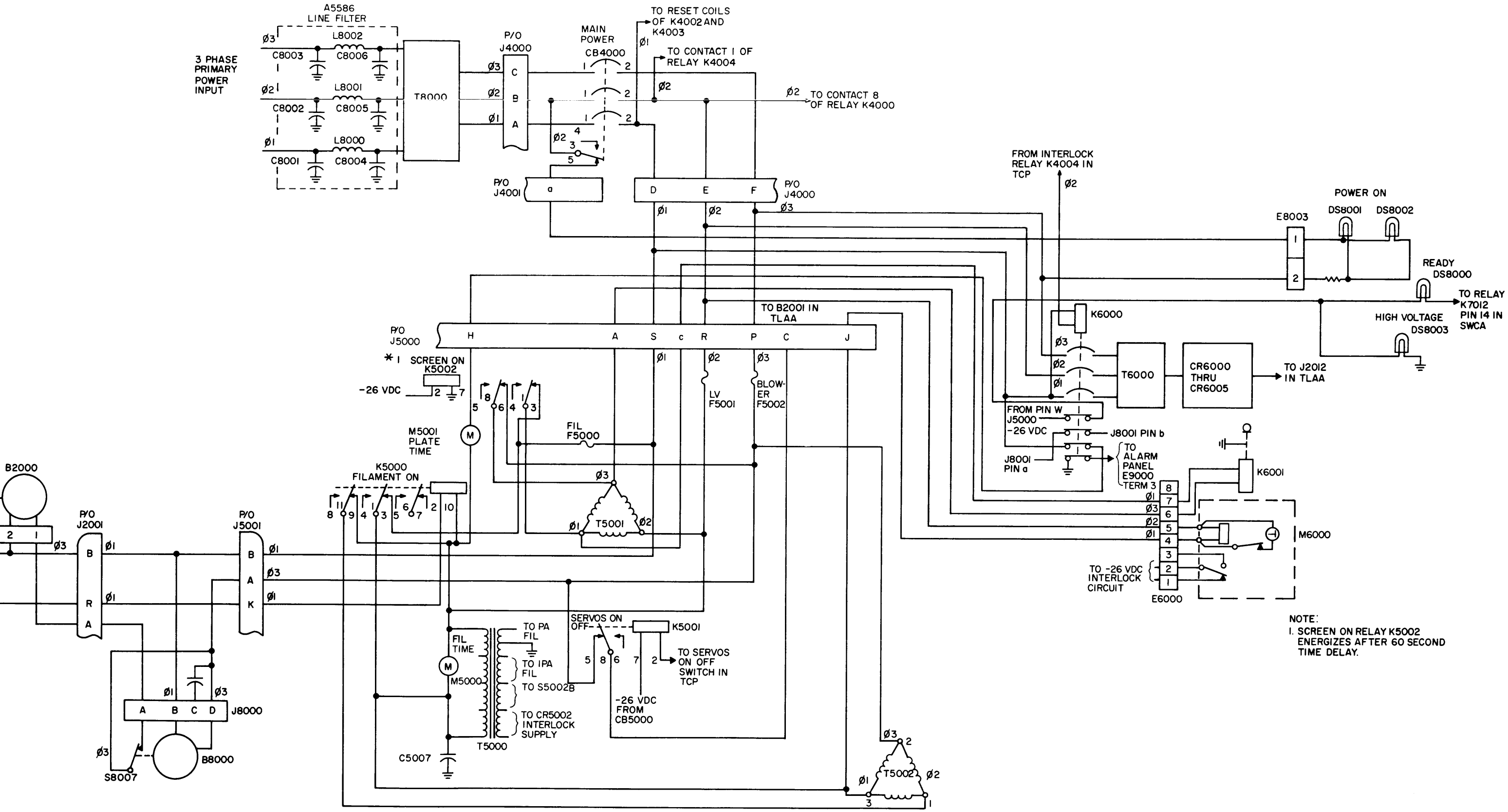


Figure 4-7. PALA-2.5K Primary AC Power

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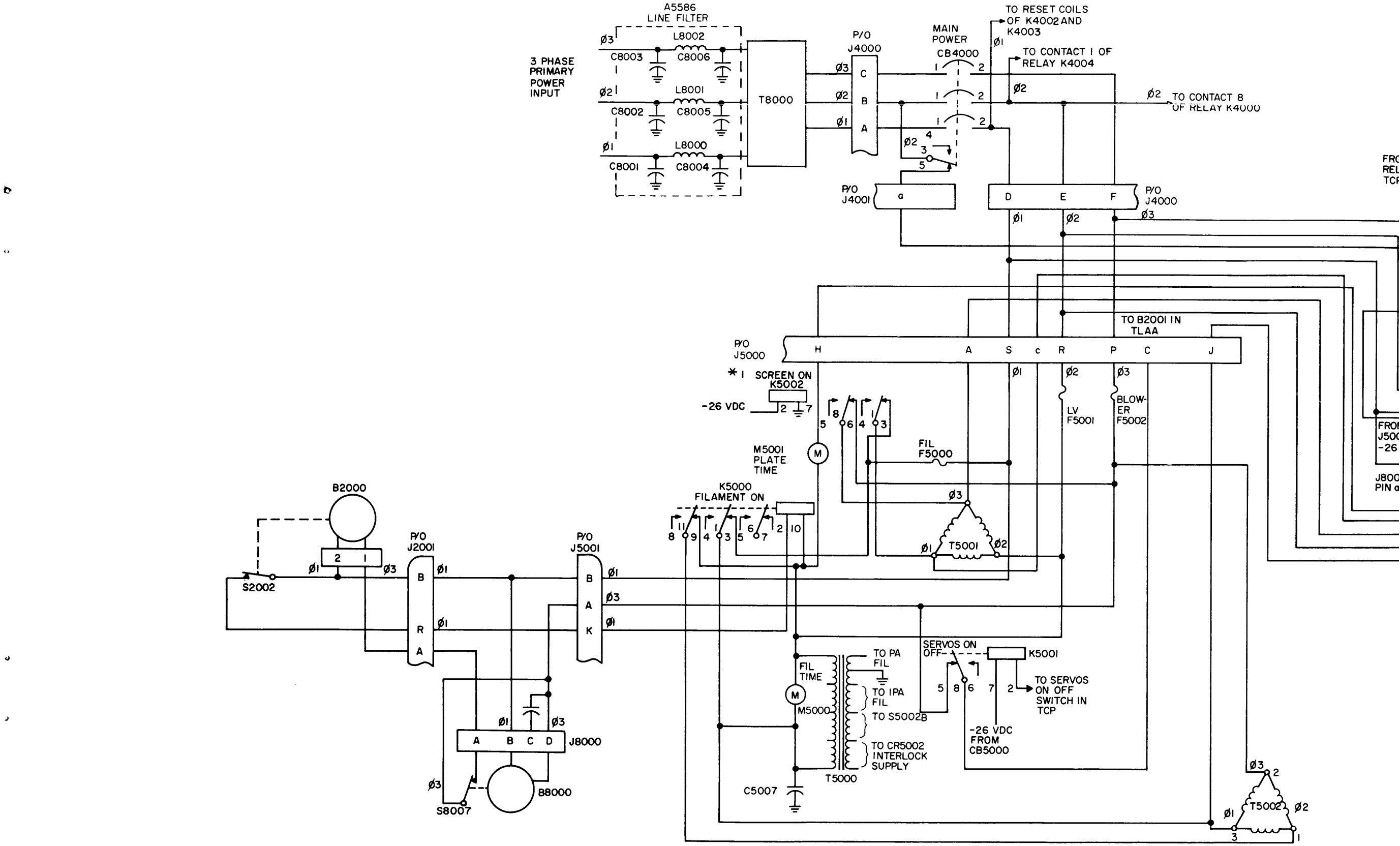

A5586
LINE FILTER
3 PHASE
PRIMARY
POWER
INPUT
Ø3
Ø2
Ø1
L8002
L8001
L8000
C8003
C8006
C8002
C8005
C8001
C8004
T8000
P/O
J4000
MAIN
POWER
CB4000
TO RESET COILS
OF K4002 AND
K4003
TO CONTACT 1 OF
RELAY K4004
TO CONTACT 8
OF RELAY K4000
P/O
J4001
P/O
J4000
TO B2001 IN
TLAA
P/O
J5000
*1 SCREEN ON
K5002
-26 VDC
LV
F5001
BLOW-
ER
F5002
M5001
PLATE
TIME
FIL
F5000
K5000
FILAMENT ON
T5001
B2000
S2002
P/O
J2001
P/O
J5001
J8000
B8000
S8007
FIL
TIME
M5000
TO PA
FIL
TO IPA
FIL
TO S5002B
TO CR5002
INTERLOCK
SUPPLY
T5000
C5007
SERVOS ON
OFF
K5001
TO SERVOS
ON OFF
SWITCH IN
TCP
-26 VDC
FROM
CB5000
T5002

009691009

panel through J4000. Phase 1 enters at pin A, phase 2 at pin B, and phase 3 at pin C. The three phased voltage is then routed through main power circuit breaker CB4000 in the closed position. After passing through CB4000, phase 2 is applied to relay contact 1 of interlock relay K4004 and is also applied to pin 8 of overload reset relay K4000. Phase 1 is applied to the reset coils of K4002 and K4003. The power on indicators, DS8001, and DS8002, light when the main power circuit breaker CB4000 is closed. This closes relay contacts 3 and 5 of CB4000, applying phase 2 voltage through pin a of J4001 to one side of the indicator lamps. The opposite side of the lamps are supplied with phase 3 voltage through pin F of J4000. The power on lamp is the word Technimatic that lights on the front panel of the rack. Phase 1, 2, and 3 leave the transmitter control panel through pins D, E, and F respectively of J4000.

At this point, the primary three phase power is routed to J5000 of the low voltage power supply and to the contacts of K6000 in the high voltage power supply with phase 1 connected to one side of the coil of K6000. The low voltage power supply will be referred to as LVPS in the following paragraphs. The high voltage power supply will be referred to as HVPS in the following paragraphs.

Phase 2 takes two paths, one path is to one side of the coil of the timer in the HVPS, the other path enters the LVPS at pin R of J5000. Phase 3 enters the LVPS, at pin P of J5000. Phase 1 enters the LVPS at pin S of J5000. Inside the LVPS, phase 1 is routed to several components. Phase 1 feeds through filament fuse F5000 to contact 3 of deenergized filament on relay K5000; it also connects to contact 3 of deenergized screen on relay K5002. (See note 1 on figure 4-7.) Phase 1 is routed out of the LVPS through pin B of J5001, where it enters pin B of J8000. From the LVPS it also enters the Power Amplifier section at pin B of J2001 and connects to one side of B2000, through pin 2. Blower B2000 cannot energize until blower B8000 is energized and closes air switch S8007. When phase 3 is applied to pin D of J8000, the blower energizes and closes switch S8007, which allows phase 3 to enter the Power Amplifier section at pin A of J2001 and energize B2000 through pin 1. When B2000 is energized, air switch S2002 closes and allows phase 1 to pass through pin R of J2001, and enter the LVPS at pin k of J5001 and connect to one side of the coil of filament on relay K5000.

When entering the LVPS, phase 2 is applied to several components, after passing through low voltage fuse F5001. Phase 2 is connected to the delta primary of T5001, to the primary of filament transformer T5000, to the coil and contact 9 of K5000. Relay K5000 now energizes. With K5000 energized, phase 1 is applied to transformer T5001 and phases 1 and 2 are applied to the delta primary of transformer T5002. When transformer T5000 is energized, by the application of phase 1 voltage, through the contacts of K5000, ac voltage is applied to the -26 vdc rectifier CR5002, activating the supply. Phase 1 is routed out of the LVPS through pin J of J5000.

After entering the LVPS, phase 3 is applied to several components by-passing through blower fuse F5002. Phase 3 is connected to the delta primary of T5002, energizing it and enabling the PA bias supply CR5000 to operate. Phase 3 connects to contact 6 of deenergized screen on relay K5002, and to deenergized servos on-off relay K5001 contact 8. Phase 3 leaves the LVPS through pin A of J5001 and connects to pin D of J8000 energizing the blower B8000 as explained in a previous paragraph.

After phase 1 leaves the LVPS through pin J, it is routed to the opposite side of the coil of the timer, M6000 in the HVPS, enabling the timer to operate. The timer presents a 60 second time delay that interrupts the -26 vdc interlock circuit. When the 60 second time delay is completed, the -26 vdc energizes the coil of screen on relay K5002 which is part of the interlock circuit. When K5002 is energized, phase 1 and 3 are applied to the delta primary of T5001, enabling the screen supply CR5001 to operate. Phase 1 and 3 at this point leave the LVPS through pins A and c and enter the HVPS. In the HVPS they are applied to the coil of relay K6001, energizing it. When K6001 is energized, the ground is removed from the HVPS.

When all the switches in the interlock circuit are properly closed, the interlock relay is energized, and routes the phase 2 voltage from the transmitter control panel to the opposite side of the coil of K6000 in the HVPS. When phase 2 is applied to K6000, it energizes and enables three phase power to activate the delta wye input transformer T6000.

The filament time meter M5000 is energized when phase 1 and 2 are applied to the meter.

One side of the plate time meter M5001 is connected to phase 2. The opposite side of the meter is connected to phase 1 which is not applied to the meter until K6000 is energized. The phase 1 voltage enters the LVPS at pin H of J5000.

4-6. INTERLOCK CIRCUIT DESCRIPTION (refer to figure 4-8)

The interlock circuit protects the equipment and personnel against harm by keeping the high voltage off until drawers, panels, and covers are closed, and blowers and the timer are operating. The unit contains 12 interlock switches located throughout the rack and drawers. To ensure the closure of each interlock switch, switch S4002, located on the transmitter control panel, monitors each of the 12 positions, and lights indicator lamp DS4000, indicating a closure at each position. The 12 positions are: (1) PS Covers, (2) PA Covers, (3) Air Switch, (4) External, (5) PS Grille, (6) PS Drawer, (7) Filter Drawer, (8) PA Drawer, (9) Rear Panel, (10) Left Panel, (11) Right Panel, and (12) Timer.

The high voltage will go on after the 60 second time delay has taken place, which closes the timer switch, and enables the -26 vdc interlock supply voltage to complete the circuit through the remaining interlocks, to energize the interlock relay K4004, supplying phase 2 to the high voltage relay K6000. Circuit breaker CB5000 in the LVPS must also be closed before the interlock circuit will operate.

The -26 vdc interlock supply voltage from CR5002 takes the following path: It first goes through the normally open contacts of switch S5000, the bottom cover and top cover interlock switches of the LVPS, out pin L of jack J5001, and into the power amplifier drawer through pin S of J2001, through the normally open contact of switch S2001, and the normally open contact of S2000, and out through pin u of J2001 and enters the LVPS at pin u of J5001. It is then routed through energized relay K5000, contacts 6 and 7, and out of the LVPS through pin L of J5000. The -26 vdc then is routed through a filter network consisting of L8109, C8104, and L8101, through pin 2 of E8002, to pin 1 of E8002 and again passing through a filter network consisting of L8100, C8100 and L8108 to the power supply grille, switch S8000 in the normally open position, to the PS Drawer Switch S8001 in the normally open position, to pin 2 of E8009, and then back through pin 1 of E8009, through to the normally open contact of switch S8003, the PA Drawer, to the normally open contact of switch S8004 Rear, to the normally open contact of switch S8005 Left Side, to the normally open contact of switch S8006 Right Side, through to pin 1 of E6000 to the normally open contact of the timer switch and out through pin 2 of E6000. The interlock supply voltage then enters the LVPS at pin K of J5000, through the closed contacts A and B of CB5000, to the coil of K5002 and continuing on through contacts 1 and 4 of deenergized bandswitch relay K5005 and out pin X of J5001, entering the PA drawer through pin X of J2001, to pin 11 of J2005 to the wiper of switch S2005C. At switch S2005C there is a momentary interruption of high voltage until the desired band selection is made. The interlock circuit may therefore be routed through any one of the 9 positions of S2005C, and then go out jack J2005. To describe the interlock circuit path, the -26 vdc will be arbitrarily passed through contact 2 of S2005C and be routed out pin 15 of J2005C to pin b of J2001, and to pin P of J8001. It then enters the SWCA through pin 32 of J7005 and goes to PA interlock switch S7004-C. Here again the 26 vdc is interrupted, opening the interlock circuit. The supply voltage may now pass through any one of 8 positions depending on which band of frequencies has been selected. The interlock voltage is then routed from the wiper to pin 3 of PC266 and goes through contact 9 and 10 of relay K7001 in the reset position to pin F of PC266 to the wiper of Filter Interlock Switch S7004E, where it again may pass through 1 of 18 positions depending on the desired band selected.

For example purposes, the -26 vdc supply voltage will go out contact 18 of S7004E and leave the SWCA through pin 50 of J7005 and pass through pin H of J8005 where it is jumpered to pin Q. From pin Q the -26 vdc is routed through pin 5 of E8005 to pin 2 of E8004, where it is directed through heat overload switch S8008. From switch S8008, the -26 vdc is routed through pin 2 of E8004 and enters the transmitter control panel at pin W of J4001. In the transmitter control panel the -26 vdc is directed through energized bias relay K4001 on contacts 6 and 1, to contacts 14 and 9 of the plate overload relay K4002, to contacts 8 and 3 of Screen Overload Relay K4003 to the coil of interlock relay K4004. The -26 vdc interlock supply voltage then goes through diode CR4000 to the high voltage circuit breaker CB4001 to ground.

4-7. HIGH VOLTAGE POWER SUPPLY (refer to figure 7-5)

The solid-state high voltage power supply provides 5,000 vdc to the plate of the 2.5 kw power amplifier tube.

The 220 vac three phase primary power enters the HVPS through relay K6000 and is applied to the delta primary of T6000 where it is stepped up to 5000 vac by the wye secondary. The output from the secondary of T6000 is then coupled to the full wave bridge rectifier circuit consisting of six solid-state diodes to produce 5000 vdc.

The 5000 vdc output voltage is filtered by a choke input type filter consisting of inductor L6000 and C6000 before it is applied to the PA plate circuit. Resistors R6000, R6001, and R6002 are bleeder resistors.

The HVPS is shorted to ground by the contactor K6001. When phases 1 and 3 are applied to the contactor coil, the ground is lifted off. Contactor K6001 is a protective device and, when deenergized, will short the HVPS output to ground and open relay K6000.

The timer M6000 is also housed in the HVPS compartment. The timer delays the application of filament voltage for 60 seconds after the main power is turned on.

Relay K6000 controls other functions of the PALA-2.5K as well as the primary power: It controls the -26 vdc power supply voltage to ready light DS8000, functions of the TCSA circuitry, application of phase 2 to the plate time meter, and is also part of the screen overload circuit.

When the high voltage is removed, K6000 in the deenergized position applies a ground to the alarm circuit.

4-8. LOW VOLTAGE POWER SUPPLY (refer to figure 7-4)

The low voltage power supply provides operating and control voltages throughout the power amplifier system. The LVPS contains the PA bias

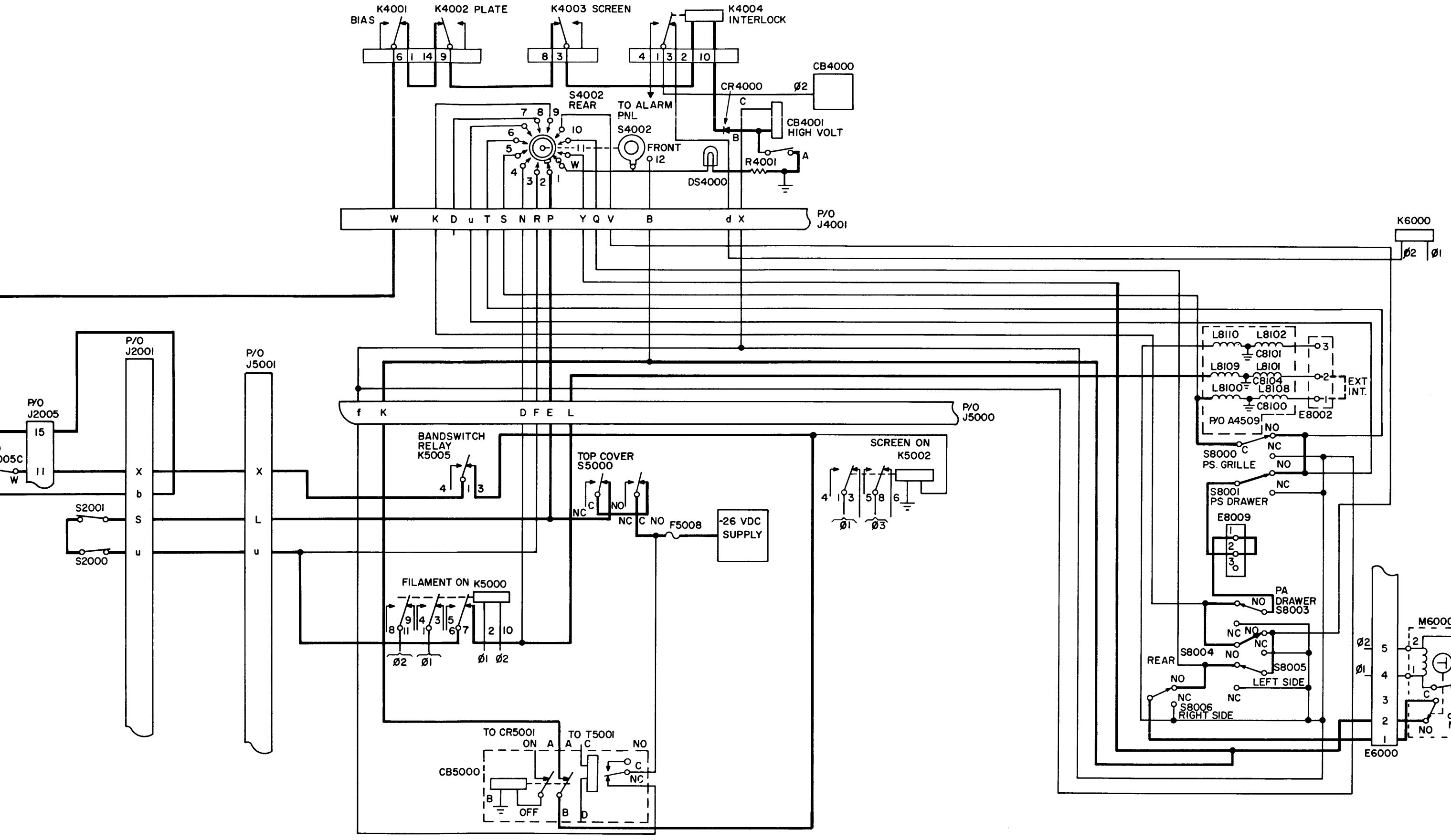
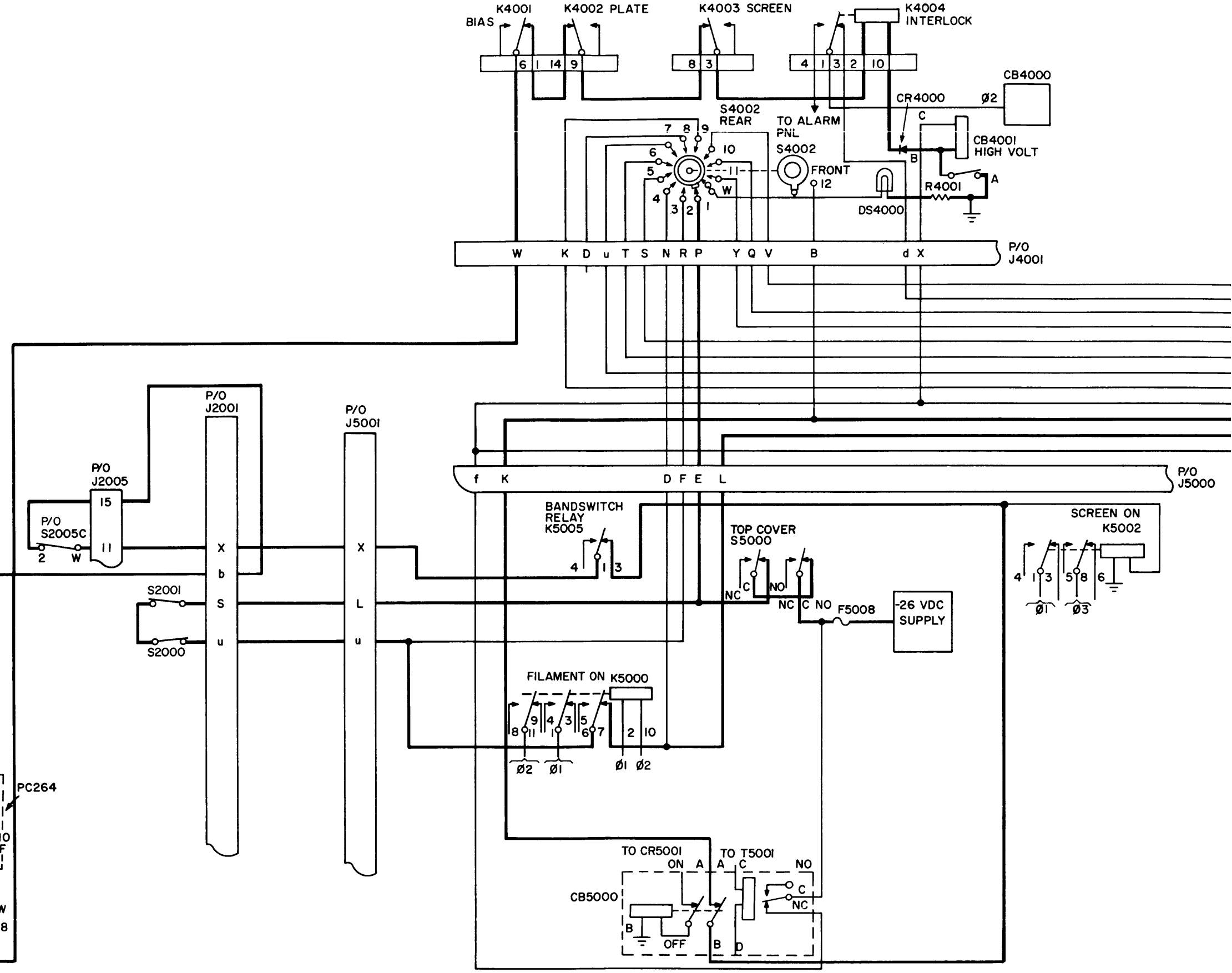


Figure 4-8. PALA-2.5K Interlock Circuit


K4001
BIAS
K4002 PLATE
K4003 SCREEN
K4004
INTERLOCK
6 1 14 9
8 3
4 1 3 2 10
CB4000
CR4000
Ø2
C
S4002
REAR
TO ALARM
PNL
S4002
FRONT
CB4001
HIGH VOLT
R4001
DS4000
7 8 9 10 11 12 W 1 2 3 4 5 6
B
A
W K D u T S N R P Y Q V B d X
P/O
J4001
P/O
J2001
P/O
J5001
P/O
J2005
15
11
P/O
S2005C
2
W
X
b
S
u
S2001
S2000
f K D F E L
P/O
J5000
BANDSWITCH
RELAY
K5005
4 1 3
TOP COVER
S5000
NC C NO
NC C NO
F5008
-26 VDC
SUPPLY
SCREEN ON
K5002
4 1 3 5 8 6
Ø1
Ø3
FILAMENT ON K5000
8 11 9 4 1 3 5 6 7 2 10
Ø2 Ø1
Ø1 Ø2
JUMPER
Q H
J8005
P J8001
E8005
5
50 32 J7005
E8004
2
1
S8008
HEAT
OVLD
S7004C
18
W
C
K7001
PC264
8 9 3 10
F
S7004E
W
18
TO CR5001
ON A
TO T5001
A C NO
C
NC
CB5000
B
OFF
B D

009691009

supply, the PA screen supply, the interlock supply, and the filament supply transformer. Part of the overload circuitry and control relays are also located in the unit.

The primary power application to the LVPS is described under Primary AC Power paragraph 4-5.

a. SCREEN SUPPLY - The low voltage circuit breaker CB5000 is part of the interlock circuit and it must be closed before the amplifier system will operate.

The full wave bridge rectifier CR5001 supplies approximately 800 vdc to the PA screen and 450 vdc to the first IPA and 800 vdc to the second IPA. It also supplies approximately 250 vdc to the screen of the first IPA tube V2000, and approximately 350 vdc to the screen of the second IPA tube V2001. The screen supply receives the 220 vac operating voltage from the delta primary of T5001, and builds it up to the 800 vac level across the wye secondary before it is rectified by CR5001. The supply is protected by circuit breaker CB5000.

The plate supply to the first IPA tube V2000 is filtered by choke L5002 and C5002. The plate supply to the second IPA tube V2001 is filtered by choke L5001 and C5000.

The screen supply is voltage regulated by two OB2 voltage regulators V5001 and V5002 and an OA2 tube V5000.

The plate return for the first and second IPA tubes enter the LVPS through pins F and G respectively of J5001. The screen returns for the first and second IPA tubes enter the LVPS through pins I and E respectively of J5001.

The PA screen return is part of the PA screen overload circuitry and enters the LVPS through pin J of J5001.

b. BIAS SUPPLY - The bias supply CR5000 supplies approximately -150 vdc under SSB modes of operation to the grid of the PA tube and approximately a negative 12-20 vdc to the grids of the first and second IPA tubes.

The bias supply receives the 220 vac operating voltage from the delta primary of T5002 and builds it up to 400 vac on the wye secondary before it is rectified by CR5000. The 400 vdc output is then dropped to the grid supply voltages across the divider network. The supply is protected by bias fuse F5003, and is filtered by choke L5000 and L5001, with two OA2 tubes V5003 and V5004, and an OB2 tube V5005 supplying the regulation.

The first IPA grid bias level is set by potentiometer R5004 and is connected to pin C of J5001 through the wiper arm.

The second IPA grid bias level is set by potentiometer R5007 and is connected to pin H of J5001 through the wiper arm.

One side of the final bias adjust potentiometer R5001, is connected to mode switch S5002 and contact 9 of PTT relay K5004. The wiper of switch S5002 is connected to pin d of J5000, and extends to pin J of J4001 in the transmitter control panel, where it is connected to the manual side of switch S4004. In the manual position, switch S4004 places a ground on switch S5002. When switch S5002 is in the SSB position and switch S4004 is in the manual position, the ground from S4004 is sensed on the grid of the PA tube V2002, reducing the bias and enabling the tube to operate class AB1. The wiper arm of the final adjust potentiometer is connected to pin N of J5001 and extends to the grid of the PA tube V2002.

When switch S5002 is in the CW, FSK position, the ground is lifted from switch S5002 and the ungrounded condition allows more bias and less plate current to make the PA tube operate class C. When the PTT relay K5004 is deenergized, a high bias condition is created, cutting off the PA tube V2002. In an energized condition, a ground is applied to the bias circuit, enabling the PA tube to operate.

c. FILAMENT SUPPLY - The filament transformer T5000 provides 6.5 vac to the filament of the PA tube, 13.8 vac to the filament circuit of the IPA tubes, 5.2 vac to the wiper of switch S5002B and to pin S of filter jack J8005, and 26.5 vac to the interlock supply CR5002.

Application of primary 220 vac power to the primary of transformer T5000 is described under Primary AC Power paragraph 4-5.

The transformer primary has phase 1 and 2 applied to each side with the filament time meter M5000 in parallel with it. The secondary is then tapped off, providing stepped down voltages as described above.

d. -26 VDC SUPPLY CIRCUIT - The -26 vdc interlock supply CR5002 provides the supply voltage for the interlock circuit and control circuits throughout the amplifier. The supply receives its 26.5 vac operating voltage from transformer T5000, and rectifies it through bridge rectifier CR5002. The supply is protected by interlock fuse F5009 and F5008.

4-9. ALARM PANEL (refer to figure 7-3)

The alarm panel serves several purposes. When high voltage is removed from the PALA-2.5K, the audible alarm will sound. It also provides a monitoring point for audio inputs, PA output, and the exciter, through front panel jacks, and the monitoring of the 100 mw trigger, second amplifier tune, second amplifier plate trigger, PA tune, PA plate trigger, PA load through a six position sense switch S9001. Each of the six switch positions should measure from about zero to -1 volt dc.

The alarm DS9001 is powered by -26 vdc from CR5002 in the LVPS through pin B of J5000. It

enters the alarm panel through pin 7 of E9000. The alarm operates when high voltage is removed and the high voltage relay K6000 deenergizes, placing a ground on one side of the alarm panel, through terminal 3 of E9000.

The alarm may be switched ON or OFF by front panel switch S9000.

4-10. BLOCK DIAGRAM DESCRIPTION OF THE PALA-2.5K AUTOMATIC CIRCUITS (refer to figure 4-9)

The PALA-2.5K is a semi-automated, fully automated, or manually operated unit, providing frequency selection in the 2-30 MHz range.

The frequency selection is controlled by the master control wafer, which receives its band selection signals from the associated exciter. The master switch assembly controls the operation of the ledex driven IPA and PA control wafers S2004A and S2005A. The control wafer in the IPA is linked to the IPA bandswitch S2004B and S2004C. The control wafer in the PA is linked to the PA tune switch S2008A and the PA load switch S2008B.

The rf input from the associated exciter at a 100 mw level is applied across a motor driven rf gain resistor R7016. The rf drive motor is controlled by a system of relays receiving feedback signals from the servo amplifiers. The rf signal is applied to the first IPA, where it is amplified and coupled to the second IPA.

The second amplifier servo receives a control voltage from the tune servo amplifier, and a 100 mw signal from the 100 mw trigger resistor R7014. These two signals start the second amplifier servo in the search mode, driving motor B2001, which drives capacitor C2038 to seek resonance. When resonance is approached, a rectified sample of plate voltage is sent to the second amplifier servo that starts it in the operate mode. The phase detector circuit then sends a correction voltage to the second amplifier servo, fine tuning and completing resonance. The second amplifier servo during tuning sends a signal to the drive up relay network in the SWCA, which increases the rf drive and increases the cathode current of the PA tube V2002 to 300 ma. The 300 ma level is determined by the RFPO adjustment on the PA tune servo amplifier. The PA tune servo amplifier then starts in the search mode driving motor B2002, which drives capacitor C2081 to seek resonance. The second amplifier servo is shut off at this time by a 28 volt signal from the PA tune servo amplifier. As resonance is approached, a sample of the PA plate voltage is applied to the PA tune servo through trigger adjust resistor R2028. The plate trigger voltage then stops the PA servo amplifier from searching and places the servo amplifier in the operate mode. In the operate mode a signal is applied to the load servo amplifier from the tune amplifier, placing it in the search mode and driving motor B2003, which drives capacitor C2089 to seek resonance. The PA tune servo amplifier is now controlled by a correction voltage from the phase detector circuit. When the PA load capacitor C2089 approaches resonance, a load sense signal from the master switch assembly is applied to the PA sense board. The PA load sense signal and the PA cathode signal then produce a difference voltage which indicates to the load servo amplifier the PA load capacitor is at resonance. The PA tune and load servo amplifiers then shut off. The unit is then fully tuned, and provides an output power up to 2.5 kw.

A sample of the rf output is routed through the ALDC circuit on the PA sense board, where it is directed to the ALDC wafer switch in the master switch assembly, and then back to the associated exciter. The ALDC circuit aids in providing a relative constant output during high modulation peaks or load changes.

Samples of the sense and trigger voltages are sent to the alarm panel for monitoring purposes.

4-11. AUTOMATIC BAND SELECTION (refer to figure 4-10

a. GENERAL - There are three bandswitching wafers in the PALA-2.5K that are positioned according to the selected carrier frequency. They are the second IPA, PA and harmonic filter bandswitch. The command signal for operating the bandswitches is controlled by the exciter, which can select one of 18 preposition frequency bands. A master control wafer on the SWCA receives the band selection information and drives the associated control wafers to a position corresponding to the selected band.

Program board PC453, used only with TMC exciter, model SME, provides flexibility in channel and frequency selection. For example, the 5-6 MHz frequency may be programmed to appear on channel 2 by placing a jumper from the horizontal channel 2 hole to the vertically aligned 5-6 MHz hole.

b. CIRCUIT ANALYSIS - When a band selection is made by associated exciter, a ground is applied to the master control wafer S7004-A through the programming board. The ground is applied from one of eight bands through J7001 in the SWCA pins U, V, RR, SS, UU, VV, WW, and XX.

In order to automatically activate the master control wafer, the tune switch S4000 in the transmitter control panel must be depressed. When the switch is depressed, a ground is applied to the tune coil of relay K7012, which is part of the automated rf drive relay network in the SWCA. The ground is applied through pin L of J7001. Relay K7012 swings to the tune position when the -26 vdc is applied to the coil. The -26 vdc also flows through contacts 16 and 15 of K7012, to pin J of the control motor, driving the master control wafer S7004A. The master control wafer is driven until the selected band position on the switch creates an open circuit between the motor and the switch.

The second IPA bandswitch S7004B and the PA bandswitch S7004J in the SWCA route the -26 vdc driving voltage from the bandswitch ledex off relay K5003 in the LVPS to the ledex motors of the second IPA bandswitch, and the PA bandswitch through the control wafers S2004A and S2005A, located in the PA drawer. The wiper of S2005A is connected to the bandswitch relay K5005 in the LVPS. When a band selection is made, the interlock circuit is opened by activating relay K5005. Relay K5005 is activated by a -26 vdc passing through the contacts and wiper of S2005A to relay K5005.

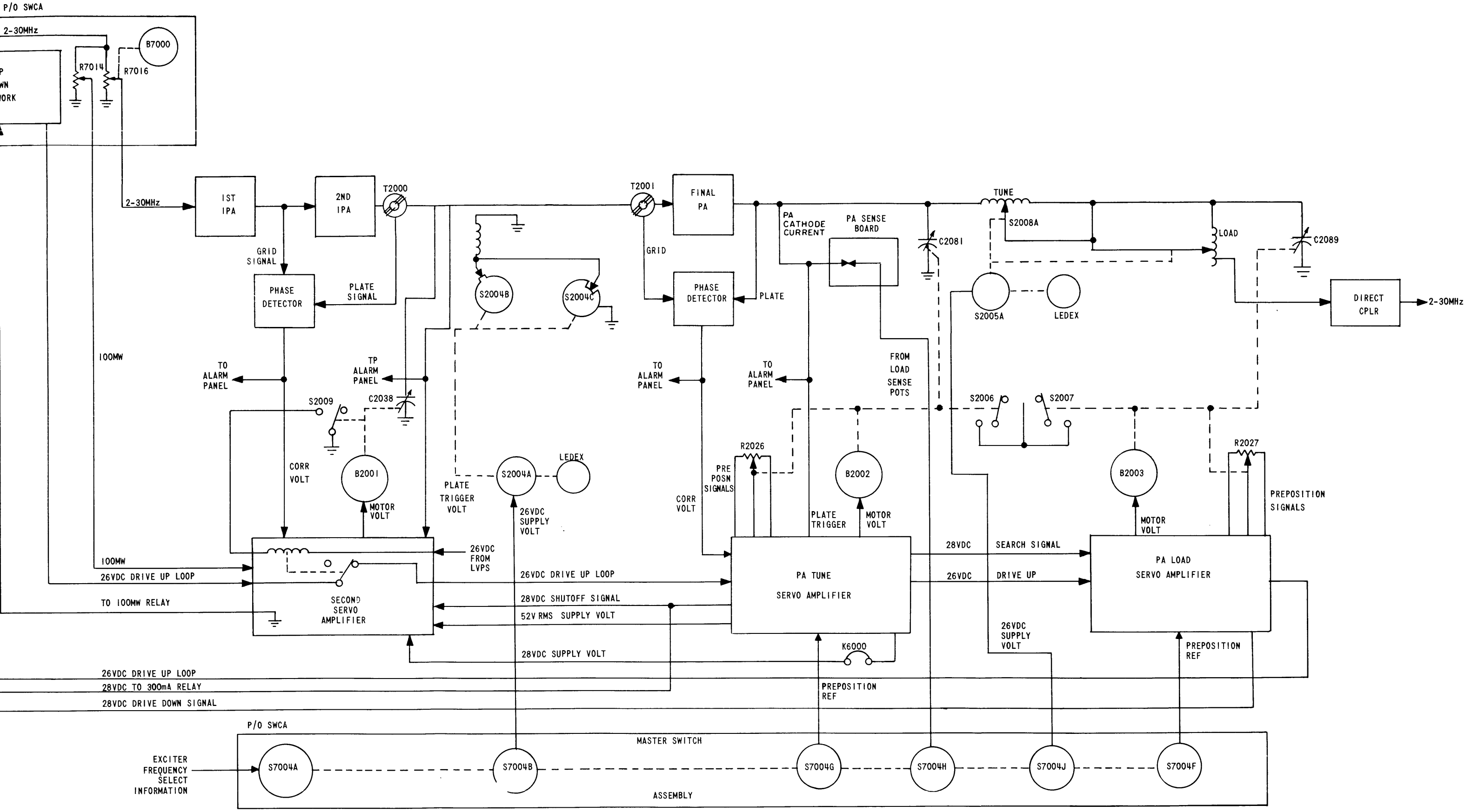
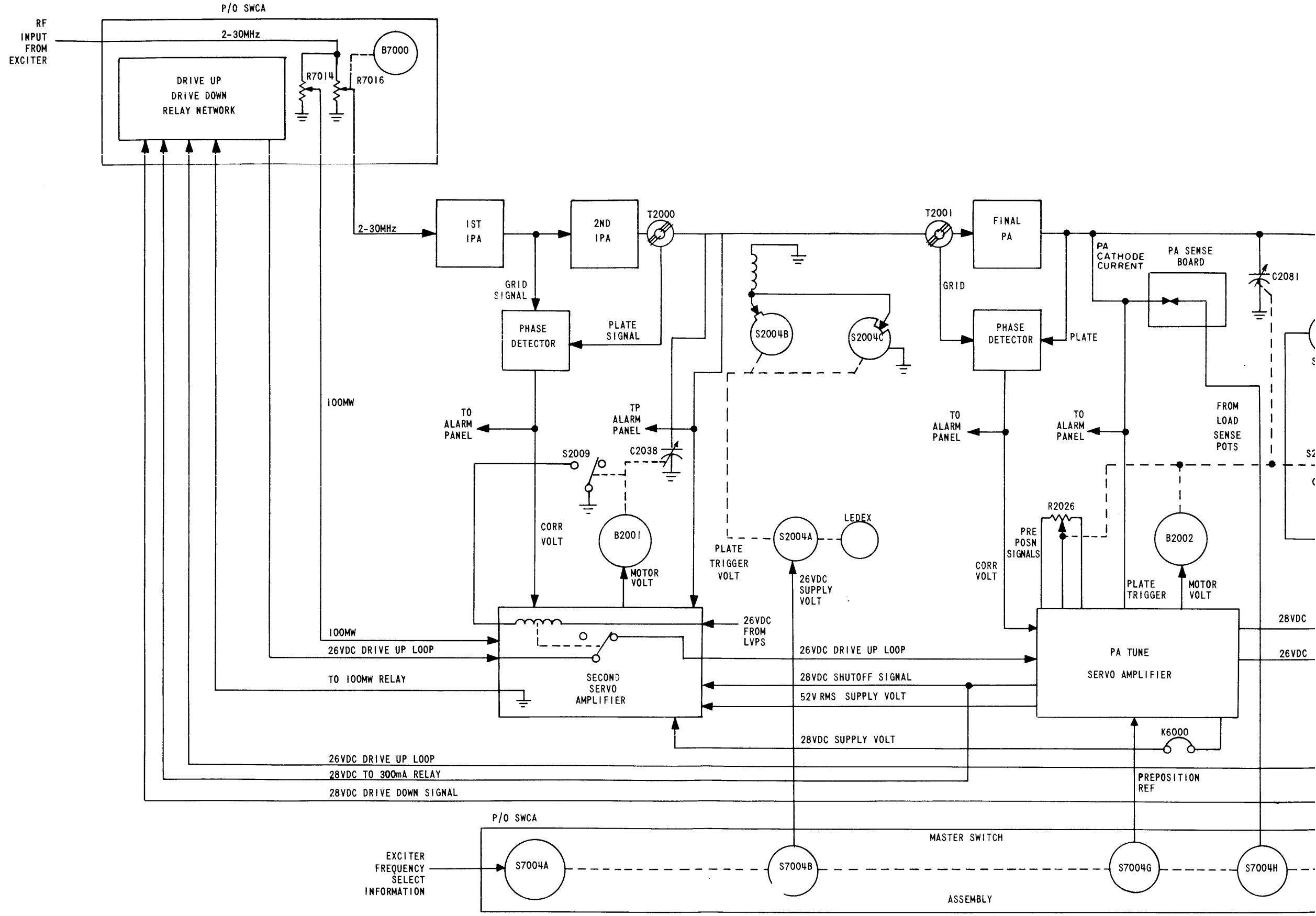


Figure 4-9. Automated Circuits, Functional Block Diagram


P/O SWCA
RF INPUT FROM EXCITER
2-30MHz
B7000
DRIVE UP
DRIVE DOWN
RELAY NETWORK
R7014
R7016
2-30MHz
IST IPA
2ND IPA
T2000
T2001
FINAL PA
GRID SIGNAL
PHASE DETECTOR
PLATE SIGNAL
S2004B
S2004C
GRID
PHASE DETECTOR
PLATE
PA CATHODE CURRENT
PA SENSE BOARD
C2081
100MW
TO ALARM PANEL
TP ALARM PANEL
TO ALARM PANEL
TO ALARM PANEL
FROM LOAD SENSE POTS
S2009
C2038
CORR VOLT
B2001
MOTOR VOLT
PLATE TRIGGER VOLT
S2004A
LEDEX
26VDC SUPPLY VOLT
R2026
PRE POSN SIGNALS
CORR VOLT
B2002
PLATE TRIGGER
MOTOR VOLT
28VDC
26VDC
100MW
26VDC DRIVE UP LOOP
TO 100MW RELAY
26VDC FROM LVPS
SECOND SERVO AMPLIFIER
26VDC DRIVE UP LOOP
28VDC SHUTOFF SIGNAL
52V RMS SUPPLY VOLT
PA TUNE SERVO AMPLIFIER
K6000
28VDC SUPPLY VOLT
26VDC DRIVE UP LOOP
28VDC TO 300mA RELAY
28VDC DRIVE DOWN SIGNAL
PREPOSITION REF
P/O SWCA
MASTER SWITCH
EXCITER FREQUENCY SELECT INFORMATION
S7004A
S7004B
S7004G
S7004H
ASSEMBLY

009691009

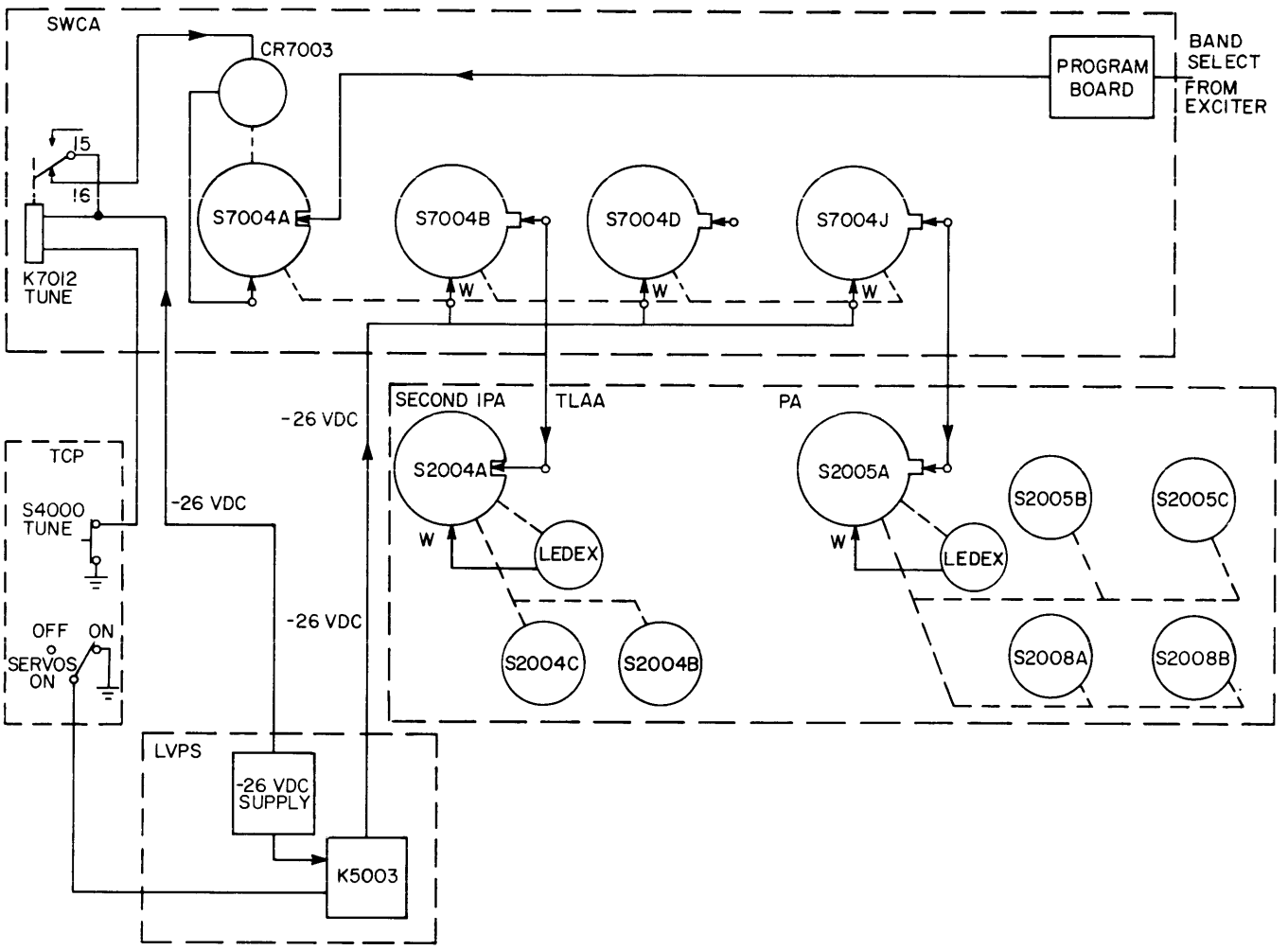


Figure 4-10. Automatic Band Selection

The control wafer for the second IPA S2004A is mechanically linked to bandswitch S2004B and C, and the control wafer for the PA S2005A is mechanically linked to S2005B and C and to the PA bandswitch S2008A, and load switch S2008B.

Filter bandswitch wafer S7004D in the SWCA is used only when a filter is connected in the system. When wafers S7004A-J are at a preselected position in the SWCA, a -26 vdc supply voltage is directed to the wipers of S7004B, S7004C, and S7004D through contacts 1 and 3 of energized bandswitch ledex off relay K5003 located in the LVPS. Relay K5003 is energized when a ground is placed on one side of the coil by servos on switch S4001 located in the transmitter control panel. The -26 vdc is routed to the SWCA through pin 44 of J7005 and is connected to the wipers of S7004B, S7004D, and S7004J. It is then routed to the control wafers of the second IPA and the PA bandswitches, activating the ledex motors, and driving the control wafers to the corresponding position of the selected band by the wafers in the SWCA. The control wafers stop turning at the band selected when an open is created between the master wafer and the ledex motor.

4-12. PRE-POSITIONING CIRCUIT DESCRIPTION (refer to figures 4-11 and 4-12)

To minimize tuning time, the PA tune and PA load capacitors are pre-positioned at a predetermined setting for each frequency in the range of 2-30 MHz.

When power is applied to the servo amplifiers, the units automatically begin operating in the pre-position mode. Phase 3 is applied to each of the servo motors.

The tune servo amplifier supplies a -20vdc to pre-position read back potentiometer R2026. The signal at the arm of R2026 is a dc voltage analog of the setting of PA tune capacitor C2081 in the range of 0- -20 vdc. A pre-position reference signal is derived from voltage divider circuits connected to switch S7004G in the SWCA. There are

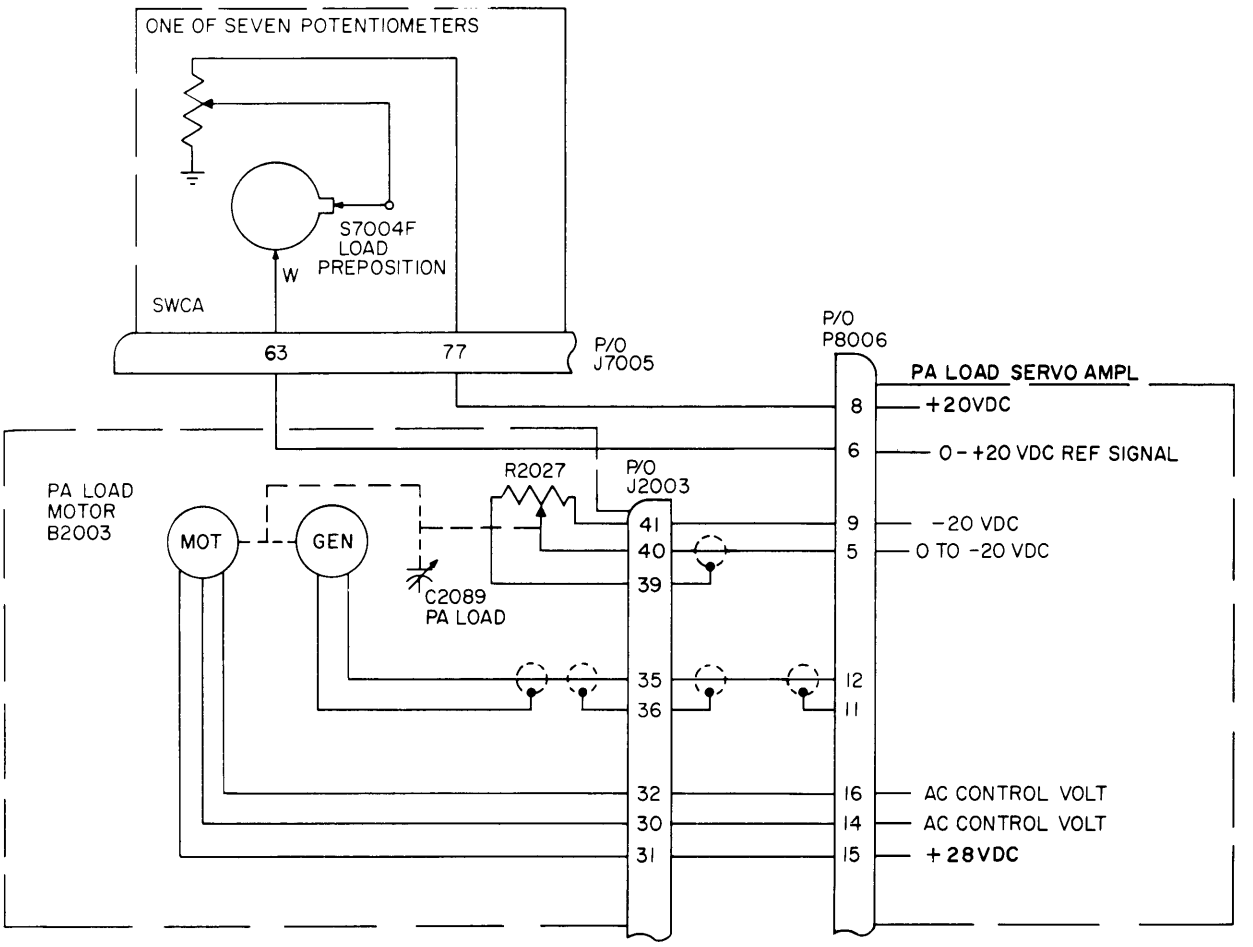


Figure 4-11. Simplified Schematic of PA Load Servo Pre-Position

three voltage divider circuits covering the 18 switch positions over the 2-30 MHz frequency range. When a frequency is selected, a +20 vdc reference signal is sent back to the tune servo amplifier. The tune servo amplifier then sends a signal to servo motor B2002, driving capacitor C2081 and R2026. When the pre-position read back signal from R2026 balances out the reference signal, tuning capacitor C2081 is then at the proper setting for the selected frequency.

The PA load capacitor C2089 is pre-positioned in the same manner as described for the PA tune capacitor. The only exception is the load servo amplifier receives its pre-position reference signal from one of 7 potentiometers that are preset and connected to the load pre-position wafer S7004F in the SWCA. Read back resistor R2027 in this case is balanced out by the pre-position reference voltage from the load pre-position wafer S7004F in the SWCA. When the balance voltage is reached, capacitor C2089 is then stopped at its pre-positioned setting.

Activation of either limit switch S2006 or S2007, will cause the PA tune and PA load servo amplifiers, to recycle back to the preposition mode, repeating the search and operate sequences.

4-13. LOAD SENSE AND ALDC SWITCH CIRCUIT DESCRIPTIONS (refer to figure 7-6)

The load sense switch S7004H is connected to the sense board in the PA drawer. The load sense switch has three potentiometers connected to the switch. Each potentiometer is preset to correspond to a band of frequencies in the 2-30 MHz range, for each of the 18 switch positions. When the PA cathode current and the load sense reference signal produce a difference voltage, the antenna output is at resonance and the servo amplifiers shut off.

The ALDC switch S7004I is connected to three potentiometers. Each potentiometer is preset to correspond to a band of frequencies in the 2-30 MHz range for each of the 18 switch positions. The ALDC output from the PA is then connected to the

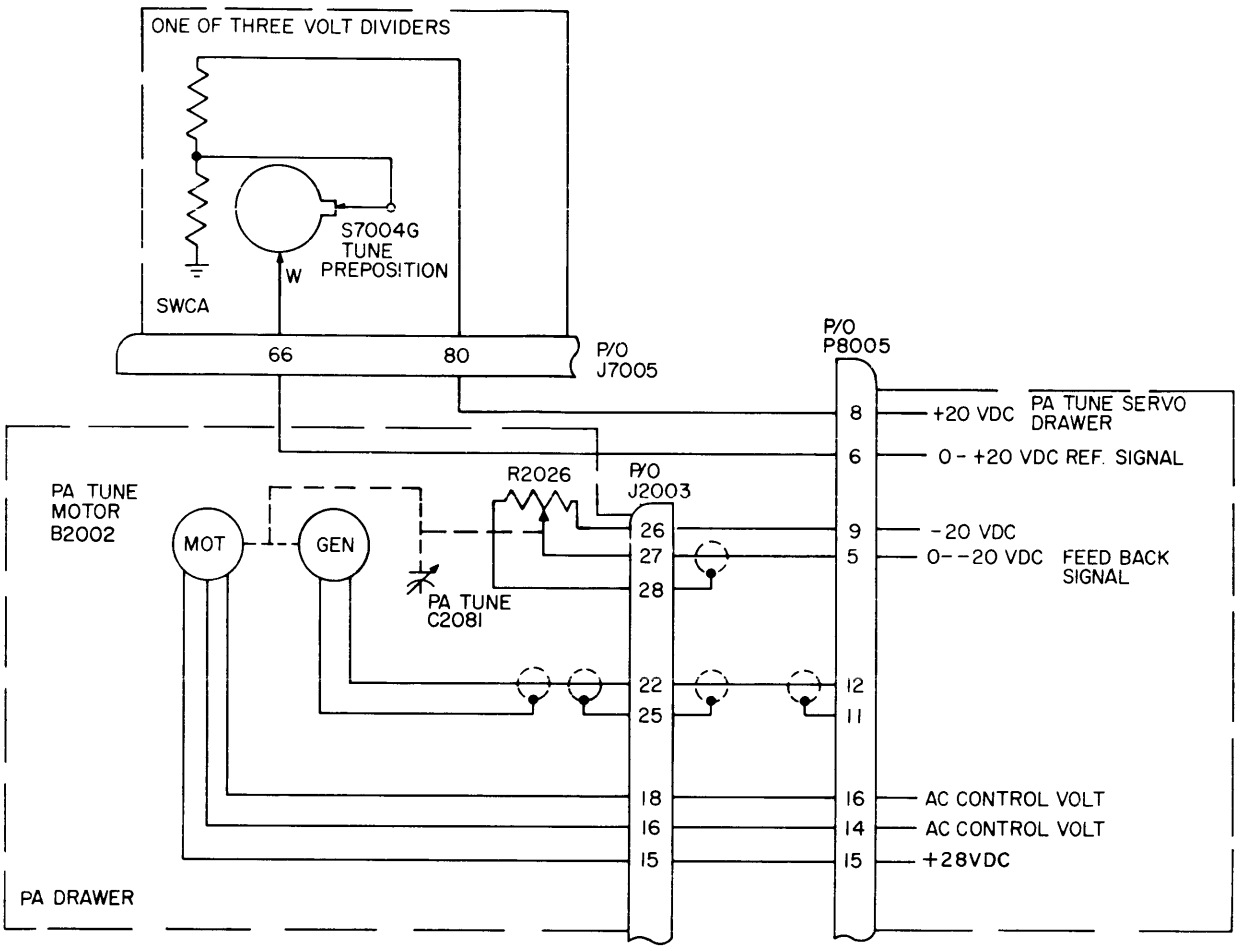


Figure 4-12. Simplified Schematic of PA Tune Servo Pre-Position Circuit

potentiometer circuit, which sends back to the exciter a signal of a different level for each band selection.

4-14. AUTOMATIC TUNING AND LOADING (refer to figures 4-13 and 4-14)

a. GENERAL - The PALA-2.5K is a servo controlled automated unit. The automated functions may be broken down into three functional areas: automatic bandswitching, servo operated IPA and PA tuning, and a motor driven rf drive control, operating in conjunction with the servo amplifiers, and the upper and lower limit settings of the PA output meter.

In order for automatic tuning and loading to be performed, three signals must be present. They are: (1) frequency range information, (2) tune command signal, and (3) rf excitation. The frequency range signal is applied through the master control wafer in the SWCA. The master control wafer then positions the second IPA and PA bandswitches to the frequency selected by the associated exciter.

To enable automatic tuning and loading functions, the High Voltage circuit breaker must be closed. The tune servo amplifier then supplies a 28 volt dc signal to the second amplifier servo through a set of auxiliary contacts on the HV contactor, K6000, in the HVPS.

Several switch positions on the transmitter control panel must also be set before auto-operation can take effect.

The auto/man switch S4004 must be placed in the auto position. When the switch is in auto, the ALDC output is disabled, and a ground placed on pin 6 of exciter jack J8002, and pin R of remote jack J8003.

In auto, the servos on-off relay K5001 in the LVPS is deenergized, enabling phase 3 to be supplied to the servo motors.

Phases 2 and 3 are routed to connectors E8000, and E8001, of the TCSA, before they are distributed to the PA tune and PA load servo amplifiers, pins 18 and 19 of P8005 and P8006.

The servos on switch S4001 must be in the Servos On position, placing a ground on bandswitch ledex off relay K5003. Relay K5003 supplies -26 vdc to CR7003, driving the master control wafer and providing the energizing voltage for drive motor B7000.

Two controls on the PA output Meter M7000 maintain the upper and lower limits of the PALA 2.5K output. When either of these two limits is reached, the output of a photo-electric cell is interrupted, positioning relays in the SWCA on PC267, which in turn control the operation of drive motor B7000.

b. CIRCUIT DESCRIPTION - The rf input from the exciter enters the SWCA at J7003, and is routed through diode CR7001, where it is rectified and applied across level adjust resistor R7014.

The signal is adjusted to a 100 mw level before it is passed through pin Y of J7001 and applied to the second servo amplifier. The control circuits then automatically adjust the rf gain resistor R7016 to the proper level, with the rf signal being coupled to the first IPA stage through J7004 to J2000 in the TLAA.

To initiate the second servo amplifier (hereafter referred to as AZ110)into the search mode, the following three signals must be present at P8004. The PA tune servo amplifier (hereafter referred to as AZ112) delivers a 52 vrms signal from pins 24 and 25 of P8005 to P8004, pins 18 and 19, of AZ110. AZ112 also delivers a 28 vdc signal from pin 29 of P8005 to pin 29 P8004 of AZ110, through the auxiliary contacts of the HV contactor K6000 located in the HVPS. The third signal, as stated before, emenates from the 100 mw trigger resistor R7014 and is applied to pin 6 of P8004 in the AZ110. The AZ110 is now supplied with its supply voltages and a trigger signal to enable it to perform. The AZ110 servo motor B2001, now begins to search in one direction, and drive capacitor C2038 to seek resonance.

The second IPA tuning capacitor is connected to a cam, when the cam rotates, switch S2009 opens and closes controlling a relay within the AZ110, by applying a ground through pin 5 of P8004. A -26 vdc enters the AZ110 through pin 8 and is applied to the coil of the relay. When the relay is energized the second amplifier plate trigger signal at pin 3 is shorted out, and a -26 vdc circuit from pin K of J7001 in the SWCA, sees an open circuit at pin 21 of of P8004. This condition means the capacitor is operating on the undesired portion of the cam. When the ground is lifted by S2009, the plate trigger signal enters pin 3 of P8004, and is applied to the relay amplifier circuitry within the AZ110.

The drive up circuit in the SWCA is then activated by a ground applied at pin 23 of P8004, to pin PP in the SWCA. The -26 vdc circuit is also closed with the voltage routed to pin 33 of AZ112 from pin 22 of AZ110. It is then routed out pin 28 of AZ112 to pin 21 of the PA load servo amplifier, (hereafter referred to as AZ111). The signal is then routed to pin NN of J7001 in the SWCA from pin 10 of AZ111, to supply -26 vdc to the drive up relay.

The plate trigger signal at pin 3 of AZ110 switches the AZ110 from the search mode to the operate mode. As resonance is approached, the phase detector circuit compares the phase relationship between the grid and plate of the second amplifier stage, and supplies a correction voltage to pin 1 of AZ110.

The drive up condition in the SWCA now has increased the rf gain through R7016 sufficiently to produce a PA cathode current of 300 ma. The 300 ma level is determined by the setting of the RFPO adjustment on the AZ111. The AZ111 then sends a 28 vdc signal from pin 13 of P8005, to pin A of J7001 in the SWCA stopping the drive up condition. It also sends a 28 vdc signal to pin 13 of AZ110 to deenergize it. The RFPO now places the AZ111 into the search mode, driving motor B2002, which drives capacitor C2081 to seek resonance, in a direction of decreasing capacitance. As resonance is approached a rectified sample of PA plate voltage is applied to pin 21 of P8005, through trigger adjust resistor R2028 in the TLAA. The trigger signal stops the AZ111 from searching, and sets it in the operate mode. A 28 vdc signal is then applied to pin 32 of the AZ111 from pin 32 of P8005. The AZ111 goes then to the search mode, and drives motor B2003 which drives capacitor C2089 to seek resonance.

The AZ112 is now controlled by the correction voltage from the phase detector circuit in the TLAA, which is supplied to pin 1 of P8005.

The AZ111 continues to search until the load sense signal on the arm of the load sense potentiometer used for the particular operating frequency, and the PA cathode current produce a zero voltage.

The operate light will then come on and a 28 vdc signal from pin 32 will be supplied to pin E of J7001 in the SWCA.

In the SWCA there is a six second time delay presented by relay K7014, the drive down relay is then energized after five seconds, reducing the rf drive to minimum. The drive down relay is then deenergized and the rf drive is increased by the drive up relay to the preset power output setting. The AZ111 and AZ112 meanwhile have shut off after the five second time delay, since tuning had been completed. The relays in the SWCA switch over to the power output condition and the ready lamp comes on.

4-15. AUTOMATIC DRIVE CONTROL

a. GENERAL - The PALA-2.5K rf drive control is motor driven. The motor increases and decreases the rf drive in response to a network of relays, receiving feedback signals from the servo amplifiers. Preset upper and lower power limits on the PA output meter determine the minimum and maximum drive levels. Should the PALA-2.5K fail to tune in the specified amount of time, a fault indicator will light on the front panel of the SWCA.

The rf drive dircuit will be described in four functions: drive-up, drive-down, operating rf drive, and power output.

(1) DRIVE-UP (refer to figures 4-13, 4-15, and 4-16) - Initially, motor B7000 is deenergized and the rf gain potentiometer is at zero. Switches S7002A and S7002B, linked to the motor, are in the normally open position. Switch S7003 is also linked to the motor but it remains in the normally closed position unless the motor is driven too far. The exciter rf input enters the SWCA at J7003 and is routed through diode CR7001, where it is rectified and applied across level adjust resistor R7014. The signal is adjusted to a 100 mw level before it is passed through pin Y of J7001. The signal is then routed to the alarm panel for monitoring, and to the second amplifier servo.

When the tune button is depressed on the front panel of the transmitter control panel, a ground is applied to the following relays, latching them into

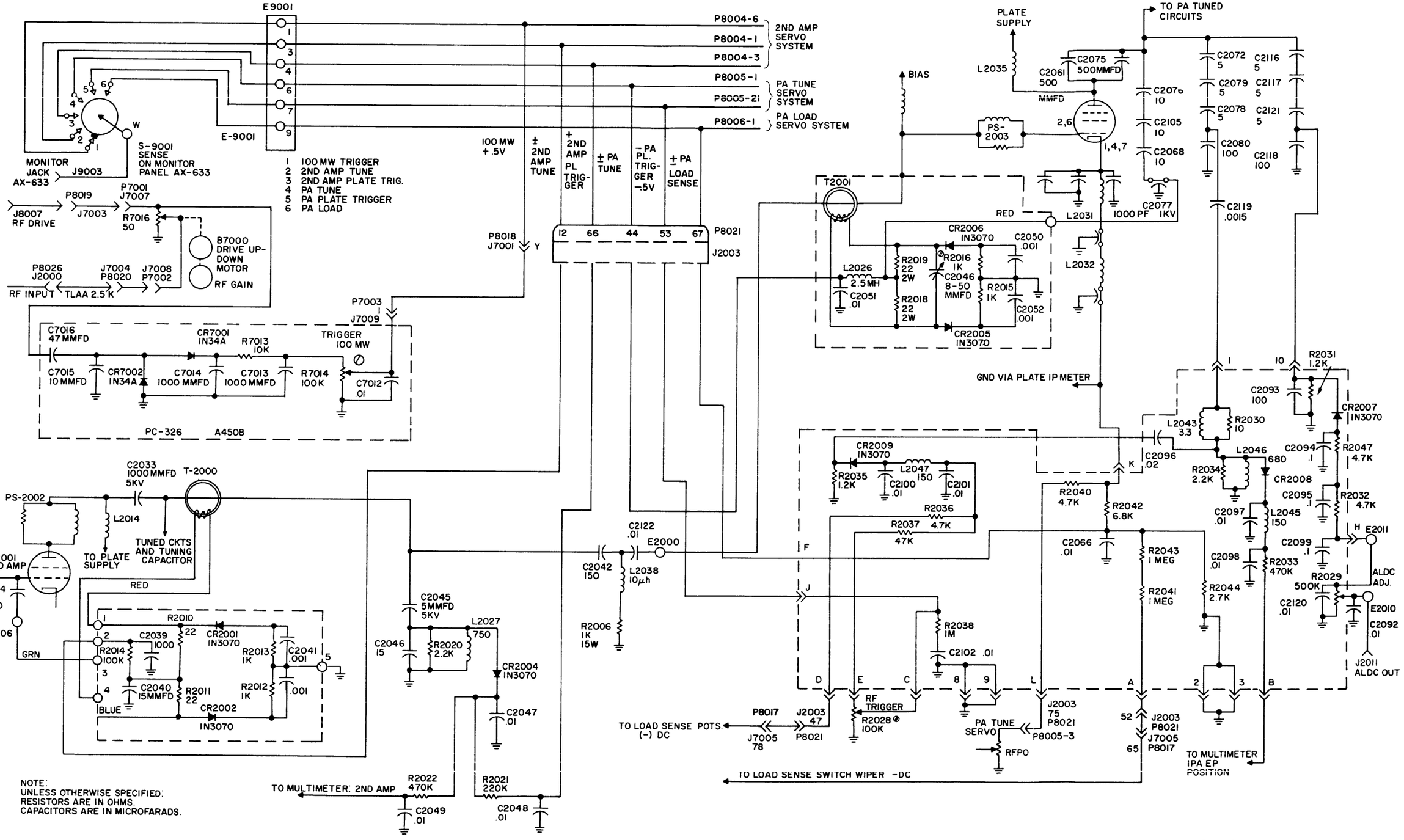


Figure 4-13. Simplified Schematic of Sense Circuits

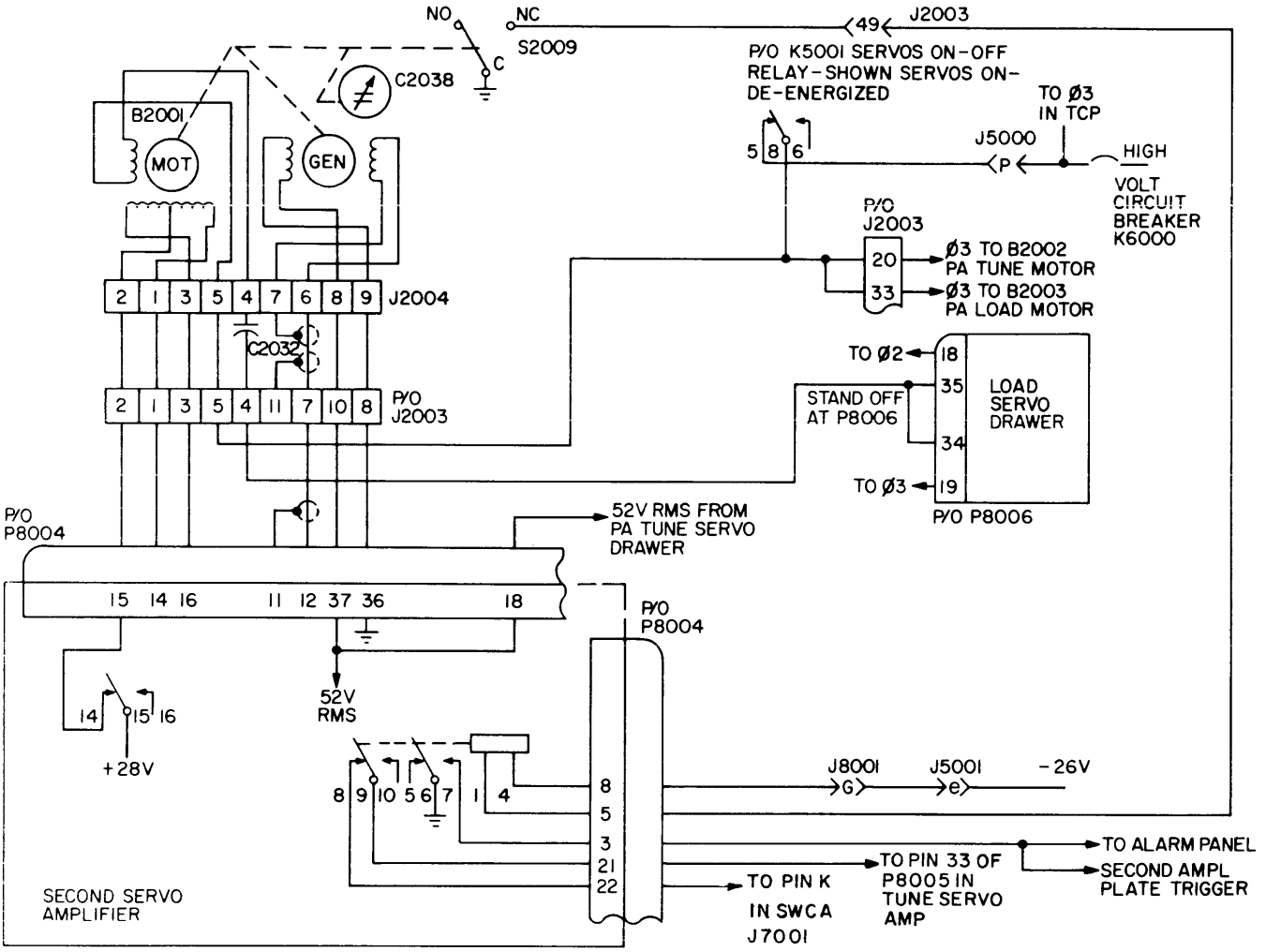


Figure 4-14. Simplified Schematic Second Amplifier Servo Motor Connections and Circuit

the following positions: K7011, K7012, the tune position; relay K7009 reset; K7010 energized for approximately 5 seconds and then will deenergize; relay not shown in above referenced figures (see figure 7-6, sheet 1 of 2); K7008 contacts 9 and 10 will close.

If the rf drive is of the correct level, a ground will be applied to relay K7003, latching the relay in the 100 mw position. The ground path is from the second servo amplifier, through pin PP of J7001, through S7002A in the normally open position, to contacts 6 and 7 of K7003. The -26 vdc then passes through the relay contacts of K7003, K7004, and K7012, leaving the SWCA through pin K of J7001 and entering the second servo amplifier. The -26 vdc supply voltage is then routed back to pin NN of J7001 in the SWCA from the load servo amplifier. The supply voltage is routed to the drive up relay K7005, energizing it. The voltage path is through normally closed switch S7003, to the relay contacts of K7009, K7008, to K7005. With K7005 energized, the -26vdc is applied to motor B7000. A ground is applied to B7000 through de-energized drive down relay K7006. The motor drives the rf gain resistor R7016 up, increasing the drive level.

The rf drive is increased until a 300 ma cathode current is reached in the final PA tube V2002. A signal from the tune servo amplifier is then routed to relay K7004 in the SWCA, placing it in the 300 ma position. The signal enters the SWCA at pin A of J7001. With relay K7004 in the 300 ma position, contacts 5 and 6 open, and interrupt the -26 vdc supply that energizes the drive up relay K7005. With relay K7005 deenergized, the supply voltage to motor B7000 is removed, deactivating it. The relay network in the SWCA is now in the following position; K7003 - 100 mv, K7004 - 300 ma, K7005 deenergized, K7006 deenergized, K7008 contacts 9 and 10 make, K7009 - reset, K7011 - tune, K7012 - tune. S7002A and S7002B are now in the normally closed position.

(2) DRIVE DOWN (refer to figure 4-17) - The PALA-2.5K will go into the operate mode after the PA and the antenna output circuits are at resonance. When resonance is reached, a signal from the load servo amplifier is routed to pin E of J7001 in the SWCA. Time delay relay K7014 interrupts the signal for approximately six seconds, before allowing it to be applied to the operate coils of K7011 and K7009. After the six second time delay relays K7011 and K7009, go to the operate condition. The -26 vdc supply voltage is then directed through the following path: the relay contacts of K7009, to the coil of the drive down relay K7006, the -26 vdc is also routed through

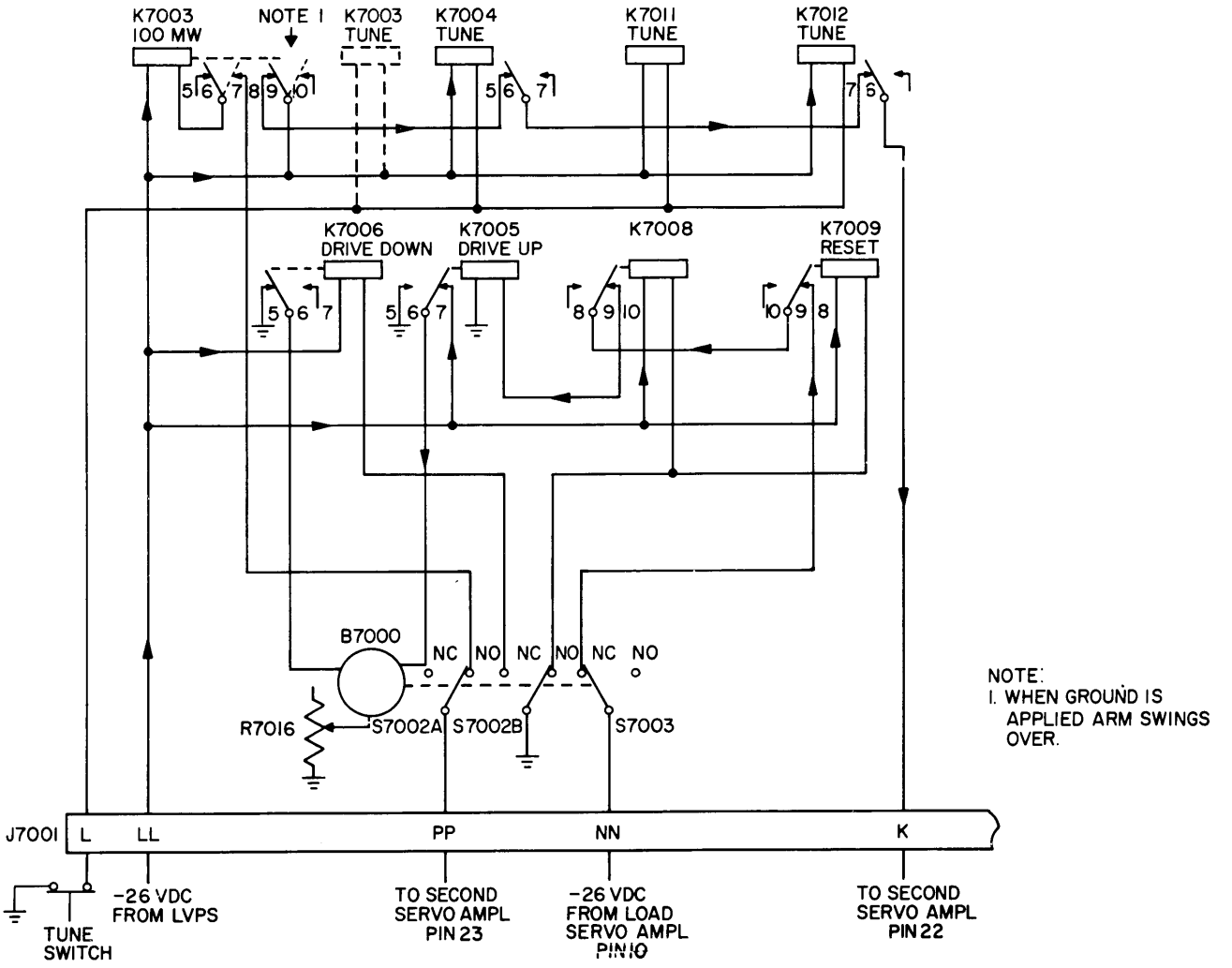


Figure 4-15. Simplified Schematic of Drive Up Condition

through contacts 12 and 13 of Z7000, and then to the coil of K7006. A ground is placed on the opposite side of the coil of K7006 through switch S7002B in the normally closed position, and enables the drive down relay to energize.

When the drive down relay K7006 is in the energized position, the -26 vdc is able to pass through the contacts of K7006 to motor B7000. The ground is placed on B7000 through the contacts of drive up relay K7005. The drive motor B7000 then drives down the rf gain resistor to the minimum rf level. At this point, switch S7002B places a ground on the reset coil of K7009, opening the supply voltage path to the drive down relay, deenergizing it and removing the supply voltage to the motor.

(3) OPERATING RF DRIVE CONDITION (refer to figure 4-18) - When the drive down relay returns to the deenergized position, the -26 vdc is able to pass through the contacts 12 and 13 of K7011 in the operate position to contacts 8 and 9 of the drive down relay. It is then applied to contacts 22 and 23 in Z7000 and returns to contacts 11 and 12 on the drive down relay, where it is directed to contacts 6 and 7 of K7012 in the tune position. The supply voltage then passes through pin K of J7001 to the second amplifier servo, returning to pin NN of J7001 from the load servo amplifier and is directed to drive up relay K7005, energizing it. The voltage path is through K7009 in the reset position, contacts 9 and 10 of K7008 to K7005.

The rf drive motor then drives the rf gain resistor to the preset power output setting on the PA output meter, where the relay swings from contact 23 to 21 on Z7000, opening the supply voltage path to the drive up relay and stopping B7000 from operating.

Contacts 15 and 16 of K7011 in the operate condition place a ground on the SSB mode position of switch S5002 in the LVPS through pin P of J7001. (See figure 7-6, sheet 1 of 2.) The ground performs the same purpose as it did in manual operation. The ground is sensed on the grid of the

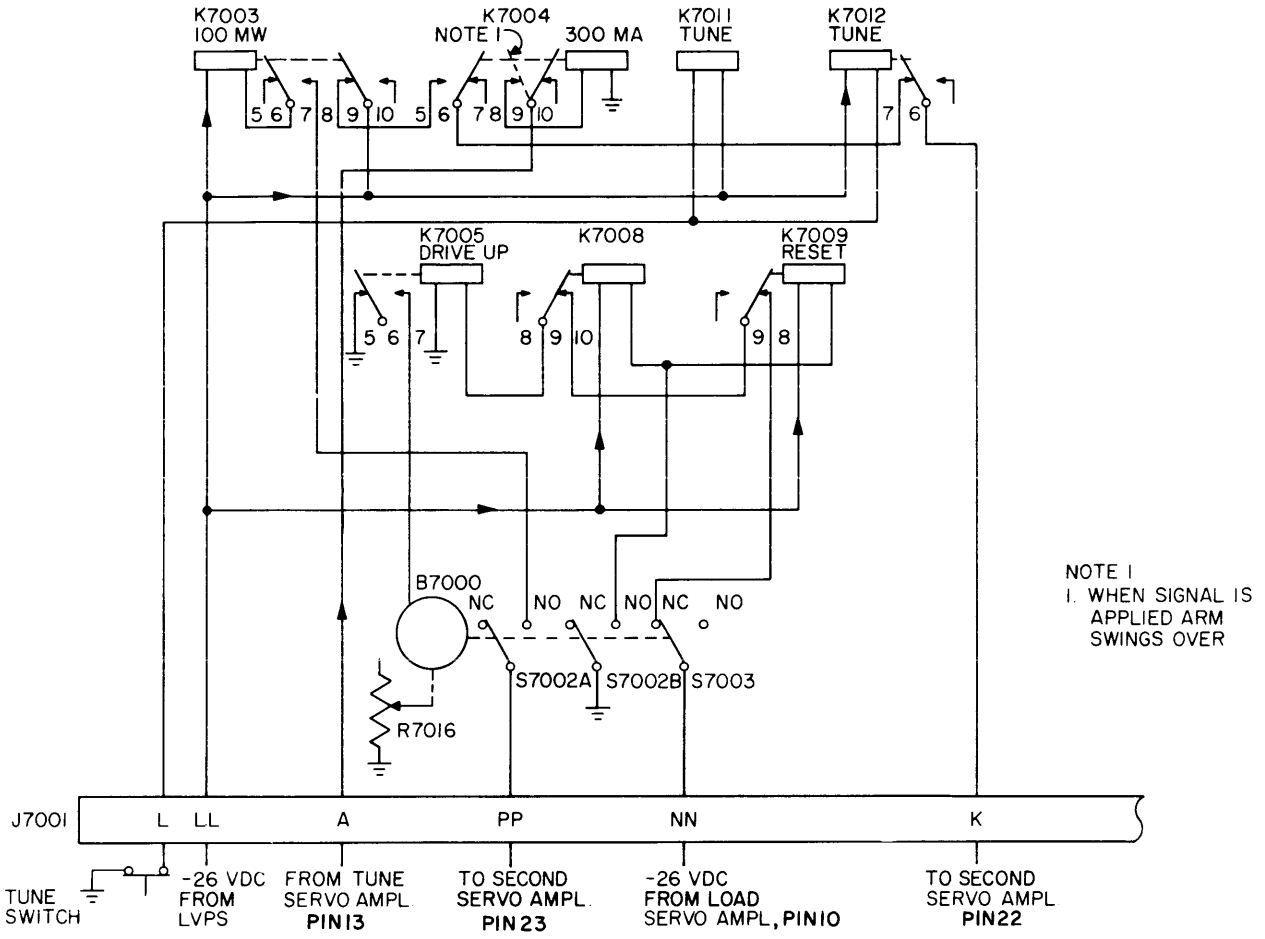


Figure 4-16. Simplified Schematic of Drive Motor Stopped at 300 MA PA Plate Current Condition

PA tube V2002, reducing the bias and making the tube operate class AB1.

Contacts 9 and 10 of K7011 and contacts 14 and 15 of K7006 form part of the PTT circuit. The circuit is connected in the SWCA at pin 79 of J7005 through K7011, through pin W to E8005 to pin f of J5001 to PTT relay K5009.

(4) POWER OUTPUT CONDITION (refer to figure 4-19) - When the relay in the PA output meter Z7000 swings to contact 21, the -26 vdc is sent to the coil of Power Output relay K7012. The contacts of relay K7012 then swing over and latch toward the power output coil. In this position, the -26 vdc goes through contacts 14 and 15 to pin N of J7001, lighting the ready indicator DS8000 on the front panel of the rack, contacts 8 and 9 are connected to remote jack J8003, contacts 6 and 7 open, interrupting the -26 vdc supply circuit, and contacts 11 and 12 lift the ground off the ALDC output circuit, enabling it to function.

4-16. SERVO OFF RELAY AND FAULT CIRCUIT (refer to figure 7-6, sheet 1 of 2)

Relay K7010 presents an approximate six seconds time delay to allow the servo motors time to recycle. Initially, the relay is energized when the tune switch is depressed. The relay remains energized for about six seconds by the time delay circuit connected to the coil, consisting of R7005, CR7006, and C7011. In the energized condition, a ground is placed on servos on-off relay K5003 in the LVPS through pin F of J7001. When this occurs, K5003 energizes, removing the supply voltage to the servo motors. Contact 6 of K7010 is in parallel with pin 6 of K7011. When K7011 is in the operate condition, a ground is placed on relay K5003, energizing it and removing the supply voltage to the servo motors.

Contacts 8 and 9 form part of the fault circuit of the SWCA, by linking the -26 vdc from contacts 15 and 16 of K7012 to the multivibrator circuit

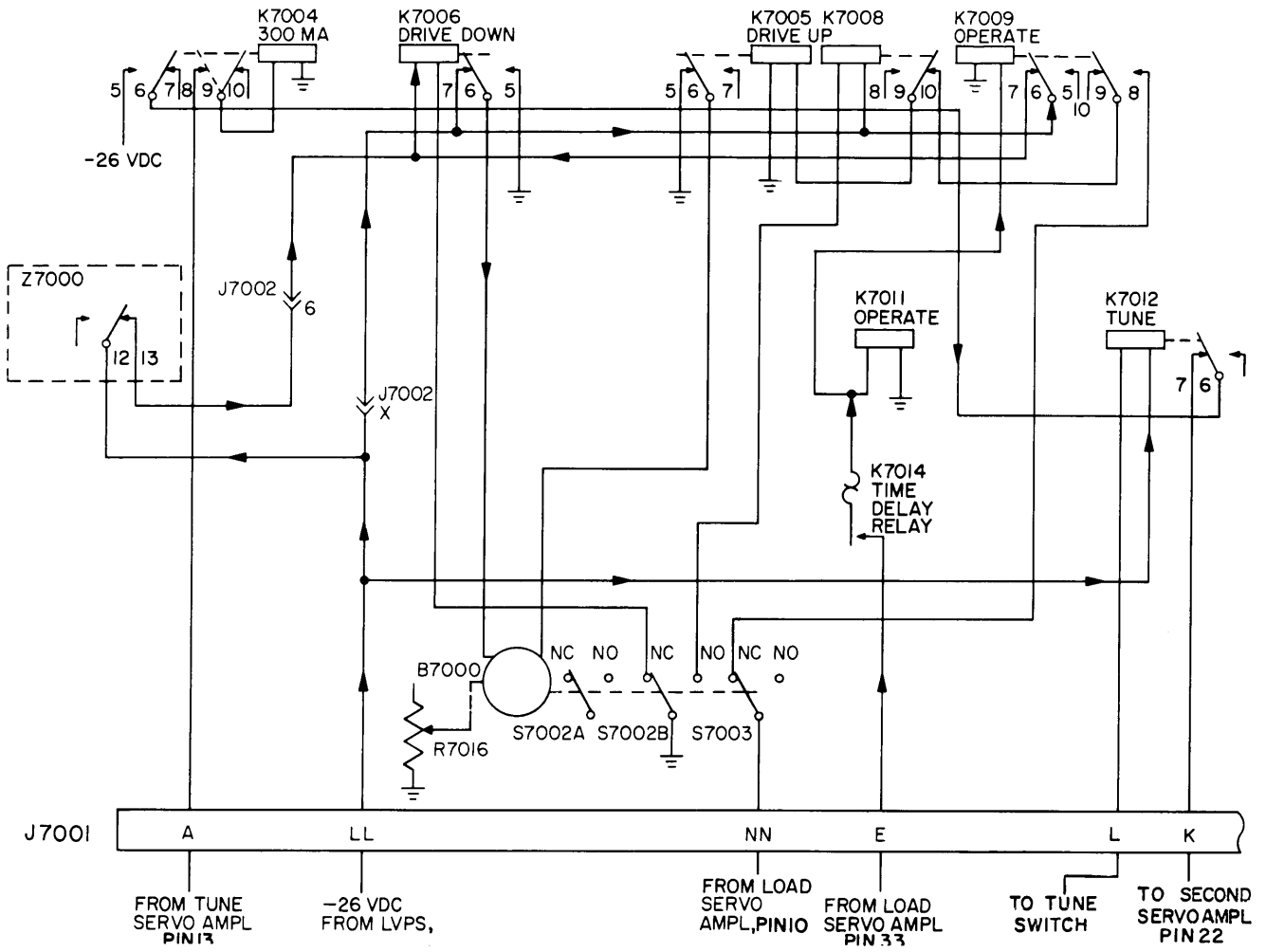


Figure 4-17. Simplified Schematic of Drive Down Condition

on PC266. Resistor R7019 is set for about 60 second time constant between R7019 and C7018. If the tuning time should go beyond the set limit, relay K7013 will energize and light the fault lamp DS7002, and also energize relay K5003, removing the supply voltage to the servo motor.

Relay K7002 is part of an optional antenna switching circuit.

4-17. SECOND AMPLIFIER SERVO, AZ110 (Refer to figure 4-20 and 4-24.)

a. GENERAL - The AZ110 supplies control voltage to the second rf amplifier tuning motor. The servo amplifier has two modes of operation, search and operate. Each of these modes are discussed in sequence.

(1) SEARCH - A 100 mw trigger signal from pin 6 of connector 17-70370 hereinafter referred to as P8004 is applied to pin 1 of connector DB25S, of the relay amplifier. A 28 vdc signal from the PA tune servo is routed through pin 29 of P8004 and is applied to pin 1 and 7 of relay K1. Pin 4 of DB25S senses a a ground and starts current flowing through relay K1 making it energize. Contacts 12 and 13 of K1, hold the relay in the energized position (through ground). Contacts 6 and 7 of K1 route the 28 vdc to the search lamp enabling it to light. Contacts 9 and 10 of K1 place a ground on pin 23 of P8004, which is connected to the SWCA, pin PP of J7001. The 28 vdc from pin 29 of P8004 is also applied to the 100k resistor, and is directed to contacts 16 and 15 of K1. The motor speed is controlled by the resistor in parallel with the 100 k resistor. This resistor is grounded at one end through pin 7 of P8004. From contact 15 of K1, the signal is directed to contacts 14 and 15 of deenergized relay K2, and routed to pin 1 of the servo amplifier connector DA15S. The servo motor is then able to start turning in one direction by the applied ac voltage from pins 8 and 15 of the servo amplifier connector DA15S. The 28 vdc also is routed to pin 8 of DB25S to enable the K2 amplifier circuit. The application of 1/4 volt plate trigger from pin 3 of P8004, to pin 10 of DB25S enables a ground to be seen at pin 7 of DB25S allowing the K2 relay to energize. Contacts 12 and 13 of K2 hold the relay energized (through ground).

(2) OPERATE - When relay K2 is energized the motor is switched from fixed voltage control from within the amplifier to the dc correction voltage developed by the sensing circuit.

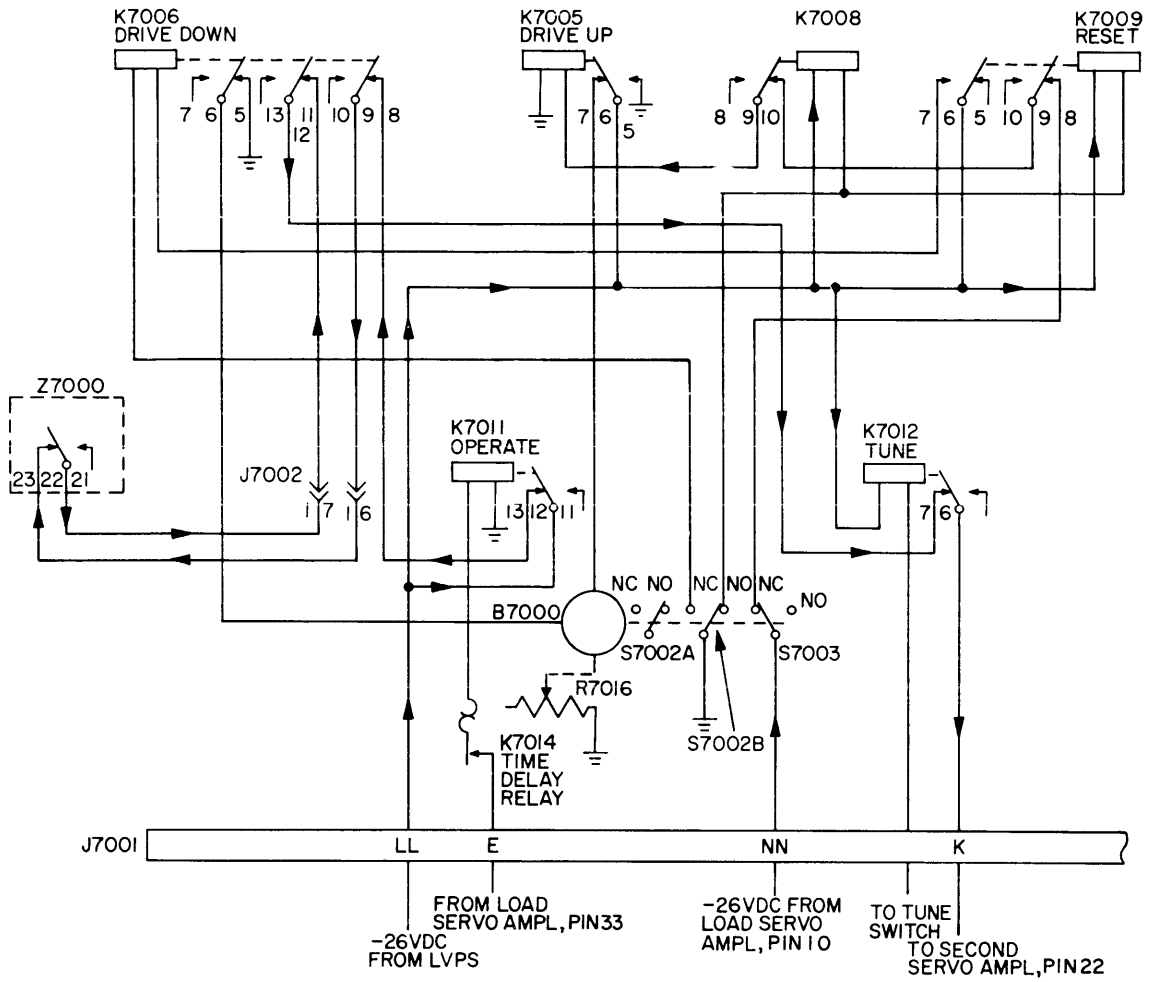


Figure 4-18. Simplified Schematic of RF Drive Operating Point Condition

Contacts 16 and 15 of energized relay K2 enable the sensing circuit signal from pin 1 of P8004, to be routed to pin 1 of the servo amplifier connector DA15S.

When the sensing circuit signal diminishes to zero, the ground is removed from pin 16 of the relay amplifier connector DB25S, which deenergizes relay K3. The 28 vdc is then able to be routed through contacts 6 and 7 of K2, to contacts 11 and 12 of K3 to the operate lamp enabling it to light.

As the sensing circuit signal diminishes to zero,the AC voltage from pin 8 and 15 of the servo amplifier diminish to zero, stopping the servo motor.

Relay K4 is energized when the PA tune servo amplifier goes to the search mode. 28 vdc is then routed through pin 13 of P8004 and is applied to pin 1 of K4. K4 is at ground therefore K4 energizes.

Contacts 12 and 13 of K4 disable the dc correction voltage to the servo amplifier module. Contacts 16 and 15 remove the 28 vdc supply voltage that operates the internal circuit of the AZ110, and the unit deactivates.

Relay K5 is energized by the closure of switch S2009 which is activated by the cam on the tuning capacitor C2038. Pin 8 of P8004 applies 26 vdc to pin 4 of K5. Pin 1 of K5 is grounded through pin 5 of P8004. The ground is applied by switch S2009.

In the energized condition contacts 6 and 7 of K5 short out the plate trigger voltage on pin 3 of P8004, while the capacitor is searching in the undesired portion of rotation.

Contacts 9 and 10 open the preposition interlock circuit to the PA tune servo amplifier.

In the deenergized condition, the ground is removed from pin 5 of P8004 since the tune capacitor is searching in the correct portion of rotation.

52 vrms from the PA tune servo amplifier is applied to pins 18 and 19 of P8004, where it is then routed to the bridge rectifier circuit, and the AC ON lamp.

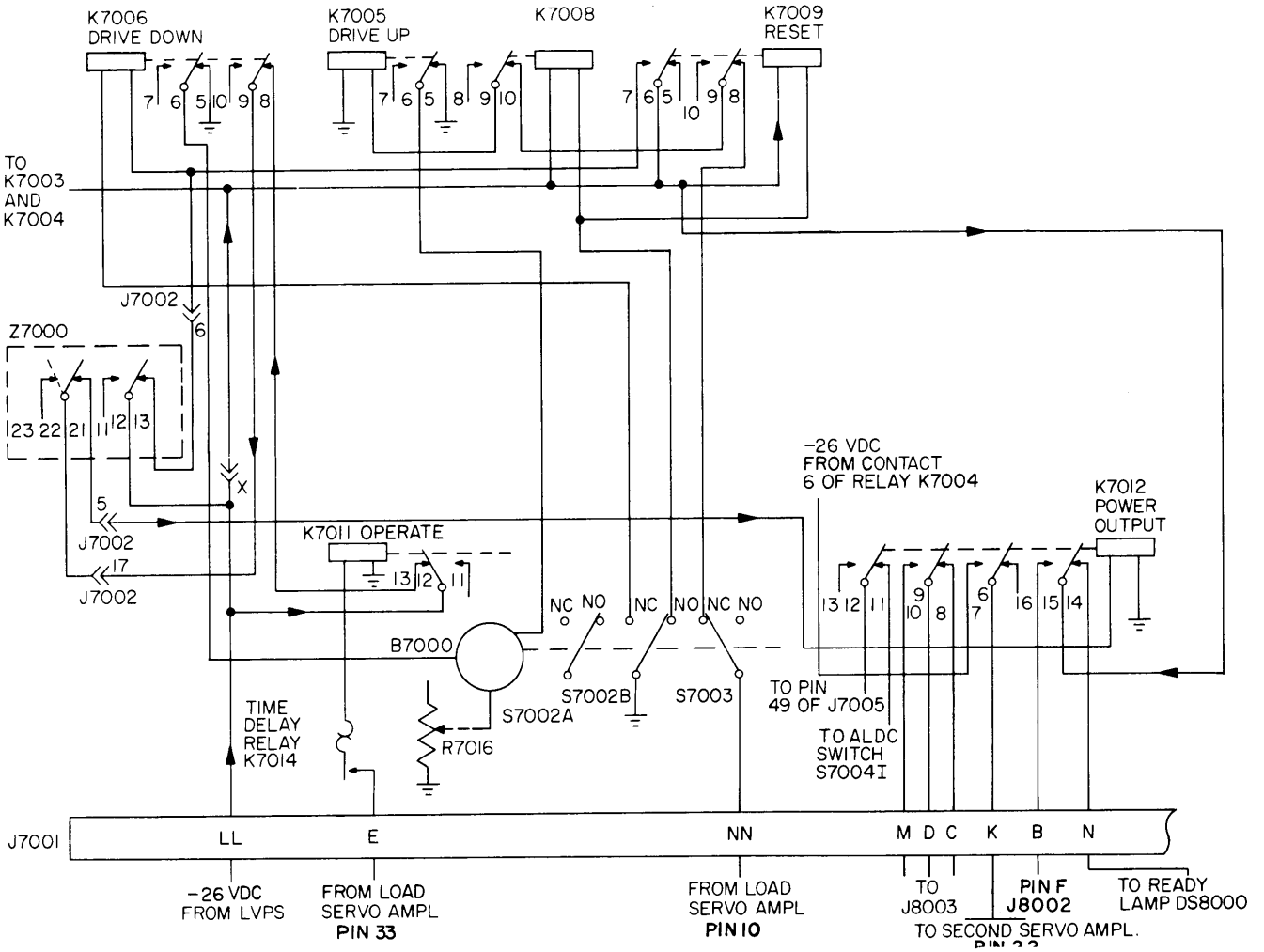


Figure 4-19. Simplified Schematic of Power Output

4-18. PA TUNE SERVO AMPLIFIER, AZ-112 (refer to figure 4-21 and 4-25)

a. GENERAL - The AZ-112 supplies a control voltage to the PA tuning motor. This control voltage is, in turn, dependent on various servo-amplifier input signals: preposition feedback and reference signals, and internally generated search signal, an rf trigger input, a course-tune sense signal, and a fine-tune sense signal. The servo amplifier has three modes of operation: pre-position, search, and operate. Each of these modes is discussed in sequence.

(1) PRE-POSITION - A pre-position feedback signal enters the AZ-112 at pin 5 of Jack 17-70370, hereafter referred to as P8005, and is routed to pin 12 of plug-in module 159B-R; a pre-position reference signal enters the AZ-112 at pin 6 of P8005 and is routed to pin 25 of 159B-R. The pre-position feedback signal is a dc analog (between 0 and -20 vdc) of the tuning capacitor setting. The pre-position reference signal is set at a +20 vdc level in accordance with the desired tuning capacitor setting. The feedback and reference signals are algebraically added and the resultant is modulated with 60 cps ac (supplied at pins 21 and 22 of jack DB25S). This ac modulated signal is amplified and routed via pin 11 of DB25S, to contacts 3 and 4 of relay K2 to pin 10 of jack DA15S to module 159BSA. The ac modulated signal is further amplified in 159BSA and feeds through pins 8 and 15 of DA15S to pins 14 and 16 of P8005 where it is routed to the external tuning motor.

When the associated tuning capacitor approaches the correct pre-position setting, the algebraic sum of the feedback and reference signals diminishes, and control voltage for the tuning motor diminishes. When the tuning capacitor reaches its correct setting, the algebraic sum of the feedback and reference signals is zero and relay K3 deenergizes.

(2) SEARCH - Application of an RFPO trigger at pin 3 of P8005 causes relay K2 to energize. The RFPO trigger indicates that the previous amplifier stage is tuned. With K2 energized, power is applied to pin 7 of 159B-Rand to the search lamp; also the signal path between pin 11 of 159B-R to pin 10 of

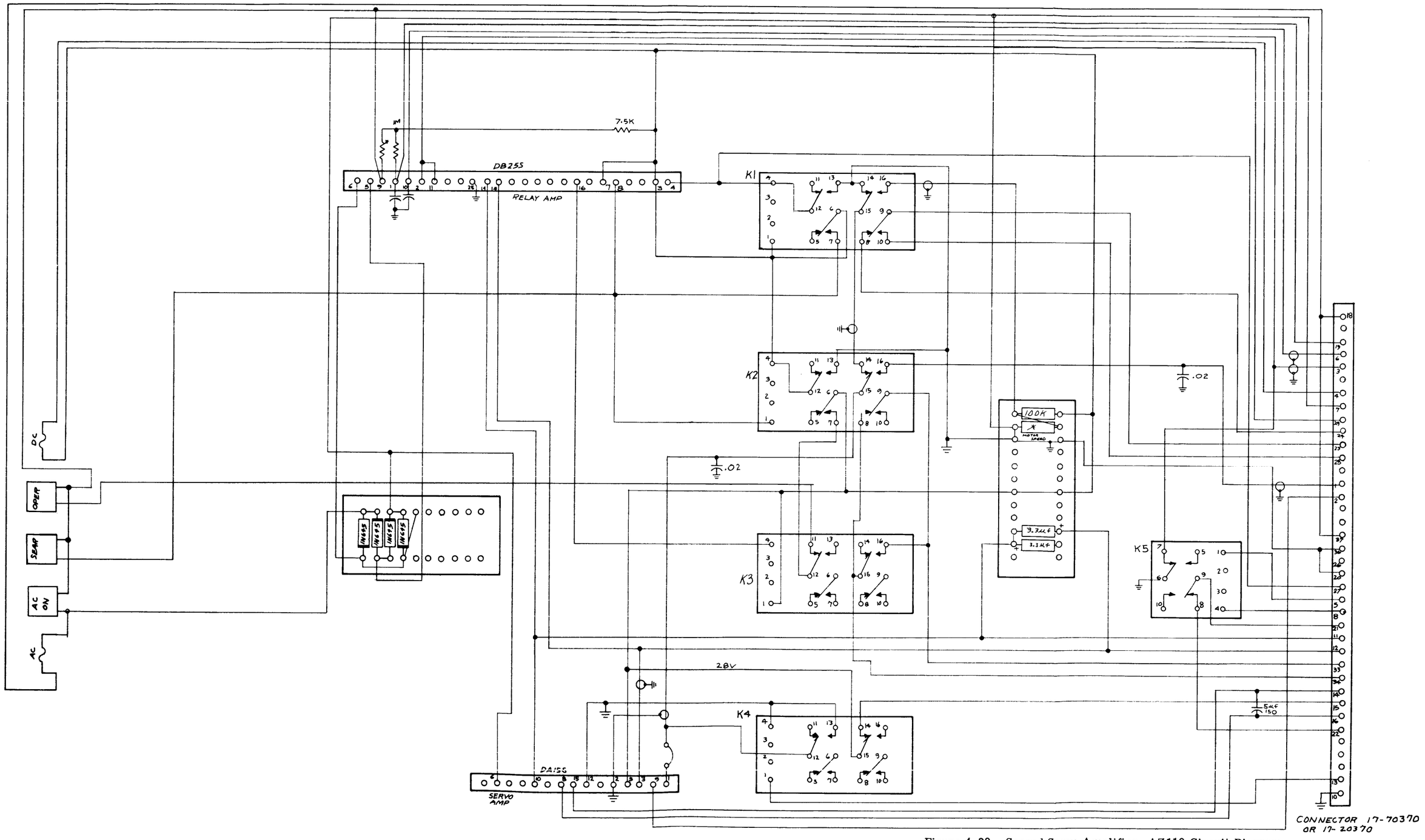


Figure 4-20. Second Servo Amplifier, AZ110 Circuit Diagram

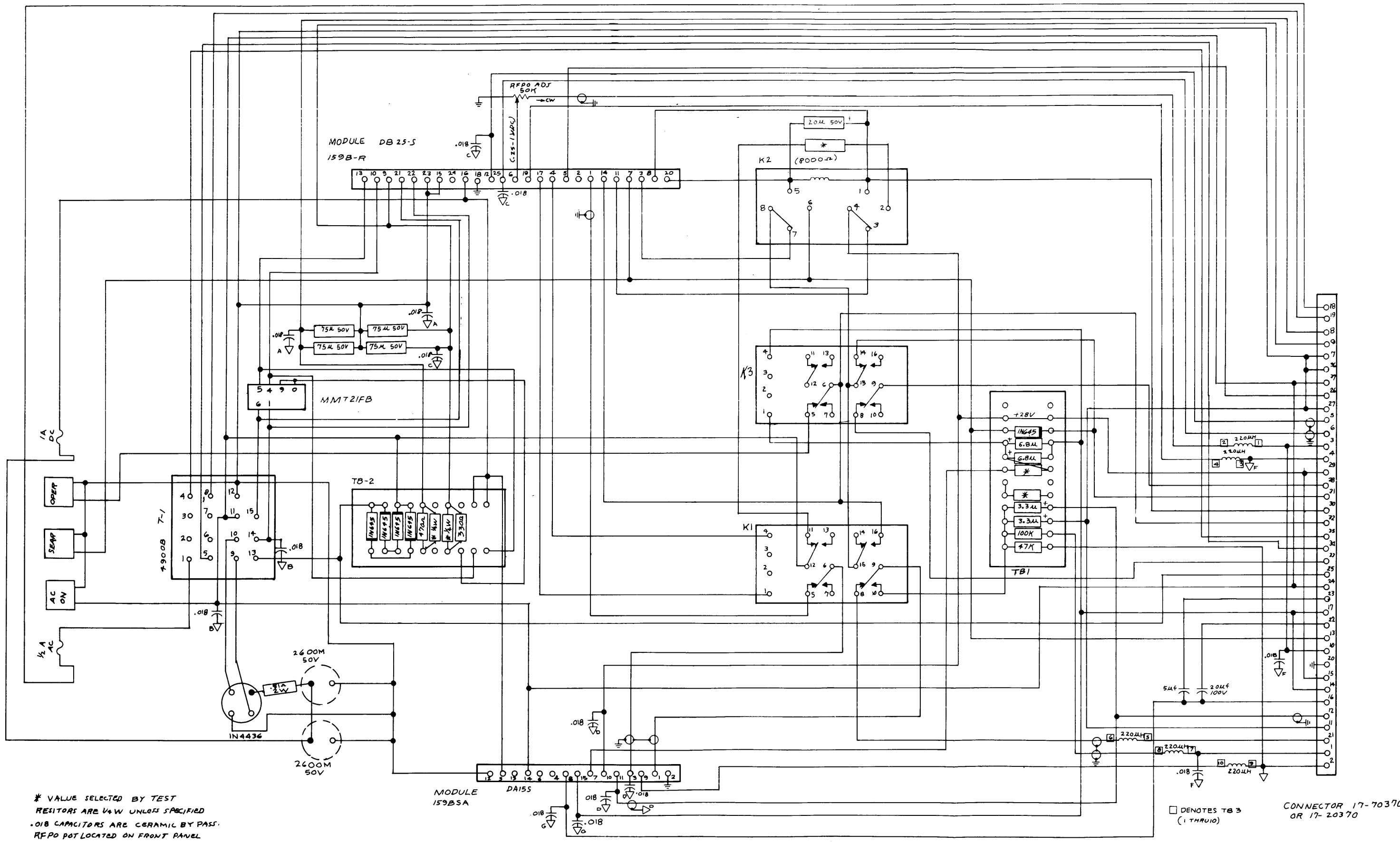


Figure 4-21. PA Tune Servo Amplifier AZ112, Circuit Diagram

159B-R is broken, and 159BSA receives a 60 cps signal from terminal 11 of transformer T1 via contacts 12 and 11 of K1 through a resistor,to terminals 2 and 4 of K2, through to pin 10 of DA15S. This 60 cps signal is amplified in DA15S and then routed to the associated tuning motor.

A coarse-tuning sense signal enters the AZ-112 at pin 21 of P8005; this signal is routed to module DA15S via contacts 8 and 9 of K1. This ac signal is amplified in 159BSA, and routed to pin 1 of 159B-R via contacts 6 and 5 of K1. When the coarse-tuning sense signal approaches 0 vdc (indicating that course-tuning is completed), relay K1 is energized. With K1 energized, +28 vdc is applied to the OPERATE lamp, and to pin 14 of 159B-R.

(3) OPERATE - A fine tuning sense signal enters the AZ-112 at pin 1 of P8005, and is routedto pin 1 of 159BSA via contacts 9 and 10 of K1. This dc sense signal is converted to ac in the same manner as the coarse-tuning sense signal was. The resultant ac signal is amplified, and routed from pin 3 of 159BSA through contacts 6 and 7 of K1, through the gain adjust resistor to pin 10 of 159BSA. This ac signal is further amplified in 159BSA and then applied to the associated tuning motor. When the fine-tuning sense signal approached 0 vdc (indicating that fine tuning is accomplished), control voltage for the tuning motor diminishes, and relay K2 operates. Operation of K2 opens the circuit. Servo amplifier gain is therefore cut off, and system oscillation (hunting) prevented.

b. LIMIT SWITCH OPERATION - Activation of one of the tuning capacitor limit switches energizes a relay in the load servo amplifier. The relay removes supply voltage from pin 8 of 159B-R and relay K2 with relay K2 deenergized, the AZ-112 starts operating in pre-position mode. The pre-position, search, and operate sequences will then be repeated.

4-19. PA LOAD SERVO AMPLFIER, AZ-111 (refer to figure 4-22 and 4-26)

a. GENERAL - The AZ-111 supplies control voltage to the IPA stage load-capacitor motor. This control voltage is, in turn, dependent on several servo amplifier inputs: pre-position feedback and reference signals, a turn-on signal (supplied by the associated TUNE servo amplifier), and a sense signal. The AZ-111 has three modes of operation: pre-position, search, and operate. Each of these modes are discussed in sequence.

(1) PRE-POSITION - A pre-position feedback signal enters the AZ-111 at pin 5 of jack 17-70370 hereafter referred to as P8006, and is routed to pin 12 of plug-in module 158B-M; a pre-position reference enters at pin 6 of P8006, and is routed to pin 25 of 158B-M. The pre-position feedback is a dc analog (between 0 and -20 vdc) of the associated load capacitor setting. The pre-position reference signal is present at a level of +20 vdc, corresponding to the desired load capacitor pre-position setting from the master stepping switch in the SWCA. The feedback and reference signals are algebraically added in 158B-M; the resultant is then modulated with a 60 cps ac signal (supplied at pins 21 and 22 of 158B-M). This ac modulated signal is routed to module 158BSA via contacts 5 and 6 of relay K1. The ac modulated signal is amplified in 158BSA, and routed to the associated load capacitor motor via pins 14 and 16 of P8006. When the associated load capacitor approaches its correct pre-position setting, the algebraic sum of the feedback and reference signals becomes small, and the motor control voltage diminishes.

(2) SEARCH - A sense signal enters the AZ-111 at pin 1 of P8006, and is routed to pin 1 of module 158BSA and converted to ac. This ac signal is amplified in 158BSA, and then routed to contact 7 of relay K1. When coarse tuning of the stage is completed, 28 vdc is applied to relay K1 to energize it, via pin 32 of P8006 via contacts 15 and 14 of K2 and contacts 11 and 12 of K3. Operation of K1 completes the signal path between pins 3 and 10 of 158-BSA. The associated load capacitor now receives control voltage that is derived from the sense input signal. Relay K2 is energized when an appreciable amount of control voltage is being applied to the load capacitor motor.

(3) OPERATE - When the sense input signal approaches 0 vdc, motor control voltage diminishes, and relay K1 energizes. With K1 energized, 28 vdc is applied to the OPERATE lamp, and to relay K4. Operation of K4 removes the ground from the fine-tune sense signal path for the associated tune servo amplifier.

b. LIMIT SWITCH OPERATION - The limit switches for the stage tune and load capacitors are connected between pins 30 and 31 of P8006. If one of these switches closes, relay K3 is energized. Operation of relay K3 removes supply voltage from K1 and relay K2 in the associated tune servo amplifier. Deenergizing these two relays (K1 and K2) places the respective servo amplifiers in pre-position mode.

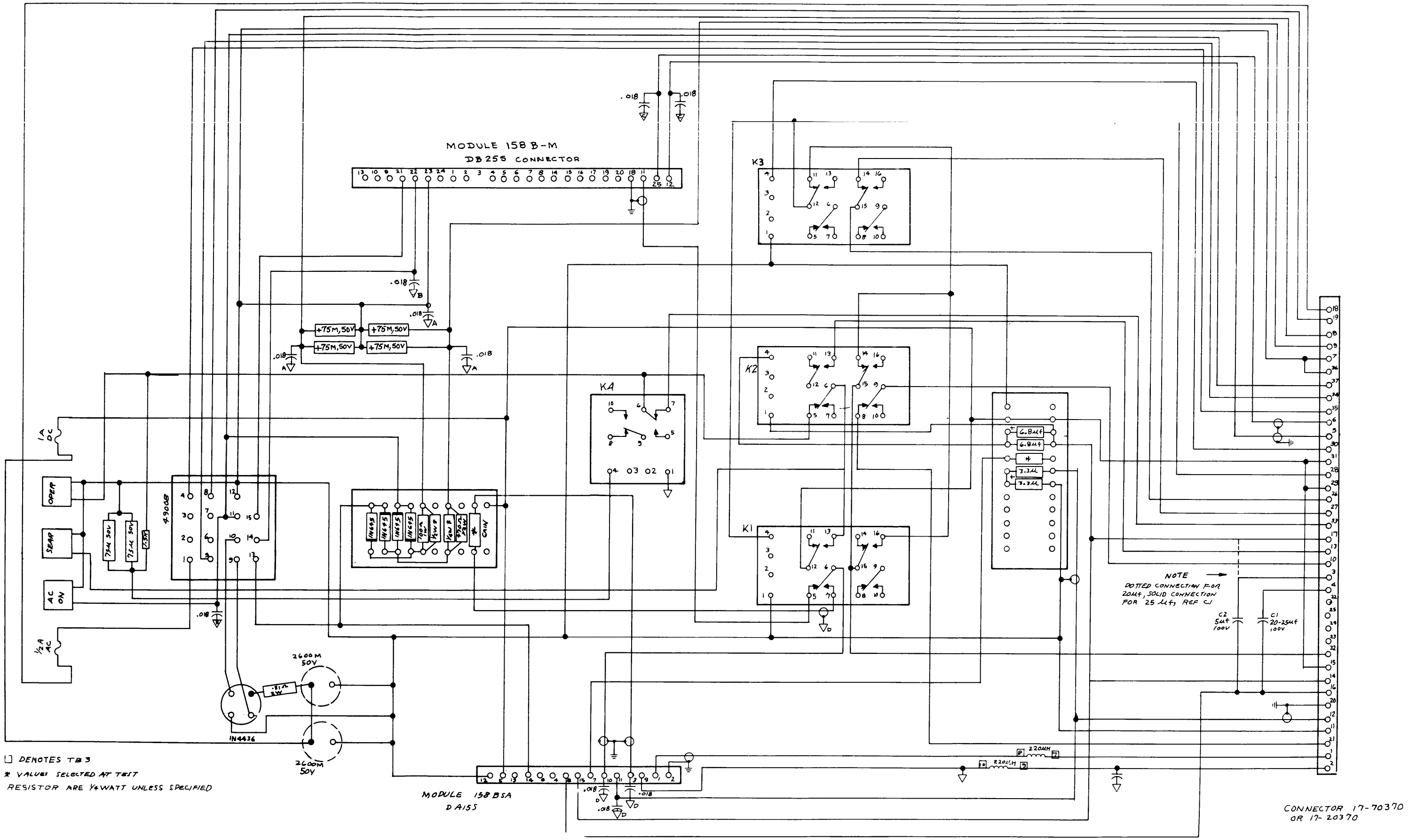
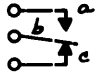


Figure 4-22. PA Load Servo Amplifier AZ111, Circuit Diagram

P8006

18, 19	60 ~ POWER SUPPLY FROM E8000 & E8001 OF TCSA
8	+20 VOLT PRE-POSITION
9	-20 VOLT FEEDBACK POT.
7	PRE-POSITION CKT COMMON
36	LO
37	HI — 26V 60 CYCLE TACH EXCITATION
34, 35	220V AT 18 and 19 WHEN 34 and 35 IS TIED TOGETHER, 110V AT 18 and 19 WHEN 18 IS TIED TO 39 and 19 to 35.
6	PRE-POSITION SIGNAL
5	FEEDBACK POT. SIGNAL
30, 31	LIMIT SWITCH
28, 29	MOMENTARY SWITCH NOT USED
26, 27	TO 30 31 OF RESONANCE SERVO
33	OPERATE LIGHT ON SIGNAL +28 VDC
17	SEE NOTE 2
13	TUNE SERVO DISABLING SIGNAL
10	DRIVE UP CONTROL LOOP TO PIN NN SWCA
3	SEE NOTE 1
4	SEE NOTE 1
22	1 M OHM RESISTOR FUNCTION
25, 24, 23	 NOT USED
32	LOAD SERVO ON SIG +28 VDC
15	MOTOR
14	CONTROL
16	PHASE
20	CHASSIS GND NOT USED
12	HI
11	LO — TACH SIGNAL
21	DRIVE UP CONTROL LOOP FROM PIN 28 TUNE SERVO AMP
1	HI
2	LO — SENSING CKT SIGNAL

NOTES:
1. EXTERNAL JUMPER 17 to 4 50~
2. EXTERNAL JUMPER 17 to 3 60~

DA15S

1	SIGNAL INPUT DC
2	CHASSIS GROUND
3	PREAMPLIFIER OUTPUT AC
4	SPARE
5	+28 VOLTS DC POWER
6	SPARE
7	AUXILIARY DC OUTPUT
8	OUTPUT TO MOTOR
9	SIGNAL GROUND 60 CPS CHOPPER EXCITATION LOW
10	POWER AMPLIFIER INPUT
11	AC TACH INPUT
12	DC POWER GROUND
13	SPARE
14	26V 60 CPS CHOPPER EXCITATION, HIGH
15	OUTPUT TO MOTOR

NOTE: Transfer functions with all circuit loads and connections.

$$\frac{\text{AC OUTPUT (PIN 3)}}{\text{DC INPUT (PIN 1)}} \approx 0.5$$

$$\frac{\text{AC OUTPUT (PIN 8, 15)}}{\text{AC INPUT (PIN 10)}} \approx 150$$

$$\frac{\text{DC OUTPUT (PIN 7, 15)}}{\text{AC OUTPUT (PIN 8, 15)}} \approx 1$$

DB25S

1	SPARE
2	SPARE
3	SPARE
4	SPARE
5	SPARE
6	SPARE
7	SPARE
8	SPARE
9	SPARE
10	SPARE
11	AC OUTPUT
12	DC INPUT #1
13	SPARE
14	SPARE
15	SPARE
16	SPARE
17	SPARE
18	CHASSIS GROUND
19	SPARE
20	SPARE
21, 22	6.3 VOLT 60 CPS
23	OUTPUT GROUND
24	SPARE
25	DC INPUT #2

NOTE: Transfer function with all system loads and connections.

$$\frac{\text{AC OUTPUT (PIN 11)}}{\text{DC INPUT (PIN 12 or PIN 25)}} \approx 0.1$$

Figure 4-23. PA Load Servo Jack

P8004

22	TO PIN K IN SWCA
21	TO PIN 33 OF P8005 IN TUNE SERVO AMP
5	FROM S2009
8	-26 VDC
3	PLATE POWER SIGNAL HI
13	SERVO DISABLE SIGNAL, PIN 13 PA TUNE SERVO
34	NOT USED
33	SECOND AMPLIFIER OPERATE SIGNAL
1	HI } SENSING CIRCUIT SIGNAL
2	LO }
4	EXCITER LEVEL AND PLATE POWER SIGNAL COMMON
6	EXCITER LEVEL SIGNAL HI (100 MW TRIGGER)
15	MOTOR
16	CONTROL
14	PHASE
24	NOT USED
23	EXCITER ON CONTACTS
25	EXCITER ON CONTACTS
26	POST NULLING NOT USED
20	POST NULLING NOT USED
27	POST NULLING NOT USED
12	TACH SIGNAL HI
11	TACH SIGNAL LOW
29	PIN 29 PA TUNE SERVO +28 VDC HI
7	PIN 7 PA TUNE SERVO 28 VDC LO
36	HI } TACH EXCITATION WINDING
37	LO }
18	TO PIN 25 } OF PA TUNE SERVO 52V RMS
19	TO PIN 24 }
10	CHASSIS GROUND NOT USED

DA15S

1	SIGNAL INPUT DC
2	CHASSIS GROUND
3	AC TACHOMETER INPUT
4	SPARE
5	+28 VDC
6	26V 60 CPS EXCITATION HI
7	SPARE
8	OUTPUT TO MOTOR
9	26V 60 CPS EXCITATION LO
10	SIGNAL GROUND
11	SPARE
12	DC POWER GROUND
13	SPARE
14	SPARE
15	OUTPUT TO MOTOR

NOTE: Transfer function with all system loads and connections.

$$\frac{\text{AC OUTPUT (PIN 8, 15)}}{\text{DC INPUT (PIN 1)}} \approx 500$$

DB25S

1	DC INPUT FOR K-1 AMP
2	SIGNAL GROUND K-1 AMP
3	+28 VDC, K-1 RELAY
4	K-1 ENERGIZE
5	-23 VDC
6	+23 VDC
7	K-2 ENERGIZE
8	K-3 RELAY
9	DC POWER GROUND
10	DC INPUT FOR K-2 AMP
11	SIGNAL GROUND FOR K-2 AMP
12	SPARE
13	SPARE
14	SIGNAL GROUND K-3 AMP
15	AC INPUT K-3 AMP
16	K-3 ENERGIZE
17	SPARE
18	SPARE
19	SPARE
20	SPARE
21	SPARE
22	SPARE
23	SPARE
24	SPARE
25	CHASSIS GROUND

NOTE: Transfer function with all system loads and connections.

1. +DC INPUT AT PIN 1 TO ENERGIZE K-1 ≈0.5 VDC
2. +DC INPUT AT PIN 10 TO ENERGIZE K-2 ≈0.25 VDC
3. AC INPUT AT PIN 15 TO ENERGIZE K-3 ≈0.3 VAC

Figure 4-24. Second Amplifier Servo Jack

P8005

18, 19	50/60 ~POWER SUPPLY FROM E8000 & E8001 OF TCSA
35, 34	CONNECT TOGETHER FOR 220V OPERATION 18 to 34; 19 to 35 FOR 110V OPERATION
8	+20 VDC PRE-POS CKT EXCITATION
9	-20 VDC PRE-POS FEEDBACK POT EXCITATION
7	PRE-POSITION CKT COMMON
36	
37	LOW / HIGH — 26V 60 ~TACH EXCITATION
26, 27	MOMENTARY SWITCH NOT USED
5	FEEDBACK POT SIGNAL
6	PRE-POSITION SIGNAL
3, 4	HI / LO — RF POWER ON
29	PRE-POSITION INTERLOCK 28VDC TO AZ110
28	TO PIN 21 ON AZ110
31	MOMENTARY SWITCH T TO PIN 27 AZ110
30	NC LIMIT SWITCH " " 26 "
32	LOAD SERVO ON SIGNAL (+28 VDC)
33	PRE-POSITION INTERLOCK TO PIN 21 AZ110
25, 24	52V RMS FOR SECOND AMPLIFIER
23, 17, 22	CHANGE JUMPER FOR 50/60 CPS
13	SECOND AMPLIFIER OFF SIGNAL TO PIN 13 AZ110
10	RFPO OUT SIGNAL
20	CHASSIS GROUND NOT USED
15	MOTOR CONTROL PHASE
14	
16	
11, 12	LO / HI — TACHOMETER SIGNAL
21	PLATE POWER TRIGGER
1, 2	HI / LO — SENSING CIRCUIT SIGNAL

DB25S

1	AC INPUT K-1 AMP
2	SPARES
3	DISABLING CIRCUIT K-1
4	K-1 RELAY OUTPUT
5	MOMENTARY ON K-1
6	DC INPUT K-2 AMP
7	K-2 LOCK IN
8	+28 VDC (K-2)
9	-19 VDC
10	6.3V 60 CPS HIGH (K-1)
11	AC OUTPUT
12	DC INPUT #1
13	6.3V 60 CPS LOW (K-1)
14	K-1 LOCK IN
15	DC POWER GROUND
16	+28 VDC
17	K-1 RELAY OUTPUT
18	CHASSIS GROUND
19	SIGNAL GROUND K-2 AMP
20	TO K-2 RELAY
21, 22	6.3V 60 CPS FOR MODULATOR
23	AC OUTPUT GROUND
24	SPARE
25	DC INPUT #2

NOTE: Transfer functions with all system loads and connections.

1. AC INPUT AT PIN 1 TO ENERGIZE K-1 ≈0.1 VAC
2. +DC INPUT AT PIN 6 TO ENERGIZE K-2 ≈0.25 VDC

$$\frac{\text{AC OUTPUT (PIN 11)}}{\text{DC INPUT (PIN 12 or 25)}} \approx 0.1$$

DA15S

1	SIGNAL INPUT DC
2	CHASSIS GROUND
3	PREAMPLIFIER OUTPUT AC
4	SPARE
5	+28 VDC POWER
6	SPARE
7	AUXILIARY DC OUTPUT
8	OUTPUT TO MOTOR
9	SIGNAL GROUND 60 CPS CHOPPER EXCITATION LOW
10	POWER AMPLIFIER INPUT
11	AC TACH INPUT
12	DC POWER GROUND
13	SPARE
14	26V 60 CPS CHOPPER EXCITATION, HIGH
15	OUTPUT TO MOTOR

NOTE: Transfer functions with all circuit loads and connections.

$$\frac{\text{AC OUTPUT (PIN 3)}}{\text{DC INPUT (PIN 1)}} \approx 0.5$$

$$\frac{\text{AC OUTPUT (PIN 8, 15)}}{\text{AC INPUT (PIN 10)}} \approx 150$$

$$\frac{\text{DC OUTPUT (PIN 7, 15)}}{\text{AC OUTPUT (PIN 8, 15)}} \approx 1$$

Figure 4-25. PA Tune Servo Amplifier Jack

SECTION 5

MAINTENANCE

5-1. GENERAL

The maintenance section contains voltage and troubleshooting charts, alignment procedures, and adjustment descriptions of critical circuits. Photographs of the internal circuitry and components of each stage are also provided to aid in maintaining the equipment.

The PALA-2.5K is a complex linear amplifier system; a trained electronics technician should first familiarize himself with the equipment before he performs any troubleshooting and maintenance required.

Section 4 of this manual includes a circuit description of each stage along with simplified schematics to help understand the operation of the PALA-2.5K. Section 7 consists of a complete set of schematic diagrams enabling each circuit to be traced out.

An interconnect wiring diagram is provided in section 2 of the manual.

5-2. 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 removed from its mounting for 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 chloroform 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.

CAUTION

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

5-3. TROUBLESHOOTING

When a piece of equipment has been operating satisfactorily and suddenly fails, the cause of failure may be due to symptoms of past failures or due to component aging.

The first step in troubleshooting is to ascertain that proper equipment voltages are present, interconnecting cables are secure, and that all fuses are in a functional condition.

NOTE

Never replace a fuse with one of a higher rating unless brief continued operation is more important than probable equipment damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been located and corrected.

5-4. SHOP MAINTENANCE

a. Bench type test - all voltages shown in the following paragraphs are typical and have been taken under the following conditions:

(1) AC line frequency - 60 Hz and 50 Hz.

(2) AC line voltage - 3 phase 117V.

(3) Transmitter High Voltage ON (no RF output).

5-5. CIRCUIT FUSE CHECKS

NOTE

The Circuit Fusing Check has been incorporated as part of maintenance to indicate the type of malfunction that would occur should a fuse blow in the Transmitter.

TABLE 5-1. TROUBLESHOOTING CHART

ITEM	INDICATION	PROBABLE CAUSE
1	MAIN POWER circuit breaker (34)	Possible shorting in HVPS or in AC input leads.
2	With MAIN POWER circuit breaker (34) ON, interlock indicator lamp (41) does not light in any position, but Technimatic main power indicator (1) is lit.	PA air switch (S2002) is not closed, preventing filament on relay from energizing. Defective filament on relayK5000.
3	After timer has cycled and LOW VOLTAGE circuit breaker (52) is closed, shorting relay in HVPS has not been heard energizing.	Shorting relay K6001 is shorted or open.
4	With all interlocks closed, LOW VOLTAGE circuit breaker (52) keeps tripping.	A short to ground in plate or screen circuit of first or second IPA. First and second IPA plate current reading on multimeter (18) may be too high. It should be set to 10 and 12 readings. Defective LOW VOLTAGE circuit breaker (52).
5	Inability to obtain high voltage after HIGH VOLTAGE circuit breaker (37) has been set to ON.	Check for shorting plug inserted in J8005 (when no filter unit is in system). Check PA plate, bias, and screen overloads. Check for -24 vdc on pins 1 and 2 of E8004. Check position of PA bandswitch S2005, to ensure interlock circuit is closed.
6	Failure of high voltage to shut off, when a band change is made.	Defective Bandswitch relay K5005.
7	High voltage is applied but no PA tube idling current can be obtained.	PTT relay K5004 is defective. No jumper on terminals 4 and 5 of E8005, PTT line is open. Defective PA tube.
8	Application of high voltage to transmitter causes screen overload circuit to activate.	Absence of PA plate voltage.
9	No PA output indication on PA output meter (4) with sufficient rf drive to second IPA.	Forward power diode in directional coupler defective or improperly seated in holder. PA drawer output jack not connected to antenna. Forward and Reflected power cables may be reversed on directional coupler.
10	SWR overload keeps tripping.	Reflected power diode in directional coupler reversed in socket. Open antenna.

TABLE 5-1. TROUBLESHOOTING CHART (Cont)

ITEM	INDICATION	PROBABLE CAUSE
11	Inability to obtain full output power with 100 mw of drive.	First and second IPA idling current set to low.
		First and second IPA or PA tube aging.
		PA improperly tuned.
		Second IPA improperly tuned.
		Defective component in output filter AF107.
		Low voltage and high voltage power supplies not operating at rated output.
12	Failure of Automatic band selection	Relay K5003 in LVPS not energized.
		Servos on-off switch is not in "ON" position.
		Relay K7012 in SWCA fails to go into the tune position, when tune button is depressed.
		Defective ledex motor driving master control wafer in SWCA.
		Failure of associated exciter to provide proper indication to master control wafer.
13	Second Amplifier servo fails to go into the search mode	+0.5 vdc not present at servo jack in 100 mw position.
		Insufficient rf drive to latch relay K7003 in SWCA to 100 mw position.
		Defective servo amplifier.
14	Second IPA does not tune at resonance	Defective diode CR2001 and CR2002 in second amplifier phase detector.
		Correction voltage at pin 1 of second amplifier servo is not present.
		Servo Amplifier is defective.
15	PA tune servo amplifier does not stop at resonant peak	Check for -0.5 vdc at sense jack on alarm panel.
		Diode CR2009 in PA drawer is defective.
		Defective PA tune servo.
16	PA tune servo amplifier goes into search; before 300 ma.	Misadjustment of RFPO.
		Defective tune servo amplifier.
17	PA load does not search in direction of decreasing numbers on PA load indicator (15)	-0.25V not preset at the time PA load goes into search.
		Load pre-position setting may be incorrect.
		RF trigger may be set too high.

TABLE 5-1. TROUBLESHOOTING CHART (Cont)

ITEM	INDICATION	PROBABLE CAUSE
18	RF gain Control (9) does not go into drive-up condition.	-26 vdc not present at pin NN of J70001 in SWCA. Contact of S7003 on rf gain motor B7000 does not close.
19	The output needle on PA Output meter (4) passes low limit switch, ready light (2) does not go on.	Check 220 vac at input to Z7001, meter power supply. Defective meter (4). Contacts 22 and 23 of Z7000 are not closing. Relay K7012 in SWCA does not go into power output condition.
20	Fault light (8) turns on too quickly, shutting off servo motors.	Defective FET transistor Q7001. Defective relay coil K7013.

TABLE 5-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

EQUIPMENT	MAKE
Multimeter	Simpson 260 or equivalent
VTVM	Hewlett-Packard Model 410B or equivalent
Signal Generator	Hewlett-Packard Model 606A or equivalent
Dummy Load	Technical Materiel Corp. Model TER-5000-50u unbalanced or equivalent
Extender Card	Supplied with equipment

TABLE 5-3. VOLTAGE CHART

COMPONENT	CONDITION	PLATE	SCREEN	GRID
V2000 (8121)	Transmitter energized with Low Voltage circuit breaker ON	350 vdc	250 vdc	-12-20 vdc
V2001 (8121)	Transmitter energized with Low Voltage circuit breaker ON	800 vdc	350 vdc	-12-20 vdc
V2002 (PL-264)	Transmitter energized H. V. ON	5 kv	800 vdc	-120-160 vdc
S-2002 Air switch interlock 230 vac. B-2000 230 vac at terminal 1 and 2. DS-2000 through DS-2008 operate at 5 vac.				
AP-128 (LOW VOLTAGE POWER SUPPLY)				
V-5001-pin 5 250 vdc V-5002-pin 5 350 vdc				

TABLE 5-3. VOLTAGE CHART

COMPONENT	CONDITION	PLATE	SCREEN	GRID
AP-128 (LOW VOLTAGE POWER SUPPLY) (Cont)				
V-5003-pin 7 400 vdc CR5000 800 vdc CR5002 -26 vdc M-5000 and M-5001 115 vac (when operating) Between F-5000, F5001, and F5002 230 vac				
TCP-1				
J4000 A. B. C. 230 vac 3 phase				

a. Make sure that at least one interlock is open.

b. With the main power switch set at OFF, remove the blower fuse. The main blower and top fan must not operate when the main power switch is set at ON. Reset main power switch at OFF and replace the blower fuse. Set main power switch at ON and continue fusing checks listed below:

c. Set bandswitch control on TCP at AUTO.

d. Remove IPA bandswitch fuse and turn SWCA BAND knob. The IPA and PA bandswitches should not turn. Replace fuse and bandswitches should turn. Check all positions of IPA and PA bandswitch positions in relation to the SWCA bandswitch settings.

e. Remove PA bandswitch fuse and turn SWCA BAND knob. The IPA bandswitch should turn but the PA bandswitch should not turn. Replace fuse, and PA bandswitch should turn.

f. Remove first one and then the other interlock fuse; interlock lamp ON TCP should go out.

5-6. PROTECTIVE INTERLOCK SYSTEM (figure 4-8)

a. Before checking the interlock system, insure that a jumper is connected from COM to NO terminals 1 and 2 on terminal board E8006 on the rear junction box. The interlock indicator lamp and switch are connected so the indicator lamp will be ON (lit) if all interlocks are closed. To find an open interlock, always turn the interlock switch to extreme counterclockwise direction to the position where the indicator lamp goes out. This is an open interlock.

In cases where there is more than one interlock opened, the preceding procedure must be repeated until all interlocks are closed and all individual interlock indicator lamps are out (extinguished).

NOTE

For this check, the PS covers, PA covers, the Air-switch and Timer will not trip the HV circuit breaker.

b. With the Power switch closed (ON), each interlock should be opened and closed with the interlock indicator switch in the appropriate position to show that the interlock is operating properly. Each time an interlock is opened, the High Voltage switch should be placed at the ON position. High Voltage should not come on.

5-7. PROTECTIVE RELAY CHECKS (refer to figures 4-2, 4-3, and 4-4)

WARNING

Line voltage is constantly present on leads connected to the top of the Main Power switch located on TCP-1.

a. Unlatch the PA plate overload relay; the corresponding overload indicator lamp should light (K4002 located in TCP chassis).

b. Unlatch the PA Screen overload relay; the corresponding overload indicator lamp should light (K4003 located in TCP chassis).

By depressing the Overload Reset switch on the main control panel, the overload indicator lamps must go out (extinguish) and stay out and the overload relays must reset.

c. The Filament Elapsed Time meter will indicate that the filaments are on.

d. With the HV at ON and PA and bias adjusted for minimum plate current, the Plate Elapse Time meter must indicate that HV is on.

Check the Time Delay Relay for proper operate and time interval, maximum time of 80 seconds after the shorting relay should energize (if all interlocks are closed).

e. Adjust PA bias adjust control on the power supply for 450 milliamperes as indicated on the TLAA Plate Current meter with AUTO/MANUAL switch set at MANUAL. With the ALARM switch set at ON, the alarm must sound (activate).

5-8. HIGH VOLTAGE REMOVAL, PROTECTIVE CIRCUIT CHECK

a. With the system energized as in the preceding paragraph d, and with the ALARM switch set at ON, mechanically trip the PA Plate Overload and PA Screen Overload protective devices in sequence. Each time a protective device is mechanically tripped, the device must reset electrically, and the high voltage must be turned on again before testing the next protective device.

b. Set High Voltage at OFF and remove the PA Bias Fuse. Setting the High Voltage switch at ON should not energize the high voltage.

c. Mechanically tripping each of the aforementioned protective devices one at a time, the high voltage must go off and the alarm must sound; the Plate Elapse Time meter must stop running.

5-9. BIAS LEVEL ADJUSTMENTS

a. Set MAIN POWER circuit breaker (34) at ON position and allow approximately 1 minute for the Time Delay Relay to cycle.

b. Set MULTIMETER switch (22) at 1ST AMPL IP position and adjust 1ST AMPL BIAS ADJ (48) for an indication of 10 on MULTIMETER (18).

c. Set MULTIMETER switch (22) at 2ND AMPL IP position, and adjust 2ND AMPL BIAS ADJ (47) for an indication of 12.

d. With XMTR TUNING switch (36) set at MANUAL position, set the HIGH VOLTAGE switch (37) at ON; adjust PA BIAS ADJ (46) for an indication of 450 ma on PA PLATE CURRENT meter (12). Turn off HIGH VOLTAGE switch (37), and set XMTR-TUNING switch (36) at AUTO position.

5-10. AUTOMATIC TUNING ADJUSTMENTS

a. 100-Milliwatt Trigger Adjustment (servo tuned transmitters only):

(1) Set the exciter to a frequency between 20 and 30 MHz.

(2) Set SERVO switch (39) at ON position; the HIGH VOLTAGE switch (37) should be at the OFF position.

(3) Advance the gain of the exciter to a 100-milliwatt output (approximately "2" on exciter monitor meter).

(4) Set the SENSE switch (58) at 100 MW position and monitor the output at jack (59) with a zero centered VTVM on the +1 volt scale. Adjust the 100 MW potentiometer (located on bottom side of SWCA chassis) so the VTVM reads +0.5 volts.

b. Load Sense Adjustments (refer to figure 5-1):

(1) Turn the transmitter manually to 1 KW. Set the SENSE switch (58) at the PA LOAD position, then adjust the load sense potentiometer No. 1 to read zero volts (zero center) at sense jack (59).

NOTE

Adjustment potentiometers are mounted on bottom underside of SWCA chassis, accessible when SWCA is pulled out of rack.

(2) Set the frequency at 2 MHz and tune the transmitter to full power. Reduce the plate current to read 250 ma.

(3) Repeat Step 1 above with frequency set at 5 MHz and adjust potentiometer No. 2, and with frequency set at 19 MHz, adjust potentiometer No. 3.

c. RF Plate Trigger Adjustment (refer to figure 5-1):

(1) Detune the transmitter and reduce the drive to 200 ma, then adjust the TUNE and LOAD capacitors (23 and 16, respectively) until a -0.25 volt indication is obtained on PA LOAD sense position.

(2) Set the SENSE switch (58) at PA PLATE position and monitor the output at jack (59) with a VTVM; the VTVM should be set at -0.5 volts.

NOTE

In order to perform the load pre-position adjustments that follow, leave the transmitter set up as above.

d. Load Pre-Position Adjustments (refer to figure 5-1):

(1) Plate bandswitch on SWCA to 2-2.5 MHz.

(2) Connect Signal Generator to J8007 (rf drive) on interconnection junction box.

(3) On TCP, place servo switch (39) to OFF.

(4) Set signal generator to 2 MHz, 2V output rms.

(5) With multimeter switch (22) on TLAA in second amplifier Ep position, advance rf gain control (9) on SWCA and adjust second amplifier tuning control (20) for maximum peak indication on multimeter (18).

(6) Place rf gain control (9) on SWCA fully ccw.

(7) Set HP VTVM to +DC Volts, 1V Range, and set pointer to center scale. Connect VTVM to sense jack J9003 (59), and set sense function switch (58) to PA load position.

(8) Turn High Voltage circuit breaker (37) ON.

(9) Manually tune and load XMTR for maximum output with minimum input. Output should be 1.0 KW, with plate current between 0.6 and 0.75, depending on frequency.

(10) Move RF gain control (9) on SWCA ccw until PWR meter (4) reads 1 KW.

(11) Adjust load sense potentiometer No. 1 for a reading on the VTVM for (0) volts (zero volts in center scale).

(12) Detune XMTR by moving Tune (23) and Load (16) controls at random.

(13) Adjust alternately the Tune and Load capacitors on TLAA for a reading of -0.25 volts on VTVM. Note Load Counter reading.

(14) Set sense function switch S9001 on the AX633 to the PA Plate trigger position.

(15) Adjust the plate trigger potentiometer located on the bottom center of the TLAA for a reading of 0.5 negative voltage on the VTVM.

(16) RF gain on SWCA fully ccw.

(17) Place HV circuit breaker (37) to OFF.

(18) On TCP-1, place SERVO Switch (39) ON.

(19) Adjust potentiometer No. 1 load preposition to obtain reading obtained in step 12.

(20) It should be noted that whenever the automatic tuning of the transmitter is being discussed, the fault light (8) must be off.

(21) Turn the high voltage circuit breaker (37) ON.

(22) Adjust RF drive on the SWCA for a reading of 300 ma of plate current as indicated on the PA plate current meter (12).

(23) On the front of the Tune Servo amplifier there is a potentiometer RFPO (24) (RF Power ON). Adjust this potentiometer to a point where the search light (29) on the tune servo amplifier is energized. At the same time that the tune servo amplifier goes into search, the PA tuning capacitor will rotate in a clockwise direction.

(24) The PA tune capacitor (23) will continue tuning until a negative 0.5 volts is reached on the PA plate trigger. At this time, the Tune Servo Amplifier will go into operate and the Load Servo Amplifier will go into search, causing the Load Capacitor (16) to rotate in a clockwise direction until the error voltage to the Servo Amplifier reaches Zero. This voltage can be seen on the VTVM when switch S9001 is in the PA load position. When the error voltage is at Zero, the Load Servo Amplifier will go into operate.

(25) Observe the output on the meter (4) on the SWCA. After a 5 second delay, the servo amplifier will turn OFF and the RF gain control (9) will drive down, causing the output to go down. The RF gain control (9) will drive all the way down until it hits the limit switches, then it will reverse and start driving up. It will continue to drive up until the output indicator hits the first red pointer. The red pointer should be set to 1 KW. When the output indicator reaches the first pointer, it will also energize the ready light (2).

(26) Set RF gain control on the SWCA for 1.0 KW output. Manually adjust tune control (23) to see if the transmitter is in resonance. If the controls are appreciably far from resonance, then an adjustment of the tune sense balance capacitor located in the TLAA is required.

(27) Set RF gain control (9) on the SWCA to minimum.

(28) High Voltage circuit breaker (37) on TCP to OFF position.

(29) On TCP-1, depress Tune button (38). Tune (23) and load (16) controls on TLAA will return to preset position and Tune Load Servo lamps will come on.

(30) This completes the adjustment of one of the load pre-position potentiometers. There are six more to do. Perform steps 1 through 29, with the exception of steps 14, and 15 through 22. Refer to load pre-position Table 5-4 for band position and potentiometer position.

5-11. ALDC ADJUSTMENT PROCEDURE (USING EXCITER WITH ALDC PROVISION)

a. Set the main ALDC control potentiometer, located on the front panel of the TLAA, to its midpoint position.

b. Extend the SWCA-3K unit so as to expose R7038, R7039, and R7040 which are accessible from the underside.

c. Tune the transmitter into a resistive load, to a frequency of 2.5 MHz. Adjust the output using the carrier only, to a level of 2.7 KW. Adjust R7038 until the output drops to 2.5 KW.

d. Tune the transmitter to a frequency between 5-15 MHz and follow the same procedure as set forth in step c with the following exception: R7039 is adjusted to obtain the 2.5 KW reading.

TABLE 5-4. LOAD PRE-POSITION ADJUSTMENTS

POTENTIOMETERS	PRE-POSITION BANDS	COUNTER READING
	2 - 2.5	180
1	2.5 - 3	180
	3 - 4	180
2	4 - 5	100
	5 - 6	115
	6 - 7	80
3	19 - 22	80
	22 - 24	80
	24 - 26	80
	7 - 9	96
4	11 - 13	96
	15 - 17	96
	9 - 11	65
	17 - 19	65
5	28 - 29	65
	29 - 30	65
6	13 - 15	70
	26 - 28	70
7	22 - 24	55

e. Tune the transmitter to a frequency between 15-30 MHz and follow the same procedure as set forth in step c with the following exception: R7040 is adjusted to obtain the 2.5 KW reading.

f. It is emphasized that the ALDC capturing voltage be adjusted in such a manner as to make its effects definitely discernable.

g. Return the SWCA into the rack and secure. If further ALDC adjustment is required, the main ALDC potentiometer located on the front panel is to be used.

5-12. OVERLOAD ADJUSTMENTS

a. PA Plate Overload:

(1) Tune system to full output on any frequency within the assigned frequency range.

(2) Overload the system output by increasing the PA output loading (decreasing Output Load capacity).

(3) Retune the PA and increase the signal generator output.

(4) Adjust the PA Plate overload adjust control to trip at 1.3 amperes.

5-13. FAULT LIGHT ADJUSTMENT

a. Place High Voltage circuit breaker (37) to OFF.

b. Press Tune button (38) on TCP. READY light (2) should be out.

c. Signal generator output to zero.

d. Fault lamp (8) should light in 60 seconds; and 3 servo amplifiers should shut off. If these conditions do not occur, adjust R7019 on SWC, PC266, using a extender card.

e. Set signal generator to 2.5 MHz.

f. Depress tune button (38).

g. Place High Voltage breaker (37) to ON.

h. Adjust signal generator output to 100 mw. System will tune transmitter at 2.5 MHz.

5-14. SECOND AMPLIFIER SERVO MOTOR REPLACEMENT DESCRIPTION (refer to figure 5-16)

a. Remove PA drawer, model TLAA from rack.

b. Remove the right section of bottom cover, and the right side panel, exposing the second amplifier servo motor (3).

c. Remove plug (1) from jack J2004.

d. Loosen the two screws (2), holding servo motor to mounting plate.

e. Remove servo motor (3).

f. Turn back anti-backlash gear (4) three teeth, and hold gear in this position while inserting new servo motor.

g. Tighten the two screws (2) holding servo motor to mounting plate.

h. Replace plug (1) into jack J2004.

5-15. TUNE AND LOAD SERVO MOTOR REPLACEMENT DESCRIPTION (refer to figure 5-17)

a. Remove PA drawer from rack

b. Set front panel control knobs as follows: second amplifier bandswitch to 2-3 MHz; second amplifier tuning - no set position; multimeter - 1st Amplifier Ip.; Tune to zero; Load to zero; PA bandswitch - no set position.

c. Remove right section of bottom cover, and tape tune and load servo motor shafts (1) and (2) securely, preventing them from turning.

d. Loosen setscrews on front panel knobs and remove from shafts.

e. Remove the nine screws holding front panel to chassis.

f. Remove plug (3) from J2007 when removing load servo motor, remove plug (4) from J2006 when removing tune servo motor.

g. Remove either the four allen head bolts (5) fastening the tune servo motor to the mounting plate, or the four allen head bolts (6) fastening the load servo motor to mounting plate, depending on which motor is defective.

h. Remove defective tune servo motor (7) or load servo motor (8).

i. Insert the new servo motor and reassemble in reverse order from disassembly.

5-16. TUNE CAPACITOR REPLACEMENT DESCRIPTION (refer to figure 5-18)

a. Remove the PA drawer, model TLAA, from rack.

b. Turn front panel tune control knob until the indicator reads zero.

c. Remove shield panel (1).

d. Remove two setscrews at coupling (2).

e. Remove the two screws (3) holding capacitor front mounting bracket.

f. Remove screw (4), holding coil to rear capacitor mounting bracket.

g. Remove screw and nut (5) fastening capacitor stack lead to rear mounting bracket.

h. Remove the two screws (6) holding capacitor to rear mounting bracket.

i. Remove screw (7) holding disc capacitor to rear mounting bracket.

j. Remove the two screws (8) holding bracket to coil.

k. Remove the tune capacitor (9).

l. Before inserting new capacitor, perform the following procedure:

(1) Rotate capacitor shaft counterclockwise until it can no longer turn. (Do not force or apply pressure.)

(2) Rotate capacitor shaft in clockwise direction for approximately 20 turns, and tighten setscrew so the shaft stops turning in clockwise direction at 20 turns.

m. Insert capacitors and reassemble parts in the reverse order from disassembly.

5-17. LOAD CAPACITOR REPLACEMENT DESCRIPTION (refer to figure 5-18)

a. Remove PA drawer, model TLAA, from rack.

b. Turn front panel load control knob until the indicator reads zero.

c. Remove the top cover.

d. Remove the shield panel (1).

e. Remove the three screws (2) holding capacitor to rear mounting bracket.

f. Remove screw (3) holding rear mounting bracket to tune coil mounting bracket, and lift bracket out.

g. Remove two front mounting bracket screws (4).

h. Lift capacitor (5) out of drawer.

i. Before inserting new capacitor, perform the following procedure:

(1) Rotate capacitor shaft counterclockwise until it can no longer turn. (Do not force or apply pressure.)

(2) Rotate capacitor shaft in a clockwise direction for approximately 20 turns and tighten setscrew so the shaft stops turning in a clockwise direction at 20 turns.

j. Insert new capacitor and reassemble in a reverse order from disassembly.

5-18. ADJUSTMENT OF DRIVE MOTOR LIMIT SWITCHES (refer to figure 5-2)

a. Adjust contact on shaft of rf gain resistor to close the two left side microswitches simultaneously, five degrees before full mechanical closure.

b. Adjust contact on shaft of rf gain resistor to close the right side microswitch five degrees before full mechanical closure.

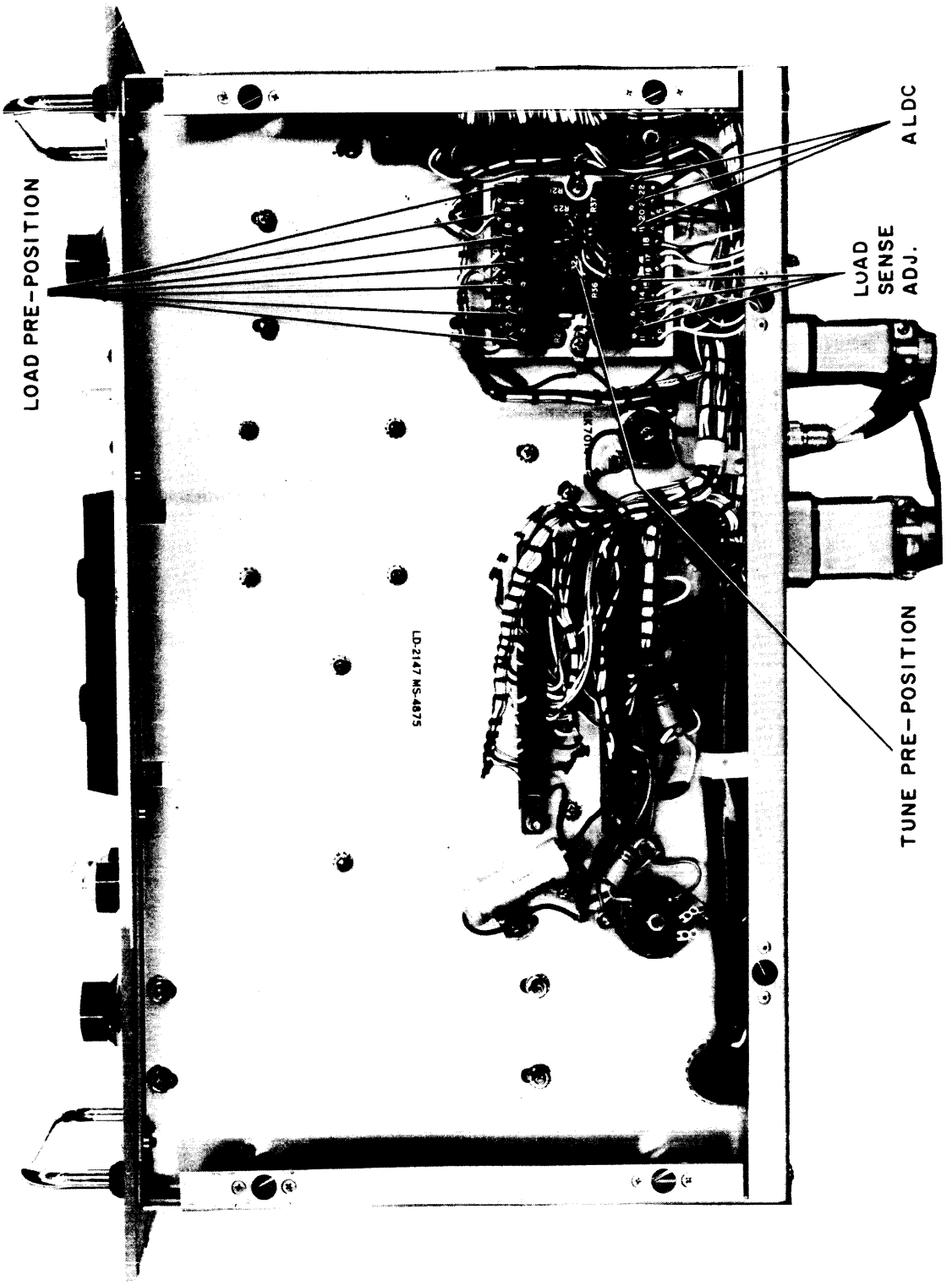


Figure 5-1. Bottom View of Standing Wave Control Unit, Model SWCA

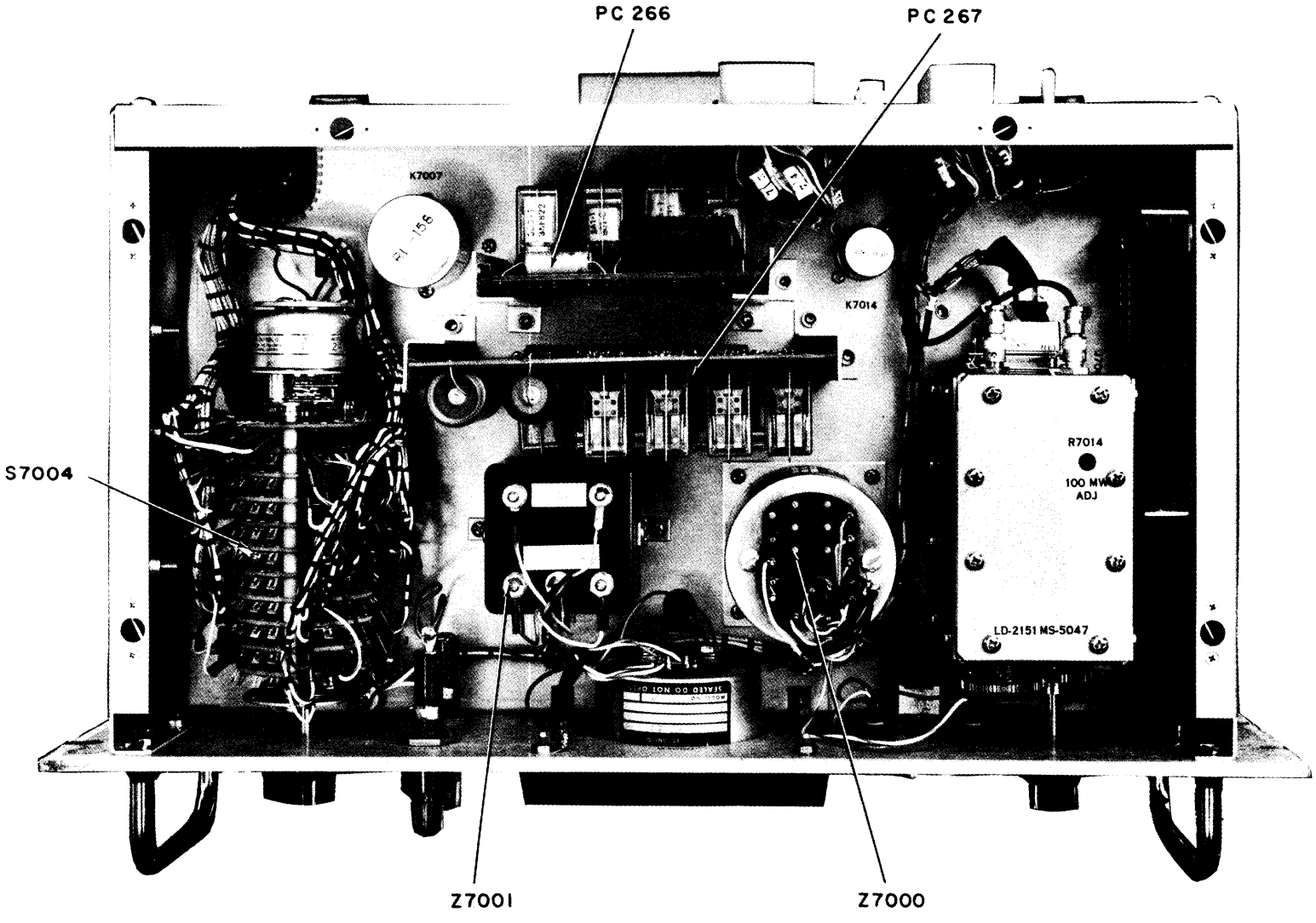


Figure 5-2. Top View of Standing Wave Control Unit, Model SWCA

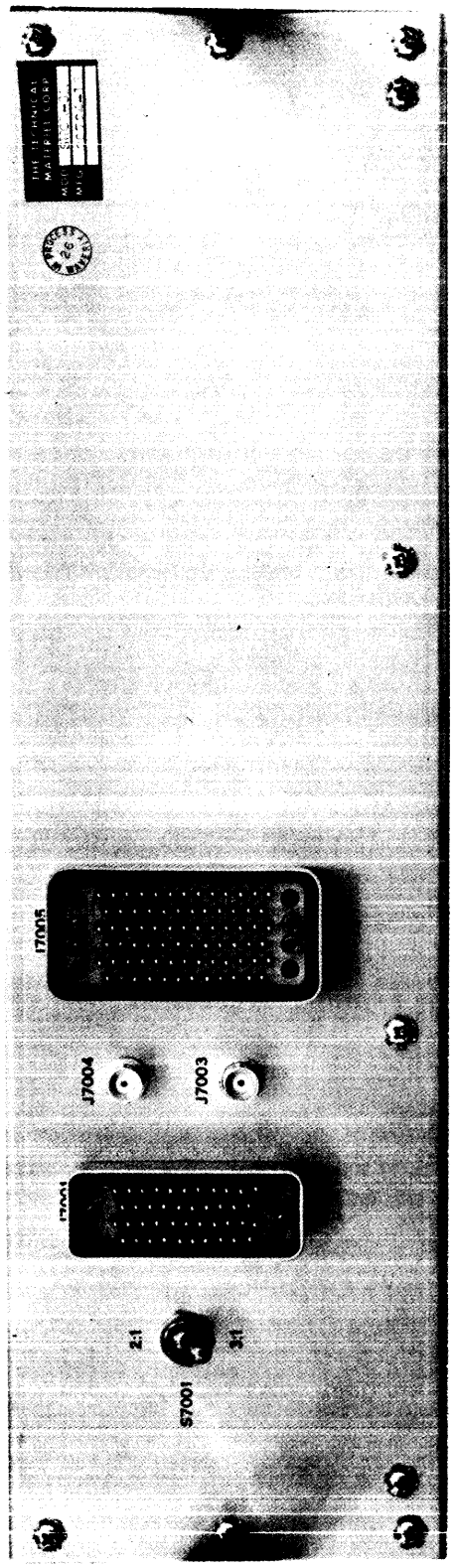


Figure 5-3. Rear View of Standing Wave Control Unit, Model SWCA

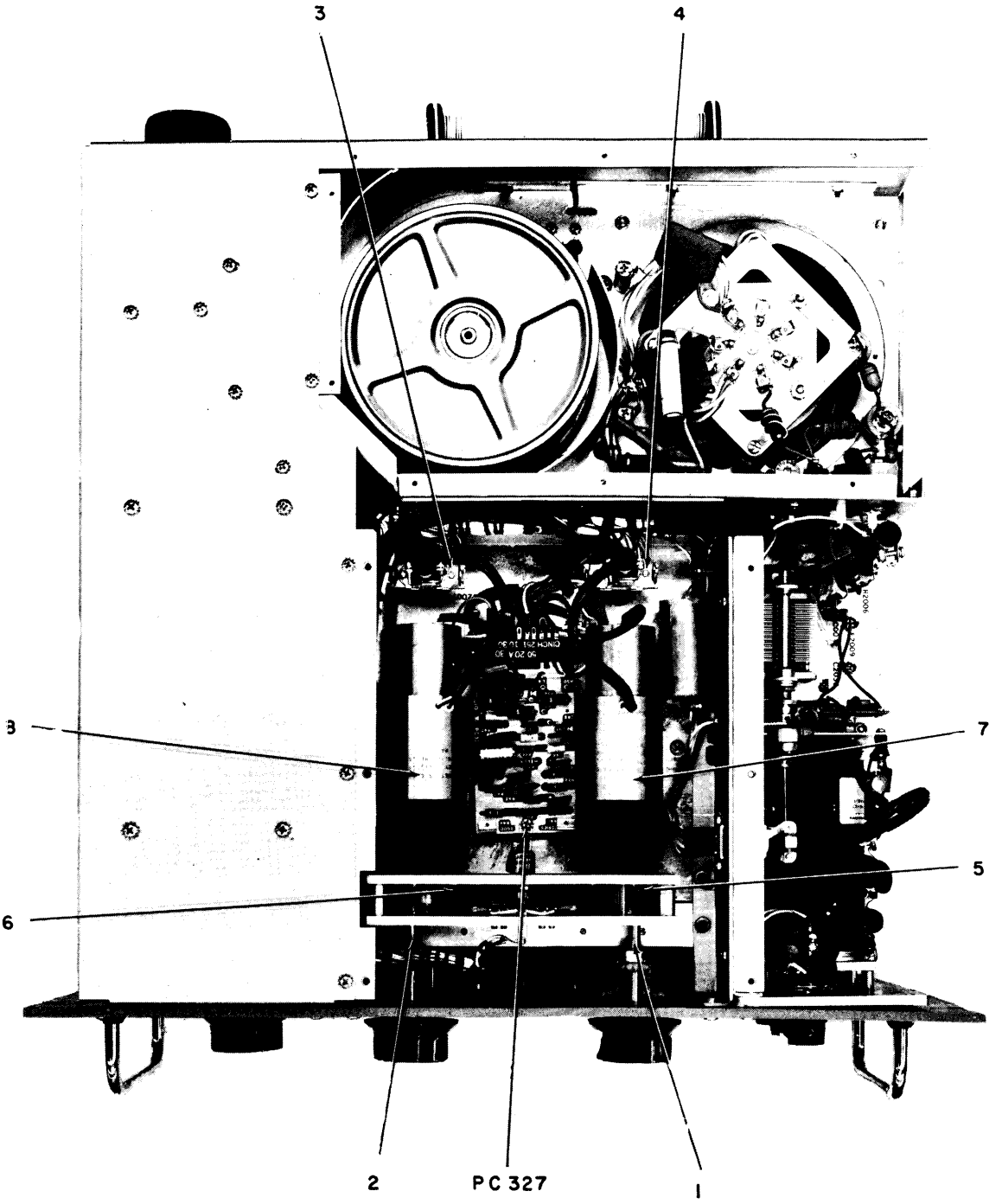


Figure 5-4. Top View of Power Amplifier Drawer, Model TLAA

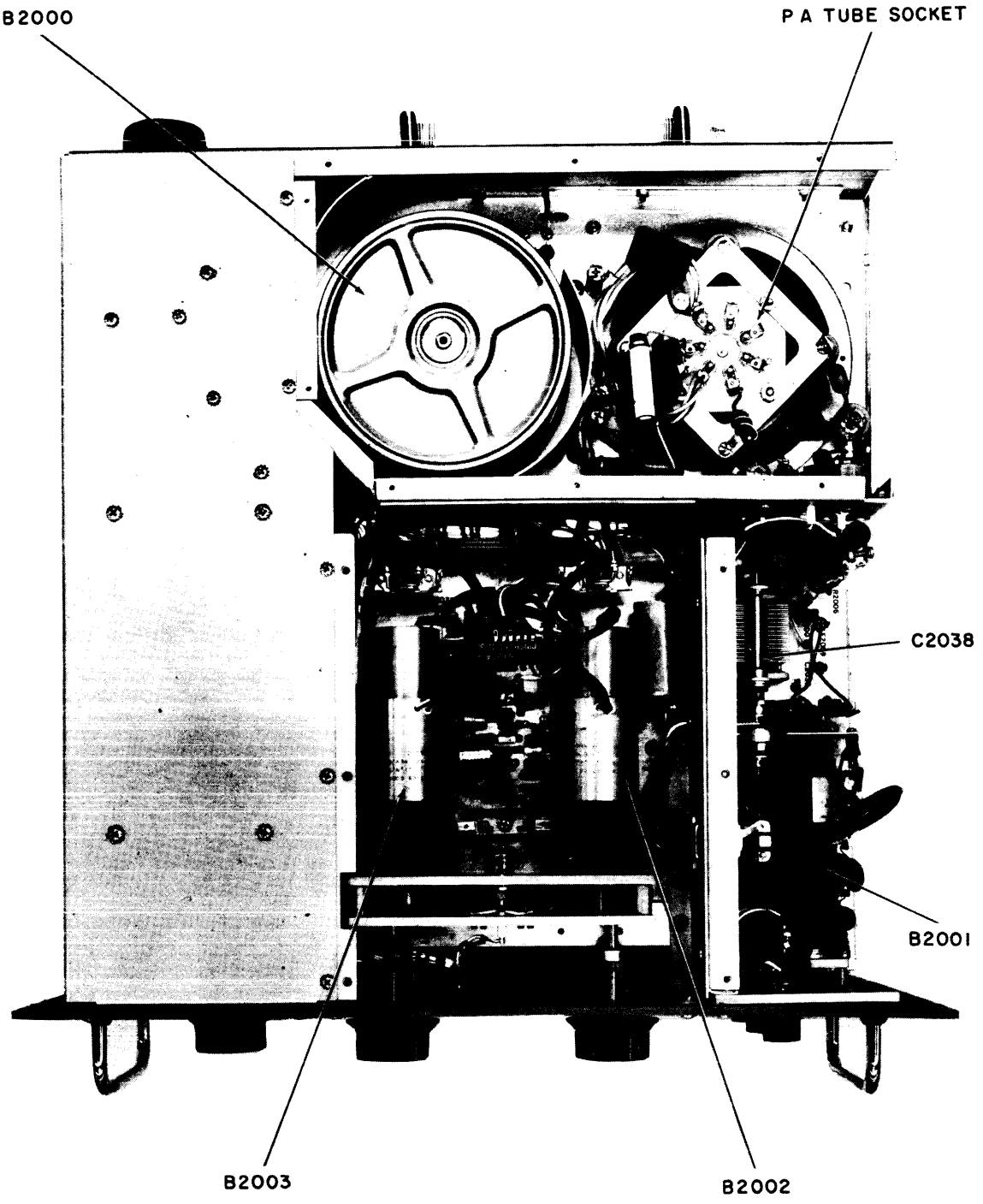


Figure 5-5. Bottom View of Power Amplifier Drawer, Model TLAA

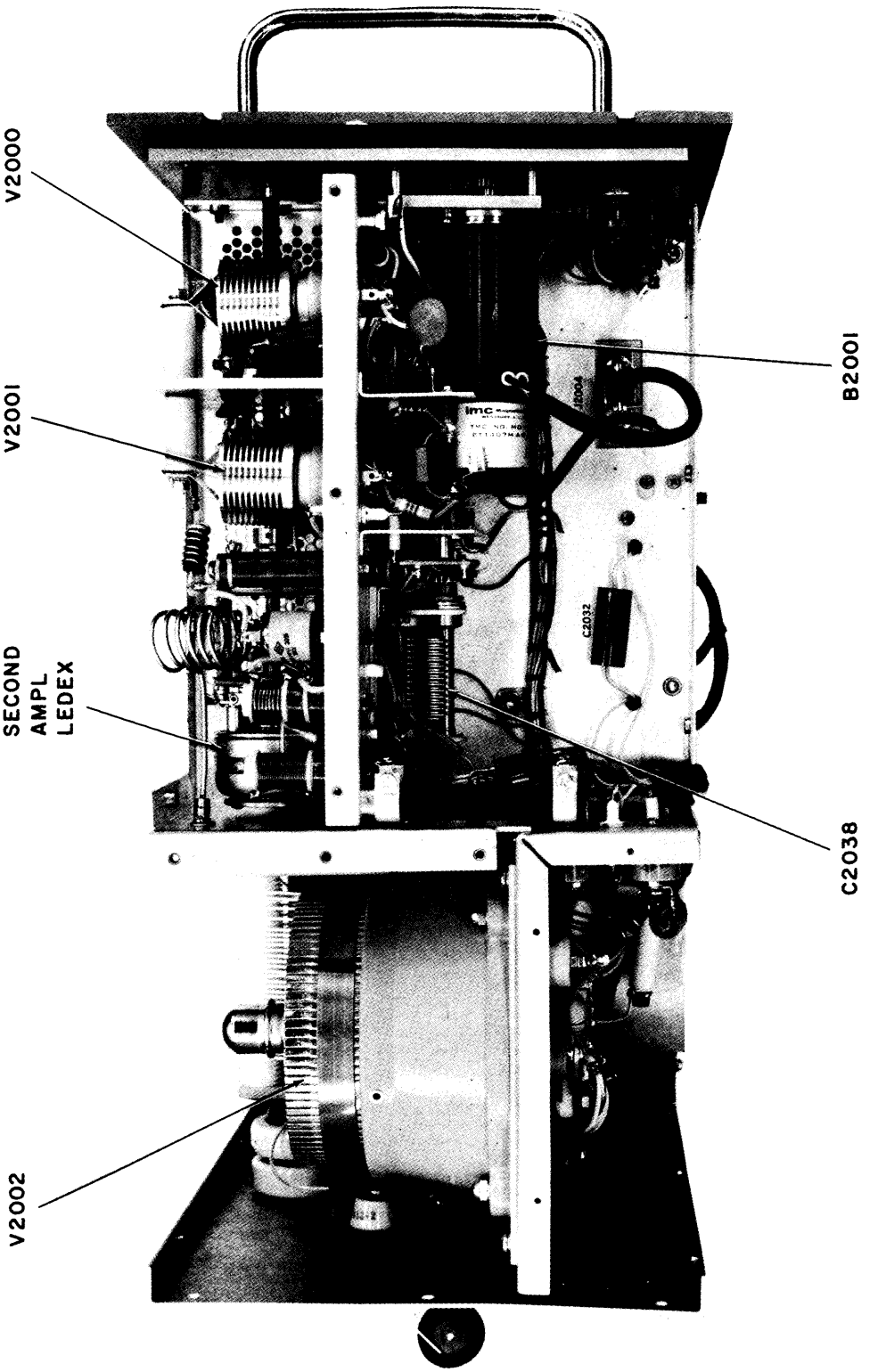


Figure 5-6. Side View of Power Amplifier Drawer, Model TLAA

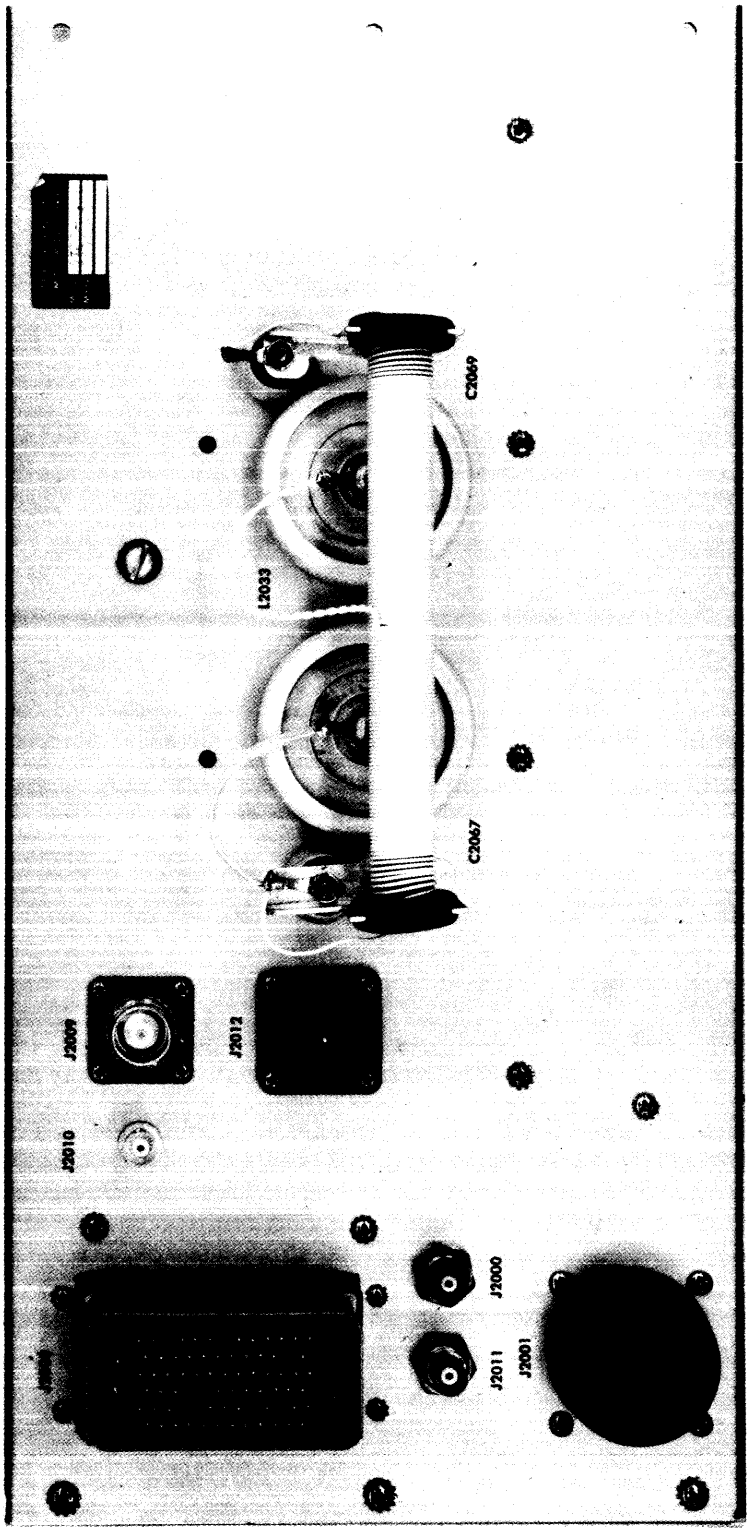


Figure 5-7. Rear View of Power Amplifier Drawer, Model TLAA

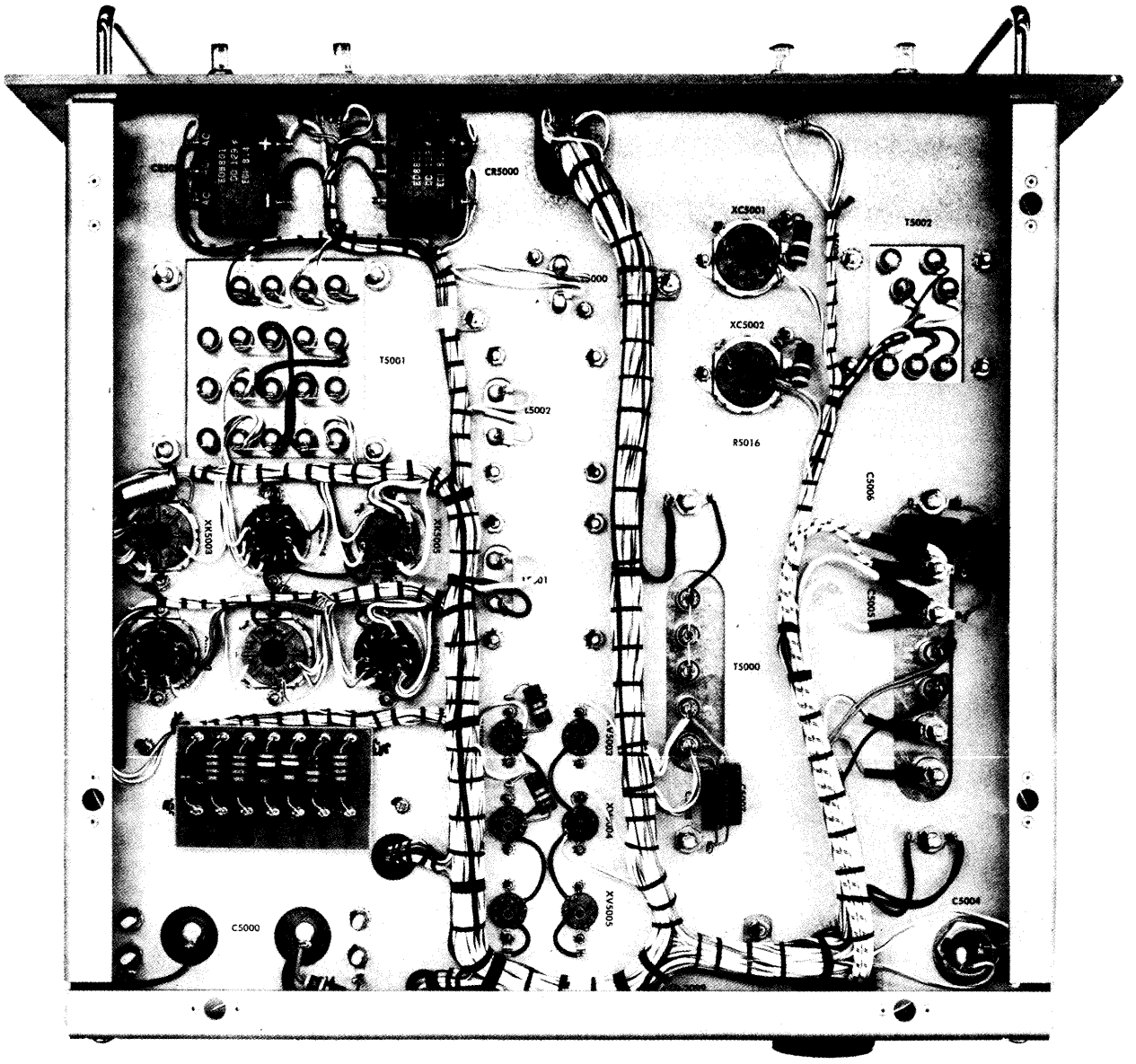


Figure 5-8. Bottom View of low Voltage Power Supply, Model AP128A

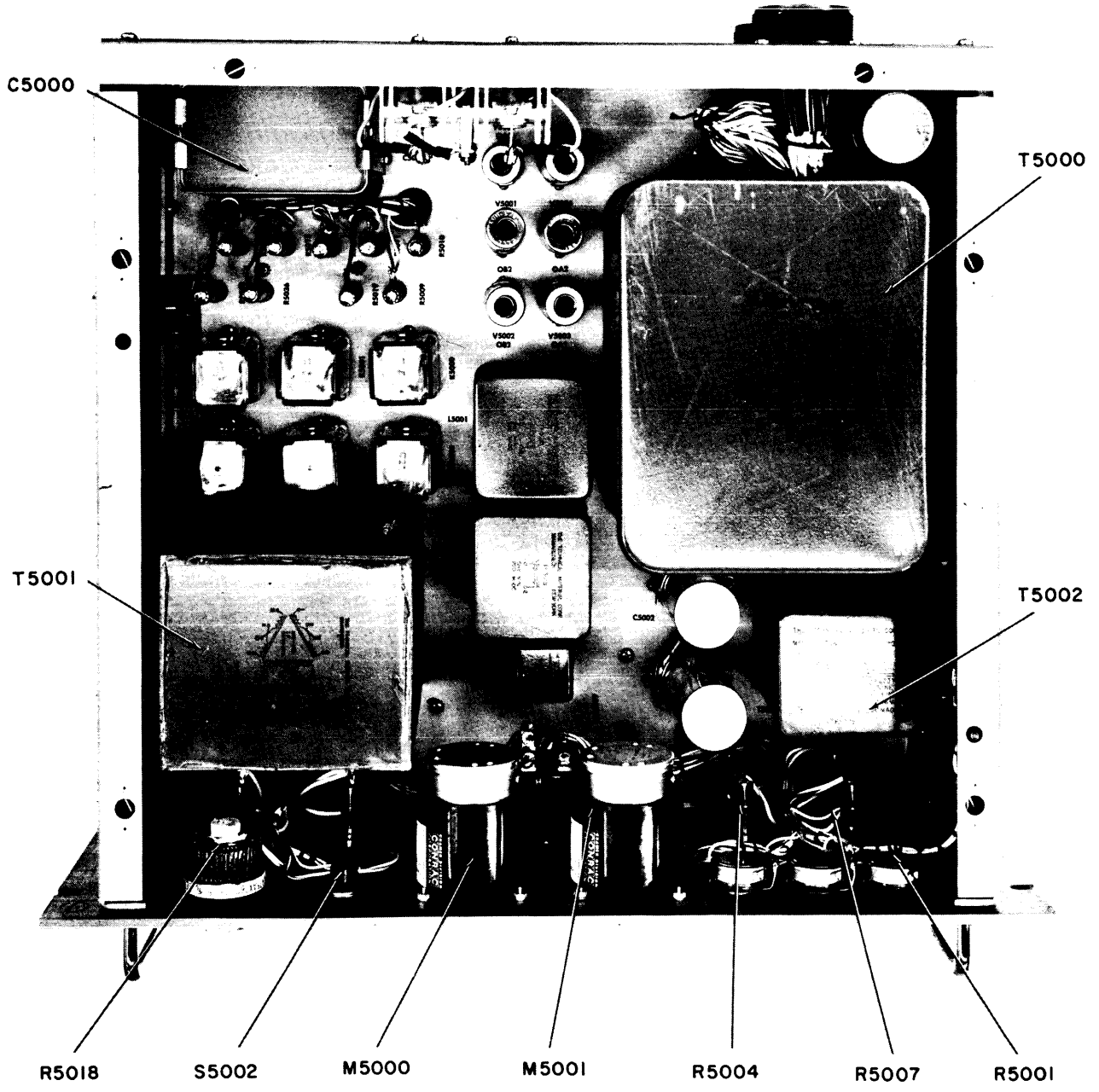


Figure 5-9. Top View of Low Voltage Power Supply, ModelAP128A

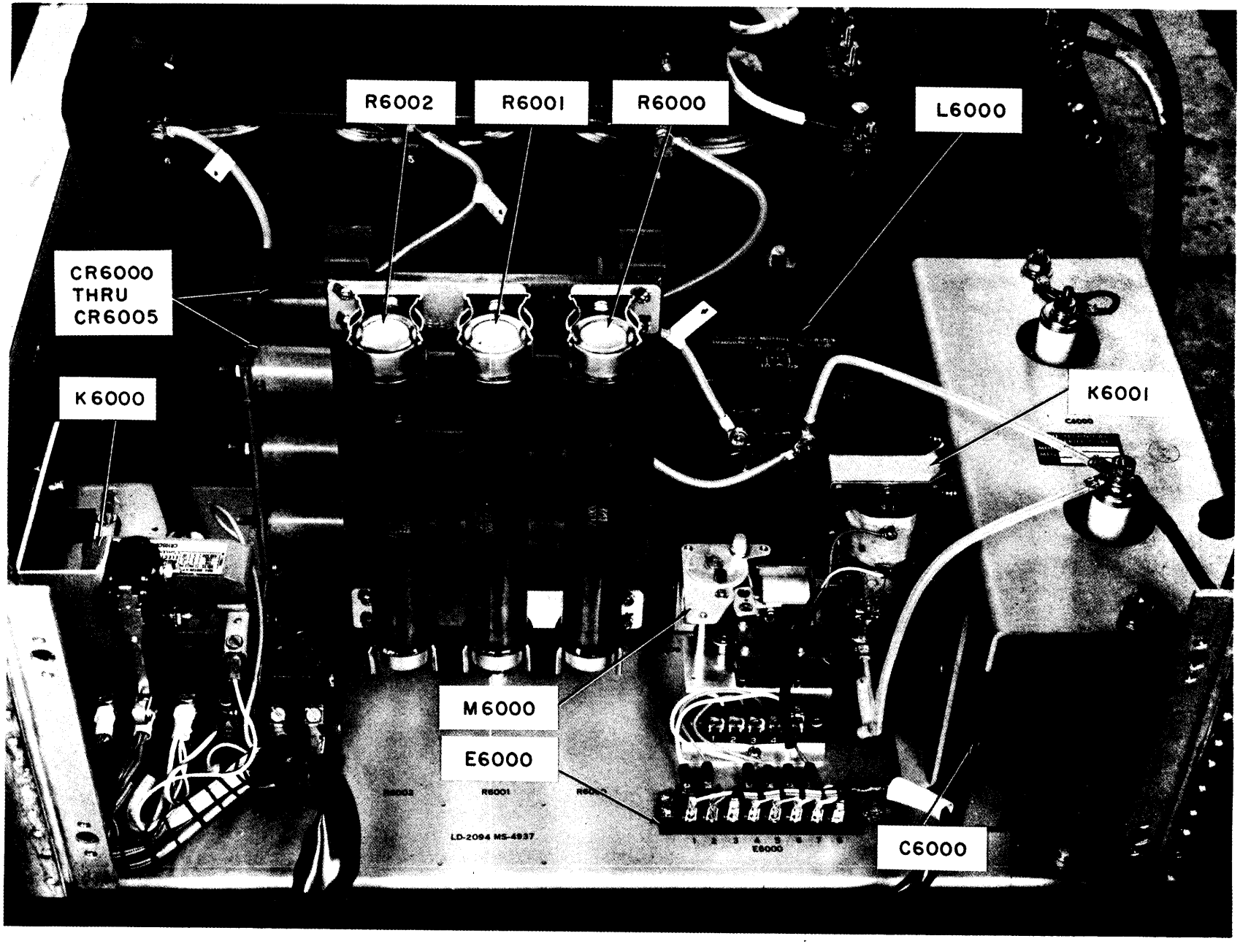


Figure 5-10. Front View of High Voltage Power Supply, Model AP 129

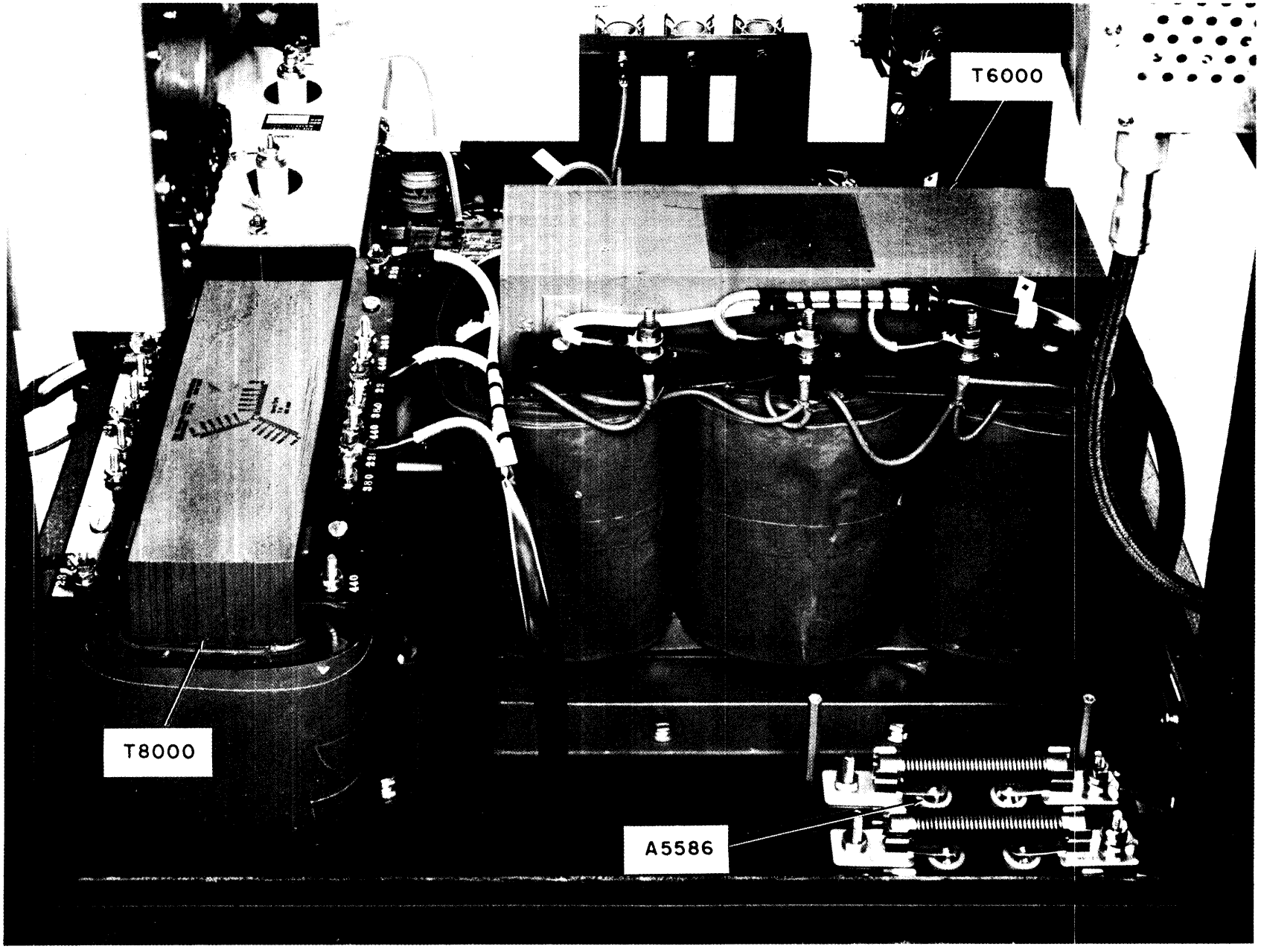


Figure 5-11. Rear View of High Voltage Power Supply, Model AP129

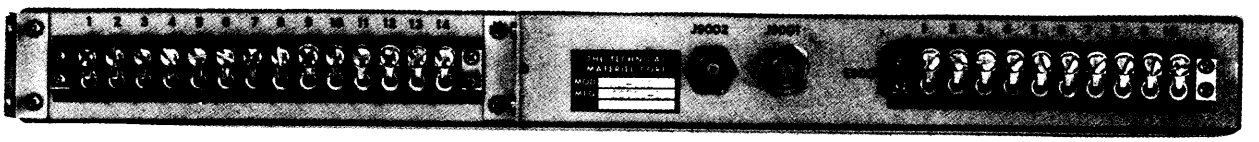


Figure 5-12. Rear Panel View of Alarm Panel, Model AX633

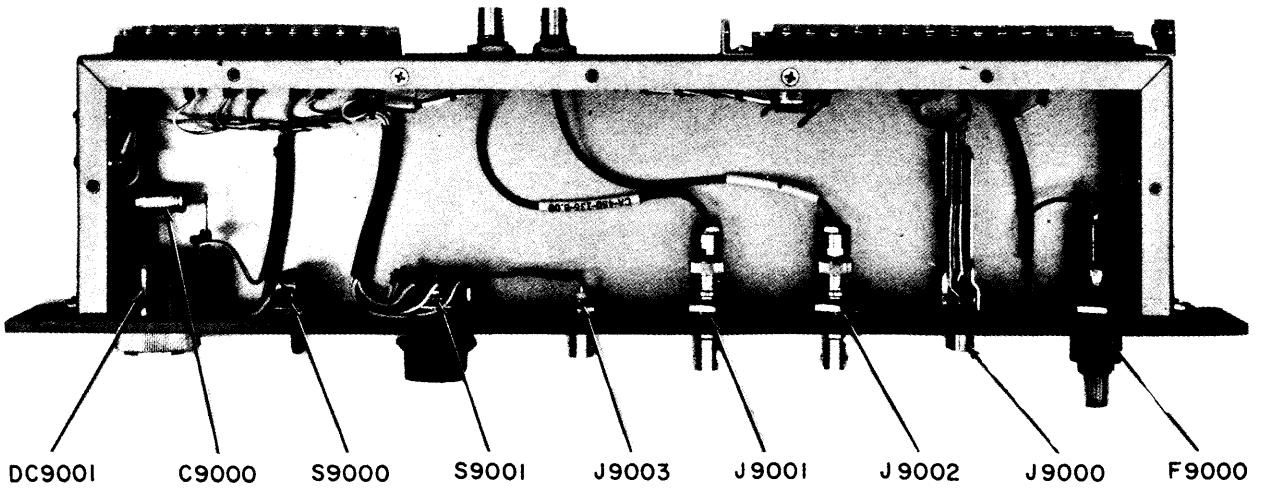


Figure 5-13. Top View of Alarm Panel, Model AX633

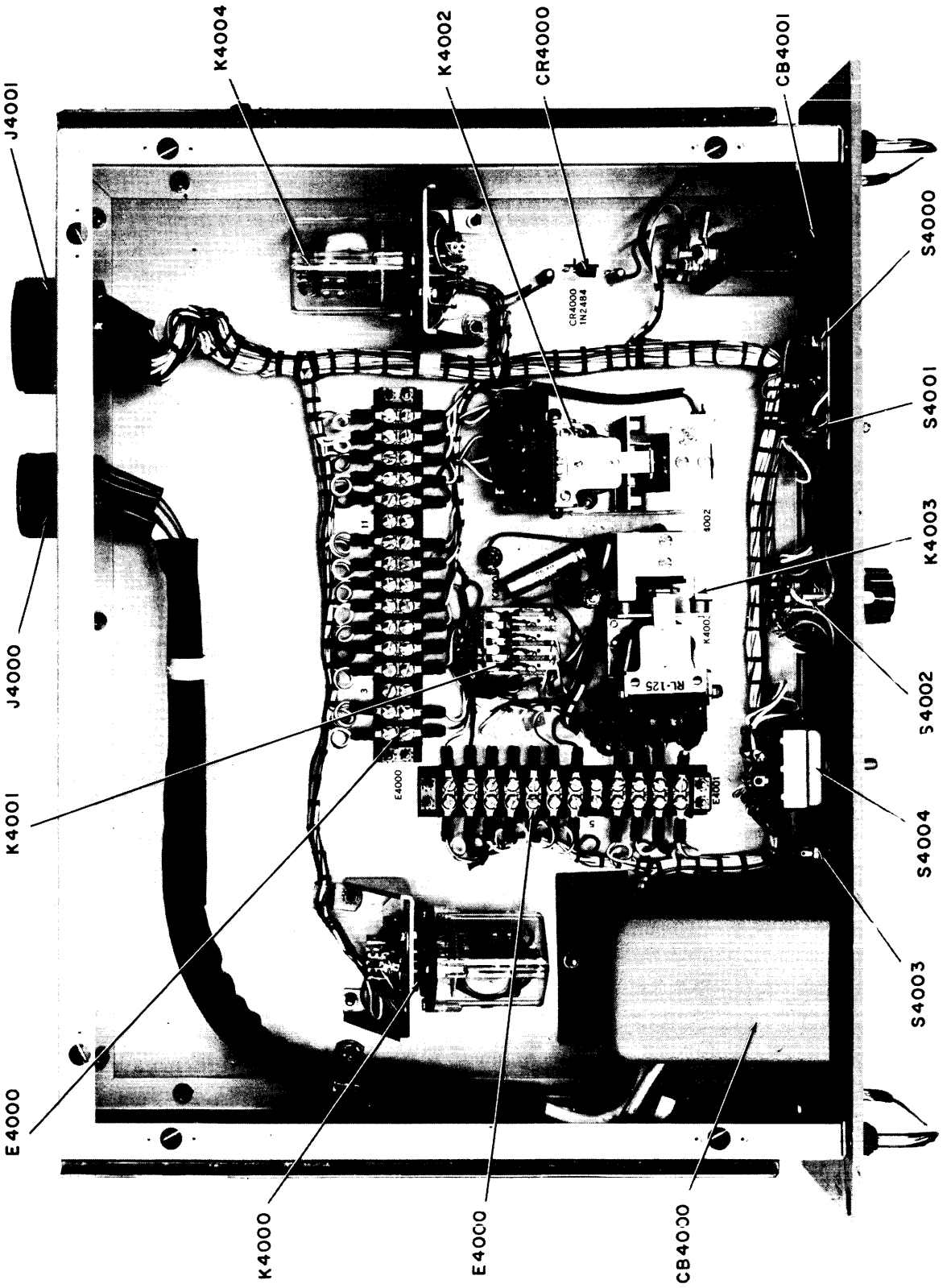


Figure 5-14. Top View of Transmitter Control Panel, Model TCP

Figure 5-15. Rear View of Junction Box

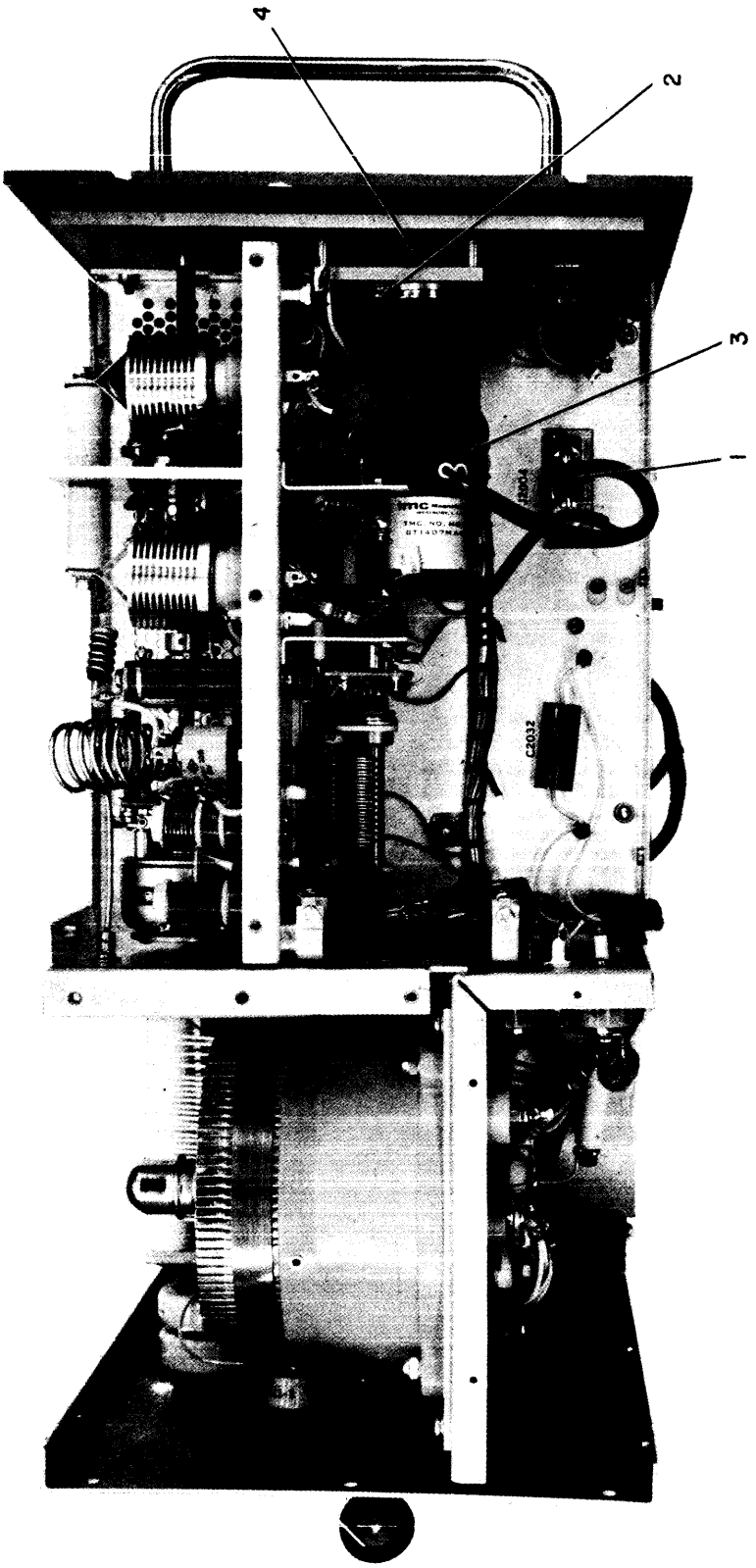


Figure 5-16. Second Amplifier Servo Motor Replacement

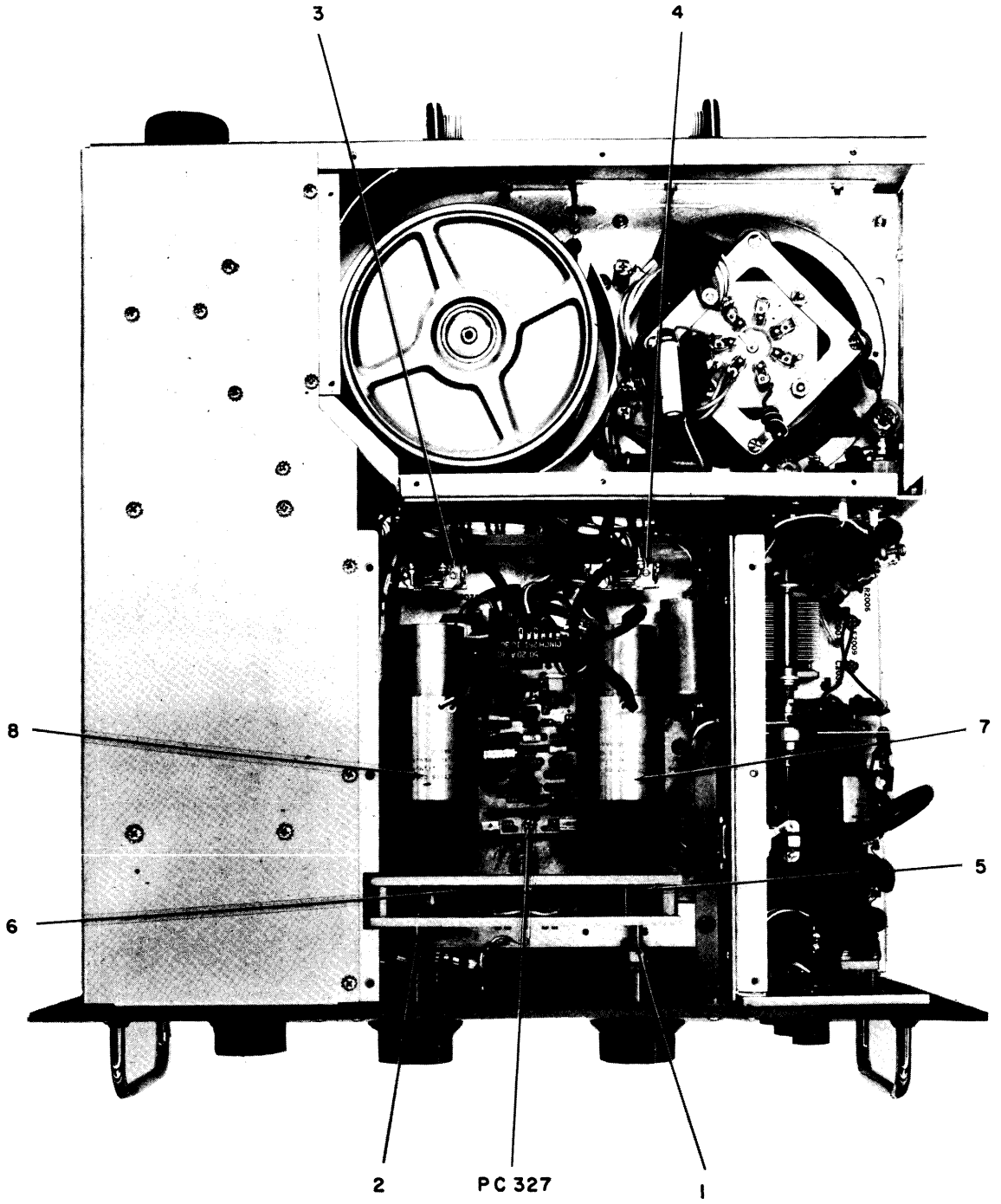


Figure 5-17. Tune and Load Servo Replacement

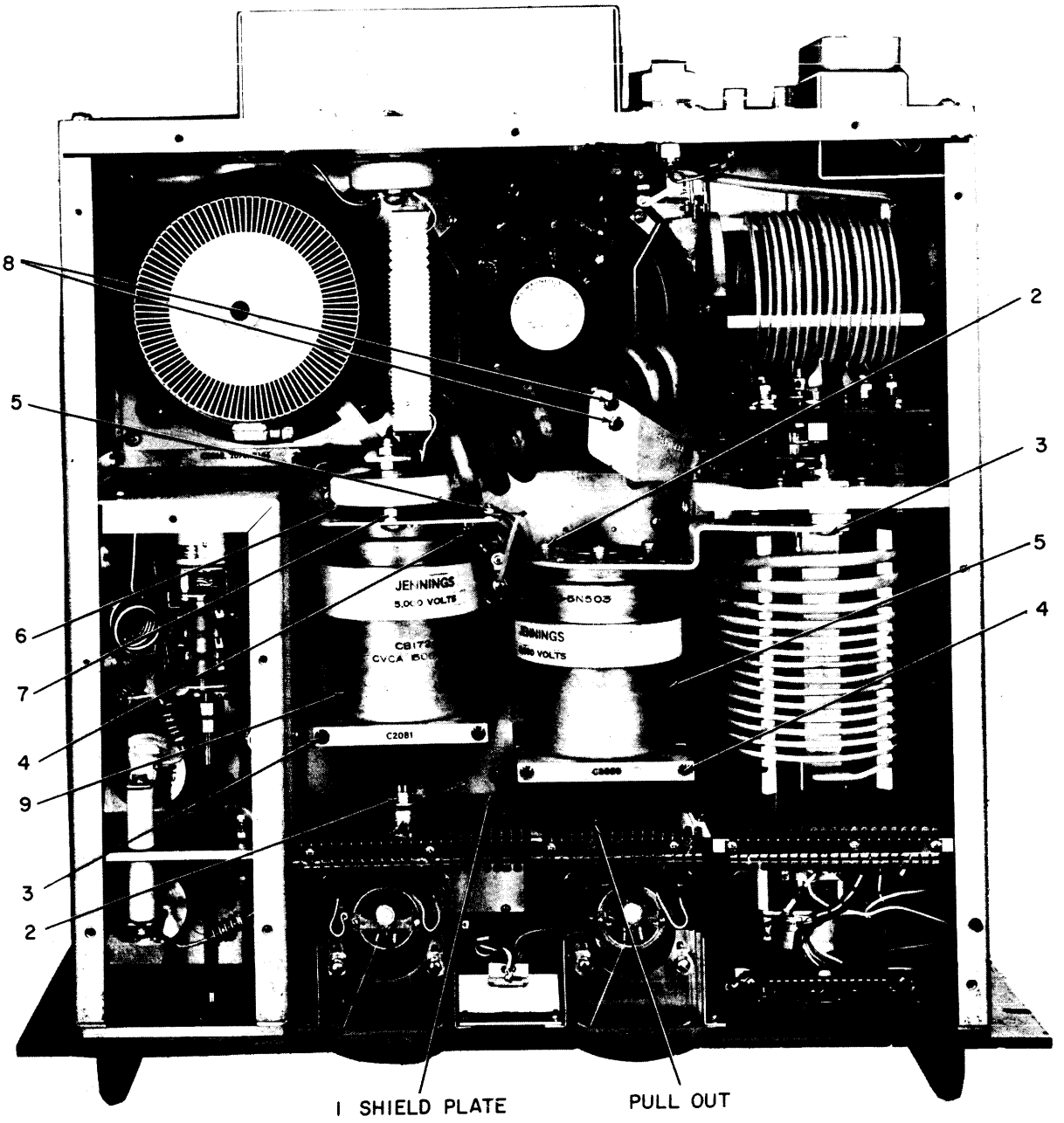


Figure 5-18. Tune and Load Capacitor Replacement

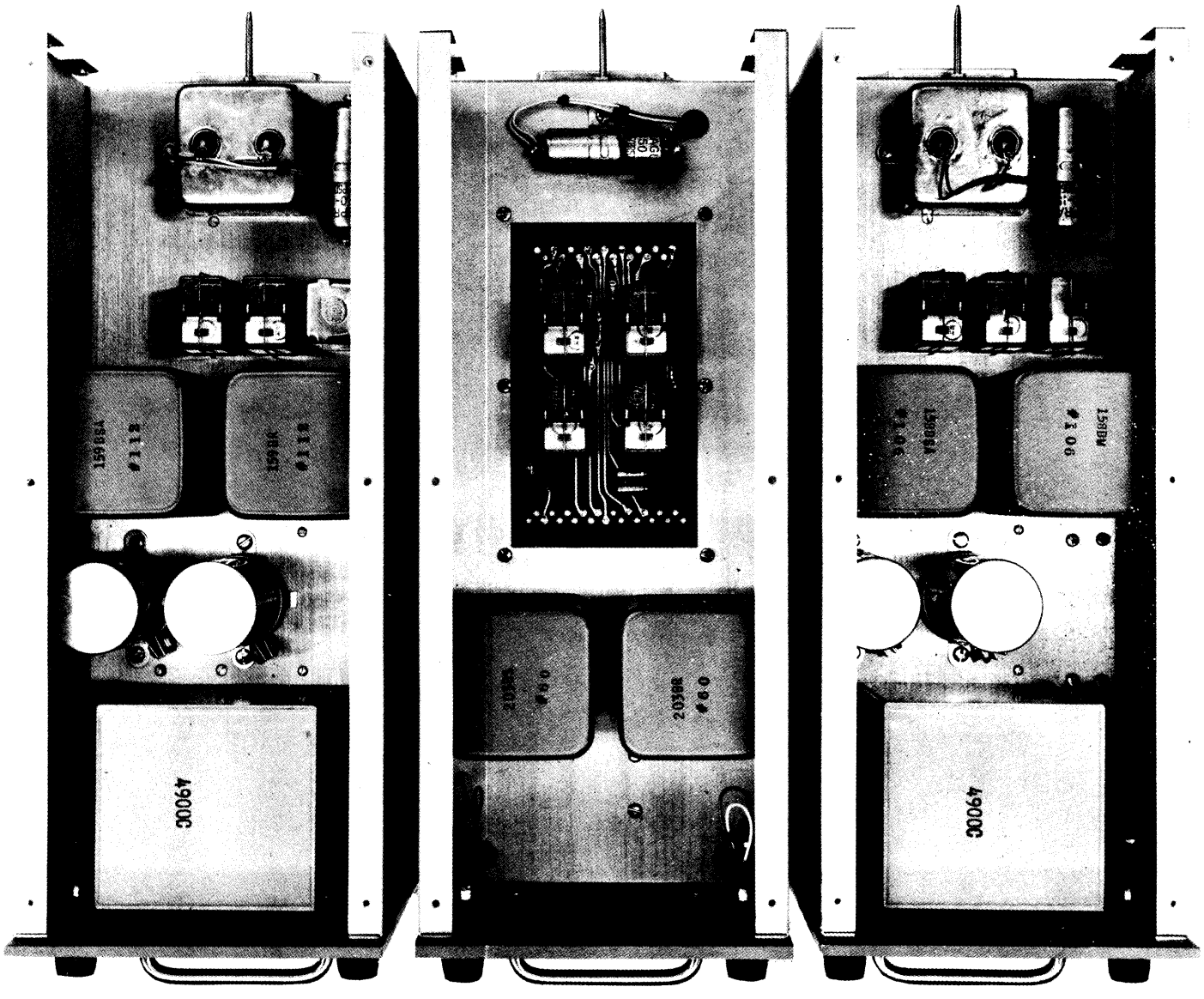


Figure 5-19. Top View, Reading Left to Right, PA Tune, Second Amplifier, and PA Load Servo Amplifiers

SECTION 6
PARTS LIST

6-1. INTRODUCTION

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

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

a. Reference symbol.

b. Description as indicated in parts list.

c. TMC part number.

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

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

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

ASSEMBLY OR SUB-ASSEMBLY — PAGE

PARTS LIST

FOR

RAK, ELECTRICAL EQUIPMENT

RAK 111-2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B8000	FAN, VANE AXIAL: AC motor 230V, ±10%; single phase. 50/60 cps, one 4 uf capacitor, 400 VAC, 2800/3300 RPM, current rating 0.85/0.6 amps.	BL117
C8000	CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uuf; ±10%; 600 WVDC.	CP41B1EF405K
C8001 thru C8006	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf ±20%; 5,000 WVDC.	CC109-38
CP8000	ADAPTER, RF	UG259/U
DS8000 and DS8003	LAMP, INCANDESCENT: 28VAC/DC; 0.04 amps; single contact, T-1-3/4 bulb.	BI110-7
DS8001 and DS8002	LAMP, INCANCESCENT: 230V, 10 Watts; S-6 type bulb; screw-type base.	BI105-1
E8000	Part of Tuning Control System, Model TCSA-1.	
E8001	Part of Tuning Control System, Model TCSA-1.	
E8002	TERMINAL BOARD, BARRIER: 10 6-32 thd. x 1/4" long binding head machine screw, black phenalic body.	TM100-10
E8003	TERMINAL BOARD, BARRIER: two 6-32 thd. x 1/4" long binding head machine screws, black phenalic body.	TM102-2
E8004	TERMINAL BOARD, BARRIER: three 6-32 thd. x 1/4" long binding head machine screws; black phenalic body.	TM102-3
E8005	TERMINAL BOARD, BARRIER: nine 6-32 thd. x 1/4" long binding head machine screws; black phenalic body.	TM102-9
E8008	TERMINAL BOARD, BARRIER: fourteen 6-32 thd. x 1/4" long binding head machine screws; black phenalic body.	TM102-14
J8000	CONNECTOR, RECEPTACLE, ELECTRICAL: 4 female contacts.	MS3102A14SZS
L8000 thru L8002	COIL, RADIO FREQUENCY: fixed; 15uh operating frequency 10 kcs.	CL410

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S8000	SWITCH, ROLLER LEVER: SPDT; current rating 15 amps at 125VAC.	SW260
S8001 thru S8006	SWITCH, INTERLOCK: push-pull; current rating 15 amps at 120/250VAC or 0.2 amps resistive at 250 VAC.	SW230
S8008	SWITCH, THERMOSTATIC	SS104-2
T8000	TRANSFORMER	TF342
XDS8000	LAMPHOLDER: used with indicator lens, TMC Part No. LI114G2.	TS184
XDS8001	LAMPHOLDER: accommodates candelabra screw-type base lamps.	TS186
XDS8002	Same as XDS8001.	
XDS8003	Same as XDS8000. Used with indicator lens, TMC Part No. LI114R1.	

PARTS LIST

FOR

HARMONIC FILTER, AF107

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C8301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100 uuf, ±10%; 5,000 WVDC.	CC109-28
C8302	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 25 uuf, ±10%; 7,500 WVDC.	CC109-13
C8303	Same as C8301.	
C8304	Same as C8302.	
C8305	Same as C8301.	
C8306	Same as C8301.	
C8307	Same as C8302.	
C8308	Same as C8301.	
C8309	Same as C8301.	
C8310	Same as C8302.	
CR8301	DETECTING ELEMENT: RF; average power rating 1.5 KW; average line power 750 WCW , calibrated at 10 MC, ±5%; used with directional coupler DC106.	DD119-5
CR8302	DETECTING ELEMENT: RF; average power rating 500 Watts; average line power 76.2 uA Two-tone, calibrated at 10MC, ±5%; used with directional coupler DC106.	DD119-6
DC8301	DIRECTIONAL COUPLER: operating frequency range 2-30MC; impedance 50 ohms; power rating 8 KW average, 20 KW peak; used with detecting element DD119-3, DD119-4.	DC106
J8301	CONNECTOR, RECEPTACLE, ELECTRICAL: teflon dielectric; series HN.	UG560*/U
L8301	COIL, RADIO FREQUENCY	CL404-1
L8302	COIL, RADIO FREQUENCY	CL404-2
L8303	Same as L8301.	

PARTS LIST

FOR

RF AMPLIFIER, MODEL TLAA-2.5K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B2000	FAN, CENTRIFUGAL: 230 V, 50/60 cps (Hz); single phase; rotation 2,800/3,200 RPM; consists of one 4 uf, 220 VAC capacitor.	BL126
B2001	MOTOR, TUBEAXIAL FAN: motor voltage fixed phase 115 volts, control phase 40 volts; current rating fixed phase 0.063 amps, control phase 0.182 amps; power input fixed phase 6.0 watts, control phase 6.4 watts; 50/60 cps; black oxide case.	MO127
B2002	MOTOR, TUBEAXIAL FAN: motor voltage fixed phase 220 volts, ±10%, control phase 36 volts; current rating fixed phase 0.067 amps, control phase 0.330 amps; power output 3 watts; 50/60 cps; steel case.	MO126
B2003	Same as B2002.	
C2000	CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 uuf, ±2%; 500 WVDC.	CM20F102G03YY
C2001	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C2002	Same as C2001.	
C2003	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, ±10%; 500 WVDC.	CC100-9
C2004	Same as C2001.	
C2005	CAPACITOR, FIXED, ELECTROLYTIC: 20 uf, 100 WVDC	CE105-20-100
C2006	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100,000 uuf, +80% -20%; 300 WVDC.	CC100-37
C2007	Same as C2006.	
C2008	CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 uuf, ±10%; 300 WVDC.	CB21QB102K
C2009	Same as C2008.	
C2010	Same as C2006.	
C2011	Same as C2006.	
C2012	Same as C2001.	
C2013	Same as C2001.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2014	CAPACITOR, FIXED, CERAMIC: 100,000 uuf, 600 WVDC	CC110-1
C2015	Same as C2003.	
C2016	Same as C2003.	
C2017	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, ±20%; 500 WVDC.	CK70AW102M
C2018	Same as C2008.	
C2019	Same as C2008.	
C2020	CAPACITOR, FIXED, MICA DIELECTRIC: 1,500 uuf, ±2%; 500 WVDC.	CM100-10
C2021	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 3,000 uuf, 300 WVDC.	CC100-31
C2022	Same as C2008.	
C2023	Same as C2008.	
C2024	CAPACITOR, FIXED, MICA DIELECTRIC: 24 uuf, ±5%; 500 WVDC.	CM15C240J03
C2025	NOT USED	
C2026	Same as C2005.	
C2027	Same as C2003.	
C2028	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2 x 4,000 uuf, GMV; 1,000 WVDC.	CC100-22
C2029	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100,000 uuf 300 WVDC.	CC100-37
C2030	Same as C2008.	
C2031	CAPACITOR, FIXED, MICA DIELECTRIC: 20 uuf, ±5%, 500 WVDC.	CM15B200J
C2032	CAPACITOR, FIXED, MYLAR DIELECTRIC: 1.0 uf, ±5%; 400 WVDC.	CN114-1RO-4J
C2033	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500 uuf, ±20%; 5,000 WVDC.	CC109-36

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2034	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, ±20%; 500 WVDC.	CC108-1P1000M
C2035	Same as C2021	
C2036	CAPACITOR, FIXED, ELECTROLYTIC: 2 uf, 6800 WVDC.	CE115-2-6800
C2037	Same as C2021.	
C2038	CAPACITOR, VARIABLE, AIR: 10.0 to 200 uuf, 1,500 V RMS; 60 cps; nominal air gap 0.0245".	CB118SRX200
C2039	CAPACITOR, FIXED, CERAMIC: 2 x 10,000 uuf, GMV, 1,000 WVDC.	CC100-23
C2040	CAPACITOR, FIXED, MICA DIELECTRIC: 15 uuf, ±5%; 500 WVDC.	CM15D150J03YY
C2041	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2 x 2,000 uuf, GMV; 1,000 WVDC.	CC100-17
C2042	CAPACITOR, FIXED, MICA DIELECTRIC: 150 uuf, ±2%; 500 WVDC.	CM15F151G03
C2043	CAPACITOR, VARIABLE, CERAMIC: 15-60 uuf, 100 WVDC.	CV112-5
C2044	NOT USED	
C2045	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 3 uuf, ±10%; 5,000 WVDC.	CC109-3
C2046	CAPACITOR, VARIABLE: 8-50 uuf, 350 WVDC.	CV109-6
C2047 thru C2049	Same as C2001.	
C2050	Same as C2041.	
C2051	Same as C2001.	
C2052	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 3 uuf, ±10%; 5,000 WVDC.	CC109-2
C2053	Same as C2003.	
C2054	Same as C2003.	
C2055	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, ±20%; 5,000 WVDC.	CC109-38

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2056	Same as C2055.	
C2057	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2,000 uuf, ±20%, 500 WVDC.	CK70AW202M
C2058	CAPACITOR, FIXED, MICA DIELECTRIC: 22,000 uuf, ±5%; 600 WVDC.	CM50B223J
C2059	Same as C2014.	
C2060	DELETED	
C2061	CAPACITOR, FIXED, CERAMIC DIELECTRIC	CC115-1-500
C2062	Same as C2014.	
C2063	CAPACITOR, FIXED, MICA DIELECTRIC: 100 uuf, ±5%; 500 WVDC.	CM15F101J03
C2064	Same as C2055.	
C2065	Same as C2034.	
C2066	Same as C2001.	
C2067	Same as C2061.	
C2068	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 uuf, ±10%; 5,000 WVDC.	CC109-6
C2069	Same as C2061.	
C2070	Same as C2061.	
C2071	Same as C2036.	
C2072	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 5 uuf, ±10%.	CC109-4
C2073	Same as C2001.	
C2074	NOT USED	
C2075	Same as C2061.	
C2076	Same as C2068.	
C2077	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,000 uuf, ±20%; 500 WVDC.	CC1084P1000M
C2078	Same as C2072.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2079	Same as C2072.	
C2080	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100 uuf, ±10%.	CC109-28
C2081	CAPACITOR, VARIABLE, VACUUM: 10 to 1,500 uuf; peak test voltage 5 Kv.	CB172-5
C2082	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.68 uf, ±10%; 1,000 WVDC.	CP106C684-10K
C2083	Same as C2082.	
C2084	NOT USED	
C2085	Same as C2001.	
C2086	NOT USED	
C2087	NOT USED	
C2088	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500 uuf, ±10% 5,000 WVDC.	CC115-1-500
C2089	CAPACITOR, VARIABLE, VACUUM: 20 to 2,000 uuf; peak test voltage 5 Kv.	CB172-6
C2090	Same as C2061.	
C2091	NOT USED	
C2092	Same as C2001.	
C2093	CAPACITOR, FIXED, MICA DIELECTRIC: 100 uuf, ±5%; 500 WVDC.	CM15F101J03
C2094	Same as C2006.	
C2095	CAPACITOR, FIXED, ELECTROLYTIC: 15 uf, 50 WVDC.	CE105-15-50
C2096	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20,000 uuf, +80% -20%; 500 WVDC.	CC100-24
C2097	Same as C2001.	
C2098	Same as C2001.	
C2099	Same as C2029.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2100	CAPCITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, 500 WVDC.	CC100-16
C2101	Same as C2100.	
C2102	Same as C2100.	
C2103	Same as C2000	
C2104	NOT USED	
C2105	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 uuf, ±10%; 5,000 WVDC.	CC109-6
C2106	NOT USED	
C2107	Same as C2006.	
C2108	Same as C2006.	
C2109	Same as C2029.	
C2110	NOT USED	
C2111	CAPACITOR, FIXED, MICA DIELECTRIC: 10 uuf, ±5%; 500 WVDC.	CM15C100J03YY
C2112	DELETED	
C2113 thru C2115	DELETED	
C2116	Same as C2008.	
C2117	Same as C2008.	
C2118	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100 uuf, ±10%; 5,000 WVDC.	CC109-28
C2119	CAPACITOR, FIXED MICA DIELECTRIC: 1,500 uuf, ±2%; 500 WVDC.	CM100-10
C2120	Same as C2001.	
C2121	Same as C2008.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR2000		1N538
CR2001	SEMICONDUCTOR DEVICE, DIODE	1N3070
CR2002	Same as CR2001.	
CR2003		1N538
CR2004	Same as CR2001.	
CR2005 thru CR2009	Same as CR2001.	
DS2000	LAMP, INCANDESCENT: 5 to 6 volts; 0.063 amps; bulb size T-1.	BI114-2
DS2001 thru DS2008	Same as DS2000.	
E2000	TERMINAL	TE0169-1
E2002	Same as E2000.	
E2003	Same as E2000.	
E2004		TE0121-2
E2005	Same as E2004.	
E2006	Same as E2000.	
E2007		AX696-1
E2008		AX696-2
E2009 thru E2011	Same as E2000.	
E2000	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 round female contact, straight type; series BNC to BNC.	JJ172
J2001	CONNECTOR, RECEPTACLE, ELECTRICAL: female	MS3102A28-21S

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J2002	CONNECTOR, RECEPTACLE, ELECTRICAL: 14 male contacts, brass gold over silver plated.	JJ242-1S
J2003	CONNECTOR, RECEPTACLE, ELECTRICAL	JJ333-75PFS3
J2004	CONNECTOR, RECEPTACLE, ELECTRICAL: 9 female contacts, removable crimp pin style; current rating 5 amps at 500 V RMS; polarized.	JJ310-4
J2005	CONNECTOR, RECEPTACLE, ELECTRICAL	JJ310-2
J2006	Same as J2004.	
J2007	Same as J2004.	
J2008	CONNECTOR, RECEPTACLE, ELECTRICAL: 20 female contacts rated for 5 amps at 1,800 V RMS.	JJ319-10DFE
J2009	CONNECTOR, RECEPTACLE, ELECTRICAL: female; teflon insulation.	UG560*/U
J2010	CONNECTOR, RECEPTACLE, ELECTRICAL: RF; 1 round female contact; 52 ohms; series BNC to BNC.	UG625*/U
J2011	Same as J2000.	
J2012	CONNECTOR, RECEPTACLE, ELECTRICAL	MS3102A18-16P
J2013	Same as J2004.	
J2014	DELETED	
J2015	CONNECTOR, RECEPTACLE, ELECTRICAL	JJ333-75PFS3
L2000	COIL, RADIO FREQUENCY, FIXED: 220 uh $\pm$10%; current rating 350 ma, molded case.	CC140-6
L2001	Same as L2000.	
L2002	DELETED	
L2003	NOT USED	
L2004	Same as L2002.	
L2005	COIL, RADIO FREQUENCY, FIXED: 124 uh; $\pm$10%.	CL361

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L2006	COIL, RADIO FREQUENCY: fixed; 3 PI; 1 mh inductance; 23 ohms, ±10% resistive; current rating 75 to 100 ma.	CL101-2
L2007	COIL, RADIO FREQUENCY: fixed; 128 uhy; test frequency 790 Kc.	CL177
L2008	COIL, RADIO FREQUENCY: fixed; 22 uh, ±10%, current rating 565 ma., molded case.	CL270-22
L2009	COIL, RADIO FREQUENCY: fixed; 1.5 uh, ±10%.	AX602
L2010	Same as L2000.	
L2011		TZ210
L2012	Same as L2007.	
L2013	Same as L2007.	
L2014	COIL, RADIO FREQUENCY: fixed; 113 uh, ±5%.	CL361
L2015	Same as L2006.	
L2016	DELETED	CL406
L2017	Non-replaceable item. Part of CL407.	
L2018	Non-replaceable item. Part of CL407.	
L2019	Non-replaceable item. Part of CL409.	
L2020	Non-replaceable item. Part of CL409.	
L2021	Non-replaceable item. Part of CL408.	
L2022	Non-replaceable item. Part of CL408.	
L2023	Non-replaceable item. Part of CL409.	
L2024	Non-replaceable item. Part of CL406.	
L2025	CHOKE, RADIO FREQUENCY: 2.5 uh; ±10%; current rating 125 ma.	CL101-3
L2026	Same as L2025.	
L2027	COIL, RADIO FREQUENCY	CL100-5

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L2028	DELETED	
L2029	NOT USED	
L2030	COIL, RADIO FREQUENCY: 185 uh, ±15 uh; operating frequency 790 Kc; 3/8" dia. x 2" long o/a.	CL178
L2031	COIL, RADIO FREQUENCY: fixed; 0.150 uh, ±10%; current rating 400 ma; molded case.	CL140-2
L2032	Same as L2031.	
L2033	COIL, RADIO FREQUENCY	CL413
L2034	NOT USED	
L2035	COIL, RADIO FREQUENCY: fixed; 33 uh, ±10%; rated for 2.5 mc.	CL366
L2036	COIL, RADIO FREQUENCY: 0.270 uh, ±10%; current rating 300 ma; molded case.	CL140-3
L2037	Same as L2036.	
L2038	CHOKE, RADIO FREQUENCY: fixed, 15 uh, ±10%, current rating 1,000 ma..	CL105-4
L2039	COIL	CL429
L2040	COIL	CL399
L2041	Same as L2030.	
L2042	COIL, RADIO FREQUENCY: fixed, 220 uh, ±10%; current rating 350 ma, molded case.	CL140-6
L2043	DELETED	
L2044	Same as L2042.	
L2045	COIL, RADIO FREQUENCY: fixed; 150 uh, ±5%; current rating 315 ma; molded case.	CL275-151
L2046	DELETED	CL275-68
L2047	Same as L2045.	
L2048	COIL	CL402
L2049	COIL	CL405

RF AMPLIFIER, MODEL TLAA-2.5K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
M2000	METER: full scale deflection 0 to 100 ua; 11,000 ohms, ±15%; dust-proof molded lucite case.	MR191-3
M2001	METER	MR191-7
MP2000	COUNTER: direct drive	CY107
MP2001	Same as MP2000.	
P2000	CONNECTOR, PLUG, ELECTRICAL: 14 female contacts rated for 7.5 amps; spring temper phosphor bronze, gold plated; 1,900 V RMS at sea level.	PL225-1P
P2001	CONNECTOR, PLUG, ELECTRICAL: w/hood; 9 male contacts crimp pin removable style; current rating 5 amps at 500 V RMS; polarized.	JJ313-4H
P2002	CONNECTOR, RECEPTACLE, ELECTRICAL	JJ313-2
P2003	Same as P2001.	
P2004	Same as P2001.	
P2005	DELETED	
P2006	CONNECTOR, PLUG, ELECTRICAL	JJ313-4H
R2000	DELETED	
R2001	RESISTOR, FIXED, COMPOSITION: 68 ohms, ±5%.	RC20GF680J
R2002	RESISTOR, PRECISION, WIREWOUND: 120 ohms, ±1%; 0.66 watt.	RB101R66R1200F
R2003	RESISTOR, FIXED, COMPOSITION: 1,000 ohms; ±5%; 1 watt	RC32GF102J
R2004	NOT USED	
R2005	DELETED	
R2006	RESISTOR, FIXED, FILM: 1,000 ohms, ±2%.	RR135-2-102
R2007	RESISTOR, FIXED, COMPOSITION: 220 ohms, ±5%.	RC20GF221J
R2008	Same as R2002.	
R2009		RC20GFXXXJ

RF AMPLIFIER, MODEL TLAA-2.5K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R2010	RESISTOR, FIXED, COMPOSITION: 47 ohms, ±5%; 1 watt.	RC32GF470J
R2011	Same as R2010.	
R2012	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, ±5%; 1/2 watt.	RC20GF102J
R2013	Same as R2012.	
R2014	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, ±5%; 1/2 watt.	RC20GF104J
R2015	Same as R2012.	
R2016	Same as R2012.	
R2017	RESISTOR, FIXED, COMPOSITION: 120 ohms, ±5%; 1 watt.	RC42GF40J
R2018		RC42GF220J
R2019	Same as R2010.	
R2020	RESISTOR, FIXED, COMPOSITION: 2,200 ohms, ±5%; 1/2 watt.	RC20GF222J
R2021	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, ±5%; 1/2 watt.	RC20GF224J
R2022	RESISTOR, FIXED, COMPOSITION: 470,000 ohms, ±5%; 1/2 watt.	RC20GF474J
R2023 thru R2025	NOT USED	
R2026	RESISTOR, VARIABLE, PRECISION: 1,000 ohms, ±3%; 0 watt at 125°C or 2.5 watts at 70°C.	RV118-1-102
R2027	Same as R2026.	
R2028	RESISTOR, VARIABLE, COMPOSITION: 100,000 ohms, ±10%; 1/2 watt.	RV106UX10C104A
R2029	RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms, ±10%; 1/2 watt.	RV106UX10B103A
R2030	RESISTOR, FIXED, COMPOSITION: 47,000 ohms: 1/2 watt.	RC42GF473J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R2031	RESISTOR, FIXED, COMPOSITION: 1,200 ohms, ±5%, 1 watt.	RC32GF122J
R2032	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±5%, 1/2 watt.	RC20GF472J
R2033	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, ±5%.	RC20GF104J
R2034	Same as R2030.	
R2035	Same as R2030.	
R2036	Same as R2032.	
R2037	Same as R2032.	
R2038	RESISTOR, FIXED, COMPOSITION: 1 megohm, ±5%; 1/2 watt.	RC20GF105J
R2039	RESISTOR, FIXED, COMPOSITION: 47 ohms, ±5%; 2 watts.	RC42GF470J
R2040	Same as R2032.	
R2041	Same as R2038.	
R2042	RESISTOR, FIXED, COMPOSITION: 6,800 ohms, ±5%; 1/2 watt.	RC20GF682J
R2043	Same as R2038.	
R2044	RESISTOR, FIXED, COMPOSITION: 2,700 ohms, ±5%.	RC20GF272J
S2000	SWITCH, INTERLOCK: SPDT; operating voltage 250 VAC; current rating 5 amps.	SW219
S2001	Same as S2000.	
S2002	SWITCH, ROTARY: 1 section, 2 positions; 60° angle of throw; non-shorting type contacts, silver plated brass; mycalex insulation.	SW252
S2003	SWITCH, ROTARY: 1 section, 4 positions; 30° angle of throw; non-shorting type contacts; mycalex insulation.	SW105
S2004	SWITCH	SW430
S2005	SWITCH	SW429

RF AMPLIFIER, MODEL TLAA-2.5K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S2006	SWITCH, SENSITIVE: SPDT; current rating 5 amps at 125 VAC or 250 VAC; 7 amps resistive, 4 amps inductive at 28 VDC; plastic body.	SW353-2
S2007	Same as S2006.	
S2008	SWITCH	AS128
S2009	Same as S2006.	
T2000		CL415-1
T2001	COIL, RADIO FREQUENCY, TOROID.	CL418
TB2000	DELETED	TB*
V2000	TUBE, ELECTRON: tetrode; 11 pin contact.	8121
V2001	Same as V2000.	
V2002	TUBE, ELECTRON	PL8576/PL264
XV2000	SOCKET, ELECTRON TUBE: 11 pin contact.	TS170-1
XV2001	Same as XV2000.	
XV2002	SOCKET, ELECTRON TUBE	TS182
PS2000	PARASITIC SUPPRESSOR	AX561
PS2001	NOT USED	
PS2002	Same as PS2000	AX561
PS2003	PARASITIC SUPPRESSOR	AX562

PARTS LIST

for

TRANSMITTER CONTROL PANEL, MODEL TCP-1A

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C4000	CAPACITOR, FIXED, ELECTROLYTIC: 75 uf, -10% +150% at 120 cps (Hz) at 25°C; 50 WVDC: polarized.	CE105-75-50
CB4000	CIRCUIT BREAKER	SW417-1
CB4001	CIRCUIT BREAKER	SW418-1
CR4000	SEMICONDUCTOR DEVICE, DIODE	1N2484
DS4000	LAMP, INDICATOR: w/white lens; 5.0 V at 0.06 amps for 60,000 hrs or 6.3 V at 0.07 amps for 6,000 hrs.	BI116-1-5
E4000	TERMINAL BOARD, BARRIER: sixteen 6-32 thd. x 1/4" long binder head machine screws; phenolic body	TM102-16
E4001	TERMINAL BOARD, BARRIER: twelve 6-32 thd. x 1/4" long binder head machine screws; phenolic body.	TM102-12
J4000	CONNECTOR, RECEPTACLE, ELECTRICAL: 7 male contacts.	MS3102A24-10P
J4001	CONNECTOR, RECEPTACLE, ELECTRICAL: 52 male contacts.	MS3102A32-414P
K4000	RELAY, ARMATURE: DPDT: 24 VDC, 400 ohms; contacts rated for 10 amps resistive at 115 VAC or 5 amps inductive at 26 VDC; nominal coil power 1 to 2 watts.	RL168-3C10-24DC
K4001	RELAY, ARMATURE	RL126
K4002	RELAY, ARMATURE	RL123
K4003	RELAY, ARMATURE: 4PDT; contacts rated for 25 amps non-inductive load at 125 VAC.	RL125
K4004	Same as K4000.	
R4000	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, ±5%; 2 watts.	RC42GF103J
R4001	RESISTOR, FIXED, COMPOSITION: 390 ohms, ±5%; 2 watts	RC42GF391J
R4003	RESISTOR, FIXED, COMPOSITION: 200 ohms, ±5%; 2 watts	RC42GF181J
S4000	SWITCH, PUSHBUTTON: w/red lens; AC; current rating 250 ma non-inductive; 30 watts.	SW296-1
S4001	SWITCH, TOGGLE: DPDT; nominal current rating 1 amp at 250 VAC/DC, 3 amps at 125 VAC/DC.	ST103-16-62

TRANSMITTER CONTROL PANEL, MODEL TCP-1A

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S4002	SWITCH, ROTARY: 1 section, 12 positions; 30° angle of throw; non-shorting type contacts.	SW250
S4003	Same as S4000.	
S4004	Same as S4001.	
XDS4000	Non-replaceable item. Part of DS4000.	
XK4000	SOCKET, RELAY: 8 contacts	TS-100-5
XK4004	Same as XK4000.	

PARTS LIST
for
LOW VOLTAGE POWER SUPPLY, AP128 & AP128/50

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C5000	CAPACITOR, FIXED, PAPER DIELECTRIC: 10 uf, ±10%; 2000 WVDC; polarized.	CP70B1EG106K
C5001	CAPACITOR, FIXED, ELECTROLYTIC: 80 uf, 450 WVDC.	CE51C800R
C5002	Same as C5001	
C5003	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, 50 WVDC.	CE105-50-50
C5004	CAPACITOR, FIXED, MICA: .01 uf, 600 WVDC 600 WVDC.	CP411BIFF405K
C5005 thru C5008	CAPACITOR, FIXED, MICA: .01 uf	CM40F103503
C5009	CAPACITOR, FIXED, ELECTROLYTIC: 15 uf; 50 WVDC	CE105-15-50
CB5000	CIRCUIT BREAKER	SW465
CR5000	RECTIFIER, SEMICONDUCTOR DEVICE: 3 phase; average current 1.5 amps at 75°C; non-recurrent surge 20 amps at 75°C; peak reverse voltage 4 Kv.	DD129
CR5001	Same as CR5000	
CR5002	RECTIFIER, SEMICONDUCTOR DEVICE: forward current 22 amps at 40°C; peak reverse voltage 200 V; output voltage 128 V.	DD132-1
CR5003	DIODE, Z	1N3031B
DS5000	Non-replaceable item. Part of XF5003.	
DS5001	Non-replaceable item. Part of XF5004.	
DS5002	Non-replaceable item. Part of XF5002.	
DS5003	Non-replaceable item. Part of XF5001.	
DS5004	Non-replaceable item. Part of XF5000.	
DS5005	LAMP, INCANDESCENT: 28.0 VAC/DC, 0.04 amps; single contact, T-1-3/4 bulb.	BI110-7
DS5006	Same as DS5005.	
DS5007	Same as DS5005.	
DS5008	Non-replaceable item. Part of XF5005.	

PARTS LIST (CONT)
for

LOW VOLTAGE POWER SUPPLY, AP128 & AP128/50

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS5009	Non-replaceable item. Part of XF5006.	
DS5010	Non-replaceable item. Part of XF5008.	
DS5011	Non-replaceable item. Part of XF5007.	
DS5012	Non-replaceable item. Part of XF5009.	
F5000	FUSE, CARTRIDGE: 5 amps; time lag; 1-1/4" long x 1/4" dia.; slo-blo.	FU102-5
F5001	FUSE, CARTRIDGE: 2 amps; time lag; 1-1/4" long x 1/4" dia.; slo-blo.	FU102-2
F5002	FUSE, CARTRIDGE: 3 amps; time lag; 1-1/4" long x 1/4" dia.; slo-blo.	FU102-3
F5003	FUSE, CARTRIDGE: 1/4 amp; time lag; 1-1/4" long x 1/4" dia.; slo-blo.	FU102-.250
F5004	FUSE, CARTRIDGE: 3/4 amp; 600 VAC/DC; 1-1/2" long x 13/32" dia.; high voltage.	FU104-R75
F5005	FUSE, CARTRIDGE: 1/2 amp; 600 VAC/DC; 1-1/2" long x 13/32" dia.; high voltage.	FU104-R5
F5006	FUSE, CARTRIDGE: 2-1/2 amps; time lag: 1-1/4" long x 1/4" dia.; slo-blo.	FU102-.750
F5007	FUSE, CARTRIDGE: 2-1/2 amps; time lag; 1-1/4" long x 1/4" dia.; slo-blo.	FU102-2.5
F5008	Same as F5002.	
F5009	FUSE, CARTRIDGE: 10 amps; time lag; 1-1/4" long x 1/4" dia.; slo-blo.	FU102-10
J5000	CONNECTOR, RECEPTACLE, ELECTRICAL: male	MS3102A327P
J5001	CONNECTOR, RECEPTACLE, ELECTRICAL: female	MS3102A327S
K5000	RELAY, ARMATURE: DPDT; 220 VDC, 5,000 ohms; contacts rated for 10 amps resistive at 115 VAC or 5 amps inductive at 26 VDC; nominal coil power 2 to 3 volt - amps. (Model AP128/50)	RL168-2C10-220AC

LOW VOLTAGE POWER SUPPLY, AP128/AP128/50

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
*K5000	RELAY, ARMATURE: DPDT; 220 VDC, 5,000 ohms; contacts rated for 10 amps resistive at 115 VAC or 5 amps inductive at 26 VDC; nominal coil power 2 to 3 volt - amps. (Model AP128/50)	RL168-2C10-220AC/50
K5001	RELAY, ARMATURE: DPDT; 24 VDC 400 ohms; contacts rated for 10 amps resistive at 115 VAC or 5 amps inductive at 26 VDC; nominal coil power 1 to 2 watts.	RL168-2C10-24DC
K5002 thru K5005	Same as K5001.	
L5000	REACTOR: 5 hy at 25 MADC; DC resistance 375 ohms; hermetically sealed rectangular steel case.	TF5028
L5001	REACTOR: 5 hy; current rating 250 MADC; nominal DC resistance 90 ohms; 120 cps (Hz) at 450 VAC, 400 cps at 30 VAC. stud mounted.	TF5025
L5002	Same as L5001.	
M5000	METER, TIME ELAPSED: 115 V, 60 cps; 2.5 watts (Model AP128)'	MR193-1
**M5000	METER, TIME ELAPSED: 115 V, 60 cps; 2.5 watts. (Model AP128/50)	MR193-1-50
M5001	Same as M5000. (Model AP128)	
**M5001	Same as M5000. (Model AP128/50)	
R5000	RESISTOR, FIXED, COMPOSITION: 12,000 ohms, ±5%; 2 watts.	RC42GF123J
R5001	RESISTOR, VARIABLE, COMPOSITION: 25,000 ohms, ±10%; 2 watts.	RV4LAYSA253A
R5002	RESISTOR, FIXED, COMPOSITION: 18,000 ohms, ±5%; 2 watts.	RC42GF183J
R5003	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, ±5%; 2 watts.	RC42GF333J
R5004	Same as R5001.	
R5005	RESISTOR, FIXED, COMPOSITION: 3,900 ohms, ±5%; 2 watts.	RC42GF392J
*NOTE add -50 to Part number of K500 for 50 cycle version. TMC Model AP128/50..		

**NOTE add -50 to Part number of M5000 & M5001 for 50 cycle version. TMC Model AP128/50 only.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R5006	Same as R5003.	
R5007	Same as R5001.	
R5008	Same as R5005.	
R5009	RESISTOR, FIXED, WIREWOUND: 50 ohms, 10 watts.	RW109-7
R5010	Same as R5009.	
R5011	Same as R5009.	
R5012	Same as R5003.	
R5013	Non-replaceable item. Part of XF5003.	
R5014	RESISTOR, FIXED, COMPOSITION: 470,000 ohms, ±5%; 2 watts.	RC42GF474J
R5015	RESISTOR, FIXED, WIREWOUND: 1,500 ohms, 10 watts.	RW109-26
R5016	Same as R5014	
R5017	Non-replaceable item. Part of XF5004.	
R5018	RESISTOR, VARIABLE, WIREWOUND: 6 ohms, ±10%; 25 watts; linear taper.	RA75AXC6ROAK-25
R5019	RESISTOR, FIXED, WIREWOUND: 5 ohms; current rating 1,000 ma; 5 watts.	RW107-6
R5020	Same as R5014.	
R5021	RESISTOR, FIXED, WIREWOUND: 5,000 ohms, ±5%; 5 watts non-inductive.	RR114-5000W
R5022	Same as R5021.	
R5023	Non-replaceable item. Part of XF5002.	
R5024	Non-replaceable item. Part of XF5001.	
R5025	Non-replaceable item. Part of XF500	

PARTS LIST
for
LOW VOLTAGE POWER SUPPLY, AP128 & AP128/50

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R5026	RESISTOR,FIXED,WIREWOUND: 500 ohms; current rating 100 ma; 5 watts.	RW107-28
R5027	RESISTOR,VARIABLE,WIREWOUND: 2,500 ohms,±10%; 25 watts watts; linear taper.	RA75AXC252AK-25
R5028	RESISTOR,FIXED,WIREWOUND: 1,000 ohms, 10 watts.	RW109-24
R5029	RESISTOR, FIXED, COMPOSITION: 56,000 ohms,±5%; 2 watts.	RC42GF563J
R5030	Non-replaceable item, Part of XF 5006.	
R5031	RESISTOR,FIXED, OMPOSITION: 82,000 ohms,±5; 2 watts.	RC42GF823J
R5032	Non-replaceable item. Part of XF5007.	
R5033	Non-replaceable item. Part of XF5009.	
R5034	Non-replaceable item. Part of XF5005.	
R5035	Non-replaceable item. Part of XF5005.	
R5036	RESISTOR, FIXED, WIREWOUND: 25 ohms, 10 watts.	RW109-6
R5037	Same as R5036.	
R5038	Same as R5036.	
S5000	SWITCH, INTERLOCK:SPDT; current rating 5 amps inductive at 30 VDC or 4 amps resistive at 30 VDC at sea level.	SW219
S5001	Same as S5000.	
S5002	SWITCH, TOGGLE	ST103-5-63
T5000	TRANSFORMER, FILIAMENT	TF341
T5001	TRANSFORMER, POWER, STEP-UP: primary 220/440 VAC; triple phase, 50/60 cps (Hz); secondary 634 VAC at 200 MADC; neutral 365 VAC at 250 MADC; secondary 346 VAC at 50 MADC.	TF313
T5002	TRANSFORMER, POWER, STEP-UP: primary 220 VAC; 50/60 cps (Hz): secondary 346 VAC at 50 ma	TF0375
V5000	TUBE, ELECTRON; voltage regulator; 7 pin minature.	0A2
V5001	TUBE, ELECTRON: voltage regulator; 7 pin minature.	0B2
V5002	Same as V5001	
V5003	Same as V5000.	
	Same as V5001.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
V5004	Same as V5000.	
V5005	Same as V5001.	
XC5000	NOT USED.	
XC5001	SOCKET, ELECTRON TUBE: 8 pin contact; saddle type; C5001 mounting.	TS101P01
XC5002	Same as XC5001. Four mounting C5002.	
XDS5000 thru XDS5004	NOT USED.	
XDS5005	LIGHT, INDICATOR: with white lens, sub-miniature type.	TS153-5
XDS5006	Same as XDS5005.	
XDS5007	Same as XDS5005.	
XF5000	FUSEHOLDER: lamp inidcating; accommodates cartridge fuse 1-1/4" long x 1/4" dia.; 300 V, 20 amps; neon lamp type with a 220K ohm lamp resistor; transparent clear flat sided knob; black body; consists of DS5004, R5025.	FH104-3
XF5001	Same as XF5000. Consists of DS5003, R5024.	
XF5002	Same as XF5000. Consists of DS5002, R5023.	
XF5003	Same as XF500. Consists of DS5000, R5013.	
XF5004	FUSEHOLDER: lam indicating; accommodates cartridge fuse 1-1/4" dia.; 500 V, 30 amps; neon lamp type with a 220K ohm lamp resistor; clear octagon knob; Consists of DS5001, R5017.	FH106
XF5005	Same as XF5004. Consists of DS5008, R5035.	
XF5006	FUSEHOLDER: lamp indicating; accommodates cartridge fuse 1-1/4" long x 1/4" dia.; 22 to 33 V, 20 amps; incandescent lamp type with a 330 ohm lamp resistor; transparent amber flat sided knob; brown body. Consists of DS5009, R5030.	FH104-11
XF5007	Same as XF5006. Consists of DS5011, R5032.	

LOW VOLTAGE POWER SUPPLY, AP128/AP128/50

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XF5008	Same as XF5006. Consists of DS5010, R5034.	
XF5009	Same as XF5006. Consists of DS5012, R5033.	
XK5000 thru XK5005	Same as XC5001.	
XF5000	SOCKET, ELECTRON TUBE: 7 pin contact.	TS102P01
XV5001 thru XV5005	Same as XV5000.	

PARTS LIST
for
HIGH VOLTAGE POWER SUPPLY, AP129, & AP129/50

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C6000	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 10 uf, ±10% 5 KVDC.	CX113-2
CR6000	RECTIFIER, SEMICONDUCTOR DEVICE: average rectified current 2.6 amps; max. forward voltage drop 9.6 V; max. peak reverse voltage 6,400 V.	DD128-1
CR6001 thru CR6005	Same as CR600.	
E6000	TERMINAL BOARD, BARRIER: eight 6-32 thd. x 1/4" long binding head machine screws; plastic body.	TM102-8
*K6000	RELAY, ARMATURE: 4 pole; contact current rating 30 amps at 600 VAC; coil voltage 208 VAC at 50 cps (Hz).	RL171-1L-50
K6001	CAP./SOL ASSY	A-5362
L6000	REACTOR: 2 hy	TF5029
M6000	TIMER, INTERVAL: adjustable; range setting 30 sec. minimum, 5 min. maximum; switch contact arrangement SPDT; current rating 10 amps at 125 VAC or 5 amps at 250 VAC resistive load.	TI105
R6000	RESISTOR, FIXED, WIREWOUND: 71,000 ohms, ±5%; 50 watts.	RW125F713J
R6001	Same as R6000.	
R6002	Same as R6000.	
S6000	Non-replaceable item. Part of M6000.	
T6000	TRANSFORMER, POWER	TF0314

* NOTE: add -50 to part number of K6000 for 50 cycle version.
TMC Model AP129/50 only.

PARTS LIST

for

RF CONTROL/INDICATOR, MODEL SWCA-3K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B7000	MOTOR	MO130-2
C7000	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C7001	Same as C7000.	
C7002	Same as C7000.	
C7003	CAPACITOR, FIXED, ELECTROLYTIC: 500 uf, 50 WVDC; polarized.	CE116-10VN
C7004	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 200,000 uuf, +80% -20%; 25 WVDC.	CC100-33
C7005	Same as C7004.	
C7006 thru C7010	Same as C7000.	
C7011	CAPACITOR, FIXED, ELECTROLYTIC: 2,000 uf, 25 WVDC polarized.	CE116-5VN
C7012	Same as C7000.	
C7013	CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 uuf, ±2%; 500 WVDC.	CM20F102G03
C7014	Same as C7013.	
C7015	CAPACITOR, FIXED, MICA DIELECTRIC: 47 uuf, ±2%; 500 WVDC.	CM15F470G03-YY
C7016	CAPACITOR, FIXED, MICA DIELECTRIC: 47 uuf, ±2%; 500 WVDC.	CM15F470G03-YY
C7017	Same as C7003.	
C7018	CAPACITOR, FIXED, ELECTROLYTIC: 100 uf, -10% +150% at 120 cps (Hz) at 25°C; 25WVDC; polarized.	CE105-100-25
C7019	CAPACITOR, FIXED, ELECTROLYTIC: 200 uf, 50 WVDC	CE105-200-50
C7020	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2,200	CC100-11
CR7000	SEMICONDUCTOR DEVICE, DIODE	1N3027B
CR7001	SEMICONDUCTOR DEVICE, DIODE	IN34A
CR7002	SAME AS CR7001.	

RF CONTROL/INDICATOR, MODEL SWCA-3K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR7003	ABSORBER, OVERVOLTAGE: operating voltage range 28 to 33 V; max. reverse voltage 10 VDC; current rating 750 ma; 200 PIV diode; 6.8 V, 1 watt Zener diode.	DD111-1
CR7004	SEMICONDUCTOR DEVICE, DIODE	IN2484
CR7005	SEMICONDUCTOR DEVICE, DIODE	IN270
CR7006	Same as CR7004.	
CR7007	Same as CR7004.	
CR7008-9	SEMICONDUCTOR DEVICE, DIODE	IN2484
DS7000	Non-replaceable item. Part of XF7000.	
DS7001	Non-replaceable item. Part of XF7000.	
DS7002	Same as DS7000.	
DS7003	Non-replaceable item. Part of XF7002.	
F7000	FUSE, CARTRIDGE: 1 amp; time lag; 1-1/4" long x 1/4" dia.; slo-blo.	FU102-1
F7001	FUSE, CARTRIDGE: 3 amps; time lag; 1-1/4" long x 1/4" dia.; slo-blo.	FU102-3
F7002	Same as F7000.	
J7000	CONNECTOR, RECEPTACLE, ELECTRICAL: 44 female contacts rated for 5 amps at 1,800 V RMS; for double sided printed circuit board.	JJ319-22DFE
J7001	CONNECTOR, RECEPTACLE, ELECTRICAL	*JJ333-42PFS-3
J7002	Same as J7000.	
J7003	CONNECTOR, RECEPTACLE, ELECTRICAL: RF; 1 round female contact, straight type; 52 ohms; BNC to BNC.	UG625*/U
J7004	Same as J7003 .	
J7005	CONNECTOR, RECEPTACLE, ELECTRICAL	*JJ333-75PFS-3
J7006	Same as J7000.	

* NOTE: Part number to be supplied at a later date.

RF CONTROL/INDICATOR, MODEL SWCA-3K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J7007	CONNECTOR, RECEPTACLE, ELECTRICAL: RF; 1 round male contact, straight type; series BNC to BNC.	JJ211
J7008	Same as J7007.	
J7009	CONNECTOR, RECEPTACLE, ELECTRICAL: male	JJ313-1
K7000	RELAY, ARMATURE: DPDT; 700 ohms, ±10% DC resistance; operating voltage 24 VDC; current rating 35 ma; power rating 700 mw at 25°C; 8 contacts rated for 3 amps at 115 VAC or 5 amps at 29 VDC; clear high impact styrene dust cover case.	RL156-1
K7001	RELAY, ARMATURE: 4PDT; 485 ohms each coil, ±10% DC resistance; operating voltage 24 VDC; current rating 49 ma each coil; power rating 1,200 mw at 25°C; 16 contacts rated for 0.5 amps at 115 VAC or 1 amp at 29 VDC; clear high impact styrene dust cover case.	RL156-10
K7002	RELAY, ARMATURE: DPDT; 485 ohms each coil, ±10% DC resistance; operating voltage 24 VDC; current rating 49 ma each coil; power rating 1,200 mw at 25°C; 10 contacts rated for 3 amps at 115 VAC or 5 amps at 29 VDC; clear high impact styrene dust cover case	RL156-9
K7003	Same as K7002.	
K7004	Same as K7002.	
K7005	Same as K7000.	
K7006	RELAY, ARMATURE: 4PDT; 700 ohms, ±10% DC resistance; operating voltage 24 VDC; current rating 35 ma; power rating 700 mw at 25°C; 14 contacts rated for 3 amps at 115 VAC or 5 amps at 29 VDC; clear high impact styrene dust cover case.	RL156-8
K7007	RELAY, HI-SEN: insulated for 400 VDC or 300 VAC; calibrated at 700°F; 9 male contacts, open 51 ua, closed 50 ua; 2,700 ohms; corrosion resistant aluminium case.	RL158
K7008	Same as K7002.	
K7009	Same as K7002.	
K7010	Same as K7000.	

RF CONTROL/INDICATOR, MODEL SWCA-3K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K7011	Same as K7001.	
K7012	Same as 7001.	
K7013	RELAY, ARMATURE: 4PDT; 185 ohms, ±10% DC resistance; operating voltage 12 VDC; current rating 65 ma; power rating 700 mw at 25°C; 8 or 12 contacts rated for 3 amps at 115 VAC or 5 amps at 29 VDC; clear high impact styrene dust cover case.	RL156-2
K7014	RELAY, ARMATURE: SPST; contacts rated for 2 amps at 115 VAC normally open; 5 seconds time delay; operating voltage 26 V; aluminum case.	RL166-26N05
L7000	COIL, RADIO FREQUENCY: fixed; 0.150 uh, ±10%; current rating 400 ma.	CL140-2
L7001	Same as L7000.	
L7002	Same as L7000.	
M7000	METER, CONTACTLESS: KW/SWR	MR195
P7000	CONNECTOR, PLUG, ELECTRICAL	*
P7001	CONNECTOR, PLUG, ELECTRICAL: RF: 1 round female contact, straight type; minature bayonet lock series.	PL204
P7002	Same as P7001.	
P7003	CONNECTOR, PLUG, ELECTRICAL: 15 female contacts rated for 5 amps at 500 V RMS; polarized.	JJ310-1H
Q7000	TRANSISTOR	2N697
Q7001	TRANSISTOR	2N492
R7000	RESISTOR, FIXED, COMPOSITION: 2,200 ohms, ±5%; 1/2 watt.	RC20GF222J
R7001	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, ±5%; 1/2 watt.	RC20GF153J
R7002	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, ±5%; 1/2 watt.	RC20GF223J
R7003	Same as R7000.	

* Part number to be supplied at a later date.

RF CONTROL/INDICATOR, MODEL SWCA-3K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R7004	RESISTOR, FIXED, COMPOSITION: 470,000 ohms, ±5%; 1/2 watt.	RC20GF474J
R7005	RESISTOR, FIXED, COMPOSITION: 220 ohms ±5%; 1/2 watt.	RC20GF221J
R7006	Non-replaceable item. Part of XF7002.	
R7007	NOT USED.	
R7008	Same as R7005.	
R7009	RESISTOR, FIXED, COMPOSITION: 220 ohms, ±5%; 1/2 watt.	RC20GF221J
R7010	RESISTOR, FIXED, COMPOSITION: 220 ohms, ±5%; 1 watt.	RC32GF221J
R7011	NOT USED.	
R7012	NOT USED.	
R7013	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, ±5%; 1/2 watt.	RC20GF103J
R7014	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, ±10%; 0.25 watts.	RV111U104A
R7015	NOT USED.	
R7016	RESISTOR, VARIABLE, COMPOSITION: 50 ohms, ±10%; 2 watts.	RV4NAYSK500A
R7017	Non-replaceable item. Part of XF7000.	
R7018	Same as R7010.	
R7019	RESISTOR, VARIABLE, COMPOSITION: 500,000 ohms, +10%; 0.25 watts.	RV111U504A
R7020	RESISTOR, VARIABLE, WIREWOUND: 5,000 ohms, ±5%; 1 watt at 50°C.	RV119-1-502
R7021 thru R7026	Same as R7020.	
R7027	RESISTOR, FIXED, COMPOSITION: 2,700 ohms, ±5%; 1/2 watt.	RC20GF272J

RF CONTROL/INDICATOR, MODEL SWCA-3K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R7028	RESISTOR, FIXED, COMPOSITION: 3,900 ohms, ±5%; 1/2 watt.	RC20GF392J
R7029	Same as R7027	
R7030	Same as R7027.	
R7031	RESISTOR, FIXED, COMPOSITION: 1,800 ohms, ±5%; 1/2 watt.	RC20GF182J
R7032	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, ±5%; 1/2 watt.	RC20GF102J
R7033	RESISTOR, FIXED, COMPOSITION: 2,200 ohms, ±5%; 1/2	RC20GF222J
R7034	RESISTOR, FIXED, COMPOSITION: 50,000 ohms, ±5%; 1 watt at 50°C.	RV119-1-503
R7035	Same as R7034.	
R7036	Same as R7034	
R7037	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, ±5%; 1/2 watt.	RC20GF103J
R7038	RESISTOR, VARIABLE, WIREWOUND: 100,000 ohmohms, ±5%; 1 watt 50°C.	RV119-1-104
R7039	Same as R7038.	
R7040	Same as R7038.	
R7041	RESISTOR, FIXED, COMPOSITION: 470 ohms, ±5%; 2 watts.	RC42GF471J
S7000	SWITCH, TOGGLE: DPDT: 6 contacts rated for 5.0 amp at 250 VAC or 6 amps at 125 VAC; bat type handle.	ST105
S7001	SWITCH, TOGGLE: SPDT; 28° angle of throw; bat type handle.	ST12D
S7002A,B	SWITCH, SENSITIVE: DPDT; current rating 5.0 amps at 125 VAC, 250 VAC; 7 amps resistive, 4 amps inductive at 28 VDC; plastic body.	SW353-3
S7003	SWITCH, SENITIVE: SPDT; current rating 5.0 amps at 125 VAC, 250 VAC; 7 amps resistive, 4 amps inductive at 28 VDC; plastic body.	SW353-2

RF CONTROL/INDICATOR, MODEL SWCA-3K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S70004A, B C, D, E, F, G, H, I, J, K	SWITCH, ROTARY: solenoid; 10 sections, 18 positons; current rating 10 to 15 amps resistive, break at 24 VDC, 5 amps resistive, break at 115 VDC; bakelite wafer insulation.	SW428
XDS7000	LIGHT, INDICATOR: w/red lens, sub-minature type.	TS153-1
XDS7001	NOT USED	
XDS7002	Same as XDS7000.	
XF7000	FUSEHOLDER: lamp indicating; acommodates cartridge fuse 1-1/4" long x 1/4" dia.; 300 V, 20 amps; neon lamp type with at 220K ohm lamp resistor; transparent clear flat sided knob; black body. Consists of DS7001, R7017.	FH104-3
XF7001	FUSEHOLDER: lamp indicating; acomodates cartridge fuse 1-1/4" long x 1/4" dia.; 22 to 33 V, 20 amps; incandescent lamp type with a 330 ohm lamp resistor; transparent amber flat sided knob; brown body. Consists of DS7003, R7006.	FH104-11
XK7000	SOCKET, RELAY: w/retainer; 6 male beryllium copper gold plated contacts; black phenolic body.	TS171-5
XK7001	SOCKET, RELAY: w/retainer; 12 male beryllium copper gold plated contacts; black phenolic body.	TS171-4
XK7002 thru XK7005	Same as XK7000.	
XK7006	Same as XK7001	
XK7007	Socket, Relay: 9 pin contact; 3 amps at 1,250 V RMS at sea level; phenolic body.	TS100-7
XK7008 thru XK7010	Same as XK7000.	
XK7011	Same as XK7001.	
XK7012	Same as XK7001.	
XK7013	Same As XK7000.	

RF CONTROL/INDICATOR, MODEL SWCA-3K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XK7014	SOCKET, RELAY: 9 pin contact.	TS131MPW
Z7000	NEWORK, RELAY METER.	NW132
Z7001	NETWORK, RELAY METER: power supply	NW131

PARTS LIST

for

TUNING CONTROL SYSTEM, MODEL TCSA-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E8000	TERMINAL BOARD, BARRIER: four 6-32 thd. x 1/4" long binding head machine screws; phenolic body.	TM102-4
E8001	Same as E8000/	
J8000	Part of Rack, Electrical Equipment, RAK111-2.	
J8001 thru J8003	NOT USED.	
J8004	CONNECTOR, RECEPTACLE, ELECTRICAL: 37 female contacts, removeable crimp pin style; current rating 5 amps, 500 V RMS; polarized.	JJ310-3
J8005	Same as J8004.	
J8006	Same as J8004.	
Z8000	SECOND AMPLIFIER SERVO	AZ110
Z8001	PA LOAD SERVO AMPLIFIER	AZ111
Z8002	PA TUNE SERVO AMPLIFIER	AZ112

PARTS LIST

for

ALARM PANEL, MODEL AX633

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C9000	CAPACITOR, FIXED, ELECTROLYTIC: 25 uf, -10% +150% at 120 cps (Hz) at 25°C; 50 WVDC; polarized.	CE105-25-50
CP9000	ADAPTER, CONNECTOR, ELECTRICAL: series BNC	UG492D/U
CP9001	Same as CP9000.	
CR9000	SEMICONDUCTOR DEVICE, DIODE	IN2484
DS9000	Non-replaceable item. Part of XF9000.	
DS9001	BUZZER: audible signal; operating voltage 6 to 28 VDC; current rating 3 to 14 ma; 1-5/8" long x 1-11/16" dia. o/a.	BZ101-1
E9000	TERMINAL BOARD, BARRIER: fourteen 6-32 thd. x 1/4" long binding head machine screws; black phenolic body.	TM100-14
E9001	TERMINAL BOARD, BARRIER: ten 6-32 thd. x 1/4" long binding head machine screws; black phenolic body.	TM100-10
F9000	FUSE, CARTRIDGE: .5 amp; 1-1/4" long x 1/4" dia.; quick acting.	FU100-.5
J9000	JACK, TELEPHONE: silver alloy contacts.	JJ116-10
J9001	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 round female contact, straight type; series BNC to BNC.	JJ172
J9002	Same as J9001.	
J9003	CONNECTOR, RECEPTACLE, ELECTRICAL: series BNC	UG1094A/U
P9000	CONNECTOR, PLUG, ELECTRICAL: 1 male contact; voltage rating 500 V peak; polarized.	PL244-1
P9001	Same as P9000.	
R9000	Non-replaceable item. Part of XF9000.	
R9001	RESISTOR, FIXED, COMPOSITION: 330 ohms, ±5%; 1 watt.	RC32GF331J
S9000	SWITCH, TOGGLE: SPST; nominal current rating 3 amps at 250 VAC/DC or 6 amps at 125 VAC/DC.	ST103-1-62

PARTS LIST (CONT)

for

ALARM PANEL, MODEL AX633

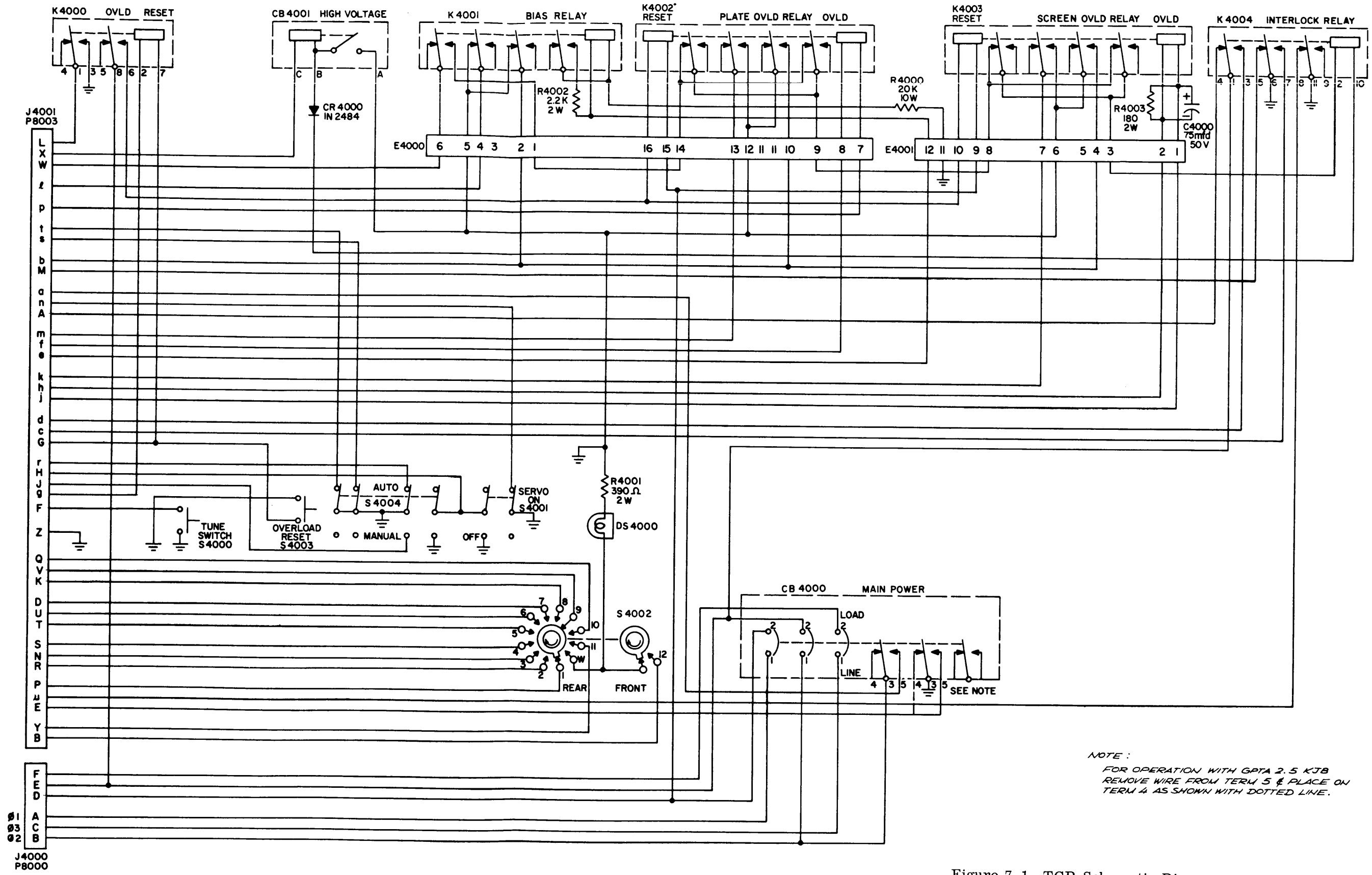
REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S9001	SWITCH, ROTARY	SW147
XF9000	FUSEHOLDER: lamp indicating; accomodates cartridge fuse 1-1/4" long x 1/4" dia.; 22 to 33 V, 20 amps; incandescent lamp type with a 330 ohm lamp resistor; transparent amber flat sided knob; brown body; consists of DS9000, R9000.	FH104-11

SCHEMATIC DIAGRAMS

This section contains schematic diagrams for the PALA-2.5K. Table 7-1 lists the figure numbers contained herein and the corresponding TMC schematic drawing numbers.

TABLE 7-1. LIST OF DIAGRAMS

Figure No.	Title	TMC & Rev. Dwg. No.
7-1	TCP, Schematic Diagram	CK1595-Ø
7-2	TLAA-2.5K, Schematic Diagram	CK1118-C
7-3	AX633, Schematic Diagram	CK1207-A
7-4	AP128A, Schematic Diagram	CK1464-B
7-5	AP129, Schematic Diagram	CK1046-B
7-6	SWCA-3K, Schematic Diagram (2 Sheets)	CK1048-E



NOTE:
FOR OPERATION WITH GPTA 2.5 KJB REMOVE WIRE FROM TERM 5 & PLACE ON TERM 4 AS SHOWN WITH DOTTED LINE.

Figure 7-1. TCP, Schematic Diagram

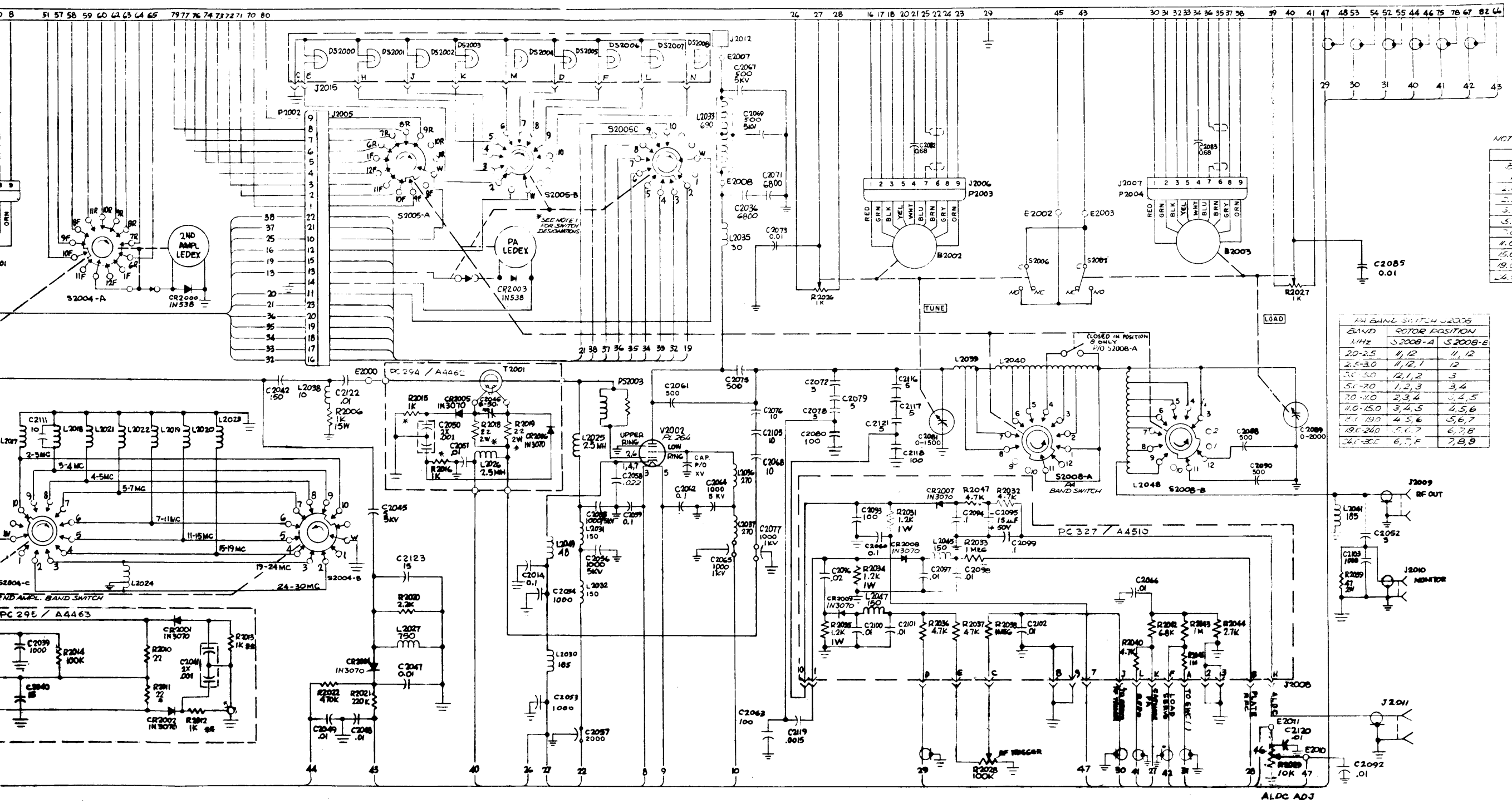


Figure 7-2. TLAA-2.5K, Schematic Diagram

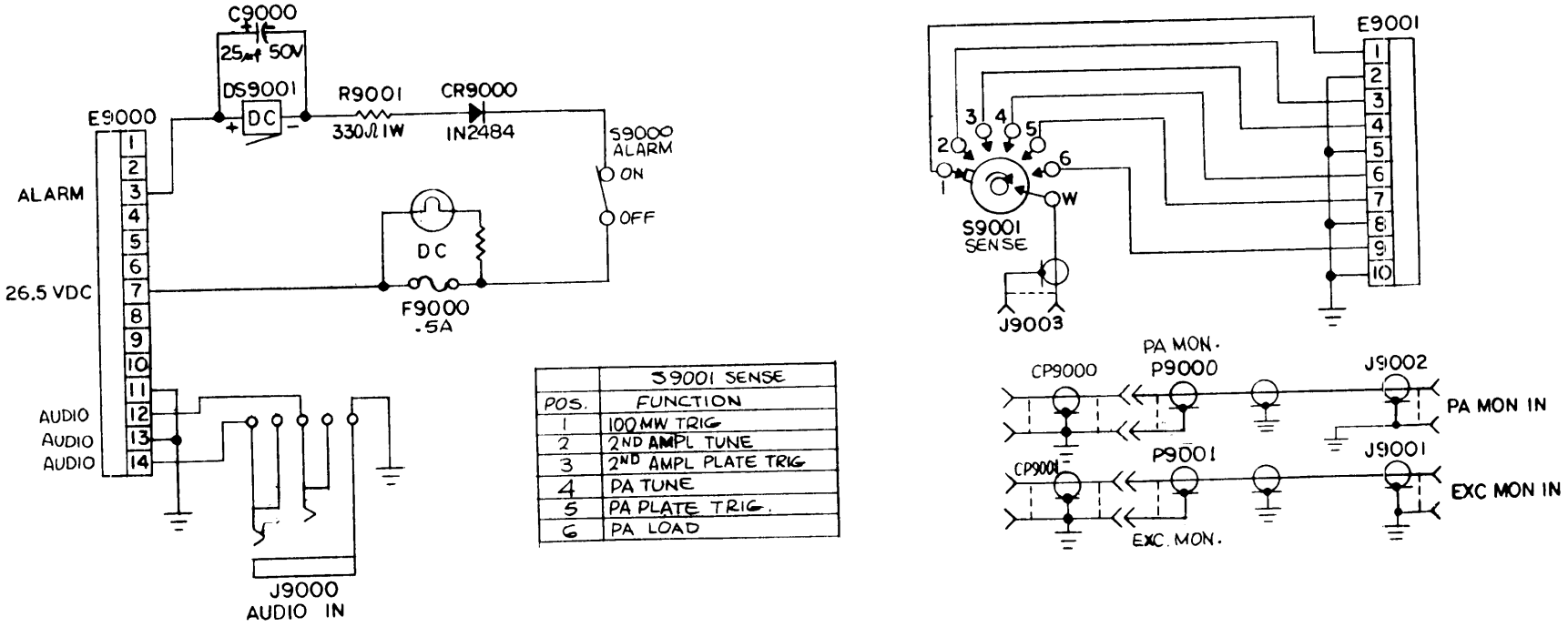
UNLESS OTHERWISE SPECIFIED

ALL RESISTORS ARE IN OHMS.
ALL COILS ARE IN MICROHENRIES.
ALL WHOLE CAPACITORS ARE IN PICOFARADS.
ALL DECIMAL CAPACITORS ARE IN MICROFARADS.
* MATCHED RESISTORS.
** MATCHING TO BE WITHIN 1% OF EACH OTHER
*** RESISTOR TO BE SELECTED UPON THE TEST OF THE UNIT

2 ND AMPL. BAND SWITCH S2004			
BAND	ROTOR POSITION		
MHZ	S2004-A	S2004-B	S2004-C
2.0-3.0	10F	10	10
3.0-4.0	9F	9	9
4.0-5.0	8F	8	8
5.0-7.0	11R	7	7
7.0-11.0	10R	6	6
11.0-15.0	9R	5	5
15.0-19.0	8R	4	4
19.0-24.0	7R	3	3
24.0-30.0	6R	2	2

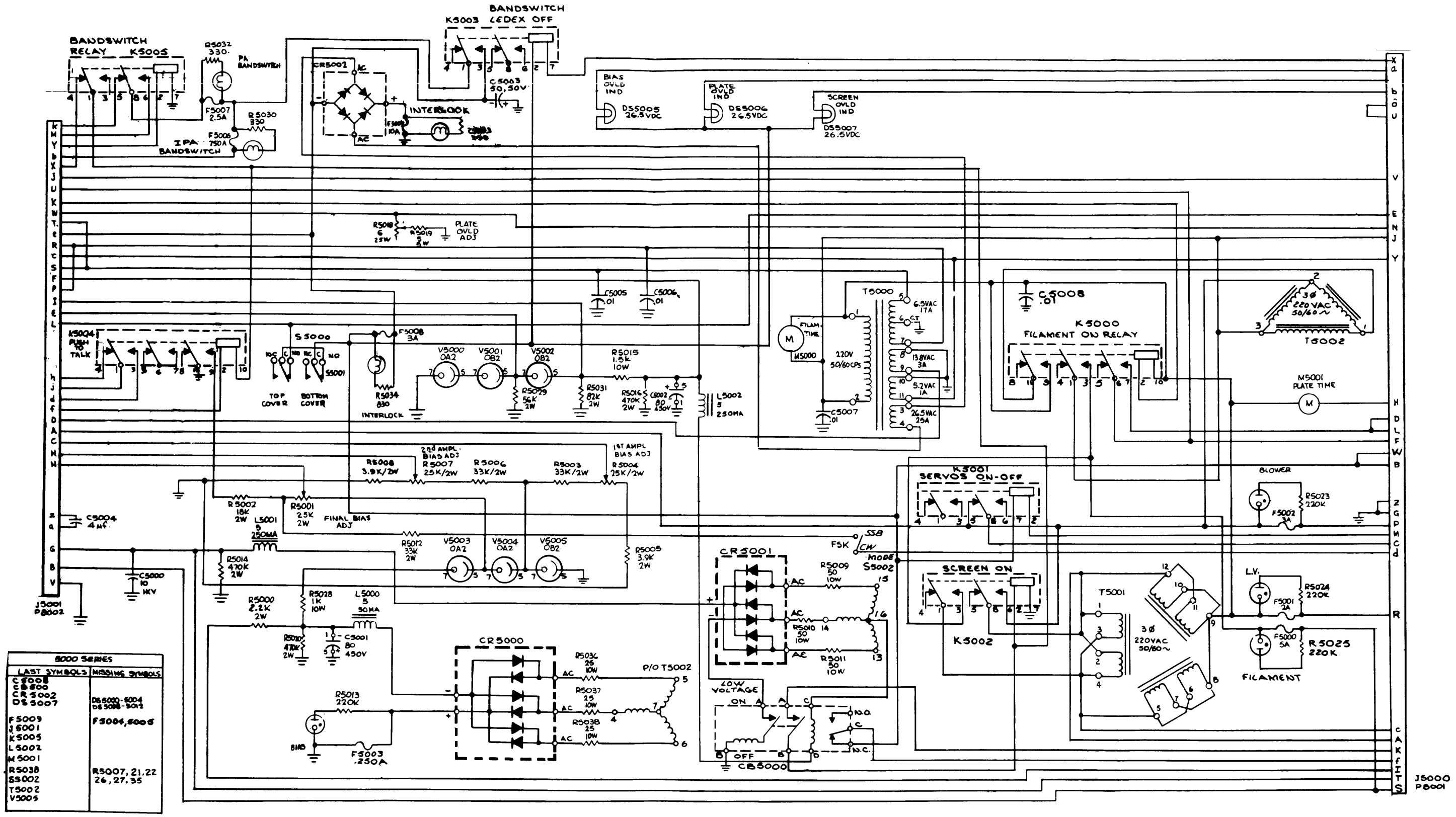
MULTIMETER S2003	
POSITION	DESIGNATION
1	1ST AMPL Ip
2	2ND AMPL Ip
3	2ND AMPL Ep
4	IPA Ep

J2000 RF INPUT
R2007 560
C2000 1000MMF
J2001
J2002 P2000
J2003
P2004 J2013
B2000 BLOWER
S2002 AIR SWITCH
S2001 TOP INTERLOCK
S2001A BOTTOM INTERLOCK
J2004 P2001
S2009 RED/BLK
B2001
S2004-A
S2004-C
2ND AMPL. BAND SWITCH
PC 295 / A4463
V2000 8121
V2001 8121
PS2000
PS2002
T2000
E2004
E2005
E2006
E2009
M2001 PLATE CURRENT
M2000 MULTIMETER
S2003 MULTIMETER
C2020 1500
C2017 1000
C2018 1000
C2019 1000
C2021 .008
C2022 1000
C2023 1000
C2024 1000
C2025 .25-.65 1000V
C2026 1000
C2027 1000
C2028 2x .004 1KV
C2029 .1
C2030 1000
C2031 20
C2033 1000 5KV
C2034 1000-1KV
C2035 .003-3KV
C2036 .24
C2037 .003-3KV
C2038 10.3-200
C2039 1000
C2040 15
C2041 1000
C2042 220
C2043 15-60
C2044 220
C2045 1000
C2046 1000
C2047 .1
C2048 1000
C2049 1000
C2050 1000
C2051 .1
C2052 .1
C2053 .1
C2054 .1
C2055 .01
C2056 .01
C2057 .1
C2058 .01
C2059 .01
C2060 .1
C2061 .1
C2062 1MF
C2109 0.1
C2111 10
L2000 220
L2001 220
L2002 220
L2004 220
L2005 125
L2006 1MH
L2007 128
L2008 22
L2009 1.5
L2010 220
L2011 45
L2012 128
L2013 128
L2014 125
L2015 1MH
L2016
L2017
L2018
L2021
L2022
L2024
R2002 .12
R2003 1K 1W
R2004 47K 2W
R2005 0.12
R2006 0.12
R2009 ***
R2014 100K
R2030 47K 2W
R2040 22 1/2W
R2041 22 1/2W
CR2000 IN907



	S9001 SENSE
POS.	FUNCTION
1	100 MW TRIG
2	2ND AMPL TUNE
3	2ND AMPL PLATE TRIG
4	PA TUNE
5	PA PLATE TRIG.
6	PA LOAD

Figure 7-3. AX633, Schematic Diagram

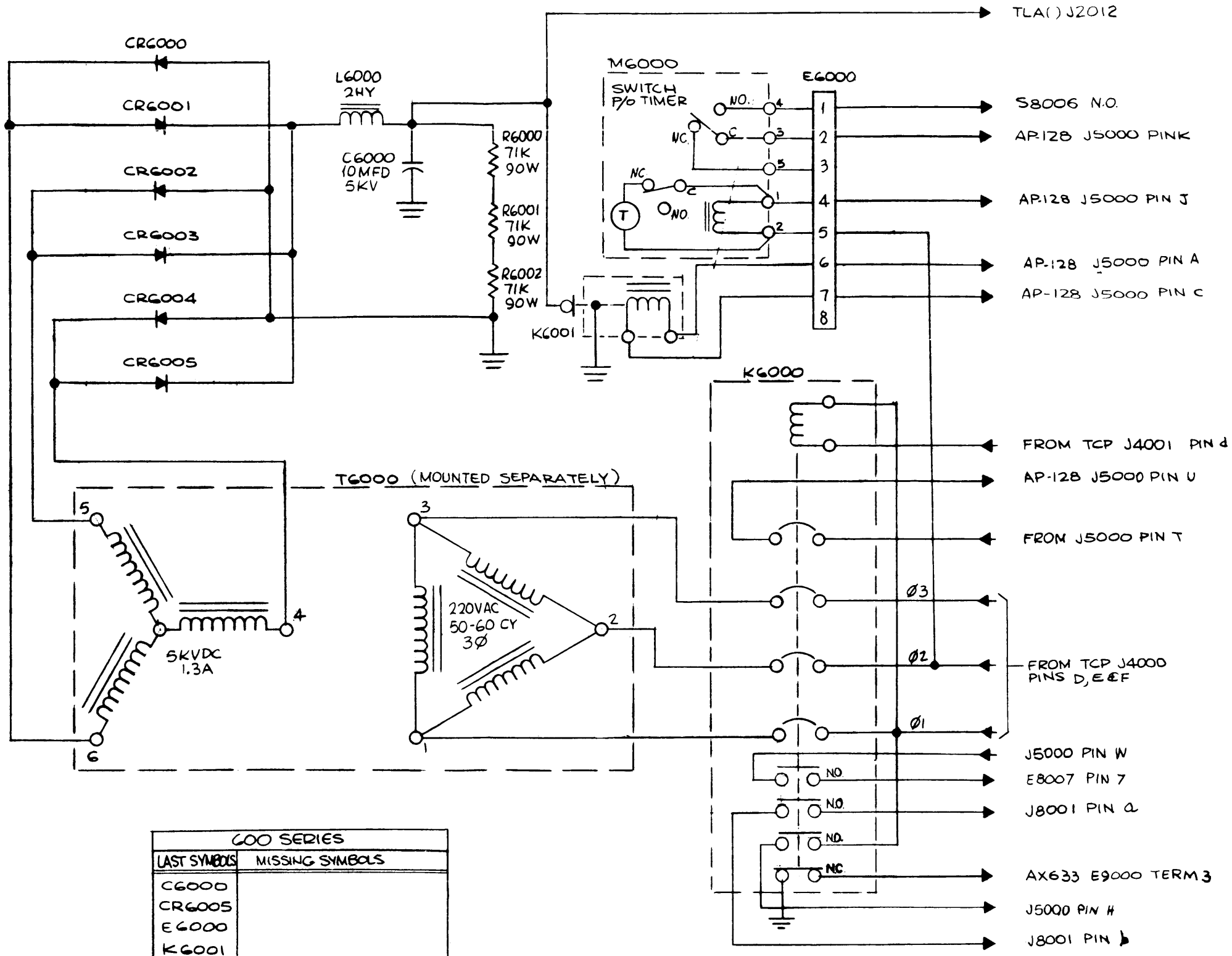


8000 SERIES	
LAST SYMBOLS	MISSING SYMBOLS
C8008	
CB8000	
CR5002	
DS5007	DS5000-5004 DS5008-5012
F5009	F5004, 5005
J6001	
K5005	
L5002	
M5001	
R5038	R5007, 21, 22 26, 27, 35
S5002	
T5002	
V5005	

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTOR VALUES ARE IN OHMS ± 5% ½ WATT
2. ALL CAPACITOR VALUES ARE IN MFD
3. ALL INDUCTANCE VALUES IN HY

Figure 7-4. AP128A, Schematic Diagram



600 SERIES	
LAST SYMBOLS	MISSING SYMBOLS
C6000	
CR6005	
E6000	
K6001	
L6000	
M6000	
R6002	
T6000	

Figure 7-5. AP129, Schematic Diagrams

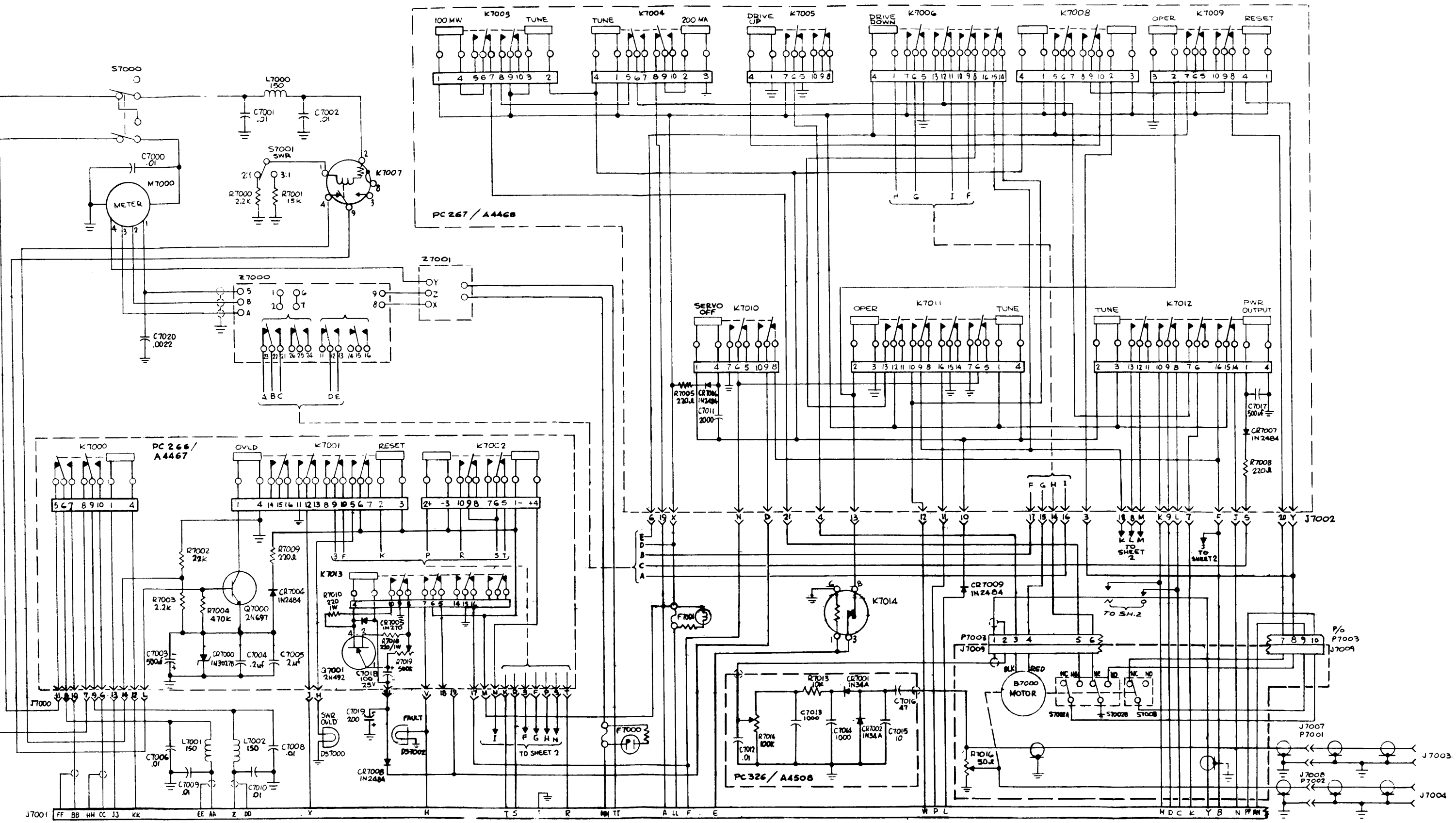


Figure 7-6. SWCA-3K, Schematic Diagram (Sheet 1 of 2)

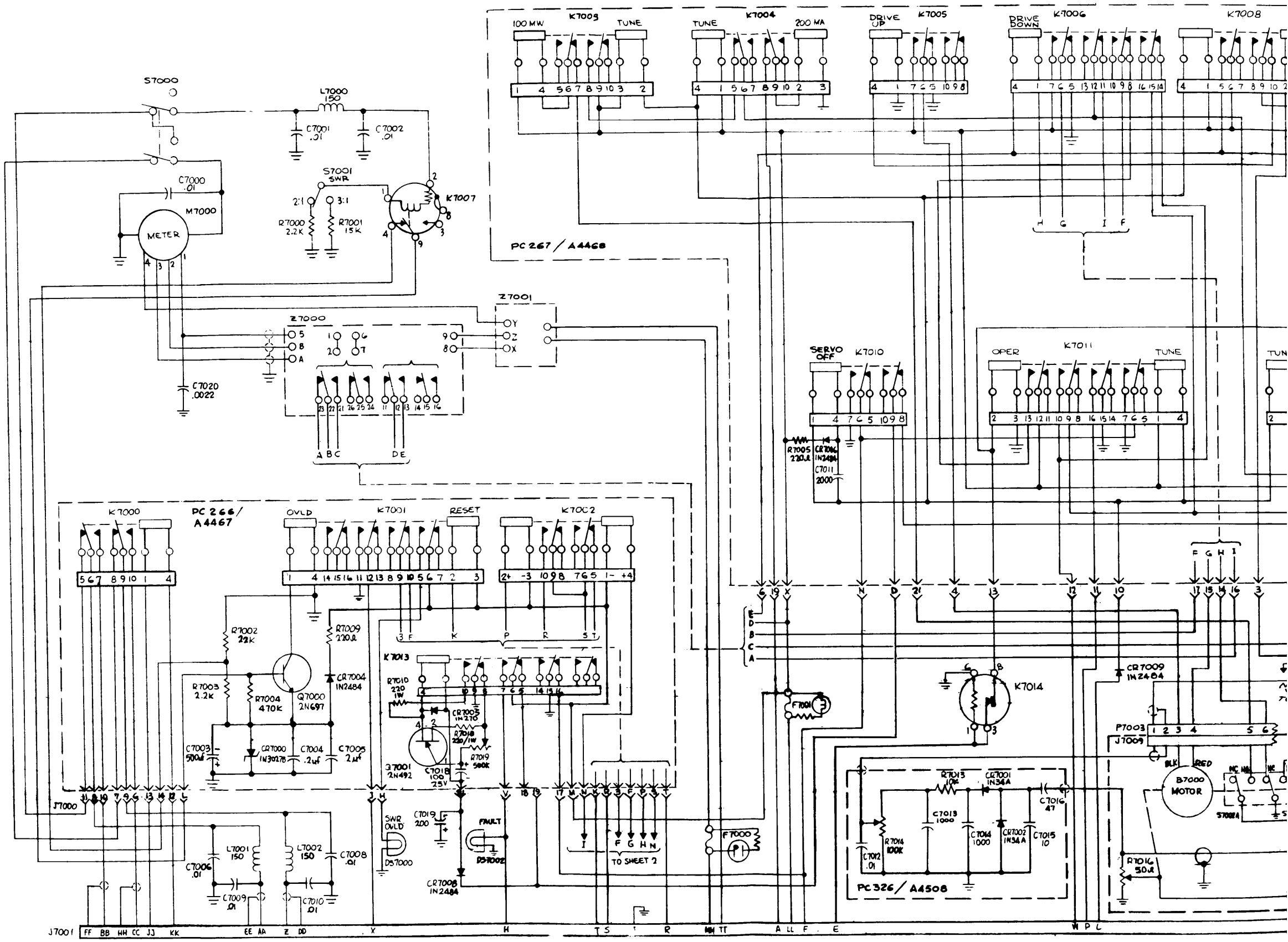
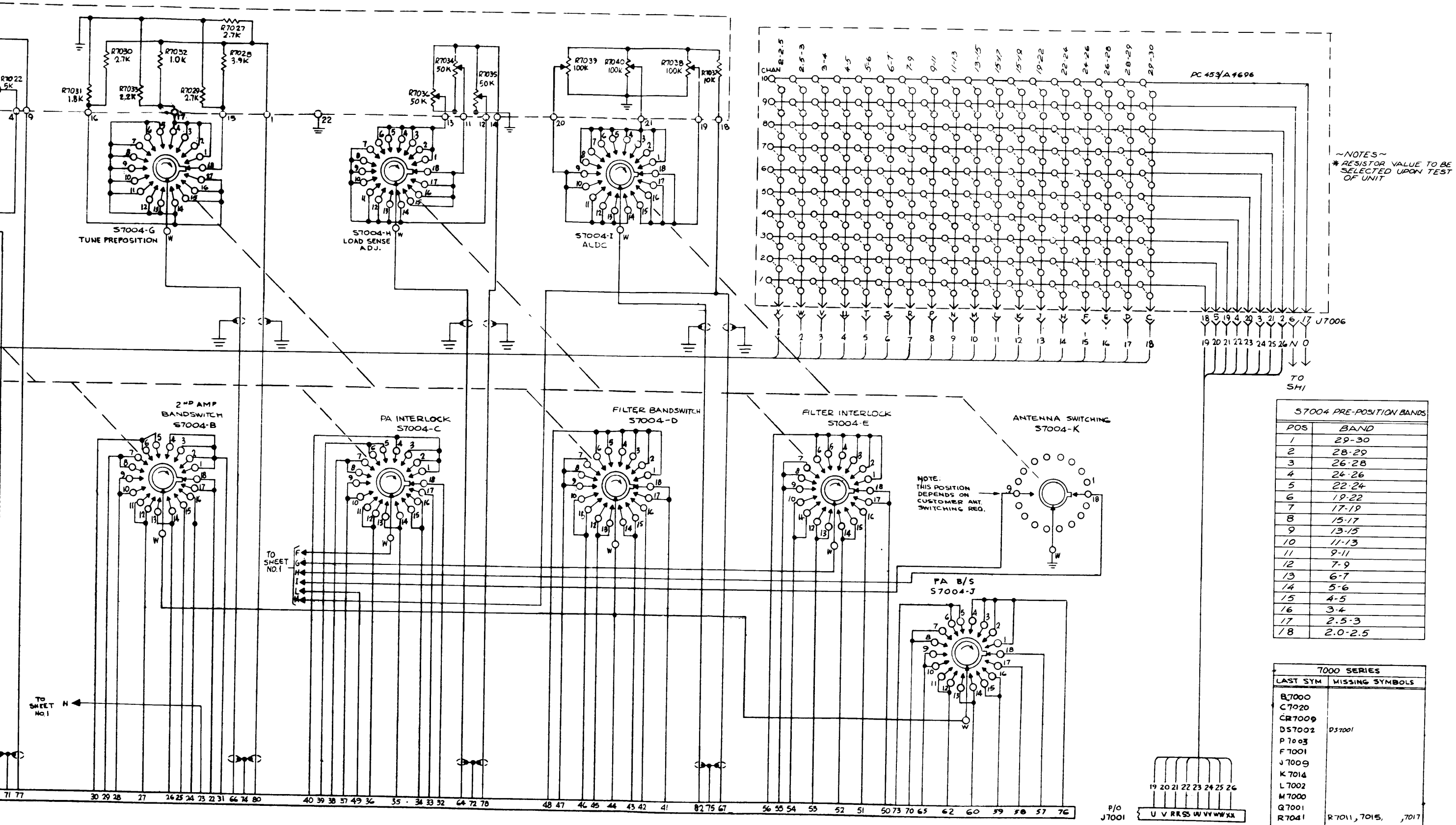


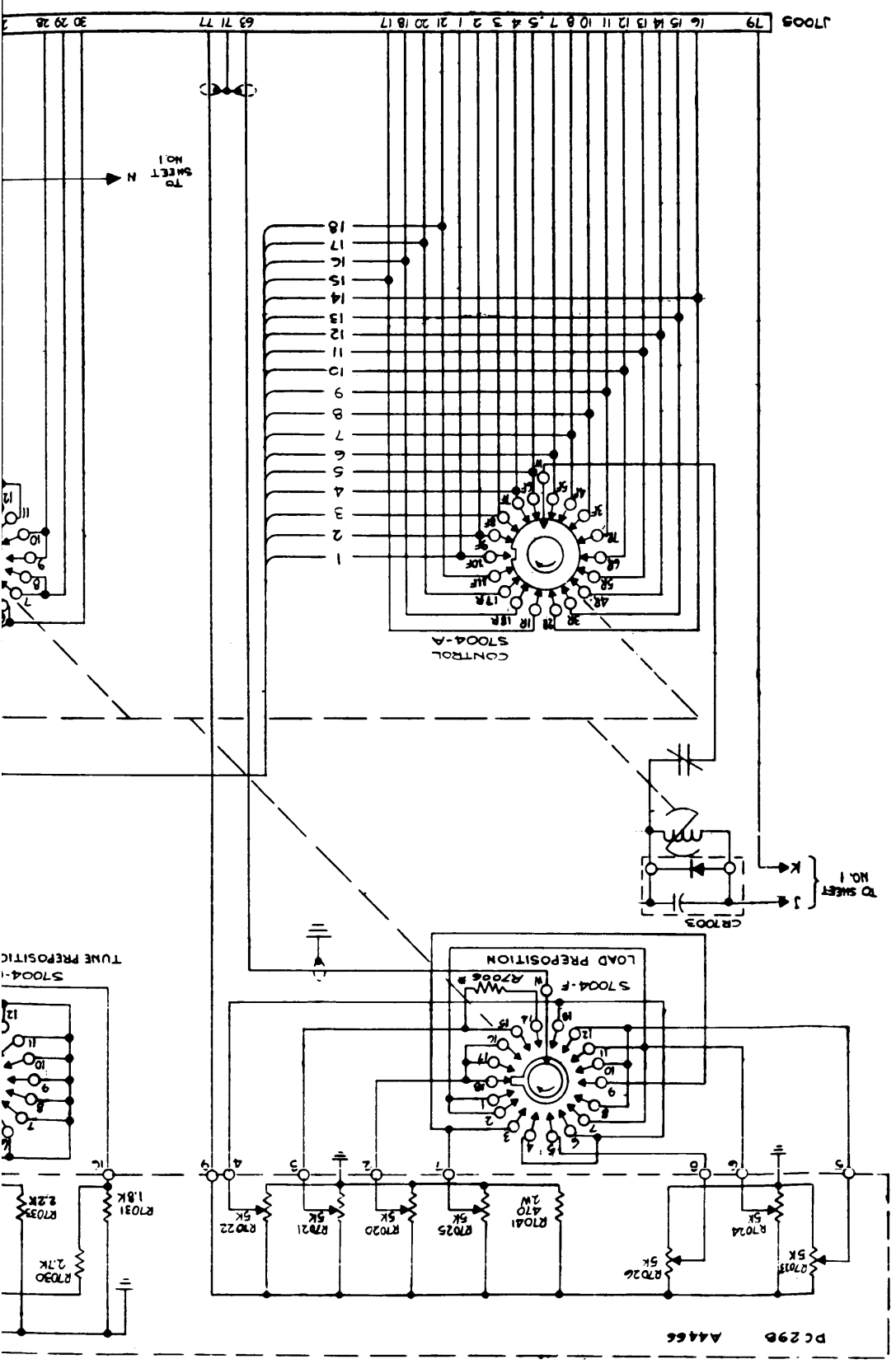
Figure 7-6. SWCA



S7004 PRE-POSITION BANDS	
POS	BAND
1	29-30
2	28-29
3	26-28
4	24-26
5	22-24
6	19-22
7	17-19
8	15-17
9	13-15
10	11-13
11	9-11
12	7-9
13	6-7
14	5-6
15	4-5
16	3-4
17	2.5-3
18	2.0-2.5

7000 SERIES	
LAST SYM	MISSING SYMBOLS
B7000	
C7020	
CR7009	
DS7002	DS7001
P7003	
F7001	
J7009	
K7014	
L7002	
M7000	
Q7001	
R7041	R7011, 7015, ,7017
S7004	
Z7001	
PC7000	
PC266	

Figure 7-6. SWCA-3K, Schematic Diagram (Sheet 2 of 2)


J7003
79 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 21 20 19 18 17
63 71 77
30 29 28
TO SHEET NO. 1
CONTROL S7004-A
LOAD PREPOSITION
S7004-F
R7003
TO SHEET NO. 1
R7031 1.8K
R7030 2.7K
R7039 2.2K
R7022 5K
R7021 5K
R7020 5K
R7025 5K
R7041 470 2W
R7026 5K
R7034 5K
R7033 5K
PC 298 A4466