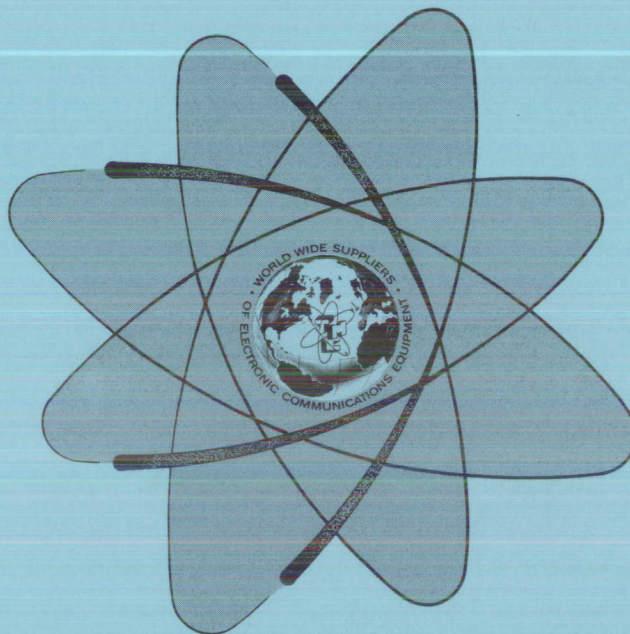


TECHNICAL MANUAL  
*for*

GENERAL PURPOSE

TRANSMITTER

MODEL GPT-500-4



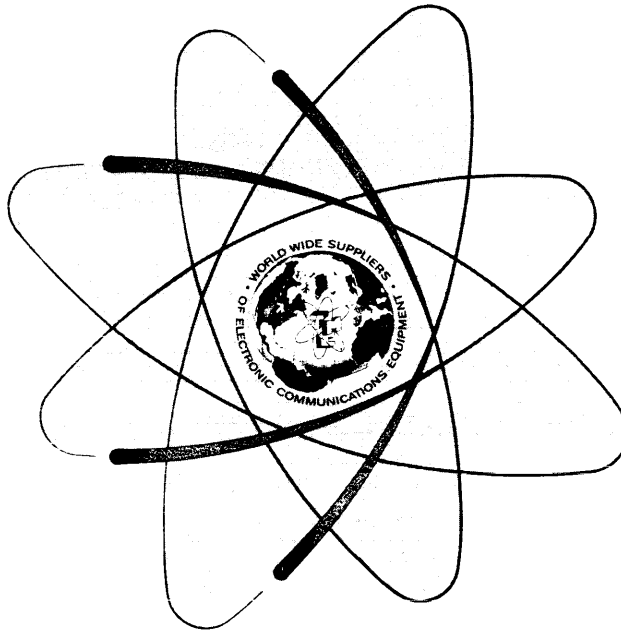
THE TECHNICAL MATERIEL CORPORATION  
MAMARONECK, N.Y.

OTTAWA, ONTARIO

COPYRIGHT 1971  
THE TECHNICAL MATERIEL CORPORATION

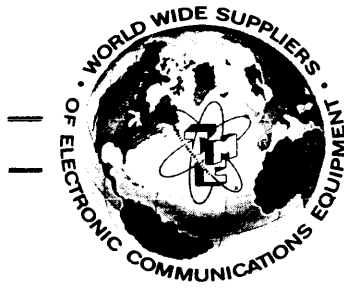
Printed in U.S.A.

TECHNICAL MANUAL  
FOR  
GENERAL PURPOSE  
TRANSMITTER  
MODEL GPT-500-4



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

Printed in U.S.A.



# THE TECHNICAL MATERIEL CORPORATION

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

700 FENIMORE ROAD

MAMARONECK, N. Y.

## 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.



TABLE OF CONTENTS

<u>Paragraph</u>		<u>Page</u>
<u>SECTION 1 - GENERAL INFORMATION</u>		
1-1	Functional Description . . . . .	1-1
1-2	Physical Description . . . . .	1-1
1-3	Technical Specifications . . . . .	1-2
<u>SECTION 2 - INSTALLATION</u>		
2-1	Unpacking and Handling . . . . .	2-1
2-2	Mechanical Installation . . . . .	2-1
2-3	Electrical Installation . . . . .	2-1
<u>SECTION 3 - OPERATOR'S SECTION</u>		
3-1	General . . . . .	3-1
3-2	Controls and Indicators . . . . .	3-1
3-3	Operating Procedures . . . . .	3-1
	a. General . . . . .	3-1
	b. Starting Procedure . . . . .	3-2
	c. Stopping Procedure (Standby) . . . . .	3-2
<u>SECTION 4 - PRINCIPALS OF OPERATION</u>		
4-1	General . . . . .	4-1
<u>SECTION 5 - MAINTENANCE</u>		
5-1	Preventive Maintenance . . . . .	5-1
5-2	Troubleshooting . . . . .	5-1
	A. General . . . . .	5-1
	B. STE-5A . . . . .	5-1
	C. PSP-500 . . . . .	5-2
	D. RFE-2-4 . . . . .	5-2

LIST OF ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
1-1	GPT-500-4 SYSTEM . . . . .	1-0
2-1	GPT-500-4 INTERCONNECT PICTORIAL . . . . .	2-3

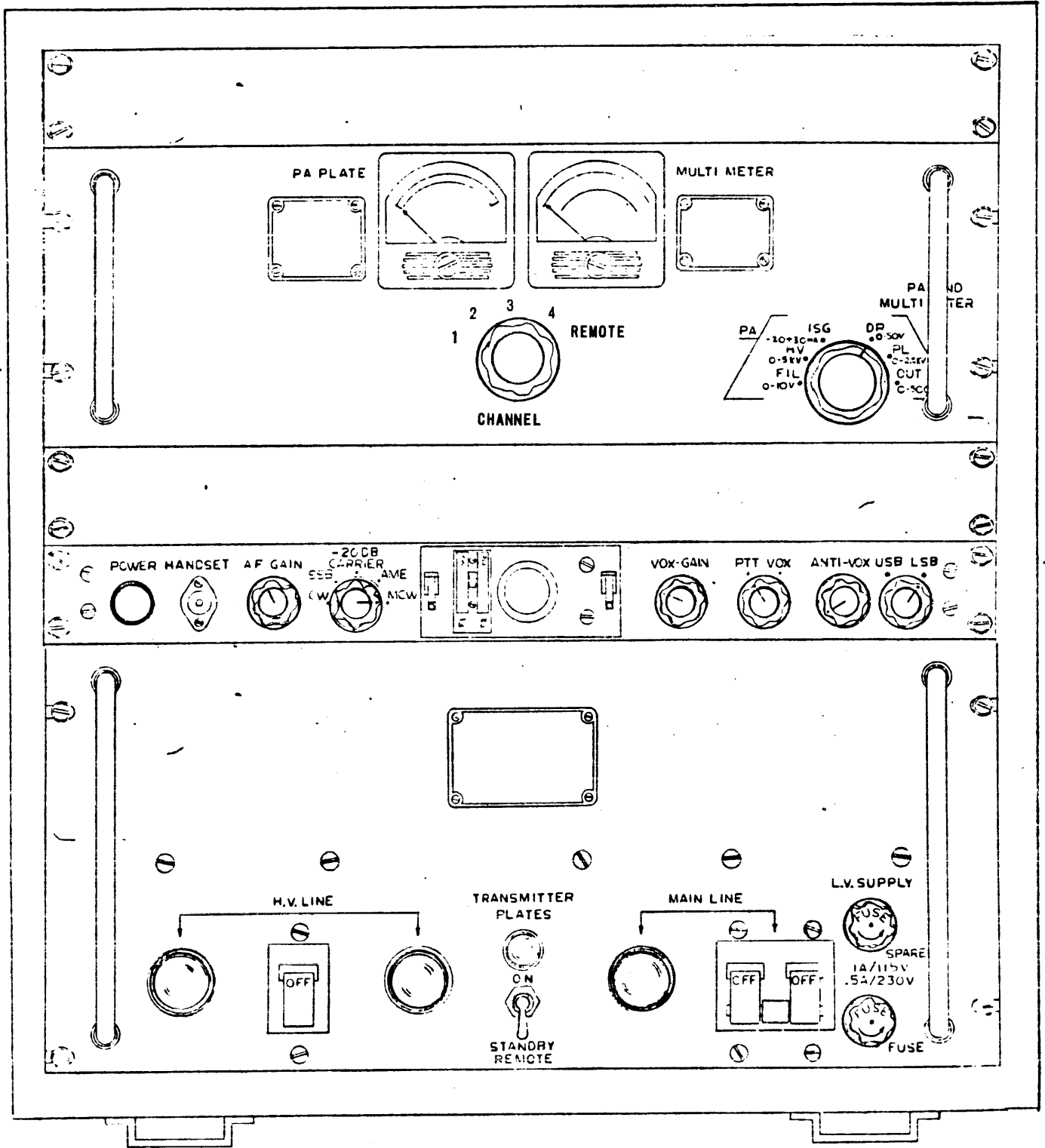


Figure 1-1. GPT-500-4 SYSTEM

## SECTION 1

### GENERAL INFORMATION

#### 1-1. FUNCTIONAL DESCRIPTION

The GPT-500-4 (figure 1-1) is a four channel, fixed frequency low power transmitter system capable of providing 500 watts peak envelope power. The system consists of the model PSP-500 Power Supply, RFE-2-4 Linear Power Amplifier and the STE-5A Sideband Strip Exciter. This system operates in the frequency range of 2 to 32 MHz. The system is capable of operating on the following modes: CW, MCW, AME, SSB, DSB and ISB. The system may be remotely controlled to provide the following operational functions: PA plates on-off, CW key, PTT (press to talk), and a selection of PTT modes between A3J (fully suppressed carrier), A3A (-20 db suppressed carrier) and A3H (full carrier).

For FSK and FAX modes of operation additional terminal equipments are required. This system is FCC type accepted under Part 81 and is type approved by the Department of Transport in Canada.

#### 1-2. PHYSICAL DESCRIPTION

The three units that comprise the GPT-500-4 transmitter system are equipped with standard 19 inch wide front panels designed to be mounted into any standard 19 inch wide equipment rack or console. The total system requires a total height of approximately 16 inches and a depth of approximately 17 inches. The total weight is approximately 150 pounds excluding a cabinet or rack.

The system has meters to indicate voltages and current for operation and maintenance indications. All the necessary controls for operation are located on the front panels. External connections are made at the rear of the units except for the connection of a handset, which may be connected to the front. Circuits are protected by fuses, circuit breakers, overload circuitry and safety interlocks at high voltage points.



### 1-3. TECHNICAL SPECIFICATIONS

#### a. General System

1. Frequency range - 2 to 32 MHz (four fixed frequency channels; customer selected)
  2. Stability - standard  $\pm 50$  Hz from 0 to  $50^{\circ}\text{C}$ , optional  $\pm 10$  Hz from  $-30$  to  $+50^{\circ}\text{C}$
  3. Power output - 500 watts peak envelope power (PEP)
  4. Output impedance - unbalanced from 30 to 1000 ohms  
- unbalanced 50 ohms with a model LPF-750
  5. Audio input
    - (a) Frequency range - 300 to 3000 Hz standard
    - (b) Impedance - 600 ohm balanced or unbalanced
    - (c) Input level range -  $-20$  dbm to 0 dbm
  6. Operating input voltage - 115 or 230 vac @50/60 Hz, single phase at approximately 1150 watts
  7. Modes of operation - CW, MCW, AME, USB, LSB, DSB and ISB
  8. Intermodulation distortion - 40 db below either tone of a standard two tone test at full rated peak envelope power (PEP)
- b. Refer to the Technical Manual of each unit for it's specific specifications.

SECTION 2  
INSTALLATION

2-1. UNPACKING AND HANDLING

Upon receipt of the equipment, unpack it carefully and inspect it for damage that may have occurred in transit. Inspect all packing material for parts which may have been supplied as Loose Items such as Technical Manuals, Hardware, Connectors and Cables.

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

2-2. MECHANICAL INSTALLATION

The GPT-500-4 can be mounted into a standard 19 inch equipment cabinet or console. Determine installation location and mount equipment cabinet or console (either base or shock mount as desired). Use the equipment mounting hardware supplied as Loose Items and mount the modular units as shown in figure 1-1. Install the heaviest unit (PSP-500) first to avoid offsetting the center of gravity of the equipment cabinet. For specific mechanical installation refer to the modular manuals provided.

2-3. ELECTRICAL INSTALLATION (Refer to figure 2-1)

The system is shipped from the factory, unless otherwise specified by the customer, wired for an input line voltage of 115 vac. To convert the system to 230 vac operation refer to the installation section of the individual modular unit manuals. Insure that ALL units are changed.

The system interconnections that are necessary are shown in figure 2-1. Specifically these are:

- a. Connect CA1601 as shown.
- b. Connect RF OUT on STE-5A (BNC connection) to the LOW INPUT on the RFE-2-4. (100 mw)
- c. Connect a jumper on TB101 between terminals 5 and 6 on PSP-500 if external interlocks are not used.

NOTE

If external interlocks are used, remove jumper from terminal 5 and 6 and connect external interlock in SERIES with terminals 5 and 6.

- d. Connect jumper between terminals 7 and 16 on TB1501 of the STE-5 exciter.

For the specific intelligence input requirements on the PSP-500 and STE-5A, refer to the technical manual for:

LINEAR POWER AMPLIFIER, PAL-500-4

SIDE BAND STRIP EXCITER, STE-5A

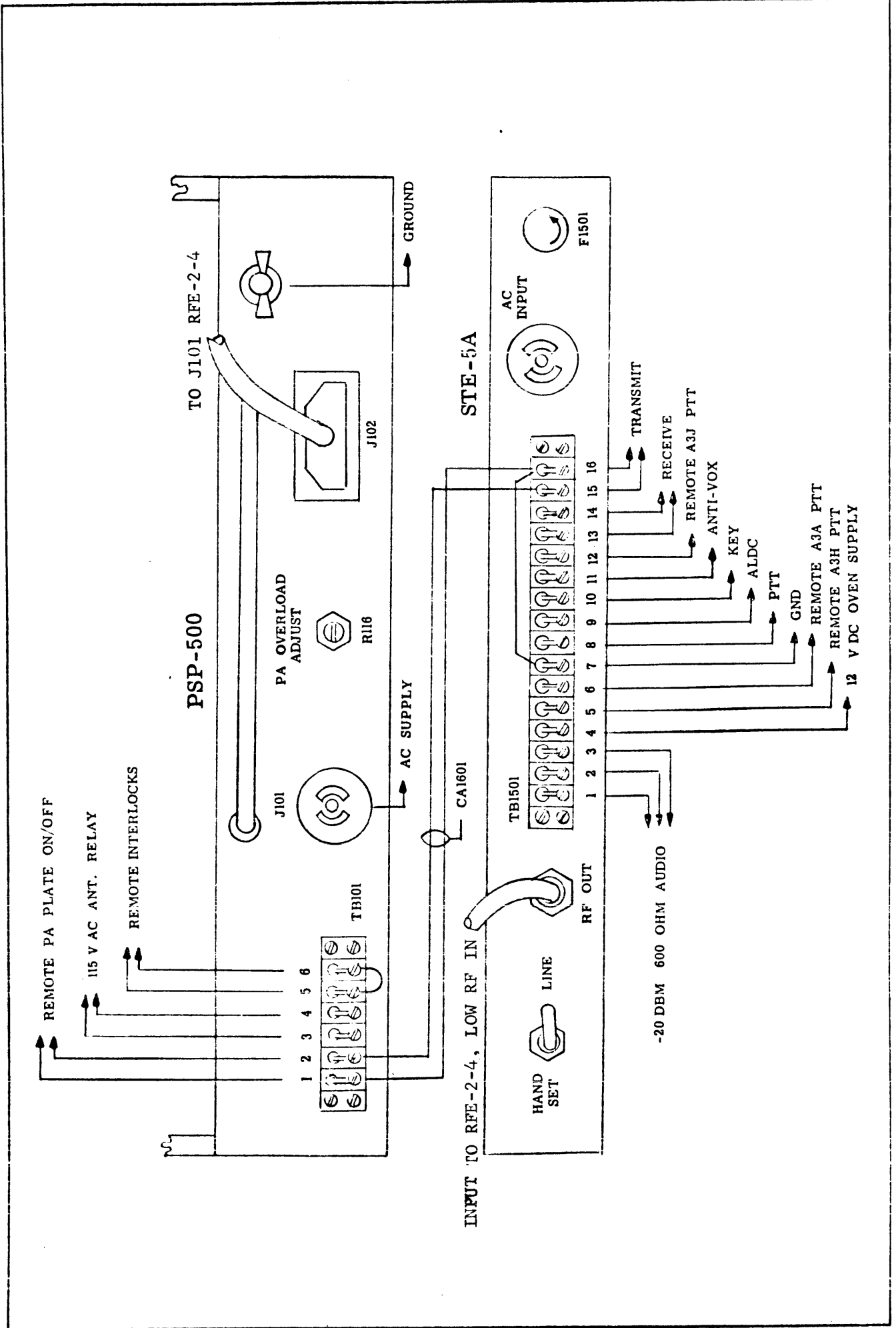


Figure 2-1. GPT-500-4 INTERCONNECT PICTORIAL

SECTION 3  
OPERATOR'S SECTION

3-1. GENERAL

The system is capable of supplying up to 500 watts PEP to an unbalanced antenna or dummy load. The RF output may also be safely set to any power level below 500 watts PEP. The system RF output is controlled by the AF GAIN control on the exciter. Remote control provisions are provided for the following:

- a. CW keying
- b. PA PLATE on-off
- c. Power output (by use of ALDC)
- d. Indication of transmit or receive (by using a set of closed contacts provided for each)
- e. Control of carrier (modes - A3A, A3H or A3J) with PTT
- f. Level of audio to be used.

3-2. CONTROLS AND INDICATORS

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

b. Refer to figures 1-1 and 2-1 for the controls and indicators put together as a system.

3-3. OPERATING PROCEDURES

A. General

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

individual units and the unit capabilities.

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

B. Starting procedure:

1. Controls and Indicator Settings for CW

- (a) Set AF GAIN control to off (disconnects power).
- (b) Set MODE switch to CW.
- (c) Set PTT/VOX switch to PTT.
- (d) Turn ANTI-VOX control maximum clockwise.
- (e) Turn VOX-GAIN control maximum counter clockwise.
- (f) H. V. LINE breaker to OFF.
- (g) TRANSMITTER PLATES switch to STANDBY/REMOTE.
- (h) Insure that an antenna or dummy load is connected to the output.
- (i) Set MAIN LINE circuit breaker to ON.
- (j) Set CHANNEL switch to desired operating channel.
- (k) Set MULTIMETER switch to RF DR.
- (l) Set the TRANSMITTER PLATES switch to ON.
- (m) Set H.V. LINE circuit breaker ON.
- (n) Turn AF GAIN control slowly until the PA PLATE meter indicates approximately 300 ma.
- (o) Increase the AF GAIN control until the desired RF output is obtained.

CAUTION

Do not exceed 360 ma on PA PLATE meter.

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

C. Stopping procedure (standby)

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

SECTION 4  
PRINCIPLES OF OPERATION

4-1. GENERAL

The GPT-500-4 system is a four channel fixed frequency transmitter. The channel or carrier frequency is determined by a plug-in module (TTRT) in the STE-5A exciter. The channel frequency is stamped on the front of the plug-in (TTRT) module.

The Linear Amplifier section of the transmitter (model RFE-2-4) uses two 4CX350A tubes connected in parallel feeding a pi network. The final tubes (4CX350A) are biased to operate in class AB1.

This unit (RFE-2-4) will accept one of two RF inputs, a low input of 100 milliwatts or a high input of 1 watt. It will require 100 milliwatts or less to produce the 500 watt peak envelope power output.

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

Principals of operation are presented in detail for each modular unit in their respective unit technical manual.

SECTION 5  
MAINTENANCE

5-1. PREVENTIVE MAINTENANCE

The air filter located on the rear should be cleaned at least once a week to prevent equipment failure due to dirt, dust or other destructive elements. At periodic intervals the units should be removed from their cabinet or rack for a more thorough cleaning and inspection. All connections should be checked for tightness and good contact. PC cards should be kept clean of dirt and foreign matter of any kind. Insulation in the RFE-2-4 should be kept clean to avoid high voltage breakdown and arcing between components due to conductive dust. Any broken insulators should be replaced.

5-2. TROUBLESHOOTING

A. General

Determine which unit the problem is located in first. The STE-5A may be isolated from the rest of the system to determine if it is operating properly. Once the problem is isolated to a unit, then refer to the technical manual of that unit for specific troubleshooting procedures.

Keeping records of normal meter indications and control settings will help to isolate trouble to a unit or stage.

B. STE-5A (Refer to STE-5A technical manual)

1. Check all input connections and/or external equipment requirements for keying or generating the various emission modes.
2. Determine if the unit will produce 100 mw output.
3. Check power supply voltages.
4. Insure that the unit has 115/230 vac power.
5. Check fuses for continuity and correct rating.



6. Check for component damage (broken, charred or discolored).

C. PSP-500 (refer to PAL-500-4 technical manual)

1. Insure that primary 115 vac is correct (System wired for 115 vac unless otherwise specified).

2. Check L.V. SUPPLY fuse for continuity and correct rating.

3. Check for a jumper between terminal 5 and 6 on TB101 if external interlocks are not used. If external interlocks are used, temporarily connect a jumper between terminals 5 and 6 and see if problem still exists.

4. Check that the transmitter is properly grounded.

D. RFE-2-4 (Refer to PAL-500-4 technical manual)

1. Check meter indication against normal indications.

2. Insure that the antenna or dummy load is properly connected on output connector

3. Use MULTIMETER on VTVM to determine what stage the problem is in.

For a more detailed troubleshooting procedure refer to the individual unit technical manual.