TECHNICAL MANUAL

for

RADIO TRANSMITTER

MODEL GPTA-2.5JB

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, CANADA

IN 1019A/JB

Issue Date: July 10, 1967

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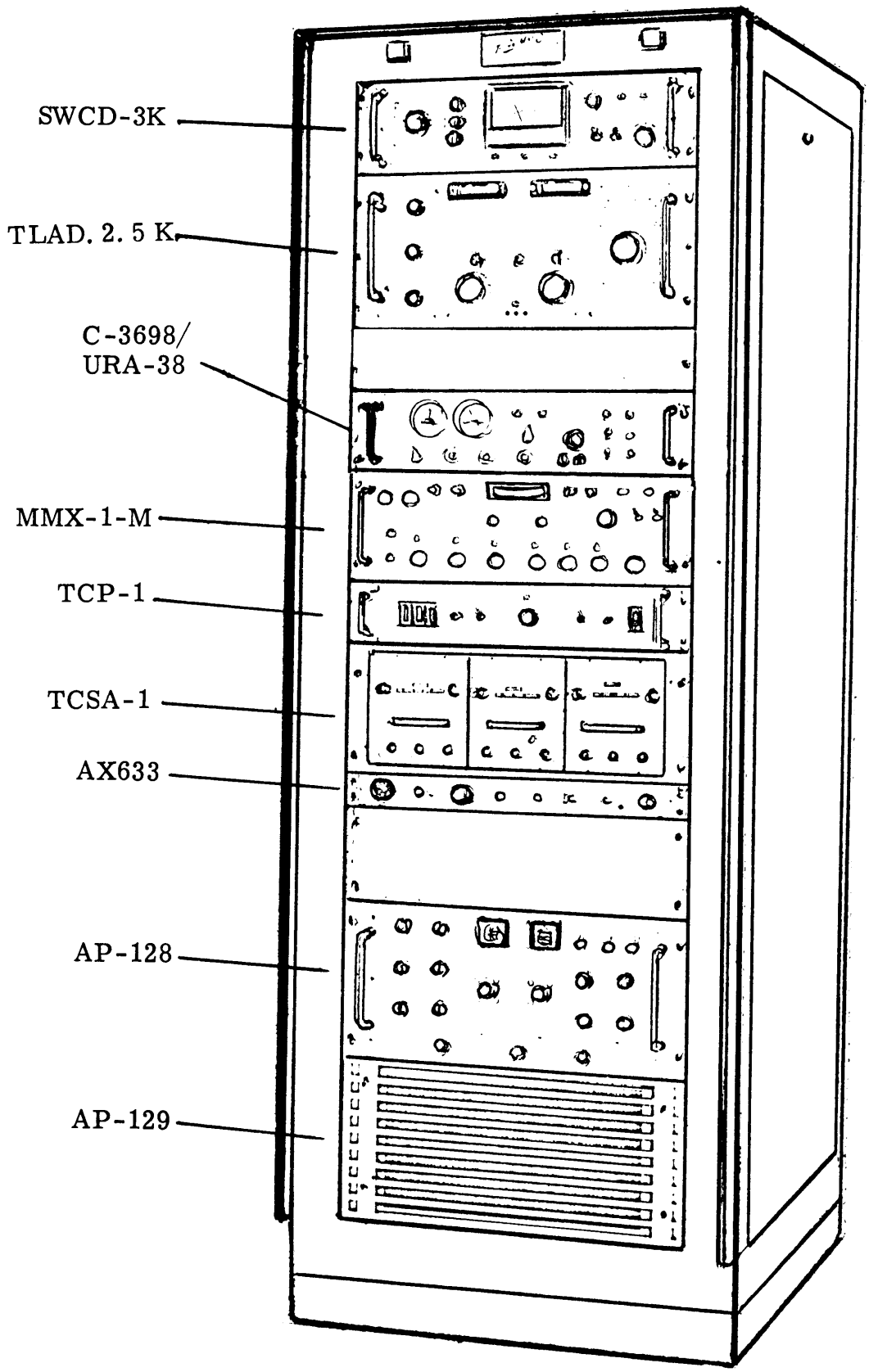


Figure 1-1. Radio Transmitter, Model GPTA-2.5JB

SECTION 1
GENERAL INFORMATION

1-1. PURPOSE OF EQUIPMENT

Radio Transmitter, Model GPTA-2.5JB (figure 1-1) is a self-tunable radio transmitter system, shock-mounted, designed to provide ship-to-ship and ship-to-shore radio communications.

The GPTA operates in the frequency range of 2 to 29.9999 megacycles, providing power output levels of either 150 watts, 400 watts, or 1000 watts PEP or average depending on type of emission for various frequency/power requirements.

The exciter section of the GPTA consists of a solid-state exciter unit (MMX-1-M), which provides rapid frequency selection in the 1.6 to 29.9999 megacycle (mHz) frequency range in 100 cycle steps.

NOTE

Although the exciter units's operating frequency ranges from 1.6 to 29.9999 megacycles (MHz), the associated linear power amplifier section is restricted to operate only in the 2 to 29.9999 megacycle range.

The exciter unit is specialized in that only A3H (upper sideband audio with carrier) is possible when operating in the frequency range of 2003, 2182, and 2638 kilocycles (kHz). When these frequencies are selected, they are automatically independent of the exciter mode switch setting.

Operating modes include single-sideband (SSB), continuous wave (CW), amplitude modulation (AM), facsimile (FAX, frequency-shift keying (FSK), and interchangeable plug-in circuit boards provide for certain independent sideband (ISB) capabilities.

Front-panel meter monitoring of all critical circuits and operational safety features are also provided. Safety features include mechanical/electrical interlocks, overload protective circuits for bias, plate current, screen current and transmission vswr.

The exciter has a built-in standard oscillator with a stability of 1 part

10^8 per day. Optional standards of 1 part in 10^6, 10^7, or 10^9 per day are available if desired. The MMX-(1)M will operate with the stability of any external 1 mc standard used.

A direct-reading meter (mounted on the front panel) allows visual monitoring of all critical circuits and the r-f output of the unit.

The GPTA transmitter system employs an antenna control sub-system, AN/URA-38, to control and match the transmitter output impedance to a 35-foot whip antenna at any frequency within the 2 to 29.9999 megacycle frequency range. The 35-foot whip antenna is used both for transmitting by the GPTA, and for receiving by an associated radio receiver system.

1-2. EQUIPMENT MAKE-UP.

The transmitter major components are listed in table 1-1. See figure 1-1 for physical component mounting locations and paragraph 1-3 for component descriptions.

1-3. DESCRIPTION OF EQUIPMENT.

a. LOW VOLTAGE POWER SUPPLY AP-128 (Figure 7-5). - The AP-128 provides operating voltages to the linear amplifier. This unit also contains the overload protection circuit controls to adjust the overload relay sensitivity settings. The AP-128 provides bias, screen and filament voltages to the linear amplifier plus voltages in the interlock and control circuits. The front panel contains filament and plate time meters and overload indicator lamps. All amplifier overload adjustments and bias controls and also front panel mounted.

b. HIGH VOLTAGE POWER SUPPLY, AP-129 (Figure 7-6). - The 5 kv power supply, mounted at the bottom of the equipment cabinet, contains the high voltage solid state rectifier stacks, filtering and the delta-wye step-up transformer.

This unit generates 5000 volt d-c for the plate of the final power amplifier tube. An automatic 60-second time delay circuit is intergrally mounted inside the unit to delay the application of screen voltages to the linear amplifier to prevent stripping of the PA filaments. This, in effect prevents a sudden heavy

conduction of the linear amplifier.

c. SERVO AMPLIFIER ASSEMBLY, TCSA-1. - The TCSA houses three servo amplifier units. These units, when controlled by the sense circuits of the linear amplifier, automatically tune and load the 2nd amplifier and PA portions of the transmitter.

d. LINEAR AMPLIFIER, TLAD-2.5K. - The linear amplifier serves as a power amplifier between the exciter and the antenna. The TLAD contains the tune, loading and bandswitching circuits and all r-f amplifier parts. The final tube (power amplifier) of the 3-stage amplifier is convection air-cooled by a self-contained blower in the r-f section.

e. MULTI-MODE EXCITER, MMX-1M. - The MMX is a completely transistorized superheterodyne communications exciter that operates in the range of 1.6 to 29.9999 megacycles.

The exciter provides up to 250-mw excitation for SSB and AME, up to 1 watt for CW, FSK and FAX modes of operation.

f. LOCAL CONTROL PANEL, TCP-1. - The TCP controls the application of plate voltage to the final power amplifier section and monitors all interlock circuits contained in the cabinet. Other front panel controls include a reset push-button associated with the overload and bias relays in the low voltage power supply AP-128.

g. ALARM PANEL, AX633. - The AX633 is an alarm and monitor unit, providing connector receptacles for monitoring the PA output and exciter output. An audio input jack, front panel mounted, provides for insertion of a two-tone test signal for testing the exciter unit. An audio alarm device, with its associated on/off toggle switch, and a d-c line fuse are also front panel mounted. The alarm is activated when the transmitter's high voltage is removed. This action is controlled by the high voltage power supply circuit breaker.

h. ANTENNA COUPLER CONTROL, C-3698/URA-38. - is a manual and automatic antenna tuning control unit, providing power and tuning control signals to an associated external antenna coupler. Metering and protection circuits enable the C-3698 to control the associated antenna coupler from a remote location.

i. ANTENNA COUPLER, CU-938/URA-38. - Is an externally mounted, pressurized unit used to match the impedance of a 50-ohm transmission line to a 15, 25, 28, or 35 foot whip antenna operating in the frequency range of 2 to 29.999 megacycles. Antenna tuning and matching may be accomplished either manually or automatically via remote antenna coupler control unit C-3698.

j. CABINET, ELECTRICAL EQUIPMENT, RAK-110-2JB. - is a shock-mounted equipment cabinet providing 63-inches of modular unit panel space, with removable rear and side panels. The RAK measures 72-inches high by 30-inches deep by 25¼-inches wide. Shock mounts are mounted at the four bottom corners of the RAK, with two shock mounts also located at the two top-rear corners. See figure 2-1 for dimensional outline and mounting data.

The RAK incorporates a directional coupler AF107, a tuning termination assembly TTA-1, and AP-145 power supply. These units are internally mounted to perform the following functions.

The AF107 consists of a low-pass filter and a directional coupler.

The TTA-1 consists of a transmit/receive relay enabling both the transmitter and an associated receiver to operate with one common antenna. A 50-ohm 1-kw average dummy load is switched into the transmitter output, for off-the-air tuning.

AP-145 (see figure 7-8) is external power supply used to operate the TTA-1.

k. RF POWER CONTROL, SWCD-3K. - is an r-f power controlling unit, used to adjust the desired GPTA r-f output level, accept pre-positioning information pertaining to the operating frequency corresponding to the exciter frequency settings, and place the GPTA in a transmit or receive condition. Level control circuits and pre-positioning signals enable the GPTA to automatically tune and load to the desired operating frequency and power level.

1-4. TECHNICAL CHARACTERISTICS.

Frequency Range:	2 to 29.9999 megacycles (MHz).
Operating Modes:	SSB, AM, CW, FAX, FSK, and ISB.
Power Output:	150, 400, 1000 watts PEP or average.
Tuning:	All tuning, loading and bandswitching controls on front panel.
Stability:	Absolute stability ±50 cycles for ambient temperature -30 to 55°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 ohm unbalanced.
Signal/Distortion Ratio:	Distortion products are at least 40 db below either tone of a standard two-tone test at full PEP output.
Cooling:	Forced air.
Operating Temperature:	Designed to operate in a 0° to 50°C ambient with relative humidity of up to 90%.
Power Input:	117 volts a-c, 60-cps. 3-phase.
Air Intake:	500 CFM.
Weight:	1000 lbs. (approx).

TABLE 1-1. MAJOR COMPONENTS

UNIT DESIGNATION	
Cabinet, Electrical Equipment, RAK-110-2JB	
Multi Mode Exciter, Model MMX-1-M	
Linear Amplifier, Model TLAD-2.5K	
Servo Amplifer, Model TCSA-1	
RF Power Control, Model SWCD-3K	
Linear Amplifier Control Panel, Model TCP-1	
Low Voltage Power Supply, AP-128	
High Voltage Power Supply, AP-129	
Alarm Panel, AX633	
Antenna Coupler Control, C-3698/URA-38	AN/URA-38
Antenna Coupler, CU-938/URA-38	

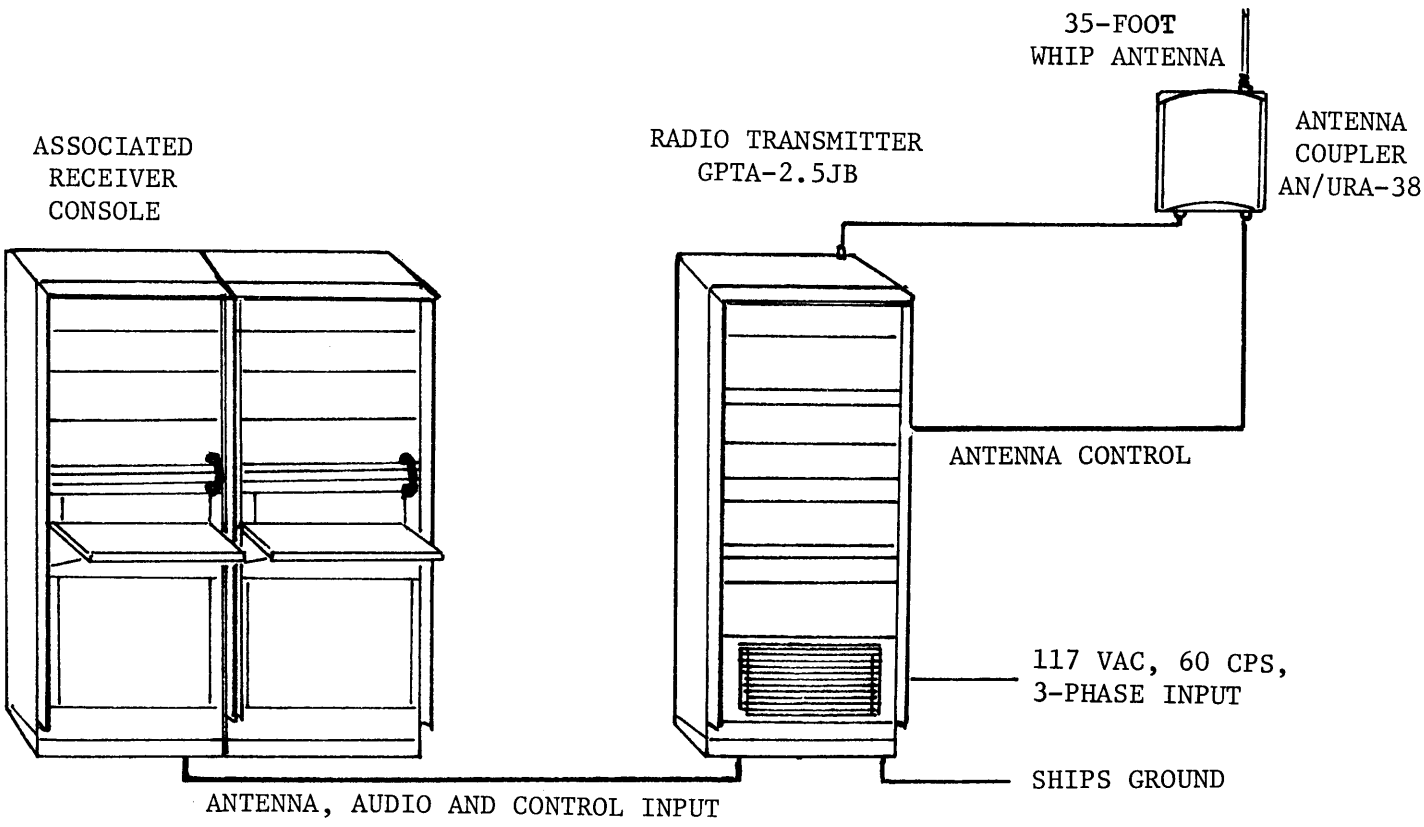


Figure 1-2. Typical System Configuration.

SECTION 2
INSTALLATION

2-1. INITIAL INSPECTION

Inspect the transmitter 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 transmitter components into the rack as shown in figure 1-1. 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 parapgraph 2-4 for installation instructions.

2-3. POWER REQUIREMENTS

The transmitter requires a 3-phase, 117 vac, 60 cps delta or wye source line. Connect source at A5586 Line Filter.

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.

Make sure that installation personnel adhere to previously outlined techniques of uncrating and material handling (see Logistics).

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.

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

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.

CAUTION

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

b. Slide power supply assembly toward rear of rack.

c. Secure rack in position with four mounting bolts.

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

STEP 4

a. Unpack transformer T8000 from crate.

b. Position transformer T8000 on base assembly.

c. Tightly bolt transformer to base assembly.

d. Remove filter-out cable, CA1244 from crate and fasten to terminals of transformer. (See figure 2-2).

e. Place 4 ceramic standoffs with their associated washers on transformer.

f. Using cover and hardware, place transformer cover on the ceramic standoffs and secure.

STEP 5

a. Unpack transformer T6000 from crate.

b. Position transformer T6000 on base assembly.

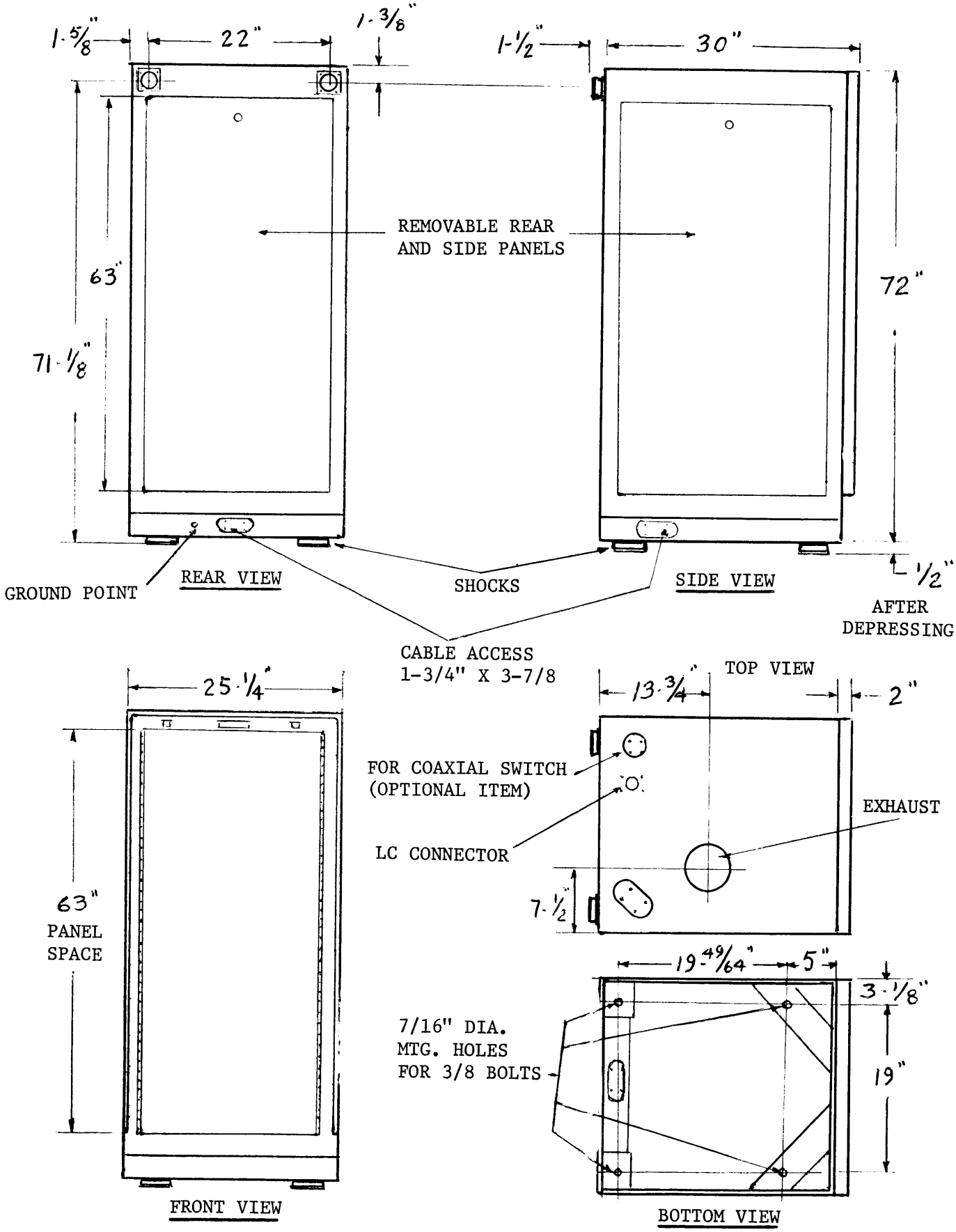
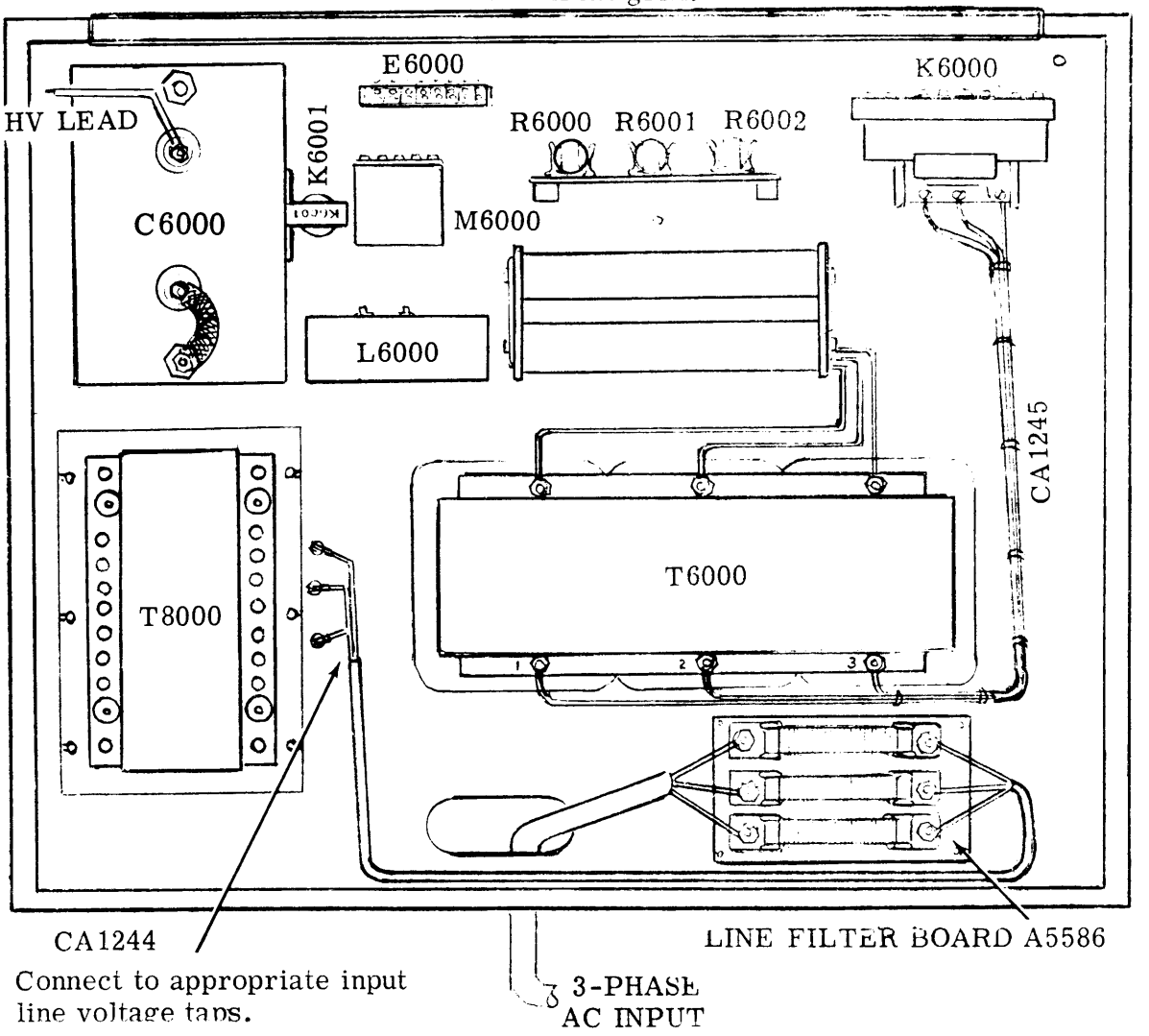


Figure 2-1. Outline Dimensional Diagram



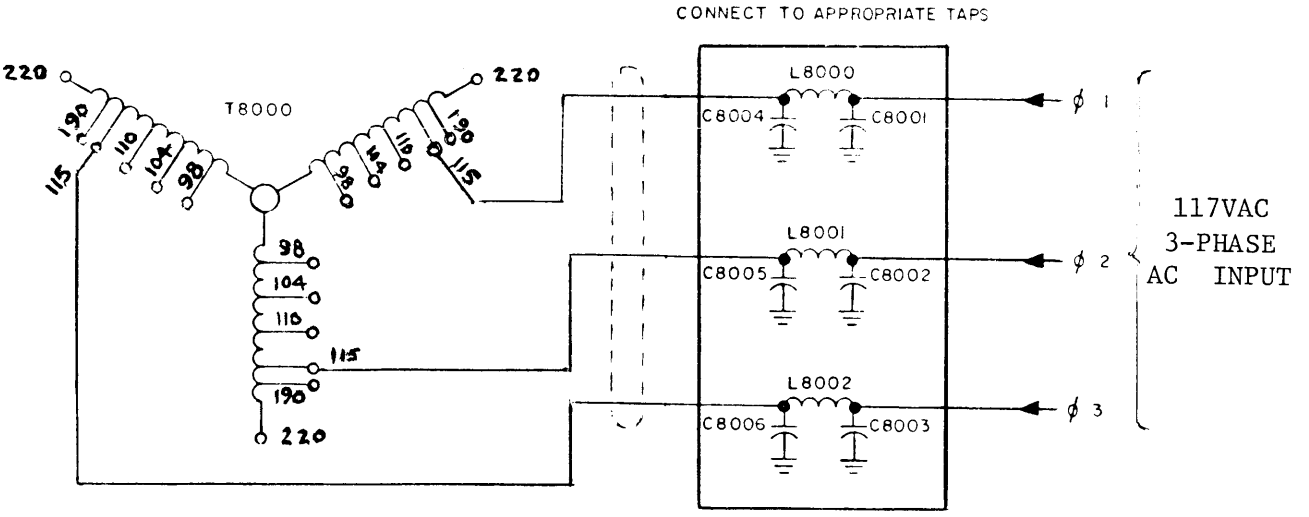


Figure 2-2. Input Power Connections, AP-129

c. Tightly bolt transformer to base assembly.

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

e. Connect jumper leads between rectifier and transformer as follows:

RECTIFIER	TRANSFORMER
From CR6000, 1	To T6000 terminal 6
From CR6002, 3	To T6000 terminal 5
From CR6004, 5	To T6000 terminal 4

STEP 6

a. Remove line filterboard A5586 from crate and remove line filterboard cover.

b. Tightly bolt line filterboard to the base inside the bottom right-rear of the rack.

c. Using loose end of CA1244 from T8000, connect white lead, phase 1 to L8000, grey lead, phase 2 to L8001, violet lead, phase 3, to L8002.

d. Route a-c input cable into base assembly through access hole and secure to appropriate terminals on line filterboard.

e. Position and secure filterboard cover to filterboard.

STEP 7

Refer to figure 1-1 for location of equipment in the rack.

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 1-1) in the rack. To install any drawer assembly, proceed as follows: (See figures 2-3 and 2-4).

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.

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

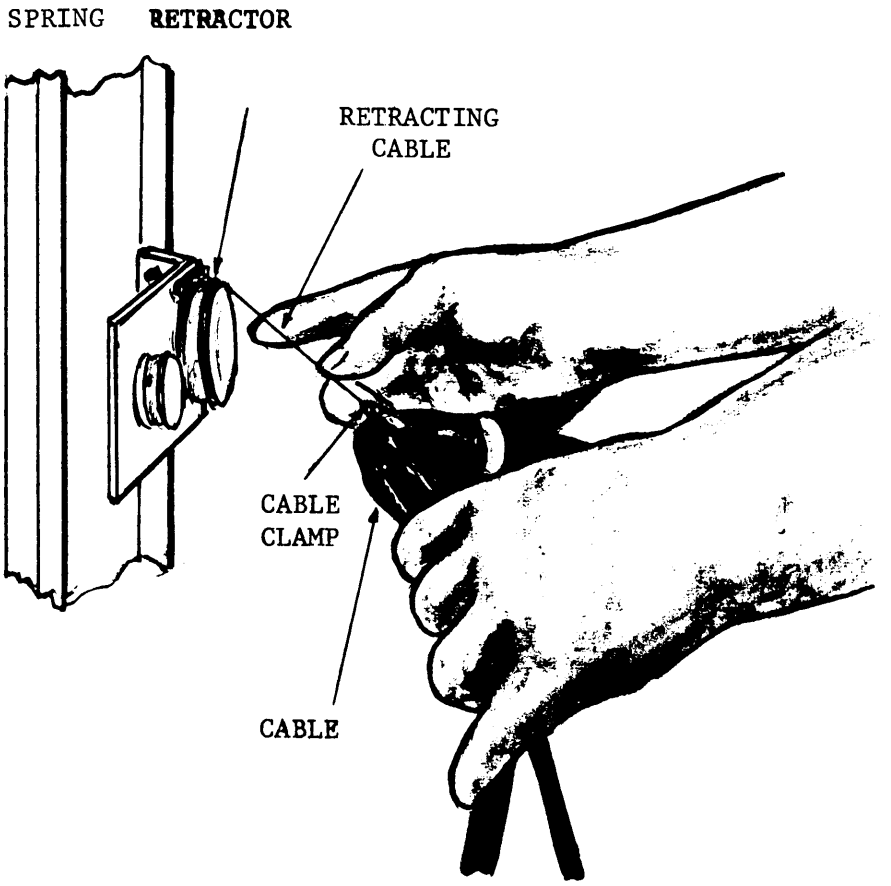


Figure 2-3. Cable Retractor Connection

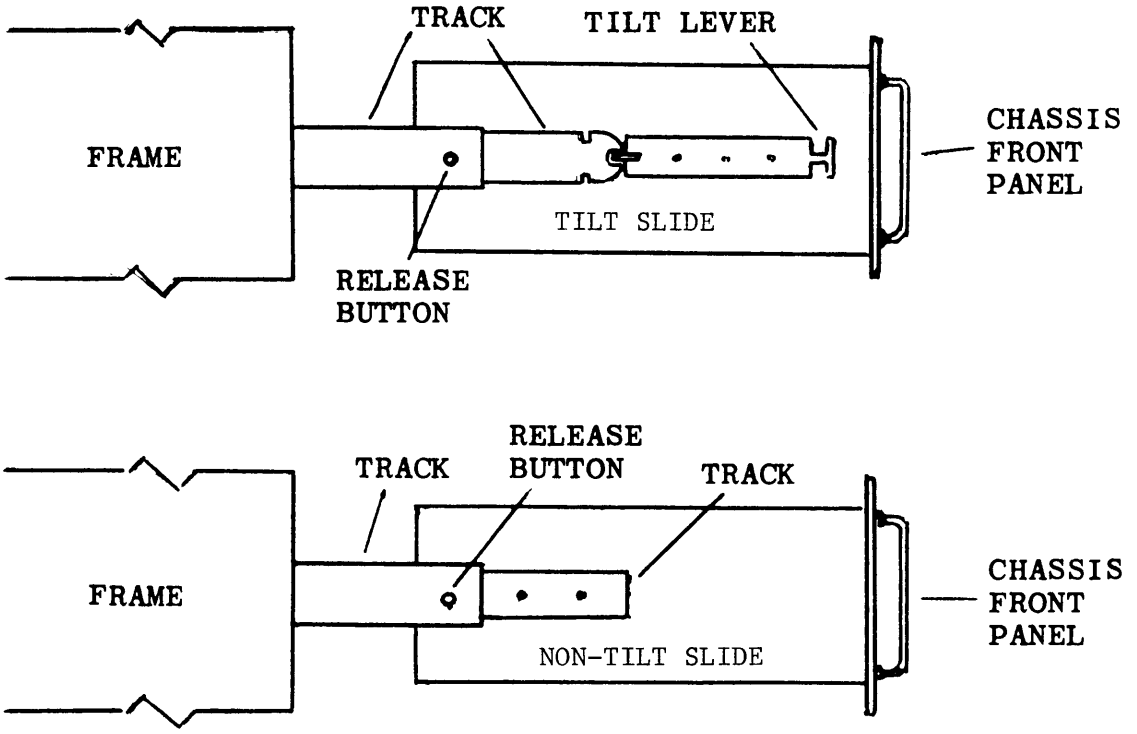


Figure 2-4. Slide Mounting Details

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 re-position 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. Remove antenna connector from crate and install on transmitter. Connector is to be fitted to the unbalanced coaxial transmission line and then attached to the transmitter coupler jack.

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

NOTE

The transmitter requires a good ground connection for efficient operation. Problems that may occur when poor ground connections exist are as follows:
(1) "Take-off". Unit does not tune correctly. As resonance is achieved, the transmitter output tries to mistakenly reach a peak value and is prevented by overload controls tripping and de-energizing the transmitter.
(2) "Hot Frame". R-f energy is felt at all parts of the frame and an r-f arc may be drawn from the frame.
(3) "Instability". The transmitter does not stabilize at the resonant frequency.

Recommendations:
(1) For land based stations, several copper rods should be driven into the ground outside the station. Depending on soil condition, the rods should be driven down to a depth of 3-feet for moist (good conductive) soil, and deeper for poor conductive soil, i.e., sand, etc.
(2) For shipboard installations, grounding to the designated "ships ground" point is required. Copper strapping should be brazed (welded) to the ground rods and fed into the station as the permanent station ground.

NOTE (CONT'D)

It is suggested that 3-inch wide copper straps be used. Copper braid should never be used, due to its high inductive values which may provide r-f ground isolation at certain frequencies.

(3) The length of the ground connection should be studied to prevent wavelength at the operating frequencies, i.e. a quarter wavelength or multiples thereof of the ground connection may cause r-f ground isolation.

(4) For the HF range (2 to 30 mc), recommended ground connection (to true ground) should be less than 10-meters wherever practicable.

(5) Connection of the station grounding system to the structure or water plumbing of the building should be avoided due to high resistive joints preventing a true connection.

(6) The station grounding system should be checked to ensure that the lowest possible resistance is achieved to true ground. A megger type metering device is usually employed for this check.

c. Replace side and rear panels and fasten.

a. ANTENNA INSTALLATION.

Selecting an antenna site requires many considerations such as height, location, surroundings, and distance from the associated communications site. See figure 2-5.

For shipboard installation, the antenna should be mounted high enough so as to clear the ship's superstructure. The CU-938/URA-38 antenna coupler must be mounted as close to the antenna base as possible. Antenna to antenna coupler interconnection is to be accomplished by use of a heavy copper conductor (No. 6 stranded copper bus), not to exceed 36-inches in length; 12-inches or less preferred. The interconnecting r-f cable and multi-conductor control cable between the CU-938/URA-38 antenna coupler and the C-3698/URA-38 antenna coupler control unit at the comunications site, should not exceed a distance of 500-feet.

For shore installation, similar considerations must be given to space requirements and cable lengths. The antenna should be mounted high enough so as to clear any surrounding hills, buildings, woods, etc. In addition, the antenna should be mounted as far as possible from interference causing high power transmission lines.

Refer to the Antenna Coupler Group, AN/URA-38 technical manual for detailed mounting requirements and procedures.

CAUTION

The voltages at the CU-938/URA-38 antenna terminal may, under certain conditions, be as high as 15 KV. Extreme caution must be observed to isolate the "hot" antenna terminal at least 6-inches from the closest object, i.e., cables, guy lines, hardware, etc.

b. PRESSURIZATION.

The CU-938/URA-38 antenna coupler must be pressurized at the time of installation. Thereafter, the pressure must be maintained between 6 to 10 PSIG. This procedure is accomplished by use of Pressurization Kit MK-260/U; proceed as follows:

NOTE

If for any reason the CU-938/URA is to be removed from its case, the case must first be de-pressurized. This is accomplished by depressing the core of the charging valve. When the case is replaced, it must be re-pressurized as described in the following procedure.

(a) Remove the intake valve cap from the CU-938/URA-38 and attach Pressurization Kit MK-260/U to intake valve.

(b) Set MK-260/U regulator at 35 PSIG.

(c) Open valve on nitrogen tank and flush the CU-938/URA-38 for 30 seconds at 35 PSIG.

(d) Close valve on nitrogen tank and disconnect MK-260/U from CU-938/URA-38.

(e) Depress valve core on CU-938/URA-38, using valve cap, to exhaust the CU-938/URA-38 to 10 PSIG.

(f) Replace valve cap on intake valve of CU-938/URA-38.

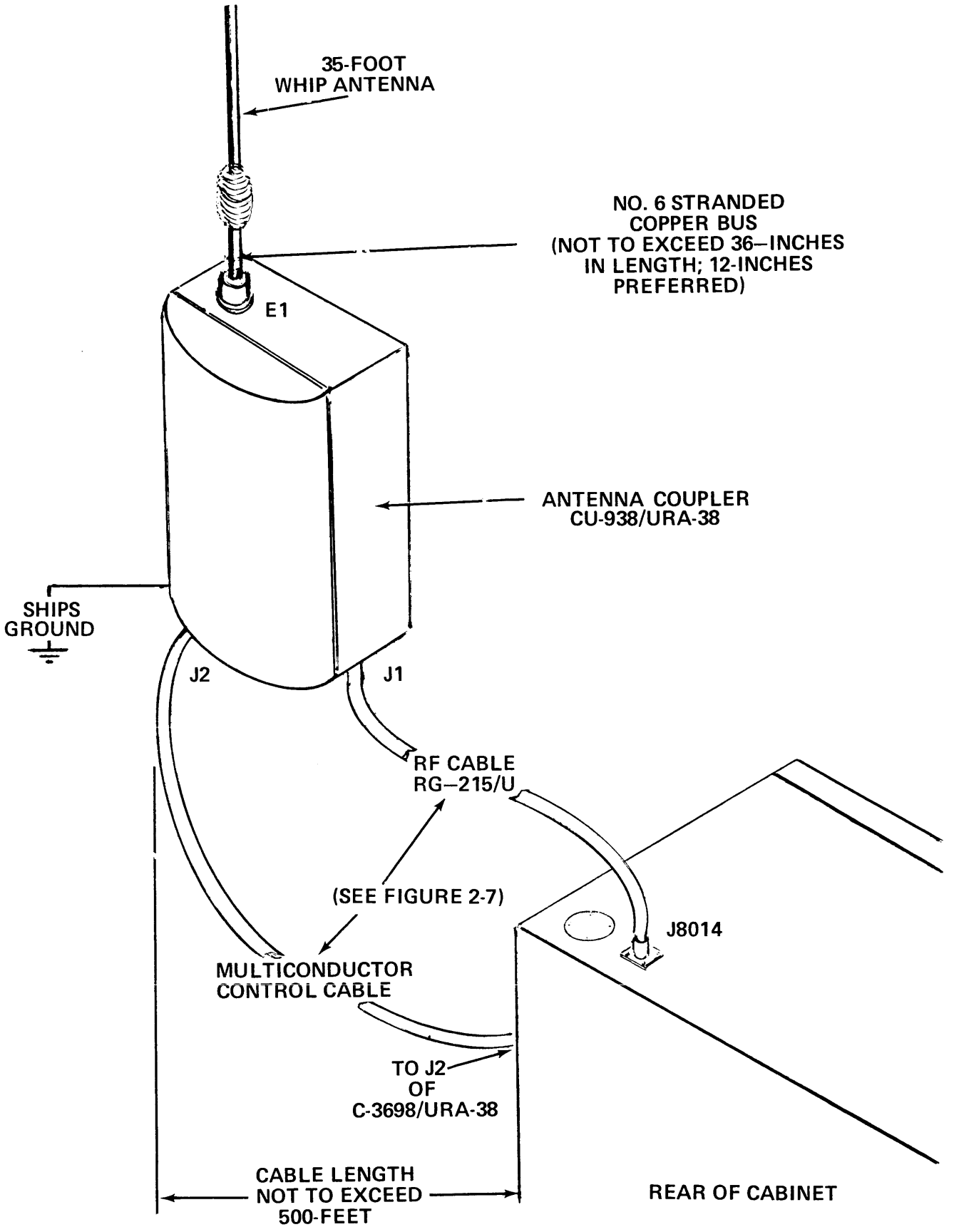


Figure 2-5. Antenna Output Connection

Table 2-1. Cable Construction Data

FROM C-3698/URA-38	TO CU-938/URA2	FUNCTION
PIN A	A	Ø DISC. OUTPUT
B	B	Ø DISC. REFERENCE
C	C	SPARE
D	D	R DISC. OUTPUT
E	E	R DISC. REFERENCE
F	F	GROUND
G	G	L MOTOR ON
H,J,K,U	H,J,K,U	C MOTOR, HOME (+), TUNE (-)
L	L	FAR END STOP
M	M	C POSITION
N	N	C MOTOR ON
P,R,S,c,	P,R,S,c,	C MOTOR, TUNE (+), HOME (-)
T	T	RESET
V,W	V,W	L MOTOR, HOME (+), TUNE (-)
X	X	L MOTOR BRAKE
Z	Z	L POSITION
a,b	a,b	L MOTOR, TUNE (+), HOME (-)
d	d	C MOTOR BRAKE
e	e	+ 12.4 VDC
f	f	OVERLOAD
g	g	BYPASS
h	h	+28 VDC
j	j	ARC DETECTOR
k	k	FAN (60 CPS)
m	m	FAN (400 CPS)
n	n	FAN (COMMON)
p	p	SPARE
r	r	SPARE
s	s	SPARE

REMARKS

Connector typs: 10-109628-21P (C-3698/URA-38)
10-109628-21S (CU-938/URA-38)

Wire Size: #22

Cable type: Multiconductor MSCA-37 type. (33 active).

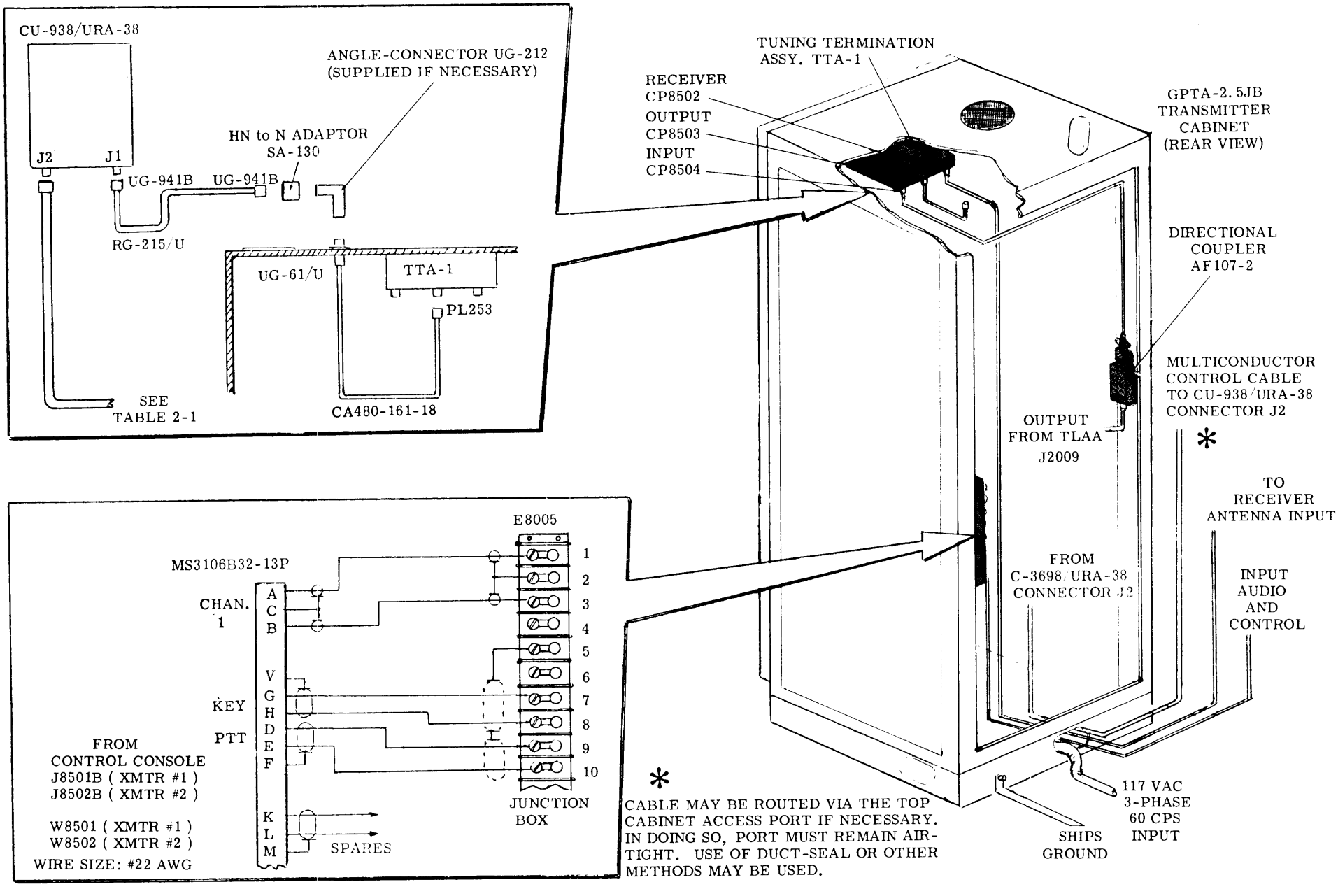


Figure 2-6. External Cable Connections.

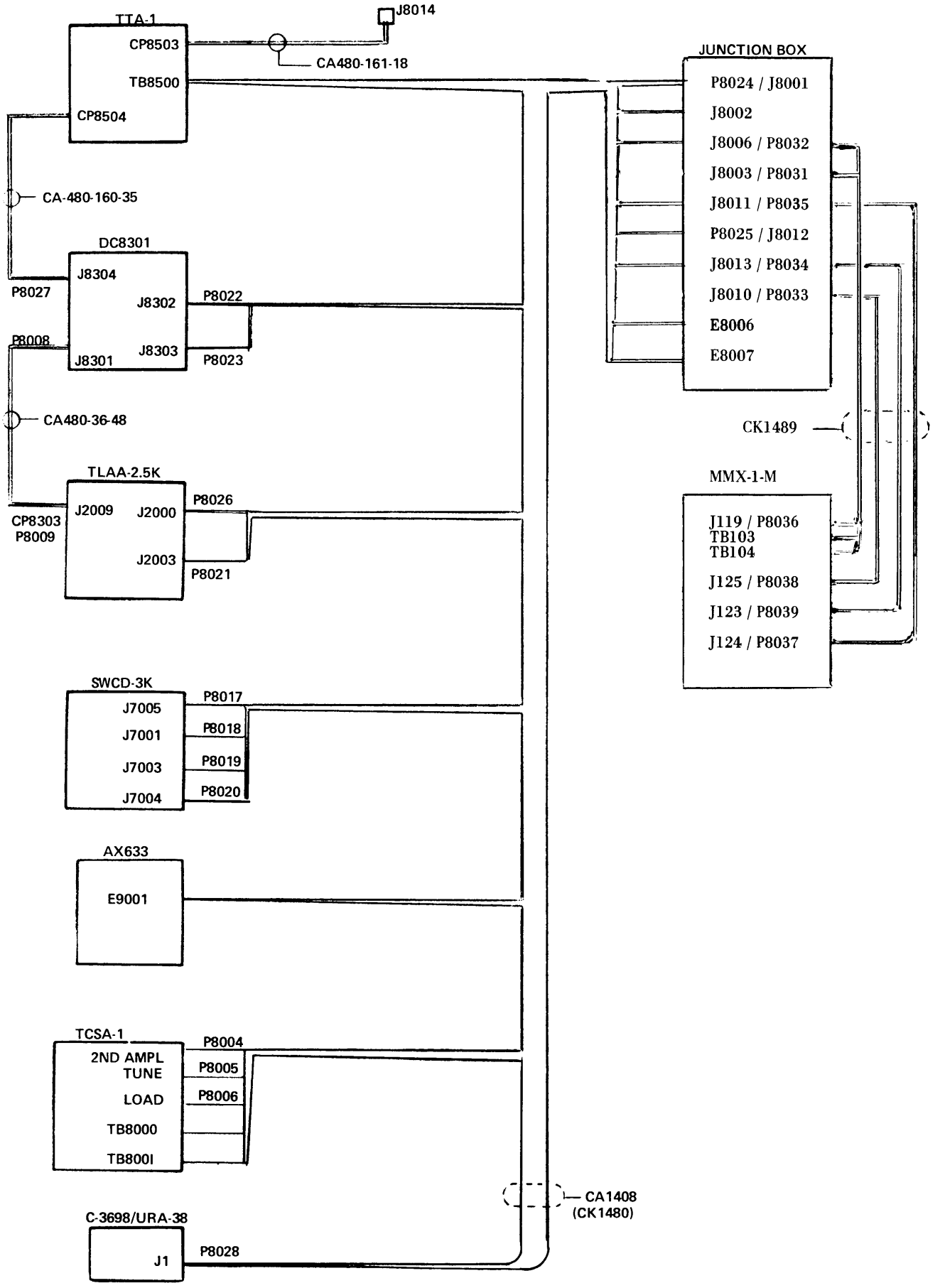


Figure 2-7. Cabinet Cabling Diagram (Sheet 1 of 2)

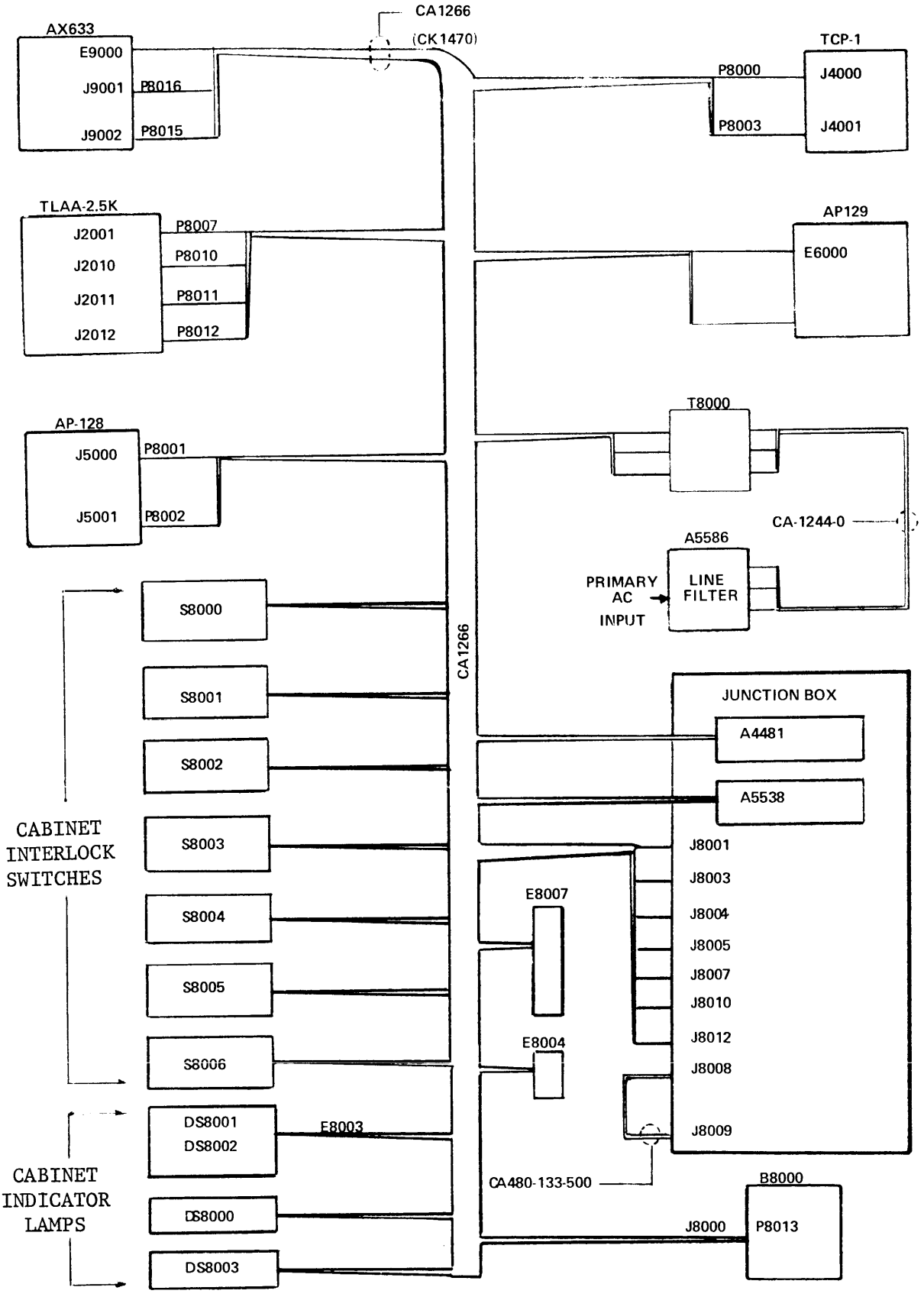


Figure 2-7. Cabinet Cabling Diagram, (Sheet 2 of 2)

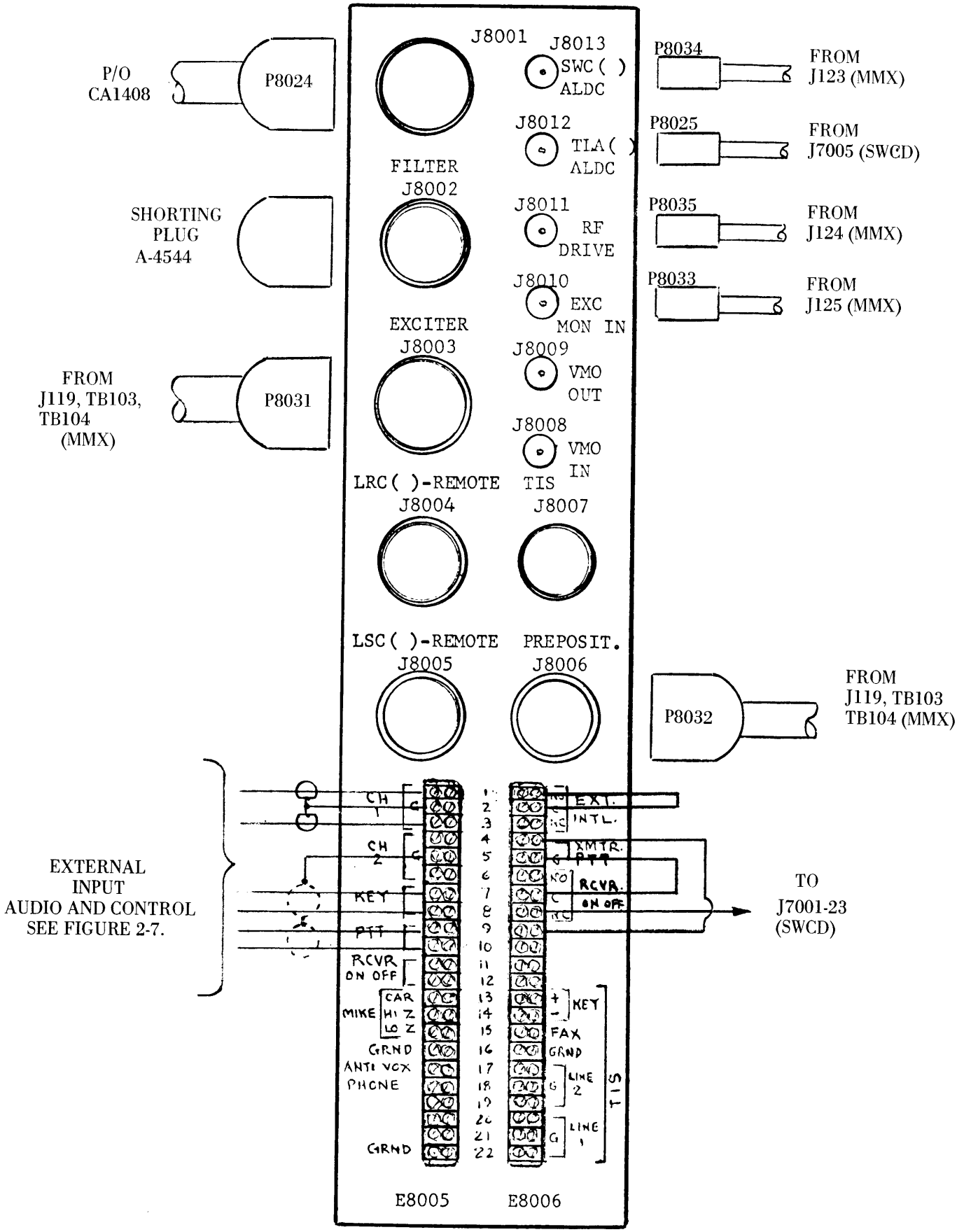


Figure 2-8. Junction Box Connections

2-5. PRE-OPERATIONAL CHECKOUT.

NOTE

When performing the Pre-Operational Checkout refer to figure 3-1 for controls and indicator location. (Copy of figure 3-1 included in this section for quick reference to control and indicator location).

a. Preliminary - With the Main Power circuit breaker set at OFF check for short circuits to ground.

1. The 3-power input phases should read not less than 1 megohm to ground.

2. The positive side of the high voltage circuit should read not less than 100K ohms, with the shorting relay open; with the shorting relay closed, the reading should be zero.

3. Place transmitter Main Power Breaker to the ON position and observe the following:

(a) Technimatic light (1) on the top of transmitter must light.

(b) Main Blower on transmitter must start running.

(c) PA BIAS overload light must light. (PA bias overload light - (79) will go out on completion of interlocks, and after the time delay has cycled).

b. Bias Level Adjustment.

1. On the RF Linear Amplifier, Model TLAD place the multimeter switch (24) in the 1st Amplifier Ip position, and adjust the 1st Amplifier Potentiometer (82) located on the Low Voltage Power Supply, Model AP-128 for a plate current reading of 10 milliamps on multimeter (20).

2. On the RF linear amplifier place the multimeter switch (24) in the 2nd Amplifier Ip position and adjust the 2nd Amplifier potentiometer (81) located on the AP-128 for a plate current of 12 milliamps on multimeter (20).

3. On the TCP place the auto-manual (41) switch in the Manual position. Turn on the High Voltage. Adjust PA bias control located on the AP-128 (80) for a PA Plate Current of 450 M.A. indicated on the TLAD Plate Current Meter (14).

c. High Voltage Alarm and Plate Elapse Time Meter Check. - With the High Voltage on, the High Voltage Light (3) should be lit. On the AX-633 place the Alarm Switch (68) to the ON position. The alarm will not sound. With the Alarm Switch left in the ON position, turn OFF the High Voltage. Now the alarm should sound indicating that the High Voltage is OFF. Also, the High Voltage light should be OFF, turn OFF Alarm Switch.

d. GPTA-2.5JB Transmitter Control Settings.

1. Place the MMX exciter switches "ON/STANDBY" and "EXCITER/PTT" to the "ON" position.

(a) The red exciter light must light (36).

(b) The meter monitor must light.

(c) Adjust the exciter "RF GAIN" control (30) to its extreme counter-clockwise position.

2. "CARRIER SWITCH" to FULL (32).
Mode Switch to USB (26).

Set the controls on the "URA-38" as follows:

(a) Main Power Switch to ON (Main Power indicator must light).

(b) Set the "MANUAL/SILENT/AUTO" switch to "AUTO".

Set the other XMTR controls as follows:

(a) Servo ON/OFF switch to ON (44).

(b) Power level to 400 Watts (9).

(c) "ANT/LOAD" (13) to Load.

(d) Auto/Manual to Auto (41).

e. Transmitter Auto Tuning.

Adjust the exciter for the desired operating frequency. With exciter controls preset as indicated the aforementioned paragraphs, place the meter SW in the "RF" position and advance the RF Gain control until meter reads approximately 1.0. Place High Voltage breaker to the ON position, Depress "TUNE" button on AX-633 and observe the following:

The transmitter must tune to the desired output frequency, at the preset output level.

After the transmitter has completed its' tuning cycle the "READY" light on the transmitter must light. (This condition indicates the transmitter has been tuned and is waiting for intelligence).

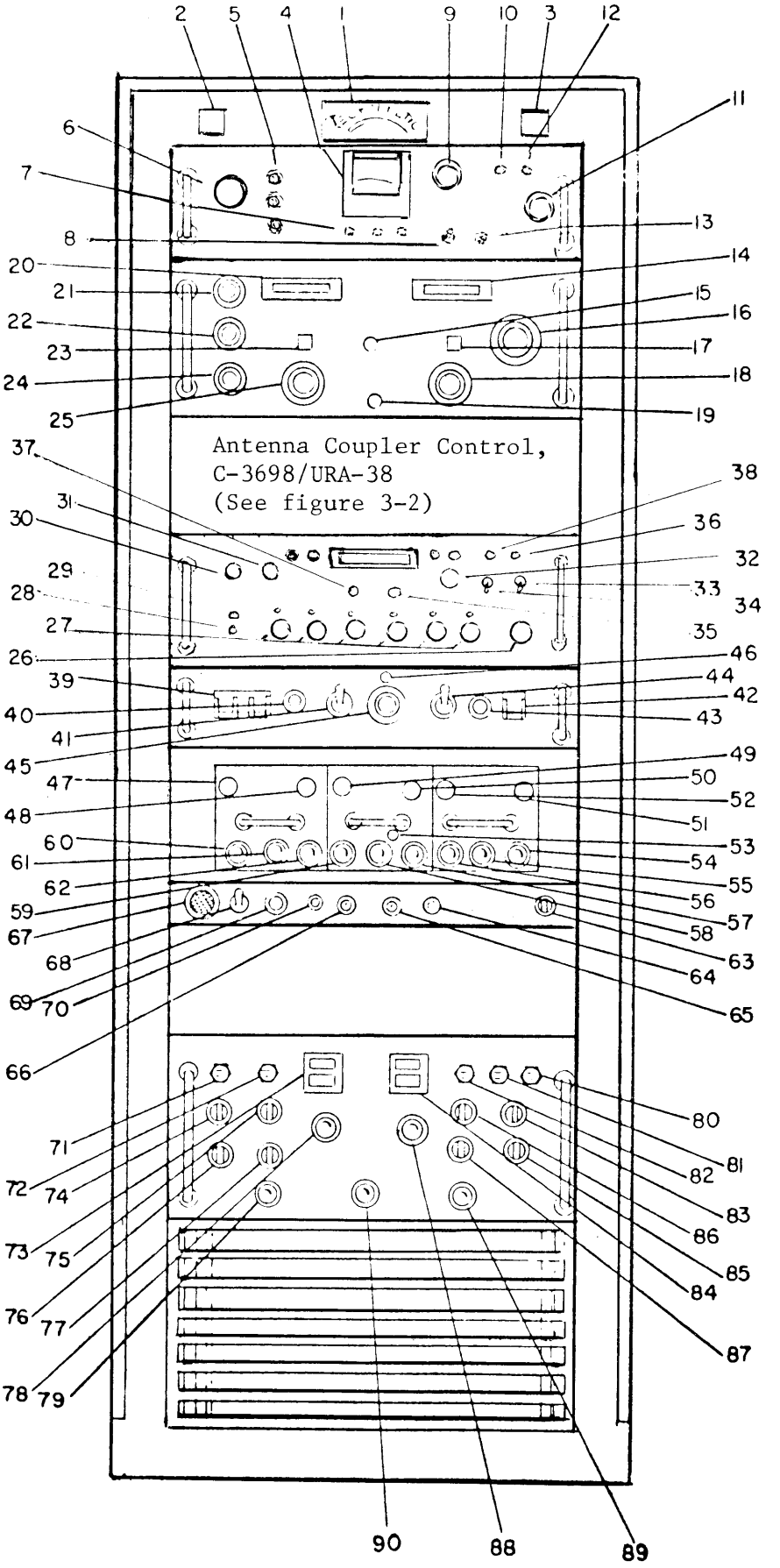


Figure 3-1 Controls And Indicators.

SECTION 3
OPERATOR'S SECTION

3-1. GENERAL.

The GPTA may be tuned manually or automatically (servo tuning). Before operating the GPTA, the operator should familiarize himself with the various control and indicator functions and location. Figures 3-1, 3-1a and 3-2, used in conjunction with table 3-3, provide control and indicator locations and functions.

A tuning chart, indicating control settings and indicator readings for proper tuning and loading at various frequency settings, is supplied in the test data package accompanying each GPTA. Reference to the supplied tuning chart will provide tuning and loading settings and indications to achieve optimum performance of the applicable GPTA. Table 3-2, is a sample tuning chart to be used as a reference for nominal settings and indications only.

3-2. OPERATING PROCEDURE.

The GPTA control settings for (a.) manual tuning and (b.) servo tuning are as follows:

NOTE

Should Normal indications outlined in the tuning procedure for either "Manual Tuning" or "Servo Tuning" be other than Normal, observe the malfunction and refer to the maintenance section. (Troubleshooting Table).

TABLE 3-1. MANUAL TUNING

Operation	Normal indications
Set Main Power circuit breaker (39) to the ON position.	The Technimatic light (1) must come on. PA blower and top fan must start running.
Set Auto/Manual switch (41) to Auto (13) and Servo ON/OFF switch to ON.	No indications.
Place MMX Exciter/PTT and Power ON/standby switches to ON (33) (34).	Monitor meter must light on MMX, Power lamp and Exciter lamps must be lit.

TABLE 3-1. MANUAL TUNING (Cont)

Operation	Normal indications
Select desired MMX operating frequency (27) and place RF output control (30) to its extreme counter-clockwise position.	Sets preposition information for auto Bandswitching and Tune and Load control presettings. (No indications).
Press Tune button (43)	PA band switch will rotate to the proper bandswitch position, 2nd Amplifier bandswitch will rotate to the proper bandswitch position, and the Tune and load controls will rotate in a clockwise direction and stop at some fixed number which is insignificant at this time.
Set the Ant/Load switch to Load (13)	Connects internal 50 ohm load to RF amplifier output. (No indication).
URA-38 (control unit) Power switch to ON (105). URA-38 MODE switch to Manual (98).	Power lamp must come on.
Manual/Auto Switch on TCP (41) to Manual. Servo ON/OFF switch OFF. (44).	Servo Amplifier lamps will go out.

NOTE

At this time it is advisable to check plate currents of the 1st and 2nd RF amplifier tubes. They should be checked in the following manner:

1 - Place the multimeter switch (24) to the 1st Amplifier Ip Position, and observe a reading of "10" on multimeter (20). Should the meter indicate some other value adjust the 1st Amplifier bias Adjust (82) located on Low Voltage Power supply, for 10 on multimeter.

2 - Place multimeter switch (24) to the 2nd Amplifier Ip position and observe a reading of "12" on multimeter (20). Should the meter indicate some other value adjust the 2nd Amplifier bias adjust (81) located on the low voltage Power Supply, for "12" on multimeter.

Set MMX Controls as follows:

Carrier switch (32) - full Mode Switch (26) - USB Meter Switch (31) - RF USB and LSB (35) (37) - "0" RF Output Control (30) - 100mw	Meter on MMX will read between 1 and 2 when meter switch has been placed in the RF position.
On RF Linear Amplifier place multimeter switch (24) to 2nd Amplifier position.	No indications at this time. (However when excitation from exciter is applied to 1st Amplifier meter will indicate during 2nd Amplifier tuning process).

TABLE 3-1. MANUAL TUNING (Cont)

Advance RF Gain Control (11) on SWCD (clockwise rotation) for a slight indication on RF Amplifiers multimeter.	Indication will be noted on RF amplifiers multimeter as RF Gain control has been advanced.
Adjust 2nd Amplifier tuning control (22) for a peak indication on RF Amplifiers multimeter (20).	Peak indication will be noted on multimeter (20).
Reduce RF output by turning RF Gain control on SWCD to its extreme counterclockwise position.	Meter indication on multimeter (20) should indicate zero.
Place H.V. breaker (42) to ON position.	High Voltage lamps (3) must light. PA Plate Current meter (14) should indicate 450ma. (Should some other value be noted adjust the PA bias adjust (80) potentiometer located on the low voltage power supply for a reading of 450ma on the PA Plate current meter (14).
Set power level switch to the desired power level.	No indication at this time.
Advance the RF Gain control on SWCD to a point where the PA Plate current increases.	
Adjust the PA Tuning control (25) until a resonance dip is obtained on the PA Plate current meter (14).	Observe Resonant dip in PA Plate current.
Adjust PA load (18) until the PA is properly loaded. After each change in loading the PA tune control (25) must be returned to resonance.	Proper loading will occur when maximum output is obtained on Output meter (4) (At a power level of 1kw the PA Plate current should be between .6 and .75 Amps depending on the frequency).
Advance RF Gain on SWCD (11) until output meter reaches preset power level.	PA output meter will indicate preset power level.
Turn RF Gain control on SWCD to its extreme counterclockwise position (11).	Power level must reduce to zero, as indicated on RF output meter (4).
Place High Voltage breakers to OFF (42).	H.V. light must go out. PA Plate current meter must indicate "0".
Place "Ant/Load" switch (13) to "ANT".	No indication
Place H.V. breaker to ON position (42).	High Voltage light must light and PA Plate current must indicate 450ma on PA Plate current meter.

TABLE 3-1. MANUAL TUNING (Cont)

Operation	Normal indication
Advance RF Gain control on SWCD for an output reading of 150 watts on the output meter (4).	
Adjust "URA-38" in the following manner:	

1. Set Mode selector switch (98) at MANUAL.

2. Set POWER toggle switch (105) at ON; POWER indicator lamp (106) should light.

3. Set L-C selector switch (93) at C.

4. Depress LEFT pushbutton (94) until TUNING indicator lamp (96) extinguishes.

5. Momentarily depress RIGHT pushbutton (95).

6. Set L-C selector switch (93) at L and repeat step (4).

7. Key GPTA at a reduced power output; DISCRIMINATOR NULL meter (91) will indicate to the right of null indication.

8. Depress RIGHT pushbutton (95) for a center mark indication on DISCRIMINATOR NULL meter (91).

NOTE

The DISCRIMINATOR NULL meter (91) indication may swing to the right before swinging left; this is normal.

9. Set L-C selector switch (93) at C.

10. Depress RIGHT pushbutton (95) for a center mark indication on DISCRIMINATOR NULL meter (91).

11. Alternately set L-C selector switch (93) at L and C and depress the LEFT pushbutton (94) and RIGHT pushbutton (95) momentarily to obtain a center mark indication on DISCRIMINATOR NULL meter (91).

NOTE

At some frequencies, the null is very sharp. This therefore requires a very slow and careful tuning procedure in order to obtain a tuned null indication.

NOTE

During manual operation, the READY indicator lamp (97) is inoperative.

12. Increase GPTA r-f output power to preset power level.

13. During transmission, periodically switch the L-C selector switch (93) at L and C position, checking for a null indication on DISCRIMINATOR NULL meter (91). Fine tune, if required, using LEFT pushbutton (94) and RIGHT pushbutton (95).

TABLE 3-1. SERVO TUNING

Operation	Normal indications
Set Main power circuit breaker (39) to the ON position.	The technimatic light (1) must come on. PA blower and top fan must start running.
Set Auto/Manual switch (41) to Auto and servo ON/OFF switch to ON	Prepares transmitter circuits for servo tuning.
Place MMX Exciter/PTT and power ON/ Standby switches to ON, (33) (34).	Monitor meter must light on MMX, power lamp and exciter lamps must be lit.
Select desired MMX operating frequency (27) and place RF output control (30) to its extreme counterclockwise position.	Sets pre-positioning information for automatic bandswitching and Automatic tune and load controls presetting.
Set Ant/Load switch (13) to Load.	Connects internal 50 ohm load to RF amplifier output. (No indications).
On URA-38 Set controls as follows: Power switch (105 - ON Mode/Switch (98) - Auto By-Pass/Normal (101) - Normal Alarm ON/OFF (100) - ON	Power lamp must come ON (Variable capacitor and inductor may return to a "Home" position on Antenna Tuner).
Place Power level switch on SWCD (9) to the desired power level.	No indications (power level control operates to control transmitter RF output in the servo-tune mode of operation).
Press Tune button (43).	Activates servo circuitry to an automatic bandswitching and, tune and load pre-position, will take place.

TABLE 3-1. LOCAL SERVO TUNING (Cont)

Operation	Normal indications
Set MMX controls as follows: Meter Switch (31) - RF Mode Switch (26) - USB Carrier Switch (32) - Full USB and LSB Gain Controls (35 (37) - "0" RF Output control (30) - 100mw (approximately "2" on Monitor meter.	With the controls set in this manner the RF output will be monitored; at the end of transmitters tuning cycle the mode will be SSBSC (single sideband suppressed carrier). NOTE When frequency select switches (27) are set at 2003kHz, 2182kHz or 2638kHz the transmitter incorporates circuitry that provides automatic A3H (upper-sideband with carrier).
Place High Voltage breaker ON (42). Press Tune button (43).	High Voltage indicator lamp will light. Transmitter will servo tune automatically. The tuning sequence is as follows: a. 2nd 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 come on). c. PA load capacitor will rotate and 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. At this time the desired type of intelligence can be fed into the exciter inputs. (Refer to the MMX exciter manual for detailed instructions for the various modes of operation). Regardless of the mode of operation the transmitter servo tuning procedure remains the same as mentioned in the previous paragraphs.

CONTROL SETTINGS TABLE 3-2. SAMPLE TUNING CHART

F OUT MC	PA BAND	PA TUNE	PA LOAD	PA L AMP	P OUT KW PEP	DIST. DB
2.0	2-2.5	142	168	580	1 KW	-37
2.4999	2-2.5	109	072	600	1 KW	-37
2.5	2.5-3.0	118	138	760	1 KW	-39
2.9999	2.5-3.0	101	077	700	1 KW	-37
3.0	3.0-5.0	110	137	650	1 KW	-40
4.9999	3.0-5.0	084	046	650	1 KW	-39
5.0	5.0-7.0	091	075	580	1 KW	-38
6.9999	5.0-7.0	077	043	540	1 KW	-37
7.0	7.0-11.0	091	074	570	1 KW	-40
10.9999	7.0-11.0	074	038	600	1 KW	-37
11.0	11.0-15.0	084	065	610	1 KW	-37
14.9999	11.0-15.0	075	039	540	1 KW	-35
15.0	15.0-19.0	078	061	550	1 KW	-36
18.9999	15.0-19.0	069	045	600	1 KW	-35
19.0	19.0-24.0	075	050	750	1 KW	-35
23.9999	19.0-24.0	039	043	630	1 KW	-35
24.0	24.0-30.0	075	056	690	1 KW	-35
29.9999	24.0-30.0	061	039	600	1 KW	-38

TABLE 3-3 CONTROLS AND INDICATORS

MODULAR UNIT	ITEM NO. Page. (3-9)	DESIGNATION	FUNCTION
RAK	1	TECHNIMATIC lamp	Indicates when primary circuit breaker (39) is set at ON position.
	2	READY lamp	Indicates transmitter is ready for operation.
	3	HIGH VOLTAGE lamp	Indicates when high voltage circuit breaker (42) is set at ON position.
RF Power Control, SWCD	4	Power meter	Indicates output power level of transmitter and reflected power level.
	5	Fuses, (3)	SWCD circuit protective fuses.
	6	PREPOSITION BANDS (Automated)	Selects operating frequency bands in the 2-30MHz frequency range. Automated for exciter control; pre-positions associated linear amplifier to selected frequency band.
	7	LEVEL ADJ, (3) potentiometers	Used to adjust meter sensing for 150, 400, and 1000 watts output power level; used in conjunction with POWER LEVEL control and RF GAIN control.
	8	KW/REFL, spring-loaded toggle switch.	Spring-loaded to remain at KW position; meter indicates output power. When held down at REFL, meter indicates reflected power.
	9	POWER LEVEL, selector switch.	Selectable transmitter power output control; 150, 400, or 1000 watts.
	10	FAULT, lamp	When lit, indicates transmitter failed to tune in specified time.
	11	RF GAIN, (Automated)	Adjusts excitation level to linear amplifier. Automated for exciter control; may be manually adjusted to over-ride automated servo control.
	12	SWR OVLD, lamp	When lit, indicates overload in SWR.
	13	LOAD/ANT, toggle switch.	When set at LOAD, transmitter output is applied to a dummy load. When set at ANT, transmitter output is applied to antenna.

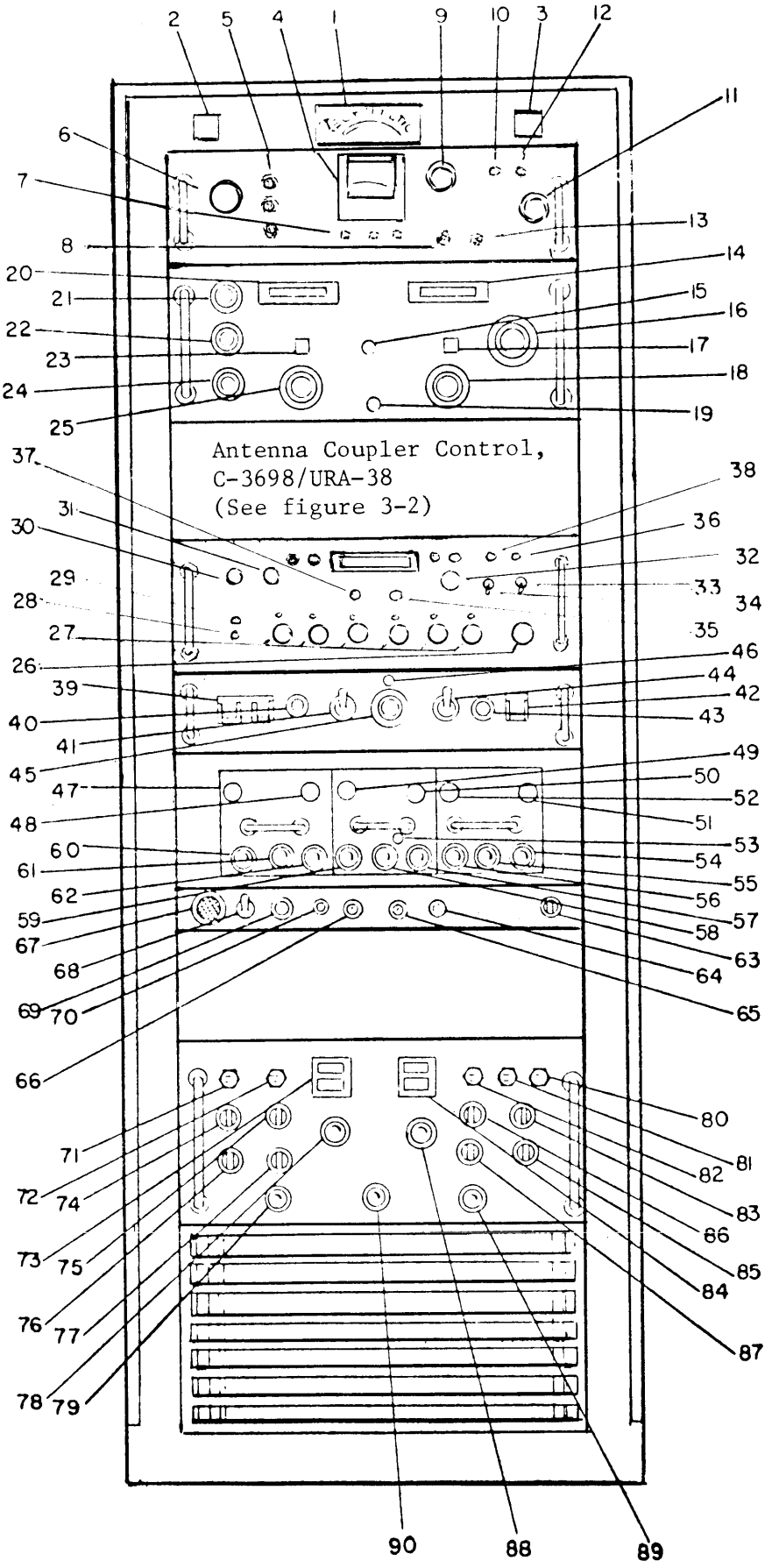


Figure 3-1a. Controls and Indicators

TABLE 3-3 CONTROLS AND INDICATORS

MODULAR UNIT	ITEM NO. Page. (3-9)	DESIGNATION	FUNCTION
Linear Amplifier TLAD	14	PLATE CURRENT indicator	Indicates intermediate power amplifier plate current.
	15	ALDC ADJ control	Adjusts level of negative feedback applied to the exciter.
	16	PA BANDSWITCH switch	Selects 2- to 30-mc range in 9 increments.
	17	Indicator (no panel designation)	Veeder indicator for LOAD control (18).
	18	LOAD control	Adjusts the loading of the final PA.
	19	RF trig control (no panel designation)	PA plate trigger adjustment for sensing circuit (factory adjusted).
	20	MULTIMETER indicator	Indicates 1st amplifier plate current, 2nd amplifier plate current, 2nd amplifier r-f plate voltage, and power amplifier r-f plate voltage.
	21	2ND AMPL BANDSWITCH switch	Selects 2- to 30-mc range in 9 increments.
	22	2ND AMPL TUNING control	Adjusts resonance of 2nd amplifier.
	23	Indicator (no panel designation)	Veeder indicator for TUNE control (25).
	24	MULTIMETER switch	Selects circuit for MULTIMETER (20).
	25	TUNE control	Adjusts resonance of the final amplifier.
Multi-Mode Exciter, MMX	26	MODE Switch	Selects the various mode capabilities of the unit.
	27	10MHz, 1MHz, 100- , 10- , 1KHz, 100Hz Switches.	Used to select the desired operating frequency in the 1.6- to 31.999 mc (MHz) in 100 cycle increments. Each switch has a window displaying the numerical value of the frequency.
	28	Key	Input for a dry contact keyer used for CW mode of operation.

TABLE 3-3 CONTROLS AND INDICATORS (Cont)

MODULAR UNIT	ITEM NO. Page.(3-9)	DESIGNATION	FUNCTION
Multi-Mode Exciter, MMX (Cont)	29	Mike	Accepts a 47,000 ohm impedance Microphone.
	30	RF OUTPUT control	Adjusts level of RF OUTPUT.
	31	METER switch	7-position selector switch. Selects circuits in system to be measured.
	32	Carrier control	Adjusts amount of carrier to be used.
	33	EXCITER Switch	Set at ON for all modes of operation using inputs other than a microphone. Set at PTT, when using the microphone input.
	34	ON/STANDBY Switch	When set at ON applies operate 12- and 24 vdc to all modules and when set at STANDBY opens operate 12- and 24 vdc to modules.
	35	USB MIKE/LINE gain control.	Adjusts level of USB input.
	36	POWER lamp	Indicator lamp for power ON condition.
	37	LSB MIKE/LINE gain control.	Adjusts level of LSB input.
	38	STANDBY Lamp	Indicator lamp lights when unit is in STANDBY condition.
Linear Amplifier Control Panel TCP	39	MAIN POWER circuit breakers	Controls application of power to all units of the transmitter excluding SMEC.
	40	OVLD RESET switch	Resets the overload relays.
	41	XMTR TUNING AUTO/ MANUAL switch	When set at AUTO, allows automatic operation of transmitter wher set at MANUAL, allows the transmitter to be tuned manually.

TABLE 3-3 CONTROLS AND INDICATORS

MODULAR UNIT	ITEM NO. Page. (3-9)	DESIGNATION	FUNCTION
Linear Amplifier Control Panel TCP (CONT)	42	HIGH VOLTAGE switch	Control application of power to high voltage power supply AP-129.
	43	TUNE switch	When depressed, initiates automatic tuning and loading.
	44	SERVO ON/OFF switch	When set at ON, enables activation of automatic band switching and tuning circuits.
	45	Interlock switch (no panel designation)	Used to locate open interlock switches (indicated by indicator lamp 46).
	46	Interlock Indicator lamp (no panel designation)	When lit, indicates interlock switch is closed.
Servo Amplifier TCSA	47	AC fuse	Protects output circuit of supply.
	48	DC fuse	Protects output circuit of supply.
	49	AC fuse	Same as item 47.
	50	DC fuse	Same as item 48.
	51	DC fuse	Same as item 48.
	52	AC fuse	Same as item 47.
	53	R.F.P.O.	R-F Power On adjustment (factory adjusted).
	54	OPERATE lamp	Lights when PA stage has completed loading.
	55	SEARCH lamp	Lights when PA stage is being loaded.
	56	AC ON lamp	Lights when servo amplifiers are tuning.
	57	OPERATE lamp	Lights when PA has completed tuning.
	58	SEARCH lamp	Lights when final amplifier is tuning.

TABLE 3-3 CONTROLS AND INDICATORS

MODULAR UNIT	ITEM NO. Page (3-9)	DESIGNATION	FUNCTION
Servo Amplifier TCSA (CONT)	59	AC ON lamp	Same as item 56.
	60	AC ON lamp	Same as item 56.
	61	SEARCH lamp	Lights when 2nd amplifier is tuning.
	62	OPERATE lamp	Lights when 2nd amplifier completes tuning.
Alarm Panel AX633	63	DC fuse	Protective fuse for alarm device circuit.
	64	AUDIO IN jack	Provides for audio test signal to be applied (during maintenance procedures).
	65	PA MON jack	Provides PA monitoring outlet for test purposes.
	66	EXCITER MON jack	Provides exciter monitoring outlet (for test purposes).
	67	Alarm Device (no panel designation)	Alarm sounds if primary power to high voltage power supply is interrupted.
	68	ALARM ON/OFF switch	Activates alarm device circuit when set at ON position.
	69	SENSE switch	Provides for the selection of circuits (as marked) for test purposes.
	70	SENSE jack	Provides monitoring outlet for the sensing positions of SENSE switch 69.
Low Voltage Power Supply AP128	71	PA PLATE OVLD ADJ potentiometer	Used to set plate overload.
	72	PA SCREEN OVLD ADJ potentiometer	Used to set screen overload.
	73	FILAMENT TIME meter	Registers filament operation time.
	74	IPA BANDSWITCH fuse	Protective fuse.

TABLE 3-3. CONTROLS AND INDICATORS

MODULAR UNIT	ITEM NO. Page.(3-9)	DESIGNATION	FUNCTION
Low Voltage POWER Supply AP128 (CONT)	75	PA BANDSWITCH fuse	Protective fuse.
	76	INTERLOCK fuse	Protective fuse.
	77	INTERLOCK fuse	Protective fuse.
	78	IPA SCREEN fuse	Protective fuse.
	79	PA BIAS OVLD lamp	Overload indicator light.
	80	PA BIAS ADJ potentiometer.	Adjust PA grid bias.
	81	2ND AMPL BIAS ADJ potentiometer	Adjust 2nd amplifier grid bias.
	82	1ST AMPL BIAS ADJ potentiometer	Adjust 1st amplifier grid bias.
	83	FILAMENT fuse	Protective fuse.
	84	PLATE TIM meter	Registers final PA plate operation time.
	85	LOW VOLTAGE fuse	Protective fuse.
	86	BLOWER fuse	Protective fuse.
	87	BIAS fuse	Protective fuse.
	88	PA SCREEN fuse	Protective fuse.
	89	PA SCREEN OVLD lamp	Overload indicator light.
	90	PA PLATE OVLD lamp	Overload indicator light.

Table 3-3. Controls and Indicators

MODULAR UNIT	ITEM NO. Page.(3-16)	DESIGNATION	FUNCTION
ANTENNA COUPLER CONTROL, C-3698 URA-38	91	DISCRIMINATOR NULL meter	Provides an indication of L or C element mistuning as selected by L-C switch during manual mode of operation.
	92	ELEMENT POSITION meter	Provides an indication of L or C element positioning as selected by L-C switch.
	93	L-C switch	Selects metering and switching required to tune L or C element during manual and silent modes of operation.
	94	LEFT pushbutton	When depressed, tuning element selected by L-C switch is repositioned in a direction which moves deflection of DISCRIMINATOR NULL or ELEMENT POSITION meter to left of scale.
	95	RIGHT pushbutton	When depressed, tuning element selected by L-C switch is repositioned in a direction which moves deflection of DISCRIMINATOR NULL or ELEMENT POSITION meter to right of scale.
	96	TUNING indicator lamp	Lights when either servo motor is energized.
	97	READY indicator lamp	Lights when elements have been correctly tuned during automatic mode of operation.
	98	Mode Selector switch	Selects AN/URA-38 mode of operation: Switch Position — Equipment Response MANUAL — Permits manual tuning. SILENT — Permits coarse manual tuning without RF power. Fine tuning is automatic when keyed. AUTO — All tuning is automatic
	99	RETUNE pushbutton	When depressed with Mode Selector switch at AUTO or SILENT, a home cycle is initiated.
	100	Overload alarm	Provides an audible indication when a pressure or temperature overload exists in the CU-938/URA-38. (OVERLOAD switch must be set at ALARM.)

Table 3-3 Controls and Indicators (Cont'd)

MODULAR UNIT	ITEM NO. age.(3-16)	DESIGNATION	FUNCTION
ANTENNA COUPLER CONTROL, C-3698/ URA-38	101	BYPASS switch	When set at ON, the CU-938/URA-38 matching network is bypassed whenever transmitter is not keyed; allowing reception on a frequency different from that used for transmission. When set at NORMAL, CU-938/URA-38 matching network is in RF signal path during both receive and transmit operation.
	102	BYPASS indicator lamp	Lights when CU-938/URA-38 matching network is bypassed.
	103	OVERLOAD switch	When set at ALARM, audible overload alarm is connected to overload circuit.
	104	OVERLOAD indicator lamp	Lights to provide visual indication when a pressure or temperature overload exists in CU-938/URA-38.
	105	POWER switch	Controls primary power application to AN/URA-38.
	106	POWER indicator lamp	Lights when AN/URA-38 is energized.

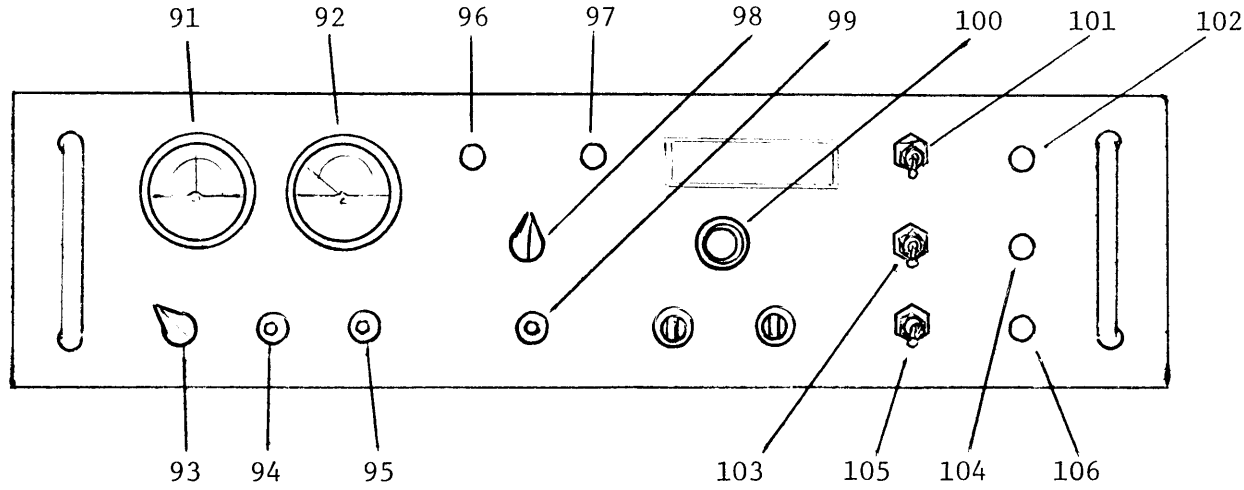


Figure 3-2. Controls and Indicators, C-3698/URA-38

SECTION 4
PRINCIPLES OF OPERATION

4-1. GENERAL.

The GPTA operates in the frequency range of 2 to 29.9999 megacycles, with a power output of up to 1 kilowatt. Automatic pre-positioning circuits are provided to pre-position the linear power amplifier bandswitches, and to pre-set the transmitter r-f output to the required level. Other circuits include electro-mechanical voltage safety features, an audible alarm circuit, and a series of critical circuit metering and indicating devices.

4-2. FUNCTIONAL ANALYSIS.

a. General. - The GPTA comprises eleven (11) major units:

1. Multi-Mode Exciter, MMX-1-M
2. RF Power Control, SWCD-3K
3. Linear Power Amplifier, TLAD-2.5K
4. Servo Amplifier, TCSA-1
5. Linear Amplifier Control Panel, TCP-1
6. Alarm Panel, AX633
7. High Voltage Power Supply, AP-129
8. Low Voltage Power Supply, AP-128
9. Antenna Coupler Control, C-3698/URA-38
10. Antenna Coupler, CU-938/URA-38
11. Power Supply, AP-145

b. Block Diagram Analysis. - The GPTA may be divided into three (3) major sections: exciter section, linear power amplifier section, and antenna tuning section. For simplicity in description, the following text will describe the operation of each section separately, intergrating where necessary.

The exciter section accepts the input intelligence, translates it to the desired mode of operation, and processes it at the selected operating frequency range.

The exciter section consists of Multi-Mode Exciter, MMX-1-M. The MMX is a

comb-filter type sideband exciter used to supply excitation outputs, at a 50-ohm impedance, to drive the associated linear power amplifier section.

Audio inputs are accepted by the MMX, processed in the desired mode of transmission and placed in the desired frequency spectrum of from 2 to 29.9999 megacycles (MHz). Excitation output, with various degrees of carrier insertion, is continuously adjustable to provide up to 250-milliwatts. Input of CW, FSK, and FAX are processed to provide an excitation output of up to 1-watt.

The MMX contains specialized circuitry to permit only A3H (upper sideband audio with carrier) mode of transmission when operating at a frequency of 2003KHz, 2182KHz, or 2638KHz. This restriction applies regarless of the MMX mode switch setting.

The linear power amplifier section accepts the input intelligence, from the associated exciter section, amplifies it (up to 1 kilowatt), and applies it to the associated antenna tuning system for transmission.

The linear power amplifier section comprises: RF Power Control SWCD-3K, Linear Amplifier TLAD-2.5K, Servo Amplifier TCSA-1, Linear Amplifier Control Panel TCP-1. Alarm Panel AX633, High Voltage Power Supply AP-129, Low Voltage Power Supply AP-128, Tuning Termination Assy, TTA-1 and Harmonic Filter AF107.

The SWCD accepts the exciter r-f output, routes it through an RF GAIN potentiometer, for excitation level control, and applies it to the input of the linear amplifier TLAD, Low level r-f signals applied to the TLAD are routed through a broadband amplifier, a tuned second amplifier and a tuned final amplifier to the r-f output jack at the rear of the TLAD. The second and final amplifier bandswitches are automatically pre-positioned by a switch located on the SWCD. Front panel meters provide the required indications for tuning and loading the amplifier stages. Operating power for the linear amplifier is furnished by power supplies AP-128 and AP-129. The linear amplifier output is coupled to the antenna tuning section via a 2 to 30 mc harmonic filter and directional coupler AF107.

Automatic transmitter tuning and loading is accomplished by servo amplifiers

driving the tuning and loading controls. This is accomplished by pre-positioning codes applied to the SWCD frequency bandswitch, when set to the predetermined frequency position.

When the MANUAL/AUTO switch on the TCP control panel is set at AUTO, contacts of a relay in the AP-128 supply voltage required to activate the stepping switches attached to the TLAD second and final PA bandswitches.

The SWCD pre-position switch routes the pre-position reference signal to the PA tune servo amplifier AZ112 and the PA load servo amplifier AZ111 in the TCSA. The PA tune and PA load servo amplifiers in turn, drive PA tune and PA load servo controls in the TLAD. Both PA tune and PA load servos are controlled by the linear amplifier sense circuits. The linear amplifier TLAD bandswitch control is directly controlled by the SWCD pre-positioned stepping switch.

The low voltage power supply AP-128 (Fig. 7-5), provides filament voltage and bias for all amplifier stages in the transmitter, plate and screen voltages for the first two amplifier stages, screen voltages for the PA stage, and 24 vac for the interlock circuits. The AP-128 contains overload relays that open interlocks, cutting off all voltages to the PA stage when preset overload levels are exceeded. The protective circuits sample the PA plate and screen currents and bias supply voltages and activate the overload relay of the SWCD when any of these currents are excessive.

The high voltage power supply AP-129 (Fig. 7-6), supplies 5000 vdc for the operation of the final power amplifier of the TLAD. The AP-129 receives its operating power from a high voltage contactor that is energized by phase-two voltage supplied by the interlock relay, and phase-three voltage that is supplied by the HIGH VOLTAGE switch in the TCP.

The TALD Linear amplifier (fig. 7-3), r-f output, at the selected operating frequency range and power level, is routed out ot a tuning termination assembly TTA-1.

The TTA accepts the r-f at the arm contact of a T/R (transmit/receive) switching network controlled by the SWCD. When the T/R switch is in the receive position, the associated receiver is connected to the external whip antenna, and the transmit r-f

is applied to a 50-ohm dummy load resistor. For routine off-the-air transmitter tuning, the 50-ohm dummy load may be connected to the r-f output by use of the LOAD/ANT toggle switch on the SWCD. Setting the SWCD at LOAD, supplies a ground return to the T/R switch solenoid causing it to energize by a -24 volts d-c from the AP-128 power supply. When the T/R switch is in the transmit position, the r-f output from the TLAD is routed out to a harmonic filter AF107. The AF107 comprises a 2 to 30 megacycle harmonic filtering network, and a directional coupler. Transmitter r-f output is routed through the harmonic filter to the directional coupler the output of which is routed out to the antenna tuning network.

Receiver signals at the whip antenna are supplied to the associated receiver input via the antenna tuning section, into AF107 directional coupler, through the 2 to 30 megacycle harmonic filter network, through the TTA T/R switch (at the receiver position), to the associated receiver input.

The TTA thus enables the GPTA transmitter and an associated receiver system to operate from one common antenna.

The antenna control section is used to tune and match the GPTA r-f output to the associated whip antenna.

The antenna tuning section consists of Antenna Control Group, AN/URA-38 comprising Antenna Coupler Control C-3698/URA-38 and Antenna Coupler CU-938/URA-38.

The C-3698/URA-38 provides the power and control signals required to tune the CU-938/URA-38. Control signals are initiated at the SWCD, processed by the C-3698/URA-38, and routed to the CU-938/URA-38. The CU-938/URA-38 is turn matches the GPTA output impedance to the 35 foot whip antenna at any frequency in the 2 to 30 megacycle range.

The 35-foot whip antenna, used with the GPTA system, is used both for transmitting and receiving.

4-3. TECHNIMATIC CIRCUIT ANALYSIS.

Bandswitches and tuning and loading elements in the transmitter r-f circuits are

automatically positioned after application of appropriate control signals from the pre-position switch in the SWCD.

The transmitter frequency range (2 to 29.9999-mc) is divided into 10 segments. The SWCD master stepping switch is positioned to one of its 10 positions which corresponds to that segment of the 2 to 29.9999-mc frequency range to which the exciter is tuned.

The bandswitch in the linear amplifier TLAD is positioned in accordance with control signals from the master stepping switch assembly. The inductive component of the linear amplifier tuned circuit is therefore adjusted for operation in the selected frequency range.

The three tuning and loading capacitors in the TLAD (2nd AMPL TUNE, PA TUNE, and PA LOAD) are set at pre-position settings when the associated TCSA servo amplifiers are initially turned on. The capacitors (all except 2nd AMPL TUNING) are positioned according to reference signals from the SWCD master stepping switch assembly. The capacitor settings are therefore dependent on the selected output frequency. Tuning time is thus minimized.

The TLAD linear amplifier sensing circuit generates input signals for the TCSA 2nd AMPL servo amplifier. The input for the 2nd AMPL servo amplifier is dependent on tube plate current. Since tube plate current increases with excitation, and excitation is dependent on the input circuit resonance, the 2nd AMPL tune capacitor is adjusted until the required tube plate current is reached.

The TLAD linear amplifier sensing circuits generate outputs that are dependent on PA tube plate current, pi-input reactance, and pi-input impedance. When excitation is applied to the PA, plate current increases, and a signal from the sensing circuits trigger the PA TUNE servo amplifier into operation. The PA tuning capacitor is adjusted so as to minimize pi-input impedance to a predetermined value. After tuning and loading of the PA is accomplished, a Drive-up signal is applied to the SWCD level control circuits from the PA LOAD servo amplifier.

Upon reception of the tuning completion signal, the relay circuits in the SWCD level control circuits disable the servo amplifier and bandswitch control circuits.

The level control circuits also disconnect the level control circuits in the stepping switch assembly, and enable its own level control circuit.

a. 2ND AMPL SERVO AMPLIFIER (AZ-110).

1. GENERAL. - The AZ-110 supplies control voltage to the second r-f amplifier tuning motor. This control voltage is in turn dependent on one of two servo-amplifier input signals: a pre-position feedback signal, or a sense signal. The servo amplifier has three modes of operation: pre-position, search, and operate. Each of these modes are discussed in sequence.

2. PRE-POSITION. - A pre-position feedback signal enters the AZ-110 at pin 6 of jack P8004, and is routed to pin 1 of plug-in module Z400. Module Z400 also receives a pre-position reference signal (-0.5 vdc) at pin 25. The pre-position feedback signal is a voltage between 0 and +20 vdc. The feedback and reference signals are algebraically added and the resultant modulated signal is amplified, and routed to contact 3 of relay K400 via pin 11 of J400.

When the pre-positioned feedback signal is appreciably removed from +0.5 vdc, relay K400 is de-energized, and the a-c modulated signal from pin 11 of Z500 is routed to pin 10 of Z101. This a-c modulated signal is amplifier in Z401, and routed to the second amplifier tuning motor via pins 14 and 16 of J402. When the feedback signal approaches a level of +0.5 vdc (the algebraic sum of the feedback and reference signals is small), tuning motor control voltage diminishes, and relay K400 is energized. With K400 energized, the signal path from pin 11 of Z400 to pin 10 of Z401 is broken; also, +28 vdc is applied to the coil of relay K402 and to SEARCH lamp DS401.

3. SEARCH. - A sense signal enters the AZ-110 at pin 1 of jack P8004 this signal is a current between 0 and +200 ua. A voltage divider comprising resistors R412 and R413, and resistor R411 form a -200 ua current source: this is the sense reference signal. The sense input and sense reference signals are

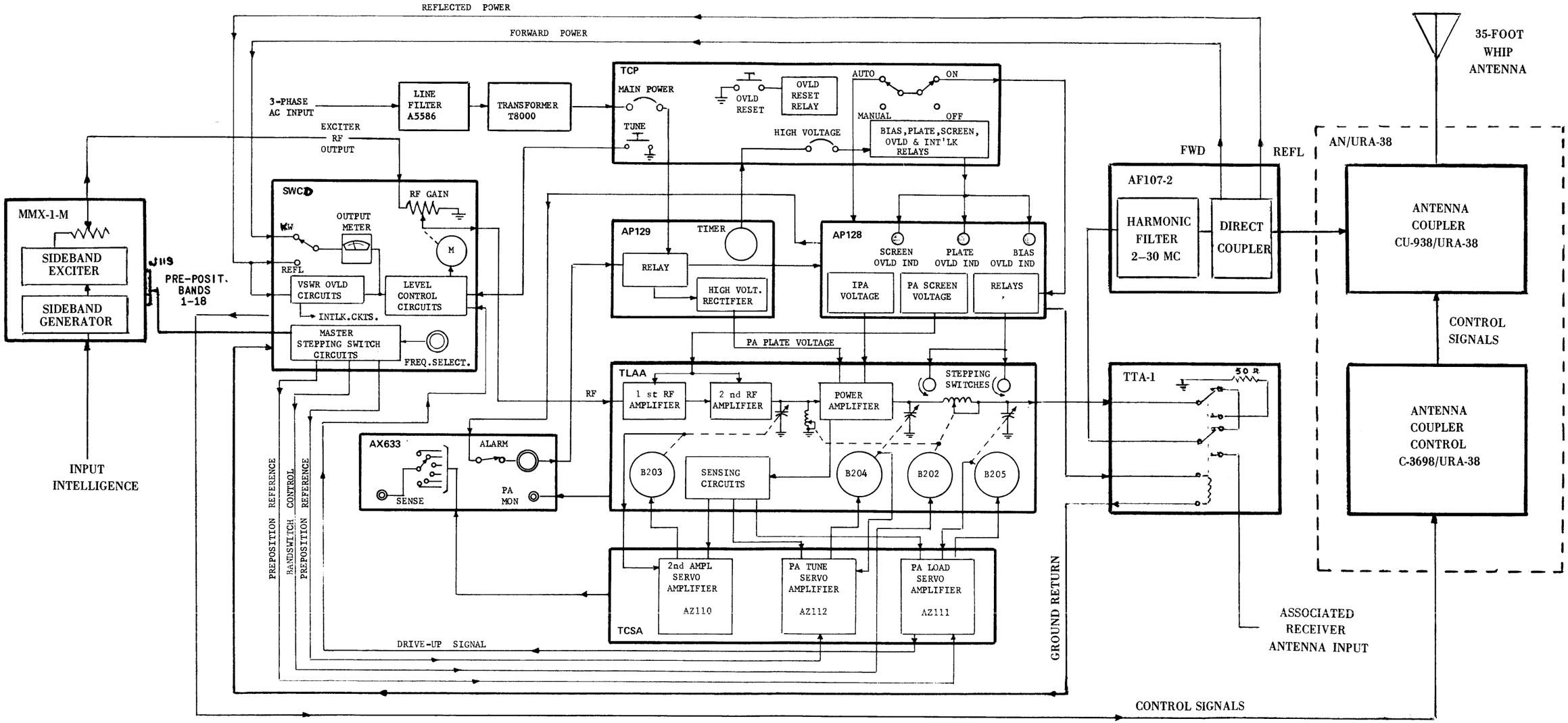


Figure 4-1. Simplified Block Diagram

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algebraically added, and the sum is applied to transformer T401 via resistor R407 and chopper G400. The a-c signal from the secondary of T401 (dependent in amplitude on the sense-input signal) is applied to plug-in module Z401 at pins 1 and 9 of Z401. The signal at pins 1 and 9 of Z401 is amplified, and routed to contact 6 of relay K401 via pin 3 of J401. When K401 is energized (pre-positioning is completed), the signal from pin 3 of J401 is routed via resistor R408 to pin 10 of Z401; this signal is amplified and routed to the tuning motor.

4. OPERATE. - When the sense-input signal approaches +200 ua (the algebraic sum of the sense-input and sense-reference signals is small), control voltage for the tuning motor diminishes; also, relay K401 is energized. Operation of K401 lights OPERATE lamp DS400, and removes supply voltage from the heater of relay K404. Relay K400, and pin 8 of Z400, however, are returned to the +28 vdc supply via diode CR405 and the external limit switch (connected between pins 30 and 31 of J402). When the sense-input signal reaches +200 ua (indicating that the second r-f amplifier is properly tuned), a 28-volt shut-off signal is applied to pin 13 of J402. This shut-off signal energized relay K403. Operation of K403 grounds out the sense-input signal, and removes supply voltage from the tuning motor (normally supplied via pin 15 of J402).

5. LIMIT SWITCH OPERATION. - If the external limit switch (connected between pins 30 and 31 of J402) opens during the search or operate sequence of operation, relay K400 is de-energized, 28 volts is removed from pin 7 of Z400, and the servo amplifier begins operating in pre-position mode. Note that the signal from pin 11 of Z400 is again routed to pin 10 of Z401. The unit will continue to operate in pre-position mode until the pre-position feedback signal reaches +0.5 vdc, and the search sequence begins.

b. PA TUNE SERVO AMPLIFIERS (AZ-112).

1. GENERAL. - The AZ112 supplies a control voltage to the PA tuning motor. This control voltages is, in turn, dependent on various servo-amplifier input signals: pre-position feedback and reference signals, and internally generated search

signal, an r-f trigger input, a coarse-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.

2. PRE-POSITION. - A pre-position feedback signal enters the AZ-112 at pin 5 of jack P8005 and is routed to pin 12 of plug-in module Z3000: a pre-position reference signal enters the AZ112 at pin 6 of P8005 and is routed to pin 25 of Z300. The pre-position feedback signal is a d-c analogue (between 0 and -20 vdc) of the tuning capacitor setting. The pre-position reference signal is set at a point between 0 and +20 vdc in accordance with the desired tuning capacitor setting. The feedback and reference signals are algebraically added and the resultant is modulated with 60 cps a-c (supplied at pins 21 and 22 of J3000). This a-c modulated signal is amplified, and routed via pin 11 of J300, contacts 3 and 4 of relay K301, and pin J301 to module Z301. The a-c modulated signal is further amplified in Z301, and routed to the external tuning motor via pins 14 and 16 of J302.

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 (the feedback and reference signals are equal and opposite in polarity), and control voltage is removed from the tuning motor.

3. SEARCH. - Application of an REPO trigger at pin 3 of P8005 causes relay K301 to energize. The REPO trigger indicates that the previous amplifier stage is tuned. With K301 energized, power is applied to pin 7 of Z300, and to SEARCH lamp DS301; also the signal path between pin 11 of Z300 to pin 10 of Z301 is broken, and Z301 receives a 60 cps signal from terminal 11 of transformer T300 via contacts 12 and 11 of K303 and resistor R301. This 60 cps signal is amplifier in Z301, 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 Z301 via contacts 8 and 9 of K303, chopper G300, and transformer T302. Chopper G300 and transformer T302 converts the d-c input signal to a-c. This a-c signal is amplified in Z301, and routed to pin 1 of Z300 via contacts 6 and 5 of K303. When the coarse-tuning sense signal approaches 0 vdc (indicating that coarse tuning is completed), relay K303 is energized. With K303 energized, +28 vdc is applied to OPERATE lamp DS300, and to pin 14 of Z300.

4. OPERATE. - A fine-tuning sense signal enters the AZ-112 at pin 1 of P8005, and is routed to Z301 via contacts 9 and 10 of K303, chopper G300, and transformer T302. This d-c sense signal is converted to a-c in the same manner as the coarse-tuning sense signal was. The resultant a-c signal is amplified, and routed from pin 3 of Z301 through contacts 6 and 7 of K303, contacts 12 and 11 of K302, and resistor R308 to pin 10 of Z301. This a-c signal if further amplified in Z301 and then applied to the associate tuning motor. When the fine-tuning sense signal approaches 0 vdc (indicating that fine tuning is accomplished), control voltage for the tuning motor diminishes, and relay K302 operates. Operation K302 opens the circuit. Servo amplifier gain is therefore cut off, and system oscillation (hunting) prevented.

5. 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 Z300 and relay K301 with relay K301 de-energized, the AZ112 start operating in pre-position mode. The pre-position, search and operate sequences will then be repeated.

c. PA LOAD SERVO AMPLIFIERS (AZ-111).

1. GENERAL. - The AZ-111 supplies control voltage to the PA 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 sequence.

2. PRE-POSITION. - A pre-position feedback signal enters the AZ-111 at pin 5 of jack P8006 and is routed to pin 12 of plug-in module Z500; a pre-position reference enters at pin 6 of P8006, and is routed to pin 25 of Z500. The pre-position feedback is a d-c analogue (between 0 and -20 vdc) of the associated load capacitor setting. The pre-position reference signal is preset at a level between 0 and +20 vdc corresponding to the desired load capacitor pre-position setting from the master stepping switch in the SWCD. The feedback and reference signals are algebraically added in Z500; the resultant is then modulated with a 60 cps a-c signal (supplied at pins 21 and 22 of Z500). This a-c modulated signal is routed to module Z501 via contacts 5 and 6 of relay K502. The a-c modulated signal is amplified in Z501, 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.

3. SEARCH. - A sense signal enters the AZ-111 at pin 1 of P8006, and is routed to Z501 via chopper G500 and transformer T501. The chopper and transformer convert the d-c sense signal to a-c. This a-c signal is amplified in Z500, and then routed to contact 7 of relay K502. When coarse tuning of the stage is completed, 28 vdc is applied to relay K502 via pin 32 of P8006 via contacts 15 and 14 of K501 and contacts 11 and 12 of K500. Operation if K502 completes the signal path between pins 3 and 10 of Z501. The associated load capacitor now receives control voltage that is derived from the sense input signal. Relay K501 is energized when an appreciable amount of control voltage is being applied to the load capacitor motor.

4. OPERATE. - When the sense input signal approaches 0 vdc, motor control voltage diminishes, and relay K502 energizes. With K502 energized, 28 vdc is applied to OPERATE lamp DS500, and to relay K504. Operation of K504 removes the ground from the fine-tune sense signal path for the associated tune servo amplifier

(this path includes pins 23 and 24 of J502, and resistor R508).

5. LIMIT SWITCH OPERATION. - The limit switches for the stage tune and load capacitors are connected between pins 30 and 31 of J502. If one of these switches closes, relay K500 is energized. Operation of relay K500 removes supply voltage from K502 and relay K301 in the associated tune servo amplifier. De-energizing these two relays (K502 and K301) places the respective servo amplifiers in pre-position mode.

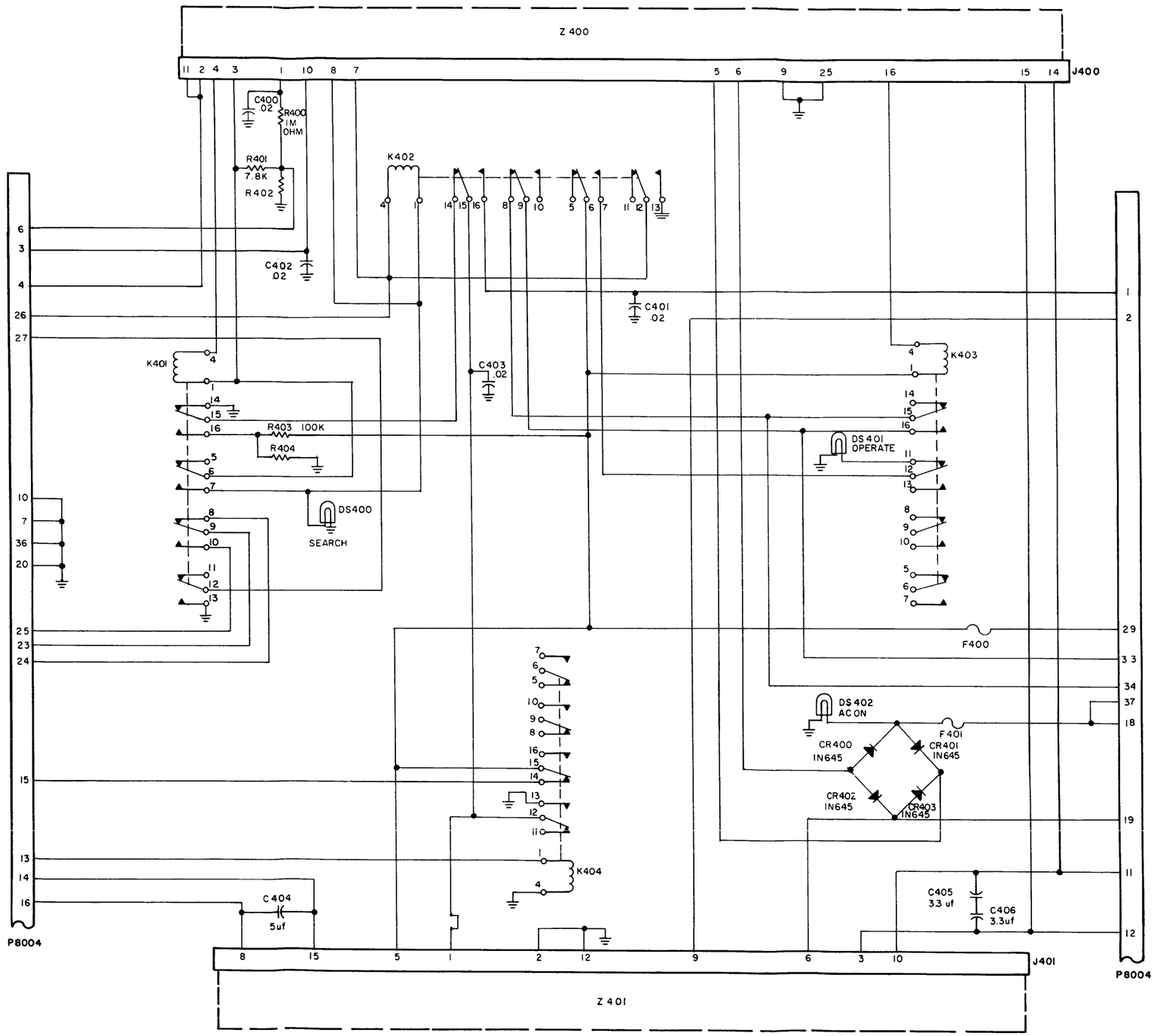


Figure 4-2. Second Servo Amplifier AZ110, Circuit Diagram

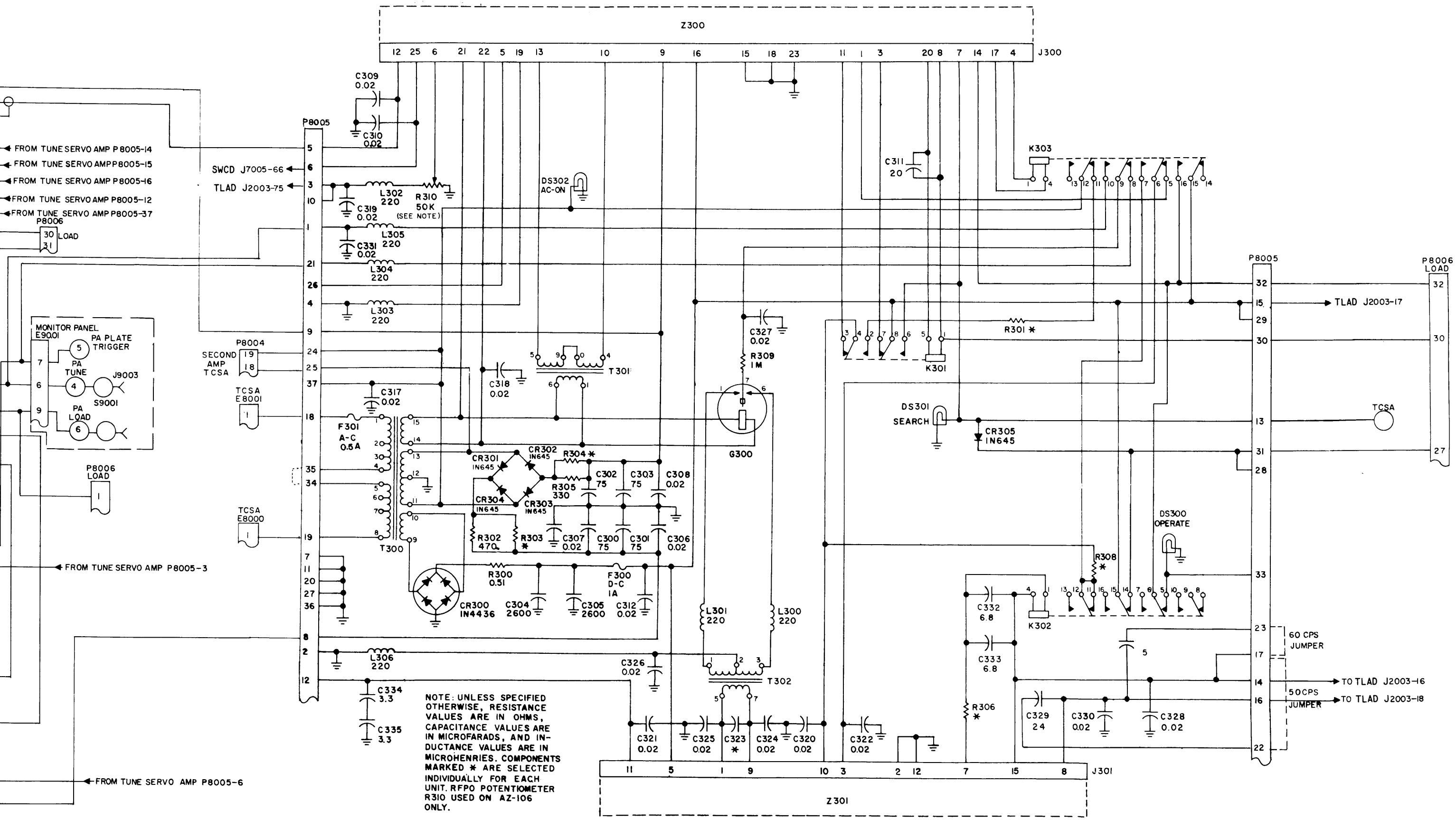
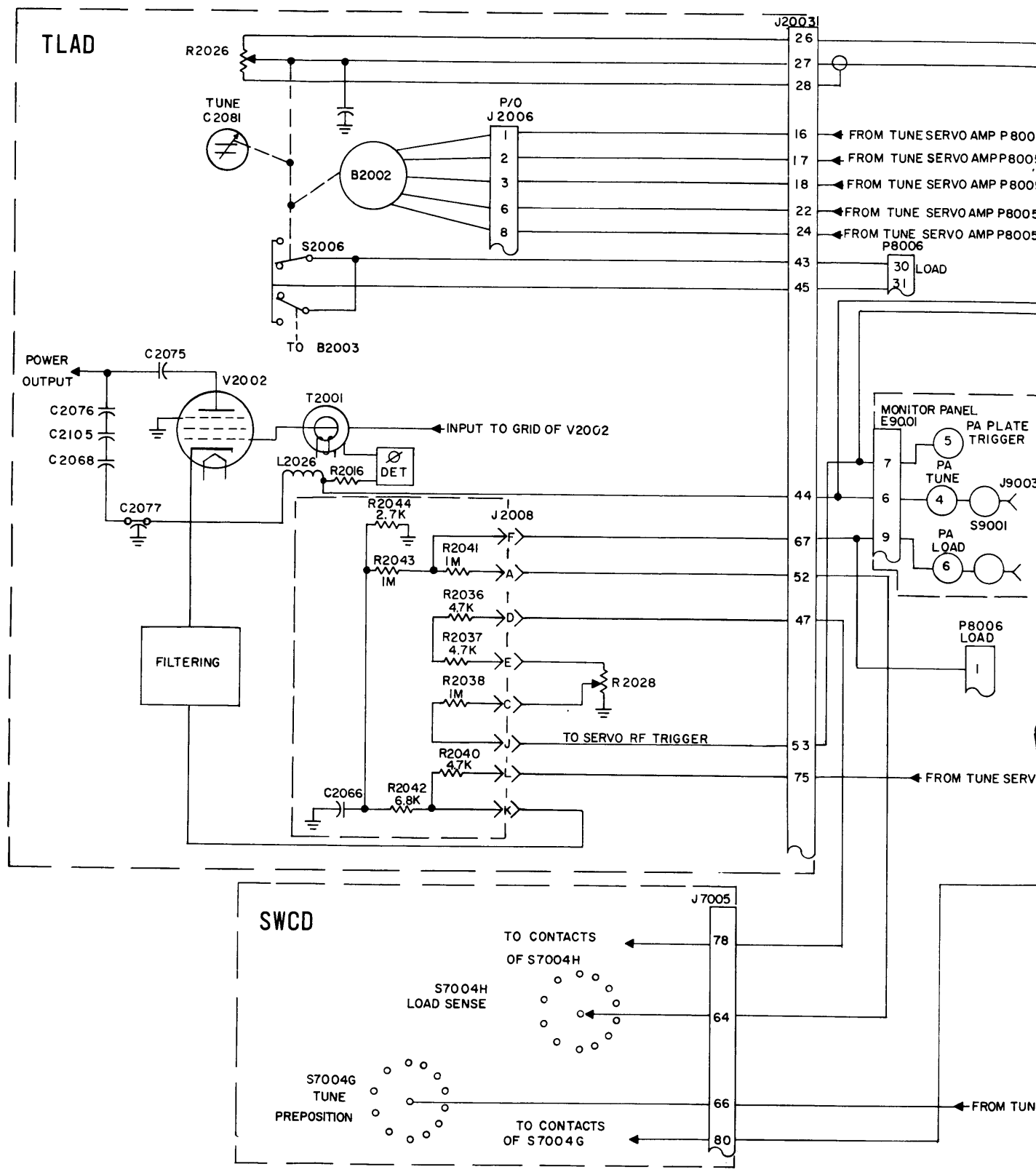


Figure 4-3. PA Tune Servo Amplifier AZ112, Circuit Diagram



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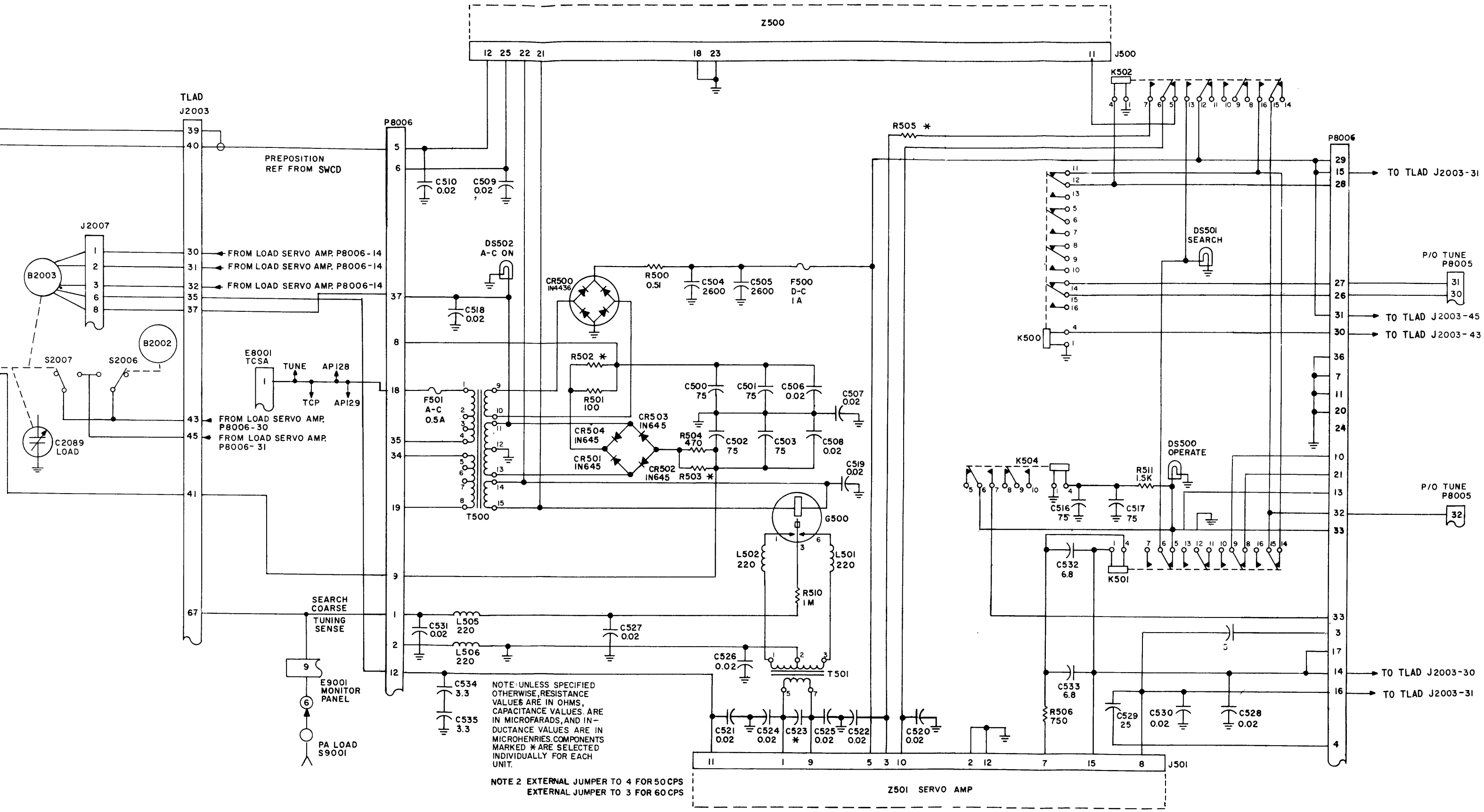
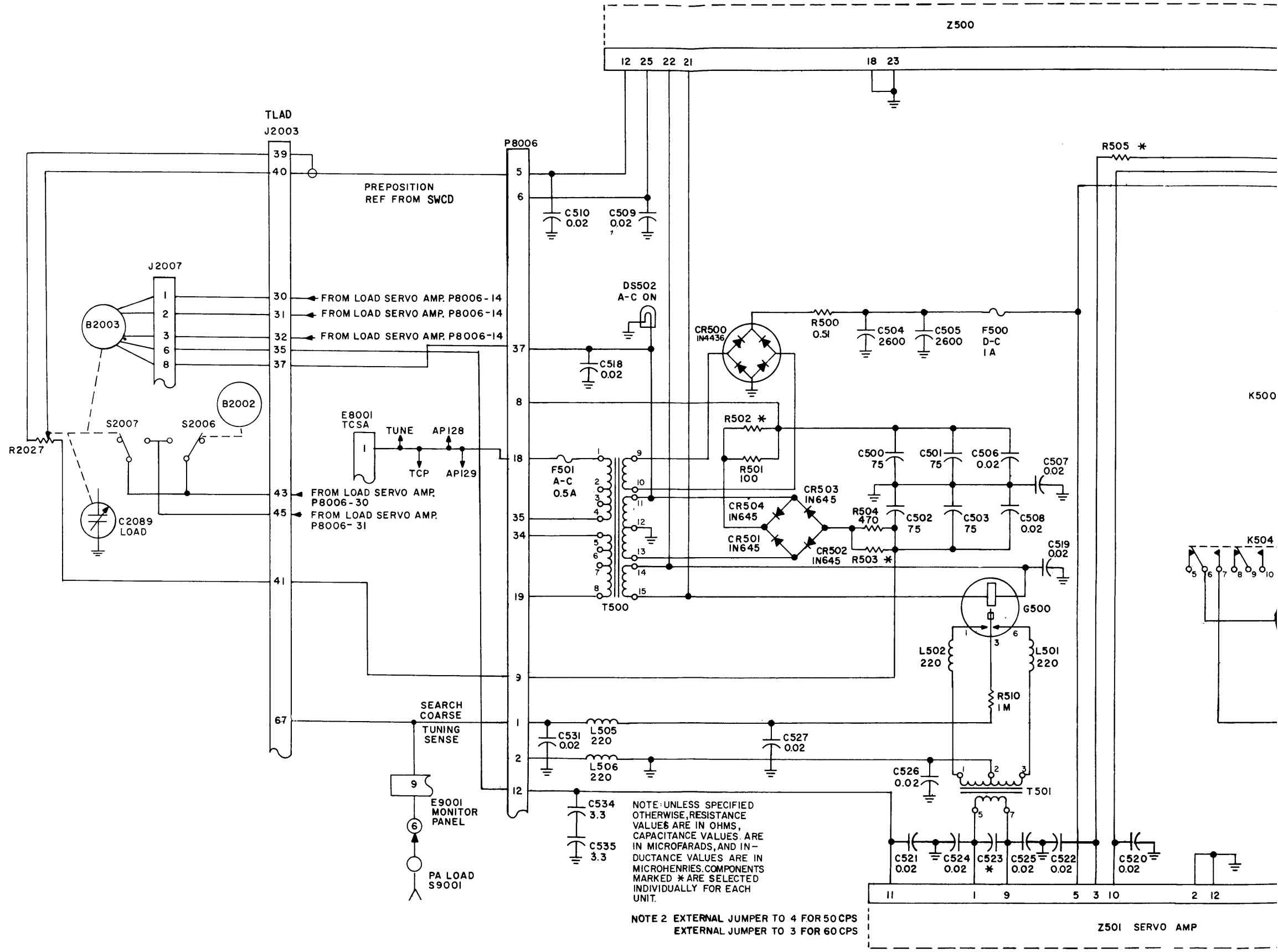


Figure 4-4. PA Load Servo Amplifier AZ111, Circuit Diagram


Z500
12 25 22 21
18 23
TLAD
J2003
P8006
PREPOSITION
REF FROM SWCD
C510 0.02
C509 0.02
J2007
B2003
B2002
S2007
S2006
R2027
C2089
LOAD
FROM LOAD SERVO AMP. P8006-14
FROM LOAD SERVO AMP. P8006-14
FROM LOAD SERVO AMP. P8006-14
E8001
TCSA
TUNE
AP128
TCP
AP129
FROM LOAD SERVO AMP. P8006-30
FROM LOAD SERVO AMP. P8006-31
DS502
A-C ON
C518 0.02
CR500 IN4436
R500 0.5I
C504 2600
C505 2600
F500 D-C 1A
R502 *
R501 100
F501 A-C 0.5A
T500
CR503 IN645
CR504 IN645
CR501 IN645
CR502 IN645
R504 470
R503 *
C500 75
C501 75
C506 0.02
C507 0.02
C502 75
C503 75
C508 0.02
C519 0.02
G500
L502 220
L501 220
R510 1M
R505 *
K500
K504
SEARCH
COARSE
TUNING
SENSE
E9001
MONITOR
PANEL
PA LOAD
S9001
C531 0.02
L505 220
L506 220
C527 0.02
C526 0.02
T501
C534 3.3
C535 3.3
C521 0.02
C524 0.02
C523 *
C525 0.02
C522 0.02
C520 0.02
11 1 9 5 3 10 2 12
Z501 SERVO AMP
NOTE: UNLESS SPECIFIED OTHERWISE, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, AND INDUCTANCE VALUES ARE IN MICROHENRIES. COMPONENTS MARKED * ARE SELECTED INDIVIDUALLY FOR EACH UNIT.
NOTE 2 EXTERNAL JUMPER TO 4 FOR 50 CPS
EXTERNAL JUMPER TO 3 FOR 60 CPS

SECTION 5
MAINTENANCE

5-1. INTRODUCTION.

This section has been prepared to assist the technican having experience with similar or related equipments.

a. The following maintenance aids are provided:

1. pre-operational checkout procedure (Section 2, Para 2-5.)
2. system block diagram (Section 4) (Figure 4-1)
3. fuse functions (Table 5-1).
4. system protective overload checkout procedure.
5. alignment procedure.
6. troubleshooting guide.

5-2. LIST OF TEST EQUIPMENT REQUIRED.

Signal Generator	Hewlett Packard Model - 606A or equivalent
Oscilloscope	Tecktronic Model 541A or equivalent
Spectrum Analyzer	Lavoie Lab Model LA-40A or equivalent
Audio Generator	Hewlett Packard Model 200CD or equivalent
VTVM	Hewlett Packard Model 410B or equivalent
Frequency Counter	Hewlett Packard Model 5244L or Equivalent
Multimeter	Simpson Model 260 or equivalent

5-3. OPERATORS MAINTENANCE.

a. Performance Test (Refer to operational checkout procedure section 3, paragraph 3-2, and repair (replace fuses, refer to figure 5-1 and table 5-1 for location of fuses).

b. Adjustments: - Perform pre-operational adjustment procedure outlined in Section 2, paragraph 2-5.

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

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

5-4. SHOP MAINTENANCE.

a. Bench type test (All Voltages shown in the following paragraphs are typical and have been taken with test equipment outlined in paragraph 5-2 of Section 5 under the following conditions.

1. AC line frequency - 60 Hz
2. AC line Voltage - 3 phase 117V
3. Transmitter High Voltage ON (No RF output)

VOLTAGE CHART

TLAD (RF POWER AMPLIFIER)

Component	Condition	Plate	Screen	Grid
V2000 (8121)	Transmitter energized H.V. ON	350VDC	250VDC	-12-20VDC
V2001 (8121)	Transmitter energized H.V. ON	800VDC	350VDC	-12-20VDC
V2002 (PL-264)	Transmitter energized H.V. ON	5 kv	800VDC	-120-160VDC

S-2002 (Air switch interlock 230VAC)

B-2000 230VAC at terminal 1 and 2

DS-2000 thru DS-2008 operate at 5VAC

AP-128 (LOW VOLTAGE POWER SUPPLY)

V-5001 - pin 5 250VDC

V-5002 - pin 5 350VDC

V-5003 - pin 7 400VDC

C5000 800VDC

CR5002 -24VDC

M-5000 & M5001 115VAC (when operating)

Between F-500, F5001, and F5002 230VAC

TCP-1

J4000 A.B.C. 230 AC 3Ø

AP-145

T-501 terminal - 1 and 2 115VAC
K-501 terminal - 4 34VDC (with Dow key relay energized).

5-5. TROUBLESHOOTING.

The first steps in troubleshooting the automated system are as follows:

a. - Observations. - Observe the operation of transmitter and determine whether the indications are normal or abnormal. Refer to operator's section,

both manual and local servo tuning.

b. - Fuse checks. - Should a malfunction occur a visual check of fuses on the system must be performed. All fuses are indicating type except for the TCSA servo amplifier.

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

d. - Localization of malfunction. - Perform the pre-operational checkout procedure outlined in paragraph 2-5. Use of this procedure will help localize the particular fault.

A troubleshooting table has been specially prepared to assist in localization of a malfuntion, should one occur. The manner in which the table has been written gives a logical sequential order for localizing malfunctions.

MANUAL OPERATION

STEP	MALFUNCTION	PERFORM OPERATION
1	No MMX exciter output in the RF position	Check control settings for desired mode of operation. Place meter switch (31) in the Q1, Q2, Q3 positions respectively and observe indication on MMX exciter's monitor meter. Meter should deflect to the designations marked on the MMX monitor meter. Should meter reading be other than normal refer to MMX manual.
2	No output indication on KW Output meter (4) after manual tuning has been accomplished.	Press KW/REFL (7) switch to ascertain if a high VSWR is present. If high VSWR is present check antenna transmission line for proper connection. If OK check forward power diode located on rear of transmitter on the inside of Rack. Forward power diode is the one that indicates a value that coincides with full scale on output meter. If it seated properly, meter deflection will be in the direction of the RF flow to the antenna or dummy load. If OK proceed to check cables from directional coupler to kw output meter (4).

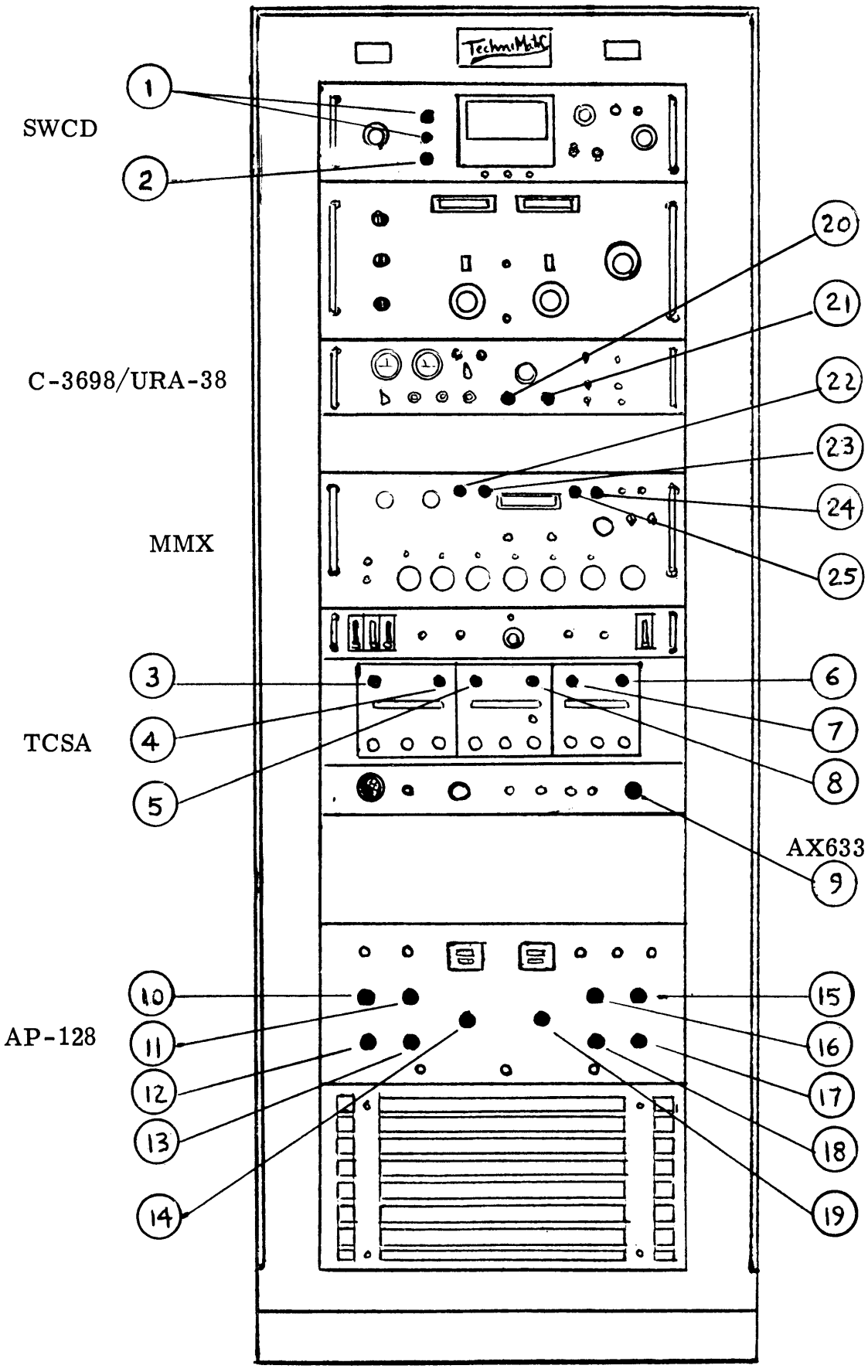
STEP	MALFUNCTION	PERFORM OPERATION
3	No High Voltage when High Voltage breaker is placed in the ON position.	Check and ascertain that all interlocks are closed. (Interlock indicator light must be lit in every interlock switch position). If OK check overload indicators PA (79) bias, PA (90) Plate, PA (89) Screen, and SWR (12) OVLD, all overload lamps should be out (extinguished). Should either PA overload lamps be lit reduce RF drive and press reset button. Should PA bias lamp (79) remain lit after approximately 5 minutes and (if all interlocks have been closed) check "Time Delay" circuit. (Located bottom left side of High Voltage Power supply AP-129). Should the indication of no H.V. still persist, wait approximately 30 minutes and attempt to apply H.V. If H.V. comes on this indicates the heat overload has been activated. Check blower system and ascertain that nothing has obstructed the air flow (intake or exhaust).
4	PA Plate overload trips with the application of H.V.	Reduce RF drive to minimum. Adjust PA bias (80) adjust for maximum bias (extreme clockwise position) readjust PA for proper setting (450ma), (with manual/auto in manual). If PA Plate overload trips upon application of H.V. ascertain the trip-out value and if less then 1.3 amps reset PA Plate overload as per para. 5-6. In a manual tuning effort the controls are at the discretion of the operator therefore refer to sample tuning chart as a guide for manually tuning transmitter (A overloaded Transmitter will draw excessive plate current and result in the plate overload tripping).
5	PA Screen overload trips with the application of H.V.	Repeat step 4 with one exception, monitor the PA screen current as outlined in section 5 paragraph 5-6, and adjust PA screen adjust (72) thereof. Refer to sample tuning chart for manual tuning.
6	Cannot find resonance on PA. (Dip in PA Plate Current).	Check to see that bandswitches are in the proper position for the frequency selected. Refer to sample tuning chart for nominal control settings. (At a resonant point there should be an indication of output on the kw output meter).

STEP	MALFUNCTION	PERFORM OPERATION
7	Low PA RF output	Check output level of MMX exciter (meter in the RF position should be reading approximately "2" depending on frequency and mode. Overall transmitter output is controlled by the RF Gain on the SWCD. Place Multimeter Switch on RF Amplifier TALD (24) to 2nd AMPL Ep position and adjust RF Gain control on SWCD (11) and in its extreme clockwise position and the multimeters needle should indicate at least "40" on meter. (Indication of RF drive to PA).
		CAUTION Do not let transmitter remain in this condition. Check ALDC adjustments outlined in the Alignment procedure. (A quick method of determining if ALDC is the cause of low output, is simply disconnect the cable connected to the ALDC Jack (J123) on the rear of the MMX exciter.
		SERVO OPERATION
8	No MMX exciter RF output	Press "Tune" button (43) on TCP. (Tune button should cause Tune carrier relay in MMX to energize). If still no output, Place Auto/manual switch in manual position (41). Place exciter ON/PTT switch to the ON position. Set MMX controls for carrier only operation. (MMX exciter should produce output under these conditions. If not, repeat step #1.
9	RF Gain control inoperative on SWCD (11).	Check cabling from MMX exciter to SWCD RF input. Check mechanical operation of RF Gain control (RF Gain Control in the extreme counterclockwise position must activate two micro-switches which are connected in the SWCD's RF Gain control circuit, this must be checked. Adjust RF Gain control manually to start servo tuning process, observe the operation of servo tuning sequence Refer to Servo tuning procedure, Table 3-1. When load capacitor (18) stops tuning and all servo amplifier indicators go off RF Gain control must automatically drive transmitter to preset output level. If not check the following.

STEP	MALFUNCTION	PERFORM OPERATION
9 (Cont)		(a) High Voltage must be ON. (b) Press "Tune" button and hold for approx. 2 seconds. (c) Check the 100 mw adjustment on SWCD (Adjust as per para. 5-10). (d) Check and ascertain that the 2nd Ampl tuning control is rotating. (e) Check relays located in SWCD on PC board Z7001. K7003, K7008, K7009, they should activate when the "Tune" button has been pressed. (This can be observed by removing SWCD's top cover and looking at relay action. (f) Check pin "Y" on J-1002 for a voltage (34VDC), if voltage is present at pin "Y", check T/R relay on TTA-1.
10	PA load rotates back and forth without loading Power Amplifier (from 000 to approx. 180).	Remove RF drive and check pre-position setting PA Load Counter reading. (Compare reading with that outlined on the pre-position chart provided. If OK proceed to check and adjust if necessary the PA load sense adjustments outlined in the Alignment procedure paragraph 5-9).
11	Transmitter PA draws excessive Plate current after servo tuning.	Check PA Tune control by manually rotating by hand. (PA tune & load control should have same drag. (There should be no mechanical binding evidence).

NOTE

The proceeding has been prepared to assist in the troubleshooting effort of an automated system such as the TMC Model GPTA-2.5JB. Once the operational sequence is fully understood with the aid of block diagrams, Alignment procedure, Operational procedure and associated schematic diagrams, troubleshooting is not difficult.



400B-8

Figure 5-1. Fuse Locations

TABLE 5-1. FUSE FUNCTIONS

ITEM NO. (Fig. 5-1)	REF. SYMBOL NO.	UNIT	FUSE RATING	FUNCTION
1	F7001	SWCD-3K	2.5A -26.5VDC	Protective fuse for control circuit; lights to indicate fuse is defective.
2	F7000	SWCD-3K	0.5A	Protective fuse lights to indicate fuse is defective.
3	F401	TCSA-1 AX110	0.5A, AC	Protective fuse for AZ110 power supply input.
4	F400	TCSA-1 AX110	1.0A, DC	Protective fuse for AZ110 power supply output.
5	F301	TCSA-1 AX112	0.5A, AC	Protective fuse for AZ112 power supply input.
6	F500	TCSA-1 AZ111	1.0A, DC	Protective fuse for AZ111 power supply output.
7	F501	TCSA-1 AZ111	0.5A, AC	Protective fuse for AZ111 power supply input.
8	F300	TCSA-1 AZ112	1.0A, DC	Protective fuse for AZ112 power supply output.
9	F9000	AX633	0.1A/DC quick-acting	Protective fuse for alarm ckt.
10	F5006	AP128	0.75A slow-blow	Protective fuse for IPA bandswitch ckt.
11	F5007	AP128	2.5A slow-blow	Protective fuse for PA bandswitch ckt.
12	F5008	AP128	3.0A slow-blow	Protective fuse for interlock ckt.
13	F5009	AP128	10.0A slow-blow	Protective fuse for interlock ckt.
14	F5005	AP128	0.5A high-voltage	Protective fuse for IPA screen ckt.
15	F5000	AP128	5.0A slow-blow	Protective fuse for filament ckt.
16	F5002	AP128	3.0A slow-blow	Protective fuse for blower ckt.
17	F5001	AP128	2.0A slow-blow	Protective fuse for low-voltage ckt.

TABLE 5-1. FUSE FUNCTIONS (Cont'd)

ITEM NO. (Fig. 5-1)	REF SYMBOL NO.	UNIT	FUSE RATING	FUNCTION
18	F5003	AP128	0.25A slow-blow	Protective fuse for bias ckt.
19	F5004	AP128	0.5A high-voltage	Protective fuse for PA screen ckt.
20		C-3698 /URA-38	1.5A	Overload protective fuse.
21		C-3698 /URA-38	1.5A	Overload protective fuse.
22	SPARE	MMX	1.5A/115 VAC .75A/230 VAC	Spare fuse for MMX LINE.
23	SPARE	MMX	1.5A/115 VAC .75A/230 VAC	Spare fuse for MMX LINE.
24	F101	MMX	1.5A/115 VAC .75A/230 VAC	Protective fuse for input line voltage.
25	F102	MMX	1.5A/115 VAC .75A/230 VAC	Protective fuse for input line voltage.

5-6. OVERLOAD ADJUSTMENTS.

NOTE

To perform this test the exciter or an RF Signal Generator can be used.

a. Place Load/Antenna switch to load position.

b. PA Plate overload:

1. Manually Tune transmitter to full output on any frequency within range.
2. Overload the transmitter by increasing the PA output loading (decreasing Output Load capacity).
3. Retune the PA and increase the Exciter output.
4. Adjust the PA Plate overload adjust to trip at 1.3 Amp.

c. PA Screen overload:

1. Manually tune transmitter as in paragraph 5-1, above, only underload transmitter by decreasing the PA loading (increasing Output Load capacity).
2. Connect a Simpson 260 meter in series with the screen overload relay K4003 or Terminal 1 E4001.
3. Retune the PA and increase the output of the Exciter to increase the screen current.
4. Adjust the PA Screen overload adjust to trip at 45 ma (milliamps).

5-7. TRANSMITTER TUNING GENERAL (MANUAL OPERATION).

a. Set transmitter tuning controls to approximate setting for the desired output frequency, using sample tuning chart located in Table 3-2.

b. Set the Exciter output and RF Gain control on SWCD to minimum to prevent the PA Screen overload from tripping, and always be certain that the drive is at minimum before applying high voltage to the transmitter.

c. Turn transmitter ON with High Voltage OFF. Set Exciter to 5 MHz.

NOTE

Set the multimeter switch on the TLAD to the 2nd amp EP position. Advance exciter output slightly and adjust RF Gain on SWCD for an indication on Multimeter, adjust the 2nd amp tuning capacitor to resonance peak indication on the meter.

d. Set SWCD's RF Gain control to minimum and turn High Voltage ON.

e. Advance SWCD RF Gain control to a point where the PA Plate current increases and adjust PA Tuning until a resonance dip is obtained on the PA Plate Current Meter.

f. Adjust PA Load until the PA is properly loaded, depending on the frequency. After each change of loading, the PA tuning should be retuned to resonance. Proper loading usually will occur at a power of 1 KW, and a plate current of between .6 and 7.5 Amps depending on frequency.

5-8. PRE-POSITION CHECK (Refer to Table 5-2, Figure 5-2, and Figure 5-3).

a. On TCP unit, place the Servo ON/OFF switch in the OFF position.

b. Install Load Servo Module and place the Servo ON/OFF switch to the ON position. Check to see if the fault light is ON. If it is ON the Servo Amp will not have the 220 Volt input voltage. Press the tune button on the TCP. The fault light should go OUT and the A.C. light on the Servo will light.

c. On the SWCD place the Master Band Switch on the 2-2.5 MHZ position.

d. Vary load pre-postion potentiometer #1 located under side SWCD, clockwise. Rotation of pot. causes load knob to move clockwise and counter numbers to decrease to zero; opposite condition occurs when pot. is moved CCW; with pot. max CCW, numbers should be approximately 180.

Install tune servo module. AC light comes on with Band Switch on SWCD to 2-2.5, tune counter should read approximately 150. On Bands 2-2.3, a slight change will be noted (reading of approximately 148). Place BS on SWCD to 24-26 mc position, tune counter will indicate approximately 80. With BS on SWCD from 26-30 mc position, tune counter will not move, but load counter will indicate a change, the amount of which is insignificant at this time.

Leave 2nd amp Servo module out.

5-9. ALIGNMENT.

1. Place Bandswitch on SWCD to the 2-2.5 mc position.

2. On TCP, place SERVO switch to OFF.

3. Set Exciter to 2 mc, 2 V output RMS.

4. With multimeter SW on TLAD in 2nd amp E_P position, advance RF Gain Control on SWCD and adjust 2nd amplifier tuning control for maximum peak indication on multimeter.

5. Place RF Gain Control on SWCD fully CCW.

6. Set HP VTVM to -DC Volts, 1 V Range, and set pointer to center scale. Connect the VTVM to SENSE jack J-9003 and set sense function SW to PA load position.

7. Turn HV CKT breaker on.

8. Manually tune and load XMTR for maximum output with minimum input. Output should be 1.0KW, with plate current between .6 and .75, depending on frequency.

9. Move RF Gain Control on SWCD CCW until PWR meter reads 1KW.

10. Adjust load sense potentiometer #1 for a reading on the VTVM for 0 volts. (Zero Volts in center scale).

11. Detune XMTR by moving Tune and Load controls at random.

12. Adjust alternately the Tune and Load Capacitors on TLAD for a reading of -.25 V on VTVM. Note Load Counter reading (See Table 5-2).

13. Set sense function switch S-9001 on the AX633 to the PA Plate trigger position.

14. Adjust the plate trigger pot located on the bottom center of the TLAD for a reading of .5 negative voltage on the VTVM.

15. Adjust RF Gain on SWCD fully CCW.

16. Place HV CKT breaker to OFF.

17. On TCP-1 place SERVO Switch ON.

18. Adjust pot #1 load pre-position to obtain reading obtained in step 12.

19. It should be noted that whenever the operator is engaged in automatic tuning

of the transmitter the fault light must be off.

20. Turn ON the High Voltage.

21. Adjust RF drive on the SWCD for a reading of 300 ma of plate current as indicated on the PA plate current meter.

22. On the front of the Tune Servo amplifier there is a pot R.F.P.O. (RF Power ON). Adjust this pot to a point where the search light 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.

23. The PA tune capacitor will continue tuning until a negative .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 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 S-9001 is in the PA load position. When the error voltage is at zero, the Load Servo Amplifier will go into operate.

24. Observe the output on the meter on the SWCD. After a 5 second delay the servo amplifier will turn OFF and the RF gain control will drive down causing the output to go down. The RF gain control 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.

25. Set RF gain control on the SWCD for 1.0 KW output. Manually adjust tune control 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 TLAD is required.

26. Set RF gain control on the SWCD to minimum.

27. Set High Voltage circuit breaker on TCP to OFF position.

28. On TCP-1, depress Tune button. Tune and load controls on TLAD will return

to preset postion and Tune Load Servo amps will come on.

The above steps complete alignment via adjustment of pre-postion potentiometer #1. Alignment by adjustment of potentiometers #2 thru #7 is accomplished in a similar manner; with the exception of steps 13, 14, and 22, repeat steps 3 thru 28. Refer to load pre-postion adjustment chart (table 5-2) for band and potentiometer postions.

5-10. INSTALL 2nd AMPLIFIER SERVO.

a. Set exciter output for exactly 100 mw output.

b. Adjust R7014 on SWCD for .5V on VTVM. (Place sense switch to 100mw position).

c. Place HV CKT Breaker to ON.

d. Depress Tune Button on TCP-1.

e. 2nd amp servo will go into search.

f. 2nd amp tuning control will search in a CCW direction for a resonant point (drive 2nd amp).

g. RF drive on SWCD will drive up for 300 ma PA plate current; the PA tune and PA Load capacitors servos will adjust the PA for proper tuning and loading.

h. RF drive control on SWCD will drive down to zero.

i. RF drive control on SWCD will drive up to preset postion.

j. Ready light will come on.

5-11. FAULT LIGHT ADJUSTMENT.

a. HV CKT Breaker OFF.

b. Press Tune Button on TCP-1. (Ready light should be out.)

c. Exciter output to zero.

d. Fault lamp should light in 60 seconds, and 3 servo amps should shut off. If these conditions do not occur, adjust R-7019 on SWCD via control on PC 266, using card extender.

5-12. SWR ADJUSTMENT.

a. Servo tune transmitter at 2 mc.

b. Turn drive CCW HV OFF.

c. Rotate reflected diode in directional coupler 180°.

d. Turn HV ON, hold reflected switch down, drive transmitter to obtain a reading of 150 w on red scale.

e. Release switch, SWR light should come ON and HV breaker should kick down.

f. Return reflected diode to normal position.

5-13. ALDC ADJUSTMENT.

a. Turn ALDC adjustment on front of TLAD to slightly less than full CCW position.

b. Disconnect ALDC lead going into MMX and connect to VTVM on negative 30 V range.

c. Servo tune transmitter to a frequency between 2.499, adjust ALDC pot.#1 for -8V at 1000 w.

d. Adjust pot #2, at a frequency between 5-18.9 and pot #3 between 19-29.9 mc for -8V.

e. Adjust pots #4, 5, 6 to 150 w, 400 w and 1000 w respectively to limit output to these levels.

5-14. POWER LEVEL ADJUSTMENT.

a. Set power level selector to 1000 w.

b. Adjust main level adjust R3 to full clockwise position, then back off 1/4 turn.

c. Servo tune transmitter at 2 mc, adjusting front panel level adjustment until output drives up to 1000 w and ready light comes ON.

d. Adjust 400 w and 150 w levels, retuning transmitter for each adjustment.

5-15. REPAIR AND REPLACEMENT.

All major units are mounted on slides except the URA-38 to ease the repair and replacement of components when necessary.

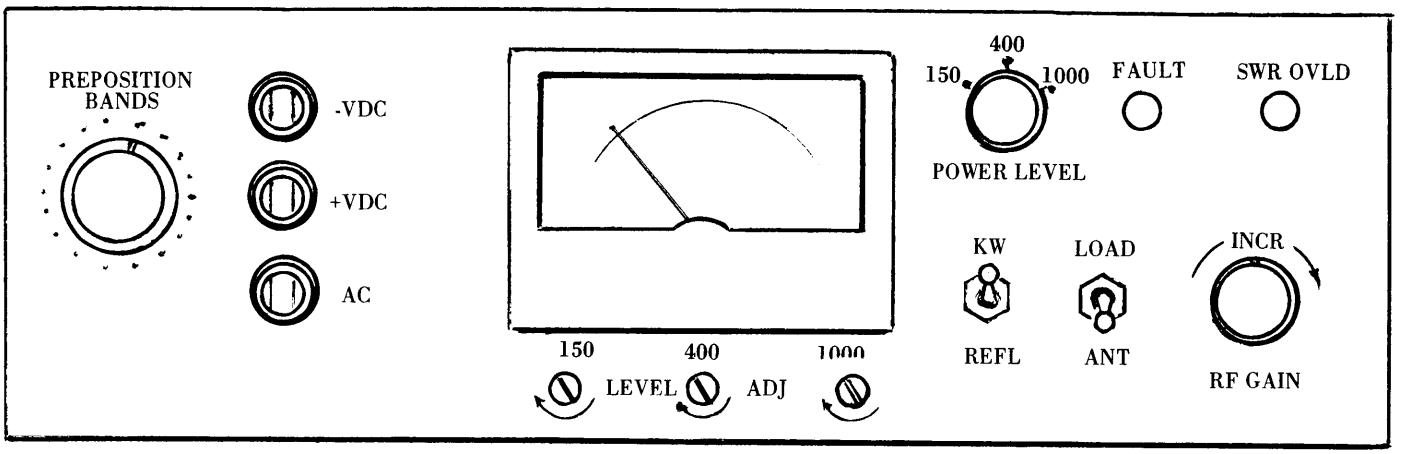
Maintenance will consist of mainly component replacement. It should be noted that after replacement of a major component realignment of that section may become necessary.

When replacing a component having many wires connected, such as switches, relays, etc. the wires should be marked for identification when replacing.

The technician should refer to the parts list in section six of this manual for the exact or equivalent part before attempting to replace a part or component.

TABLE 5-2. LOAD PRE-POSITION CHART

POTENTIOMETERS	PRE-POSITION BANDS	COUNTER READING
1	2 - 2.5	180
	2.5 - 3	180
	3 - 4	180
2	4 - 5	108
	5 - 6	108
3	6 - 7	65
	19 - 22	65
	24 - 26	65
4	7 - 9	100
	11 - 13	100
	15 - 17	100
5	9 - 11	70
	17 - 19	70
	28 - 30	70
6	13 - 15	75
	26 - 28	75
7	22 - 24	55



FRONT PANEL, SWCD

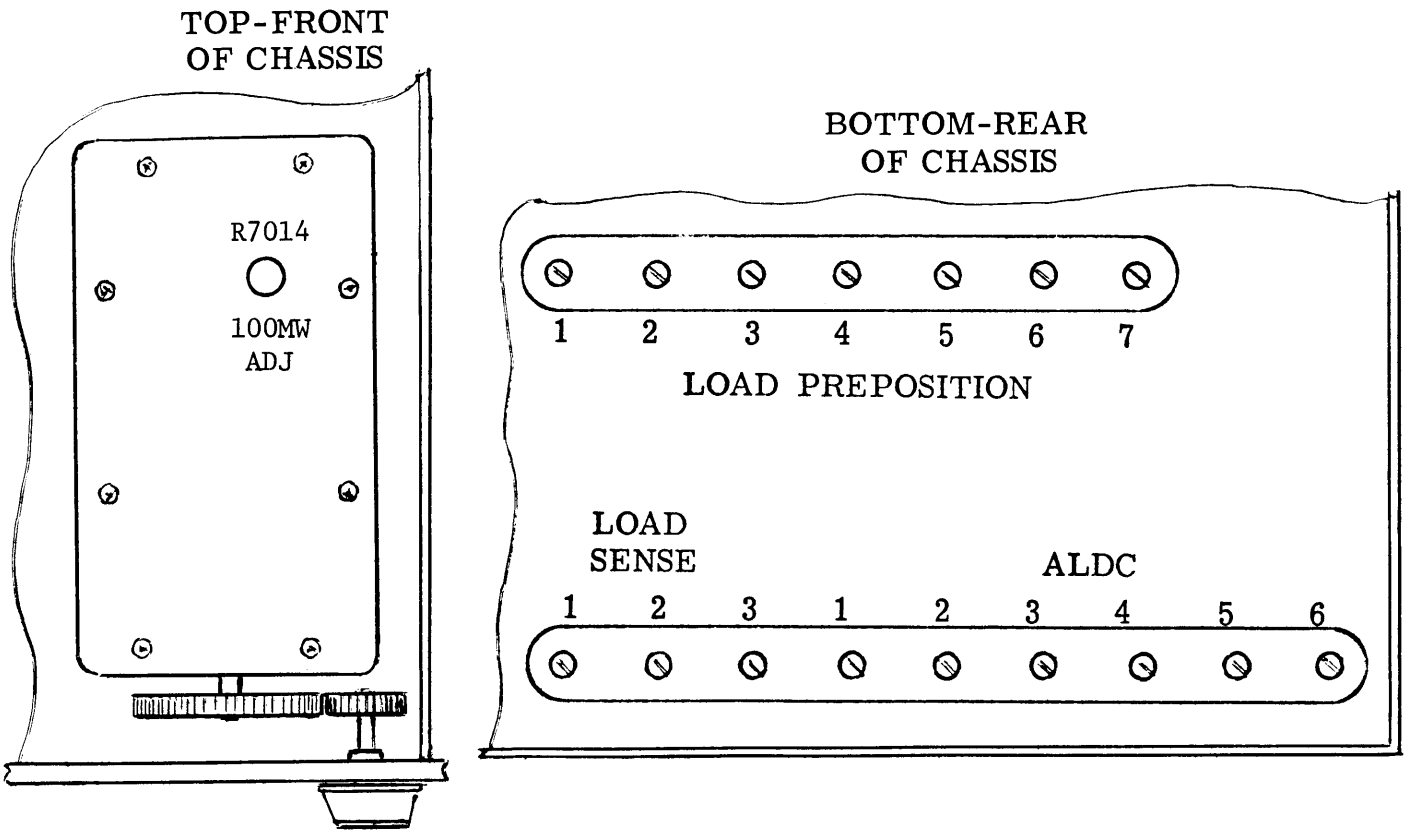


Figure 5-3. Location of Adjustment Potentiometers, SWCD.

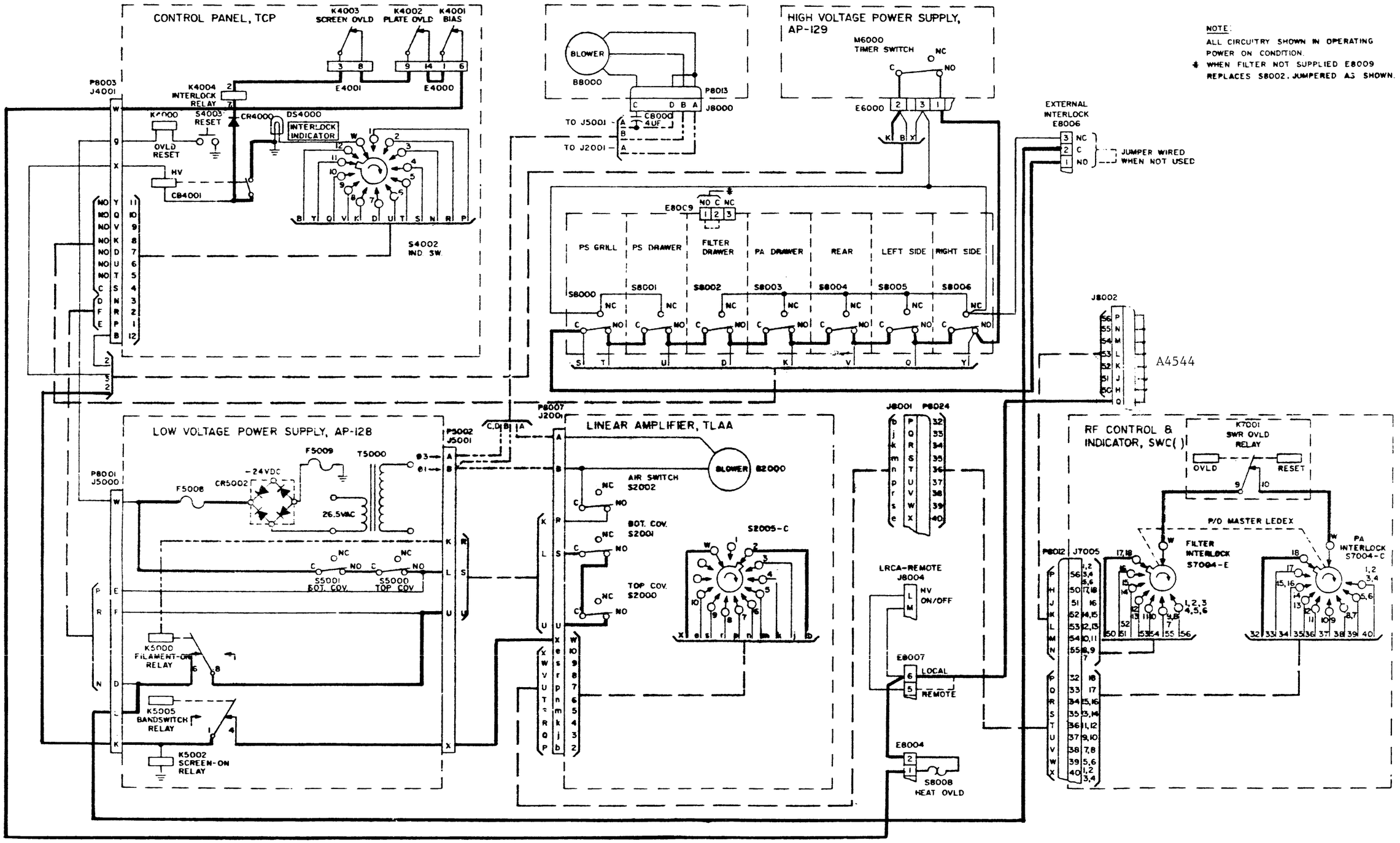


Figure 5-2. System Interlocks

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 a 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 inparts list.

c. TMC part number.

d. Model and seriel 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

LOW VOLTAGE POWER SUPPLY, AP128

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C5000	CAPACITOR, FIXED, PAPER DIELECTRIC: 10 uf, ±10% 2000 WVDC, polarized.	CP70IEG106K
C5001	CAPICITOR, FIXED, ELECTROLYTIC: 80 uf, 450 WVDC	CE51C800R
C5002	Same as C5001	
C5003	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10+50%, at 120 cps (Hz) at 25°C, 50 WVDC, polarized.	CE105-50-50
C5004	CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uuf, ±10%, 600 WVDC	CP41BFF405K
C5005 thru C5008	Same as C5004	
C5009	CAPACITOR, FIXED, ELECT, 15 uf, 50 WVDC	CE105-15-50
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
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.	B1110-7
DS5006	Same as DS5005	
DS5007	Same as DS5005	
DS5008	Non-replaceable item. Part of XF5005.	

LOW VOLTAGE POWER SUPPLY, AP128

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.; high voltage.	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: 3/4 amp, 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	MS3102A-32-7P
J5001	CONNECTOR, RECEPTACLE, ELECTRICAL: female	MS3102A-32-7S
K5000	RELAY, ARMATURE: DPDT, 220 VAC, 5000 ohms, contacts rated for lo amps resistive at 115 VAC or 5 amps inductive at 26 VDC, nominal coil power 2 to 3 volt amps. (Model AP128)	RL168-2C10-220AC

LOW VOLTAGE POWER SUPPLY, AP128

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
*K5000	RELAY, ARMATURE: DPDT, 220 VAC, 5000 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 ma dc, 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, 50 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: 18000 ohms, ±5%, 2 watts.	RC42GF183J
R5003	RESISTOR, FIXED, COMPOSITION: 33000 ohms, ±5%, 2 watts.	RC42GF333J
R5004	Same as R5001	
R5005	RESISTOR, FIXED, COMPOSITION: 33000 ohms, ±5%, 2 watts.	RC42GF392J

*NOTE: add -50 to Part Number of M5000, M5001, and K5000 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 470000 ohms, ±5%, 2 watts	RC42GF474J
R5015	RESISTOR, FIXED, WIREWOUND: 1500 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: 6 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 XF5000	
R5026	RESISTOR, VARIABLE, WIREWOUND: 2500 ohms, current rating 100 ma, 5 watts	RW107-28

LOW VOLTAGE POWER SUPPLY, AP128

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R5027	RESISTOR, VARIABLE, WIREWOUND: 2500 ohms, ±10%, 25 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 XF5006	
R5031	RESISTOR, FIXED, COMPOSITION: 82000 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 XF5008	
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 ratin 5 amps inductive at 30 VDC or 4 amps resistive at 30 VDC at sea level.	SW219
S5001	Same as S5000	
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
V5000	TUBE, ELECTRON: voltage regulator, 7 pin miniature.	0A2
V5001	TUBE, ELECTRON: voltage regulator, 7 pin miniature	0B2
V5002	Same as V5001	
V5003	Same as V5000	

LOW VOLTAGE POWER SUPPLY, AP128

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 for 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 indicating, 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 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 XF5000. Consists of DS5000, R5013	
XF5004	FUSEHOLDER: lamp indicating, accommodates cartridge fuse 1-1/4" long x 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

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XF5007	Same as XF5006. Consists of DS5011, R5032.	
XF5008	Same as XF5006. Consists of DS5010, R5034	
XF5009	Same as XF5006. Consists of DS5012, R5033.	
XK5000 thru XK5005	Same as SC5001	
SV5000	SOCKET, ELECTRON TUBE: 7 pin contact.	TS102P01
SV5001 thru XV5005	Same as XV5000	

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 CR6000	
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 60 cps (Hz)	RL171-1L
K6001	CAPACITOR, SOL ASSY.	A5362
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: 71000 ohms, 90 watts	RW127
R6001	RESISTOR, FIXED, WIREWOUND: 71000 ohms, ±5%, 50 watts	RW125F713J
R6002	Same as R6001	
S6000	Non-replaceable item. Part of M6000	
T6000	TRANSFORMER, POWER, STEP-UP: primary 220 VAC, ±10%, frequency 50/60 Hz, 3 phase, secondary 5,000 VDC, current rating 1.3 amps, open frame case.	TF0314

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

MAIN CHASSIS ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR7003	SUPPRESSOR, ARC, DIODE	DD111-1
CR7013	SEMICONDUCTOR, DEVICE DIODE	IN2986B
K7007	RELAY, ARMATURE, SPST,	RL158
K7014	RELAY	RL166-26N05
J7000	CONNECTOR, RECEPTACLE, 22 Contacts	JJ319A22DFE
J7002	Same as J7000	
J7006	Same as J7000	
J7010	Same as J7000	
S7004A-K	SWITCH, ROTARY, 18 Positions	SW428
T7000	TRANSFORMER, POWER.	TF282
R7001	RESISTOR, VARIABLE, COMP, 5,000 ohms, 1/2 watts	RV106UX8B502A
R7006	Same as R7001	
R7017	Same as R7001	
XK7007	SOCKET, ELECTRON, TUBE	TS100-7
XK7014	SOCKET, ELECTRON, TUBE	TS131MPW

FRONT PANEL ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS7000	LIGHT, INCANDESCENT	BI110-7
DS7001	Same as DS7000	
M7000	METER, KW/REFLECTED.	MR203
S7000	SWITCH, TOGGLE	ST105
S7001	SWITCH, ROTARY	SW148
S7005	SWITCH, TOGGLE, DPST.	ST103-13-63
XDS7000	LIGHT, IND - YEL	TS153-3
XDS7001	LIGHT, IND - RED	TS153-1
XF7000	FUSE HOLDER, IND.	FH104-11
XF7001	FUSE HOLDER, IND.	FH104-3
XF7002	Same as XF7000.	

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BRANCHED WIRING HARNESS

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J7001	CONNECTOR, RECEPTACLE, ELECT., 34 Contacts	JJ333-75PFS34
J7003	CONNECTOR, RECEPTACLE, BNC, FEMALE	JJ172
J7004	Same as J7003	
J7005	Same as J7001	
P7007	CONNECTOR, PLUG, MINATURE	PL204
P7008	Same as P7007	
P7009	CONNECTOR, RECEPTACLE, 15 Contacts	JJ310-1H

BMA 129

MOTOR ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B7000	MOTOR, D.C. GEAR	MO130-2
J7007	CONNECTOR, RECEPTACLE, MINATURE,	JJ211
J7008	Same as J7007	
R7016	RESISTOR, VARIABLE, COMP. 50 ohms, ±10%, 2 watts.	RV4NAYSK500A
S7003	SWITCH, SENSITIVE, SPDT, 5 AMPS, 125/250 VAC	SW353-2
S7002A,B,	SWITCH, SENSITIVE, DPDT, 5 AMPS, 125/250 VAC	SW353-3

PC BOARD ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C7003	CAPACITOR, FIXED, ELECT., 500 ufd, 50 WVDC.	CE116-10VN
C7004	CAPACITOR, FIXED, CERAMIC, 200000 uufd, +80%-20%, 25 WVDC.	CC100-33
C7005	Same as C7004	
C7018	CAPACITOR, FIXED, ELECT., 100 mfd, 25 WVDC.	CE105-100-25
CR7000	SEMICONDUCTOR, DEVICE, DIODE	IN3027B
CR7004	SEMICONDUCTOR, DEVICE, DIODE	IN2484
CR7005	SEMICONDUCTOR, DEVICE, DIODE	IN270
K7000	RELAY, ARMATURE, DPDT, 24 VDC, 35 ma.	RL156-1
K7001	RELAY, ARMATURE, 4 PDT, 24 VDC, 49 ma.	RL156-10
K7002	RELAY, ARMATURE, DPDT, 24 VDC, 49 ma	RL156-9
K7013	RELAY, ARMATURE, 4 PDT, 12 VDC, 65 ma.	R156-2
Q7000	TRANSISTOR	2N697
Q7001	TRANSISTOR	2N492
R7002	RESISTOR, FIXED, COMP., 22000 ohms, ±5%; 1/2 watt.	RC20GF223J
R7003	RESISTOR, FIXED, COMP., 2200 ohms, ±5%, 1/2 watts.	RC20GF222J
R7004	RESISTOR, FIXED, COMP., 470000 ohms, ±5%, 1/2 watts.	RC20GF474J
R7009	RESISTOR, FIXED, COMP., 220 ohms, ±5% 1/4 watts.	RC07GF221J
R7010	RESISTOR, FIXED, COMP., 220 ohms, ±5%, 1 watt.	RC32GF221J
R7018	Same as R7010	
R7019	RESISTOR, VARIABLE, COMP., 500000 ohms, ±10%, 1/4 watt.	RV111U504A
XK7000	SOCKET, RELAY, 6 Contacts	TS171-5
XK7001	SOCKET, RELAY, 12 Contacts. TS171-4	
XK7002	Same as XK7000	
XK7013	Same as XK7001	

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PC BOARD ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C7020	CAPACITOR, FIXED, ELECT., 200 mfd, 50 WVDC.	CE105-200-50
CR7012	SEMICONDUCTOR, DEVICE, DIODE	IN4245
K7015	RELAY, ARMATURE, 4PDT, 24 VDC, 49 ma.	RL156-10
K7016	Same as K7015	
K7017	RELAY, ARMATURE, DPDT, 24 VDC, 49 ma.	RL1560-9
K7018	RELAY, ARMATURE, DPDT, 24 VDC, 35 ma.	RL156-1
K7019	RELAY, ARMATURE, 4 PDT, 24 VDC, 35 ma.	RL156-8
K7020	Same as K7017	
K7021	Same as K7018	
R7015	RESISTOR, FIXED, COMP, 20,000 ohms, $\pm$5%, 1/2 watt.	RC20GF203J
XK7015	SOCKET, RELAY, 12 Contacts	TS171-4
XK7016	Same as XK7015	
XK7017	SOCKET, RELAY, 6 Contacts,	TS171-5
XK7018	Same as XK7017	
XK7019	Same as XK7015	
XK7020	Same as XK7017	
XK7021	Same as XK7017	

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PC BOARD ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C7007	CAPACITOR, FIXED, ELECT, 200 mfd, 50 WVDC	CE105-200-50
C7011	CAPACITOR, FIXED, ELECT, 2000 mfd, 25 WVDC	CE116-5VN
C7017	CAPACITOR, FIXED, ELECT, 75 mfd, 50 WVDC	CE105-75-50
CR7004	SEMICONDUCTOR, DEVICE, DIODE	IN3022B
CR7006	SEMICONDUCTOR, DEVICE, DIODE	IN2484
CR7007	SEMICONDUCTOR, DEVICE, DIODE	IN4245
CR7008	Same as CR7006	
CR7009	Same as CR7006	
CR7010	SEMICONDUCTOR, DEVICE, DIODE	DD130-600-1.5
K7003	RELAY, ARMATURE, DPDT, 24 VDC, 49 ma.	RL156-9
K7004	Same as K7003	
K7005	RELAY, ARMATURE, DPDT, 24 VDC, 35 ma.	RL156-1
K7006	Same as K7005	
K7008	Same as K7003	
K7009	Same as K7003	
K7010	RELAY ARMATURE, 4PDT, 24 VDC, 35 ma.	RL156-8
K7011	RELAY, ARMATURE, 4PDT, 24 VDC, 49 ma.	RL156-10
K7012	Same as K7011	
R7005	RESISTOR, FIXED, COMP, 220 ohms, $\pm$5%, 1/2 watt.	RC20GF221J
R7008	RESISTOR, FIXED, COMP., 180 ohms, $\pm$5%, 1 watt	RC32GF181J
R7011	RESISTOR, FIXED, COMP., 390 ohms, $\pm$5%, 1 watt	RC32GF391J
XK7003	SOCKET, RELAY, 12 Contacts	TS171-4
XK7004	Same as XK7003	
XK7005	Same as XK7003.	

PC BOARD ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XK7006	Same as XK7003.	
XK7008 thru XK7012	Same as XK7003.	

PC BOARD ASSEMBLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R7007	RESISTOR, VARIABLE, COMP. 100000 ohms, ±5%, 1/2 watt.	RV119-1-104
R7012	Same as R7007	
R7020	RESISTOR, VARIABLE, COMP. 5000 ohms, ±5%, 1/2 watt.	RV119-1-502
R7021 thru R7026	Same as R7020.	
R7027	RESISTOR, FIXED, COMP. 2700 ohms, ±5%, 1/2 watt.	RC20GF272J
R7028	RESISTOR, FIXED, COMP. 3900 ohms, ±5%, 1/2 watt.	RC20GF392J
R7029	Same as R7027	
R7030	Same as R7027	
R7031	RESISTOR, FIXED, COMP., 1800 ohms, ±5%, 1/2 watt.	RC20GF182J
R7032	RESISTOR, FIXED, COMP., 1000 ohms, ±5%, 1/2 watt.	RC20GF102J
R7033	RESISTOR, FIXED, COMP., 2200 ohms, ±5%, 1/2 watt.	RC20GF222J
R7034	RESISTOR, VARIABLE COMP., 50000 ohms, ±5%, 1/2 watt	RV119-1-503
R7035	Same as R7034	
R7036	Same as R7034	
R7037	RESISTOR, FIXED, COMP., 10000 ohms, ±5%, 1/2 watt.	RC20GF103J
R7038	RESISTOR, VARIABLE, COMP., 100000 ohms, ±5%, 1/2 watt.	RV119-1-104
R7039	Same as R7038	
R7040	Same as R7038	
R7041	RESISTOR, FIXED, COMP., 470 ohms, ±5%, 2 watts.	RC42GF471J
R7024	Same as R7007.	

RF AMPLIFIER

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B2000	FAN, CENTRIFUGAL: 230 V, 50/60 cps 2,800/3,200 RPM:	BL126
B2001	MOTOR, TUBEAXIAL FAN: 115 volts, 50/60 cps;	MO127
B2002	MOTOR, TUBEAXIAL FAN: 220 volts, 50/60 cps;	MO126
B2003	Same as B2002.	
C2000	CAPACITOR, FIXED, MICA: 1,000 uuf, ±2%; 500 WVDC.	CM20F102G03YY
C2001	CAPACITOR, FIXED, CERAMIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C2002	Same as C2001.	
C2003	CAPACITOR, FIXED, CERAMIC, 1,000 uuf, ±10%; 500 WVDC.	CC100-9
C2004	Same as C2001.	
C2005	CAPACITOR, FIXED, ELECT. 20 mfd, 100 WVDC.	CE105-20-100
C2006	CAPACITOR, FIXED, CERAMIC: 100,000 uuf, +80%-20%; 300 WVDC.	CC100-37
C2007	Same as C2006.	
C2008	CAPACITOR, FIXED, MICA: 1,000 uuf, ±10%; 300 WVDC.	CB210B102K
C2009	Same as C2008.	
C2010	Same as C2006.	
C2011	Same as C2006.	
C2012	Same as C2001.	
C2013	Same as C2001.	
C2014	CAPACITOR, FIXED, MICA: 51 uuf, ±5%, 500 WVDC.	CC110-1
C2015	Same as C2003	
C2016	Same as C2003	
C2017	CAPACITOR, FIXED, CERAMIC: 1,000 uuf, ±20%; 500 WVDC.	CK70AW102M
C2018	Same as C2008	

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2019	Same as C2008	
C2020	CAPACITOR, FIXED, MICA: 1,500 uuf, ±20%; 500 WVDC.	CM100-10
C2021	CAPACITOR, FIXED, CERAMIC, 3,000 uuf, GMV 2,000 WVDC.	CC100-31
C2022	Same as C2008.	
C2023	Same as C2008.	
C2024	CAPACITOR, FIXED, MICA: 24 uuf, ±5%; 500 WVDC.	CM15C240J03
C2025	CAPACITOR, FIXED, ELECT., 20 mfd, 100 WVDC	CE105-20-100
C2026	Same as C2025	
C2027	Same as C2003	
C2028	CAPACITOR, FIXED, CERAMIC: 2 x 4,000 uuf, GMV; 1,000 WVDC.	CC100-22
C2029	Same as C2006.	
C2030	Same as C2008.	
C2031	NOT USED	
C2032	CAPACITOR, FIXED, MYLAR: 1.0 uf, ±5%; 400 WVDC.	CN114-1RO-4J
C2033	CAPACITOR, FIXED, CERAMIC: 500 uuf, ±20%; 5,000 WVDC.	CC109-36
C2034	CAPACITOR, FIXED, CERAMIC: 1,000 uuf, ±20%; 500 WVDC.	CC108-4P1000M
C2035	Same as C2021	
C2036	CAPACITOR, FIXED, CERAMIC: 6800 uuf, +40%-20%, 5000 WVDC.	CC115-2-6800
C2037	Same as C2021	
C2038	CAPACITOR, VARIABLE, AIR: 10.0 to 200 uuf, 1,500 V RMS;	CB118SRX200
C2039	CAPACITOR, FIXED CERAMIC (DUAL) 2 x 2,000 uuf, GMV 500 WVDC.	CC100-23
C2040	CAPACITOR, FIXED, MICA: 15 uuf, ±5%; 500 WVDC.	CM15D150J03YY

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2041	CAPACITOR, FIXED, CERAMIC: 2 x 1000, GMV, 1000 WVDC.	CC100-17
C2042	CAPACITOR, FIXED, MICA: 150 uuf, ±2%; 500 WVDC.	CM15F151G03
C2043	NOT USED	
C2044	NOT USED	
C2045	CAPACITOR, FIXED, CERAMIC: 5 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: 3 uuf, ±10%; 5,000 WVDC.	CC109-2
C2053	Same as C2003.	
C2054	Same as C2003.	
C2055	CAPACITOR, FIXED, CERAMIC: 1,000 uuf, ±20%; 5,000 WVDC.	CC109-38
C2056	Same as C2055	
C2057	CAPACITOR, FIXED, CERAMIC, 2000 uuf, ±20%, 500 WVDC	CK70AW202M
C2058	CAPACITOR, FIXED, MICA, 22000 uuf, ±5%, 600 WVDC	CM50B223J
C2059	Same as C2014	
C2060	NOT USED	
C2061	CAPACITOR, FIXED, CERAMIC: 50 uuf, ±10%, 5000 WVDC.	CC115-1-500
C2062	Same as C2014.	
C2063	Same as C2014.	
C2064	Same as C2055.	
C2065	CAPACITOR, FIXED, CERAMIC, FEED THRU, 1000 uuf, ±20%, 500 WVDC.	CC108-4P1000M

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2066	Same as C2001.	
C2067	Same as C2061.	
C2068	CAPACITOR, FIXED, CERAMIC: 10 uuf, ±10%, 5,000 WVDC.	CC109-6
C2069	Same as C2061.	
C2070	Same as C2061.	
C2071	Same as C2036.	
C2072	CAPACITOR, FIXED, CERAMIC, 5 uuf, ±10%, 5000 WVDC	CC109-4
C2073	Same as C2001.	
C2074	NOT USED.	
C2075	Same as C2061.	
C2076	Same as C2068.	
C2077	Same as C2034.	
C2078	Same as C2072.	
C2079	Same as C2072.	
C2080	CAPACITOR, FIXED, CERAMIC, 500 uuf, ±20%, 5000 WVDC.	CC109-36
C2081	CAPACITOR, VARIABLE, VACCUUM: 10 to 1,500 uuf; peak test voltage 5 Kv.	CB172-5
C2082	CAPACITOR, FIXED, PAPER: 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	Same as C2061.	
C2089	CAPACITOR, VARIABLE, VACUUM: 20 to 2,000 uuf; 5 kv.	CB172-6

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2090	Same as C2061.	
C2091	NOT USED.	
C2092	Same as C2001	
C2093	CAPACITOR, FIXED CERAMIC, 51 uuf, ±5%, 500 WVDC.	CC100-28
C2094	Same as C2006.	
C2095	Same as C2006.	
C2096	CAPACITOR, FIXED, CERAMIC: 20,000 uuf, +80%-20%; 500 WVDC.	CC100-24
C2097	Same as C2001.	
C2098	Same as C2001.	
C2100 thru C2102	Same as C2001.	
C2103	Same as C2000.	
C2104	NOT USED.	
C2105	Same as C2068	
C2106	NOT USED.	
C2107 thru C2109	Same as C2006.	
C2110	NOT USED.	
C2111	CAPACITOR, FIXED, MICA: 10 uuf, ±5%, 500 WVDC.	CM15C100J03YY
C2112	CAPACITOR, FIXED, MICA: 18 uuf, ±5%, 500 WVDC.	CM15C180J03YY
C2113 thru C2115	Same as C2014	
C2116	Same as C2072.	
C2117	Same as C2072.	

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2118	CAPACITOR, FIXED, CERAMIC: 100 uuf, ±10%; 5,000 WVDC.	CC109-28
C2119	Same as C2020.	
C2120	Same as C2001.	
C2121	Same as C2072.	
CR2000	SEMICONDUCTOR, DEVICE, DIODE,	IN538
CR2001	SEMICONDUCTOR, DEVICE, DIODE	IN3070
CR2002	Same as CR2001.	
CR2003	Same as CR2000.	
CR2004	SEMICONDUCTOR, DEVICE, DIODE	LN645A
CR2005	Same as CR2001.	
CR2006	Same as CR2001.	
CR2007 thru CR2009	Same as CR2004.	
C2123	Same as C2040	
DS2000	LAMP, INCANDESCDNT: 5 to 6 volts; 0.063 amps; bulb size T-1.	BI114-2
DS2001 thru DS2008	Same as DS2000.	
E2000	TERMINAL	TEO 169-1
E2002	Same as E2000.	
E2003	Same as E2000.	
E2004	TERMINAL	TEO121-2
E2005	Same as E2004	
E2006	Same as E2000	

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E2007	COIL RADIO, FREQUENCY, FILTER	AX696-1
E2008	COIL, RADIO, FREQUENCY, FILTER	AX696-2
E2009 thru E2011	Same as E2000.	
J2000	CONNECTOR, RECEPTACLE, FEMALE: 1 round contact, straight type;	JJ172
J2001	CONNECTOR, RECEPTACLE, FEMALE	MS3102A28-21P
J2002	CONNECTOR, RECEPTACLE, FEMALE: 14 contacts.	JJ242-1S
J2003	CONNECTOR, RECEPTACLE, MALE,	JJ333-75-PFS3
J2004	CONNECTOR, RECEPTCLE, FEMALE: 9 contacts	JJ310-4
J2005	CONNECTOR, RECEPTACLE, FEMALE.	JJ300-2
J2006	Same as J2004	
J2007	Same as J2004	
J2008	CONNECTOR, RECEPTACLE, FEMALE: 20 contacts:	JJ319-10DFE
J2009	CONNECTOR, RECEPTACLE, FEMALE: teflon insulation.	UG560*/U
J2010	CONNECTOR, RECEPTACLE, FEMALE: RF, 1 round contact	UG625*/U
J2011	Same as J2000.	
J2012	CONNECTOR, RECEPTACLE	MS3102A18-16P
J2013 and J2014	Same as J2004.	
J2015	CONNECTOR, RECEPTACLE, FEMALE: 30 contacts, straight type.	JJ319A15DPE
L2000	COIL, RADIO FREQUENCY: fixed 22 uh, $\pm$10%; molded case.	CL140-6
L2001	Same as L2000.	

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L2002	COIL, RADIO FREQUENCY: fixed; 120 uh, ±5%; molded case.	CL275-121
L2003	NOT USED.	
L2004	Same as L2002.	
L2005	COIL, RADIO FREQUENCY: fixed; 124 uh, ±10%	CL361
L2006	COIL, RADIO FREQUENCY: fixed; 1 mh	CL101-2
L2007	COIL, RADIO FREQUENCY: fixed; 128 uh;	CL177
L2008	NOT USED.	
L2009	COIL, RF. FILTER, 1.5 uh, ±10%.	AX602
L2010	Same as L2000.	
L2011	TRANSFORMER, R.F.	TZ210
L2012 and L2013	Same as L2007.	
L2014	Same as L2005	
L2015	Same as L2006	
L2016	COIL	CL406
L2017	COIL, AMPL, PLATE	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	COIL	CL406
L2025	COIL, RADIO FREQUENCY: Fixed; 2.5 mh, ±10%.	CL101-3

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L2026	Same as L2025	
L2027	COIL, RADIO FREQUENCY, 750 uh, ±10%, 75 ma	CL100-5
L2028	Same as L2026.	
L2029	NOT USED.	
L2030	COIL, RADIO FREOUENCY: 185 uh, ±15 uh:	CL178
L2031	COIL, RADIO FREQUENCY: fixed. 0.150 uh, ±10% molded case.	CL140-2
L2032	Same as L2031.	
L2033	COIL, RADIO FREQUENCY	CL413
L2034	NOT USED.	
L2035	COIL, RADIO FREQUENCY: fixed; 33 uh, ±10%;	CL366
L2036	COIL, RADIO FREQUENCY: 0.270 uh, ±10%; molded case.	CL140-3
L2037	Same as L2036.	
L2038	COIL, RADIO FREQUENCY: fixed, 10 uh, ±10%; molded case.	CL105-4
L2039	COIL, RADIO FREQUENCY:	CL429
L2040	COIL, BANDSWITCH	CL399
L2041	Same as L2030.	
L2042	Same as L2000.	
L2043	COIL, RADIO FREQUENCY: fixed; 3.3 uh, ±10%;	CL275-3R3
L2044	Same as L2045.	
L2045	COIL, RADIO, FREQUENCY: fixed, 150 uh, ±5%;	CL275-151
L2047	Same as L2045.	
L2048	COIL, RADIO, FREQUENCY.	CL402.
L2049	COIL, RADIO, FREQUENCY.	CL405

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
M2000	METER: full scale deflection 0 to 100 ua;	MR191-3
M2001	METER, full scale deflection 0 to 1.5 amps.	MR191-7
P2000	CONNECTOR, PLUG, MALE: 14 contacts	PL225-1P
P2001	CONNECTOR, PLUG, MALE: 9 contacts.	JJ313-4H
P2002	CONNECTOR, PLUG, MALE 25 contacts	JJ313-2
P2003	Same as P2001.	
P2004	Same as P2001.	
P2005	CONNECTOR, PLUG, MALE: 9 contacts.	JJ319A10DPE
P2006	Same as P2001.	
R2000	RESISTOR, FIXED, COMPOSITION: 2,700 ohms, ±5%; 1/2	RC20GF272J
R2001	RESISTOR, FIXED, COMPOSITION: 68 ohms, ±5%; 1/2 watt.	RC20GF680
R2002	RESISTOR, PRECISION, WIREWOUND: 120 ohms, ±1%; 0.66 watt.	RB101R66R1200
R2003	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, ±5%; 1 watt	RC32GF102J
R2004	NOT USED.	
R2005	Same as R2001.	
R2006	RESISTOR, FIXED, GLASS: 150K ohms, 10 watt.	RR135-2-102
R2007	RESISTOR, FIXED, COMPOSITION: 220 ohms, ±5%; 1/2 watt	RC20GF221J
R2008	Same as R2002.	
R2009	NOT USED.	
R2010	RESISTOR, FIXED, COMPOSITION: 47 ohms, ±5%; 1 watt.	RC32GF470J
R2011	Same as R2010.	
R2012	RESISTOR, FIXED COMPOSITION: 1,000 ohms, ±5%; 1/2watt	RC20GF102J
R2013	Same as R2012.	

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R2014	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, ±5%, 1/2 watt	RC20GF104J
R2015	Same as R2012	
R2016	Same as R2012.	
R2017	Same as R2039.	
R2018	RESISTOR, FIXED, COMPOSITION. 22 ohms, ±5%, 2 watt.	RC42GF220J
R2019	Same as R2018.	
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 watts.	RV106UX10C104A
R2029	RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms, ±10%; 1/2 watts.	RV106UX10B103A
R2030	RESISTOR, FIXED, COMPOSITION: 10 ohms, ±5%; 1/2 watt.	RC32GF100J
R2031	RESISTOR, FIXED, COMPOSITION: 1,200 ohms, ±5%; 1 watt	RC32GF122J
R2032	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±5%; 1/2 watt.	RC20GF472J
R2033	Same as R2014	
R2034	Same as R2031	

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R2035	Same as R2031	
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%, 1/2 watt.	RC20GF272J
R2047	Same as R2032	
S2000	SWITCH, INTERLOCK: SPDT: 250 VAC: 5 amps.	SW219
S2001	Same as S2000.	
S2002	SWITCH, ROTARY: 1 section, 2 positions.	SW252
S2003	SWITCH, ROTARY: 1 section, 4 positions;	SW105
S2004	SWITCH, ROTARY, SOLENOID, 12 positions 26 VDC	SW430
S2005	SWITCH, ROTARY, SOLENOID, 12 positions, 26 VDC	SW429
S2006	SWITCH, SENSITIVE: SPDT: 125/250 VAC, 5 amps	SW353-2
S2007	Same as S2006.	
S2008	SWITCH, ASSEMBLY	AS128
S2009	Same as S2006.	
T2000	COIL, R.F. TOROID	CL415-1
T2001	COIL, R.F. TOROID	CL418

RF AMPLIFIER (Cont)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
TB2000	TERMINAL BOARD	TB*
V2000	TUBE, ELECTRON: 11 pin contact.	8121
V2001	Same as V2000	
V2002	TUBE, ELECTRON	PL8576/PL264
XV2000	SOCKET, ELECTRON TUBE: 11 pin	TS170-1
XV2001	Same as XV2000.	
XV2002	SOCKET, ELECTRON TUBE	TS182
PS2000		AX*
PS2001	NOT USED.	
PS2002		AX*
PS2003		AX*

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, RAK	
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

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	SW418-1
CB4001	Same as CB4000	
CB4002	CIRCUIT BREAKER.	SW427
CR4000	SEMICONDUCTOR DEVICE, DIODE	IN2484
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.	B1116-1-5
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
F4000	FUSE CTG.	FU100-.5
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.	RL168-2C10-24DC
K4001	RELAY, ARMATURE	RL126
K4002	RELAY, ARMATURE	RL123
K4003	RELAY, ARMATURE: 4PDT; contacts rated for 25 amps non-inductive load at 125 VAC.	RL127
K4004	Same as K4000.	
K4005	Same as K4000.	
R4000	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, ±5%; 2 watts.	RC42GF103J
R4001	RESISTOR, FIXED, COMPOSITION: 390 ohms, ±5%; 2 watts.	RC42GF391J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
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
S4002	SWITCH, ROTARY: 4PDT; 1 section, 12 positions; 30° angle of throw; non-shorting type contacts.	SW250
S4003	Same as S4000.	
S4004	SWITCH, TOGGLE: 4PDT; 10 amps at 115 VAC or 20 amps at 28 VDC; single hole mounting.	ST109B
XDS4000	Non-replaceable item. Part of DS4000.	
XF4000	FUSE HOLDER, IND	FH104-3
XK4000	SOCKET, RELAY: 8 contacts; saddle type.	TS101P01
XK4001 thru XK4003	NOT USED	
XK4004	Same as XK4000.	
XK4005	Same as XK4000.	

ALARM PANEL

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C9000	CAPACITOR, FIXED, ELECT, 25 mfd, 50 WVDC.	CE105-25-50
CP9000	ADAPTER, CONNECTOR, BNC.	UG492D/U
CP9001	Same as CP9000	
CR9000	SEMICONDUCTOR, DEVICE, DIODE.	IN2484
DS9001	BUZZER.	BZ101-1
E9000	TERMINAL, BOARD, BARR., 14 terminals	TM100-14
E9001	TERMINAL, BOARD, BARR., 10 terminals	TM100-10
F9000	FUSE, CARTRIDGE, 1/2 Amp, 250V or Less.	FU100-.5
J9000	JACK, TELEPHONE.	JJ116-10
J9001	CONNECTOR, RECEPTACLE, BNC	JJ172
J9002	Same as J9001.	
J9003	CONNECTOR, RECEPTACLE, BNC.	UG1094A/U
P9000	CONNECTOR, RECEPTACLE, BNC.	PL244-1
P9001	Same as P9000.	
R9001	RESISTOR, FIXED, COMP., 330 ohms, $\pm$5%, 1 watt.	RC32GF331J
S9000	SWITCH, TOGGLE, SPST.	ST103-1-62
S9001	SWITCH, ROTARY.	SW147
XF9000	HOLDER, FUSE, IND.	

PARTS LIST

for

TUNING TERMINATION ASSY, MODEL TTA-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C8500	CAPACITOR, FIXED, CERAMIC, .01 uf, GMV; 500 WVDC	CC100-16
C8501 thru C8504	Same as C8500	
CP8500	ADAPTER, CONNECTOR, ELECTRICAL: angle type; series UHF.	SA129
CP8501	Same as CP8500	
CP8502	ADAPTER, CONNECTOR, ELECTRICAL: feedthru; series BNC	UG492/U
CP8503	ADAPTER, CONNECTOR, ELECTRICAL: teflon insulation; series HN to HN.	UG1019/U
CP8504	Same as CP8503	
E8500	TERMINAL BOARD, BARRIER: six terminals; black phenolic bakelite body.	TM100-6
K8500	RELAY COAXIAL: coil voltage 24 VDC; average power rating 1 KW.	RL180
P8500	CONNECTOR, PLUG, ELECTRICAL: 1 male contact, rated for 500 peak; teflon dielectric.	PL259A/TEF
P8501	CONNECTOR, PLUG	PL259
P8502	Same as P8501	
P8503	Same as P8500	
P8504	CONNECTOR, PLUG, ELECTRICAL: 1 male contact, silver plated; series BNC.	UG260/U
P8505	CONNECTOR, PLUG ELECTRICAL: 1 male contact, brass silver plated; angle type; series HN.	PL253-1
P8506	Same as P8505	
R8500	RESISTOR, FIXED, GLASS: 50 ohms, $\pm$10%; 250 watts.	RR119-50

AF107-2

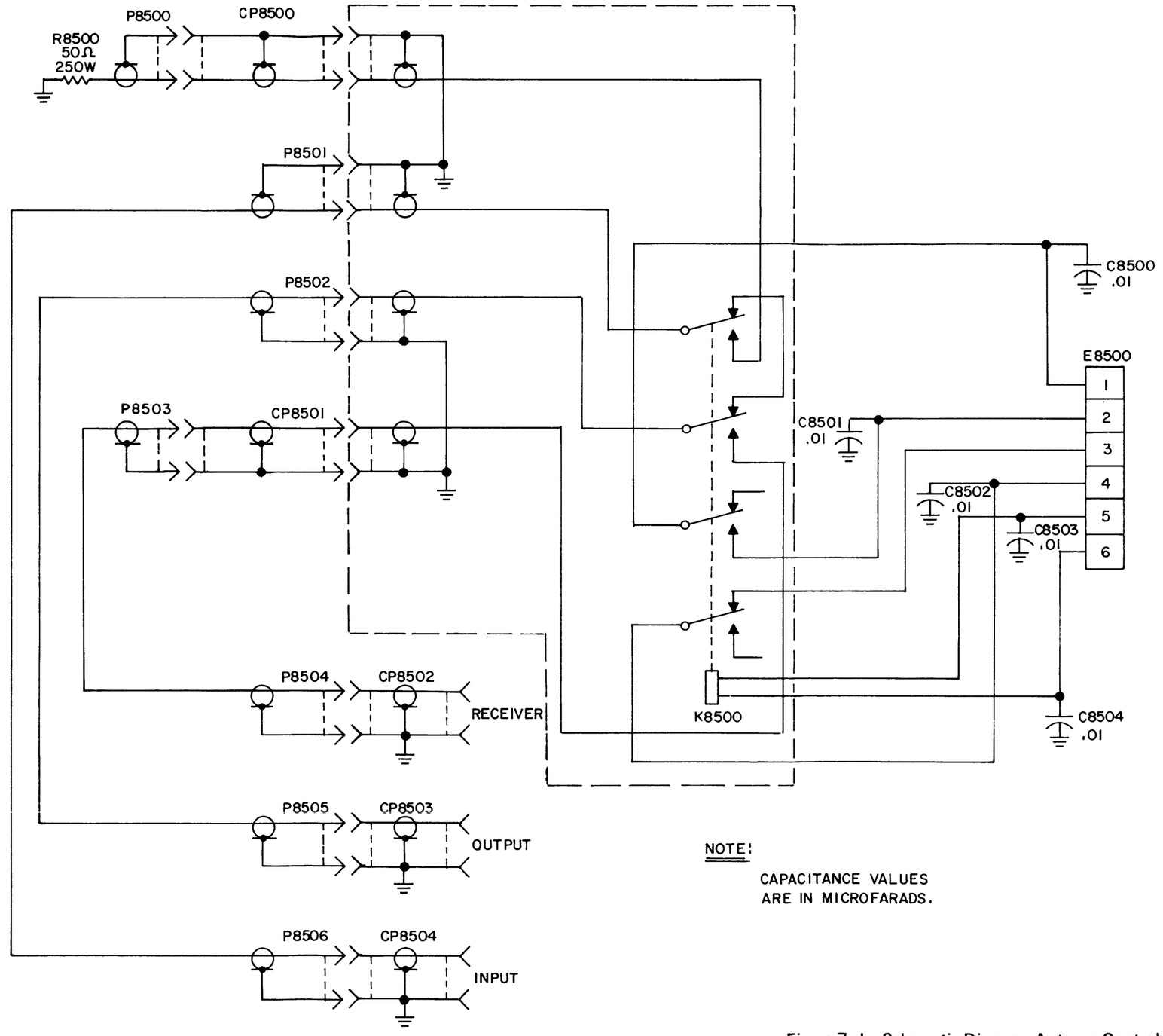
LOW PASS FILTER

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C8301	Capacitor, Fixed, Ceramic, 100 uuf, ±10%. 5000 WVDC	CC109-28
C8302	Capacitor, Fixed, Ceramic, 25 uuf, ±10%, 7500 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, 2-30 mc, 1.5 KW	DD119-5
CR8302	Detecting, Element, RF, 2-30 mc, .5 KW	DD119-6
DC8301	Coupler, Directional	DC106
L8301	Coil, RF	CL404-1
L8302	Same as L8301	
J8301	Connector, Receptacle, female	UG560/U

POWER SUPPLY, RELAY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C500	CAPACITOR, FIXED, ELECT, 75 mfd, 50 WVDC.	CE105-75-50
CR500	RECTIFIER, SEMICONDUCTOR, DEVICE.	DD144-3
CR501	SEMICONDUCTOR, DEVICE, DIODE.	IN2484
F500	FUSE CARTRIDGE, 1/8 Amp. 250V or Less.	FU100-.125
F501	FUSE CARTRIDGE, 2/10 Amp, 250V or Less.	FU100-.200
K500	RELAY, ARM, DPDT., 24 VDC, 35 ma.	RL156-1
T500	TRANSFORMER, POWER.	TF282
TB500	TERM, BOARD, BARR.	TM102-6
XF501	HOLDER, FUSE, 20 Amp.	FH104-3
XF502	HOLDER, FUSE, 20 Amp.	FH104-11
XK500	SOCKET, RELAY, W/RETAINER.	TS171-1

SECTION 7
SCHEMATIC DIAGRAMS



Figrue 7–I. Schematic Diagram, Antenna Control
Model TTA-I

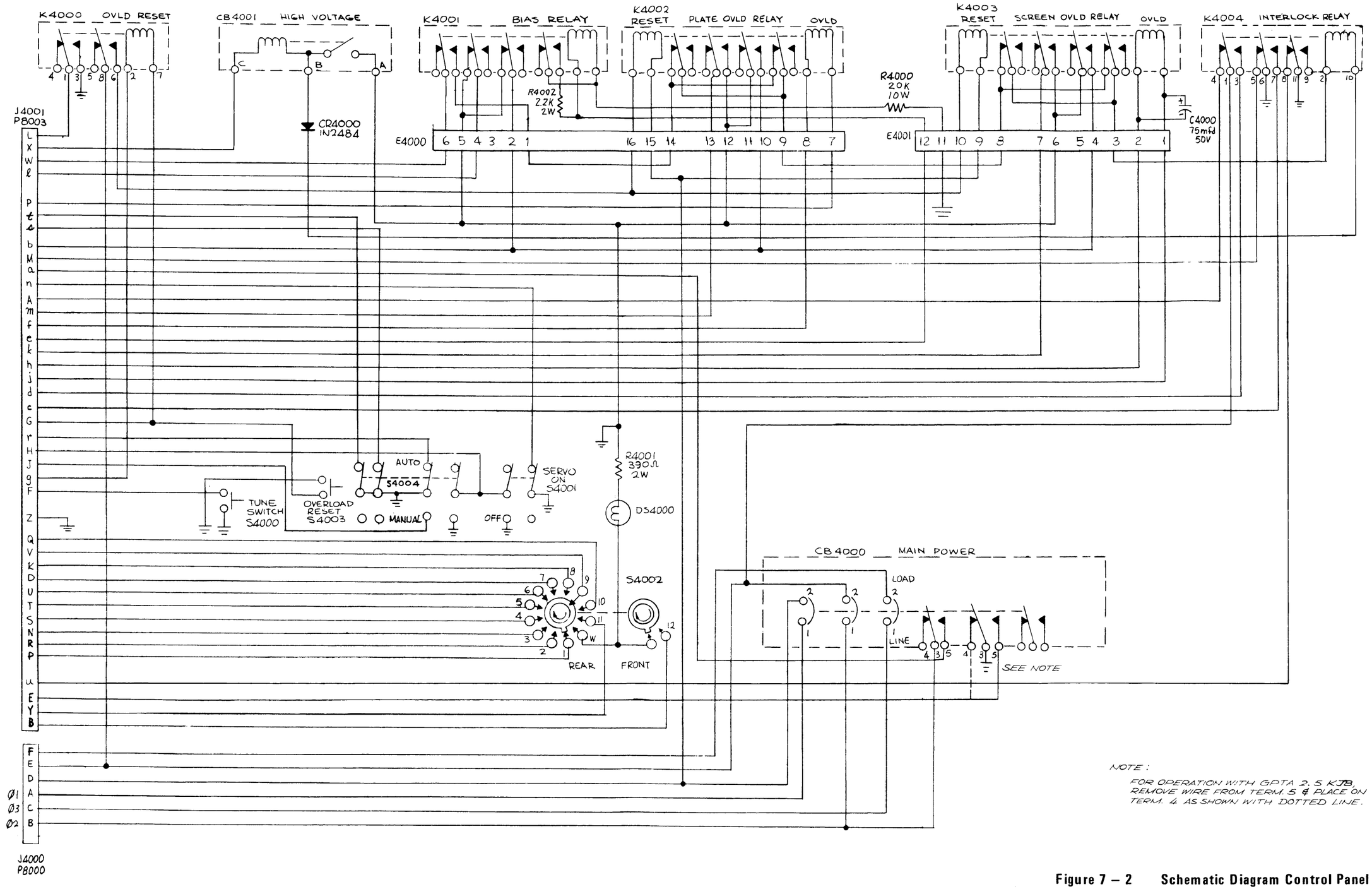


Figure 7 – 2 Schematic Diagram Control Panel Model TCP – 1

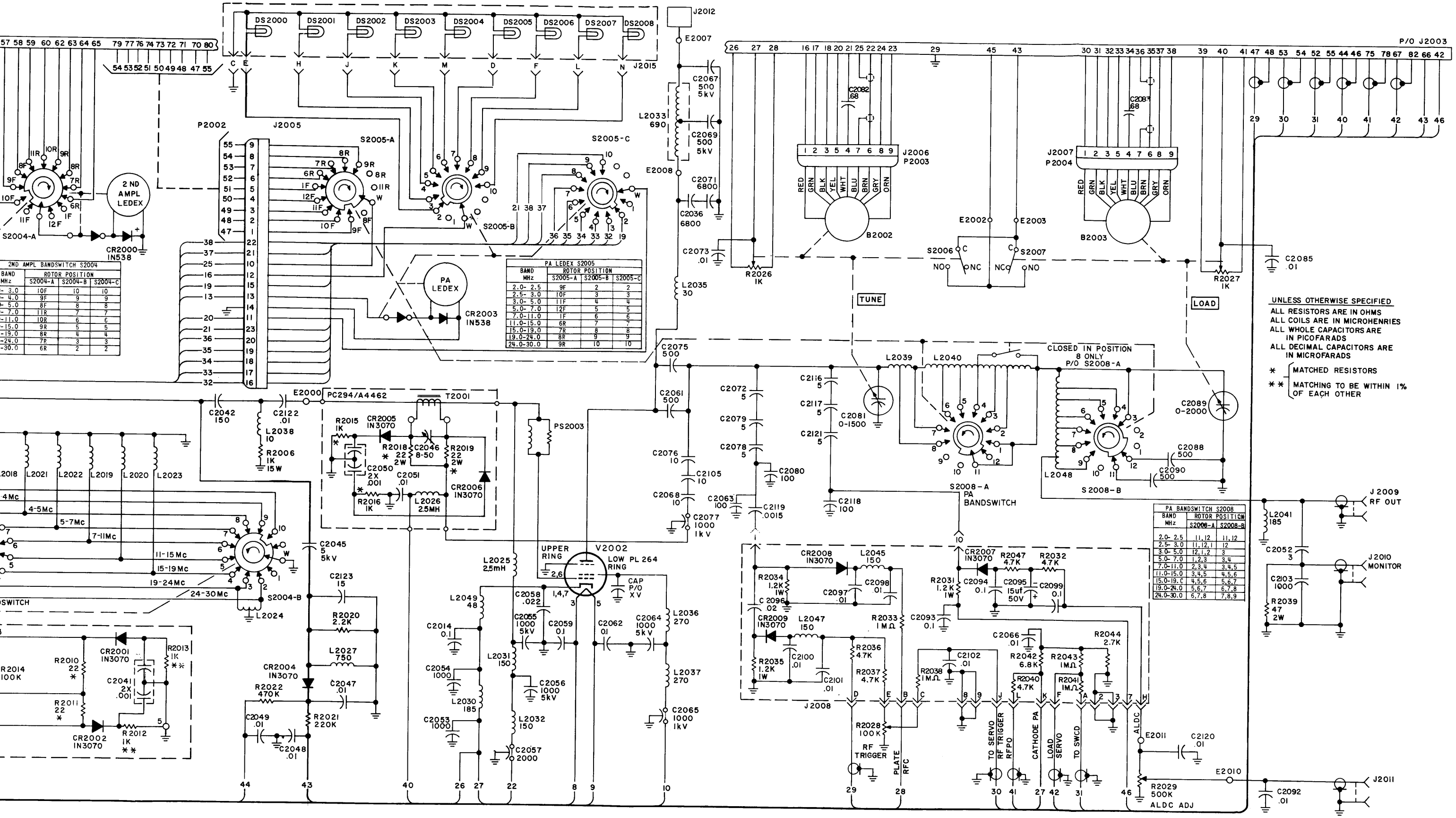


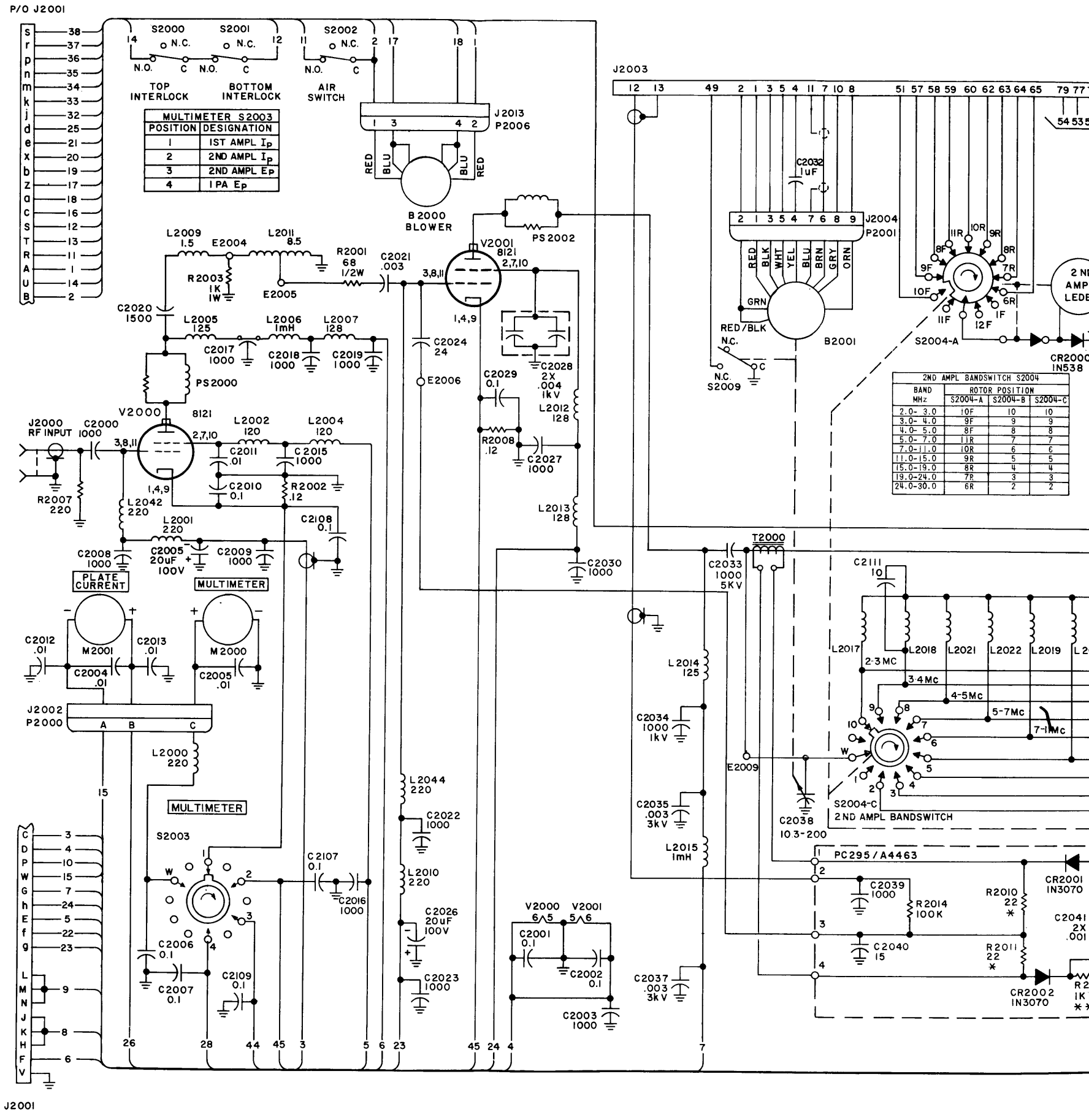
Figure 7–3 Schematic Diagram

Automated Linear Powre Amplifier

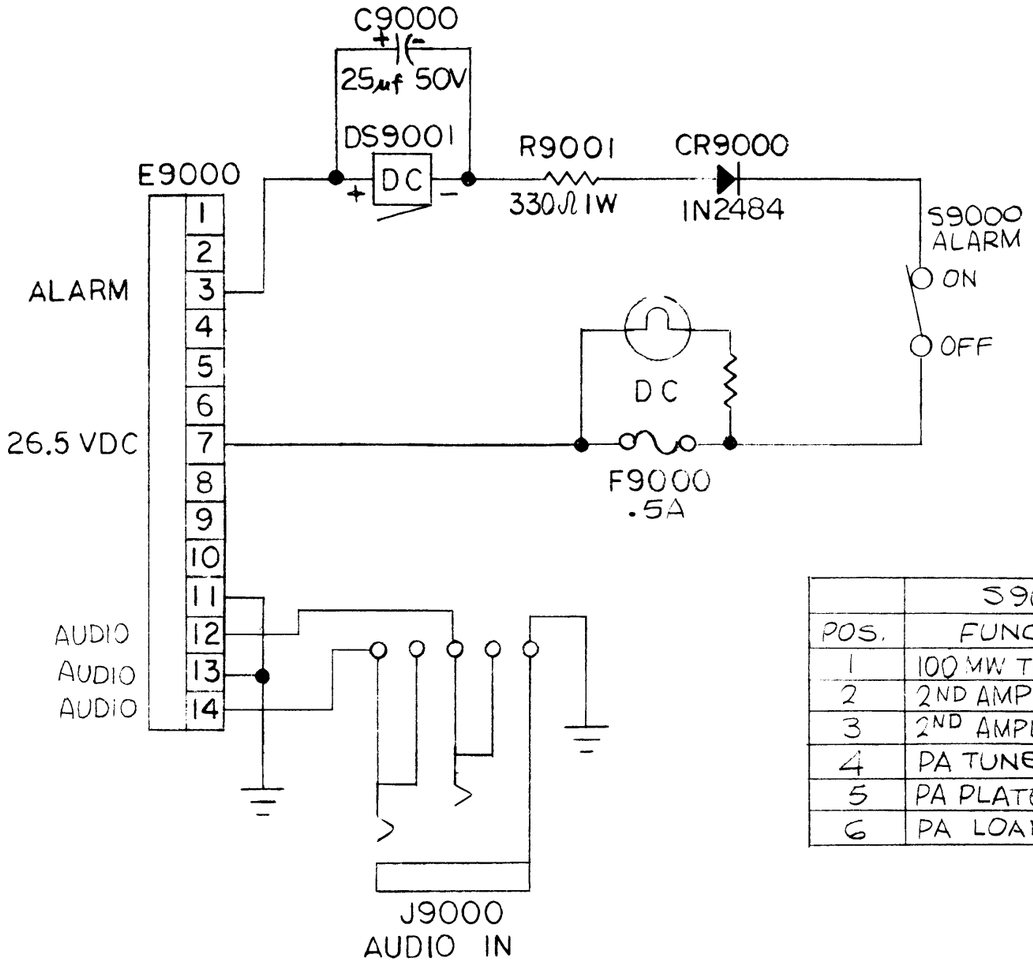
Model TLAD–2.5K

CK1542 ∅

7-7/7-8



001691019A/JB



	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

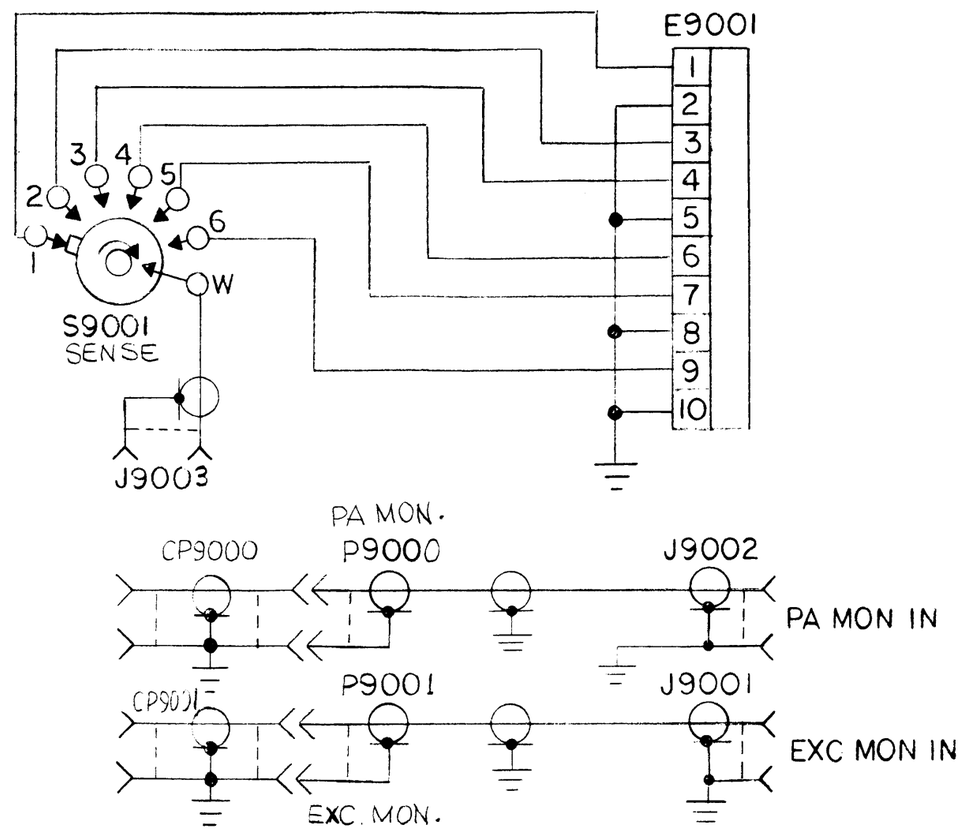
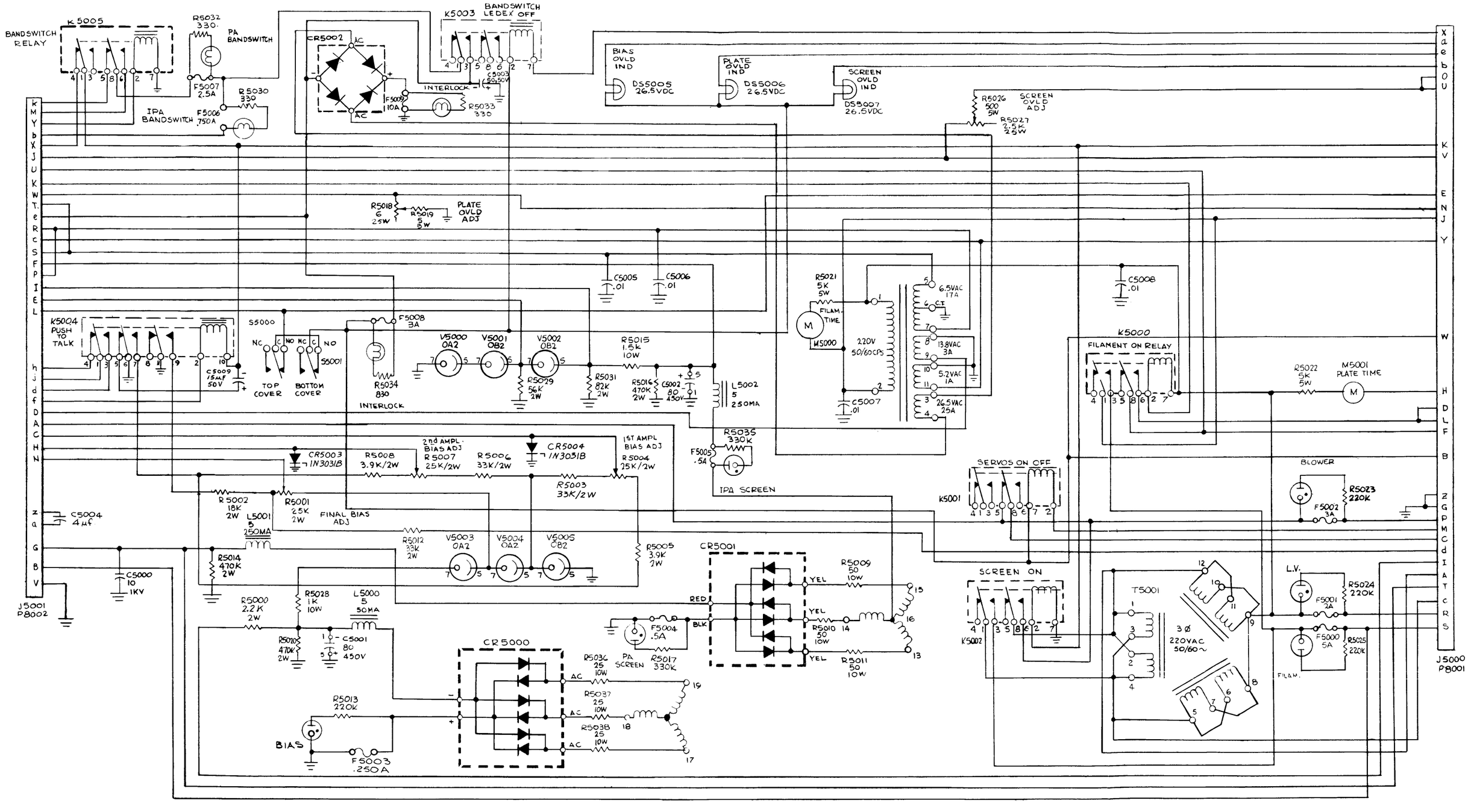


Figure 7 – 4 Schematic Diagram Alarm Control Panel Model AX633



UNLESS OTHERWISE SPECIFIED

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

Figure 7 – 5 **Schematic Diagram**

Low Voltage Power Supply

Model AP128

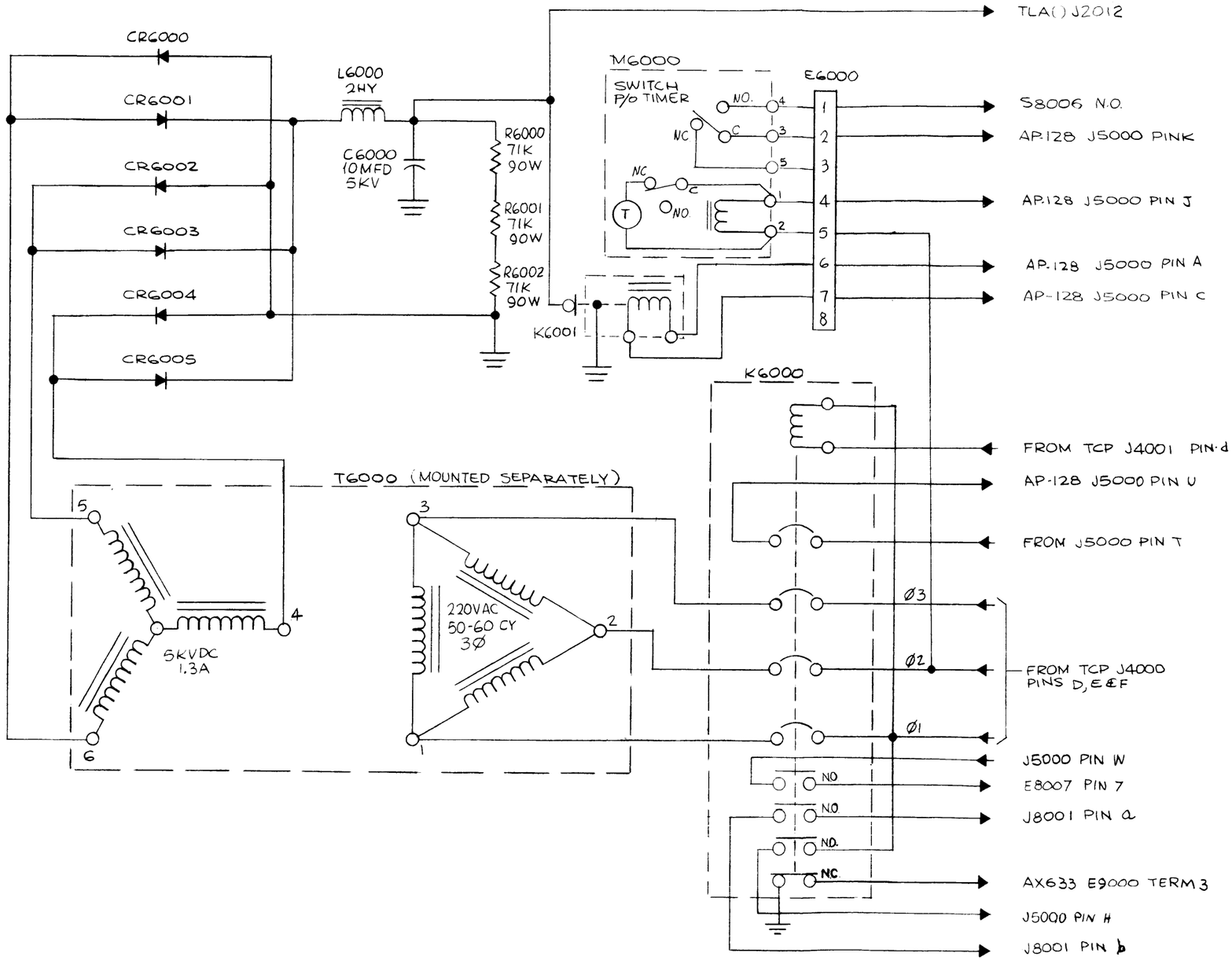


Figure 7 – 6

Schematic Diagram
High Voltage Power Supply
Model AP129

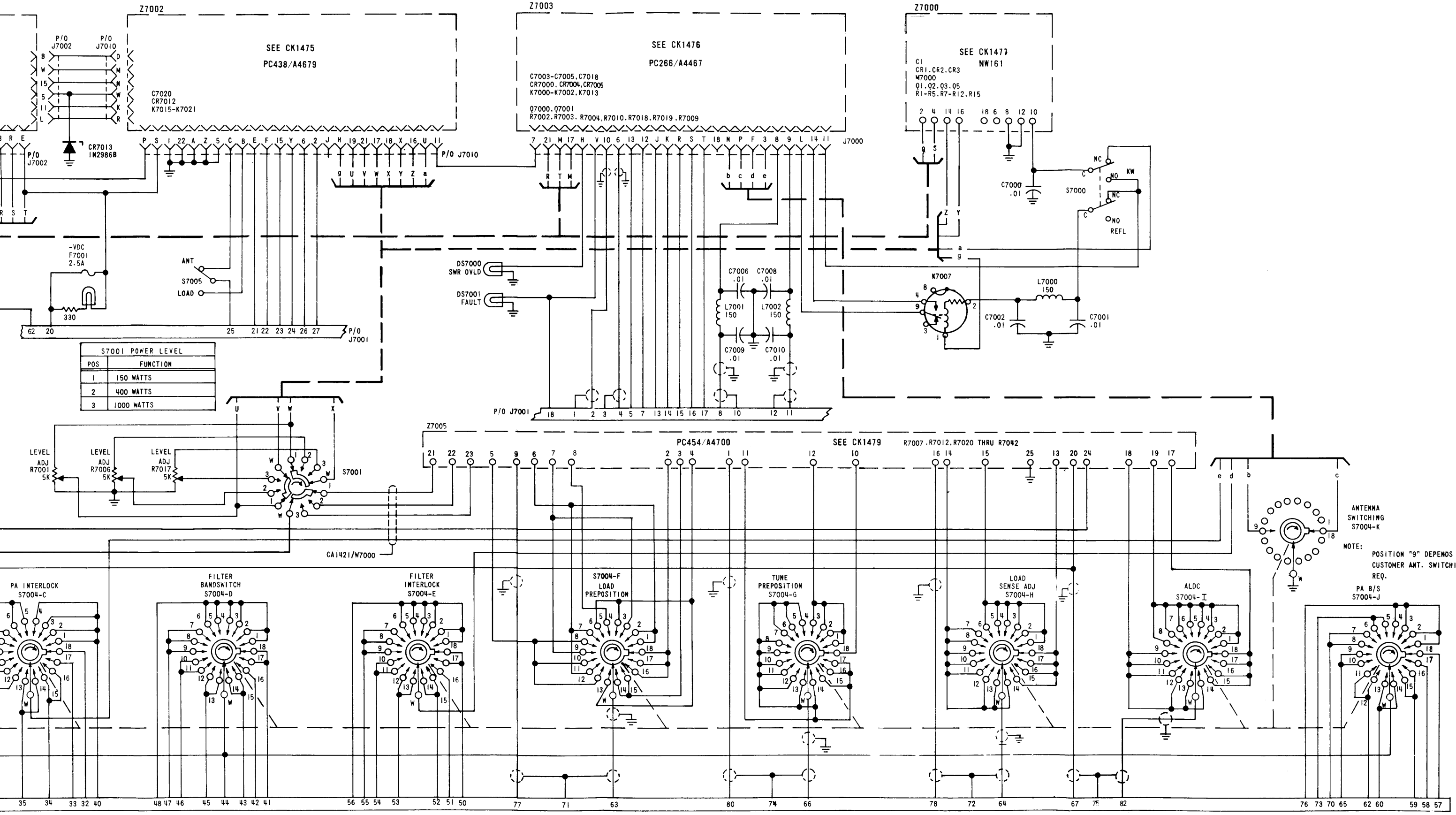
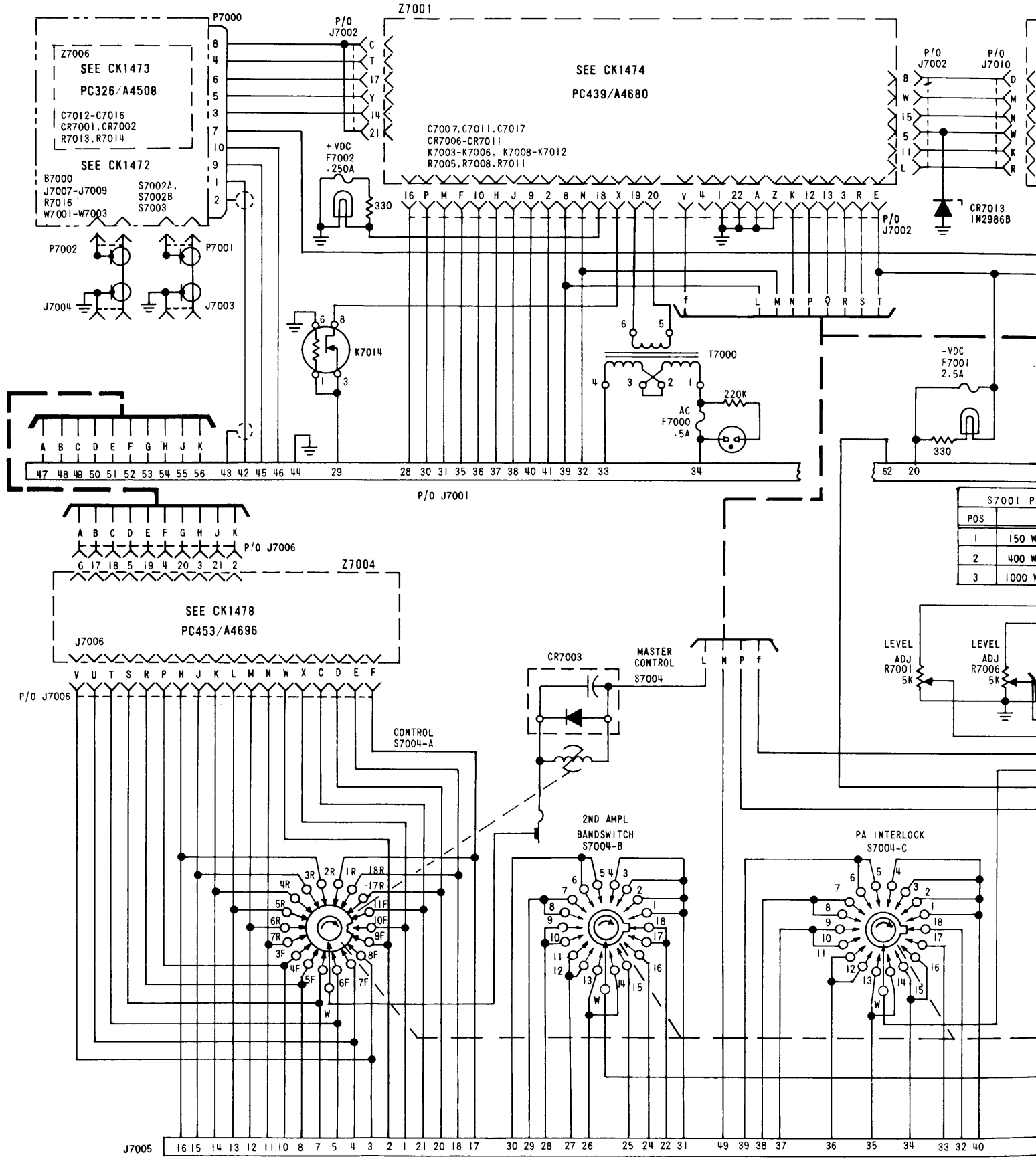


Figure 7 – 7a **Schematic Diagram**
Inter-connect, RF Power
Control Unit Model SWCD-3K
(sheet 1 of 9)



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AIN MODULE

Z7006

2

R7016
50Ω
2W

R.F. GAIN
ADJ

W7002

W7003

J7007

J7008

TO P7001

TO P7002

PC326/A4508

CK1473

MOTOR
B7000

NC NO NC NO

C C

S7002A S7002B

NC NO

C

S7003

CA1303
W7001

BLK RED

7009

7000 2 1 3 4 10 9 7 8 6 5

Figure 7-7b Schematic Diagram, Assembly A4508 With RF Gain Module (sheet 2 of 9)

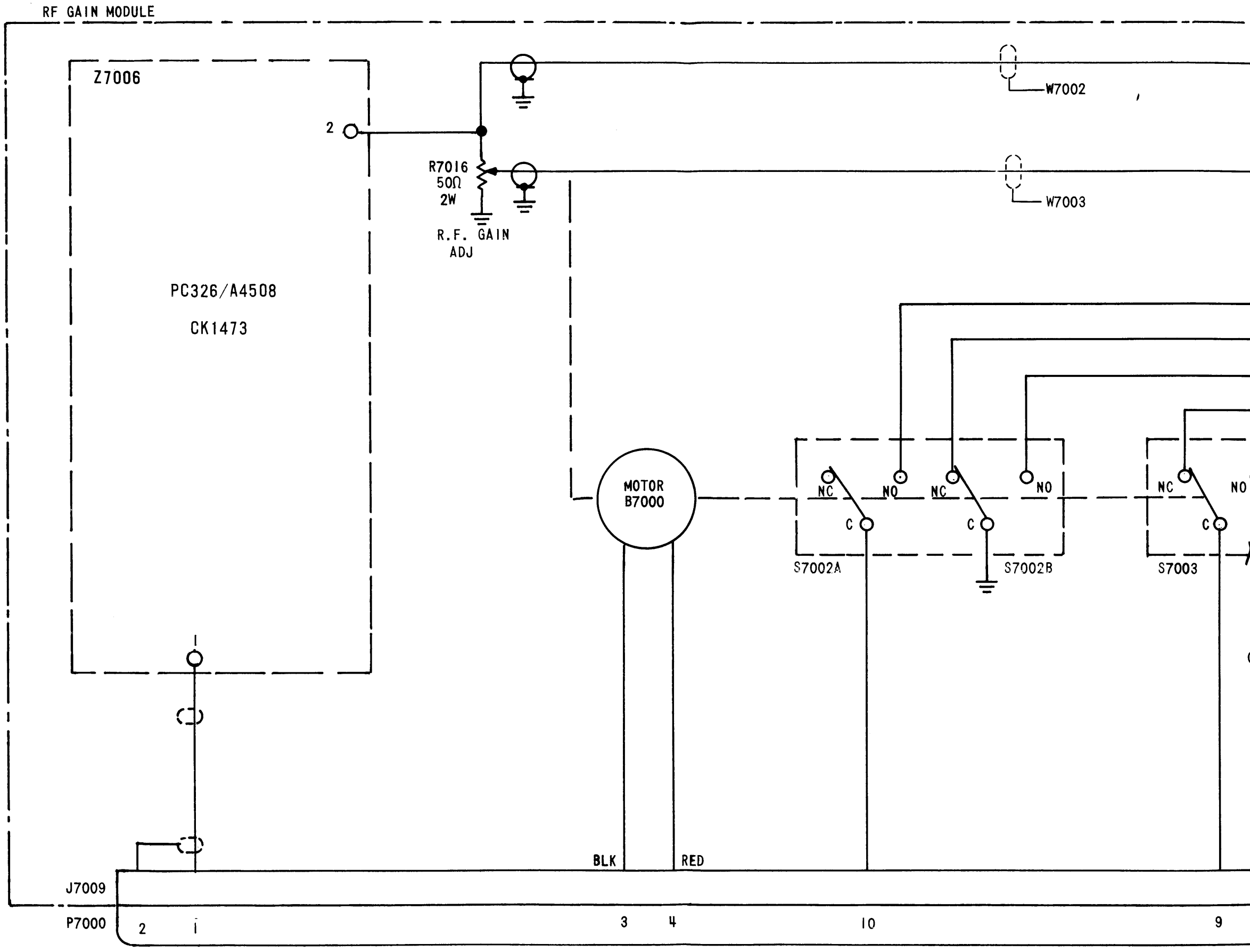
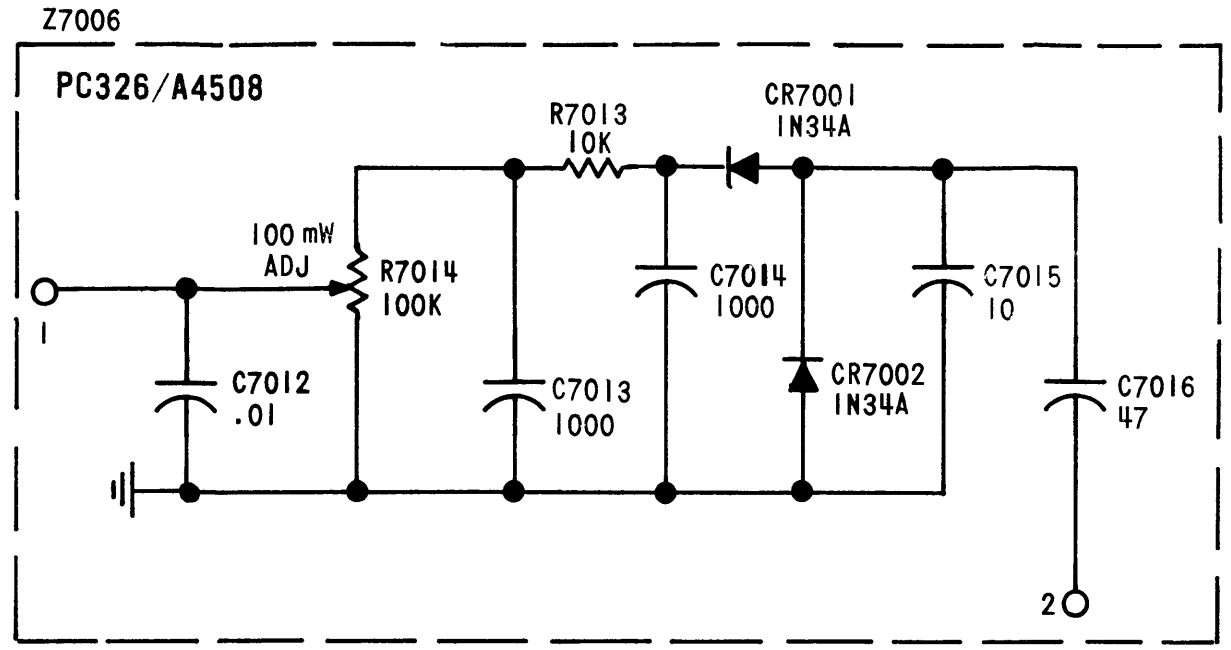


Figure 7

001691019A/JB

CK1472 A



UNLESS OTHERWISE SPECIFIED

1. ALL RESISTANCE VALUES ARE IN OHMS 1/2 WATT.
2. ALL DECIMAL NUMBER CAPACITANCE VALUES ARE IN MICROFARADS.
3. ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICOFARADS.

Figure 7–7c **Schematic Diagram, Assembly A 4508 (sheet 3 of 9)**

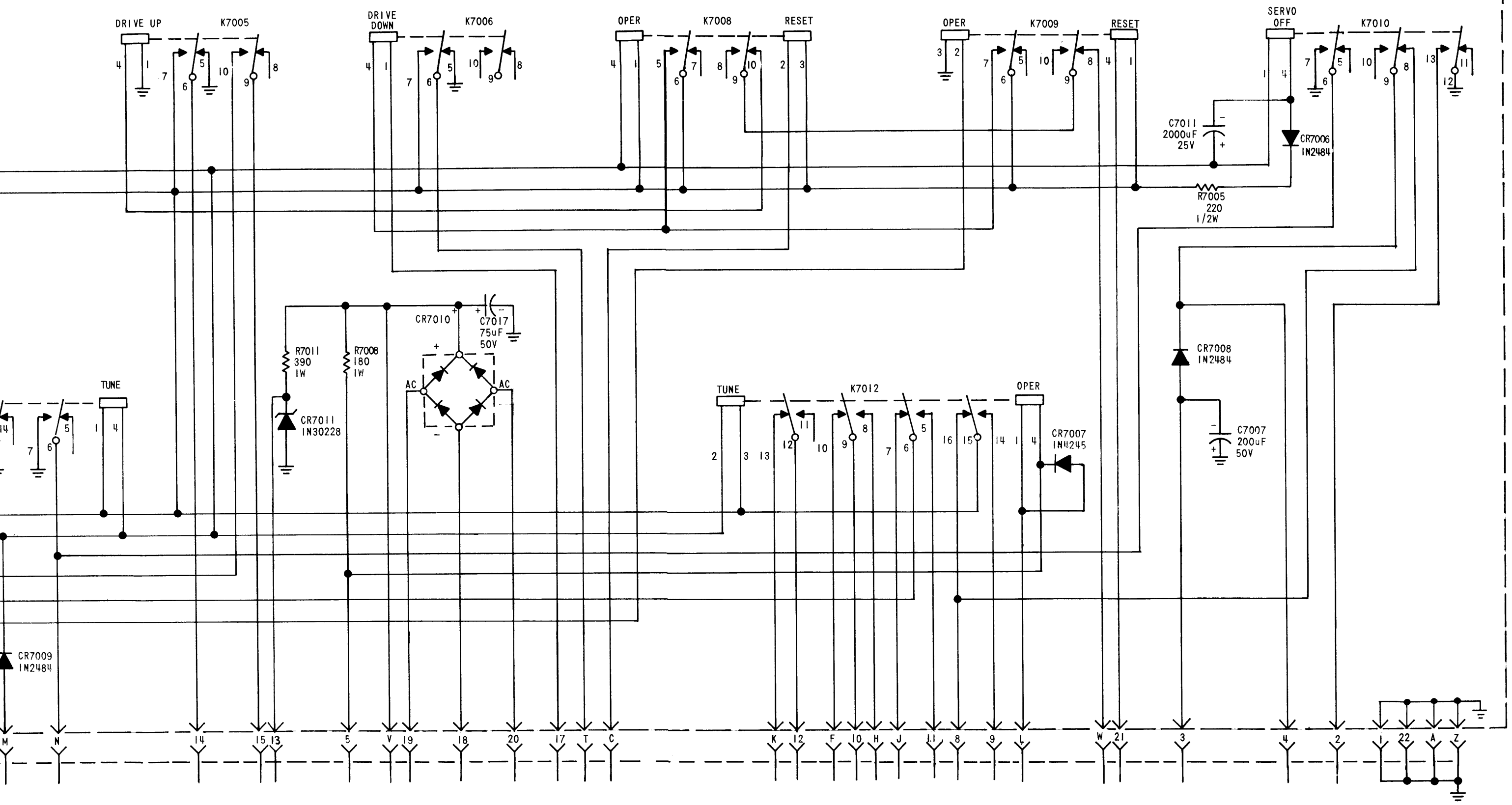
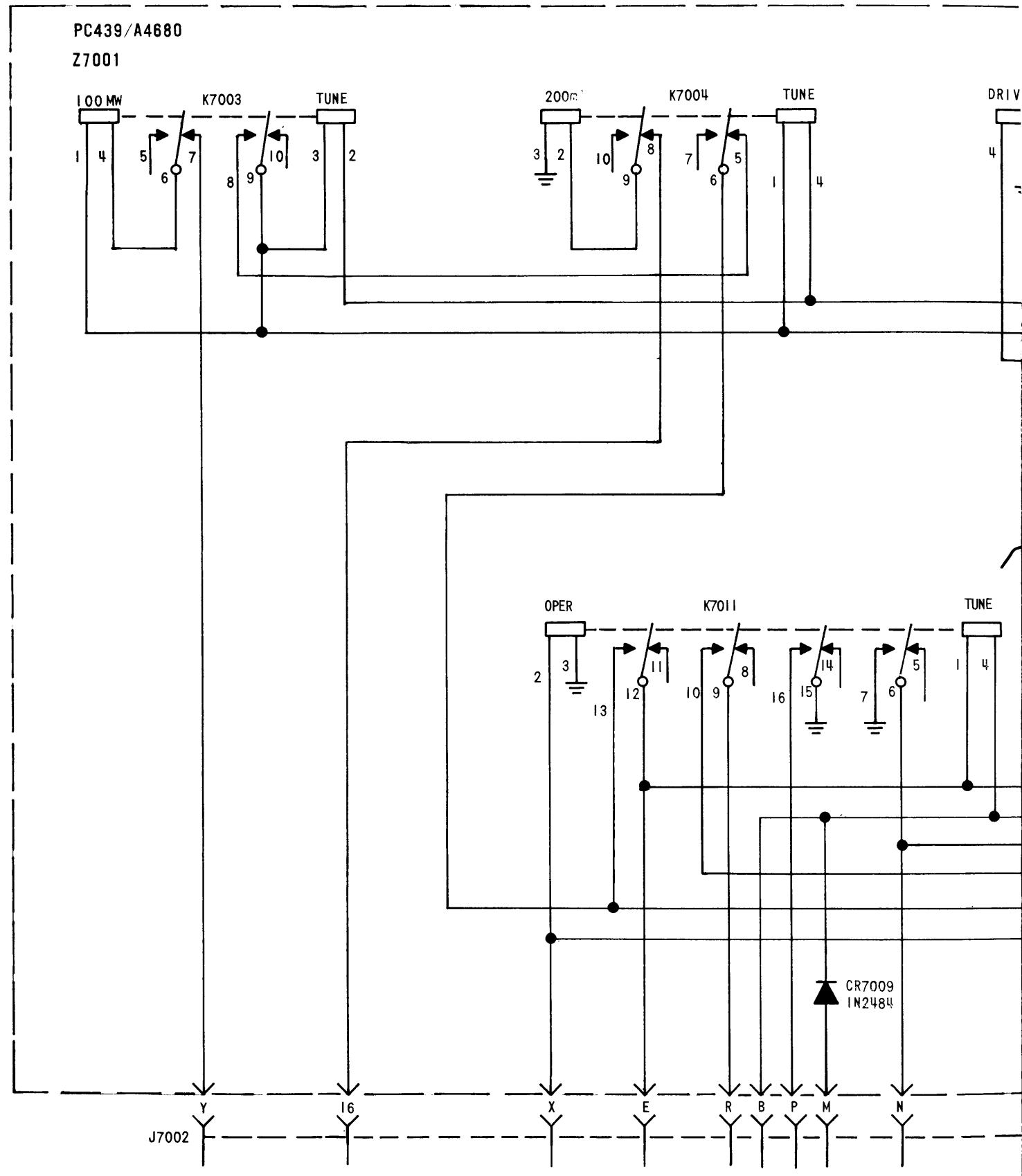


Figure 7–7d Schematic Diagram, Assembly A 4680 (sheet 4 of 9)



001691019A/JB

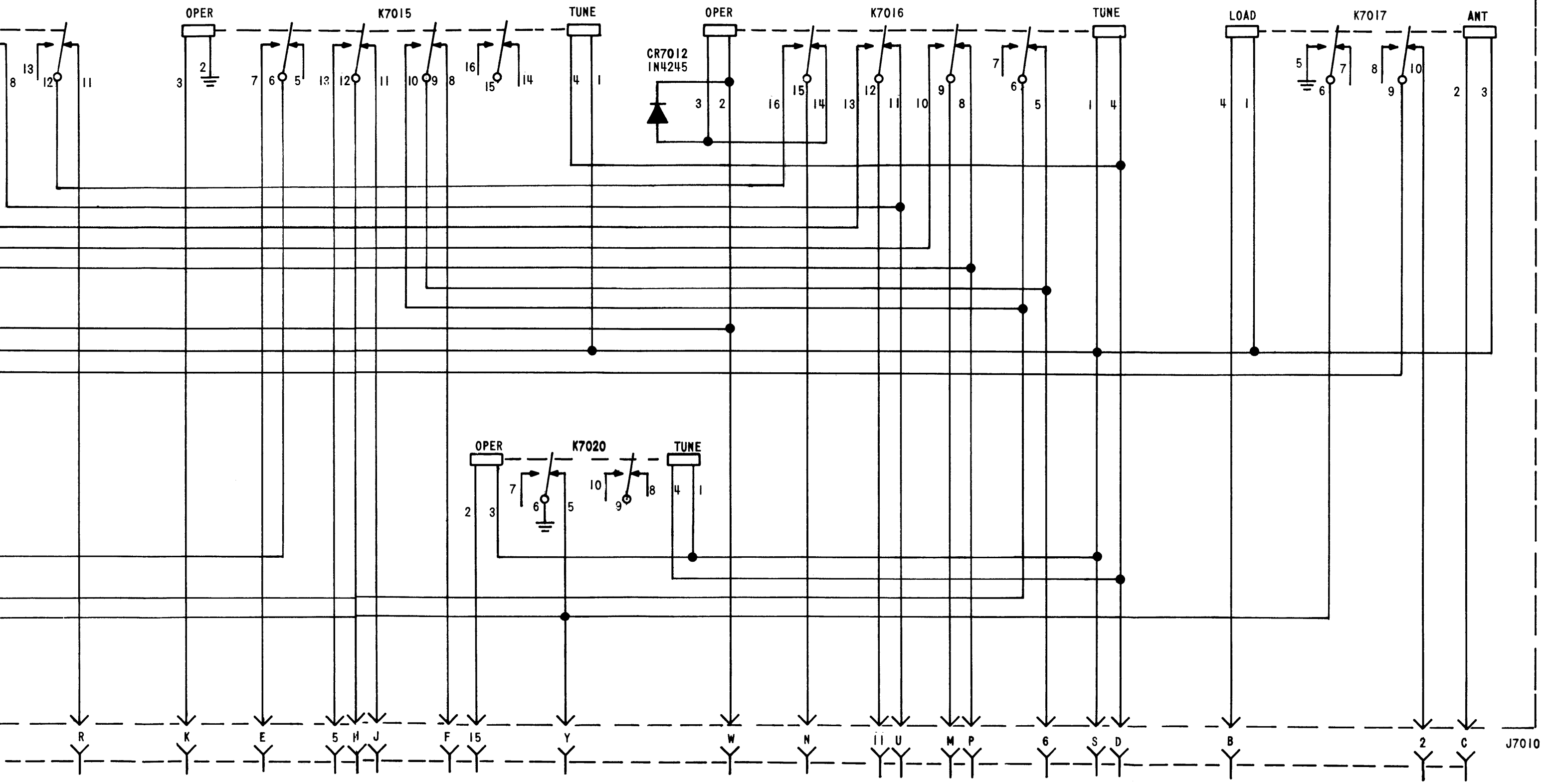
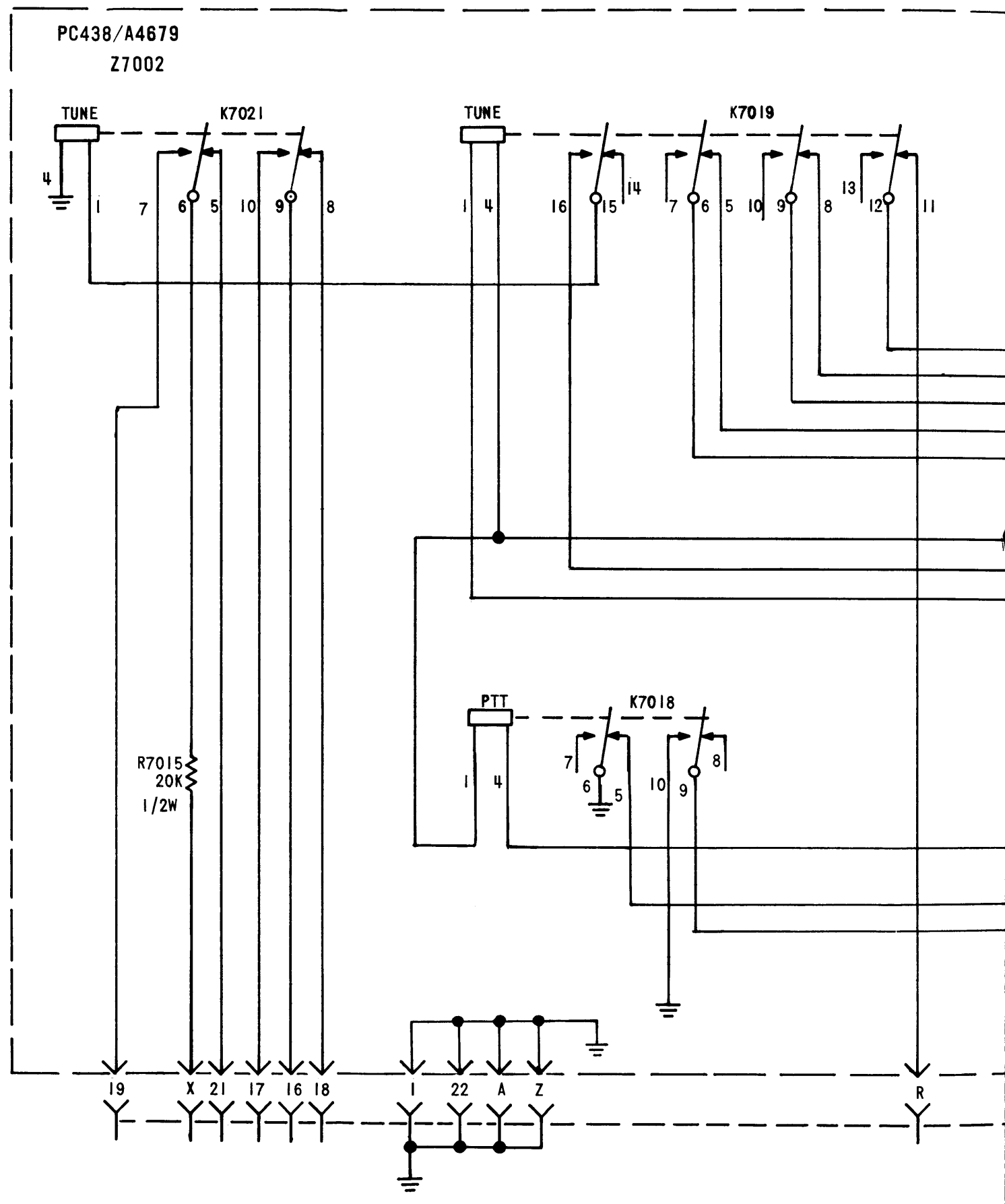
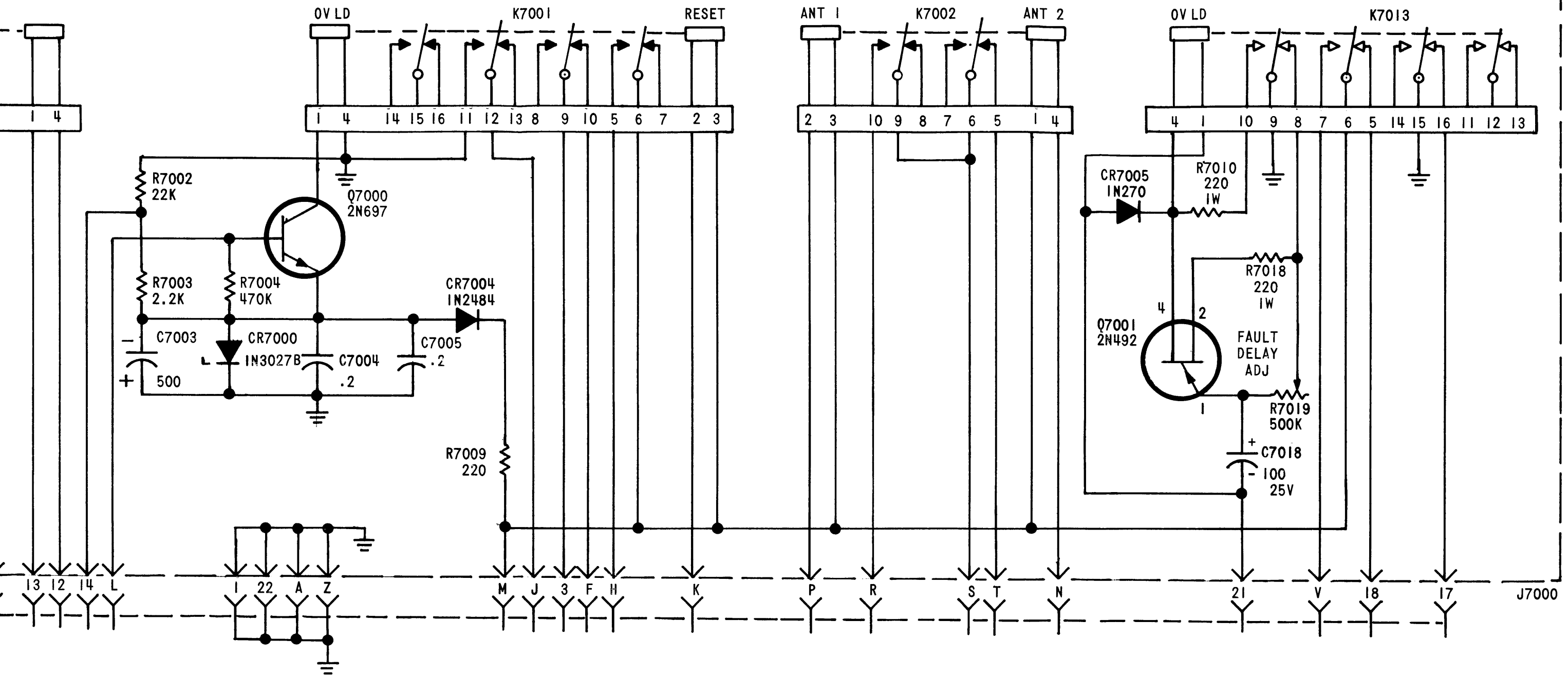


Figure 7–7e Schematic Diagram, Assembly A4679 (sheet 5 of 9)



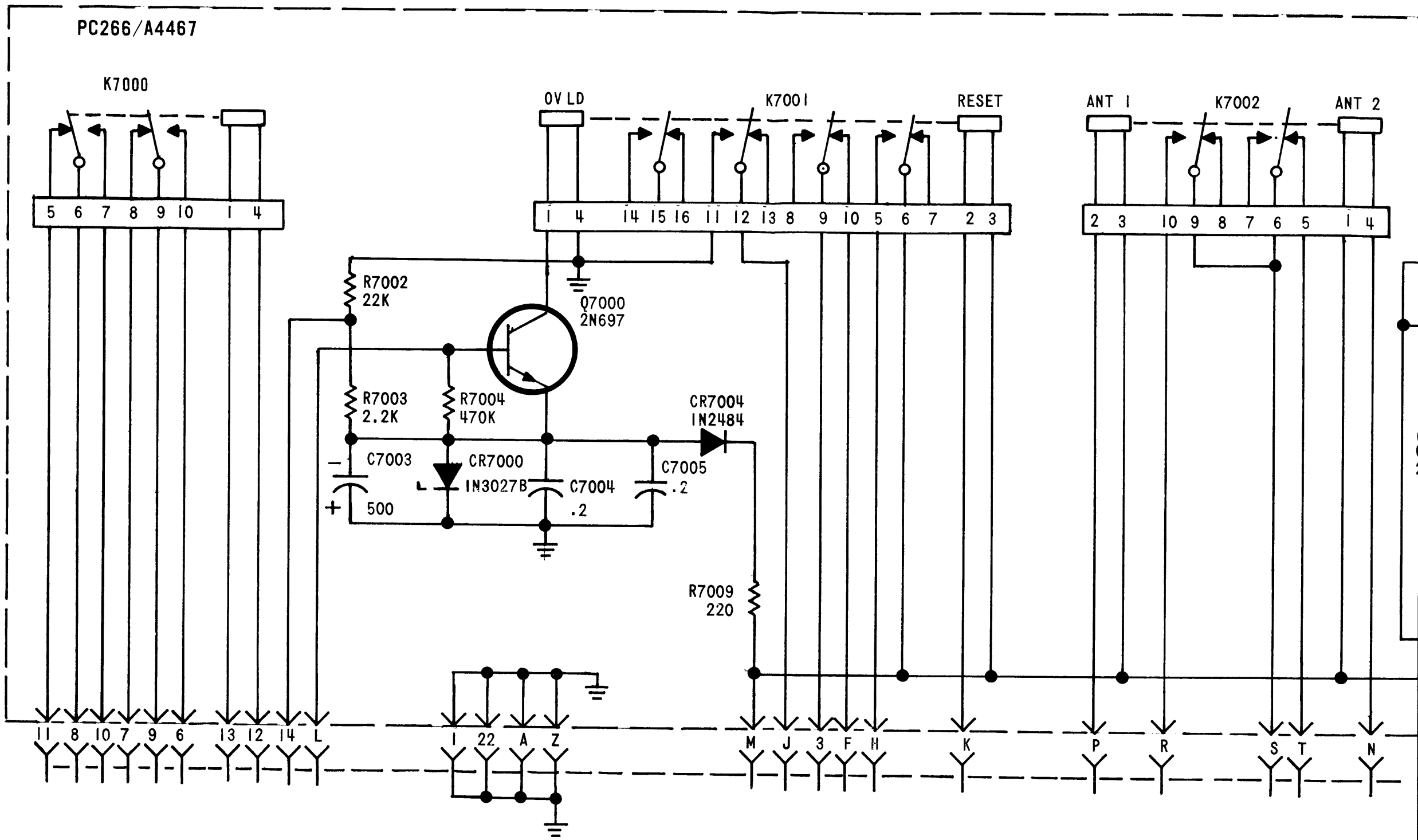
001691019A/JB



UNLESS OTHERWISE SPECIFIED

CE VALUES ARE IN OHMS 1/2 WATT,
NUMBER CAPACITANCE VALUES ARE IN MICROFARADS.
MBER CAPACITANCE VALUES ARE IN PICOFARADS.

Figure 7-7f **Schematic Diagram, Assembly NW 161 (sheet 7 of 9)**



UNLESS OTHERWISE SPECIFIED

1. ALL RESISTANCE VALUES ARE IN OHMS 1/2 WATT,
2. ALL DECIMAL NUMBER CAPACITANCE VALUES ARE IN MICROFARADS.
3. ALL WHOLE NUMBER CAPACITANCE VALUES ARE IN PICOFARADS.

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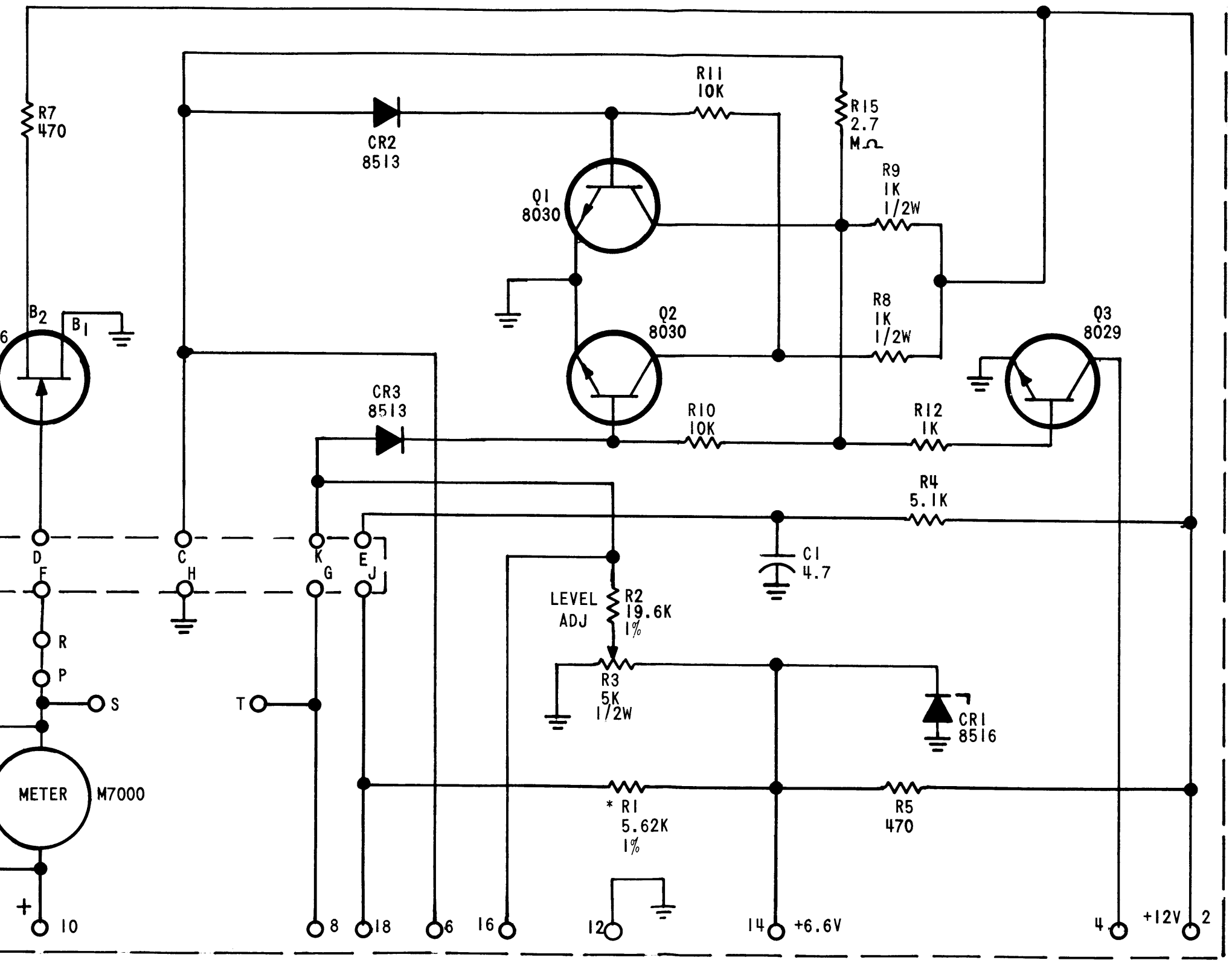
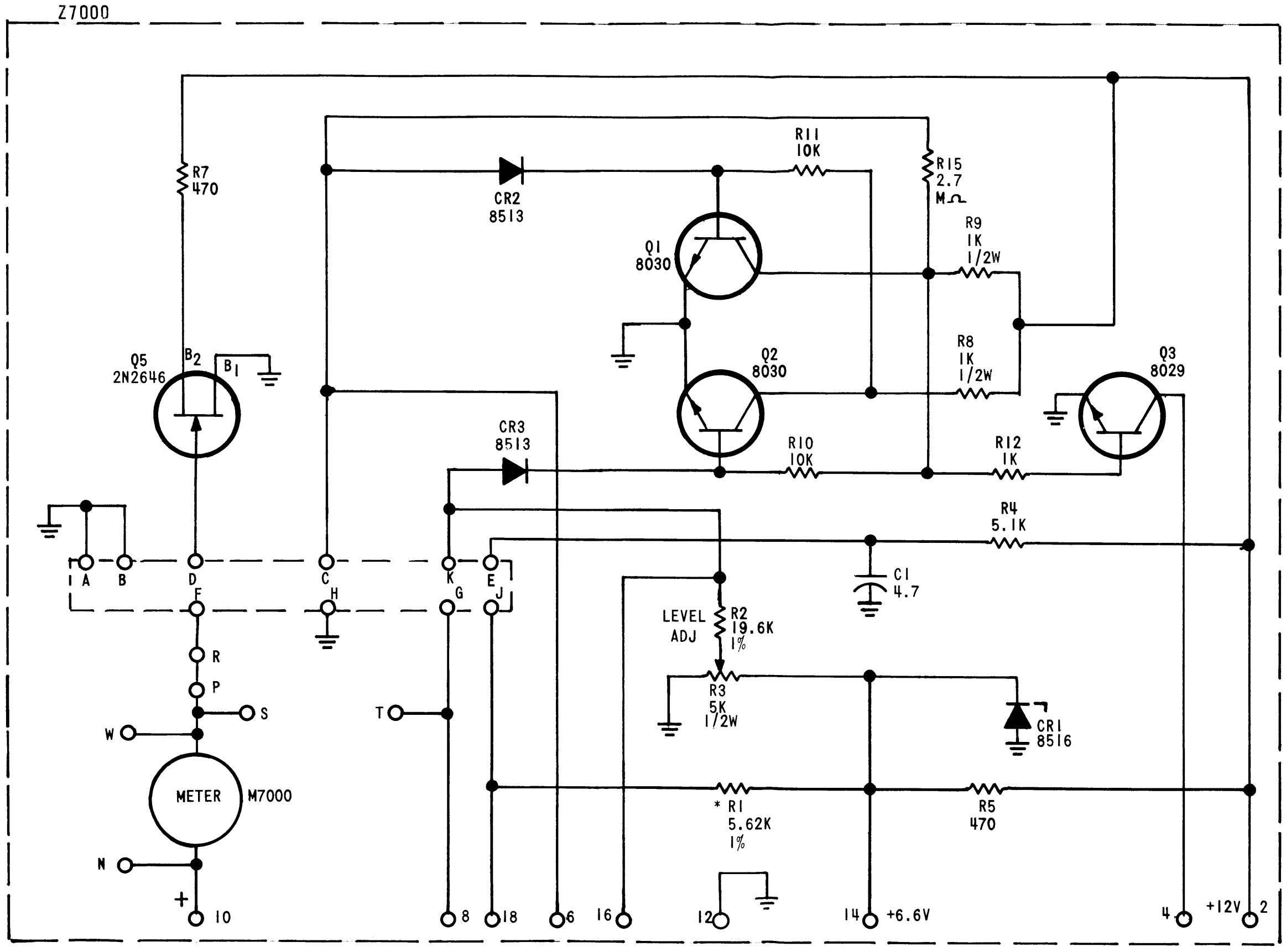
CK1476 ∅



*NOTE:

VALUE SHOWN WILL CHANGE FROM UNIT TO UNIT DUE TO THE SPECIFIC CALIBRATION INVOLVED.

Figure 7-7g Schematic Diagram, Assembly NW 161 (sheet 7 of 9)



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CK1477 ø

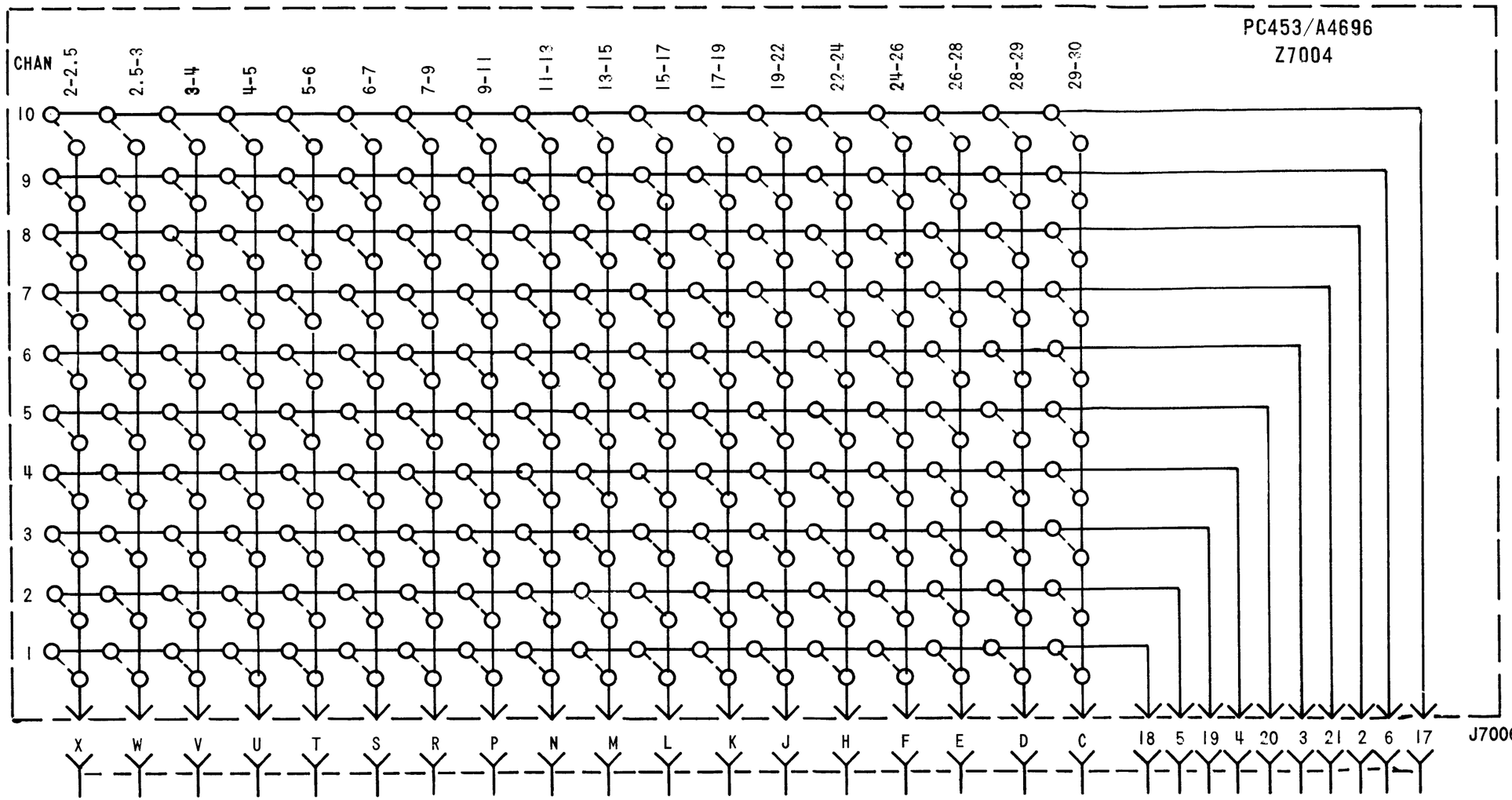


Figure 7-7h Schematic Diagram, Assembly A 4696 (sheet 8 of 9)

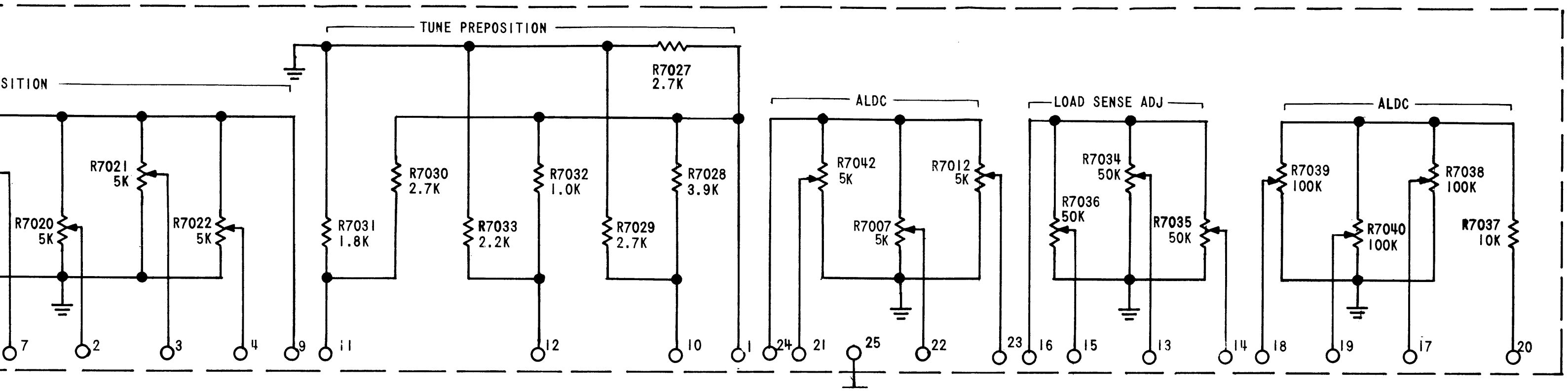
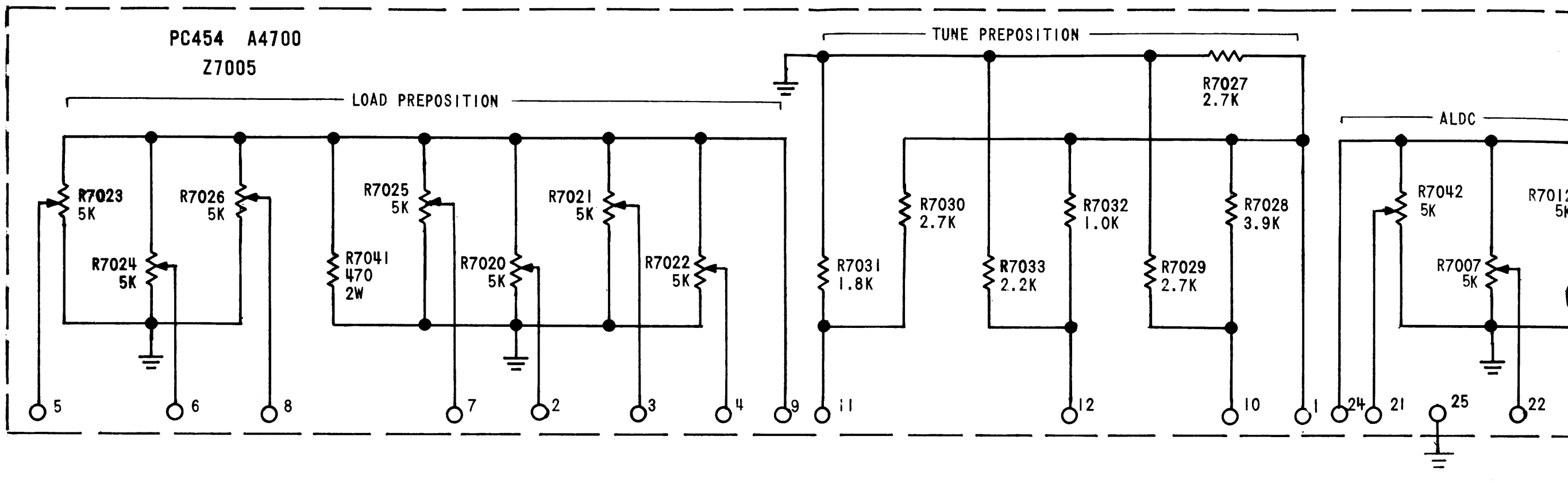


Figure 7–7j Schematic Diagram, Assembly A 4700 (sheet 9 of 9)



001691019A/JB

CK1479 A

LAST SYMBOLS	MISSING SYMBOLS
C501 TB501 F502 K501 T501	

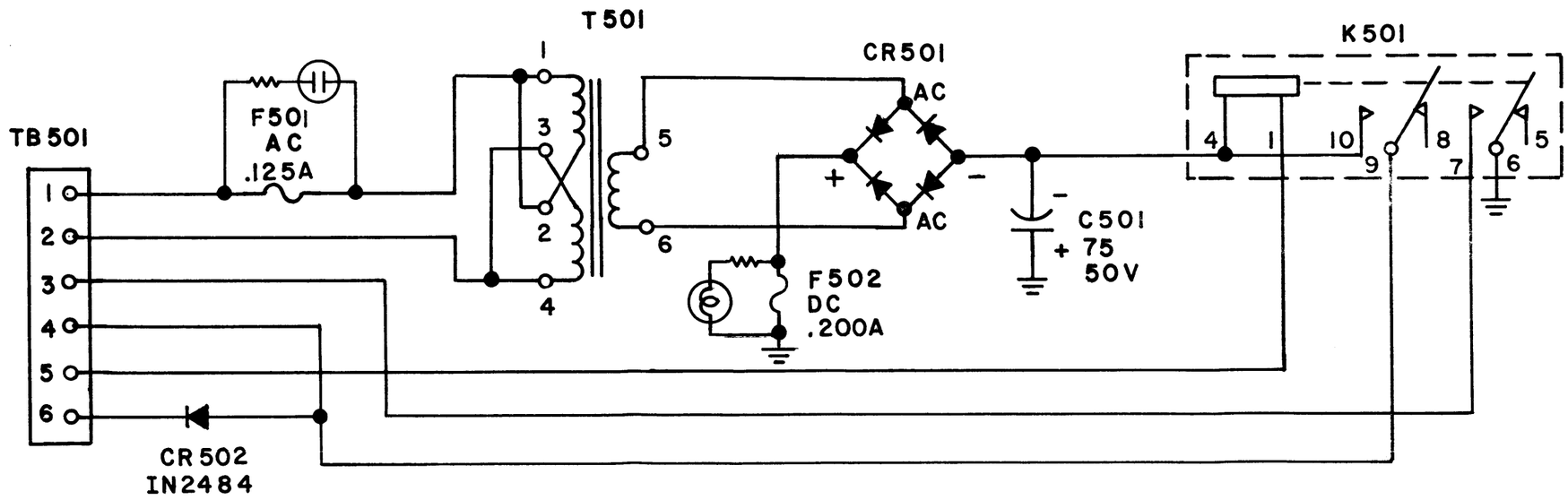


Figure 7-8 Schematic Diagram, AP - 145

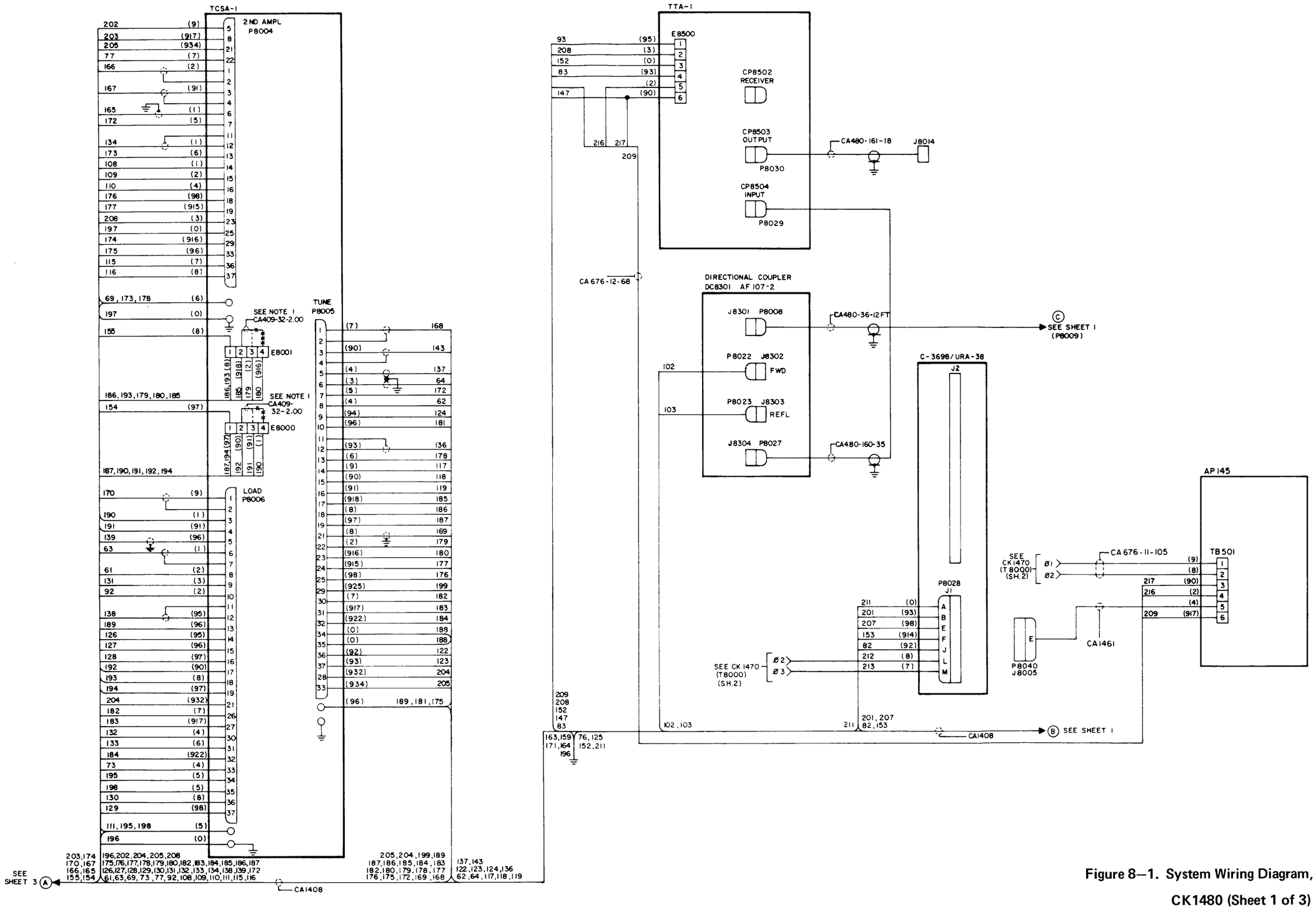
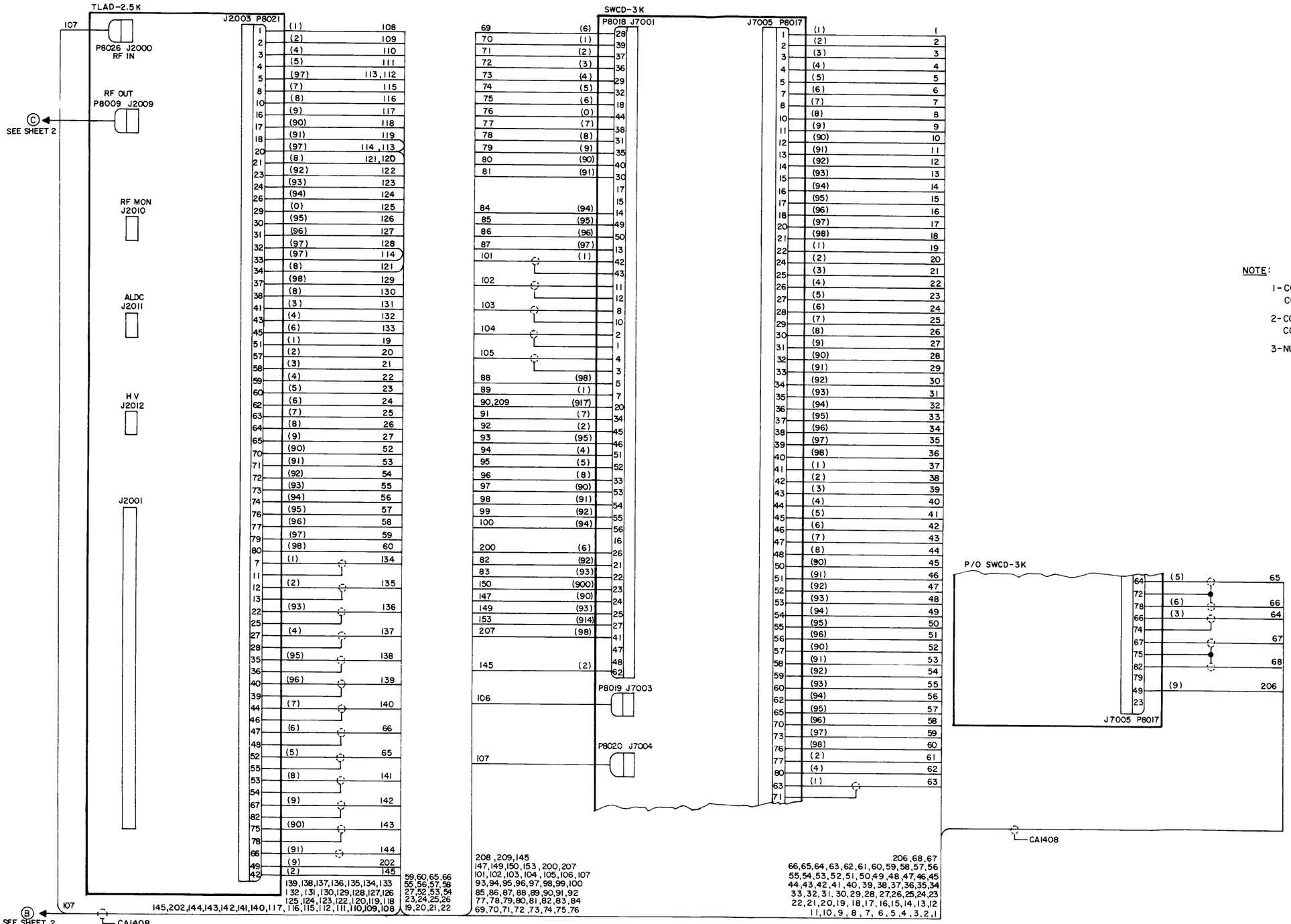


Figure 8—1. System Wiring Diagram, CK1480 (Sheet 1 of 3)



NOTE:

1-CONNECT AS SHOWN ----- FOR 50 Hz.
CONNECT AS SHOWN ✱✱✱✱ FOR 60 Hz.

2-CONNECT AS SHOWN ✱✱✱✱ FOR REMOTE OPERATION.
CONNECT AS SHOWN ----- FOR LOCAL OPERATION.

3-NUMBERS IN PARENTHESIS ARE WIRE COLORS

Figure 8–1. System Wiring Diagram, CK1480 (Sheet 2 of 3)

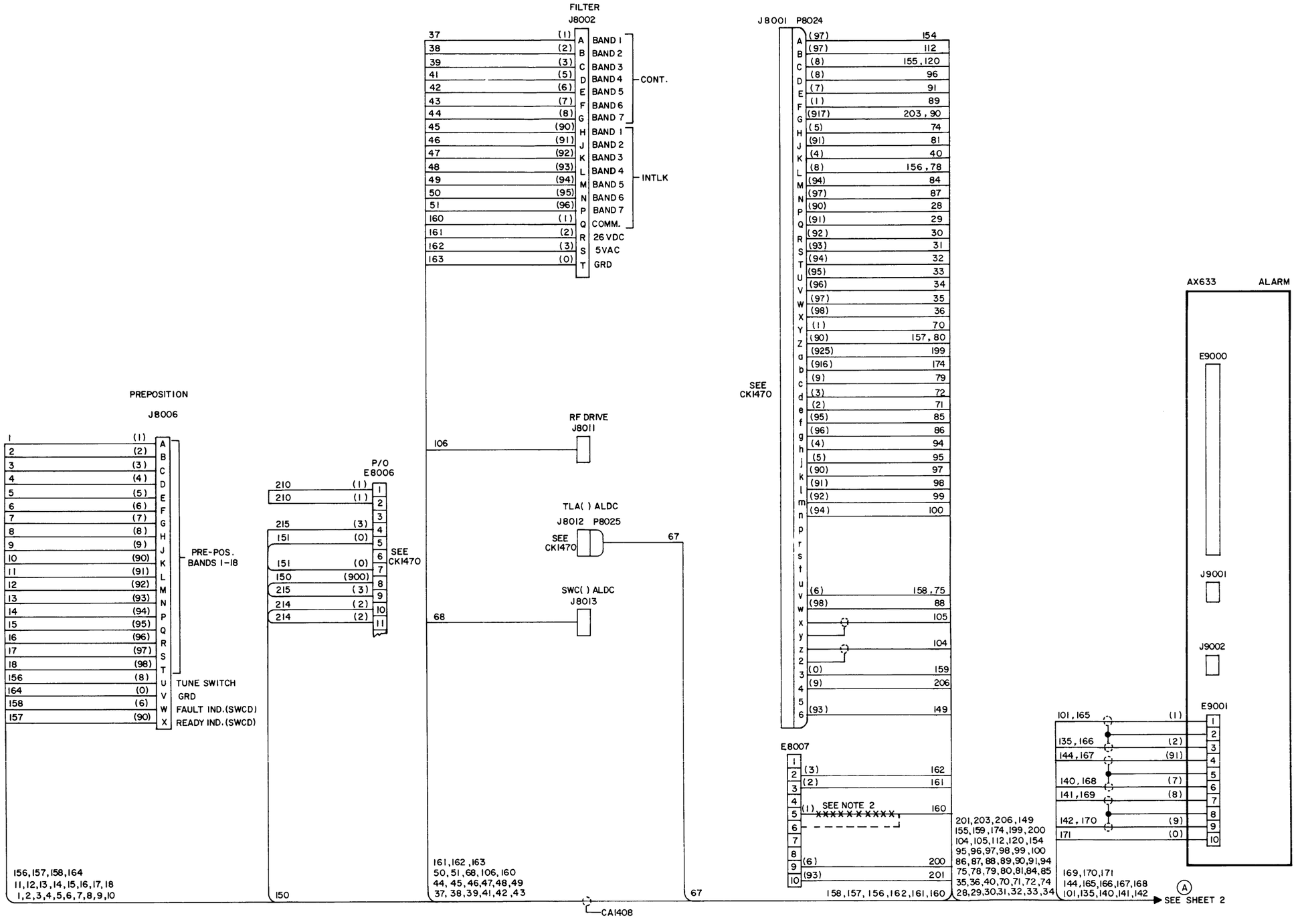


Figure 8-I. System Wiring Diagram, CK1480 (Sheet 3 of 3)

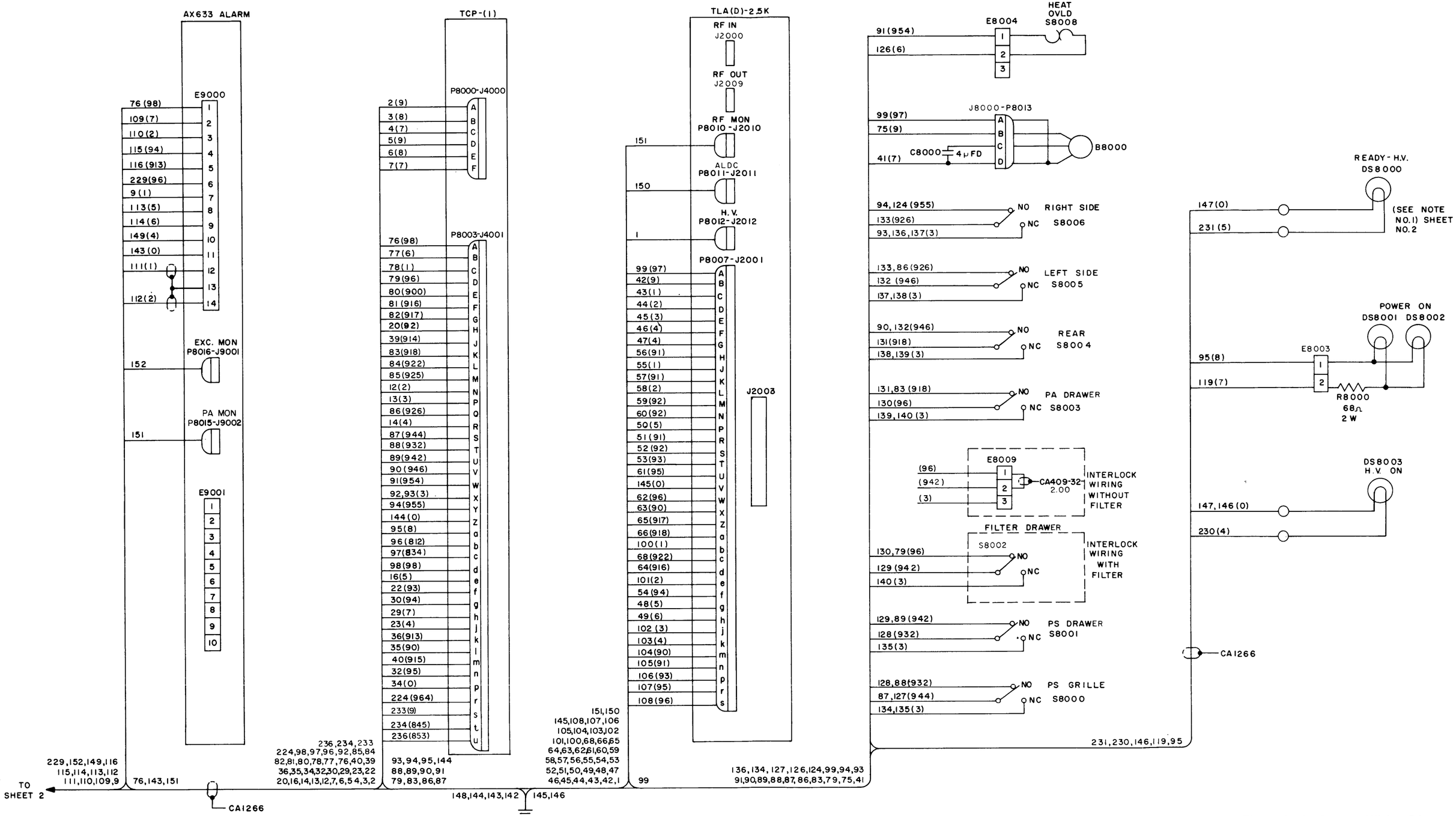


Figure 8–2. System Wiring Diagram

CK1470 (Sheet 1 of 3)

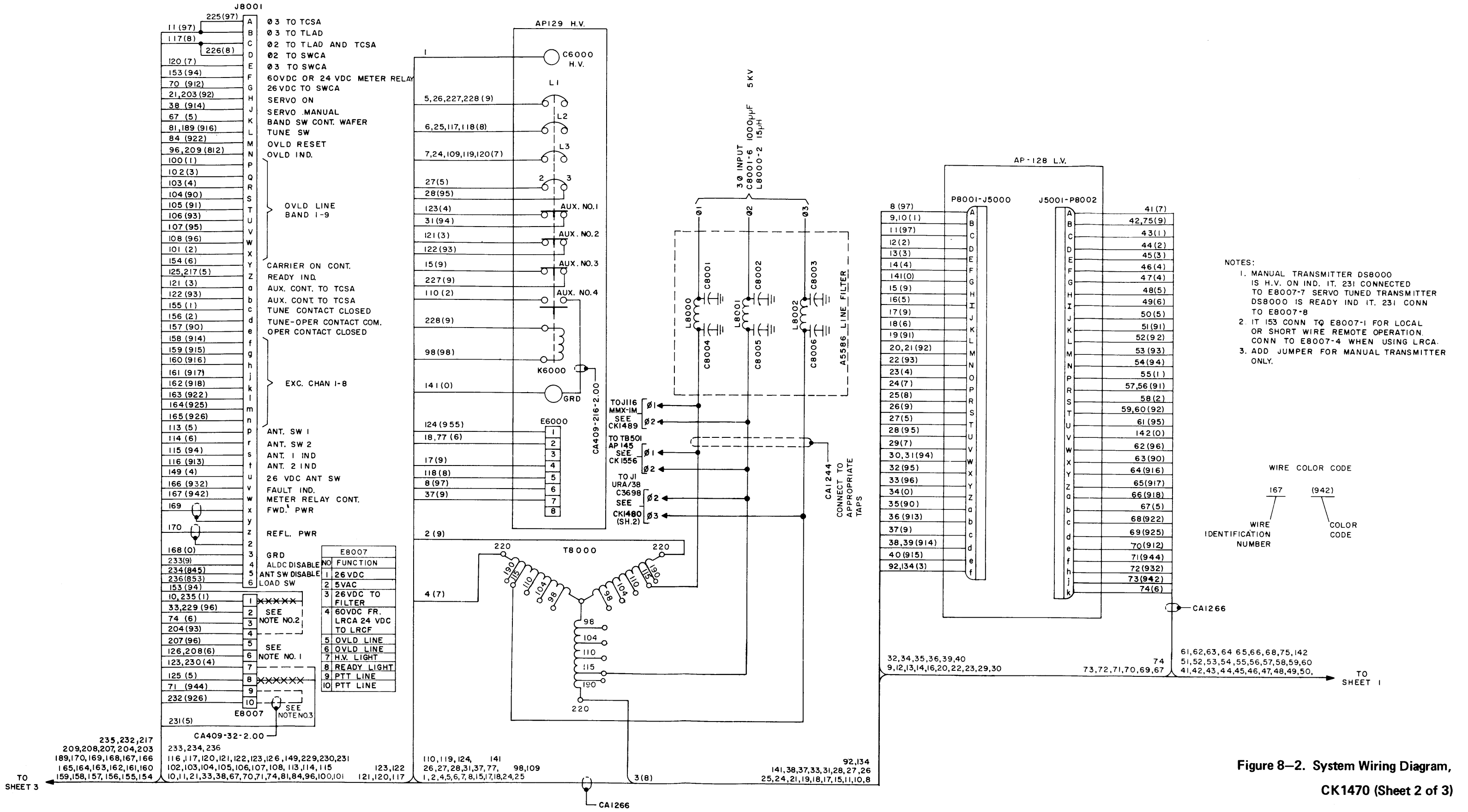


Figure 8–2. System Wiring Diagram, CK1470 (Sheet 2 of 3)

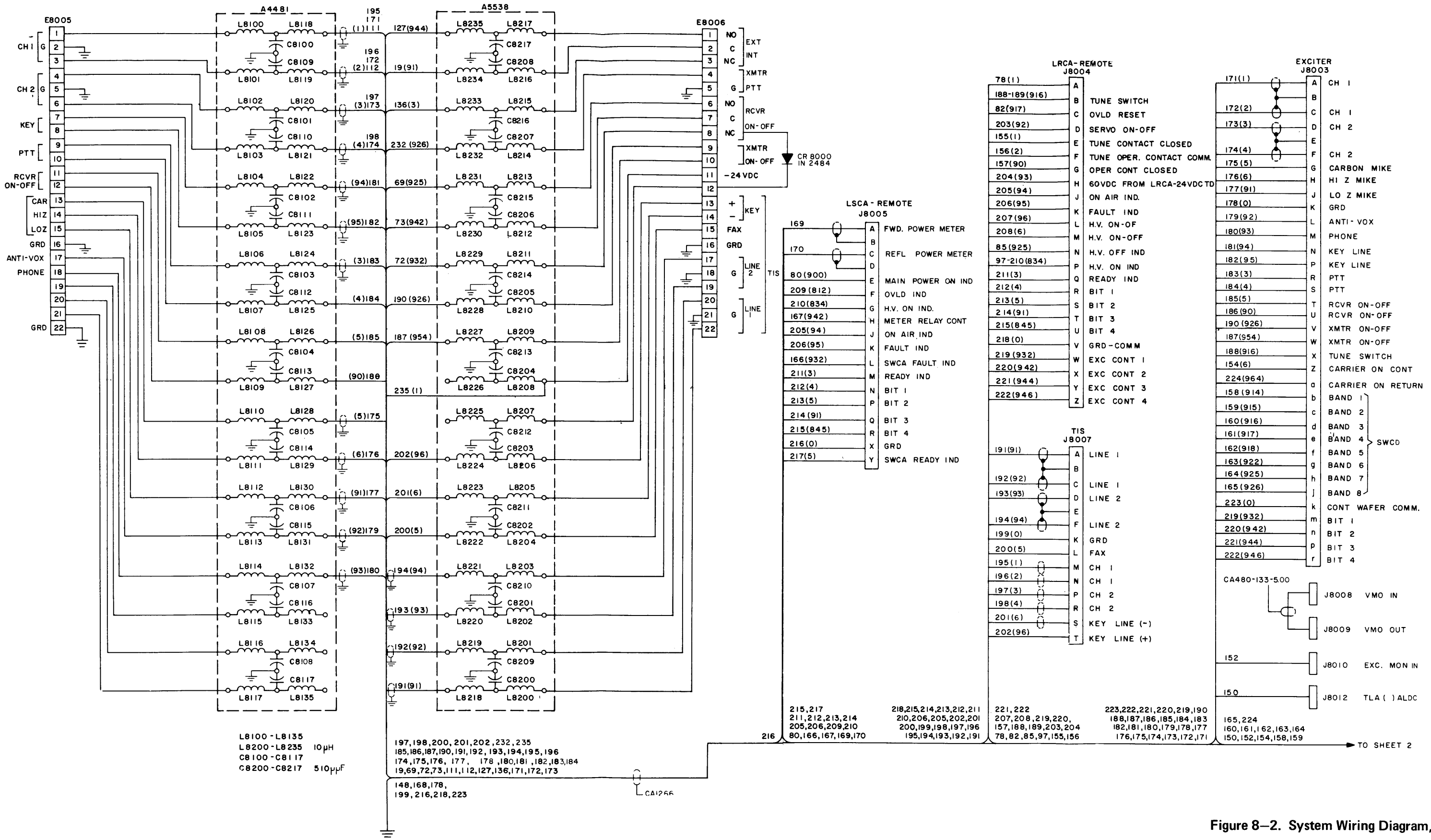
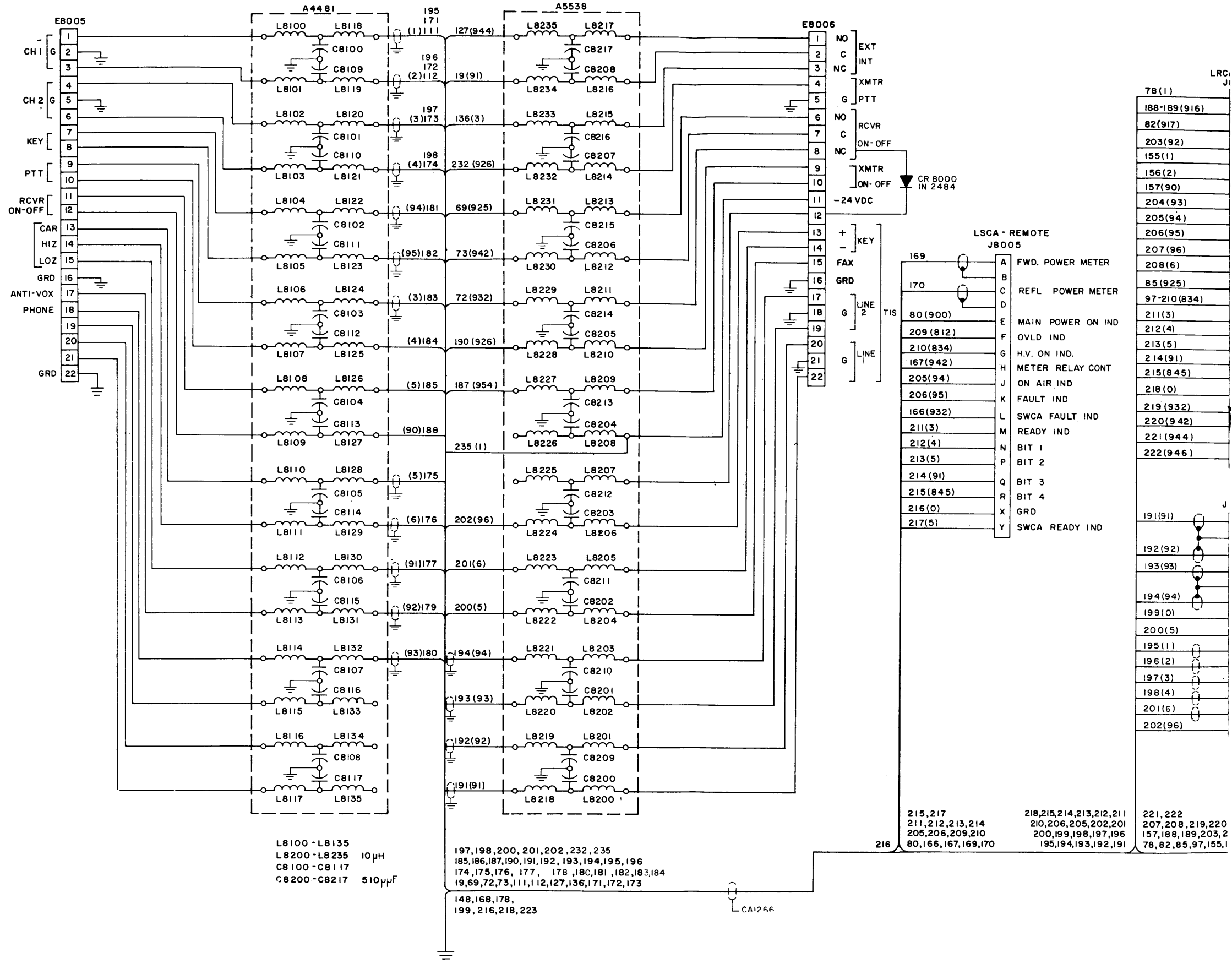


Figure 8–2. System Wiring Diagram, CK1470 (Sheet 3 of 3)


A4481
A5538
E8005
E8006
CH 1
CH 2
KEY
PTT
RCVR ON-OFF
CAR
HIZ
LOZ
GRD
ANTI-VOX
PHONE
EXT
INT
XMTR PTT
RCVR ON-OFF
XMTR ON-OFF
CR 8000 IN 2484
-24 VDC
KEY
FAX
LINE 2
LINE 1
TIS
LSCA - REMOTE
J8005
FWD. POWER METER
REFL POWER METER
MAIN POWER ON IND
OVLD IND
H.V. ON IND.
METER RELAY CONT
ON AIR IND
FAULT IND
SWCA FAULT IND
READY IND
BIT 1
BIT 2
BIT 3
BIT 4
GRD
SWCA READY IND
L8100 - L8135
L8200 - L8235 10µH
C8100 - C8117
C8200 - C8217 510µµF
197,198,200,201,202,232,235
185,186,187,190,191,192,193,194,195,196
174,175,176,177, 178,180,181,182,183,184
19,69,72,73,111,112,127,136,171,172,173
148,168,178,
199,216,218,223
CA1266
215,217
211,212,213,214
205,206,209,210
80,166,167,169,170
218,215,214,213,212,211
210,206,205,202,201
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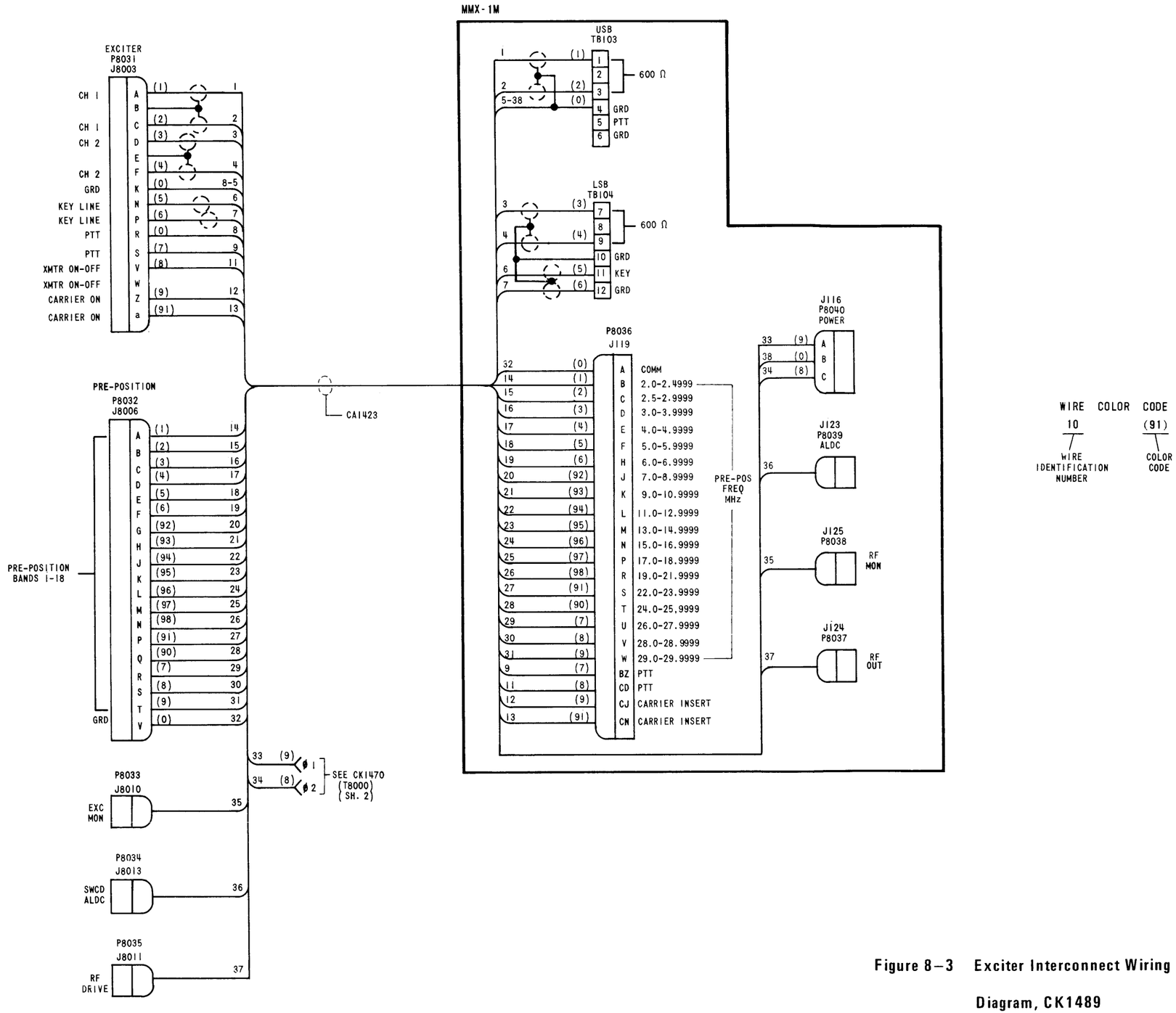
221,222
207,208,219,220
157,188,189,203,2
78,82,85,97,155,1



WIRE COLOR CODE

10 — WIRE IDENTIFICATION NUMBER

(91) — COLOR CODE

Figure 8–3 Exciter Interconnect Wiring Diagram, CK1489