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TECHNICAL MANUAL

FOR

HFLM-1KA
HIGH FREQUENCY
LINEAR POWER AMPLIFIER

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1979

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THE TECHNICAL MATERIEL CORPORATION

CABLE: TEPEI
700 FENIMORE ROAD, MAMARONECK, NY 10543 U.S.A.
TEL: 914-698-4800
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TWX: 710-566-1100

TMC (CANADA) LIMITED **TMC INTERNATIONAL**
RR No. 5, Ottawa K1G 3N3 Ontario CANADA
TEL. 613-521-2050
TLX: 053-4146

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INSTRUCTION BOOK CHANGE NOTICE

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(APPENDIX B)

PAGE 6-3 HFLM-1KA

A103R5 CHANGED FROM RW105-32 TO RW105-35
A103R6 CHANGED FROM RW105-32 TO RW105-35

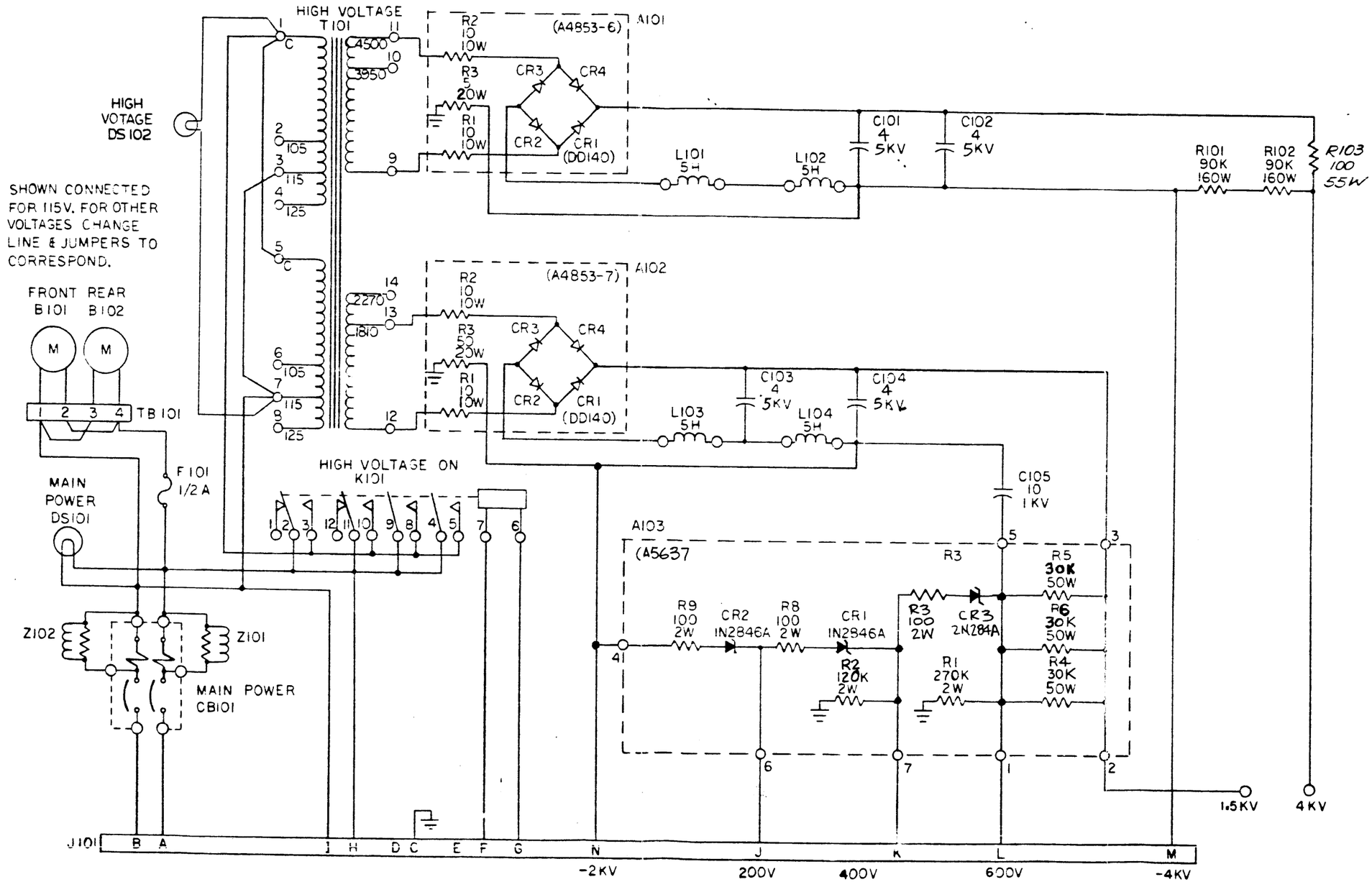
PAGE 7-3

SCHEMATIC DIAGRAM
HIGH VOLTAGE POWER SUPPLY AP152

CHANGE ON A5637 A103

R5 CHANGED FROM 15K TO 30K
R6 CHANGED FROM 15K TO 30K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	A-4853-6 Assembly, Board, PC Rect	
A101CR1 thru A101CR4	Rect, Scond, Dev	DD140
A101R1	Resistor, Fixed, WW 10W	RW109-4
A101R2	Same as A101R1	
A101R3	Resistor, Fixed, WW 20W	RW110-3
	A-4853-7 Assembly, Board, PC Rect	
A102CR1 thru A102CR4	Rect, Scond, Dev	DD140
A102R1	Resistor, Fixed, WW 10W	RW109-4
A102R2	Same as A102R1	
A102R3	Resistor, Fixed, WW 20W	RW110-7
	A5637 Assembly, Board, PC Zener	
A103CR1	Scond, Dev, Dio	1N2846A
A103CR2	Same as A103CR1	
A103R1	Resistor, Fixed, Comp	RC42GF274J
A103R2	Resistor, Fixed, Comp	RC42GF124J
A103R3	Resistor, Fixed, Comp	RC42GF101J
A103R4	Resistor, Fixed WW 50W	RW105-35
A103R5	SAME AS A103R4	
A103R6	Same As A103R4	
A103R8	Same As A103R3	
A103R9	Same as A103R3	



Schematic Diagram,
High Voltage Power Supply AP152

(CK1869)

NOTE:

ALL REFERENCES TO T.M.C. MULTI-MODE EXCITER MMX-2B OR APPENDIX A DOES NOT PERTAIN TO THIS MANUAL. FOR CONTINUITY OF OPERATION THIS MANUAL REFERENCES T.M.C. EXCITER MMX-2B. ANY SUITABLE EXCITER WHICH PROVIDES AN RF OUTPUT OF AT LEAST 100 MW MAY BE USED -FORWARD-

PREFACE

This technical manual discusses the information you will require to install, operate and maintain the HFTM-1KJ2B High Frequency Transmitter. This manual is intended for operators and technicians who will be responsible for the proper functioning of the equipment.

This text is compiled in three parts:

HFTM-1KJ2B	Transmitter System	Part I
MMX-2B	Multi-Mode Exciter	Appendix A
HFLM-1KA	High Gain Linear Power Amplifier	Appendix B

You should read this manual in sequence, section by section, to become totally familiar with the transmitter. After completing this manual, you should be able to install, operate, and depending on your level of technical training, perform maintenance to the component level.

Changes are periodically made to this manual through publication of TECHNICAL NEWSLETTERS that are distributed to users of the equipment. The REGISTRATION CARD located at the front of this manual should be completed and sent to:

THE TECHNICAL MATERIEL CORPORATION
700 Fenimore Road
Mamaroneck, New York 10543 U.S.A.

Attention: Technical Data Group

Your name and address will be entered on permanent TMC records and applicable publications automatically mailed to you. Requests for related publications should be made to your TMC representative, to a TMC field office in your area, or to TMC at the above address.

Forms are provided at the back of this manual for your use. Included are the following: READER'S COMMENTS; REQUEST FOR SPARE PARTS; REQUEST FOR FIELD SERVICE; REQUEST FOR PUBLICATIONS; REQUEST FOR TRAINING; NOTES; and TMC LOCATION MAP.

To facilitate the maintenance of accurate records on the operation of the equipment, a SERVICE LOG and FIELD REPORT are also included.

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PART I

LIST OF ILLUSTRATIONS

LIST OF TABLES

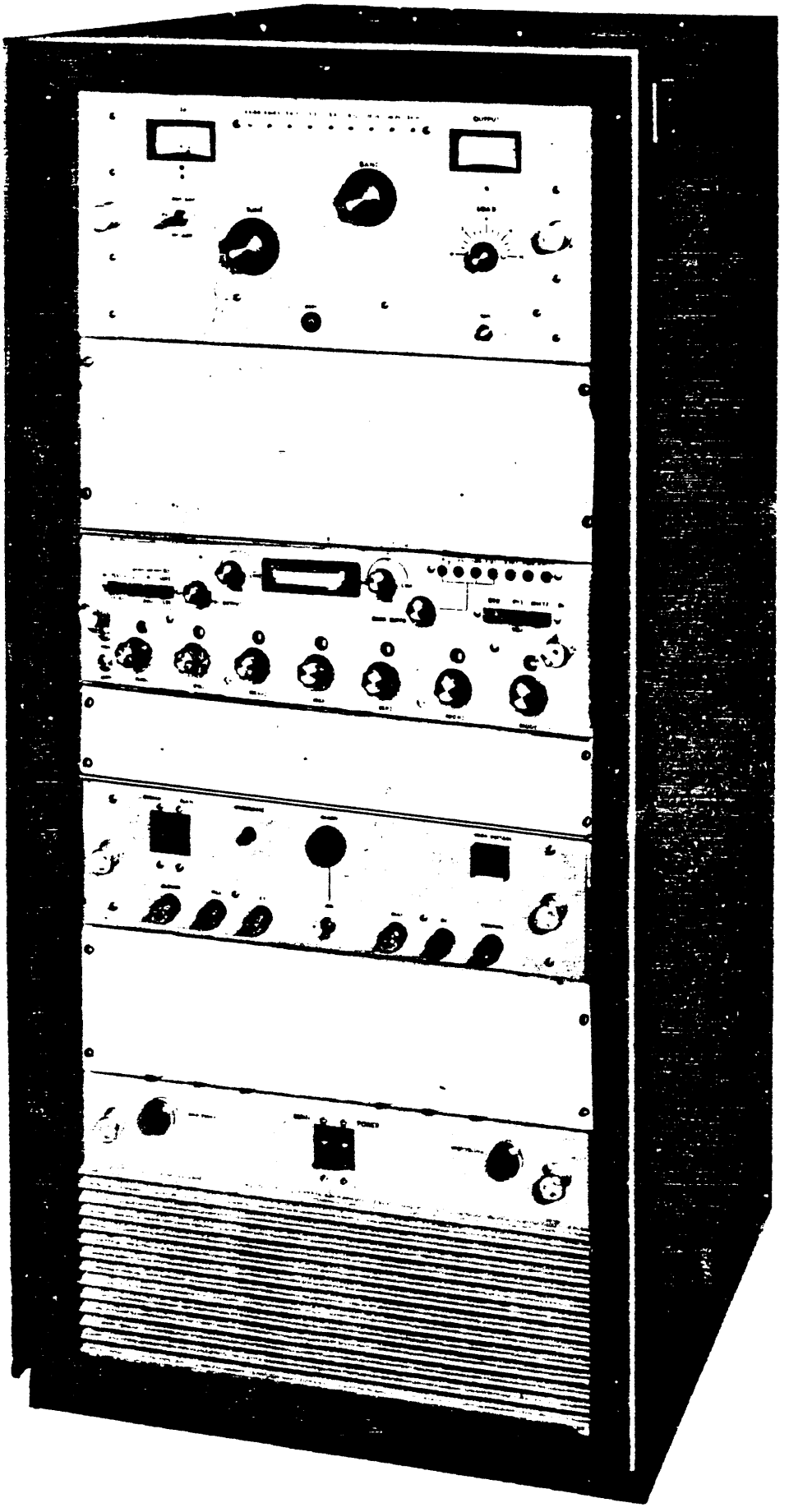


Figure 1-1. High Frequency Linear Power Amplifier HFTM-1KJ2B

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION.

This manual presents operating and maintenance instructions for the High Frequency Transmitter, Model HFTM-1KJ2B, designed and manufactured by the Technical Materiel Corporation, Mamaroneck, New York. This manual includes a general description of the equipment; installation and operating procedures; principles of operation; maintenance and troubleshooting data; and a parts list.

High Frequency Transmitter, Model HFTM-1KJ2B (shown in figure 1-1), hereinafter referred to as the HFTM-1KJ2B or the transmitter, consists of a solid state, multi-mode, exciter MMX-2B, used in conjunction with a high frequency linear power amplifier, HFLM-1KA. The exciter is capable of providing CW (Continuous wave), AM (amplitude modulation), SSB (single sideband) including AME (amplitude modulated equivalent) full carrier, FSK (frequency shift keying), FAX (facsimile) and optional ISB (independent sideband) modes of operation. The high frequency linear power amplifier amplifies the exciter output to provide 1 kilowatt PEP (peak envelope power) and average throughout the frequency range of 2.0 to 30 mhz. The transmitter is readily adaptable for shipboard, aircraft, and land installations.

1-2. PHYSICAL DESCRIPTION.

As shown in figure 1-1, the transmitter consists of a single equipment cabinet, which houses the MMX-2B exciter, and all units which comprise the HFLM-1KA linear power amplifier. The HFLM-1KA consists of two-stage broadband linear amplifier, power amplifier and associated power supplies and control circuits. Table 1-1 lists the transmitter components; Figure 1-2 shows the physical location of transmitter components.

TABLE 1-1. COMPONENTS OF HIGH FREQUENCY TRANSMITTER HFTM-1KJ2B

NOMENCLATURE	COMMON NAME
MMX-2B	MULTI-MODE EXCITER
HFLM-1KA consisting of: TLAM-1KA AP-151 AP-152	LINEAR POWER AMPLIFIER RF LINEAR POWER AMPLIFIER LOW VOLTAGE AND BIAS SUPPLY HIGH VOLTAGE POWER SUPPLY

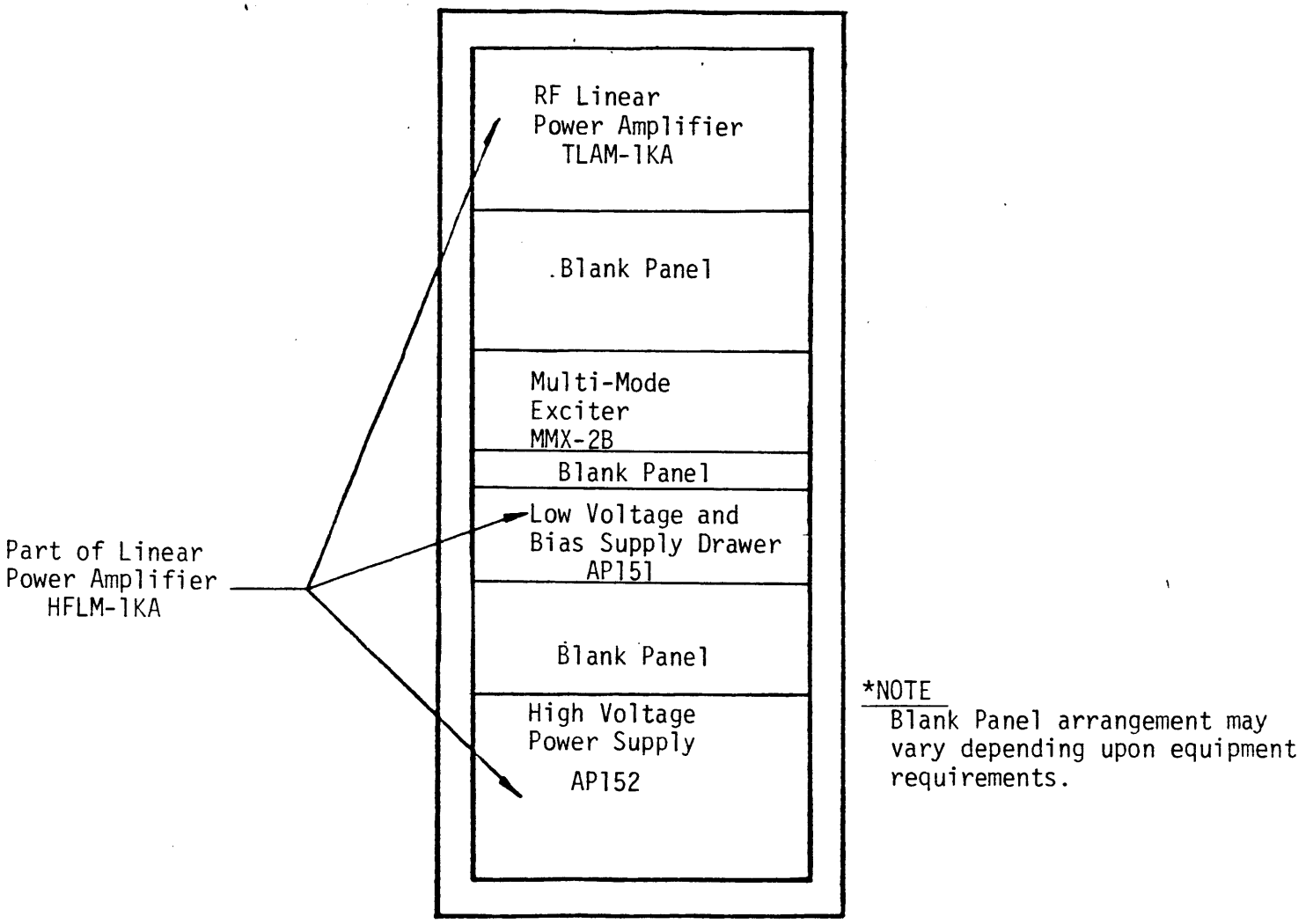


Figure 1-2. Physical Configuration of HFTM-1KJ2B

Primary power connection to the transmitter is made at the bottom rear of the equipment cabinet; external input and output connections are made through either of two access holes in the bottom rear and side of the equipment cabinet. RF output power is routed through a directional coupler mounted in the HFLM-1KA to the output connector (J10) located on the interface panel in the rear of the transmitter.

1-3. REFERENCE DATA.

Table 1-2 lists the technical specifications of the transmitter. Table 1-3 lists the power tube complement of the transmitter.

TABLE 1-2. TECHNICAL SPECIFICATIONS

Frequency Information	
Range	2 to 30 mhz is Standard; 1.6 to 30 MHz is Optional
Stability Synthesized	One part in 10^8 per day is Standard
Operational	
Modes	CW(A1), AM(A3), AME(A3H), USB(A3A), LSB, two-channel ISB(A3B, FSK(F1, A7J) and FAX(F4, A7J) capability is available
Carrier Suppression	Front panel selectable: full carrier, -6db, -16 db or fully suppressed (greater than -55 db)
Power Output	1000 watts PEP and AVERAGE (CW) continuous, key-down service
Output Impendance	50 ohms nominal unbalanced; 70 ohms nominal Optional
VSWR	Maximum of 2:1 without degrading performance
Tuning	Manual
ALDC	Manual Load and Drive Control to improve linearity, limit distortion, and maintain a relatively constant output level during high modulation peaks and load changes. Front panel control allows adjustment of the level at which the ALDC takes effect.

TABLE 1-2. TECHNICAL SPECIFICATIONS (CONT)

Power Distortion and Noise Ratings	
Spurious Signals	At least 50 db down from full PEP output
Noise Level	At least 50 db down from full PEP output
Unwanted Sideband	Better than 50 db rejection referenced to full PEP output
Intermodulation	Distortion products are at least 35 db below either tone of a standard two-tone test at full rated PEP
Audio	
Sideband Response	±1.5 db, 250-3040 Hz or 250-6080 Hz
Input	1) Two independent 600-ohm channels, balanced or unbalanced. -20 dbm to +5 dbm input will permit full power output. 2) Built-in microphone preamplifier for low level dynamic microphone. Front panel selection and jack. Mike input -55 db into 47K ohms with front panel jack.
Keying Information	
CW	Key jack on front panel and terminals on rear apron allow up to 300 WPM carrier keying, dry contact.
FSK	50 to 100 band with neutral or polar keying
FAX	+1 to +10 VDC will provide a linear shift of 800 Hz
Installation and Environmental Data	
Environmental	Operates 0 to +50°C with up to 90% relative humidity
Cooling	High capacity, filtered, forced air
Primary Power	115/230 VAC, 50/60 Hz, Single Phase at 3.75 killowatts

TABLE 1-3. TRANSMITTER POWER TUBE COMPLEMENT

REFERENCE DESIGNATION	PART NUMBER OR TYPE	FUNCTION
V12Q1	8233	1st RF Amplifier
V1202	4CX350A	2nd RF Amplifier
V1301	8576	Power Amplifier

SECTION 2

INSTALLATION

2-1. INITIAL UNPACKING AND INSPECTION.

The HFTM-1KJ2B transmitter was assembled, calibrated and tested at the factory before shipment. Inspect all packages for possible damage during transit. With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and furnishing of replacement parts. Carefully unpack each crate as indicated by the packing list provided with the transmitter shipment. Inspect all packing materials for parts that may have been shipped as loose items (cabinet hardware, connectors, technical manuals, etc.) Refer to figure 2-1 for typical preparation for shipments.

2-2. POWER REQUIREMENTS.

The transmitter requires a single phase source of 115/230 vac, 50/60 hz at appromimately 3.75 kilowatts.

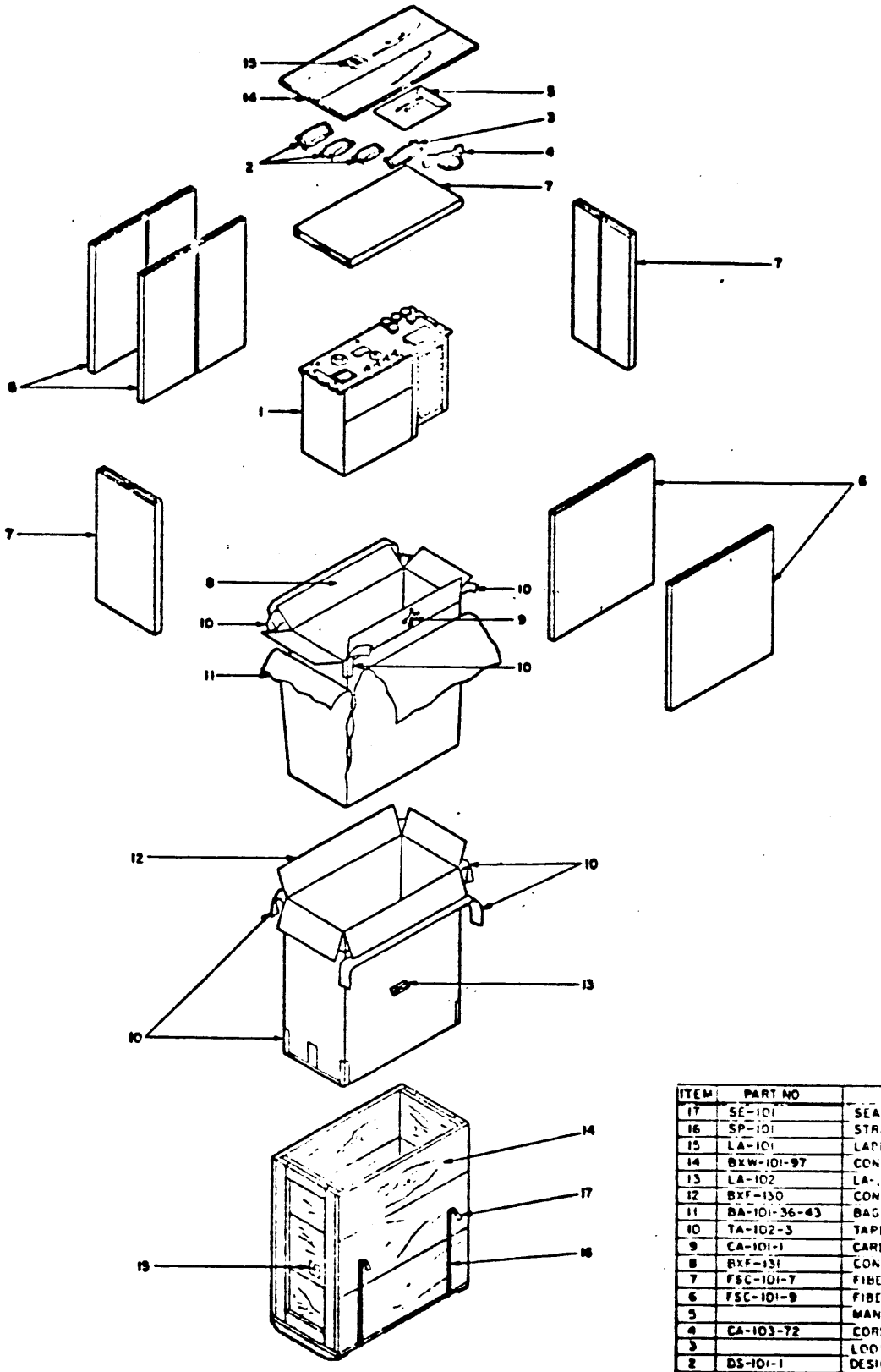
2-3. INSTALLATION.

a. General. A minimum number of assemblies, subassemblies, components and hardware have been disassemblied 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.

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 tages and that all packing material, tags and tape have been removed before sealing-up the cabinet or section of the cabinet with a front panel drawer.

b. Equipment Cabinet Installation. Remove equipment cabinet from crate and positive upright (mounting holes and primary power input connections are located on the bottom portion of the equipment cabinet). Position the equipment cabinet in the desired location, allowing a minimum clearance of two feet on the top and all sides for maintenance and installation purposes. It is of particular importance that a minimum clearance of two feet be allowed in the rear of the cabinet for door removal and external cable connections.

Using mounting hardware and the holes located in the base of the cabinet, secure the equipment cabinet in position.



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	LA-, METHOD II
12	BXF-130	CONTAINER, OUTER
11	BA-101-36-43	BAG, BARRIER
10	TA-102-3	TAPE, PRESSURE SENSITIVE
9	CA-101-1	CARD, HUMIDITY INDICATOR
8	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 2-1. Modular Units, Typical Preparation for Shipment

c. Modular Unit Installation. The component location for modular unit installation in the HFTM-1KJ2B transmitter is shown in figure 2-2. All transmitter units are slide mounted. The modular units of the HFLM-1KA should be installed into the equipment cabinet by referring to the detailed installation procedural steps in Appendix B for Linear Power Amplifier HFLM-1KA. The exciter unit should be installed in the same manner, refer to Appendix A.

WARNING

BEFORE MAKING EXTERNAL CONNECTIONS TO THE TRANSMITTER, INSURE THAT THE EXTERNAL PRIMARY POWER IS OFF AND TAGGED.

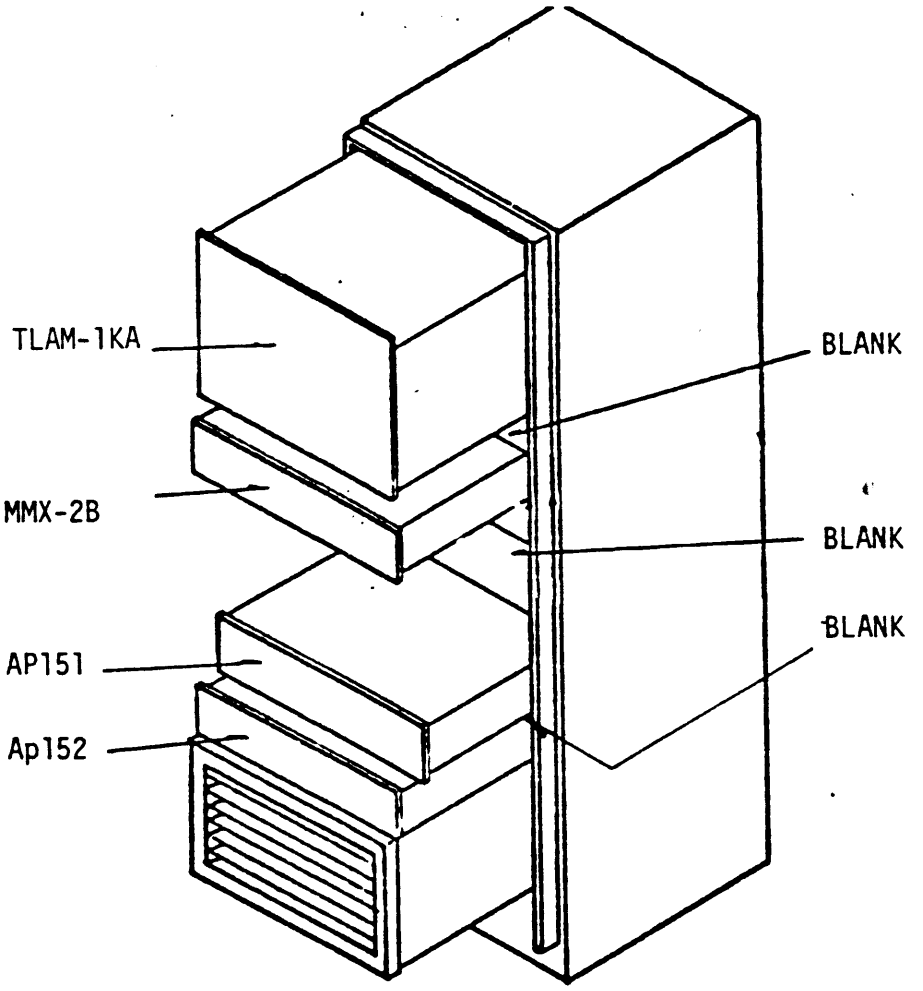


Figure 2-2. HFTM-1KJ2B Modular Unit Installation

d. Electrical Interconnections. Once the modular units have been installed in the equipment cabinet, connect all plugs to their respective jacks (refer to figures, 2-3, 2-4 for interconnect wiring and to figure 2-6 for connector locations). All interconnect cables are marked with their respective J reference numbers (jacks) and mating P reference numbers (plugs) for ease of installation.

e. External Connections. External input and output connections are made to the transmitter at the interface panel, located in the rear of the equipment cabinet. As shown in figure 2-5, the interface panel consists of nine terminal jacks which provide a termination point for intelligence inputs, external transmitter control inputs, and transmitter status indicator outputs. If external transmitter control lines are not provided and connected to J7 on the interface panel, jumper connections must be added at terminal jack J7 to complete circuits within the transmitter, enabling operation. Refer to figure 2-3 and Table 2-1 for information pertaining to external connections and/or control jumpers. Figure 2-3 is the interconnect wiring diagram; Table 2-1 lists the external interface panel connections and their functions.

TABLE 2-1. EXTERNAL CONNECTIONS TO INTERFACE PANEL

EXCITER CONTROL JACK J6	
DESIGNATION	FUNCTION/CONNECTION
USB	600 ohm audio input lines; connect to pins A,B and C. Use a shielded pair.
LSB	600 ohm audio input lines; connect to pins E,F and G. Use a shielded pair.
FSK	Frequency shift keying line; connect (+) to pin L and (-) to pin K.
FAX	Facsimile input line; connect across pins N and Q. Pin Q is ground.
FSK CONTACT KEY	Frequency shift contact keyer; connect across pins P and Q. Pin Q is ground.
CW KEY	Continuous wave keyer; connect across pins R and S. Pin S is ground.
PTT	Push-to-talk device; connect across pins T and U. Pin U is ground.

TABLE 2-1. EXTERNAL CONNECTIONS TO INTERFACE PANEL (CONT)

TRANSMITTER CONTROL JACK J7	
DESIGNATION	FUNCTION/CONNECTION
+24 VDC	+24 vdc output is available between pin A and ground when the transmitter main power is on.
EXTERNAL INTERLOCKS	A closure must be provided to enable transmitter operation; connect external interlock device lines or jumper across pins B and C.
OVERLOAD RESET	A closure must be provided across the COM and NC contacts by an external in-activated switch or jumper; connect jumper or external overload reset switch lines across pins E and G.
AUTO RESET RECYCLE	When the option of Transmitter Automatic Reset Circuit is utilized, the connection of this option is made at pin K.
HV ON	A closure must be provided to enable transmitter high voltage; connect jumper or external high voltage on device lines across pins R and S. Pin S is ground.
XMTR PTT	Push-to-talk device lines which must provide a closure to bias on transmitter; connect external transmitter push-to-talk device or jumper across pins T and U. Pin U is ground.
OUTPUT METER CONTROL	Input line for activating signal outputs to external forward and reflected power meters; provide a ground on pin Y when and if signal outputs are desired for external monitoring of forward and reflected power.

TABLE 2-1. EXTERNAL CONNECTIONS TO INTERFACE PANEL (CONT)

TRANSMITTER READBACK JACK J8	
DESIGNATION	FUNCTION/CONNECTION
+24 VDC	+24 vdc output is available between pin A and ground when the transmitter main power is on.
RECEIVER MUTE	Receiver mute terminals provide switch closure in transmitter off condition; connect receiver mute lines across pins B,C and D. C is common; B is normally open; and D is normally closed.
OVERLOAD INDICATOR	Overload indicator terminals are switch closures to ground provided by a transmitter overload condition; connect overload indicating device lines to terminals G and H. G is normally closed; H is normally open.
HV ON INDICATOR	High voltage on indicator lines are for connection in series of a 24 vdc indicating device; connect high voltage indicating device lines across pins P and R. Pin P is (+).
FORWARD POWER REFLECTED POWER	Output terminals for connection of external forward and reflected power meter; connect forward power meter lines across pins a and b; connect reflected power meter lines across pins c and d.

f. RF Monitor Connection. The rf monitor output terminal jack J3 is located on the interface panel and provides a low level rf sample of the exciter output for external monitoring. If external monitoring is desired, connect the monitor line to J3 using the rf connectors UG88/U.

g. External Standard Connection. All output frequencies of the HFTM-1KJ2B transmitter are referenced to the 1 mhz internal standard of the MMX-2B exciter. This internal standard has a stability of 1 part in 10^8 per day for ambient change of 15°C. Higher stability is available by use of an external station standard. The external standard input line connection should be made at J4 of the interface panel using the rf connectors UG88/U.

NOTE

When using an external standard set the EXT/INT switch on the rear of the MMX-2B exciter to the EXT position.

h. RF Output Connection. The rf output terminal jack J10 is located on the interface panel. Connect a 50 ohm transmission line to J10, using the r f connector plug UG59/U. The transmission line must be terminated into a 50 ohm dummy load or antenna.

i. Primary Power Connection. The transmitter leaves the factory wired for 115 vac or 230 vac operation (as per customer requirements). Transmitter power requirements are 115/230 vac, 50/60 hz at approximately 3.75 kw. The power input connection is J2001 or TB2001 either of which is located in the bottom rear of the equipment cabinet (refer to figure 2-6).

WARNING

BEFORE CONNECTING PRIMARY POWER INPUT LINES TO THE TRANSMITTER, INSURE THAT THE EXTERNAL PRIMARY POWER IS OFF AND TAGGED.

If primary power input lines require J2001, use the ac connector plug PL190-NG which is supplied as a loose item. If primary power input lines connect to TB2001, use (3) lugs TE141-3 supplied as a loose item.

NOTE

The transmitter cabinet is equipped with two safety interlock switches, S2001 and S2002 (refer to figure 2-6), which must be closed before operating the transmitter. The rear door interlock S2001 is closed when the rear door is mounted and fastened on the equipment cabinet; the high voltage power supply interlock S2002 is closed when the AP152 power supply drawer is mounted and fastened with panel locks in the equipment cabinet.

8 | 7 | 6

D

C

B

LIN AMP
TLAM-IK

J1006
RF OUT
P3001
INTFC J10

J1005
ALDC
P2005
INTFC J2

J1004
RF IN
P2004
INTFC J1

J1003
P2003

A	API51 J301-U
B	S2001-COM
C	INTFC J7-D
D	API51 J301-m
E	INTFC J7-Y
F	INTFC J8-a
G	INTFC J8-c
H	API51 J301-2
I	API51 J301-W
J	
K	API51 J301-X
L	
M	
N	API51 J301-Y
O	GND
P	API51 J301-Z, a
R	API51 J301-b, c
S	API51 J301-d, e
T	API51 J301-f, g
U	API52 J101-I
V	API51 J301-h
W	API51 J301-j
X	API51 J301-k
Y	API52 J101-J
Z	API52 J101-K
a	API52 J101-K
b	
c	
d	
e	API52 J101-L
f	
g	
h	
j	
k	

J1002
2 KV
P2002
API52 A103-E1

J1001
4 KV
P2001
API52 R102

INTERFACE

EXCITER
CONTROL
J6

EXCITER-XMTR
INTERCONNECT
J5

API52 J101-A	A	AC
GND	B	GND
API52 J101-B	C	AC
API51 J301-A, INTFC J7-A	D	+24VD
API51 J301-P, INTFC J7-T	R	XMTR
GND	S	GND
GND	U	GND

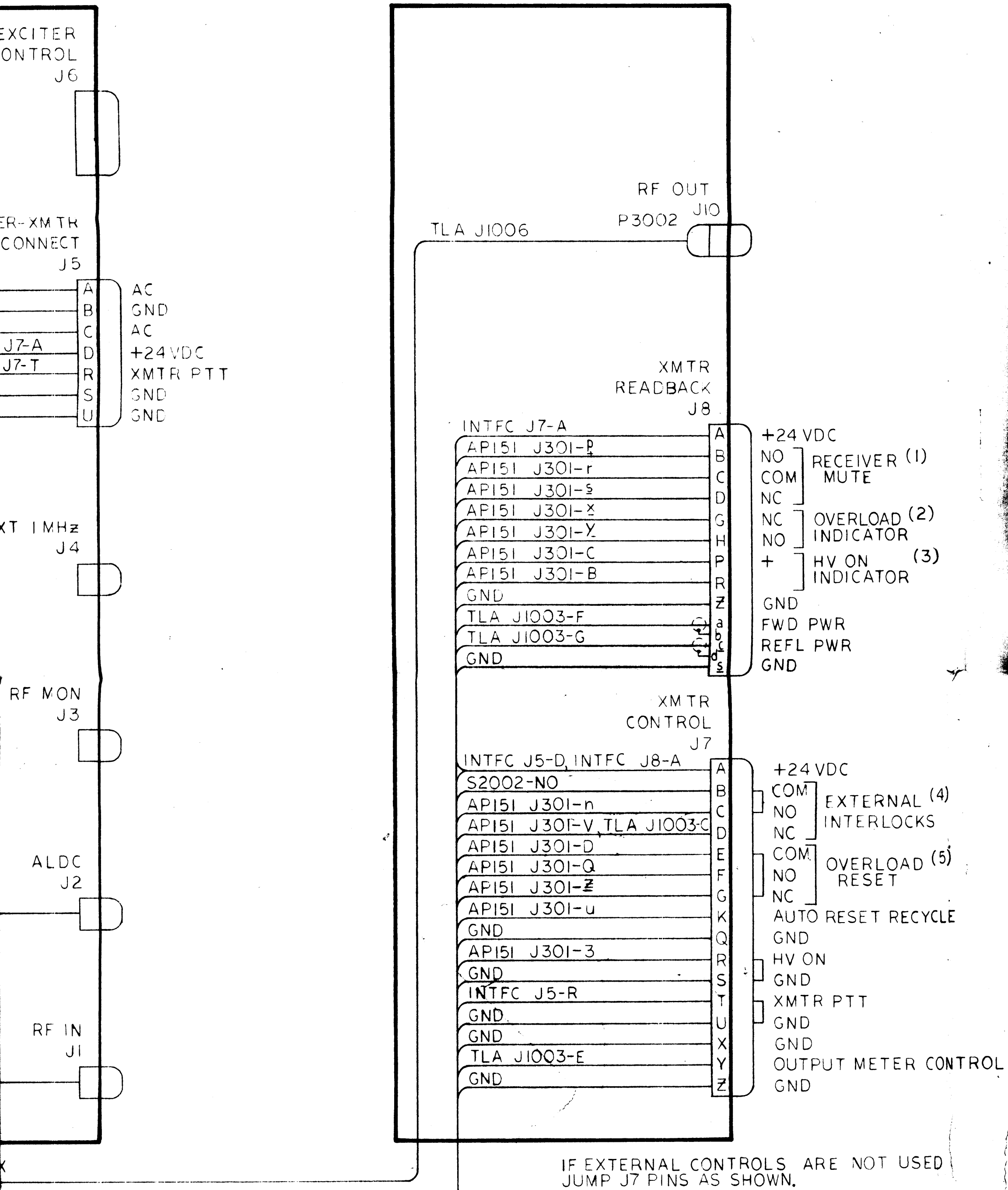
EXT 1MHz
J4

RF MON
J3

ALDC
J2
TLA J1005

RF IN
J1
TLA J1004

CA480-36-XX


EXCITER
ONTROL
J6
ER-XMTR
CONNECT
J5
A AC
B GND
C AC
J7-A D +24VDC
J7-T R XMTR PTT
S GND
U GND
XT 1MHz
J4
RF MON
J3
ALDC
J2
RF IN
J1
INTERFACE
RF OUT
P3002 J10
TLA J1006
XMTR
READBACK
J8
INTFC J7-A
API51 J301-P
API51 J301-r
API51 J301-s
API51 J301-X
API51 J301-Y
API51 J301-C
API51 J301-B
GND
TLA J1003-F
TLA J1003-G
GND
A +24VDC
B NO
C COM RECEIVER (1) MUTE
D NC
G NC
H NO OVERLOAD (2) INDICATOR
P +
R HV ON (3) INDICATOR
Z GND
a FWD PWR
b REFL PWR
c GND
d
s
XMTR
CONTROL
J7
INTFC J5-D, INTFC J8-A
S2002-NO
API51 J301-n
API51 J301-V, TLA J1003-C
API51 J301-D
API51 J301-Q
API51 J301-Z
API51 J301-u
GND
API51 J301-3
GND
INTFC J5-R
GND
GND
TLA J1003-E
GND
A +24VDC
B COM
C NO EXTERNAL (4) INTERLOCKS
D NC
E COM
F NO OVERLOAD (5) RESET
G NC
K AUTO RESET RECYCLE
Q GND
R HV ON
S GND
T XMTR PTT
U GND
X GND
Y OUTPUT METER CONTROL
Z GND
IF EXTERNAL CONTROLS ARE NOT USED
JUMP J7 PINS AS SHOWN.

3	2

REVISIONS					
E.M.N.NO	DRAFT	CHKD	ZONE	LTR	DESCRIPTION
	Q			C	ORIGINAL RELEASE FOR PRODUCTION
21540	-E	EJ		A	1-32 SH. WAS AP 151 CHG TO AP1
21933	AT			B	AC INPUTS REVISED

LV PWR SPLY
AP151

J301

P2005

A	INTFC J5-D
B	INTFC J8-R
C	INTFC J8-P, AP151 J301-2
D	INTFC J7-E, AP152 J101-F
E	AP152 J101-H
F	AP152 J101-M
G	AP152 J101-N
H	
J	
K	
L	
M	
N	
P	INTFC J5-R
Q	INTFC J7-F
R	AP152 J101-G
S	
T	
U	TLA J1003-A
V	INTFC J7-D, S2001-NC
W	TLA J1003-I
X	TLA J1003-K
Y	TLA J1003-N
Z	TLA J1003-P
a	TLA J1003-P
b	TLA J1003-R
c	TLA J1003-R
d	TLA J1003-S
e	TLA J1003-S
f	TLA J1003-T
g	TLA J1003-T
h	TLA J1003-V
j	TLA J1003-W
k	TLA J1003-X
L	
m	TLA J1003-D
n	INTFC J7-C
p	INTFC J8-B
r	INTFC J8-C
s	INTFC J8-D
t	
u	INTFC J7-K
v	
w	
x	INTFC J8-G
y	INTFC J8-H
z	INTFC J7-G
2	TLA J1003-H, AP151 J301-C
3	INTFC J7-R
4	
5	
6	GND

HV PWR SPLY
AP152

R102
4 KV
TLA J1

A103-E2
2 KV
TLA J1

J101

P2007

A	J2001
B	J2001
C	GND
D	
E	
F	AP151
G	AP151
H	AP151
I	TLA J
J	TLA J
K	TLA J
L	TLA J
M	AP151
N	AP151

DC
RECEIVER (1)
MUTE

OVERLOAD (2)
INDICATOR

HV ON (3)
INDICATOR

PWR
PWR

VDC
EXTERNAL (4)
INTERLOCKS

OVERLOAD (5)
RESET

RESET RECYCLE

N

R PTT

PUT METER CONTROL

RE NOT USED

REVISIONS							
E.M.N.NO	DRAFT	CHKD	ZONE	LTR	DESCRIPTION	DATE	APPROVED
	J			C	ORIGINAL RELEASE FOR PRODUCTION	3/1[illegible]	
21[illegible]	[illegible]	EJ		A	[illegible] AP151 [illegible] TO AP152	5/29/73	EJ
21933	[illegible]			B	AC INPUTS REVISED	3-31-82	

HV PWR SPLY
AP151

J301

P2006

A	INTFC J5-D
B	INTFC J8-R
C	INTFC J8-P, AP151 J301-2
D	INTFC J7-E, AP152 J101-F
E	AP152 J101-H
F	AP152 J101-M
G	AP152 J101-N
H	
J	
K	
L	
M	
N	INTFC J5-R
P	INTFC J7-F
Q	AP152 J101-G
R	
S	
T	TLA J1003-A
U	INTFC J7-D, S2001-NC
V	TLA J1003-I
W	TLA J1003-K
X	TLA J1003-N
Y	TLA J1003-P
Z	TLA J1003-P
a	TLA J1003-R
b	TLA J1003-R
c	TLA J1003-S
d	TLA J1003-S
e	TLA J1003-T
f	TLA J1003-T
g	TLA J1003-V
h	TLA J1003-W
j	TLA J1003-X
k	
L	
m	TLA J1003-D
n	INTFC J7-C
p	INTFC J8-B
r	INTFC J8-C
s	INTFC J8-D
t	
u	INTFC J7-K
v	
w	
x	INTFC J8-G
y	INTFC J8-H
z	INTFC J7-G
2	TLA J1003-H, AP151 J301-C
3	INTFC J7-R
4	
5	
6	GND

HV PWR SPLY
AP152

R102
4 KV
TLA J1001

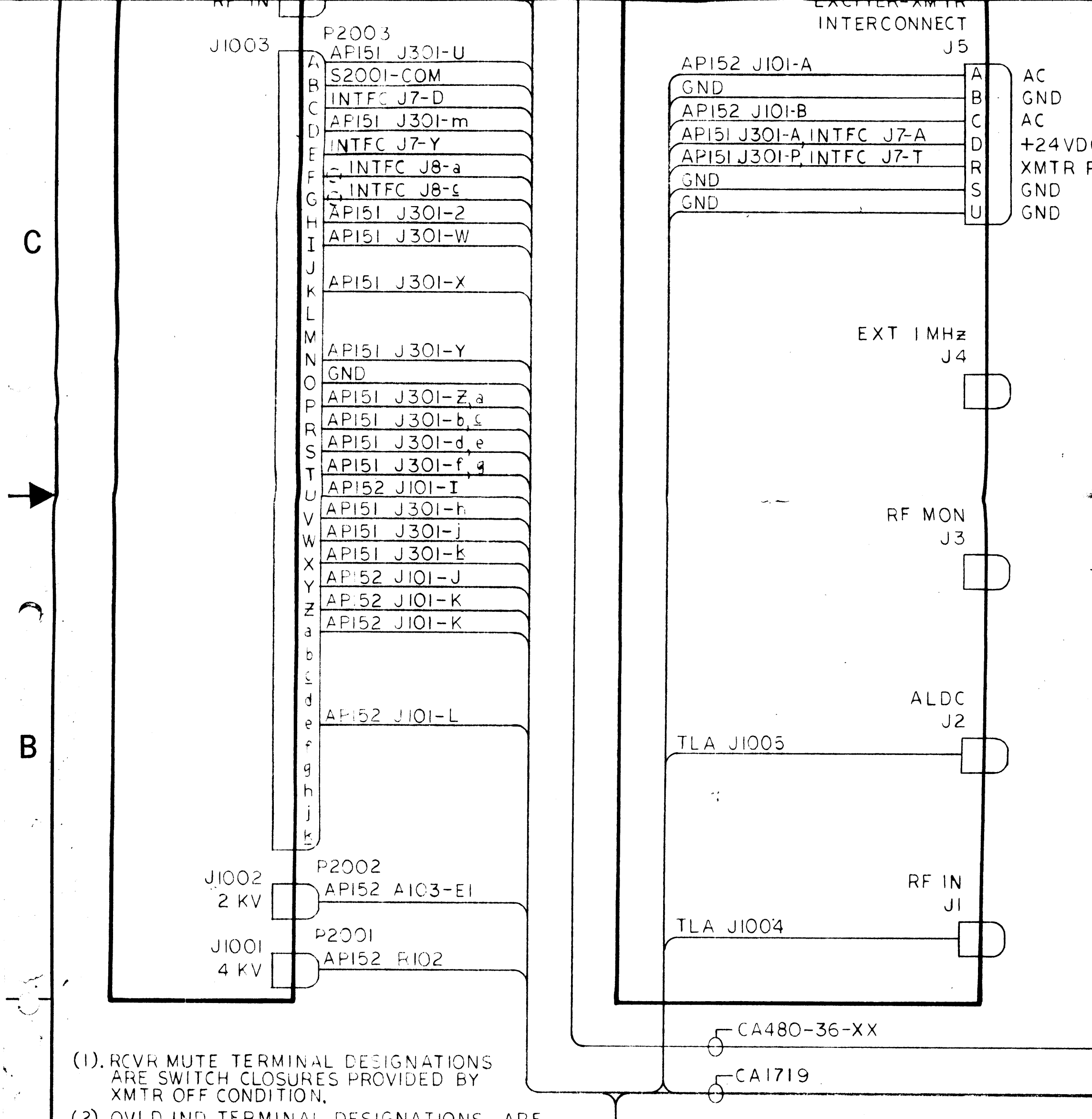
A103-E2
2 KV
TLA J1002

J101

P2007

A	J2001, INTFC J5-A
B	J2001, INTFC J5-C
C	GND
D	
E	
F	AP151 J301-D
G	AP151 J301-R
H	AP151 J301-E
I	TLA J1003-U
J	TLA J1003-Y
K	TLA J1003-Z, a
L	TLA J1003-e
M	AP151 J301-F
N	AP151 J301-G

CK1943 A



(1). RCVR MUTE TERMINAL DESIGNATIONS ARE SWITCH CLOSURES PROVIDED BY XMTR OFF CONDITION.

(2). OVLD IND TERMINAL DESIGNATIONS ARE SWITCH CLOSURES TO GND PROVIDED BY XMTR OVERLOADED CONDITION.

(3). HV ON IND TERMINALS ARE FOR CONNECTION TO A SERIES CONNECTED 24VDC DEVICE.

(4). INTLK TERMINAL DESIGNATIONS ARE FOR CONNECTION TO AN INACTIVATED SWITCH.

(5). OVLD RESET TERMINAL DESIGNATIONS ARE FOR CONNECTION TO AN INACTIVATED SWITCH.

(6) AC INPUT MAY APPEAR VIA A JACK J2001 OR A TERMINAL STRIP TB2001.

AC
GND
AC
+24VDC
XMTR PTT
GND
GND

TLA J1006

P3002

XMTR
READBACK
J8

INTFC J7-A	A	+24 VDC
API51 J301-P	B	NO — RECEIVER (1) MUTE
API51 J301-r	C	COM — RECEIVER (1) MUTE
API51 J301-S	D	NC — RECEIVER (1) MUTE
API51 J301-X	G	NC — OVERLOAD (2) INDICATOR
API51 J301-Y	H	NO — OVERLOAD (2) INDICATOR
API51 J301-C	P	+ — HV ON (3) INDICATOR
API51 J301-B	R	
GND	Z	GND
TLA J1003-F	a	FWD PWR
TLA J1003-G	b	REFL PWR
GND	c	
	d	
	S	GND

XMTR
CONTROL
J7

INTFC J5-D, INTFC J8-A	A	+24 VDC
S2002-NO	B	COM — EXTERNAL (4) INTERLOCKS
API51 J301-n	C	NO — EXTERNAL (4) INTERLOCKS
API51 J301-V, TLA J1003-C	D	NC — EXTERNAL (4) INTERLOCKS
API51 J301-D	E	COM — OVERLOAD (5) RESET
API51 J301-Q	F	NO — OVERLOAD (5) RESET
API51 J301-Z	G	NC — OVERLOAD (5) RESET
API51 J301-u	K	AUTO RESET RECYCLE
GND	Q	GND
API51 J301-3	R	HV ON
GND	S	GND
INTFC J5-R	T	XMTR PTT
GND	U	GND
GND	X	GND
TLA J1003-E	Y	OUTPUT METER CONTROL
GND	Z	GND

IF EXTERNAL CONTROLS ARE NOT USED
JUMP J7 PINS AS SHOWN.
XMTR PTT IS CONTROLLED BY J5-R OR J7-T.

PLY
2

NO

PWR
INPUT
TB2001

GND	1	
AP152 J101-A	2	AC
AP152 J101-B	3	

GND

PWR
INPUT
J2001

G
B W

AP152 J101-A
AP152 J101-B

	HFLM-1K/REV A	RAK139
QTY / UNIT	MODEL USED ON	ASS'Y NO.
APPLICATION		
	CODE	

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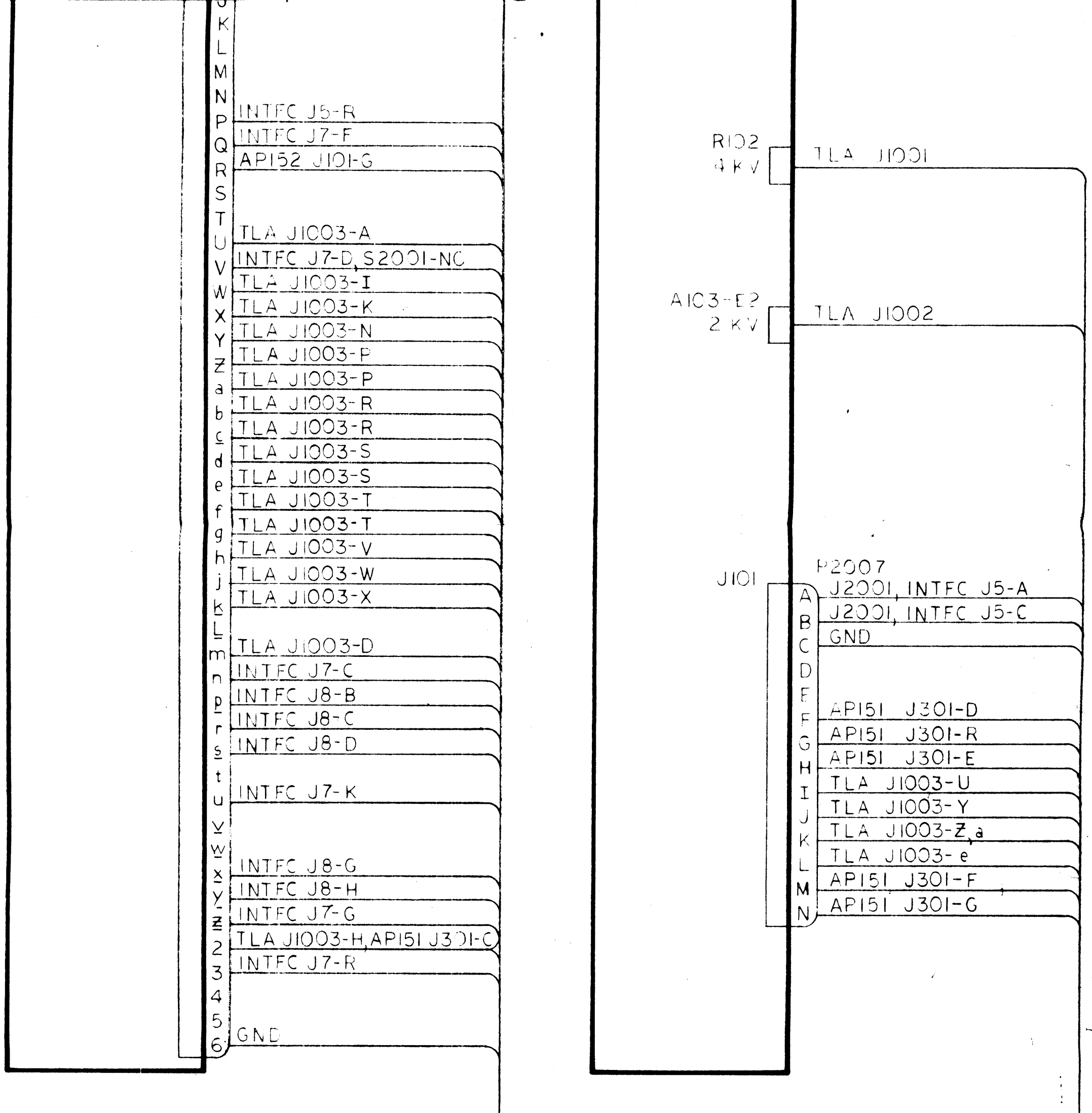
6 5 4



PWR
INPUT
J2001

AK139
ASS'Y NO.

QTY. REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES	FINAL APPROVAL	DATE 21 JUL 72
	MECH. DES.	DATE
TOLERANCES ON DECIMALS: .X ± .05, .XX ± .01, .XXX ± .005 FRACTIONS: ± 1/64 ANGLES: ± 0° 30'	ELECT. DES.	DATE 21 JUL 72
	CHECKED	DATE
	DRAWN	DATE 15 JUL 72
MATERIAL		
FINISH		

Figure 2-3

INTERCONNECT WIRING DIAGRAM

rial disclosed hereon.
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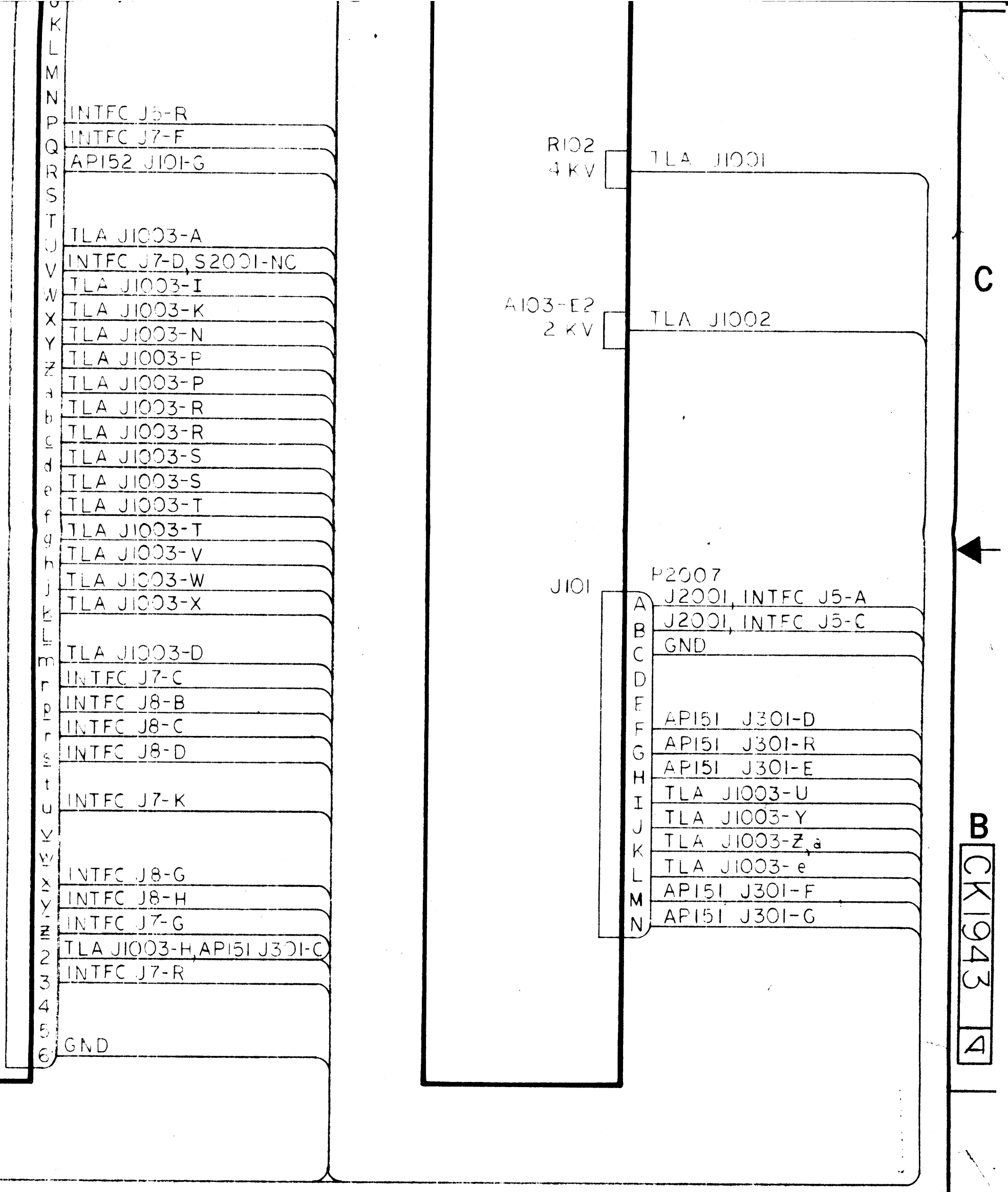
t any time.

GK1943-B

3 2 1



QTY. REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL

FINAL APPROVAL		DATE 21 JUL 72
MECH. DES.		DATE
ELECT. DES.		DATE 8 AUG 72
CHECKED		DATE
DRAWN		DATE 15 AUG 72

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

TOLERANCES ON

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

MATERIAL

FINISH

Figure 2-3

INTERCONNECT WIRING DIAGRAM

CK1943-B

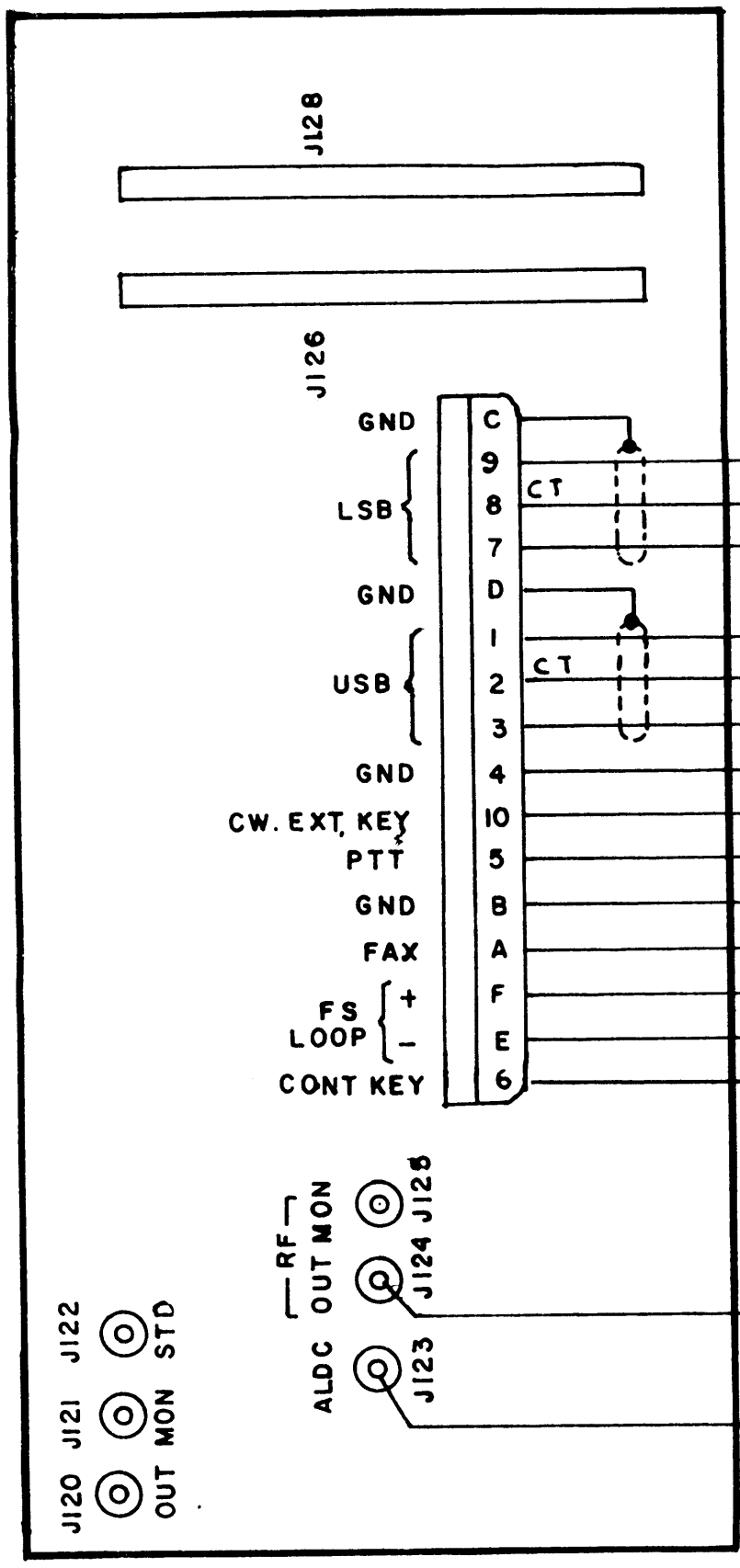
A

3 2 1

4 3

D C B A

MMX-2B



	HFTM-1KAJ2	
QTY / UNIT	MODEL USED ON	ASS'Y NO.
APPLICATION		
	CODE	

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UNLESS OT
DIMENSIO
AND INCLUDE
OR PL

TOL

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

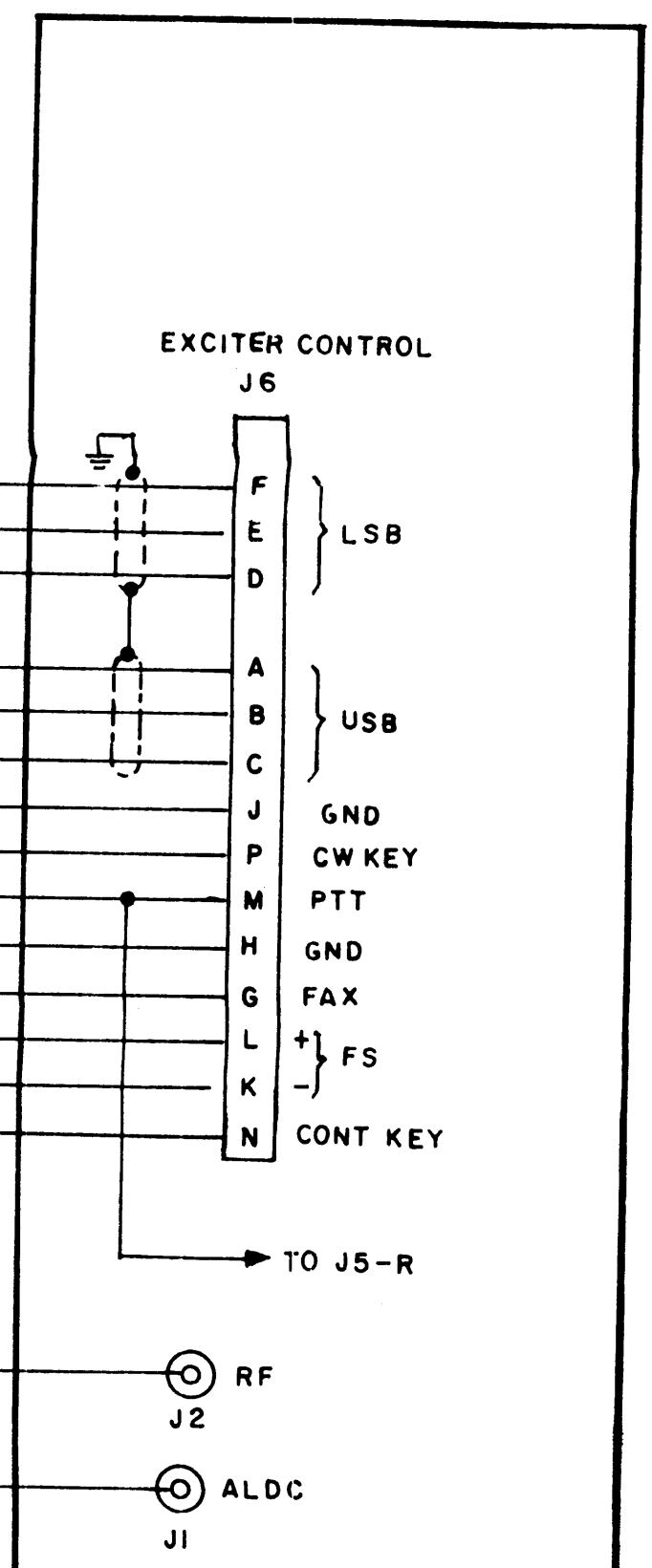
MATERIAL

FINISH

FCI-10-170 (1-66)

4 3

REVISIONS							
ZONE	LTR	DESCRIPTION	DATE	E.M.N.NO	DRAFT	CHKD	APPD



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

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES	FINAL APPROVAL CDC	DATE 7-18-79
	MECH. DES.	DATE
TOLERANCES ON DECIMALS: .X ± .05, .XX ± .01, .XXX ± .005 FRACTIONS: ± 1/64 ANGLES: ± 0° 30′	ELECT. DES.	DATE
	CHECKED	DATE
	DRAWN G. DeLuca	DATE 7-18-79
MATERIAL		
FINISH		

Figure 2-4

INTERCONNECT WIRING DIAGRAM

CK2222-Ø

TABLE 2-2. CONNECTORS SUPPLIED AS LOOSE ITEMS

TMC PART NUMBER	FUNCTION
UG88/U (optional)	Connection to interface panel jacks J1 and J2
MS3106B24-28P (optional)	Connection to interface panel jack J5
MS3106B24-28P	Connection to interface panel jack J6
MS3106B24-28P	Connection to interface panel jack J7
MS3106B28-21P (optional)	Connection to interface panel jack J8
UG59/U	Connection to interface panel jack J10
PL190-NG (ac connections or optional)	Connection to ac power input jack J2001
TE141-3	Connection to ac power input terminal strip TB2001 (3 REQ)
PJ055B	Connection to exciter KEY input jack
PJ068B	Connection to exciter MIKE input jack

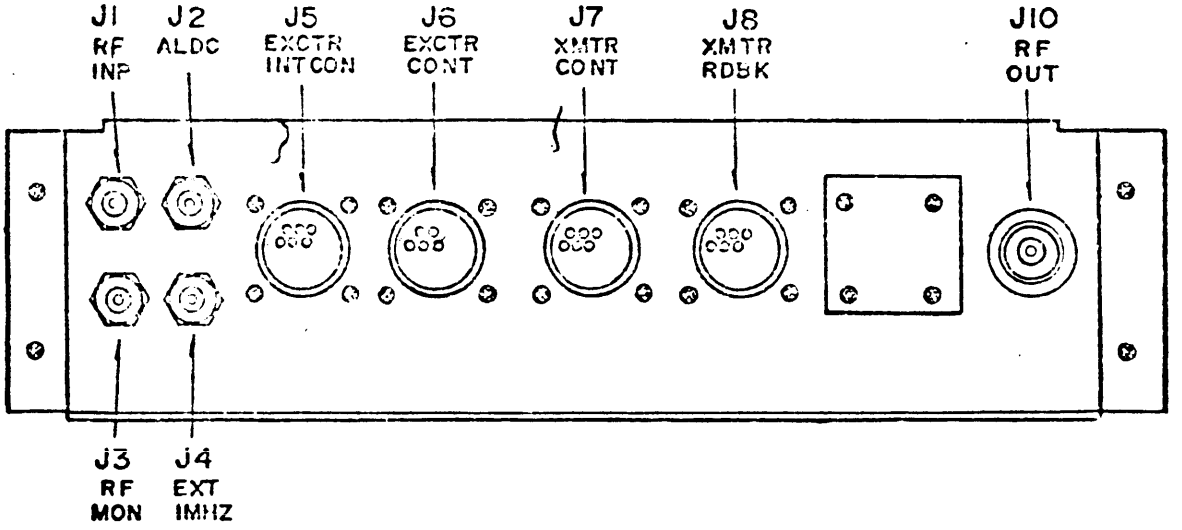


Figure 2-5. Interface Panel

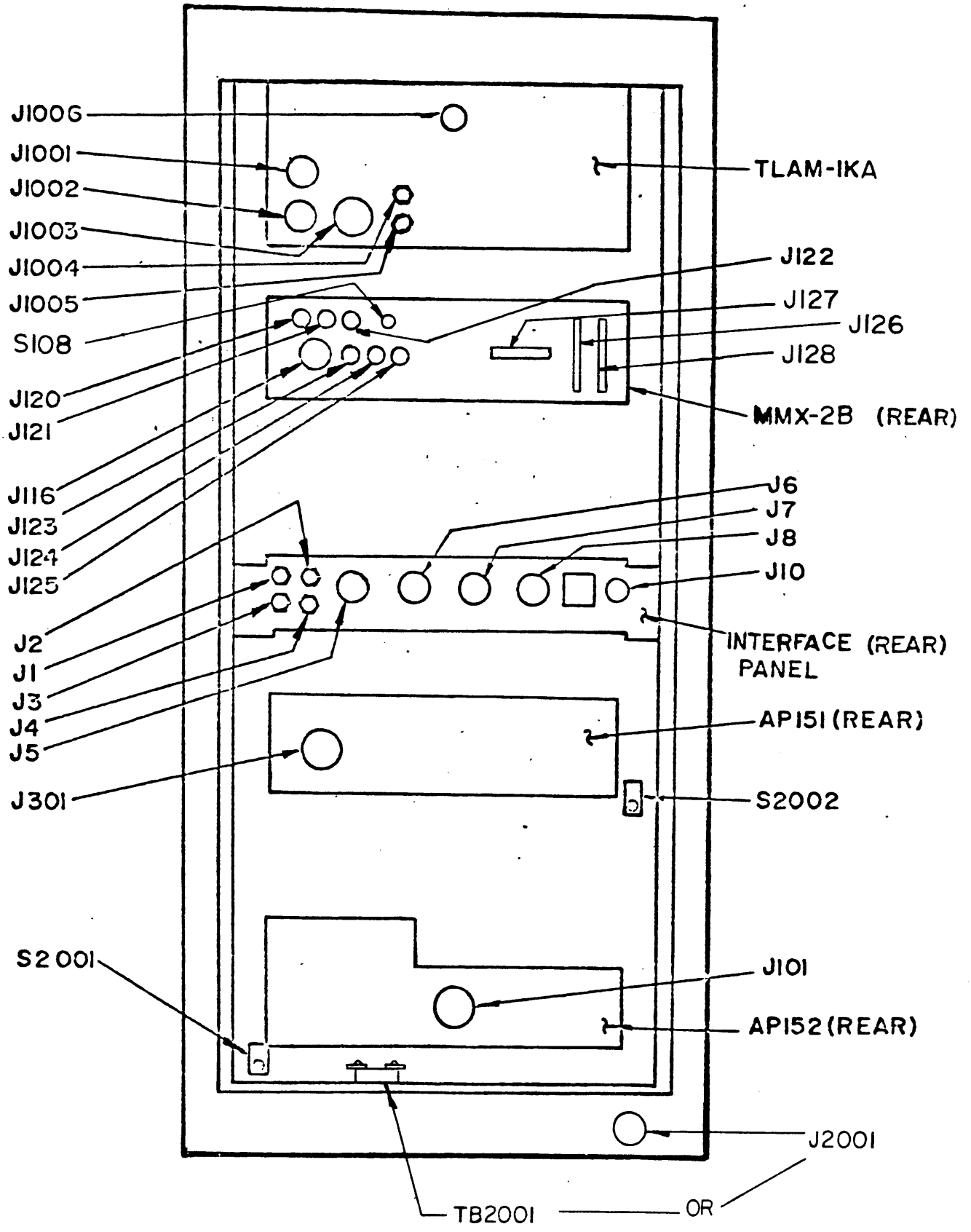


Figure 2-6. HFTM-1KJ2B Component Locations, Rear View

SECTION 3

OPERATOR'S SECTION

3-1. SCOPE.

This section gives detailed operating instructions for the HFTM-1KJ2B transmitter.

3-2. GENERAL.

Although an extensive interlock and overload system is designed into the HFTM-1KJ2B transmitter, a single incorrect control setting might still overload certain components, inviting early failure and consequently transmitter "down-time", not to mention improper and illegal emission.

Prior to operation of the transmitter, the operator should become thoroughly familiar with the location and function of all transmitter controls and indicators. When operating the transmitter, a definite operating sequence (as outlined by the operating instructions) should be strictly followed; the operator should establish a procedural pattern, thus ensuring consistent operation.

3-3. CONSIDERATIONS IN TRANSMITTER TUNING.

a. GENERAL. Before the HFTM-1KJ2B is tuned for any specified mode of operation, it should be initially tuned and loaded on a carrier frequency.

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

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

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

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

c. PEAK ENVELOPE POWER VERSUS AVERAGE POWER INDICATION. A common misapprehension continues to exist over the ratio between average and PEP in high power transmitters, particularly when multichannel (multitone) transmissions are used. Bear in mind that the Peak Envelope Power (PEP) during modulation can be many times that of the Average Power indicated on the PA OUTPUT meter. Thus the transmitter Average Power must be reduced sufficiently to avoid a serious peak overload to the transmitter, with consequent "flat topping" and possible damage.

When two tones of equal amplitude are applied to a SSB system, the ratio of PEP to Average Power is .405 x PEP. This relationship is valid for two tones only. When the HFTM-1KJ2B's OUTPUT meter indicates 500 watts with two tones of equal amplitude applied to the transmitter, peak envelope power (PEP) will be 1000 watts under that condition only. A graphical representation of peak and average power ratio as a function of the number of tones is shown in figure 3-1.

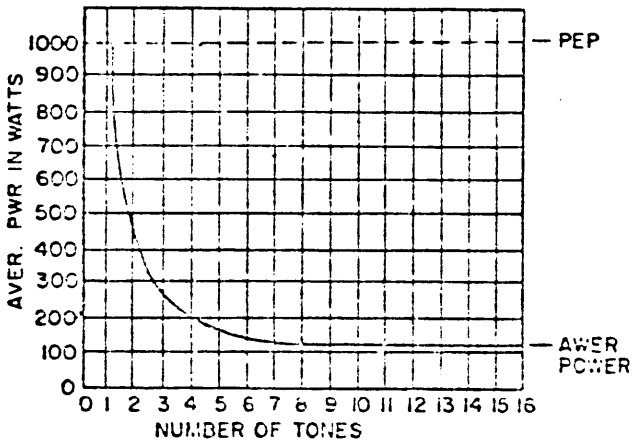


Figure 3-1. Ratio Average Power and PEP as a Function of Tones

3-4. OPERATING CONTROLS AND INDICATORS.

Control and indicator chart, table 3-1 has been prepared in conjunction with control and indicator location drawing, figure 3-2, to assist in the location and operation of all controls and indicators required for tuning and operating the HFTM-1KJ2B transmitter.

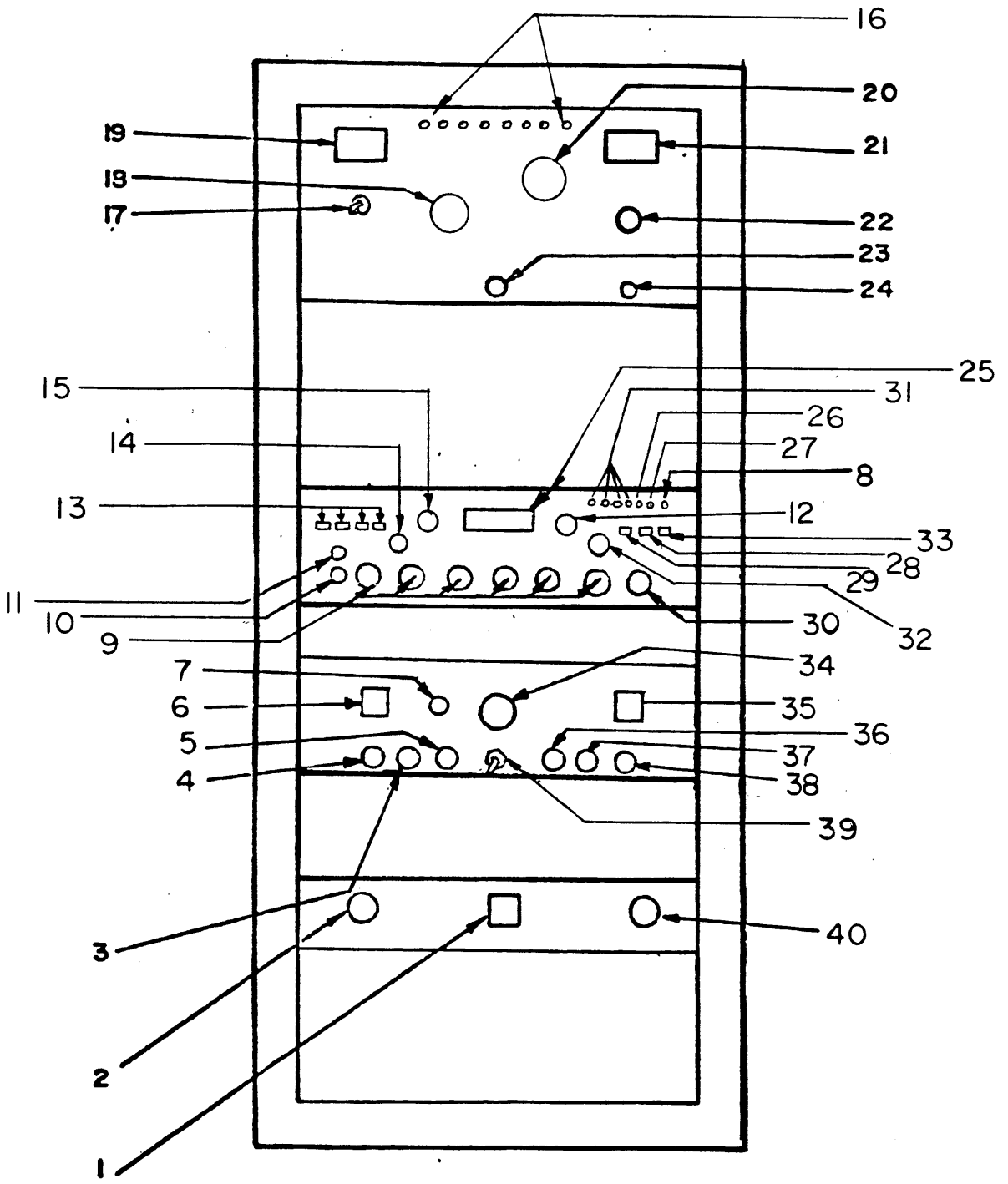


Figure 3-2. HFTM-1KJ2B Controls and Indicators

TABLE 3-1. CONTROLS AND INDICATORS

ITEM NO.	PANEL DESIGNATION	FUNCTION
1	MAIN POWER circuit breaker	When placed in the ON position, applies ac power to the transmitter.
2	MAIN POWER indicator lamp	When illuminated, indicates that ac power is applied to the transmitter.
3	FILA indicator fuse	Protective fuse for filament and bias transformer; when illuminated, indicates open fuse.
4	BLOWER indicator fuse	Protective fuse for blower; when illuminated, indicates open fuse.
5	LV indicator fuse	Protective fuse for primary ac input to low voltage transformer; when illuminated indicates open fuse.
6	SCREEN and PLATE circuit breakers	In ON position, applies screen and plate voltages to the rf amplifier tubes.
7	INTERLOCKS indicator	When illuminated, indicates that all interlocks are closed and the interlock circuit is complete.
8	REMOTE RMTE indicator	When illuminated indicater exciter is remotely controlled.
9	10MHZ, 1MHZ, 100KHZ, 10KHZ, 1KHZ, 100HZ selector switches	Frequency selector switches used to set desired operating frequency.
10	KEY jack	Front panel key jack for dry contact keyer connection in CW mode of operations.
11	MIKE jack	Front panel mike jack for 47,000 ohm impedance microphone input.
12	USB MIKE/LINE	Adjust level of USB input.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

ITEM NO.	PANEL DESIGNATION	FUNCTION
13	METER selector switchs	Four-position pushbutton switch for selecting internal circuits to be monitored on front panel meter. See Appendix A for detailed description.
14	RF OUTPUT control	Adjusts the level of rf output signal from the exciter.
15	LSB MIKE/LINE	Adjusts level of LSB input
16	BAND indicators	Illuminates when desired band is positioned.
17	PLATE meter switch (marked 2nd AMP, IPA and 1st AMP)	Selects plate current circuit to be monitored on the PLATE current meter.
18	TUNE control	Adjusts the variable tune capacitor.
19	PLATE meter	Indicates plate currents of the 1st rf amplifier, 2nd rf amplifier and IPA as selected by the meter switch.
20	BAND selector switch	Selects frequency band of operation from 2.0 mhz to 30 mhz (1.5 - 2.0, 2.0 - 2.6 - 3.0, 3-5, 5-8, 8-12, 12-16, 16-24, 24-30).
21	OUTPUT meter	Indicates output and reflected powers in killowatts.
22	LOAD control	Adjusts the variable load capacitor.
23	ALDC control	Adjusts the level of automatic load and drive control feedback voltage from the amplifier to the exciter.
24	REFL pushbutton switch	When pressed, activates OUTPUT meter to monitor reflected power; otherwise, the OUTPUT meter monitors output power.
25	MONITOR meter	Monitors exciter circuits selected by METER switch.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

ITEM NO.	PANEL DESIGNATION	FUNCTION
26	STANDBY indicator	When illuminated, indicates that ac power is applied to the exciter crystal ovens and power supplies and that dc potentials are not applied to the exciter circuitry; illuminated when the ON/STANDBY switch is in the STANDBY position.
27	POWER indicator	When illuminated, indicates that dc potentials are applied to the exciter circuitry; illuminated when the ON/STANDBY switch is in the ON position.
28	PTT/VOX switch	Controls Push to Talk (PTT) circuits to key exciter and transmitter. Controls used in Voice Operated Relay circuits to key exciter with voice operation.
29	STANDBY STBY switch	Controls application of power to all operating circuits. STANDBY (In) condition applies power to 1 mhz frequency standard only while the OPERATE (Out) position applies power throughout exciter. STBY LED indicator displays for STANDBY condition and PWR indicator for an OPERATE condition.
30	MODE selector switch	Selects the mode of transmitter operation: i.e. AM (amplitude modulation), USB (upper sideband), LSB (lower sideband), ISB (independent sideband), CW (continuous wave), FSK (frequency shift keying), or FAX (facsimile).
31	CARR SUPPR indicators	Indicates the degree of carrier suppression.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

ITEM NO.	PANEL DESIGNATION	FUNCTION
32	CARR SUPPR	Establishes the amount of carrier used by setting suppression levels (see Appendix A for a detailed description.)
33	REMOTE (RMTE) switch	Controls local/remote feature of exciter. Exciter control is local with switch "Out"; remote with switch "In".
34	ALARM indicator	Audible alarm which sounds to indicate the failure and loss of high voltage.
35	HIGH VOLTAGE indicator switch	A pushbutton switch which controls the application of high voltage to the rf amplifier; illuminates to indicate that high voltage is applied.
36	BIAS indicator fuse	Protective fuse in dc return of bias supply; when illuminated, indicates open fuse.
37	DC indicator fuse	Protective fuse for 24 vdc supply; when illuminated, indicates open fuse.
38	CONTROL indicator fuse	Protective fuse for low voltage and filament transformer: when illuminated, indicates open fuse.
39	ALARM ON/OFF switch	Switch to control the alarm circuitry; in the off position the alarm circuitry is inoperative; in the ON position the alarm sounds when high voltage fails or is removed from the rf amplifier.
40	HIGH VOLTAGE indicator	When illuminated, indicates that high voltage is applied to the rf amplifier.

3-5. OPERATING PROCEDURES.

a. Introduction. The operation of the HFTM-1KJ2B transmitter is detailed in the paragraphs which follow. Paragraph 3-5b. Preliminary Operation gives detailed instructions for control settings prior to operation, for application of main power and high voltage, and for bias checks and adjustments. Paragraph 3-5c. General Operation gives detailed instructions for transmitter tuning on carrier and for transmitter operation in the various intelligence modes.

CAUTION

Do not attempt to operate transmitter unless it has been determined that the rf output connection of the transmitter is properly terminated in an antenna or dummy load.

b. Preliminary Operation. Prior to initial application of power to the transmitter, the HFTM-1KJ2B controls should be set as outlined in Table 3-2.

TABLE 3-2. STARTING CONTROL SETTINGS

CONTROL DESIGNATION	LOCATION	SETTING
1) Primary Power circuit breaker	external to the transmitter	OFF position
2) MAIN POWER circuit	AP152 front panel	OFF (down) position
3) SCREEN and PLATE circuit breakers (6)	AP151 front panel	OFF (down) position
4) ALARM ON switch (39)	AP151 front panel	OFF (down) position
5) PA, 1st AMP and 2nd AMP bias controls	within AP151 drawer	fully clockwise (maximum bias)
6) RF OUTPUT control (14)	MMX-2B front panel	fully CCW
7) LSB MIKE/LINE (15) and USB MIKE/LINE (12)	MMX-2B front panel	mid-range (0)
8) STANDBY switch (29)	MMX-2B front panel	STANDBY position
9) EXCITER VOX/PTT switch (28)	MMX-2B front panel	VOX position
10) ALDC control (23)	TLAM-1KA front panel	fully CCW
11) LOAD control (22)	TLAM-1KA front panel	CCW to first indicator line on left
12) Plate current overload adjust screw	TLAM-1KA front panel below PLATE meter	screw adjusted so that overload indicator (red) on PLATE meter is set at 800 ma.

Once the transmitter controls have been set to their starting control settings, the HFTM-1KJ2B is ready for initial application of main power and high voltage and for bias adjustment. These procedures are detailed in Table 3-3.

NOTE

Before High Voltage is applied MMX RF Control Knob must be at minimum (ccw).

TABLE 3-3. PRELIMINARY OPERATING PROCEDURE

STEP	OPERATION	NORMAL INDICATION
1	Set Primary Power circuit breaker to the ON position.	Primary Power indicator (if any) external to transmitter illuminates.
2	Set MAIN POWER circuit breaker (1) to the ON position.	PA blower operates and MAIN POWER indicator (2) on AP152 illuminates. INTERLOCKS indicator (7) on the AP151 illuminates (all safety interlocks must be closed and the time delay cycle must be completed).
3	Set SCREEN and PLATE circuit breakers (6) to ON position.	No indication.
4	Unfasten the panel locks on the AP151 and pull drawer out to expose the PA, 1st AMP and 2nd AMP BIAS controls.	No indication.
5	Press the HIGH VOLTAGE switch/ indicator (35) on the AP151 to illuminate indicator (it may be necessary to press the HIGH VOLTAGE switch twice).	HIGH VOLTAGE indicators (35) and (40) on the AP151 and AP152 must illuminate.
6	With the PLATE meter switch (17) on the TLAM-1KA in its neutral (IPA) position, adjust the PA BIAS control in the AP151 drawer for 200 to 210 ma quiescent current.	PLATE meter (19) on TLAM-1KA indicates 200 to 210 ma.
7	Hold the PLATE meter switch (17) on the TLAM-1KA in the up (2nd AMP) position, and adjust the 2nd AMP BIAS control in the AP151 drawer for 200 to 210 ma of quiescent current.	PLATE meter (19) on TLAM-1KA indicates 200 to 210 ma.
8	Hold the PLATE meter switch (17) on the TLAM-1KA in the down (1st AMP) position, and adjust the 1st AMP BIAS control in the AP151 drawer for 40 to 50ma of quiescent current.	PLATE meter (19) on TLAM-1KA indicates 40 to 50 ma.

c. General Operation. Prior to operating the HFTM-1KJ2B transmitter in any of its intelligence modes, the transmitter must be initially tuned on carrier. Table 3-4 details the procedure for transmitter tuning on carrier.

TABLE 3-4. TRANSMITTER TUNING PROCEDURE (CARRIER ONLY)

STEP	OPERATION	NORMAL INDICATION
1	Perform steps 1 thru 5 in Table 3-3 to apply main power and high voltage to the transmitter	Indications are the same as Table 3-3.
2	With the PLATE meter switch (17) on the TLAM-1KA in its neutral position, observe the PLATE meter (19) on the TLAM-1KA	PLATE meter (19) on the TLAM-1KA indicates 200 to 210 ma (if not, perform step 6 in Table 3-3).
3	Hold the PLATE meter switch (17) on the TLAM-1KA in the Up (2nd AMP) position.	PLATE meter (19) on the TLAM-1KA indicates 200 to 210 ma (if not, perform step 7 in Table 3-3).
4	Hold the PLATE meter switch (17) on the TLAM-1KA in the down (1st AMP) position.	PLATE meter (19) on the TLAM-1KA indicates 40 to 50 ma (if not, perform step 8 in Table 3-3).
5	RF OUTPUT control must be fully CCW on the MMX-2B. PTT line must be closed via MMX-2B or interface panel. Press the HIGH VOLTAGE switch/indicator (35) on the AP151 to illuminate indicator (it may be necessary to press the HIGH VOLTAGE switch twice).	HIGH VOLTAGE indicators (35) and (40) on the AP151 and AP152 must illuminate.
6	Set the BAND selector switch (20) on the TLAM-1KA to a band which covers the desired operating frequency.	Light will illuminate when desired band is reached (16).
7	Set controls on the MMX-2B as follows: METER switch (13) to RF position, STANDBY switch (29) to ON position, VOX/PTT switch (28) to PPT position, and MODE switch (30) to CW position.	The POWER indicator (27) on the MMX-2B illuminates.

TABLE 3-4. TRANSMITTER TUNING PROCEDURE (CONT)
(CARRIER ONLY)

STEP	OPERATION	NORMAL INDICATION
8	Insert a shorting plugs in the MMX-2B Key (10), MIKE (11).	MONITOR meter (25) on the MMX-2B reads approximately 2.
9	Adjust RF OUTPUT (14) on the MMX-2B clockwise slightly to cause an increase in PA plate current.	PLATE meter (19) on the TLAM-1KA indicates an increase in PA plate current (not to exceed 300 ma).
10	Adjust TUNE control (18) on the TLAM-1KA for a noticeable resonant dip in PA plate current.	PLATE meter (19) on the TLAM-1KA indicates a resonant dip and OUTPUT meter (21) on the TLAM-1KA indicates simultaneously an increase in output power.
11	Adjust the LOAD control (22) on the TLAM-1KA as required to produce maximum output power.	The OUTPUT meter (21) on the TLAM-1KA indicates a further increase in output power during loading process.
12	Readjust the TUNE control (18) on the TLAM-1KA to insure that the transmitter is at resonance. Repeat steps 10 and 11 as necessary.	The OUTPUT meter (21) on the TLAM-1KA indicates highest value when the transmitter is properly tuned into an antenna or dummy load.
13	Rotate the RF OUTPUT control (14) on the MMX-2B clockwise to increase output power to the desired level. (Refer to the Maintenance Section of Appendix B, and Appendix A for ALDC Adjustment.)	The OUTPUT meter (21) on the TLAM-1KA indicates the average power output lever.
14	Remove the shorting plug in the MMX-2B Key (10)	The OUTPUT meter (21) on the TLAM-1KA indicates zero.

Once the transmitter has been tuned on carrier as per Table 3-4, it is ready for operation in an intelligence mode. Exciter control positions for the various intelligence modes of operation are outlined in Appendix A.

SECTION 4

THEORY OF OPERATION

4-1. OVERALL BLOCK DIAGRAM ANALYSIS.

Figure 4-1 is an overall block diagram of the HFTM-1KJ2B transmitter. Power input of 115/230 vac, 50/60 hz is applied via J2001 or TB2001 to the AP152 high voltage power supply and to the MMX-2B exciter.

Intelligence inputs to the transmitter are applied via the interface panel to the exciter; these inputs include line audio (for both upper and lower sidebands), frequency shift keying, facsimile, and exciter PTT control. A CW keyline input also appears on the interface panel and is routed to the exciter. The test key switch provides CW keyline closure for tuning and test purposes.

Transmitter control inputs to the HFTM-1KJ2B are also applied via the interface panel; these inputs include control lines for high voltage on circuitry, transmitter PTT, overload reset, and external interlocks. External control of the transmitter is optional; however, if the external control imputs are not utilized, jumper connections must be made at the interface panel to complete transmitter circuitry.

The MMX-2B provides an rf output (J124) of at least 100 milliwatts (250 millivolts) within the frequency range of 2.0 to 30 mhz in any of the following modes; AM, USB, LSB, ISB including AME, CW, FSK or FAX. The exciter output is applied via J1004 to the chain of amplifiers within the TLAM-1KA linear power amplifier. The AP151 low voltage and bias supply and AP152 high voltage supply provide the dc operating potentials for the linear amplifier chain.

The rf output of the TLAM-1KA is one killowatt PEP and average throughout the frequency range of the transmitter. This output is applied via J1006 to J10 on the interface panel. The antenna connection is made at J10.

The TLAM-1KA provides an ALDC (automatic load and drive control) feedback voltage to the MMX-2B exciter, which prevents the rf output of the transmitter from exceeding a preset level. The ALDC circuit in the exciter automatically compensates for high modulation peaks and load changes, providing a relatively constant output level, in addition to limiting distortion and improving linearity.

4-2. FUNCITONAL ASSEMBLY SECTIONS.

Refer to Appendix A and B for detailed theory of operation for the Multi-Mode Exciter and the High Frequency Linear Power Amplifier.

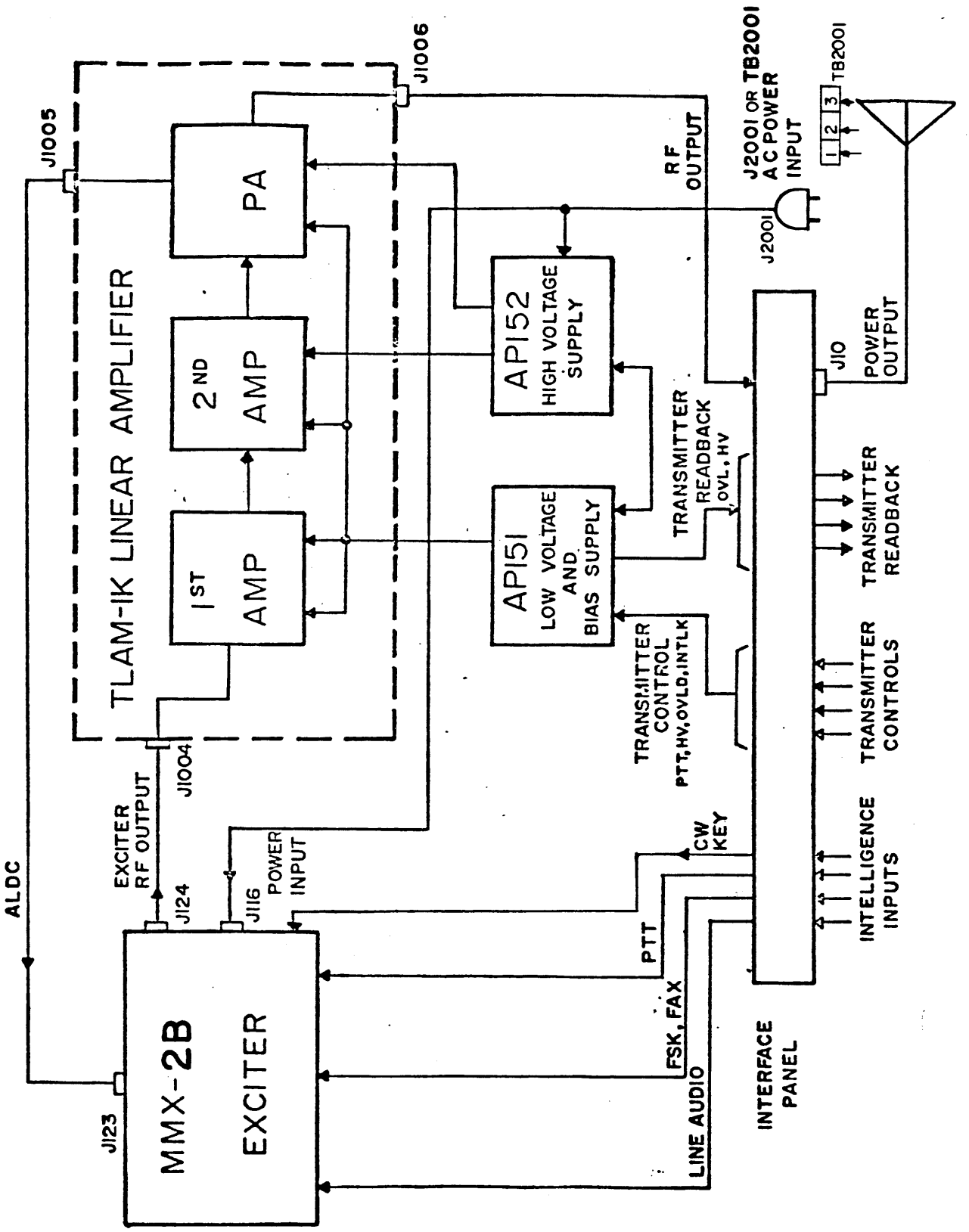


Figure 4-1. HFTM-1KJ2B Overall Block Diagram

SECTION 5

MAINTENANCE AND TROUBLESHOOTING

5-1. INTRODUCTION.

The HFTM-1KJ2B transmitter has been designed for long term, trouble-free operation. When it becomes necessary to perform alignment and/or adjustments to the equipment, it is recommended that technicians perform the necessary operations outlined in the associated HFLM-1KA and MMX-2B Appendixes. The following maintenance aids are provided for troubleshooting and replacement of parts:

a. Overall block diagram (Section 4, figure 4-1)

b. Interconnect wiring diagram (Section 2, figure 2-3, 2-4),

5-2. TEST EQUIPMENT REQUIRED.

Table 5-1 lists the test equipment required for maintaining and troubleshooting the transmitter. Refer to Appendix A and B for additional equipment required to maintain and troubleshoot these two components.

TABLE 5-1. TEST EQUIPMENT REQUIRED

EQUIPMENT	TYPE
Singal Generator	Hewlett-Packard Model 606A, or equivalent
VTVM	Hewlett-Packard Model 410B, or equivalent
Multimeter	Simpson Model 260, or equivalent
Oscilloscope	Tektronix, Model 541A, or equivalent

5-3. OPERATOR'S MAINTENANCE PROCEDURE.

a. Refer to transmitter operating procedures (Tables 3-2, 3-3, and 3-4).

b. Refer to troubleshooting (paragraph 5-5).

c. Refer to maintenance procedures described in Appendix A and B

5-4. PREVENTIVE MAINTENANCE.

In order to prevent equipment failure due to dust, dirt or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to. At periodic intervals, the equipment should be pulled out on its slides for internal cleaning and inspection. The wiring and all components should be inspected for dirt, dust, corrosion, grease or other harmful conditions. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease with any suitable cleaning solvent, Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichlorethylene or Methyl Chloroform may be used, providing the necessary precautions are observed. For detailed preventive maintenance procedures, refer to Appendix A and B.

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.

5-5 TROUBLESHOOTING.

Troubleshooting the HFTM-1KJ2B consists of isolating faults to either the MMX-2B exciter or the HFLM-1KA power amplifier. Refer to the associated appendixes for detailed troubleshooting information.

a. Disconnect the MMX-2B rf output from the HFLM-1KA and connect the MMX-2B to a 50 ohm, 1 watt, non-inductive dummy load. Use an oscilloscope to monitor the exciter output, referring to the Appendix A for normal indications.

b. Use an ohmmeter to check for continuity of interconnect cabling between the MMX-2B and HFLM-1KA. (Refer to figure 2-4.)

c. Disconnect the MMX-2B and connect a signal generator to the HFLM-1KA input. Operate the HFLM-1KA into a dummy load (if available) and monitor the HFLM-1KA meters for proper operation. (Refer to Table 3-4 and Appendix B for normal indications.)

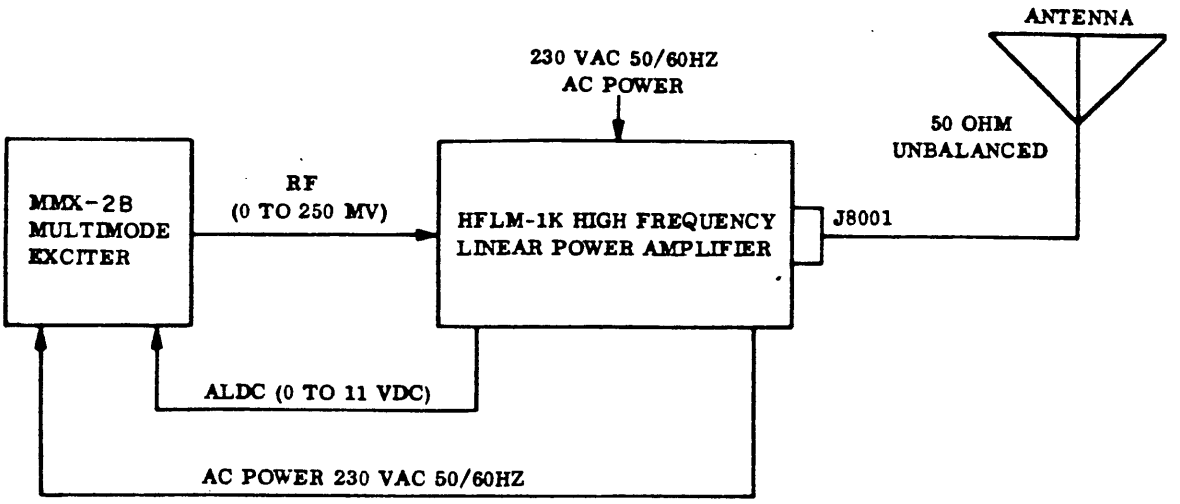


Figure 5-1. HFTM-1KJ2B Overall Block Diagram

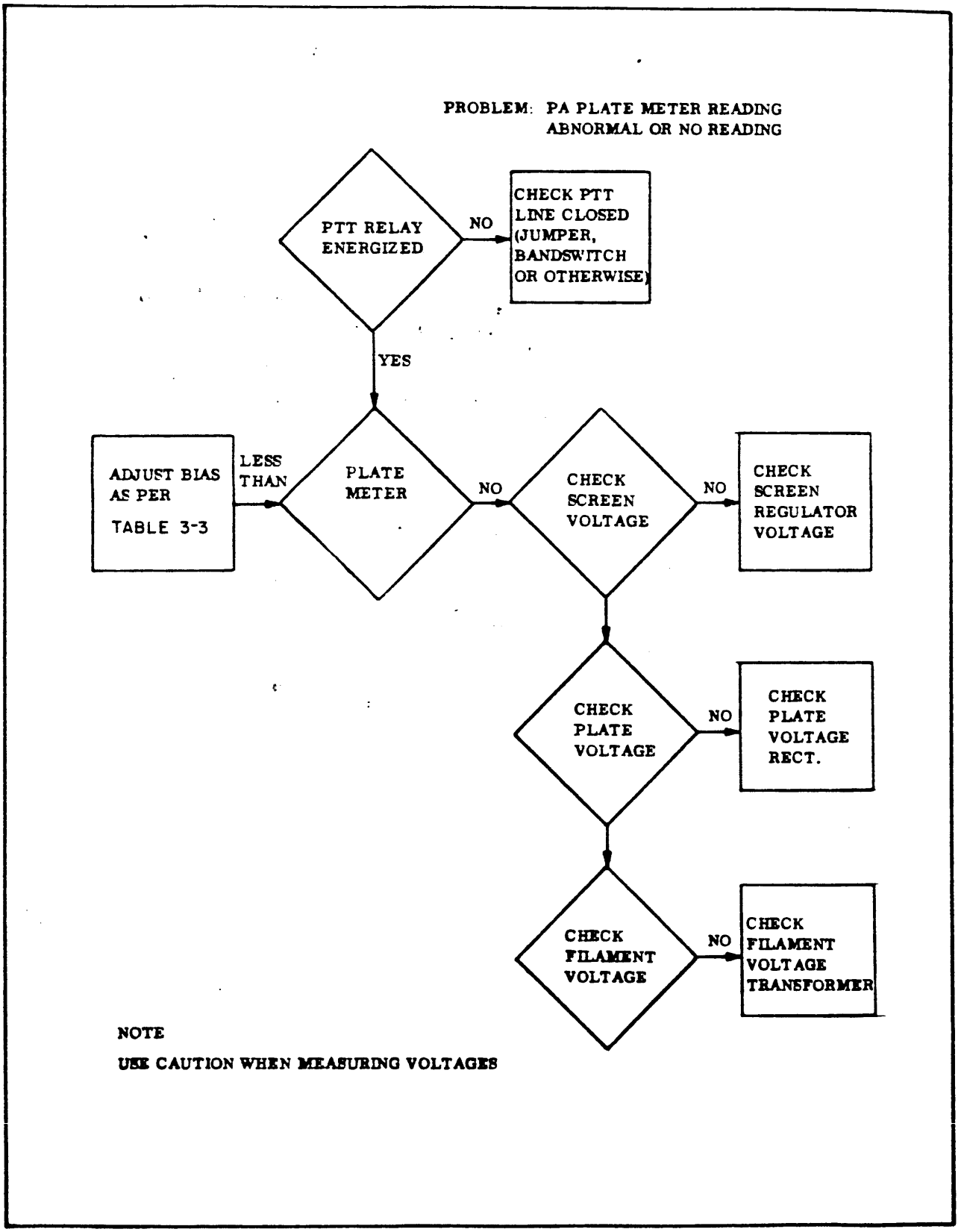
5-6. TROUBLESHOOTING CHARTS A,B,C,D

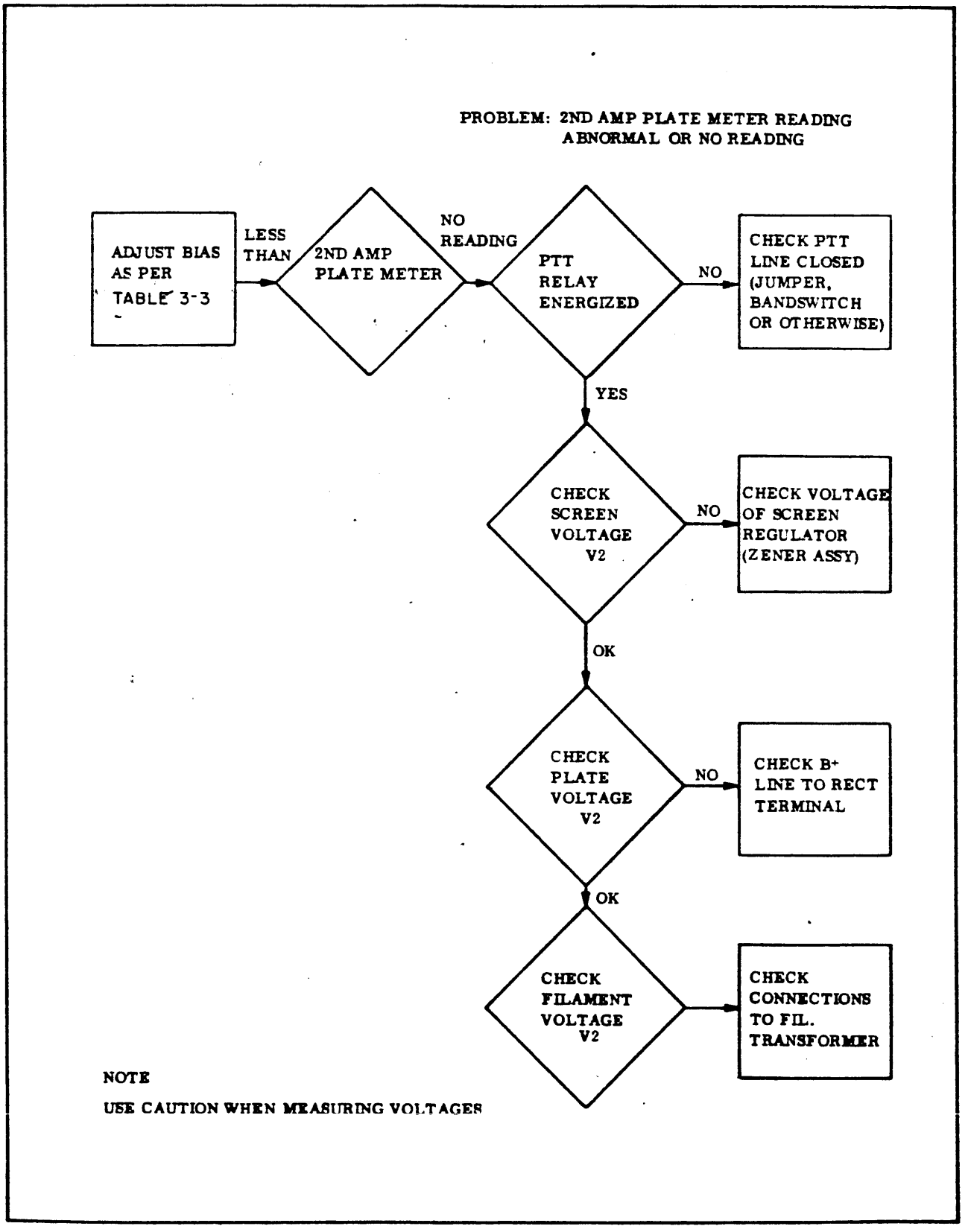
The maintenance programs listed are for the purpose of assisting in troubleshooting and maintenance of the transmitter. These charts or programs do not list all possible difficulties; however, they can be used as a starting point to isolate a particular malfunction. To use the charts, follow these instructions.

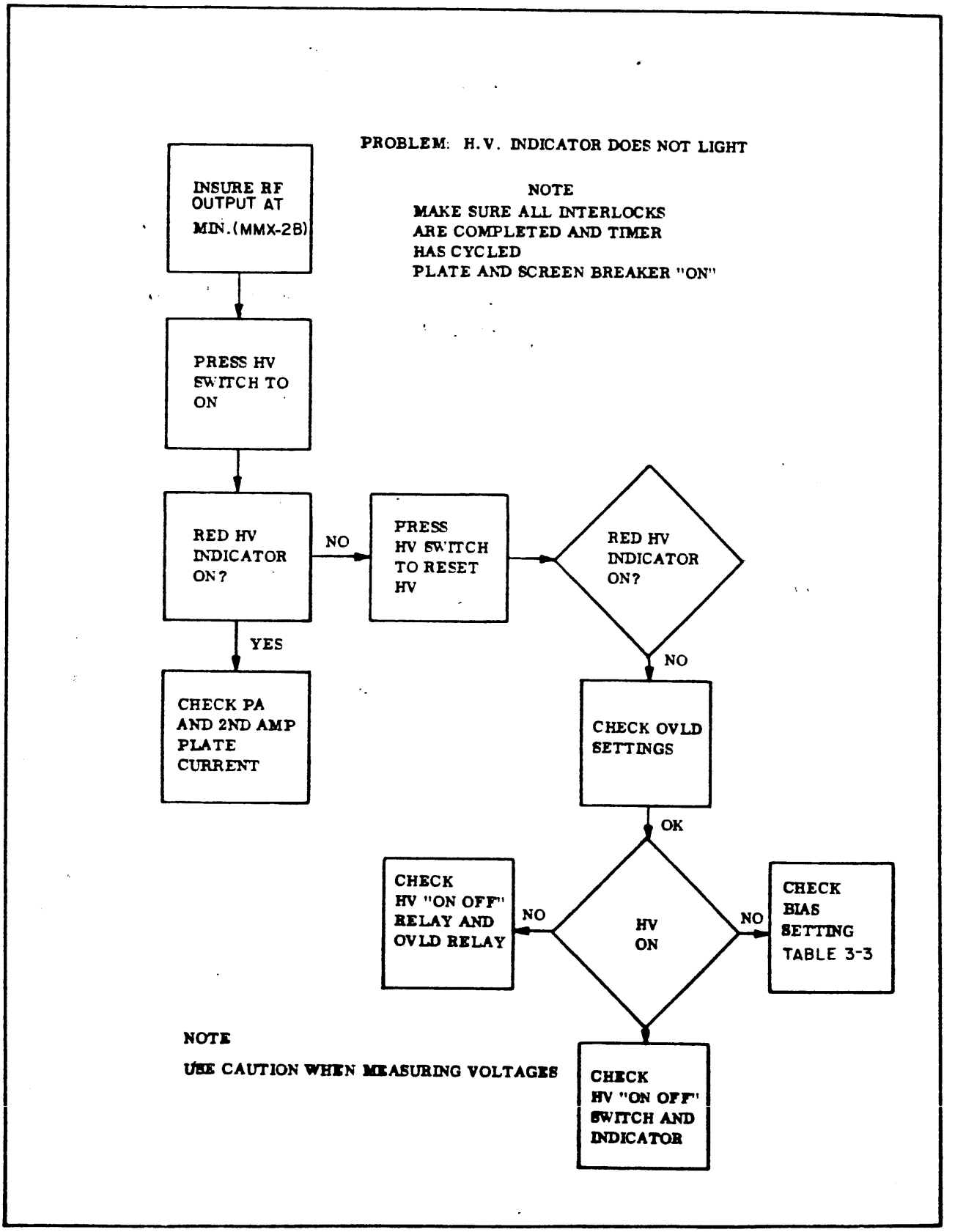
1. Determine the nature of the trouble.
2. Find the programs which described it most completely (refer to program list).
3. Follow the arrow from that block to the first suggested fault - INVESTIGATE.
4. If no trouble can be found, follow the arrow to the next fault suggested - INVESTIGATE.
5. If trouble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

MAINTENANCE PROGRAM LIST

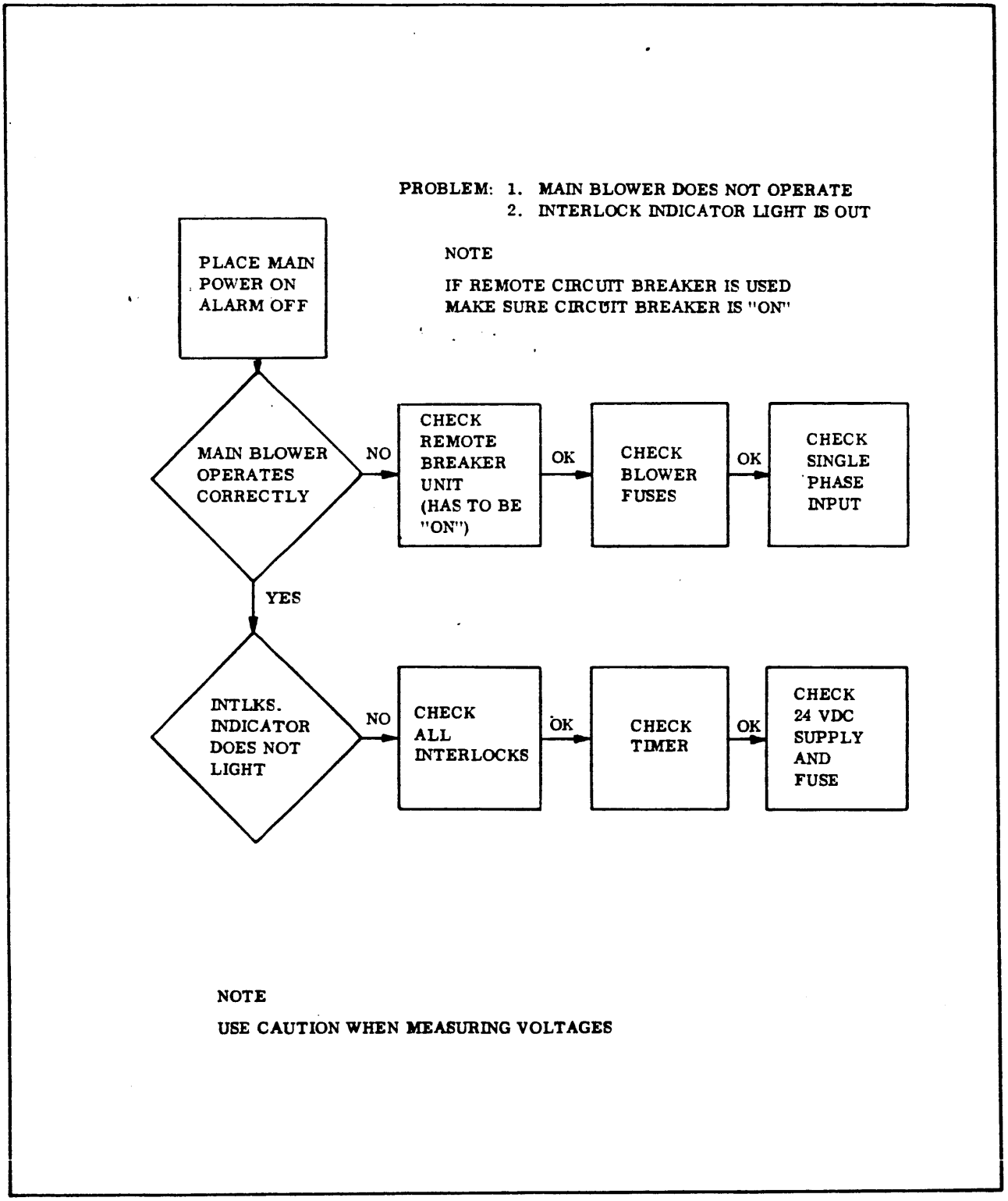
Maintenance program "A"	PA PLATE meter reading abnormal
Maintenance program "B"	2ND AMP PLATE meter reading abnormal
Maintenance promram "C"	No high voltage
Maintenance program "D"	Main Blower does not operate, interlock indicator light is out


PROBLEM: PA PLATE METER READING ABNORMAL OR NO READING
PTT RELAY ENERGIZED
NO
CHECK PTT LINE CLOSED (JUMPER, BANDSWITCH OR OTHERWISE)
YES
ADJUST BIAS AS PER TABLE 3-3
LESS THAN
PLATE METER
NO
CHECK SCREEN VOLTAGE
NO
CHECK SCREEN REGULATOR VOLTAGE
CHECK PLATE VOLTAGE
NO
CHECK PLATE VOLTAGE RECT.
CHECK FILAMENT VOLTAGE
NO
CHECK FILAMENT VOLTAGE TRANSFORMER
NOTE
USE CAUTION WHEN MEASURING VOLTAGES


PROBLEM: 2ND AMP PLATE METER READING ABNORMAL OR NO READING
ADJUST BIAS AS PER TABLE 3-3
LESS THAN
2ND AMP PLATE METER
NO READING
PTT RELAY ENERGIZED
NO
CHECK PTT LINE CLOSED (JUMPER, BANDSWITCH OR OTHERWISE)
YES
CHECK SCREEN VOLTAGE V2
NO
CHECK VOLTAGE OF SCREEN REGULATOR (ZENER ASSY)
OK
CHECK PLATE VOLTAGE V2
NO
CHECK B+ LINE TO RECT TERMINAL
OK
CHECK FILAMENT VOLTAGE V2
CHECK CONNECTIONS TO FIL. TRANSFORMER
NOTE
USE CAUTION WHEN MEASURING VOLTAGES


PROBLEM: H.V. INDICATOR DOES NOT LIGHT
NOTE
MAKE SURE ALL INTERLOCKS ARE COMPLETED AND TIMER HAS CYCLED
PLATE AND SCREEN BREAKER "ON"
INSURE RF OUTPUT AT MIN.(MMX-28)
PRESS HV SWITCH TO ON
RED HV INDICATOR ON?
NO
PRESS HV SWITCH TO RESET HV
RED HV INDICATOR ON?
NO
YES
CHECK PA AND 2ND AMP PLATE CURRENT
CHECK OVLD SETTINGS
OK
CHECK HV "ON OFF" RELAY AND OVLD RELAY
NO
HV ON
NO
CHECK BIAS SETTING TABLE 3-3
CHECK HV "ON OFF" SWITCH AND INDICATOR
NOTE
USE CAUTION WHEN MEASURING VOLTAGES

TROUBLESHOOTING "PROGRAM D"



SECTION 6

PARTS LIST

6-1. INTRODUCTION.

The HFTM-1KJ2B transmitter consists of the MMX-2B exciter, and HFLM-1KA linear power amplifier. The parts lists for the MMX-2B exciter and HFLM-1KA linear power amplifier are contained in their respective Appendixs.

6-2. GENERAL.

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, electron tube, 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 desigantion which includes the reference designation of the plug-in device.

TABLE 6-1. PARTS LIST FOR EQUIPMENT CABINET (RAK)

REFERENCE SYMBOL	DESCRIPTION	TMC PART NO.
TB2001 or J2001	Terminal Strip Connector, Receptacle	TM120-3 JJ297-1
S2001	Switch, Interlock	SW230
S2002	Same as S2001	
As req.	2 Input AC Strip Spring Retractor	As req. SP137-2

APPENDIX B

CHANGE NO. 001 EMN 21933

INSTRUCTION BOOK CHANGE NOTICE

Date 3/15/82

Manual affected: HFLM-1KA **IN** 120-2116

Assembly A5637 (A103) AP152
RW105-32 Changed from 3 to 2 req. (R5, R6)
RW105-35 Changed from RW105-32 (R4)
Pages effected 7-3, 6-3

Assembly A4879 (A1001) TLAM-1KA
(R21) 22K ½W Resistor changed from 470K ½W Resistor
(R22) 560 ohm ¼W Resistor changed from 5.6K ¼W Resistor
(R10) 560 ohm ½W Resistor changed from 120 ohm ½W Resistor
Pages effected 7-4, 6-14

Assembly A4877 (A301) AP151
(R11) 10K 2W Resistor changed from 12K 2W Resistor
Pages effected 7-2, 6-6

SHOULD ADDITIONAL COPIES OF THIS CHANGE NOTICE BE REQUIRED, PLEASE CONTACT:
THE TECHNICAL MATERIEL CORP., 700 F nimore Road, Mamaroneck, New York
Attn.: Director of Eng. Services.

TABLE OF CONTENTS

Appendix B

LIST OF ILLUSTRATIONS

LIST OF TABLES

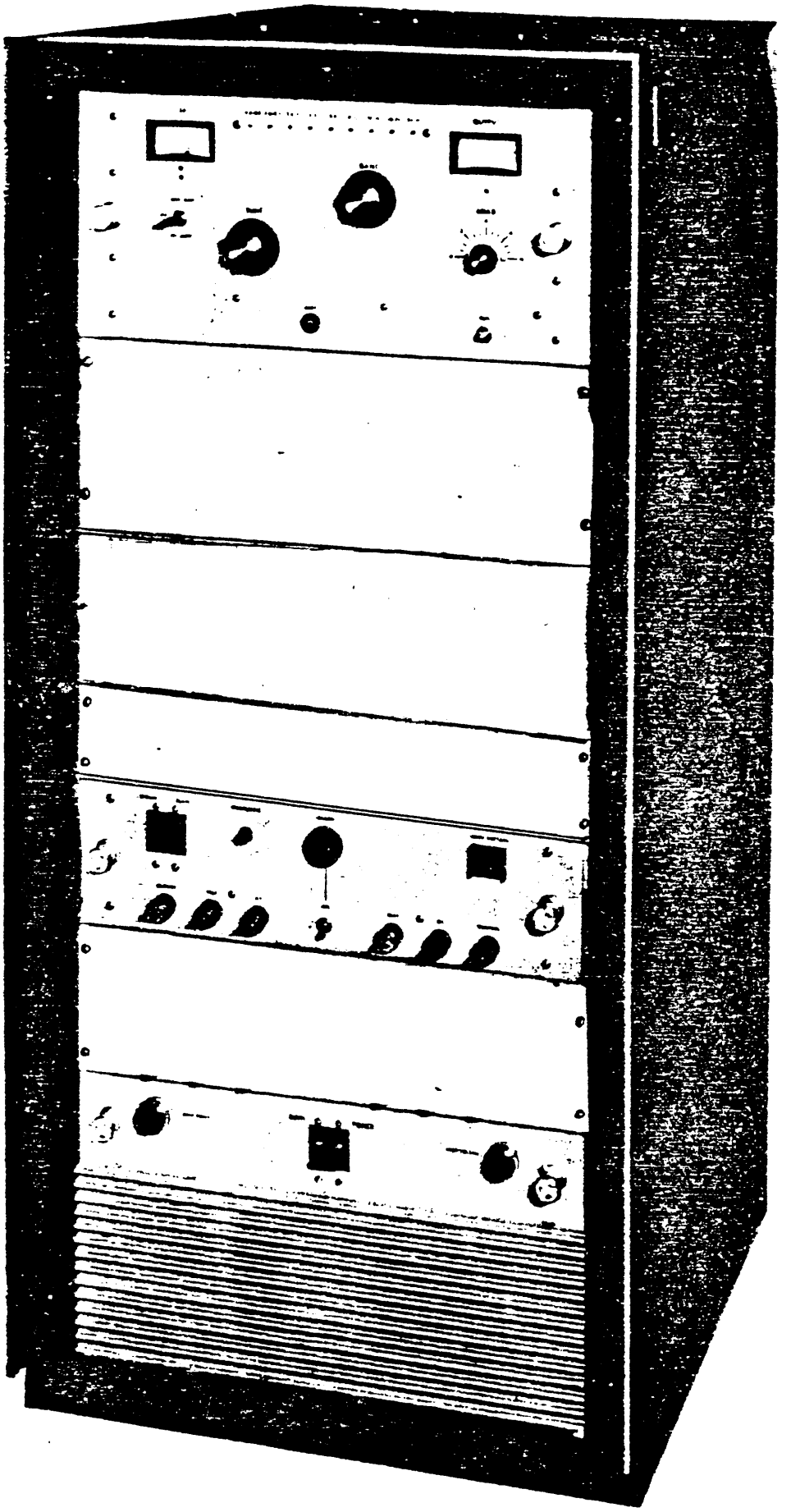


Figure 1-1. High Frequency Linear Power Amplifier HFLM-1KA

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION

The TMC Model HFLM-1KA (figure 1-1) is a manually tuned, high frequency linear power amplifier and when used with a suitable exciter provides 1 kilowatt PEP or average power throughout the frequency range of 2.0 MHz to 30 MHz.

This linear amplifier, along with a suitable exciter, may be used as the prime source of HF communication, or as part of an existing transmitting system. The small size and light weight of the HFLM-1KA makes it readily adaptable for shipboard, aircraft and land installations.

1-2. PHYSICAL DESCRIPTION

a. General

As shown in firgure 1-1, the HFLM-1KA consists of a single equipment cabinet, housing all of the components that make up the HFLM-1KA. Table 1-1 lists the major components of the HFLM-1KA as they appear in figure 1-1. The HFLM-1KA houses a two-stage broad band linear amplifier, power amplifier, and associated power supplies. Provisions are made to install optional equipments, such as an exciter, antenna tuner and/or a harmonic filter, switchable or fixed.

TABLE 1-1. MAJOR COMPONENTS

TMC Designation	Nomenclature
RF Linear Power Amplifier	TLAM-1KA
Low Voltage and Bias Supply Drawer	AP-151
High Voltage Power Supply	AP-152

b. RF Linear Power Amplifier TLAM-1KA

The TLAM-1KA is slide-mounted in the equipment cabinet and serves as the power amplifier for the HFLM-1KA. It contains two broadbanded, lowlevel rf amplifiers and a final amplifier which provides 1000 watts PEP or average output. The final tube is an 8576 tetrode and is air-cooled by a blower within the TLAM-1KA. A front panel plate meter and its associated switch provides constant monitoring of the amplifier plate circuits. Also mounted on the front panel are an OUTPUT meter and associated switch for monitoring forward and reflected power, TUNE and LOAD controls, the BAND switch and associated band indicator lamps, and an ALDC control.

d. Low Voltage and Bias Supply Drawer AP-151

The AP-151 is slide-mounted directly above the AP-152. It contains the filament and bias transformer, low voltage transformer, and the overload, bias, and PTT relays. Mounted on the front panel and the SCREEN and PLATE circuit breakers, an INTERLOCKS indicator, the high voltage ALARM and its associated switch, a HIGH VOLTAGE indicator (used also as a combination push-button-indicator switch in certain configurations), and indicator fuses for BLOWER, FILAMENT, LV, BIAS, DC, and CONTROL.

e. High Voltage Power Supply AP-152

The heavy high voltage power supply components are mounted on a chassis and slide-mounted in the base of the equipment cabinet. The AP-152 contains the high voltage transformer, high voltage ON relay, and front and rear blower motors and associated high voltage circuitry. Mounted on the front panel are the MAIN POWER circuit breaker and indicator lamp.

1-3. REFERENCE DATA

Table 1-2 lists the technical specifications of the Linear Power Amplifier, HFLM-1KA.

TABLE 1-2. TECHNICAL SPECIFICATIONS

FREQUENCY RANGE:	2.0 MHz to 30 MHz. (dependent upon exciter capabilities)
OPERATING MODES:	Capable of all standard modes of operation (CW, AM, AME, ISB, SSB, FAX, FSK), but dependent upon the capablities of the exciter being used with the HFLM-1KA.
POWER OUTPUT:	1000 watts peak envelope power or average
OUTPUT IMPEDANCE:	50 ohms, unbalanced (70 ohms optional).
STABILITY AND FREQUENCY CONTROL:	Capable of within 1 part in 10^8 but dependent upon the stability of the exciter being used with the HFLM-1KA.
TUNING:	Manual
RF INPUT:	Provides 1000 watts PEP or average output with an input of approximately 100 milliwatts.
SPURIOUS SIGNALS:	At least 50 db down from rated PEP output.
HARMONIC SUPPRESSION:	Better than -45 db with reference to full PEP output.

TABLE 1-2. TECHNICAL SPECIFICATIONS (cont)

HARMONIC FILTERS:	Available as an option, fixed for all frequencies above 30 MHz or band-switched for lower frequencies.
NOISE:	50 db down; special "white noise" protection.
POWER SUPPLY RIPPLE:	55 db down from full PEP output.
COOLING	Filtered forced air cooling; semi-pressurized cabinet.
ENVIRONMENTAL:	Designed to operate in any ambient temperature between the limits of 0 to 50°C for humidity up to 90%.
PRIMARY POWER:	115/230 vac, single phase, 50/60 Hz.
POWER REQUIREMENTS:	Approximately 3.75 kilowatts.
SIZE:	The individual components of the HFLM-1KA require an approximate rack space of 23"W x 27"D x 49"H. The overall size of the HFLM-1KA depends upon the customer selected options and equipment cabinet.
INSTALLED WEIGHT:	The approximate total weight of the individual components of the HFLM-1KA is 500 pounds. The overall weight depends upon the customer selected options and equipment cabinet.
COMPONENTS AND CONSTRUCTION:	Manufactured in accordance with JAN/MIL specifications wherever practicable.
SPECIAL FEATURES:	Overload protection and alarm circuitry, controlled and adjustable ALDC, and safety interlocks at all high voltage points.

SECTION 2

INSTALLATION

2-1. INITIAL UNPACKING AND INSPECTION

The HFLM-1KA Linear Power Amplifier was assembled, calibrated, and tested at the factory prior to shipment. Inspect all packages for possible damage during transit. Carefully unpack each crate as indicated by packing list provided with the linear amplifier shipment. Inspect all packing materials for parts which may have been shipped as loose items (cabinet hardware, connectors, technical manuals, etc.). With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and furnishing of replacement parts.

2-2. POWER REQUIREMENTS

The HFLM-1KA requires a single phase source of 115 or 230 vac 50/60 Hz, at approximately 3.75 kw.

2-3. 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 during transit. The method of disassembly and separate packaging also permits realistic equipment handling.

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

Cables, wires, and other miscellaneous items that are disconnected during equipment disassembly for shipment 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 cabinet or section of the cabinet with a front panel drawer.

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

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 cabinet from crate, if supplied.

b. Position cabinet upright (power supply grill located on lower portion of cabinet front indicates upright position), and remove rear panel as necessary (dependent upon equipment cabinet selection). The removal of rear panels on TMC furnished equipment cabinets can be accomplished by turning the screw fastener located at the left and right of the rear panel.

c. Remove all packing material from cabinet and position cabinet in accordance with pre-installation planning.

WARNING

INSURE THAT PRIMARY POWER EXTERNAL TO THIS EQUIPMENT IS OFF AND TAGGED.

STEP 3 (Primary AC Input Connection)

a. Route ac input cable to base assembly and connect to PWR INPUT terminal strip TB2001. (On some models ac input connects to jack J2001).

STEP 4 (Installation of Power Amplifier Tube, 8576)

a. Remove the top cover from the TLAM-1KA.

b. Carefully lift power amplifier tube from crate and position it on top of the PA tube socket in the TLAM-1KA.

c. Position tube to line up with PA tube socket contacts.

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

e. Press tube firmly down into socket. A slight amount of effort may be required to seat tube. Caution should be observed in seating the tube so as not to damage contacts in socket. Check tube seating; it must be all the way down and centered in tube socket.

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

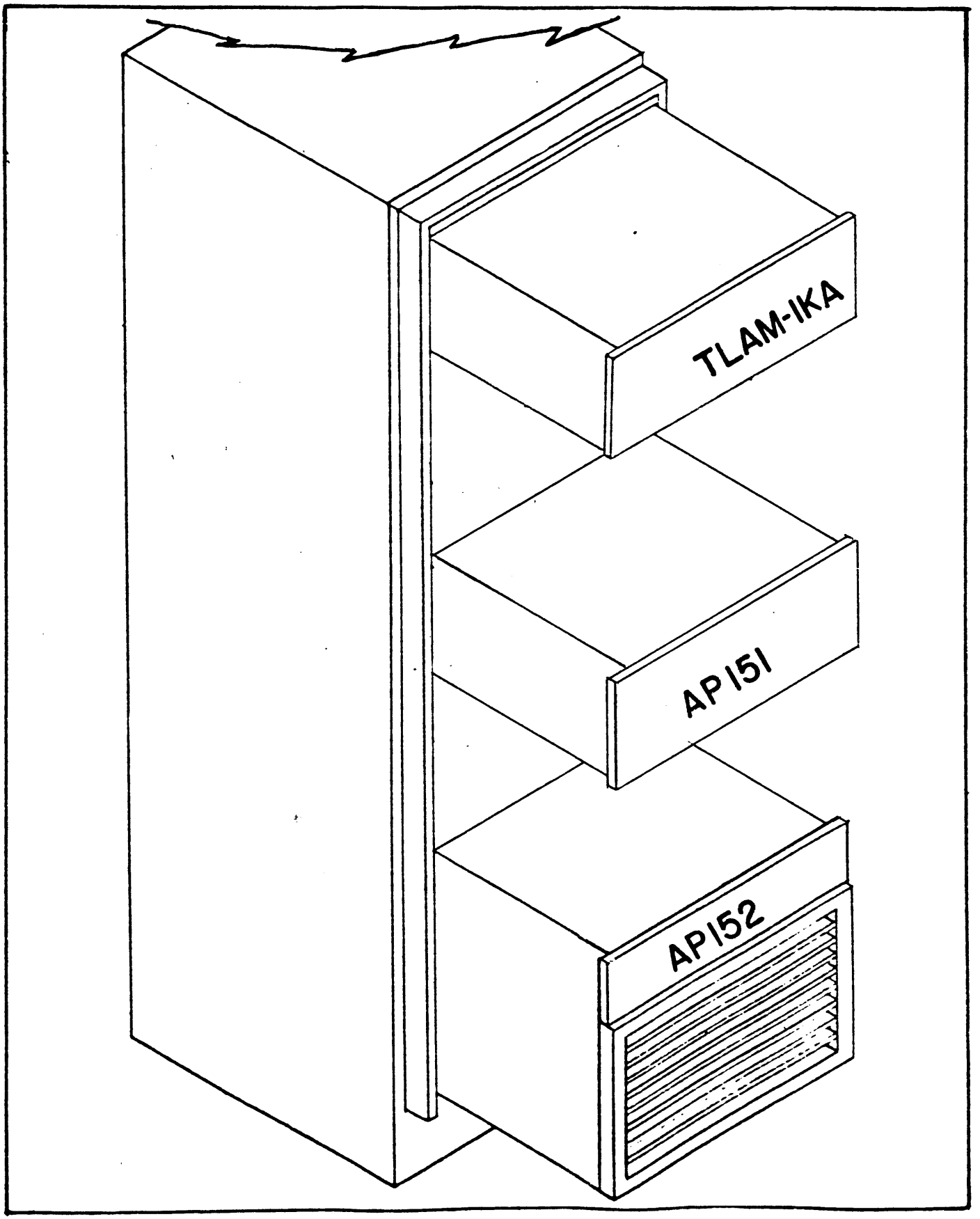


Figure 2-1. Typical HFLM-1KA Installation

g. Replace the top cover of the TLAM-1KA and secure it in place.

STEP 5

a. Remove all plug-in relays from LOOSE ITEMS crate.

b. Install relays in their respective units; plug-in relays are marked for identification and ease in locating their respective sockets.

STEP 6 (Installation of Modular Units)

a. All units in the HFLM-1KA are slide-mounted; refer to figure 2-1 for information regarding cabinet location of modular units.

b. Begin the installation of modular units with the bottom unit (AP-152) and proceed up to prevent the equipment cabinet from tipping over.

c. Untape or unstrap cable assemblies and all other components secured to the cabinet for shipment.

d. Refer to figure 2-2 and pull the center section of the associated track out until it locks in an extended position.

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

f. Make the necessary cable and electrical connections to the modular unit. (Refer to part 1 of this manual for these interconnections and required external connections.)

g. Depress release buttons and slide modular unit completely into compartment of equipment cabinet.

h. Secure the front panel of modular unit to the cabinet with hardware provided.

i. Repeat steps d through h for the installtion of each modular unit in the equipment cabinet.

STEP 7

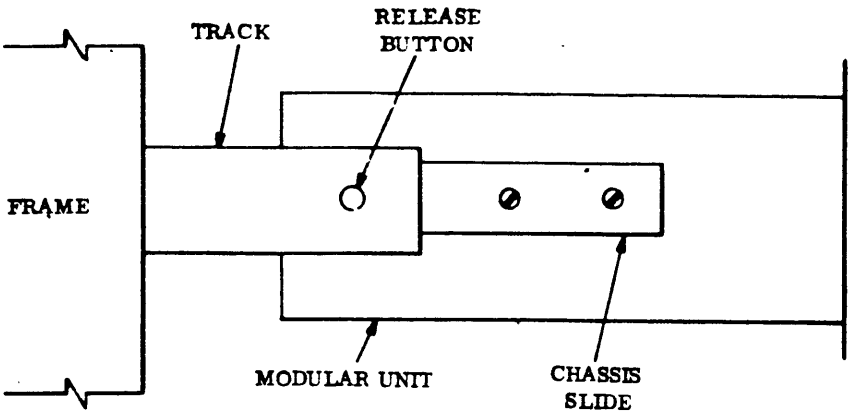
a. Using the grounding hardware supplied, secure grounding strap to the equipment cabinet.

b. Connect 50 ohm unbalanced antenna, or dummy load, to the output connector of the HFLM-1KA.

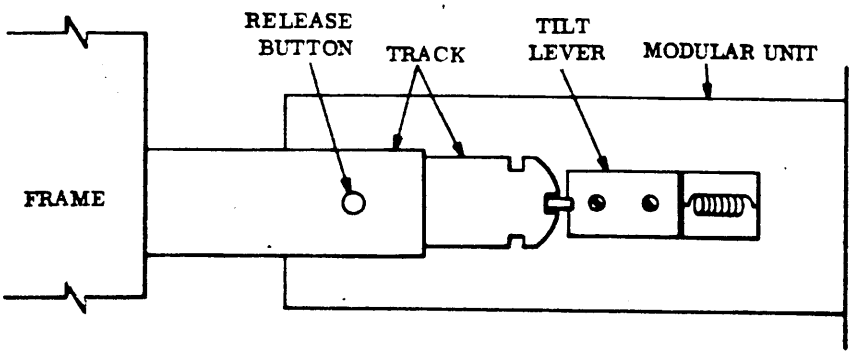
c. Affix rear panel to cabinet and secure in place.

STEP 8 (High Voltage Transformer Check)

Once the HFLM-1KA has been installed and all modular units connected, it is recommended that the ac input to the high voltage transformer be checked. To do this, carefully read the instructions and proceed with extreme caution.



A NON-TILTING SLIDE MECHANISM



TILTING SLIDE MECHANISM

Figure 2-2. Slide-Mounting Details

CAUTION

With EXTERNAL PRIMARY POWER BREAKER AND MAIN POWER BREAKER SET AT OFF, the single phase ac input should MEASURE NOT LESS THAN 1 MEGOHM TO GROUND. The positive side of the high voltage circuit should measure not less than 100 kilohms.

WARNING

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

a. Insure primary AC BREAKER external to equipment is OFF and TAGGED.

b. Make sure that the bias potentiometers located in the AP-151 Low Voltage and Bias Supply Drawer are turned to maximum bias (PA BIAS, 2ND AMP BIAS, and 1ST AMP BIAS potentiometers extremely clockwise).

c. Place an ac voltmeter across the single phase input of the high voltage transformer located in the AP-152, High Voltage Power Supply (T101 terminals 1 and 3). The meter should be on the 300 vac range.

d. Clear personnel away from the HFLM-1KA and apply primary power.

e. On the AP-152 set the MAIN POWER breaker to the ON position.

f. On the AP-151 set the PLATE and SCREEN breakers to the ON position.

g. Wait approximately 10 to 15 minutes for all tube filaments to warm up.

h. On the AP-151 unit press the HIGH VOLTAGE pushbutton switch; the HIGH VOLTAGE indicator should light. (H.V. pushbutton may have to be pressed twice)

i. Note the ac input voltage as measured on the ac voltmeter.

j. Press the HIGH VOLTAGE switch again to remove high voltage; the HIGH VOLTAGE indicator must go out.

k. Place MAIN POWER breaker to OFF position.

l. If the ac voltage noted in step i does not correspond with the ac input terminal markings on the high voltage transformer, relocate the ac input leads to the corresponding terminals on the high voltage transformer (refer to figure 7-2). Insure primary AC BREAKER external to equipment is OFF and TAGGED prior to performing the relocation of ac input leads.

m. Repeat step h. Referring to figure 7-1 for corresponding voltage taps on low voltage and filament transformer T301 and T302. (located in AP-151 unit)

n. Press H.V. pushbutton to remove high voltage.

2-4. PRE-OPERATIONAL CHECKOUT PROCEDURE

Once the installation procedures are completed, pre-operational checks outlined in this paragraph should be performed to insure correct installation.

TABLE 2-1. PRE-OPERATIONAL CHECKOUT PROCEDURE

Step	Modular Unit	Operation	Normal Indication
1	AP-152	Set MAIN POWER breaker to ON position.	MAIN POWER indicator should light. Band indicator on TLAM should light.
2	AP-151	Set SCREEN & PLATE breakers to the ON position.	Approximately 60 seconds the interlocks lamp must light. If not, check that all interlock switches are closed.
3		Loosen panel locks on AP-151 and slide unit on chassis slides to expose BIAS ADJUST controls.	

NOTE

The following steps give instructions for setting quiescent current values. Insure that the transmitter PTT line is closed (via associated exciter or jumper on interface panel) before attempting to set amplifier quiescent currents.

CAUTION

Before applying high voltage to the transmitter, insure that the RF OUTPUT control on the MMX-2B is fully counterclockwise.

4	AP-151	Press the HIGH VOLTAGE switch to light indicator (it may be necessary to press the HIGH VOLTAGE switch twice).	HIGH VOLTAGE switch indicator will illuminate red.

NOTE

For steps 6,7 and 8 the BIAS controls are located in the AP-151 drawer. Each individual amplifier has a bias level within the specified ranges, but peculiar to itself, in order for the amplifier to operate with minimum distortion.

TABLE 2-1. PRE-OPERATIONAL CHECKOUT PROCEDURE (CONT)

Step	Modular Unit	Operation	Normal Indication
5	TLAM-1KA	Set the Ip meter switch to 1ST AMP, and adjust the 1ST AMP BIAS control (located in AP-151) for between 40 to 50 ma on the Ip meter.	Ip meter will indicate quiescent current of 40 to 50 ma.
6	TLAM-1KA	Set the Ip meter switch to 2ND AMP, and adjust the 2ND AMP BIAS control (located in AP-151) for between 200 to 210 ma on the Ip meter.	Ip meter will indicate quiescent current of 200 to 210 ma on the Ip meter.
7	TLAM-1KA	Set the Ip meter switch to PA, and adjust the PA BIAS control (located in AP-151 for between 200 to 210 ma on the Ip meter.	Ip meter will indicate quiescent current of 200 to 210 ma.
8	AP-151	Slide AP-151 back into equipment cabinet and lock in place.	
9	TLAM-1KA	Rotage BAND control (clock-wise only) observe that BAND indicators light for each band position.	

SECTION 3

OPERATOR'S SECTION

NOTE

The operating section of this manual is written for the HFTM-1KJ2B Transmitter. The HFTM-1KJ2B Transmitter is a HFLM-1KA High Frequency Linear Amplifier coupled with TMC's MMX-2B Exciter. The purpose of presenting this section as a transmitter is to illustrate continuity of operation. Any suitable exciter providing at least 100 mw of power can be used with the High Frequency Linear Amplifier HFLM-1KA.

Any reference to MMX-2B or Appendix A in section 3 (which is TMC's MMX-2B Exciter technical data) should be disregarded and substutited with the exciter or RF generator in use.

SECTION 3

OPERATOR'S SECTION

3-1. SCOPE.

This section gives detailed operating instructions for the HFTM-1KJ2B transmitter.

3-2. GENERAL.

Although an extensive interlock and overload system is designed into the HFTM-1KJ2B transmitter, a single incorrect control setting might still overload certain components, inviting early failure and consequently transmitter "down-time", not to mention improper and illegal emission.

Prior to operation of the transmitter, the operator should become thoroughly familiar with the location and function of all transmitter controls and indicators. When operating the transmitter, a definite operating sequence (as outlined by the operating instructions) should be strictly followed; the operator should establish a procedural pattern, thus ensuring consistent operation.

3-3. CONSIDERATIONS IN TRANSMITTER TUNING.

a. GENERAL. Before the HFTM-1KJ2B is tuned for any specified mode of operation, it should be initially tuned and loaded on a carrier frequency.

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

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

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

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

c. PEAK ENVELOPE POWER VERSUS AVERAGE POWER INDICATION. A common misapprehension continues to exist over the ratio between average and PEP in high power transmitters, particularly when multichannel (multitone) transmissions are used. Bear in mind that the Peak Envelope Power (PEP) during modulation can be many times that of the Average Power indicated on the PA OUTPUT meter. Thus the transmitter Average Power must be reduced sufficiently to avoid a serious peak overload to the transmitter, with consequent "flat topping" and possible damage.

When two tones of equal amplitude are applied to a SSB system, the ratio of PEP to Average Power is .405 x PEP. This relationship is valid for two tones only. When the HFTM-1KJ2B's OUTPUT meter indicates 500 watts with two tones of equal amplitude applied to the transmitter, peak envelope power (PEP) will be 1000 watts under that condition only. A graphical representation of peak and average power ratio as a function of the number of tones is shown in figure 3-1.

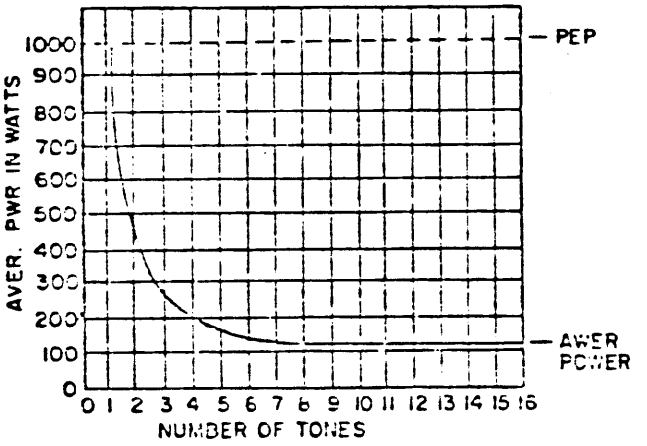


Figure 3-1. Ratio Average Power and PEP as a Function of Tones

3-4. OPERATING CONTROLS AND INDICATORS.

Control and indicator chart, table 3-1 has been prepared in conjunction with control and indicator location drawing, figure 3-2, to assist in the location and operation of all controls and indicators required for tuning and operating the HFTM-1KJ2B transmitter.

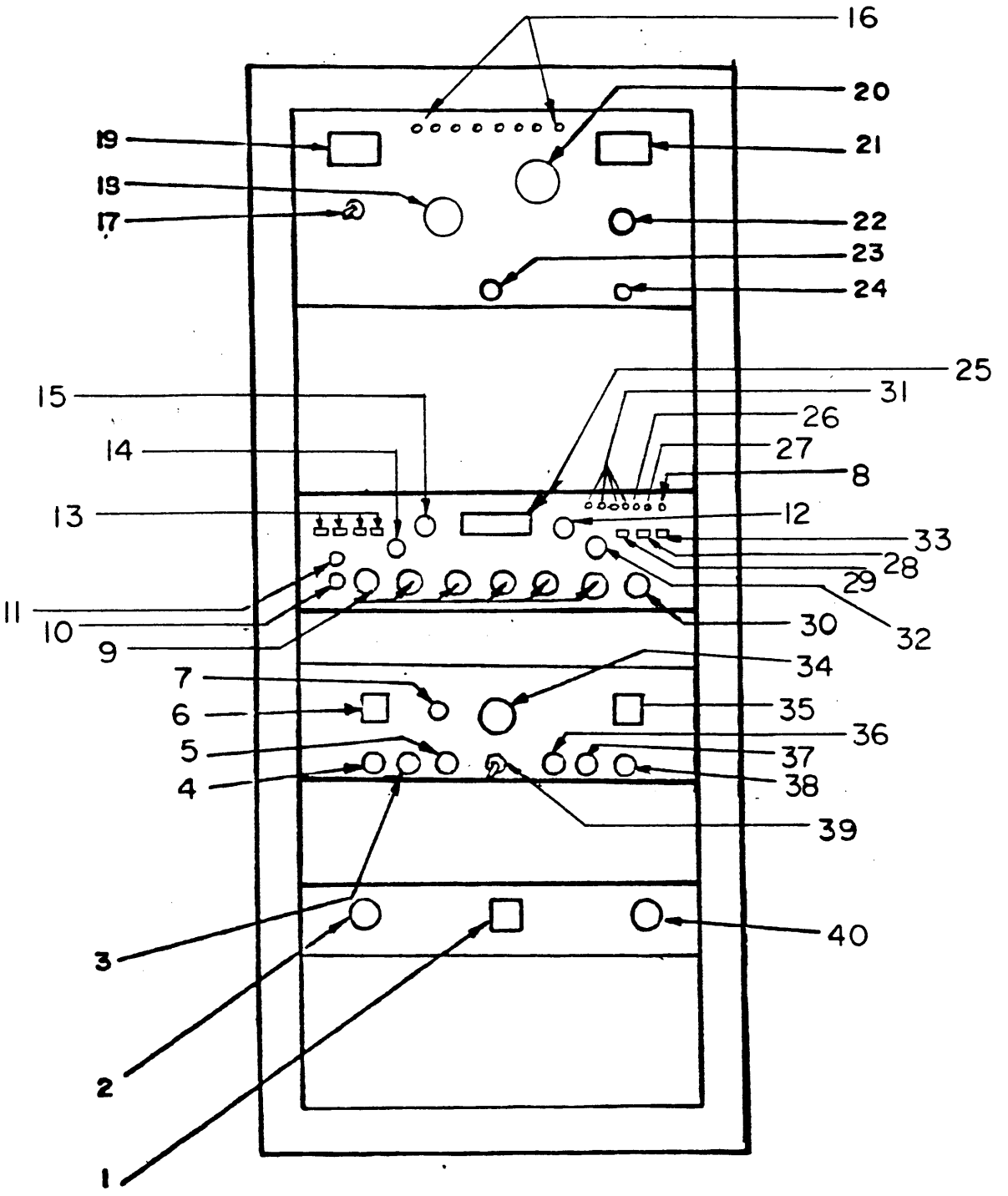


Figure 3-2. HFTM-1KJ2B Controls and Indicators

TABLE 3-1. CONTROLS AND INDICATORS

ITEM NO.	PANEL DESIGNATION	FUNCTION
1	MAIN POWER circuit breaker	When placed in the ON position, applies ac power to the transmitter.
2	MAIN POWER indicator lamp	When illuminated, indicates that ac power is applied to the transmitter.
3	FILA indicator fuse	Protective fuse for filament and bias transformer; when illuminated, indicates open fuse.
4	BLOWER indicator fuse	Protective fuse for blower; when illuminated, indicates open fuse.
5	LV indicator fuse	Protective fuse for primary ac input to low voltage transformer; when illuminated indicates open fuse.
6	SCREEN and PLATE circuit breakers	In ON position, applies screen and plate voltages to the rf amplifier tubes.
7	INTERLOCKS indicator	When illuminated, indicates that all interlocks are closed and the interlock circuit is complete.
8	REMOTE RMTE indicator	When illuminated indicater exciter is remotely controlled.
9	10MHZ, 1MHZ, 100KHZ, 10KHZ, 1KHZ, 100HZ selector switches	Frequency selector switches used to set desired operating frequency.
10	KEY jack	Front panel key jack for dry contact keyer connection in CW mode of operations.
11	MIKE jack	Front panel mike jack for 47,000 ohm impedance microphone input.
12	USB MIKE/LINE	Adjust level of USB input.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

ITEM NO.	PANEL DESIGNATION	FUNCTION
13	METER selector switchs	Four-position pushbutton switch for selecting internal circuits to be monitored on front panel meter. See Appendix A for detailed description.
14	RF OUTPUT control	Adjusts the level of rf output signal from the exciter.
15	LSB MIKE/LINE	Adjusts level of LSB input
16	BAND indicators	Illuminates when desired band is positioned.
17	PLATE meter switch (marked 2nd AMP, IPA and 1st AMP)	Selects plate current circuit to be monitored on the PLATE current meter.
18	TUNE control	Adjusts the variable tune capacitor.
19	PLATE meter	Indicates plate currents of the 1st rf amplifier, 2nd rf amplifier and IPA as selected by the meter switch.
20	BAND selector switch	Selects frequency band of operation from 2.0 mhz to 30 mhz (1.5 - 2.0, 2.0 - 2.6 - 3.0, 3-5, 5-8, 8-12, 12-16, 16-24, 24-30).
21	OUTPUT meter	Indicates output and reflected powers in killowatts.
22	LOAD control	Adjusts the variable load capacitor.
23	ALDC control	Adjusts the level of automatic load and drive control feedback voltage from the amplifier to the exciter.
24	REFL pushbutton switch	When pressed, activates OUTPUT meter to monitor reflected power; otherwise, the OUTPUT meter monitors output power.
25	MONITOR meter	Monitors exciter circuits selected by METER switch.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

ITEM NO.	PANEL DESIGNATION	FUNCTION
26	STANDBY indicator	When illuminated, indicates that ac power is applied to the exciter crystal ovens and power supplies and that dc potentials are not applied to the exciter circuitry; illuminated when the ON/STANDBY switch is in the STANDBY position.
27	POWER indicator	When illuminated, indicates that dc potentials are applied to the exciter circuitry; illuminated when the ON/STANDBY switch is in the ON position.
28	PTT/VOX switch	Controls Push to Talk (PTT) circuits to key exciter and transmitter. Controls used in Voice Operated Relay circuits to key exciter with voice operation.
29	STANDBY STBY switch	Controls application of power to all operating circuits. STANDBY (In) condition applies power to 1 mhz frequency standard only while the OPERATE (Out) position applies power throughout exciter. STBY LED indicator displays for STANDBY condition and PWR indicator for an OPERATE condition.
30	MODE selector switch	Selects the mode of transmitter operation: i.e. AM (amplitude modulation), USB (upper sideband), LSB (lower sideband), ISB (independent sideband), CW (continuous wave), FSK (frequency shift keying), or FAX (facsimile).
31	CARR SUPPR indicators	Indicates the degree of carrier suppression.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

ITEM NO.	PANEL DESIGNATION	FUNCTION
32	CARR SUPPR	Establishes the amount of carrier used by setting suppression levels (see Appendix A for a detailed description.)
33	REMOTE (RMTE) switch	Controls local/remote feature of exciter. Exciter control is local with switch "Out"; remote with switch "In".
34	ALARM indicator	Audible alarm which sounds to indicate the failure and loss of high voltage.
35	HIGH VOLTAGE indicator switch	A pushbutton switch which controls the application of high voltage to the rf amplifier; illuminates to indicate that high voltage is applied.
36	BIAS indicator fuse	Protective fuse in dc return of bias supply; when illuminated, indicates open fuse.
37	DC indicator fuse	Protective fuse for 24 vdc supply; when illuminated, indicates open fuse.
38	CONTROL indicator fuse	Protective fuse for low voltage and filament transformer: when illuminated, indicates open fuse.
39	ALARM ON/OFF switch	Switch to control the alarm circuitry; in the off position the alarm circuitry is inoperative; in the ON position the alarm sounds when high voltage fails or is removed from the rf amplifier.
40	HIGH VOLTAGE indicator	When illuminated, indicates that high voltage is applied to the rf amplifier.

3-5. OPERATING PROCEDURES.

a. Introduction. The operation of the HFTM-1KJ2B transmitter is detailed in the paragraphs which follow. Paragraph 3-5b. Preliminary Operation gives detailed instructions for control settings prior to operation, for application of main power and high voltage, and for bias checks and adjustments. Paragraph 3-5c. General Operation gives detailed instructions for transmitter tuning on carrier and for transmitter operation in the various intelligence modes.

CAUTION

Do not attempt to operate transmitter unless it has been determined that the rf output connection of the transmitter is properly terminated in an antenna or dummy load.

b. Preliminary Operation. Prior to initial application of power to the transmitter, the HFTM-1KJ2B controls should be set as outlined in Table 3-2.

TABLE 3-2. STARTING CONTROL SETTINGS

CONTROL DESIGNATION	LOCATION	SETTING
1) Primary Power circuit breaker	external to the transmitter	OFF position
2) MAIN POWER circuit	AP152 front panel	OFF (down) position
3) SCREEN and PLATE circuit breakers (6)	AP151 front panel	OFF (down) position
4) ALARM ON switch (39)	AP151 front panel	OFF (down) position
5) PA, 1st AMP and 2nd AMP bias controls	within AP151 drawer	fully clockwise (maximum bias)
6) RF OUTPUT control (14)	MMX-2B front panel	fully CCW
7) LSB MIKE/LINE (15) and USB MIKE/LINE (12)	MMX-2B front panel	mid-range (0)
8) STANDBY switch (29)	MMX-2B front panel	STANDBY position
9) EXCITER VOX/PTT switch (28)	MMX-2B front panel	VOX position
10) ALDC control (23)	TLAM-1KA front panel	fully CCW
11) LOAD control (22)	TLAM-1KA front panel	CCW to first indicator line on left
12) Plate current overload adjust screw	TLAM-1KA front panel below PLATE meter	screw adjusted so that overload indicator (red on PLATE meter is set at 800 ma.

Once the transmitter controls have been set to their starting control settings, the HFTM-1KJ2B is ready for initial application of main power and high voltage and for bias adjustment. These procedures are detailed in Table 3-3.

NOTE

Before High Voltage is applied MMX RF Control Knob must be at minimum (ccw).

TABLE 3-3. PRELIMINARY OPERATING PROCEDURE

STEP	OPERATION	NORMAL INDICATION
1	Set Primary Power circuit breaker to the ON position.	Primary Power indicator (if any) external to transmitter illuminates.
2	Set MAIN POWER circuit breaker (1) to the ON position.	PA blower operates and MAIN POWER indicator (2) on AP152 illuminates. INTERLOCKS indicator (7) on the AP151 illuminates (all safety interlocks must be closed and the time delay cycle must be completed).
3	Set SCREEN and PLATE circuit breakers (6) to ON position.	No indication.
4	Unfasten the panel locks on the AP151 and pull drawer out to expose the PA, 1st AMP and 2nd AMP BIAS controls.	No indication.
5	Press the HIGH VOLTAGE switch/ indicator (35) on the AP151 to illuminate indicator (it may be necessary to press the HIGH VOLTAGE switch twice).	HIGH VOLTAGE indicators (35) and (40) on the AP151 and AP152 must illuminate.
6	With the PLATE meter switch (17) on the TLAM-1KA in its neutral (IPA) position, adjust the PA BIAS control in the AP151 drawer for 200 to 210 ma quiescent current.	PLATE meter (19) on TLAM-1KA indicates 200 to 210 ma.
7	Hold the PLATE meter switch (17) on the TLAM-1KA in the up (2nd AMP) position, and adjust the 2nd AMP BIAS control in the AP151 drawer for 200 to 210 ma of quiescent current.	PLATE meter (19) on TLAM-1KA indicates 200 to 210 ma.
8	Hold the PLATE meter switch (17) on the TLAM-1KA in the down (1st AMP) position, and adjust the 1st AMP BIAS control in the AP151 drawer for 40 to 50ma of quiescent current.	PLATE meter (19) on TLAM-1KA indicates 40 to 50 ma.

c. General Operation. Prior to operating the HFTM-1KJ2B transmitter in any of its intelligence modes, the transmitter must be initially tuned on carrier. Table 3-4 details the procedure for transmitter tuning on carrier.

TABLE 3-4. TRANSMITTER TUNING PROCEDURE (CARRIER ONLY)

STEP	OPERATION	NORMAL INDICATION
1	Perform steps 1 thru 5 in Table 3-3 to apply main power and high voltage to the transmitter	Indications are the same as Table 3-3.
2	With the PLATE meter switch (17) on the TLAM-1KA in its neutral position, observe the PLATE meter (19) on the TLAM-1KA	PLATE meter (19) on the TLAM-1KA indicates 200 to 210 ma (if not, perform step 6 in Table 3-3).
3	Hold the PLATE meter switch (17) on the TLAM-1KA in the Up (2nd AMP) position.	PLATE meter (19) on the TLAM-1KA indicates 200 to 210 ma (if not, perform step 7 in Table 3-3).
4	Hold the PLATE meter switch (17) on the TLAM-1KA in the down (1st AMP) position.	PLATE meter (19) on the TLAM-1KA indicates 40 to 50 ma (if not, perform step 8 in Table 3-3).
5	RF OUTPUT control must be fully CCW on the MMX-2B. PTT line must be closed via MMX-2B or interface panel. Press the HIGH VOLTAGE switch/indicator (35) on the AP151 to illuminate indicator (it may be necessary to press the HIGH VOLTAGE switch twice).	HIGH VOLTAGE indicators (35) and (40) on the AP151 and AP152 must illuminate.
6	Set the BAND selector switch (20) on the TLAM-1KA to a band which covers the desired operating frequency.	Light will illuminate when desired band is reached (16).
7	Set controls on the MMX-2B as follows: METER switch (13) to RF position, STANDBY switch (29) to ON position, VOX/PTT switch (28) to PPT position, and MODE switch (30) to CW position.	The POWER indicator (27) on the MMX-2B illuminates.

TABLE 3-4. TRANSMITTER TUNING PROCEDURE (CONT)
(CARRIER ONLY)

STEP	OPERATION	NORMAL INDICATION
8	Insert a shorting plugs in the MMX-2B Key (10), MIKE (11).	MONITOR meter (25) on the MMX-2B reads approximately 2.
9	Adjust RF OUTPUT (14) on the MMX-2B clockwise slightly to cause an increase in PA plate current.	PLATE meter (19) on the TLAM-1KA indicates an increase in PA plate current (not to exceed 300 ma).
10	Adjust TUNE control (18) on the TLAM-1KA for a noticeable resonant dip in PA plate current.	PLATE meter (19) on the TLAM-1KA indicates a resonant dip and OUTPUT meter (21) on the TLAM-1KA indicates simultaneously an increase in output power.
11	Adjust the LOAD control (22) on the TLAM-1KA as required to produce maximum output power.	The OUTPUT meter (21) on the TLAM-1KA indicates a further increase in output power during loading process.
12	Readjust the TUNE control (18) on the TLAM-1KA to insure that the transmitter is at resonance. Repeat steps 10 and 11 as necessary.	The OUTPUT meter (21) on the TLAM-1KA indicates highest value when the transmitter is properly tuned into an antenna or dummy load.
13	Rotate the RF OUTPUT control (14) on the MMX-2B clockwise to increase output power to the desired level. (Refer to the Maintenance Section of Appendix B, and Appendix A for ALDC Adjustment.)	The OUTPUT meter (21) on the TLAM-1KA indicates the average power output lever.
14	Remove the shorting plug in the MMX-2B Key (10)	The OUTPUT meter (21) on the TLAM-1KA indicates zero.

Once the transmitter has been tuned on carrier as per Table 3-4, it is ready for operation in an intelligence mode. Exciter control positions for the various intelligence modes of operation are outlined in Appendix A.

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL

The HFLM-1KA transmitter provides manual tuning over a frequency range of 2 to 30 MHz. The transmitter requires an rf input of at least 100 mw.

The TLAM-1KA (power amplifier) contains two broadband low level rf amplifiers and a final amplifier that provides 1000 watts PEP or average output. The PA output is maintained constant at the selected power level by ALDC feedback to the exciter.

The RF Amplifier section contains three linear amplifier stages; the 1ST AMP, 2ND AMP and the POWER AMPLIFIER. The first and second amplifiers are broadband linears and require no tuning throughout the frequency range. The final stage is a tuned parallel L circuit that provides an output impedance of 50 ohms.

All RF Amplifier stages are air-cooled by a self-contained blower located inside the Power Amplifier section. Front panel meters monitor plate currents, output power in kilowatts and indications of current and/or SWR overloads.

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

Figure 4-1 illustrates the rf signal flow of the HFTM-1KA transmitter. When all circuit conditions are met and a suitable exciter used to drive the HFLM, rf voltage is amplified and routed to the output connector in the following manner.

The external exciter's output (2.0 to 30 MHz) is routed to the TLAM-1KA. This exciter output level must be at least 100 milliwatts.

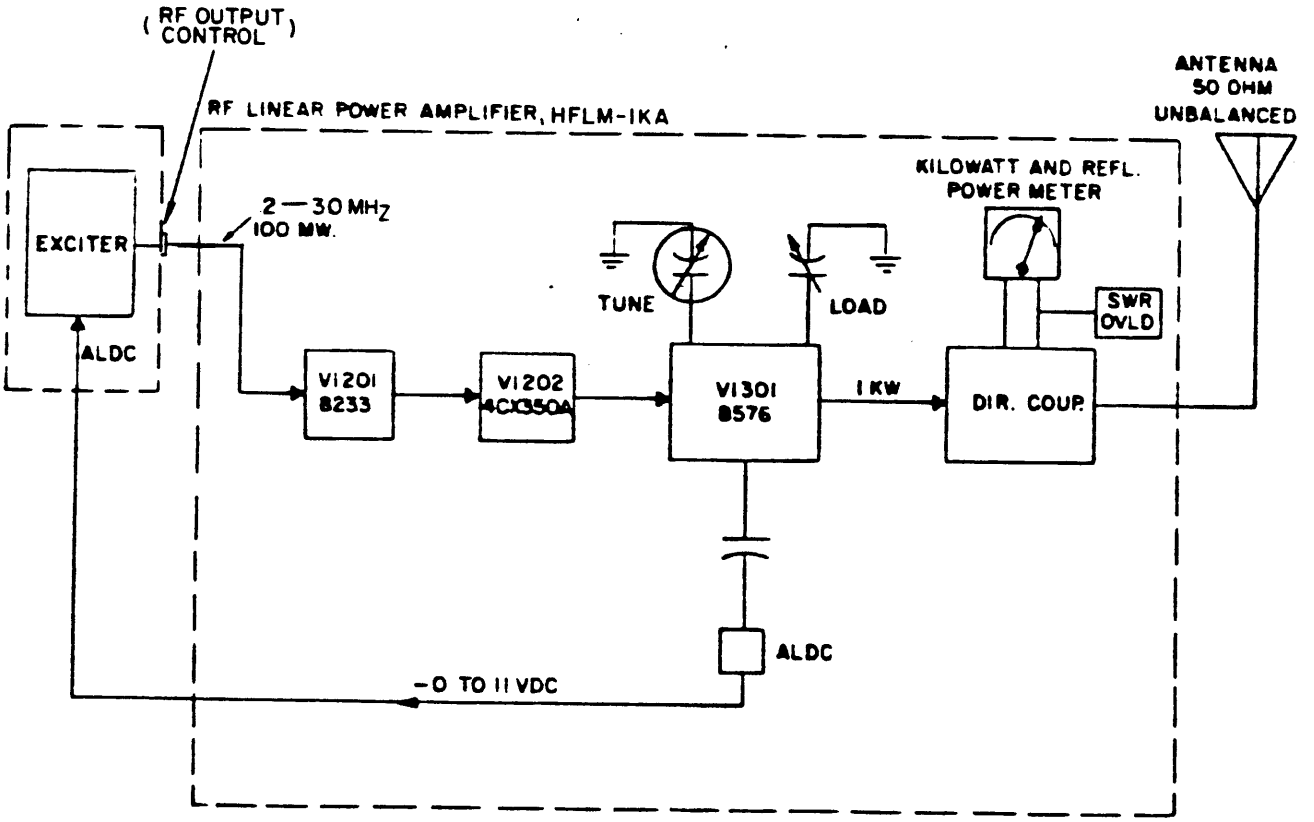
From this point the exciter output, controlled by the exciter RF OUTPUT control knob, is routed to the 1ST RF AMPLIFIER, V1201. V1201 serves to amplify the exciter output to a level sufficient to drive the 2nd RF AMPLIFIER, V1201. V1202 further amplifies the rf output which is routed to the input of the 1 kilowatt POWER AMPLIFIER, V1201.

The 1ST and 2ND AMPLIFIERS are broadbanded throughout the frequency range to simplify tuning and operation. However, the Power Amplifier employs the use of TUNE and LOAD controls for PA tuning and output loading. Note that the 1 kilowatt output passes through a directional coupler that samples and rectifies a portion of the rf output for metering purposes.

The directional coupler and KILOWATT meter combination monitor the HFLM's output and is calibrated in average power.

Output overload (SWR) is provided in addition to plate circuit overload to protect the HFLM against antenna voltage standing wave ratios.

Operationally during voice modulation, the possibility of high modulation peaks that may cause the HFLM to dump through it's overload circuitry is always apparent. Therefore, the Automatic Load and Drive Circuit reduces this condition when used with a suitable exciter that will accept this negative voltage to maintain a constant input level, which in effect will provide a constant HFLM output.



Block Diagram, HFLM-1KA

Figure 4-1

4-3. AC POWER DISTRIBUTION (refer to figure 4-2)

a. General

Single phase primary power is applied to PWR INPUT jack or terminals and provide primary voltages for transmitter operation. The HFLA-1KA system is interlocked throughout for personnel and equipment safety. When one of the protective interlocks open, power is removed from the transmitter and high voltage is automatically shut off.

b. Block Diagram Analysis

Primary single phase 115 or 230 vac is connected to PWR INPUT and is routed to one side of MAIN POWER breaker CB101. Closure of the MAIN POWER breaker provides ac power to the MAIN POWER indicator (DS101), high voltage on/off relay contacts (K101), one section of high voltage transformer (T101), front and rear fans B101 and B102 respectively. AC power is also routed through J101 pin I and enters the TLAM-1KA at J1003 pin U, to one side of PA fan B1301. Primary ac is applied to the other side of the PA fan via fan fuse F301 causing the fan to operate thus closing the contacts of blower air switch S1301. The closed air switch contacts provides an ac path through J1003 pin V and is routed to Low Voltage and Bias supply at J301 pin h and re-routed to one side of filament/bias transformer T301 and one side high voltage transformer T302.

Single phase ac is also routed through AP-152 J101 pin H to J301 pin E and through Low Voltage fuse F303 to the other side of Low Voltage transformer T302.

c. Low Voltage/Bias Power Supply AP151

With primary ac applied to the primary of low voltage transformer T302, 36 vac is applied to CR303 which is the source of the 24V DC supply. Primary ac at the junction of J301 pin E is also routed to Filament/Bias transformer T301 via filament fuse F302. The secondary of transformer T301 provides 230 vac to K301 bias relay contacts, 6.8 vac for the PA filament voltage, and bias voltage for the amplifier tubes.

d. Linear Power Amplifier TLAM-1KA

It can be seen thus far that should PA fan B1301 fail to operate ac power would be removed from both the filament bias transformer, T301 and low voltage transformer T302. When voltage is removed from T301 and T302, primary bias voltage, filament voltage and the 24 vdc would be disabled.

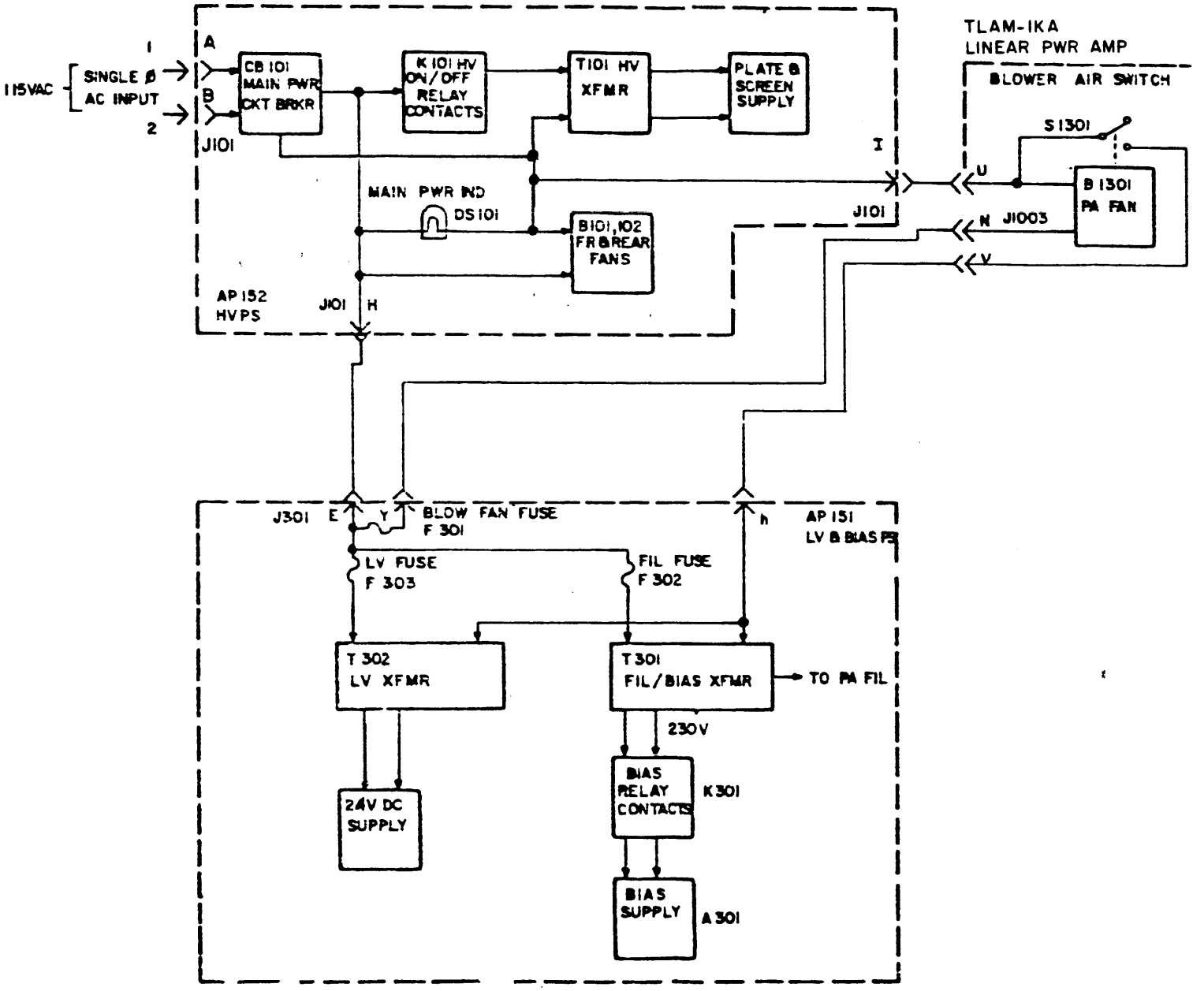


Figure 4-2. AC Power Distribution

4-4. DC POWER DISTRIBUTION (Refer to figure 4-3)

a. Plate and Screen Voltages

Application of ac power to High Voltage transformer T101 provides plate and screen voltage for RF Amplifier tubes V1301, V1201, and V1202. 4000 vdc is derived from plate rectifier A101 for plate voltage to the PA tube V1301.

Screen rectifier A102, also rectifies the secondary output of T101. This rectified output is fed to Zener diode assembly A103 that functions to regulate dc voltage potentials. Within the zener assembly, voltages are tapped and applied to RF Amplifier tubes as follows:

(1) 200 vdc First Amplifier Screen (V1201)
(2) 400 vdc Second Amplifier Screen (V1202)
(3) 800 vdc Power Amplifier Screen (V1301)

The screen rectifier also furnishes 2000 vdc for the plate of V1202 and 400 vdc for the plate of V1201.

Filament transformer T301 supplies 6.3 vac filament voltage to each RF Amplifier tube.

b. BIAS Voltage (Refer to figure 4-4)

When Bias Relay K301 energizes, ac voltage is applied to the bias rectifier A301. The negative dc output of A301 (approximately 240 vdc) is filtered by L301, L302, C301 and C302 before application to the zener diode regulators. The dc return for the Bias supply is through Bias fuse F304 to protect the circuit against overloads. Regulated bias voltages are tapped from Zeners CR301 and CR302 for application to the three bias potentiometers. The ground necessary for the voltage drop across the PA bias potentiometer is supplied by contacts of the energized PTT relay K1. The bandswitch and/or harmonic filter interlock circuit prevents 24 vdc from reaching the PTT relay during band changes to keep the PA amplifier stage at maximum bias, or close to cut off.

The bias supply provides -200 vdc to the PA bias potentiometer. The bias potentiometer is adjusted to provide between 200 ma and 210 ma quiescient current on the PA (Ip) plate current meter when the meter switch is in it's normal position. The junction of CR301 and CR302 provides -50 vdc to the 2ND AMP and 1ST AMP bias potentiometers before application to the 2ND and 1ST AMP grids. The 2ND AMP bias potentiometer is adjusted to provide between 200 ma and 210 ma on the Ip meter when the meter switch is in the 2ND AMP (up) position. The 1ST AMP bias potentiometer is adjusted to provide between 40 ma and 55 ma when the meter switch is in 1ST AMP (down) position.

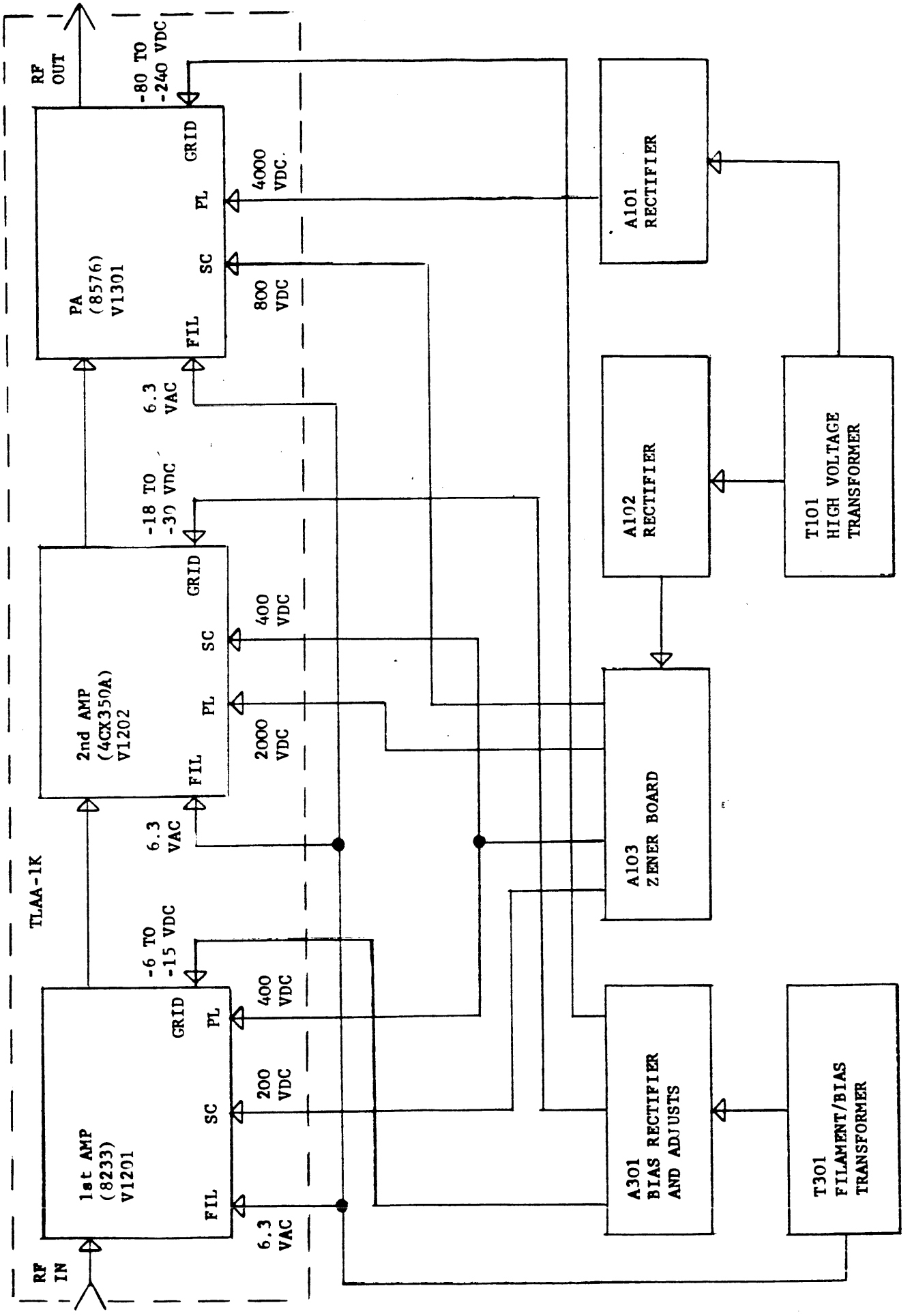


Figure 4-3. HFLM-1KA OPERATING POTENTIALS

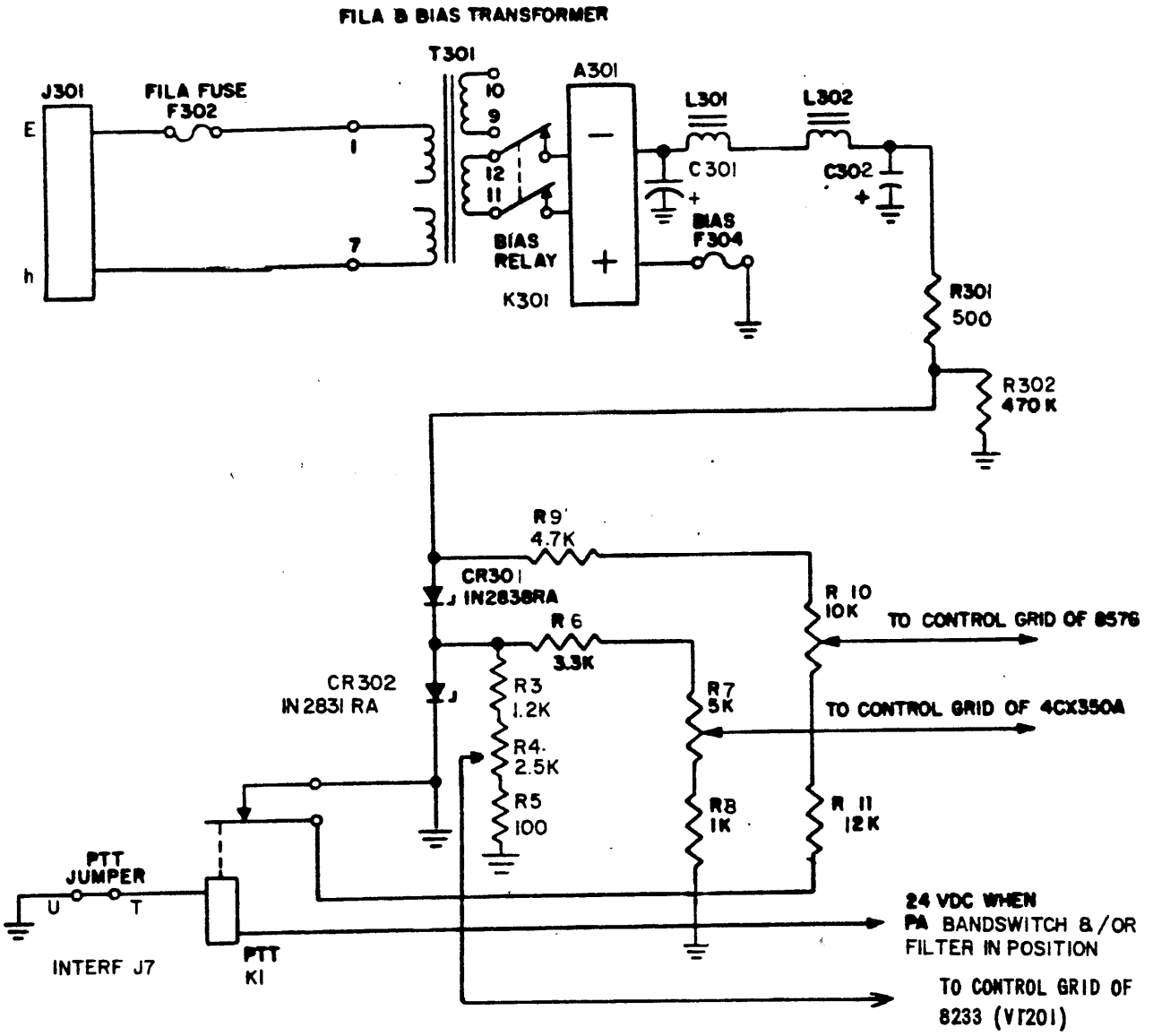


FIGURE 4-4. SIMPLIFIED BIAS CONTROL

4-5. PROTECTIVE INTERLOCKS AND OVERLOADS

Simplified High Voltage Overloads and Interlocks Circuit Analysis (Refer to figure 4-5)

The 24 vdc derived in the AP-151, Low Voltage and Bias supply is routed to Time Delay Z1101. When the elasped time is completed the 24 vdc is routed through mechanically closed protective interlocks (S1101, S1003, S2001, S2003 and External interlock). When all interlocks are closed 24 vdc is applied to K301 the bias on relay and Interlock indicator DS301, CB302 PLATE circuit breaker, CB301 SCREEN circuit breaker and one side of H.V. on/off relay K101.

When H.V. on/off switch is pressed to ON (switch indicator lights) 24 vdc is switched to overload board A1001, ON indicator DS302, consequently lighting the H.V. indicator. Simultaneously a ground path is provided via contacts on reset relay K2 and this ground is routed to H.V. ON/OFF relay K101, and H.V. ON indicator. Closed contacts on K101 energizes the plate and screen supply providing plate voltage and screen voltage to the RF amplifier tubes V1201, V1202, and V1301.

When an interlock switch is opened the 24 vdc is removed from H.V. ON/OFF relay K101 and Bias relay K301 and is re-routed via the normally closed position of the interlock switches to the overload relay A301K1. The energized overload relay removes the ground that is required to energize the H.V. ON/OFF relay and H.V. ON indicator light.

The contacts on the overload relay also provide a ground path to one side of ALARM ON/OFF switch S301 (when ALARM switch is in ON position with H.V. off due to an overload the audible alarm would sound).

An indication on the PLATE current meter (Ip) that is equal to the setting of the red overload pointer provides a contact closure on the meter sensing circuit. The contact closure supplies a gating pulse to trigger an overload SCR, providing a path for the 24 vdc to the overload lamp on the meter, and 24 vdc to the OVLD relay, causing it to unlatch and de-energize the H.V. ON/OFF relay.

A dc sample from the reflected power diode is routed through an operational amplifier and the SWR ADJ. potentiometer. The dc sample provides a trigger for the associated SCR, providing a path for the 24 vdc to the SWR overload lamp on the RF Amplifier front panel.

To restore high voltage, the H.V. ON/OFF pushbutton switch is pressed twice. Pressed the first time, the H.V. ON/OFF switch provides 24 vdc to the reset side of the OVLD RELAY and closing the contacts on the relay. Pressed the second time, the H.V. ON/OFF switch restores the 24 vdc to the contacts necessary to energize the H.V. ON/OFF relay which applies plate and screen voltages to the transmitter again.

Should any of the interlocks open when H.V. is ON, the overload coil on the overload relay is diverted to a line connecting all the normally closed contacts of the interlocks to the overload side of the overload relay. An open interlock places the transmitter in an overload condition, preventing the potentially dangerous application of high voltage when the open interlock is closed.

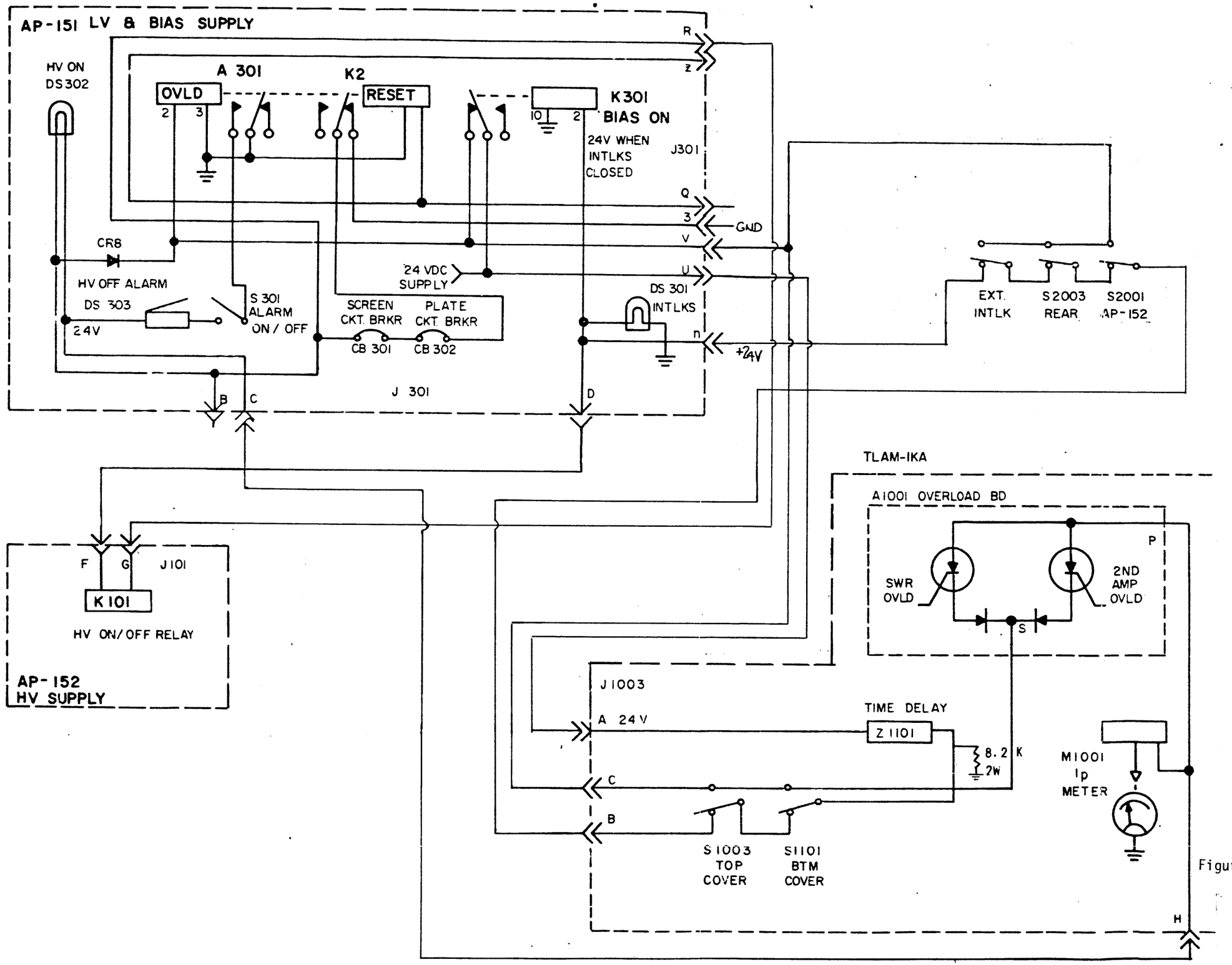


Figure 4-5. Simplified Interlock & HV Overload Circuits

4-6. ALDC.

The ALDC circuit provides a feedback voltage to an associated exciter to prevent excessive rf output from the transmitter.

A filtered and regulated 24 vdc is routed through the ALDC potentiometer (R1109) and applied to the ALDC Assembly located in the TLAM-1KA. This voltage is used to back bias the ALDC rectifier. The threshold adjusted ALDC voltage leaves the ALDC Assembly and is routed to the ALDC input of an exciter. The ALDC threshold adjustment is normally adjusted on carrier so that increase in rf will not exceed the Power Level reading.

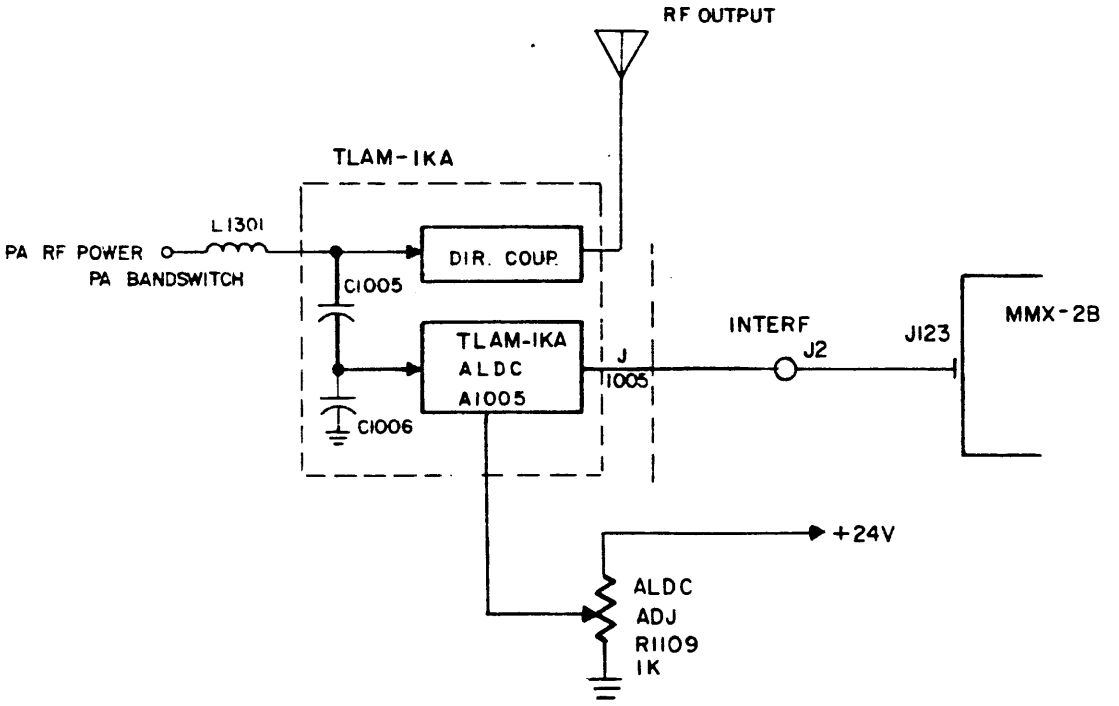


Figure 4-6

Simplified ALDC Circuit

SECTION 5

MAINTENANCE

5-1. INTRODUCTION

The HFLM-1KA has been designed for long term trouble free operation. When it becomes necessary to perform alignment and/or adjustments to the equipment, it is recommended that technicians perform the necessary operations outlined in the applicable paragraphs in this section.

A. The following maintenance aids are provided for troubleshooting, alignment and replacement of parts.

1. System block diagram (Section 4 Figure 4-1)
2. Fuse Location Drawing (Figure 5-1)
3. Fuse Functions (Table 5-2)
4. System overload and bias setting procedure
5. Auto-Tuning adjustment procedure

5-2. LIST OF TEST EQUIPMENT REQUIRED

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

5-3. OPERATOR'S MAINTENANCE PROCEDURE

a. Refer to operational checkout procedures (Part I, Section 3).

b. Refer to operator's troubleshooting chart (Table 5-1).

5-4. PREVENTIVE MAINTENANCE

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

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

WARNING

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

CAUTION

WHEN USING TRICHLORETHYLENE, AVOID CONTACT WITH PAINTED SURFACES, DUE TO ITS PAINT REMOVING EFFECTS.

5-5. TROUBLESHOOTING

The first step in troubleshooting is as follows:

a. Observations

Observe the operation of transmitter and determine whether the indications are normal or abnormal. (Refer to operator's section Part I, Section 3).

b. Fuse Checks

Should a malfunction occur a visual check of fuses on the system must be performed. (All fuses are indicating type. Refer to Figure 3-2 of Part I, Section 3 for fuse location.)

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 operation procedure outlined in Part I, Section 3. Use of this procedure will help localize the particular fault at hand.

e. Field Maintenance

Procedures presented on the following pages give instructions for qualified personnel to maintain, align, and/or troubleshoot the HFLM-1KA Transmitter.

WARNING

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

1. CHECK TO ASCERTAIN MAIN PRIMARY POWER IS OFF OR REMOVED FROM TRANSMITTER.

2. SHORT OUT ALL H.V. POINTS WITH SHORTING STICK.

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

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

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

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

TABLE 5-1. OPERATOR'S TROUBLESHOOTING CHART

No.	Malfunction	Probable Cause of Malfunction
1	Blower will not operate.	Replace defective BLOWER fuse.
2	PA Plate current and 2ND AMP Plate current excessive.	Replace defective BIAS fuse, or check bias adjustments for proper levels.
3	Interlock Indicator will not light.	Replace defective DC fuse, or check for open interlock.
4	HIGH VOLTAGE indicator will not light when HIGH VOLTAGE switch is pressed.	Replace defective LOW VOLTAGE fuse. Check that PLATE and SCREEN breakers are in ON position. High Voltage switch may have to be pressed twice.

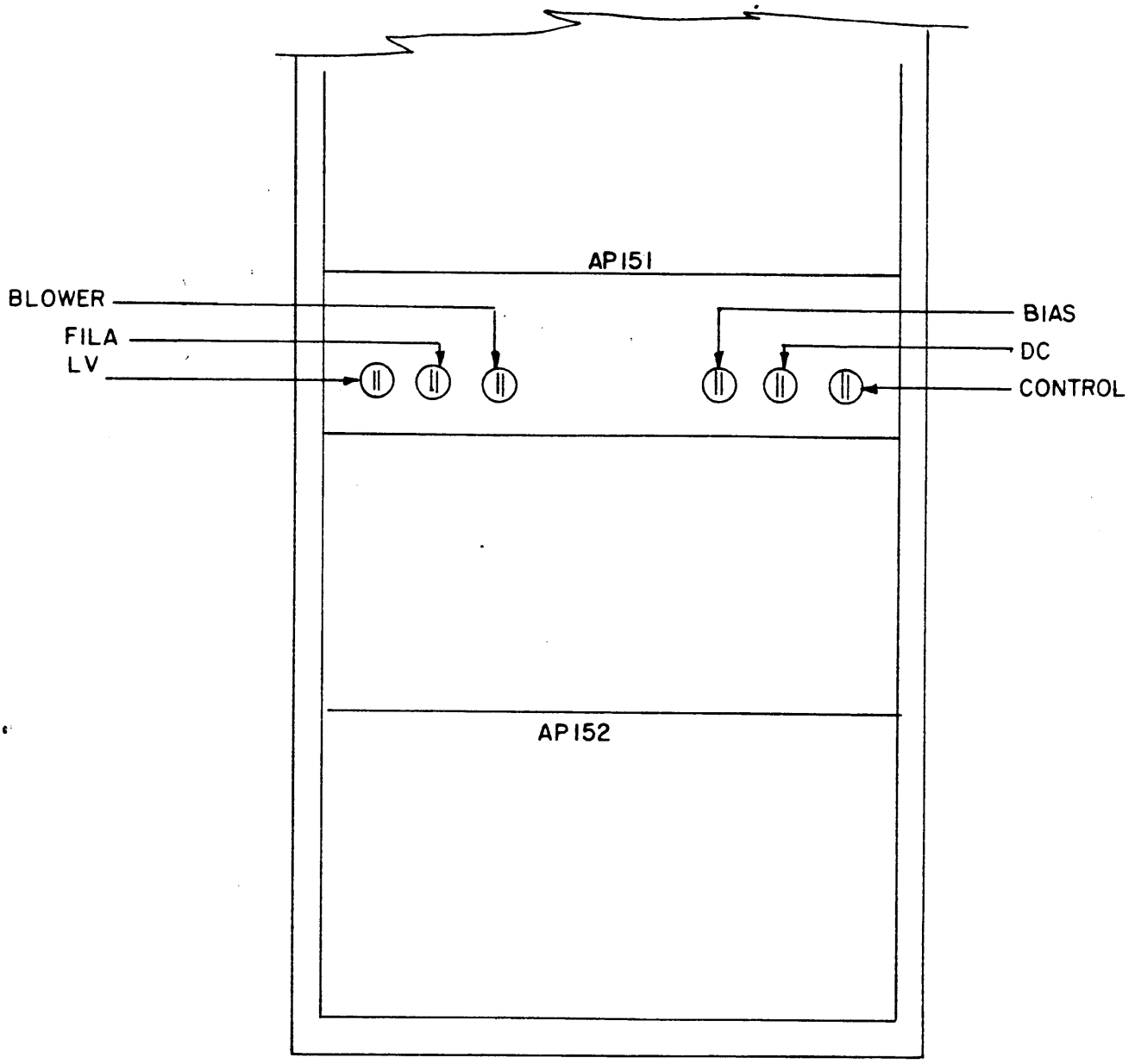


Figure 5-1

Fuse Location Drawing

TABLE 5-2. FUSE FUNCTIONS

No.	Fuse	Function
1	BLOWER Fuse	Protective fuse for blower, lights to indicate fuse defective (1.5 amp 115 vac, .75 amp 230 vac).
2	FILAMENT Fuse	Protective fuse for Filament and Bias transformer, lights to indicate fuse defective (2.0 amp 115 vac, 1.0 amp 230 vac).
3	BIAS Fuse	Protective fuse for dc return of bias supply, lights to indicate fuse defective (.2 amp).
4	L.V. Fuse	Protective fuse for primary ac input to L.V. transformer, lights to indicate fuse defective (1.0 amp 115 vac, .5 amp 230 vac).
5	DC Fuse	Protective fuse for dc return of 24 vdc supply, lights to indicate fuse defective (2.0 amp).
6	CONTROL Fuse	Protective fuse for Low Voltage and Filament-Bias transformer, lights to indicate fuse defective (1.0 amp 115 vac).

5-6. ALDC ADJUSTMENT PROCEDURE (Refer to figure 4-6)

Purpose:

The ALDC adjustments outlined are for the purpose of limiting RF PEAK power during modulation emission modes. The transmitter provides a negative dc voltage which is adjustable and proportional to the transmitter output. This voltage is made available at the transmitter ALDC jack to interface with an appropriate exciter. The exciter accepts this voltage to limit the RF drive.

a. Rotage the front panel ALDC control (on TLAM-1KA) counterclockwise for minimum ALDC action. Tune and load the transmitter to a carrier frequency of 12 MHz (a 12 MHz input signal must be available from the associated exciter or a signal generator).

1. Adust RF Control on the MMX-2B for a PA output indication of 1100 watts.

2. Adjust ALDC threshold knob (located on the front panel of the TLAM-1KA until the power output indication commences to decrease.

3. Continue to adjust the ALDC threshold knob fbr a PA Output indication of 1000 watts.

4. Increase RF control on the MMX-2B (to check ALDC capture). PA Output should remain constant.

5. Reduce RF drive to minimum and turn off H.V. This completes ALDC adjustment procedure.

The ALDC adjustment may be set for values lower than specified in the procedure if desired.

NOTE

Should the ALDC capture voltage be insufficient, resulting in an increase in PA Output when rf drive is increased, further adjustment of the ALDC knob may be necessary to hold the PA Output constant.

5-7. TRANSMITTER BIAS ADJUSTMENT PROCEDURE (Refer to Figure 5-4, 4-4)

The bias adjustments outlined below are to obtain quiescent tube values. Before bias adjustments can be made the Low Voltage Power Supply (AP151) must be extended out on its slides to expose the bias adjustment potentiometers.

1. Adjust bias controls maximum clockwise (bias voltage will be at a maximum value.)

2. Place MAIN POWER, PLATE and SCREEN breakers to the ON position.

3. Insure that RF Control (MMX-2B) is at minimum (completely counter clockwise).

TABLE 5-3. TUBE QUIESCENT CURRENT VALUES

REF SYM	TUBE TYPE	TUBE FUNCTION	QUIESCENT PLATE CURRENT ADJ TO
V1201	8233	1ST AMP	40-50 ma
V1202	4CX350A	2ND AMP	200-210 ma
V1301	8576	PA	200-210 ma

NOTE

1. MAX BIAS VOLTAGE WILL BE PRESENT IF:

   A. BANDSWITCH OR FILTER (OPTIONAL) NOT IN PROPER POSITION.
   B. PTT RELAY NOT ENERGIZED.
   C. BIAS CONTROLS ARE AT MAX CLOCKWISE.

2. WHEN MAX BIAS VOLTAGE IS PRESENT AT V1201, V1202, V1301 THE QUIESCENT PLATE CURRENT IS REDUCED TO ZERO WHICH PLACES THE AMPLIFIERS AT OR NEAR CUTOFF.

5. Press HIGH VOLTAGE button to light indicator subsequently applying HIGH VOLTAGE.

6. Observe "Ip" meter and adjust PA BIAS control for an indication between 200 ma - 210 ma as read on Ip meter.

7. Hold meter switch "UP" (to 2ND AMP position), observe Ip meter, and adjust 2ND AMP bias control for an indication between 200 ma - 210 ma as read on Ip meter.

8. Hold meter switch down (1ST AMP position) observe Ip meter and adjust 1ST AMP bias control for an indication between 40 ma - 50 ma as read on the Ip meter.

9. Press HIGH VOLTAGE switch to OFF position. (HIGH VOLTAGE indicator must go out.) Slide drawer back to original position.

5-8. OVERLOAD CIRCUIT TEST

a. PURPOSE

The Overload Circuitry functions to protect the HFLM-1KA against possible excessive current and VSWR overloads. To set and/or check the overloads perform the following.

1. Energize Transmitter (MAIN POWER breaker ON, PLATE SCREEN breaker ON).

2. Loosen panel locks and extend low voltage drawer out on its slides to expose bias controls.

3. Press HIGH VOLTAGE switch to ON (HIGH VOLTAGE indicator should light).

4. Apply rf (12) MHz to HFLM-1KA

5. Tune transmitter for rated output.

6. Reduce rf drive to minimum.

NOTE

When overload occurs, HIGH VOLTAGE switch must be pressed twice to re-apply high voltage. Press to reset overload and press to apply high voltage.

5-9. PA PLATE OVERLOAD ADJUSTMENT

Step 1 Adjust Overload indicator (adjustment screw (part of meter) located directly below meter face) for 300 ma as indicated on PLATE current meter.

Step 2 Adjust PA Bias control counterclockwise until PLATE current meter indicates 300 ma. Observe the following:

a. When meter indicator reaches the value of overload indicator setting, the high voltage will trip off.

b. PLATE current (Ip) meter face will illuminate, indicating overload in plate current.

c. Meter indicator will remain at the overload value to indicate which caused overloaded condition.

Step 3 Readjust bias to maximum clockwise position and press HIGH VOLTAGE pushbutton to reset high voltage. (H.V. Switch must be pressed twice.)

Step 4 To check further operation of plate overload, adjust bias control counterclockwise again, noting that high voltage tripped as in Step 2; set overload indicator for indication of 800 ma. Readjust PA bias control for 200 - 210 ma as indicated on the Ip meter.

5-10. 2ND AMPLIFIER PLATE OVERLOAD ADJUSTMENT (Refer to Figure 5-6)

Step 1 Extend TLAM out on its slides to expose the 2ND AMP and SWR overload adjustment control.

Step 2 Push "PLATE meter switch" up and observe 2ND AMP plate current.

Step 3 Adjust 2ND BIAS control counterclockwise until 2ND AMP plate current indicates 400 ma.

Step 4 Adjust 2ND AMP PLATE OVERLOAD potentiometer until high voltage trips off (located on bottom of TLAM-1KA.

a. PLATE current meter will illuminate, indicating overload in 2ND AMP plate current.

b. High Voltage will trip OFF, HIGH VOLTAGE indicator will go out.

c. PLATE current meter will indicate zero.

Step 5 Readjust 2ND AMP BIAS control to maximum clockwise position and press HIGHT VOLTAGE pushbutton to reset high voltage (HIGH VOLTAGE switch must be pressed twice).

Step 6 To check further operation of 2ND AMP PLATE OVERLOAD, readjust bias control counterclockwise again, noting that high voltage tripped as in Step 4.

Step 7 Reset bias control for a 2ND AMP plate current reading of 200 to 210 ma.

5-11. SWR OVERLOAD ADJUSTMENT (Refer to Figure 5-6)

Step 1 Tune transmitter into a 50 ohm dummy load at a frequency of 12 MHz.

Step 2 Remove HIGH VOLTAGE. Disconnect antenna or dummy load.

Step 3 Press HIGH VOLTAGE pushbutton to apply high voltage.

Step 4 Push SWR pushbutton and carefully increase drive until a reading of 250 watts on KILOWATT meter, is observed on the reflected power scale.

Step 5 Adjust SWR potentiometer until high voltage trips OFF (located on bottom of TLAM-1KA).

a. The OUTPUT meter will illuminate

b. High voltage will trip OFF; HIGH VOLTAGE indicator will go out.

c. PLATE current meter will indicate zero.

c. To further check operation of SWR overload, reduce RF Drive, press HIGH VOLTAGE pushbutton to ON and increase RF Drive again until overload trips HIGH VOLTAGE OFF.

NOTE

For SWR settings other than 2:1, refer to Figure 5-2.

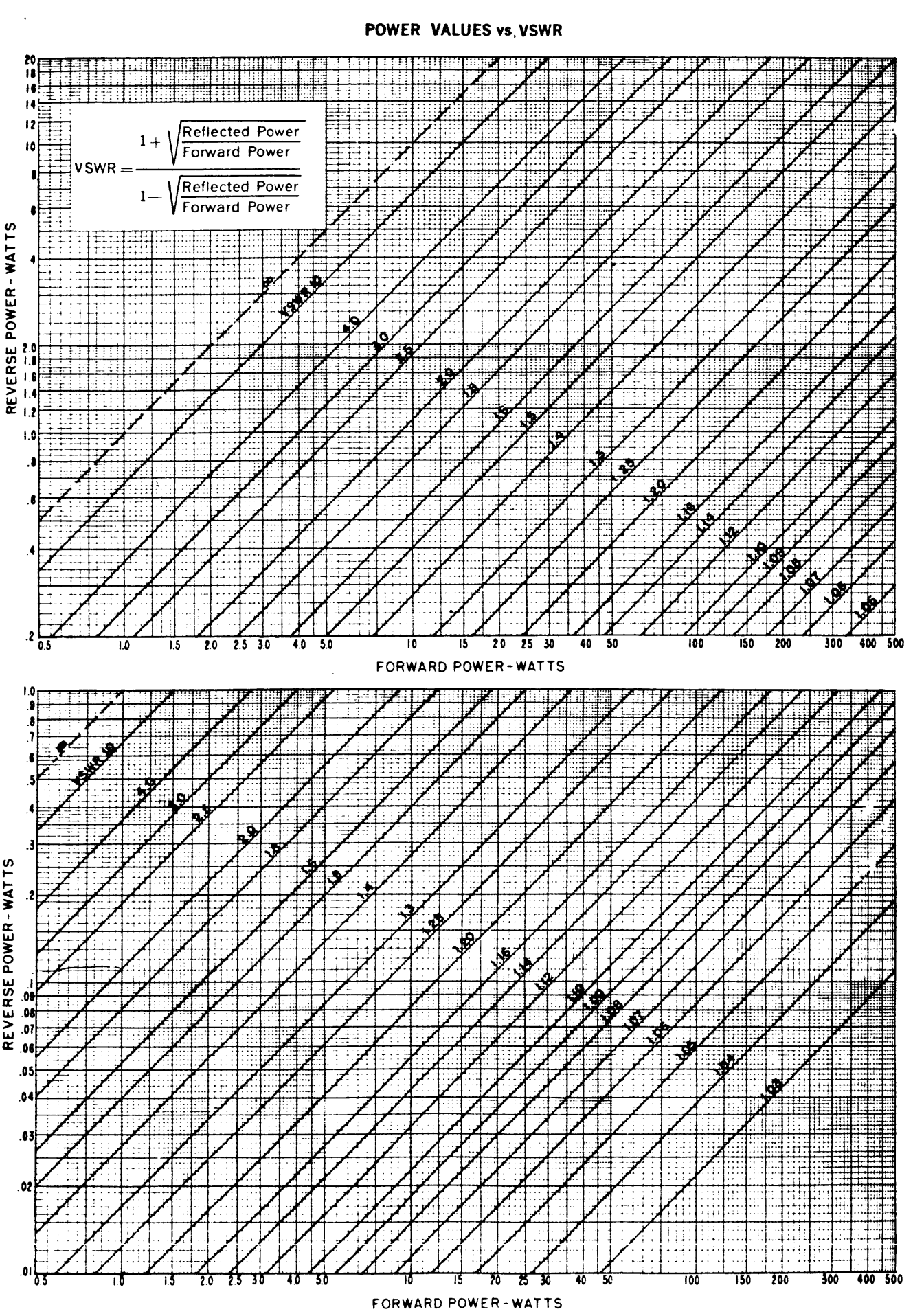


Figure 5-2. VSWR Nomograph

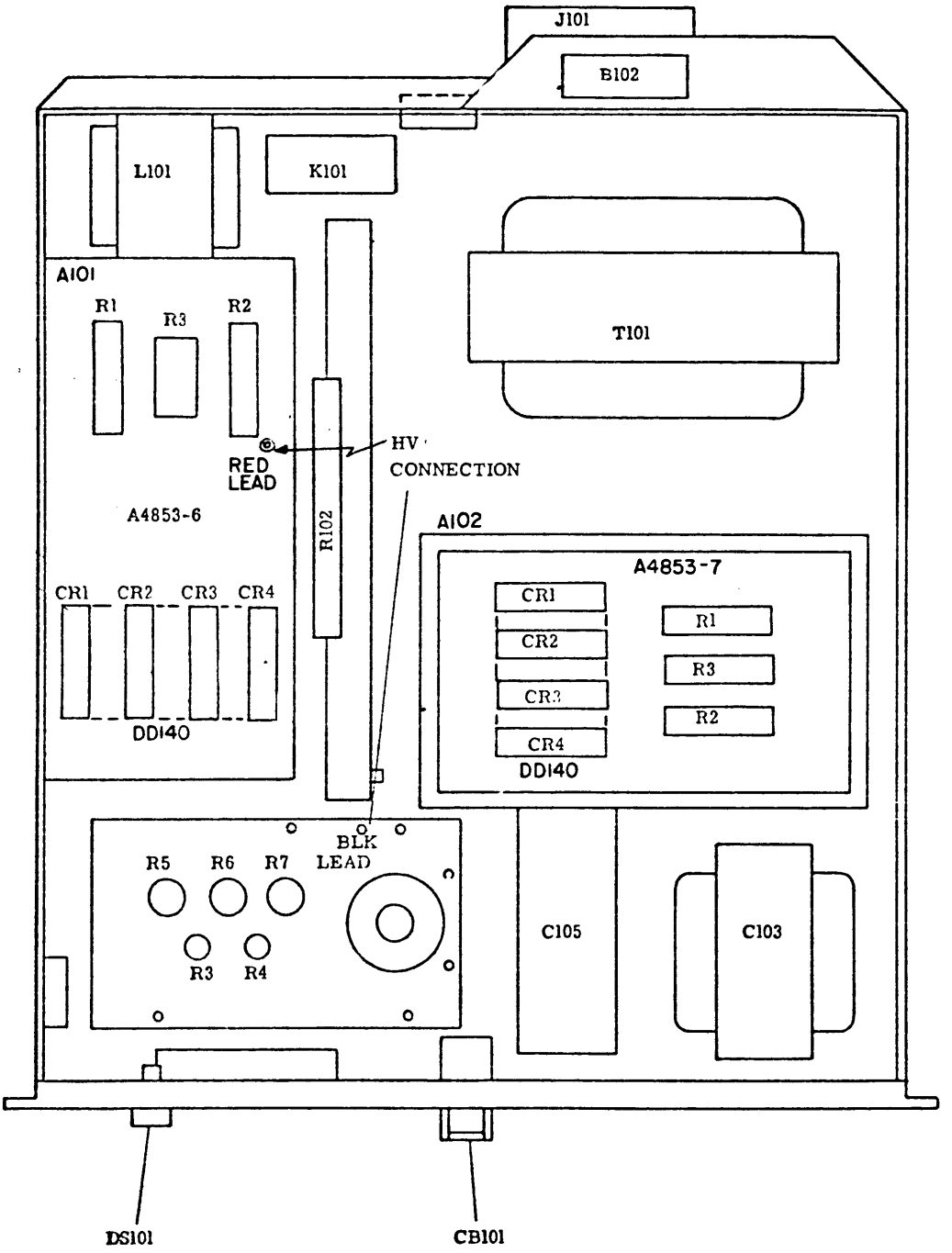


Figure 5-3. AP-152 Top View

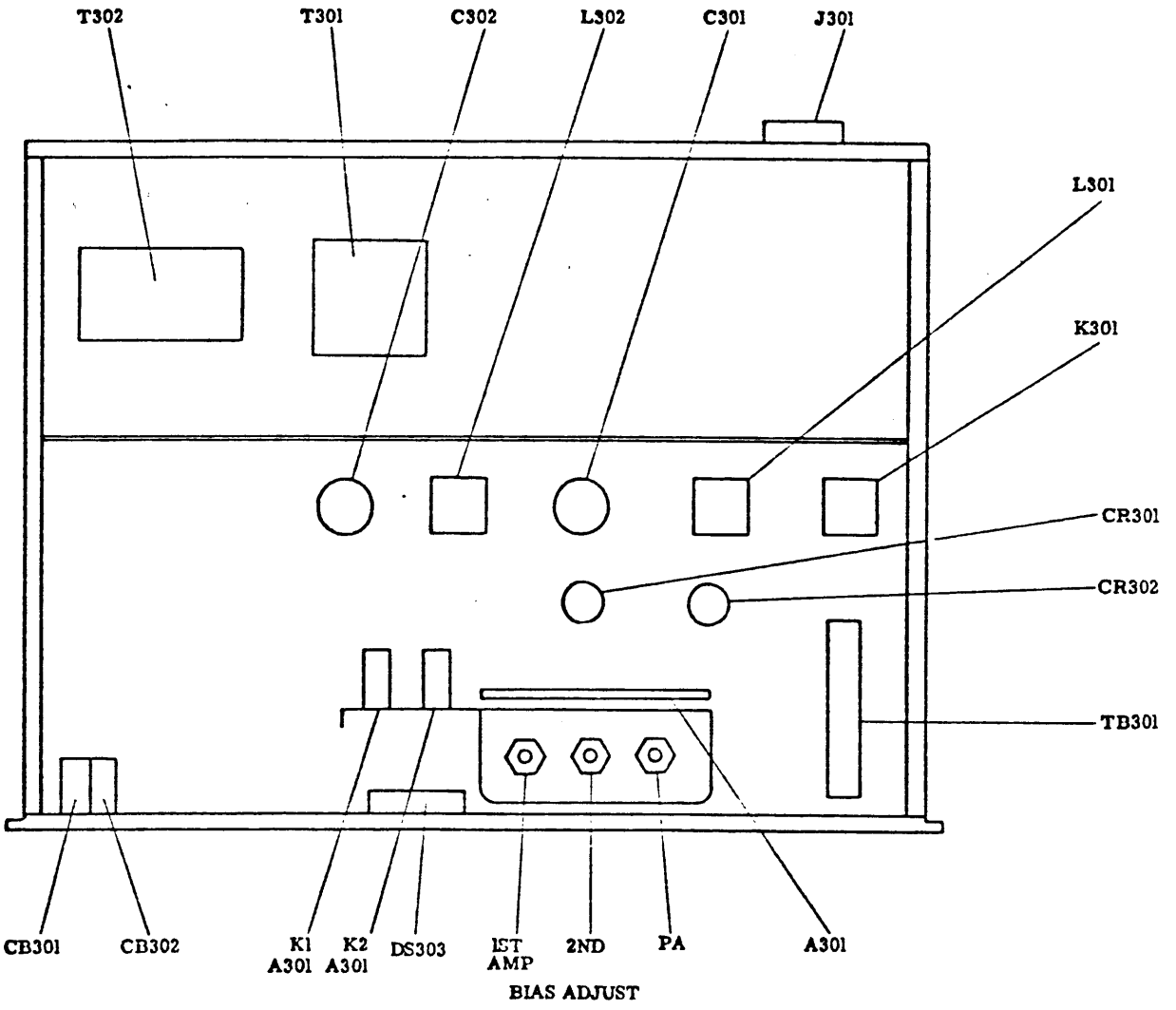


Figure 5-4. AP-151 Top View

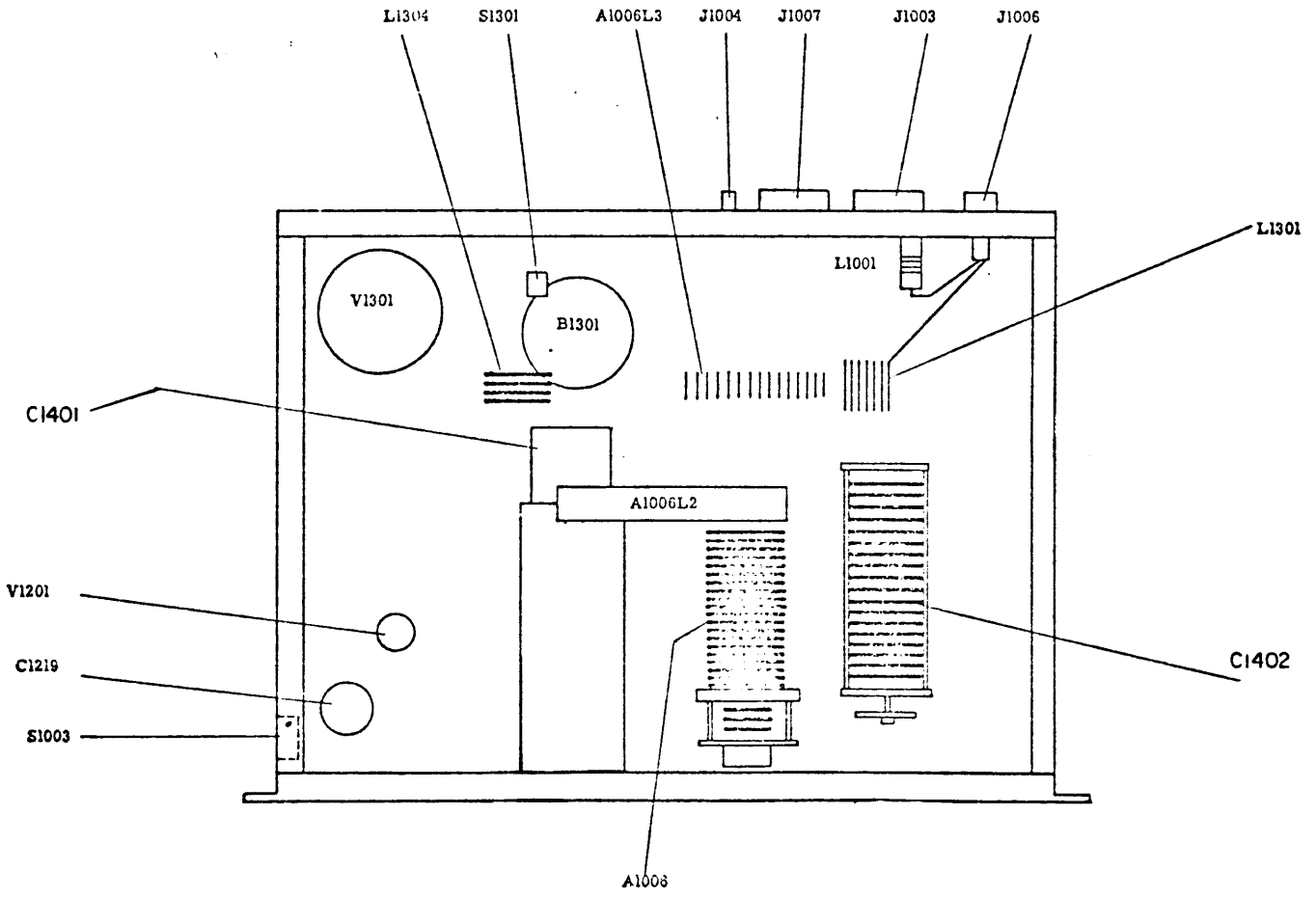


Figure 5-5. TLAM-1KA Top View

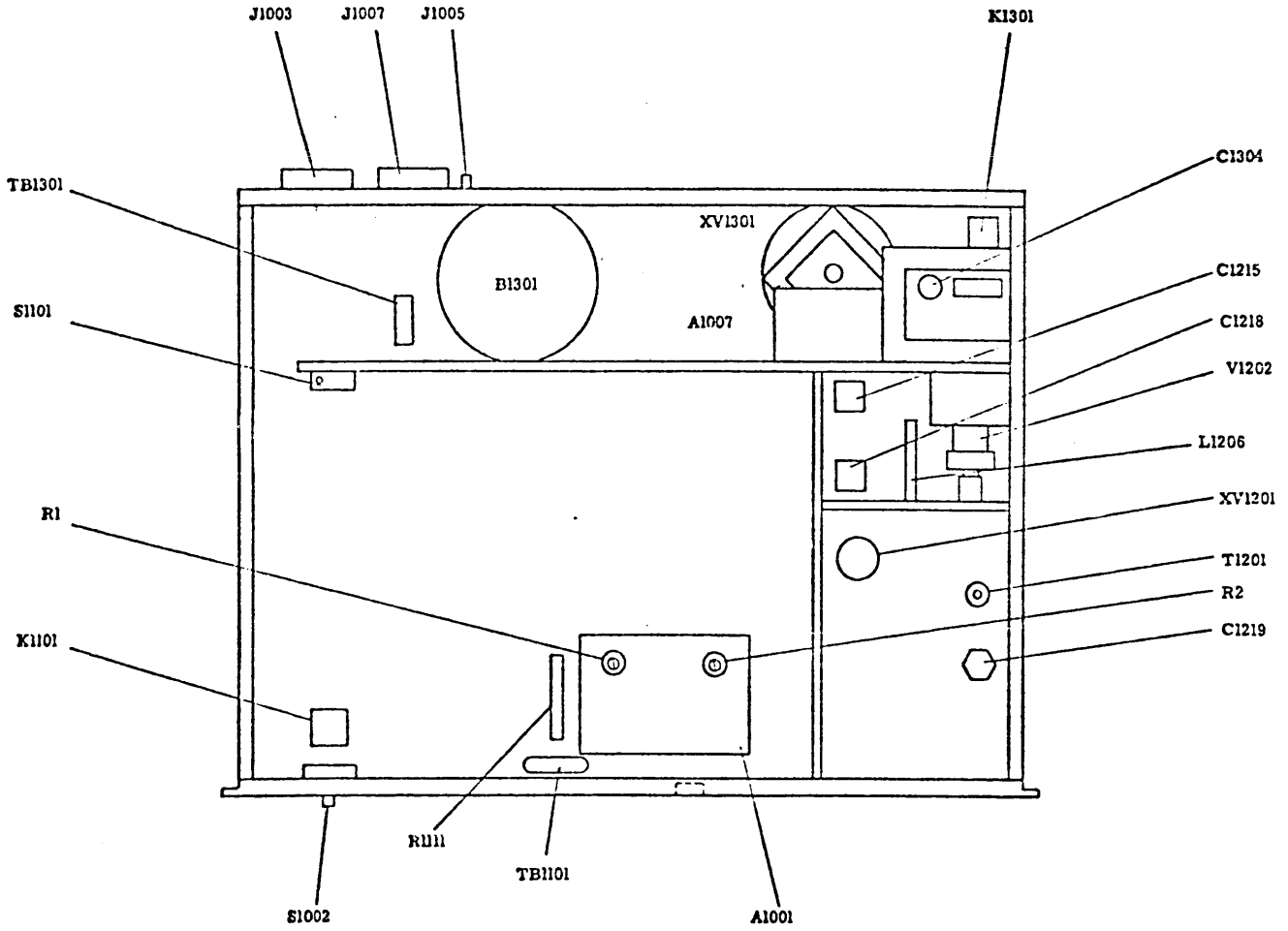


Figure 5-6. TLAM-1KA Bottom View

SECTION 6

PARTS LIST

6-1. INTRODUCTION

Reference designations have been assigned to identify all electrical parts of the equipment. These designations are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams and the parts list. The letters of a reference designation indicate the kind of part (generic group), such as resistor, capacitor, transistor, etc. The number differentiates between parts of the same generic group. Sockets associated with a particular plug-in device, such as transistor or fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for relay K201 is designated XK201. The assemblies and/or sub-assemblies that are a part of a major assembly are suffixed with an asterisk; parts list breakdown for these assemblies are located in the rear of the parts section. For example, in parts list for Power Amplifier, the Reference Sysbol A1001 shows a TMC part number A4879*, the parts list breakdown for A4879 is located in the rear of parts list for TLAM-1KA. To expedite delivery when ordering replacement parts, specify the TMC part number and the model number of the equipment. See example below.

To order C1 of A4879, order as follows:

A4879 C1, TMC Part No. CX119-104M.

AP152 H/V Power Supply

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A101	Assembly, PC, Board, Rect	A-4853-6*
A102	Assembly, PC, Board, Rect	A-4853-7*
A103	Assembly, PC, Board, Zener	A5637*
B101	Fan, Vent	BL106-2
B102	Same as B101	
C101	Capacitor, Fixed, Film	CN128-1
C102 thru C104	Same as C101	
C105	Capacitor, Fixed, Paper	CP70B1EG106K
CB101	Circuit, Breaker	SW261
DS101	Lamp, Incand	BI105-1
DS102	Same as DS101	
F101	Fuse, Circuit	FU102-.500
K101	Rel, Arm	RL184-3
L101	React, 5H	TF5034
L102 thru L104	Same as L101	
R101	Res, Fixed, WW 160W	RW117-39
R102	Same as R101	
R103	Resistor, Fxd, WW 55W	RW115-101-55
T101	Xfmr, P1	TF413
TB101	Terminal, Bd, Barr	TM102-4
XDS101	Socket, Lamp	TS136-2FS
XDS102	Socket, Lamp	TS136-1FS
XF101	Fuse holder	FH105
XK101	Soc, Rel	TS196-1
Z101	Shunt, Circuit, Breaker	AR196
Z102	Shunt, Circuit, Breaker	AR197

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	A-4853-6 Assembly, Board, PC Rect	
A101CR1 thru A101CR4	Rect, Scond, Dev	DD140
A101R1	Resistor, Fixed, WW 10W	RW109-4
A101R2	Same as A101R1	
A101R3	Resistor, Fixed, WW 20W	RW110-3
	A-4853-7 Assembly, Board, PC Rect	
A102CR1 thru A102CR4	Rect, Scond, Dev	DD140
A102R1	Resistor, Fixed, WW 10W	RW109-4
A102R2	Same as A102R1	
A102R3	Resistor, Fixed, WW 20W	RW110-7
	A5637 Assembly, Board, PC Zener	
A103CR1	Scond, Dev, Dio	1N2846A
A103CR2	Same as A103CR1	
A103R1	Resistor, Fixed, Comp	RC42GF274J
A103R2	Resistor, Fixed, Comp	RC42GF124J
A103R3	Resistor, Fixed, Comp	RC42GF101J
A103R4	Resistor, Fixed WW 50W	RW105-35
A103R5	Resistor, Fixed WW 50W	RW105-32
A103R6	Same As A103R5	
A103R8	Same As A103R3	
A103R9	Same as A103R3	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A301	Board, Assembly, Pc, Bias	A-4877*
C301	Capacitor, Fixed, Elec	CE52C200Q
C302	Same as C301	
C303	Capacitor, Fixed, Elec	CE116-8VN
C304	Same as C303	
CB301	Circuit, Breaker	SW262
CB302	Circuit, Breaker	SW215
CR301	Scond, Dev, Dio	1N2843RA
CR302	Scond, Dev, Dio	1N2831RA
CR303	Scond, Rect	RX108-2
CR304	Scond, Dev, Dio	1N3321B
CR305	Scond, Dev, Dio	1N3324B
DS301	Lamp, Incand	BI110-7
DS302	Same as DS301	
DS303	Gen, Audio, Sig.	BZ101-2
F301	Fuse, Cartridge (115V operation only)	FU102-1.5
F301	Fuse, Cartridge (230V operation only)	FU102-.75
F302	Fuse, Cartridge (115V operation only)	FU102-2
F302	Fuse, Cartridge (230V operation only)	FU102-1
F303	Same as F301	
F304	Fuse, Cartridge	FU102-.2
F305	Fuse, Cartridge	FU100-4
F306	Fuse, Cartridge	FU102-2.5
J301	Conn, Recep, ML	MS3102A32-414P
K301	Rel, Arm.	RL168-3C10-24DC
L301	React. 5H	TF5028
L302	Same as L301	
R301	Res, Fxd, WW 10W	RW109-19
R302	Res, Fxd, Comp	RC42GF474J
R303	Res, Fxd, Comp	RC20GF103J
R304	Res, Fxd, WW 10W	RW109-1
R305	Same as R304	
R306	Res, Fxd, WW 20W	RW110-5

AP151 L/V and Bias Supply

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R307	Same as R304	
R308	Res, Fxd, Comp	RC42GF392J
R309	Res, Fxd, WW 20W	RW110-5
R310	Res, Fxd, Comp	RC42GF101J
R311	Same as R310	
R312	Same as R309	
S301	Switch, Toggle, SPST	ST103-5-62
S302	Switch, Push, DPDT	SW522-1
T301	Transformer, Fil	TF414
T302	Transformer, L/V	TF416
TB301	Terminal, Strip, Barr	TM100-8
XA301	Conn, Pc, Board	JJ319-22DFE
XC301	Socket, Octal	TS101P01
XC302	Same as XC301	
XCR301	Soc, Scond, Dev	TS166-1
XCR302	Same as XCR301	
XDS301	Light, Ind	TS153-11
XDS302	Light, Ind	TS184
XF301	Fuseholder	FH104-3
XF302	Same as XF301	FH104-3
XF303	Same as XF301	
XF304	Same as XF301	
XF305	Fuseholder	FH104-11
XF306	Same as XF305	
XK301	Same as XC301	

A-4877 Board, Assembly, PC Bias

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR1	Rect, Scond, Dev	DD130-600-1.5
CR2	Scond, Dev, Dio	1N645
CR3 thru CR10	Same as CR2	
K1	Rel, Arm 4PDT	RL156-15
K2	Rel, Arm 4PDT	RL156-10
R1	Res, Fxd, Comp	RC42GF100J
R2	Same as R1	
R3	Res, Fxd, Comp	RC42GF122J
R4	Res, Var, Comp	RV4LAYSA252A
R5	Res, Fxd, Comp	RC42GF101J
R6	Res, Fxd, Comp	RC42GF332J
R7	Res, Var, Comp	RV4LAYSA502A
R8	Res, Fxd, Comp	RC42GF151J
R9	Res, Fxd, Comp	RC42GF472J
R10	Res, Var, Comp	RV4LAYSA103A
R11	Res, Fxd, Comp	RC42GF103J
R12	Res, Fxd, Comp	RC32GF122J
R13	Res, Fxd, Comp	RC32GF152J
R14	Same as R12	
R15	Same as R13	
XK1	Soc, Rel	TS171-4
XK2	Same as XK1	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1001	Printed Circuit Board Assembly	A-4879*
A1002	Not used	
A1003	Not used	
A1004	Printed Circuit Board Assembly	A-4878*
A1005	Printed Circuit Board Assembly	A-4850-2*
A1006	Bandswitch Assembly	AS160*
A1007	Not used	
A1008	Matching Network Assembly	AX787*
C1001 thru C1004	Capacitor, Fxd, Polyester	CX119-104M
C1005	Capacitor, Fxd, Cer	CC109-3
C1006	Capacitor, Fxd, Mica	CM15B151J03
DC1001	Coupler, Directional	DC108
DS1001	Lamp, Incand	BI101-1820
DS1002	Same as DS1001	
J1001	Conn, Recp, ML	MS3102A-18-16P
J1002	Conn, Recp, Fml	MS3102A18-16S
J1003	Conn, Recp, ML	MS3102A32-7P
J1004	Conn, Recp, BNC	JJ172
J1005	Same as J1004	
J1006	Conn, Recp, HN	UG560*/U
J1007	Conn, Recp, ML	MS3102A32-414P
J1008	Conn, Recp, FML	JJ310-3
L1001	Coil, RF	CL13°
M1001	Meter, FL	MR216-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
M1002	Meter, Output	MR217
S1001	Switch, Lever	SW523-3
S1002	Switch, Actuator	SW347
S1003	Switch, Intlk	SW219
XA1001	Conn, Recp, PC Board	JJ319-22-DFE
XDS1001	Lamp, Holder, Bay	TS107-2
XDS1002	Same as XDS1001	
C1101 thru C1107	Capacitor, Fxd, Cer	CK70AW202M
C1108	Capacitor, Fxd, Cer	CC108-4P-1000M
C1109	Same as C1108	
C1110	Not used	
C1111	Not used	
C1112	Capacitor, Fxd, Cer	CK70AW202M
C1113	Not used	
C1114	Not used	
C1115	Not used	
C1116	Capacitor, Fxd, Elec	CE105-25-25
C1117	Capacitor, Fxd, Elec	CE105-10-50
CR1101	Not used	
CR1102	Not used	
E1101	Not used	
E1102	Bush, Slot Heat	TE101-3

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
E1103	Term, Turret	TE102-2
E1104	Bush, Slot Head	TE101-3
E1107	Same as E1103	
E1108	Same as E1103	
K1101	Rel, Arm, DPDT	RL156-1
R1101 thru R1103	Resistor, Fxd, Comp	RR114-5W
R1104	Resistor, Fxd, Comp	RC42GF100J
R1105	Resister, Fxd, WW	RW111-4
R1106	Not used	
R1107	Resistor, Fxd, Comp	RC32GF102J
R1108	Resistor, Fxd, Comp	RC20GF103J
R1109	Resistor, Var, Comp	RV106UX10C102A
R1110	Resistor, Fxd, Comp	RC20GF101J
R1111	Resistor, Fxd, WW	RW110-1
R1112	Resistor, Fxd, Comp	RC42GF102J
R1113	Resistor, Fxd, Comp	RC42GF821J
S1101	Switch, Intlk	SW219
TB1101	Terminal, Strip	TM121-1
XK1101	Socket, Relay	TS171-1
Z1101	Time, Delay	NW183-24-30
C1201	Capacitor, Fxd, Mica	CM111C181J5S
C1202	Capacitor, Fxd, Cer	CC100-16
C1203	Capacitor, Fxd, Cer	CC100-37
C1204	Capacitor, Fxd, Cer	CC100-32
C1205	Same as C1204	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1206	Capacitor, Fxd, Cer	CC100-31
C1207	Capacitor, Fxd, Mica	CM111E220J5S
C1208	Capacitor, Fxd, Mica	CM112F222F3S
C1209 thru C1212	Same as C1203	
C1213	Capacitor, Fxd, Cer	CC100-23
C1214	Same as C1213	
C1215	Capacitor, Fxd, Cer	CC109-38
C1216	Same as C1204	
C1217	Same as C1203	
C1218	Same as C1215	
C1219	Capacitor, Fxd, Paper	CP41B1EF405K
C1220	Same as C1203	
E1201 thru E1208	Term, Turret	TE102-2
L1201	Not used	
L1202	Coil, RF	CL101-2
L1203 thru L1205	Coil, RF	CL140-2
L1206	Ind, Fxd	CL459
L1207	Coil, RF	CL178
R1201	Resistor, Fxd, Comp	RC20GF102J
R1202	Resistor, Fxd, Comp	RC32GF100J
R1203	Resist r, Fxd, Comp	RC42GF120J
R1204	Resist r, Fxd, Comp	RC42GF222J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1205	Resistor, Fxd, Comp	RC20GF333J
R1206	Resistor, Fxd, Comp	RC42GF331J
R1207	Resistor, Fxd, Comp	RC42GF472J
R1208	Resistor, Fxd, Comp	RR114-20W
R1209	Resistor, Fxd, Comp	RC20GF101J
R1210	Same as R1209	
R1211	Resistor, Fxd, Comp	RC42GF183J
R1212	Resistor, Fxd, Comp	RC42GF154J
R1213	Same as R1212	
R1214	Resistor, Fxd, WW 10W	RW109-30
T1201	Coil, RF, Adj	CL460
V1201	Tube, El	8233
V1202	Tube, El	4CX350A
XV1201	Socket, El Tube	TS198
XV1202	Socket, El Tube	TS197
Z1201	Supp, Parasitic	A1546-2
Z1202	Supp, Parasitic	A1546-4
B1301	Blower, Cent	BL134
C1301	Not Used	
C1302	Not Used	
C1303	Not Used	
C1304	Not Used	
C1305	Not Used	
C1306	Not Used	
C1307	Capacitor, Fxd, Cer	CC100-32
C1308	Same as C1307	
C1309	Capacitor, Fxd, Cer	CC100-37
C1310	Capacitor, Fxd, Cer	CC109-38

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1311 thru C1314	Capacitor, Fxd, Cer	CC109-36
C1316	Not used	
C1317 thru C1321	Not used	
C1322	Same as C1310	
C1323	Same as C1310	
E1301	Term, Turret	TE102-2
E1302	Ins, Standoff	NS3W0108
L1301	Coil, Output	CL463
L1302	Coil, RF	CL140-6
L1303	Same as L1302	
L1304	Coil, RF	CL471
L1305	Coil, RF	CL140-1
R1302	Resistor, Fxd, Comp	RR114-5W
R1303	Same as R1301	
S1301	Switch, Micro	SW252
TB1301	Term, Strip, Barr	TM102-6
V1301	Tube, El	8576/PL264J
XV1301	Socket, El, Tube	TS182

A-4879 Printed Circuit Board Assembly

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C2 thru C17	Capacitor, Fixed, Polyester	CC100-28
C18	Not used	
C19 thru C21	Same as C3	
C22	Capacitor, Fixed, Mica	CM111C200J5S
C23	Capacitor, Fixed, Mica	CM111E511H5S
C24	Capacitor, Fixed, Elec	CE105-3-25
C25	Same as C3	
C26	Capacitor, Fxd, Elec	CE105-50-15
C27	Capacitor, Fxd, Elec	CE105-20-15
CR1	Scond, Dev, Dio	1N759
CR2	Same as CR1	
CR3 thru CR5	Scond, Dev, Dio	1N2484
CR6 thru CR9	Scond, Dev, Dio	1N645
CR10	Not Used	
CR11	Same as CR3	
L1	Coil, RF	CL240-120
L2	Same as L1	
Q1	Transist r	2N492A
Q2	Transistor	2N1595

A-4879 Printed Circuit Board Assembly (con't)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Q3	Same as Q2	
R1	Resistor, Var, Comp	RV111U502A
R2	Resistor, Var, Comp	RV111U103A
R3	Resistor, Fixed, Comp	RC20GF152J
R4	Resistor, Fixed, Comp	RC20GF102J
R5	Resistor, Fixed, Comp	RC20GF153J
R6	Resistor, Fixed, Comp	RC20GF391J
R7	Same as R6	
R8	Same as R4	
R9	Resistor, Fixed, Comp	RC20GF821J
R10	Resistor, Fixed, Comp	RC20GF560J
R11	Resistor, Fixed, Comp	RC20GF122J
R12	Not used	
R13	Not used	
R14	Not used	
R15	Not used	
R16	Not used	
R17	Not Used	
R18	Not Used	
R19	Not Used	
R20	Resistor, Fixed, Comp	RC20GF224J
R21	Resistor, Fixed, Comp	RC20GF223J
R22	Resist r, Fixed, Comp	RC07GF561J
Z1	Network, OP Amp	RW156

PA Tune, Load Capacitors

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1401	Capacitor, Var, Vac	CB178
C1402	Capacitor Var. Air	CB175

A-4878 Printed Circuit Board Assembly

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1 thru C9	Capacitor, Fxd, Polyester	CX119-104M
CR1 thru CR9	Scond, Dev, Dio	1N645
DS1 thru DS9	Lamp, Incand	BI114-2
E1 thru E10	Terminal, Stud	TE127-2
R1	Resistor, Fxd, Comp	RC32GF391J

A-4850-2 Printed Circuit Board Assembly

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	Capacitor, Fixed, Cer	CC100-28
C2	Same as C1	
C3	Capacitor, Fixed, Elec	CE107-6
CR1	Scond, Dev, Dio	1N34A
E1 thru E3	Terminal, Stud	TE127-2
R1	Resistor, Fixed, Comp	RC20GF272J
R2	Resistor, Fixed, Comp	RC20GF102J

AS160 Band Switch Assembly

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1 thru C6	Capacitor, Fixed, Cer	CC109-38
C7	Capacitor, Fixed, Cer	CC109-28
C8	Capacitor, Fixed, Cer	CC109-19
CR1	Scond, Dev, Dio	1N547
E1	Term, Turret	TE102-2
E2	Same as E1	
K1	Rel, Arm, DPDT	RL168-2C10-24DC
L1	Coil, Rf	CL292
L2	Coil, MN, Tank	CL470
L3	Coil. Load	CL472
P1	Conn, PL, ML, 37/C	JJ313-3H
S1A	Assembly, Bnd, Bd	BMA464
S1B	Assembly, Output, Bd	BMA465
S2	Switch, Rotary, Solenoid	SW429
XK1	Socket, Relay	TS100-3

AX787 Matching Network

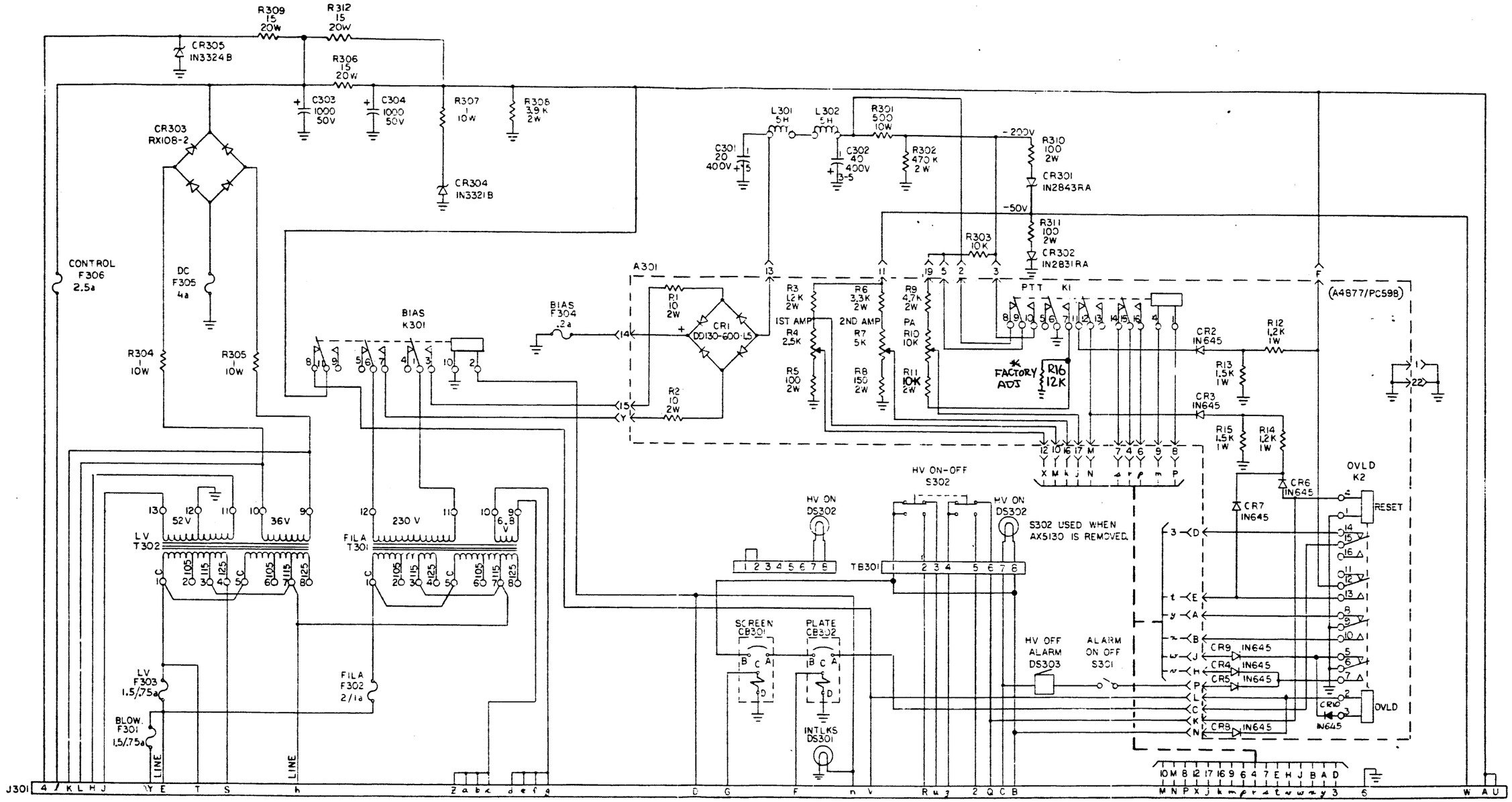
REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	Cap., Variable	CV111D450
C2	Cap., Fxd, Mica	CM111C151J5S
C3	Cap., Fxd, Ceramic	CC100-28
C4	Same as C3	
C5	Same as C3	
C6	Same as C3	
C7	Cap., Fxd, Mica	CM112F562J5S
CR1	Scond, Dev, Dio	1N645
K1	Relay, Armature	RL185
K2	Same as K1	
K3	Same as K1	
L1	Choke, RF	CL105-2
R1	Res, Fxd	RR116-1400W
T1	XFMR, Interstage	TR206

SECTION 7

MAINTENANCE DIAGRAMS

7-1. GENERAL

This section contains the following maintenance diagrams for HFLM-1KA.

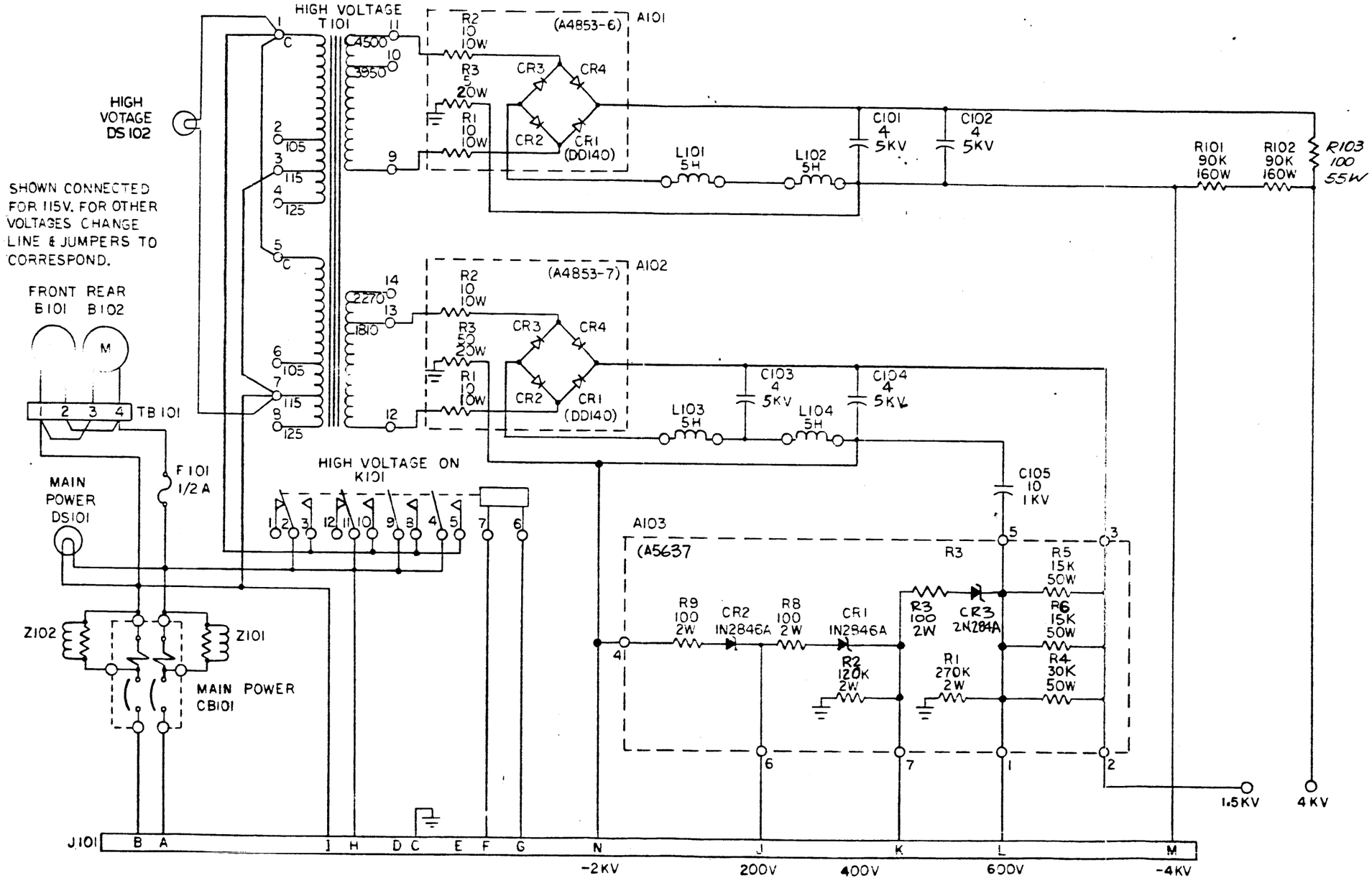


UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCES ARE IN OHMS, ½ W.
2. ALL CAPACITANCES ARE IN MFD.
3. ALL INDUCTANCES ARE IN H.
4. AC FUSE VALUES SHOWN FOR 115/230 V OPERATION.
5. TRANSFORMERS SHOWN WIRED FOR 115 V. FOR OTHER VOLTAGES CHANGE LINE & JUMPERS TO CORRESPOND.
6. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX THE PART DESIGNATION WITH THE SUB-ASSEMBLY DESIGNATION.

Schematic Diagram,
Low Voltage and Bias Supply AP151

(CK1870-F)



Schematic Diagram,
High Voltage Power Supply AP152

(CK1869-J)

QTY REQ.	ITEM	PART NO.

FINAL APPROVAL	DATE 4/17/80
MECH. DES.	DATE
ELECT. DES.	DATE
CHECKED	DATE
DRAWN	DATE

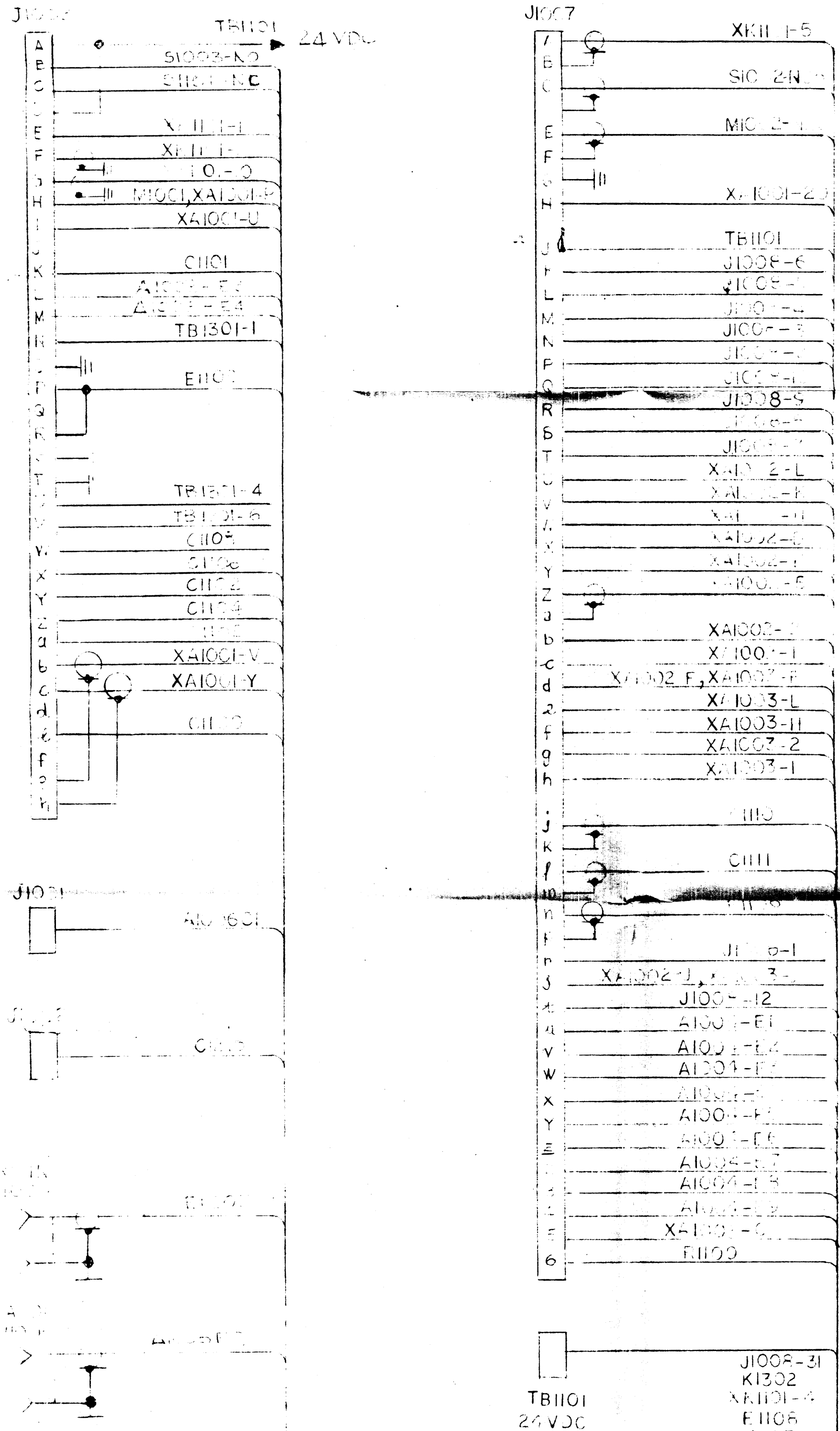
Figure 7-3

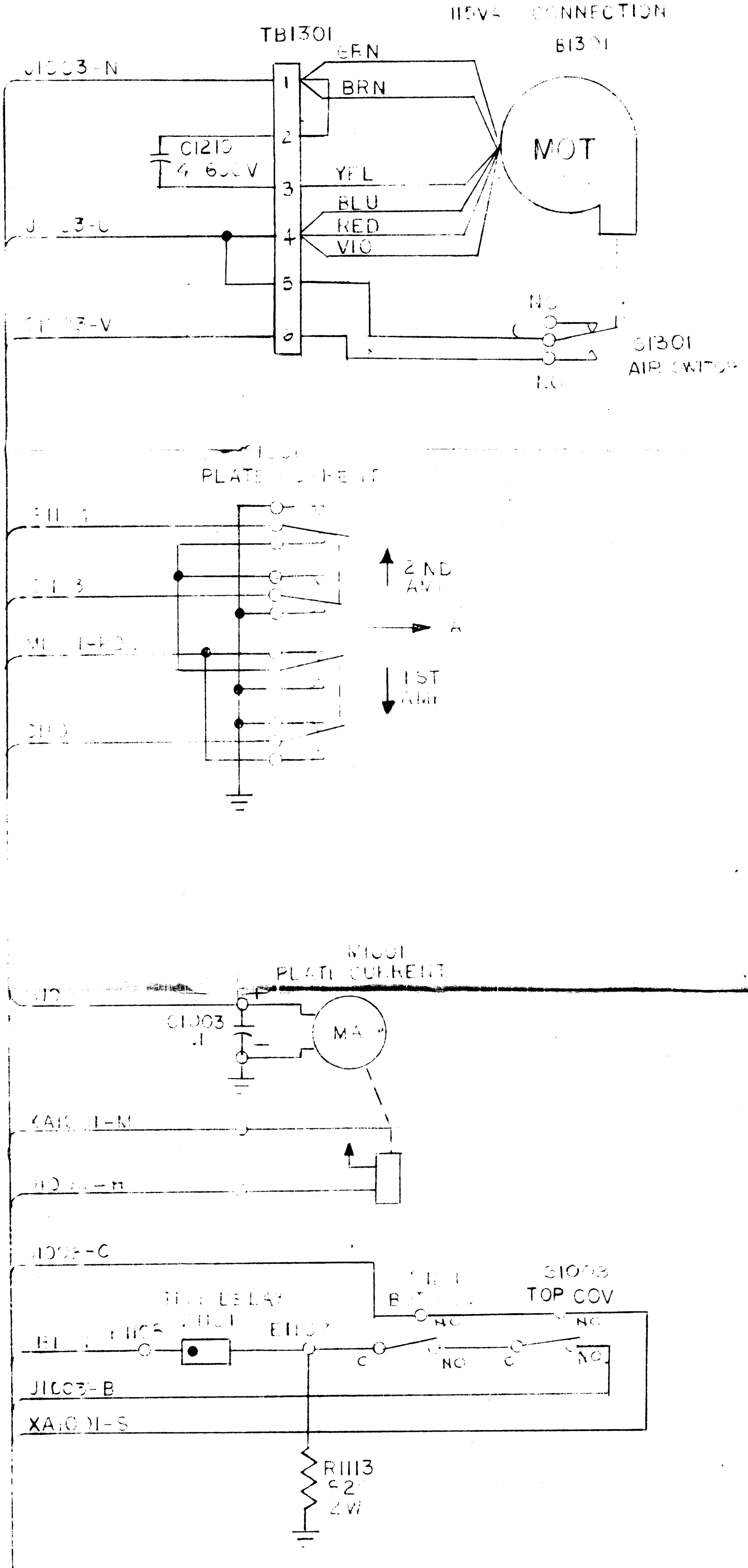
TLAM-1KA

SCHEMATIC DIAGRAM

Sheet - 1 of 3

CK2221-A


J1008
TB1101
24 VDC
S1003-NO
S1101-NC
XA1001-1
XA1001-2
10.-Q
M1001,XA1001-P
XA1001-U
C1101
A1001-E3
A1001-E4
TB1301-1
E1101
TB1301-4
TB1101-6
C1105
C1106
C1102
C1104
XA1001-V
XA1001-Y
C1103
J1021
A1001-E1
C1107
J1022
E1102
J1023
A1001-E2
J1007
XK1101-5
S1002-NO
S1002-NC
M1002-1
XA1002-2
TB1101
J1008-6
J1008-7
J1008-4
J1008-3
J1008-2
J1008-1
J1008-5
XA1002-L
XA1002-K
XA1002-11
XA1002-D
XA1002-1
XA1002-5
XA1002-J
XA1002-F
XA1003-L
XA1003-11
XA1003-2
XA1003-1
C1110
C1111
J1008-12
A1001-E1
A1001-E4
A1001-E7
A1001-F4
A1001-E6
A1001-E7
A1001-E8
A1001-E9
R1100
TB1101
24 VDC
J1008-31
K1302
XK1101-4
E1108
J1007-1


TB1301
GRN
BRN
YEL
BLU
RED
VIO
MOT
C1213
S1301
AIR SWITCH
PLATE CURRENT
2ND AMP
1ST AMP
M1001
PLATE CURRENT
C1003
.1
MA
C1117
10
50V
S1002-NO1
XA1001-X
J1003-G
J1007-A
XA1001-Z
J1003-F
J1003-E
TB1101
J1007-C
XK1101-8
J1007-F
XA1001-T
R1113
52
2W
TOP COV
NO
NC
C

230 VAC CONNECTION

TB1101

GRN
YEL
BLU
WHT
BRN
RED

1
2
3
4
5
6

NOT

* ONE PAIR OF LEADS ONLY IS USED.
IF TEP-IK IS REMOVED, UNUSED PAIR

METER

S1002-NO1
XA1001-X
J1003-G
J1003-A
XA1001-E
J1003-F
J1003-E
TB1101

10
5
6
7
1
4

S1002
REFLECTED

J1007-C
NC 8
7 NC
5
6
XK1101-S
4
3

C1117
10
50V

R1108
1MΩ

M1002
1MA

J1007-F

S1001
VLD

XA1001-P

C1001
.1

S1002
SWP

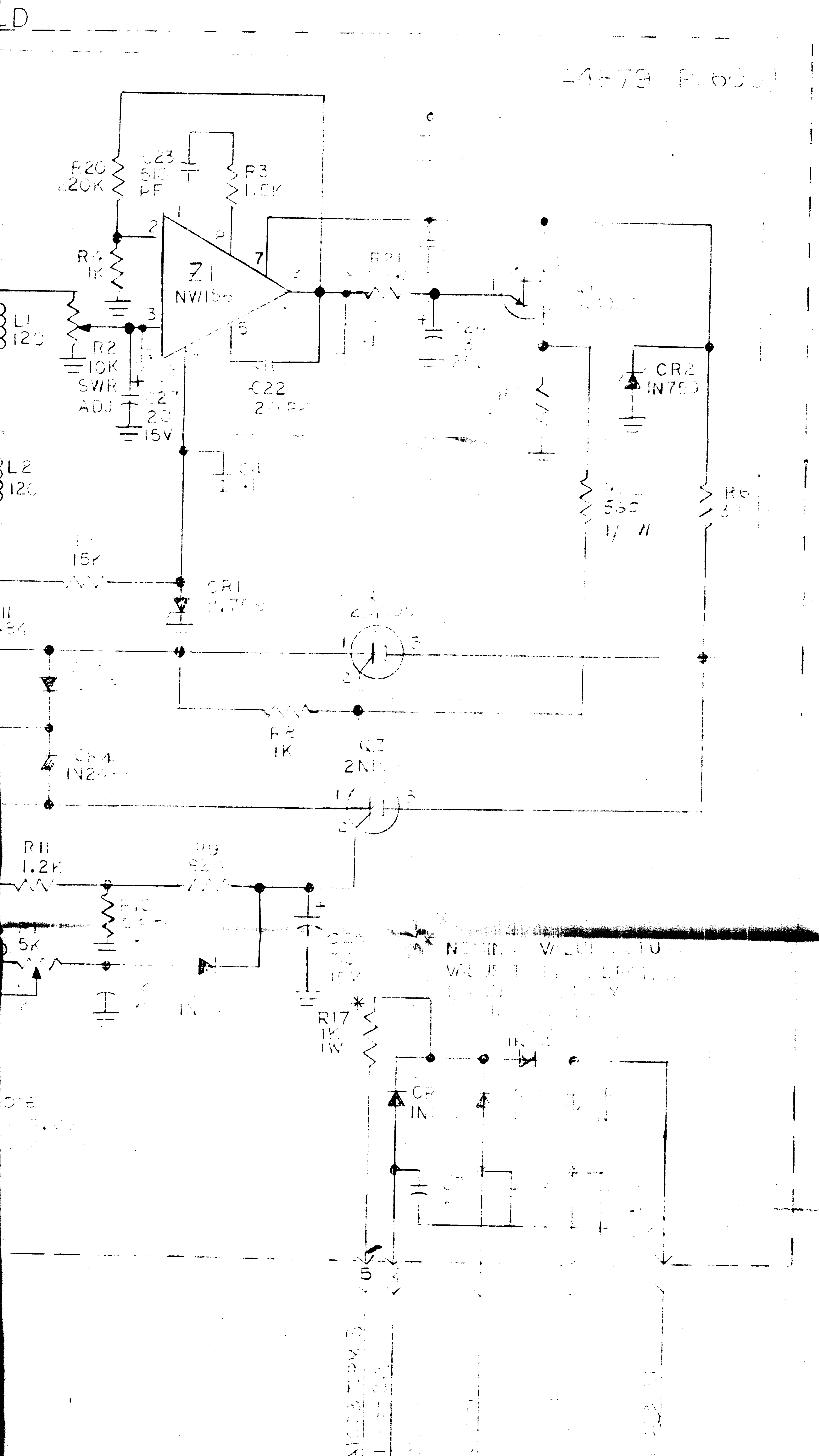
XA1001-T

AIOOI OVLD

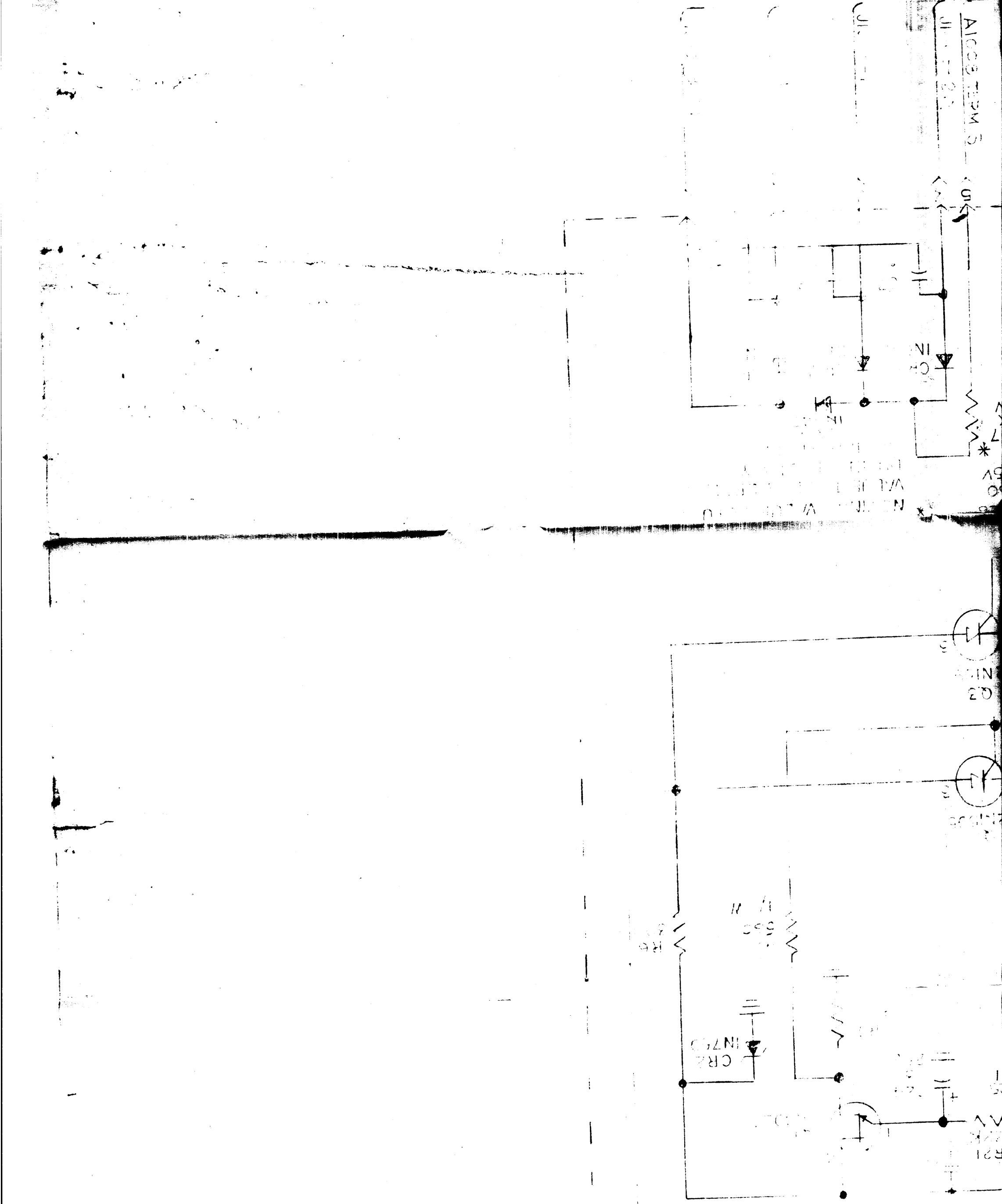
R1109
20
19
R1112
XK1101-X
J1003-H
DC1001-REF L
V
XK1101-6
Z
J1003-K
DC1001-FWD
Y
J1003-E
U
XK1101-T
T
S1003-N
S
XK1101-R
R
XK1101-M
M
XK1101-L
L
C1
L1
120
C17
.1
L2
120
CR11
N2484
R11
1.2K
C11
.1
CVLD 5K
1
2
21
22

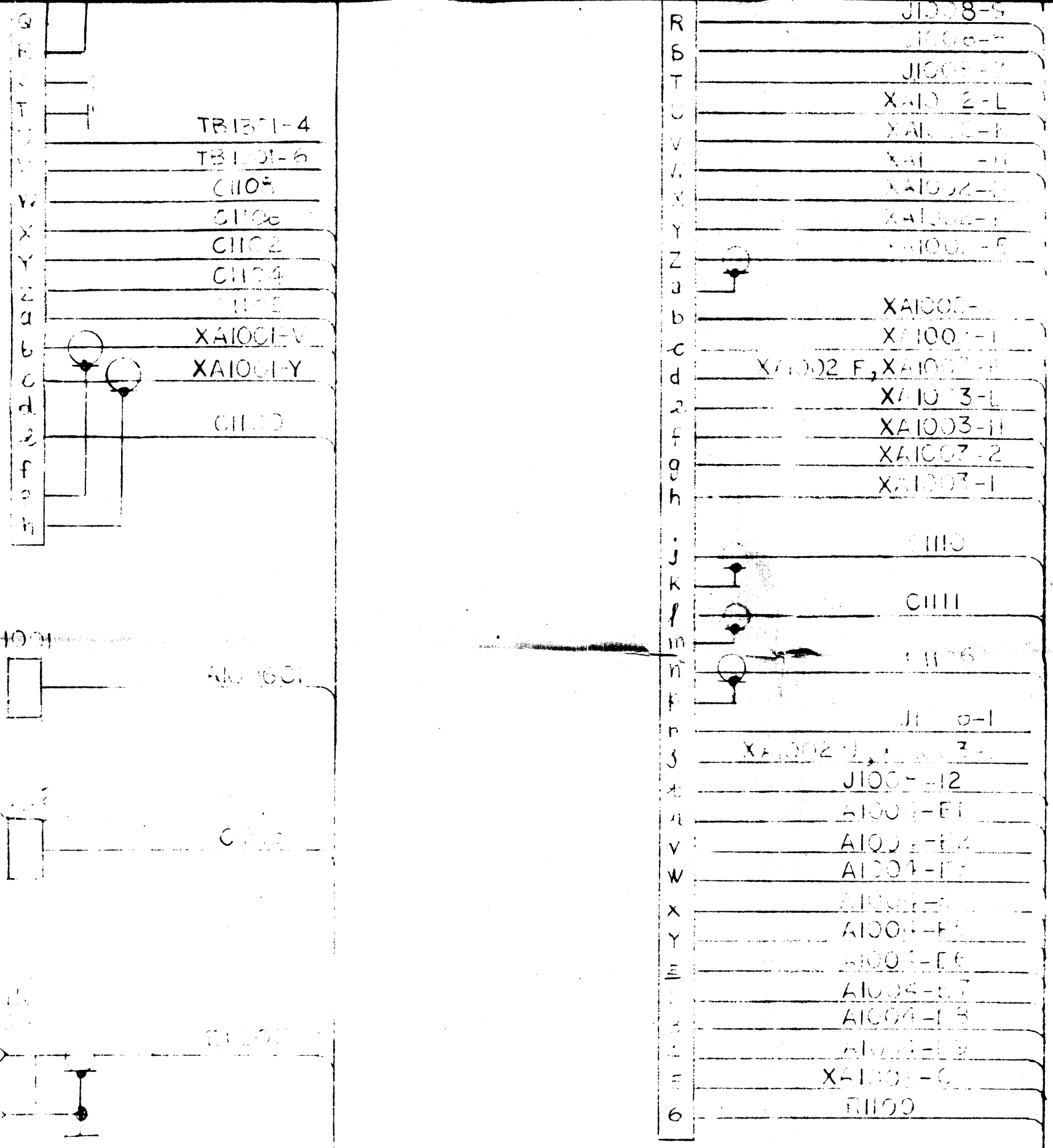
NOTE

XA1001



LD
R20
R3
1.5K
R4
1K
Z1
L1
120
R2
10K
SWR
ADJ
20
15V
C22
L2
120
15K
CR2
IN750
550
R8
1K
R11
1.2K
5K
R17
1K
1W
5





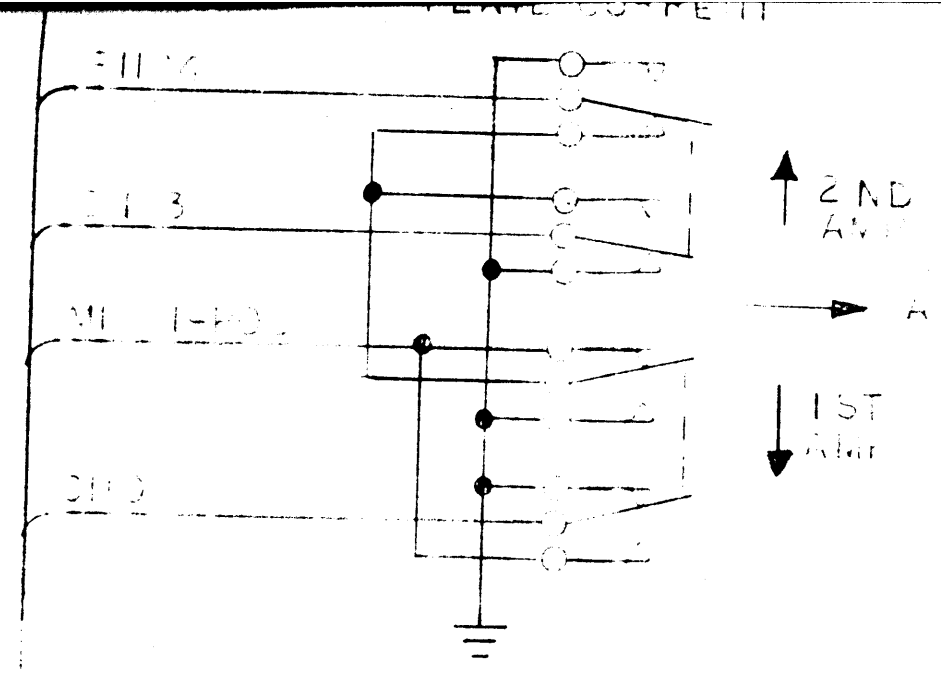
A1000	
LAST	MISSING
A1037	
C1000	
D1000	
DS1002	
J1008	
J1001	
M1002	
S1003	
XA1000	
XA1003	

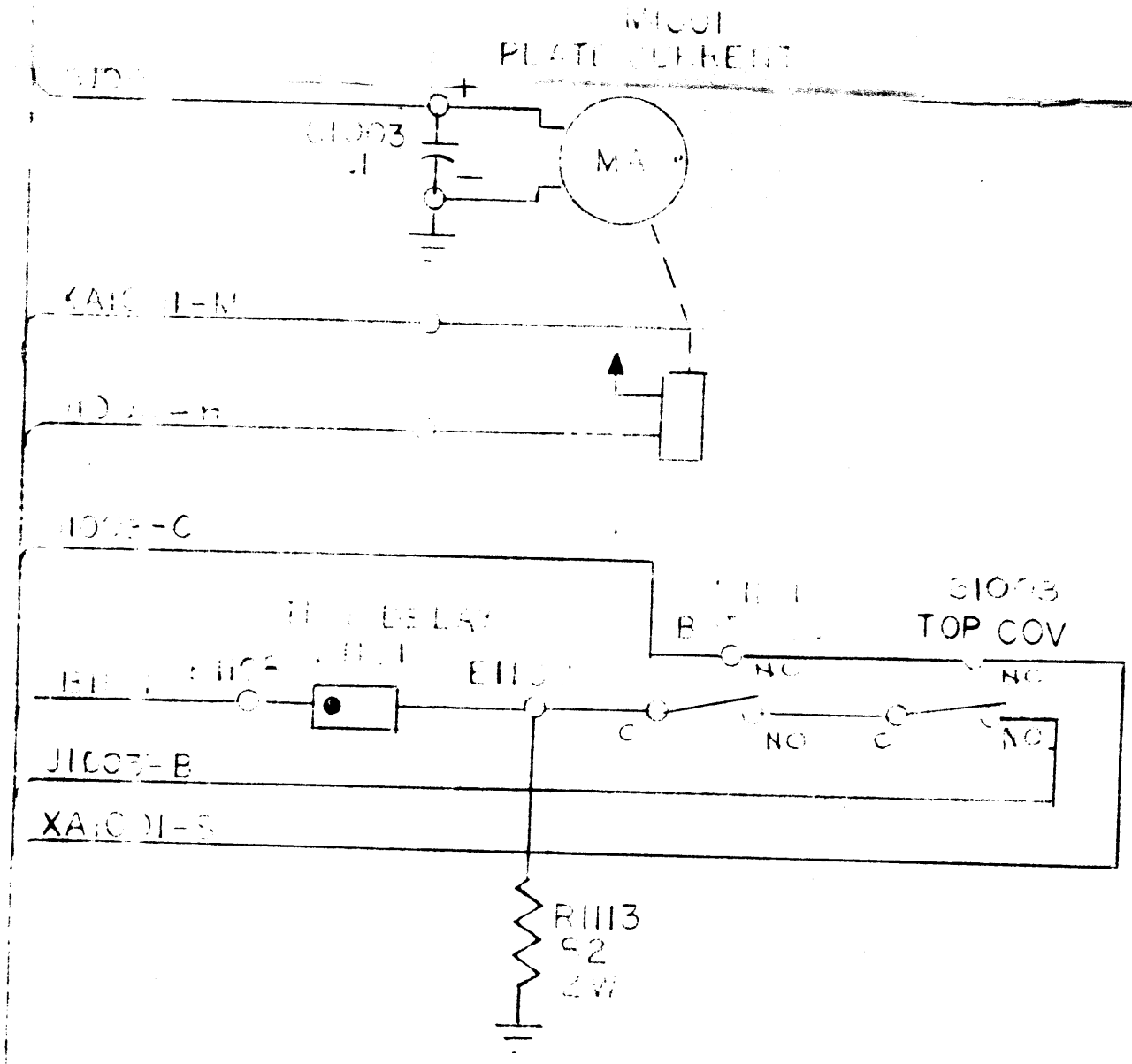
A1001	
LAST	MISSING
27	
CR11	CR10
L2	
Q3	
R22	
Z1	

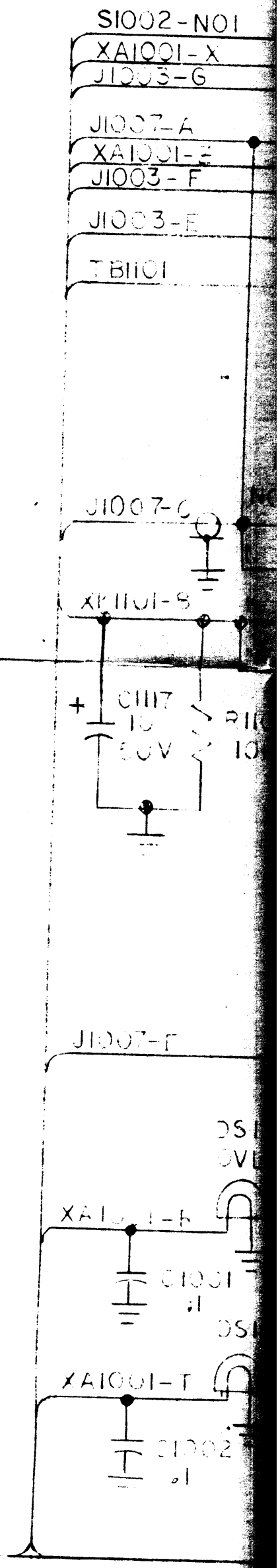
A1002	
LAST	MISSING
A1	
B1	
C1	
S2	

A1003	
LAST	MISSING

A1002A1 A1003A1	
LAST	MISSING





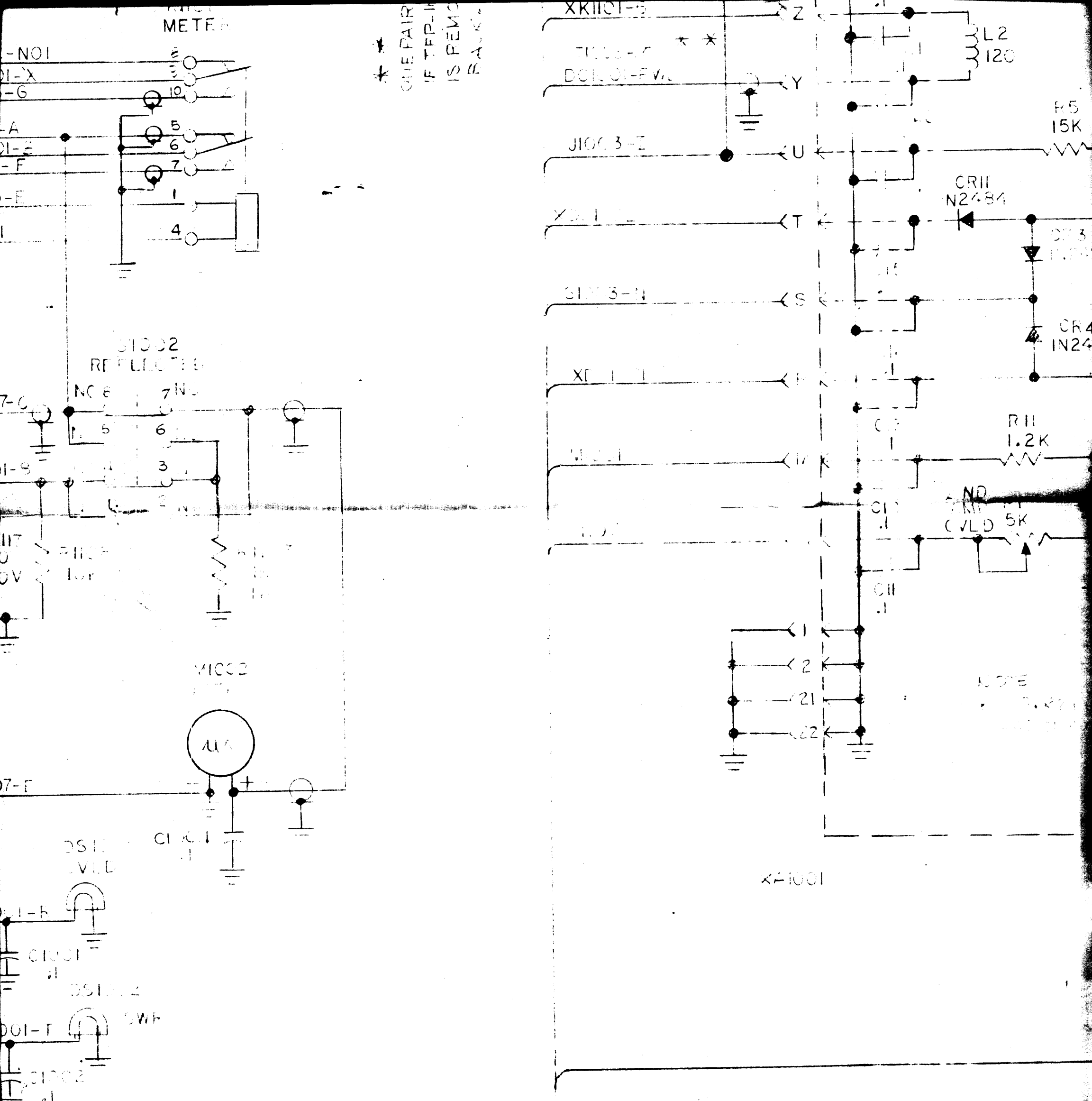


A1004	
LAST	MISSING
C9	
CR2	
D3	
E10	
P1	

A1005	
LAST	MISSING
C3	
CR1	
J2	

A1006	
LAST	MISSING
C6	
CR1	
E2	
K1	
L3	
P1	
S2	
XK1	

A1100	
LAST	MISSING
	C1113
	C1114
E1105	
K1101	E1101
R1113	
S1101	
TB1101	
XK1101	
Z1101	

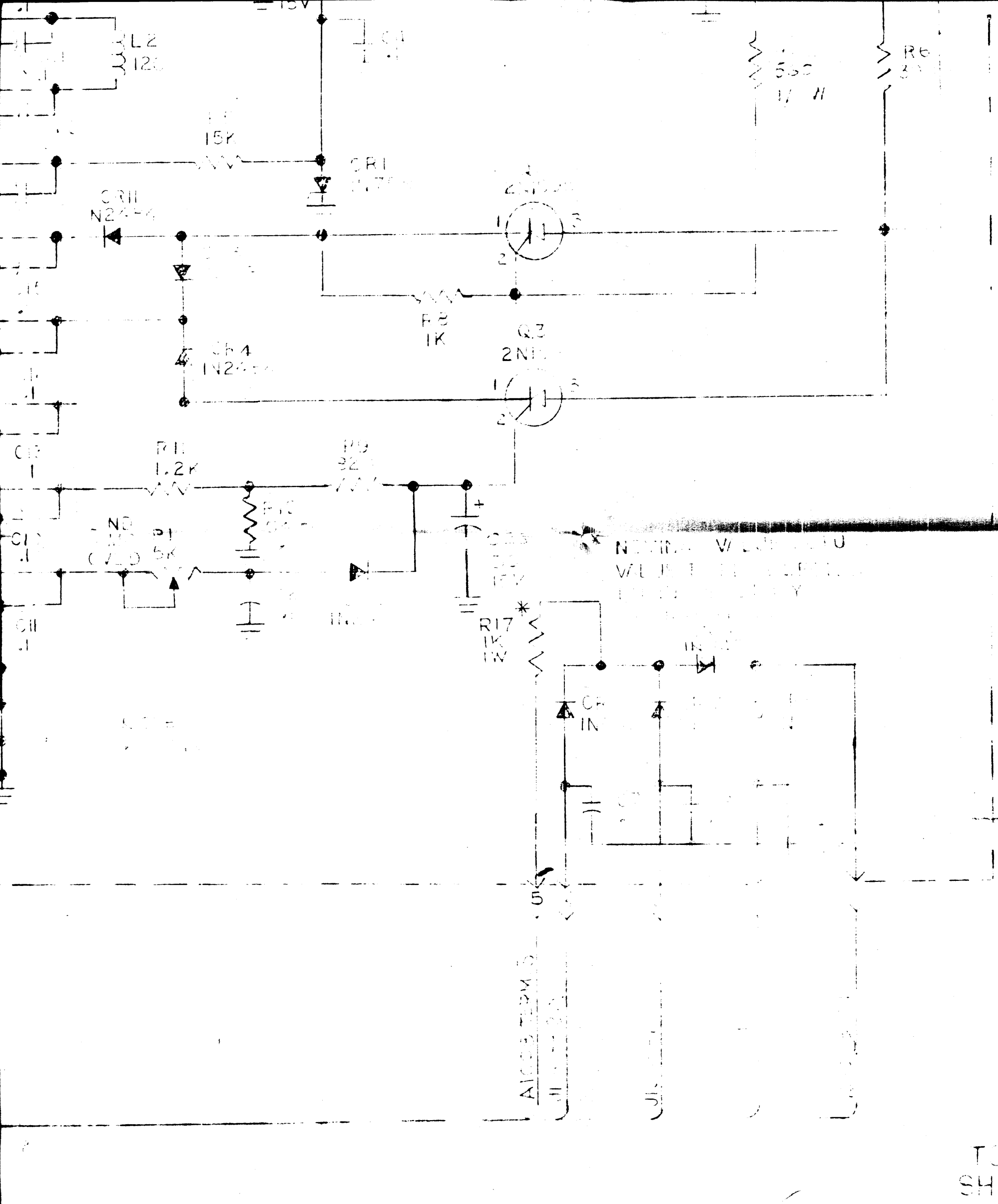


1200	
LAST	MISSING
C1220	
F1	
L120	L1201
R1214	
T1201	
V1201	
XV1202	
Z1201	

1300	
LAST	MISSING
B1301	C1301,2,4,5,6
C1323	
F1302	
	K1301, K1302
L1307	
R1302	R1301
S1301	
	T1301
TB1301	
V1301	
XV1301	

A1008	
LAST	MISSING
C7	
CR1	
E4	
X3	
F1	

ZONE	LTR	DESCRIPTION
	A	R21 was 100K, R22 was 5.6



21 was 100K , 22 was 5.6K

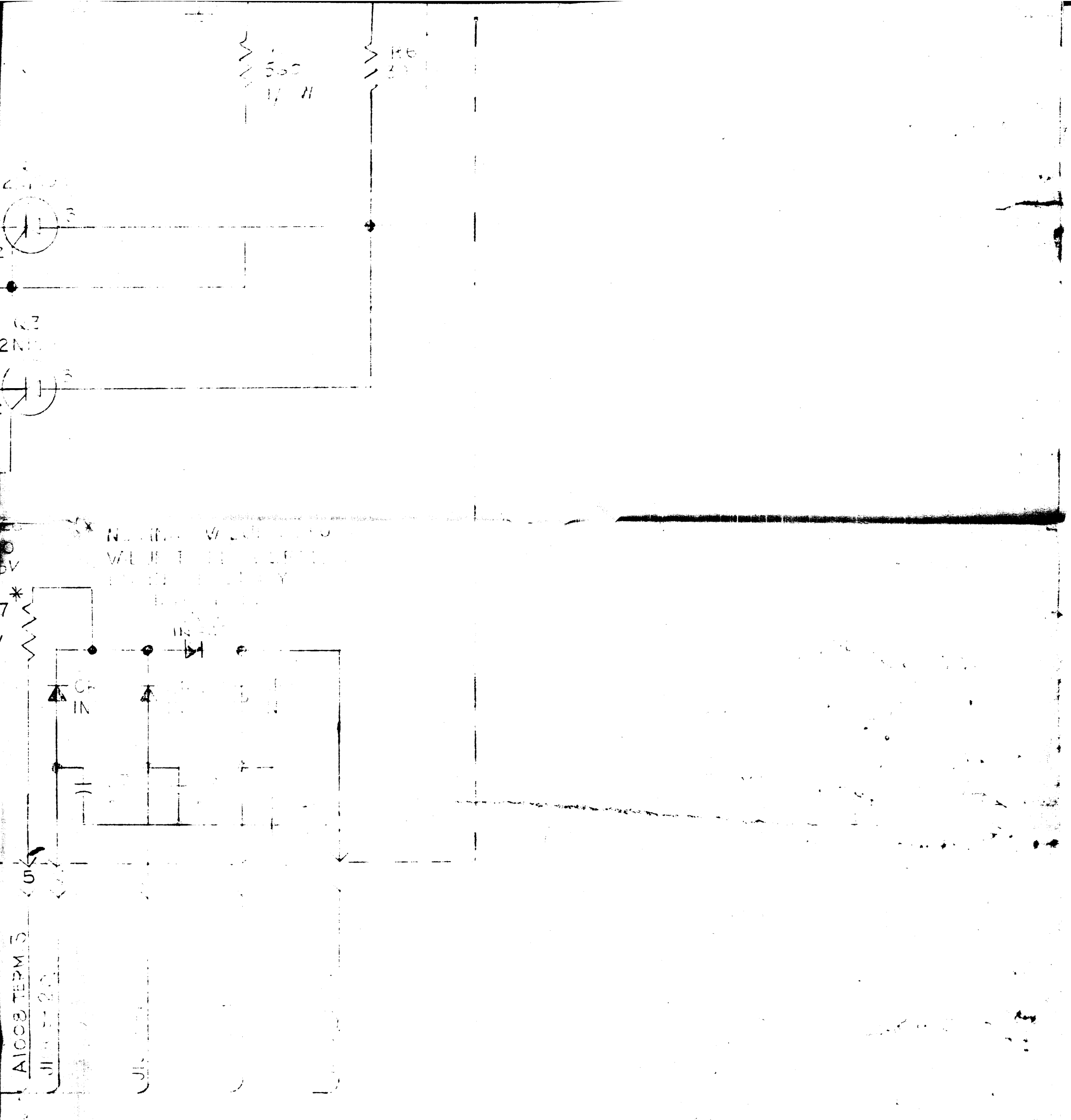
REVISIONS					
DESCRIPTION	DATE	E.M.N.NO.	DRAFT	CHKD.	APPD.

TO SH.

QTY. REQ.	ITEM	PART NO.

FINAL APPROVAL OB	DATE 4/17/60
MECH. DES.	DATE
ELECT. DES.	DATE
CHECKED	DATE
DRAWN G D.L	DATE

CK2221



QTY. REQ.	ITEM	PART NO.

FINAL APPROVAL	DATE 4/17/80
MECH. DES	DATE
ELECT. DES	DATE
CHECKED	DATE
DRAWN C D L	DATE

Figure 7-3

TLAM-1KA

SCHEMATIC DIAGRAM

Sheet - 1 of 3

Z1201
47
E1206
1ST AMP
V1201
8233
C1206
003
2KV
T1201
15T
10T
C1201
180
E1202
R1210
100
C1220
.1
R1211
18K
2W
C1203
.1
C1204
.1
500V
R1205
33K
R1202
10
1W
R1204
2.2K
2W
L1202
1MH
E1203
C1217
E1204
C1202
.01
E1205
C1205
.1
500V
C1216
.1
500V
R1214
3K
10W
R1203
12
2W
C1101
.002
C1103
.002
E1104
C1102
.002
C1104
.002

AX787

8-25

13-2

K3

K2

E4

E3

E2

E1

C3 .1

C4 .1

C5 .1

C6 .1

A1008

T1

4T

3T

R1 1400 10W

CR IN6

L1206 4.5

C1218 .001 5KV

2ND AMP

V1202 8321/4CX350A

KEY 2,4,6,5

1

3

7

R1212 150K 2W

R1213 150K 2W

C1213 2X.01 1KV

C1212 .1

R1208 20 5W

C1208 .0022

C1207 22pf

Z1202

R1206 330 2W

R1207 4.7K 2W

L1204 150

L1207 185

E1207

E1201

C1209 .1

C1210 .1

C1211 .1

C1214 2X.01 1KV

C1215 .001 5KV

L1203 150

L1205 150

C1106 .002

C1107 .002

C1105 .002

13-24

24-30

K2

K1

CR1
IN645

R1
1400
10W

L1
4UH

C1
7-45
PF

C2
150PF

C7
5600 PF

DA
V1301
8576/PL2645

2,6
1,4,7

3

5

C1311
500 pf
5KV

C1309
.1

R1302
5
5W

L1302
220

E1301

E1302

C1307
.1
500V

C1308
.1
500V

C1310
.001
5KV

L1305
2500UH

L1303
220

C1108
.001
1KV

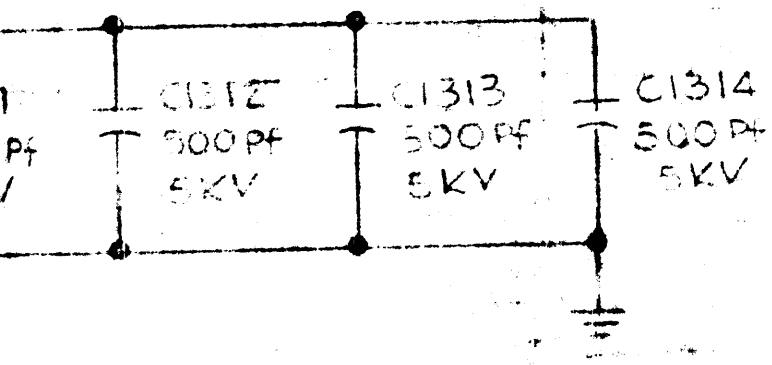
C1112
.002

E1102

C1109
.001
1KV

TO
SH. 3

B



E1206

47

1ST AMP
V1201
8233

C1206
.003
2KV

T1201
15T
10T

R1211
18K
2W

C1201
180

E1202

R1210
100

C1220
.1

C1203
.1

C1204
.1
500V

R1205
33K

R1202
10
1W

R1204
2.2K
2W

L1202
1MH

E1203

C1217

E1204

C1202
.01

E1205

C1205
.1
500V

C1216
.1
500V

R1214
3K
10W

R1203
12
2W

C1101
.002

C1103
.002

E1104

C1102
.002

C1104
.002

R1101
5
5W

J1004

J1003-K

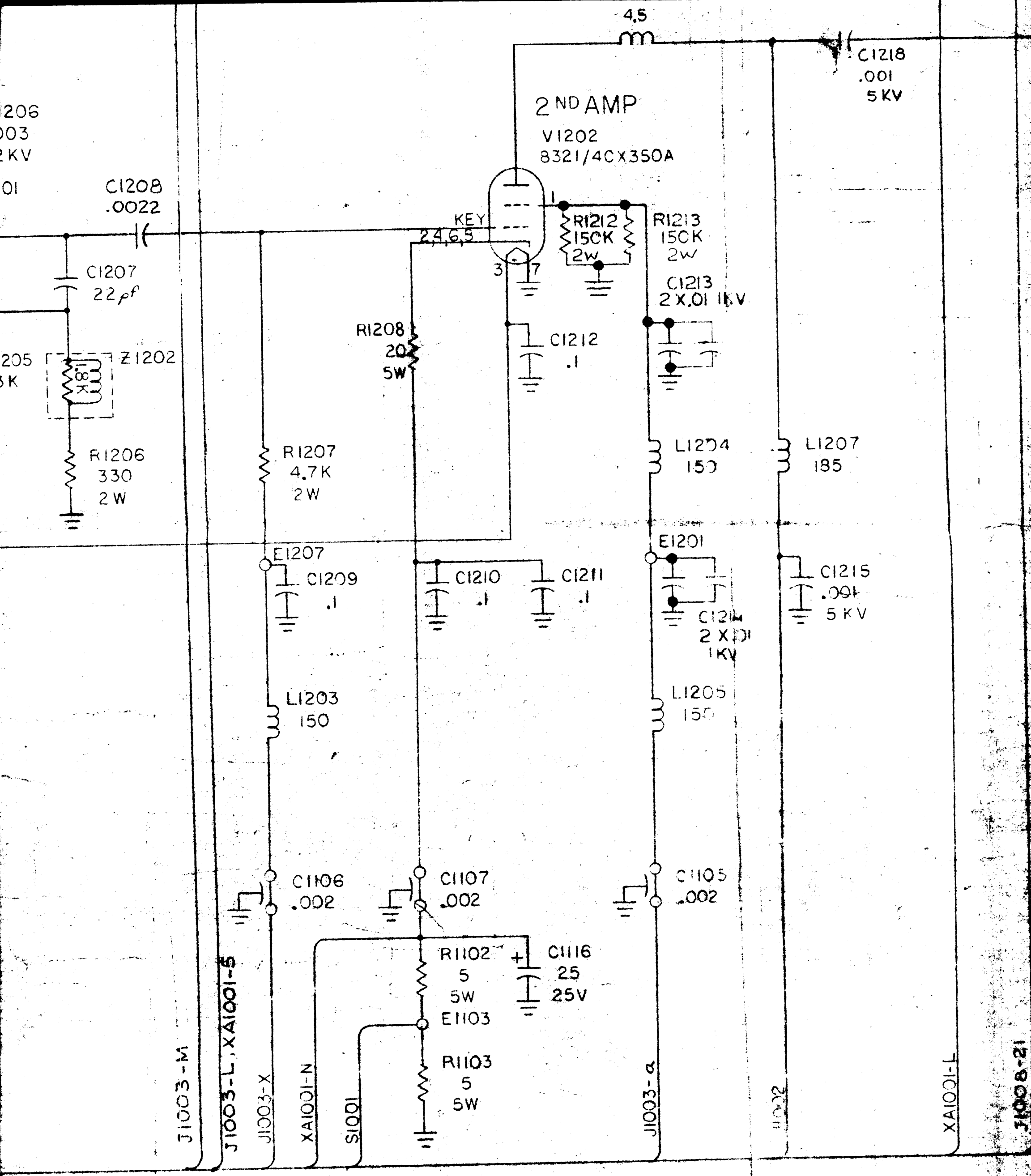
S1001

E1102

J1003-Y

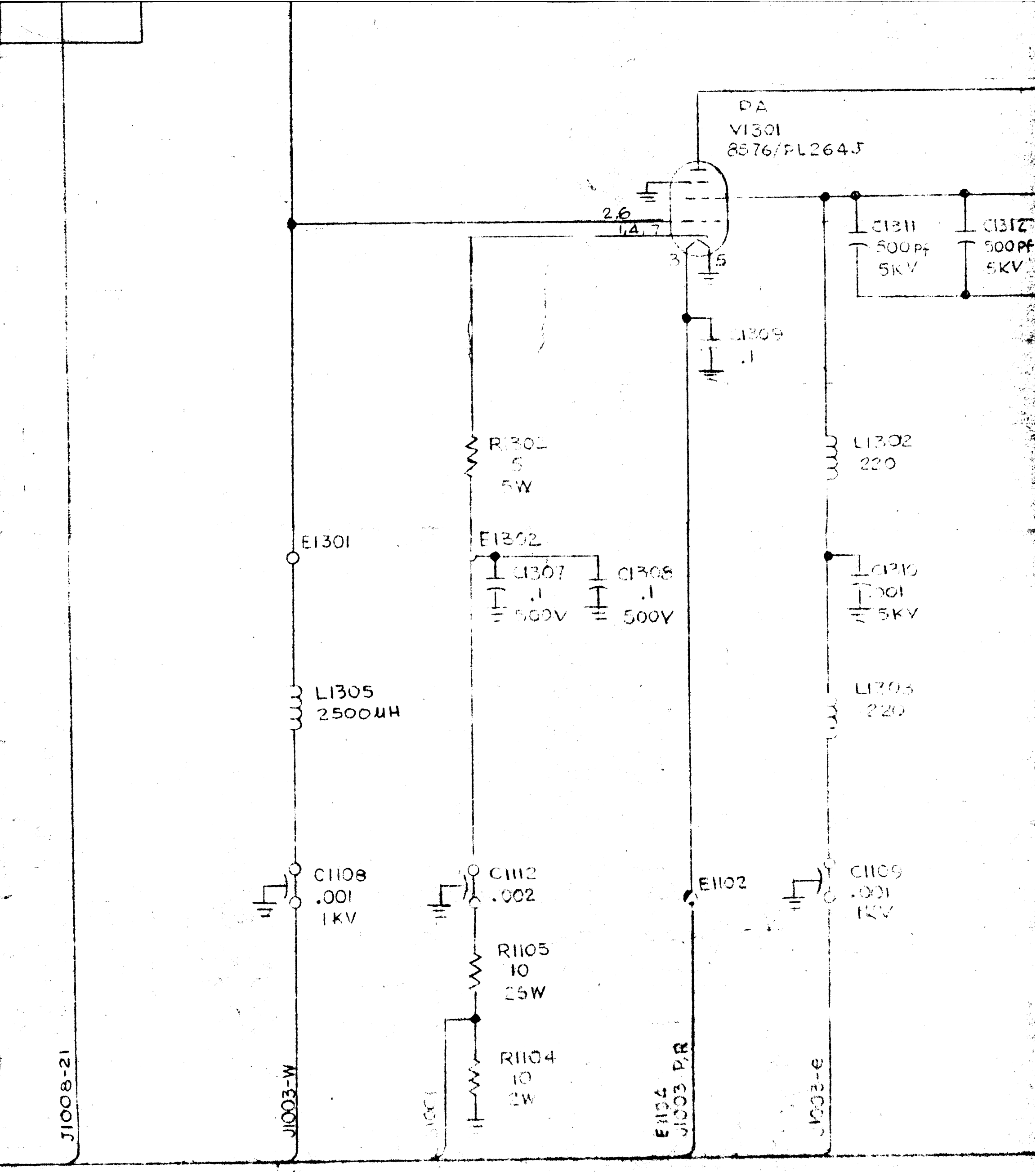
J1003-Z

TO SH 1



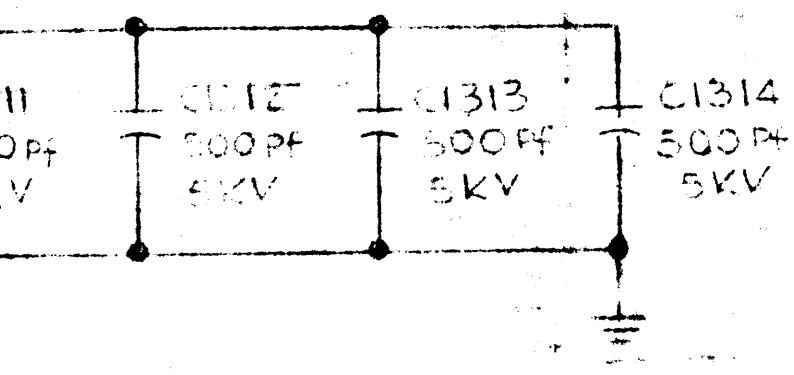
UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCES ARE IN OHMS, 1/2 W.
2. ALL INDUCTANCES ARE IN MICROHENRIES.
3. ALL CAPACITANCES ARE IN MICROFARADS.
4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION, PREFIX THE PART DESIGNATION WITH THE SUB-ASSEMBLY DESIGNATION.



REVISIONS							
LTR	DESCRIPTION	DATE	APPROVED				
	ORIGINAL RELEASE	9-28-62		dgd			
A	See SHEET 1943	9-28-62	21931	MD			

QTY	MODEL USED ON
	HT TM-1KJ2



USED ON	ASSY
TM-1KJ2	

Figure 7-3

TLAM-1KA

SCHEMATIC DIAGRAM

Sheet - 2 of 3

TO
SH.2

A1006 BANDSWITC

(AS160)

C13__
.001
5KV

C1323
.001
5KV

L1304

PA TUNE

C1
5-500 pf

L1306

L1307

L2

C5
.001
5 KV

C6
.001
5KV

C3
.001
5 KV

C4
.001
5 KV

L1
45

C1
.001
5KV

C2
.001
5 KV

P1
J1008

ANDSWITCH

L3

C7
100 pf
5KV

C8
50 pf
5KV

S1A
R

1306

1307

S1B
R

S1 & S2 SHOWN IN POSITIO

K1

S2A
F

S2B
F

S2C
F

S2A
R

S2B
R

E1

CR1
IN547

E2

C6
.001
5KV

C4
.001
5KV

C2
.001
5KV

P1

L1301

C1005
5 pf
5 KV

C1006
150 pf

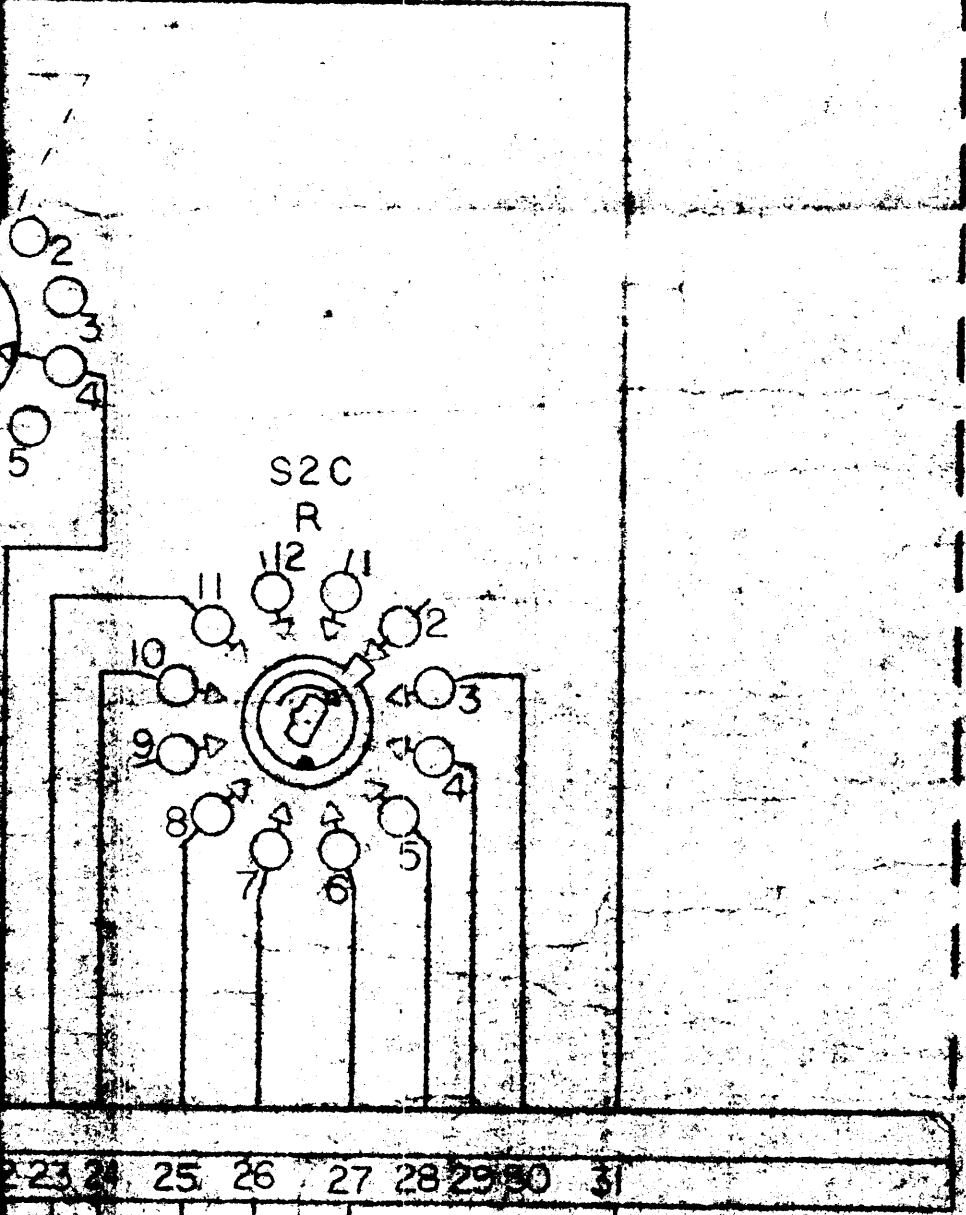
C1
23-325 PF
PA
LOAD

POS	BND-MHZ
1	1.5-2.0
2	2.0-2.6
3	2.6-3.0
4	3-5
5	5-8
6	8-12
7	12-16
8	#
9	16-24
10	24-30
11	#
12	#

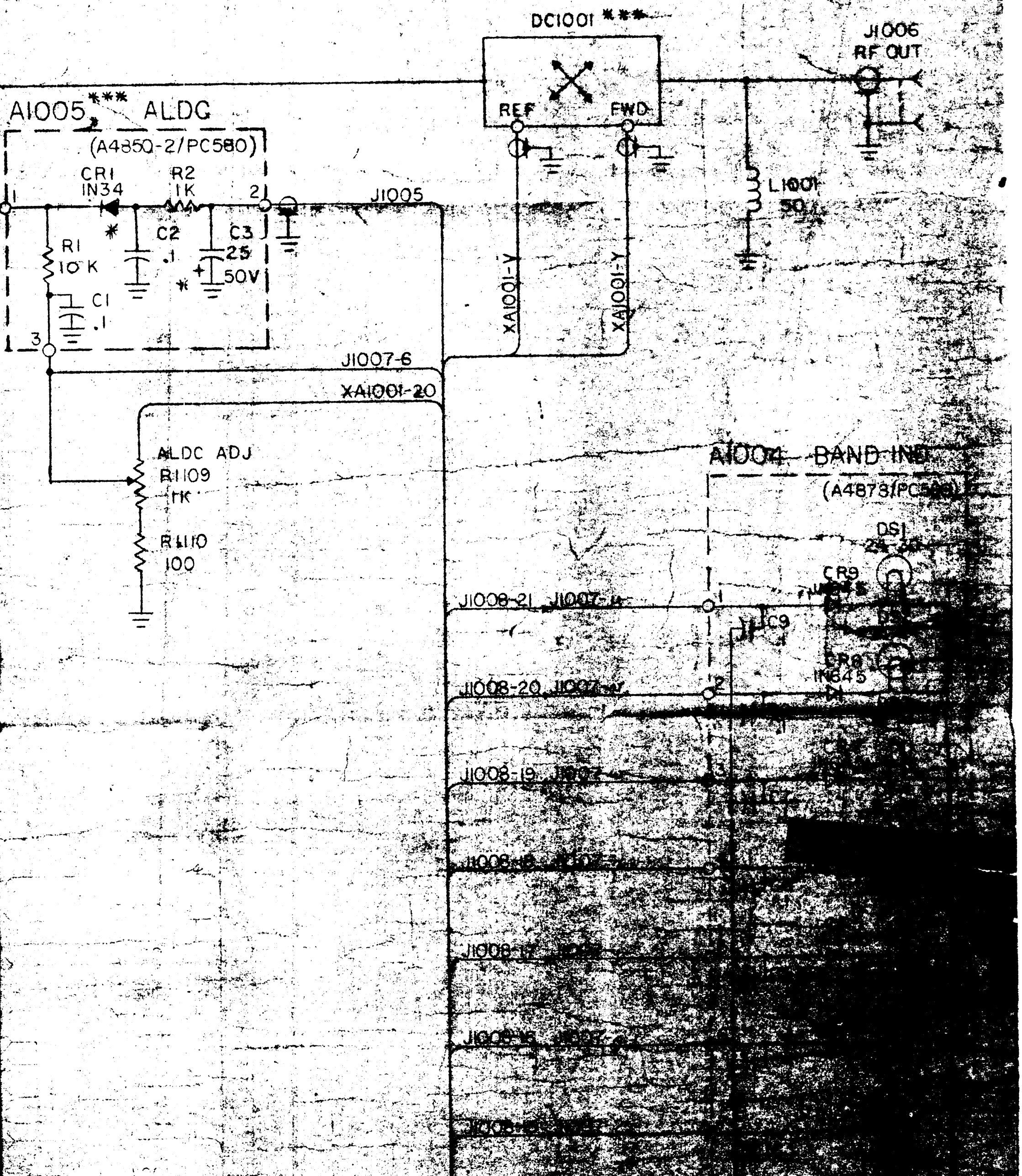
SIB
R

IN POSITION 1, BAND 1.

S2C
R



*** A1005, C1005, C1006, DC1001 ARE MOUNTED IN THE TLA IF THERE IS NO TFR-IM USED IN THE SYSTEM.



PA TUNE

C1
5-500 pf

L1304

L1306

L1307

L2

C5
.001
5 KV

C6
.001
5KV

C3
.001
5 KV

C4
.001
5 KV

L1
45

C1
.001
5KV

C2
.001
5KV

P1

J1008

J1001

TO SH. 2

S1 & S2 SHOWN IN POSITION I

S1A R

S1B R

K1

S2A F

S2B F

S2C F

S2A R

S2B R

C6 .001 5KV

C4 .001 5KV

C2 .001 5KV

CR1 IN547

E1

E2

P1

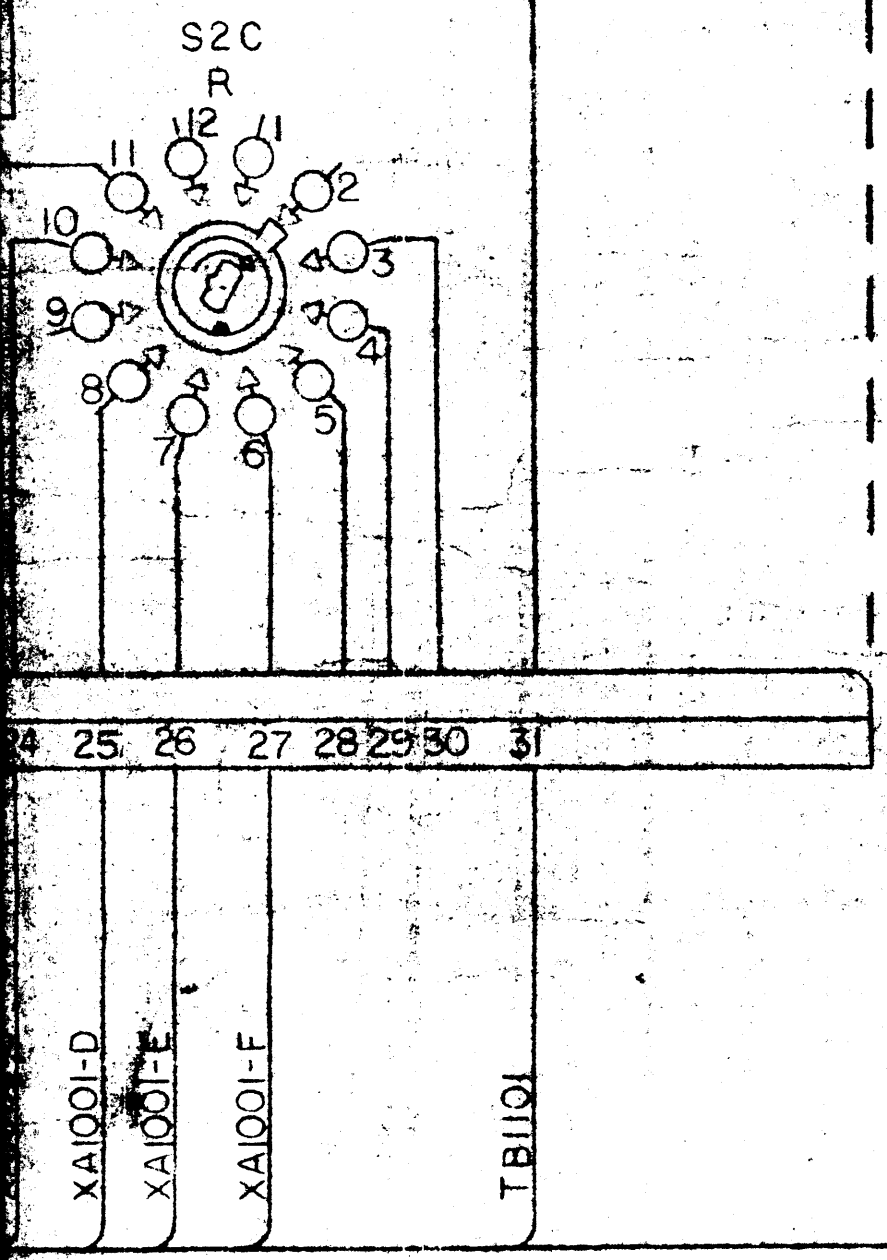
J1008

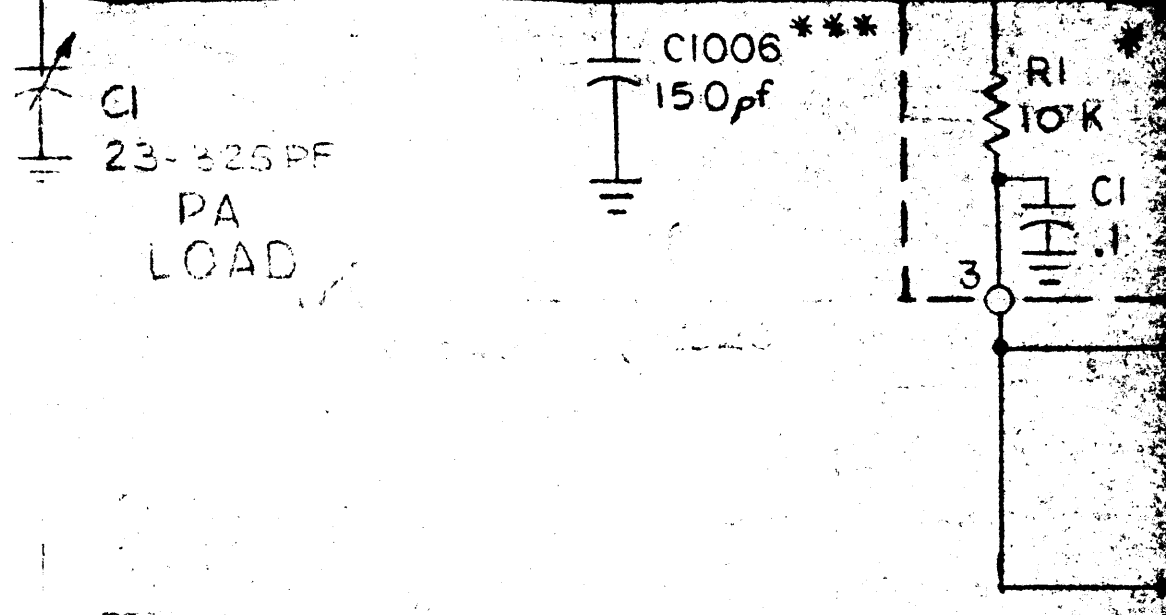
R1111 20W

J1007-r
J1007-K
J1007-L
J1007-M
J1007-N
J1007-P
J1007-Q
J1007-R
J1007-S
J1007-T
J1007-t
A1004-1, A1008-E2
A1004-2, XA1001-K
A1004-3, XA1001-J
A1004-4, XA1001-H
A1004-5
A1004-6
A1004-7
A1004-8
A1004-9
XA1001-B
XA1001-C
XA1001-D
XA1001-E

OSITION 1, BAND 1.

POS	BND-MHZ
1	1.5-2.0
2	2.0-2.6
3	2.6-3.0
4	3-5
5	5-8
6	8-12
7	12-16
8	#
9	16-24
10	24-30
11	#
12	#





ZONE	LTR	DESCRIPTION	DATE	APPD	DRAFT	CHKD	APPD
	Ø	ORIGINAL RELEASE	2-28-80		dwj		
	A	SEE SHEET 1 of 3	3-25-80	2/1931	dwj		

QTY	MODEL USED ON
	HFTM-1KJ2

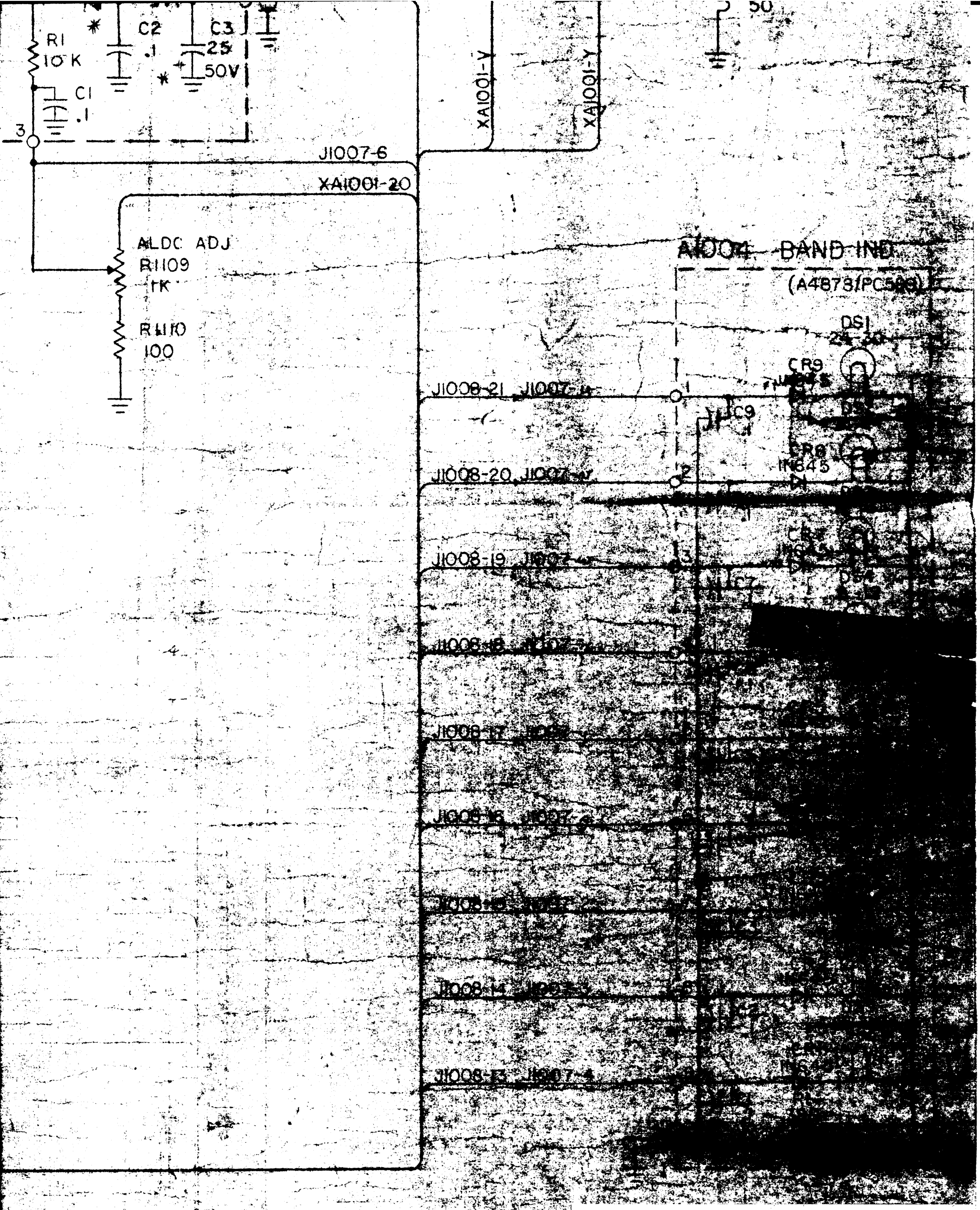


Figure 7-3

TLAM-1KA

SCHEMATIC DIAGRAM

Sheet - 3 of 3

USED ON | ASS'Y
1-1KJ2