MASTER COPY
DO NOT DESTROY

TECHNICAL MANUAL

for

SPECIAL PURPOSE TRANSMITTER

Model

SPT-3K/VHF

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, CANADA

TECHNICAL MANUAL

for

SPECIAL PURPOSE TRANSMITTER

Model

SPT-3K/VHF

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. **OTTAWA, CANADA**

IN1047

ISSUE DATE: AUGUST 1970

NOTICE

THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS
700 FENIMORE ROAD MAMARONECK, N. Y.

Warranty

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

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

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

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

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

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

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

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

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

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

PROCEDURE FOR ORDERING REPLACEMENT PARTS

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

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

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

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

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

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

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

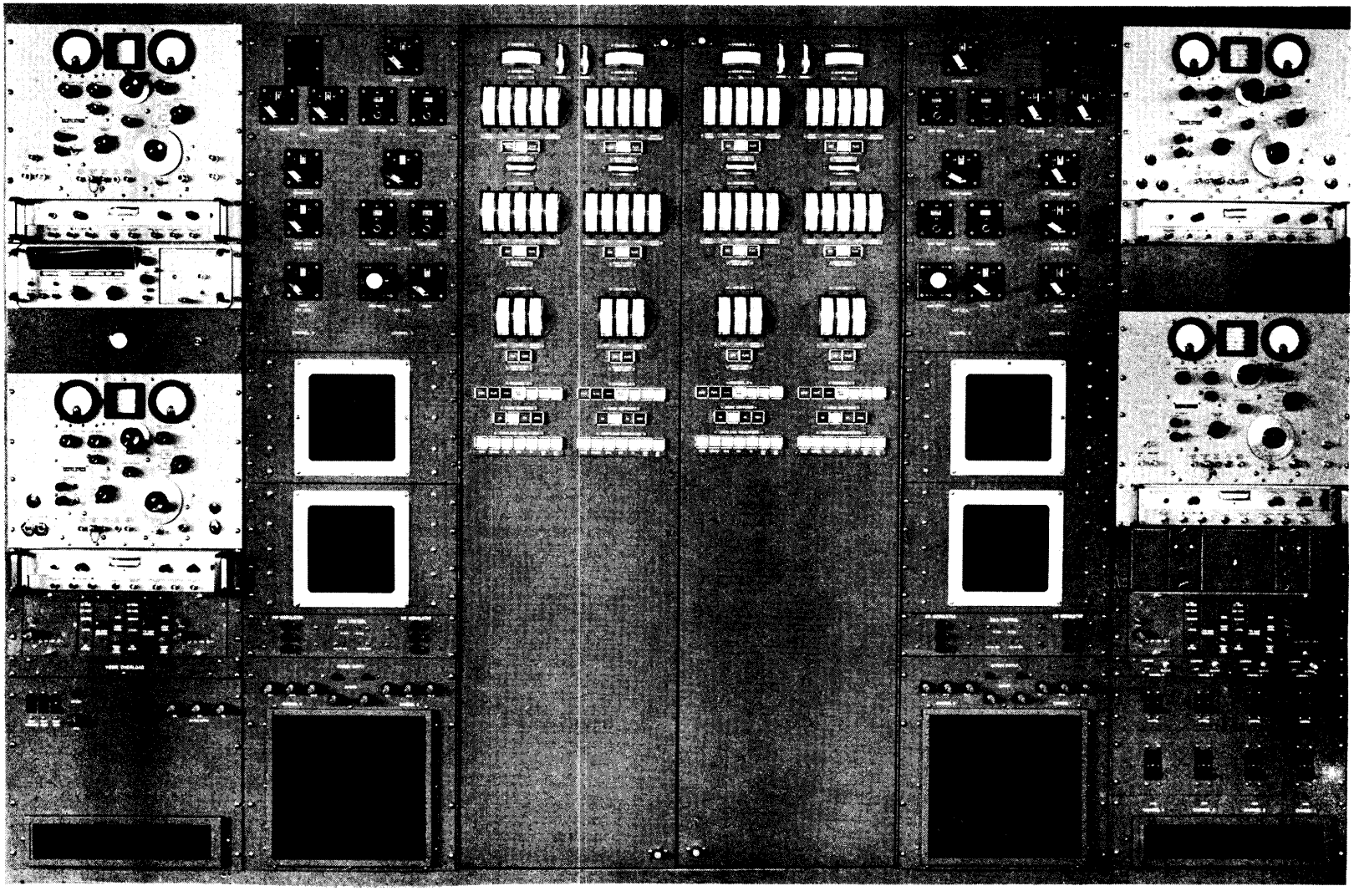


Figure 1-1. Front View of Special Purpose Transmitter Model SPT-3K/VHF

SECTION I

GENERAL INFORMATION

1-1. GENERAL.

TMC model SPT-3KVHF transmitter provides CW, AM, FM and VIDEO transmission in the 30 megahertz to 350 megahertz range. Coverage is provided in two bands (30 to 150 MHz, and 150 to 350 MHz). In each band, two identical channels are provided so that a total of four simultaneous 2 KW outputs can be obtained, each with a fully independent modulation capability.

The VIDEO modulator is designed to accept all CCIR standard television signals for monochrome television transmission on any international TV allocation.

Important features of this transmitter complex are its ability to be switched rapidly between modes of operation and between frequencies. Either low band RF output can be placed on either low band antenna; and either high band RF output can be placed on either high band antenna. Test points, metering and status indicators are front panel mounted. Additionally, the transmitter has variable RF power control and a video demodulator chopper unit which is included for test purposes to monitor video signals. VSWR indicators are provided for each channel.

Remote control terminals for several important operating functions and indications, including "plate on-off" and "output power level", are furnished for interface with other control consoles.

1-2. DESCRIPTION.

The front view of the SPT-3KVHF transmitter cabinet is shown in figure 1-1. The Left and Right sides of the transmitter are almost symmetrical. Equipment within the transmitter consists of the following:

a. Hewlett Packard HP608FR Signal Generator. 10 to 455 MHz, 0.1uV to 500 mV output. Operating and Service Manual separately supplied. (4 units - 1 per channel)

b. Hewlett Packard HP8708A Synchronizer. The synchronizer is used to phase-lock the HP608FR Signal Generator for the carrier frequency. Operating and Service Manual separately supplied. (4 units - 1 per channel).

c. Systron Donner Series 1017 50 MHz Frequency Meter. Instruction and Service Manual separately supplied. (1 unit)

d. Systron Donner Model 1979H Prescaler Plug-In. The Prescaler Plug-In increases the capabilities of the reading range to 350 MHz by dividing the input signal and the time lease by 8. Instruction Manual separately supplied. (1 unit)

e. Two Center Doors which can swing open and on which are located Grid, Screen, Plate and Band Meters and the controls for Grid and Plate voltages, Bridge Switches and Overload (O/L) Indicators.

f. Two Intermediate Panels with the air cooling blowers, square intake openings (in some units), Tuning Control Panels, Video Modulators, Bias Controls and Screen Supply Fuse panels.

g. Left Side of the Transmitter contains the Counter-Input Selector, Signal Processor, VSWR Overload Unit, and the Master Control Panel.

h. Right Side of the Transmitter contains a Power Supply Unit, Signal Processor, Demodulator Chopper, and the Primary Control Panel.

1-3. MONITORING FACILITIES.

a. Meters. There are 64 meters on the center door panels of the SPT-3KVHF Transmitter cabinet. The meters provide monitoring of each channel for input power, bias voltage and current, screen voltage and current, plate voltage and current, output reflected power, and output forward power. The pushbutton switches on the door panels are used to select the bias, screen, and plate monitor points (voltage or current). They are color-coded and illimunate in the VOLTS position.

b. Overload Indicator. The overload indicators provide visual identification of any overloads, the indication persisting even after the associated relays have disabled the affected channel.

c. Frequency Meter with Prescaler. The frequency meter and prescaler are mounted below the synchronizer on the Left Side. The purpose is to provide frequency measurements for each channel.

d. Video Monitoring. A sample signal is routed to the Video Demodulator-Chopper unit from the final power amplifier stage, providing a probe point for an oscilloscope connection. During video transmission the percentage of modulation can be measured.

1-4. TECHNICAL CAPABILITIES.

Frequency:Range:	30 to 150 MHz (2 channels) and 150 MHz to 350 MHz (2 channels).
Modes of Operation:	CW, AM, FM and VIDEO.

TECHNICAL CAPABILITIES (Cont.)

Power Output:	a. 2 KW CW (A-1) b. 2.5 KW at sync peak VIDEO (A-5C) w/1.2 KW AVG. c. 2 KW AM d. 2 KW FM (F-3)
Output Inpedance:	50 ohms unbalanced. Will match any antenna with a VSWR of 2:1 or less.
Frequency Stability:	Phase locked oscillator controlled, 5 parts in 10^6 per day.
Frequency Control:	Continuous with digital readout on all four bays. Resolution equals 5 parts in 10^6.
Tuning System:	Continuous tuning with all power level, tuning, and bandswitching controls available from the front panel.
Noise Level:	Noise level is at least 45db down from full output on AM, with a 400 cycle modulating tone at 100% modulation.
RF Bandwidth:	1 MHz, ±1db, 2.5 MHz, ±2 db, 4 MHz, ±3 db, 6 MHz, ±12 db, 7 MHz, ±24 db (TV allocations only).
Audio Response:	100 Hz to 5000 Hz ±3 db in AM mode, 50 Hz to 10,000 Hz in FM mode (±50 KHz peak deviation) with pre-emphasis.
Audio Input:	0 dbm for 100% modulation.
Audio Input Impedance:	600 ohms ±10% balanced.
Video Input Level:	1 volt peak to peak composite video at 75 ohms.
Video Modulation Capability:	12.5% ± 2.5% (Reference White).
Video Sideband Suppression:	No sideband filters are supplied.

Video Harmonic Suppression:	No harmonic filters are supplied.
Heat Dissipation:	Approximately 38 KW maximum with all bays operating at full power in the AM mode.
Metering:	Front panel meters indicate operation of all critical circuits in each bay.
Altitude:	0 to 8000 feet.
Safety Features:	Overload and bias protection with automatic alarm and indication and safety interlocks for protection at all high voltage points, in accordance with good engineering practice.
Keying Information:	CW: 500 words per minute, by contact closure to ground.
Installation Data:	Weight: Approximately 5000 lbs. Size: 110" wide x 72" high x 40" deep. (Power supplies are mounted external to the transmitter.)
Cooling:	Forced air.
Primary Power:	208 volts, 60 Hz, 3 phase ±10%, maximum 50 KW average demand with all bays operating at full power in AM mode. Transformers tapped + or -10% on primaries where required.
Special Features:	a. Sample points for monitoring throughout in accordance with good engineering practice. b. Continuously variable, front panel and remotely controlled power level for each bay.

SECTION 2

INSTALLATION

2-1. INITIAL INSPECTION.

The SPT3KVHF transmitter has been tested and calibrated before shipment. Upon delviery of the transmitter, all equipment should be checked against the equipment packing list for damage and completeness. With respect to equipment damage for which the carrier is liable, The Technical Materiel Corporation will assist in describing method of repair and furnishing of parts.

NOTE

Due to the complexity of the SPT3KVHF system, actual installation of the transmitter will be performed by qualified TMC personnel at the operating site.

2-2. INSTALLATION REQUIREMENTS.

a. 208 V, 3 phase, 60 cps, 128A @ .97 P.F. (#4 AWG 600V, 4 wire cable recommended).

b. Grounding system for transmitter, power supply components and antennas.

c. (4) antennas with 50 ohm impedance, (2) LO band 30-150 MHZ and (2) HI Band 150-350 MHZ.

d. Floor space: 110" x 40" with an additional 110" x 30" in front of transmitter for maintenance and operating span.

2-3. EQUIPMENT DIMENSIONS (INCHES).

a. (1) Transmitter - 72 H by 110 W by 40 D

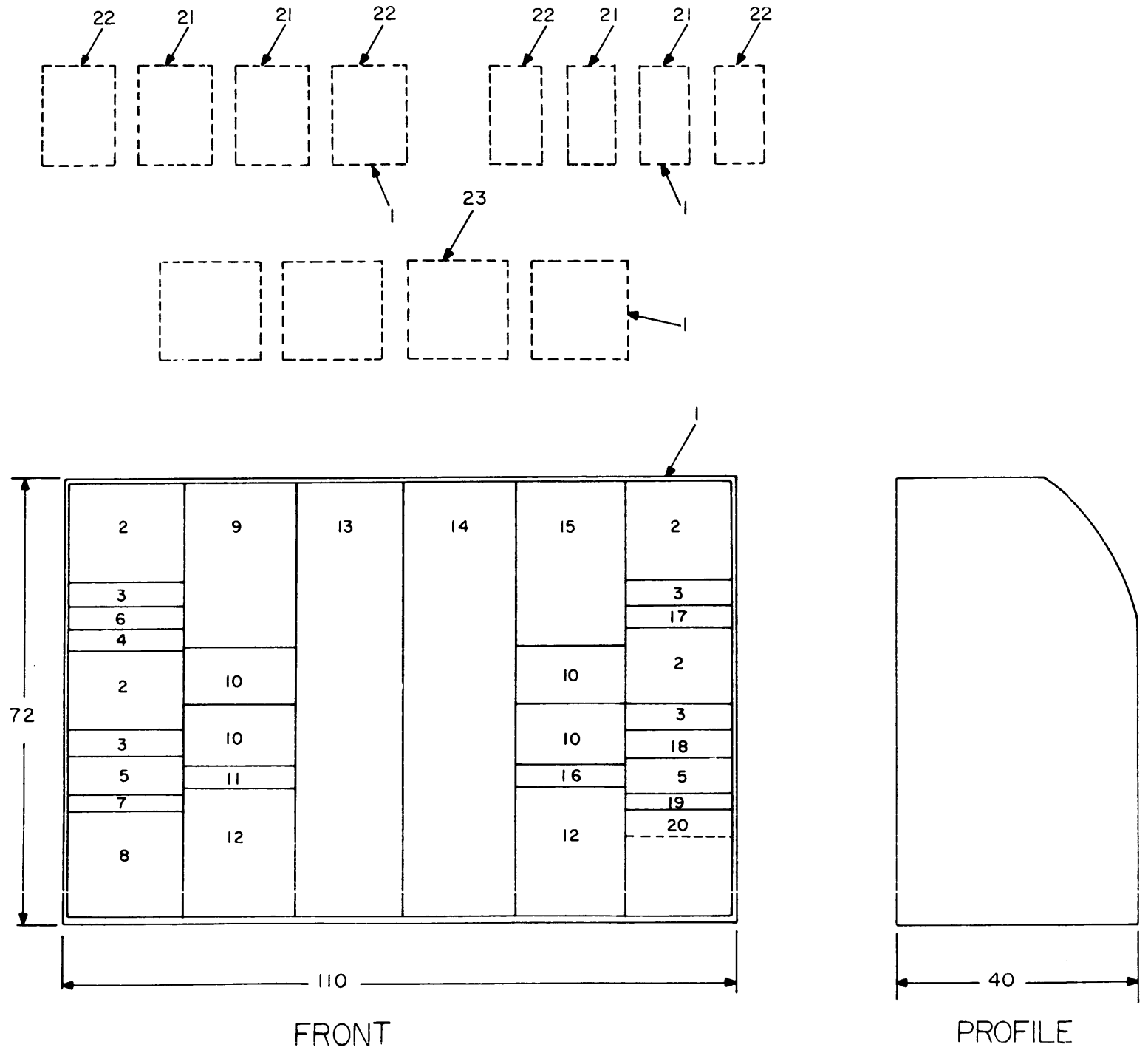
b. (4) Bias and Modulator Supplies - 22 3/4 H by 11W by 22 D

c. (4) Screen Supplies - 22 3/4 by 8W by 22D

d. (4) Plate Supplies - 29H by 16 1/2 by 18D

NOTE

The power supplies may be situated in any convenient location adjacent to the transmitter. Cabling of sufficient size and length will be provided to suit the needs of the installation.



ITEM NO.	DESCRIPTION	CODE IDENT	IDENT NO.	QTY REQ'D
1	TRANSMITTING SET, T.V.		SPT3KVHF	1
2	SIGNAL GENERATOR		AV1065	4
3	SYNCHRONIZER ASSY	28480	8708A	4
4	COUNTER-INPUT SELECTOR ASSY		AX8093	1
5	SIGNAL PROCESSOR ASSY		AX8026	2
6	FREQUENCY COUNTER ASSY	06811	1017-2EDI/1979H	1
7	VSWR OVERLOAD ASSY		AX8037	1
8	MASTER CONTROL ASSY		AX8070	1
9	CHANNEL 3 AND 4 TUNING CONTROL ASSY		AX8074-2	1
10	VIDEO MODULATOR ASSY		AX8038	4
11	CHANNEL 3 AND 4 BIAS CONTROL ASSY		AX8067-2	1
12	SCREEN SUPPLY FUSE PANEL ASSY		AX8073	2
13	CHANNEL 3 AND 4 CONTROL-INDICATOR ASSY		AX8040-2	1
14	CHANNEL 1 AND 2 CONTROL-INDICATOR ASSY		AX8040-1	1
15	CHANNEL 1 AND 2 TUNING CONTROL ASSY		AX8074-1	1
16	CHANNEL 1 AND 2 BIAS CONTROL ASSY		AX8067-1	1
17	BLANK PANEL		MS157-3	
18	POWER SUPPLY ASSY		AP141	1
19	DEMODULATOR-CHOPPER ASSY		AX8028	1
20	PRIMARY CONTROL ASSY		AX8069	1
21	SCREEN POWER SUPPLY		AP140	4
22	BIAS & MODULATOR POWER SUPPLY		AP139	4
23	PLATE POWER SUPPLY		AV1080	4

NOTE:

Items 21, 22 and 23 are located external of Item 1.

Figure 2-1. Front Panel Unit Location

SECTION 3

OPERATOR'S SECTION

3-1. INTRODUCTION.

Section 3 presents normal operating procedures for the TMC Model SPT-3KVHF Transmitter. The following paragraphs describe power on procedures, exciter carrier tuning procedures for the HP608F and HP8708A, transmitter tuning on carrier for both high (channels 1 and 4) and low (channels 2 and 3) bands, and operational procedures for the various modes: CW, AM, FM and VIDEO. The tuning procedures are generalized, and, except where noted, can be used to tune any of the four channels. Controls and indicators are illustrated and described in Table 3-1.

3-2. CONTROLS AND INDICATORS.

Table 3-1 and Figure 3-1 specify all the controls and indicators for channel one. The controls and indicators of channels 2, 3 and 4 that are identical to channel one, are not referenced in table 3-1 or on figure 3-1. The following list of controls and indicators pertain only to channels 2 and 3. These are referenced by numbers in parentheses in table 3-1 and on figure 3-1.

CONTROL	ITEM
PA OUTPUT LOADING	126
PA INPUT TUNING	127
PA OUTPUT TUNING	128
2nd IPA OUTPUT LOADING	129
2nd IPA INPUT TUNING	130
2nd IPA OUTPUT TUNING	131
1st IPA BANDSWITCH	132
1st IPA TUNING	133
BLOWER FUSE	134

TABLE 3-1. CONTROLS AND INDICATORS

ITEM	NAME	DESCRIPTION
1	MEGACYCLES dial	Indicates frequency of RF output signal directly in megacycles.
2	RF OUTPUT meter	Indicates level of RF power applied to attenuator.
3	AMPL TRIMMER	Tunes RF power amplifier for maximum output as indicated on output meter.
4	XTAL CAL GAIN	Adjusts loudness of beat frequency signal obtained from XTAL CAL OUTPUT jack.
5	MODULATION selector	Sets modulation mode.
6	FREQUENCY RANGE	Selects tuned circuits for desired frequency range and positions range pointer on MEGACYCLES dial.
7	ATTEN control	Adjusts and indicates RF output level in microvolts, millivolts and dbm.
8	TEST OUTPUT jack	Supplies a test signal to external test equipment.
9	XTAL CAL OUTPUT	Crystal calibrates output, accomodates earphone plug.
10	FREQ ANALOG OUTPUT	A resistance, inversely proportional to frequency dial setting, is available here for use with a Synchronizer to maintain constant loop gain.
11	BUFFER AMPLIFIER INPUT jack.	Applies input signal to Buffer Amplifier.
12	RF OUTPUT	Output connector for calibrated RF signal (See CAUTION Paragraph 3-6 in Hewlett Packard Service Manual 608F VHF SIGNAL GENERATOR).
13	XTAL CAL 1 MC-OFF-5 MC	Selector switch for crystal calibrator.
14	Phase error meter	Indicates relative amount of phase error.

TABLE 3-1. CONTROLS AND INDICATORS (Cont.)

ITEM	NAME	DESCRIPTION
15	AC/DC switch	Sets modulation input for ac- or dc- coupled operation.
16	MODULATION/LEVEL	Modulation switch selects mode of operation. Level control adjusts modulation input sensitivity (clockwise rotation increases sensitivity).
17	FREQUENCY TUNING VERNIER	Outer knob tunes locked frequency over ±0.25%, inner knob tunes ±0.05%. Internal reference operation only.
18	MODULATION INPUT	Input terminal for frequency or phase modulating signal. (Amplitude modulating signal is applied to signal generator)
19	FREQUENCY ANALOG INPUT	Externally connected resistance adjusts 8708A output level for signal generator being phase-locked.
20	FREQUENCY CONTROL OUTPUT	DC correction voltage output to phase-lock signal generator.
21	DEVIATION MONITOR	Uncalibrated dc output signal provides relative signal indication of phase locked frequency deviation.
22	CALIBRATE	Used to compensate for effects of aging and drift.
23	RF INPUT jack	FREQUENCY RANGE switch position determines which lamp is lit. Signal generator being phase locked is connected to BNC beneath lit lamp.
24	RF INPUT jack	Same as item 23.
25	12 + VDC	Positive 12 vdc test point.
26	ADJ	Adjusts 12 vdc level of power supply.
27	Fuse	115 vac line fuse for 12 vdc power supply fuse.
28	-12 VDC	Negative 12 vdc test point.
29	12 + VDC	Positive 12 vdc test point.
30	Lamp indicator	Lamp lights when power supply is on.
31	ADJ	Same as item 26.
32	AM OP BIAS adjust	Adjusts the bias level to stage (Q4) in AM Processing Amplifier.
33	AM GAIN control	Adjusts the amount of audio signal applied to AM Processing Amplifier.
34	Video Processing Amplifier BIAS adjust	Adjusts the bias level to a stage (Q2) in the Video Processing Amplifier.
35	Video INPUT LEVEL adjust	Adjusts the amount of the video signal applied to Video Processing Amplifier.
36	ADJ	Adjusts the 24 vdc level of power supply.
37	FM GAIN CONTROL	Adjusts the amount of audio signal applied to the FM Processing Amplifier.
38	Lamp indicator	Indicator lamp lights when 24 vdc power supply is on.
39	24 + VDC	Positive 24 vdc test point.
40	F1	115 vac line fuse for 24 vdc power supply.
41	-24 VDC	Negative 24 vdc test point.
42	OUTPUT jack	Output jack for Demodulator Chopper channel 1.
43	CHOPPER/OFF switch	On position activates chopper circuit in Demodulator Chopper Unit. Off position deactivates chopper circuit in Demodulator Chopper Unit.

TABLE 3-1. CONTROLS AND INDICATORS (Cont.)

ITEM	NAME	DESCRIPTION
44	VIDEO REF LEVEL adjust	Adjusts the video drive level to the video modulator for best composite output waveform.
45	REMOTE/LOCAL switch	In the REMOTE position it allows the on/off operation of the transmitter and transmitter gain control from a remote unit. In the LOCAL position it allows the operation of the transmitter from the front panel.
46	CONTROL circuit breaker (channel 1)	Applies 208 vac to the primary of channel 1 control circuit transformer.
47	MAIN CHANNEL 1 circuit breaker	Applies 3 phase 208 vac primary power to the transmitter.
48	PERCENT MODULATION meter	Indicates percent of modulation of RF output signal.
49	Cursor knob	Positions cursor on dial.
50	Freq control	Selects output frequency in conjunction with FREQUENCY/ RANGE Switch.
51	RF OUTPUT control	Adjusts level of RF power at input to attenuator.
52	MODULATION control	Adjusts modulation level to desired value (percentage of modulation indicated on modulation meter).
53	PA INPUT TUNING	Tunes PA input tuning circuit, high band.
54	PA OUTPUT TUNING	Tunes PA output tuning circuit, high band.
55	FINE FREQ	Vernier for frequency control.
56	DC .25 AMP	DC FUSE which protects internal dc power supply against short circuits in the instrument.
57	AC POWER indicator	Lights when ac power is applied.
58	2ND IPA OUTPUT TUNING	Tunes second IPA output tuning circuit, high band.
59	AC LINE	Fuse protecting instrument against short circuit.
50	AC POWER ON switch	In ON position, power from line is supplied to primary of power transformer.
61	AM OUTPUT jack	AM output signal coming from Signal Processor Assembly.
62	2ND IPA INPUT TUNING	Tunes input tuning circuit of second IPA.
63	UNCAL RF INPUT jack	Uncalibrated RF input signal from Signal Generator.
64	FM INPUT jack	FM input signal from FM processing amplifier.
65	FREQ CONTROL INPUT	Input jack for dc voltage is used to control oscillator frequency.
66	AM/PULSE MOD INPUT	Receives sine wave or pulse from external source for modulation of RF output signal. When using internal modulation, the 400- or 1000-cps sine-wave modulation signal is present at this connector for use as a synchronizer signal.
67	UNCAL RF OUTPUT	Output connector providing uncalibrated RF output signal.
68	PUSH ON/OFF	Depressing turns instrument on, lamp lights.
69	FREQUENCY RANGE	Sets frequency range limits (See Table 3 1 in Hewlett Packard Service Manual SYNCHRONIZER 8708A).
70	1ST IPA TUNING	TUNES first IPA input and output tuning circuits simultaneously.
71	REF FREQ OUTPUT	Internal reference output is connected to BNC beneath unlit lamp.
72	-12 VDC	Negative 12 vdc test point for 12 volt power supply.

TABLE 3-1. CONTROLS AND INDICATORS (Cont.)

ITEM	NAME	DESCRIPTION
73	Indicator lamp	Lights when 12 vdc power supply is energized.
74	F1 fuse	Not used
75	PA GRID bias adjust	Adjusts bias to grid of channel 1 PA.
76	F2 fuse	Not used
77	2ND IPA GRID bias adjust	Adjusts bias to second IPA grid, channel 1.
78	F3 fuse	Not used
79	BLOWER indicator lamp	When either the second IPA or PA blower is deactivated, lamp will light.
80	PH_1 line fuse	Protects screen supply.
81	BLOWER fuse	Protects second IPA blower.
82	PH_2 line fuse	Protects screen supply.
83	PH_3 line fuse	Protects screen supply.
84	PA SCREEN meter	Indicates PA screen current.
85	PA OUTPUT POWER meter	Indicates PA output power.
86	PA INPUT TUNING meter	Indicates level of reflected rf power at the input of the PA.
87	PA GRID meter	Indicates PA grid current.
88	PA SCREEN meter	Indicates PA screen voltage (Screen current scale is not used).
89	PA PLATE meter	Indicates PA plate current.
90	OUTPUT REFLECTED meter	Indicates PA reflected output power.
91	PA SCREEN push button	Used to read screen voltage.
92	PA PLATE push button	PA PLATE meter will read plate voltage and light when push button is depressed.
93	2ND IPA SCREEN meter	Indicates second IPA screen current.
94	2ND IPA INPUT TUNING	Indicates level of reflected rf power at the input of the 2nd IPA.
95	2ND IPA GRID meter	Indicates second IPA grid current.
96	2ND IPA SCREEN meter	Indicates 2nd IPA screen voltage.
97	2ND IPA PLATE meter	Indicates 2nd IPA plate current.
98	2ND IPA OUTPUT POWER	Indicates the level of forward rf power at the output of the 2nd IPA.
99	2ND IPA GRID push button	2ND IPA GRID meter will now read grid voltage when push button is depressed and lights.
100	2ND IPA SCREEN push button	Not used.
101	2ND IPA PLATE push button	2ND IPA PLATE meter will now read plate voltage when push button is depressed and lights.
102	1ST IPA GRID meter	Indicates 1st IPA grid current.
103	1ST IPA PLATE meter	Indicates 1st IPA plate current.
104	1ST IPA OUTPUT POWER meter	Indicates the 1st IPA rf output level.
105	1ST IPA GRID push button	1ST IPA GRID meter will now indicate grid voltage when button is depressed and lights.
106	1ST IPA PLATE push button	1ST IPA PLATE meter will now indicate plate voltage when push button is depressed and lights.
107	START push button (lights when depressed)	Starts transmitter by closing control circuit relays necessary to apply three phase power to bias and filament supplies.

TABLE 3-1. CONTROLS AND INDICATORS (Cont.)

ITEM	NAME	DESCRIPTION
108	PLATE push button	Closes plate control relays supplying three phase input power to screen and plate supplies when depressed and lit.
109	READY indicator	When lit indicates interlocks are closed and 5 minute time delay has expired.
110	SELECT MODE indicator	When lit indicates bias supply has discharged sufficiently to select any mode.
111	REMOTE P.I. BYPASS push button	When lit indicates remote plate control is bypassed.
112	O/L IND RESET push button	Extinguishes overload indicator lamp when pushbutton is depressed after an overload condition.
113	O/L RESET push button	Resets overload latching relay when depressed.
114	VIDEO mode push button	Applies -40 and -120 vdc to video modulator when depressed and is lit.
115	FM mode push button	Allows audio input signal to enter FM Processing Amplifier when depressed and lit.
116	AM mode push button	Allows audio input to enter AM Processing Amplifier when depressed and lit.
117	1ST IPA overload indicator	When lit indicates an overload condition in 1st IPA.
118	2ND IPA overload indicator	When lit indicates an overload condition in 2nd IPA.
119	PA overload indicator	When lit indicates an overload condition in the PA.
120	CW mode push button	Allows CW keying signal to enter Attenuator Control Assembly when depressed and lit.
121	24V overload indicator	When lit indicates an overload condition in 24 volt dc supply.
122	BIAS overload indicator	When lit indicates an overload condition in bias supply.
123	SCREEN overload indicator	When lit indicates an overload condition in screen supply.
124	VSWR overload indicator	When lit indicates an overload condition in VSWR .
125	PA GRID push button	PA GRID meter will read grid voltage and light when push button is depressed.
126	PA OUTPUT LOADING (Channels 2 and 3 only)	Loads PA output circuit.
127	PA INPUT TUNING (channels 2 and 3 only)	Tunes input tuning circuit of PA.
128	PA OUTPUT TUNING (channels 2 and 3 only)	Tunes output tuning circuit of PA.
129	2ND IPA OUTPUT LOADING (channels 2 and 3 only)	Loads 2nd IPA output circuit.
130	2ND IPA INPUT TUNING (channels 2 and 3 only)	Tunes input tuning circuit of 2nd IPA.
131	2ND IPA OUTPUT TUNING (channels 2 and 3 only)	Tunes output tuning circuit of 2ND IPA.
132	1ST IPA BANDSWITCH (channels 2 and 3 only)	Selects desired frequency band of operation.
133	1ST IPA TUNING (channels 2 and 3 only).	Tunes output tuning circuit of 1st IPA.
134	BLOWER fuse (channels 2 and 3 only)	Protects second IPA and PA blower.

TABLE 3-1. CONTROLS AND INDICATORS (Cont.)

ITEM	NAME	DESCRIPTION
135	RANGE	Selects attenuation factors of 1, 10, or 100 of signal applied to COUNTER INPUT HET position for Models 1291, 1948A, 1970 and ACTO plug-ins.
136	INPUT jack	Prescaler signal input for frequencies above 50 Mhz.
137	LEVEL control (on Prescaler)	Provides adjustment for counting positive or negative pulses.
138	LEVEL control (on Counter)	Selects dc trigger level point on input signal at C input from +1 volt to -1 volt times attenuation factor. This permits triggering on either positive or negative pulses at the dc level selected.
139	POWER ON indicator	Lit when primary power is applied.
140	GATE lamp	On when gate is open.
141	POWER ON/OFF switch	Main ON-OFF switch.
142	TB OUT jack	Time base output in decade steps from 0.1 Hz to 1 MHz selected by Time Base Switch, 470 ohm impedance, 6 volt p-p rectangular waveform stability same as internal time base.
143	RESET push button	Manual reset push button.
144	TIME BASE	Outer knob selects time base from 10 sec to 10^6.
145	FUNCTION SELECTOR TEST	A self check of counting circuitry with 10 MHz internal signal.
146	AC-DC	Selects direct-coupled input in DC position or 1 uf coupling capacitor in AC position.
147	INPUT jack	Counter input signal jack for frequencies below 150 MHz.
148	Counter selector switch	Selects channel to be coupled to counter.
149	COUNTER switch	Selects the input to the counter
150	Counter selector output	Output signal jack.
151	28 VDC indicator	Indicate presence of 28 volts in Master Control Circuit.
152	RIGHT RACK circuit breaker	Supplies AC voltage to right rack.
153	LEFT RACK circuit breaker	Supplies AC voltage to left rack.
154	MISC CONTROLS circuit breaker.	Supplies 115 VAC to miscellaneous circuits and to the 28 vdc control circuit power supply.
155	15A fuse	Protects 28 vdc power supply output circuit.
156	3A line fuse	Protects 28 vdc power supply.
157	3A line fuse	Same as Item 156.
158	3 A line fuse	Same as Item 156.

3-3. STARTING AND TUNING PROCEDURE

The following are step-by-step procedures for bringing the transmitter to full operation for any mode of emission. The procedures are arranged as follows:

a. Starting procedures for standby condition. Steps 1 through 19; pages 3-10 through 3-11.
b. Carrier tuning procedures for signal generator and synchronizer in carrier mode. Steps 20 and 21; pages 3-11 through 3-13.
c. Transmitter channel tuning for carrier mode. Step 22, pages 3-13 through 3-16.
d. CW mode of operation tuning; paragraph 3-4, page 3-17.
e. AM mode of operation tuning; paragraph 3-5, page 3-17.
f. FM mode of operation tuning; paragraph 3-6, page 3-17.
g. VIDEO mode of operation tuning; paragraph 3-7, page 3-21.

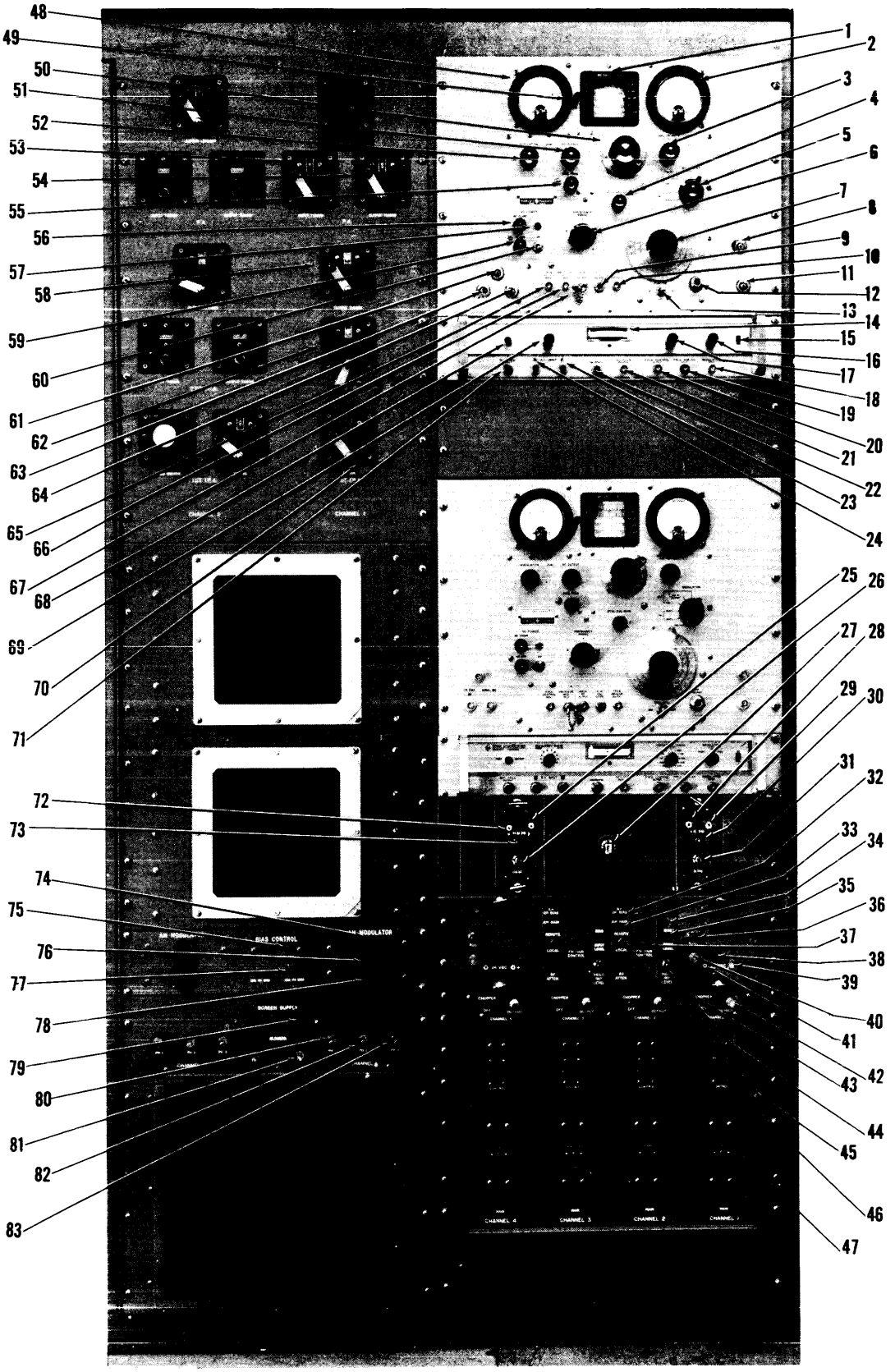


Figure 3-1. Controls and Indicators (Sheet 1 of 3)

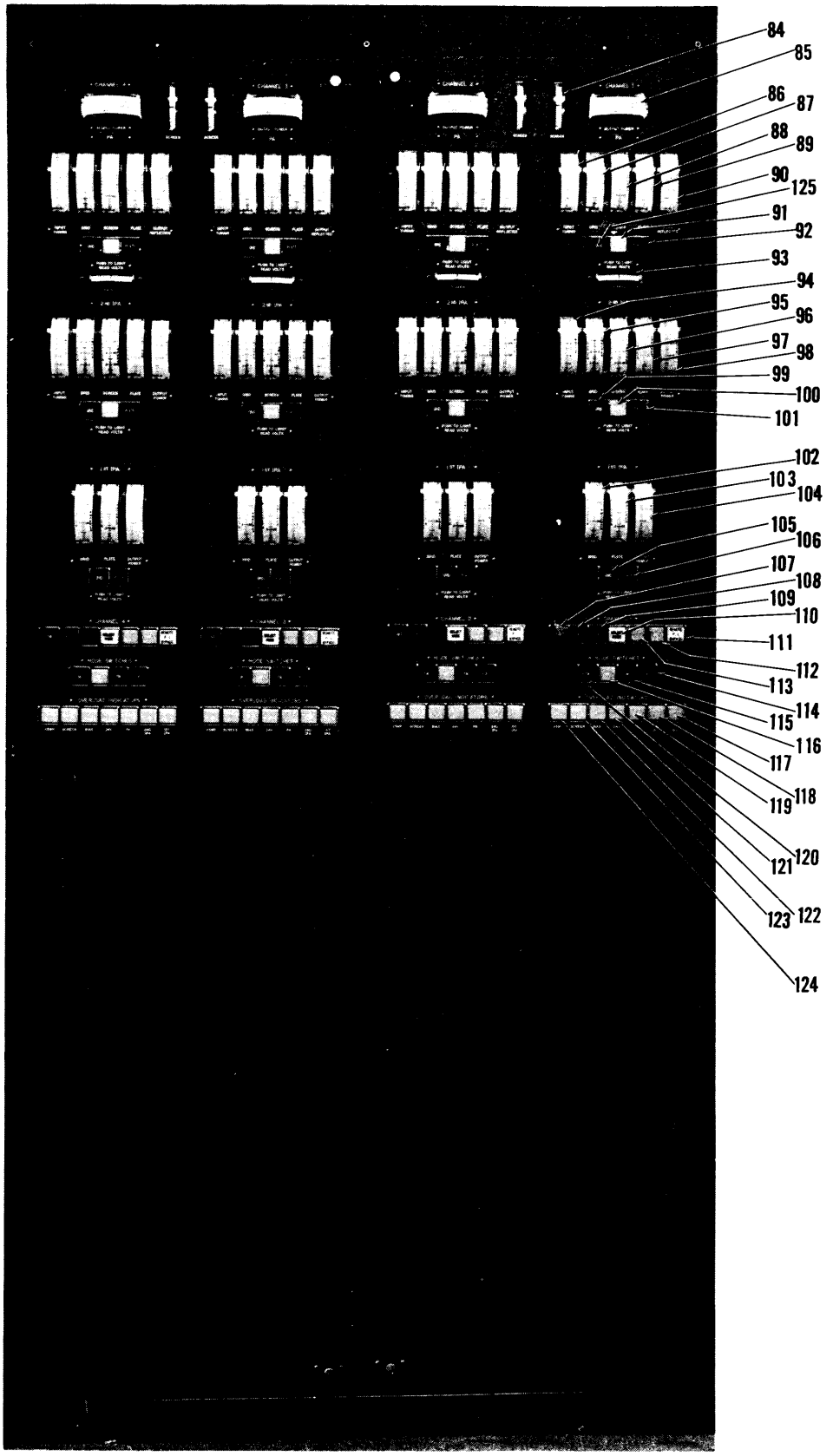


Figure 3-1. Controls and Indicators (Sheet 2 of 3)

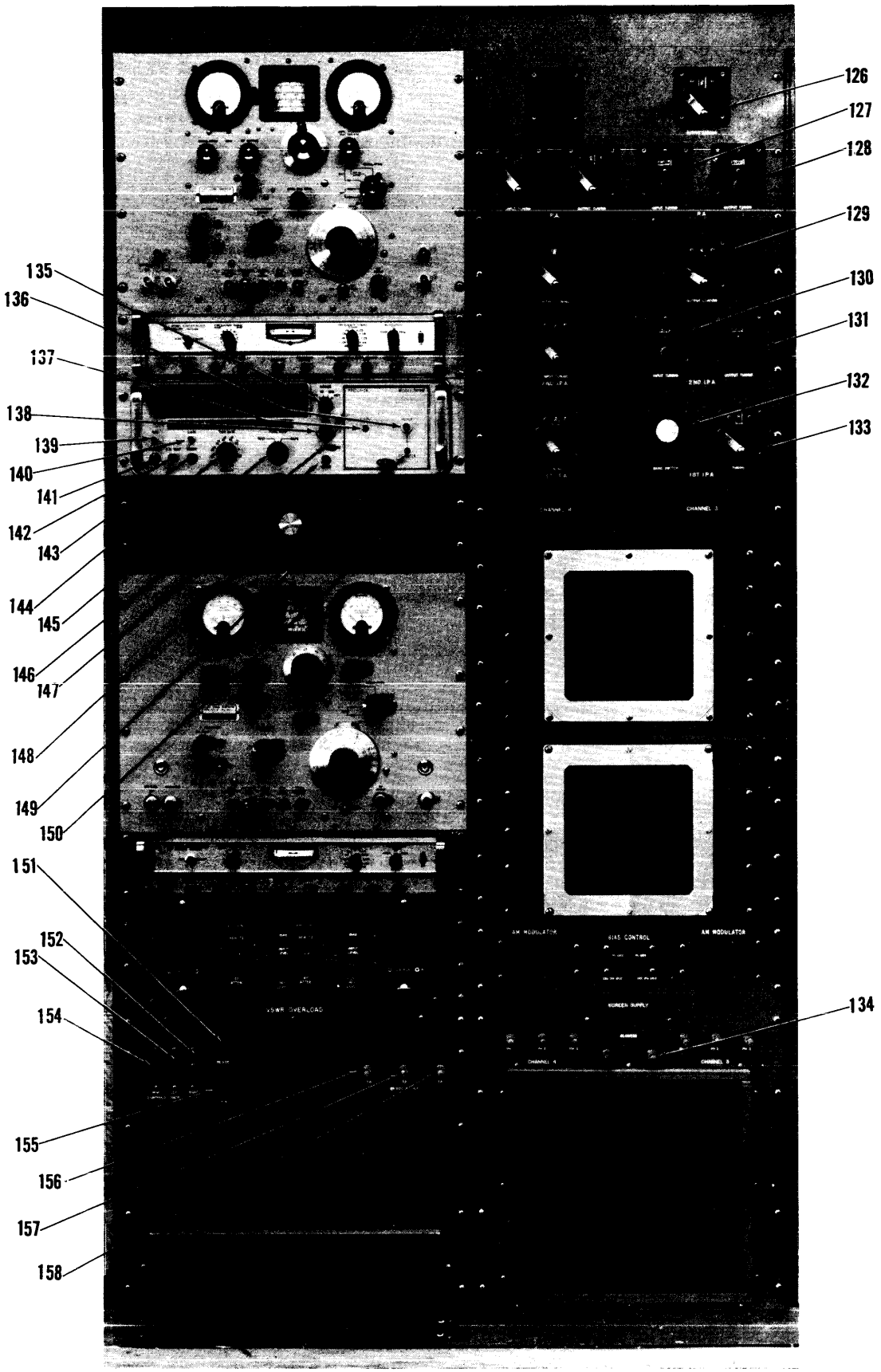


Figure 3-1. Controls and Indicators (Sheet 3 of 3)

TABLE 3-2. TRANSMITTER STARTING AND TUNING PROCEDURE

STEP	OPERATION	NORMAL INDICATIONS
1	Place START (107) and PLATE (108) buttons in the "off" (OUT) position	No Indications
2	Turn the signal generator ATTEN control (7) fully CCW	No Indications
3	Place MISC CONTROLS breaker (154) to ON	AC power will be applied to the left and right equipment racks, and the cavity tuning motors; power supply indicator lights for the 12, 24, and 28 VDC power supplies will light.
4	Place LEFT RACK breaker (153) to ON	
5	Place RIGHT RACK breaker (152) to ON	
6	Place channel MAIN breaker (47) to ON.	Blowers will start running.
7	Place channel CONTROL breaker (46) to ON	
8	Depress channel START button (107) to ON	START button indicator will light; METER lights will light; BIAS control relay 1A62K4 will loudly activate (this means that all AIR SWITCHES have activated)
9	Turn Signal Generator AC POWER switch (60) to ON	POWER ON light and DIAL lights will light.
10	Depress synchronizer ON/OFF switch (68) to ON	Indicator light in bottom and dial lights will light.
11	Turn frequency counter POWER switch (141) to ON	POWER indicator will light.
12	SIGNAL PROCESSING ASSEMBLY:	
	a. Place AM processing amplifier LOCAL/REMOTE switch (45) in LOCAL.	No Indications
	b. Adjust FM GAIN control (37) fully CCW	No Indications
	c. Adjust VIDEO REF LEVEL control (44) fully CW	No Indications
13	Depress all MODE buttons (114, 115, 116, 120) to OUT position	SELECT MODE button (110) lit; No MODE button lights lit.
14	Depress REMOTE P.I. BYPASS button (111) to ON position	Button indicator light lit
15	Depress 2nd IPA GRID button (99)	Button indicator will light; 2nd IPA GRID meter (95) will indicate approximately 40 volts.
16	Depress PA GRID button (125)	Button indicator will light; PA GRID meter (87) will indicate approximately 60 volts.
17	Set the following in accordance with CONTROLS on the tuning control assembly calibrated frequency placard or from the sample tuning charts tables 3-3 and 3-4.	
	NOTE Throughout the step-by-step tuning procedures where two ITEM numbers appear after the control the first number is for channels 1 and 4, the second number is for channels 2 and 3, unless otherwise specifically noted.	

TABLE 3-2. TRANSMITTER STARTING AND TUNING PROCEDURE (Cont)

STEP	OPERATION	NORMAL INDICATIONS
17 (cont)	a. Set 1ST IPA BANDSWITCH (132) to desired frequency range (channels 2 and 3 only)	No indications
	b. 1ST IPA TUNING (70) (133)	Counter reading.
	c. 2ND IPA INPUT TUNING (62) (130)	" "
	d. 2ND IPA OUTPUT TUNING (58) (131)	" "
	e. 2ND IPA LOADING (129) (channels 2 and 3 only)	" "
	f. PA INPUT TUNING (53) (127)	" "
	g. PA OUTPUT TUNING (54) (128)	" "
	h. PA OUTPUT LOADING (126) (channels 2 and 3 only)	" "
	i. Patch channel RF OUTPUT coaxial transmission line to dummy load or antenna.	No indications
	CAUTION Be certain step i is accomplished prior to pressing the START button.	
18	Approximately 5 minutes after equipment is STARTED the TIME DELAY relay 1A62K3 will cycle.	READY light (109) will light.
19	Equipment is now in full standby. Allow the equipment warmup for the prescribed time before applying high voltage. Proceed with steps 20 and 21 while equipment is warming up.	
20	Connect BNC to BNC patch cables between the signal generator HP-608F and the synchronizer HP-8708A as shown in figure 3-2.	No indications
21	Carrier tuning procedure for the HP608F signal generator and HP8708A synchronizer:	
	a. To place these equipments to a standby condition only perform preceding steps 1 through 5 and 9 through 12.	
	b. Place FREQUENCY RANGE switch (6) to desired range.	Red pointer on left hand edge of MEGACYCLES meter (1) indicates range selected.
	c. Turn MODULATION control (52) fully CCW.	PERCENT MODULATION meter (48) reads minimum deflection.
	d. Set XTAL CAL switch (13) to OFF.	No Indications

TABLE 3-2. TRANSMITTER STARTING AND TUNING PROCEDURE (Cont)

STEP	OPERATION	NORMAL INDICATIONS
21 (cont)	e. (608F) Set MODULATION switch (5) to CW mode.	No indications
	f. (8708A) Set FREQUENCY TUNING VERNIER (17) outside knob to 0.	No indications
	g. (8707A) Set FREQUENCY TUNING VERNIER (17) inner knob to center of range (2-1/2 turns from either end).	No indications
	h. (8708A) Set FREQUENCY RANGE switch (69) to desired range.	No indications
	i. (8708A) Depress CALIBRATE button (22) and adjust meter adjusting control (small screwdriver adjustment above calibrate button) for centerline indication on METER (14).	Meter (14) indication
	j. (8708A) Set MODULATION LEVEL switch (16) (outer knob) to CW. Set inner knob to full CCW position.	
	k. (8708A) Set the AC/DC switch (15) to AC position.	
	l. (608F) Adjust the frequency control knob (50) to approximately desired frequency on MEGACYCLES meter (1).	Meter (1) reading
	m. (608F) Adjust RF OUTPUT control (51) to obtain a deflection indication on the RF OUTPUT meter (2)	Meter (2) deflection
	n. (608F) Depress and adjust the AMPL TRIMMER (3) for a peak indication on the RF OUTPUT meter (2). Release AMPL TRIMMER knob. Adjust RF OUTPUT control (51) for +7 (red) on DB scale on RF OUTPUT meter (2).	Meter (2) deflection
	o. Set the counter selector switch (148) to the channel number to which you are tuning. Connect a BNC-to-BNC patch cable from the counter selector output (150) to the prescaler INPUT jack (136).	Counter will indicate frequency of signal generator
	p. (608F and 8708A) Using the 608F frequency control knob (50) and the 8708A FREQUENCY TUNING VERNIER (outer and inner knobs) (17) adjust to the desired frequency using the frequency counter to monitor. (This is called FINE TUNING).	Counter will indicate frequency

TABLE 3-2. TRANSMITTER STARTING AND TUNING PROCEDURE (Cont)

STEP	OPERATION	NORMAL INDICATIONS
21 (cont)	q. (608F) Carefully readjust the frequency control knob (50) to centerline the 8708A meter (14) pointer reading.	
	NOTE The frequency should be adjusted to within 10Hz as indicated on the frequency counter of the desired operating frequency.	
22	TUNING TRANSMITTER TO CARRIER ONLY:	
	NOTES	
	1. Steps 1 through 21 preceding, should be completed before proceeding with the following steps.	
	2. Read steps (d), (e) and (f), NORMAL INDICATIONS column before proceeding. If any of the voltage readings are excessively low or high or if the current readings are extremely high, as listed under Normal Indications, immediately depress PLATE button (108) to "off" position.	
	CAUTIONS	
	1. While performing the following steps insure that the power and current values stated in tables 3-5 and 3-6 are not exceeded.	
	2. The High Band cavities, channels 1 and 4, and in particular the 1st IPA, are subject to self-induced transients (self oscillations), which are indicated by sudden maximum power meter indications. Should this occur, immediately rotate the 608F ATTEN control (7) to full CCW position; if meter condition still persists, continue turning the cavity tuning control in the direction you were turning when the transient occured. When the meters return to the minimum indication position, turn the ATTEN control (7) CW until input indication is again indicated per step 22h and continue tuning.	
	a. Rotate ATTEN control (7) CW until 1ST IPA GRID meter (102) needle shows deflection upward.	Indicates that 608F RF drive is normal "thru" to the input of the 1st IPA.
	b. Rotate ATTEN control (7) to full CCW position.	1ST IPA GRID meter (102) indicates no drive.
	c. Depress the following pushbuttons to "in" position:	
	1ST IPA PLATE button (106)	Button Indicator light will light
	2ND IPA SCREEN button (100)	" " " " "
	PA SCREEN button (91)	" " " " "
	PA PLATE button (92)	" " " " "
	d. Depress PLATE button (108). This applies HV to the transmitter.	Button indicator light will light, and 1ST IPA PLATE meter (103) will indicate 1 KV, and PA PLATE meter (89) will indicate 6.25 KV.

TABLE 3-2. TRANSMITTER STARTING AND TUNING PROCEDURE (Cont)

STEP	OPERATION	NORMAL INDICATIONS
22 (cont)	NOTE After 3 second delay, 2ND IPA SCREEN meter (96) will indicate 700 V; and PA SCREEN meter (88) will indicate 1 KV. 2ND IPA SCREEN meter (93) and PA SCREEN meter (84) - No Indications. 2ND IPA PLATE meter (97) may or may not deflect, but MAXIMUM INDICATION should not exceed 60 ma.	
	e. Depress 2ND IPA PLATE button (101)	Button Indicator LIGHTS. 2ND IPA PLATE meter (97) will indicate 2.3 KV.
	f. Depress the following pushbuttons to out position:	
	PA PLATE button (92)	Button indicator light EXTINGUISHES. Small current may now be indicated on PLATE meter (89) but NOT to exceed 100 ma. If more then 100 ma adjust PA BIAS CONTROL (75) to IDLE CURRENT of not more then 100 ma.
	2ND IPA PLATE button (101)	Button indicator light extinguishes. Small current may now be indicated on 2ND IPA PLATE meter (97) but NOT to exceed 30 ma. If more then 30 ma adjust 2ND IPA BIAS CONTROL (77) to NO LESS then 5 ma but not more then 30 ma.
	1ST IPA PLATE button (106)	Button indicator light extinguishes. 1ST IPA PLATE meter (103) should read between .06 and .07 ma. (See section 5 for procedure to adjust the 1ST IPA idle current).
	NOTE When tuning transmitters you are concerned in tuning tank circuits to resonance for impedance matching. In this transmitter not only does each stage have reflective degradation to the preceding stage but it has reflective effects between the output and input circuits of a stage. Therefore, more precise tuning repetitions must be made to insure optimum resonance for impedance matching.	
	g. Turn 608F ATTEN control (7) SLOWLY CW until:	1ST IPA GRID meter (102) indicates approximately 10 ma.
	h. Adjust 1ST IPA TUNING control (70) (133)	Peak indication on 1ST IPA OUTPUT POWER meter (104). POSSIBLY: Pointer deflection on 2ND IPA INPUT TUNING meter (94). PROBABLE: Pointer deflection on 2ND IPA PLATE meter (97).
	i. Adjust 2ND IPA INPUT TUNING control (62) (130)	Peak indication on 2ND IPA PLATE meter (97).

TABLE 3-2. TRANSMITTER STARTING AND TUNING PROCEDURE (Cont)

STEP	OPERATION	NORMAL INDICATIONS
22 (cont)	j. Repeat step h.	
	k. Adjust ATTEN control (7)	1ST IPA OUTPUT POWER meter (104) to indicate 3 watts output.
	CAUTION In the following steps do not let: the 2ND IPA OUTPUT POWER (98) exceed 30 watts; the PA OUTPUT POWER (85) exceed 200 watts; the 2ND IPA SCREEN (93) current and the PA SCREEN (94) current exceed ±5 ma.	
	l. Adjust 2ND IPA OUTPUT TUNING control (58) (131)	Peak indication on 2ND IPA OUTPUT POWER meter (98); POSSIBLY: Pointer deflection in PA INPUT TUNING meter (86); PROBABLE: Pointer deflection in PA PLATE meter (89).
	m. Repeat step i.	
	n. Adjust ATTEN control (7)	2ND IPA OUTPUT meter (98) to indicate approximately 30 watts.
	o. Adjust PA INPUT TUNING control (53) (127)	Peak indication on PA PLATE meter (89).
	p. Repeat step l.	
	q. Adjust ATTEN control (7)	PA PLATE meter (89) to indicate approximately 0.6 amps.
	r. Adjust PA OUTPUT TUNING control (54) (128)	Peak indication on PA OUTPUT POWER meter (85). If using dummy load the PA OUTPUT REFLECTED meter (90) should not deflect.
	NOTE During the following steps the following forward-to reflected power meter reading ratio's are required:	

STAGE	NOT LESS THEN	ULTIMATE MINIMUM
1ST IPA (104) to 2ND IPA (94)	3:1	10:1
2ND IPA (98) to PA (86)	6:1	10:1
PA (85) to LOAD (90)	9:1	10:1

	s. FINAL TUNING: (1) Repeat steps (g) through (r) if tuning channels 1 or 4, then proceed from step (m). (2) Repeat steps (g) through (r) if tuning channels 2 or 3, then proceed from step (t).	
	NOTE Steps (t) and (u) are for channels 2 or 3 ONLY.	

TABLE 3-2. TRANSMITTER STARTING AND TUNING PROCEDURE (Cont)

STEP	OPERATION	NORMAL INDICATIONS
22 (cont)	t. Adjust 2ND IPA OUTPUT TUNING (131), 2ND IPA OUTPUT LOADING (129), and PA INPUT TUNING (127) to obtain maximum impedance match between 2ND IPA OUTPUT (98) and PA INPUT (86).	Peak indication on 2ND IPA OUTPUT POWER meter (98), for minimum indication on PA INPUT TUNING meter (86), for maximum indication on PA PLATE meter (89).
	u. Adjust PA OUTPUT TUNING (128) and PA OUTPUT LOADING (126) controls for maximum impedance match between the PA and the RF termination load (Dummy load or antenna).	Maximum PA OUTPUT POWER (85) in watts.
	v. Adjust ATTEN control (7) CW	PA OUTPUT POWER meter (85) indicates 500 watts.
	w. Check all CURRENT and POWER meters for indicated deflection	Retain meter readings within prescribed limits of Table 3-4 and to meet the criteria set out in the NOTE between steps (r) and (s) on page 3-15.
	x. Repeats steps (v) and (w).	PA OUTPUT POWER meter (85) indicates 1000 watts.
	y. Repeat steps (v) and (w)	PA OUTPUT POWER meter (85) indicates 1500 watts.
	z. Repeat steps (v) and (w); refer to the following note	PA OUTPUT POWER meter (85) indicates 2000 watts.

NOTE

At 2000 watts PA OUTPUT the 2ND IPA and the PA PLATE meters (97 and 89 respectively) should read:

2ND IPA	Between 0.3 and 0.45 amps
PA	Between 1 and 1.4 amps

If NOT, take the following corrective action(s):

1.	CHANNELS 1 and 4: High Reading(s)	Retune all stages, the PA OUTPUT POWER meter (85) set to indicate 700 watts while tuning, but returned to 2000 watts for FULL POWER readings.
	Low Reading(s)	No recourse.
2.	CHANNELS 2 and 3: High Reading(s)	Decrease stage LOADING by CCW adjustment of OUTPUT LOADING control and then readjustment OUTPUT TUNING control to resonance.
	Low Reading(s)	Increase stage LOADING by CW adjustment of OUTPUT LOADING control and then readjust OUTPUT TUNING control to resonance.

TABLE 3-2. TRANSMITTER STARTING AND TUNING PROCEDURE (Cont)

STEP	OPERATION	NORMAL INDICATIONS
22 (cont)	aa. Adjust ATTEN control (7) fully CCW	All current and power meters fall to minimum reading.
	bb. Depress PLATE button (108) to "off"	Button indicator light extinguishes; PA and 2ND IPA SCREEN voltage falls to ZERO; 1ST IPA idle current (103) falls to ZERO.

CHANNEL IS NOW TUNED FOR CARRIER OPERATION.

3-4. CW MODE OF OPERATION TUNING.

Proceed as follows:

1. All steps of table 3-2 must be accomplished.
2. Depress CW mode button (120) to "in" position. Button light lit; SELECT MODE light (110) stays lit.
3. Repeat steps 22b through f of table 3-2.
4. Close the external telegraph key contacts connected to the transmitter key line.
5. Adjust the ATTEN control (7) CW to apply drive to transmitter. PA OUTPUT/POWER meter (85) will indicate output power level.
6. Test for keying by operating the telegraph key. In CW mode PA OUTPUT POWER meter (85) will indicate XMTR keying by rapid rise and fall of meter needle.
7. Transmitter ready for CW MODE emission.

3-5. AM MODE OF OPERATION TUNING.

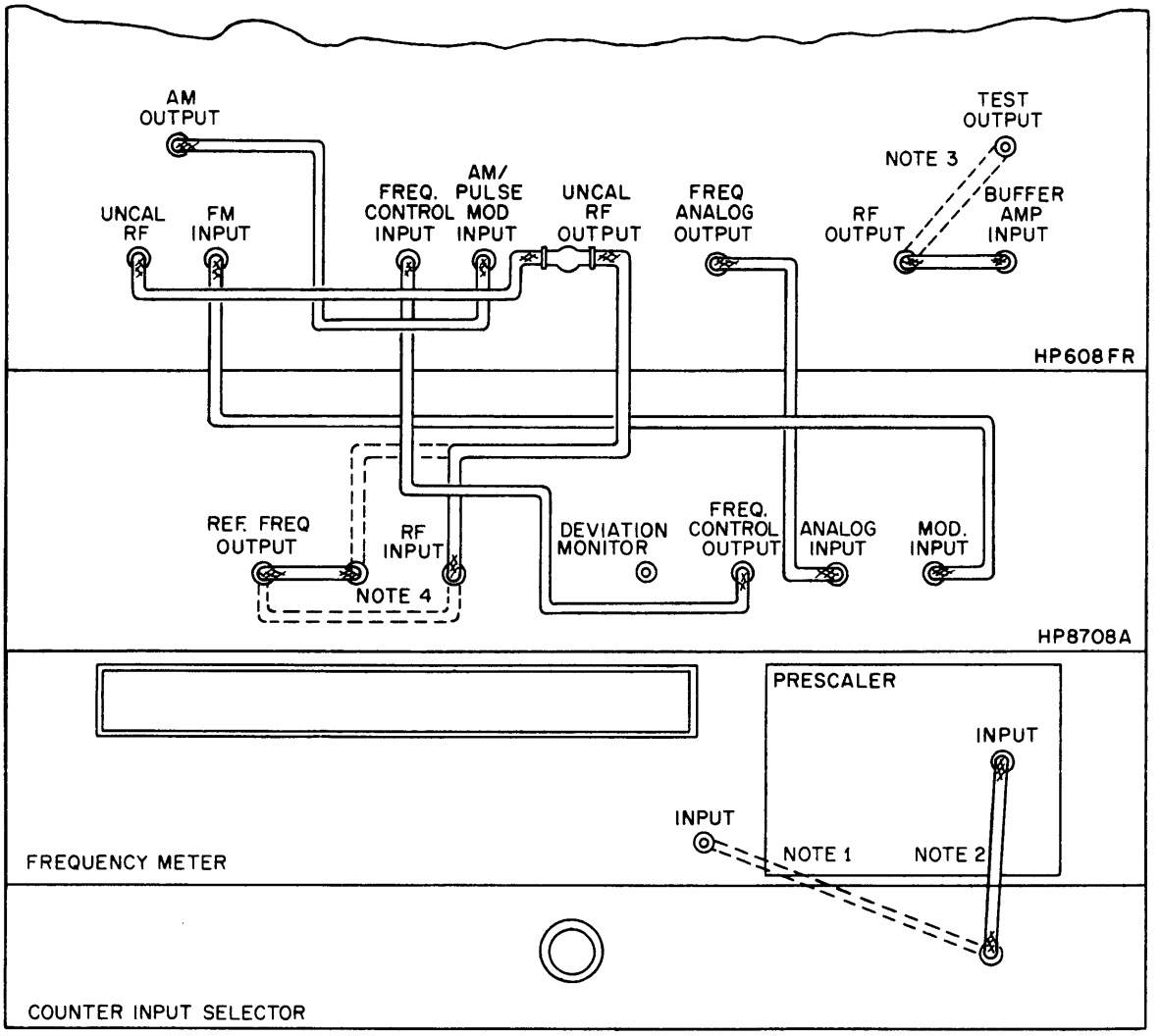
Proceed as follows:

1. All steps of table 3-2 must be accomplished.
2. (608F) Set MODULATION control (52) for desired modulation percentage. PERCENT MODULATION meter (48) indicates modulation percentage setting.
3. (608F) Set MODULATION selector switch (5) to EXT AM position.
4. Depress AM mode button (116) to "in" position. Button indicator will light and SELECT MODE light (110) extinguishes.
5. Repeat steps 22c through g.of table 3-2.
6. Adjust ATTEN control (7) CW to apply drive to the transmitter. PA OUTPUT POWER meter (85) will indicate output power level.
7. Transmitter ready for AM mode emission.

3-6. FM MODE OF OPERATION TUNING.

Proceed as follows:

1. All steps of table 3-2 must be accomplished.
2. Depress FM mode button (115) to "in" position. Button indicator will light and SELECT MODE light (110) remains lit.
3. (608F) Set MODULATION selector switch (5) to the CW position.
4. (608F) Disconnect normal patch cable (figure 3-2) and patch FM INPUT jack (64) to TEST (or MONITOR) OUTPUT jack (8).
5. Externally patch FM INPUT test signal (step 4) to oscilloscope.
6. Apply external FM signal to transmitter FM input lines.
7. Adjust FM GAIN control (37) CW until waveform on oscilloscope indicates a signal level of 0.705 V P-P (normal sine wave)
8. (608F) Reconnect FM INPUT jack (64) to MODULATION INPUT jack (18). (External monitor loses signal.)
9. (8708A) Set MODULATION LEVEL switch (16) to FREQ position.
10. (8708A) Set AC/DC switch (15) to AC position.
11. Repeat steps 22b through f of table 3-2.



NOTES:

1. When patch cable is coupled to frequency meter INPUT, display will read up to 50 MHz.
2. When patch cable is coupled to Prescaler INPUT, display will read up to 350 MHz.
3. When patch cable is coupled to TEST OUTPUT, the exciter output can be externally monitored.
4. Connect UNCAL RF OUTPUT to RF INPUT below lit lamp. Connect REF FREQ OUTPUT to RF INPUT below unlit lamp.

Figure 3-2. Generator, Synchronizer, Frequency Meter, and Counter Input Selector Patching Diagram

TABLE 3-3. TYPICAL LOW BAND TUNING CHART

	1st IPA					2nd IPA					PA				
F MC	IG	IP	OUT-PUT POWER	TUN-ING	INPUT TUN-ING	IN WATTS	IP	OUT-PUT TUNING	OUTPUT LOAD-ING	OUT-PUT POWER	INPUT WATTS	INPUT TUN-ING	IP	OUT-PUT TUNING	OUTPUT LOAD-ING	*OUT-PUT POWER
31	30	.05	8	942	1050	1	.3	51	799	500	80	0000	1	81	679	2KW
36	28	.05	3	962	2086	1	.20	990	864	200	22	1096	.7	682	813	2KW
40	30	.05	5	937	2223	.8	.25	1355	935	260	2436	1336	.7	1374	848	2KW
46	36	.05	4.8	955	2519	.4	.29	2311	961	200	36	1694	.7	2413	1848	2KW
50	36	.05	4.8	936	2773	.6	.25	2920	911	200	30	1904	.7	2819	872	2KW
55	30	.05	5	923	2971	1.6	.210	3393	913	250	35	1205	.75	3283	872	2KW
61	.4	.05	2.5	998	944	1	.0300	3653	033	9	1084	.6	3529	967	50	2KW
65	.025	.05	2	984	1350	.6	.0300	3905	032	180	20	1449	.6	3755	982	2KW
70	.02	.05	.5	966	3454	.3	.0300	4.65	032	65	9	2156	.5	4060	982	2KW
85	40	.05	3.5	932	4851	.4	.27	4684	037	250	28	3484	.7	4660	928	2KW
80	.075	.05	3.0	940	4869	3.0	.0350	4541	032	150	18	2813	.6	4452	974	2KW
75	.06	.05	.5	950	3986	.32	.0300	4374	032	60	9	2518	.5	4285	930	2KW
90	45	.05	3.2	989	4907	.4	.26	4838	958	150	16	3484	.7	4750	957	2KW
95	50	.05	4	977	4974	.4	.26	4938	944	150	18	3484	.7	4859	958	2KW
100	40	.05	2	963	5000	.3	.25	5046	944	150	20	3619	.7	4950	958	2KW
105	40	.05	3.5	954	5044	.7	.26	5082	002	200	26	3695	.8	5044	937	2KW
110	20	.05	1.5	945	4662	.4	.23	5140	042	200	30	5191	.7	5056	987	2KW
115	20	.05	1	941	5387	.3	.23	5196	027	100	16	4911	.7	5147	980	2KW
120	15	.05	1.5	934	5397	.25	.15	5248	027	180	22	4811	.7	5192	980	2KW
125	28	.05	2.5	927	5387	.2	.15	5299	028	230	22	4911	.8	5240	980	2KW
130	47	.05	3.5	924	5430	.2	.21	5333	025	200	19	5140	.65	5278	060	2KW
135	45	.05	2.5	920	5430	.3	.15	5360	064	100	19	5518	.7	5312	140	2KW
140	40	.05	2.5	913	5430	.8	.16	5394	064	220	29	5518	.8	5345	140	2KW
145	38	.05	2.5	909	5427	.9	.17	5401	064	220	28	5530	.8	5370	140	2KW
150	36	.05	2.4	904	5420	.8	.15	5420	068	215	25	5590	.8	5396	140	2KW

NOTE: *OUTPUT IMPEDANCE - 50 OHMS UNBALANCED

TABLE 3-4. TYPICAL HIGH BAND TUNING CHART

F MC	IG	IP	OUT-PUT POWER	TUNING	INPUT TUNING	IN WATTS	IP	OUT-PUT TUNING	OUT-PUT POWER	INPUT WATTS	INPUT TUNING	IP	OUT-PUT TUNING	*OUT-PUT POWER
150	28	.04	3	007	290	.5	.25	415	150	20	285	1.5	375	2KW
155	28	.04	4	250	289	.5	.25	375	195	90	250	1.5	350	2KW
160	28	.04	7	350	287	.7	.25	367	189	80	220	1.5	235	2KW
165	28	.04	12	400	282	.8	.25	355	175	70	240	1.5	310	2KW
170	28	.04	15	542	217	1	.25	340	165	50	217	1.5	295	2KW
175	28	.04	11	442	270	1	.3	280	160	55	220	1.5	270	2KW
180	28	.04	9	753	285	2	.3	294	165	65	226	1.5	263	2KW
185	28	.04	8	695	230	.2	.3	244	165	35	200	1.5	243	2KW
190	28	.04	7	973	270	1	.25	270	165	35	200	1.5	233	2KW
195	28	.04	8	1025	315	3	.25	250	160	40	198	1.5	218	2KW
200	28	.04	11	1079	374	8	.2	223	150	50	195	1.5	205	2KW
210	28	.04	13	.275	263	1.5	.35	208	150	37	111	1.5	184	2KW
220	28	.04	9	1427	205	.25	.2	187	150	35	164	1.5	160	2KW
230	27	.04	5	1569	174	.2	.2	159	215	40	163	1.3	141	2KW
240	29	.04	6	1674	135	.2	.2	140	130	20	137	1.3	125	2KW
250	29	.04	6	1793	136	.2	.2	127	150	22	058	1.3	108	2KW
260	28	.04	5	1900	114	.2	.2	109	100	11	064	1.3	094	2KW
270	28	.04	5	1992	094	.2	.2	094	95	10	090	1.25	081	2KW
280	28	.04	7.5	2081	083	5	.2	078	90	8	061	1.2	069	2KW
290	28	.04	7.5	2145	081	5	.28	070	110	11	058	1.1	057	2KW
300	28	.04	10	2200	073	.8	.2	057	90	10	057	1.1	047	2KW
310	28	.04	5	2287	036	1	.16	045	96	8	039	1	037	2KW
320	25	.04	5	2351	052	1.2	.2	032	60	9	036	.98	028	2KW
330	25	035	10	2418	043	2	.3	025	60	12	024	.9	019	2KW
340	25	040	11	2478	048	4	.25	017	80	25	021	1	012	2KW
350	28	040	18	2513	004	8	.2	014	70	25	014	.9	004	2KW

NOTE: *OUTPUT IMPEDANCE - 50 OHMS UNBALANCED

TABLE 3-5. MAXIMUM DC VALUES LOW BANDS

1ST IPA:	
Plate	120 ma.
2ND IPA:	
Plate	500 ma.
Screen	45 ma.
Grid	60 ma.
PA:	
Plate	1.4 amp
Screen	-60 to 100 ma.

TABLE 3-6. MAXIMUM DC VALUES HIGH BANDS

1ST IPA:	
Plate	110 ma.
2ND IPA:	
Plate	450 ma.
Screen	60 ma.
Grid	150 ma.
PA:	
Plate	1.4 amp
Screen	100 ma.
Grid	300 ma.

12. Adjust ATTEN control (7) CW to apply drive to transmitter. PA OUTPUT POWER meter (85) indicates output power level.

13. Adjust MODULATION LEVEL control (16) inner knob CW for desired DEVIATION as observed on external monitor. Keep deviation level BELOW the level at which the 8708A synchronizer will jump sync.

14. Transmitter ready for FM MODE emission.

3-7. VIDEO MODE OF OPERATION TUNING.

Proceed as follows:

1. All steps of table 3-2 must be accomplished

2. Readjust the signal generator FREQUENCY (50 and 1) to the picture carrier frequency desired.

3. Repeat steps 21 (p) and (q) of table 3-2 to stabilize signal generator on new frequency.

4. Repeat steps 22 (b) through (j) of table 3-2. 1ST IPA will indicate greater OUTPUT POWER (104) is now required to drive the 2ND IPA.

5. Adjust ATTEN control (7) fully CCW.

6. Depress PLATE button (108) to "off" position (H.V. removed from XMTR).

7. Depress VIDEO mode button (114) to "in" position. Button indicator will light and SELECT MODE light (110) is extinguished.

8. Place CHOPPER switch (43) in OFF position.

9. Apply external video modulation signal to transmitter video input lines.

10. Patch Demodulator-Chopper OUTPUT jack (42) to external picture and waveform monitors

11. Repeat steps 22(b) through (f) of table 3-2.

12. Adjust ATTEN control (7) CW to apply drive to XMTR. 1ST IPA OUTPUT POWER meter (104) and 2ND IPA INPUT TUNING meter (94) will indicate power levels.

CAUTION

DO NOT drive the 1ST IPA OUTPUT POWER meter (104) above 5 watts indicated.

13. Adjust VIDEO REF LEVEL control (44) slowly CCW until the 2ND IPA PLATE meter (97) and OUTPUT POWER meter (98) start to indicate.

CAUTION

When accomplishing step 14 adjustments keep the PA OUTPUT POWER level (85) below 300 watts by adjustment of the ATTEN control (7).

14. View the external picture and waveform monitors, continue adjusting the VIDEO REF LEVEL control (44) until a compromise is reached between the best picture and the best waveform. When reached, adjust ATTEN control (7) CW until PA POWER OUTPUT level (85) is 500 watts. If required make additional fine adjustment with the VIDEO REF LEVEL control (44) for best picture to best waveform ratio.

15. Adjust ATTEN control (7) fully CCW. All power and current meters fall to minimum value reading.

16. Patch external sideband response analyzer, such as the RCA BW-5C, to XMTR video input lines; patch the sideband response analyzer outputs to an oscilloscope.

17. Adjust ATTEN control (7) CW to apply drive to XMTR. PA OUTPUT POWER meter (85) indicates 500 watts.

NOTES

1. Procedures for tuning and calibrating the sideband response analyzer BW5C are specified in paragraph 3-8.
2. View the transmitted waveform on the external monitor. Objective is to have an overall bandwidth equivalent to the CCIR television standard transmission desired.
3. Transmitter adjustment procedures for this tuning operation, together with the tuning theory, is described in paragraph 3-9.

18. Transmitter ready for VIDEO mode emission.

3-8. PATCHING AND OPERATING THE SIDEBAND RESPONSE ANALYZER BW5C IN CONJUNCTION WITH THE TRANSMITTER.

Connect and adjust the test equipment setup as follows:

a. Oscilloscope HP141A.

1. Place SWEEP TIME switch to EXT.
2. Place FUNCTION switch to CH B.
3. Place MAGNIFIER TO X10.
4. Patch the horizontal sweep from the BW5C to the EXT input of the HP141A.
5. Patch the vertical sweep from the BW5C to the CH B input of the HP141A.
6. Adjust oscilloscope intensity and vertical position controls to position sweep.
7. Adjust oscilloscope sweep time and horizontal position controls for a full sweep display.

b. Sideband Response Analyzer BW5C.

1. Adjust REC GAIN control fully CW.
2. Adjust the MIXER, RF AMP and RCVR OSC controls to obtain carrier pips on the display; peak the carrier pips with the RF AMP and the MIXER controls.
3. Adjust SCOPE PHASING control to cause the carrier pips to coincide (overlap).
4. Set BLANKING switch to ON.
5. Adjust MARKER control to align the FC index on the MARKER dial. Readjust the MIXER, RF AMP and RCVR OSC controls to cause the carrier pip to coincide with the marker on the oscilloscope display (always keep carrier pip in view and peak carrier pip with the RF AMP and MIXER controls).
6. Center the carrier pip on the oscilloscope display with the SWEEP POSITION control.

c. Transmitter

1. Energize the transmitter as detailed in table 3-2. Following tuning, turn the ATTEN dial (7) of the transmitter channel to be tested fully CCW and be certain that the START button (107) is off.
2. Patch the BW5C video output signal to the video input line for the transmitter channel being tested.
3. Press METER SWITCH on the BW5C and calibrate the video sweep output signal for one volt peak-to-peak using the VIDEO SWEEP OUTPUT control and the OUTPUT meter.
4. Select the VIDEO mode (114) of operation and tune the transmitter channel being tested as described in paragraph 3-7.
5. Select the two volt/per CM vertical range on the oscilloscope and adjust the REC GAIN control on the BW5C for a 15 volt peak carrier signal amplitude on the oscilloscope display.
6. Adjust the DET PEAK control on the BW5C to bring sideband response above the base line viewed on the oscilloscope display.
7. Observe that the ratio of carrier signal amplitude, displayed on the oscilloscope exceeds the amplitude of the video response, also displayed on the oscilloscope by a minimum of 3X (3:1 ratio). Vary the MARKER control between the minimum points of the video sweep excursion on the display to determine the video bandwidth of the transmitter channel undergoing test. Refer to paragraph 3-9 to properly tune the transmitter for the required response.

3-9. VIDEO MODE OF OPERATION.

a. Video Modulation - The generator must be adjusted 1.5 MHz down from operating frequency and the 1st IPA output must be retuned (see figure 3-3). This is done in order to make the 2nd IPA clip off the unwanted lower sideband. However, by so moving the 1st IPA down in frequency, the drive level to the 2nd IPA is reduced due to resonance offset.

b. 2ND IPA and PA Tuning - This must be broadened without effectively changing their tuned circuits (input/output tuning). High band and low band tuning procedures are as follows:

(1). HIGH BANDS. Since the 2nd IPA has no output loading control the PA output loading is fixed in a maximum position, the only controls left are the input/output on the 2nd IPA and PA. When the transmitter is tuned on carrier for an output level of 2KW, the 2nd IPA Ip should not exceed 450 MA and the PA Ip 1.5A. For video mode of operation at an output power of 1200 watts, these figures should be approximately 350 MA and 1.2A maximum. Therefore, a slight retuning of the 2nd IPA and PA may be necessary to keep the plate currents within these limits. No adjustments for 1st IPA are necessary, because Ip is fixed.

(2). LOW BANDS. The low band channels, since operating at lower frequencies, do not have the bandwidth of the high bands; therefore, video tuning is more critical. Video tuning is accomplished by increasing the loading (raising Ip) of the 2nd IPA and PA with their output loading controls. Also, minor adjustments to the output tuning of the 2nd IPA and PA and possibly minor adjustments to the PA input tuning may be required. Maximum Ip ratings are the same as the high-bands. (2nd IPA Ip-350 MA max, PA Ip-1.4A).

3-10. TERMINOLOGY

In broadcasting, it is necessary to refer to specific amplitude levels of the composite television video signal. The six important amplitude levels are shown in figure 3-4 and are described below:

a. Reference White Level - The level at the point of observation corresponding to the specified maximum excursion of the picture signal in the white direction.

b. White Peak - The maximum excursion of the picture signal in the white direction at the time of observation.

c. Black Peak - The maximum excursion of the picture signal in the black direction at the time of observation.

d. Reference Black Level - The level at the point of observation corresponding to the specified maximum excursion of the picture signal in the black direction.

e. Blanking Level - The level of the signal during the blanking interval. It coincides with the level of the base of the synchronizing pulse. (Sometimes known as "blacker than black").

f. Synchronizing Level - The level of the peaks of the synchronizing signal.

g. IRE Units - An arbitrary scale used to relate components of the composite video signal.

h. Composite Video - The final transmitter mixture of intensity information and synchronizing information.

i. Video Polarity - In the US and CCIR TV systems, the composite video is impressed on the transmitter so as to produce maximum output power on synchronizing peaks, and minimum power on white peaks. Some foreign television standards represent white peaks with maximum power.

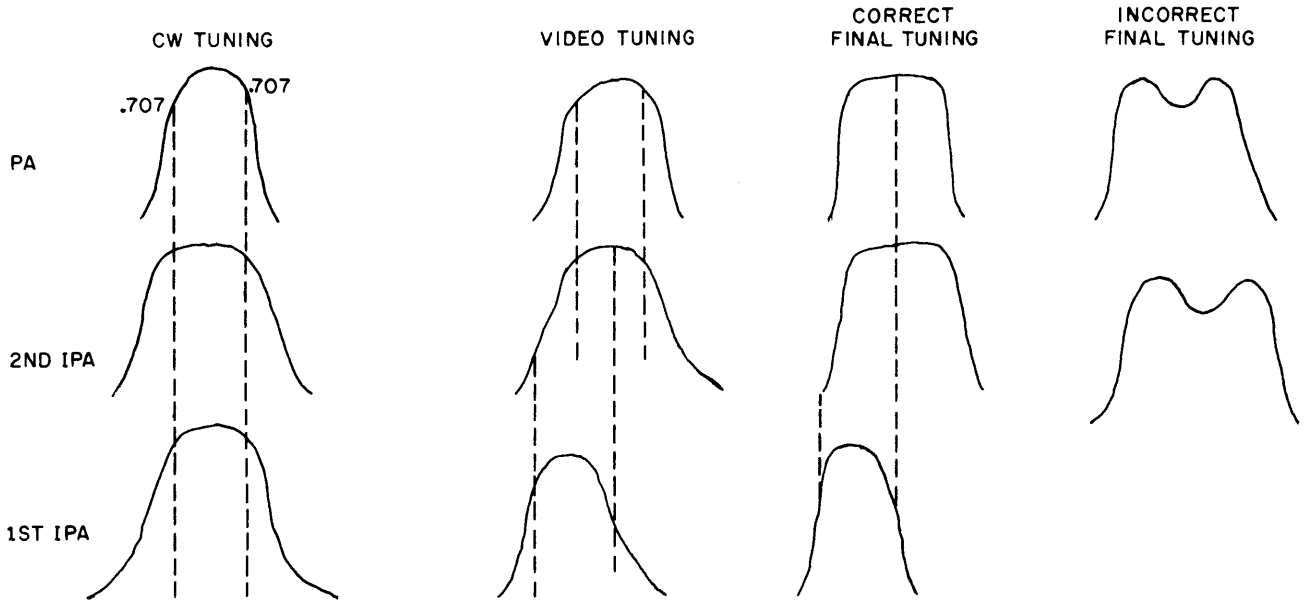


Figure 3-3. Video Tuning

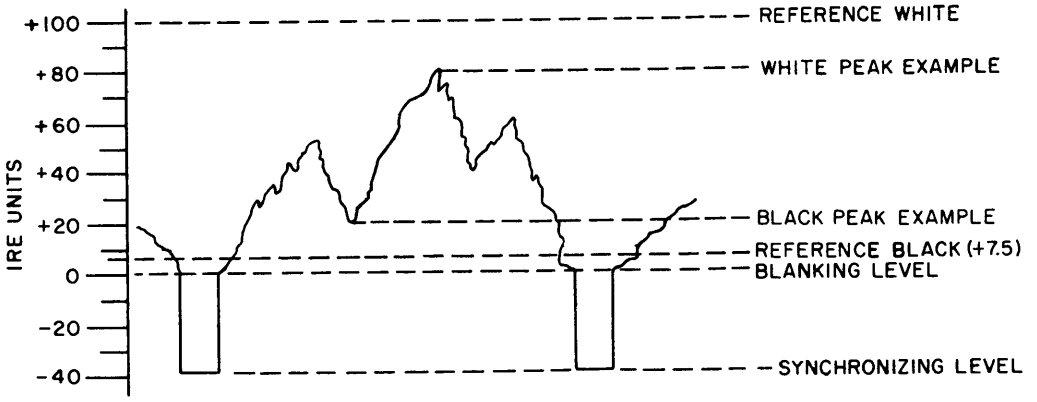


Figure 3-4. Video Waveform

SECTION 4

PRINCIPLES OF OPERATION

4-1. INTRODUCTION

This section presents principles of operation of the transmitter from the standpoint of a technician having experience with similar or related equipment. Basic theory is excluded. The transmitter's principles of operation is described at two levels: functional block diagram analysis and detailed circuit analysis. Detailed circuit analysis is provided, in this technical manual only for equipment not separately described in additional technical manuals. For a list of additional equipment manuals, refer to paragraph 1-2. The four channels of the transmitter are functionally similar; therefore, only one channel is covered in detail in this section. Common names are used except where official nomenclature is required for clarity.

4-2. BRIEF DESCRIPTION OF MODULAR UNITS (See Fig. 4-1.)

a. Attenuator Control and AM Processing Amplifier Subassembly. This subassembly is part of the signal processor assembly. The subassembly AX8030 comprises an attenuator control section and an AM processing amplifier section. The attenuator control section applies a gain-control current to the attenuator assembly. The level of this current determines the transmitter output power level. As the current increases, the transmitter output power level increases. The attenuator control section can be operated in either of two modes: REMOTE or LOCAL, selected by a front-panel switch on the module. When REMOTE mode is selected, the attenuator control section receives a 0 to +15 vdc remote gain control signal from a potentiometer in a remote unit. As the remote gain control signal becomes more positive, the current output of this section increases; which increases the transmitter output power level. CW mode of operation uses a telegraph key located in a remote unit by interrupting the remote gain control signal applied to the attenuator control section. When LOCAL mode is selected the input signals to the attenuator control section are not used. The output current of the section is fixed at maximum and the transmitter output power level is controlled by the HP608FR attenuator. The AM processing amplifier section of the subassembly is an audio preamplifier which receives a 0-dbm audio input from a remote unit. The audio output of the section is applied to the signal generator when AM mode of transmitter operation is desired.

b. FM Processing Amplifier Subassembly. The processing amplifier is an audio preamplifier which receives a 0-dbm audio input from a remote unit and supplies a frequency-modulating signal to the Synchronizer HP8708A.

c. Video Processing Amplifier Subassembly. The video processing amplifier is a video preamplifier which receives a one volt peak-to-peak video input from a remote unit and applies an amplified video signal to the video modulator assembly. The video processing amplifier incorporates video reference level adjustments so that the composite video signal black, white, and sync levels can be adjusted to conform to any television broadcast standard.

d. Video Modulator Assembly. The video modulator assembly receives the processed video signal from the video processing amlifier subassembly and amplifies the signal to a level sufficient to grid-modulate the second IPA assembly.

e. Signal Generator HP608FR. The HP608 generates the transmitter's rf carrier frequency. For carrier-frequency range of each channel, refer to paragraph I-4. The primary output (CAL. RF OUT) of the generator is a 0.5-v rms (max.) rf signal that is routed through the attenuator assembly to the first rf amplifier. The CAL. RF OUT level is normally set at +7 dbm. A sample of the oscillator output (UNCAL RF) is applied to the Synchronizer HP8708A and routed through the counter-input selector switch for input to the counter assembly. The oscillator receives a frequency-control voltage from the synchronizer. This voltage is derived from the UNCAL RF signal and is used to correct frequency drift in generator by phase locking. When FM mode of transmitter operation is selected the frequency-control voltage is used to frequency-modulate the generator. A frequency analog input is applied to the synchronizer by the generator. This input is a 0-ohm to 4-kilohm resistance that causes the generator-synchronizer loop gain to be constant regardless of the rf carrier frequency of the generator. The frequency analog resistance is minimum at the high frequency end of each generator rf band, and maximum at the low frequency end.

f. Synchronizer HP8708A. The synchronizer receives the frequency analog and UNCAL RF outputs of the signal generator. If there is any frequency variation in the generator output, the frequency control output of the synchronizer varies to correct for the detected frequency variation. The synchronizer also receives an audio signal from the FM processing amp when the FM mode of transmitter operation is selected. The frequency control output applies the FM modulating signal to the generator. The frequency analog output from the oscillator varies the gain of the synchronizer to make the output level independent of frequency.

g. Attenuator Assembly. The attenuator assembly receives the rf output signal of generator and the gain-control current from the attenuator control. The gain-control current determines the amount of rf signal passed by the attenuator assembly. As the gain-control increases, the attenuation decreases and more of the rf signal (up to +5dbm) is applied to the first rf amplifier assembly.

h. 1ST RF Amplifier Assembly. The first rf amplifier assembly is a wideband, fixed-tuned rf amplifier. Nominal gain of this assembly is 37dB; frequency response is 30MHz to 150MHz (lowband) and 150 MHz to 350MHz (high band). Output of the first rf amplifier is routed through a coupler to the first IPA.

i. Coupler Assembly. The rf output from the first rf amplifier assembly is routed through the coupler assembly to the first IPA. The coupler rectifies a sample of the rf signal and applies the resulting dc signal to the 1ST IPA GRID meter

j. 1ST IPA Grid Meter. The 1ST IPA GRID meter indicates the level in rf milliamperes of the rf signal applied to the first IPA. The meter also indicates grid voltage when the 1ST IPA GRID (PUSH TO LIGHT READ VOLTS) button is depressed.

k. 1ST IPA Assembly. The first IPA assembly amplifies the rf signal from the coupler. Nominal gain of the first IPA is 13dB. The first IPA output is routed through the first directional coupler to the second IPA assembly.

l. 1ST Directional Coupler. The rf output from the first IPA is routed through the first directional coupler to the Second IPA. The coupler rectifies samples of the forward and reflected rf signals. The rectified forward-power sample is applied to the FIRST IPA OUTPUT POWER meter. The rectified reflected-power sample is applied to the SECOND IPA INPUT TUNING meter.

m. 1ST IPA Output Power Meter. This meter indicates the level, in watts, of the first IPA rf output level.

n. 2ND IPA Input Tuning Meter. This meter indicates the level in watts, of reflected power level at the input of the second IPA.

o. 2ND IPA Assembly. The second IPA assembly amplifies the rf signal from the first directional coupler. Nominal gain of the second IPA is 13 dB. When the transmitter is operated in video mode, the second IPA assembly also receives a composite video-modulating signal from the video modulator assembly. The second IPA output is routed, through the second directional coupler, to the PA assembly.

p. 2ND Directional Coupler. The rf output from the second IPA assembly is routed through the second directional coupler to the PA assembly. The coupler rectifies samples of the forward and reflected rf signals. This rectified forward-power sample is applied to the SECOND IPA OUTPUT POWER meter. The rectified, reflected-power sample is applied to the PA INPUT TUNING meter.

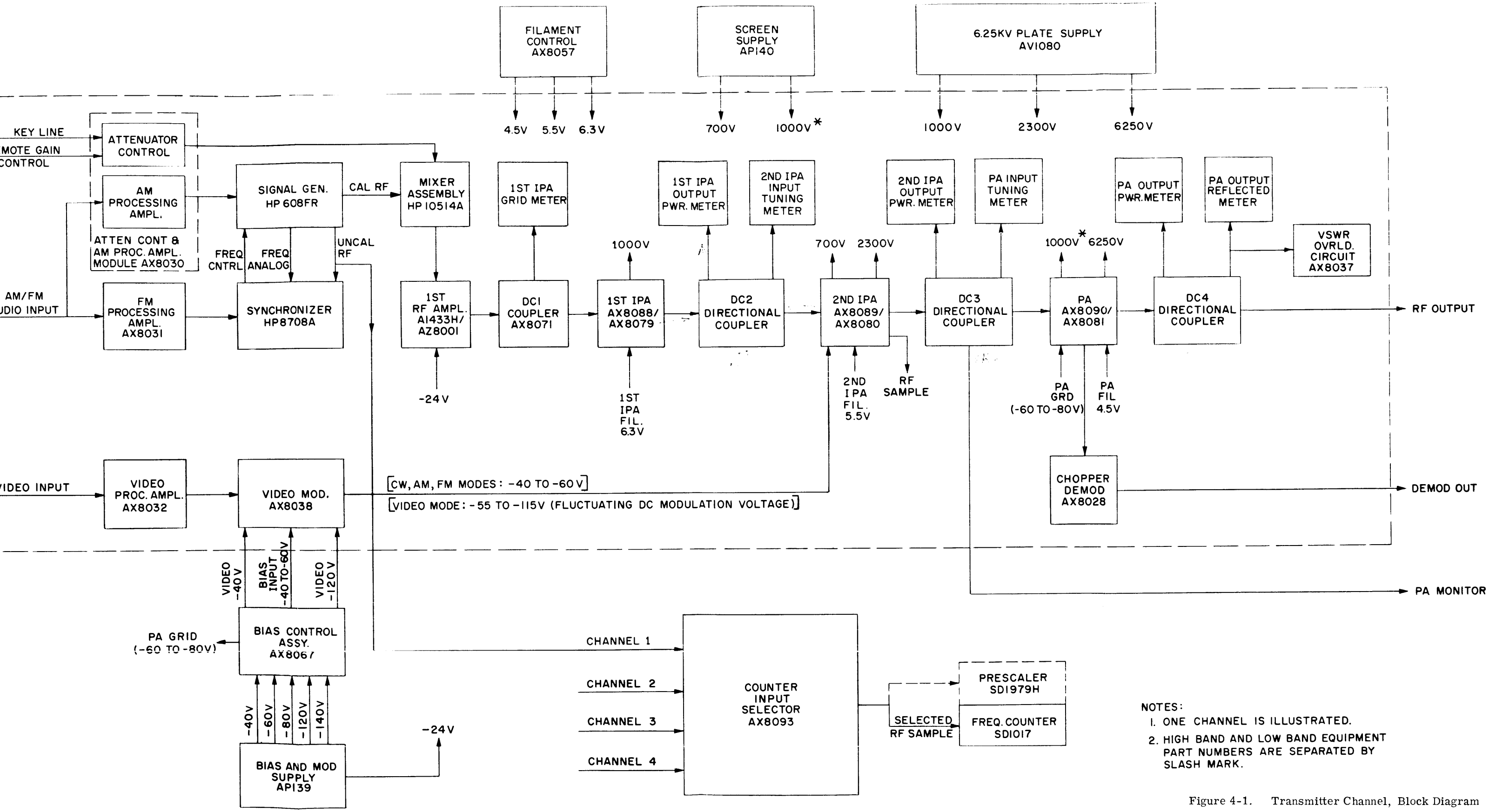
q. 2ND IPA Input Tuning Meter. This meter indicates the level, in reflected watts, of the First IPA rf output level.

r. PA Input Tuning Meter. This meter indicates the level, in watts, of reflected rf power at the input of the PA.

s. PA Assembly. The PA assembly amplifies the rf signal from the second directional coupler. Nominal gain of the PA is 10 dB. The PA output is routed through the output directional coupler, to the antenna. A sample of the PA output is applied to the demodulator-chopper assembly and may be monitored using external test equipment.

t. Demodulator-Chopper Assembly. The demodulator-chopper assembly receives a sample of the video-modulated rf signal from each PA assembly. The demodulator-chopper removes the carrier from the signal, leaving the video-modulation envelope. The envelope is then chopped (periodically interrupted), providing a means for synchronizing external test equipment (such as an oscilloscope) when measuring signal parameters. The demodulator-chopper output is available for monitoring.

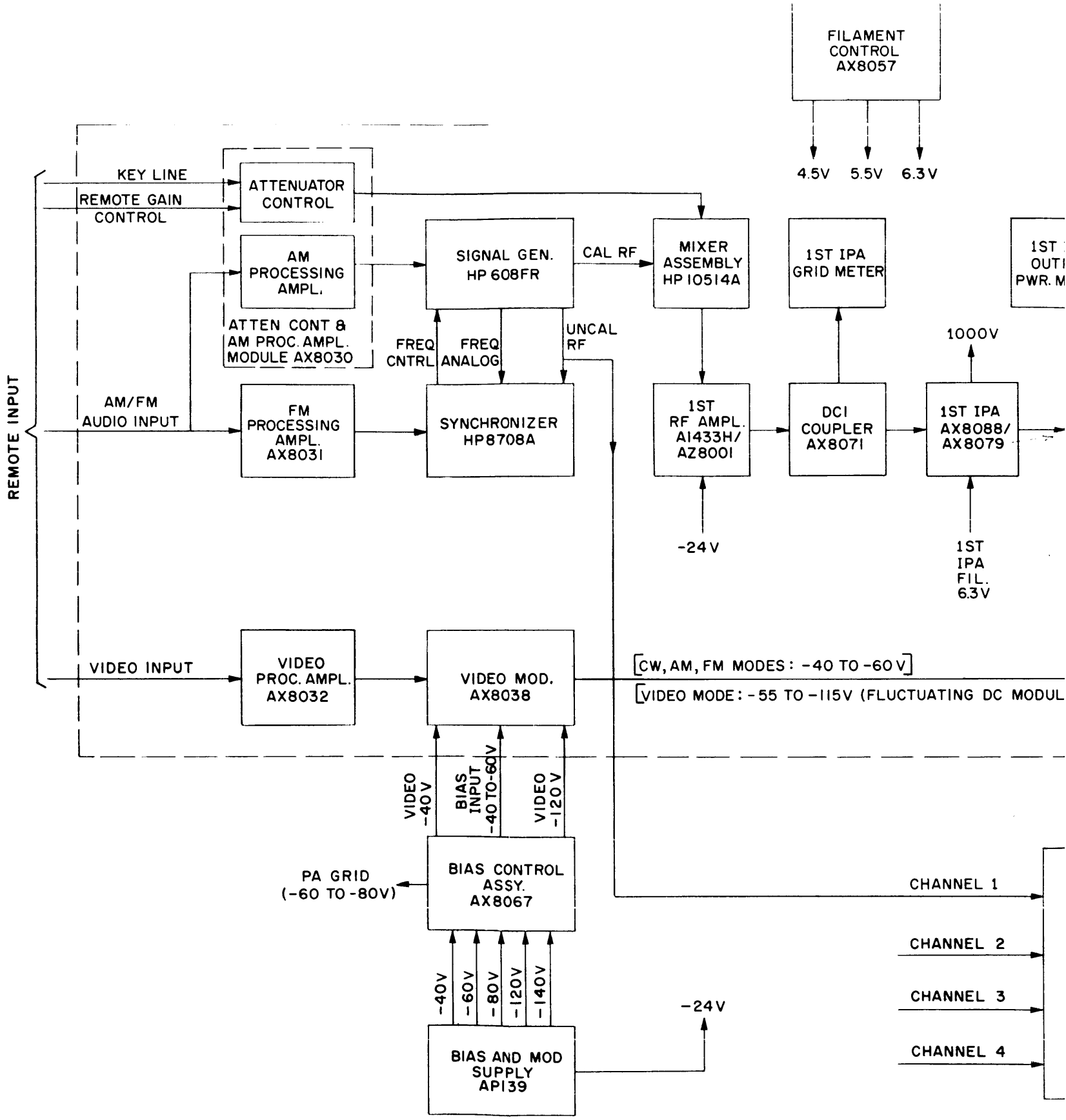
u. Output Directional Coupler Assembly. The rf output from the PA assembly is routed through the output directional coupler to the rf patch panel. The output of the directional coupler rectifies samples of the forward and



NOTES:

1. ONE CHANNEL IS ILLUSTRATED.
2. HIGH BAND AND LOW BAND EQUIPMENT PART NUMBERS ARE SEPARATED BY SLASH MARK.

Figure 4-1. Transmitter Channel, Block Diagram


FILAMENT CONTROL AX8057
4.5V
5.5V
6.3V
KEY LINE
REMOTE GAIN CONTROL
ATTENUATOR CONTROL
AM PROCESSING AMPL.
ATTEN CONT & AM PROC. AMPL. MODULE AX8030
SIGNAL GEN. HP 608FR
CAL RF
MIXER ASSEMBLY HP 10514A
1ST IPA GRID METER
1ST OUTP PWR. M
FREQ CNTRL
FREQ ANALOG
UNCAL RF
1000V
REMOTE INPUT
AM/FM AUDIO INPUT
FM PROCESSING AMPL. AX8031
SYNCHRONIZER HP8708A
1ST RF AMPL. A1433H/ AZ8001
DCI COUPLER AX8071
1ST IPA AX8088/ AX8079
-24V
1ST IPA FIL. 6.3V
VIDEO INPUT
VIDEO PROC. AMPL. AX8032
VIDEO MOD. AX8038
[CW, AM, FM MODES: -40 TO -60V]
[VIDEO MODE: -55 TO -115V (FLUCTUATING DC MODUL
VIDEO -40V
BIAS INPUT -40 TO -60V
VIDEO -120V
PA GRID (-60 TO -80V)
BIAS CONTROL ASSY. AX8067
CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4
-40V
-60V
-80V
-120V
-140V
-24V
BIAS AND MOD SUPPLY AP139

reflected rf signals. The rectified forward power sample is applied to the PA OUTPUT POWER meter. The rectified reflected-power sample is applied to the PA OUTPUT REFLECTED meter.

v. PA Output Power Meter. This meter indicates the transmitter output power in watts.

w. PA Output-Reflected Meter. This meter indicates the level, in watts of reflected rf power at output of PA.

x. Counter-Input Selector Switch. The counter input selector switch routes an rf sample of any one of the four generators to the frequency counter for monitoring.

y. Frequency Counter and Prescaler. The frequency counter comprises a plug-in prescaler and a frequency counter. The prescaler extends the direct reading range of the counter to 350MHz. The prescaler includes a front-panel adjusted mixer-oscillator. The output frequency of the prescaler is equal to the difference between the mixer-oscillator setting and the incomming frequency. The prescaler difference output is applied to the frequency counter. The frequency counter receives the prescaler difference and indicates its frequency on a front-panel nixie display.

4-3. GENERAL.

The following functional block diagram description of the SPT-3K/VHF discusses signal flow within the transmitter in three different levels of operation, namely: Carrier Generation, Amplification of the RF Signal, and Modulation.

4-4. FUNCTIONAL BLOCK DIAGRAM DESCRIPTION OF THE TRANSMITTER (See Figure 4-1)

a. Carrier Generation. The carrier frequency is generated by the HP-608FR signal generator. The signal from the generator is applied to the attenuator assembly which controls the gain of the signal being applied to the power amplifier chain. A sample of the rf output (UNCAL RF) is applied to the synchronizer and also to the counter input selector switch. The counter input selector switch can select any one of the UNCAL RF outputs from the generators of the four transmitter channels for input to the frequency counter. The fundamental frequency of the selected signal is displayed by the counter. The synchronizer examines the uncal RF signal and compares it to a standard that is generated within the synchronizer. If the uncal RF signal and the standard remain constant, signifying no frequency drift, the synchronizer dc frequency control voltage which is applied to the generator remains constant. If there is drift, the frequency control dc voltage will vary within the range of -2 to -32 volts. This varying frequency control voltage corrects the output frequency within the signal generator to oppose the drift. This frequency control voltage is also deliberately varied during the frequency modulation mode of operation. A frequency analog signal is also coupled between the signal generator and the synchronizer. This is a variable resistance that corrects for the nonlinearity of the synchronizer frequency response so that the generator and synchronizer loop gain is held constant.

b. Amplification of The RF Signal. The attenuator control and AM processing amplifier sub-assembly AX8030 is part of the signal processor assembly. Within the attenuator control and AM processing amplifier sub-assembly, are the AM processing amplifier and the attenuator control circuits. The attenuator control circuit receives CW keying and a remote gain control signal from a remote unit. The CW keying is a square wave type of input at a 0 to 15 volts dc level. The gain control signal is variable between 0 and 15 volts dc. The attenuator control generates voltage that varies from ground to a positive voltage level depending upon the level of the remote gain control input to the attenuator control. The output voltage or current from the attenuator control is applied to the attenuator assembly. Also applied to the attenuator assembly is the rf output of the generator (CAL RF). The attenuator assembly controls the amount of rf that is passed from the generator to the transmitter power amplifier chain. When current from the attenuator control is minimum, the attenuator assembly presents an infinite impedance to rf from the generator and no rf is applied to the input of the first RF amplifier. When the current from the attenuator control increases, the impedance of the attenuator assembly will decrease allowing rf output to be applied to the first RF amplifier. Thus, when the attenuator control output is minimum, the rf signal applied to the 1st RF amplifier is minimum; when the attenuator control output is maximum, the rf output of the attenuator assembly is maximum. The maximum output is going to be approximately the same as the maximum output of the signal generator (5vrms, +7 dbm).

The signal from the attenuator assembly is applied to the 1st RF amplifier. Each transmitter channel contains a first RF amplifier stage. The 1st RF amplifiers of the two low band channels are identical; and the first RF amplifiers of the two high band channels are identical. The low band first RF amplifier is a broadband semiconductor amplifier that covers the entire frequency range of 30

to 150MHz without tuning; the high band first RF amplifier is a broadband semiconductor amplifier that covers the entire high band range of 150 to 350MHz without tuning. Gain of each of the RF amplifiers is nominally 37 dB.

The output of the first RF amplifier is routed to a straight through coupler to the first IPA. The coupler incorporates a small rectifying network which rectifies a portion of the output of the first RF amplifier and applies the rectifying voltage to the first IPA grid meter. The first IPA grid meter indicates the input to the first IPA grid (output of the first RF amplifier).

The first IPA is a grounded grid triode amplifier that amplifies the RF from the first RF amplifier and routes it through the first directional coupler to the input of the second IPA. In the first directional coupler there are two diodes: one diode detects forward power and the other diode detects refected power. The detected forward power is equivalent to the output power level of the first IPA so that the sample rectified by the forward diode is called the first IPA output power sample and it is applied to the first IPA output power meter. The voltage detected by the reflected power diode in the directional coupler indicates the state of tune of the second IPA input. This signal is applied to the second IPA input tuning meter.

The RF or carrier wave from the first directional coupler is applied to the cathode circuit of the second IPA. The second IPA is a tetrode amplifier with the RF carrier wave applied to the cathode. The video modulator video output is applied to the control grid. The second IPA provides 13 db power gain. The output of the second IPA is applied through the second directional coupler to the PA. The second directional coupler includes two diodes. The first diode rectifies a sample of forward power, and applies it to the second output power meter. The second diode in the directional coupler is set up to measure reflected power. The output of this reflected diode is applied to the PA input tuning meter. The third output of the second directional coupler is applied to the PA.

The PA is also a tetrode amplifier. The PA provides 10 dB power gain. The output from the PA is routed through the PA directional coupler to the patch panel. The patch panel allows routing of the RF outputs to an antenna or to a dummy load. The PA directional coupler incorporates two diodes: the forward diode indicates PA output power, the reverse diode indicates reflected power from the antenna or dummy load.

The first IPA, second IPA, and PA make use of resonant cavities rather than conventional tuning. The RF or carrier wave is applied to the cathode circuit of each power amplifier (IPA and PA).

c. Modulation. The SPT-3K/VHF accomodates three types of modulation: AM, FM, and video.AM is accomplished by the combination of the AM processing amplifier and signal generator. FM is accomplished by the FM processing amplifier, the synchronizer and the signal generator. Video modulation is accomplished by the combination of the video processing amplifier, the video modulator and the second IPA.

(1) Amplitude Modulation - Modulation is applied to the AM processing amplifier. The AM processing amplifier is a linear Class A/B pre-amplifier that provides a 7vp-p output signal for application to the external AM input of the signal generator. This provides sufficient drive for the modulation circuits in the HP608F to allow up to 95% modulation of the RF carrier (adjustable).

(2) FM Modulation - The FM processing amplifier is a low distortion audio amplifier providing about 6 dB of gain. Audio is applied to the FM processing amplifier. The output of the FM processing amplifier is applied to the modulation input of the synchronizer. When the synchronizer is set for frequency modulation, the signal from the FM processing amplifier causes the frequency control voltage output of the synchronizer to vary at the incomming audio modulation rate. The varying frequency control voltage causes the RF output frequency of the generator to deviate about the RF carrier at the audio rate, thus providing frequency modulation. The amount of FM deviation depends on the amplitude of the frequency control voltage variations. The rate of FM deviation depends on the frequency of the frequency control voltage changes.

(3) Video Modulation - In the video mode, the video processing amplifier receives from an external video source a complete waveform consisting of video signals, blanking and sync pulses. The video processing amplifier is not an amplifier in the true sense of the word since its gain is less than one, but has a main function to establish the waveform reference levels so that the transmitter is compatible to both positive and negative CCIR standards. Facilities are included to reverse the polarity of the

video signal for this compatibility. The processing amplifier makes it possible to radiate either positive or negative polarity video envelopes. The output of the video processing amplifier is applied to the video modulator. The video modulator is a current amplifier and applies the modulating signal to the grid of the second IPA.

d. Demodulator and Chopper. A sample of the PA rf output is directed to ~~two places for~~ testing purposes: ~~to external test equipment~~ where frequency deviation and percent of modulation ~~are measured and to~~ the demodulator and chopper assembly. The demodulator chopper is used for examining video signals. It removes the carrier from a sample of the transmitted composite video signal. The modulated video waveform is interrupted periodically, and sent to external test equipment where it can be eigher recorded or viewed on an oscilloscope. Chopping allows the oscilloscope to sync to the video waveform.

4-5. SCHEMATIC DIAGRAM DESCRIPTIONS GENERAL.

The schematic diagram descriptions that follow are provided only for portions of the SPT-3KVHF transmitter not separately described in additional technical manuals. Schematic diagram descriptions for the following transmitter equipment will be found in their respective technical manuals: Signal Generator HP608FR, Synchronizer HP8708A, Frequency Counter Systron Donner 1017, Prescaler Systron Donner 1979H, Attenuator assembly HP10514A.

4-6. SCHEMATIC DIAGRAM DESCRIPTION OF SIGNAL PROCESSOR ASSEMBLY (See Figure 7-1)

The signal processor assembly AX8025 controls the CW, FM, AM and VIDEO modulation inputs for the high and low bands. The signal processor assembly incorporates three modular plug-in units for the high band, three identical plug-in units for the low band, and two 24 vdc power supplies. The plug-in units are the attenuator control and AM processing amplifier AX8030 the FM processing amplifier AX8031 and the video processing amplifier AX8032.

a. Schematic Diagram Description of the Attenuator Control Assembly. (See Figures 7-1 and 7-2). The attenuator control and AM processing amplifier module plugs into jack J12 mounted on the signal processor assembly cabinet. The module consists of the attenuator control assembly and the AM processing assembly. The attenuator control assembly will be described first. The circuit consists of transistor Q1 and Q2. The attenuator control assembly functions as a dc amplifier, or as a dc keyer when in the CW mode. When the local-remote switch 1A6A2S1 is in the local position 24vdc from the power supply is coupled through pin 2 of J9, to pin 2 of J12. The 24vdc is then dropped across R1 to 20vdc and regulated by CR1. The 20vdc is routed through the local remote switch to the collector of Q1. Q1 is a dc driver amplifier that controls the on/off conditions of Q2. When the local remote switch is in the remote position, a 0- +15 vdc bias is applied to the collector of Q1 from an external unit. The 0- +15 vdc enters terminal 9 of TB1 and is routed to pin 15 of J12. When the signal is zero or ground, Q1 cuts off Q2 removing the current path for the attenuator assembly. As the input increases toward +15 vdc Q2 is turned on increasing the bias to the bridge in the attenuator assembly and lowering the resistance path for the current from the attenuator assembly. In the CW mode, a key is added in series with the remote gain control pot in the external unit. When the key is opened and closed the voltage varies from zero to the preselected voltage set by the remote gain control potentiometer. The output signal from Q2 is taken off the emitter and is applied to pin 7 of J12 and routed to jack J4.

b. Schematic Diagram Description of the AM Processing Amplifier. (See Figures 7-1 and 7-2). The AM processing amplifier is a class A audio amplifier that raises the audio modulation input signal from an external unit to levels sufficient to audio modulate the signal generator. The AM processing amplifier consists of transistor stages Q3, Q4, and Q5. When operating in the AM mode, relay K26 energizes and routes the audio signal to R11 and R12, and also routes the 24 vdc input through R9 across zener diode CR2 to provide regulated 20vdc for the transistor circuits. Relay K26 is de-energized for all other modes. When de-energized, 560 ohm resistor R10, is connected across terminals 10 and 12 to terminate audio input transformer T1. One side of the coil of K26 receives a +28 vdc through terminal 13 of TB1 and is routed to pin 11 of J12. The other side of the coil of K26 receives a -28 vdc through pin S of J9 which is routed to pin 3 of J12.

The audio input signal from the external unit is applied to terminals 14 and 15 of terminal board TB1 on the signal processor cabinet chassis. The signal is then applied to the primary of the 600 ohm AM input transformer T1 located on the signal processor assembly chassis, and is coupled to the secondary. From the secondary of T1 the signal is routed to pins 10 and 12 of J12. Relay K26 which is energized in the AM

mode applies the signal across R11 and R12 which are in parallel. The audio signal is developed across R11 and R12. R12 the AM gain control is adjustable so the desired amount of audio signal can be applied to the base of NPN grounded emitter transistor stage Q3. The amplified signal comes off the collector of Q3 and is coupled to the base of NPN emitter follower stage Q4. The base bias of Q4 is adjusted by R18. The signal is then taken off the emitter Q4 and directly coupled to the base of NPN emitter follower stage Q5, where it is applied to pin 8 of J12 through capacitor C4. The signal is then routed to the primary of AM output transformer T2, located on the signal processor cabinet chassis. The secondary output signal is applied to terminal board TB1 at terminals 16 and 17.

c. Schematic Diagram Description of the FM Processing Amplifier. (See Figures 7-1 and 7-3). The FM processing amplifier amplifies the audio input signal from an external unit, to a level sufficient to frequency modulate the synchronizer. The FM processing amplifier is a low distortion audio preamplifier with a gain of approximately +6 dBm. The audio signal enters the signal processor cabinet chassis through terminals 6 and 7 of TB1 and is applied to the primary of FM input transformer T3. The secondary output signal is applied to contacts 1 and 3 of energized AM/FM select relay K1 located on the signal processor assembly chassis. The signal then enters pin 7 of jack J11 and is applied to FM GAIN control 1A28R17. Control 1A28R17 adjusts the level of audio signal applied to the FM processing amplifier. The adjusted audio signal is then routed out pin 5 of J11 and coupled in pin 1 of J11 where it is applied to capacitor C1 and routed to pin 7 of the integrated circuit IC1. Resistor R1 is adjusted to produce the best linearity of an incoming audio sine wave over the required audio frequency response.

The integrated circuit board provides three stages of audio amplification before coupling the signal to the dc level shifting diodes. The dc level shifting diodes make the peak values of the audio signal acceptable to the last amplifier stage. The signal is then fed back through the RC network consisting of C6, C7, C8, R9, R11, and R13 to pin 4 on the IC (integrated circuit). The pre-emphasis network consisting of C9 and L1 adjusts the amount of feedback to pin 4. This enables the pre-emphasis curve to be compatible with FM broadcast requirements.

The pre-emphasis circuit functions in the following manner: by adjusting L1 the amount of high frequency negative feedback to pin 4 can be controlled. C9, L1 and R15 always have a high reactance to low frequency; therefore, the setting of L1 has little effect on the low frequency negative feedback; however, L1 can be adjusted to give the C9, L1, and R15 network a low reactance to high frequency. If this is done, the amount of negative feedback at high frequencies will be relatively low compared to the low frequency negative feedback, and the pre-emphasis curve will be as follows: high frequency output of the last amplifier stage in the IC will be higher than the low frequency output. This means the low frequencies will be attenuated compared to the high frequencies. The output signal is then taken off of pin 3 of the IC and applied to pin 15 of J11 and coupled to jack J3 mounted on the signal processor assembly chassis.

d. Schematic Diagram Description of the Video Processing Amplifier. (See Figure 7-4). The primary function of the video processing amplifier is to establish reference levels to drive the video modulator with either positive or negative video envelope polarities to meet either CCIR or U.S. national standards. The unit consists of two video amplifier stages Q1 and Q2, clipping circuit diode CR1 and a clamp coupler Q3 with an emitter follower output stage Q4. The video input signal enters the signal processor cabinet at jack J2 and enters the processing amplifier at J10-1. The video input signal is then processed across potentiometer R17 before being applied to the base of NPN stage Q1. The output of Q1 may be taken from either the emitter for a negative polarity (connections C-D) or the collector for a positive polarity (connections E-D).

The signal is then applied to the base of amplifier stage Q2. The emitter of Q2 is grounded across RC networks R9, R16, R18 and C4. Potentiometer R18 (Bias Adjust) determines the frequency response characteristics of the amplifier. The output of Q2 is then applied to the base of clamp coupler Q3, through C8 and C10 and across chopping diode CR1 and clipping adjust R1. CR1 is reversible for whichever polarity is in use. R1 is a front panel control called VIDEO REFERENCE LEVEL, its function is to adjust the video drive to the transmitter to give proper sync and black reference level to the output picture waveform. Q3 output is directly coupled to the base of emitter follower Q4. The output of Q4 is routed through CR3 to J10-14 and thence to J1 on the signal processor cabinet from where it is routed directly to J1 in the video modulator.

e. 24V Power Supply. (See Figure 7-5). The 24V power supply is a highly regulated, low ripple, power supply using a full wave rec-

tifier and a current limited series transistor regulator with zener diode reference. The +24V output supplies the FM processing amplifier, the AM processing amplifier, the attenuator control and the video processing amplifier. Input to the power supply (115 VAC) is applied to transformer T1. The secondary voltage is stepped down and rectified across bridge rectifier, CR2 and capacitor filtered. Control R8 is a front panel adjustment to adjust regulation at +24V; zener diode CR3 maintains the emitter of Q4 at a constant +12V reference regardless of load changes. Any change in output voltage is immediately felt at the base of Q4 through the arm of VOLTAGE ADJUST R8. Any change in the conduction of Q4 causes a corresponding change in series leg, Q1 and Q2. As the conduction of series regulator Q1 changes the voltage drop across R12 changes, thereby causing corresponding changes in output voltage.

The circuit of Q3 and tunnel diode CR1 provides protection against excessive current drain of Q1, Q2, and Q4. CR1 holds Q3 in a non-conducting state until the voltage across it exceeds .3V. Q3 conducts, cutting off Q4, which in turn cuts off the current through series leg Q1 and Q2, thereby preventing damage to the regulating elements. R11 is adjusted to develop .3V across CR1 when the current drain exceeds 1.5A. Additional protection to the circuitry is provided by F2, a .5A fuse. Failure of the 24V supply deenergizes K1, closing contacts 6 and 14, energizing the overload trip relay. The negative return for K26 in the attenuator control and AM processing amplifier is interrupted when contacts A and B of K1 open. This prevents the application of audio to the AM processing amplifier when the +24V supply voltage is not present.

4-7. SCHEMATIC DIAGRAM DESCRIPTION OF THE VIDEO MODULATOR (See Figure 7-6).

The video modulator receives three inputs: -40 vdc at J2, -120vdc at J3 and offset video at J1 from the video processing amplifier. The purpose of the video modulator is to amplify the video from the video processing amplifier to a level sufficient to grid modulate the 2nd IPA. The output of the video modulator is a fluctuating dc voltage that replaces the normal bias to the 2nd IPA during video transmission. In the video mode the normally closed contacts of K23 open and the normally open contacts close. The output stage of the video modulator consists of two identical circuits: one set comprises transistors Q3 through Q6, and the other set comprises Q7 through Q10. These circuits, if the video signal is not considered, are a voltage divider with both circuits conducting equally. The voltage at J4 will be -90 vdc, the midway point of negative dc voltage inputs when the video processing amplifier is properly adjusted (refer to page 5-29). To generate the fluctuating video signal at output jack J4, the balance between these two circuits must be upset. This is done by applying the same signal 180 out-of-phase to the two circuits. Assume the positive sync portion of the video signal is present at input, J1. This positive going signal is coupled through R39 to the base of Q1. The signal at the collector of Q1 is negative going and positive going at the emitter. Since Q2 is a PNP transistor, this has the effect of a negative going pulse applied to the base of Q2. Q2 conducts more. This couples the positive going pulse from the collector of Q2 to the emitter of Q11, and the positive pulse is routed from Q11 and R6 to the base of Q5. Since the same pulse is being applied in a negative going direction to the base of Q9, the inputs at Q9 and Q5 are 180° out of phase. As the pulse applied to Q5 is positive going, Q5 tends to turn on more while the pulse is present. Conversely, the negative pulse applied to Q9 tends to turn Q9 off. As Q5 conducts the signal at the collector of Q5 goes more negative, and the signal at the emitter goes more positive. The positive going signal at the emitter of Q5 is applied to the base of Q6; the negative going signal at the collector of Q5 is applied to the collector of Q6. These signals tend to increase the conduction of Q6. The negative going signal is also applied to the emitters of Q3 and Q4. This is the same effect as positive going signals applied to the bases of Q3 and Q4. Since Q3 and Q4 are NPN's, they also turn on.

It can be seen that the positive going signal applied to the base of Q5 has increased the conduction of Q3, Q4, Q5, and Q6. The network consisting of Q7, Q8, Q9 and Q10 has decreased conduction due to the negative signal at the base of Q9. The effective resistance of the Q3 through Q6 circuit has decreased while the resistance of the Q7 through Q10 circuit has increased. This upsets the balance of the voltage divider network and the voltage at J4 becomes less negative, or approaches -40vdc. The exact level of dc voltage depends upon the imbalance created. This is controlled by the level of the video modulation signal. During the time that the black and white video information is present (sync signal not present) the video input signal becomes negative going and the functions of the circuits are reversed. This causes the video signal at output jack J4 to swing more negative towards -120vdc. Capacitor resistor networks at jacks J2 and J3 serve as broadband filters for the dc inputs. Zener diode CR1 clamps the collector voltage of Q1 at some point that maintains the black and white reference levels. Diodes CR2, 3, and 4 act as a dc level shifter to bring the signal from Q1 into the correct operating range of Q2. Failure of blower BL1 would open contacts of the air interlock switch interrupting the closure in the interlock chain.

4-8. SCHEMATIC DIAGRAM DESCRIPTION OF THE AMPLIFIER CHAIN

a. 1ST RF Amplifier Assembly. The 1st RF amplifier is a sealed solid state, wide band, fixed tuned RF amplifier. Nominal gain of this assembly is 37 db. Frequency coverage is 30 MHz to 150 MHz in the low band and 150 MHz to 350 MHz in the high band. Input to the 1st RF amplifier is routed through the atten-

uator assembly. The amplified RF signal is sent through the coupler to the cathode of the 1st IPA amplifier. Minus 24vdc is applied to the 1st RF amplifier

b. 1ST IPA Amplifier Low Band. (See Figure 7-7). The 1st IPA amplifier uses a Machlett 8403 triode tube in a grounded grid configuration, operating class B linear in the 30 to 150 MHz range. The input and output tuned circuits use 6 bands to cover the frequency range. The input circuit is broadbanded and requires no fine tuning. A basic coil provides a path for filament current during bandswitching and resonates with the input capacity of the tube in the lowest frequency band. Coils are switched in parallel with the basic coil to resonate in the higher frequency bands. The output circuit is a high Q tuned circuit that utilizes a variable capacitor in parallel with the output capacity of the tube to resonate with a selected inductor across its frequency range. Each output coil is tapped to provide maximum power and optimum coupling to a 50 ohm load.

c. 1ST IPA Amplifier High Band. (See Figure 7-8). The 1st IPA stage uses a Machlett 8403 triode tube in a grounded grid class B linear amplifier. The input and output tuned circuits are foreshortened quarter-wave coaxial cavities with adjustable sliding shorts for tuning. One adjusting knob tunes input and output simultaneously. The input is a low Q, H-field coupled circuit with a 50 ohm nominal input impedance through the operating range of 150 to 350 MHz. The output circuit is a high Q, E-field coupled and optimized for operation into 50 ohm load.

d. 2ND IPA Amplifier Low Band. (See Figure 7-9). The second IPA amplifier uses a 7213 RCA tetrode as a grounded grid class B linear stage. The output circuit tunes 30 to 150MHz in two bands. A 50 pf capacitor is switched in to tune the low end of the band. The input circuit uses a variable inductance along with the tube capacitance to resonate in the 30 to 150 MHz region. The output circuit utilizes adjustable strip line to resonate with the output capacity of the tube between 75 and 150 MHz. A 50 pf capacitor is added to tune to 30 to 80 MHz range. A variable capacitor is used to provide optimum coupling into a 50 ohm load.

e. 2ND IPA High Band. (See Figure 7-10). In the 2nd amplifier stage an RCA 7231 tetrode is used in a class B linear amplifier stage. The input and output tuned circuits are foreshortened quarter-wave coaxial cavities with adjustable sliding shorts for tuning. The rf input is H-field coupled into the cathode tank and displays a nominal 50 ohm impedance. In the output tank circuit E-field coupling is used for rf output. The coupling is optimized for maximum output, in the 150 to 350MHz range, into a 50 ohm load.

f. PA Amplifier Low Band. (See Figure 7-11). The PA amplifier uses an RCA 8501 tetrode tube in a grounded-grid configuration, operating class B linear in the 30 to 150 MHz range. The output circuit uses two bands to cover the frequency range. The input circuit uses a variable inductance to resonate with the input capacity of the tube between 30MHz and 150MHz. The output circuit utilizes an adjustable strip-line to resonate with the output capacity of the tube between 75 to 150MHz. A 50 pf capacitor is added to the tuned circuit for the 30 to 80MHz range. A variable capacitor is used to provide optimum coupling to a 50 ohm load.

g. PA Amplifier High Band. (See Figure 7-12). The PA amplifier is identical in electrical design and operation to the 2nd IPA amplifier (high band). Physically it is much larger to accomodate the larger tube and high power levels. The RCA 8501 tetrode is used in this application.

4-9. VSWR OVERLOAD ASSEMBLY. (See Figures 7-13 and 7-14).

The VSWR overload assembly receives a dc voltage from the reflected power diode on the PA output directional coupler. If the VSWR overload diode output exceeds +.5vdc the VSWR overload relay K21 energizes, interrupting the closure in the interlock circuits. The PA reflected diode output is applied to V1 of the VSWR overload assembly. When the signal at J1 is positive-going the output of integrated circuit IC1 is also positive going. This positive-going signal is applied to the base of transistor Q1. The conduction of Q1 decreases, causing its collector voltage to become more negative. This negative-going voltage is applied through R9 to the base of transistor Q2. Q2 functions as a collector follower. With the signal on the base of Q2 going negative, the signal at the Q2 collector is positive-going. This positive-going signal is applied to the base of Q3 causing it to increase conduction. The coil of K21 is in series with Q3. When the current through Q3 reaches sufficient value, relay K21 energizes, interrupting the interlock circuits. The contact closures of K21 will trip the overload trip relay, 1A16K11 and light the overload indicator lamp, 1A16DS84. The relationship between input signal at J1 and the current level of Q3 is controlled by potentiometer R1. To align the VSWR overload a regulated current (+7vdc) is applied to J1 and R1 is adjusted to energize K21.

4-10. SCHEMATIC DIAGRAM DESCRIPTION OF THE POWER SUPPLY ASSEMBLY, 12V (See Figures 7-13 and 7-14.)

This power supply provides plus or minus 12V outputs for operation of the AX8037, VSWR overload assembly. There are two 12V supplies within the AP-141 assembly. Polarity of the output voltage from the supply is determined by its position in the assembly. The supply mounted on the left produces +12V due to ground available at pin 12 of the VSWR overload assembly. The supply on the right produces -12V. The model AP-141 is a regulated, full wave bridge rectified supply. AC input (115V AC) is applied to pins 8 and 15 of P1 for application to transformer, T1. The rectified output from bridge rectifier, CR-2 is adjusted for 12V regulation by VOLTAGE ADJUST R1. Zener diode, CR5 maintains the emitter of Q3 at a constant 4.7V reference. Diodes, CR4-1, 2, 3, and 4 maintain

a bias reference for the base and collector of Q3. Load changes felt at the arm of R1 cause corresponding changes in the conduction of Q3. Increasing load changes cause Q3 to conducto more causing series regulators Q1 and Q2 to also increase. The effective resistance of the series regulators decreases, thereby causing less voltage drop through them bringing the output back to normal. Zener diode CR3 protects Q1, Q2, and Q3 against excessive current drain by curring Q3 off when limits are exceeded.

4-11. SCHEMATIC DIAGRAM DESCRIPTION OF THE VIDEO DEMODULATOR CHOPPER (See Figure 7-15).

The purpose of the demodulator chopper assembly is to demodulate the video modulated rf samples from the power amplifiers of the transmitter and to chop or periodically interrupt these signals making them suitable for video tape recording or viewing on a waveform monitor such as an oscilloscope. The unit consists of four identical circuits, one for each channel.

The rf sample from the power amplifier is applied to jack J1 of the demod chopper. Capacitors C2 and C3 are adjusted to allow the demod chopper circuits to match the high or low band frequency ranges. The signal is then coupled to the base of Q3 through C4. At this point it is still a video modulated rf signal. When S1 is in the chopper position or the wiper is connected to ground, oscillator Q1 begins to oscillate. The oscillator output on the collector of Q1 is applied to the base of Q2. During the positive half cycle of the Q1 output, Q2 is turned on grounding the signal at the input to C4. This removes the rf input to the base of Q3. During the negative half cycle of Q1 output, Q2 is turned off and the video modulated rf signal is coupled through C4 to the base of Q3. Since Q1 is free running oscillator, this means that the video modulated rf signal at the input to Q3 will be alternately shorted to ground and present, chopping the signal.

When S1 is in the off position, the positive bias applied to the base of Q1 is increased. Conduction through Q1 therefore increases. The voltage at the collector of Q1 decreases or turns less positive. This tends to turn off Q2 and at the same time Q1 stops oscillating. Since Q2 now presents a high resostance from C4 to ground the video modulated rf signal will be coupled through C4 to the base of Q3 with no chopping. Q3 is a grounded emitter amplifier. The chopped or unchopped video-modulated rf signal is coupled from the collector of Q3 through C7 to a detector and demodulator network consisting of CR3, CR4, C9, R11, C10, C11, and R12. The rectified and detected output of the detector network is applied to the base of emitter follower Q4. The output of Q4 is applied to the base of grounded emitter amplifier Q5 and from there it is coupled through C12 to J2, the output. R1, CR1, and C1 form a filter for the +24vdc input from the master control assembly network. Filter network consisting of C5, L2, and C8 provides rf filtering for the 24 volt dc input. L1 adjusts the frequency response characteristics of the Q3 output stage to match the frequency range of the high or low band.

4-12. INTRODUCTION TO SCHEMATIC DIAGRAM DESCRIPTION OF CONTROL CIRCUITS (See Figure 7-16)

Figure 7-16 is a simplified schematic drawing of the control circuitry within the SPT-3KVHF transmitter. This drawing illustrates the conditions necessary to apply 3 phase power to the filament and power supply transformers, control functioning to select various modes of transmission, indicator lamp circuitry and overload circuitry to protect the transmitter. The following discussions in paragraphs 4-13 through 4-16 are typical of all four channels in the transmitter.

4-13. APPLICATION OF PRIMARY AC TO FILAMENT, BIAS, SCREEN AND PLATE SUPPLIES (See Figure 7-16).

a. Filament and Bias Supplies. Upon closure of the main circuit breaker, CB8 two of the three input phases are available at the control circuit breaker, CB7. Closure of the control breaker applies AC input to the primary of transformer, 6A1T1. Closure of start switch, 1A16S24A applies 115 V AC from secondary of transformer 6A1T1 to relay 1A16K1 energizing this relay and closing its associated contacts. Relay 1A16K2 will also energize providing that 2nd IPA and PA air switches, video modulator, screen supply and grid bias and modulator supply interlocks are closed. Closure of 1A16K2 contacts routes 115VAC to relay 1A62K1 through two sets of normally closed contacts. The normally open contacts of 1A62K1 in the filament assembly close applying the 3 phase input from the main circuit breaker, CB8 to the filament transformers. Reduced filament voltage is available at this time due to surge limiting resistor, 1A52R1 in the phase 2 line. Full filament voltage is available when 3 second Filament Time Delay relay 1A62K4 energizes closing its associated contacts across the surge limiting resistor. To protect against filament overloads phases 1 and 3 pass through current overload relays, 1A62K1A1 and 1A62KA2. If the filament current becomes excessive the normally closed contacts of the overload relays open, de-energizing relay, 1A62K1 removing the 3 phases from the filament transformers. It is to be noted that when all conditions necessary to apply 3 phase power to the filament transformers are satisfied, relay 1A62K2 will also be energized applying 3 phase power to the bias and modulator supply.

b. Screen and Plate Supplies. All relays, switches and circuit breakers necessary to apply AC input to the filament and bias

supplies must be actuated. Note that one phase of AC input is applied to PA plate T/D relay that energizes after a 5 minute time delay. This relay energizes 2 sets of normally open contacts. One of these contacts applies +28V to the ready lamp 1A16DS82 causing it to light. The other set routes the 115VAC control voltage phase from the external interlock terminal on 1A42TB3 and the front panel interlock on the screen supply fuse panel assembly to normally open contacts on relay 1A16K3. Plate control relay 1A16K3 is energized when the PLATE switch 1A16S25 is depressed and when there is a closure on REMOTE PI BYPASS switch 1A16S30 to the neutral line. Note that filament and bias voltages can be obtained with the right and left door interlocks open; however, these interlocks must be closed in order to energize plate control relay 1A1K3 and to apply power to the screen and plate supplies. The closure of 1A16K3 applies one leg of 115 vac immediately to relay 6A1K6 thru normally closed contacts of time delay relay 6A1K4 closing contacts of 6A1K6, bringing full 3 phase power through fuses 1A21F6, F7, and F8 to the contacts on screen supply relay, 3K1. 3 phase input is also applied to H. V. transformers 6A2T1 through 5 ohm series dropping resistors 6A1R11, R12, and R13 initially reducing the high voltage output to a lesser value. Relay 6A1K4 energizes 1 second after 6A1K6, opening its normally closed contacts and closing its normally open contacts. Relay 6A1K6 is now held energized by 6A1K4. Screen supply relay 3K1 is now energized routing 3 phases to screen supply. Plate surge relay 6A1K5 is energized shorting the 5 ohm resistors and supplying full 3 phase input to HV transformer 6A2T1.

4-14. OVERLOAD CIRCUITRY (See Figures 7-16 and 7-13).

If no overloads have occured, all the conditions required to apply primary power to the bias, screen, plate and filament supplies are present. An overload trip in the 1st IPA, 2nd IPA, PA, 24 volt supply, screen supply, VSWR or bias supply will interrupt primary power to the HV and screen supplies. Since all overload circuits operate essentially the same, an explanation of the VSWR overload circuitry only is given. The VSWR overload relay 1A8A4K21 consists of two sets of contacts. The movable contact of the top set is connected to one leg of the 115vac line; its stationary contact is connected to one side of the trip relay 1A16K11. The bottom set of contacts is connected to a memory module circuit that uses an SCR to indicate which overload has tripped. Assume that the reflected power of the transmitter has exceeded its preset limit. The contacts on the overload relay, 1A8A1K21 close. The top set, connected to the trip relay energizes it, causing its normally open contact to close, lighting the main overload indicator 1A16DS84. The trip relay also opens its normally closed contact interrupting the control voltage necessary to obtain primary power to the screen and HV supplies. The closing of the bottom set of contacts on the VSWR overload relay provides a current path through the two IN4004 diodes and the 10K resistor causing the gate of the SCR in network Z6 to go positive. The SCR conducts causing a current path through the VSWR overload lamp. Depressing the overload reset button 1A16S28 restores the trip relay to its normal operating position, extinguishing the overload lamp located in the reset button and applying primary power to the screen and plate power supplies. The VSWR overload lamp 1A16DS102 will remain lit since the SCR continues to conduct even though the gating pulse is no longer present. (The contacts on the SWR overload relay returned to the normally open position when the trip relay removed primary power). Depressing the overload indicator reset button 1A16S29 restores the SCR to a non-conducting state extinguishing VSWR overload lamp 1A16DS102.

4-15. MODE SELECTION CIRCUITRY (See Figure 7-16).

There are four pushbutton indicator lamps on the front panel to select and to indicate the mode of operation: CW, AM, FM and Video. Selection of a mode should only be made when all the mode selector indicators are out and the SELECT MODE indicator 1A16DS83 is lit. The mode switches on the simplified schematic are shown in the "off" position.

a. CW Mode Selection. (See Figure 7-16). Depressing the CW mode selector 1A15S35 swings the 2 movable contacts to the left. This applies +28V to CW indicator lamp 1A16DS91 and attenuator control relay 1A28A5K25. The lamp lights and the relay energizes, opening its normally closed contacts in the AM processing amplifier (see figure 7-2). This removes the ground path for Q1 in the AM processing amplifier so that the ground may be supplied by a telegraph key.

b. AM Mode Selection. (See Figure 7-16). Depressing the AM mode selector, 1A16S36 supplies +28V to AM indicator lamp 1A16DS92 and relays 2K2, 1A16K5, 1A28A5K26 and 1A20A2K2. The lamp lights and the relays energize. The following functions are performed: relay 1A16K5's normally open contacts close applying 28V power to the coil of relay 2K1 to energize closing its normally open contacts (see figure 7-18) routing bias voltages to J1 of the bias supply. Relay 2K2 also energizes causing its normally open contacts to close bypassing zener diodes CR8 through CR13 in the bias and modulator supply unit. This reduces the bias output.

Energized relay 1A28A5K6 routes +24V to the AM processing amplifier section through its normally open contacts. The normally closed contacts open and remove R10, a 560 ohm resistor, from the audio input line to the AM processing amplifier. Incomming audio is applied through closed contacts to the base of transistor Q3 in the amplifier. Bias control assembly relay 1A20A2K2 is energized and its normally closed contacts open, removing bias voltage from the video modulator since it is not necessary to supply the -40 and -120V to this unit when operating in AM mode.

c. FM Mode Selection. (See Figure 7-16). Depressing the FM mode selector, 1A16S37 lights FM indicator lamp 1A16DS93 and energizes relay 1A28K1 in the signal processor cabinet assembly. This relay routes the audio input from FM input transformer to the input of the FM processing amplifier.

d. Video Mode Selection. (See Figures 7-16 and 7-18). When all of the mode selector buttons are extinguished the following circuit conditions are present: relay K2 in the bias and modulator supply is de-energized and its contacts are in the "video" position. Relay 2K1 is de-energized, its normally open contacts are open and the source of bias to filter capacitor C4 in the bias and modulator supply is removed. However, C4 is still charged when changing from one mode of operation to another. Relay K5 is held energized due to the charge on C4. C4 begins to discharge through bleeder resistors R7, 8 and 9, and through K5, the mode select relay. When C4 is discharged, relay K5 de-energizes and its normally open contacts close. This causes the SELECT MODE lamp to light. The video select slave relay K3 energizes (through closed contacts 1 and 4 of relay K5) and its normally closed contacts open. This disconnects the bias output from J1.

Depressing the VIDEO button, lights the video indicator lamp 1A16DS94 and energizes the latch winding of relay 1A16K12, closing its normally open contacts. This energizes relays 2K1 and 1A19K29. 1A19K29 operates a relay in the video modulator and connects the video output of the modulator to the grid of the 2nd IPA. When relay 2K1 energizes, its contacts close applying voltage to filter capacitor C4 which begins charging. When C4 is charged mode select relay K5 energizes and its normally open contacts open. The select mode lamp goes out. The video select slave relay de-energizes, its contacts close connecting the bias output to J1. When video mode is selected the AM bias relay K3 is de-energized and the bypass of CR8 through CR13 is removed. Therefore, the bias voltage out pin 24 of connector J1 is -120V. This voltage is required to operate the video modulator.

4-16. INDICATOR LAMP CIRCUITRY FOR START, PLATE ON, SELECT MODE AND READY (See Figure 7-16)

"Start" lamp, 1A16DS80 lights whenever Start Switch 1A16S24 is closed and relay 1A16K1 energizes supplying +28V to the lamp. Plate lamp 1A16DS81 lights whenever the PLATE switch 1A16S25 is closed and relay 1A16K4 energizes. The operation of the select mode lamp was covered in the discussion on video mode selection. Ready lamp 1A16DS82 lights when the 5 minute time delay of 1A52K3 has expired.

4-17. SCHEMATIC DIAGRAM DESCRIPTION OF BIAS, SCREEN, FILAMENT AND PLATE SUPPLIES

a. Bias and Modulator Supply. (See Figures 7-16 and 7-18). The bias and modulator supply AP-139 provides all negative voltages required in the transmitter. Four of these power supplies are employed in the transmitter system, one for each channel.

Primary voltage input to transformer T1 is 208 volts, 3 phase. The supply uses a 3 phase full-wave bridge rectifier (CR-1) and zener diode regulation. Bias overload relay K4 is connected in the positive return of CR1 to provide overload protection. R11 is the bias overload adjustment. Closure of contacts on K4 provide overload light indication and energize overload trip relay 1A16K11.

Choke input filters L1, C1 and L2, C2 filter out the AC components. R5, R10 and zener diodes CR4, 5 and 6 provide bias voltages for the 2nd IPA and PA stages. These voltages are sent to the bias control circuit through 2 power transistors, Q1 and Q2. to provide a variable output of fixed bias. The bias for the 2nd IPA is routed through K29 in the video modulator via normally closed contacts for CW, AM and FM modes of transmission. When operating in the video mode K29 energizes, opening its contacts so that bias may now be provided to the 2nd IPA by the video modulator. At pin 23 of J1 is -24vdc for the 1st RF amplifier.

When operating in the video mode K1 energizes, routing the -220V through dropping resistors R1, 2 and 3 to provide -120 at the top of zener stack CR8 through CR21. The -120 is routed through normally closed contacts of the video select slave relay to pin no. 24 of J1. Negative 40vdc is available at pin 22 of J1. These are the voltages necessary for operation of the video modulator.

When operating in the AM mode, K1 and K2 energize. The contact of K2 moves to the AM position energizing the AM bias relay. The video select relay contacts open through the latching action and the AM bias relay contacts close. This provides a path from the -80V tap at R14 to pin 24 at J1. This voltage is necessary for operation of the AM modulator. Relay K5 prevents any mode changes until charge on C4 has diminished.

The failure of blowers BL1 and BL2 open the contacts of S1 interlock switch. This would interrupt the application of primary power to all supplies.

b. Regulated Screen Power Supply. (See Figures 7-16 and 7-19). The screen power supply provides the regulated screen voltages for the 2nd IPA and PA stages. Four of these supplies are employed in the transmitter system.

The screen power supply uses a 208vac three phase input with full wave rectification. Voltage regulation is provided by means of series fed zener diodes with a tap in the series for the 2nd IPA screen circuit.

Primary power for transformer T1 is through relay K1. The secondary of T1 supplies the full wave 3-phase bridge rectifier comprised of CR1 through CR12, compensating resistors R1 through R12 and suppressor capacitors C1 through C12.

The negative end of the bridge is connected to ground through screen overload relay K2. The contacts of K2 provide overload indication on the front panel and energize trip relay 1A16K11.

L1, C1 and C2 provide filtering of the AC components. Zener diodes CR1 through CR10 provide a regulated +1000 vdc at J3 for the screen of the PA tube. Zener diodes CR1 through CR7 provide +700 vdc at J2 for the screen circuit of the 2nd IPA.

Failure of the blower BL1 would open contacts of air interlock switch S1 interrupting primary power application to all supplies.

c. Filament Control. (See Figures 7-16 and 7-17). The filament supply utilizes 3 transformers to supply filament voltages to the 1st IPA, 2nd IPA and PA stages.

Upon closure of K1, 2 phases are applied to T202, the 2nd IPA filament transformer and T203, the 1st IPA filament transformer. Secondary output of T202 is 5.5 vac at 1.75 amps. Secondary output of T203 is 6.0 vac at 1.25 amps.

Primary input to T201 PA filament transformer is routed through filament surge resistor R1 until the 3 second filament time delay relay K4 energizes shorting R1 and applying full primary voltage to T201. Secondary voltage of T201 is 4.5V at 1.25 amps.

d. 6.25 KV Plate Power Supply. (See Figures 7-16 and 7-20). The 6.25KV plate power supply provides plate voltages for the 1st IPA, 2nd IPA and PA stages of the transmitter.

The transformer, T1 uses 208V, three phase input power. This supply incorporates three independent power supplies (one for each power amplifier in the chain) using a common 3-phase transformer. The high level outputs are:

1000vdc, 120ma to 1st IPA
2300vdc, 460ma to 2nd IPA
6250vdc, 1.4 amps to PA

Transformer T1 has a single set of primary windings and 3 sets of secondary windings on a common core. Each secondary feeds a conventional 3 phase full wave bridge rectifier and choke input filter section, as well as the bleeder resistors across each filter for safety and load regulation.

The semiconductor diode stacks CR1 through CR18 are series diodes with parallel equalizing resistors and surge suppression capacitors. The number of diodes per card in the silicon rectifier assembly is determined by the output voltage of each section and its specific use in the transmitter.

The negative end of each rectifier is brought out to a terminal board TB2 and is available for return to ground through external overload relays. E1 through E3 are spark plug gaps connected across these external returns to provide protection for the external equipment against surges or inadvertant loss of ground on the negative returns.

All connections in and out of the power supply are made through the plate control unit with the exception of the 6.25 KV supply output which is terminated inside the supply cabinet and is available directly to the plate lead coaxial cable.

4-18. MASTER CONTROL WIRING. (See Figure 7-21)

The master control circuit supplies AC power for the tuning motor circuits and left and right rack equipment. It also supplies +28vdc for the door

interlocks, mode selection, overload control, and demodulator chopper. Closure of miscellaneous control breaker CB1 supplies power to the tuning motor circuits and energizes 28vdc primary power relay K1. The normally open contacts of K1 close, supplying three phase input to transformer T1 through front panel neon indicator fuses, F1, 2, and 3. The secondary is applied to full wave bridge rectifier CR1. The +28 vdc output of CR1 is filtered by C5, fused by neon indicator fuse F4, and applied to terminals 6 and 8 of TB1. Terminal 6 supplies +28vdc to the mode selection and overload circuits. Terminal 8 is applied to the right door interlock for protection control. Closure of left and right rack circuit breakers CB2 and 3 supply 115 vac power to left and right rack equipment.

SECTION 5

MAINTENANCE

5-1. INTRODUCTION

This section contains maintenance procedures for TMC manufactured equipment. Maintenance for vendor supplied equipment (Hewlett Packard, Systron Donner) is covered by the associated vendor technical manual. This transmitter has been thoroughly tested and aligned before shipment, and with normal usage should function as described in the previous sections. However, as in all electronic devices, occasional failure of a component may result in malfunctioning, necessitating maintenance action. This section is divided into segments to facilitate its use in the adjustment, alignment, maintenance, and repair of the transmitter.

5-2. PREVENTIVE MAINTENANCE

Preventive maintenance detects and corrects trouble producing conditions before they become serious enough to effect equipment operation. Trouble producing conditions are dirt and grime, contact erosion, improper contact pressure, lack of lubrication, improper relay adjustment, dirty air filters, overheating unstable power supplies, and loose parts (due to vibration). The recommended schedules for preventive maintenance follow:

a. Operator's Performance Record Check. Check the operators performance record for irregularities and possible sources of future trouble. Observe all electrical quantities measureable with the built-in meters and compare observations with established standards or irregularities. Observe indicator buttons (switch/lights) for abnormal operations, once each shift during an "On The Air" period.

b. Visual Check. Visually and manually inspect all parts in the transmitter for overheating and damage daily during an "Off The Air" period. Inspect all sliding or moving bandswitch contacts. Check the operation of all interlocks. Table 5-1 lists the location and function of all interlocks.

TABLE 5-1. INTERLOCK LOCATIONS AND FUNCTIONS

QTY	INTERLOCK	LOCATION	FUNCTION
(2)	Door Interlocks	Located on top right and left door closure	Prevent application of HV unless doors are closed
(4)	PA AIR switches	Located in PA Blower Assemblies	Prevent application of HV to PA stage without cooling
(4)	2nd IPA AIR switches	Located in 2nd IPA Blower Assemblies	Prevent application of HV to 2nd IPA stage without cooling
(4)	Bias Supply AIR switches	Located in Bias supply Assembly	Prevent application of 3-phase power to Bias supply without cooling
(4)	Screen Supply AIR switches	Located in Screen Supply	Prevent application of 3-phase power to Screen without cooling
(4)	Video Modulator AIR switches	Located in Video Modulator	Prevent operation of Video modulator without cooling
(4)	Access Panel Interlocks	(2) Located behind each Access Panel	Prevent application of HV with panel off
(4)	External Interlocks	(2) Located behind each Access Panel	Provide additional external interlock protection if needed.

c. General Cleaning and Lubrication. Monthly during "Off The Air" periods check and recondition rotary and switch contacts as necessary. Use crocus cloth and trichlorethylene or ethylenedichloride for cleaning. Inspect and clean the transmitter. Check the condition of the filters. Replace or clean dirty filters. Inspect the transmitter for loose screws, especially in those areas in which appreciable vibration occurs. Note the

condition of gear trains, those showing signs of becoming dry should be lubricated with a drop or two of any high quality, light machine lubricant. Check the condition of all modular units.

d. Cavity Cleaning and Lubrication.

1. Remove tube access plate.

2. Remove the tube being careful not to touch the ceramic portions. Pull the tube straight out using the tube pullers supplied.

3. Clean the contacts with a carbon tetrachloride or freon 11 solution. The entire end of the cavity may be submerged in a cleaning solution if necessary. The anode by-pass area should also be cleaned. If the tube is dirty it too may be cleaned in either of the above named solutions.

4. Lightly oil the drive mechanism.

5. Reinsert the tube making sure it is properly aligned before any pressure is applied to seat the tube.

6. Replace the tube access cover.

5-3. PRE-OPERATIONAL CHECK OUT PROCEDURES

The following pre-operational procedures assume the transmitter to be installed in the desired location, and all intercabling, and antenna or dummy load connections made. Pre-operational checks are divided into mechanical and electrical.

a. Mechanical Check-Out.

1. Set all MAIN breakers to OFF.

2. Check all manually operated controls on all of the channel tuning control assemblies. Counter-clockwise rotation of tuning controls will cause the counter numerical values to increase; clockwise rotation of the tuning controls must cause the numerical values to decrease.

3. Check the following switch/indicators to assure proper operation. Each button has a spring loaded switch and when depressed a "click" must be heard. When depressed again the button must return to its normal state.

Mode Switches:

CW

AM

FM

VIDEO

Control Switches:

START

PLATE

O/V RESET

REMOTE PI BY-PASS

Push to Light - Read Volts Switches (1st IPA):

GRID

PLATE

Push to Light - Read Volts Switches (2nd IPA):

GRID

SCREEN

PLATE

Push to Light - Read Volts Switches (PA):

GRID

SCREEN

PLATE

b. Electrical Check-Out. Perform the pre-operational electrical checkout as per table 5-2.

WARNING

ALL PROTECTIVE COVERS MUST BE AFFIXED TO TRANSMITTER PRIOR TO PERFORMING ELECTRICAL CHECK-OUT. EXTREMELY HIGH VOLTAGES AND CURRENTS ARE GENERATED WITHIN THIS EQUIPMENT. EXPOSURE TO HIGH VOLTAGE POTENTIALS MAY CAUSE LOSS OF LIFE.

TABLE 5-2. ELECTRICAL CHECK OUT PROCEDURES

STEP	OPERATION	NORMAL INDICATIONS
1	Place the Channel 1, 2, 3, 4 MAIN Breakers to the ON position.	1st IPA blower, 2nd IPA blower and PA blower must come on for channels 1, 2, 3, 4.
2	Place the control breakers to the ON position.	No indications.
3	Place the LEFT RACK breaker to the ON position.	Breaker applies 115VAC to left rack; -24vdc P/S indicators must light.
4	Place the RIGHT RACK breaker to the ON position.	Breaker applies 115VAC to right rack -24vdc P/S indicators must light.
5	Place the MISC CONTROLS breaker to the ON position.	The 24vdc indicator on the left rack, and the -12vdc and +12vdc on the right rack must light.
6	Press the following switch/ indicator buttons twice.	When pressed the first time, the indicator will light; when pressed the second time, the indicator will be extinguished.
	a. Mode Switches: CW FM AM VIDEO	
	b. Control Switch Indicator Buttons: START O/L RESET O/L IND RESET REMOTE PI BY-PASS	
	c. 1st IPA Voltage and Current Meter Buttons: GRID PLATE	
	NOTE The 1st IPA, 2nd IPA and PA meters have a dual function. The meters will read voltage or current depending on the state of the indicator (on or off). Meter values are indicated on Table 5-3. These values will be for static conditions ONLY.	
	d. 2nd IPA Voltage and Current Meter Buttons: GRID SCREEN PLATE	
	e. PA Voltage and Current Meter Buttons: GRID SCREEN PLATE	

TABLE 5-2. ELECTRICAL CHECK OUT PROCEDURES (Cont)

STEP	OPERATION	NORMAL INDICATIONS
7	Place the attenuator controls on the signal generators of all channels to their extreme counter-clockwise positions.	No indications
	NOTE When lit the READY light indicates that high voltage can be applied to the transmitter. The SELECT MODE light indicates that a mode of operation can be selected.	
8	Adjust 1st IPA BIAS CONTROL for a plate current reading of .07 ma as indicated on the 1st IPA PLATE current meter.	1st IPA PLATE current meter reads .07 ma.
9	Adjust 2nd IPA BIAS CONTROL for 40v.	2nd IPA GRID voltage meter reads 40v.
10	Adjust PA BIAS CONTROL for 50v.	PA GRID voltage meter reads 50v.
11	Depress REMOTE PI BY-PASS button.	When indicator lights transmitter is in LOCAL position. When indicator is out transmitter is in REMOTE position.
12	Depress PLATE button.	High voltage will be applied to transmitter.
13	Observe meter indications of all meters listed on table 5-3.	Indications should be as per table 5-3.
14	Repeat steps 6 through 13 for all four transmitter channels.	

TABLE 5-3. TRANSMITTER STATIC LEVELS

NOTE

The meter values listed below are for static conditions: (1) no rf drive from signal generators, (2) Push to read volts, position of the pushbuttons and (3) START button depressed.

CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
1ST IPA-	1ST IPA-	1ST IPA-	1ST IPA-
PLATE 1000V	PLATE 1000V	PLATE 1000V	PLATE 1000V
2ND IPA:	2ND IPA:	2ND IPA:	2ND IPA:
GRID 40V	GRID 40V	GRID 40V	GRID 40V
SCREEN 700V	SCREEN 700V	SCREEN 700V	SCREEN 700V
PLATE 2300V	PLATE 2300V	PLATE 2300V	PLATE 2300V
PA:	PA:	PA:	PA:
GRID 50V	GRID 50V	GRID 50V	GRID 50V
SCREEN 1000V	SCREEN 1000V	SCREEN 1000V	SCREEN 1000V
PLATE 6200V	PLATE 6200V	PLATE 6200V	PLATE 6200V

5-4. TROUBLESHOOTING

The following Troubleshooting Table 5-4 lists possible malfunctions of the transmitter and possible causes of the listed malfunctions. When an assembly is thought to be faulty, an interchange of assemblies between identical channels (between 2 and 3 or between 1 and 4) may be made. This will insure that the assembly or sub-assembly is truly at fault.

TABLE 5-4. TROUBLESHOOTING

STEP	MALFUNCTION	POSSIBLE CAUSE
1	Bias contactor in filament control assembly has not been heard to energize, filament and bias voltages not present.	1) Open air interlock. 2) Filament overload present.
2	Bias voltage present but READY lamp does not come on 5 minutes after depressing START button.	1) Access panel not completely shut. 2) Defective 5 minute time delay relay, K3.
3	READY lamp on but unable to obtain plate and screen voltages by depressing PLATE switch.	1) Remote P.I. BYPASS switch not in by-pass position. 2) Doors not completely shut. 3) Defective plate control time delay relay, K4.
4	Carrier frequency keeps drifting as indicated on counter.	1) Front panel cables improperly patched. 2) Insufficient warm-up time. 3) Synchronizer or signal generator improperly tuned. 4) Synchronizer not turned on.
5	No bias indication on any front panel meter.	1) Defective bias and modulator supply. 2) Open air interlock. 3) Open cable. 4) K2 on filament control not energized.
6	All MODE lamps inoperative.	1) MISC CONTROLS not closed on master control panel. 2) +28v not present. 3) 28v fuse on master control open.
7	No screen voltage indication on 2ND IPA SCREEN meter.	1) 2nd IPA screen multiple open. 2) Open or shorted cable. 3) Shorted by-pass capacitor in cavity.
8	No drive indication on 1ST IPA GRID meter in CW mode.	1) Key line not closed (REMOTE only). 2) No output from signal generator. 3) GRID meter switch not positioned for current reading.
9	Depressing O/L RESET button does not extinguish lamp in button.	1) Defective O/L latching relay. 2) O/L condition still present. 3) Defective contacts on O/L relay. 4) O/L relay locked up.
10	Depressing O/L IND RESET button does not extinguish lamp.	1) Overload still present. 2) Defective memory module. 3) Shorted O/L IND RESET switch.
11	SELECT MODE lamp does not light.	1) Defective contacts on mode selector relay, K5. 2) Relay K1 in bias supply is energized. 3) Open cable connection.
12	All plate voltages indicate below normal.	1) Defective diode assembly in plate supply. 2) Line voltage below normal. 3) Phase missing from line input. 4) Contacts of resistor shorting, relay not closing.

TABLE 5-4. TROUBLESHOOTING (Cont)

STEP	MALFUNCTION	POSSIBLE CAUSE
13	Unable to obtain drive indication on 1ST IPA GRID meter in AM mode.	1) Carrier frequency not present. 2) Defective mixer assembly. 3) Defective AM processing amplifier. 4) Defective 1st rf amplifier. 5) Defective 24V supply.
14	Unable to obtain PA output in the video mode.	1) Defective 24V supply. 2) Defective video modulator. 3) Open cable.
15	Unable to obtain rated output in any mode.	1) Improper tuning. 2) Defective amplifier tube. 3) Poor amplifier tube connections. 4) Defective rf inter cable. 5) Low Drive.
16	VSWR O/L indicates while trying to obtain full output.	1) Improper tuning. 2) Cable to antenna or dummy load open. 3) Defective VSWR assembly (IC network).
17	PA OUTPUT REFLECTED meter reads excessively high; OUTPUT POWER meter reads very low.	1) Output power diodes reversed. 2) Shorted output cable. 3) Output coupler diode/diodes positioned wrong.
18	Filament contactor intermittantly deenergizes.	1) One of the air interlock vanes is intermittantly opening.
19	SWR O/L does not energize when exceeding reflected power limits.	1) Defective VSWR pc board. 2) Open cable. 3) 12V supply inoperative.
20	Erratic output indicated on PA OUTPUT POWER meter.	1) Arcing in rf cable or connector. 2) Improper tuning. 3) By-pass capacitor in cavity breaking down. 4) Sliding short arcing in cavity. 5) Fluctuating drive into 1st IPA.

5-5. INTRODUCTION TO ALIGNMENT AND ADJUSTMENT

Procedures for transmitter assemblies and subassemblies which require alignment or adjustments are outlined in paragraphs 5-6 through 5-10. Table 5-5 lists test equipment required for those procedures.

TABLE 5-5. REQUIRED TEST EQUIPMENT

EQUIPMENT	APPLICATION	RANGE AND ACCURACY
Sideband Response Analyzer BW5C	Generates a swept video test signal for testing the response of the transmitter circuits.	10-0-10MHz sweep width ±1dB amplitude to 7MHz
Video Monitor RCA CUE 8/N	Monitoring the picture quality of the transmitted television waveform.	Eight inch screen. 405, 525, 625 or 819-line standard (selectable)

TABLE 5-5. REQUIRED TEST EQUIPMENT (Cont)

EQUIPMENT	APPLICATION	RANGE AND ACCURACY
TV Sync Pulse Generator Thorn WG 81/R	Produces SYNC, blanking and drive signals.	405, 525 or 625-line standard (selectable) ±.005%
Audio Generator HP202CD	Generate test signals to check operation of the transmitter audio circuits.	1Hz to 100kHz ±2%
Frequency Counter HP5245L	Measure the frequency of the rf carriers.	0 to 50 MHz ±1 count
Frequency Converter HP5253B	Extends the frequency range of the frequency counter HP5245L.	50 to 512 MHz 1Hz readout resolution
VTVM HP410B	Provides accurate measurement of ac and dc voltages for alignment and ohmmeter readings for troubleshooting.	15mV to 1500V ±2% 10 ohms to 10 megohms ±5%
Oscilloscope HP141A	Observing test waveforms for alignment and troubleshooting.	Uses plug-in vertical amplifiers and time base unit.

5-6. AM PROCESSING AMPLIFIER AX8030 ALIGNMENT

a. Introduction. The AM processing amplifier is an audio amplifier that raises the input audio modulated signal to levels sufficient to amplitude modulate the rf signal generator. The AM processing amplifier is located in the signal processor-assembly.

b. Attenuator Control and AM Processing. Amplifier Subassembly Alignment Procedure.
1. Connect equipment as shown in figure 5-1 to the AM Processing Amplifier section of the PC board.
2. Connect oscilloscope to Q3 base, set generator for 1KHz 0.75V P-P output as shown on oscilloscope.
3. Connect oscilloscope to Q5 emitter.
4. Adjust AM GAIN control R12 for 7V P-P indication on oscilloscope. Signal displayed on oscilloscope should be undistorted sine wave. If signal appears clipped, proceed to step 5.
5. Adjust AM OP BIAS control R18 until signal not clipped.
6. Repeat steps 4 and 5 until signal displayed on oscilloscope is 7VP-P sine wave.

5-7. FM PROCESSING AMPLIFIER AX8031 ALIGNMENT

a. Introduction. The FM processing amplifier is a subassembly located in the signal processor assembly. The function of the FM processing amplifier is to amplify the audio input to a level sufficient to frequency modulate the synchronizer. The FM processing amplifier functions as a low distortion audio pre-amplifier with a gain of approximately 6db.

b. FM Processing Amplifier Alignment Procedure.
1. Connect equipment as shown in figure 5-2.
2. Remove FM processing amplifier from the signal processor assembly and connect extender card.
3. Place LEFT, RIGHT and MISC circuit breakers to ON position.
4. Connect multimeter to pin 11 on P1. Meter should read 24vdc (approximately).
5. Adjust FM GAIN control R17 located on the FM processing amplifier for the desired FM deviation.
6. Connect scope to terminal 15 and adjust R1 (located on PC board) for best overall linearity of the frequency range of Hz to 10,000 Hz.
7. With scope connected to MON, adjust coil L1 for desired pre-emphasis curve.
8. Replace FM processing amplifier into the signal processor assembly.

5-8. VIDEO PROCESSING AMPLIFIER AX8032 ALIGNMENT

Connect equipment as shown in figure 5-3. Use the extender card AX8092 to connect the video processing amplifier.

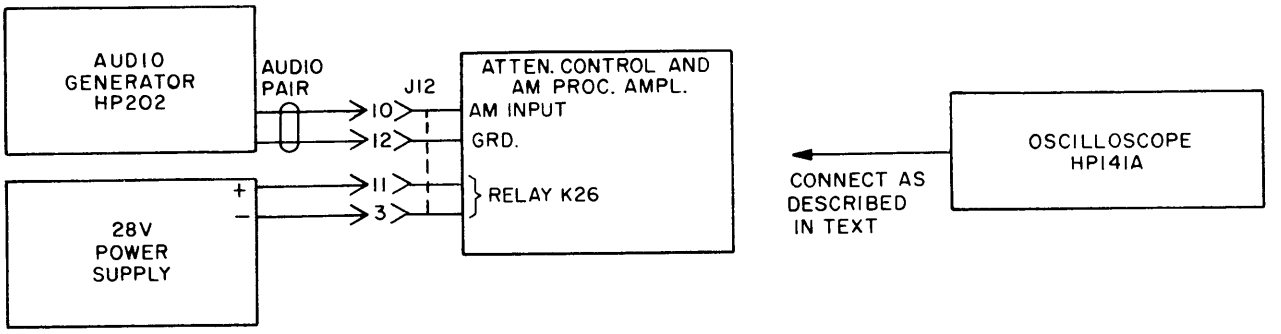


Figure 5-1. Test Set-Up for AM Processing Amplifier

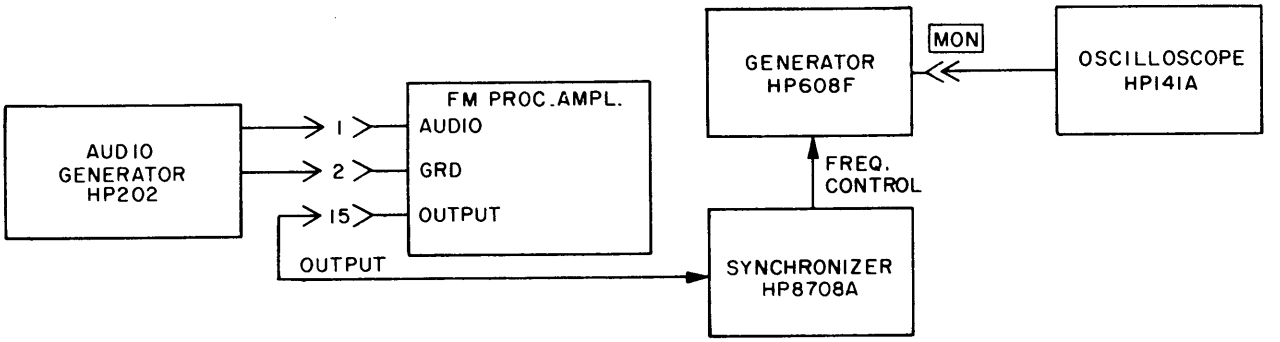


Figure 5-2. Test Set-Up for FM Processing Amplifier

CAUTION

R19 should always be in max CW position prior to applying power to proc amp to prevent Q4 output transistor burnout.

1. Connect the multimeter to the junction of Q3-R10; adjust potentiometer R19 to read 6.2vdc on the meter.

2. Connect scope probe to the junction of Q4-R20. Proceed as follows:
   a. Set R18 max CCW.
   b. Adjust R17 for a signed amplitude of 800 millivolts peak-to-peak on the scope.
   c. Turn R18 CW to check frequency response characteristics.

NOTE

R18 normally will remain in full CCW position.

   d. Put small piece of masking tape over both R17 and R18 to prevent settings being tampered with.

NOTE

R17 established output level of the video proc amp. As long as a 1 volt P-P signal is sent from the system (Unit 19), R17 will not require changing. Should this input level for any reason be less, then R17 and R18 must be readjusted. The setting of R18 determines frequency response of the video proc amp.

5-9. VIDEO MODULATOR AX8038 ALIGNMENT.

Connect equipment as shown in figure 5-3.

CAUTION

Never operate video modulator without a termination, preferably an oscilloscope.

1. Connect an oscilloscope to J4 using a 10:1 probe.
2. Connect a multimeter to J4. The meter should read approximately -90V, provided relay K29 has energized.

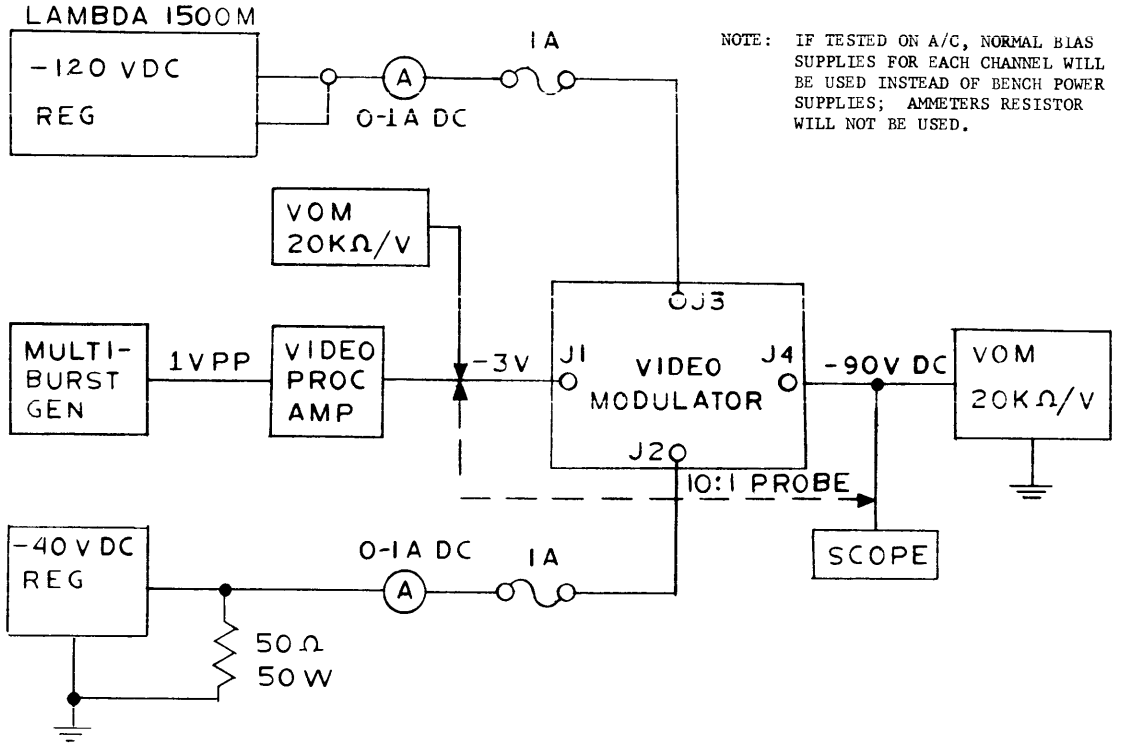


Figure 5-3. Test Setup for Video Processing Amplifier and Video Modulator

3. Vary R19 in video proc amp to demonstrate upper and lower limits of video modulator output dc voltages. For a usable picture, the limits of the video modulator are -55 vdc to -115 vdc, corresponding to a voltage swing of +5.8 vdc to +6.6 vdc at the junction of Q3-R10 in the video proc amp.

NOTES

1. The SYNC region of the modulation envelope is at the lower negative voltages of the modulator output (-55 to -80 vdc) and this corresponds to the higher dc voltages (+6.2 to +6.6 vdc) at the junction of Q3 and R10.
2. The black/white region of the modulation envelope is at the higher negative voltages of the modulator output (-80 to 115 vdc) and this corresponds to the lower dc voltages (+5.8 to +6.2 vdc) at the junction of Q3 and R10.
3. Therefore, the full linearity of the video modulator is related to the capability for R19 in the video proc amp, to close out either the sync at one end or the black/white at the other end of its rotation.

4. Refer to figure 5-3. The two line ammeters will vary in opposite directions as the VIDEO REF LEVEL control R19 is varied, but will be balanced when the voltage at the junction of Q3 and R10 in the video proc amp reaches +6.2 vdc.

5-10. OVERLOAD ADJUSTMENTS

All overload adjustments within the transmitter have been factory preset. In the event of component replacement, the following instructions should be followed in adjusting the associated overload.

WARNING

APPLICATION OF POWER TO TRANSMITTER RESULTS IN HIGH VOLTAGES WHICH ARE EXTREMELY DANGEROUS TO LIFE. OBSERVE THE FOLLOWING SAFETY PRECAUTIONS WHEN ADJUSTING:

1. HIGH VOLTAGE MUST BE OFF.
2. REMOVE ALL PRIMARY AC INPUTS TO TRANSMITTER.
3. SHORT OUT ALL HIGH VOLTAGE POINTS WITH SHORTING ROD.

CAUTION

The transmitter should not be operated in the condition outlined below for prolonged periods due to the excessive plate dissipation.

a. 1st IPA Plate Overload Adjustment.
   1. Tune the transmitter for CW operation.
   2. Detune the 1st IPA with the OUTPUT TUNING control and increase drive sufficiently to obtain reading of 120 MA on 1st IPA PLATE current meter.
   3. Adjust the associated 1st IPA plate overload in the plate control assembly until 1st IPA overload trips at 120 MA.

b. 2nd IPA Plate Overload Adjustment.
   1. Tune the transmitter for CW operation.
   2. Detune the 2nd IPA with the OUTPUT TUNING control and increase drive sufficiently to obtain reading of 450 MA on 2nd IPA PLATE current meter.
   3. Adjust the associated 2nd IPA plate overload in the plate control assembly until 2nd IPA overload trips at 450 MA.

c. Adjustment of the PA Plate Overload.
   1. Tune the transmitter for CW operation.
   2. Detune the PA with the OUTPUT TUNING control and increase drive until a reading of 1.8 AMPS is obtained on the PA PLATE current meter.
   3. Adjust associated PA plate overload in the plate control assembly until PA plate overload trips at 1.8 AMPS.

d. Screen and Bias Supply Overload Adjustments. Overloads in the screen and bias supplies are designed to trip out on a short circuit. The associated overload adjustments in the power supplies are preset to mid-range.

e. VSWR Overload Adjustment Procedure.
   1. Tune transmitter on CW at any frequency near mid-range.
   2. Decrease drive to minimum and switch PLATE to off position.
   3. Reverse the associated channel, reflected power diode so that it reads forward power.
   4. Drive transmitter up again, so that OUTPUT REFLECTED meter indicates ~~400~~ watts (2:1 ratio).
   5. Adjust R1 on the VSWR overload assembly to the point where the VSWR O/L indicator lights.
   6. Restore the reflected power diode to its normal position.

5-11. CAVITY REPLACEMENT PROCEDURE

The SPT-3KVHF Transmitter's amplifier section contains two 1st IPA high band cavities, two 2nd IPA high band, and two PA high band cavities. The low band is identical in the number of cavities. When it has been determined that maintenance is required, necessitating the removal of a cavity, the following general procedure is suggested:

NOTE

High band cavities can be removed from the transmitter via the front door opening.

a. 1st IPA High Band. (Mounted horizontally upper left or right rear of transmitter.)
   1. Disconnect all external wiring on cavity.
   2. Remove four mounting bolts.
   3. Remove cavity.

b. 2nd IPA High Band. (Mounted vertically forward of 1st IPA high band cavities.)
   1. Disconnect all external wiring on cavity.
   2. Remove four mounting bolts.
   3. Remove cavity.

c. PA High Band. (Mounted vertically left and right of door opening.)
   1. Disconnect all external wiring on cavity.
   2. Remove four bolts connecting coupler to cavity.
   3. Remove four mounting bolts.
   4. Remove cavity.

NOTE

An access opening is provided on the left side of the transmitter to facilitate removal of the low band cavities.

d. 1st IPA Low Band. (Mounted horizontally at center of left or right of door opening.)
   1. Disconnect all external wiring on cavity.
   2. Remove four mounting bolts.
   3. Remove cavity.

e. 2nd IPA Low Band. (Mounted horizontally on forward bottom of left or right of door opening).
   1. Remove any equipment present on the left edge of transmitter to expose opening on bottom for cavity removal.
   2. Disconnect all external wiring.
   3. Remove blower.
   4. If channel 2 cavity is defective, channel 2, 3 PA low band cavities must be removed first.
   5. If channel 3 cavity is defective, remove channel 2 PA low band first.
   6. Removal of cavity or cavities is through the access opening at the bottom left of the transmitter.

f. PA Low Band. (Mounted horizontally on rear bottom of left and right door openings).
   1. Remove any equipment of left edge of transmitter and disconnect wiring.
   2. Remove blower.
   3. Remove cavity if channel 2 cavity is defective, channel 2 PA low band must be removed first.

SECTION 6

PARTS LIST

6-1. INTRODUCTION

The parts list presented in this section is a cross-reference list of parts identified by a reference designation and TMC part number. In most cases, parts appearing on schematic diagrams are assigned reference designations. The reference designation system employed in the SPT-3K/VHF transmitter provides information to locate assemblies and their component parts. Each assembly is assigned a reference designation which consists of three or more sets of numerals and letters. The first numeral refers to the major unit involved. The second set consisting of a letter and a numeral, refers to the major assembly of that particular unit. The next set indicates the schematic symbol of the part on the major assembly. If there is a subassembly to the major assembly, this designation appears after the major assembly designations. The designation for major assemblies are specified in table 6-2; these are numbered from top to bottom and left to right. For example, the Video Modulator for Channel 3 has a designation of A12. A designation of 1A12C5 indicates capacitor C5, in the Video Modulator for Channel 3.

Table 6-1 specifies the designations of each major unit and lists the associated TMC part number. Table 6-2 identifies each transmitter assembly by reference designation, describes the assembly and specifies the assembly part number. Also listed adjacent to each part number is the Page column which specifies on what page of the following parts list the breakdown for that particular assembly is located.

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

a. Reference symbol.
b. Description indicated in the parts list.
c. TMC part number.
d. Model and serial number of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

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

The Technical Materiel Corporation
Attention: Sales Department
700 Fenimore Road
Mamaroneck, New York 10543

TABLE 6-1. UNIT DESIGNATIONS

UNIT	NAME	PART NO.	PAGE
1	Transmitter	AX8076	
2	Bias and Modulator Supply, CH 1	AP139	6-4
3	Screen Supply, CH 1	AP140	6-7
4	Screen Supply, CH 2	AP140	
5	Bias and Modulator Supply, CH 2	AP139	
6	Plate Supply, CH 1	AV1080	6-9
6A1	Control Assembly		
6A2	Supply Assembly		
7	Plate Supply, CH 2	AV1080	
7A1	Control Assembly		
7A2	Supply Assembly		
8	Plate Supply, CH 3	AV1080	
8A1	Control Assembly		
8A2	Supply Assembly		
9	Plate Supply, CH 4	AV1080	
9A1	Control Assembly		
9A2	Supply Assembly		
10	Bias and Modulator Supply, CH 3	AP139	
11	Screen Supply, CH 3	AP 140	

TABLE 6-1. UNIT DESIGNATIONS (Cont)

UNIT	NAME	PART NO.
12	Screen Supply, CH 4	AP140
13	Bias and Modulator Supply, CH 4	AP139

NOTE

Units 2 thru 13 are mounted external to the transmitter.

TABLE 6-2. UNIT 1 TRANSMITTER ASSEMBLY DESIGNATIONS

REF SYMBOL	DESCRIPTION	PART NO.	PAGE
A1	Generator, CH 4	AV1065	6-11
A2	Synchronizer, CH 4	HP8708A	
A3	Frequency Counter	SD1979H	
A4	Counter Input Selector	AX8093	6-12
A5	Generator, CH 3	AV1065	
A6	Synchronizer, CH 3	HP8708A	
A7	Signal Processor CH 3, 4	AX8026	6-13
A7A1	24V P.S., CH4	AP137	6-15
A7A2	Atten Cont & AM Proc, CH 4	AX8030	6-19
A7A3	FM Proc Amp., CH 4	AX8031	6-17
A7A4	Vid. Proc. Amp., CH 4	AX8032	6-21
A7A5	Atten Cont-AM Proc, CH 3	AX8030	
A7A6	FM Proc, CH 3	AX8031	
A7A7	Vid Proc, CH 3	AX8032	
A7A8	24V P.S., CH 3	AP137	
A8	VSWR Overload	AX8037	6-23
A9	Master Control	AX8070	6-25
A10	Tuning Control, Chan 3, 4	AX8074-2	6-26
A11	Video Modulator, CH 4	AX8038	6-28
A12	Video Modulator, CH 3	AX8038	
A13	Bias Control, CH 3, 4	AX8067-2	6-35
A14	Screen Supply Fuse Panel, CH 3, 4	AX8073-2	6-41
A15	Control-Indicator	AX8040-2	6-42
A16	Control-Indicator	AX8040-1	
A17	Tuning Control, CH 1, 2	AX8074-1	
A18	Video Modulator, CH 1	AX8038	
A19	Video Modulator, CH 2	AX8038	
A20	Bias Control, CH 1, 2	AX8067-1	
A21	Screen Supply Fuse Panel CH 1, 2	AX8073-1	
A22	Generator, CH 1	AV1065	
A23	Synchronizer, CH 1	HP8708A	
A25	Generator, CH 2	AV1065	
A26	Synchronizer, CH 2	HP8708A	

TABLE 6-2. UNIT 1 TRANSMITTER ASSEMBLY DESIGNATIONS (Cont)

REF SYMBOL	DESCRIPTION	PART NO.	PAGE
A27	Power Supply Assembly	AP141	
A27A1	12V Power Supply	AP138	
A27A2	12V Power Supply	AP138	
A28	Signal Processor, CH 1, 2	AX8026	
A28A1	24V P.S., CH 2	AP137	
A28A2	Atten Cont & AM Proc Amp., CH 2	AX8030	
A28A3	FM Proc. Amp., CH 2	AX8031	
A28A4	Vid. Proc Amp., CH 2	AX8032	
A28A5	Atten Cont-AM Proc., CH 1	AX8030	
A28A6	FM Proc., CH 1	AX8031	
A28A7	Vid. Proc., CH 1	AX8032	
A28A8	24V P.S., CH 1	AP137	
A29	Demodulator-Chopper	AX8028	6-51
A30	Primary Control	AX8069	6-56
A31	Attenuator CH 4	HP10514A	
A32	1ST RF Amp Coupler, Low Band, CH 3	AX8071	6-57
A33	1ST RF Amplifier, Low Band CH 3	AZ8001	
A34	Attenuator CH 3	HP10514A	
A35	2ND IPA, Low Band, CH 3	AX8080	6-58
A36	Screen Multiplier CH 3, 4	AX8061	6-59
A37	Connector Junction, CH 3, 4	AX8091-2	6-60
A38	1ST IPA, Low Band, CH 3	AX8079	6-61
A39	1ST IPA, Low Band, CH 2	AX8079	
A40	1ST RF Amp., Low Band, CH 2	AX8071	
A41	Screen Multiplier, CH 1, 2	AX8061	
A42	Connector Junction, CH 1, 2	AX8091-1	
A43	Attenuator, CH 1	HP10514A	
A44	1ST RF Amplifier, Low Band, CH 2	AZ8001	
A45	Attenuator, CH 2	HP10514A	
A46	2ND IPA Low Band, CH 2	AX8080	
A47	1ST IPA, High Band, CH 4	AX8088	6-62
A47A1	1ST RF Amp Coupler, High Band CH 5	A1433H	
A48	2ND IPA, High Band, CH 4	AX8089	6-63
A49	PA, High Band, CH 4	AX8090	6-64
A50	PA, Low Band, CH 3	AX8081	6-65
A52	Filament Control CH 4	AX8057	6-66
A56	Filament Control, CH 3	AX8057	
A60	Filament Control CH 2	AX8057	
A62	Filament Control, CH 1	AX8057	
A63	1ST IPA High Band, CH 1	AX8088	
A63A1	1ST RF Amp. Coupler	AX8071	
A63A2	1ST RF Amp.,	AX1433H	
A64	2ND IPA High Band, CH 1	AX8089	
A65	PA High Band, CH 1	AX8090	
A66	PA Low Band, CH 2	AX8081	

Unit 2 Bias and Modulator Supply AP139 (Sheet 1 of 3)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B1	BLOWER, AIR	BL8001-1
B2	SAME AS B1	
CR1	SEMICONDUCTOR DEVICE, 3-PHASE RECTIFIER	DD8002
CR2	SEMICONDUCTOR DEVICE, DIODE	IN538
CR3	SAME AS CR2	
CR4	SEMICONDUCTOR DEVICE, ZENER DIODE 20 VDCW	IN3319RB
CR5	SAME AS CR4	
CR6	SEMICONDUCTOR DEVICE, ZENER DIODE 16 VDCW	IN3315RB
CR7	SAME AS CR6	
CR8	SEMICONDUCTOR DEVICE, ZENER DIODE 10 VDCW 50 WATT	IN3309RB
CR9	SEMICONDUCTOR DEVICE, ZENER DIODE 10 VDCW 50 WATT	IN3309B
CR10	SAME AS CR8	
CR11	SAME AS CR9	
CR12	SAME AS CR8	
CR13	SAME AS CR9	
CR14	SAME AS CR8	
CR15	SAME AS CR9	
CR16	SAME AS CR8	
CR17	SAME AS CR9	
CR18	SAME AS CR8	
CR19	SAME AS CR9	
CR20	SAME AS CR8	
CR21	SAME AS CR9	
C1	CAPACITOR, FXD, ELECTROLYTIC 700 UF 300 VDCW	CE8001-700-300
C2	SAME AS C1	
C3	CAPACITOR, FXD, PAPER 2 UF 600 VDCW	CP53BIFF205K
C4	CAPACITOR, FXD, ELECTROLYTIC 5600 UF 150 VDCW	CE8001-5600-150

Unit 2 Bias and Modulator Supply AP139 (Sheet 2 of 3)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J1	CONNECTOR	JJ8005
K1	RELAY, 24 VDC	RL168-2-10-24VDC
K2	SAME AS K1	
K3	RELAY, LATCH	RL8007
K4	RELAY, OVERLOAD	RL8009
K5	SAME AS K1	
L1	CHOKE, FILTER	TF8016
L2	SAME AS L1	
R1	RESISTOR, FXD, WIREWOUND 10, 200 WATT	RW116-100B
R2	SAME AS R1	
R3	SAME AS R1	
R4	RESISTOR, FXD, WIREWOUND .5, 20 WATT	RW110-47
R5	RESISTOR, FXD, WIREWOUND 100, 200 WATT	RW116-101B
R6	RESISTOR, FXD, WIREWOUND 2K, 10 WATT	RW109-28
R7	RESISTOR, FXD, WIREWOUND 1K, 25 WATT	RW111-20
R8	SAME AS R7	
R9	SAME AS R7	
R10	SAME AS R5	
R11	RESISTOR, VAR, WIREWOUND 1, 25 WATT	RA75ASA or R5AK25
R12	RESISTOR, FXD, WIREWOUND 2500, 10 WATT	
R13	SAME AS R12	
R14	SAME AS R4	
R15	RESISTOR, FXD, WIREWOUND 1500, 10 WATT	RW109-26
S1	SWITCH, AIR	SW253
T1	TRANSFORMER, 3-PHASE POWER	TF8012
XK1	SOCKET, RELAY	TS100-3
XK2	SAME AS XK1	

008701047

Unit 2 Bias and Modulator Supply AP139 (Sheet 3 of 3)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XK4	SOCKET, RELAY	TS8003
XK5	SAME AS XK1	

Unit 3 Screen Supply AP140 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	RECTIFIER ASSEMBLY	A8072
A1A1	RECTIFIER TERMINAL BOARD ASSY	A8076-2
A1A2	SAME AS A1A1	
A1A3	SAME AS A1A1	
A1CR1	SEMICONDUCTOR DEVICE, DIODE	IN4007
A1CR2	SAME AS A1CR1	
THRU		
A1CR8		
A1C1	CAPACITOR, FXD, CERAMIC 4700 pf	CC100-14
THRU		
A1C8		
A1R1	RESISTOR, FXD, COMPOSITION 4 MEG, 1/2 WATT	RC20GF105J
THRU		
A1R8		
B1	BLOWER, AIR	BL8001-1
CR1	SEMICONDUCTOR DEVICE, ZENER DIODE 100 VDCW, 50 WATTS	IN3340RB
CR2	SEMICONDUCTOR DEVICE, ZENER DIODE 100 VDCW, 50 WATTS	IN3340B
CR3	SAME AS CR1	
CR4	SAME AS CR2	
CR5	SAME AS CR1	
CR6	SAME AS CR2	
CR7	SAME AS CR1	
CR8	SAME AS CR2	
CR9	SAME AS CR1	
CR10	SAME AS CR2	
C1	CAPACITOR, FXD, PAPER 12 UF 2KVDCW	CP70EIFJ126K1
C2	SAME AS C1	

Unit 3 Screen Supply AP140 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J1	CONNECTOR	JJ8009
J2	CONNECTOR, TYPE HN	UG496/U
J3	CONNECTOR, TYPE C	UG568/U
K1	RELAY, POWER CONTACTOR	RL8004
K2	RELAY, OVERLOAD	RL8009
L1	CHOKE, FILTER 8 HENRY 450 MA	TF8015
R1	RESISTOR, VAR, WIREWOUND 15, 12 WATT	RP100SA150K
R2	RESISTOR, FXD, WIREWOUND 3K, 200 WATT	RW116-302B
R3	RESISTOR, FXD, WIREWOUND 25, 10 WATT	RW109-6
R4	RESISTOR, FXD, WIREWOUND 100K, 50 WATT	RW105-41
S1	SWITCH, AIR	SW253
T1	TRANSFORMER, 3-PHASE POWER	TF8011
XK2	SOCKET, RELAY	TF8003

ENGINEERING MODIFICATION NOTICE

EMN NO. 2021

DATE 3/22/71

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

SHEET 1 OF 1

MODEL AFFECTED: SPT-3K VHF

SECTION AFFECTED: HV1080

ORIGINATOR: J. GRANTHAM

APPROVAL:

FINAL APPROVAL

DISTRIBUTION

DEPT.	EMN	DOC.	SIGN	DEPT.	EMN	DOC.	SIGN
ENG. CO-ORD				STOCK & INV.	1		
ENG. STDS.				QUAL. ASSUR.	2		1
ENG. ADMIN.				MASTER FILE 0			
PURCHASING	1			MASTER FILE 1			
METHODS				MASTER FILE 2			
PROD. PLANNING	1			MASTER FILE 3			
DATA CONTROL				J. ROBERTS			
MATL. CONTROL	1						

DOCUMENTS AFFECTED

TYPE: DWG [X] LIST NPL [ ] ML [ ] SPEC [ ]

DOCUMENT NO.	REV.	CHD.
CK8085	A	0

DESCRIPTION

1. CK8085
   A PICT. (SHT 1 OF 2)
   1) ON K4 TIME DELAY, CONNECT TERMINAL 2 AND 4 TOGETHER

REASON FOR CHANGE

[ ] TO AGREE WITH EMN NO.

[X] ERROR — PERTAINING TO:

OTHER:

DISPOSITION OF STOCK

DEPLETE [ ] DISCARD [ ] MODIFY [ ] CONFORMS [ ] NO STOCK [ ] NOT AFFECTED [ ]

REMARKS

PRICE CHANGE

NONE [ ] INCREASED BY DECREASED BY

MODIFICATION EFFECTIVE

IMMEDIATELY (ALL NEW PARTS) [ ]
NEXT PROD. RUN [ ]
SPECIFIC DATE
SERIAL NO.
MFGR. NO.
JOB NO.

REMARKS

EFFECTED SUPPORTING DOCUMENTS (ENG. INFO.)

STATUS	LIST	ASSY	SCHEM	SPEC.					REMARKS
CHGD									
EMN NO.									
N/A									
C NF.									

ENGINEERING MODIFICATION NOTICE

EMN NO. [illegible]

DATE [illegible]

THE TECHNICAL MA[illegible] CORP
MAMARONECK NEW YORK

SHEET 1 OF 1

MODEL AFFECTED [illegible]

SECTION AFFECTED [illegible]

ORIGINATOR [illegible]

APPROVAL [illegible]

FINAL APPROVAL [illegible]

DISTRIBUTION				DOCUMENTS AFFECTED			NOTES
DEPT	EMN	DOC	SIGN	TYPE DWG ☒ LIST NPL ☐ ML ☐ SPEC ☐			
ENG.				DOCUMENT NO	REV.	CHD	
PURCHASING				[illegible]	D		
PROD PLANNING							
MATL CONTROL							
QUAL ASSUR							
STOCK & INV							
PUBLICATIONS	1						

DESCRIPTION

1. [illegible]

A. PICT (SHT 1)

1) AT A2 [illegible]

2) AT K4 [illegible]

3) CONNECT [illegible]

B. PICT (SHT 2)

1) AT [illegible]

2) [illegible]

REASON FOR CHANGE

☐ TO AGREE WITH EMN NO. PERTAINING TO

☒ ERROR

OTHER

DISPOSITION OF STOCK	DEPLETE ☐	DISCARD ☐	MODIFY ☐	CONFORMS ☐	NO STOCK ☐	NOT AFFECTED ☐	
	REMARKS						
MODIFICATION EFFECTIVE	IMMEDIATLY ALL NEW PARTS ☐	NEXT PROD RUN ☐	SPECIFIC DATE	SERIAL NO.	MFGR NO	JOB NO.	REMARKS
EFFECTED SUPPORTING DOCUMENTS (ENG. INFO.)	STATUS	LIST	ASSY	SCHEM	SPEC	REMARKS	
	CHGD						
	EMN NO						
	N/A						
	CONF						

Unit 6 Plate Supply AV1080 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	PLATE CONTROL ASSEMBLY	AX8058
A2	SUPPLY ASSEMBLY	BP6.25-1410M
A1J1	CONNECTOR	JJ8003
A1J2	CONNECTOR	JJ8007
A1J3	CONNECTOR	MS3102A18-1P
A1J4	CONNECTOR	UG496/U
A1K1	RELAY	RL8009
A1K2	SAME AS A1K1	
A1K3	SAME AS A1K1	
A1K4	RELAY, TIME DELAY	RL8006
A1K5	RELAY	RL8002
A1K6	RELAY	RL8003
A1R1	RESISTOR, VAR, WIREWOUND 100, 25 WATT	RA75AXA10AK5
A1R2	RESISTOR, VAR, WIREWOUND 15, 25 WATT	RA75ASA501A-K25
A1R3	SAME AS A1R2	
A1R4	RESISTOR, FXD, WIREWOUND .1	RW8003-1
A1R5	SAME AS A1R4	
A1R6	SAME AS A1R4	
A1R7	SAME AS A1R4	
A1R8	RESISTOR, FXD, PRECISION 49.9	RM65D49R9F
A1R9	RESISTOR, FXD, PRECISION 40.9	RN6540R2F
A1R10	RESISTOR, FXD, PRECISION 100	RN65D1000F
A1R11	RESISTOR, FXD, WIREWOUND 5, 225 WATT	RW116-5R0-8
A1R12	SAME AS A1R11	
A1R13	SAME AS A1R11	
A1T1	TRANSFORMER, CONTROL	TF8004
A1XK1	SOCKET, RELAY	TS8003
A1XK2	SAME AS A1XK1	
A1XK3	SAME AS A1XK1	

Unit 6 Plate Supply AC1080 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1XK4	SOCKET, RELAY	TS100-3
A2A1	TERMINAL BOARD ASSEMBLY	AX8059
A2A1R1	RESISTOR, FXD, COMPOSITION 43K 2 WATT	RC42GF433J
A2A1R2	RESISTOR, FXD, PRECISION 499K	RN70D4993F
THRU		
A2A1R5		
A2A1R6	SAME AS A2A1R1	
A2A1R7	SAME AS A2A1R2	
THRU		
A2A1R12		
A2A1R13	SAME AS A2A1R1	
A2A1R14	SAME AS A2A1R2	
THRU		
A2A1R31		
A2A1TB1	TERMINAL STRIP	TM102-3

1A1 Generator AV1085

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	PANEL, Front	MS8420
	CONNECTOR, BNC (5 EA)	UG492D/U
	CONNECTOR, TYPE N (1 EA)	UG536/U
	CONNECTOR, BNC (1 EA)	UG88/U
	SIGNAL GENERATOR, RF	HP608FR

1A4 Counter Input Selector AX8093

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	PANEL, Front	MS8449
J1	CONNECTOR	UG492/U
S1	SWITCH	SW239

008701047

1A7 Signal Processor AX8026 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	CABINET	A8058
	CHASSIS ASSY	A8051
	PANEL SIDE	MS8347
	PANEL, Top and Bottom	MS8348
	PANEL, Right	MS8350
A1, A8	POWER SUPPLY, 24V	AP137
A2, A5	ATTEN. CONTROL AND AM PROCESSING AMPL.	AX8030
A3, A6	FM PROCESSING AMPLIFIER	AX8031
A4, A7	VIDEO PROCESSING AMPLIFIER	AX8032
J1	CONNECTOR	UG925/U
J2	SAME AS J1	
J3	SAME AS J1	
J4	SAME AS J1	
J5	SAME AS J1	
J6	SAME AS J1	
J7	SAME AS J1	
J8	SAME AS J1	
J9	CONNECTOR	JJ8010
J10	CONNECTOR	JJ319A15SFE
J11	SAME AS J10	
J12	SAME AS J10	
J13	SAME AS J10	
J14	SAME AS J10	
J15	SAME AS J10	
J16	SAME AS J9	
K1	RELAY, DPDT, 24 VOLT	RL168-2-10-24DC
K2	SAME AS K1	

1A7 Signal Processor AX8026 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1	RESISTOR, FXD, COMPOSITION 2K, 5PCT 1 WATT	RC32GF202J
R2	RESISTOR, FXD, COMPOSITION 2.2K, 5 PCT 1 WATT	RC32GF222J
R3	SAME AS R2	
R4	SAME AS R1	
TB1	TERMINAL STRIP	TM100-18
TB2	SAME AS TB1	
T1	TRANSFORMER	TF8001
T2	TRANSFORMER	TF8003
T3	SAME AS T1	
T4	SAME AS T1	
T5	SAME AS T2	
T6	SAME AS T1	
XK1	SOCKET	TS100-3

1A7A1 Power Supply AP137 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	FINAL ASSEMBLY	A8056
A1	PC BOARD ASSEMBLY	A8071
	BOARD PC, Etched	PC 8026-1
CR1	SEMICONDUCTOR DEVICE, TUNNEL DIODE	DD 8004
CR2	SEMICONDUCTOR DEVICE, BRIDGE RECTIFIER	IN 5198
CR3	SEMICONDUCTOR DEVICE, ZENER DIODE	IN 963B
CR4	SEMICONDUCTOR DEVICE, DIODE	IN2069
C1	CAPACITOR, FXD, ELECTROLYTIC 5000 UF 75 VDCW	CE8001-5500-75
C2	CAPACITOR, FXD, CERAMIC .01UF	CC100-16
C3	CAPACITOR, FXD, ELECTROLYTIC 2X75UF 30 VDCW	CE119-75-30
DS1	LAMP, INCANDESCANT 327-387	B1110-9
F1	FUSE 1 AMP	FU100-1.0
F2	FUSE 250 Ma	FU100-.250
K1	RELAY	
P1	CONNECTOR	PL8011
Q1	SEMICONDUCTOR DEVICE, TRANSISTOR	2N3055
Q2	SEMICONDUCTOR DEVICE, TRANSISTOR	2N1711
Q3	SAME AS Q2	
Q4	SEMICONDUCTOR DEVICE, TRANSISTOR	2N4036
R1	RESISTOR, FXD, WIREWOUND 3, 10PCT 20 WATT	RW110-2
R2	RESISTOR, FXD, WIREWOUND .24, 10PCT 2 WATT	RW8002-1
R3	RESISTOR, FXD, COMPOSITION 820K, 5PCT 1/2 WATT	RC20GF824J
R4	RESISTOR, FXD, COMPOSITION 270, 5PCT 1/2 WATT	RC20GF271J
R5	RESISTOR, FXD, COMPOSITION 1K, 5PCT 1/2 WATT	RC20GF102J

1A7A1 Power Supply AP137 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R6	RESISTOR, FXD, COMPOSITION 2200, 5 PCT 1/2 WATT	RC20GF222J
R7	RESISTOR, FXD, COMPOSITION 1300, 5PCT 1/2 WATT	RC20GF132J
R8	DELETED	
R9	RESISTOR, FXD, COMPOSITION 1100, 5PCT 1/2 WATT	RC20GF112J
R10	RESISTOR, FXD, COMPOSITION 68, 5PCT 1/2 WATT	RC20GF680J
R11	RESISTOR, VAR, 100, 10PCT	RV8001-1
R12	RESISTOR, FXD, COMPOSITION 620, 5PCT 2 WATT	RC42GF621J
T1	TRANSFORMER	TF8006
XQ1	SOCKET, TRANSISTOR	TS166-2
XQ2	SOCKET, TRANSISTOR	TS8005
XQ3	SAME AS XQ2	
XQ4	SAME AS XQ2	

1A7A2 Atten Control and AM Processing Amplifier AX8030 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	FINAL ASSEMBLY	A8083
A1	PC BOARD ASSEMBLY	A8050
	BOARD, PC, Etched	PC8020
CR1	SEMICONDUCTOR DEVICE, Zener Diode	IN2984B
CR2	SAME AS CR1	
CR3	SEMICONDUCTOR DEVICE, Zener Diode	IN4740
C1	CAPACITOR, FXD, CERAMIC .02UF	CC100-24
C2	CAPACITOR, FXD, ELECTROLYTIC 50UF	CE105-50-15
C3	CAPACITOR, FXD, ELECTROLYTIC 4.7UF	CE123-475-3582
C4	CAPACITOR, FXD, ELECTROLYTIC 25UF	CE105-25-12
K25	RELAY, Flat Package	RL8010-2
K26	SAME AS K25	
Q1	SEMICONDUCTOR DEVICE, Transistor	2N3391
Q2	SAME AS Q1	
Q3	SEMICONDUCTOR DEVICE, Transistor	2N1613
Q4	SAME AS Q3	
Q5	SAME AS Q3	
R1	RESISTOR, FXD, COMPOSITION 100, 5PCT 2 WATT	RC42GF101J
R2	RESISTOR, FXD, COMPOSITION 330, 5PCT 1/2 WATT	RC20GF331J
R3	RESISTOR, VAR, COMPOSITION 1500, 10PCT 2 WATT	RV4NAYSA152A
R4	RESISTOR, FXD, COMPOSITION 10K, 5PCT 1/2 WATT	RC20GF103J
R5	RESISTOR, FXD, COMPOSITION 4700, 5PCT 1/2 WATT	RC20GF472J
R6	RESISTOR, FXD, COMPOSITION 47K, 5PCT 1/2 WATT	RC20GF473J
R7	RESISTOR, FXD, COMPOSITION 1K, 5PCT 2 WATT	RC426F102J

1A7A2 Atten Control and AM Processing Amplifier AX8030 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R8	RESISTOR, FXD, COMPOSITION 5600, 5PCT 1/2 WATT	RC20GF562J
R9	RESISTOR, FXD, COMPOSITION 1K, 5PCT 1/2 WATT	RC20GF102J
R10	RESISTOR, FXD, COMPOSITION 560, 5PCT 1/2 WATT	RC20GF561J
R11	RESISTOR, FXD, COMPOSITION 20, 5PCT 2 WATT	RC42GF200J
R12	RESISTOR, FXD, COMPOSITION 1500, 5PCT 1/2 WATT	RC20GF152J
R13	RESISTOR, VAR, COMPOSITION 1K, 10PCT	RV8001-2
R14	RESISTOR, FXD, COMPOSITION 180K, 5PCT 1/2 WATT	RC20GF184J
R15	RESISTOR, FXD, COMPOSITION 12K, 5PCT 1/2 WATT	RC20GF123J
R16	RESISTOR, FXD, COMPOSITION 220, 5PCT 1/2 WATT	RC20GF222J
R17	RESISTOR, FXD, COMPOSITION 220, 5PCT 1/2 WATT	RC20GF221J
R18	RESISTOR, FXD, COMPOSITION 100K, 5PCT 1/2 WATT	RC20GF104J
R19	RESISTOR, VAR, COMPOSITION 5K, 10PCT	RV106UX8B502A
R20	RESISTOR, FXD, COMPOSITION 2700, 5PCT 1/2 WATT	RC20GF272J
R21	SAME AS R18	
R22	RESISTOR, FXD, COMPOSITION 150, 5PCT 2 WATT	RC42GF151J
R23	RESISTOR, FXD, COMPOSITION 620, 5PCT 1/2 WATT	RC20GF621J

1A7A3 FM Processing Amplifier AX8031 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	FINAL ASSEMBLY	AX8085
A1	PC BOARD ASSEMBLY	AX8060
CR1	SEMICONDUCTOR DEVICE, Zener Diode	IN4738
C1	CAPACITOR, FXD, ELECTROLYTIC .68UF	CE123-684-35A2
C2	CAPACITOR, FXD, ELECTROLYTIC 25UF 12 VDCW	CE105-25-12
C3	CAPACITOR, FXD, ELECTROLYTIC 100UF 12 VDCW	CE105-100-12
C4	CAPACITOR, FXD, ELECTROLYTIC 10UF 12 VDCW	CE105-10-12
C5	SAME AS C2	
C6	CAPACITOR, FXD, ELECTROLYTIC .68UF	CE123-3
C7	SAME AS C2	
C8	CAPACITOR, FXD, CERAMIC .027UF	CC8001
C9	CAPACITOR, FXD, CERAMIC .056UF	CC8002
C10	CAPACITOR, FXD, ELECTROLYTIC 3UF 25 VDCW	CE105-3-25
IC1	INTEGRATED CKT, Linear Ampl.	NW 8002
L1	INDUCTOR, VAR, 3-10MH	CL8001
R1	RESISTOR, VAR, COMPOSITION 10K 2 WATT	RV4NAYSA502A
R2	RESISTOR, FXD, COMPOSITION 1K, 5PCT 1/2 WATT	RC20GF102J
R3	RESISTOR, FXD, COMPOSITION 47K, 5PCT 1/2 WATT	RC20GF473J
R4	SAME AS R3	
R5	RESISTOR, FXD, COMPOSITION 10K, 5PCT 1/2 WATT	RC20GF103J
R6	RESISTOR, FXD, COMPOSITION 560, 5PCT 1/2 WATT	RC20GF561J
R7	RESISTOR, FXD, COMPOSITION 3900, 5PCT 1/2 WATT	RC20GF392J

1A7A3 FM Processing Amplifier AX8031 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R8	SAME AS R2	
R9	RESISTOR, FXD, COMPOSITION 100K, 5PCT 1/2 WATT	RC20GF104J
R10	SAME AS R9	
R11	RESISTOR, FXD, COMPOSITION 4700, 5PCT 1/2 WATT	RC20GF472J
R12	RESISTOR, FXD, COMPOSITION 270, 5PCT 1/2 WATT	RC20GF271J
R13	RESISTOR, FXD, COMPOSITION 39K, 5PCT 1/2 WATT	RC20GF393J
R14	SAME AS R2	
R15	RESISTOR, FXD, COMPOSITION 82, 5 PCT 1/2 WATT	RC20GF820J
R16	RESISTOR, FXD, WIREWOUND 470, 2 WATT	RW8002-3
X1C1	SOCKET, Integrated Circuit	TS8006-1

1A7A4 Video Processing Amplifier AX8032 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	FINAL ASSEMBLY	A8086
	PC BOARD ASSEMBLY	A8101
CR1	SEMICONDUCTOR DEVICE, DIODE	IN270
CR2	SEMICONDUCTOR DEVICE, ZENER DIODE	IN963A
CR3	SEMICONDUCTOR DEVICE, ZENER DIODE	IN4738A
CR4	SEMICONDUCTOR DEVICE, ZENER DIODE	IN2979R
C1	CAPACITOR, FXD, ELECTROLYTIC 250UF 50 VDCW	CE8004
C2	CAPACITOR, FXD, ELECTROLYTIC 100UF 20 VDCW	CE121-100-20
C3	SAME AS C2	
C4	CAPACITOR, FXD, ELECTROLYTIC .0022UF	CC100-11
C5	DELETED	
C6	DELETED	
C7	SAME AS C1	
C8	SAME AS C2	
C9	SAME AS C2	
C10	SAME AS C2	
C11	CAPACITOR, FXD, CERAMIC 120pf	CC100-4
Q1	SEMICONDUCTOR DEVICE, TRANSISTOR	2N4123
Q2	SAME AS Q1	
Q3	SAME AS Q1	
Q4	SEMICONDUCTOR DEVICE, TRANSISTOR	2N1613
R1	RESISTOR, VAR, COMPOSITION 5K, 10PCT 2 WATT	RV4LAYSA502A
R2	DELETED	
R3	RESISTOR, FXD, COMPOSITION 18K, 5PCT 1/2 WATT	RC20GF183J
R4	RESISTOR, FXD, COMPOSITION 6200, 5PCT 1/2 WATT	RC20GF622J

1A7A4 Video Processing Amplifier AX8032 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R5	RESISTOR, FXD, COMPOSITION 150, 5PCT 1/2 WATT	RC20GF151J
R6	RESISTOR, FXD, COMPOSITION 82K, 5PCT 1/2 WATT	RC20GF823J
R7	RESISTOR, FXD, COMPOSITION 3300, 5PCT 1/2 WATT	RC20GF332J
R8	RESISTOR, FXD, COMPOSITION 150, 5PCT 1/2 WATT	RC42GF151J
R9	RESISTOR, FXD, COMPOSITION 47, 5PCT 1 WATT	RC32GF470J
R10	RESISTOR, FXD, COMPOSITION 100K, 5PCT 1/2 WATT	RC20GF104J
R11	RESISTOR, FXD, COMPOSITION 2700, 5PCT 1/2 WATT	RC20GF272J
R12	RESISTOR, FXD, COMPOSITION 1K, 5PCT 1/2 WATT	RC20GF102J
R13	RESISTOR, FXD, COMPOSITION 24, 5PCT 1/2 WATT	RC20GF240J
R14	SAME AS R8	
R15	RESISTOR, FXD, COMPOSITION 180, 5PCT 1/2 WATT	RC20GF181J
R16	RESISTOR, FXD, COMPOSITION 1200, 5PCT 1/2 WATT	RC20GF122J
R17	RESISTOR, VAR, COMPOSITION 50	RV8002-1
R18	RESISTOR, VAR, COMPOSITION 500	RV8002-2
R19	DELETED	
R20	RESISTOR, FXD, COMPOSITION 150, 1 WATT	RC32GF151J
R21	RESISTOR, FXD, COMPOSITION 68, 5PCT 2 WATT	RC42GF680J

1A8 VSWR Overload Assembly AX8037

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	CHASSIS ASSEMBLY	A8055
	COVER, TOP	MS8235
	CHASSIS	MS8236-1
	PANEL/FRAME	LD8067/MS8233
A1	PC BOARD ASSEMBLY CH4	A8077
A2	PC BOARD ASSEMBLY CH3	A8077
A3	PC BOARD ASSEMBLY CH2	A8077
A4	PC BOARD ASSEMBLY CH1	A8077
J1	CONNECTOR	MS3102A16SIP
J2	CONNECTOR	UG6258/U
J3	SAME AS J1	
J4	SAME AS J2	
J5	SAME AS J1	
J6	SAME AS J2	
J7	SAME AS J1	
J8	SAME AS J2	
K1	RELAY, 12 VOLT	RL168-2C5-12VDC
K2	SAME AS K1	
K3	SAME AS K1	
K4	SAME AS K1	
XK1	SOCKET, RELAY	TS100-3
XK2	SAME AS XK1	
XK3	SAME AS XK1	
XK4	SAME AS XK1	

1A8A1 VSWR Overload PC Board Assembly A8077

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	BOARD, PC Etched	PC8022
CR1	SEMICONDUCTOR DEVICE, ZENER DIODE	IN753A
C1	CAPACITOR, FXD, CERAMIC 33pf	CC100-13
IC1	INTEGRATED CKT	NW8001
Q1	SEMICONDUCTOR DEVICE, TRANSISTOR	2N3638
Q2	SAME AS Q1	
Q3	SEMICONDUCTOR DEVICE, TRANSISTOR	2N1711
R1	RESISTOR, VAR	RV121-1-103
R2	RESISTOR, FXD, COMPOSITION 2200, 5PCT	RC07GF222J
R3	RESISTOR, FXD, COMPOSITION 10, 5PCT 1/4 WATT	RC07GF100J
R4	RESISTOR, FXD, COMPOSITION 100, 5PCT 1/4 WATT	RC07GF101J
R5	RESISTOR, FXD, COMPOSITION 56K, 5PCT	RC07GF563J
R6	RESISTOR, FXD, COMPOSITION 1200, 5PCT 1/4 WATT	RC07GF122J
R7	RESISTOR, FXD, COMPOSITION 1K, 5PCT 1/4 WATT	RC07GF102J
R8	RESISTOR, FXD, COMPOSITION 8200, 5PCT 1/4 WATT	RC07GF822J
R9	RESISTOR, FXD, COMPOSITION 3900, 5PCT 1/4 WATT	RC07GF392J
R10	RESISTOR, FXD, COMPOSITION 12K, 5PCT 1/4 WATT	RC07GF123J
R11	RESISTOR, FXD, COMPOSITION 10K, 5PCT 1/4 WATT	RC07GF103J
X1C1	SOCKET, IC	TS8006-2

1A9 Master Control

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	PANEL, FRONT ENGRAVED	LD8080/MS8265
CB1	CIRCUIT BREAKER	SW8008
CB2	SAME AS CB1	
CB3	SAME AS CB1	
CR1	SEMICONDUCTOR DEVICE, BRIDGE RECTIFIER	DD8001
C1	CAPACITOR, FXD, ELECTROLYTIC 700uf 75 VDCW	CE8001-5500-75
DS1	LAMP, INCANDESCENT 327	B1110-9
F1	FUSE, INDICATING, 15 AMP	FU100-15
F2	FUSE, INDICATING 3 AMP	FU100-3
F3	SAME AS F2	
F4	SAME AS F2	
K1	RELAY, PWR 115 VAC	RL168-2C10-115 AC
TB1	TERMINAL BOARD	TE0168-3B
T1	TRANSFORMER	TF8013
XDS1	SOCKET, LAMP	TS153-2
XF1	FUSEHOLDER	FH104-11
XF2	FUSEHOLDER	FH104-3
XF3	SAME AS XF2	
XF4	SAME AS XF2	
XK1	SOCKET RELAY	TS100-3

1A10 Tuning Control AX8074 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	FRONT PANEL, Engraved	LD8077-1/ MS83356-1
MP1	CYCLOMETER	PO113-2
	COUNTER (P/O PO113-2)	CY10M
MP2	SAME AS MP1	
MP3	SAME AS MP1	
MP4	COUNTER	CY102-3
MP5	SAME AS MP4	
MP6	SAME AS MP1	
MP7	SAME AS MP1	
MP8	SAME AS MP1	
MP9	SAME AS MP4	
MP10	SAME AS MP1	
MP11	SAME AS MP1	
MP12	KNOB	MP127-8FB
MP13	SAME AS MP1	
S1	SWITCH, MICRO	SW186-3
S2	SAME AS S1	
S3	SAME AS S1	
S4	SAME AS S1	
	BEZEL (4 EA)	MS8282
	BEZEL (1 EA)	MS8289
	CABLE, FLEXIBLE DRIVE	CA8124-1-42
	COLLAR (P/O CA8124-1-42)	CB209-5
	CABLE, FLEXIBLE DRIVE	CA8124-2-54
	CASING (P/O CA8124-2-54)	CA8124-2
	COLLAR (P/O CA8124-2-54)	MS8292-1
	CORE (P/O CA8124-2-54)	CA8124-2
	CABLE, FLEXIBLE DRIVE	CA8124-1-60

1A10 Tuning Control AX8074 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	CASING (P/O CA8124-7-60)	CA8124-1-CAS
	CORE (P/O CA8124-1-60)	CA8124-1-COR
	CABLE, FLEXIBLE DRIVE	CA8124-1-72
	CASING (P/O CA8124-1-72)	CA8124-1-CAS
	COLLAR (P/O CA8124-1-72)	MS8292-1
	CORE (P/O CA8124-1-72)	CA8124-2-COR
	CABLE, FLEXIBLE DRIVE	CA8124-1-78

1A11 Video Modulator AX8038

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	CHASSIS	MS8363
	PLATE, Top	MS8364
	PLATE, Bottom	MS8365
A1	FINAL AMPL ASSY, RIGHT SIDE	A8067-1
A2	FINAL AMPL ASSY, LEFT SIDE	A8067-2
A3	PANEL ASSY	A8069
A4	AMPLIFIER ASSY	A8093
A5	DRIVER ASSY	A8098
A6	BY-PASS ASSY, RIGHT SIDE	A8046-1
A7	BY-PASS ASSY, LEFT SIDE	A8046-2
C4	CAPACITOR, FXD, PAPER 10UF	CP70EJFF106KU
C5	CAPACITOR, FXD, ELECTROLYTIC 700UF	CE8001-700-300
C8	SAME AS C4	
J1	CONNECTOR	UG290/U
J2	SAME AS J1	
J3	SAME AS J1	
J4	CONNECTOR	UG703/U
J5	SAME AS J1	
K29	RELAY	RL8001
R39	RESISTOR, FXD, COMPOSITION 47, 5PCT 1 WATT	RC32GF470J
TB1	TERMINAL BOARD	TM108-12
TB2	TERMINAL BOARD	TM102-4

1A11A1, A2 Final Amplifier Assy A8067 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	OUTPUT AMPLIFIER ASSY #1	A8097-1
A2	OUTPUT AMPLIFIER ASSY #2	A8097-2
A3	OUTPUT AMPLIFIER ASSY #3	A8097-3
A4	OUTPUT AMPLIFIER ASSY #4	A8097-4
A5	FINAL AMPL BOARD ASSY #1	A8082-1
A6	FINAL AMPL BOARD ASSY #2	A8082-2
A1Q3	SEMICONDUCTOR DEVICE, TRANSISTOR	2N3229
A1Q4	SEMICONDUCTOR DEVICE, TRANSISTOR	2N3448
A1R27	RESISTOR, FXD, COMPOSITION 6.2 1/2 WATT	RC20GF6R2
A1XQ4	SOCKET, TRANSISTOR	TS166-2
A2Q5	SAME AS A1Q3	
A2Q6	SAME AS A1Q4	
A2Q6	SAME AS A1XQ4	
A2R28	SAME AS A1R27	
A3Q7	SAME AS A1Q3	
A3Q8	SAME AS A1Q4	
A3R29	SAME AS A1R27	
A4Q9	SAME AS A1Q3	
A4Q10	SAME AS A1Q4	
A5R15	RESISTOR, FXD, COMPOSITION 1.2K, 5PCT 2 WATT	RC42GF122J
A5R16	SAME AS A5R15	
A5R17	SAME AS A5R15	
A5R18	SAME AS A5R15	
A5R19	SAME AS A5R15	
A5R20	SAME AS A5R15	
A5R31	RESISTOR, FXD, COMPOSITION 30, 5PCT 2 WATT	RC42GF300J
A5R33	SAME AS A5R31	
A5R35	SAME AS A5R31	

1A11A1, A2 Final Amplifier Assy A8067 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A5R37	SAME AS A5R31	
A5TB	TERMINAL, Min	TE0168-3B
	BOARD, PC Etched	PC8030-1
	BOARD, PC Etched	PC8030-3
A6R3	RESISTOR, FXD, COMPOSITION 470, 5PCT 1/2 WATT	RC20GF471J
A6R4	RESISTOR, FXD, COMPOSITION 390, 5PCT 1/2 WATT	RC20GF391J
A6R21	SAME AS A5R15	
A6R22	SAME AS A5R15	
A6R23	SAME AS A5R15	
A6R24	SAME AS A5R15	
A6R25	SAME AS A5R15	
A6R26	SAME AS A5R15	
A6R32	SAME AS A5R31	
A6R34	SAME AS A5R31	
A6R36	SAME AS A5R31	
A6R38	SAME AS A5R31	
A6TB	SAME AS A5TB	
	BOARD, PC Etched	PC8030-2
	BOARD, PC Etched	PC8030-4

1A11A3 Panel Assembly A8069

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	AIR INTERLOCK ASSY	A8099
	PANEL, Front	MS8346-1
B1	MOTOR, BLOWER	BL8001-2
	AIR PADDLE	PO168-2
	BRACKET, AIR SWITCH MOUNTING	MS8275
S1	SWITCH, AIR	SW253

1A11A4 Amplifier Assembly A8093

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	INPUT AMPLIFIER ASSY	A8091
A2	FEEDBACK AMPLIFIER ASSY	A8092
	BRACKET, HEATSINK	MS8377
A1CR1	SEMICONDUCTOR DEVICE, ZENER DIODE	IN334ORB
A1Q1	SEMICONDUCTOR DEVICE, TRANSISTOR	40410
A2C1	CAPACITOR, FXD, CERAMIC .1UF	CC100-32
A2Q2	SAME AS A1Q1	
A2Q11	SAME AS A1Q1	
A2R40	RESISTOR, FXD, COMPOSITION 10K, 5PCT 2 WATT	RC42GF103J
A2R41	SAME AS A2R40	
	BOARD, TERMINAL MACHINED	MS8371
	TERMINAL	TE0168-3B
	TERMINAL	TE0168-4B

1A11A5 Driver Assembly A8098

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	BOARD, DRIVER ASSEMBLY	A8081
	BOARD, PC, Etched	PC8031
CR2	SEMICONDUCTOR DEVICE, DIODE	IN4001
CR3	SAME AS CR2	
CR4	SAME AS CR2	
R1	RESISTOR, FXD, COMPOSITION 470, 5PCT 1/2 WATT	RC20GF471J
R2	RESISTOR, FXD, COMPOSITION 20K, 5PCT 2 WATT	RC42GF203J
R5	RESISTOR, FXD, COMPOSITION 100, 5PCT 1/2 WATT	RC20GF101J
R8	RESISTOR, FXD, COMPOSITION 24, 5PCT 1/2 WATT	RC20GF240J
R9	RESISTOR, FXD, COMPOSITION 360, 5PCT 2 WATT	RC42GF361J
R10	SAME AS R9	
R11	SAME AS R9	
R12	SAME AS R9	
R13	SAME AS R9	
R14	SAME AS R9	
	BRACKET, HEATSINK	MS8377
	BRACKET, MOUNTING	MS8389
	TERMINAL	TE0168-313

1A11A6, A7 By-Pass.Assembly A8046

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	BOARD, TERMINAL	MS8335
C2	CAPACITOR, FXD, CERAMIC .01UF	CC100-16
C3	CAPACITOR, FXD, CERAMIC .1UF	CC100-32
C6	SAME AS C2	
C7	SAME AS C3	
R42	RESISTOR, FXD, COMPOSITION 47K, 5PCT 2 WATT	RC42GF473J
R43	SAME AS R42	

1A13 Bias Control AX8067 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	CHASSIS ASSY	A8053
	PANEL, FRONT	MS8352-1
	CHASSIS	MS8352-3
	COVER, Top and Bottom	MS8228
A1, A5	PC BOARD, ASSY	A8078
A2, A6	HEATSINK ASSY	A8079
A3	LEFT PART ASSY	A8061-1
A4	RIGHT PART ASSY	A8061-2
CR1	SEMICONDUCTOR DEVICE, DIODE	IN1612R
CR2	SAME AS CR1	
C1	CAPACITOR, FXD, ELECTROLYTIC 4500UF 50 VOLT	CE8001-4500-50
C2	SAME AS C3	
C3	SAME AS C1	
C4	SAME AS C1	
F1	FUSE, 2 AMP	FU102-2
F2	SAME AS F1 (CHANNEL 1)	
F3	SAME AS F1 (CHANNEL 1)	
F4	SAME AS F1 (CHANNEL 2)	
F5	SAME AS F1 (CHANNEL 2)	
F6	SAME AS F1 (CHANNEL 2)	
J1	CONNECTOR, BNC (CHANNEL 1)	UG625/U
J2	SAME AS J1 (CHANNEL 1)	
J3	SAME AS J1 (CHANNEL 1)	
J4	SAME AS J1 (CHANNEL 1)	
J5	SAME AS J1 (CHANNEL 1)	
J6	SAME AS J1 (CHANNEL 1)	
J7	SAME AS J1 (CHANNEL 1)	
J8	SAME AS J1 (CHANNEL 1)	

1A13 Bias Control AX8067 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J9	SAME AS J1 (CHANNEL 1)	
J10	CONNECTOR, BNC (CHANNEL 2)	UG625/U
J11	SAME AS J1 (CHANNEL 2)	
J12	SAME AS J1 (CHANNEL 2)	
J13	SAME AS J1 (CHANNEL 2)	
J14	SAME AS J1 (CHANNEL 2)	
J15	SAME AS J1 (CHANNEL 2)	
J16	SAME AS J1 (CHANNEL 2)	
J17	SAME AS J1 (CHANNEL 2)	
J18	SAME AS J1 (CHANNEL 2)	
R1	RESISTOR, VAR, WIREWOUND 2500 12 WATT	RP100SA252K
R2	SAME AS R1	
R3	SAME AS R1	
R4	SAME AS R1	
TB1	TERMINAL STRIP	TM100-6
TB2	SAME AS TB1	
TB3	SAME AS TB1	
TB4	SAME AS TB1	
TB5	TERMINAL STRIP	TM102-2
TB6	SAME AS TB5	
XF1	FUSEHOLDER	FH100-1
XF2	SAME AS XF1	
XF3	SAME AS XF1	
XF4	SAME AS XF1	
XF5	SAME AS XF1	
XF6	SAME AS XF1	

1A13A1 PC Board Assembly A8078 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FXD, ELECTROLYTIC 5UF 16 VDCW	CE8002-4R7-16
C2	CAPACITOR, FXD, ELECTROLYTIC 1000UF	CE8003
C3	CAPACITOR, FXD, ELECTROLYTIC 2UF 16 VDCW	CE8002-2R7-16
C4	CAPACITOR, FXD, CERAMIC 100pf	CC100-3
C5	CAPACITOR, FXD, CERAMIC .01UF	CC100-16
C6	CAPACITOR, FXD, ELECTROLYTIC 300UF 6 VDCW	CE8002-300-6
C7	CAPACITOR, FXD, ELECTROLYTIC 100UF 50 VDCW	CE119-100-50
Q1	SEMICONDUCTOR DEVICE, TRANSISTOR	40406
Q2	SEMICONDUCTOR DEVICE, TRANSISTOR	40407
Q3	SEMICONDUCTOR DEVICE, TRANSISTOR	40408
Q4	SEMICONDUCTOR DEVICE, TRANSISTOR	40409
Q5	SEMICONDUCTOR DEVICE, TRANSISTOR	40410
R1	RESISTOR, FXD, COMPOSITION 82K 5 PCT 1/2 WATT	RC20GF823J
R2	RESISTOR, FXD, COMPOSITION 18K 5 PCT 1/2 WATT	RC20GF183J
R3	RESISTOR, FXD, COMPOSITION 180 5 PCT 1/2 WATT	RC20GF181J
R4	RESISTOR, FXD, COMPOSITION 10K 5 PCT 1/2 WATT	RC20GF103J
R5	RESISTOR, FXD, COMPOSITION 33K 5 PCT 1/2 WATT	RC20GF333J
R6	SAME AS R4	
R7	RESISTOR, FXD, COMPOSITION, 100K 5 PCT 1/2 WATT	RC20GF104J
R8	RESISTOR, FXD, COMPOSITION 4700 5 PCT 1/2 WATT	RC20GF472J
R9	RESISTOR, FXD, COMPOSITION 270 5 PCT 1/2 WATT	RC20GF271J

1A13A1 PC Board Assembly A8078 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R10	RESISTOR, VAR, WIREWOUND 250	RA8001-2
R11	RESISTOR, FXD COMPOSITION 5600 5 PCT 1/2 WATT	RC20GF562J
R12	RESISTOR, FXD, COMPOSITION 3900 5 PCT 1/2 WATT	RC20GF392J
R13	RESISTOR, VAR, WIREWOUND 100	RA8001-1
R14	RESISTOR, FXD, COMPOSITION 100 5 PCT 1/2 WATT	RC20GF101J

1A13A2 Heatsink Assy A8079

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	HEATSINK	MS8386
CR1	SEMICONDUCTOR DEVICE DIODE	IN3754
Q1	SEMICONDUCTOR DEVICE, TRANSISTOR	40411
Q2	SAME AS Q1	
XQ1	SOCKET, TRANSISTOR	TS166-1
XQ2	SAME AS XQ1	

1A13A3 Left Part Assy A8061-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	HEATSINK	A8079
A2	HEATSINK	A8080
CR1	SEMICONDUCTOR DEVICE, DIODE	IN538
CR2	SAME AS CR1	
C1	CAPACITOR, FXD	CN112A104M1
K1	RELAY, 24V	RL168-2C10-24DC
K2	SAME AS K1	
R1	RESISTOR, FXD, WIREWOUND 250 5 WATTS	RW107-23
R2	SAME AS R1	
R3	RESISTOR, FXD, PRECISION .1	RW8003-1
R4	SAME AS R3	
R5	RESISTOR, FXD, PRECISION 499K 1/2 WATT	RN70B4993F
R6	SAME AS R5	
R7	RESISTOR, FXD, COMPOSITION 43K 5 PCT 2 WATT	RC42GF433J
R8	SAME AS R7	
R9	RESISTOR, FXD, WIREWOUND .27 5 WATT	RW8001-1
R10	RESISTOR, FXD, WIREWOUND .33 5 WATT	RW8001-2
R11	RESISTOR, FXD, WIREWOUND 20 20 WATT	RR114-20W
XK1	SOCKET, RELAY	TS100-3
XK2	SAME AS XK1	

1A14 Screen Supply Fuse Panel AX8073

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	PANEL, FRONT	MS8276
	FILTER, AIR	AD103-18
F1	FUSE, 3 AMP	FU100-3
F2	SAME AS F1	
F3	FUSE, 10 AMP	FU100-10
F4	SAME AS F3	
F5	SAME AS F3	
F6	SAME AS F3	
F7	SAME AS F3	
F8	SAME AS F3	
DS1	LAMP, INDICATOR	B1111-2
DS2	SAME AS DS1	
XDF1	LIGHT, INDICATING	TS154-1
XDF2	SAME AS XDF1	
XF1	FUSEHOLDER	FH104-3
XF2	SAME AS XF1	
XF3	SAME AS XF1	
XF4	SAME AS XF1	
XF5	SAME AS XF1	
XF6	SAME AS XF1	
XF7	SAME AS XF1	
XF8	SAME AS XF1	

1A15 Control Indicator AX8040 (Sheet 1 of 5)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	ASSEMBLY, INDICATOR LAMP	AX8095
DS1	LAMP, INCANDESCENT	B18001
THRU		
DS24		
DS25	LAMP, INCANDESCENT	B1110-9
THRU		
DS30		
DS31	LAMP, INCANDESCENT	B18001
THRU		
DS50		
DS51	LAMP, INCANDESCENT	B1110-9
THRU		
DS56		
DS57	LAMP, INCANDESCENT	B18001
THRU		
DS68		
DS69	LAMP, INCANDESCENT	B1110-9
THRU		
DS108		
J1	CONNECTOR	JJ8001
J2	SAME AS J1	
J3	CONNECTOR	JJ319-6SPE
THRU		
J16		
J17	CONNECTOR	JJ8003
J18	SAME AS J17	
K1	RELAY 115VAC	RL168-2C10-115AC
K2	SAME AS K1	

1A15 CONTROL INDICATOR AX8050 (Sheet 2 of 5)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K3	RELAY 24 VDC	RL168-2C10-24VDC
K4	SAME AS K1	
K5	SAME AS K3	
K6	SAME AS K1	
K7	SAME AS K1	
K8	SAME AS K3	
K9	SAME AS K1	
K10	SAME AS K3	
K11	RELAY, LATCHING	RL8007
K12	SAME AS K11	
K13	SAME AS K11	
K14	SAME AS K11	
M1	METER, PA OUTPUT POWER	MR8001-1
M2	METER, PA SCREEN	MR191-14
M3	SAME AS M2	
M4	SAME AS M1	
M5	METER, PA INPUT TUNING	MR8001-3
M6	METER, PA GRID	MR8001-9
M7	METER, PA SCREEN	MR8001-8
M8	METER, PA PLATE	MR8001-7
M9	METER, OUTPUT REFLECTED	MR8001-2
M10	SAME AS M5	
M11	SAME AS M6	
M12	SAME AS M7	
M13	SAME AS M8	
M14	SAME AS M9	
M15	METER, 2ND IPA SCREEN	MR191-13
M16	SAME AS M15	

1A15 Control Indicator AX8040 (Sheet 3 of 5)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
M17	METER, 2ND IPA INPUT TUNING	MR8001-5
M18	METER, 2ND IPA GRID	MR8001-9
M19	METER, 2ND IPA SCREEN	MR8001-11
M20	METER, 2ND IPA PLATE	MR8001-10
M21	METER, 2ND IPA OUTPUT POWER	MR8001-4
M22	SAME AS M17	
M23	SAME AS M18	
M24	SAME AS M19	
M25	SAME AS M20	
M26	SAME AS M21	
M27	METER, 1ST IPA GRID	MR8001-12
M28	METER, 1ST IPA PLATE	MR8001-8
M29	METER, OUTPUT POWER	MR8001-6
M30	SAME AS M27	
M31	SAME AS M28	
M32	SAME AS M29	
S1	SWITCH, PUSHBUTTON, PA GRID LENS FOR S1	SW8010-1-2
	LENS FOR S1	LI8001-2
S2	SWITCH, PUSHBUTTON, PA SCREEN	SW8010-1-4
	LENS FOR S2	LI8001-4
S3	SWITCH, PUSHBUTTON, PA PLATE	SW8010-1-3
	LENS FOR S3	LI8001-3
S4	SAME AS S1	
S5	SAME AS S2	
S6	SAME AS S3	
S7	SWITCH, PUSHBUTTON, 2ND IPA GRID	SW8010-1-2
	LENS FOR S7	LI8001-2
S8	SWITCH, PUSHBUTTON, 2ND IPA SCREEN	SW8101-1-4
	LENS FOR S8	LI8001-4

1A15 Control Indicator AX8040 (Sheet 4 of 5)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S9	SWITCH, PUSHBUTTON, 2ND IPA PLATE	SW8010-1-3
	LENS FOR S9	LI8001-3
S10	SAME AS S7	
S11	SAME AS S8	
S12	SAME AS S9	
S13	SWITCH, PUSHBUTTON 1ST IPA GRID	SW8010-1-2
	LENS FOR S13	LI8001-2
S14	SWITCH, PUSHBUTTON 1ST IPA PLATE	SW8010-1-3
	LENS FOR S14	LI8001-3
S15	SAME AS S13	
S16	SAME AS S14	
S17	SWITCH, PUSHBUTTON, START	SW8010-2-9
	LENS FOR S17	LI8001-9
S18	SWITCH, PUSHBUTTON, PLATE	SW8010-1-6
	LENS FOR S18	LI8001-6
S19	SWITCH, PUSHBUTTON, READY	SW8010-4-10
	LENS FOR S19	LI800-10
S20	SWITCH, PUSHBUTTON, SELECT MODE	SW8010-4-11
	LENS FOR S20	LI8001-11
S21	SWITCH, PUSHBUTTON, O/L RESET	SW8010-4-12
	LENS FOR S21	LI8001-12
S22	SWITCH, PUSHBUTTON, O/L RESET	SW8010-4-13
	LENS FOR S22	LI8001-13
S23	SWITCH, PUSHBUTTON, REMOTE P.I. BYPASS	SW8010-5-14
	LENS FOR S23	LI8001-14
S24	SAME AS S17	
S25	SAME AS S18	
S26	SAME AS S19	
S27	SAME AS S20	

1A15 Control Indicator AX8040 (Sheet 5 of 5)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S28	SAME AS S21	
S29	SAME AS S22	
S30	SAME AS S23	
S31	SWITCH, PUSHBUTTON, CW	SW8010-1-5
	LENS FOR S31	LI8001-5
S32	SWITCH, PUSHBUTTON, AM	SW8010-1-6
	LENS FOR S32	LI8001-6
S33	SWITCH, PUSHBUTTON, FM	SW8010-1-7
	LENS FOR S33	LI8001-7
S34	SWITCH, PUSHBUTTON, VIDEO	SW8010-1-8
	LENS FOR S34	LI8001-8
S35	SAME AS S31	
S36	SAME AS S32	
S37	SAME AS S33	
S38	SAME AS S34	
XDS95	LAMPHOLDER, INDICATOR	TS8001
THRU		
XDS108		
	LENS FOR XDS95 THRU XDS108	LI8001-1
XK1	SOCKET, RELAY	TS100-3
THRU		
XK10		
Z1	MODULE, MEMORY	NW8003
THRU		
Z14		

1A16 THROUGH 1A26

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
1A16	SAME AS 1A15	
1A17	SAME AS 1A10	
1A18	SAME AS 1A11	
1A19	SAME AS 1A11	
1A20	SAME AS 1A13	
1A21	SAME AS 1A14	
1A22	SAME AS 1A1	
1A23	SAME AS 1A2	
1A24		
1A25	SAME AS 1A1	
1A26	SAME AS 1A2	

1A27 Power Supply AP141

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	CHASSIS	MS8461
	PANEL, FRONT	MS8460
	PANEL, REAR	MS8459
A1	12 VOLT POWER SUPPLY	AP138
A2	SAME AS A1	
F1	FUSE	FU102-2
J1	CONNECTOR	JJ8010
J2	SAME AS J1	
TB1	TERMINAL STRIP	TM100-3
XF1	FUSEHOLDER	FH104-3

1A27A1 12 Volt Power Supply AP138 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	FINAL ASSEMBLY	A8054
A1	PC BOARD ASSEMBLY	A8070
	PC BOARD, Etched	PC8024
A1CR2	SEMICONDUCTOR DEVICE, DIODE	IN5198
A1CR3	SEMICONDUCTOR DEVICE, ZENER DIODE	IN750A
A1CR4	SAME AS A1CR2	
A1CR5	SAME AS APCR3	
A1C2	CAPACITOR, FXD, ELECTROLYTIC 10 UF 12 VDCW	CE105-10-12
A1C3	CAPACITOR, FXD, ELECTROLYTIC 2X 75 UF 30 VDCW	CE119-75-30
A1K1	RELAY	RL8010-1
A1Q2	SEMICONDUCTOR DEVICE, TRANSISTOR	2N3251A
A1Q3	SEMICONDUCTOR DEVICE, TRANSISTOR	2N404
A1R1	RESISTOR, FXD, COMPOSITION 1K, 5 PCT 1/2 WATT	RC20GF102J
A1R2	RESISTOR, FXD, COMPOSITION 470, 5 PCT 1/2 WATT	RC20GF471J
A1R3	RESISTOR, FXD, COMPOSITION 3300, 5 PCT 1/2 WATT	RC20GF332J
A1R4	RESISTOR, FXD, WIREWOUND .33	RW8002-2
A1R5	RESISTOR, FXD, COMPOSITION 4700, 5 PCT 1/2 WATT	TC20GF472J
A1R7	SAME AS A1R1	
A1R8	SAME AS A1R3	
A1R10	RESISTOR, FXD, COMPOSITION 15, 5 PCT 1/2 WATT	RC20GF150J
A1XQ2	SOCKET TRANSISTOR	TS8005
A1XQ3	SAME AS A1XQ2	
C1	CAPACITOR, FXD, ELECTROLYTIC 2500 UF 75 VDCW	CE8001-2500-75

1A27A1 12 Volt Power Supply AP138 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS1	LAMP, INCANDESCENT	B1110-6
F1	FUSE, 0.5 AMP	FU102-0.5
P1	CONNECTOR	PL8011
Q1	SEMICONDUCTOR DEVICE, TRANSISTOR	MJ2268
R1	RESISTOR, VAR, COMPOSITION 1500, 10PCT 2 WATT	RV4LAYSA152A
R2	RESISTOR, FXD, WIREWOUND 2	RW109-50
R3	RESISTOR, FXD, WIREWOUND 5, 10 WATT	RW109-3
T1	TRANSFORMER, POWER	TF8005
X1	JACK, TIP	JJ219-11-9
X2	SAME AS X1	
XDS1	SOCKET, LAMP	TS153-2
XF1	FUSEHOLDER	FH105
XQ1	SOCKET, TRANSISTOR	TS166-2

1A29 Demodulator-Chopper AX8028

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	CHASSIS	MS8236-2
	PANEL, Front	LD8091/ MS8422
	COVER, Top	MS8235
A1, A4	PC BOARD ASSY, CH1 and CH4	A8049-1
A2, A3	PC BOARD ASSY, CH2 and CH3	A8049-2
J1	CONNECTOR, BNC	UG657/U
J2	SAME AS J1	
J3	SAME AS J1	
J4	SAME AS J1	
J5	CONNECTOR, BNC	UG6258/U
J6	SAME AS J5	
J7	SAME AS J5	
J8	SAME AS J5	
J9	SAME AS J5	
R1	RESISTOR, FXD, COMPOSITION 75, 5 PCT 1/2 WATT	RC20GF750J
S1	SWITCH, TOGGLE	ST107E
S2	SAME AS S1	
S3	SAME AS S1	
S4	SAME AS S1	
TB1	TERMINAL STRIP	TM100-2

1A29A1, A4 PC Board Assembly A8049-1 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	PC BOARD, Etched	PC8021
CR1	SEMICONDUCTOR DEVICE, ZENER DIODE	IN4745A
CR2	SEMICONDUCTOR DEVICE, DIODE	IN270
CR3	SAME AS CR2	
CR4	SAME AS CR2	
C1	CAPACITOR, FXD, ELECTROLYTIC 250 UF 50 VDCW	CE119-250-50
C2	CAPACITOR, VAR, AIR 3-15pf	CV8001
C3	SAME AS C2	
C4	CAPACITOR, FXD, MICA 4.7pf	CM111C050K5S
C5	CAPACITOR, FXD, CERAMIC .02UF	CC100-24
C6	SAME AS C5	
C7	CAPACITOR, FXD, CERAMIC 20pf	CC100-45
C8	CAPACITOR, FXD, CERAMIC .05UF	CC100-46
C9	CAPACITOR, FXD, CERAMIC 10pf	CC100-27
C10	SAME AS C5	
C11	CAPACITOR, FXD, ELECTROLYTIC 5 UF 12 VDCW	CE105-5-12
C12	CAPACITOR, FXD, ELECTROLYTIC 100 UF 25 VDCW	CE105-100-25
L1	CHOKE ASSY, RF, 0.21UH	A8047
L2	CHOKE, RF, 10 UH	CL275-100
Q1	SEMICONDUCTOR DEVICE, TRANSISTOR	2N2222
Q2	SEMICONDUCTOR DEVICE, TRANSISTOR	2N4124
Q3	SEMICONDUCTOR DEVICE, TRANSISTOR	2N3563
Q4	SAME AS Q2	
R1	RESISTOR, FXD, COMPOSITION 390, 5 PCT 2 WATT	RC42GF391J
R2	RESISTOR, FXD, COMPOSITION 62, 5 PCT 1/2 WATT	RC20GF620J
R3	RESISTOR, FXD, COMPOSITION 1 MEG, 5PCT 1/2 WATT	RC20GF105J
R4	RESISTOR, FXD, COMPOSITION 100K, 5PCT 1/2 WATT	RC20GF104J
R5	RESISTOR, FXD, COMPOSITION 33K, 5 PCT 1/2 WATT	RC20GF333J

1A29A1, A4 PC Board Assembly AX8049-1 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R6	RESISTOR, FXD, COMPOSITION 10K, 5PCT 1/2 WATT	RC20GF103J
R7	RESISTOR, FXD, COMPOSITION 4700, 5PCT 1/2 WATT	RC20GF472J
R8	RESISTOR, FXD, COMPOSITION 18K, 5PCT 1/2 WATT	RC20GF183J
R9	RESISTOR, FXD, COMPOSITION 3300, 5PCT 1/2 WATT	RC20GF332J
R10	RESISTOR, FXD, COMPOSITION 220, 5 PCT 1/2 WATT	RC20GF221J
R11	RESISTOR, FXD, COMPOSITION 39K, 5PCT 1/2 WATT	RC20GF393J
R12	SAME AS R6	
R13	RESISTOR, FXD, COMPOSITION 47K, 5 PCT 1/2 WATT	RC20GF473J
R14	SAME AS R9	
R15	RESISTOR, FXD, COMPOSITION 150, 5 PCT 1/2 WATT	RC20GF151J
R16	RESISTOR, FXD, COMPOSITION 75, 5PCT 1/2 WATT	RC20GF750J
R17	RESISTOR, FXD, COMPOSITION 1K, 5PCT 1/2 WATT	RC20GF102J

1A29A2, A3 PC Board Assembly A8049-2 (Sheet 1 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	PC BOARD, Etched	PC8021
CR1	SEMICONDUCTOR DEVICE, ZENER DIODE	IN4745A
CR2	SEMICONDUCTOR DEVICE, DIODE	IN270
CR3	SAME AS CR2	
CR4	SAME AS CR2	
C1	CAPACITOR, FXD, ELECTROLYTIC 250UF 50 VDCW	CE119-250-50
C2	CAPACITOR, VAR, AIR 3-15pf	CV8001
C3	SAME AS C2	
C4	CAPACITOR, FXD, MICA 4.7pf	CM111C050K5S
C5	CAPACITOR, FXD, CERAMIC .02UF	CC100-24
C6	SAME AS C5	
C7	CAPACITOR, FXD, CERAMIC 20pf	CC100-45
C8	CAPACITOR, FXD, CERAMIC .05UF	CC100-46
C9	CAPACITOR, FXD, CERAMIC 10pf	CC100-27
C10	SAME AS C5	
C11	CAPACITOR, FXD, ELECTROLYTIC 5UF 12 VDCW	CE105-5-12
C12	CAPACITOR, FXD, ELECTROLYTIC 100UF 25 VDCW	CE105-100-25
L1	CHOKE ASSY, PF, 15UH	CL430-3
L2	CHOKE, RF 10UH	CL275-100
Q1	SEMICONDUCTOR DEVICE, TRANSISTOR	2N2222
Q2	SEMICONDUCTOR DEVICE, TRANSISTOR	2N4124
Q3	SEMICONDUCTOR DEVICE, TRANSISTOR	2N3563
Q4	SAME AS Q2	
R1	RESISTOR, FXD, COMPOSITION 390, 5 PCT 2 WATT	RC42GF391J
R2	RESISTOR, FXD, COMPOSITION 330, 5 PCT 1/2 WATT	RC20GF331J
R3	RESISTOR, FXD, COMPOSITION 1 MEG, 5 PCT 1/2 WATT	RC206GF105J
R4	RESISTOR, FXD, COMPOSITION 100K, 5 PCT 1/2 WATT	RC20GF104J
R5	RESISTOR, FXD, COMPOSITION 33K, 5 PCT 1/2 WATT	RC20GF333J

1A29A2, A3 PC Board Assembly A8049-2 (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R6	RESISTOR, FXD, COMPOSITION 10K, 5PCT 1/2 WATT	RC20GF103J
R7	RESISTOR, FXD, COMPOSITION 4700, 5 PCT 1/2 WATT	RC20GF472J
R8	RESISTOR, FXD, COMPOSITION 18K, 5 PCT 1/2 WATT	RC20GF183J
R9	RESISTOR, FXD, COMPOSITION 3300, 5 PCT 1/2 WATT	RC20GF332J
R10	RESISTOR, FXD, COMPOSITION 220, 5PCT, 1/2 WATT	RC20GF221J
R11	RESISTOR, FXD, COMPOSITION 39K, 5PCT 1/2 WATT	RC20GF393J
R12	SAME AS R6	
R13	RESISTOR, FXD, COMPOSITION 47K, 5PCT 1/2 WATT	RC20GF473J
R14	SAME AS R9	
R15	RESISTOR, FXD, COMPOSITION 150, 5PCT 1/2 WATT	RC20GF151J
R16	RESISTOR, FXD, COMPOSITION 75, 5 PCT 1/2 WATT	RC20GF750J

1A30 Primary Control AX8069

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	PANEL, UPPER FRONT	LD8081/ MS8403
	PANEL, LOWER FRONT	LD8082/ MS8405
	FILTER, AIR	AD103-13
CB1	CIRCUIT BREAKER	SW8009
CB2	CIRCUIT BREAKER	SW240
CB3	SAME AS CB1	
CB4	SAME AS CB2	
CB5	SAME AS CB1	
CB6	SAME AS CB2	
CB7	SAME AS CB1	
CB8	SAME AS CB2	

1A32 1ST RF Amplifier Coupler AX8071

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	CASE	PO8001
	STRAP, SILVER	MS203-3
CR1	SEMICONDUCTOR DEVICE, DIODE	IN82
C1	CAPACITOR, FXD, CERAMIC	CC100-46

1A35 2ND IPA, Low Band AX8080

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	CAVITY ASSEMBLY	AC1136
A1S1	LIMIT SWITCH	SW260
A1S2	SAME AS A1S1	
A1S3	SAME AS A1S1	
A1S4	SAME AS A1S1	
A1V1	ELECTRON TUBE, POWER	7213
A2	MOTOR DRIVE RELAY ASSY	AX8082
A3	MOTOR ASSEMBLY	AX8098
B1	BLOWER, AIR	BL103
C1	CAPACITOR, FXD, PAPER	CP
DC1	DIRECTIONAL COUPLER	DC8002-1
J1	CONNECTOR	MS3102A14S2K
P4	PLUG	PL8012
S1	SWITCH, AIR	SW253

1A36 Screen Multiplier AX8061

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	FINAL ASSEMBLY	A8043-3
A1, A3	TERMINAL BOARD ASSEMBLY, PA	A8043-1
A2, A4	TERMINAL BOARD ASSEMBLY, IPA	A8043-2
A1R1	RESISTOR, FXD, COMPOSITION 43K, 5PCT, 2 WATT	RC42GF433J
A1R2	RESISTOR, FXD, PRECISION 499K, 1 PCT	RN70D4993F
A1R3	SAME AS A1R2	
A1R4	SAME AS A1R2	
A1R5	SAME AS A1R2	
A1R6	RESISTOR, FXD, PRECISION 9.9, 1PCT	RN65B49R9F
A1R7	RESISTOR, FXD, WIREWOUND	RW8003-2
A2R8	SAME AS A1R7	
A2R9	RESISTOR, FXD, PRECISION 1 MEG, 1 PCT	RN70D1004F
A2R10	SAME AS A1R1	

1A37 Connector Junction AX8091-2

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	PANEL, CONNECTOR	MS8354-2
	PANEL, TERMINAL	MS8355-2
J1	CONNECTOR	JJ8002
J2	CONNECTOR, BNC	UG625B/1
J3	CONNECTOR	JJ8004
J4	CONNECTOR	JJ8006
J5	CONNECTOR	JJ8008
J6	CONNECTOR	MS3102A18-16P
J7	CONNECTOR, TYPE HN	UG496/U
J8	CONNECTOR, TYPE C	UG568/U
J9	SAME AS J7	
J10	SAME AS J1	
J11	SAME AS J2	
J12	SAME AS J3	
J13	SAME AS J4	
J14	SAME AS J5	
J15	SAME AS J6	
J16	SAME AS J7	
J17	SAME AS J8	
J18	SAME AS J7	
S1	MICROSWITCH	SW260
S2	SAME AS S1	
TB1	TERMINAL STRIP	TM8001-2
TB2	SAME AS TB1	
TB3	TERMINAL STRIP	TM8001-1
TB4	SAME AS TB3	

1A38 1ST IPA Low Band AX8079

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	CAVITY ASSEMBLY	AV1133
A1V1	ELECTRON TUBE, POWER	ML8403
B1	BLOWER, AIR	BL106-2
DC1	DIRECTIONAL COUPLER	DC8002-2
R1	RESISTOR, VAR, WIREWOUND 300, 25 WATT	RA75ASA501A K25
R2	RESISTOR, FXD, COMPOSITION 47, 5 PCT 2 WATT	RC42GF470J
TB1	TERMINAL STRIP	TM100-2

1A47 1ST IPA, High Band AX8088

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	CAVITY ASSEMBLY	AV1132
A1V1	ELECTRON TUBE, POWER	ML8403
B1	BLOWER, AIR	BL106-2
CP1	ADAPTER	UG491/U
CP2	ADAPTER	UG606/U
DC1	DIRECTIONAL COUPLER	DC8002-2
P1	CONNECTOR, BNC	UG306/U
R1	RESISTOR, VAR, WIREWOUND 300, 25 WATT	RA75ASA501A-K25
TB1	TERMINAL STRIP	TM100-2

1A48 2ND IPA, High Band AX8089

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	CAVITY ASSEMBLY	AC1134
A1V1	ELECTRON TUBE, POWER	7213
B1	BLOWER, AIR	BL103
C1	CAPACITOR, FXD, ELECTROLYTIC	CP41B1FF405K
J1	CONNECTOR	MS3102A14S2P
P3	PLUG	PL8012
S1	SWITCH, AIR	SW253

1A49, PA, High Band AX8090

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	CAVITY ASSEMBLY	AV1135
A1V1	ELECTRON TUBE, POWER TETRODE	8501
B1	BLOWER, AIR	BL130
CR1	SEMICONDUCTOR DEVICE, DETECTOR	DD8003-4
CR2	SEMICONDUCTOR DEVICE, DETECTOR	DD8003-3
DC1	DIRECTIONAL COUPLER	DC8001-2
J1	CONNECTOR	MS3106B18-1S
P3	PLUG	PL8012
S1	SWITCH, AIR	SW253

1A50 PA, Low Band AX8081

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
A1	CAVITY ASSEMBLY	AV1137
A1S1	SWITCH, LIMIT	SW260
A1S2	SAME AS A1S1	
A1S3	SAME AS A1S1	
A1S4	SAME AS A1S1	
A1V1	ELECTRON TUBE, POWER	8501
A2	MOTOR DRIVE ASSEMBLY	
A2M1	MOTOR, AC	MO8001
A2M2	SAME AS A2M1	
A3	MOTOR DRIVE RELAY ASSEMBLY	AX8062
B1	BLOWER, AIR	BL116
CR1	SEMICONDUCTOR DEVICE, 1KW DETECTOR	DD8003-2
CR2	SEMICONDUCTOR DEVICE, 5KW DETECTOR	DD8003-1
C1	CAPACITOR, FXD, PAPER	CP41B1FF405K
C6	CAPACITOR, FXD, 100pf 25 VDCW	C08001
J1	CONNECTOR	MS3102A14S2P
P3	PLUG	PL8012
S1	SWITCH, AIR	SW253

1A52 Filament Control AX8057

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	FINAL ASSEMBLY	A8059
A1	CURRENT OVERLOAD ELEMENT	FU8001
A2	SAME AS A1	
K1	RELAY, PA FIL	FL8005
K2	RELAY, BIAS SUPPLY CONTROL	RL8004
K3	RELAY, 3 SEC TIME DELAY	RL8006
K4	RELAY, 5 MIN TIME DELAY	RL8006
R1	RESISTOR, FXD, FINSTRIP	RR127-1
TB1	TERMINAL STRIP	TM8001-2
T1	TRANSFORMER, FILAMENT	RF8008
T2	TRANSFORMER, FILAMENT	TF8009
T3	TRANSFORMER, FILAMENT	TF8010
XK3	SOCKET, RELAY	TS100-3
XK4	SAME AS XK3	

SECTION 7

DIAGRAMS

7-1. INTRODUCTION.

7-2. This section contains the schematic diagrams applicable to the model SPT-3KVHF transmitter.

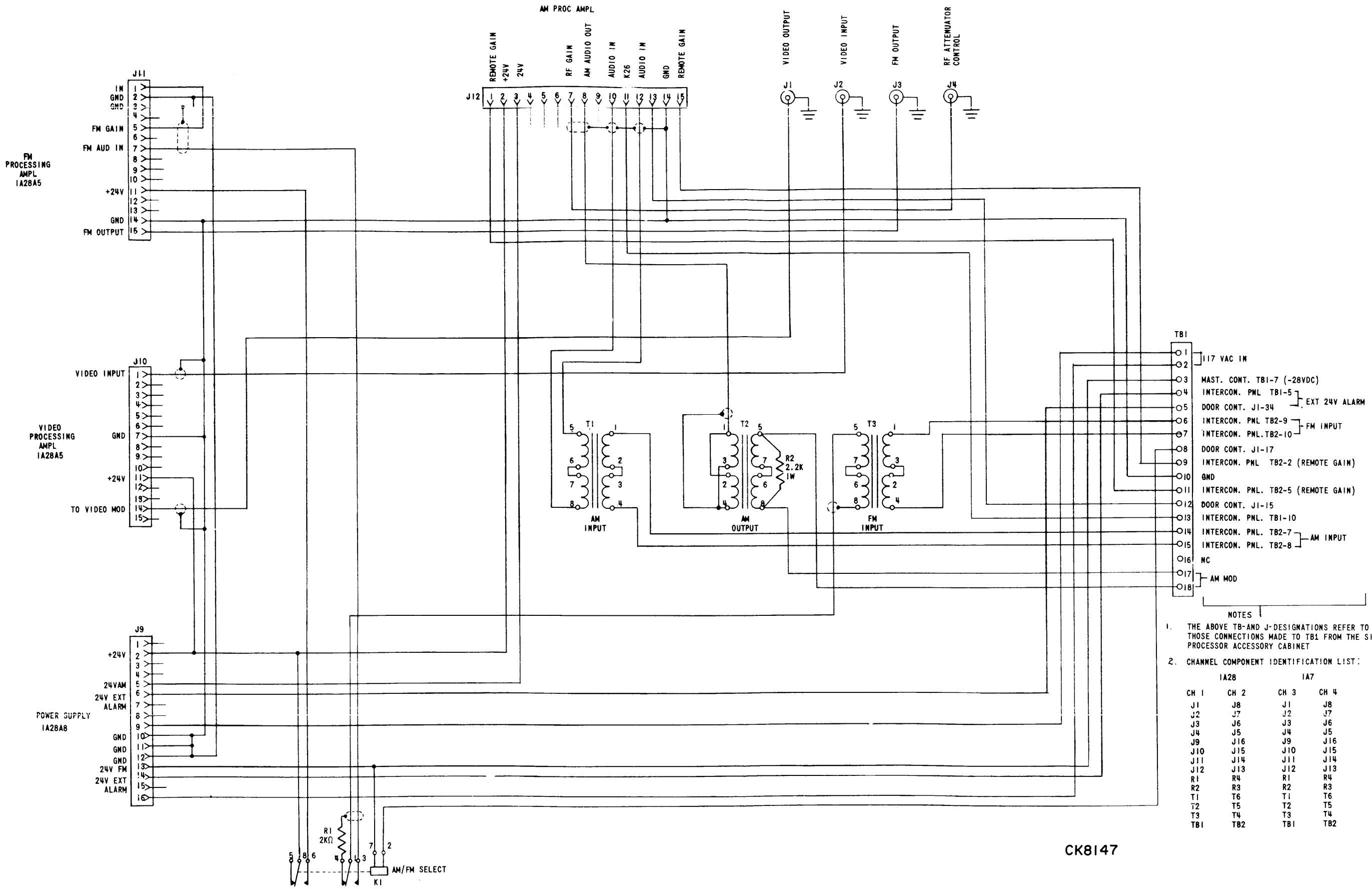
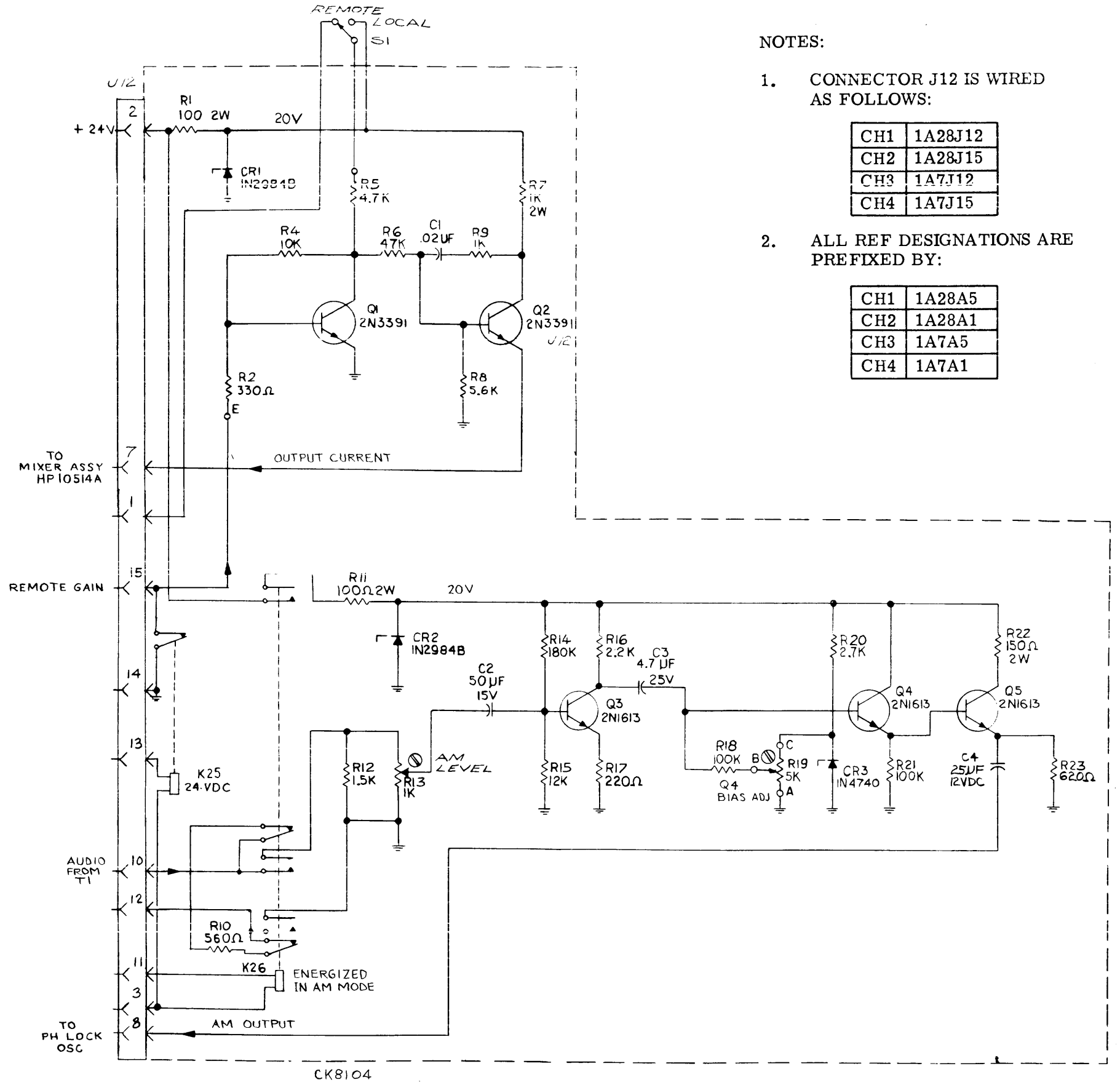


Figure 7-1. Signal Processor Cabinet Assembly AX8026, Schematic Diagram



NOTES:

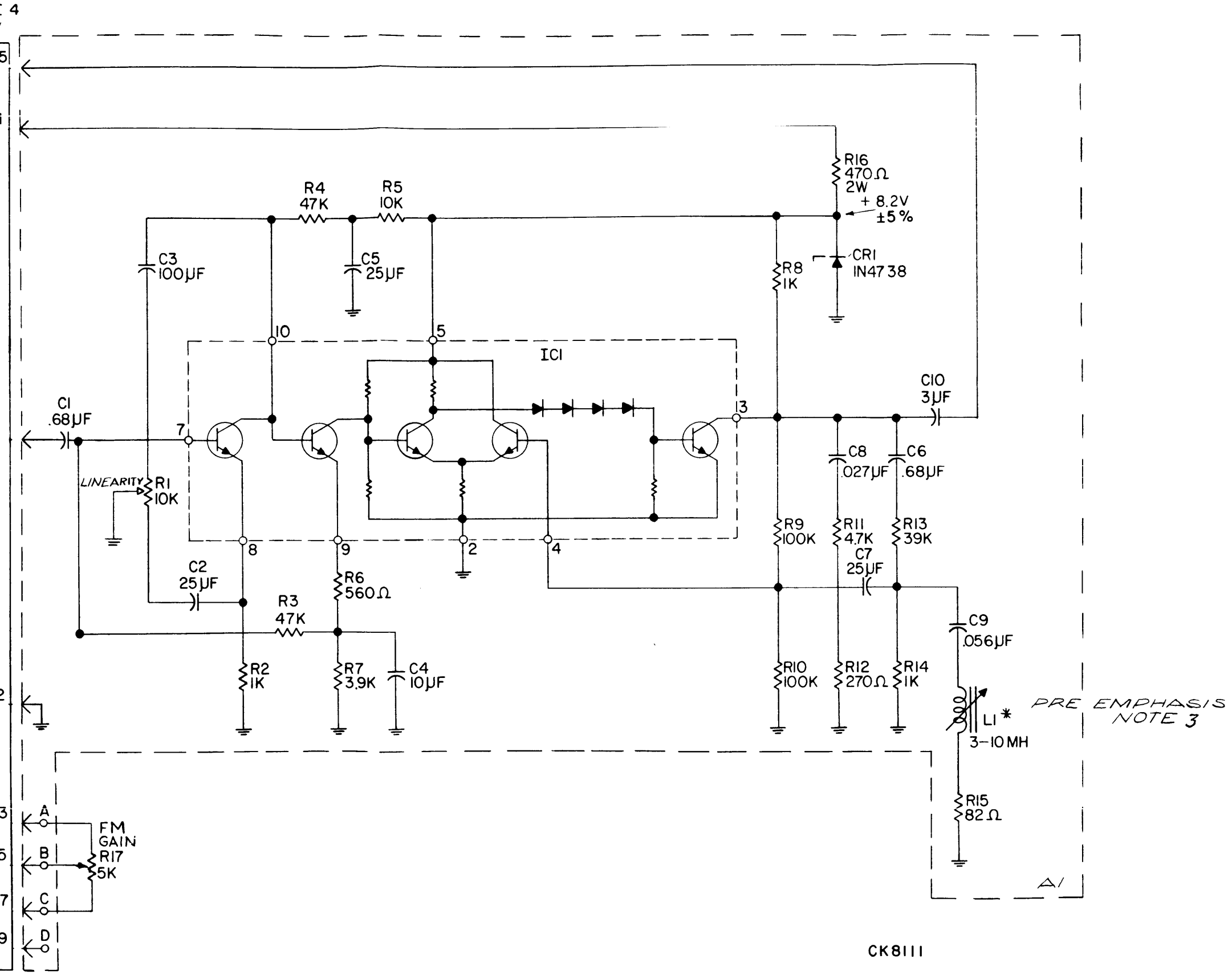
1. CONNECTOR J12 IS WIRED AS FOLLOWS:

CH1	1A28J12
CH2	1A28J15
CH3	1A7J12
CH4	1A7J15

2. ALL REF DESIGNATIONS ARE PREFIXED BY:

CH1	1A28A5
CH2	1A28A1
CH3	1A7A5
CH4	1A7A1

Figure 7-2. Attenuator Control and AM Processing Amplifier AX8030, Schematic Diagram



CK8111

NOTES:

1. UNLESS OTHERWISE SPECIFIED
   ALL RESISTANCES ARE IN OHMS
   ALL CAPACITANCE IS IN MICROFARADS

2. ALL REF DESIGNATIONS
   PREFIXED BY:

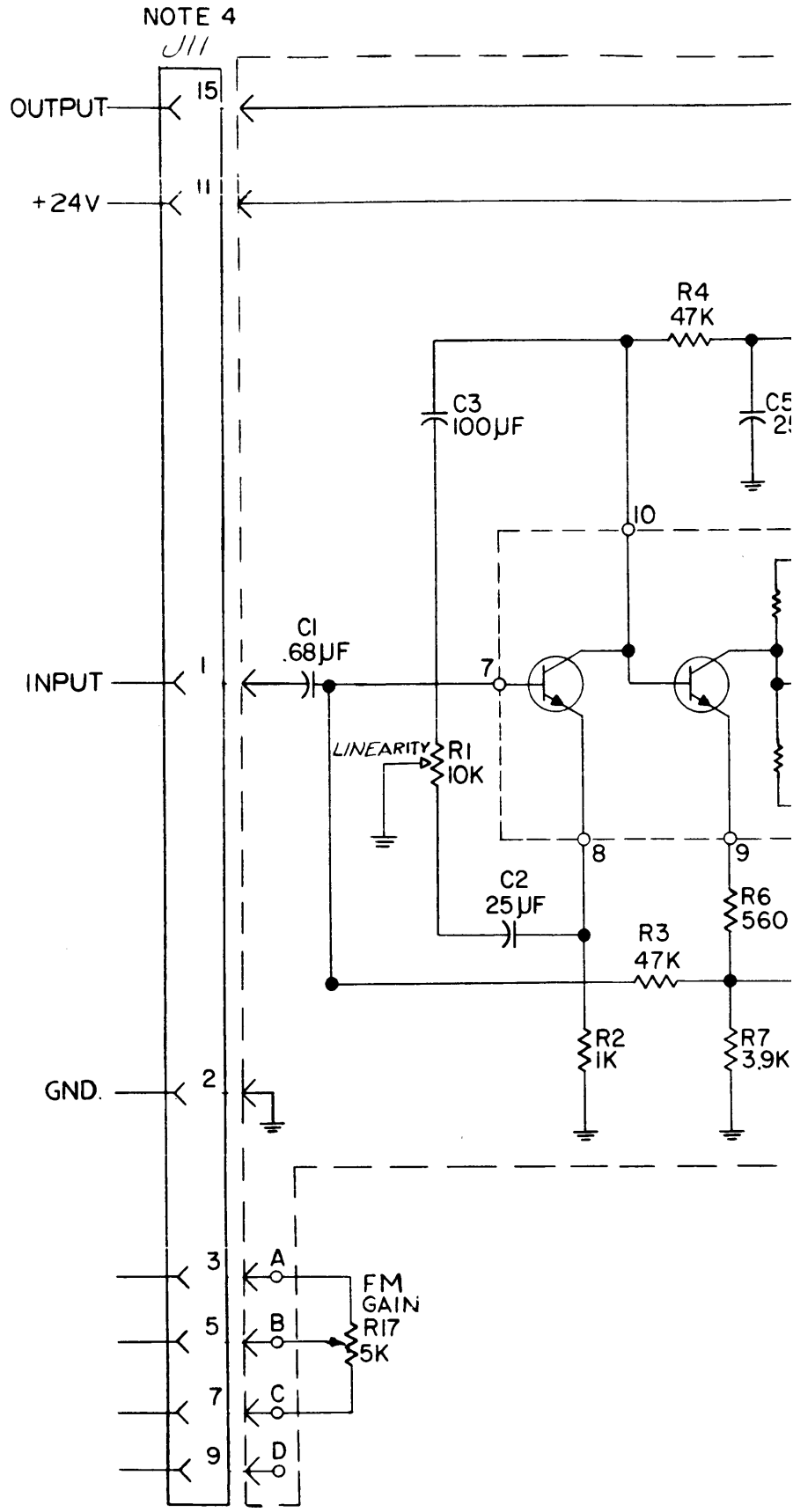
CH1	1A28A6
CH2	1A28A3
CH3	1A7A6
CH4	1A7A3

3. COIL L1 IS ADJUSTED TO
   GIVE THE DESIRED PRE-EMPHASIS
   CURVE

4. J11 WIRING CONNECTIONS ARE
   LISTED BELOW:

CH1	1A27J11
CH2	1A28J14
CH3	1A7J11
CH4	1A7J14

Figure 7-3. FM Processing Amplifier AX8031, Schematic Diagram


NOTE 4
J11
OUTPUT
15
+24V
11
R4
47K
C3
100µF
C5
25
10
C1
.68µF
INPUT
1
7
LINEARITY
R1
10K
8
9
C2
25µF
R6
560
R3
47K
R2
1K
R7
3.9K
GND.
2
3
A
FM
GAIN
R17
5K
5
B
7
C
9
D

NOTES:

1. ALL REF DESIGNATIONS PREFIXED BY:

CH1	1A28J10
CH2	1A28J13
CH3	1A7 J10
CH4	1A7 J13

2. CONNECTION C-D IS MADE FOR NEGATIVE VIDEO MODULATION (USA), CONNECTION E-D IS MADE FOR POSITIVE VIDEO MODULATION (EUROPE)

3. J10 WIRING CONNECTIONS ARE LISTED BELOW:

CH1	1A28 A7
CH2	1A28A4
CH3	1A7A7
CH4	1A7A4

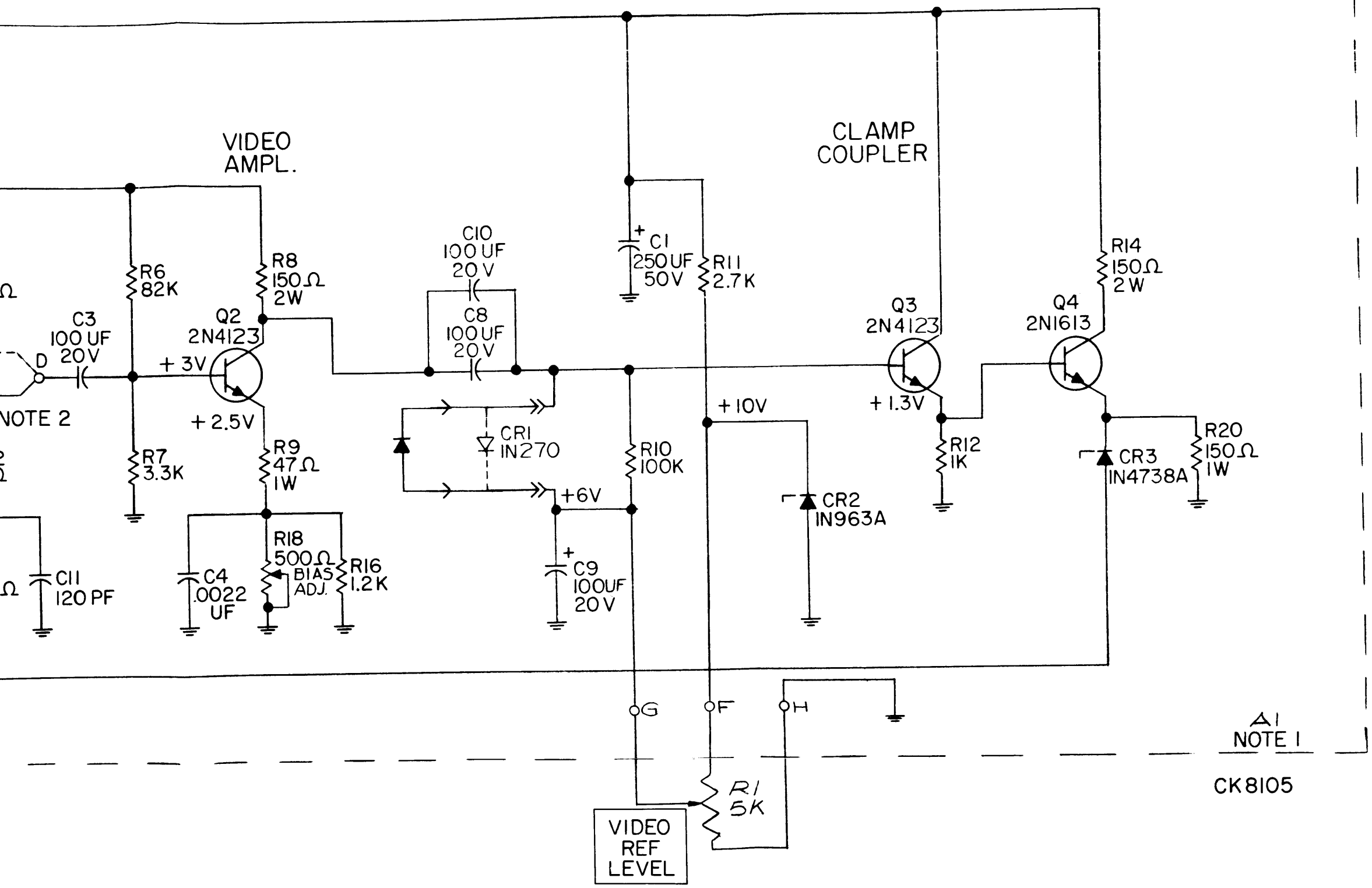
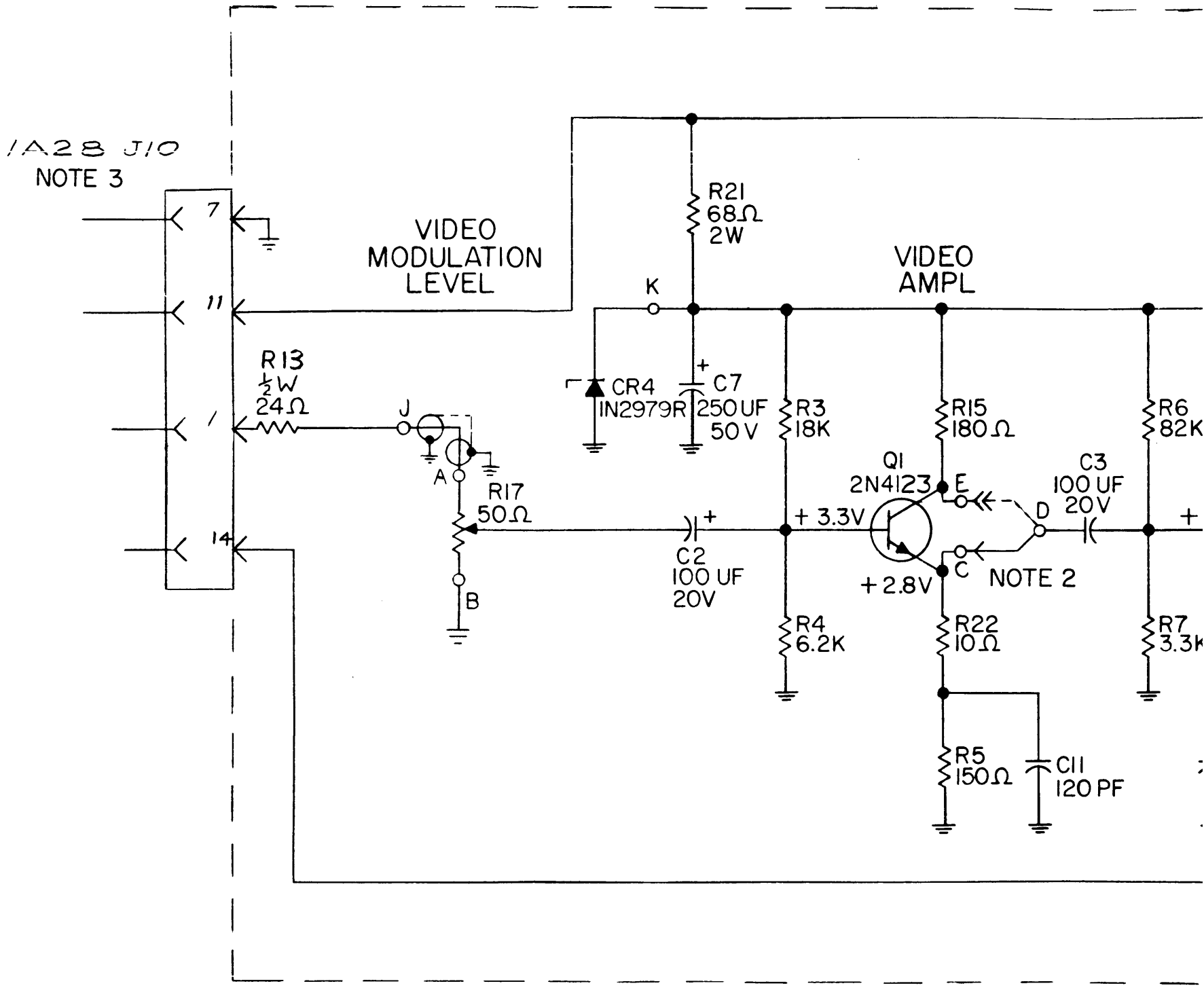


Figure 7-4. Video Processing Amplifier AX8032, Schematic Diagram


1A28 J10
NOTE 3
7
11
1
14
VIDEO
MODULATION
LEVEL
R13
½W
24Ω
J
A
B
R17
50Ω
K
CR4
IN2979R
C7
250UF
50V
R21
68Ω
2W
VIDEO
AMPL
R3
18K
R4
6.2K
C2
100 UF
20V
+ 3.3V
Q1
2N4123
E
C
D
+2.8V
NOTE 2
R15
180Ω
R22
10Ω
C3
100 UF
20V
R6
82K
R7
3.3K
R5
150Ω
C11
120 PF

NOTES:

1. CONNECTOR IS WIRED AS FOLLOWS:

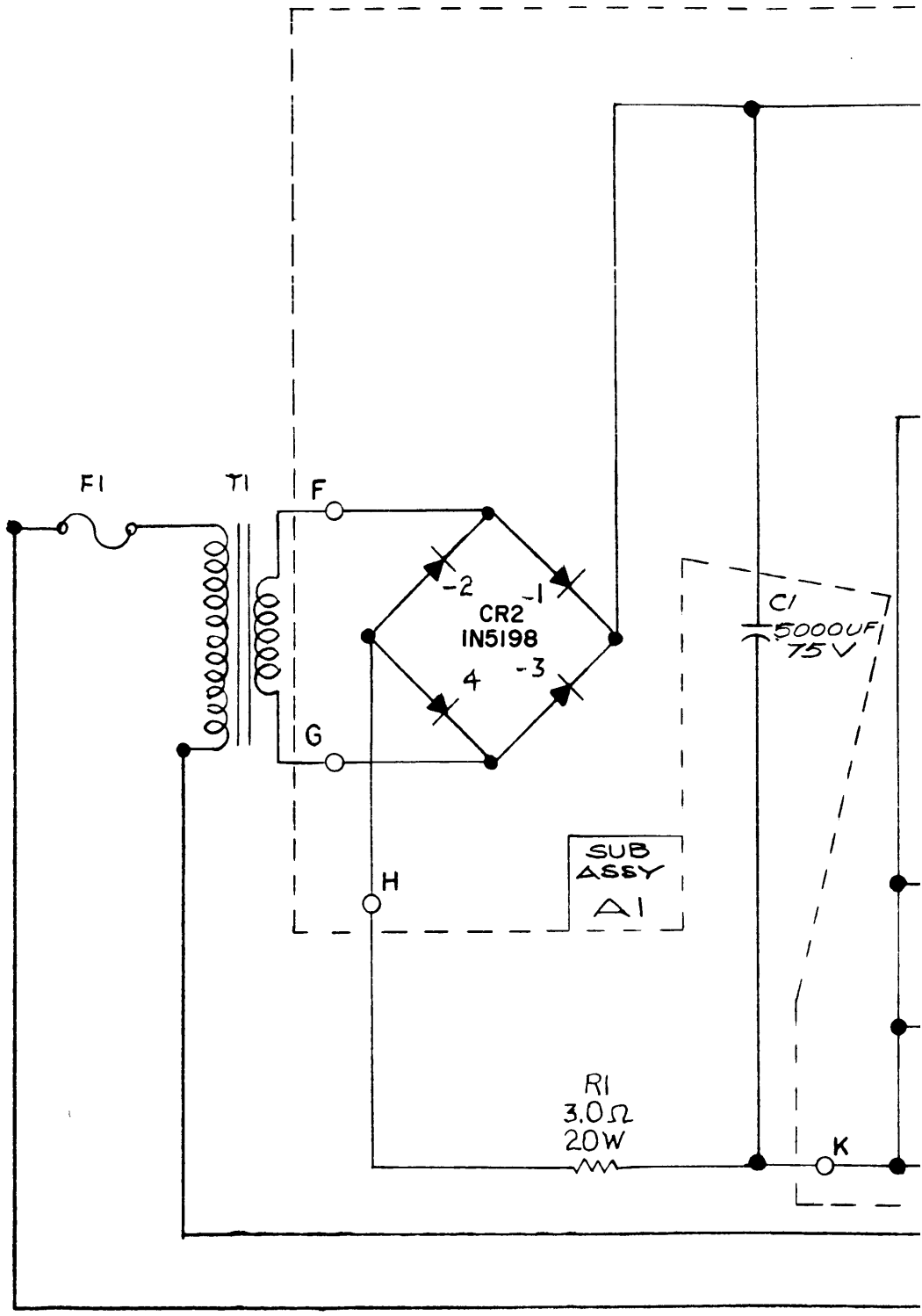
CH1	1A28J9
CH2	1A28J16
CH3	1A7J9
CH4	1A7J16

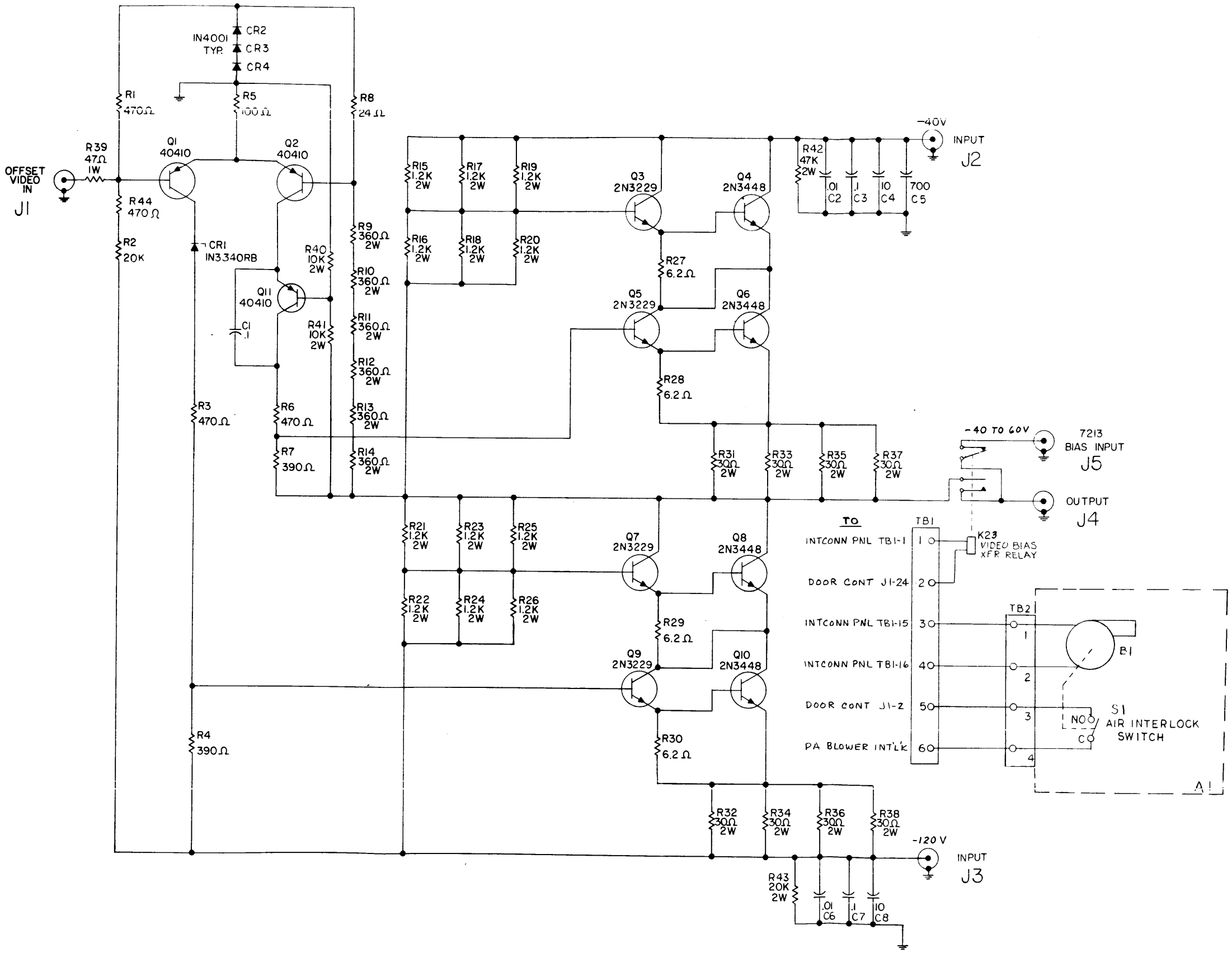
2. ALL REF DESIGNATIONS ARE PREFIXED BY:

CH1	1A28A8
CH2	1A28A1
CH3	1A7A8
CH4	1A7A1

3. ALL RESISTORS ARE 1/2 WATT, 10% UNLESS OTHERWISE NOTED

Figure 7-5. 24 Volt Power Supply AP137, Schematic Diagram


F1
T1
F
G
H
K
CR2
IN5198
-1
-2
-3
4
C1
5000UF
75V
SUB
ASSY
A1
R1
3.0Ω
20W



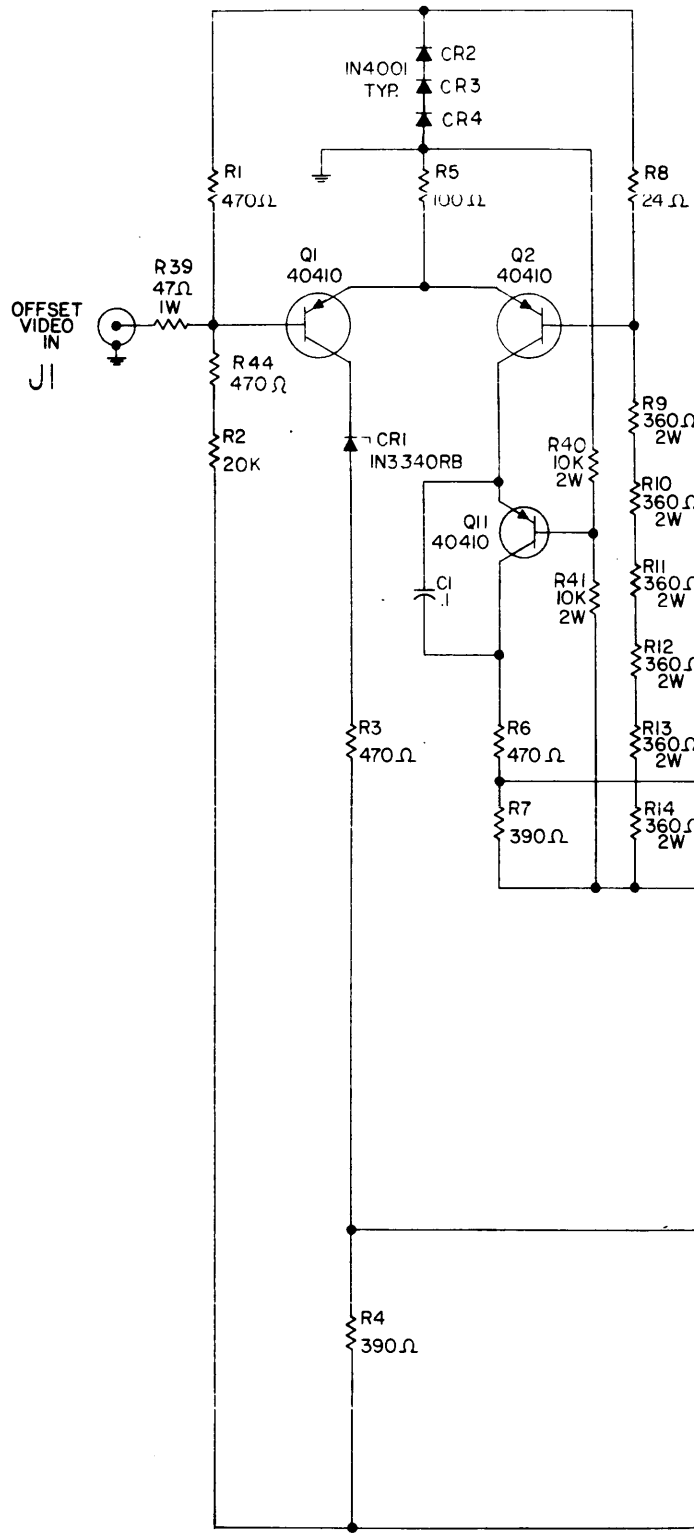
NOTES:

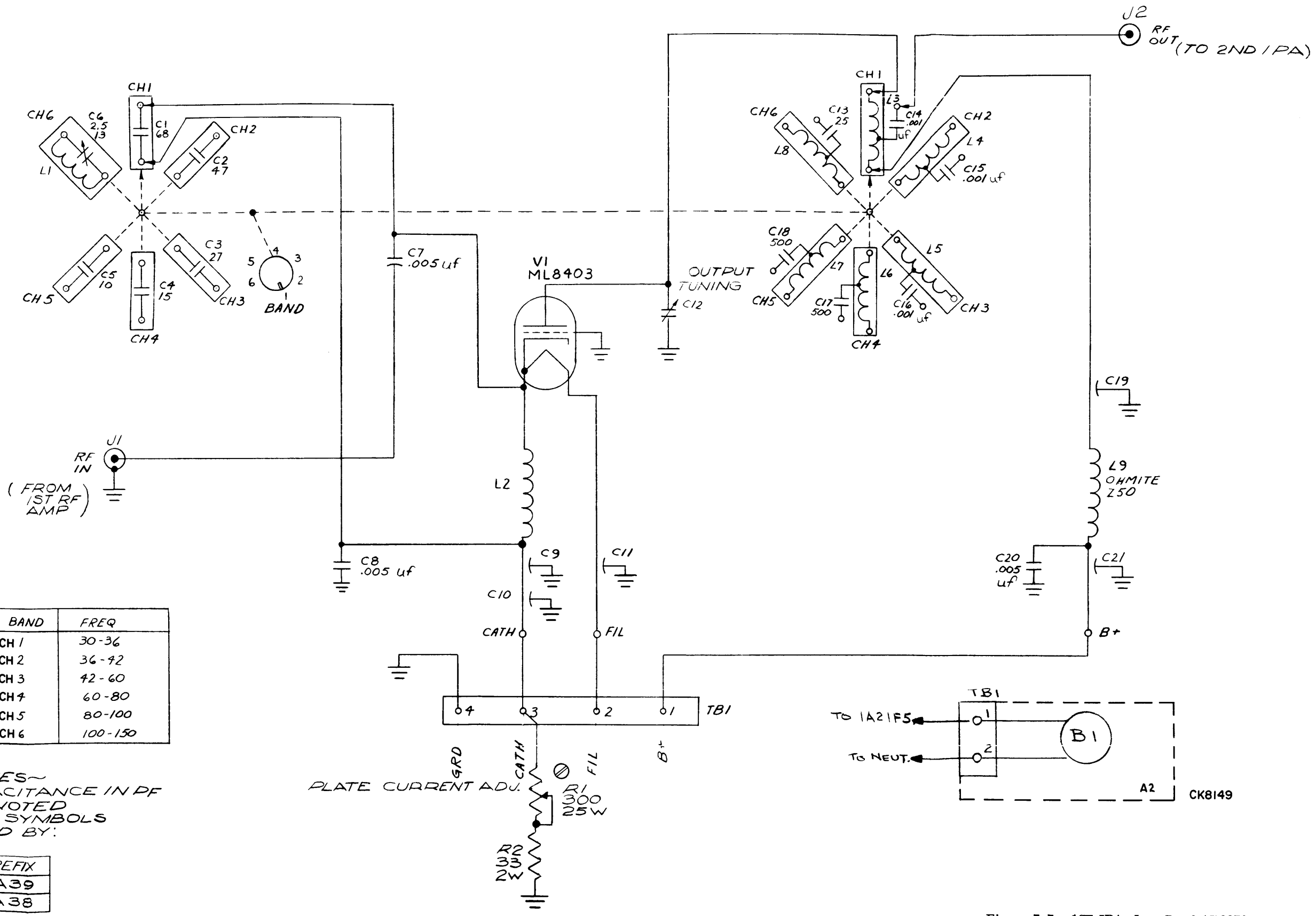
1. ALL REF. SYMBOLS PREFIXED BY THE FOLLOWING
   - CH 1 1A19
   - CH 2 1A18
   - CH 3 1A12
   - CH 4 1A11
2. ALL RESISTORS ARE 1/2 W UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

CK8142

Figure 7-6. Video Modulator AX8038, Schematic Diagram

008701047


IN4001
TYP.
CR2
CR3
CR4
R1
470Ω
R5
100Ω
R8
24Ω
R39
47Ω
1W
Q1
40410
Q2
40410
OFFSET
VIDEO
IN
J1
R44
470Ω
R2
20K
CR1
IN3340RB
R40
10K
2W
R9
360Ω
2W
R10
360Ω
2W
Q11
40410
C1
.1
R41
10K
2W
R11
360Ω
2W
R12
360Ω
2W
R3
470Ω
R6
470Ω
R13
360Ω
2W
R7
390Ω
R14
360Ω
2W
R4
390Ω



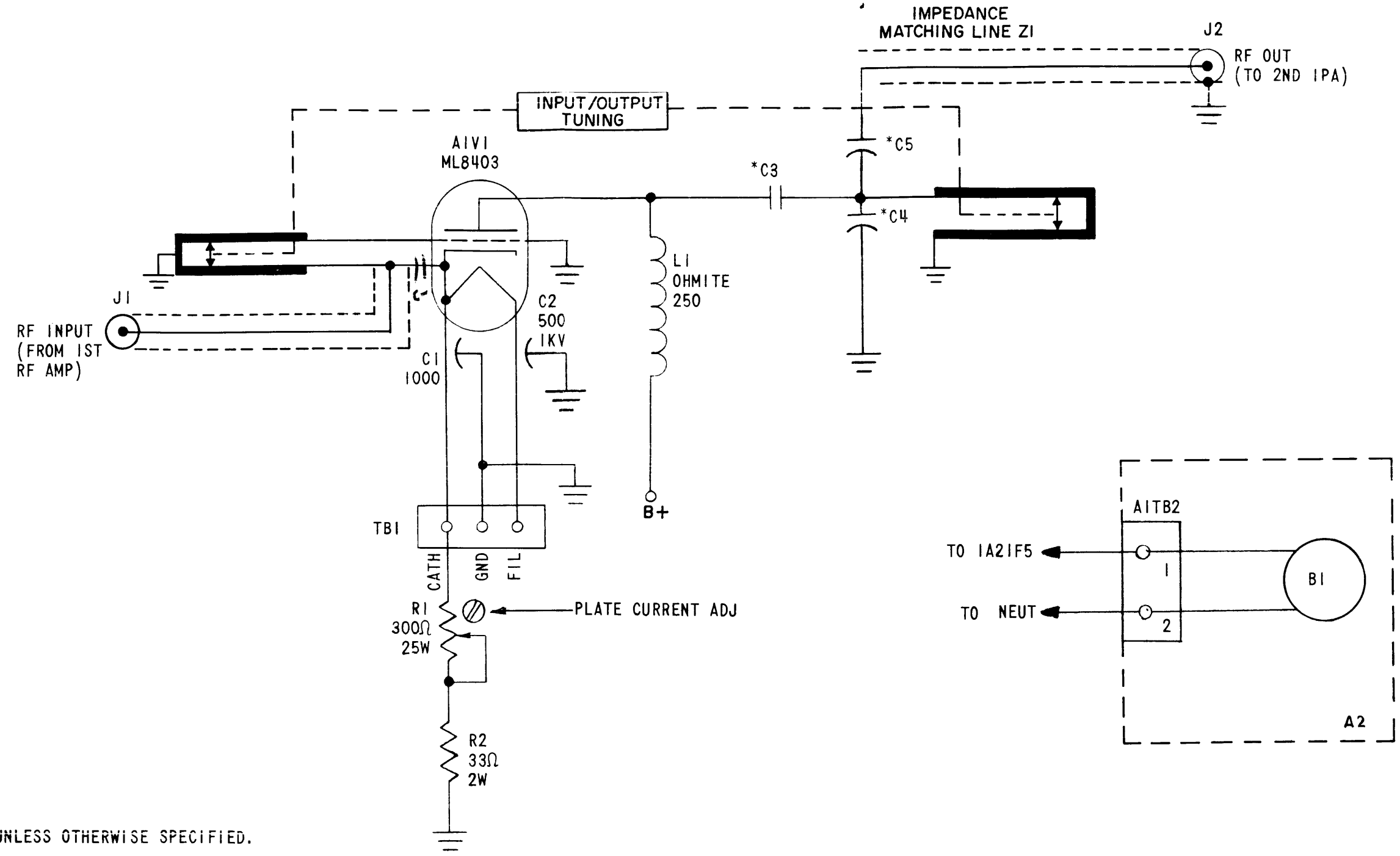
BAND	FREQ
CH 1	30-36
CH 2	36-42
CH 3	42-60
CH 4	60-80
CH 5	80-100
CH 6	100-150

~NOTES~

1. ALL CAPACITANCE IN PF UNLESS NOTED
2. ALL REF. SYMBOLS PREFIXED BY:

CHAN	PREFIX
2	1A39
3	1A38

Figure 7-7. **1ST IPA**, Low Band AX8079, Schematic Diagram



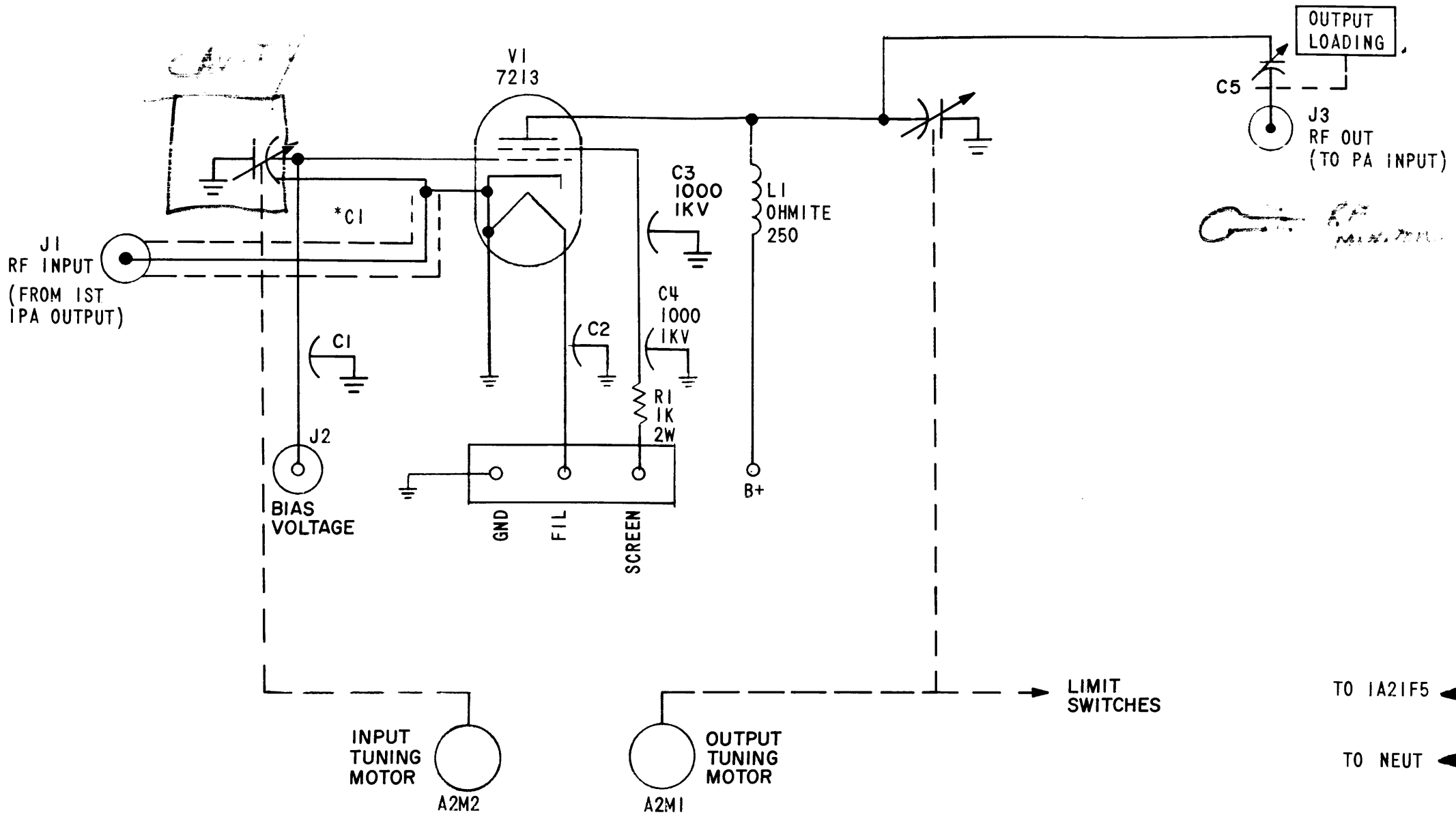
CK8148

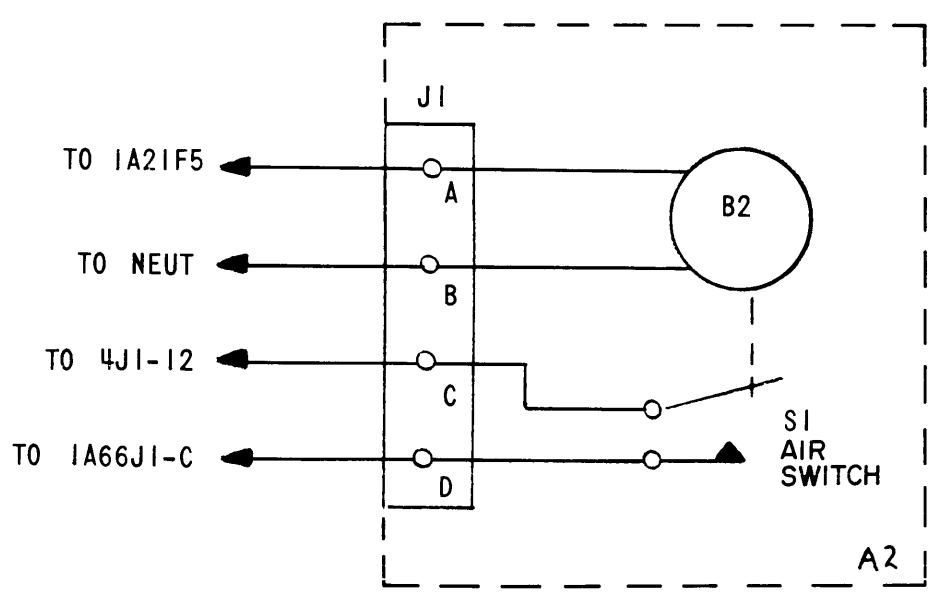
Figure 7-8. 1ST IPA, High Band, AX8088, Schematic Diagram

NOTES:

1. ALL CAPACITANCE IN pf UNLESS OTHERWISE SPECIFIED.
2. ALL REF SYMBOLS PREFIXED BY:

CHAN	PREFIX
2	1A63
3	1A47



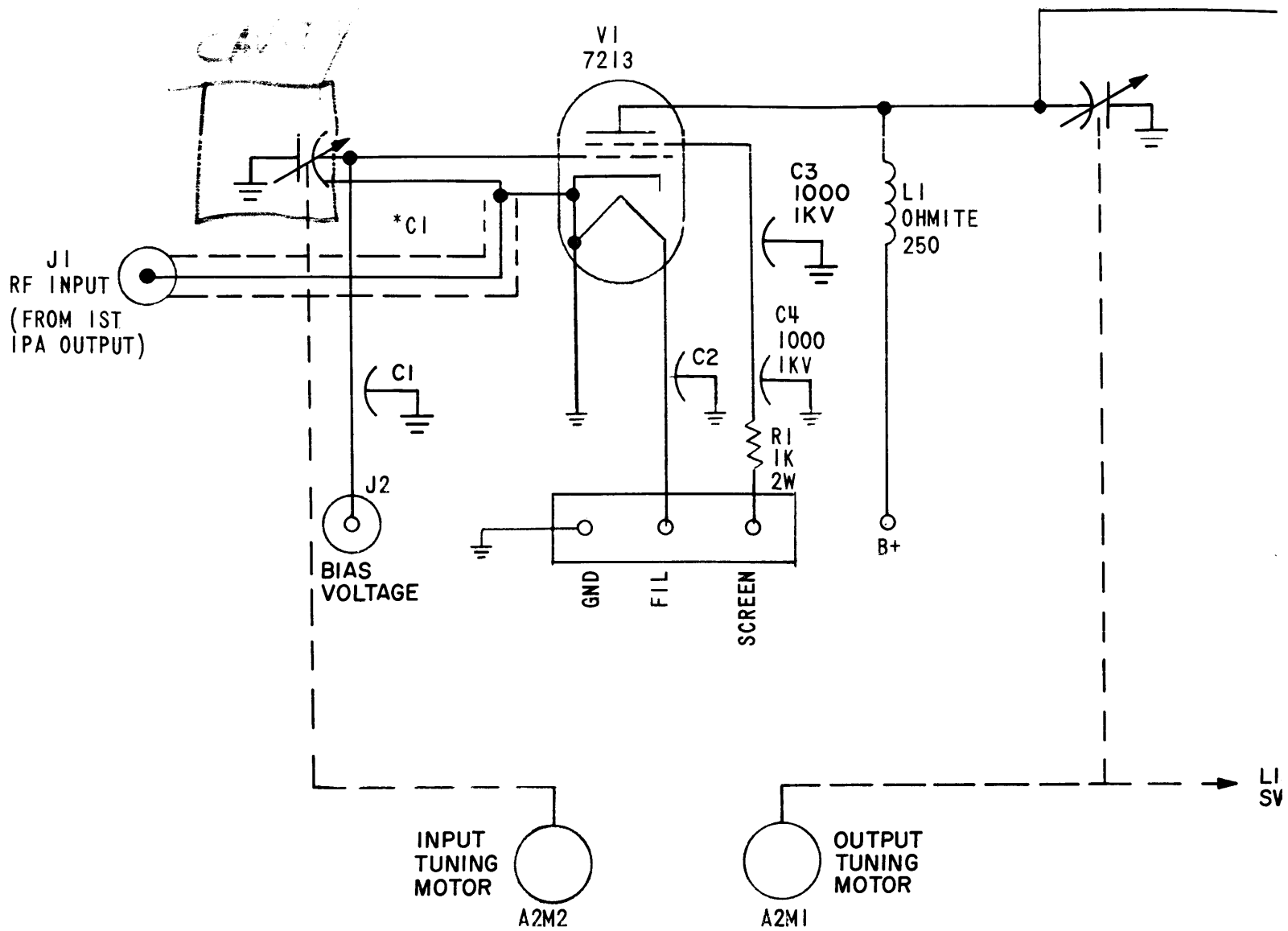


CK8163

ALL REF SYMBOLS PREFIXED BY:

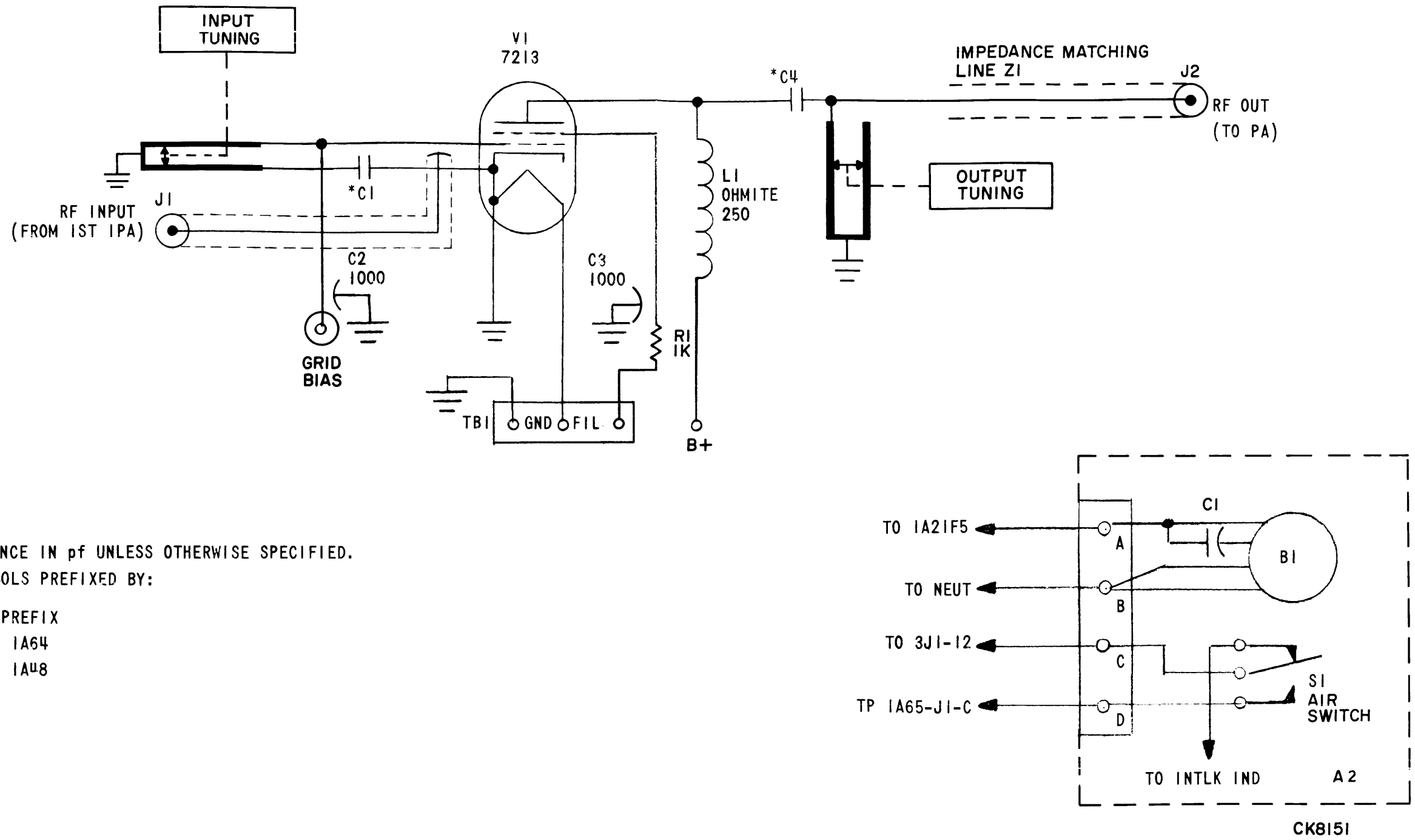
CHAN	PREFIX
2	1A46
3	1A35

Figure 7-9. 2ND IPA, Low Band, AX8080, Schematic Diagram



ALL REF SYMBOLS PREFIXED BY:

CHAN	PREFIX
2	1A46
3	1A35

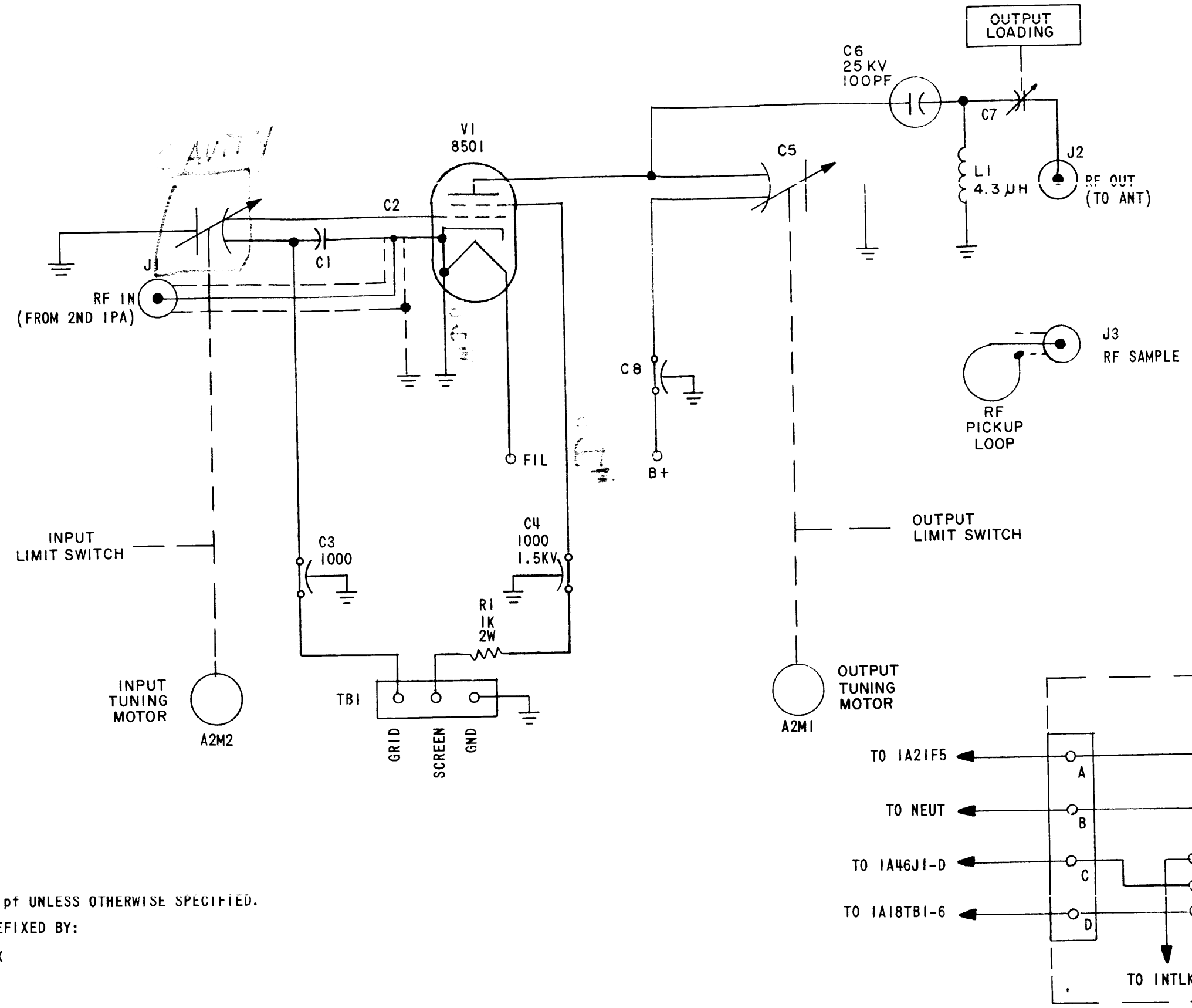


NOTES:

1. ALL CAPACITANCE IN pf UNLESS OTHERWISE SPECIFIED.
2. ALL REF SYMBOLS PREFIXED BY:

CHAN	PREFIX
1	1A64
4	1A48

Figure 7-10. 2ND IPA, High Band, AX8089, Schematic Diagram

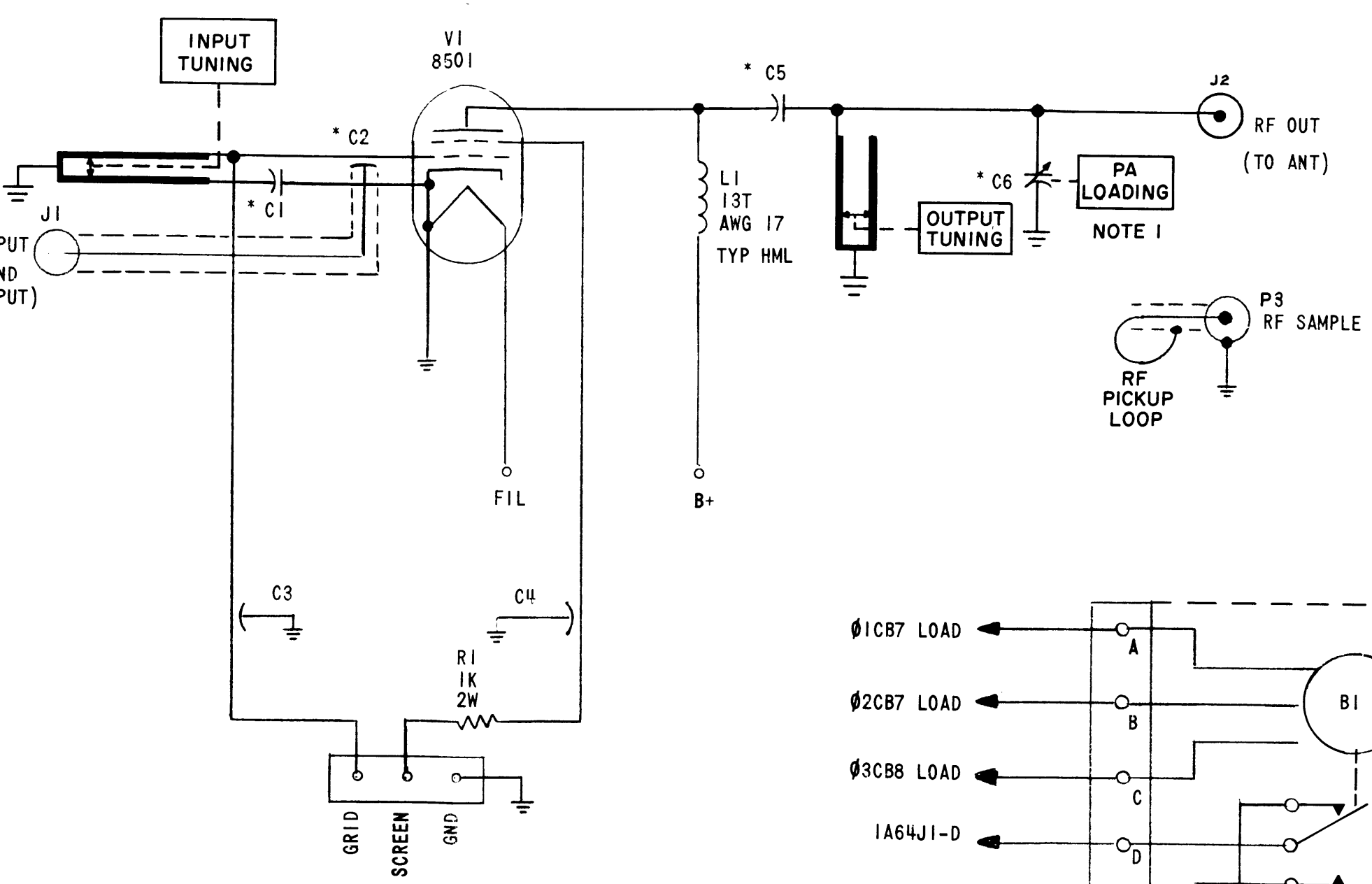


NOTES:

1. ALL CAPACITANCE IN pf UNLESS OTHERWISE SPECIFIED.
2. ALL REF SYMBOLS PREFIXED BY:

CHAN	PREFIX
2	1A66
3	1A50

Figure 7-11. PA, Low Band, AX8081, Schematic Diagram

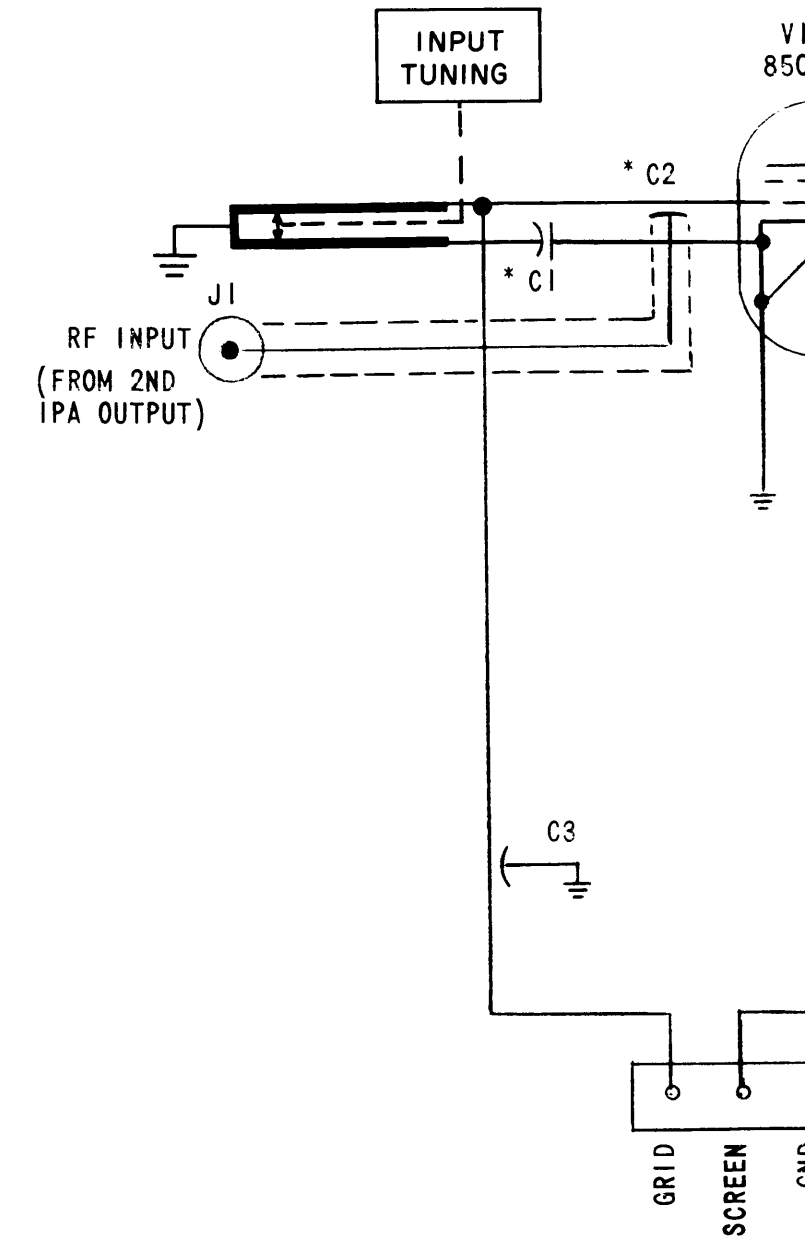


NOTES:

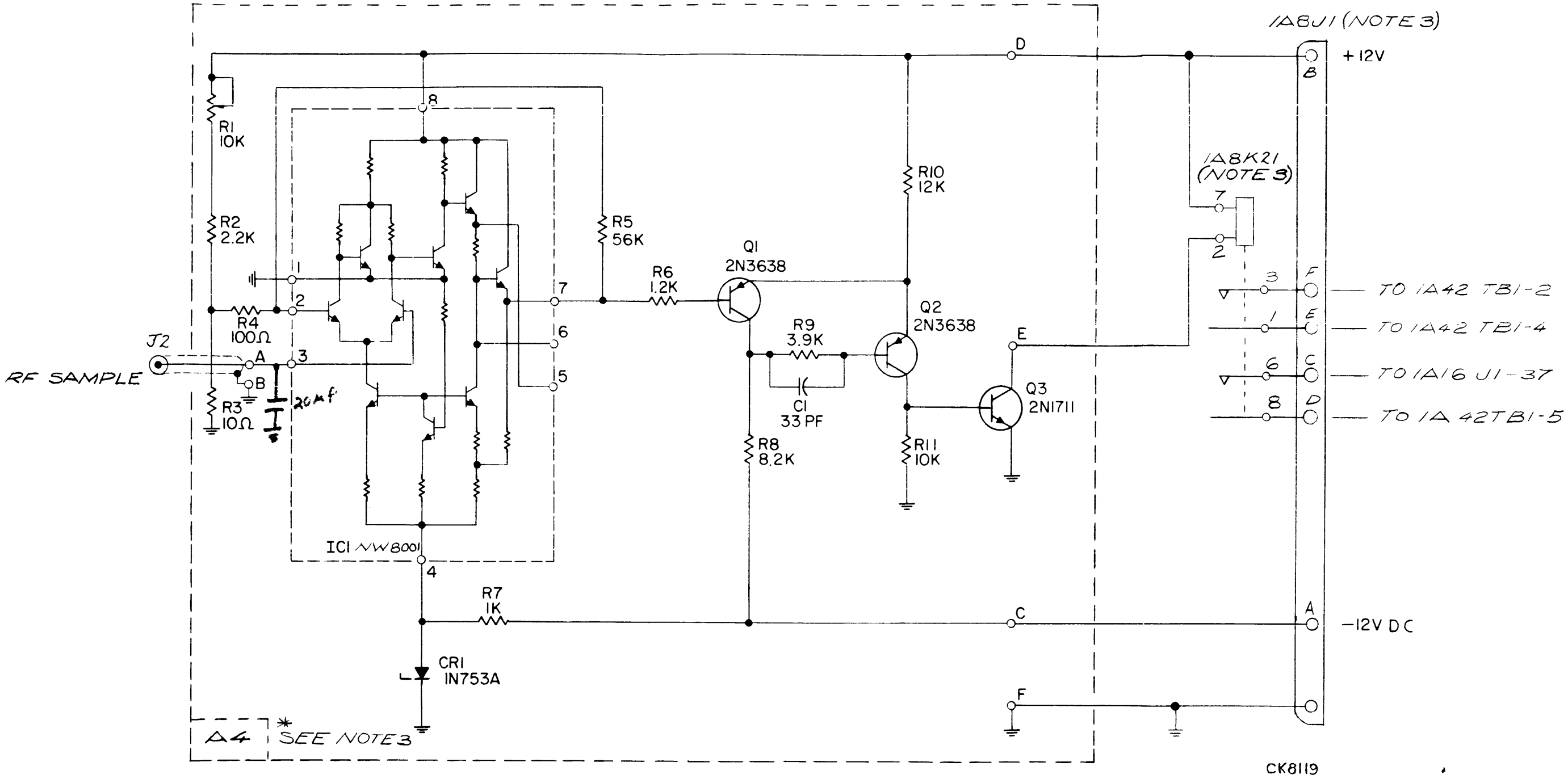
1. P.A. LOAD PRE-SET AT FACTORY, DO NOT ADJUST.
2. ALL CAPACITANCE IN pf UNLESS OTHERWISE SPECIFIED.
3. ALL SYMBOLS PREFIXED BY THE FOLLOWING

CHAN	PREFIX
1	1A65
4	1A49

Figure 7-12. PA, High Band AX8090, Schematic Diagram


INPUT
TUNING
* C2
* C1
J1
RF INPUT
(FROM 2ND
IPA OUTPUT)
C3
GRID
SCREEN

CK8162



NOTES:

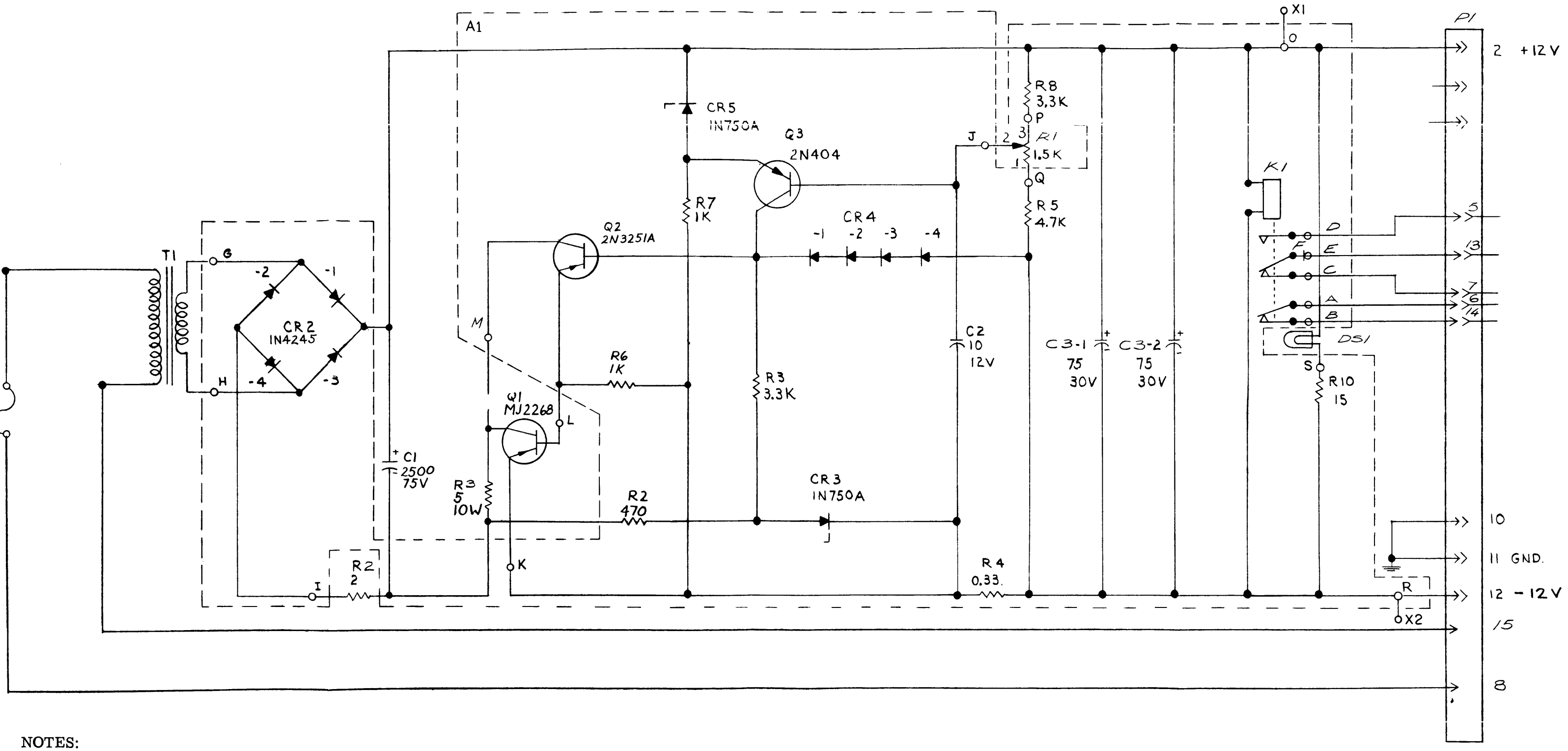
1. ALL REF DESIGNATIONS ARE PREFIXED BY:

CH1	1A8A4
CH2	1A8A3
CH3	1A8A2
CH4	1A8A1

2. CKT REF DESIGNATIONS FOR EACH CHANNEL ARE AS FOLLOWS:

CH1	J1	J2	K4
CH2	J3	J4	K3
CH3	J5	J6	K2
CH4	J7	J8	K1

Figure 7-13. VSWR Overload Assembly AX8037, Schematic Diagram



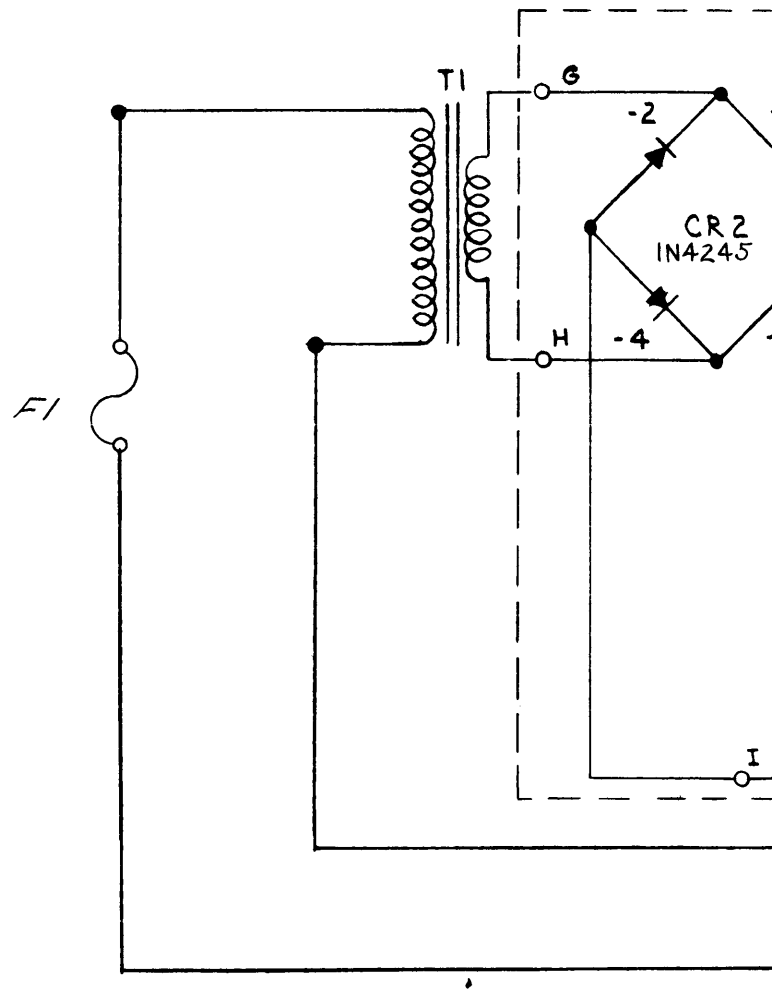
NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL RESISTANCES ARE OHMS ALL CAPACITORS ARE IN MICROFARADS

2. ALL REF DESIGNATIONS PREFIXED BY:

LEFT	1A27A1
RIGHT	1A27A2

Figure 7-14. 12 Volt Power Supply AP138, Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL RESISTANCES ARE OHMS ALL CAPACITORS ARE IN MICROFARADS

NOTES:

1. UNLESS OTHERWISE SPECIFIED: ALL RESISTANCES ARE IN CAMES 1/2 WATT 10 PCT. ALL CAPACITANCES ARE IN PICOFARADS.
2. COMPONENT VALUES IN PARENTHESIS ( ) ARE FOR THE 150 - 350 MHz UNITS ONLY 1A29A1, A4 (CH1 and CH4). COMPONENT VALUES MARKED WITH AN ASTERIK * ARE FOR THE 30 TO 150 MHz UNITS ONLY 1A29A2, A3 (CH2 and CH3).
3. COIL L1 IS USED ON UNITS 1A29A1 and A4 ONLY (150 - 350 MHz).
4. CONNECTOR J3 IS MOUNTED AT THE REAR OF AC BOARD A4 R17 AND JUMPER WIRE FROM J3 TO THE INDICATED POINT (A) ARE INCORPORATED ON PC BOARD A4 (CH4) ONLY.
5. ONLY ONE CHANNEL (CH4) IS SHOWN.

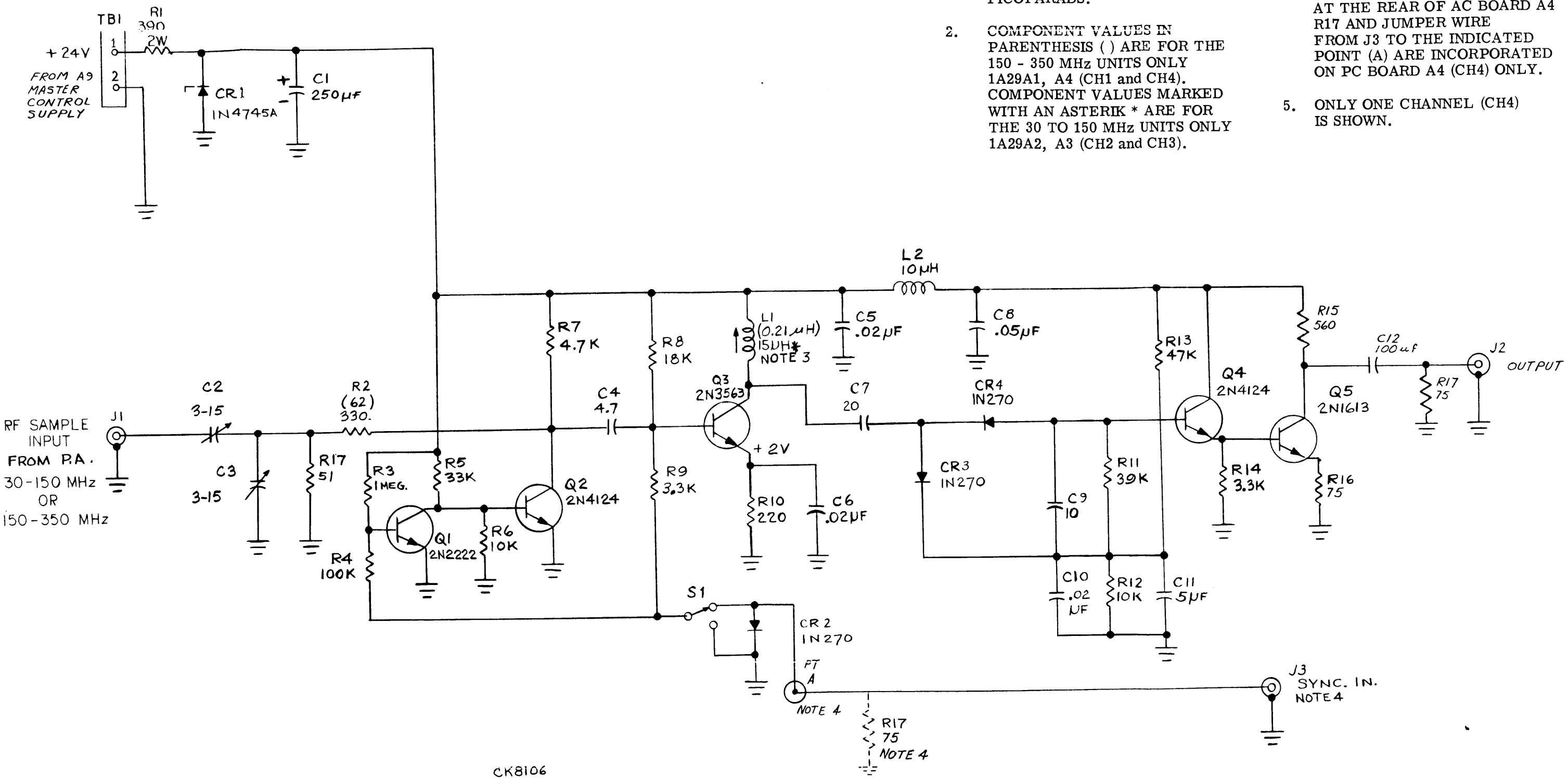
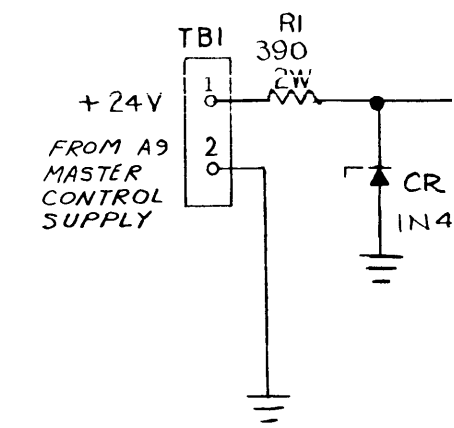
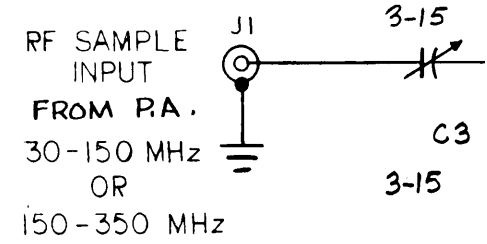
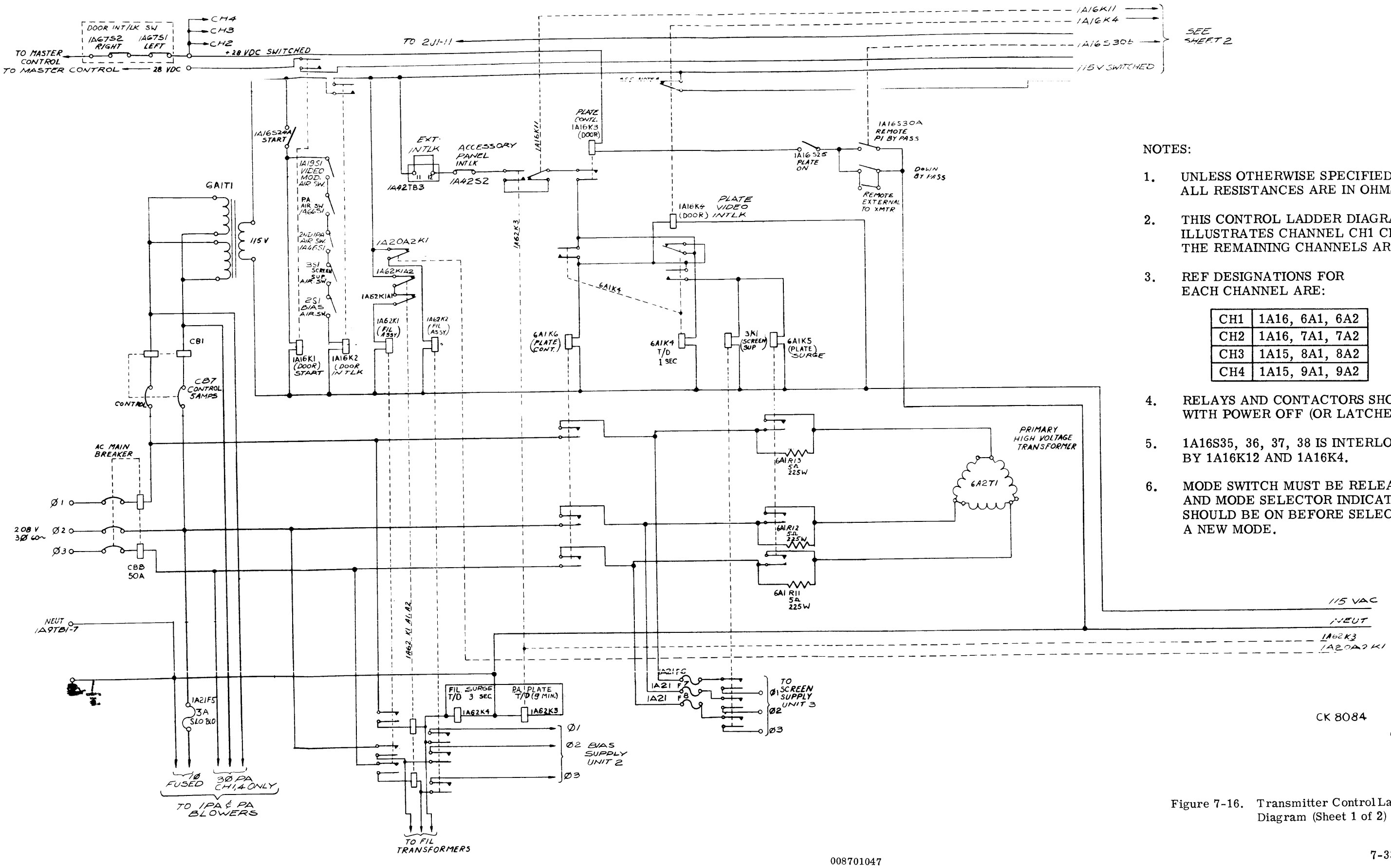


Figure 7-15. Video Demodulator Chopper AX8028, Schematic Diagram


TBI
R1
390
2W
+24V
1
2
FROM A9
MASTER
CONTROL
SUPPLY
CR
IN4


RF SAMPLE
INPUT
FROM P.A.
30-150 MHz
OR
150-350 MHz
J1
3-15
C3
3-15

C2



NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL RESISTANCES ARE IN OHMS

2. THIS CONTROL LADDER DIAGRAM ILLUSTRATES CHANNEL CH1 CIRCUITS. THE REMAINING CHANNELS ARE IDENTICAL.

3. REF DESIGNATIONS FOR EACH CHANNEL ARE:

CH1	1A16, 6A1, 6A2
CH2	1A16, 7A1, 7A2
CH3	1A15, 8A1, 8A2
CH4	1A15, 9A1, 9A2

4. RELAYS AND CONTACTORS SHOWN WITH POWER OFF (OR LATCHED)

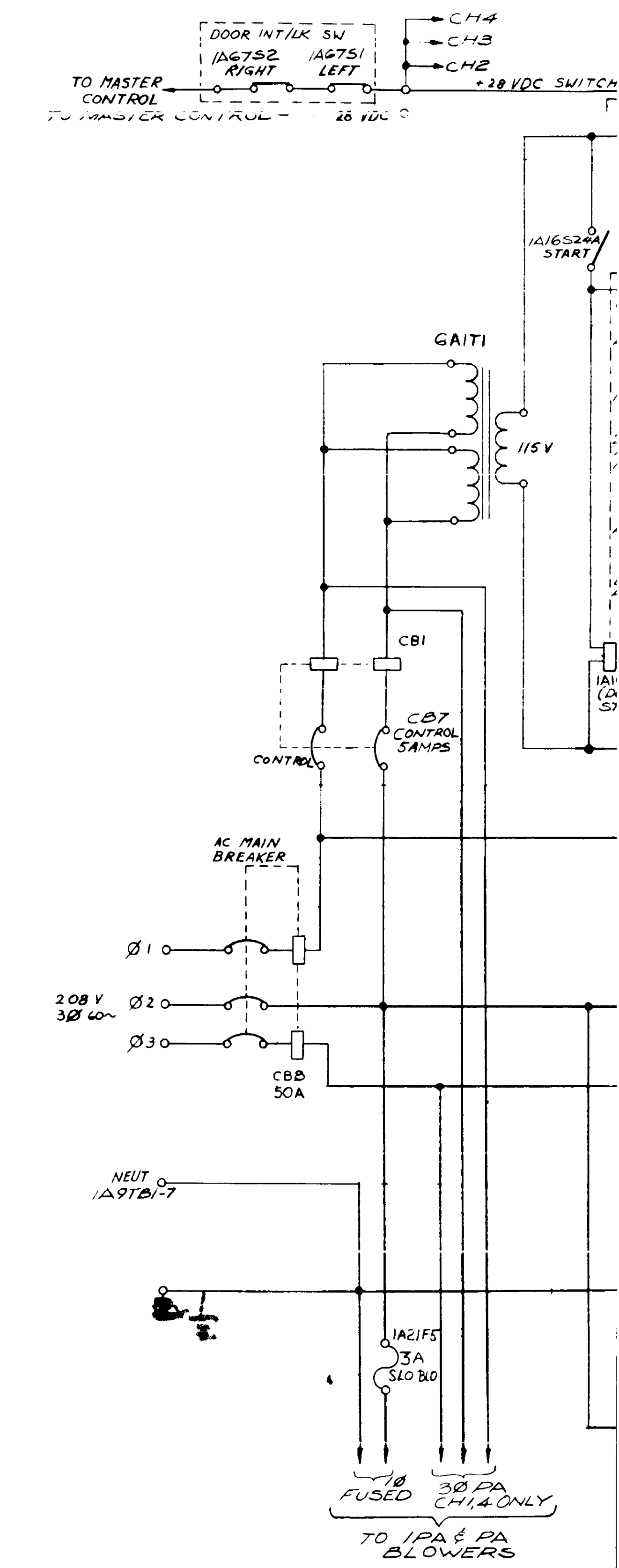
5. 1A16S35, 36, 37, 38 IS INTERLOCKED BY 1A16K12 AND 1A16K4.

6. MODE SWITCH MUST BE RELEASED AND MODE SELECTOR INDICATOR SHOULD BE ON BEFORE SELECTING A NEW MODE.

CK 8084

Figure 7-16. Transmitter Control Ladder, Schematic Diagram (Sheet 1 of 2)

008701047


DOOR INT/LK SW
1A6TS2 RIGHT
1A6TS1 LEFT
TO MASTER CONTROL
CH4
CH3
CH2
+28 VDC SWITCH
1A16S24A START
GAIT1
115 V
CB1
CB7 CONTROL 5AMPS
CONTROL
AC MAIN BREAKER
Ø 1
Ø 2
Ø 3
208 V 3Ø 60~
CB8 50A
NEUT 1A9TB1-7
1A21F5 3A SLO BLO
1Ø FUSED
3Ø PA CH1,4 ONLY
TO IPA & PA BLOWERS

1A1GK11
1A1GK4
1A16S30
+28V
115 VAC
115 VAC

MODE SWITCHES
CW 1A16S35
AM 1A16S36
1A16S37
VIDEO 1A16S38

1A16K5 (DOOR)
2CR2 IN538
1A20CR1
1A28A5K26 ATTN CONT
1A28A5K25 ATTN CONT
2K2 GRID BIAS & MOD
1A28K1 SIG. PROC CAB.
BIAS CONT 1A20A2K2
2CR3 IN2069
1A20CR2 IN2069

L T
(DOOR) 1A16K12 VIDEO CKT. CNTRL.

1A16S30 b
1A62K3
1A16K4
2K1 AM/VIDEO BIAS APPLY
1A16S24b0
1A16D580 START
1A10 K29 VIDEO MOD. BIAS AUX
A21DS2
1A16D582 READY
1A16D583 SELECT MODE
1A16D581 PLATE ON
1A16D586 REMOTE PLATE ON
1A16S30
1A16D584 O/L

CW 1A16D591
AM 1A16D592
FM 1A16D593
VIDEO 1A16D594

1A1GK11
1A1GK4
1A16S30
+28V
115 VAC
115 VAC

N.C. O/L IND RESET 1A16S29
N.C. N.C. O/L RESET 1A16S28
RESET (DOOR)
1A16K11 OVLD RELAY DOOR
TRIP

1ST IPA 6A1K1
2ND IPA 6A1K2
PA 6A1K3
1A27A1K1 24V SUPPLY
3K2 SCREEN
1A8A4K21 SWR
BIAS O/L 2K4

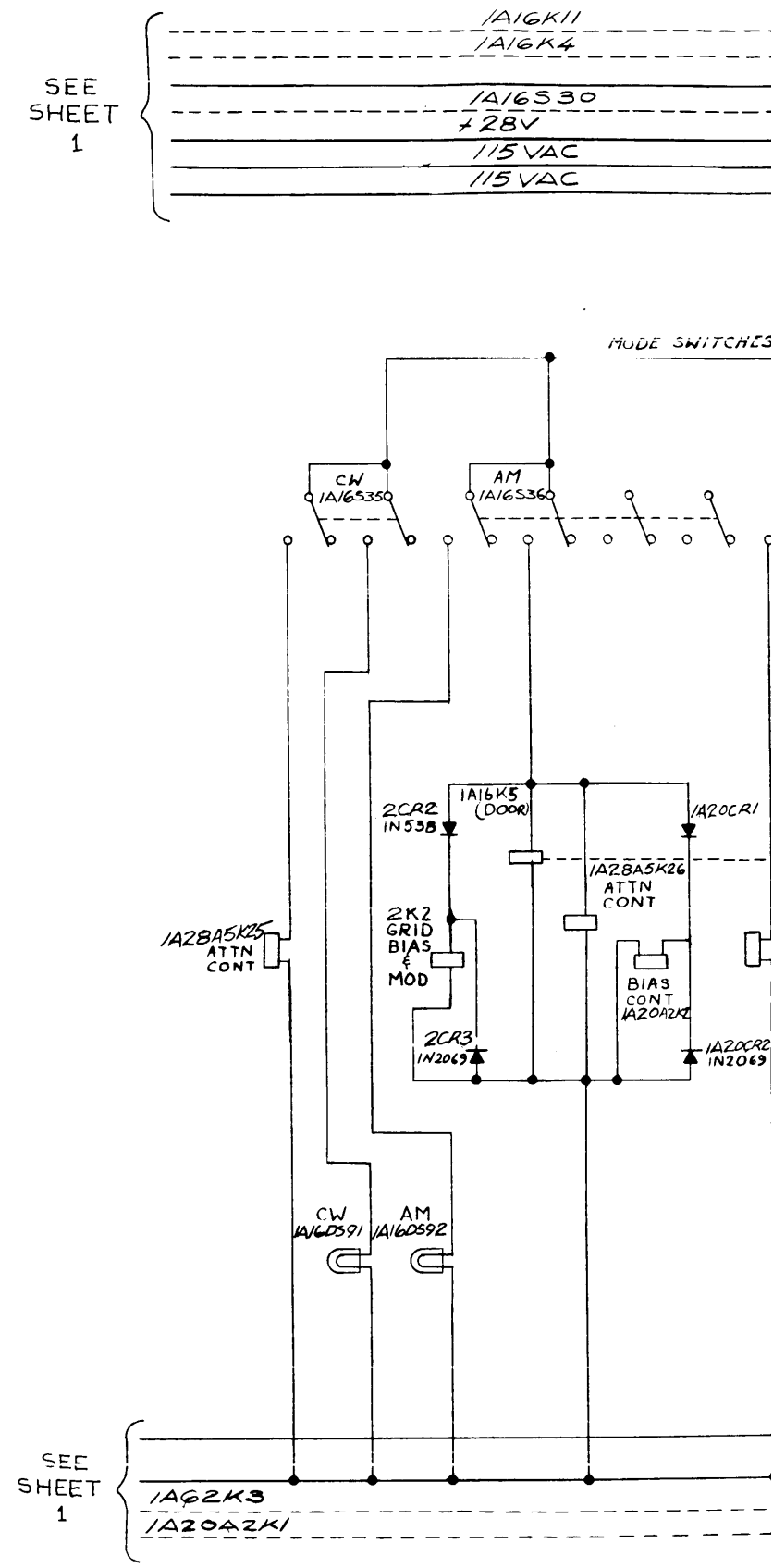
GE C106B1 ANODE GATE CATHODE
R 10K
0.01
1K
IN4004
Z1
Z2
Z3
Z4
Z5
Z6
Z7

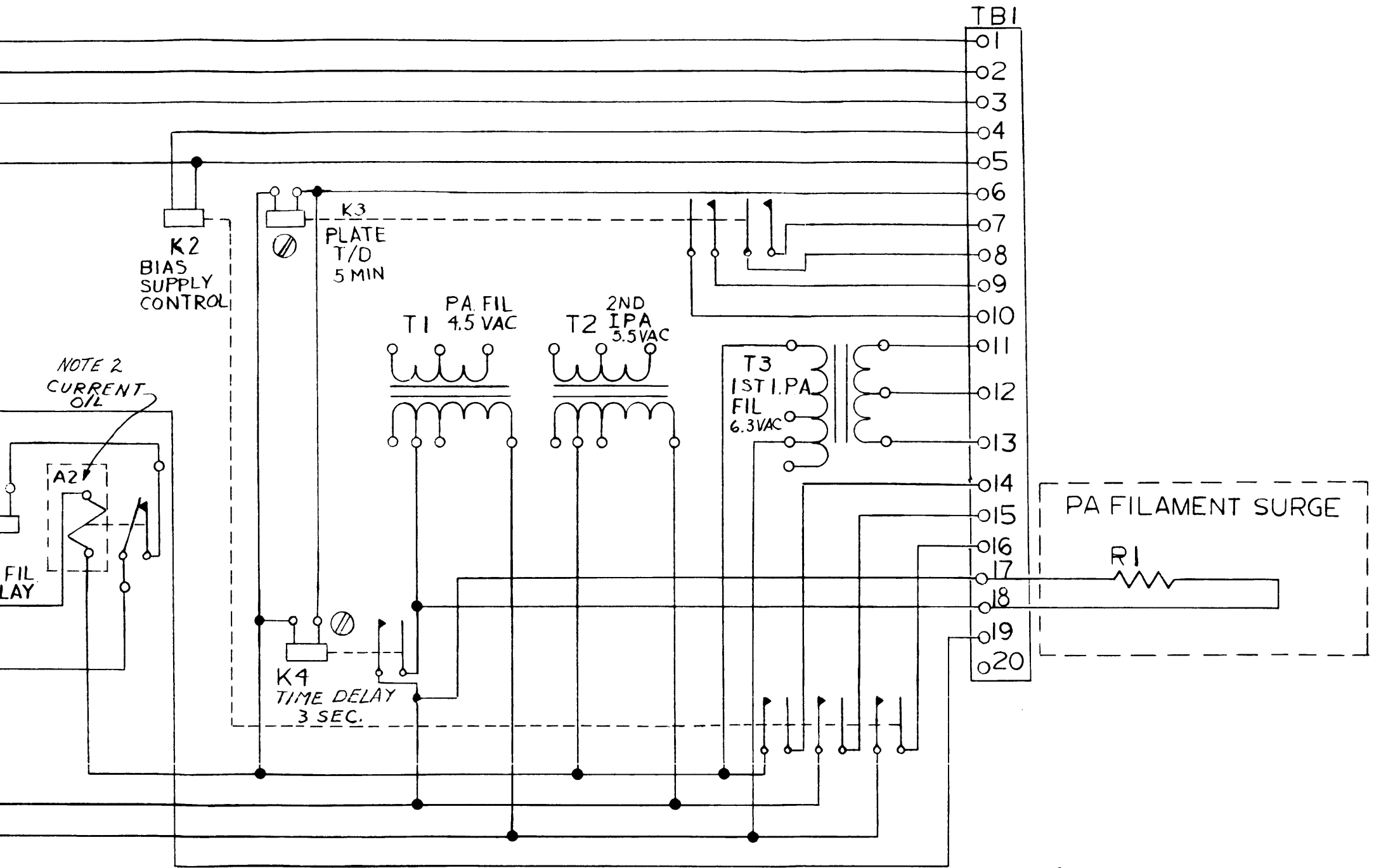
1A16DS108 1ST IPA O/L
1A16DS107 2ND IPA O/L
1A16DS106 PA. O/L
1A16DS105 24V O/L
1A16DS104 BIAS O/L
1A16DS103 SCREEN O/L
1A16DS102 (V5WR) O/L
1A16DS85 INDICATOR O/L
BIAS CONTROL 1A20A2K1

TO MTR LAMPS & MTR SWITCH LAMPS (ON DOOR)

CK8084

Figure 7-16. Transmitter Control Ladder, Schematic Diagram (Sheet 2 of 2)


SEE SHEET 1
1A16K11
1A16K4
1A16S30
+28V
115 VAC
115 VAC
MODE SWITCHES
CW 1A16S35
AM 1A16S36
2CR2 IN538
1A16K5 (DOOR)
1A20CR1
1A2BA5K26 ATTN CONT
1A2BA5K25 ATTN CONT
2K2 GRID BIAS & MOD
BIAS CONT 1A20A2K1
2CR3 IN2069
1A20CR2 IN2069
CW 1A16D591
AM 1A16D592
SEE SHEET 1
1A62K3
1A20A2K1



NOTES:

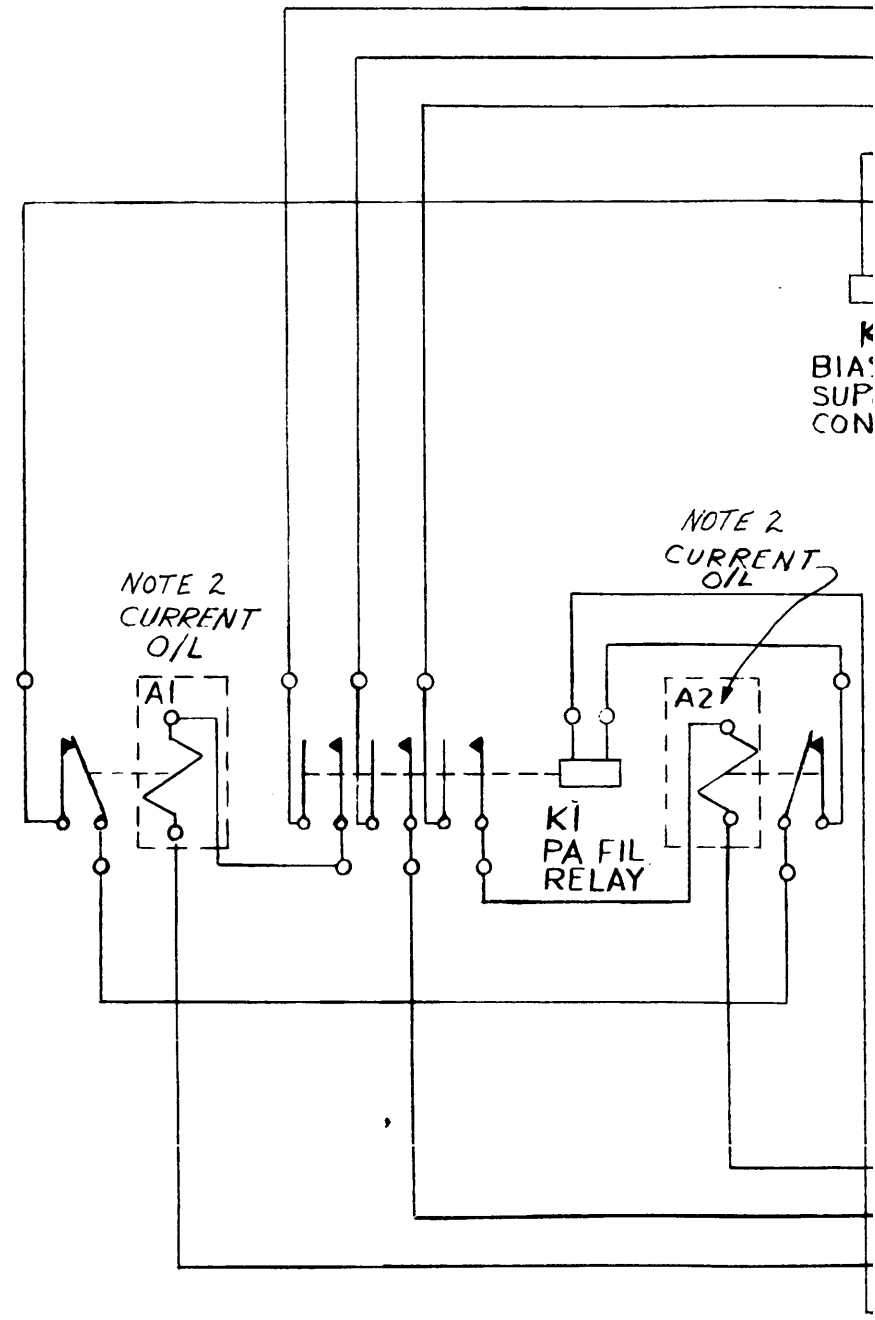
1. ALL REF DESIGNATIONS PREFIXED BY:

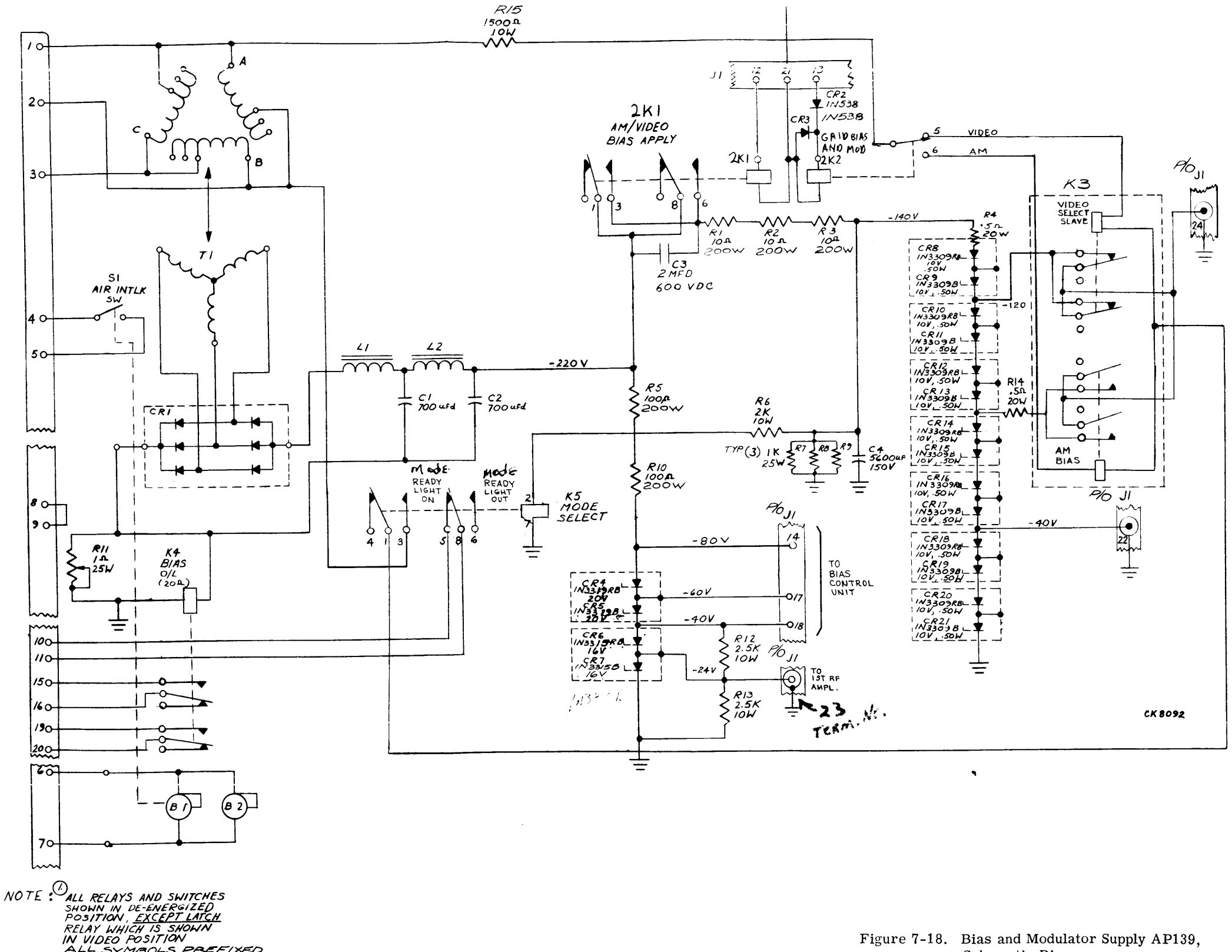
CH1	1A62
CH2	1A60
CH3	1A56
CH4	1A52

2. CURRENT OVERLOAD ELEMENTS OF RELAY K1 (A1, A2) REQUIRE MANUAL RESET WHEN OVERLOADED

3. ONE CHANNEL SHOWN

Figure 7-17. Filament Control AX8057, Schematic Diagram


NOTE 2
CURRENT
O/L
NOTE 2
CURRENT
O/L
A1
A2
K1
PA FIL
RELAY

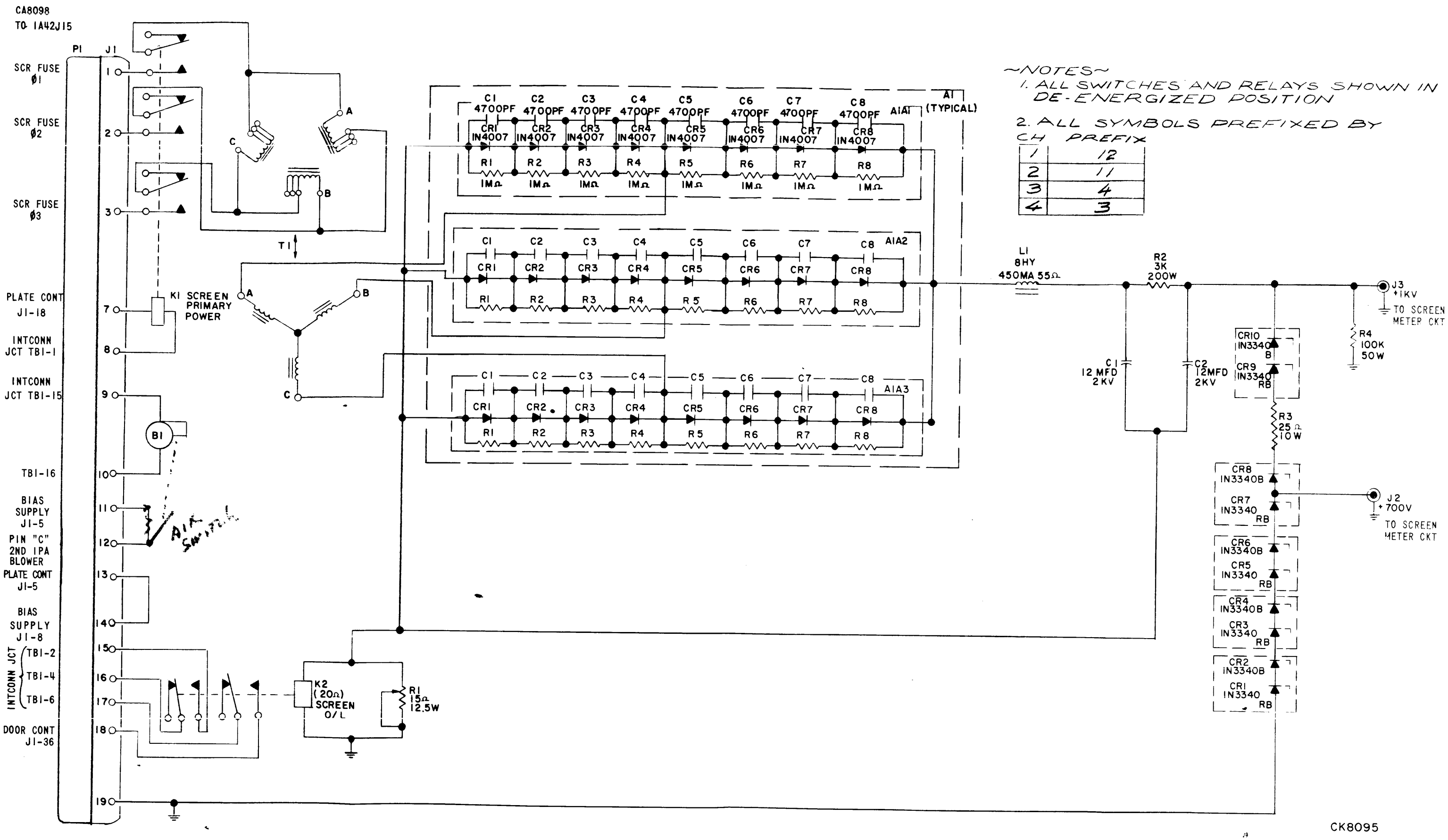


NOTE: ① ALL RELAYS AND SWITCHES SHOWN IN DE-ENERGIZED POSITION, EXCEPT LATCH RELAY WHICH IS SHOWN IN VIDEO POSITION

② ALL SYMBOLS PREFIXED BY.

CH1	13
CH2	10
CH3	5
CH4	2

Figure 7-18. Bias and Modulator Supply AP139, Schematic Diagram

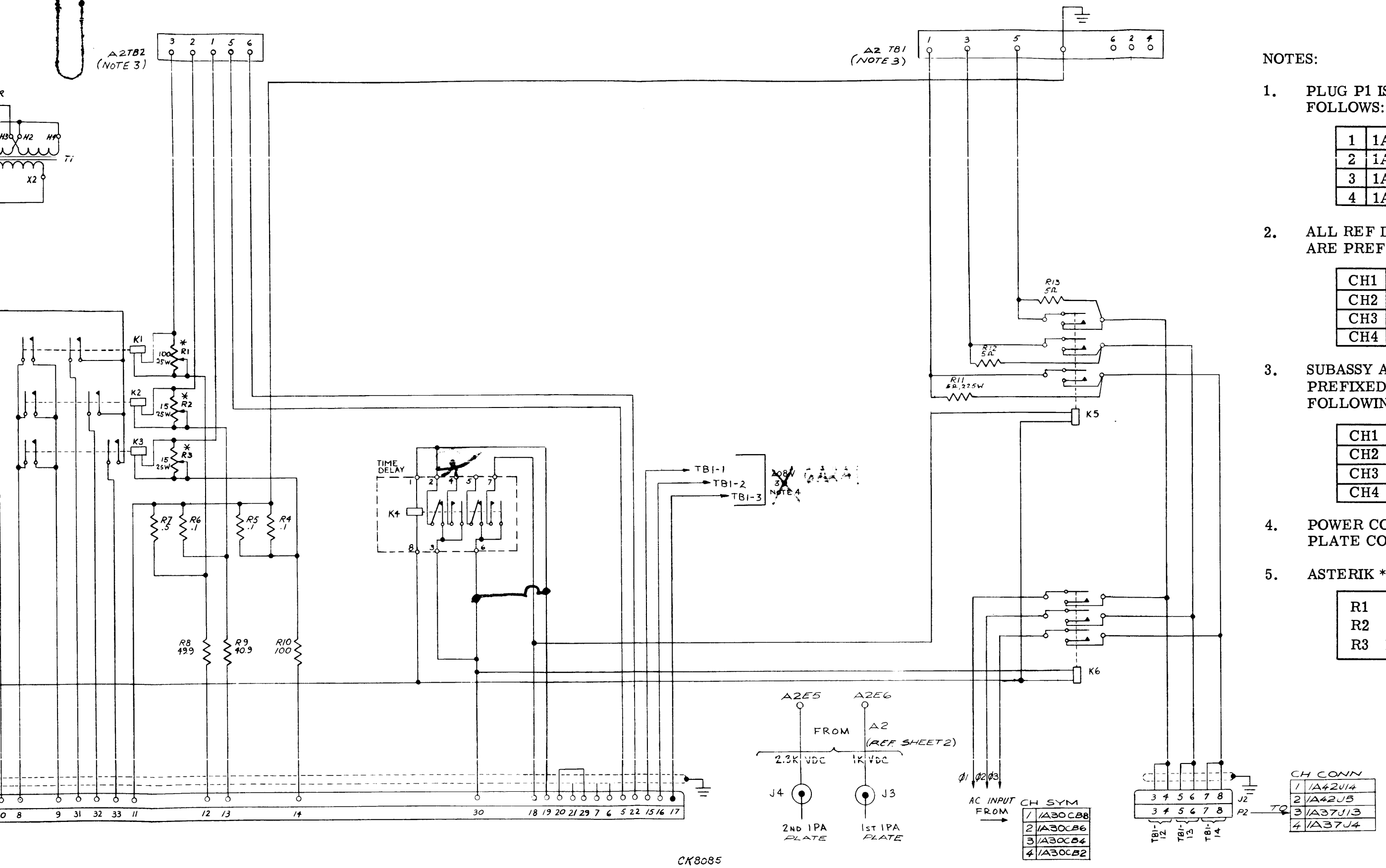


~NOTES~

1. ALL SWITCHES AND RELAYS SHOWN IN DE-ENERGIZED POSITION
2. ALL SYMBOLS PREFIXED BY

CH	PREFIX
1	12
2	11
3	4
4	3

Figure 7-19. Screen Supply AP140, Schematic Diagram



NOTES:

1. PLUG P1 IS WIRED AS FOLLOWS:

1	1A42J16
2	1A42J7
3	1A37J10
4	1A37J1

2. ALL REF DESIGNATIONS ARE PREFIXED BY:

CH1	6A1
CH2	7A1
CH3	8A1
CH4	9A1

3. SUBASSY A2 (Sheet 2 of 2) PREFIXED BY THE FOLLOWING REF DESIGNATIONS:

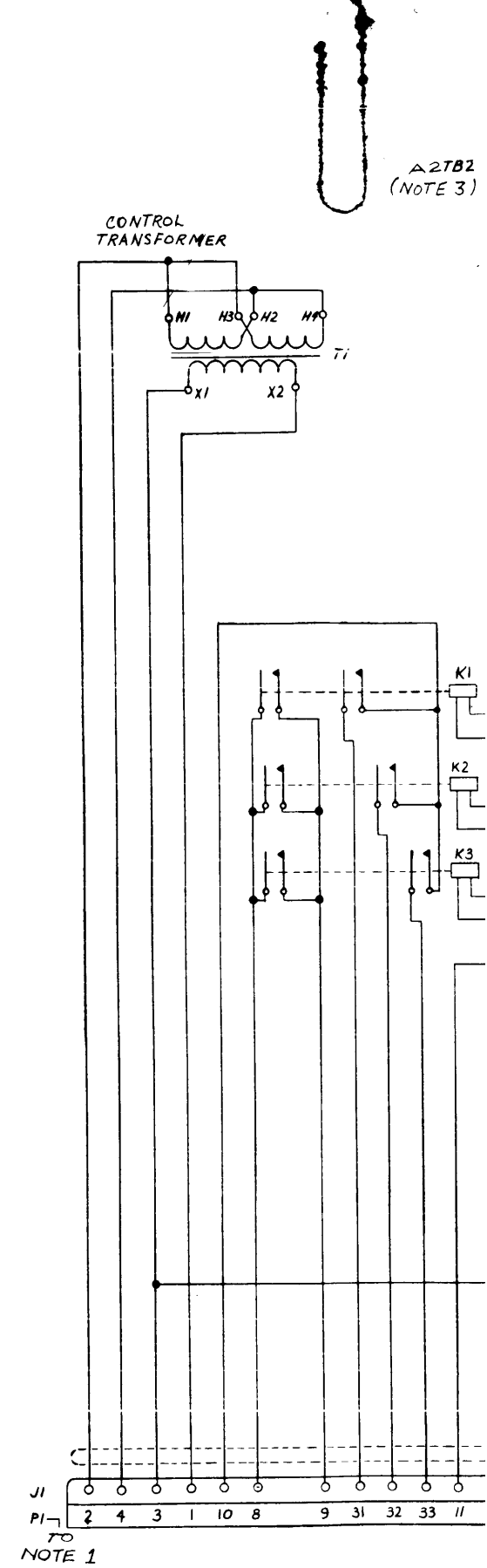
CH1	6A2
CH2	7A2
CH3	8A2
CH4	9A2

4. POWER CONNECTIONS TO PLATE CONTROL ASSY A2

5. ASTERIK * SPECIFIES

R1	1st	I.P.A.	O/L
R2	2nd	I.P.A.	O/L
R3	PA	O/L	

Figure 7-20. 6.25KV Plate Supply AV1080, Schematic Diagram (Sheet 1 of 2)


A2TB2
(NOTE 3)
CONTROL
TRANSFORMER
H1
H3
H2
H4
T1
X1
X2
K1
K2
K3
J1
P1
TO
NOTE 1
2
4
3
1
10
8
9
31
32
33
11

INPUT
208V-Δ OR Y
3φ - 60~
13 K.V. A.
APPROX.

GND
SPACER

GND
STUD

6.25 KV
NEG. END

2.3 KV
NEG END

1KV
NEG. END

H.V.
ACCESS
INT.

N.O.
S1
"C"
N.C.

T-1

TB1

TB2

R1 5Ω 25W
R2 5Ω 25W
R3 5Ω 25W
R4 5Ω 25W
R5 5Ω 25W
R6 5Ω 25W
R7 5Ω 25W
R8 5Ω 25W
R9 5Ω 25W

CR1* CR2* CR3*
CR4* CR5* CR6*
CR7Δ CR8Δ CR9Δ
CR10Δ CR11Δ CR12Δ
CR13▲ CR14▲ CR15▲
CR16▲ CR17▲ CR18▲

E1
E2
E3

OUTPUTS

L1 8 Hy
R16 5Ω
+ 6.25 KVDC/1.4A TO PA B+ INPUT
E4
C1
R13 10MΩ

L2 8 Hy
R11 5Ω
E5
+ 2.3 KVDC/460MA. TO A1J4 ON PLATE CONTROL
C2
R14A 5MΩ
R14B 5MΩ

L3 4 Hy
R12 5Ω
E6
+ 1KV DC/120 MA TO A1J3 ON PLATE CONTROL
C3
R15 5MΩ

TERMINAL BOARD

6A2A1
TB3
2.3KV
6.25KV
1KV
R12 499K
R5 499K
R11 499K
R21 499K
R22 499K
R20 499K
R23 499K
R4 499K
R10 499K
R19 499K
R24 499K
R9 499K
R18 499K
R25 499K
R3 499K
R17 499K
R26 499K
R8 499K
R16 499K
R27 499K
R2 499K
R7 499K
R15 499K
R28 499K
R14 499K
R29 499K
R1 43K
R6 43K
R13 43K
R30 499K
R31 499K
A1

(NOTE 3)
TO A1J1
TB1
PIN 15
PIN 16
PIN 17

H. V. TRANSFORMER ASSEMBLY

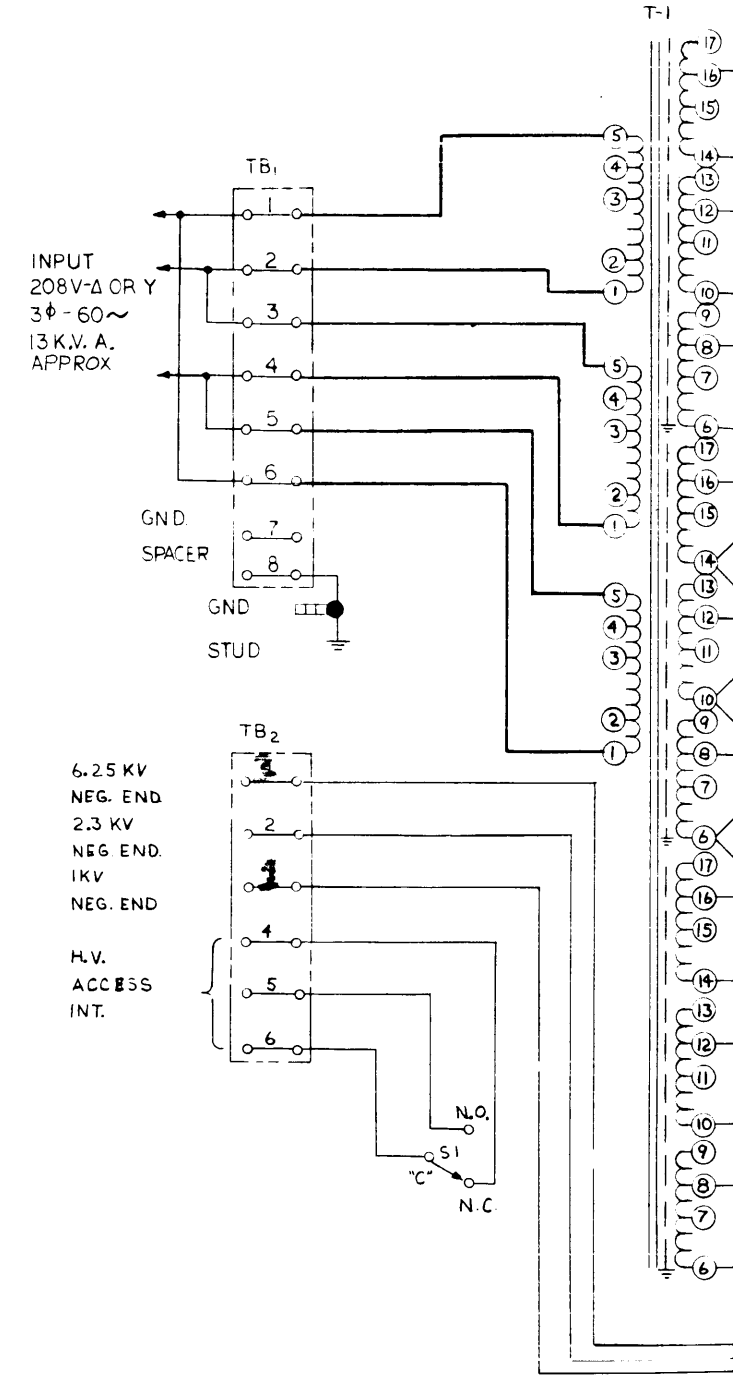
SILICON RECTIFIER ASSEMBLY

FILTER ASSEMBLY

CK8085

* INDICATES 17 DIODES, CAPACITORS & RESISTORS CR1 THROUGH CR6 (6 CARDS)
Δ INDICATES 6 DIODES, CAPACITORS & RESISTORS CR7 THROUGH CR12 (3 CARDS)
▲ INDICATES 3 DIODES, CAPACITORS & RESISTORS CR13 THROUGH CR18 (1 CARD)

Figure 7-20. 6.25KV Plate Supply AV1080, Schematic Diagram (Sheet 2 of 2)



H. V. TRANSFORMER ASSEMBLY

✳ INDICATES 17 DIODES, CAPACITORS & RESISTO
Δ INDICATES 6 DIODES, CAPACITORS & RESIS
▲ INDICATES 3 DIODES, CAPACITORS & RESIS

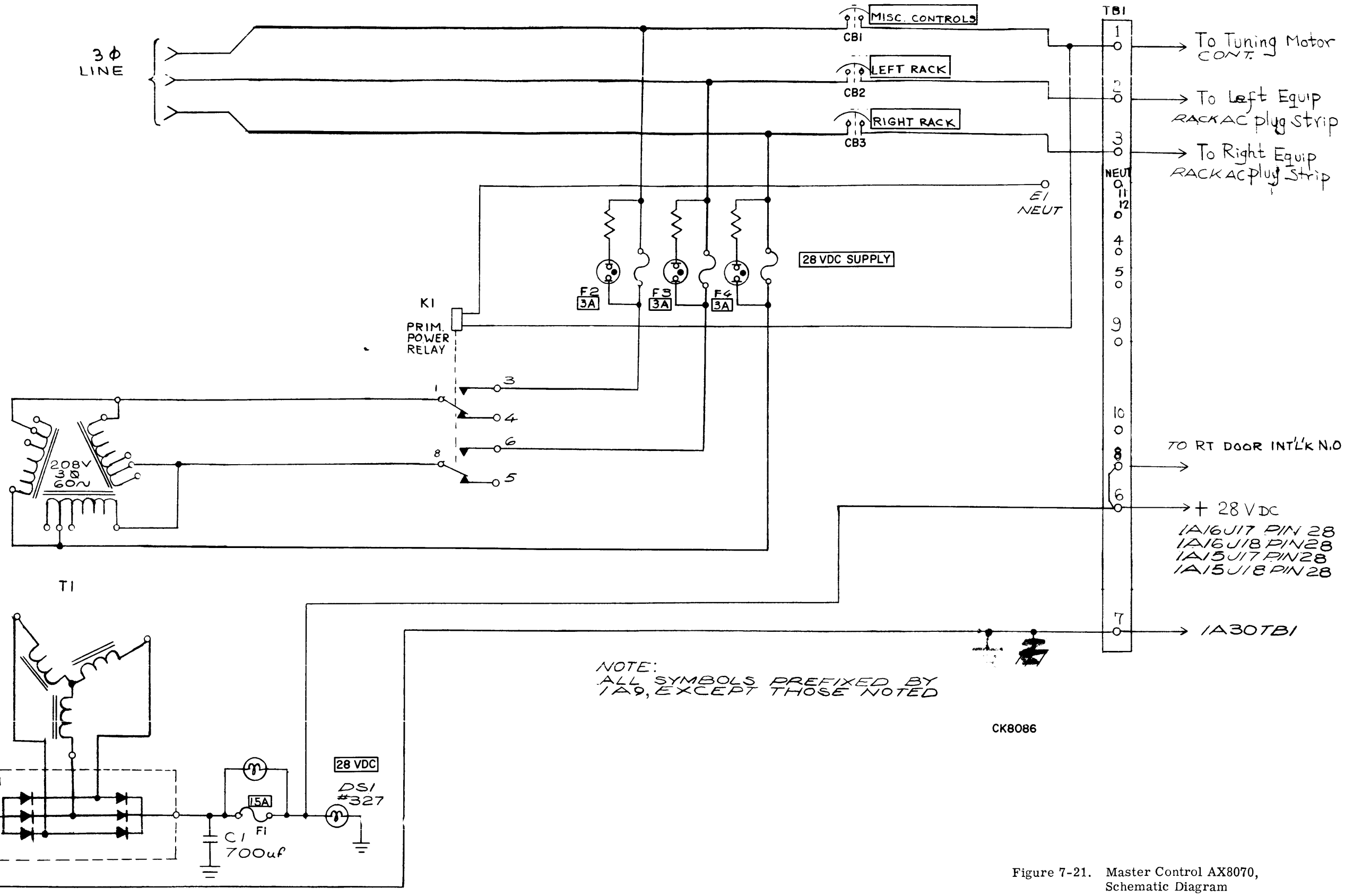
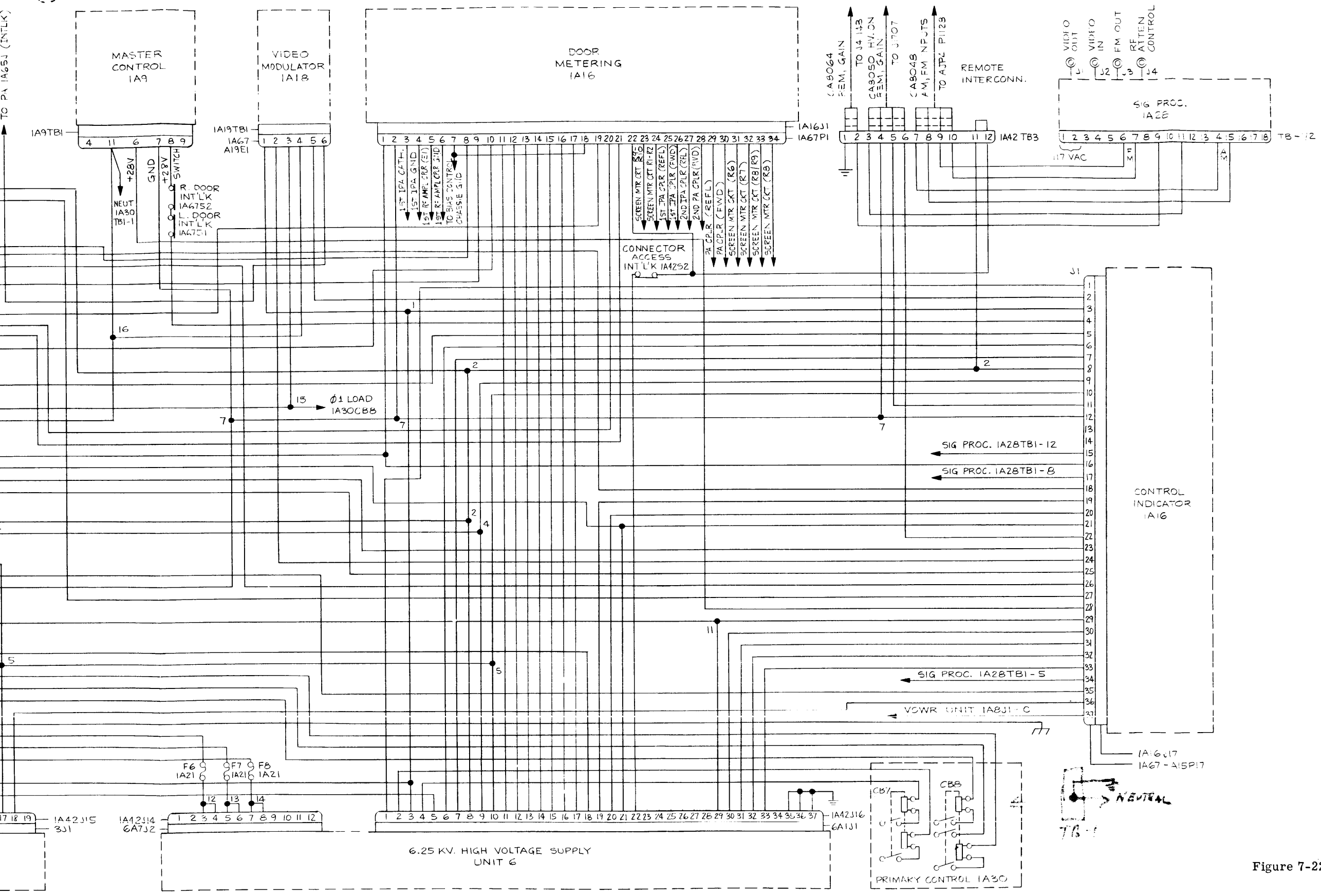


Figure 7-21. Master Control AX8070, Schematic Diagram



NOTES:

1. ◆ DENOTES TERMINAL NUMBER ON INTERCONNECT JUNCTION ASSY. 1A42TB1
2. COMMON TERMINALS ON 1A42TB1 INTERCONNECT JCT ASSY: 2 & 3, 5 & 6, 7 & 8
3. TYPICAL CHANNEL (1), REFER TO SYMBOL IDENTIFICATION INTERCHANGE LIST FOR CHANNEL 2, 3, 4

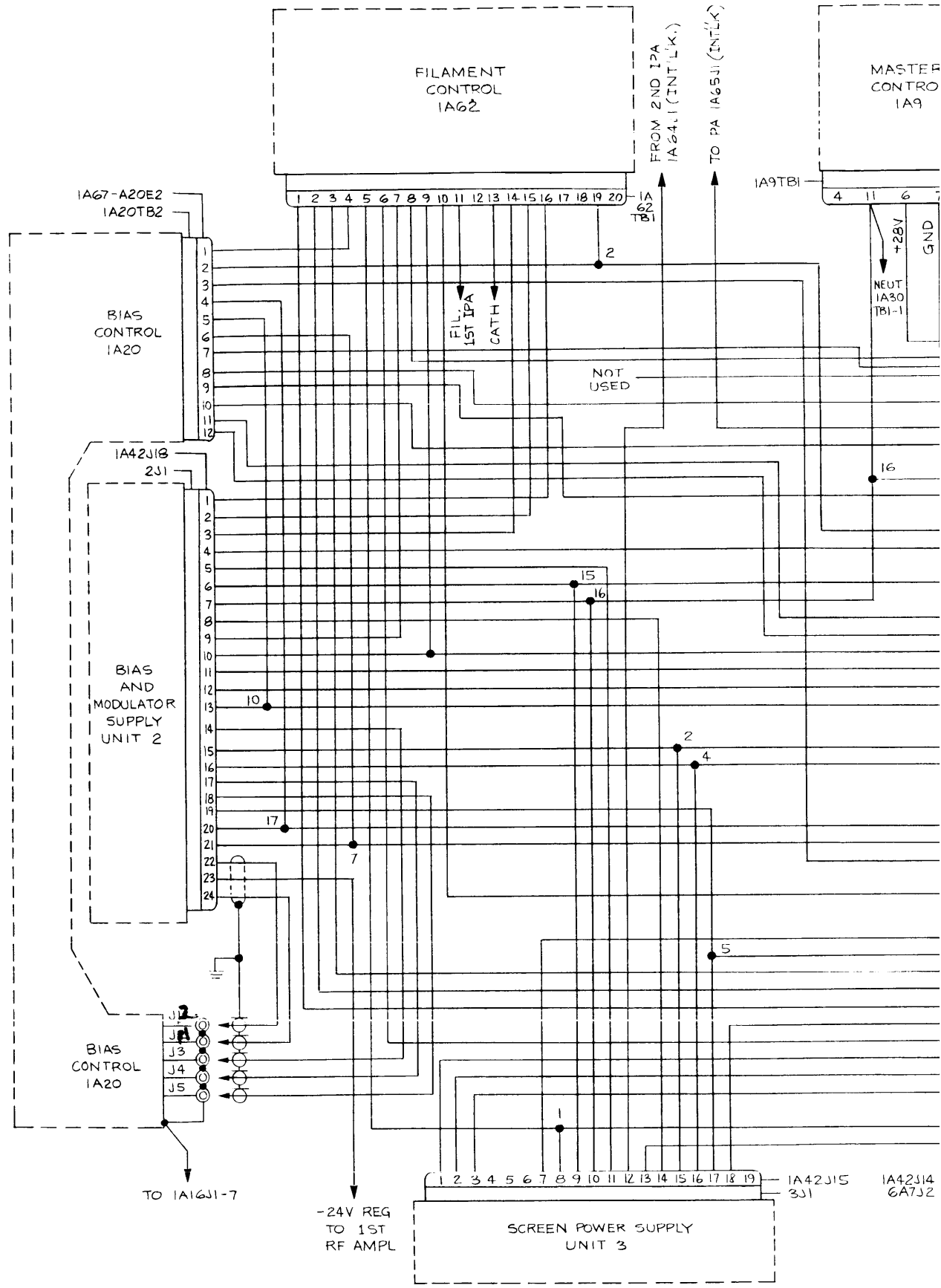
CHANNEL SYMBOL IDENTIFICATION INTERCHANGE LIST

CHANNEL 1	CHANNEL 2	CHANNEL 3	CHANNEL 4
1A62TB1	1A60TB1	1A56TB1	1A52TB1
1A9TB1	←	←	→
1A19TB1	1A18TB1	1A12TB1	1A11TB1
1A67A19E1	1A67A18E1	1A67A12E1	1A67A11E1
1A16J1	1A16J2	1A15J1	1A15J2
1A67A16P1	1A67A16P2	1A67A15P1	1A67P15P2
1A42TB3	1A42TB4	1A37TB2	1A37TB1
1A42TB1	1A42TB2	1A37TB4	1A37TB3
1A16J17	1A16J18	1A15J17	1A15J18
1A67A16P17	1A67A16P18	1A67A15P17	1A67A15P18
CB7	CB5	CB3	CB1
CB8	CB6	CB4	CB2
1A42J16	1A42J7	1A37J10	1A37J1
6A1J1	7A1J1	8A1J1	9A1J1
6A1J2	7A1J2	8A1J2	9A1J2
1A42J14	1A42J5	1A37J13	1A37J4
3J1	4J1	11J1	12J1
1A42J15	1A42J6	1A37J14	1A37J5
2J1	5J1	10J1	13J1
1A42J18	1A42J9	1A37J12	1A37J3
1A20TB2	1A20TB4	1A13TB2	1A13TB4
1A67A20E2	1A67A20E4	1A67A13E2	1A67A13E4
1A42S2	1A42S1	1A37S2	1A37S1
1A67S1	←	←	→
1A67S2	←	←	→
1A28TB1	1A28TB2	1A7TB1	1A7TB2
1A8J1	1A8J3	1A8J5	1A8J7

CK8098

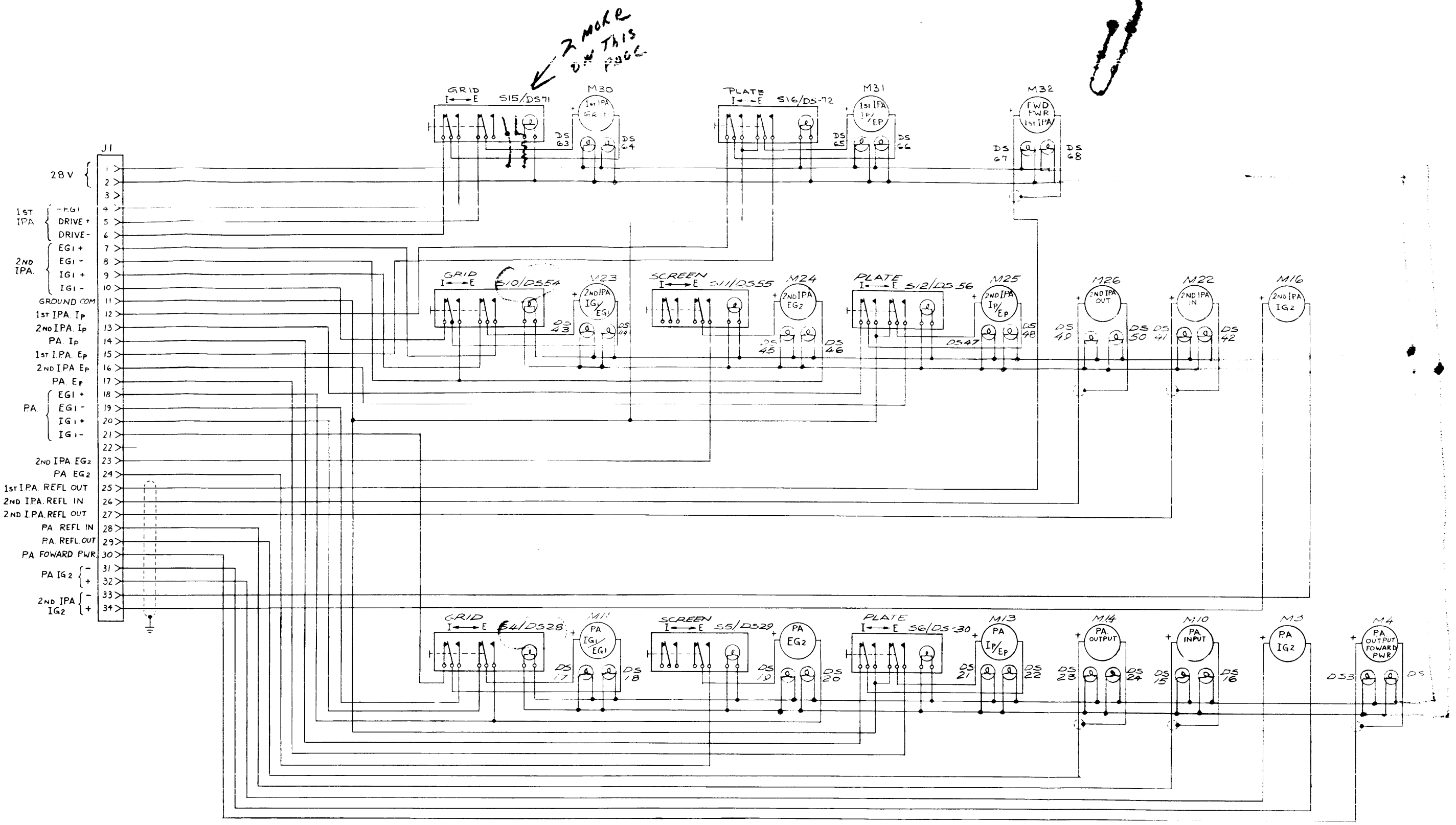
Figure 7-22. Channel 1, Wiring Diagram

008701047


FILAMENT CONTROL 1A62
FROM 2ND PA 1A64J1 (INT LK.)
TO PA 1A65J1 (INT LK.)
MASTER CONTRO 1A9
1A9TB1
4 11 6
+28V
GND
NEUT 1A30 TB1-1
1A67-A20E2
1A20TB2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
1A TB2 TB1
2
FIL. 1ST PA
CATH
BIAS CONTROL 1A20
NOT USED
1A42J1B
2J1
16
15
16
BIAS AND MODULATOR SUPPLY UNIT 2
10
2
4
17
7
5
J1
J2
J3
J4
J5
1
BIAS CONTROL 1A20
TO 1A16J1-7
-24V REG TO 1ST RF AMPL
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
1A42J15
3J1
1A42J14
6A7J2
SCREEN POWER SUPPLY UNIT 3

CHANNEL SYMBOL
SS REFERENCE LIST

	1A15	
CH 2	CH 3	CH 4
J2	J1	J2
J4	J3	J4
M2	M3	M2
M1	M4	M1
M5	M10	M5
M6	M11	M6
M7	M12	M7
M8	M13	M8
M9	M14	M9
M17	M22	M17
M18	M23	M18
M19	M24	M19
M20	M25	M20
M21	M26	M21
M27	M30	M27
M28	M31	M28
M29	M32	M29
DS1	DS3	DS1
DS2	DS4	DS2
DS5	DS15	DS5
DS6	DS16	DS6
DS7	DS17	DS7
DS8	DS18	DS8
DS9	DS19	DS9
DS10	DS20	DS10
DS11	DS21	DS11
DS12	DS22	DS12
DS13	DS23	DS13
DS14	DS24	DS14
DS25	DS28	DS25
DS26	DS29	DS26
DS27	DS30	DS27
DS31	DS41	DS31
DS32	DS42	DS32
DS33	DS43	DS33
DS34	DS44	DS34
DS35	DS45	DS35
DS36	DS46	DS36
DS37	DS47	DS37
DS38	DS48	DS38
DS39	DS49	DS39
DS40	DS50	DS40
DS51	DS54	DS51
DS52	DS55	DS52
DS53	DS56	DS53
DS57	DS63	DS57
DS58	DS64	DS58
DS59	DS65	DS59
DS60	DS66	DS60
DS61	DS67	DS61
DS62	DS68	DS62
DS69	DS71	DS69
DS70	DS72	DS70
DS73	DS80	DS73
DS74	DS81	DS74
DS75	DS82	DS75
DS76	DS83	DS76
DS77	DS84	DS77
DS78	DS85	DS78
DS79	DS86	DS79
DS87	DS91	DS87
DS88	DS92	DS88
DS89	DS93	DS89
DS90	DS94	DS90
DS95	DS102	DS95
DS96	DS103	DS96
DS97	DS104	DS97
DS98	DS105	DS98
DS99	DS106	DS99
DS100	DS107	DS100
DS101	DS108	DS101
S1	S4	S1
S2	S5	S2
S3	S6	S3
S7	S10	S7
S8	S11	S8
S9	S12	S9
S13	S15	S13
S14	S16	S14
S17	S24	S17
S18	S25	S18
S19	S26	S19
S20	S27	S20
S21	S28	S21
S22	S29	S22
S23	S30	S23
S31	S35	S31
S32	S36	S32
S33	S37	S33
S34	S38	S34



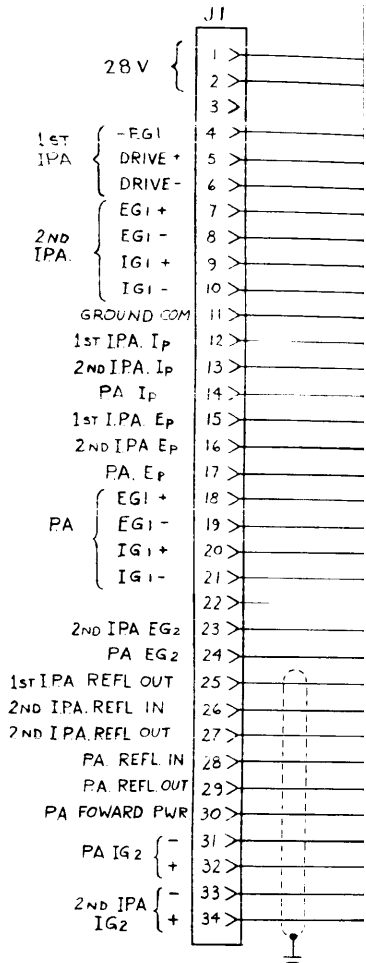
NOTE:
TYPICAL CHANNEL ..(CHANNEL 1)
FOR CHANNELS 2, 3 AND 4 REFER TO
SYMBOL CROSS REFERENCE INDEX

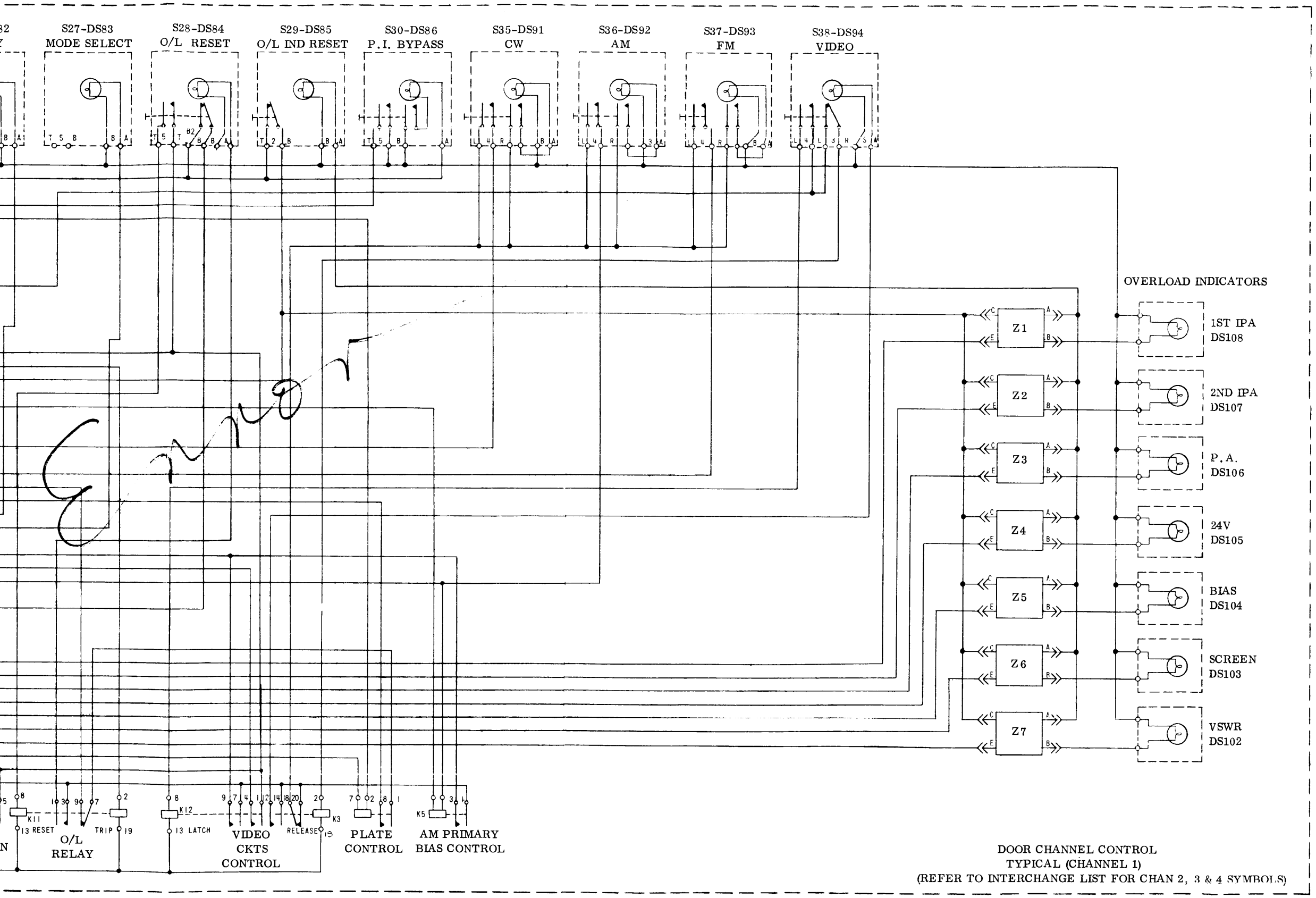
CK8150

Figure 7-23. Door Metering Channel 1, Schematic Diagram

CHANNEL SYMBOL
CROSS REFERENCE LIST

1A16 CH 1	1A16 CH 2	1A15 CH 3	1A15 CH 4
J1	J2	J1	J2
J4	J4	J3	J4
M3	M2	M3	M2
M4	M1	M4	M1
M10	M5	M10	M5
M11	M6	M11	M6
M12	M7	M12	M7
M13	M8	M13	M8
M14	M9	M14	M9
M22	M17	M22	M17
M23	M18	M23	M18
M24	M19	M24	M19
M25	M20	M25	M20
M26	M21	M26	M21
M30	M27	M30	M27
M31	M28	M31	M28
M32	M29	M32	M29
DS3	DS1	DS3	DS1
DS4	DS2	DS4	DS2
DS15	DS5	DS15	DS5
DS16	DS6	DS16	DS6
DS17	DS7	DS17	DS7
DS18	DS8	DS18	DS8
DS19	DS9	DS19	DS9
DS20	DS10	DS20	DS10
DS21	DS11	DS21	DS11
DS22	DS12	DS22	DS12
DS23	DS13	DS23	DS13
DS24	DS14	DS24	DS14
DS28	DS25	DS28	DS25
DS29	DS26	DS29	DS26
DS30	DS27	DS30	DS27
DS41	DS31	DS41	DS31
DS42	DS32	DS42	DS32
DS43	DS33	DS43	DS33
DS44	DS34	DS44	DS34
DS45	DS35	DS45	DS35
DS46	DS36	DS46	DS36
DS47	DS37	DS47	DS37
DS48	DS38	DS48	DS38
DS49	DS39	DS49	DS39
DS50	DS40	DS50	DS40
DS54	DS51	DS54	DS51
DS55	DS52	DS55	DS52
DS56	DS53	DS56	DS53
DS63	DS57	DS63	DS57
DS64	DS58	DS64	DS58
DS65	DS59	DS65	DS59
DS66	DS60	DS66	DS60
DS67	DS61	DS67	DS61
DS68	DS62	DS68	DS62
DS71	DS69	DS71	DS69
DS72	DS70	DS72	DS70
DS80	DS73	DS80	DS73
DS81	DS74	DS81	DS74
DS82	DS75	DS82	DS75
DS83	DS76	DS83	DS76
DS84	DS77	DS84	DS77
DS85	DS78	DS85	DS78
DS86	DS79	DS86	DS79
DS91	DS87	DS91	DS87
DS92	DS88	DS92	DS88
DS93	DS89	DS93	DS89
DS94	DS90	DS94	DS90
DS102	DS95	DS102	DS95
DS103	DS96	DS103	DS96
DS104	DS97	DS104	DS97
DS105	DS98	DS105	DS98
DS106	DS99	DS106	DS99
DS107	DS100	DS107	DS100
DS108	DS101	DS108	DS101
S4	S1	S4	S1
S5	S2	S5	S2
S6	S3	S6	S3
S10	S7	S10	S7
S11	S8	S11	S8
S12	S9	S12	S9
S15	S13	S15	S13
S16	S14	S16	S14
S24	S17	S24	S17
S25	S18	S25	S18
S26	S19	S26	S19
S27	S20	S27	S20
S28	S21	S28	S21
S29	S22	S29	S22
S30	S23	S30	S23
S35	S31	S35	S31
S36	S32	S36	S32
S37	S33	S37	S33
S38	S34	S38	S34





DOOR CHANNEL CONTROL
TYPICAL (CHANNEL 1)
(REFER TO INTERCHANGE LIST FOR CHAN 2, 3 & 4 SYMBOLS)

CK8097

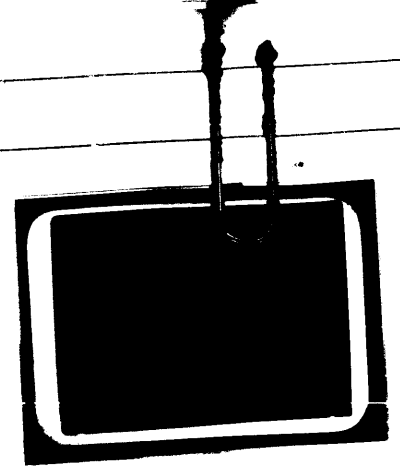
Door Channel Symbol Interchange List CK8097

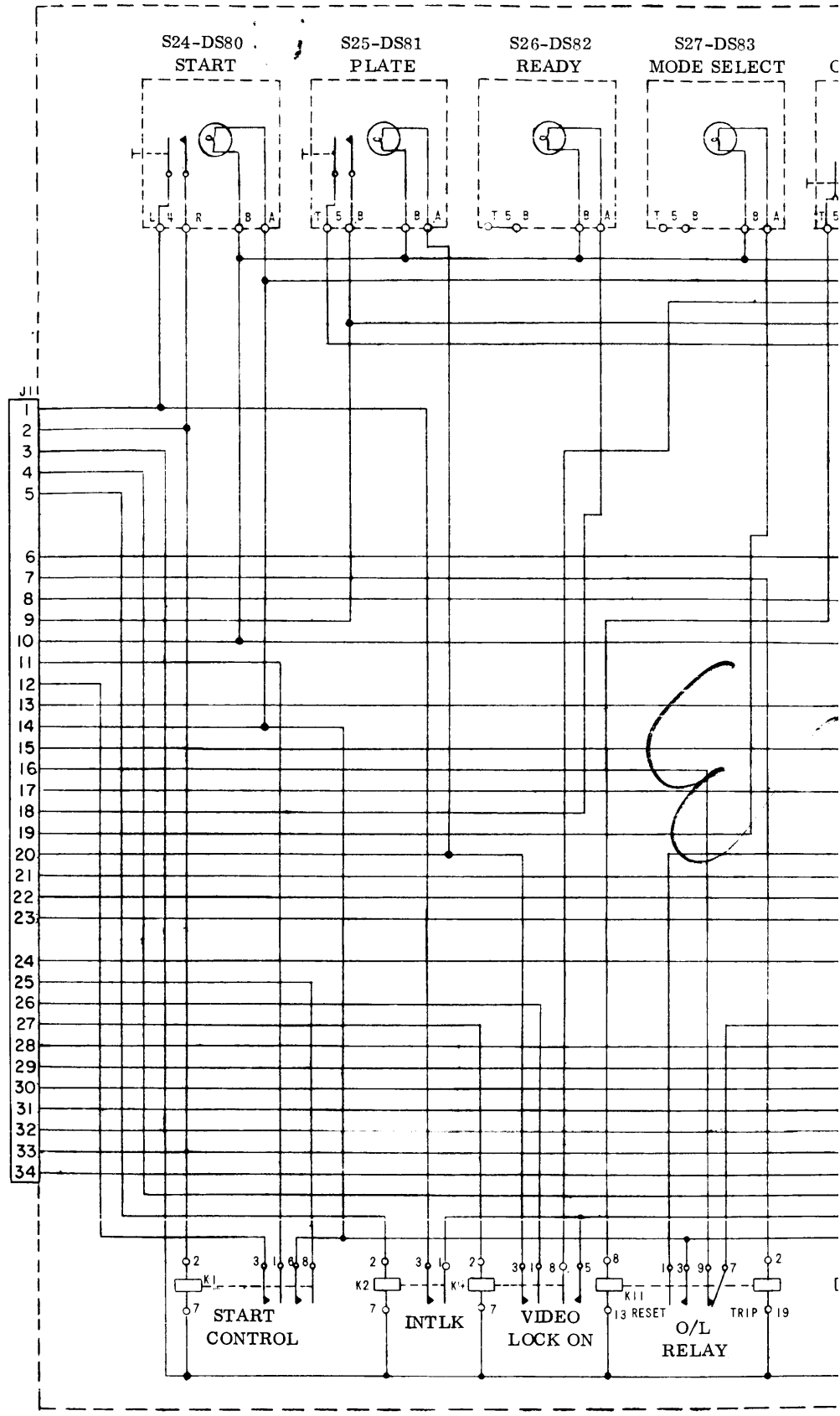
	1A16		1A15
CH1	CH2	CH3	CH4
DS80	DS73	DS80	DS73
DS81	DS74	DS81	DS74
DS82	DS75	DS82	DS75
DS83	DS76	DS83	DS76
DS84	DS77	DS84	DS77
DS85	DS78	DS85	DS78
DS86	DS79	DS86	DS79
DS91	DS87	DS91	DS87
DS92	DS88	DS92	DS88
DS93	DS89	DS93	DS89
DS94	DS90	DS94	DS90
DS102	DS95	DS102	DS95
DS103	DS96	DS103	DS96
DS104	DS97	DS104	DS97
DS105	DS98	DS105	DS98
DS106	DS99	DS106	DS99
DS107	DS100	DS107	DS100
DS108	DS101	DS108	DS101
S24	S17	S24	S17
S25	S18	S25	S18
S26	S19	S26	S19
S27	S20	S27	S20
S28	S21	S28	S21
S29	S22	S29	S22
S30	S23	S30	S23
S35	S31	S35	S31
S36	S32	S36	S32
S37	S33	S37	S33
S38	S34	S38	S34
Z1	Z8	Z1	Z8
Z2	Z9	Z2	Z9
Z3	Z10	Z3	Z10
Z4	Z11	Z4	Z11
Z5	Z12	Z5	Z12
Z6	Z13	Z6	Z13
Z7	Z14	Z7	Z14
K1	K6	K1	K6
K2	K7	K2	K7
K3	K8	K3	K8
K4	K9	K4	K9
K5	K10	K5	K10
K11	K13	K11	K13
K12	K14	K12	K14

Figure 7-24. Control Indicator AX8040, Schematic Diagram

8097

REV. Ø





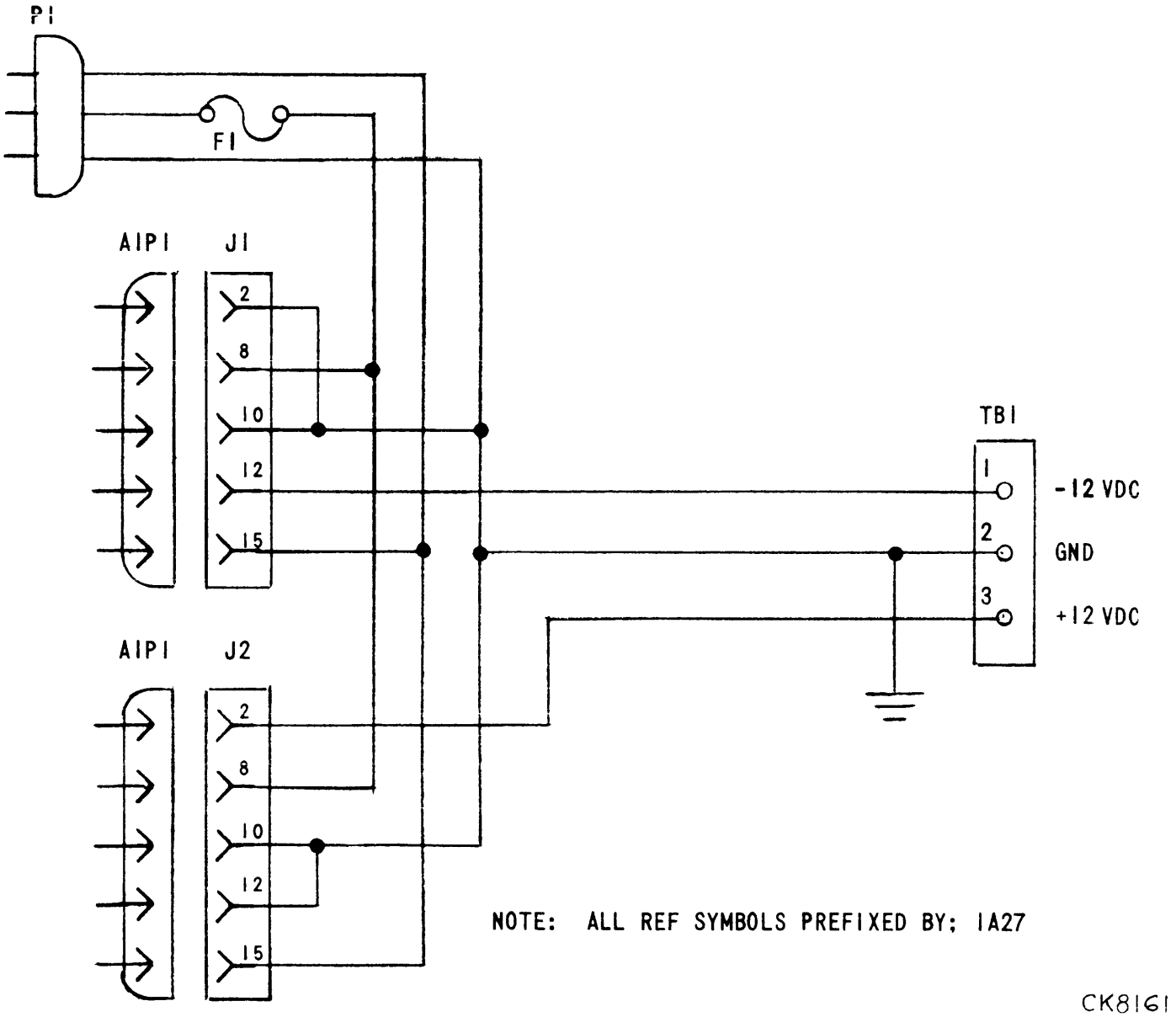


Figure 7-25. Power Supply Assembly AP-141, Chassis Wiring Diagram

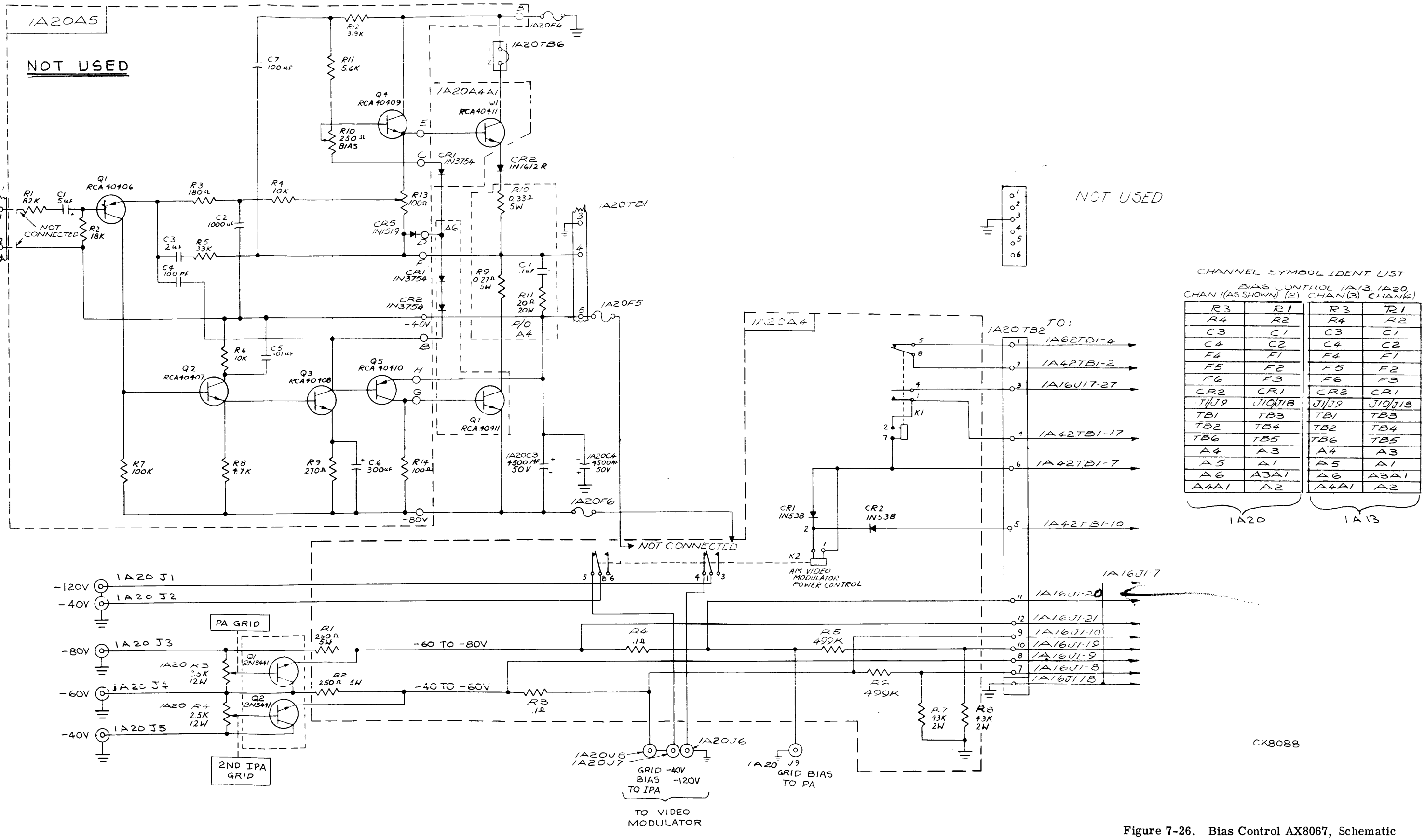
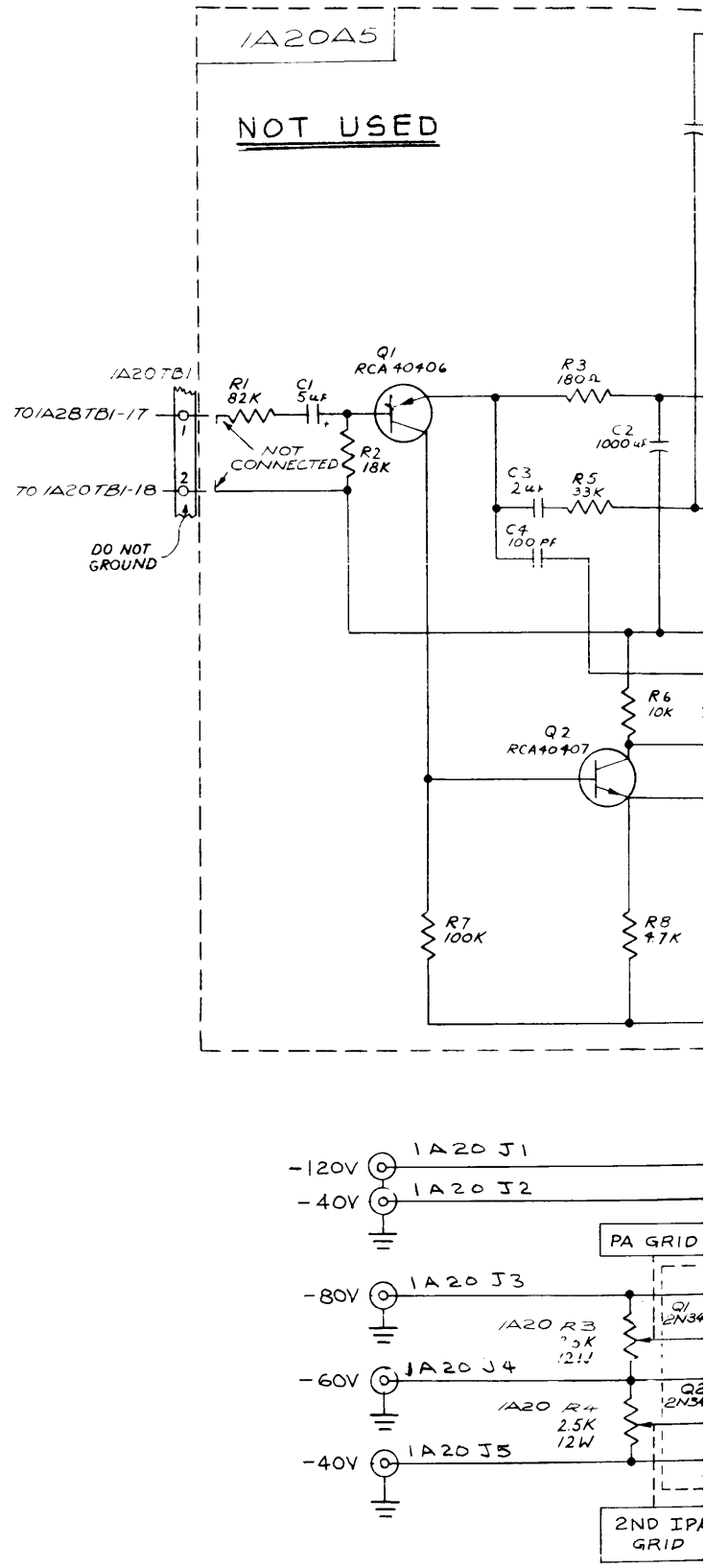
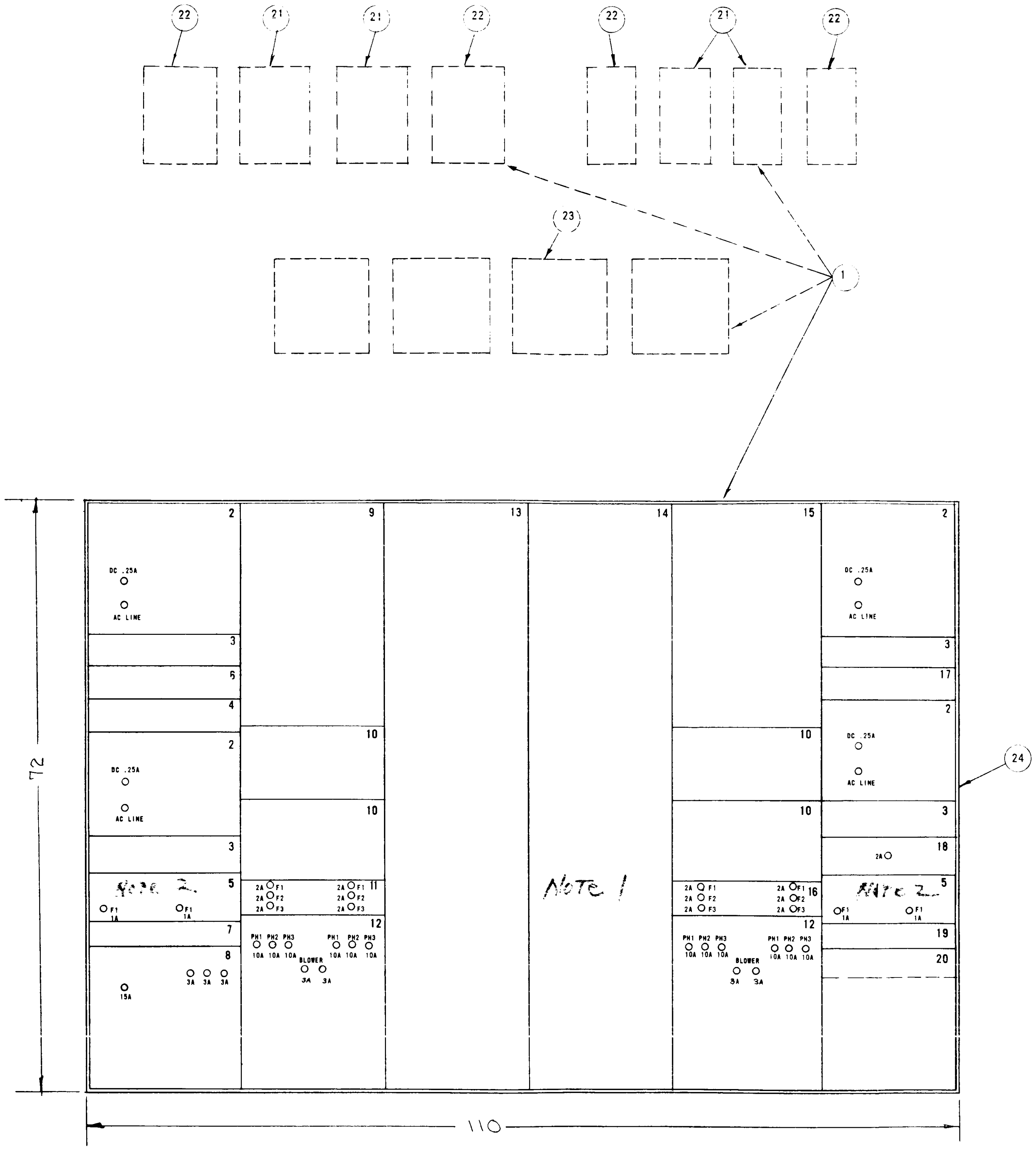


Figure 7-26. Bias Control AX8067, Schematic Diagram


1A20A5
NOT USED
1A20TB1
TO 1A2BTB1-17
TO 1A20TB1-18
DO NOT GROUND
R1 82K
C1 5μf
NOT CONNECTED
R2 18K
Q1 RCA40406
R3 180Ω
C2 1000μf
C3 2μf
R5 33K
C4 100 PF
R6 10K
Q2 RCA40407
R7 100K
R8 47K
-120V
-40V
-80V
-60V
-40V
1A20 J1
1A20 J2
1A20 J3
1A20 J4
1A20 J5
1A20 R3
1A20 R4 2.5K 12W
PA GRID
2ND IPA GRID



ID8059

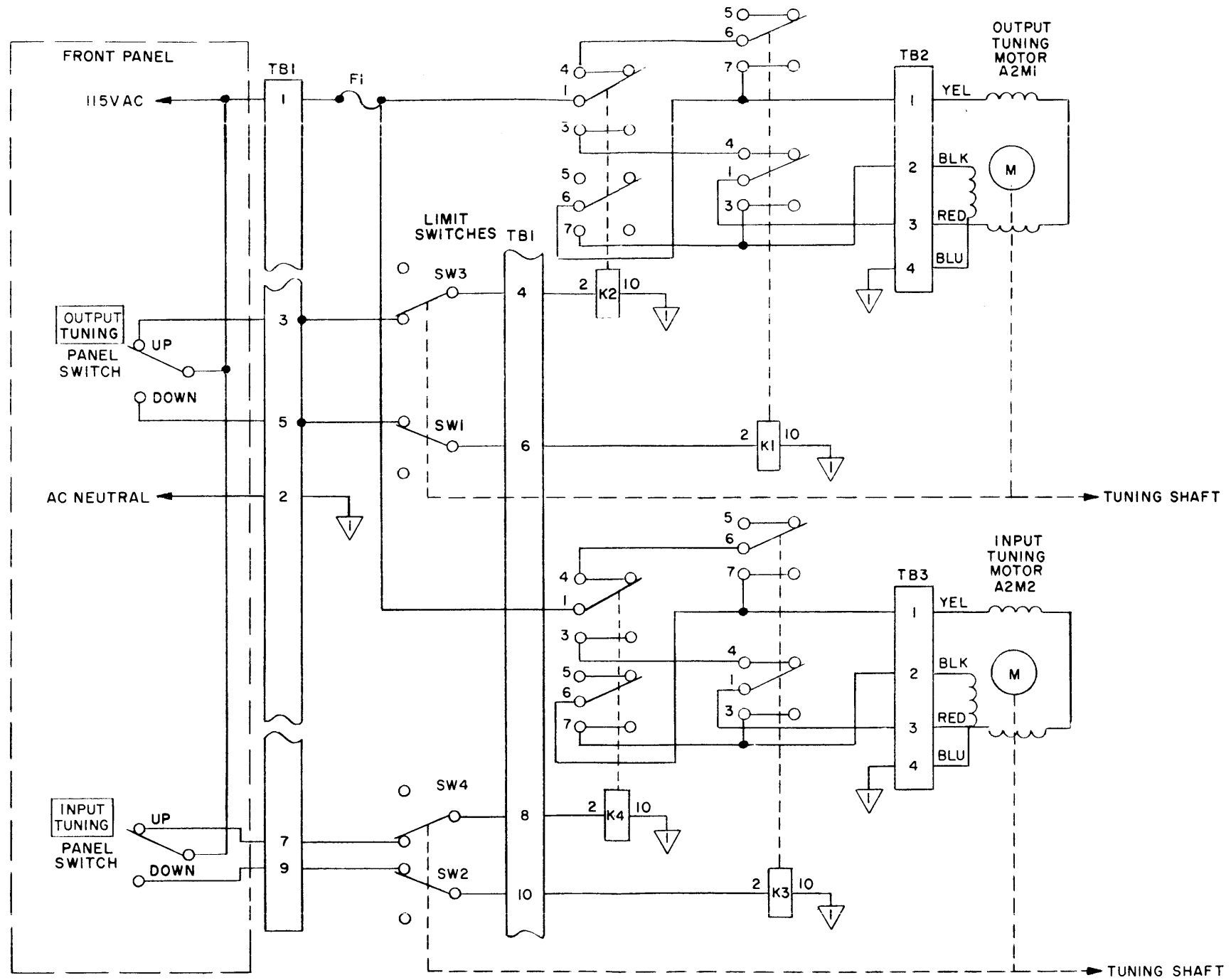
008701047

QTY REQD	NOMEN OR DESC	CODE IDENT	IDENT NO	FIND NO
1	AMPLIFIER		AX8076	24
4	PLATE POWER SUPPLY		AV1080	23
4	BIAS & MODULATOR POWER SUPPLY		AP139	22
4	SCREEN POWER SUPPLY		AP140	21
1	PRIMARY CONTROL ASSEMBLY		AX8069	20
1	DEMODULATOR-CHOPPER ASSEMBLY		AX8028	19
1	POWER SUPPLY ASSEMBLY		AP141	18
	BLANK PANEL		MS157-3	17
1	CHANNEL 1 & 2 BIAS CONTROL ASSEMBLY		AX8067-1	16
1	CHANNEL 1 & 2 TUNING CONTROL ASSEMBLY		AX8074-1	15
1	CHANNEL 1 & 2 CONTROL-INDICATOR ASSEMBLY		AX8040-1	14
1	CHANNEL 3 & 4 CONTROL-INDICATOR ASSEMBLY		AX8040-2	13
2	SCREEN SUPPLY FUSE PANEL ASSEMBLY		AX8073	12
1	CHANNEL 3 & 4 BIAS CONTROL ASSEMBLY		AX8067-2	11
4	VIDEO MODULATOR ASSEMBLY		AX8038	10
1	CHANNEL 3 & 4 TUNING CONTROL ASSEMBLY		AX8074-2	9
1	MASTER CONTROL ASSEMBLY		AX8070	8
1	VSWR OVERLOAD ASSEMBLY		AX8037	7
1	FREQUENCY COUNTER ASSEMBLY	06811	1017-2ED1/1979H	6
2	SIGNAL PROCESSOR ASSEMBLY		AX8026	5
1	COUNTER-INPUT SELECTOR ASSEMBLY		AX8093	4
4	SYNCHRONIZER ASSEMBLY	28480	8708A	3
4	GENERATOR		AV1065	2
1	TRANSMITTING SET, TV		SPT3KVHF	1

Note 1 Tuning motor fuses [illegible] 2 1/2 A and 1A located on relay panel on top of cavities

Note 2 F2 for 24v [illegible] located internally

Figure 7-27. Fuse Location Diagram



CK8087

NOTES:

1. TO REVERSE MOTOR DIRECTION INTERCHANGE THE BLUE AND BLACK LEADS.
2. ⏚ AC NEUTRAL
3. RELAYS ARE SHOWN DEENERGIZED.

Figure 7-28. Tuning Motor Control, Schematic Diagram