UNCLASSIFIED

TECHNICAL MANUAL

for

RADIO TRANSMITTER

MODEL GPTA 2.5AA

(SYSTEM)

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

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IN-1019A/AA

Issue Date: August, 1967

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.

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

FOREWORD

Radio Transmitter, Model GPTA-2.5AA is a dual-rack transmitter system, the first rack containing the exciter section, the second rack containing the linear amplifier section.

The system description for the exciter section is contained in the SBG-3 technical manual.

The system description for the linear amplifier section is contained in the addended version of the ATLA-2.5K technical manual.

Detailed unit descriptions are contained in the individual modular unit technical manuals.

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GG or G Not acceptable for use at fixed stations above 4 MHz under Part 87 after January 1, 1966.

HH or H Not acceptable for use in the band 136 to 470 MHz under Part 87 at land mobile stations after January 1, 1966 and at fixed stations after January 1, 1970.

HA Type acceptance includes operation with A3H and A3A emission modes. Necessary bandwidth designations are the same as shown in the A3J emission designator listing.

HR Type acceptance includes operation with A3H and A3A emission modes. Necessary bandwidth designations are the same as shown in the A3J emission designator listing. Type accepted also for licensing in the Maritime and fixed service in Alaska under Part 85. Transmitter capable of automatic reduction of "transmitter power" as defined in Parts 81, 83 and 85 (i.e., plate input power for A3 emission or peak envelope power for single sideband emissions) on predetermined channels to a value not exceeding 150 watts.

HS Same as HR Note above. In addition, operation below 4 MHz at listed output power is limited to use on a single channel.

JJ or J Acceptable for color transmission only when operated at the power output shown and employing the RCA MI-34026 phase correction network.

KA Capable of operation within 3.0 kHz authorized bandwidth. Type acceptance includes operation with A3A emission mode. Necessary bandwidth designation is the same as shown in the A3J emission designator listing. Type accepted also for licensing in the maritime and fixed services in Alaska under Part 85.

KC Capable of operation within 3.0 kHz authorized bandwidth. Type acceptance includes operation with A3A and A3H emission modes. Necessary bandwidth designations are the same as shown in the A3J emission designator listing.

KK or K Acceptable for monochrome transmission only.

KR Capable of operation within 3.0 kHz authorized bandwidth. Type acceptance includes operation with A3H and A3A emission modes. Necessary bandwidth designations are same as shown in A3J emission designator listing. Type accepted also for the maritime and fixed services in Alaska under Part 85. Transmitter capable of automatic reduction of "transmitter power" as defined in Parts 81, 83 and 85 on all channels to values less than listed down to a level not exceeding 150 watts.

KV Capable of operation within 3.0 kHz authorized bandwidth. Type acceptance includes operation with A3A and A3H emission modes. Necessary bandwidth designations are the same as shown in the A3J emission designator listing. Type accepted also for licensing in the maritime and fixed services in Alaska under Part 85.

LL or L Type accepted only when equipped with a suitable modulation limiter.

MM or M Type accepted only for Section 91.555.

MW Not acceptable for new authorizations under Part 21. No further use of this transmitter is permitted under Part 21 after February 1, 1976.

NA Type acceptance includes operation with A3A emission mode. Necessary bandwidth designation is the same as shown in the A3J emission designator listing. Type accepted for licensing in the Maritime and fixed services in Alaska under Part 85.

NH Type acceptance includes operation with A3H emission mode. Necessary bandwidth designation is the same as shown in the A3J emission designator listing. Type accepted for licensing in the Maritime and fixed services in Alaska under Part 85.

NJ Type acceptance includes operation with A3H and A3A emission modes. Necessary bandwidth designations are the same as shown in the A3J emission designator listing. Type accepted for licensing in the Maritime and fixed services in Alaska under Part 85.

NK Capable of operation within 3.0 kHz authorized bandwidth. Type accepted also for licensing in the maritime and fixed services in Alaska under Part 85.

NN or N Type accepted for licensing in the Maritime and fixed services in Alaska under Part 85.

NR Type accepted for licensing in the Maritime and fixed services in Alaska under Part 85. Transmitter capable of automatic reduction of power to 150 watts or less (plate input power for A3 emission or peak envelope power for single sideband emissions) on predetermined channels.

OJ After Jan. 1, 1974, use is limited to frequencies for which §83.351(b)(13) is applicable.

PB Not acceptable for use in new installations on or after December 10, 1970.

PE Not acceptable for new radiotelephone systems authorized on or after July 22, 1971 under Part 91 or September 8, 1972 under Part 89. No further use of this transmitter is permitted after July 22, 1976 under Part 91 or September 8, 1977 under

STANDARD COMMUNICATIONS

571-1	Type acceptance is limited to use with Standard Communications Corporation transmitter Type SR-C811S only.
1060	Type acceptance is limited to use with Standard Communications Corporation transmitter Types SR-C801A, SR-C803L and SR-C803LA only. Both the amplifier and transmitter must be type accepted for the particular service in which it is to be licensed.
SR-CL25	Type acceptance is limited to use with Standard Communications SR-C801S transmitter only.

STANDARD ELECTRONICS

**	Transmitters employing Type 936 exciter acceptable for stereophonic operation, SCA operation or both simultaneously when used with Standard Electronic Type 935 stereophonic generator. Transmitters employing Type 2202 exciter acceptable for stereo, SCA or both simultaneously when used with American Electronic Laboratories Type 2203 stereophonic generator.

TECHNICAL MATERIEL CORPORATION

HFT-1KJ	Power output may be manually reduced to 800, 400 or 150 watts PEP. KV Note also applies.

THE SPECIFICS COMPANY

**	Not acceptable for SCA operation. Acceptable for stereophonic operation when used with the Collins 786M-1 stereophonic generator and additional Collins pre-emphasis network for left channel. This network is supplied with the transmitter and provides pre-emphasis for both stereophonic and monophonic operation.

THETA-COM OF CALIFORNIA

AML-TC-121 AML-TD-171	1. Auxiliary equipment necessary for remote control operation. 2. When multiplexing output with the "magic tee" configurations, the power output per channel may vary downward from the listed values in 3 dB steps, depending on the configuration used.

TRACOR, INC.

6500	Consists of Tracor Model 650A TV carrier synthesizer and Tracor Model 304D Rubidium Frequency Standard.

TYPE NUMBER	NOTES	RULES PART NUMBERS	CRS CLASS	FREQUENCY RANGE	INPUT WATTS	OUTPUT WATTS	FREQ TOL.	EMISSION	EXP DATE
SYMETRICS ENG CORP-CONTINUED									
TR11		21 89 91 93		148-174	29	18	.0005	16F3	
TR11A		21 89 91 93		143-174	36	22	.0005	16F3	
TR11B		21 89 91 93		146-174	43	27	.0005	16F3	
TAMAR ELECTRONICS INC									
TTB-5		87		118-128	22	6.5	AMP	6A3	
TASKER INDUSTRIES									
FA 5723		B 87		328-336		4	.005	.3A2	
TECH. ASSOCIATES OF NEW ORLEANS									
5F71L		MM 91		132-174	.072	.022	.01	16F3	
TECHNICAL MATERIEL CORP									
GPT-500YA		HA 81		2-3		400	20HZ	2.8A3J	
GPT-500YA		HA 81		2-3		500	20HZ	2.8A3J	
GPTA-2.5AA		83		4-27.5		1250	50CPS	5.6A3B	
GPTA-2.5AA		83		4-27.5		2500	50CPS	2.8A3A	
GPTA-2.5AA		83		4-27.5		2500	50CPS	2.8A3H	
GPTA-2.5AA		83		4-27.5		2500	50CPS	2.8A3J	
GPTA-2.5EB		83		4-16		1000	50CPS	2.8A3A	
GPTA-2.5EB		83		4-16		1000	50CPS	2.8A3H	
GPTA-2.5EB		83		4-16		1000	50CPS	2.8A3J	
GPTM-1KJE		83		4-27.5		1000	50CPS	2.8A3J	
GPTM-1KJE		83		4-27.5	1700	500	50CPS	6A3	
GPTM-2.5JA		HA 83		4-27.5		1000	50CPS	2.8A3J	
GPTR-2-5ED		87		2-20		2500	10CPS	3A3A	
GPTR-2-5ED		87		2-20		2500	10CPS	3A3H	
GPTR-2-5ED		87		2-20		2500	10CPS	3A3J	
HFT-1KJ		** 81 83		1.5-30		1000	20 HZ	.3F1	
HFT-1KJ		** 81 83		1.5-30		1000	20 HZ	2.8A3J	
HFT-1KJ		** 81 83		1.5-30		1000	20 HZ	.16A1	
MRS-2		HA 83		2-27.5		1000	50CPS	2.8A3J	
TTR-10(A)		83		2-4		100	50CPS	2.8A3A	
TTR-10(A)		83		2-4		100	50CPS	2.8A3H	
TTR-10(A)		83		2-4		100	50CPS	2.8A3J	
TEK-AID INC									
72		81 83 91		1.6-3.3	72	36	.01	6A3	
TEL COM INDUSTRIES									
TEL-COM 150A		21		148-174	40	25	.0005	16F3	
TEL INSTRUMENT ELECTRONICS									
T-23A		87		1030-1030		317UW		22000P9	
T-25A		87		1030-1030		317UW		22000P9	
T-26A		87		75-75	.048	.03	.005	6A2	
T-27A		87		108-108		92UW	.005	21A9	
T-28A		87		108.1-108.1		92UW	.005	.3A2	
T-29A		87		334.7-334.7		200UW	.005	.3A2	
T-30		87		75-75	.048	.03	.005	6A2	
T-30		87		108-108	.009	92UW	.005	21A9	
T-30		87		108.1-108.1	.009	92UW	.005	.3A2	
T-30		87		334.7-334.7	.070	200UW	.005	.3A2	
T-30A		87		75-75	.048	.03	.005	6A2	
T-30A		87		108-108	.009	92UW	.005	21A9	
T-30A		87		108.1-108.1	.009	92UW	.005	.3A2	
				334.7-334.7	.070	200UW	.005	.3A2	

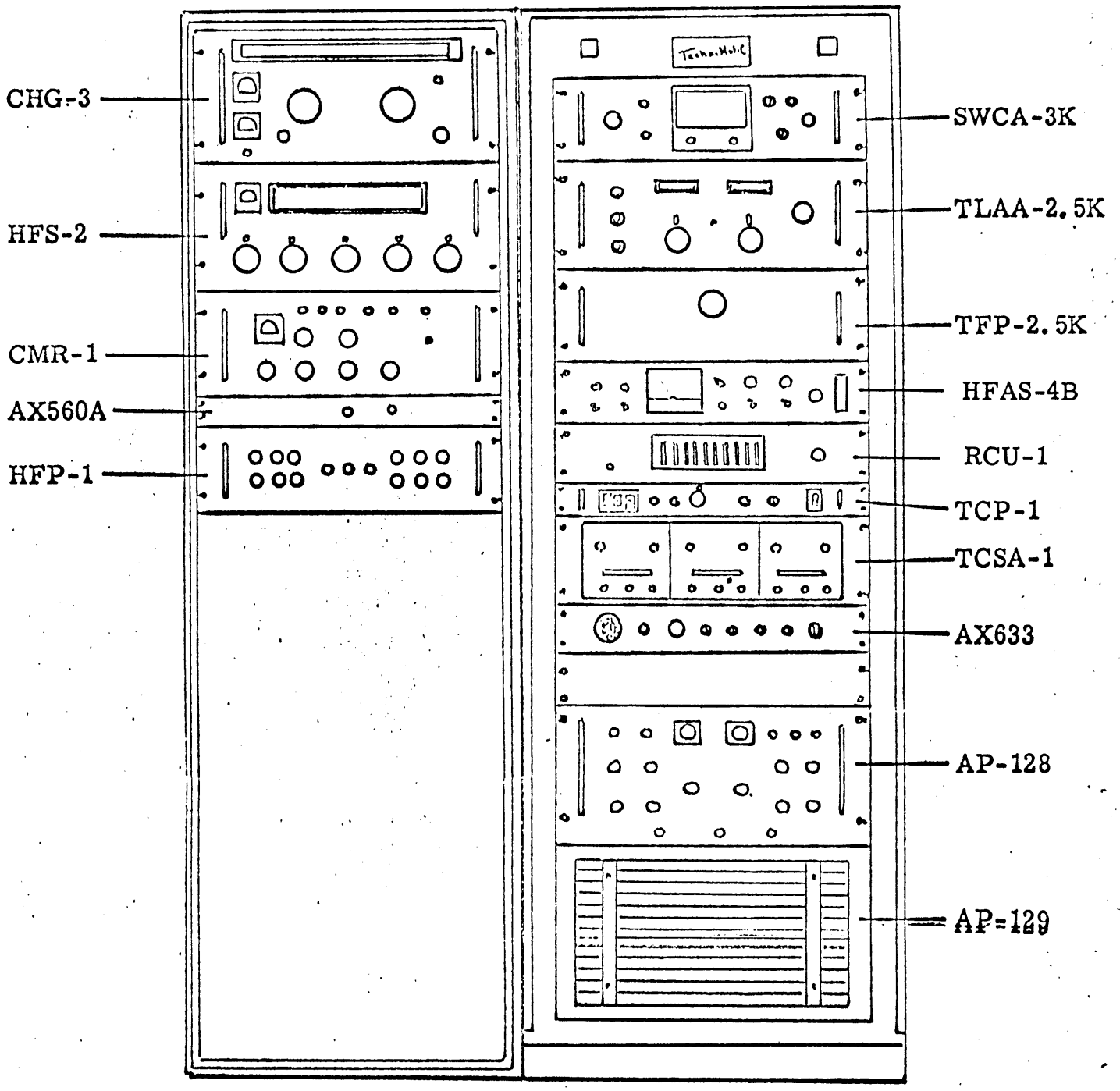


Figure 1-1. Radio Transmitter, Model GPTA-2.5AA

SECTION 1
GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION

Radio Transmitter, Model GPTA-2.5AA (figure 1-1) is a general purpose, self-tunable transmitter system providing 2500 watts peak envelope power (PEP) throughout the 2 to 30 megacycle (MHz) frequency range.

Operating modes include single-sideband (SSB), amplitude modulation equivalent (AME), continuous wave (CW) and modulated continuous wave (MCW). Facsimile (FAX) and frequency-shift keying (FSK) may also be transmitted when used with additional equipment to provide FAX and FSK input signals.

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

1-2. PHYSICAL DESCRIPTION

The GPTA is physically contained in two seperate equipment cabinets (see figure 1-1).

The linear amplifier section is contained in a RAK-110-2AA equipment cabinet measuring 72-inches high x 25-1/4 inches wide x 30-inches deep.

The exciter section is contained in a RAK-20E equipment cabinet measuring 71-inches high x 20-5/8-inches wide x 20-1/2 inches deep.

Both equipment cabinets, RAK-110-2AA1 and RAK-20E, contain shock-mount bases.

The RAK-20E provides enough chassis space for mounting two complete exciter sections.

1-3. EQUIPMENT MAKE-UP

The transmitter major components are listed in table 1-1. See figure 1-1 for physical component mounting locations. Refer to the applicable exciter and linear amplifier system manuals for detailed component descriptions and specifications.

Table 1-1. Equipment Supplied

DESIGNATION
LINEAR AMPLIFIER SECTION
Linear Amplifier, Model TLAA-2.5K
Servo Amplifier, Model TCSA-1
RF Control and Indicator, Model SWCA-3K
Linear Amplifier Control Panel, Model TCP-1
Harmonic Filter, Model TFP-2.5K
Alarm Panel, AX633
Low Voltage Power Supply, AP-128
High Voltage Power Supply, AP-129
Rack, Electrical Equipment, RAK-110-2AA1
High Frequency Antenna System, Model HFAS-4B
Remote Control Unit, Model RCU-1
EXCITER SECTION
Sideband Exciter, Model CMR-1
Control Synthesizer, Model HFS-2
RF Translator, Model CHG-3
Control Panel, AX560A
Power Supply, Model HFP-1
Rack, Electrical Equipment, RAK-20E

SECTION 2
INSTALLATION

2-1. UNPACKING AND HANDLING

Each modular unit comprising the GPTA system has been thoroughly inspected and tested at the factory before shipment. Upon arrival of the equipment, inspect each packing case and its contents immediately for possible damage. Unpack the quipment carefully. Inspect all packing material for parts which may have been shipped as loose items.

With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts.

2-2. INSTALLATION

All of the units used in the GPTA system are equipped with standard width 19-inch front panels. These units are to be mounted in the equipment rack as shown in figure 1-1. Figure 2-4 and 2-5 illustrate electrical interconnections of GPTA modular units. Refer to the individual technical and sub-system manuals for detailed connection and installation procedures.

a. INSTALLATION OF MODULAR UNITS. - Refer to figure 1-1 for modular unit mounting locations. All major units are slide-mounted on pull-out, or tilt-lock drawer slides. To install any slide-mounted unit in its compartment, see figures 2-1 and 2-2 and proceed as follows:

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

CAUTION

Start by installing bottom units first in order to avoid rack tripping over from extended center of gravity.

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

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

4. Make necessary calbe and electrical connections. To prevent cables from snagging, utilize the cable retractors, located at the inside-rear of the rack (figure 2-1).

5. Depress release buttons and slide modular unit completely into compartment.

6. Secure front panel of modular unit to rack with screws and washers.

Figure 2-5 illustrates the cable interconnections of the GPTA exciter rack. For linear amplifier cable interconnections, refer to the linear amplifier system manuals.

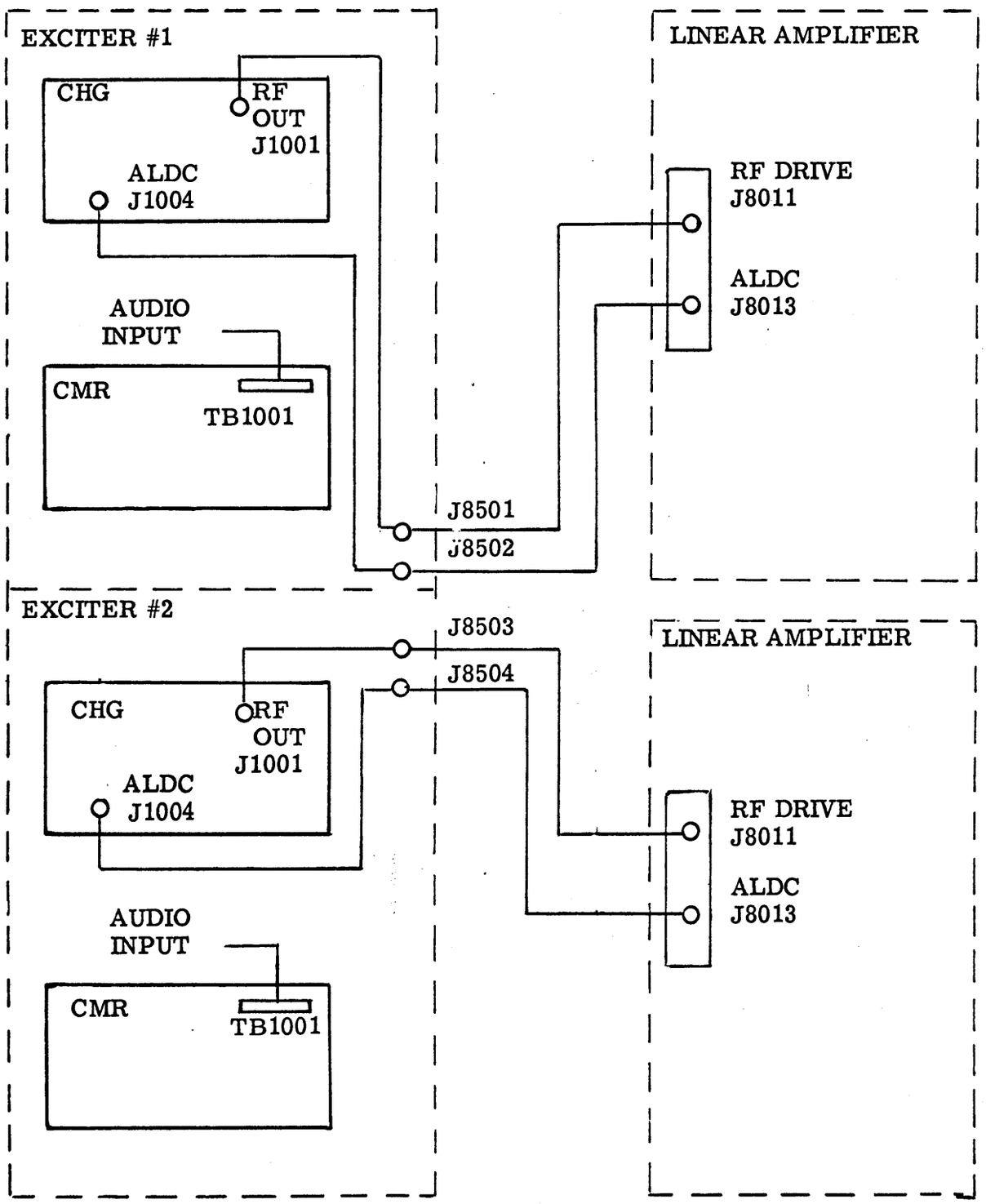


Figure 2-3. Exciter/Linear Amplifier Interconnections

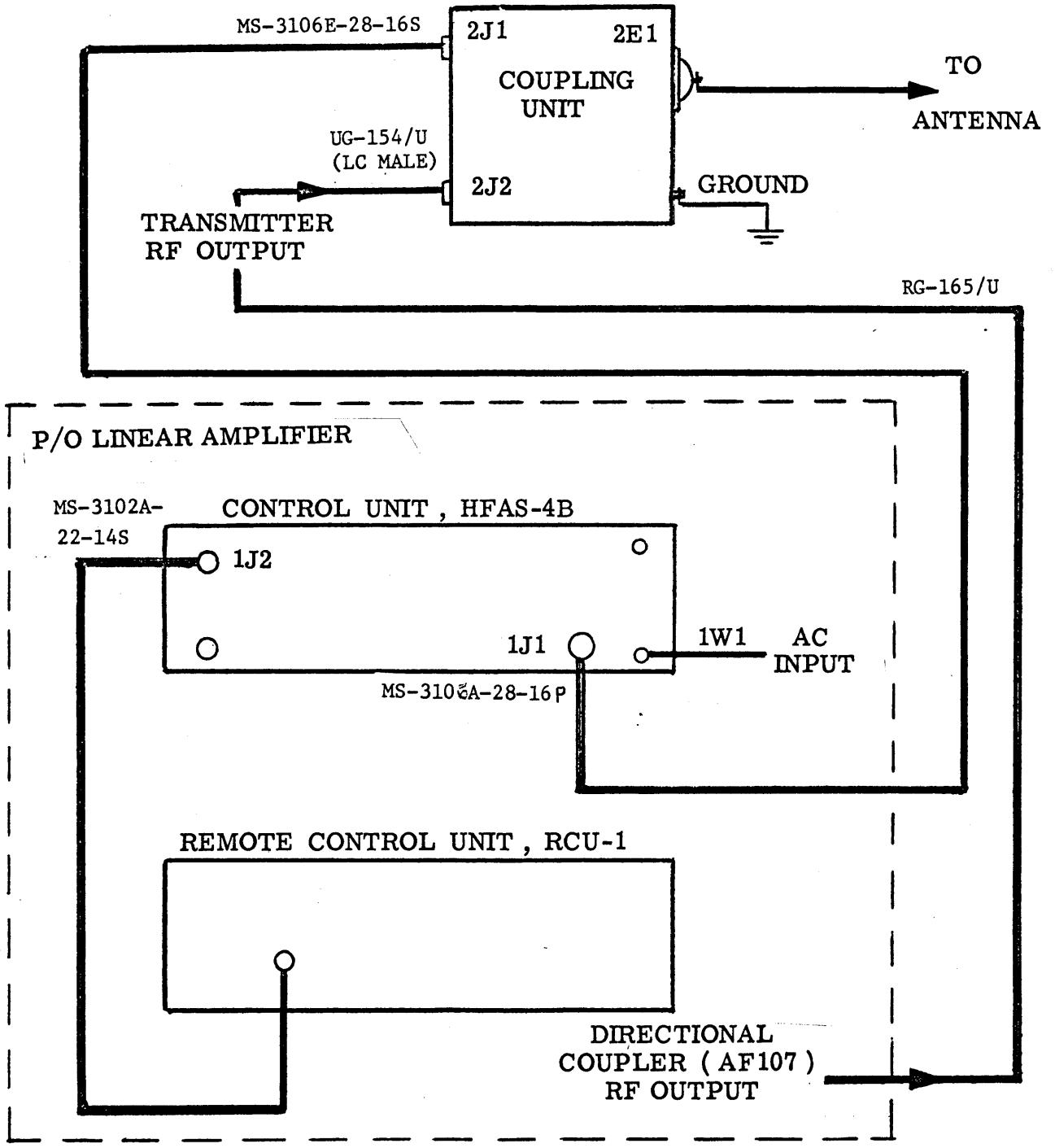
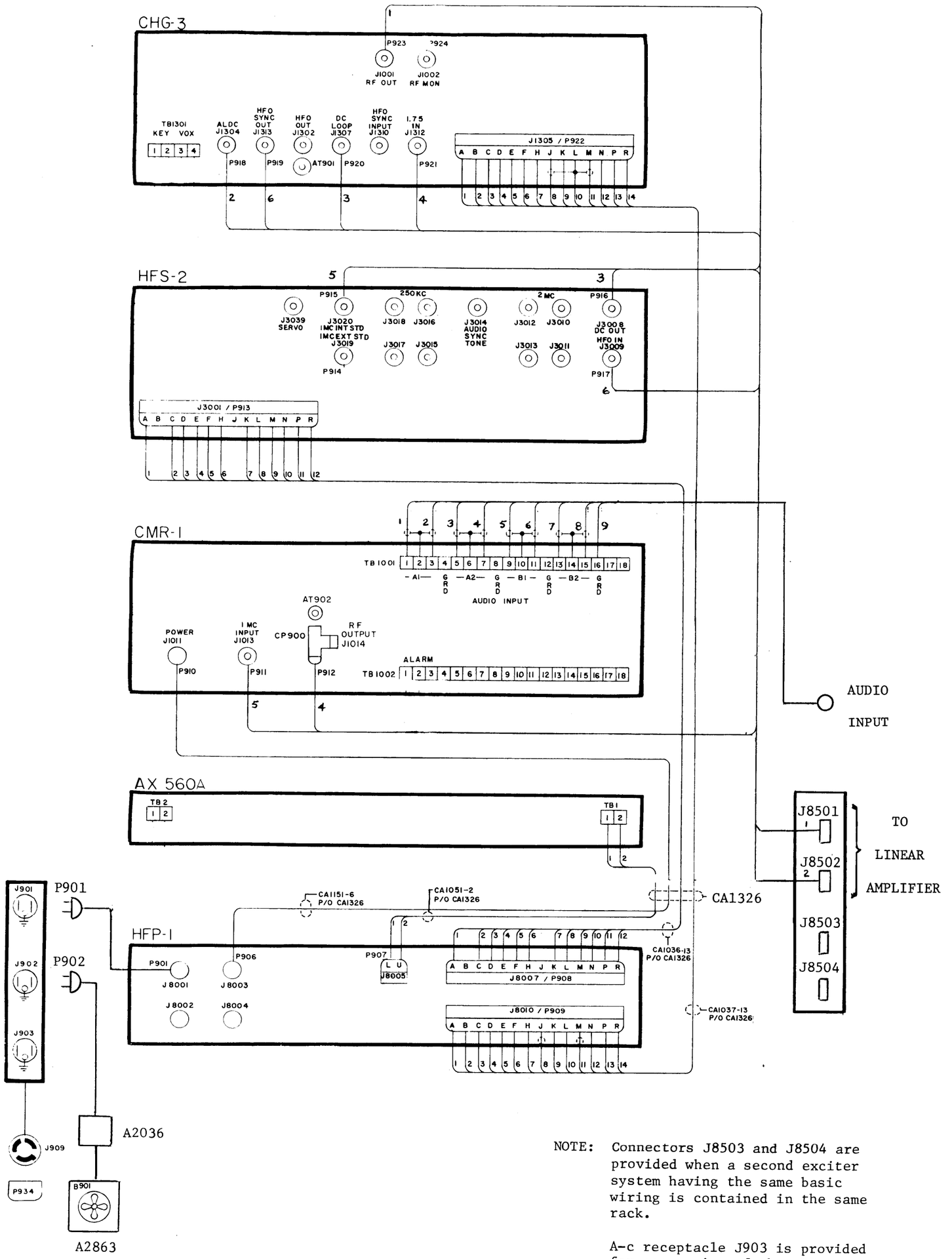


Figure 2-4. Antenna Tuning System, Interconnection



NOTE: Connectors J8503 and J8504 are provided when a second exciter system having the same basic wiring is contained in the same rack.

A-c receptacle J903 is provided for connection of the HFP power supply of a second exciter system when used.

Figure 2-5. Exciter Interconnect Cabling Diagram

SECTION 3
OPERATOR'S SECTION

3-1. GENERAL

The GPTA comprises two sections, the exciter section and the linear amplifier section. Each section is comprised of modular units, each of which perform a particular function in the overall system. The tuning procedures for each unit may vary in accordance with the desired mode and frequency of transmission. Therefore, reference to the applicable modular unit technical manual will denote proper control and level settings for the desired mode of transmission.

3-2. OPERATOR'S INSTRUCTIONS

Table 3-1, used in conjunction with figure 3-1, provides control and indicator functions of the modular units comprising the GPTA system.

Refer to the individual modular unit technical manuals for detailed operating instruction, used in conjunction with the tuning charts supplied as part of the test data package (supplied with the equipment).

TABLE 3-1. CONTROLS AND INDICATORS

ITEM NO. (See Figure 3-1)	CONTROL or INDICATOR	FUNCTION
EXCITER SECTION RF TRANSLATOR, CHG		
1	MEGACYCLES dial	Displays illuminated RF band dial, selected by operating BAND control knob, item 3.
2	TUNE control	Moves pointer to appropriate frequency along dial of selected band. (TUNE control is fitted with a lock, item 6.)
3	BAND switch	Rotates MEGACYCLES dial, item 1, and switches is desired RF band, as follows: BAND 1 = 2 - 3 mc BAND 2 = 3 - 4 mc BAND 3 = 4 - 6 mc BAND 4 = 6 - 8 mc BAND 5 = 8 - 12 mc BAND 6 = 12 - 16 mc BAND 7 = 16 - 24 mc BAND 8 = 24 - 32 mc
4	SYNC IND lamp	Lights to indicate system is synchronized (indicates only when CHG is in synthesized operation).
5	RF GAIN control	Controls amplitude of RF output signals.
6	LOCK knob	Locks TUNE control, item 2, to prevent accidental shift off selected frequency.
7	SYNCHRONIZE meter	Indicates amount and polarity of DC voltage. When system is out of synchronization, meter reads zero (meter functions only when CHG is in synthesized operation).
8	RF LEVEL meter	Indicates level of r-f output signal.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

ITEM No. (See fig. 3-1)	CONTROL or INDICATOR	FUNCTION
	CONTROL SYNTHESIZER, HFS	
9	.1KC switch S3101	Tunes the synthesizer in 100-cycle steps.
10	1 KC switch S3201	Tunes the synthesizer in 1000-cycle steps.
11	10 KC switch S3301	Tunes the synthesizer in 10-kc steps.
12	100 KC switch S3401	Tunes the synthesizer in 100-kc steps.
13	1 MC switch S3501	Tunes the synthesizer in 1-mc steps between 2 and 32-mc.
14	1 MC COMPARATOR meter M3001	Indicates frequency error in internal 1-mc standard.
15	Digital display indicators DS3001.	Indicates the frequency components set by controls.
	SIDEBAND EXCITER, CMR	
16	INPUT LEVEL (dbm)	Indicates power input level (to each channel) between -20 dbm and +3 dbm, as selected by METER FUNCTION switch, item 23.
17	CHANNEL ACTIVITY lamps (one for each channel)	Lights to indicate that corresponding channel is active (channel audio input level is -26dbm or higher)
18	STANDBY lamp	Lights when all channels are inactive (no audio input)
19	POWER lamp	Lights to indicate unit is in operation.
20	ON switch	When at ON position, energizes the unit.

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

ITEM NO. (See fig. 3-1)	CONTROL or INDICATOR	FUNCTION
	SIDEBAND EXCITER, CMR (CONT)	
21	CARRIER SUPPRESSION (db) switch	Reinserts carrier at indicated levels below full power output.
22	CHANNEL PRIORITY controls (one for each channel)	Controls apportionment of output power for each channel (graduated in percentages).
23	METER FUNCTION switch	Selects channel input signal for monitoring by INPUT LEVEL meter, item 16.
	CONTROL PANEL, AX560A	
24	OPERATE/STANDBY toggle switch	Power control switch, controlling HFP power supply.
25	TEST KEY toggle switch	In up position, provides steady test keying to CHG. In center position, off. In down position, provides momentary keying.
	POWER SUPPLY, HFP	
26	STANDBY, lamp	Indicates HFP is in STANDBY condition (i.e., HFP is sending power to oscillator ovens and frequency standard in system units.)
27	TIME DELAY lamp	Indicates HFP is going through time delay stage between standby and operative conditions.
28	OPERATE lamp	Indicates HFP is in OPERATE condition, (sending power to all units in system).
	MAIN POWER switch, on rear of unit.	STANDBY position applies power to frequency standard and oscillator ovens; OFF position disconnects main line voltage input to HFP.

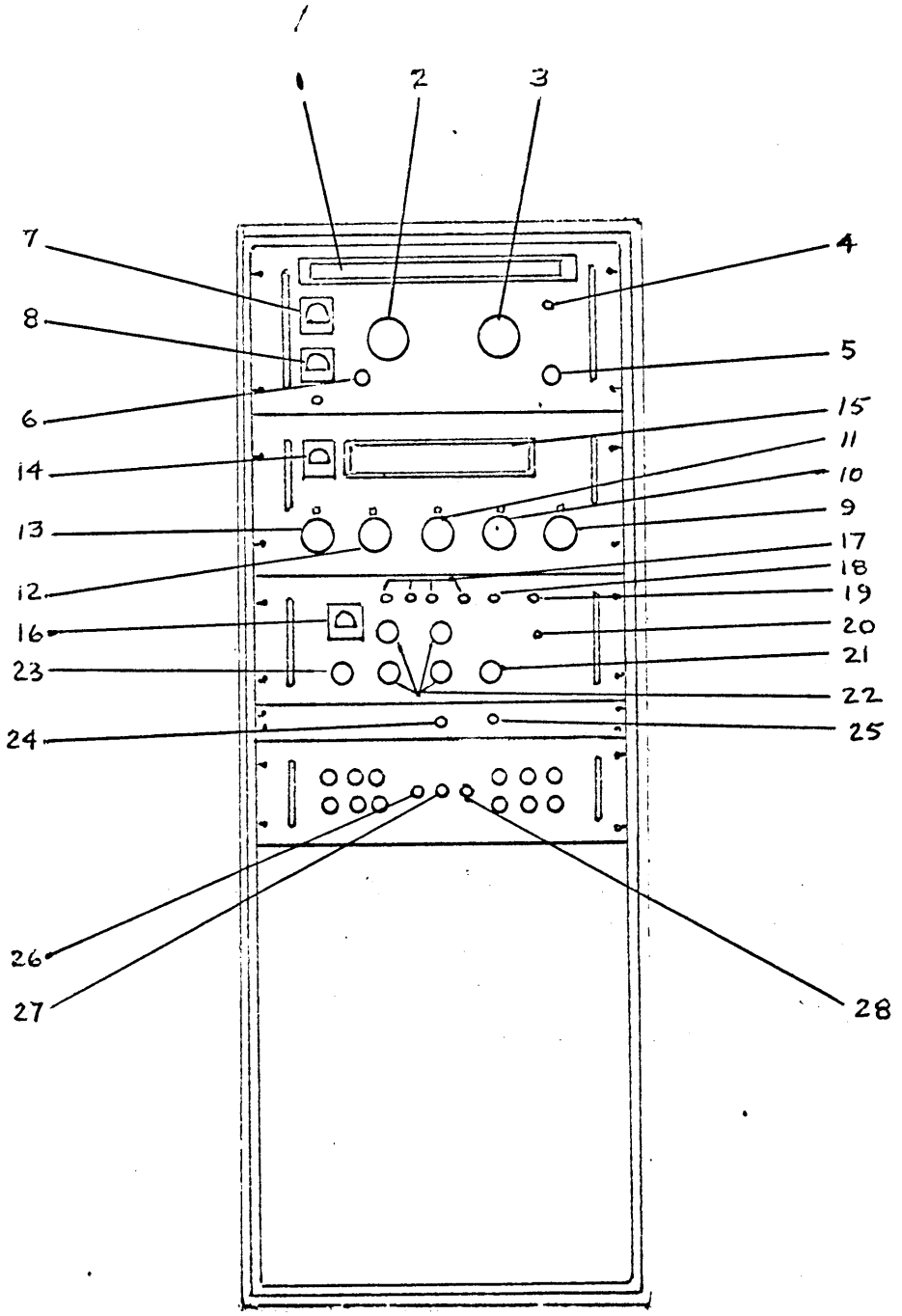


Figure 3-1. Control Locations, Exciter

TABLE 3-1. CONTROLS AND INDICATORS, LINEAR AMPLIFIER

MODULAR UNIT	ITEM No. (Fig. 3-1.)	DESIGNATION	FUNCTION
RAK	1	TECHNIMATIC lamp	Indicates when primary circuit breaker (35) is set at ON position.
	2	READY lamp	Indicates GPTA is ready for operation.
	3	HIGH VOLTAGE lamp	Indicates when high voltage circuit breaker (35) is set at ON position.
Standing Wave Ratio Indicator SWCA	4	Power Meter (no panel designation)	Indicates forward and reflected power (KW).
	5	Frequency Selector Switch (no panel designation)	Selects frequencies in the 2- to 30-mc range.
	6	Power Limit control (no panel designation)	Used for setting minimum r-f power output of GPTA.
	7	SWR OVLD lamp	Lights when standby wave ratio is excessive.
	8	FAULT lamp	Lights to indicate GPTA filed to tune in specified time.
	9	RF GAIN control	Adjusts excitation level to the TLAA (higher level in INCR arrow direction).
	10	KW/REFL switch	Activates meter (4) for forward or reflected power indication.
	11	Power Limit control (no panel designation)	Used for setting maximum r-f power output.
Linear Amplifier TLAA	12	IPA PLATE CURRENT indicator	Indicates intermediate power amplifier plate current.

TABLE 3-1. CONTROLS AND INDICATORS, LINEAR AMPLIFIER (Cont)

MODULAR UNIT	ITEM No. (Fig. 3-1)	DESIGNATION	FUNCTION
Linear Amplifier TLAA (Cont)	13	ALDC ADJ control feedback applied	Adjusts level of negative feedback applied to the exciter
	14	PA BANDSWITCH switch	Selects 2- to 30-mc range in 9 increments.
	15	Indicator (no panel designation)	Veeder indicator for LOAD control (18).
	16	LOAD control	Adjusts the loading of the final PA.
	17	RF trig control (no panel designation)	PA plate trigger adjustment for sensing circuit factory adjusted).
	18	MULTIMETER indicator	Indicates 1st amplifier plate current, 2nd amplifier plate current, 2nd amplifier plate current, 2nd amplifier r-f plate voltage, and power amplifier r-f plate voltage.
	19	2ND AMPL BANDSWITCH switch	Selects 2- to 30-mc range in 9 increments.
	20	2ND AMPL TUNING control	Adjusts resonance of the 2nd amplifier.
	21	Indicator (no panel designation)	Veeder indicator for TUNE control (25).
	22	MULTIMETER switch	Selects circuit for MULTIMETER (20).
	23	TUNE control	Adjusts resonance of the final PA.
Harmonic Filter TFP-2.5K	24	FILTER BANDSWITCH, 7-position rotary solenoid switch.	Used to select appropriate harmonic filter network corresponding to transmitter operating frequency.

TABLE 3-1. CONTROLS AND INDICATORS, LINEAR AMPLIFIER (Cont)

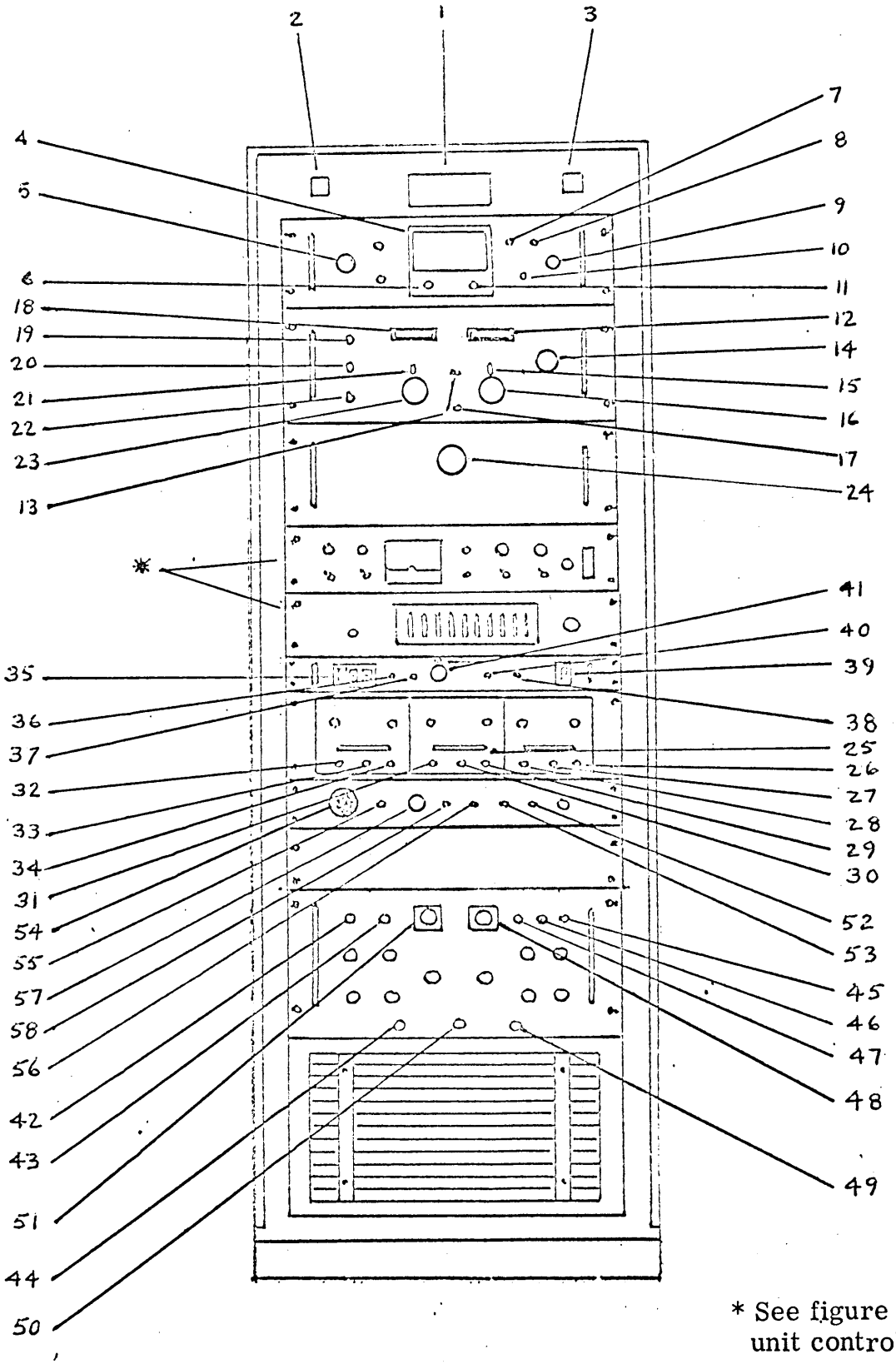
MODULAR UNIT	ITEM No. (Fig. 3-1)	DESIGNATION	FUNCTION
Servo Amplifier TCSA (Cont)	25	R.F.P.O.	R-f Power On adjustment (factory adjusted).
	26	OPERATE lamp	Lights when PA stage has completed loading.
	27	SEARCH lamp	Lights when PA stage is being loaded.
	28	AC ON lamp	Lights when servo amplifiers are tuning.
	29	OPERATE lamp	Lights when final amplifier is tuning.
	30	SEARCH lamp	Lights when final amplifier is tuning.
	31	AC ON lamp	Lights when servo amplifiers are tuning.
	32	AC ON lamp	Lights when servo amplifiers are tuning.
	33	SEARCH lamp	Lights when 2nd amplifier is tuning.
	34	OPERATE lamp	Lights when 2nd amplifier completes tuning.
Linear Amplifier Control Panel TCP	35	MAIN POWER Circuit breakers	Controls application of power to all units of the GPTA.
	36	OVLD RESET switch	Resets the overload relays.
	37	XMTR TUNING AUTO/ MANUAL switch	When set at AUTO, allows automatic operation of GPTA; when set at MANUAL, allows the GPTA to be tuned manually.
	38	HIGH VOLTAGE switch	Controls application of power to high voltage power supply AP129.
	39	TUNE switch	When depressed, initiates automatic tuning and loading.

TABLE 3-1. CONTROLS AND INDICATORS, LINEAR AMPLIFIER (Cont)

MODULAR UNIT	ITEM NO. (Fig. 3-1)	DESIGNATION	FUNCTION
Linear Amplifier Control Panel TCP	40	SERVO ON/OFF switch	When set at ON, enables activation of automatic band switching and tuning circuits.
	41	Interlock switch (no panel designation)	Used to locate open interlock switches (lamp above switch lights, indicating interlock switch is closed).
	42	PA PLATE OVLD ADJ potentiometer	Used to set plate overload.
	43	PA SCREEN OVLD ADJ potentiometer	Used to set screen overload.
	44	PA BIAS OVLD lamp	Overload indicator light.
	45	PA BIAS ADJ potentiometer	Adjust PA grid bias.
	46	2ND AMPL BIAS ADJ potentiometer	Adjust 2nd amplifier grid bias.
	47	1ST AMP BIAS ADJ potentiometer	Adjust 2nd amplifier grid bias.
	48	PLATE TIME meter	Registers final PA plate operation time.
	49	PA SCREEN OVLD lamp.	Overload indicator light.
	50	PA PLATE OVLD lamp	Overload indicator light.
	51	FILAMENT TIME meter	Registers filament operation time.
Alarm Panel AX633	52	AUDIO IN jack	Provides for audio test signal to be applied (during maintenance procedures).
	53	PA MON jack	Provides PA monitoring outlet for test purposes.

TABLE 3-1. CONTROLS AND INDICATORS, LINEAR AMPLIFIER (Cont)

MODULAR UNIT	ITEM NO. (Fig. 3-1)	DESIGNATION	FUNCTION
Alarm Panel AX633 (Cont)	54	Alarm Device (no panel designation)	Alarm sounds if primary power to high voltage power supply is interrupted.
	55	ALARM ON/OFF switch	Acitivates alarm device circuit when set at ON position.
	56	EXCITER MON jack	Provides exciter monitoring outlet (for test purposes).
	57	SENSE switch	Provides for the selection of circuits (as marked) for test purposes.
	58	SENSE lamp	Provides monitoring outlet for the sensing positions of SENSE switch.



* See figure 3-2b. for unit control descriptions.

Figure 3-2a. Control Locations, Linear Amplifier

Table 3-1. Controls and Indicators, Linear Amplifier (Cont)

REF SYMBOL	PANEL DESIGNATION	FUNCTION
1	POWER, indicator lamp	Lights when power toggle switch is set at ON; indicates power applied to unit.
2	ON/OFF, toggle switch	When set at ON, primary a-c input power is applied to unit.
3	SWR, pushbutton switch/indicator lamp.	When pressed, permits panel meter to indicate SWR reading.
4	TUNE/OPERATE toggle switch	When set at OPERATE, interlock circuits are operational and servo control circuit is disabled to prevent accidental detuning. When set at TUNE, interlock circuits are disabled and servo control circuit activated for tuning purposes.
5	Meter, no panel designation	Indicates relative forward power, and SWR (relative reflected power) as selected by METER switch.
6	METER, four-position selector switch.	FWD position permits panel meter to indicate relative forward power. SWR/TUNE position permits tuning controls to become operational; to prevent accidental false tuning when set at FWD. CAL-A/B positions used to calibrate the panel meter by use of the tuning controls and preset card.
7	SENS, potentiometer	When adjusted for a full-scale panel meter setting, SWR may be read directly off meter scale (meter switch set at SWR).
8	MASTER TUNING C-1, 2; toggle switch	Used to tune operating frequency (see graph in associated technical manual) with sufficiently low SWR. (Used in conjunction with A and B MASTER TUNING controls).
9	MASTER TUNING A, potentiometer	Used to tune operating frequency (see graph in associated technical manual) with sufficiently low SWR.
10	MASTER TUNING B, potentiometer	Used to tune operating frequency (see graph in associated technical manual) with sufficiently low SWR.

Table 3-1. Controls and Indicators, Linear Amplifier (Cont)

REF SYMBOL	PANEL DESIGNATION	FUNCTION
11	TUNING, two-position selector switch.	When set at MASTER, the MASTER TUNING controls become operative. When set at PRESET, the plug-in preset card functions in place of the inoperative MASTER TUNING controls.
12	PRESET, receptacle	Used to accept a plug-in preset tuning card. (Not used when Remote Control Unit, RCU-1 is employed).
13	TUNE, indicator lamp	Lights when selected tuning is accomplished.
14	Plug-in preset cards	Ten plug-in preset tune cards, used to tune HFAS.
15		When set at OFF, the preset card in the HFAS is utilized. When set at either one of the ten selectable positions, that selected preset plug-in card is utilized. When set at REMOTE, selection of either one of the ten plug-in cards may be remotely selected.

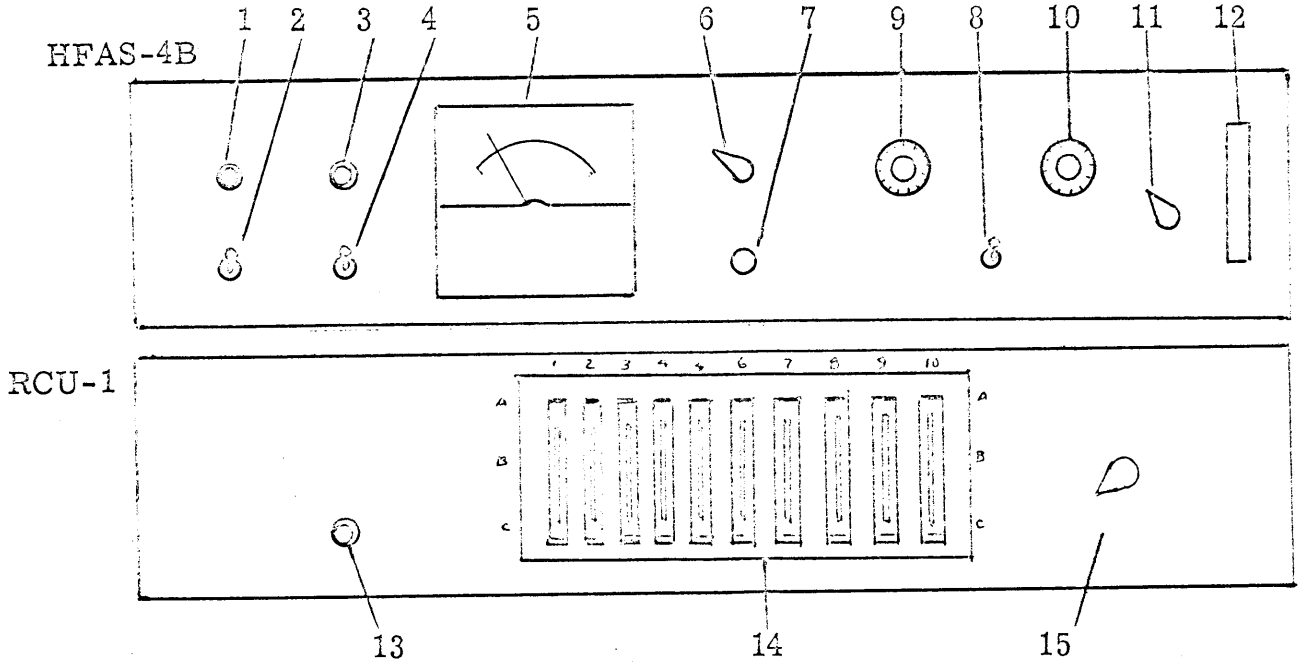


Figure 3-2b. Control Locations, Linear Amplifier

SECTION 4
PRINCIPLES OF OPERATION

4-1. GENERAL

The GPTA transmitter system comprises two major sections; the exciter section and the linear amplifier section.

The exciter section accepts the input intelligence, translates and combines it to produce the input intellegence at a desired output frequency, within the 2 to 30 mc (MHz) frequency range.

The linear amplifier accepts the exciter output intelligence, at the desired frequency range, and amplifies it up to a 2500 watts (PEP) level. This power amplified output is then routed to a directional coupler for antenna use.

4-2. OVERALL FUNCTIONAL ANALYSIS

a. EXCITER SECTION (figure 4-1) - The Sideband Exciter CMR provides the primary stage of frequency conversion and frequency division multiplexing for the SBT four-channel independent sideband transmitting system. The CMR accepts up to four 600-ohm audio input signals. The four singals are processed separately by independent amplifiecation, modulation, filtering and gain control circuits (channels A1, A2, B1 and B2). The outputs of each of these channel circuits are then combined to yield an independent sideband output that is centered at a frequency of 1.75 mc.

The 1.75 mc carrier (used for channels A1 and B1) and the multiplexing sub-carriers (1.75371 mc and 1.75629 mc used for channels A2 and B2) are synthesized within the CMR from a 1-mc reference signal. This 1-mc reference signal is supplied by the associated Control Synthesizer HFS.

The 1.75 mc CMR output is applied to the RF Translator CHG, heterodyning this signal to the desired output frequency. A sample of high frequency oscillator output (3.75 mc to 33.75 mc) of the CHG is routed to the Control Synthesizer HFS, which in turn supplies a d-c control voltage back to the CHG to stabilize the high frequency oscillator. The resulting output of the CHG is a stabilized r-f output, containing the input intelligence at a selected frequency within the 2 to 30 mc frequency range. The CHG r-f output is then routed to the linear amplifier section.

A standby/operate toggle switch on the AX560A operates the control relay in Power Supply HFP, thus controlling the application of operating voltages from the HFP to the exciter component units.

b. LINEAR AMPLIFIER SECTION (figure 4-2). (MHz) output of the associated exciter is extended via the RF GAIN control of the SWCA to the linear power amplifier TLAA where the exciter output level is increased to 2.5 KW. Low level r-f signals applied to the TLAA are routed through a broadband amplifier, a tuned second amplifier and a tuned final amplifier to the r-f output jack at the rear of the TLAA. The second and final amplifier band switches are automatically pre-positioned by a switch located on the SWCA. Front panel meters provide the required indications for tuning and loading the amplifier stages. Operating power for TLAA is furnished by power supplies AP128 and AP129.

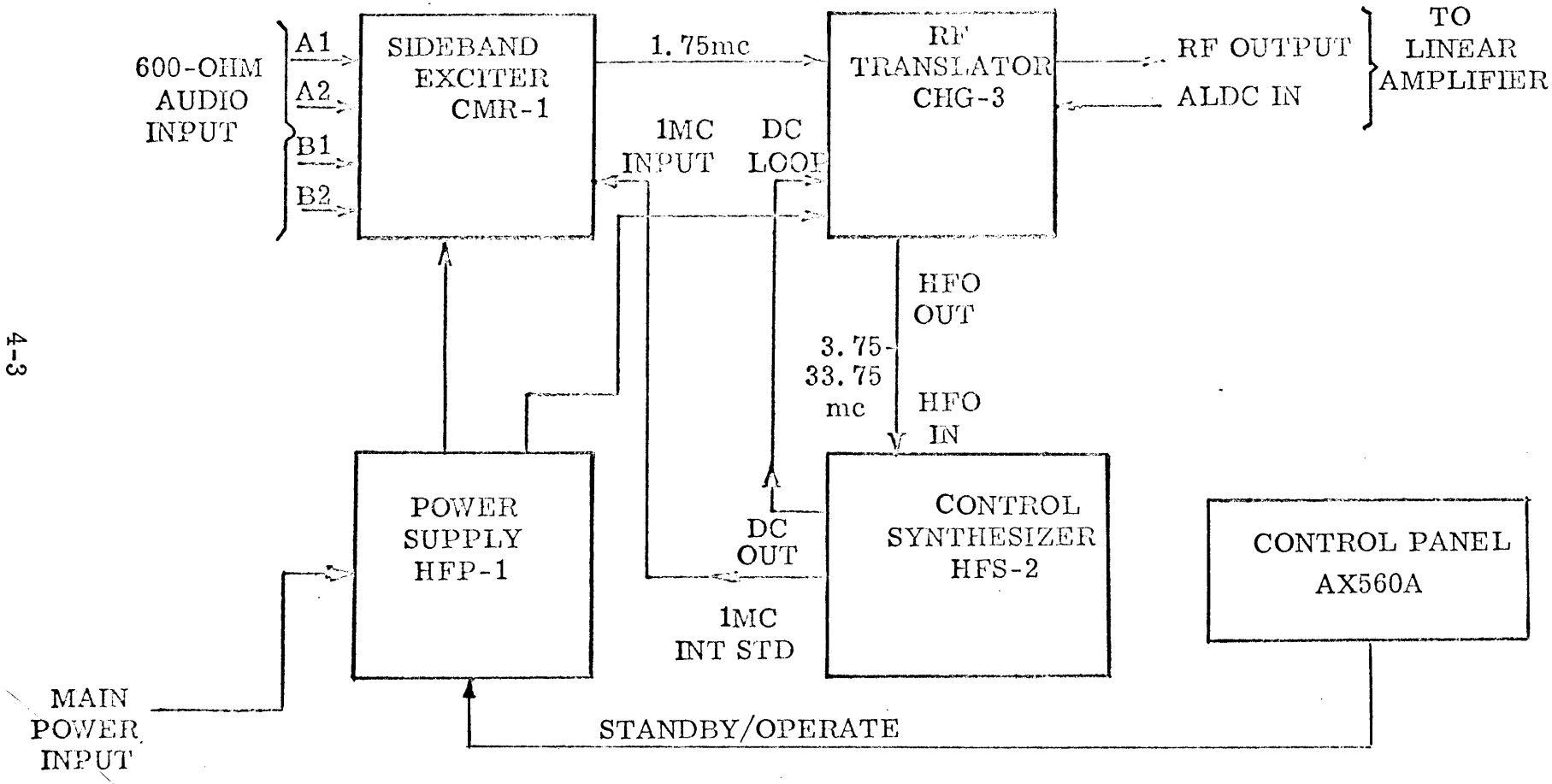


Figure 4-1. Block Diagram, Exciter

The 2.5kw output of the TLAA is coupled to the antenna via a directional coupler which provides the forward and reflected power indication to the SWCA.

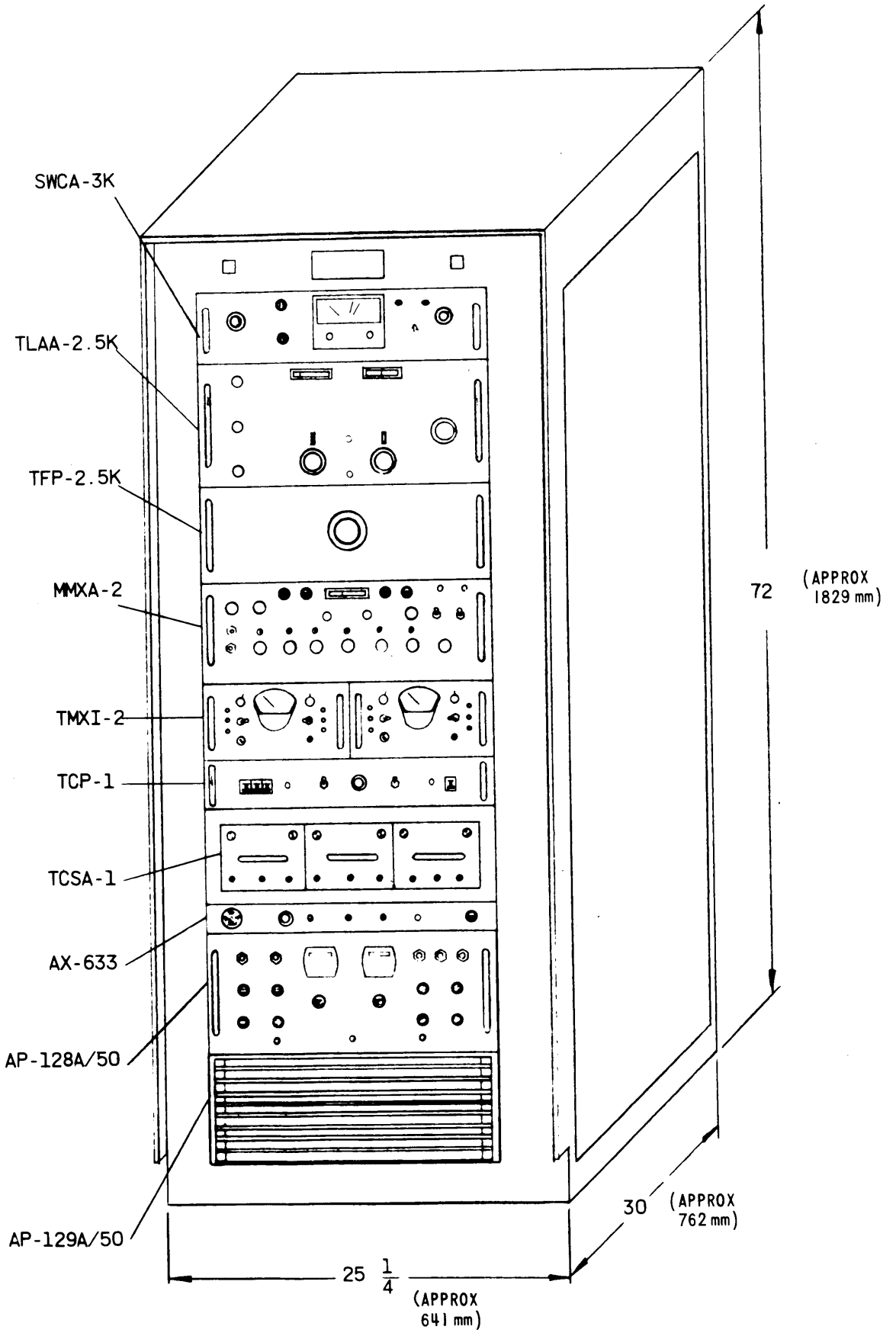
The RF Control and Indicator SWCA comprises an RF GAIN control that adjusts the r-f excitation to the TLAA, a pre-position switch that sets the TLAA bandswitches to the proper band segment, and a front panel meter that provides a forward and reflected power output indication of the GPTA. The r-f output of the exciter is applied across the 50-ohm RF GAIN control and the TLAA is connected to the wiper. The pre-positioning switch receives it's operating voltage from the power supply AP128. When the MANUAL/ AUTO switch is set at AUTO, contacts of a relay in the AP128 supply the voltage required to activate the stepping switches attached to the second and final PA bandswitches. The power meter circuit is configured to permit selection of forward or reflected power indications depending upon the setting of the FWD/REFL switch. The reflected power is monitered in a seperate circuit that trips the overload relay when the SWR reaches 2:1 or 3:1 depending on the setting of the rear panel switch.

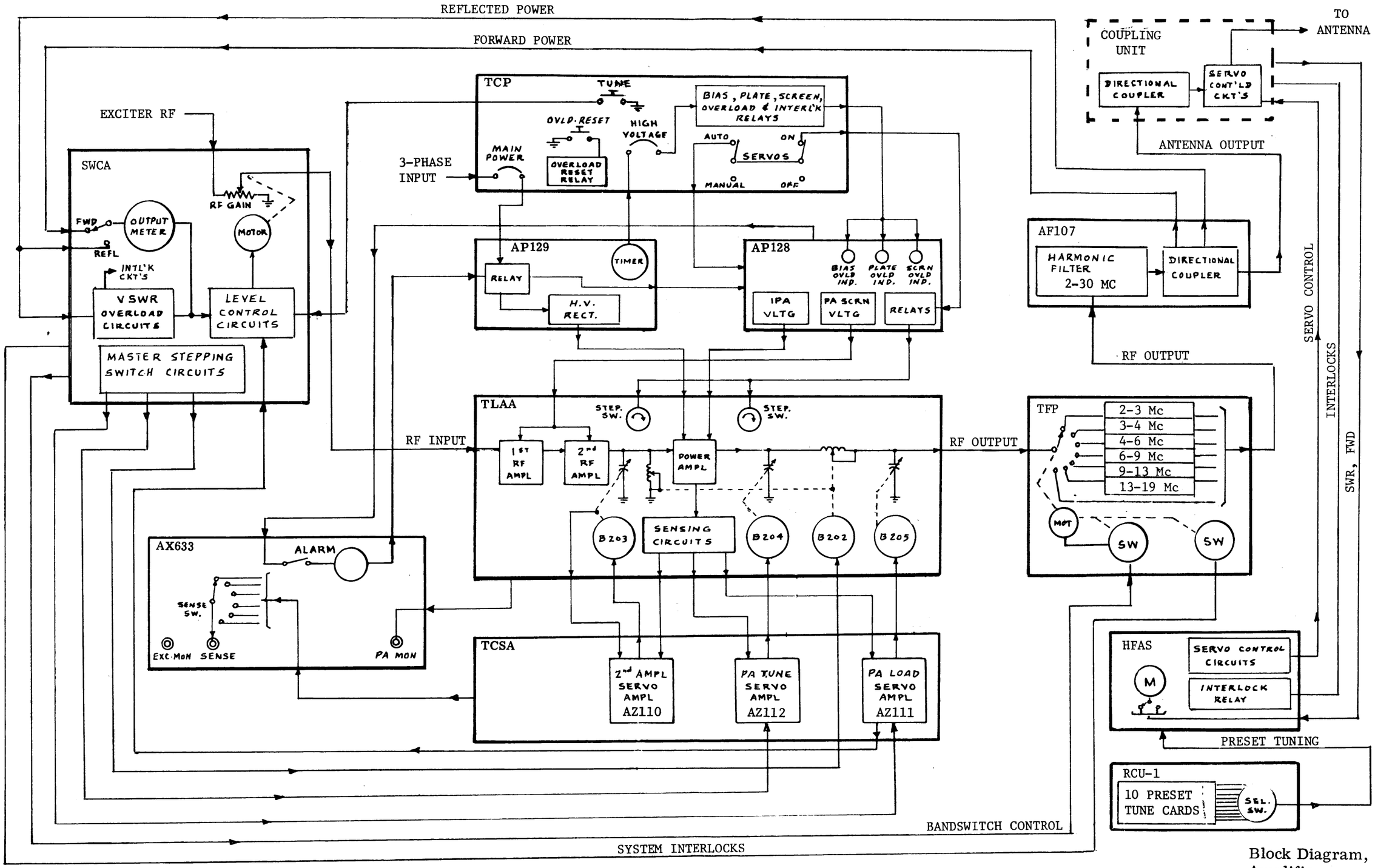
The low voltage power supply AP 128 provides filament voltage and bias for all amplifier stages in the transmitter, plate and screen voltages for the first two amplifier stages, screen voltage for the PA stage, and 24 vac for the interlock circuits. The Low Voltage Power Supply contains overload relays that open interlocks, cutting off all voltages to the 2.5-kw PA stage when preset overload levels are exceeded. The protective circuits sample the PA plate and screen currents and bias supply voltages and activate the overload relay of the SWCA when any of these currents are excessive.

The High Voltage Power Supply AP-129 supplies the 5000 vdc for the operation of the final power amplifier of the TLAA. The AP-129 receives its operating power from a high voltage contactor that is energized by phase-two voltage supplied by the interlock relay, and phase-three voltage that is supplied by the HIGH VOLTAGE switch on TCP.

The HFAS control unit contains servo amplifiers and control potentiometers used to adjust the coupling network from a remote location. The HFAS also includes an SWR metering circuit.

The metering circuit provides for calibration of preset tuning data cards. The RCU remote control unit enables the HFAS to operate with up to ten preset tuning data cards, the particular tuning data card selected at the RCU.


SWCA-3K
TLAA-2.5K
TFP-2.5K
MMXA-2
TMXI-2
TCP-1
TCSA-1
AX-633
AP-128A/50
AP-129A/50
72
(APPROX
1829 mm)
30
(APPROX
762 mm)
25 1/4
(APPROX
641 mm)



Block Diagram, Linear Amplifier

SECTION 5
MAINTENANCE

5-1. PREVENTIVE MAINTENANCE.

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

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

WARNING

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing of the vapor. Avoid prolonged or repeated contact with skin. Flammable solvents shall not be used on energized equipment or near any equipment from which a spark may be received. Smoking, "hot work", etc. is prohibited in the immediate area.

CAUTION

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

5-2. TROUBLESHOOTING

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

The first step in troubleshooting is to ascertain that proper equipment voltages are present, interconnecting cables are secure, and that all fused are in functional condition. Refer to table 5-1, used in conjunction with figure 5-1, for system fuse locations and functions.

NOTE

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

Visual troubleshooting of the modular unit chassis components and tube conditions may also help localize the fault.

Table 5-1. Fuse Functions, Linear Amplifier

ITEM NO. (Fig. 5-1)	REF. SYMBOL NO.	UNIT	FUSE RATING	FUNCTION
1	F7002	SWCA-3K	3A/24 VDC SLOW-BLOW	Protective fuse for control circuit; lights to indicate fuse is defective.
2	F7000	SWCA-3K	1A/230VAC SLOW-BLOW	Protective fuse for power output meter circuits; lights to indicate fuse is defective.
3	F401	TCSA-1 AS110	0.5A, AC	Protective fuse for AZ110 power supply input.
4	F400	TCSA-1 AZ110	1.0A, DC	Protective fuse for AZ110 power supply output.
5	F301	TCSA-1 AS112	0.5A, AC	Protective fuse for AZ112 power supply input.
6	F500	TCSA-1 AZ111	1.0A, DC	Protective fuse for AZ111 power supply output.
7	F501	TCSA-1 AZ111	0.5A, AC	Protective fuse for AZ111 power supply input.
8	F300	TCSA-1 AZ112	1.0A, DC	Protective fuse for AZ112 power supply output.
9	F9000	AX633	0.1A/DC quick-acting	Protective fuse for alarm ckt.
10	F5006	AP128	0.75A slow-blow	Protective fuse for IPA bandswitch ckt.
11	F5007	AP128	2.5A slow-blow	Protective fuse for PA bandswitch ckt.
12	F5008	AP128	3.0A slow-blow	Protective fuse for interlock ckt.
13	F5009	AP128	10.0A slow-blow	Protective fuse for interlock ckt.
14	F5005	AP128	0.5A high-voltage	Protective fuse for IPA screen ckt.
15	F5000	AP128	5.0A slow-blow	Protective fuse for filament ckt.
16	F5002	AP128	3.0A slow-blow	Protective fuse for blower ckt.

Table 5-1. Fuse Functions, Linear Amplifier (CONT)

ITEM NO. (Fig. 5-1)	REF. SYMBOL NO.	UNIT	FUSE RATING	FUNCTION
17	F5001	AP128	2.0A slow-blow	Protective fuse for low-voltage ckt.
18	F5003	AP128	0.25A slow-blow	Protective fuse for bias ckt.
19	F5004	AP128	0.5A high-voltage	Protective fuse for PA screen ckt.

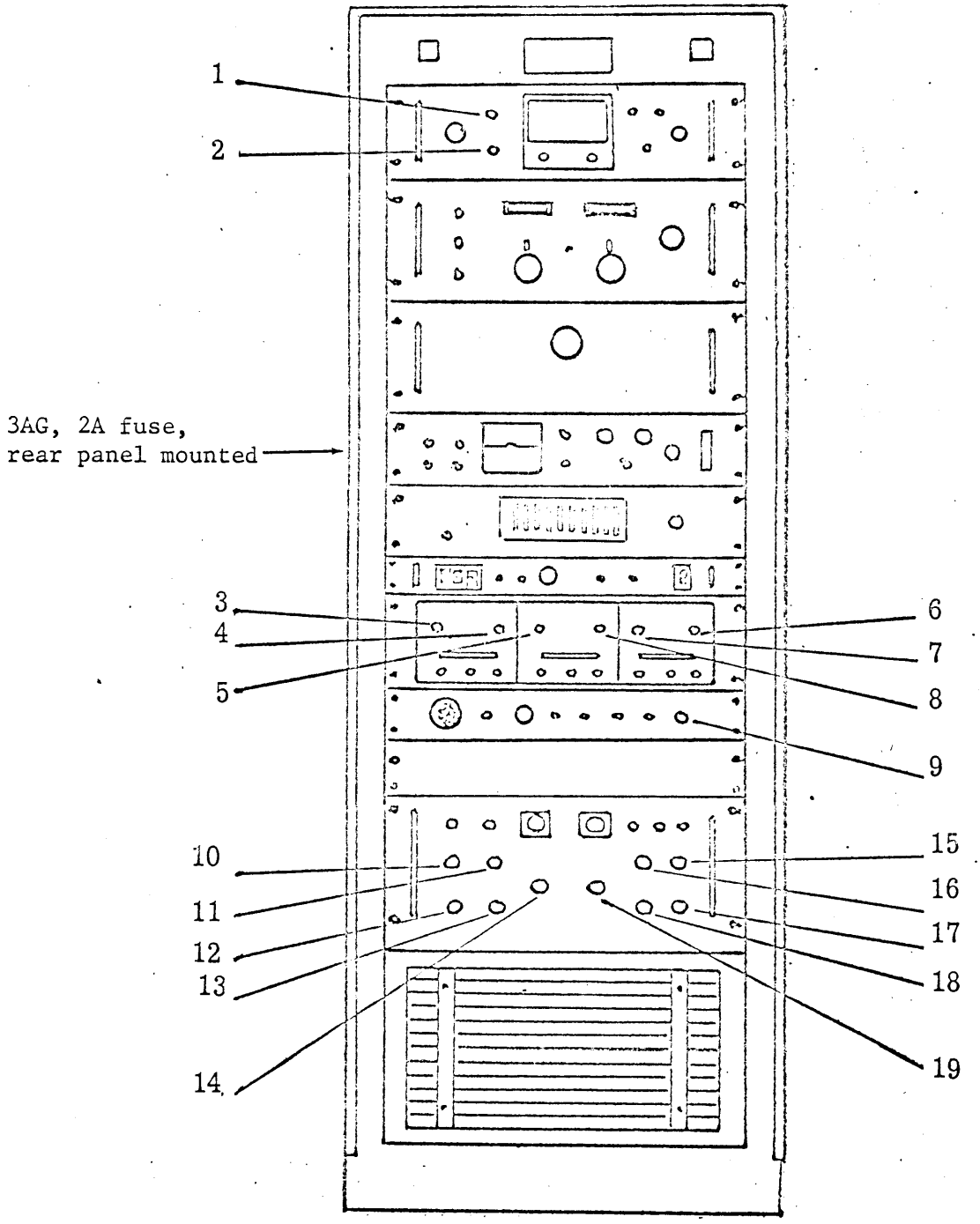


Figure 5-1. Fuse Locations, Linear Amplifier

Table 5-2. Fuse Functions, Exciter

ITEM No. (Figure 5-1)	PANEL DESIGNATION	FUNCTION
	SIDEBAND EXCITER, CMR	
1	B+, F3, 1 amp, 250 wvdc, quick-acting	Protects external +12 volt supply.
2	B-, F2, 1 amps, 250 wvdc, quick-acting	Protects external -12 volts supply.
3	AC, F1, 1 amp, time lag, slow-blow	Protects external power supply.
4	DC, F4, 1 amps, 250 wvdc, quick-acting	Protects internal components.
	POWER SUPPLY, HFP	
5	B- LINE .125 A	Section "B" B- output to J8010.
6	B- LINE .125 A	Section "B" B- output to J8008.
7	B+ LINE .250 A	Section "B" B+ output to J8005 and J8008.
8	B- LINE .125 A	Section "B" B- output to J8006.
9	B+ LINE .375 A	Section "A" B+ output to J8007.
10	B+ LINE .375 A	Section "A" B+ output to J8005.
11	FIL LINE 4 A	6.8 vac output to J8006.
12	FIL LINE 5 A	6.8 vac output to J8009.
13	FIL LINE 15 A	6.8 vac output to J8007.
14	FIL LINE	6.8 vac output to J8010.
15	FIL LINE 10 A	6.8 vac output to J8008.
16	FIL LINE 10 A	6.8 vac output to J8005.
17	F8003 4A/115V 2A/230V	Line voltage supply to J8009 and J8010; 6.3 vac supply to J8005; time delay and circuit in HFP.
18	F8007 .750 A	Input to section "A" B+ regulator in GFP.
19	F8008 .750 A	Input to section "B" B+ regulator in HFP
20	F8001 15A/115V 8A/230V	Main line voltage input and line voltage output to J8002.

Table 5-2. Fuse Functions, Exciter

ITEM No (Figure 5-1)	PANEL DESIGNATION	FUNCTION
	POWER SUPPLY, HFP (CONT)	
21	F8004 4A/115V 2A/230V	Line voltage supply to J8009 and J8010; 6.3 vac supply to J8005; time delay and filament circuits in HFP.
22	F8005 2A/115V 1A/230V	Line voltage supply J8004.
23	F8006 1/10A	Input to bias supply in HFP.
24	F8002 15A/115V 8A/230V	Main line voltage input and line voltage output to J8002.

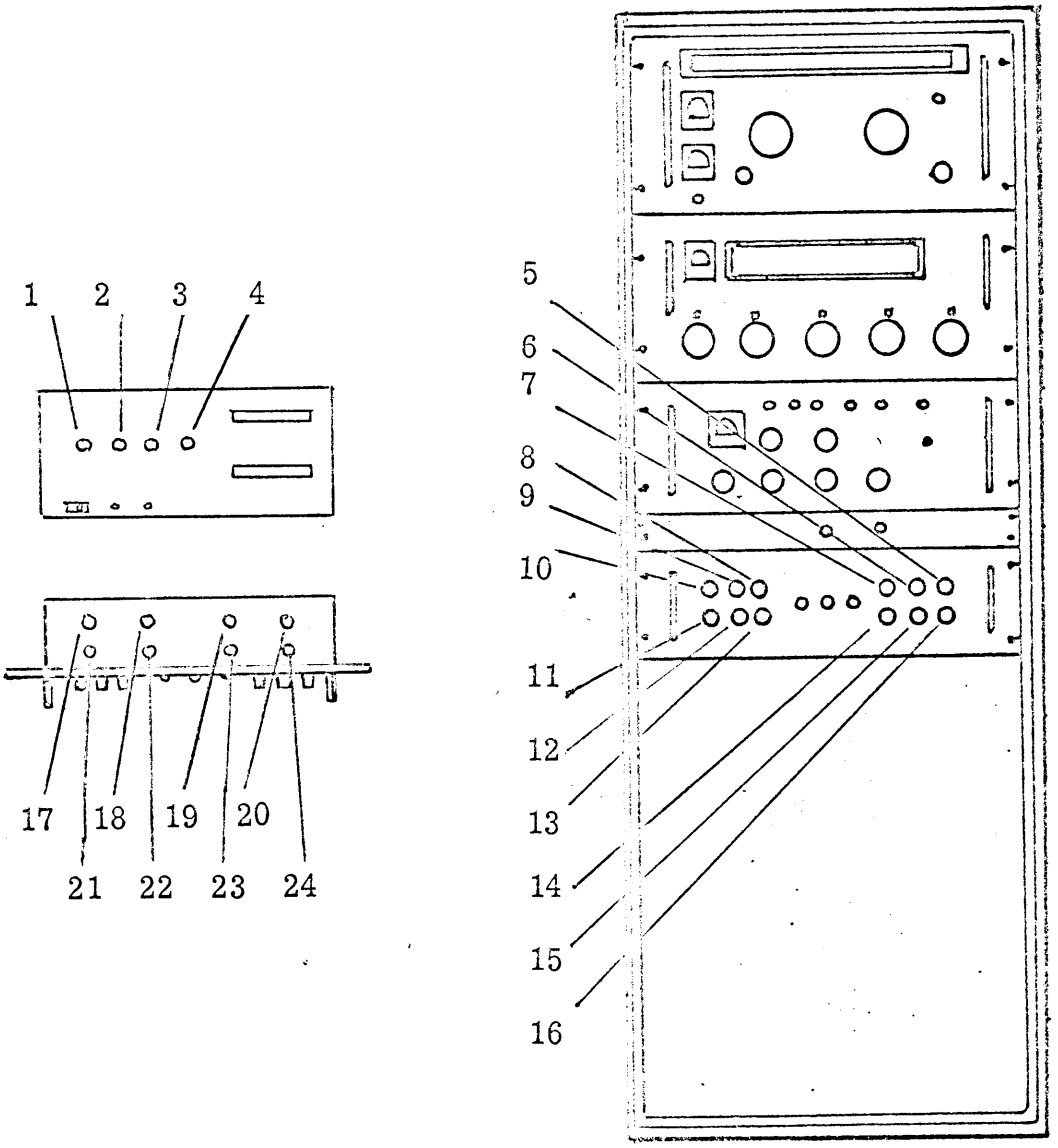


Figure 5-2. Fuse Locations, Exciter