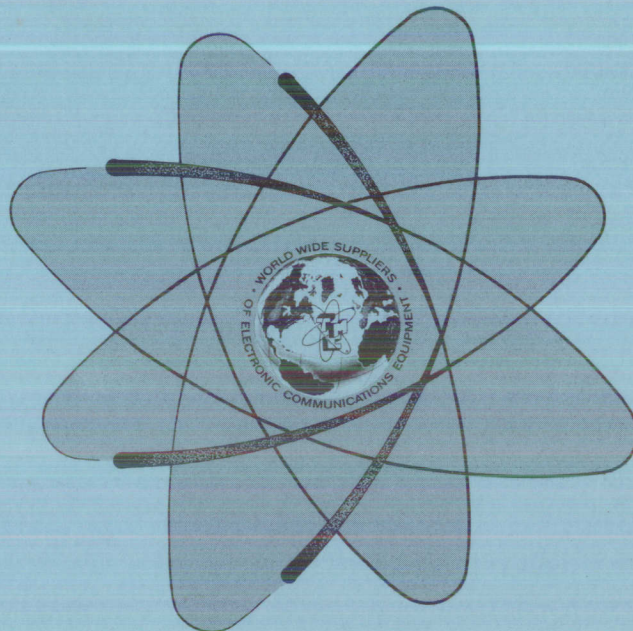


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TECHNICAL MANUAL
for

**COASTAL HARBOR RADIO TRANSMITTING
SYSTEM MODEL SYM 1204
for
RADIO STATION KFX**



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

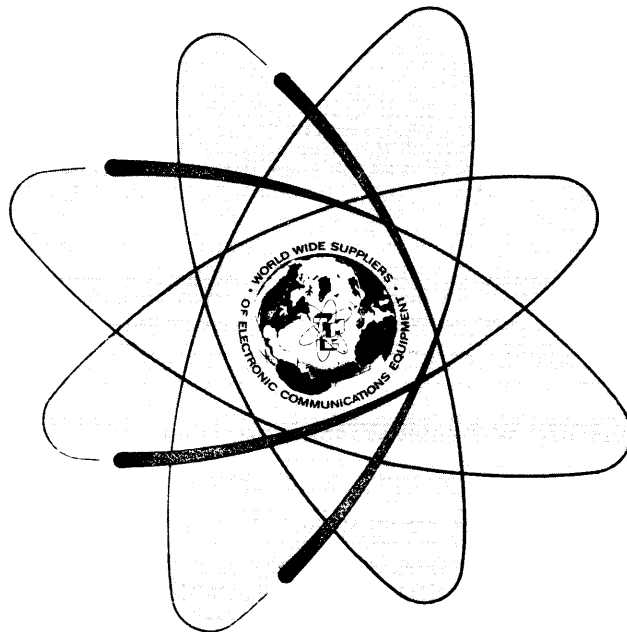
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TECHNICAL MANUAL
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COASTAL HARBOR RADIO TRANSMITTING
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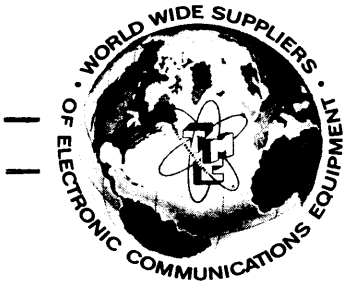
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THE TECHNICAL MATERIEL CORPORATION

C O M M U N I C A T I O N S E N G I N E E R S

700 FENIMORE ROAD

MAMARONECK, N. Y.

W a r r a n t y

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

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

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

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

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

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

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

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

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

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

PROCEDURE FOR ORDERING REPLACEMENT PARTS

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

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

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

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

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

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

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SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION

This manual presents system instructions for Radio Transmitting System Model SYM-1204. Included are general descriptions of the equipment, installation and operating procedures; principles of operation and troubleshooting data.

Radio Transmitting System, Model SYM-1204 (figure 1-1), hereinafter referred to as system, consists of three Sideband Strip Exciters Model STE-5A used in conjunction with three 500 watt Linear Amplifiers, Model PAL-500. The combination of Models STE-5A and PAL-500 is commonly known as the Model GPT-500YA Transmitter. Therefore, the System 1204 is essentially three complete 500 watt transmitting systems housed in two equipment racks. The exciters provide PTT A3H, PTT A3J and PTT A3A modes of emission. The Linear Power Amplifiers amplify the exciter output to provide 500 watts output at carrier frequencies of 2182.0 kHz, 2598 kHz and 2442 kHz. Additionally, the SYM-1204 includes three Transmitter Power Monitors Model TPM-1K that indicate the peak power output of each transmitter within the system.

Table 1-1 lists the system components in figure 1-1.

TABLE 1-1. COMPONENTS OF RADIO SYSTEM SYM-1204

<u>Nomenclature</u>	<u>Common Name</u>
TPM-1K	Transmitter Power Monitor
RFE-1	Linear Amplifier
STE-5A S	Sideband Strip Exciter
PSP-500	Power Supply
QDP-7A1X8	Patch Panel

1-2. PHYSICAL DESCRIPTION

As shown in figure 1-1, the system consists of two equipment cabinets 73-7/8 inches high by 46 inches wide by 22-1/2 inches deep, which houses all the components which comprise the SYM-1204. Primary power connections are made at the AC strip, located in the rear of the equipment cabinet. RF power is routed through Low Pass filter LPF-750-3 to transmitter Power Monitor and re-routed to patch panel QDP-7A1X8, located in the front of the equipment cabinet. The GPT-500YA components (STE-5A and PAL-500) are slide mounted into the equipment cabinet for easy access and maintenance purposes.

1-3. REFERENCE DATA

The Transmitting System, Model SYM-1204 consists of three model GPT-500YA Transmitters which are FCC type accepted under part 81 and is type approved by the Department of Transport in Canada, refer to the Technical Manual for the GPT-500YA for technical specifications.

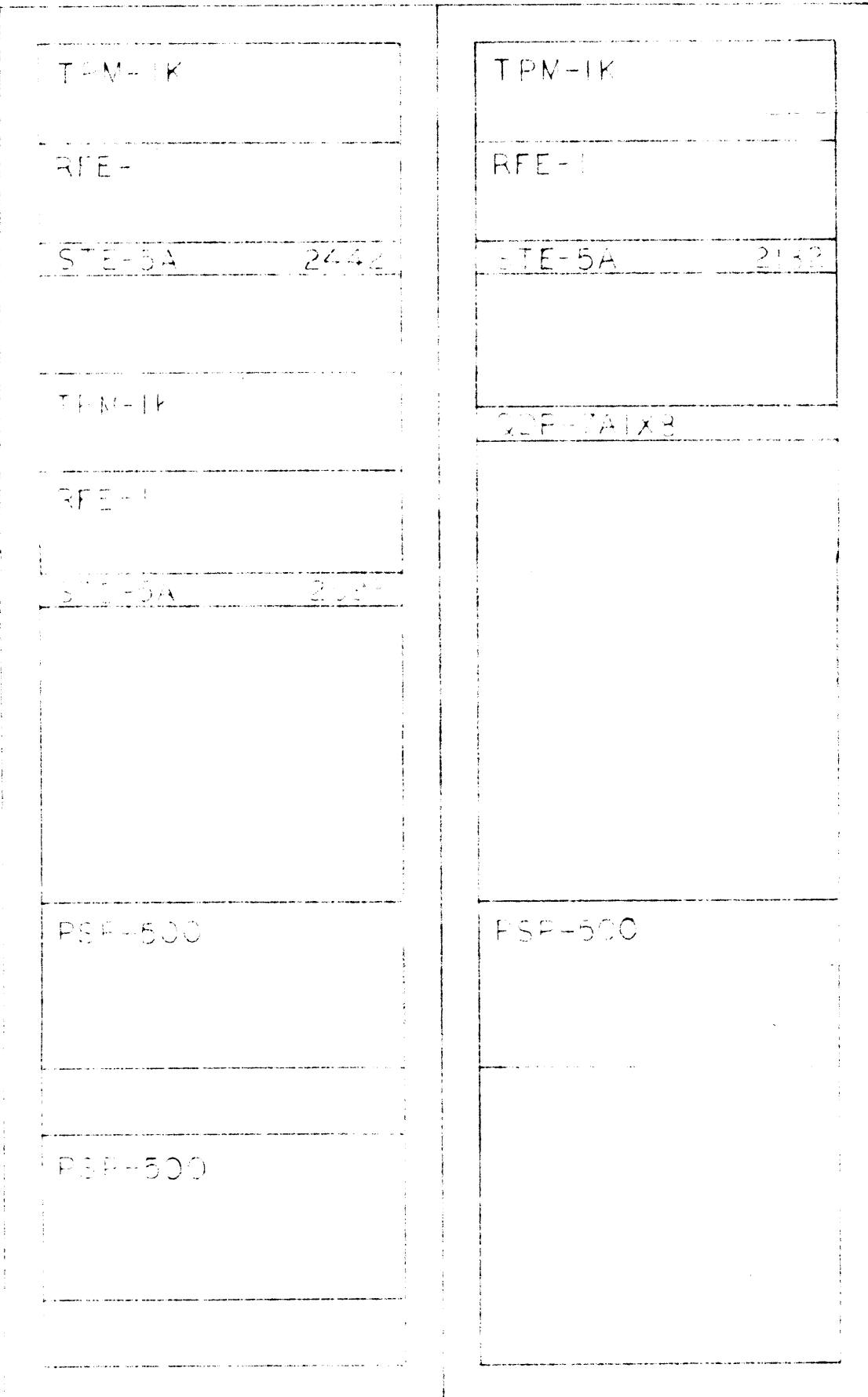
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REF. AIR & POWER ACCESS THROUGH BOTTOM OF RACKS.

SYM 1204		
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COASTAL HARBOR RADIO TRANSMITTING SYSTEM
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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES		FINAL APPROVAL	DATE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK Figure 1-1 Component Location Drawing
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SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING

The SYM-1204 Transmitter System is shipped in boxes as shown by (figures 2-1 and 2-2). The box number is stenciled on the outside of each box and the contents are listed on the packing list. Inspect all boxes 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 contents of each box for possible damage and inspect the packing material for parts that may have been shipped as loose items.

2-2. POWER REQUIREMENTS

All units of the System leave the factory wired for 115 volt, 50/60 cycle, single phase line voltage unless ordered otherwise. Power consumption of the system is approximately 3450 watts (1150 watts for each GPT-500); power cabling of sufficient size to provide 30 amperes at 115 volts ac, single phase, is adequate.

2-3. INSTALLATION

a. Location of Transmitter - Before attempting to install the SYM-1204 ensure that adequate power (paragraph 2-2) is available at the selected site or location. Refer to outline dimensional drawing figure 2-3 when choosing the operating location. The room (or van) in which the transmitter is located must have a ceiling height of at least 7 feet. Adequate ventilation must be provided; operation of the transmitter in a poorly ventilated room will cause the surrounding temperature to become too high. Also, a clearance of about two feet at the rear of the rack is needed for opening the door.

After unpacking and inspecting the cabinet, place it in its operating location. It is advisable to do this while modular units are not installed because the added weight of the assembled transmitter will make movement more difficult. The four holes in the top of the rack and the four eyebolts included as loose parts in the shipment are for moving the rack with a crane hoist. Holes in the base are for rigid-mounting or shock mounting the rack to the floor. Holes along the top of the rear wall are for the top shock mounts. Use these holes as a template for drilling holes in the shelter or van.

NOTE

When equipment is to be shockmounted, a shockmounting kit and separate installation instructions are supplied.

b. Installation of Modular Units - Refer to figure 1-1 for information regarding cabinet location of all modular units.

All modular units are slide mounted except for Patch Panel QDP-7A1X8, and Transmitter Power Monitor TPM-1K. To install any slide-mounted unit in its compartment refer to figure 2-4 and proceed as follows:

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

(2) Pull center section of associated compartment track out until it locks in an extended position.

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

(4) Start at the bottom and proceed up to prevent the rack from tipping over.

(5) Make the necessary cable and electrical connections as described in paragraph 2-3c. To prevent the cables extending from modular units from snagging, utilize the reel-mounted springs located inside the rack.

(6) Depress release buttons and slide modular unit completely into compartment.

(7) Secure front panel of modular unit to the rack with screws.

c. Interconnection of Modular Units - Figure 2-5 illustrates the cabling and wiring interconnection between the various modular units contained in the system. Refer to figure 2-5 and connect modular units as indicated.

d. Initial Adjustments - The SYM-1204 has been factory tested and adjusted before disassembly for crating. No initial adjustments of chassis mounted variable components are necessary before operation.

e. External Connections to SYM-1204

(1) Primary AC Input Connections - There are three AC input leads (black, white and green) located at the bottom end of the AC strip in the rear of each equipment cabinet. Connect the green lead to ground, black and white leads to primary AC input.

NOTE

Cable entry holes are provided at the bottom of the equipment cabinet for 600 ohm audio lines, remote emission mode select and RF Output. Determine required length and route cables through cable entry holes and connect as indicated below.

(2) Audio Input Connections - Provide three separate 600 ohm lines (shielded pairs) one audio line for each sideband exciter and connect lines to terminal board TB1501 terminals 1, 2, 3 located on the rear of each STE-5A exciter unit. Terminals 1, 2 and 3 on TB1501 are the 600 ohm balanced audio input terminals.

(3) Remote Mode Selection - Remote mode selection is accomplished in the STE-5A exciters when external connections are made to terminal board TB1501. The external connections are merely contact closures and may be completed via switches or pushbuttons. The remote mode connections are as follows:

for A3H operation short TB1501 7 to 5
for A3A operation short TB1501 7 to 6
for A3J operation short TB1501 7 to 12

(4) External RF Output and Hi VSWR Indication - Power Monitor TPM-1K provides contact closure for an indicating device when the transmitted power is at a pre-determined output level and when the VSWR is at a pre-determined high level. Connect RF indicator lines to TB1 terminals (2) (3) (4) on rear of TPM-1K unit. Connect SWR indicator lines to TB1 terminals (7) (8) (9).

(5) RF Power Output Connection - Transmitter RF power is routed from each Linear amplifier through separate low pass filters and separate Power Monitors and terminated at patch panel QDP-7A1X8. Antenna connections for each transmitter within the system consists of connecting the transmission line to the appropriate connector on the patch panel.

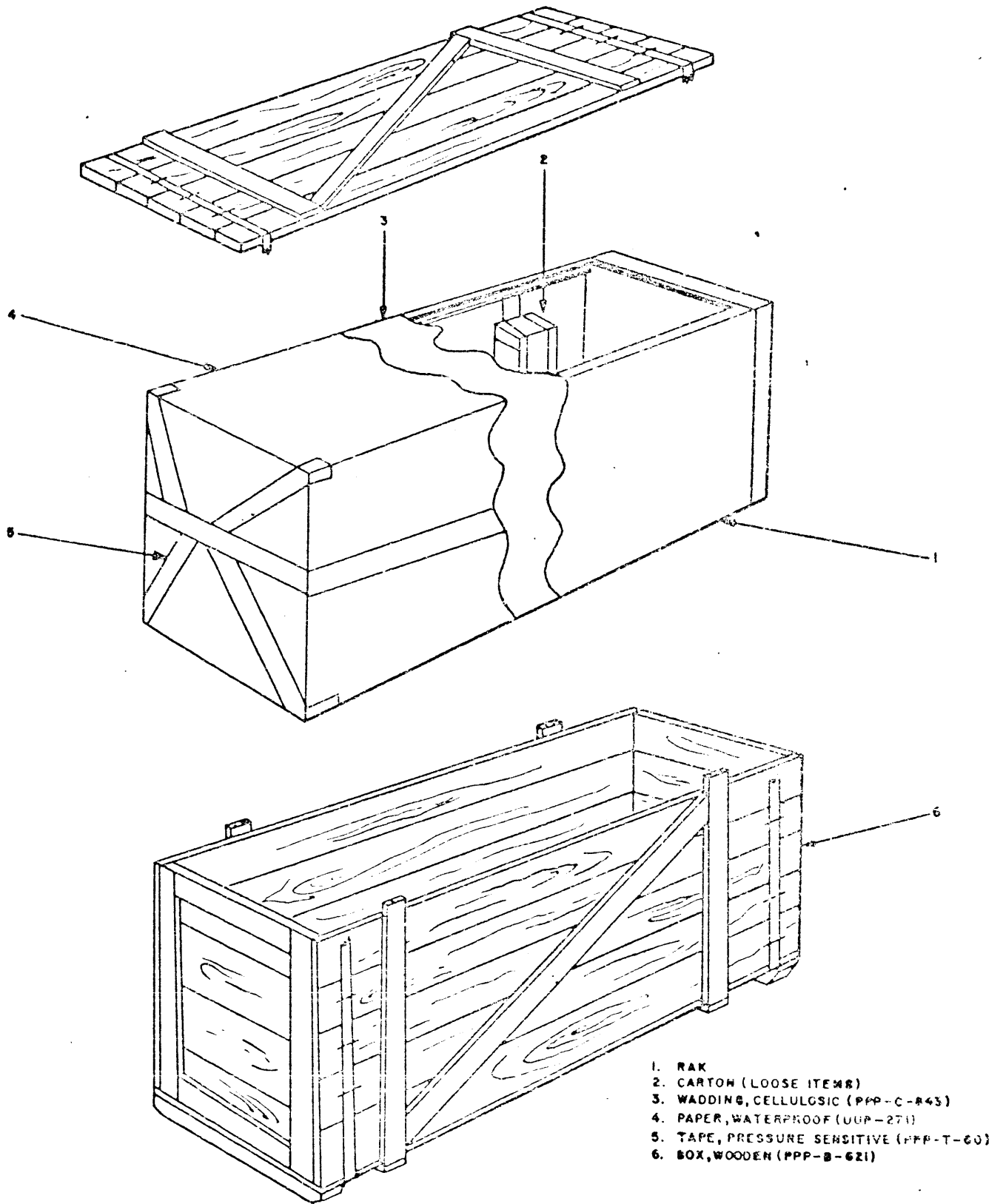
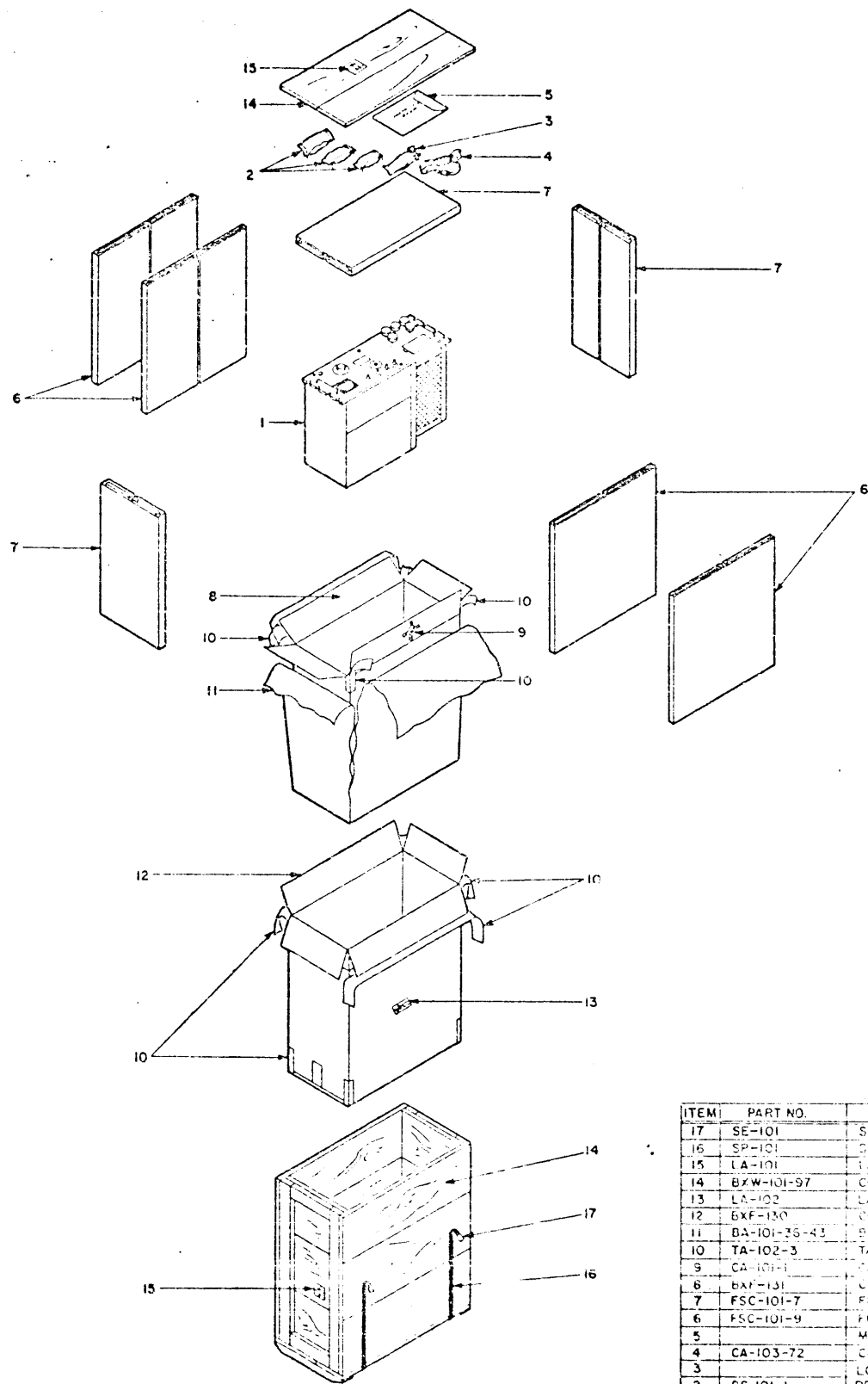


Figure 2-1. Rack, Preparation for Shipment



ITEM	PART NO.	DESCRIPTION
17	SE-101	SEALS, STRAPPING
16	SP-101	STRAPPING, STEEL
15	LA-101	LABEL, FRAGILE
14	BXW-101-97	CONTAINER, SHIPPING
13	LA-102	CAF, METHOD II
12	BXF-130	CONTAINER, OUTER
11	BA-101-35-43	BAG, BARRIER
10	TA-102-3	TAPE, PRESSURE SENSITIVE
9	CA-101-F	CARD, HUMIDITY INDICATOR
6	BXF-131	CONTAINER
7	FSC-101-7	FIBERBOARD SHEET, CREASED
6	FSC-101-9	FIBERBOARD SHEET, CREASED
5		MANUALS, INSTRUCTION
4	CA-103-72	CORD, LINE
3		LOOSE ITEMS
2	DS-101-1	DESICCANT, 16 UNIT
1		MODULAR UNIT

Figure 2-2. Modular Units, Preparation for Shipment Typical

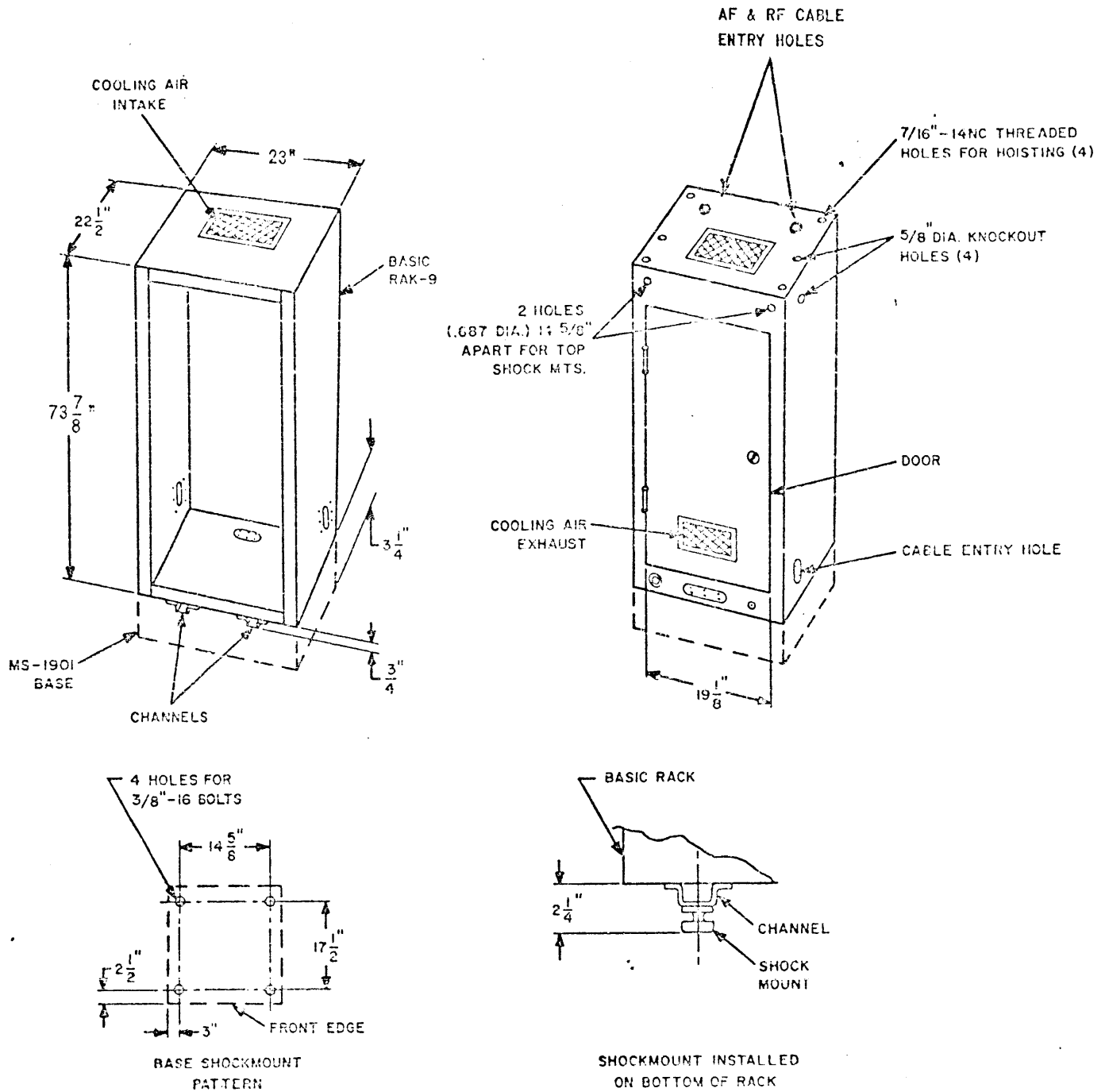
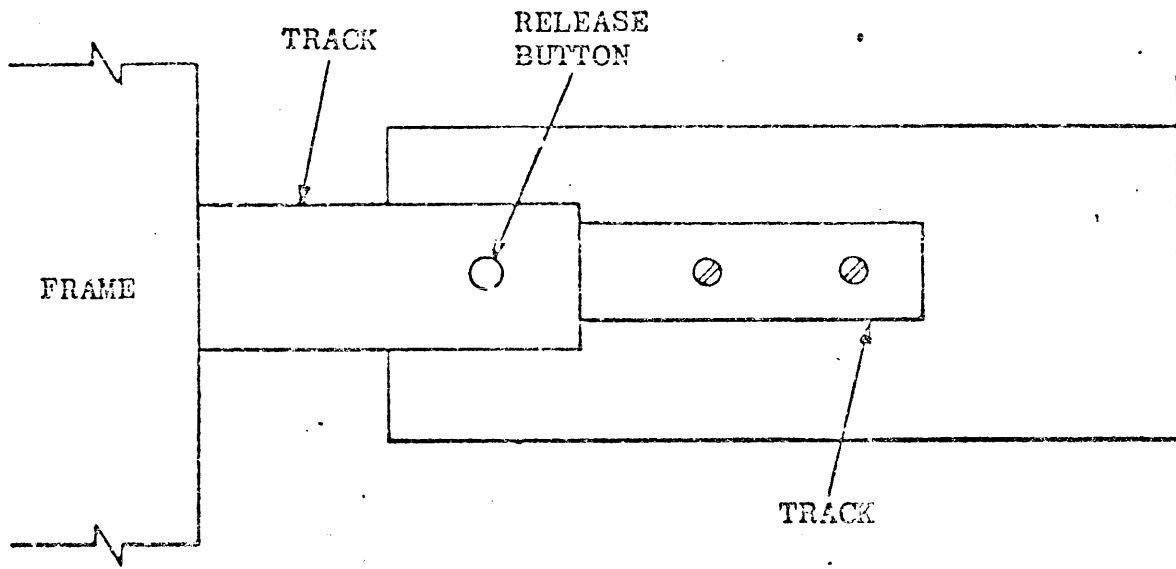
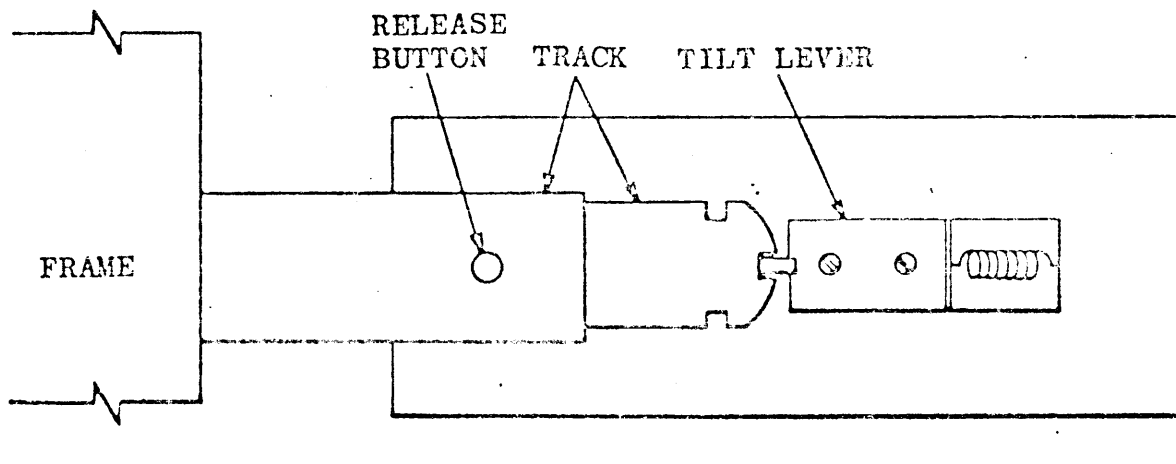


Figure 2-3. Outline Dimensional and Installation Drawing



NON-TILT CHASSIS SLIDE



TILT CHASSIS SLIDE

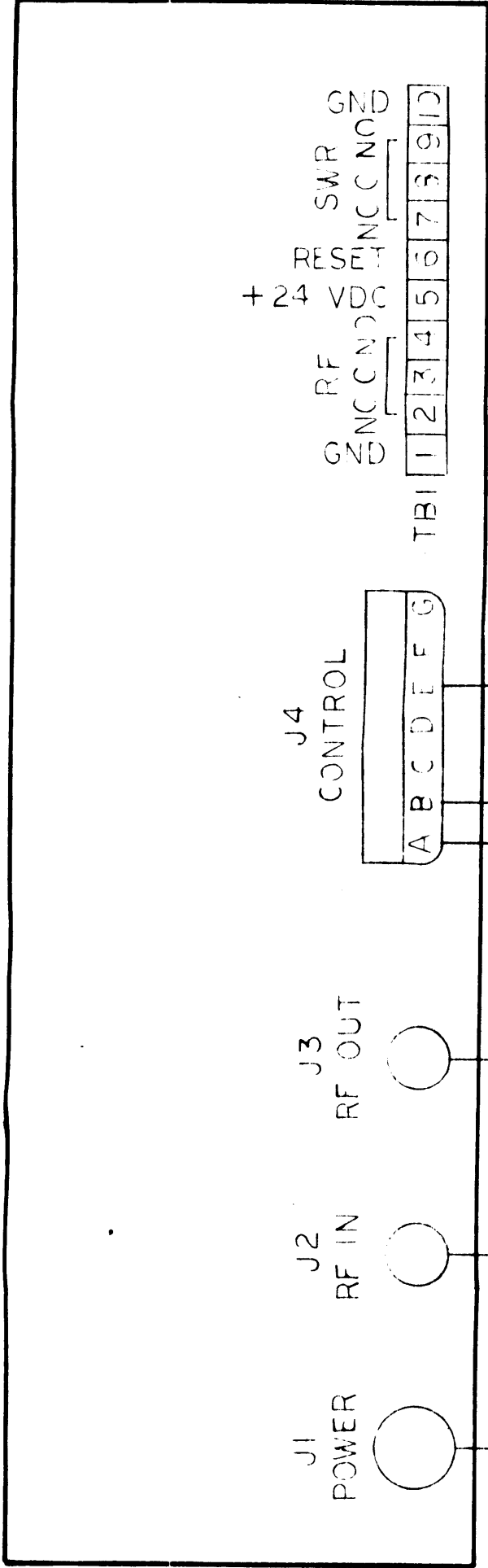
Figure 2-4. Slide-Mounting Details

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TPM-1K



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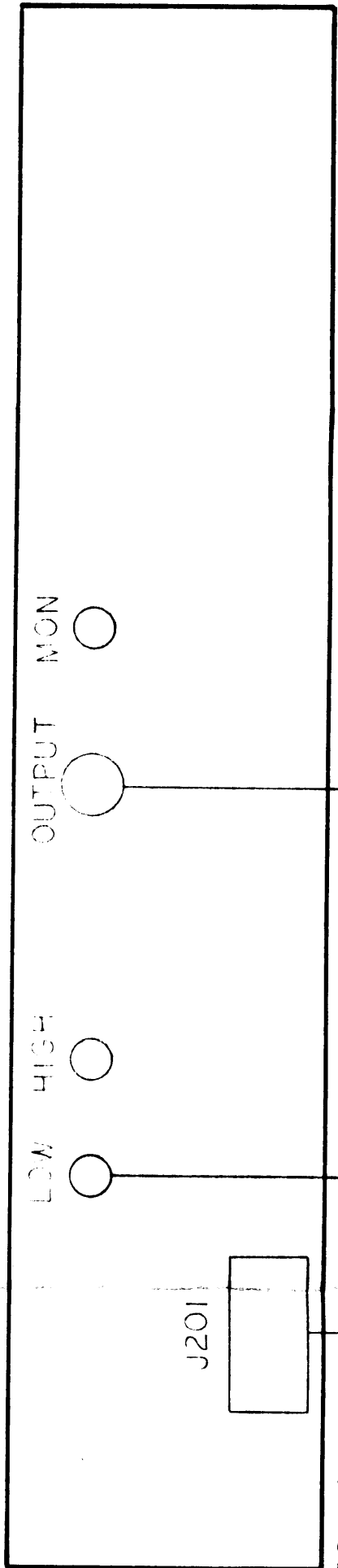


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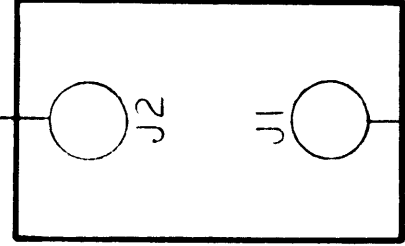


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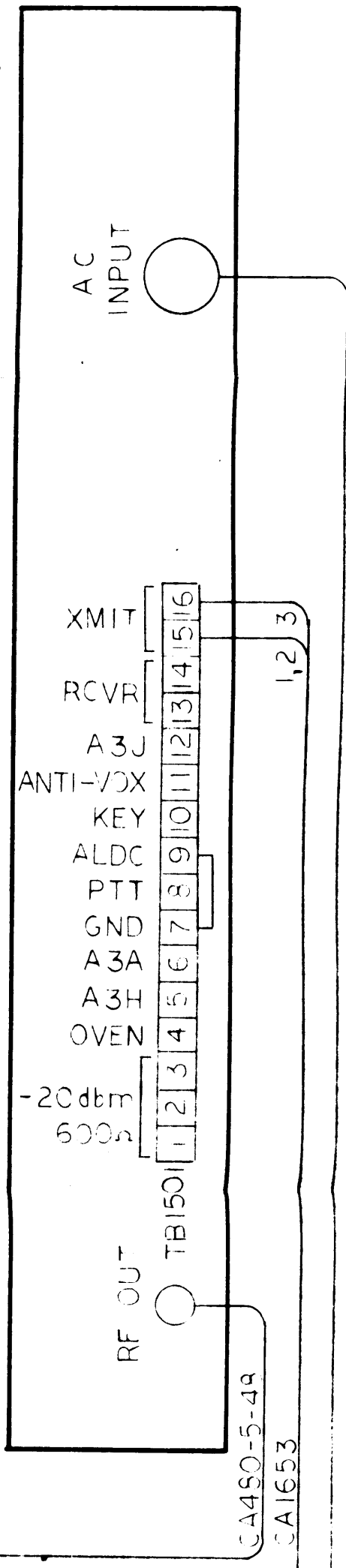
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CA480-01-

LPF-750-3



STE-5A



CA480-5-49

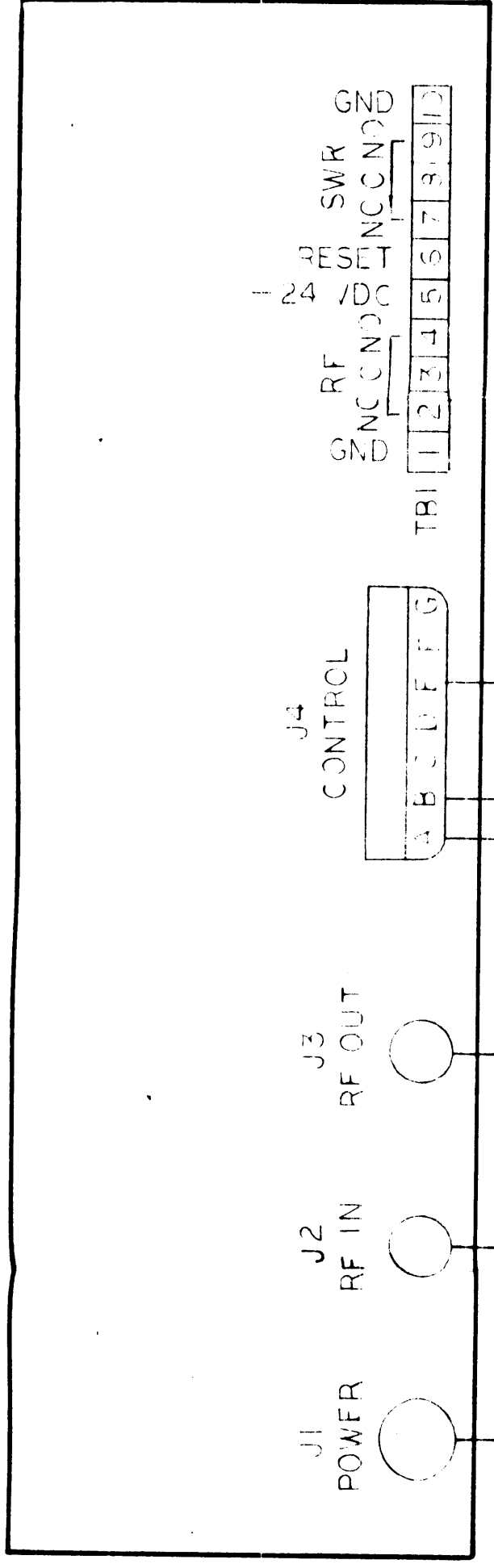
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TPM-1K

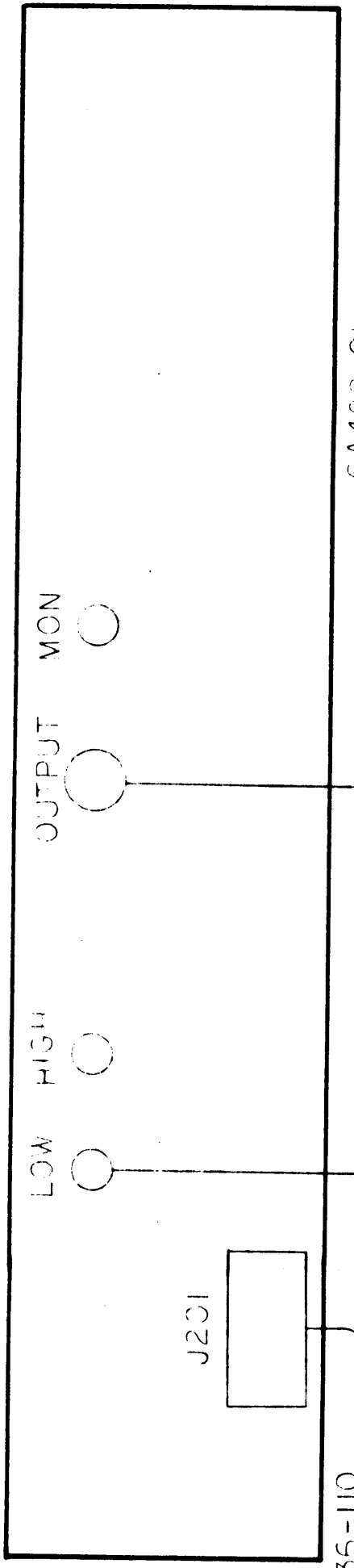
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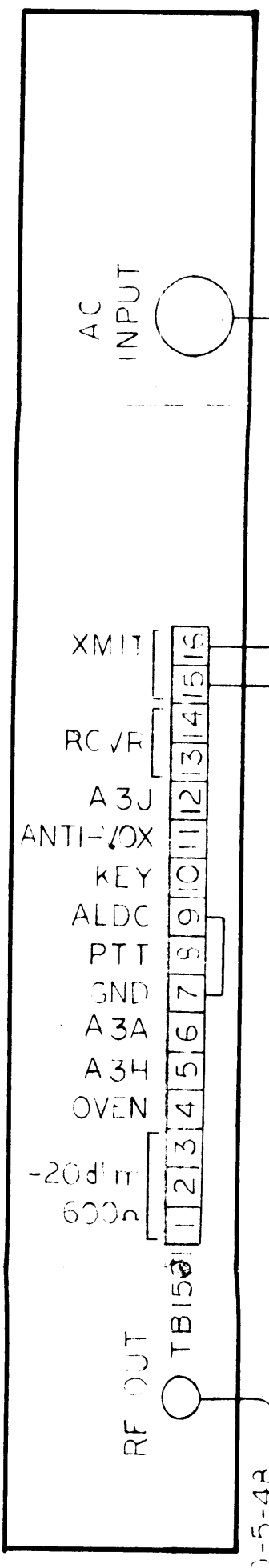
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STE-5A



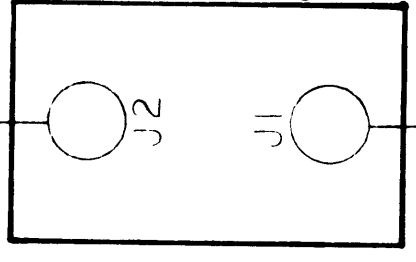
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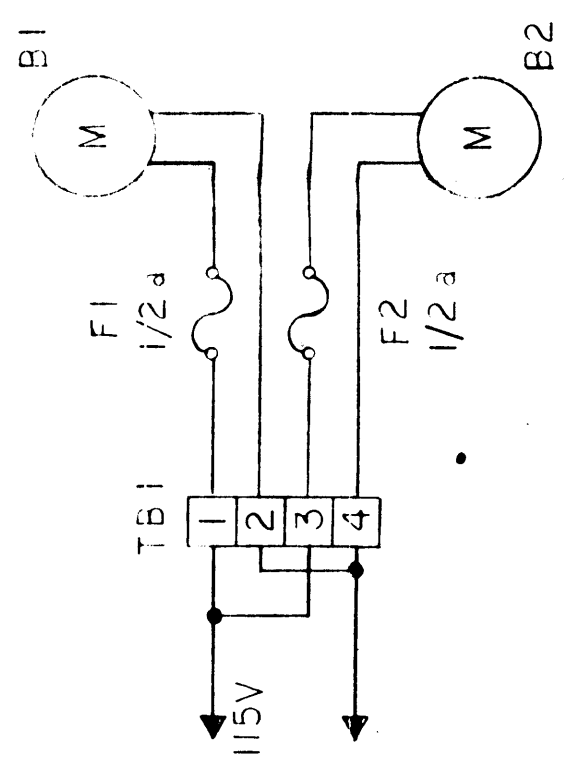
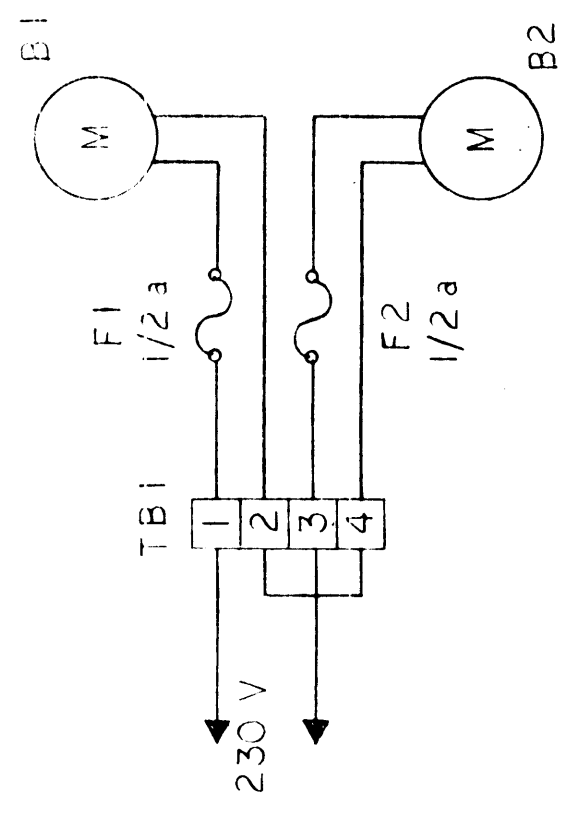
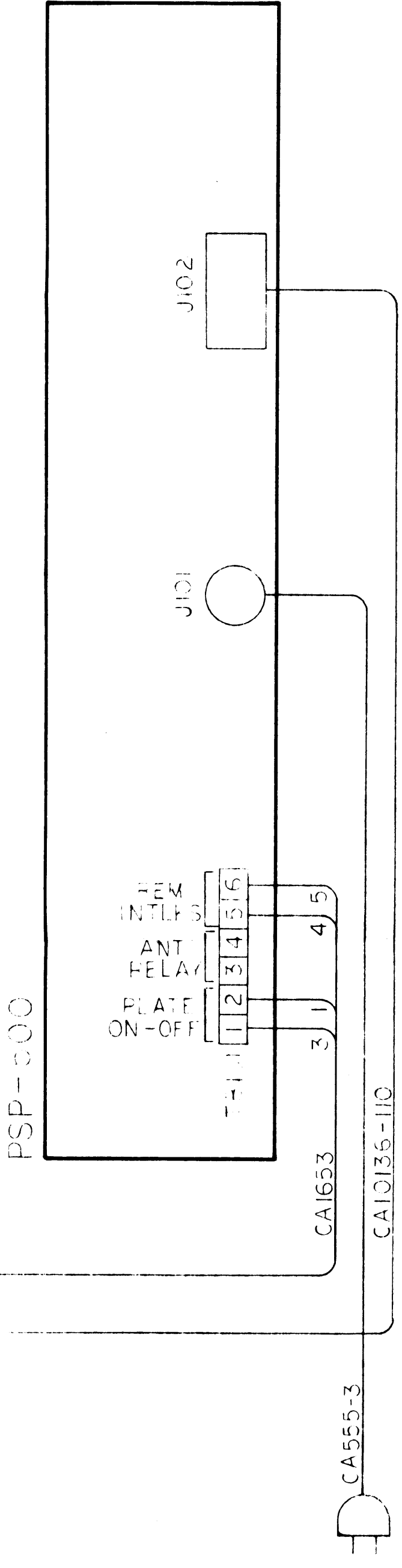
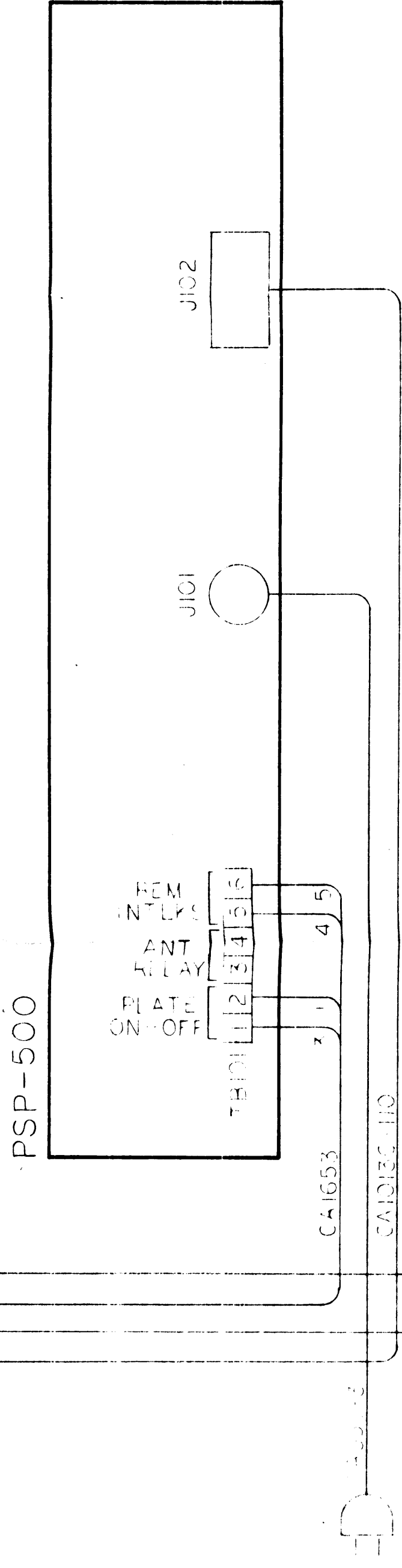


TO PATCH PANEL JACK NO. 2

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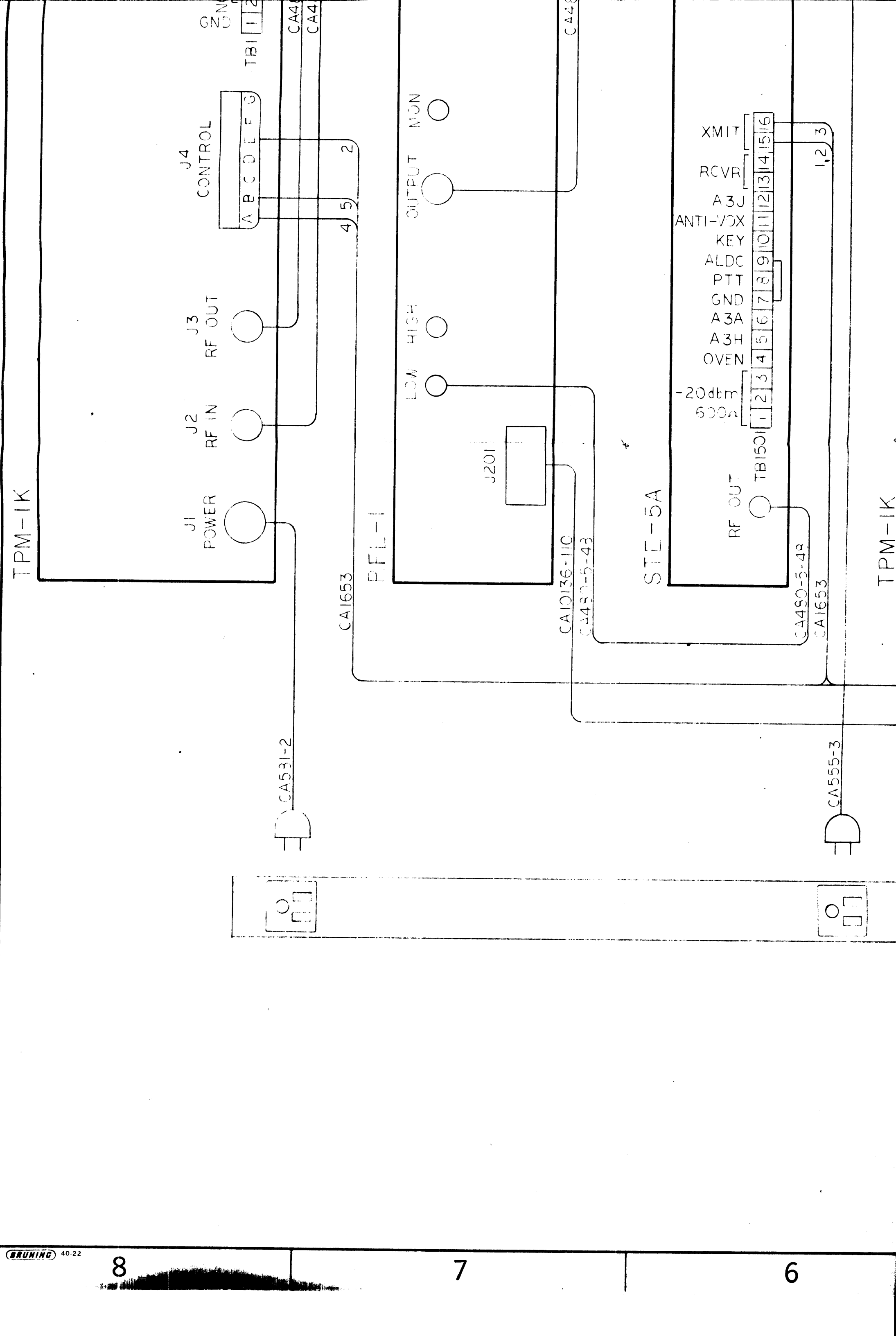
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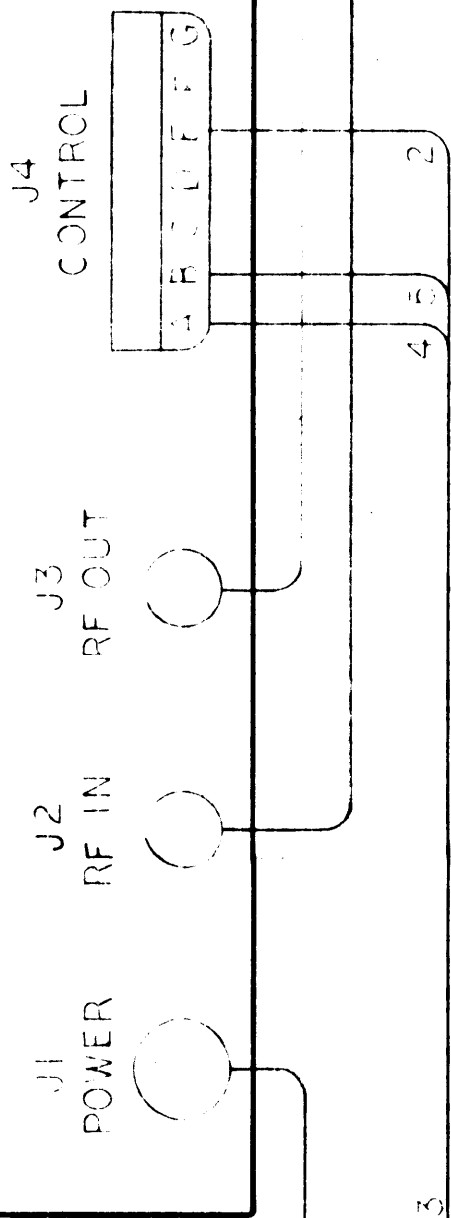
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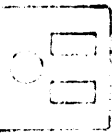
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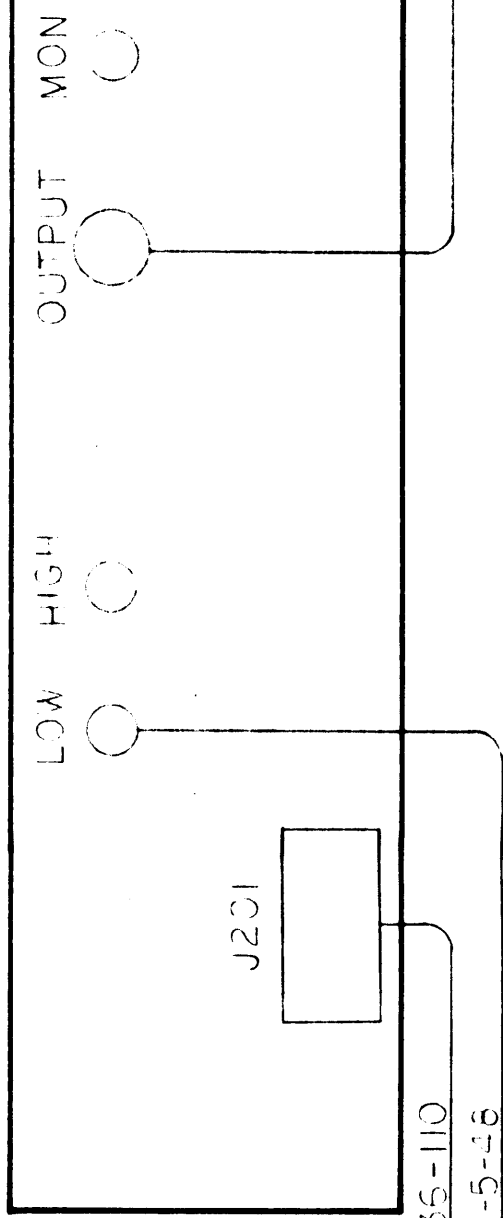
TPM-1K



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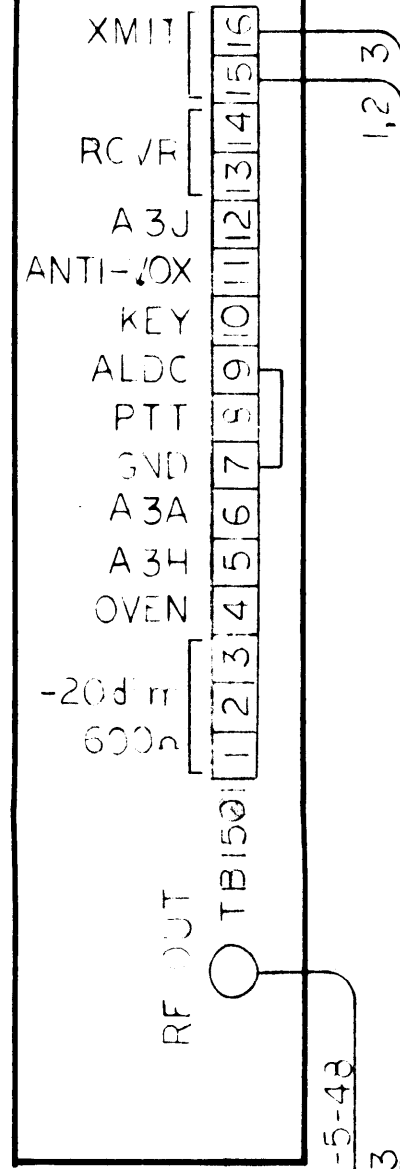


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STE-5A



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PSP-500

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APPLICATION			
	CODE		

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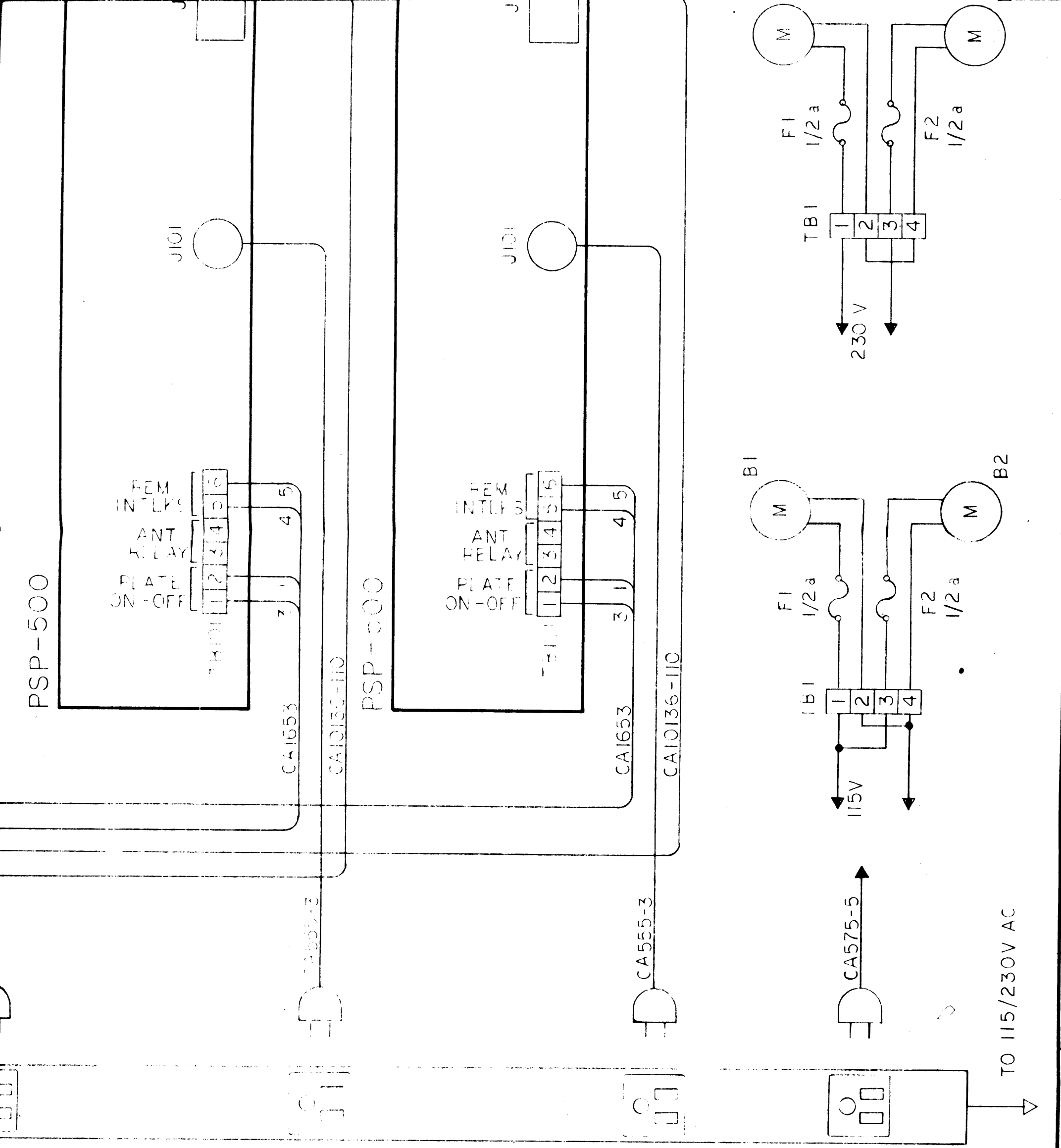
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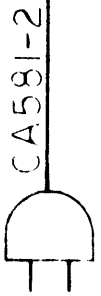
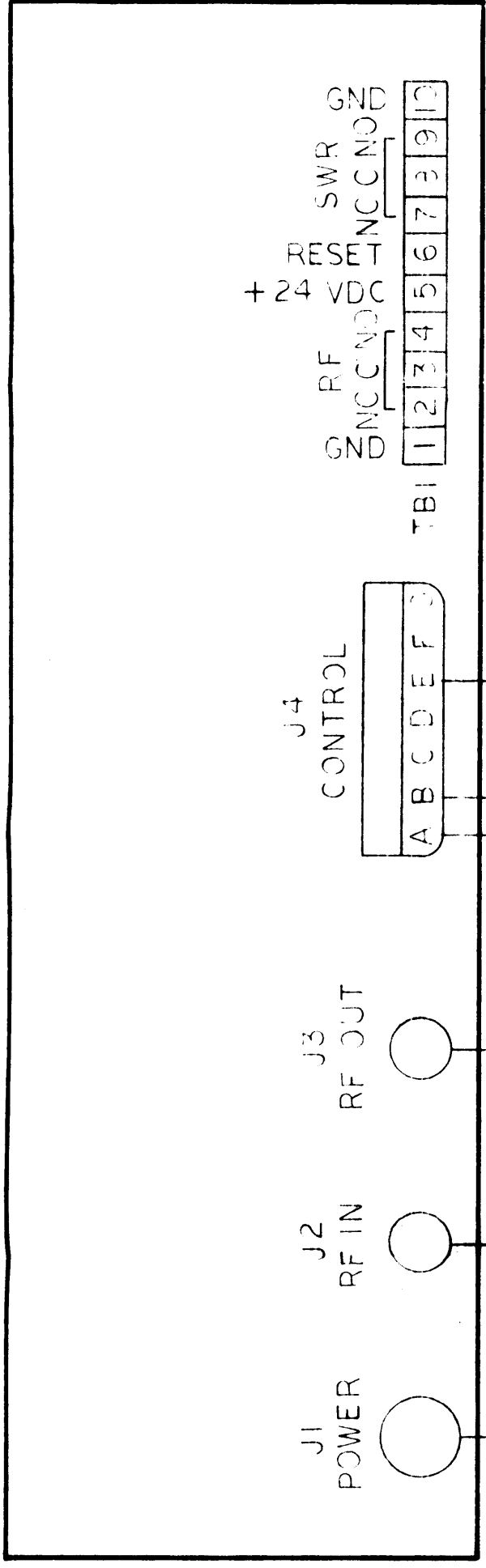
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Figure 2-5
Wiring Diagram
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 A
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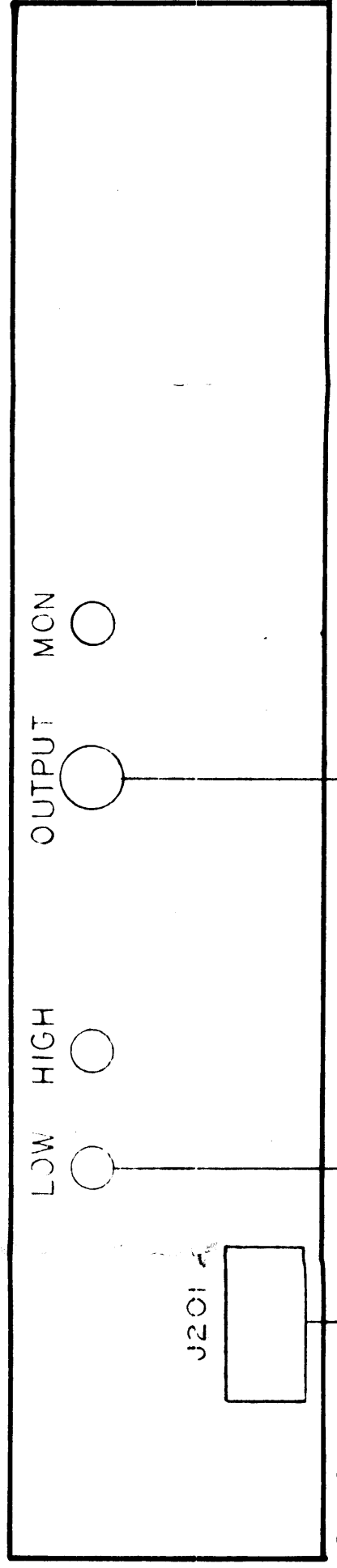
B C D

TPM-1K



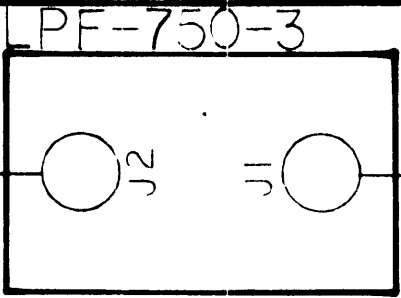
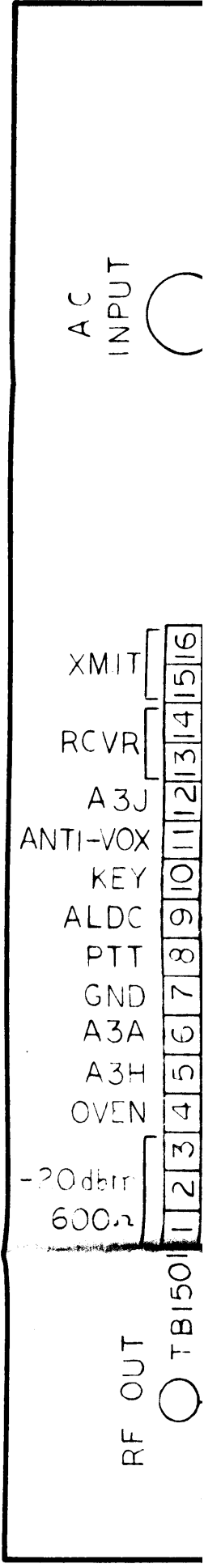
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RFE-1



CA10136-110
CA480-5-48

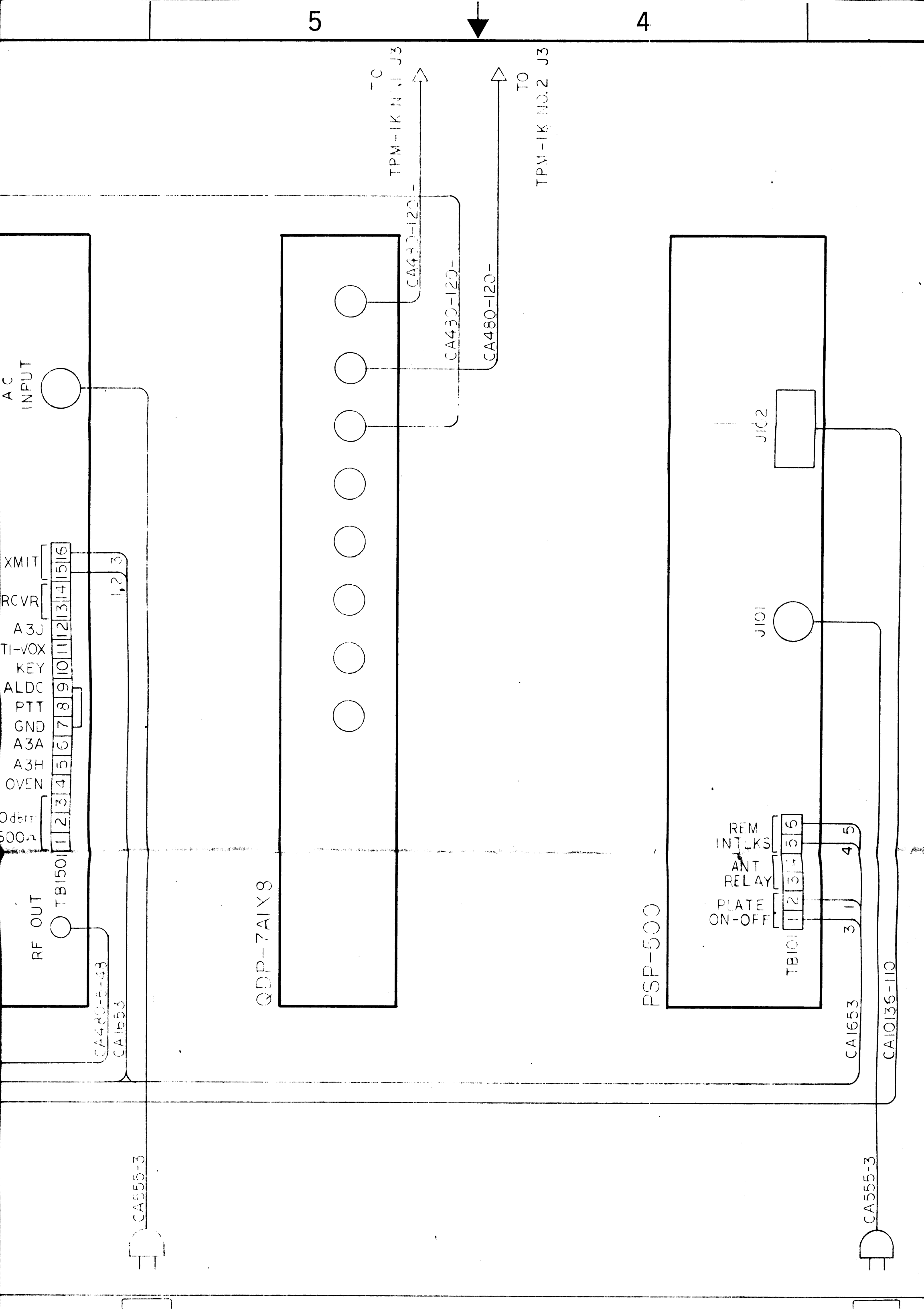
STE-5A



8

7

6



5

4

AC INPUT

XMIT

RCVR

A3J

TI-VOX

KEY

ALDC

PTT

GND

A3A

A3H

OVEN

Odetr

500.2

RF OUT

QDP-7A1X8

PDP-500

REM INT LKS
ANT RELAY
PLATE ON-OFF

J101

J102

TPM-1K N.1 J3

TPM-1K NO.2 J3

CA480-5-43

CA1553

CA430-120-

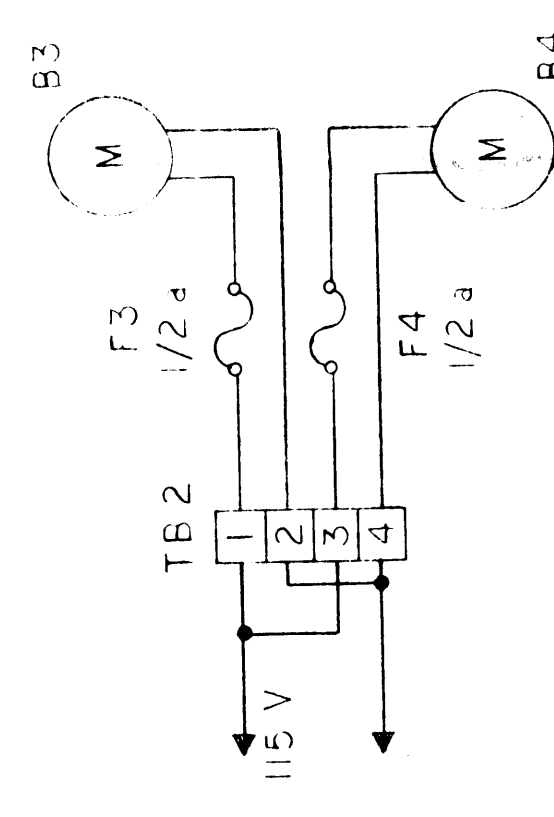
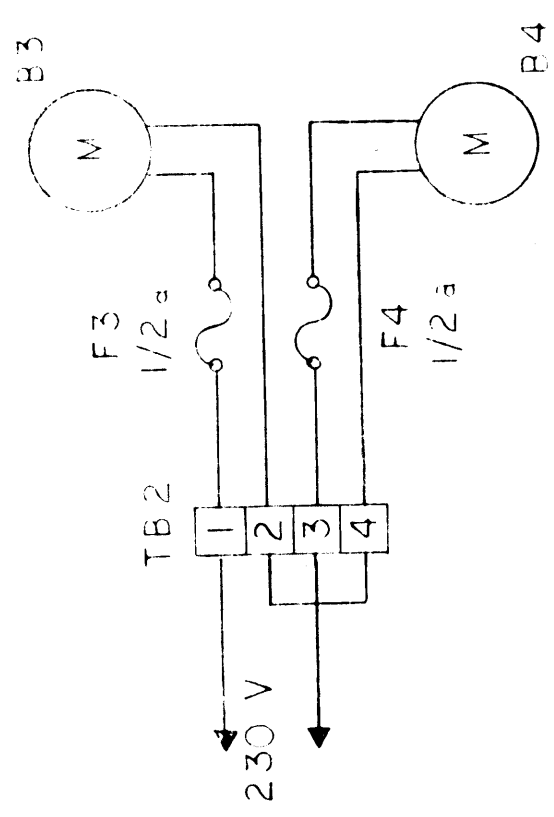
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CA480-120-

CA555-3

CA555-110

REVISIONS					DATE	APPROVED
E.M.N.NO	DRAFT	CHKD	ZONE	LTR	DESCRIPTION	
				2		11-1-71



30 V AC

D
C
B
2061XC

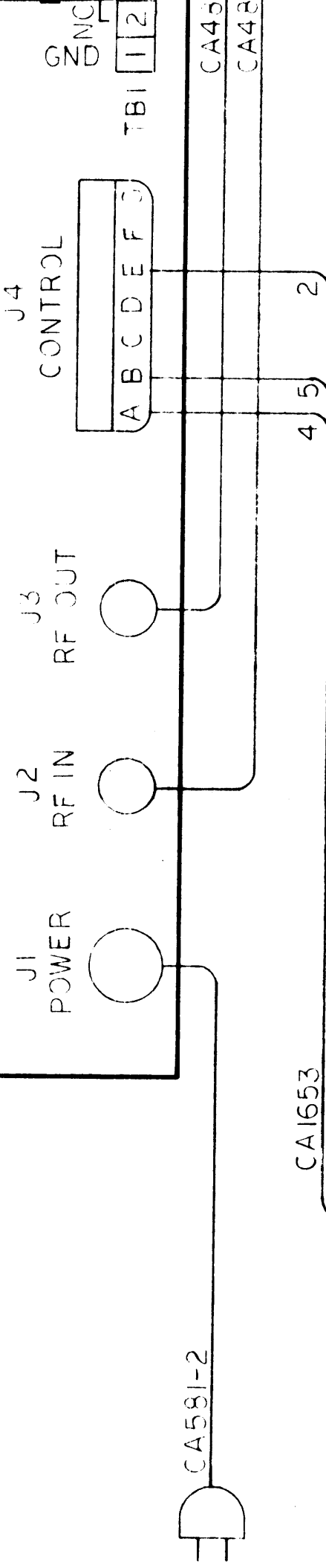
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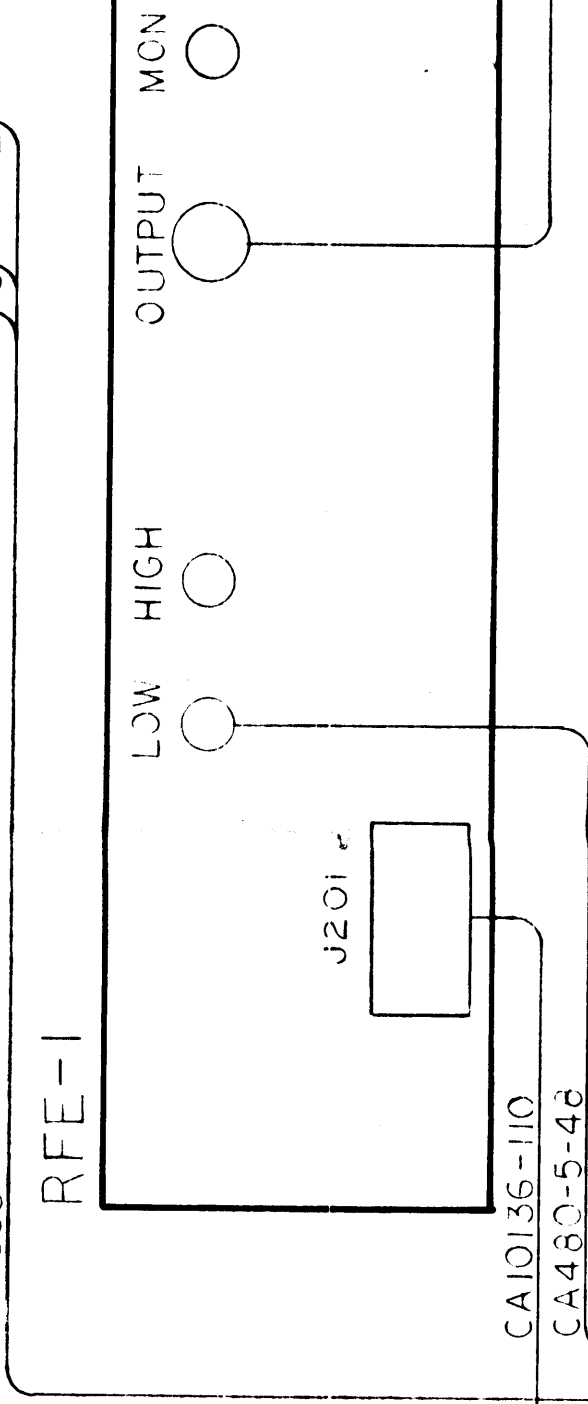
B

A

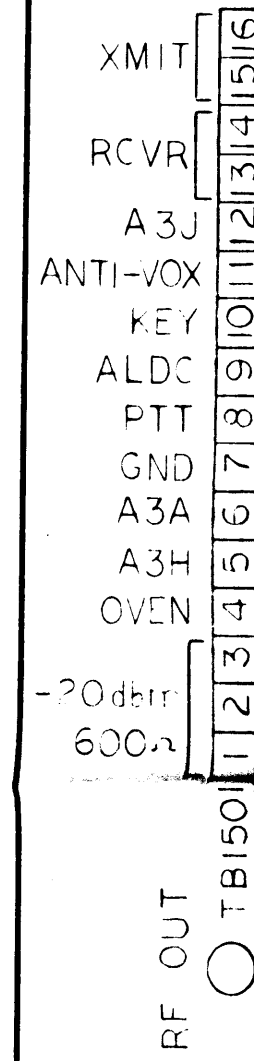
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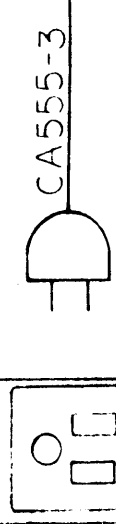
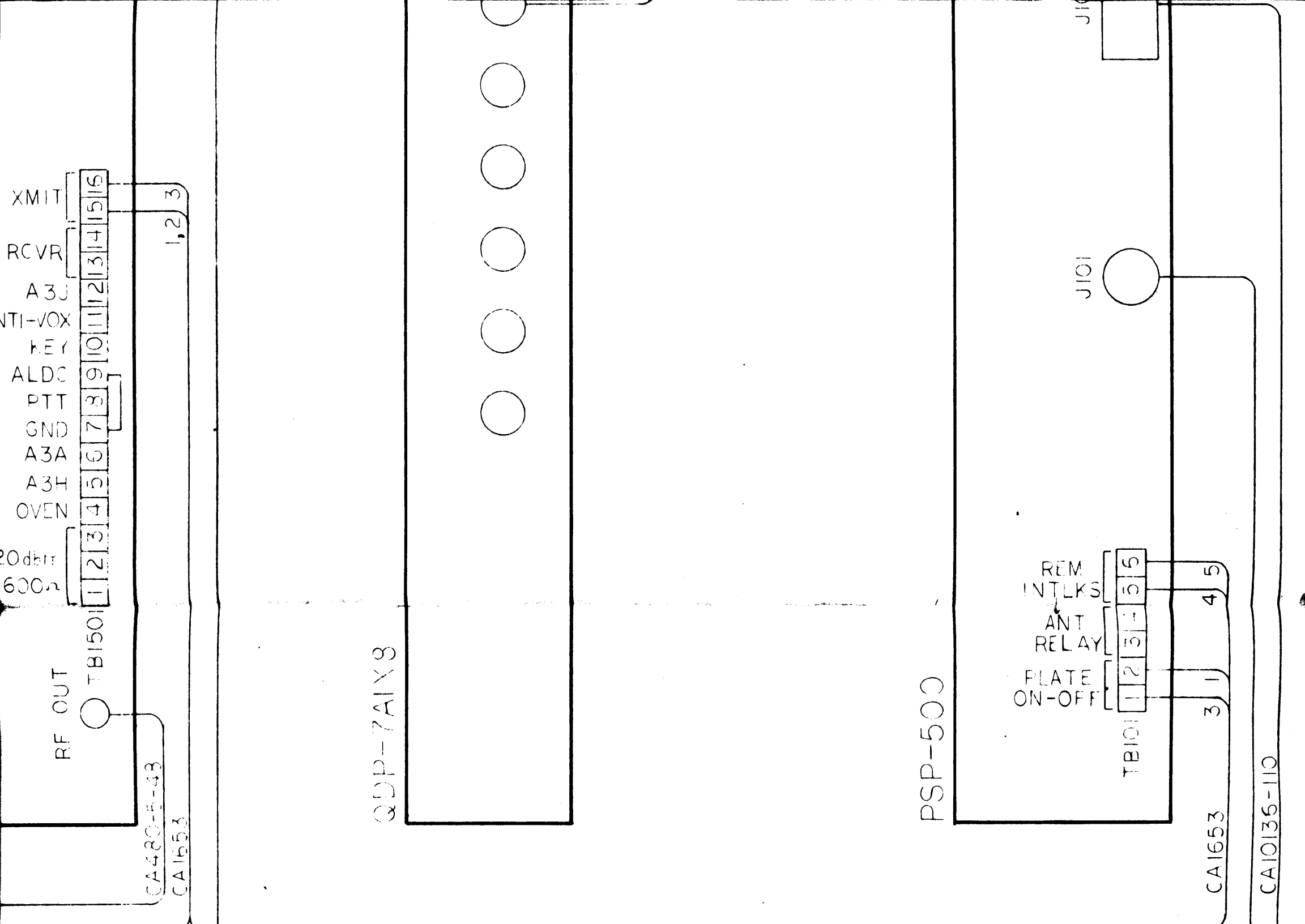


RFE-1



STE-5A





	SYM 1204	
QTY / UNIT	MODEL USED ON	ASS'Y NO.
APPLICATION		
	CODE	

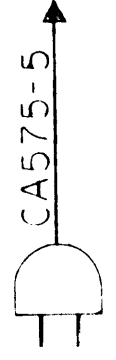
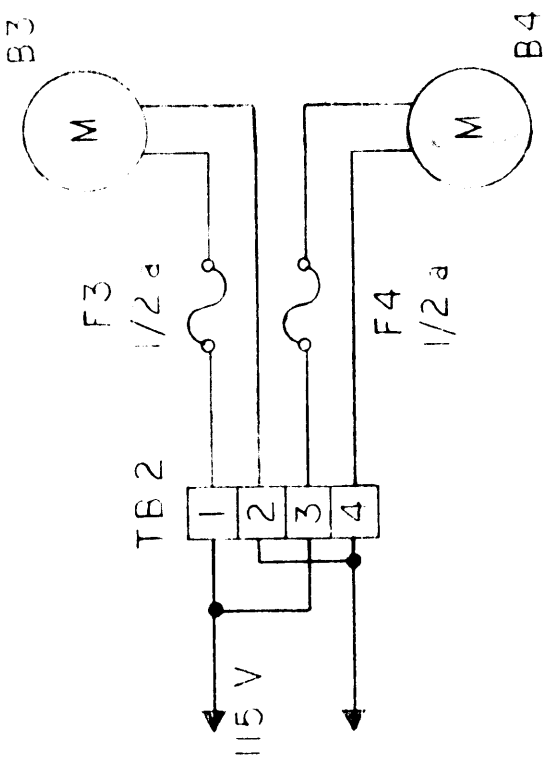
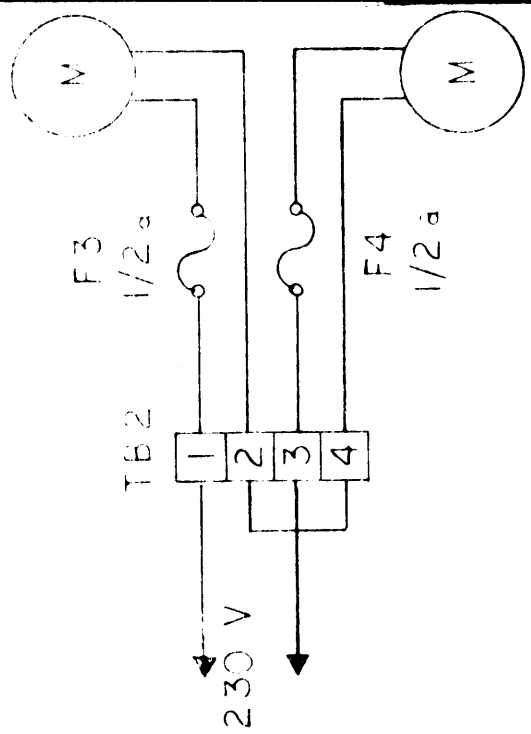
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4



CA555-3
CA10136-110



TO 115/230 V AC

C

B
CK1907

A

QTY. REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
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LIST OF MATERIAL

THE TECHNICAL MATERIEL CORP.
MAMARONECK, NEW YORK

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES

TOLERANCES ON	
DECIMALS	FRACTIONS
.X ± .05	± 1/64
.XX ± .01	ANGLES
.XXX ± .005	± 0° -30'

FINAL APPROVAL	DATE
MECH. DES.	DATE
ELECT. DES.	DATE
CHECKED	DATE
DRAWN	DATE

Figure 2-5
Wiring Diagram
(Sheet 2 of 2)

MATERIAL
FINISH

3

2

1

hereon.
or used
ORATION

SECTION 3

OPERATOR'S SECTION

3-1. GENERAL

The Radio Transmitting System, SYM-1204 is capable of supplying up to 500 watts PEP from each GPT-500YA transmitter within the SYM-1204 system for transmission on three separate unbalanced antennas or dummy load. The RF output may also be safely set to any power level below 500 watts PEP. The system RF output is controlled by the AF GAIN control on the exciter. Remote control provisions are provided for the following:

- a. VSWR overload reset.
- b. Indication of transmit power level (by using a set of contacts provided for each transmitter within the SYM-1204).
- c. Control of carrier (modes - A3A, A3H or A3J) with PTT.

3-2. CONTROLS AND INDICATORS

All controls and indicators for the system are located on the front panels of the modular unit except the HAND SET/LINE switch which is on the rear of the STE-5A. For a detailed description of these controls and their functions refer to the units technical manual.

3-3. OPERATING PROCEDURES

A. General - Detailed operating procedures for individual units may be found in the unit technical manuals. Before attempting to operate the system, the operator should become familiar with the controls and indicators of the individual units and the units capabilities.

To give the operator the sequence of system operation, a general operating procedure is given in paragraph B.

B. Starting Procedure:

1. Application of Primary Power to Transmitter System.
 - (a) Connect Power cables to AC input leads on each equipment cabinet.
 - (b) Set POWER SW on TPM-1K to ON.
2. Controls and Indicator Settings.
 - (a) Set AF GAIN control to OFF (disconnects power).
 - (b) Set MODE switch to AME and apply an audio tone to 600 ohm input of STE-5A exciter.

- (c) Set PTT/VOX switch to PTT.
- (d) Turn ANTI-VOX control maximum clockwise.
- (e) Turn VOX-GAIN control maximum counter clockwise.
- (f) H.V. LINE breaker to OFF.
- (g) TRANSMITTER PLATES switch to STANDBY/REMOTE.
- (h) Turn PA TUNING control to 0.
- (i) Turn PA LOADING control to 0.
- (j) Set MAIN LINE circuit breaker to ON.
- (k) Set DRIVER BAND switch to desired frequency range.
- (l) Set PA BAND switch to desired frequency range.
- (m) Set MULTIMETER switch to RF DR.
- (n) Activate push to talk and turn AF GAIN control clockwise slightly.
- (o) Set the TRANSMITTER PLATES switch to ON. (After 60 second time delay transmitter plate indicator will light.)
- (p) Adjust DRIVER TUNING for a peak on the MULTIMETER.

NOTE

Keep peaks below 20 when tuning the DRIVER by decreasing (ccw) the AF GAIN.

- (q) Reduce exciter AF GAIN maximum ccw.
- (r) Insure that an antenna or dummy load is connected to the output.
- (s) Set H.V. LINE circuit breaker ON.
- (t) Turn AF GAIN control slowly until the PA PLATE meter indicates approximately 300 ma.
- (u) Adjust PA TUNING control for a resonant dip on the PA PLATE meter.
- (v) Adjust the PA LOADING and TUNING controls for a dip in PA PLATE current indication and until the PA LOADING control causes no further increase in PA PLATE meter indication.
- (w) Increase the AF GAIN control until the TPM-1K FORWARD POWER meter indicates 400 watts.

NOTE

Transmitter Power Monitor TPM-1K is a peak reading power meter and is calibrated at the factory. Calibration procedure is outlined in section 5 of this manual. When it is necessary to adjust or check the TPM-1K refer to section 5.

CAUTION

Do not exceed 340 ma for a CW signal on PA PLATE meter and 380 ma for a two tone signal.

For other modes of operation and a more detailed operating procedure refer to the individual unit technical manuals.

C. Standby Procedure

1. Turn AF GAIN maximum CCW.
2. Set TRANSMITTER PLATES switch to STANDBY/REMOTE.
3. Set H.V. LINE breaker to OFF.

D. Remote Mode Selection (Terminal board TB1501 on STE-5A)

1. Set MODE switch to AME position.
2. Provide contact closure for desired mode of emission (via switch, pushbutton, etc.) as follows: for

PTT A3H short contacts 7 to 5 on TB1501
PTT A3A short contacts 7 to 6 on TB1501
PTT A3J short contacts 7 to 12 on TB1501



D

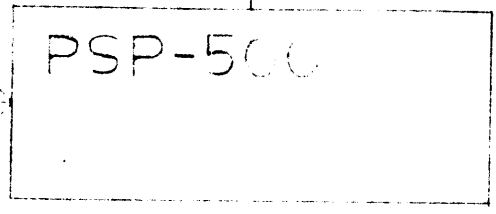
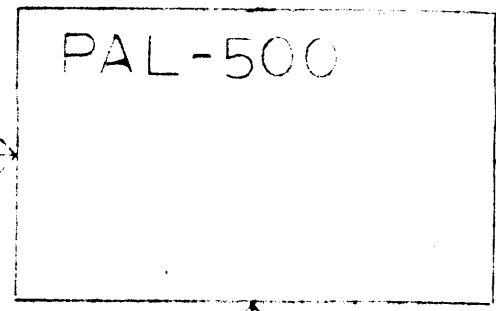
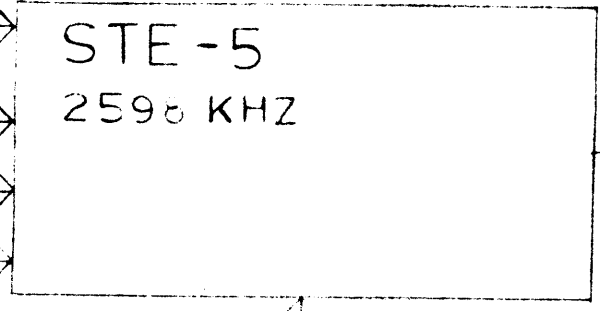
HI VSWR INDICATOR
RF INDICATOR

AUDIO 600Ω

A3H PTT

A3J PTT

A3A PTT



115V AC

C

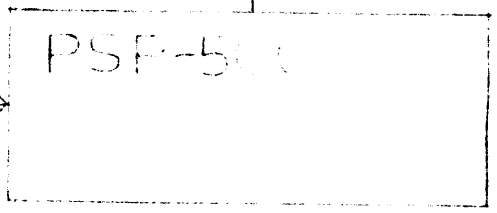
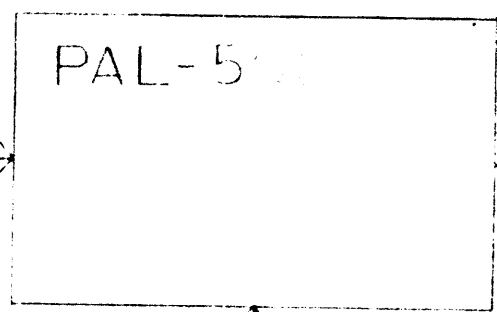
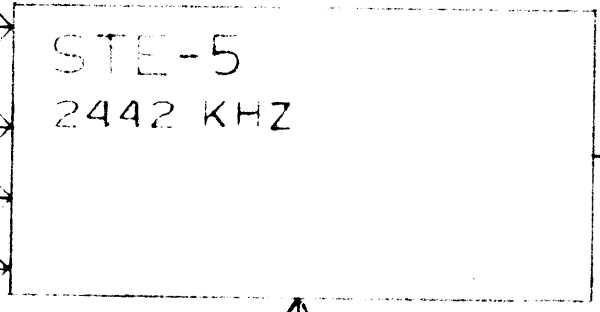
HI VSWR INDICATOR
RF INDICATOR

AUDIO 600Ω

A3H PTT

A3J PTT

A3A PTT



115V AC

B

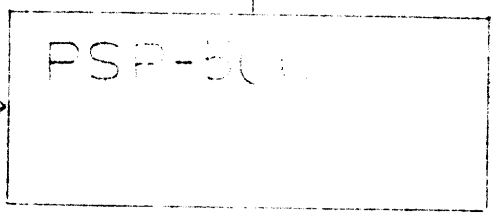
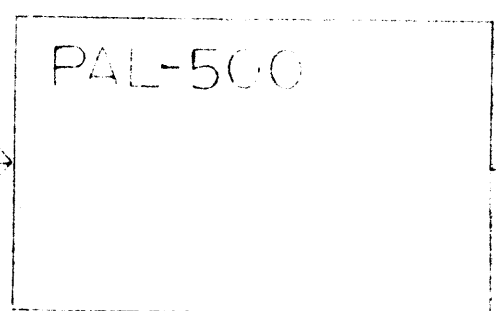
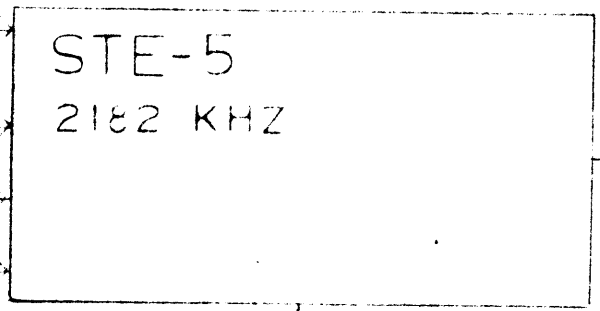
HI VSWR INDICATOR
RF INDICATOR

AUDIO 600Ω

A3H PTT

A3J PTT

A3A PTT



115V AC

COASTAL
K F
SO 5

NOTE: CUSTOMER WILL SUPPLY CONTACT CLOSURE FOR ALL CONTROL CIRCUITS.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
AND INCLUDE CHEMICAL FILM
OR PLATED FINISH

TOLERANCES
DECIMALS
.X ± .05
.XX ± .01
.XXX ± .005

MATERIAL

FINISH

SYM 1204		
QTY / UNIT	MODEL USED ON	ASS'Y NO.
APPLICATION		
CODE		

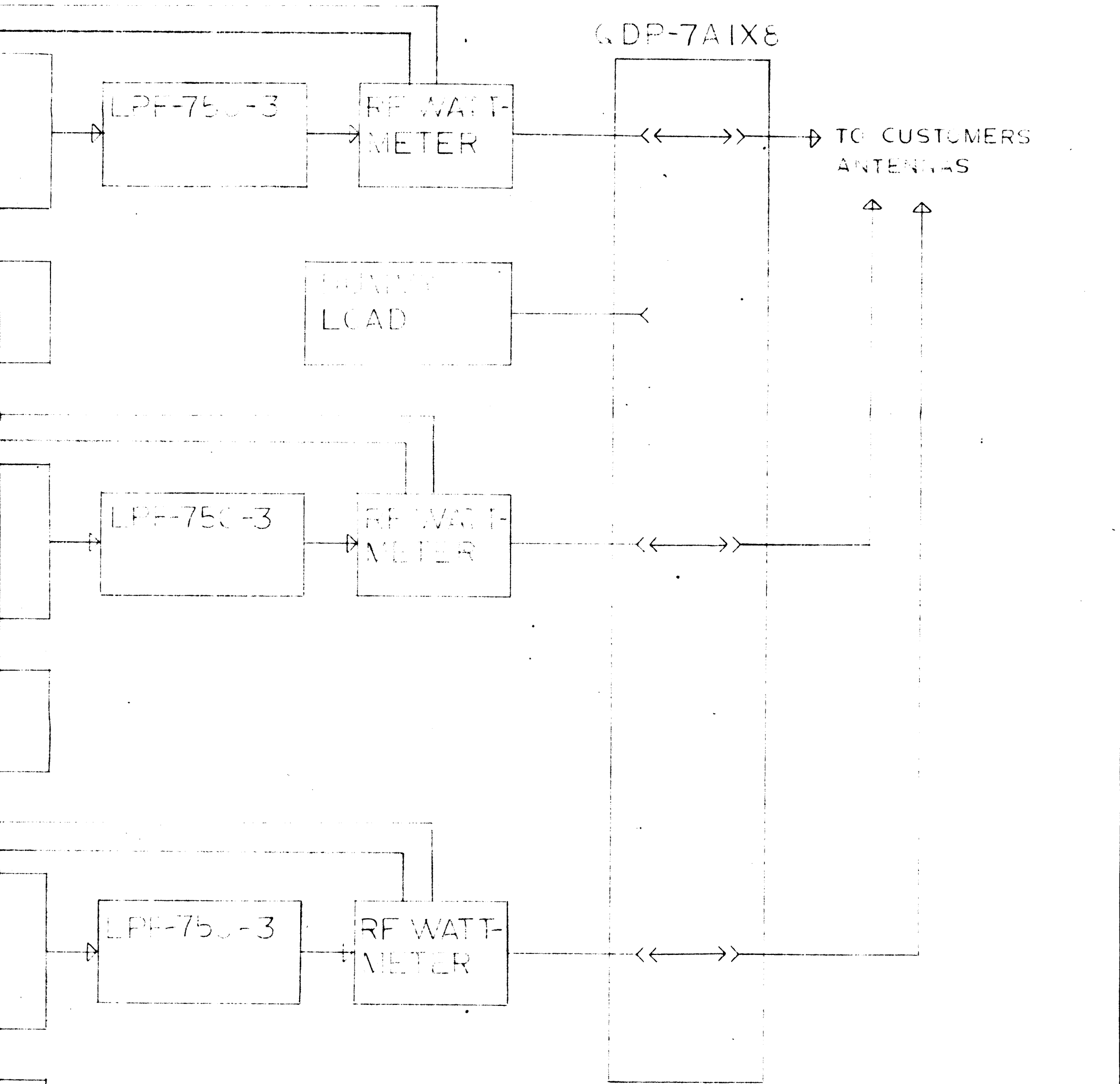
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2

1

					REVISIONS		
E.M.N.NO	DRAFT	CHKD	ZONE	LTR	DESCRIPTION	DATE	APPROVED
					OPN. TO THE L.P.F. & WATT-METER		



COASTAL HARBOR RADIO TRANSMITTER SYSTEM

KFX

SO 519119

QTY. REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
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LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES	
TOLERANCES ON	
DECIMALS	FRACTIONS
.X ± .05	± 1/64
.XX ± .01	ANGLES
.XXX ± .005	± 0° -30'
MATERIAL	
FINISH	

FINAL APPROVAL	DATE
<i>[Signature]</i>	250711
MECH. DES.	DATE
ELECT. DES.	DATE
<i>[Signature]</i>	250711
CHECKED	DATE
DRAWN	DATE
C. D. DEAN	7-12-71

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MAMARONECK, NEW YORK

Figure 4-1
Flow Chart

D

C

ID399

B

A

2

1

D

C

B

J2
RF IN

J1
POWER

S1
POWER

F1
AC

A1 RF IND.
(A4899/PC616)

R1 10 5W
R2 10 5W
R3 15 5W
R4 15 5W
R5 150 2W
R6 10 1W
R7 10 1W
R8 33 1W
R9 33 1W

CR1
CR2
CR3
CR4

DD130-200-1.5
DD130-200-1.5

C1 25 50V
C2 25 50V

F2 +DC 1/2 a
F3 -DC 1/10 a

L1 120
L2 120

C3 640 pf
C4 640 pf
C5 .1
C6 .1

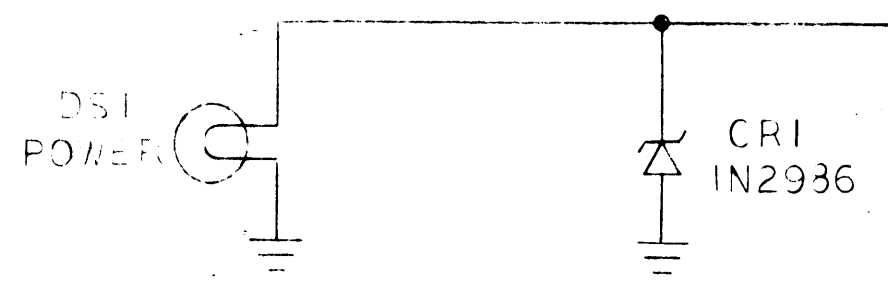
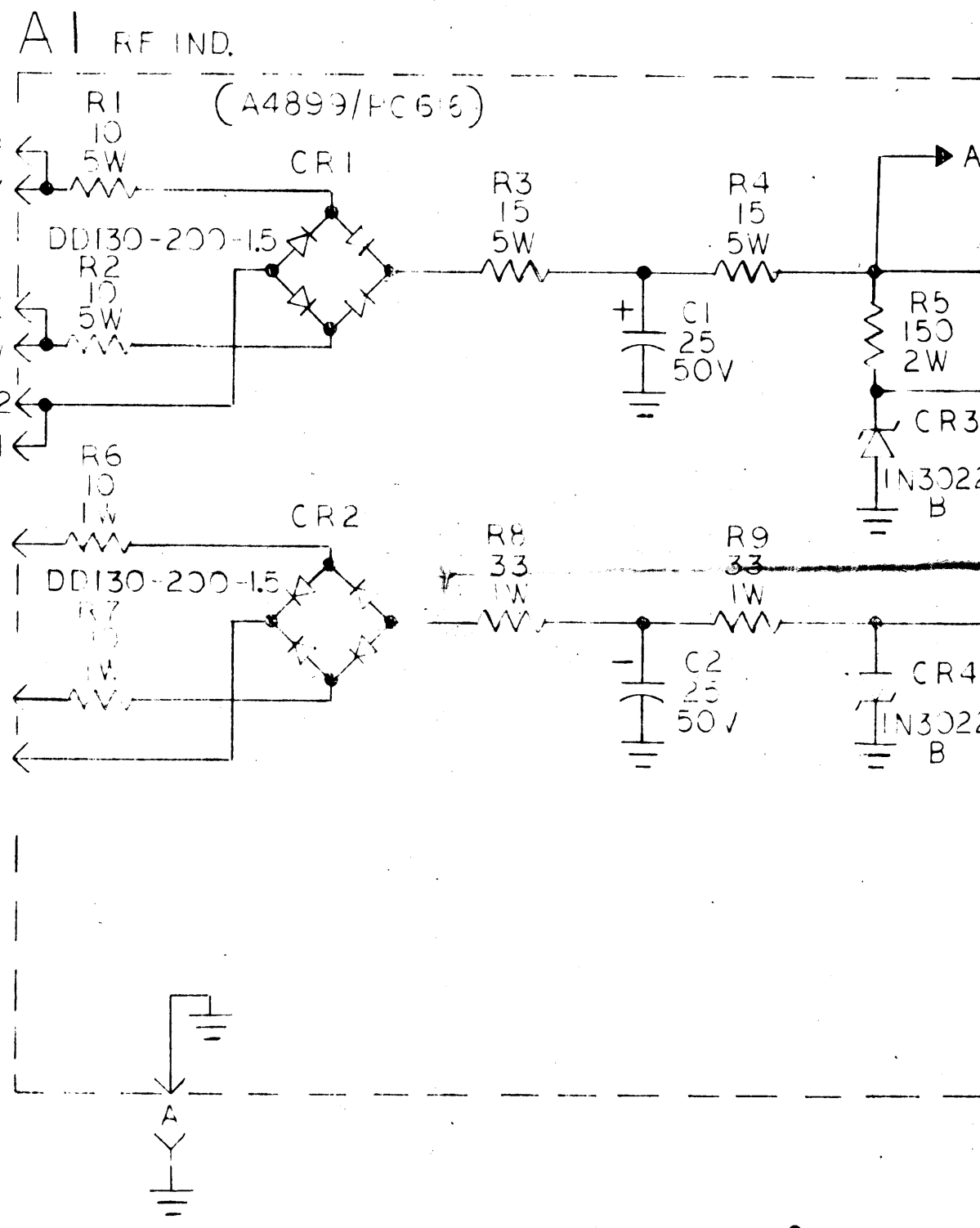
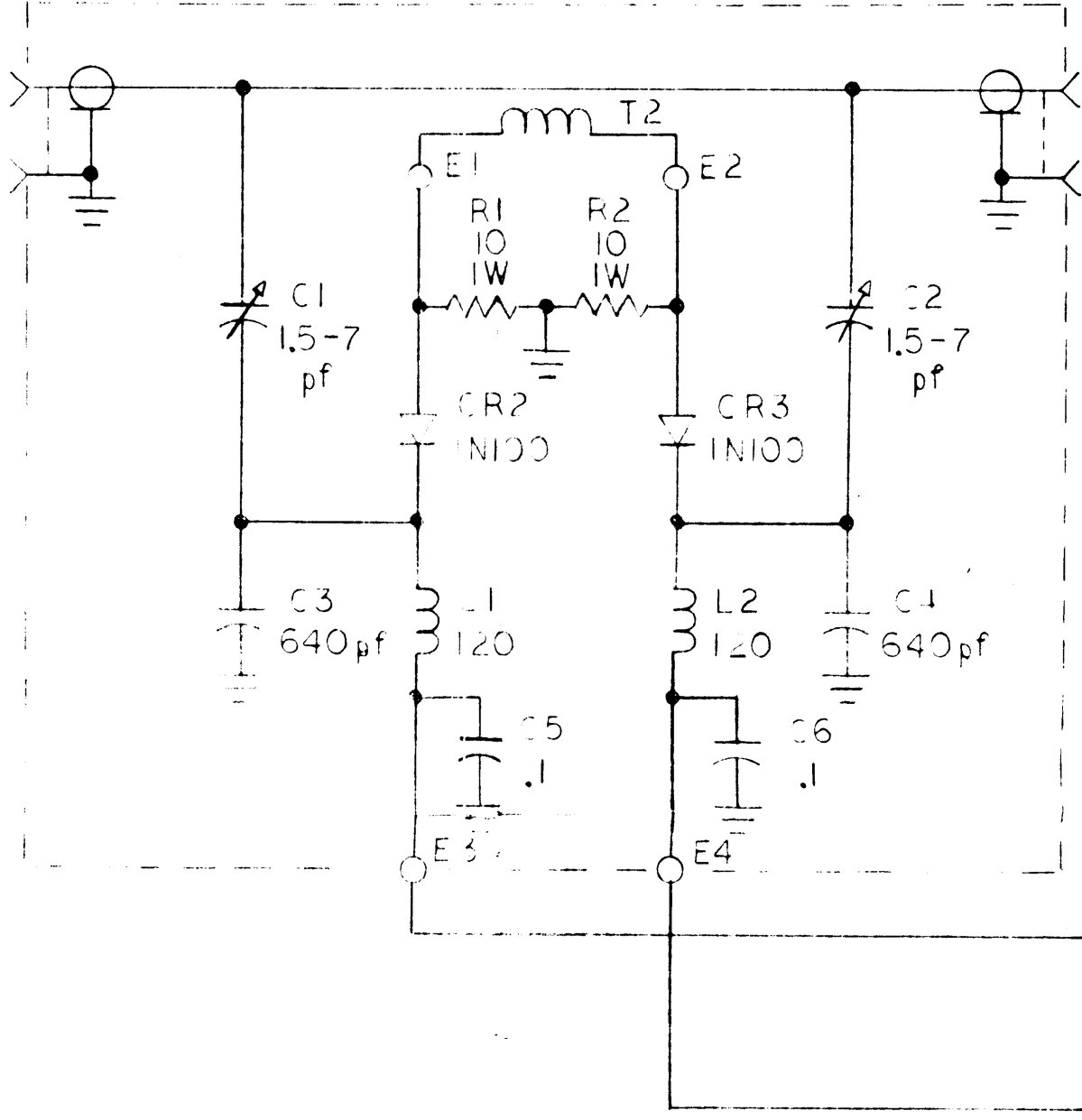
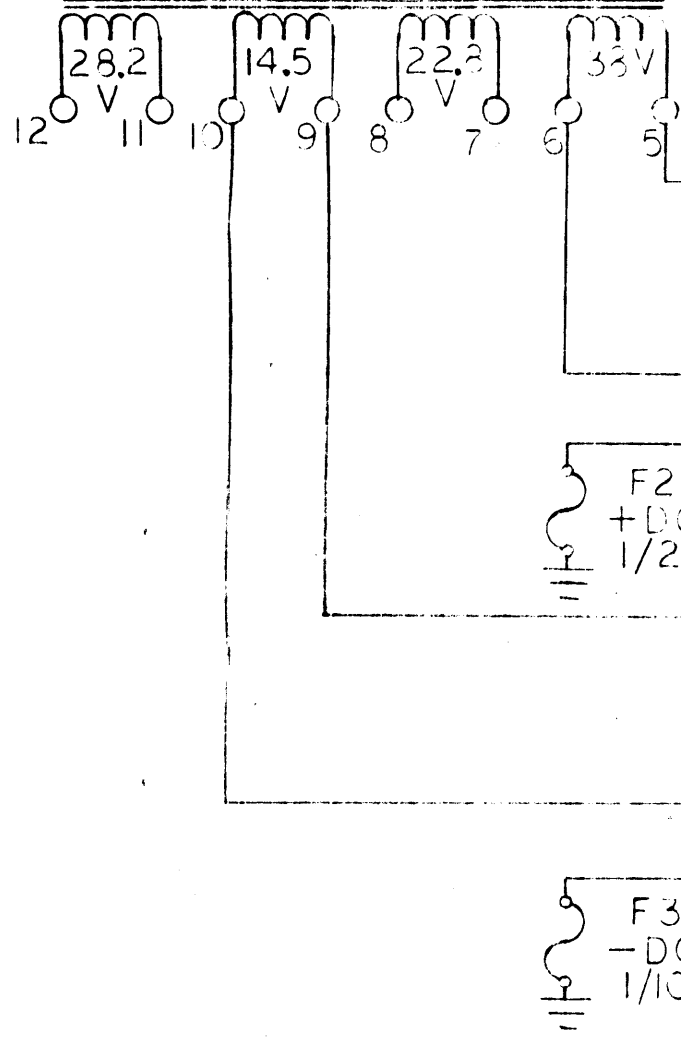
E1
E2
E3
E4

T1

T2

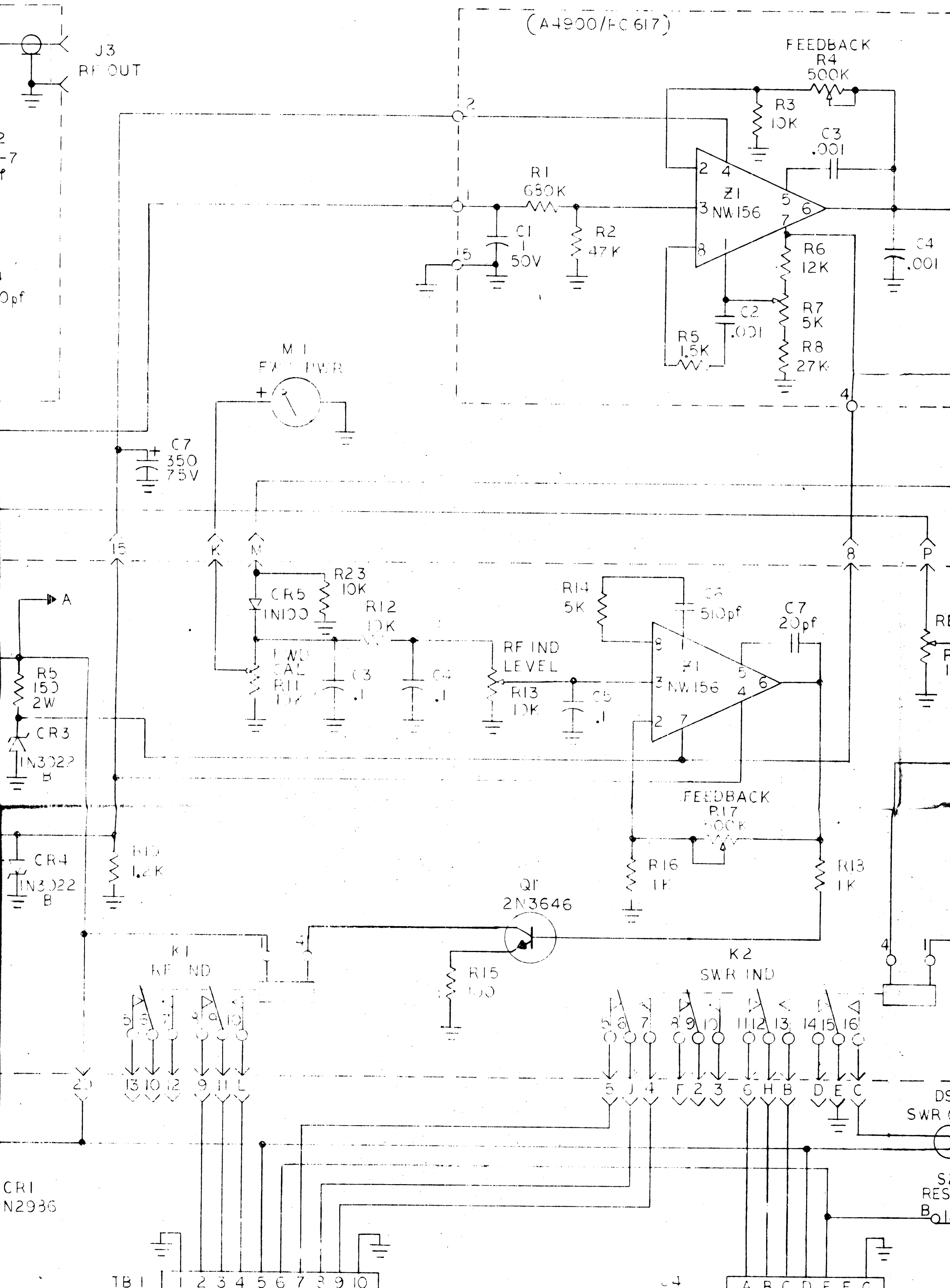
DS1 POWER

CR1 IN2936

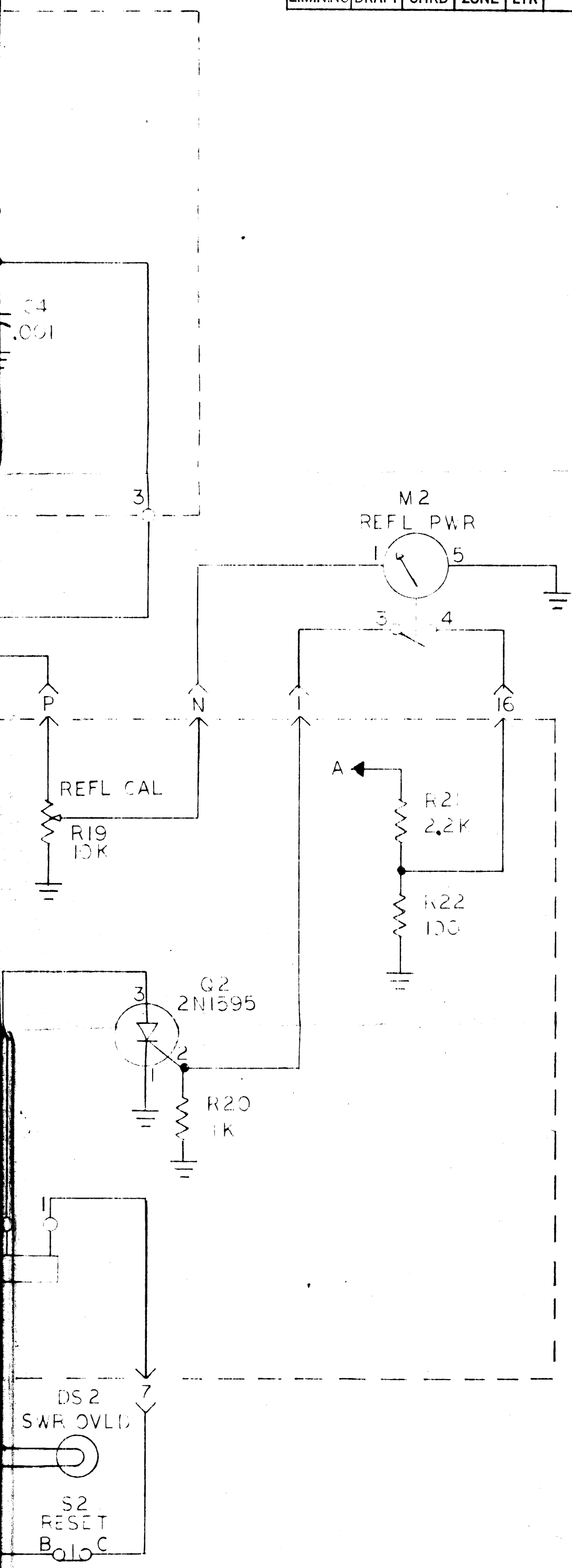


UNLESS OTHERWISE SPECIFIED:
ALL RESISTANCES IN OHMS, 1/2W

A2 PEAK READING AMP (A4900/FC 617)



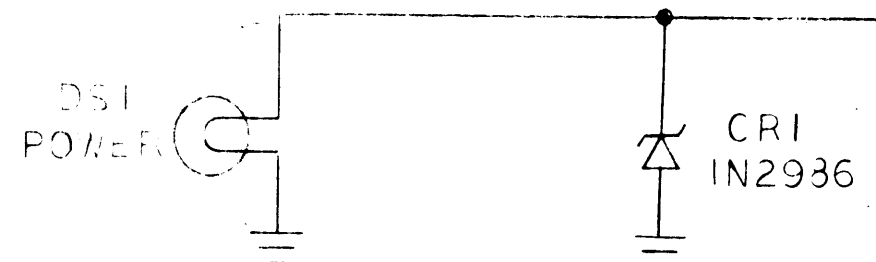
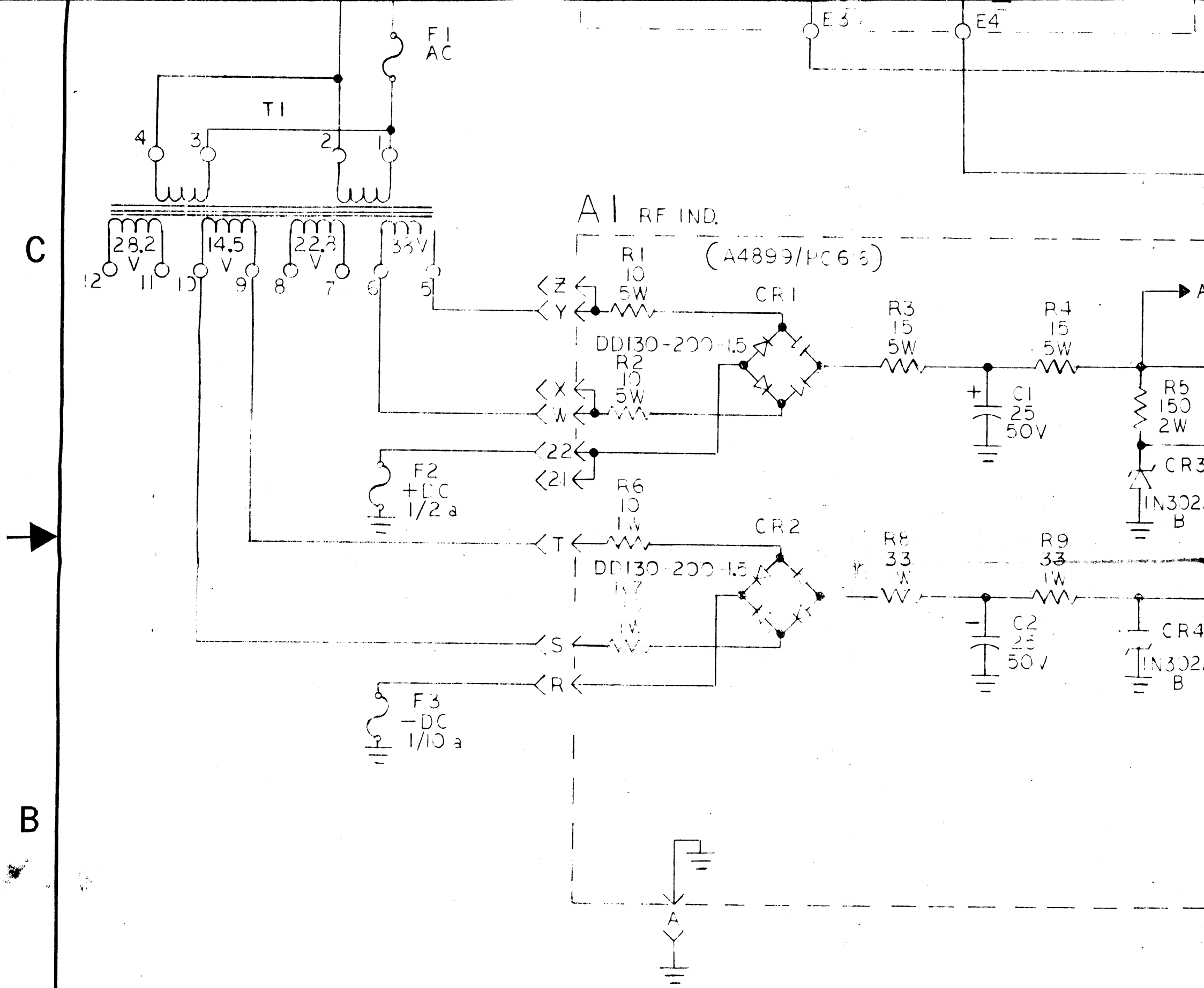
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E.M.N.NO	DRAFT	CHKD	ZONE	LTR	DESCRIPTION	DATE	APPROVED



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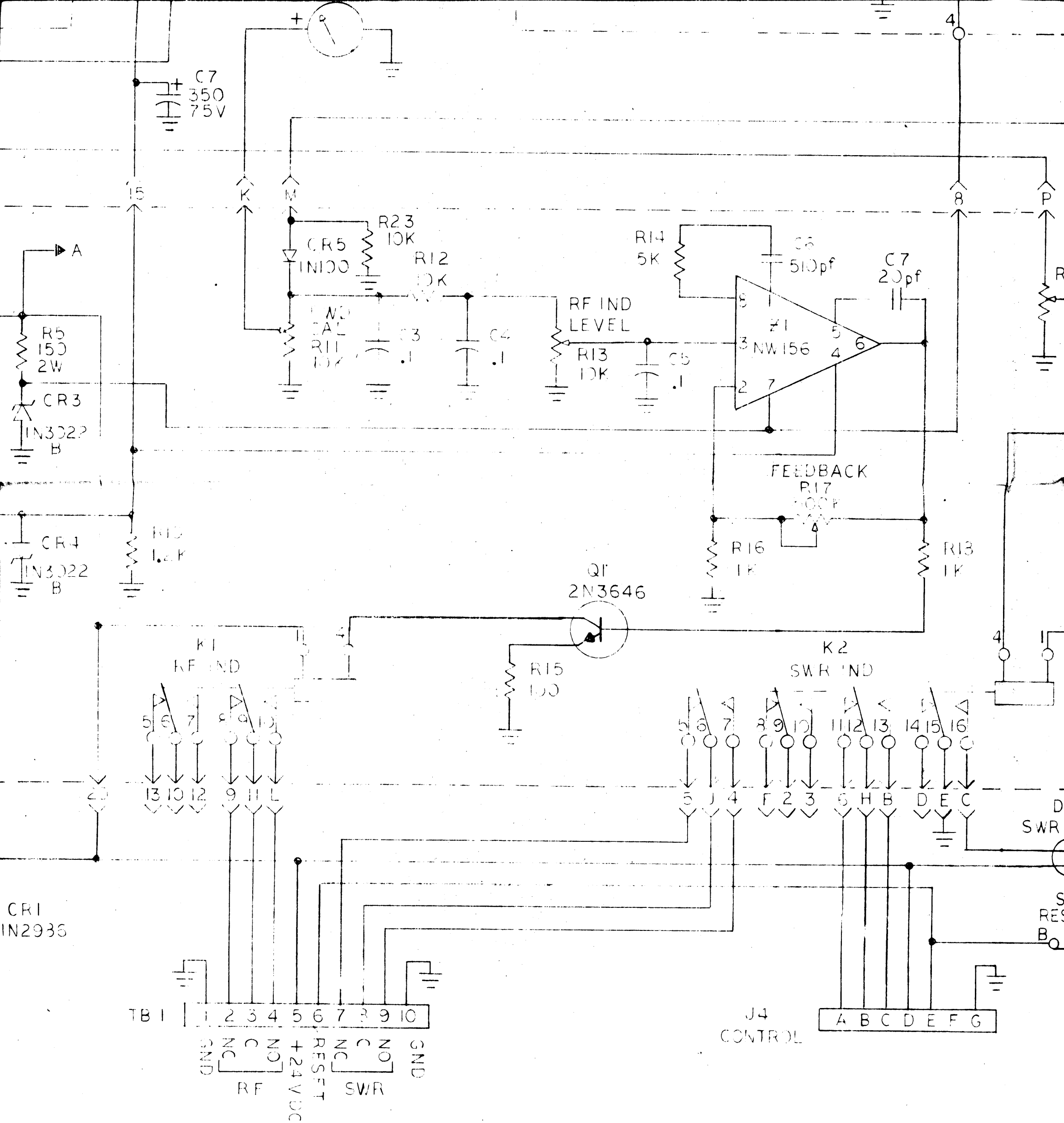
C

B
CK1912



UNLESS OTHERWISE SPECIFIED:
 1. ALL RESISTANCES IN OHMS, 1/2W.
 2. ALL CAPACITANCES IN MICRO-FARADS.
 3. ALL INDUCTANCES IN MICRO-HENRIES.
 4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN.
 FOR COMPLETE DESIGNATION PREFIX THE PART
 DESIGNATION WITH THE SUB-ASSEMBLY
 DESIGNATION.

LAST SYMBOLS			
UNIT		A1	A2
A2	M2	C7	C4
C7	R2	CR5	E5
CR3	S2	K2	R8
DS2	T2	Q2	Z1
E4	TB1	R23	
F3	XDS2	XK2	
J4	XF3	Z1	
L2	XAI		

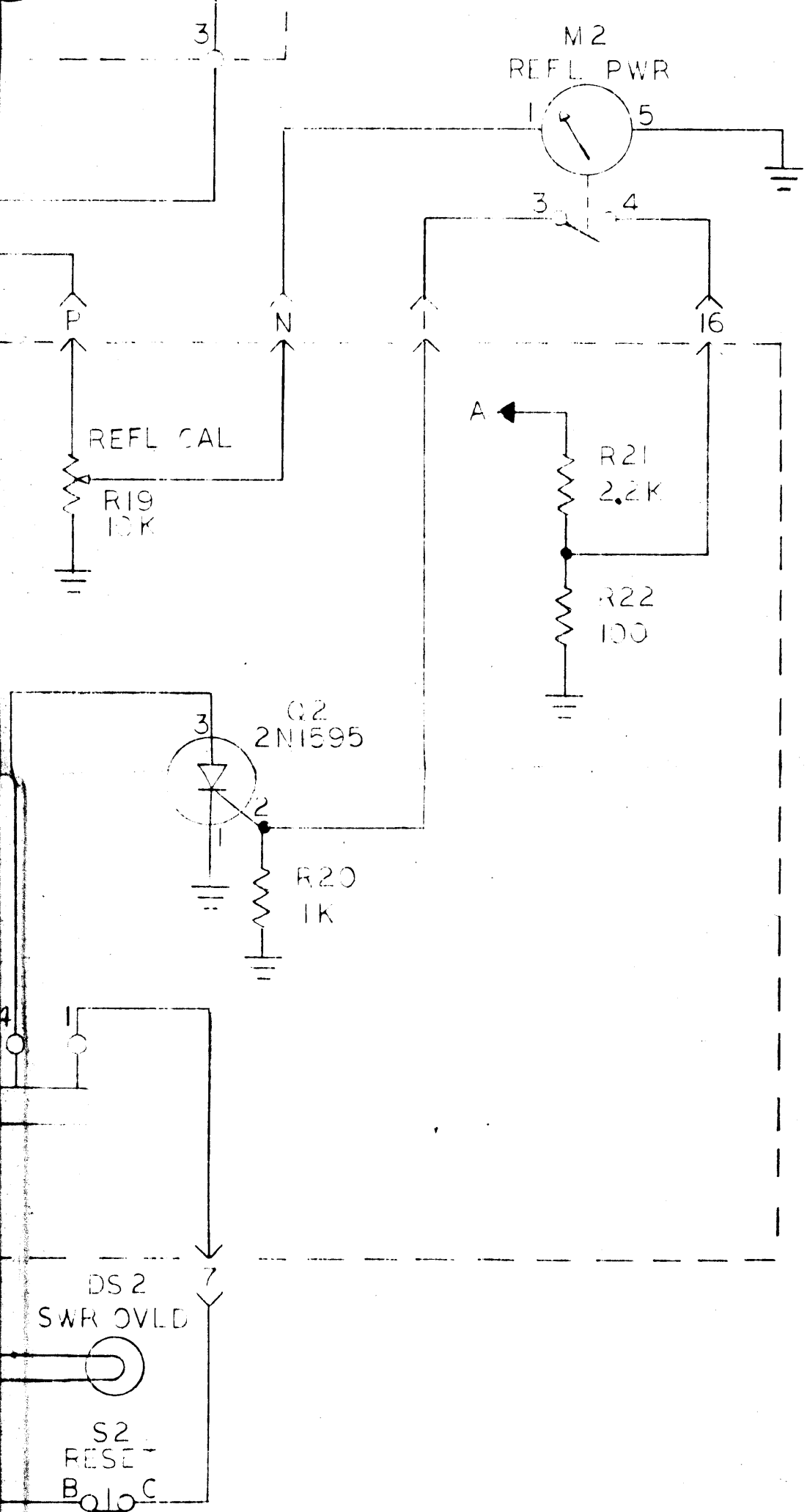


	TPM-1K	
QTY / UNIT	MODEL USED ON	ASSY NO.
APPLICATION		
	CODE	
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4



C
B
CK1912

QTY. REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
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LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES

TOLERANCES ON	
DECIMALS	FRACTIONS
.X ± .05	± 1/64
.XX ± .01	ANGLES
.XXX ± .005	± 0° -30'

FINAL APPROVAL	DATE
<i>[Signature]</i>	23 Nov 11
MECH. DES.	DATE
ELECT. DES.	DATE
<i>[Signature]</i>	23 Nov 11
CHECKED	DATE
DRAWN	DATE
<i>[Signature]</i>	1 Nov 11

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MAMARONECK, NEW YORK

Figure 4-2
Transmitter Power Monitor
TPM-1K Schematic Diagram

hereon.
or used
RATION

A

3

2

1

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL

The Coastal Radio Transmitting System, SYM-1204 (Refer to figure 4-1) is a triple channel fixed frequency transmitter. The channels or carrier frequencies are determined by a plug-in module (TTRT) in each STE-5A exciter. The channel frequency is stamped on the front of the plug-in (TTRT) module.

Each Linear Amplifier section of the transmitter (model RFE-1) uses two 4CX350A tubes connected in parallel feeding a pi network. The final tubes (4CX350A) are biased to operate in class AB1.

This unit (RFE-1) will accept one of two RF inputs, a low input of 100 milliwatts or a high input of 1 watt. It will require 100 milliwatts or less to produce the 500 watt peak envelope power output.

The exciter (STE-5A) RF output is transformer coupled from a 2N3553 type transistor and is capable of delivering 100 milliwatts to the power amplifier section of a transmitter.

Principles of operation are presented in detail for each major modular unit in their respective unit technical manual. In addition to the three GPT-500YA Transmitters low pass filter, model LPF-750-3 and RF Power Monitor TPM-1K are included in the SYM-1204 Transmitting System. These additional units are discussed in the following paragraphs only to the extent of their interrelationship to the overall system.

4-2. LOW PASS FILTER LPF750-3 (refer to Modular technical manual)

The LPF-750-3 is a low pass fixed filter which is designed to attenuate harmonics and spurious emissions above 4000 kHz. The filter will pass fundamental frequencies between 2000 kHz and 3500 kHz without appreciable loss provided the transmitter is properly terminated.

The filter is connected in the system between the PAL-500 output connector and Power Monitor TPM-1K.

4-3. TRANSMITTER POWER MONITOR TPM-1K (Refer to figure 4-2)

Power Monitor, TPM-1K is connected between output connector and Low Pass Filter LPF-750-3. This modular unit serves to provide visual monitoring of the transmitter peak envelope power and reflected power in watts. Additionally, the TPM-1K provides separate contact closure for RF indication and high SWR indication. Terminals are provided for remote RESET of the SWR overload.

A. Forward Power

During ON THE AIR periods of transmissions RF forward power is

routed through the Low Pass Filter to the RF IN connector J2 on the RF coupler assembly. The RF coupler assembly provides the TPM-1K with signals that are proportional to forward and reflected power. These signals are derived from the RF input applied to E1 and E2 within the RF coupler. Capacitors C1 and C2 are adjusted to balance the voltage across FORWARD POWER and REFLECTER POWER meters M1 and M2.

A proportional forward power voltage is routed from the RF coupler assembly at terminal E3 and applied to Peak Reading Amplifier assembly A2. The sampled forward power voltage is amplified in A2 and routed to the FORWARD POWER meter calibrate potentiometer and RF Indicator assembly A1. Feedback adjust A2R4, adjust the gain of Peak Leading Amplifier A2.

The Forward Power calibrate potentiometer is used to calibrate the Forward Power meter that indicates transmitter peak power up to 500 watts.

RF Indicator assembly A1 serves to supply rf indication for an external monitoring device, SWR overload trip and indication, in addition to reflected power calibration.

The forward power voltage applied to assembly A1 is routed through RF level indication adjust and applied to amplifier A1Z1. The amplified output of A1Z1 is applied to the base of transistor Q1. The adjustment of RF LEVEL Indicator control determines the power level that will cause transistor Q1 to conduct. When transistor Q1 conducts, RF Indicator relay A1K1 energizes providing a contact closure between terminals (3) and (4) on TEB1 when the transmitter power level is at a pre-determined level. Feedback potentiometer A1R17 adjusts the gain of amplifier A1Z1 and should be set to mid position initially.

B. Reflector Power

A sample of reflected power voltage is routed from the coupler at terminal E4 and is routed through REFLECTED CAL potentiometer A1R19 to the REFLECTED POWER meter.

The REFLECTED POWER meter is equipped with an adjustable overload indicator which can be set to trip at a value determined by the operator. When the reflected power indicator hits the red overload pointer, a contact closure is provided within the reflected power metering circuit which triggers SCR Q2, and routes 24 vdc to SWR INDICATOR relay A1K2 causing A1K2 to energize. the energized relay contacts provide the ground necessary to light the SWR OVERLOAD indicator, and opens the transmitter remote interlock circuit which causes high voltage to be removed.

A reset button is provided on the TPM-1K front panel to reset the overload circuit once it trips. In addition to the SWR overload reset button the SWR overload can be reset via remote mode selection.

Procedures for the adjustment and/or calibration of the TPM-1K is outlined in section 5 of this manual.

SECTION 5

MAINTENANCE

5-1. INTRODUCTION

The SYM-1204 System is designed for long term, trouble-free operation. When it becomes necessary to perform alignment and/or adjustments to the system, it is recommended that technicians perform the necessary operations outlined in the associated PAL-500 and STE-5A technical manuals. The following data is provided for troubleshooting and maintenance.

- a. Overall Flow Chart Diagram (Section 4, figure 4-1).
- b. Component Location (figure 1-1).
- c. System Wiring Diagram (figure 2-5).
- d. TPM-1K Alignment Procedure (para 5-5).

5-2. TEST EQUIPMENT REQUIRED

Table 5-1 lists the test equipment required for maintaining and troubleshooting the transmitter. Refer to the STE-5 and PAL-500 technical manuals for additional equipment required to maintain and troubleshoot these two components.

TABLE 5-1. TEST EQUIPMENT REQUIRED

<u>EQUIPMENT</u>	<u>TYPE</u>
Signal Generator:	Hewlett-Packard Model 606A, or equivalent
VIVM:	Hewlett-Packard Model 410B, or equivalent
Multimeter:	Simpson Model 260, or equivalent
Oscilloscope:	Tektronix, Model 541A or equivalent
Spectrum Analyzer	TMC, Model PTE-4A, or equivalent
Directional Wattmeter	Bird Model 43, or or equivalent

5-3. OPERATOR MAINTENANCE

Operators maintenance consists of maintaining recordings of operating

transmitter front panel meter readings on a routine basis. During off the air periods the operator should perform the following preventive maintenance procedures:

- (1) Check and record exciter operating frequency.
- (2) Check and replace or tighten if necessary, all spare fuses, control knobs, indicator lamps, interconnect cabling and external equipment connections.
- (3) Clean all air filters and remove dust and foreign matter accumulated during operating periods.
- (4) Check mechanical operation of operational controls (tuning control rotations, (clockwise and counterclockwise) ON/OFF switches and circuit breakers.
- (5) Check chassis and terminal strip hardware for looseness, and tighten as necessary.
- (6) Check and record the adjustable bias control ranges, and report any abnormalities to supervisor in charge. (Refer to PAL-500 technical manual).
- (7) Check Remote circuitry to insure operation. (Mode selection and remote SWR reset).
- (8) Check PA, Bandswitch for signs of overheating.

5-4. TROUBLESHOOTING

NOTE

Before troubleshooting determine if transmitter is connected for remote or local operation.

Troubleshooting the SYM-1204 consists of isolating faults to either the STE-5A Exciter, PAL-500 Power Amplifier or TPM-1K Transmitter Power Monitor. Once a fault is isolated to a particular unit refer to the associated technical manuals for detailed troubleshooting procedures. Refer to operator's section for normal indications.

To isolate a fault between the STE-5A exciter, PAL-500 amplifier and TPM-1K monitor proceed as follows:

- a. Exciter Check - Disconnect the STE-5A RF OUTPUT from the LOW jack on the RFE and connect the STE-5A to a 50 ohm, 1 watt, non-inductive dummy load. Use an oscilloscope to monitor the exciter output, referring to the STE-5A technical manual for normal indications and exciter control positions.
- b. External Signal Inputs Connections - Use an ohmmeter or VTVM to check for continuity and/or signal levels via interconnecting cables between the STE-5A and PAL-500. (Refer to figure 2-5).
- c. PAL-500 Check - Disconnect the STE-5A and connect a signal generator to the RFE LOW input jack. Signal generator output and frequency must be

within the range normally provided by the STE-5A exciter. Operate the PAL-500 into a dummy load (if available) and monitor the PAL-500 meters for proper operation. (Refer to the PAL-500 technical manual for normal indications. Refer to paragraph 2-3 and check all internal and external jack connections.)

d. TPM-1K Check - Set POWER switch to ON position, POWER indicator must light. SWR overload indicator should be out, FORWARD and REFLECTED meters should indicate zero. Connect transmitter to J2 (RF IN) and resistive load to J3 (RF OUT).

Turn transmitter ON; set exciter MODE switch to AME. Remove audio input and set AF GAIN control counterclockwise (do not turn extreme clockwise). FORWARD POWER meter should indicate 100 watts.

Turn transmitter OFF. Interchange coaxial cables by connecting the transmitter to J3 (RF OUT) and resistive load to J2 (RF IN). Turn transmitter ON with exciter set in AME and REFLECTED POWER meter should indicate 100 watts.

5-5. TRANSMITTER POWER MONITOR ALIGNMENT (Refer to figure 5-1)

The TPM-1K alignment is presented in four parts: Directional Coupler Alignment, Forward Power Calibration, Reflected Power Calibration and RF Indicator adjustment. To perform these aforementioned adjustments refer to the following paragraphs:

A. Directional Coupler Adjustment

1. Zero Forward and Reflected power meter pointers by turning screwheads at pointer hubs.
2. Connect coupler RF Output connector J3 to 50 ohm resistive load.
3. Tune transmitter on channel frequency for an output of 200 watts as indicated on the Forward Power meter and adjust Equalize capacitor C1 (left capacitor as viewed from top of TPM-1K) until Forward Power meter indicates minimum power on the meter scale.
4. Turn transmitter OFF. Interchange coaxial cables at the directional coupler by connecting the resistive load to RF IN (J2) and the transmitter to RF OUT (J3).
5. Turn transmitter ON and increase power until Reflected Power meter indicates 1/4 scale and adjust NULL capacitor C2 until Reflected Power meter indicates minimum on the Reflected Power meter.
6. Turn transmitter OFF and restore coaxial cables to original position (Linear Amplifier Output connected to RF IN (J2) Antenna or Patch Panel connected to RF OUT (J3)).

B. Forward Power Calibration (Refer to figure 5-1, A1)

1. Connect transmitter to an external directional wattmeter (Bird model 43 or equivalent) in series with a 50 ohm resistive load.

2. Loosen and remove TPM-1K cabinet mounting hardware and pull TPM-1K out from cabinet and remove top cover. (For ease of operation slide RFE-1 unit out of cabinet enough for TPM-1K to rest on while making the following adjustments.)

3. Turn transmitter ON. (AF GAIN control must be at max ccw.) Set STE-5A exciter MODE switch to AME position, apply a single audio tone to the exciter 600 ohm input terminals.

4. Tune and load transmitter on operating frequency and observe external wattmeter. Adjust AF GAIN control clockwise until external wattmeter indicates 200 watts average power. Adjust FWD control until FORWARD Power meter on TPM-1K indicates 400 watts.

5. Remove audio tone applied in step 3 and FORWARD POWER meter on TPM-1K should indicate 100 watts. (Do not readjust AF GAIN control.)

6. With the transmitter set at 100 watts (AME carrier power) set exciter MODE switch to CARRIER -20 db position and apply two audio tones to 600 ohm input terminals (DO NOT ADJUST AF GAIN CONTROL) and TPM-1K FORWARD POWER meter should indicate 400 watts.

7. Set exciter MODE switch to SSB with two audio tones applied to 600 ohm input terminals (DO NOT ADJUST AF GAIN CONTROL) and TPM-1K FORWARD POWER meter should indicate 400 watts.

NOTE

Feedback adjust A2R4 is set to mid-position initially. This control is used to adjust the gain of Peak Reading Amplifier A2 and should only be adjusted if the correct reading cannot be obtained with the FWD adjustment control.

C. RF Indicator Adjustment

NOTE

FORWARD POWER calibration outlined in para B must be completed before making the RF indicator adjustment.

1. Connect multimeter across terminals (3) and (4) on TB1 (located on the rear of the TPM-1K).

2. Rotate AF GAIN control to increase forward power indication to 200 watts, (or power level desired) observe multimeter and adjust RF IND adjust until multimeter indicates a short circuit (zero ohms).

3. Reduce transmitter output to zero and place meter across terminals (2) and (3) on TB1 and meter should indicate zero ohms when the transmitter output is at zero or below 200 watts.

4. To check the RF INDICATOR adjustment increase and decrease the transmitter output above and below 200 watts and observe the following multimeter readings:

Transmitter Forward Power

Multimeter Indication at TB1

200 watts	terminals (3) and (4) zero ohms
less than 200 watts	terminals (2) and (3) zero ohms

NOTE

FDBK (Feedback) potentiometer AlR17 is initially set to its mid-position and should only be adjusted to increase the sensitivity of RF IND potentiometer AlR13.

D. Reflected Power Calibration

1. Turn transmitter OFF. Interchange coaxial cables at the coupler assembly by connecting the resistive load to J2 (RF IN) and the transmitter to J3 (RF OUT).
2. Connect external wattmeter in series with resistive load.
3. Turn transmitter ON. Adjust red overload pointer on Reflected Power meter for full scale indication.
4. Increase power until external wattmeter indicates 100 watts.
5. Adjust REFL potentiometer until REFLECTED POWER meter indicates 100 watts Reflected.
6. Reduce transmitter power to zero and set the red overload pointer to a value lower than 100 watts.
7. Increase the transmitter power until the Reflected Power indicator hits the red overload pointer and observe the following indications:
 - (a) SWR OVERLOAD indicator lights.
 - (b) Transmitter high voltage removed.
 - (c) Transmitter Output reduces to zero.
8. Turn transmitter OFF. Restore original coaxial connections at the coupler assembly by connecting the transmitter output to J2 (RF IN) and the resistive load to J3 (RF OUT).

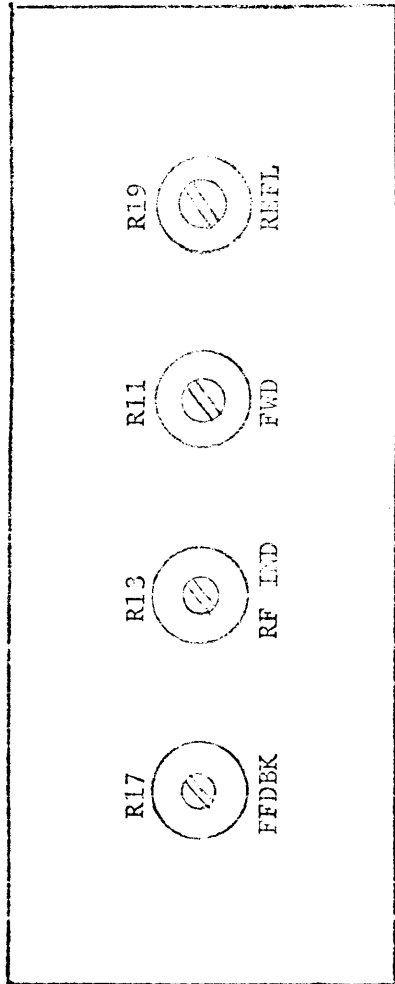
TABLE 5-2. SYSTEM TROUBLESHOOTING CHART

<u>Trouble</u>	<u>Probable Cause</u>	<u>Remedy</u>
<p><u>NOTE</u></p> <p>INSURE ALL CABLE CONNECTIONS (patch panel, antenna, external signal) are properly made and secure.</p>		
No Forward Power indication	Transmitter OFF because overload relay tripped.	Forward Power will be re-established by performing one or more of the following procedures:
	Loose or improperly connected cables (refer to figure 2-5).	(1) Reduce transmitter output.
	Defective Forward Power meter or meter amplifier (refer to para 5-5 and figure 4-2).	(2) Push RESET pushbutton on TPM-1K.
		(3) Check transmitter amplifier refer to PAL-500 technical manual.
		(4) Check exciter output refer to STE-5A technical manual.
Low Forward Power indication	Transmitter improperly matched into antenna.	Refer to Operating procedure in section 3.
	Exciter output low.	Exciter output must be connected to RFE LOW input. Refer to STE-5A exciter manual.
	TPM-1K Forward Power calibration misaligned.	Refer to para 5-5B.
Forward Power indication excessively high	Coupler assembly or TPM-1K improperly adjusted.	Refer to para 5-5 and check: Coupler alignment, Forward Power Calibration procedures.
SWR overload trips	SWR overload pointer set too low.	Reset SWR overload pointer and press RESET pushbutton.
	Reflected Power indication excessive.	Connect transmitter to 50 ohm resistive load and check Reflective Power calibration (para 5-5D).
	Defective transmission line.	Check antenna connection.

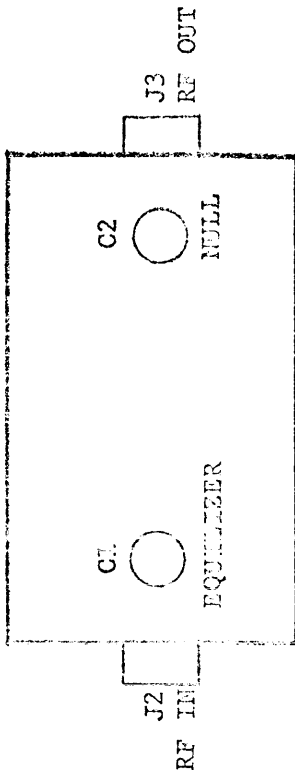
TABLE 5-2. SYSTEM TROUBLESHOOTING CHART (continued)

<u>Trouble</u>	<u>Probable Cause</u>	<u>Remedy</u>
Transmitter MAIN LINE circuit breaker trips	AC input line shorted.	Check Power input.
Transmitter H.V. line circuit breaker trips	Overload relay tripped because of open interlock, excessive plate current.	Reduce exciter output to zero. Check top and bottom on cover interlocks, external interlock. Refer to PAL-500 manual and check bias settings on RFE-1.
No PA plate current indication on RFE PA PLATE meter.	CW/SSB switch in CW position.	Set SSB/CW switch (located on rear of RFE) to SSB position.
	PA BIAS improperly set.	Refer to PAL-500 manual and check PA bias setting.
	Insufficient Primary power.	Each PAL-500 requires 1160 watt ac input per transmitter.
	High Voltage not applied to RFE-1 amplifier.	Refer to PAL-500 technical manual.

A1 (RF INDICATOR)



COUPLER ASSEMBLY



A2 (PEAK READING AMP)

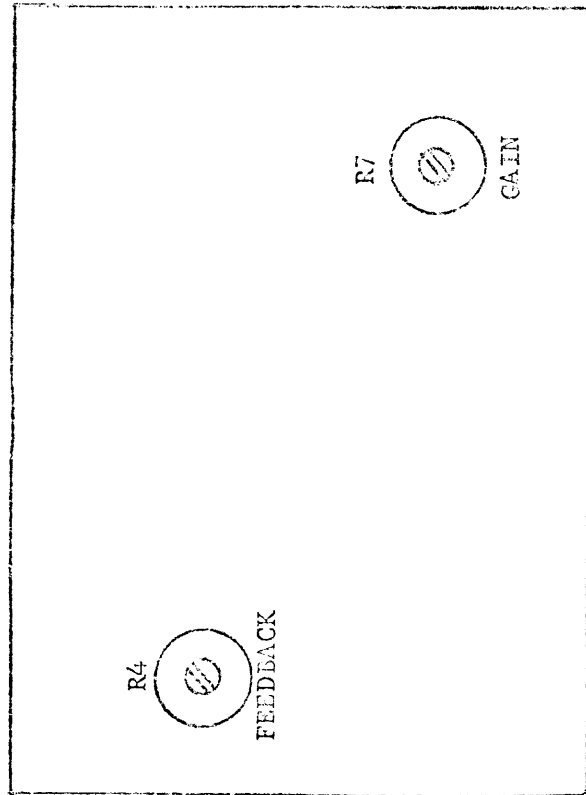


Figure 5-1. Component Location for TPM-1K Adjustment.

SECTION 6
PARTS LIST

6-1. INTRODUCTION

Reference designations have been assigned to identify all Subassembly/PC Card parts of the equipment. They are used for marking the equipment and are included on drawings, diagrams, and in the parts list. The letters of a reference designation indicate the kind of part (generic group), such as resistor, capacitor, unit, subassembly, PC card, transistor, integrated circuit, etc. The number differentiates between parts of the same generic group. Sockets associated with a particular plug in device, such as electron tubes or lamps, are identified with a reference designation which includes the reference designation of the plug-in device.

NOTE

Parts list data for the SYM-1204 is divided between the STE-5A, PAL-500, LPF-750-3 and the QDP-7A1X8 technical manuals. Refer to the applicable manual for Technical Materiel Corporation part numbers when ordering replacement parts for the above mentioned modular units.

Parts List for the Blower Assembly A-4896 and the Transmitter Power Monitor TPM-1K are listed on the following pages.

A-4896 Blower Assembly

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B1	Not Used	
B2	Not Used	
B3	Fan, Axial	BL106-2
B4	Same as B3	
F1	Not Used	
F2	Not Used	
F3	Fuse, Slow-Blow	FU102-.5
F4	Same as F3	

TPM-1K Transmitter Power Monitor

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	Assembly, RF Indicator	A-4899
A2	Assembly, Peak Reading	A-4900
C1 thru C6	Not Used	
C7	Capacitor, Fxd, Elect	CE119-350-75
CR1	Scnd, Dev, Dio	1N2986
DS1	Lamp, Incand, Bay	BI101-1819
DS2	Same as DS1	
F1	Fuse, Slow-Blow	FU102-.25
F2	Fuse, Slow-Blow	FU102-.5
F3	Fuse, Slow-Blow	FU102-.1
J1	Conn, Recp, ML 3/C	MS3102A16S-5P
J2 & J3	Not Used	
J4	Conn, Recp, FML 7/C	MS3102A16S-1S
M1	Meter, Fwd, Pwr	MR229
M2	Meter, Refl, Pwr	MR230
S1	Switch, Toggle	ST22K
S2	Switch, Push-Button	SW296-1
T1	Transformer, Sd	TF363
TB1	Terminal, Strip, Barr	TM100-10
XDS1	Light, Ind	TS106-2
XDS2	Light, Ind, Red	TS106-1
XF1 thru XF3	Fuse, Holder	PH100-1

A-4899 RF Indicator Assembly

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1C1	Capacitor, Fxd, Elec	CE105-25-50
A1C2	Same as A1C1	
A1C3	Capacitor, Fxd, Polyester	CX119-104M
A1C4	Same As A1C3	
A1C5	Same As A1C3	
A1C6	Capacitor, Fxd, Mica	CM111E511H5S
A1C7	Capacitor, Fxd, Mica	CM111C200J5S
A1CR1	Scond, Dev, Dio	DD130-200-1.5
A1CR2	Same as A1CR1	
A1CR3	Scond, Dev, Dio	1N3022B
A1CR4	Same As A1CR3	
A1CR5	Scond, Dev, Dio	1N100
A1K1	Rel, Arm, DPDT	RL156-1
A1K2	Rel, Ar, 4 PDT	RL156-8
A1Q1	Transistor	2N3646
A1Q2	Transistor	2N1595
A1R1	Resistor, Fxd, Comp 5W	RR114-10W
A1R2	Same As A1R1	
A1R3	Resistor, Fxd, Comp 5W	RR114-15W
A1R4	Same As A1R3	
A1R5	Resistor, Fxd, Comp	RC42GF151J
A1R6	Resistor, Fxd, Comp	RC32GF100J
A1R7	Same As A1R6	
A1R8	Resistor, Fxd, Comp	RC32GF330J
A1R9	Same as A1R8	

A-4899 RF Indicator Assembly (con't)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1R10	Resistor, Fxd, Comp	RC20GF122J
A1R11	Resistor, Var, Comp	RV111U103A
A1R12	Resistor, Fxd, Comp	RC20GF103J
A1R13	Same as R11	
A1R14	Resistor, Fxd, Comp	RC20GF502J
A1R15	Resistor, Fxd, Comp	RC20GF101J
A1R16	Resistor, Fxd, Comp	RC20GF102J
A1R17	Resistor, Var, Comp	RV111U504A
A1R18	Same as R16	
A1R19	Same as R11	
A1R20	Same as R16	
A1R21	Resistor, Fxd, Comp	RC20GF222J
A1R22	Same as R15	
A1R23	Same as R12	
A1XK1	Socket, Relay	TS171-5
A1XK2	Socket, Relay	TS171-4
A1Z1	Network, Op Amp	NW156

A-4900 Peak Reading Assembly

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A2C1	Capacitor, Fixed,	CN114-1R05J
A2C2	Capacitor, Fixed, Cer	CC100-29
A2C3	Same as A2C2	
A2C4	Same as A2C2	
A2E1 thru A2E5	Term, Stud	TE127-2
A2R1	Resistor, Fixed, Comp	RC20GF684J
A2R2	Resistor, Fixed, Comp	RC20GF473J
A2R3	Resistor, Fixed, Comp	RC20GF103J
A2R4	Resistor, Var, Comp	RV111U504A
A2R5	Resistor, Fixed, Comp	RC20GF152J
A2R6	Resistor, Fixed, Comp	RC20GF123J
A2R7	Resistor, Var, Comp	RV111U502A
A2R8	Resistor, Fixed, Comp	RC20GF273J
A2Z1	Network, Op Amp	NW156

BMA468 Coupler Assembly

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	Capacitor, Var	CV11A070
C2	Same as C1	
C3	Capacitor, Fxd, Mica	CM200F640F
C4	Same as C3	
C5	Capacitor, Fxd, Polyester	CX119-104M
C6	Same as C5	
CR1	Not Used	
CR2	Scnd, Dev, Dio	1N100
CR3	Same as CR2	
E1	Ins, Feed-thru	TE193-B4S9
E2	Same as E1	
E3	Term, Turret	TE102-2
E4	Same as E3	
J1	Not Used	
J2	Conn, Recp, HN	UG496/3
J3	Same as J2	
L1	Coil, Rf	CL240-120
L2	Same as L1	
R1	Resistor, Fxd, Comp	RC32GF100J
R2	Same as R1	
T2	Coil, Rf, Toroid	CL473