OPERATING AND SERVICE MANUAL

1465

MODEL 4410G

RF POWER AMPLIFIER WITH
GaAs FET RECEIVE PREAMP

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REVISED JANUARY 1984

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IMPORTANT NOTICE

ALTHOUGH THE INFORMATION CONTAINED IN THIS MANUAL HAS BEEN THOROUGHLY CHECKED FOR ACCURACY AND RELIABILITY, TE SYSTEMS SHALL HAVE NO LIABILITY OR RESPONSIBILITY TO CUSTOMER OR ANY OTHER PERSON OR ENTITY WITH RESPECT TO ANY LIABILITY, LOSS OR DAMAGE CAUSED OR ALLEGED TO BE CAUSED DIRECTLY OR INDIRECTLY BY PRODUCTS SOLD BY TE SYSTEMS, INCLUDING BUT NOT LIMITED TO ANY INTERRUPTION OF SERVICE, LOSS OF BUSINESS OR ANTICIPATORY PROFITS OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OR OPERATION OF SUCH PRODUCTS. FURTHERMORE, TE SYSTEMS DOES NOT REPRESENT THE DESCRIBED EQUIPTMENT AS SUITABLE FOR ANY PURPOSE AND DOES NOT ASSUME ANY LIABILITY RISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT DESCRIBED HEREIN.

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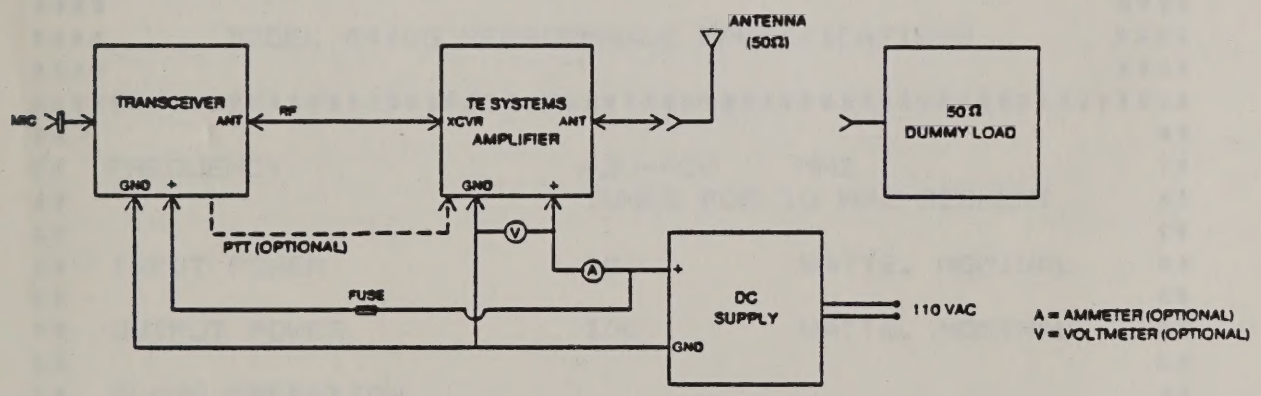
SECTION I
GENERAL INFORMATION

DESCRIPTION

THE TE SYSTEMS MODEL 4410G IS A RF AMPLIFIER SUBSYSTEM DESIGNED TO INTERFACE BETWEEN A 2-WAY TRANSCEIVER AND AN ANTENNA. THIS PRODUCT UNIQUELY INTEGRATES A HIGH POWER RF AMPLIFER WITH A VERY LOW NOISE GAAS FET RECEIVE PREAMP THEREBY PROVIDING PERFORMANCE UNACHIEVABLE HERETOFORE. DURING TRANSMIT, THE UNIT FUNCTIONS BY LINEARLY AMPLIFYING THE TRANSCEIVER'S OUTPUT SIGNAL UP TO THE SPECIFIED POWER LEVEL. WHEN IN THE RECEIVE MODE, IT PERFORMS LIKE AN LNA (LOW-NOISE AMPLIFIER) BY AMPLIFYING THE RECEIVED SIGNAL WITH MINIMUM NOISE FIGURE.

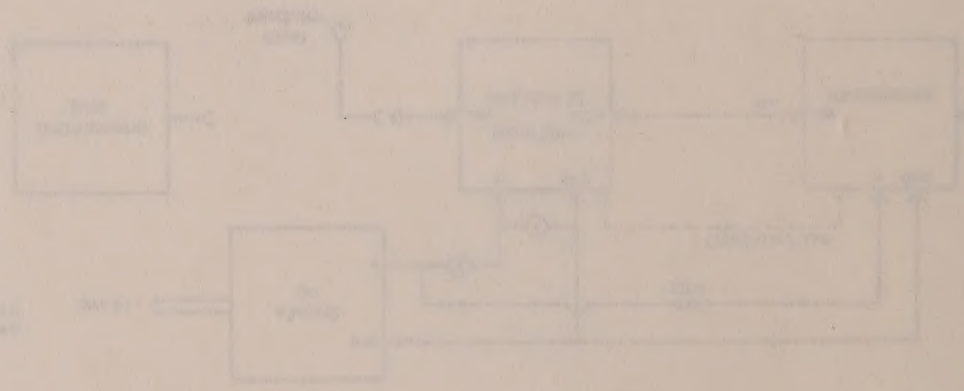
A TYPICAL INSTALLATION IS SHOWN BELOW:



OPERATIONAL / TEST SET-UP FOR AMPLIFIER

THE MODEL 4410G FEATURES FRONT PANEL SWITCHES THAT CONTROL ALL RF FUNCTIONS. IN NORMAL TRANSCEIVE OPERATION, THE RF POWER AMP MAY BE USED ALONE, THE RECEIVE PREAMP LNA MAY BE USED ALONE, OR BOTH MAY BE SWITCHED ON. IN THE LATTER CASE, THE POWER AMP FUNCTIONS DURING TRANSMIT, AND THE RECEIVE LNA SWITCHES IN DURING RECEIVE. THIS MAKES THE UNIT FULLY COMPATIBLE WITH A TRANSCEIVER'S OPERATION.

FURTHER CONTROL CAN BE OBTAINED BY USING THE REMOTE CONTROL FUNCTIONS AVAILABLE THROUGH THE REMOTE JACK ON THE REAR OF THE UNIT. THE FOLLOWING FUNCTIONS ARE CONTROLLABLE: SWITCHING DELAY, PTT, AMPLIFIER IN/OUT, AND LED ILLUMINATION. ADDITIONALLY, THE SWITCHING DELAY CAN BE EASILY ADJUSTED BY A POTENTIOMETER CONTROL MOUNTED ON THE REAR PANEL.



THE ENTIRE UNIT IS HOUSED IN AN ATTRACTIVELY STYLED PAINTED ENCLOSURE DESIGNED TO FIT SECURELY TOGETHER FOR MAXIMUM STRENGTH AND MINIMUM WEIGHT. TWO OF THE FRONT PANEL SWITCHES HAVE LED STATUS LIGHTS TO PROVIDE VISUAL MONITORING OF THE UNIT'S CONTROL CONDITION, AND ADDITIONALLY THREE SEPERATE LED LIGHTS ARE USED TO PROVIDE READOUT OF THE UNIT'S OPERATING CONDITION: RF ON, OVERTEMP, AND EXTERNAL PTT. ALL CABLE INTERCONNECTION IS DONE ON THE REAR PANEL AND IS VISUALLY CONCEALED TO THE OPERATOR. THE UNIT IS SURFACE MOUNTED ON FOUR RUBBER FEET WITH THE HEATSINK FINS FACING UPWARDS THEREBY ALLOWING THE HEAT TO CONVECTION COOL. THE UNIT'S APPROXIMATE SIZE IS 2.8" X 5.8" X 10.5" (H,W,L).

SPECIFICATIONS

TE SYSTEMS MANUFACTURES A COMPLETE LINE OF HIGH POWER LINEAR RF AMPLIFIERS WITH OR WITHOUT LOW-NOISE GAAS FET PREAMPLIFIERS. THE SPECIFICATIONS FOR THIS PARTICULAR AMPLIFIER ARE SHOWN BELOW IN THE PRODUCT SPECIFICATION SUMMARY TABLE:

MODEL 4410G PERFORMANCE SPECIFICATIONS

FREQUENCY	420-450 TUNED FOR 10 MHZ SEGMENT	MHZ
INPUT POWER	10	WATTS, NOMINAL
OUTPUT POWER	100	WATTS, NOMINAL
CLASS OPERATION		
PA	A-B	LINEAR
PREAMP	A	LINEAR
T/R SWITCHING SENS.	0.5	WATT, TYPICAL
ANTENNA VSWR	3:1	MAXIMUM
RECEIVE PREAMP GAIN	10	DB, NOMINAL MIN.
RECEIVE PREAMP NF	1.1	DB, NOMINAL
DC SUPPLY	13.6 19	VDC A, NOMINAL
SIZE	2.8 X 5.8 X 10.5 (H,W,L")	
WEIGHT	4	LBS

THE REQUIRED SYSTEM IMPEDANCE IS 50 OHMS UNBALANCED. A PROPER ANTENNA LOAD IMPEDANCE MUST BE PRESENTED TO THE RF POWER AMPLIFIER DURING TRANSMIT. LOAD VSWRS EXCEEDING 3:1 ARE NOT RECOMMENDED AND MAY CAUSE TRANSISTOR FAILURE DUE TO POWER IMBALANCES WITHIN THE UNIT OR EXCESSIVE DEVICE POWER DISSIPATION. TE SYSTEMS RECOMMENDS CHECKING THE ANTENNA'S VSWR BEFORE APPLYING FULL POWER FROM THE AMPLIFIER.

THE RATED DUTY OF THE AMPLIFIER IS 50% USING NORMAL COMMUNICATION TRANSMISSON PERIODS (ICAS). LONGER DUTY TRANSMISSONS REQUIRE EITHER FORCED AIR COOLING OF THE HEATSINK FINS OR POWER DERATING OR BOTH. CHECK WITH TE SYSTEMS OR ITS AGENT FOR RECOMMENDED OPERATING CHANGES FOR HIGHER DUTY USAGE.

INSTRUMENT IDENTIFICATION

TE SYSTEMS' RF POWER AMPLIFIERS HAVE THEIR MODEL NUMBERS SPECIFIED ON THE RIGHT SIDE OF THE FRONT OPERATING PANEL BENEATH THE TE SYSTEMS NAME. ADDITIONALLY, THE FREQUENCY RANGE CAPABILITY FOR THE UNIT IS IDENTIFIED IN MEGAHERTZ.

ON THE REAR PANEL, THE MODEL NUMBER AND THE SERIAL NUMBER ARE INSCRIBED ON THE METALLIZED LABEL. THIS ALSO HAS THE FCC IDENTIFYING NUMBER FOR TYPE ACCEPTANCE. THE COMPLETE FABRICATION AND PERFORMANCE HISTORY OF EACH UNIT IS MAINTAINED AT TE SYSTEMS FOR RECORD PURPOSES. ALL CORRESPONDENCE CONCERNING EACH UNIT SHOULD INCLUDE THE COMPLETE MODEL AND SERIAL NUMBER.

OPTIONS

RF POWER AMPLIFIERS WITH NO GAAS FET PREAMP CAN BE FACTORY MODIFIED TO INCORPORATE THE INTERNAL PREAMP. THIS REQUIRES A FRONT PANEL CHANGE, INSTALLATION OF THE INTERNAL PREAMP WITH NOISE FIGURE OPTIMIZATION TUNING, AND A COMPLETE PERFORMANCE CHECKOUT. ARRANGEMENTS WITH TE SYSTEMS MUST BE MADE ON THIS MATTER BEFORE THE MODIFICATION CAN BE MADE.

RETUNING THE AMPLIFIER, PREAMP OR BOTH CAN BE PERFORMED BY TE SYSTEMS AT ANY DATE AFTER PURCHASE. PREARRANGEMENT WITH TE SYSTEMS OR ITS AGENT MUST BE MADE BEFORE THIS CAN BE PERFORMED. RETUNING THE UNIT TO FREQUENCIES COVERED BY OTHER MODELS IS NOT POSSIBLE.

OTHER HARDWARE OPTIONS, SUCH AS MOUNTING BRACKETS, ARE AVAILABLE FROM TE SYSTEMS OR ITS AGENT. CONTACT THEM FOR CURRENT OPTION PART NUMBERS, PRICING, AND AVAILABILITY.

TE SYSTEMS

WARRANTY

This TE Systems product is warranted against defects in materials and workmanship for a period of one year from the date of shipment, except that in the case of certain components listed below, the warranty shall be for the specified period.

SPECIFIC COMPONENTS	WARRANTY PERIOD
RF POWER TRANSISTORS	1 YEAR
LOW NOISE GAAS FET	6 MONTHS

TE Systems will, at its option, repair or replace products which prove to be defective during the warranty period provided they are returned to TE Systems, or its Agent, and provided the proper operating specifications and preventive maintenance procedures as listed in this manual are followed. Repairs necessitated by misuse of the product are not covered by this warranty. No other warranties are expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. TE Systems is not liable for consequential damages.

WARNING

Power transistor damage and/or other component failure may occur if improper antenna load impedance is connected to the output port during transmit. See specifications section for proper antenna load impedance.

IF A DEFECT SHOULD OCCUR DURING THE WARRANTY PERIOD, DO NOT ATTEMPT TO REPAIR THE AMPLIFIER. INSTEAD, CONTACT TE SYSTEMS OR ITS AGENT FOR INSTRUCTIONS ON EITHER RETUNING THE UNIT PER THE MAINTENANCE SECTION OF THIS MANUAL OR RETURNING IT. UNITS RETURNED MUST BE FREIGHT PREPAID, PACKAGED CAREFULLY TO PREVENT SHIPPING DAMAGE, INSURED TO THE FULL VALUE, AND BE

COMPLETELY ASSEMBLED . THE WARRANTY WILL BE VOIDED IF THE EQUIPMENT IS RETURNED SHOWING SIGNS OF ATTEMPTED REPAIRS OR IS ALTERED IN ANY WAY.

** NOTE - THE REGISTRATION CARD MUST BE SUBMITTED WITHIN 10 DAYS OF PURCHASE TO VALIDATE THE EQUIPMENT'S WARRANTY - AVAILABLE ONLY TO THE ORIGINAL OWNER.

ITEMS SUPPLIED

THE FOLLOWING ITEMS ARE SUPPLIED WITH THE RF POWER AMPLIFIER AS PARTS REQUIRED TO PROPERLY OPERATE THE ELECTRONIC EQUIPMENT:

QUANTITY	DESCRIPTION
1	OPERATING MANUAL
1	DC POWER RECEPTABLE, 4 PIN FEMALE
1	REMOTE PLUG, 7 PIN MALE

SECTION II

INSTALLATION

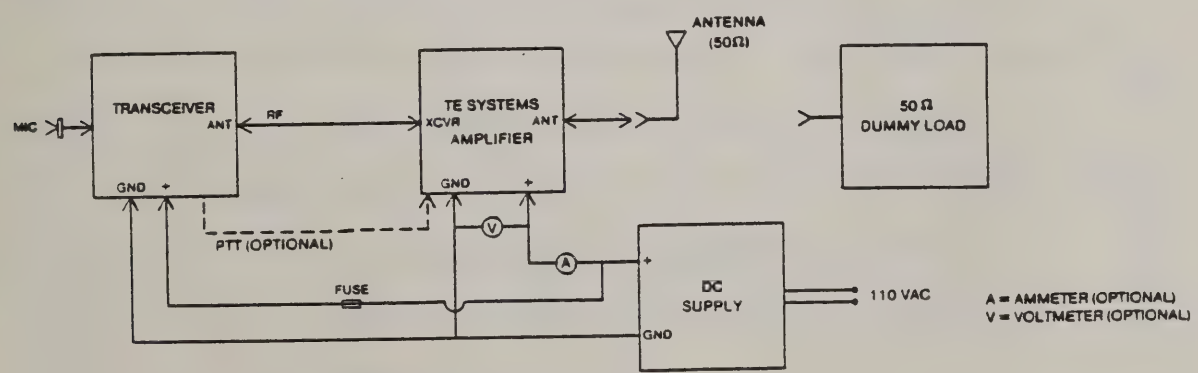
INITIAL INSPECTION

THE RF AMPLIFIER WAS CAREFULLY INSPECTED BOTH MECHANICALLY AND ELECTRICALLY BEFORE SHIPMENT, AND IT SHOULD BE FREE OF MARS AND SCRATCHES AND IN GOOD ELECTRICAL ORDER UPON RECEIPT. THE UNIT SHOULD BE CHECKED TO VERIFY THAT NO PHYSICAL DAMAGE HAS OCCURRED IN TRANSIT. IF THERE IS DAMAGE, PLEASE RETAIN THE SHIPPING CARTON AND PADDING MATERIAL FOR THE CARRIER'S INSPECTION, AND IMMEDIATELY NOTIFY TE SYSTEMS OR ITS AGENT.

RF AND DC CONNECTIONS

THE TE SYSTEMS AMPLIFIER UNIT MAY BE PROPERLY INSTALLED BY INSERTING IT BETWEEN A TRANSCEIVER AND THE ANTENNA. THE REAR PANEL RF CONNECTOR LABELLED "XCVR" IS COAXIALLY CONNECTED TO THE TRANSCEIVER'S ANTENNA PORT. THE CONNECTOR LABELLED "ANT" IS THEN CONNECTED TO THE ANTENNA. GOOD LOW-LOSS, HIGH QUALITY 50 OHM COAX CABLE SHOULD BE USED FOR BOTH OF THESE INTERCONNECTIONS.

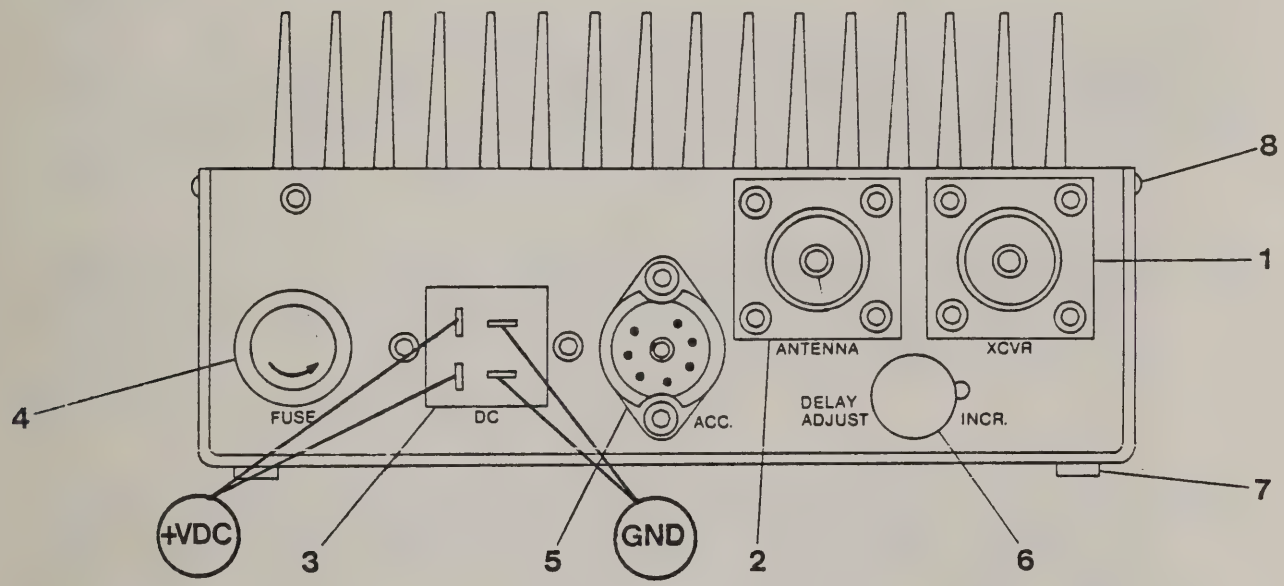
THE INSTALLATION CONNECTION IS SHOWN BELOW:



OPERATIONAL / TEST SET-UP FOR AMPLIFIER

POWER IS SUPPLIED TO THE AMPLIFIER VIA THE 4-PIN DC CONNECTOR ON THE REAR PANEL. THE TWO VERTICAL PINS CLOSEST TO THE FUSE HOLDER ARE FOR THE +13.6 VDC. THE TWO HORIZONTAL PINS CLOSEST TO THE REMOTE SOCKET ARE FOR GROUND. SEE THE REAR PANEL DIAGRAM BELOW:

BACK VIEW - DC VOLTAGE CONNECTION



BACK VIEW - INTERCONNECTION IDENTIFICATION

REAR PANEL INTERCONNECTION TABLE

1. RF INPUT CONNECTOR (CONNECT TO XCVR)
2. RF OUTPUT CONNECTOR (CONNECT TO ANTENNA)
3. DC CONNECTOR
4. FUSE
5. REMOTE ACCESSORY SOCKET
6. DELAY AJUST CONTROL (CW-SSB MODE ONLY)
7. RUBBER MOUNTING FEET
8. COVER ATTACHMENT SCREWS

ADDITIONALLY, THE REMOTE SOCKET MAY BE USED FOR PTT OR DISABLING THE AMPLIFIER. PLEASE REFER TO THE SECTION ON REMOTE CONTROL FEATURES FOR INFORMATION ON THIS CONNECTION.

MOUNTING

THE RF AMPLIFIER IS EQUIPPED WITH FOUR RUBBER MOUNTING FEET ON THE BOTTOM COVER AND THEY FUNCTION TO KEEP THE UNIT SECURE ON A TABLE TOP SURFACE. THE VARIOUS CABLE INTERCONNECTIONS SHOULD BE ATTACHED ON THE REAR PANEL AND ROUTED BACKWARDS OUT OF SIGHT.

NORMAL OPERATION OF THE UNIT WILL HAVE THE BLACK ANODIZED FINS UPWARDS TO ALLOW MAXIMUM CONVECTION COOLING. AN AIR SPACE MUST BE ALLOWED FOR THE CONVECTION COOLING TO OCCUR, OR ELSE OVERHEATING WILL OCCUR. THE USER SHOULD EXPERIMENT TO DETERMINE HOW MUCH AIR SPACE IS NEEDED FOR HIS PARTICULAR INSTALLATION AND OPERATING TECHNIQUE.

AS AN OPTION, A MOUNTING BRACKET (TE SYSTEMS P/N 1035) CAN BE FITTED TO THE AMPLIFIER UNIT TO PERMIT MOUNTING THE AMPLIFIER FROM EITHER THE TOP OR BOTTOM SIDE. THE BRACKET HOLDS THE AMPLIFIER FIRMLY AND ALLOWS A SLIGHT UPWARD OR DOWNWARD TILT TO PROVIDE EASE OF PANEL CONTROL. ATTACHMENT OF THE BRACKET ONTO THE AMPLIFIER IS DONE TO THE SIDES OF THE AMPLIFIER BODY USING EXISTING TAPPED HOLES SO NO ADDITIONAL HARDWARE MODIFICATIONS ARE NECESSARY.

IN SOME APPLICATIONS, THE USER MAY WANT TO MECHANICALLY ATTACH HIS UNIT TO ANOTHER SURFACE. IN THIS CASE, THE COVER MAY BE REMOVED AND HOLES DRILLED OR PUNCHED IN IT AS DESIRED TO ALLOW THE PROPER ATTACHMENT. WHEN REMOVING THE COVER/LID, NOTE THE ORIGINAL FIT AS THE COVER IS NOT COMPLETELY SYMMETRICAL. AFTER SECURING THE LID WITH THE NEW ATTACHMENT SCHEME, IT IS REUNITED WITH THE AMPLIFIER BODY USING THE EIGHT BLACK HOLDING SCREWS.

SINCE THE UNIT IS SUPPLIED WITH A TIGHT FITTING COVER TO MINIMIZE RF RADIATION AND REDUCE FOREIGN PARTICLE CONTAMINATION, ANY MODIFICATIONS TO THE COVER SHOULD BE CONSISTENT WITH THE ORIGINAL DESIGN INTENT.

POWER SUPPLY REQUIREMENTS

THE MODEL 4410G RF AMPLIFIER HAS THE FOLLOWING MAXIMUM PEAK CURRENT REQUIREMENT:

MODEL 4410G	19 AMPS NOMINAL

TE SYSTEMS RECOMMENDS A 13.6 VOLT DC SUPPLY HAVING AT LEAST A 20% HIGHER CONTINUOUS CURRENT RATING THAN THAT REQUIRED BY THE AMPLIFIER. IF OTHER EQUIPMENT IS TO BE OPERATED ALSO ON THE DC SUPPLY, THEN THE CUMULATIVE AMPERAGE REQUIREMENTS SHOULD BE USED FOR THE COMPUTATION.

IF EXCESSIVELY LONG TRANSMISSIONS ARE ANTICIPATED, THEN A HIGHER CURRENT RATED SUPPLY MAY BE DESIRABLE. IF THE POWER SUPPLY ENCLOSURE TEMPERATURE REACHES 50 DEGREES CENTIGRADE OR HIGHER DURING OPERATION, FAN COOLING MAY BE NECESSARY TO CONVECTION COOL THE UNIT DOWN TO ITS SAFE OPERATING AREA. CHECK WITH THE SUPPLY MANUFACTURER TO VERIFY ITS CAPABILITIES.

ENVIRONMENTAL REQUIREMENTS

TE SYSTEMS RF AMPLIFIERS ARE DESIGNED TO OPERATE OVER THE TEMPERATURE RANGE OF 0 TO +60 DEGREES CENTIGRADE. THE RF AMPLIFIER UNIT WILL MEET THE PERFORMANCE SPECIFICATIONS WHEN OPERATING WITHIN THE TEMPERATURE RANGE OF 10 TO 40 DEGREES CENTIGRADE. ABOVE AND BELOW THIS RANGE AND WITHIN THE TEMPERATURE PERFORMANCE LIMITS, THE UNIT WILL OPERATE SATISFACTORLY BUT THE PARAMETERS OF PERFORMANCE MAY OR MAY NOT BE WITHIN THE SPECIFICATION.

THE UNIT WILL PROBABLY OPERATE SATISFACTORILY WELL BELOW 10 DEGREES CENTIGRADE, BUT DAMAGE TO THE AMPLIFIER MAY OCCUR WITH OPERATION ABOVE +65 DEGREES CENTIGRADE. THE DAMAGE OCCURS DUE TO THE OVERHEATING OF THE ACTIVE JUNCTION AREA AND EMITTER FINGER RESISTORS WITHIN THE TRANSISTOR. THE RESULT MAY BE POWER AND GAIN LOSS THAT IS IRRETRIEVABLE.

A THERMOSTAT IS INCORPORATED WITHIN THE UNIT TO TEMPORARILY DISABLE THE AMPLIFYING MODE ONCE THE HEATSINK TEMPERATURE EXCEEDS +65 DEGREES. THE SWITCH HAS SOME HYSTERISIS SO THAT OPERATION IS NOT RESTORED UNTIL THE TEMPERATURE DROPS DOWN 15 DEGREES.

WHILE THE UNIT HAS A TIGHT FITTING COVER THAT ALLOWS MINIMUM FOREIGN MATERIAL COLLECTION WITHIN THE UNIT, IT IS NOT A WEATHER TIGHT SEAL. MOUNTING OF THE AMPLIFIER AT OR NEAR THE ANTENNA WITHOUT ENVIRONMENTAL PROTECTION MAY SEVERELY DEGRADE THE MECHANICAL INTEGRITY OF THE UNIT. IF SUCH OPERATION IS DESIRABLE, THE UNIT MUST BE PROTECTED FULLY FROM MOISTURE COLLECTION, SALT SPRAY, OR OTHER DETRIMENTAL ENVIRONMENTAL STRESSES.

SECTION III

OPERATING INSTRUCTIONS

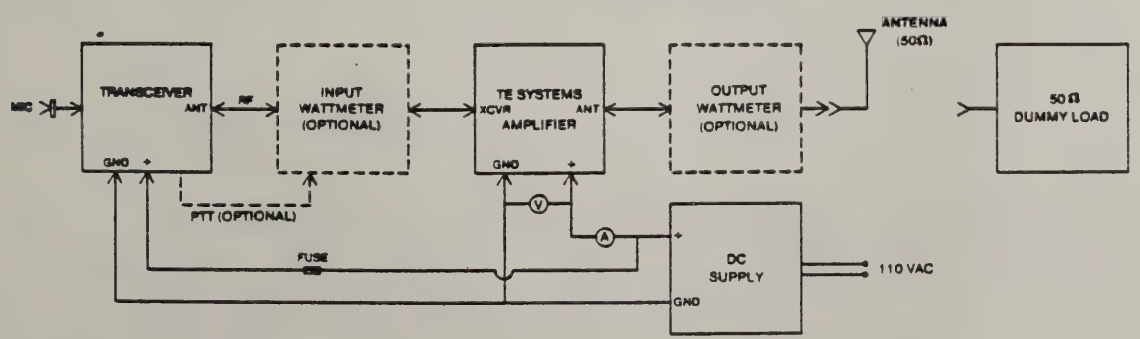
INTRODUCTION

THE MODEL 4410G IS A RF POWER AMPLIFIER AND RECEIVE PREAMP COMBINATION HOUSED TOGETHER IN ONE UNIT. UPON TRANSMIT THE UNIT FUNCTIONS TO AMPLIFY THE TRANSMITTED SIGNAL UP TO THE SPECIFIED POWER LEVEL. SWITCHING THE TRANSCEIVER BACK TO THE RECEIVE MODE CAUSES THE AMPLIFIER TO SIMULTANEOUSLY SWITCH INTO EITHER THE STRAIGHT THROUGH OR LNA PREAMP MODE. THE UNIT CAN FUNCTION IN VARIOUS COMBINATIONS OF THE ABOVE DEPENDING UPON THE USER SELECTED SWITCH SETTINGS. OPERATION STATUS LIGHTS MOUNTED ON THE FRONT CONTROL PANEL INDICATE THE OPERATING CONDITION OF THE UNIT DURING OPERATION. A COMPLETE PROCEDURE FOR OPERATION OF THE UNIT IN ITS VARIOUS MODES IS DETAILED IN THE FOLLOWING PARAGRAPHS.

OPERATION

THE MODEL 4410G RF AMPLIFIER IS DESIGNED TO AMPLIFY THE TRANSMITTED INPUT RF SIGNAL UP TO THE SPECIFIED OUTPUT LEVEL AND PERFORM LOW NOISE SIGNAL AMPLIFICATION ON RECEIVE. THE RESULT IS A MUCH STRONGER SIGNAL ON TRANSMIT WITH A SUPERIOR LISTENING SYSTEM ON RECEIVE.

THE BASIC OPERATION OF THE UNIT IS DESCRIBED IN THE SECTIONS BELOW. BEFORE BECOMING FAMILIAR WITH THE FEATURES OF THIS UNIT, THE AMPLIFIER UNIT SHOULD BE CONNECTED PROPERLY AS SHOWN BELOW AND DESCRIBED FULLY IN THE RF AND DC CONNECTIONS SECTION OF THIS MANUAL.



OPERATIONAL / TEST SET-UP FOR AMPLIFIER

NOTE - IN THE OPERATIONAL/TEST SET-UP BLOCK DIAGRAM, THE USE OF INPUT AND/OR OUTPUT WATTMETERS IS OPTIONAL, BUT THEY MAY BE USEFUL IN DETERMINING THE PROPER OPERATION OF THE AMP. FOR EXAMPLE, THE AMPLIFIER'S INPUT TUNING MAY BE OPTIMIZED FOR THE PROPER MATCH TO THE DRIVING EXCITER. THIS IS ACCOMPLISHED BY TUNING THE AMPLIFIER'S INPUT TUNING TRIMMER (LOCATED INSIDE THE UNIT) FOR MINIMUM REFLECTED POWER AS MEASURED ON THE INPUT POWER METER. IN THE FORWARD POSITION, THE POWER METER MEASURES THE INPUT POWER APPLIED TO THE AMPLIFIER. THIS MEASUREMENT SHOULD BE DONE AT THE AMPLIFIER'S INPUT PORT. REFER TO SECTION V FOR DETAILS ON PERFORMING THIS PROCEDURE.

AT THE OUTPUT OF THE AMPLIFIER, THE IMPEDANCE MATCH TO THE ANTENNA MAY BE OPTIMIZED BY TUNING THE AMPLIFIER'S OUTPUT TRIMMER (LOCATED INSIDE THE UNIT) FOR MAXIMUM OUTPUT POWER AS MEASURED ON THE OUTPUT POWER METER. REFER TO SECTION V FOR DETAILS ON PERFORMING THIS PROCEDURE.

THE VSWR OF THE ANTENNA MAY BE CHECKED BY MEASURING THE REFLECTED POWER. THE RESULTANT VSWR CAN BE CALCULATED FROM THE FORMULA:

$$VSWR = \frac{1 + SQRT(R/F)}{1 - SQRT(R/F)}$$

WHERE R = REFLECTED POWER IN WATTS, AND F = FORWARD POWER IN WATTS. IN CASES WHERE THERE ARE LARGE RELECTED POWERS, THE ACTUAL POWER (P) DELIVERED TO THE ANTENNA IS:

$$P = F - R \qquad \text{WATTS}$$

REMEMBER THAT THE ACCURACY OF THE INPUT AND OUTPUT POWERS DEPENDS ON THE MEASURING EQUIPMENT USED. POWER METERS SUCH AS THE BIRD 43 ARE ACCURATE TO +- 5% AT FULL SCALE ONLY AND WITH OUTPUT POWERS OF 100 WATTS, THE MEASUREMENT ERROR CAN BE +- 5 WATTS OR MORE WHEN USING A 100 WATT SLUG.

A) RF POWER AMP TURN-ON

WITH THE UNIT CONNECTED AS SHOWN IN THE OPERATIONAL/TEST SETUP DIAGRAM ABOVE, NEXT REFER TO THE FRONT VIEW DIAGRAM BELOW. WITH ALL CONTROL SWITCHES IN THE OFF POSITION, THE AMPLIFIER WILL NOT BE FUNCTIONED ON AND, THEREFORE, IT WILL ACT AS A STRAIGHT THROUGH INTERCONNECTION PROVIDING NO SIGNAL AMPLIFICATION.

ADDENDUM REMOVING THE 3K-A FROM ITS CABINET

REMOVING THE RF DECK

[1] Remove the knobs on the front panel of the RF section (TUNE control knob, LOAD control knob, BAND switch knob, and the multimeter switch knob). Use the number 6 and number 8 spline tools supplied in the 3K-A's accessory bag. Do not remove the hex nut on the multimeter switch.

[2] Remove the perforated RF deck cabinet top by unscrewing the four counter-sunk screw holding the cover in place. Then lift the cover off (see Figure 1).

[3] Remove the perforated RF deck sub-top by unscrewing the 6 screws inside the amplifier, removing the 3 screws along the top of the RF deck's rear panel, and lifting the sub-top out of the amplifier (see Figures 2 and 3).

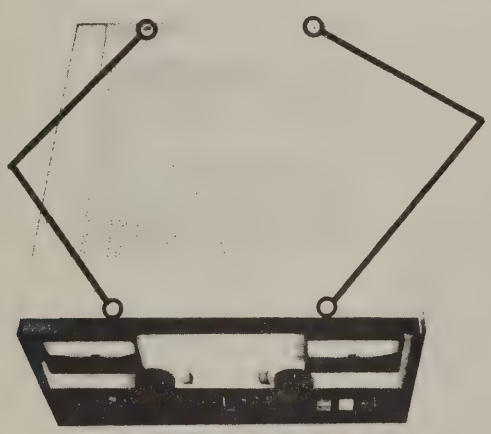


Figure 1. Top Cabinet View of the 3K-A.

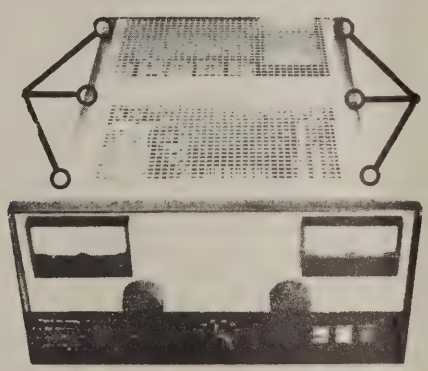


Figure 2. View of the 3K-A Sub-top.

[4] Remove the rear panel of the power supply by unscrewing the six screws holding it in place (see Figure 3).

[5] After the power supply rear panel is taken off loosen the three screws holding the RF deck to the power supply section (see Figure 4).

[6] Inside the RF deck, in the center of the bottom plate, are two screws holding the RF deck to the power supply. The screws are held by nuts which are accessible from the power supply section. Remove these two screws (see Figure 5).

[7] Unscrew the high voltage connector, disconect the filament connector, and disconnect the 11 pin metering control plug from the bottom of the RF deck (see Figure 4)

[8] Slide the RF deck out of the cabinet towards the rear.

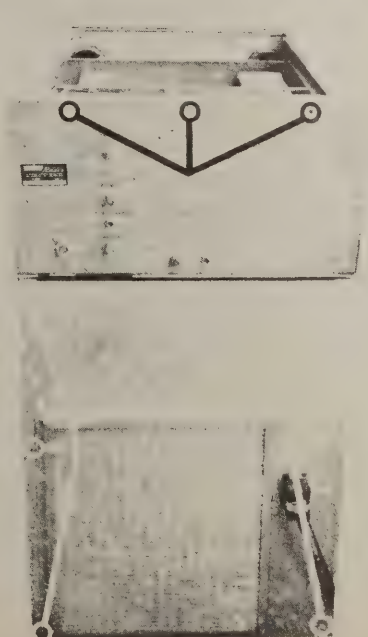


Figure 3. 3K-A Rear View – Tops Removed.

REMOVING THE POWER SUPPLY WRAP-AROUND COVER

[1] Remove the RF deck as described above.

[2] Remove the POWER switch knob with the 8/32 spline tool provided in the 3KA's accessory bag.

[3] Disconnect the two blower wires from the terminal strip (positions 4 and 5) (see Figure 4).

[4] Lay the 3K-A on its side and remove the six screws which hold the wrap-around to the bottom plate of the amplifier. (see Figure 6).

CAUTION

In step 5, do NOT let the wrap-around cover drop when it is loosened. Extensive damage to the POWER switch or the relay may occur if this cover drops. BE VERY CAREFUL.

[5] Remove the seven screws and nuts holding the RF deck frame and cover to the power supply (see Figure 7). DO NOT LET THE WRAP AROUND SLIP DOWN ON TO THE POWER SWITCH. The cover should now be loose and ready to lift off.

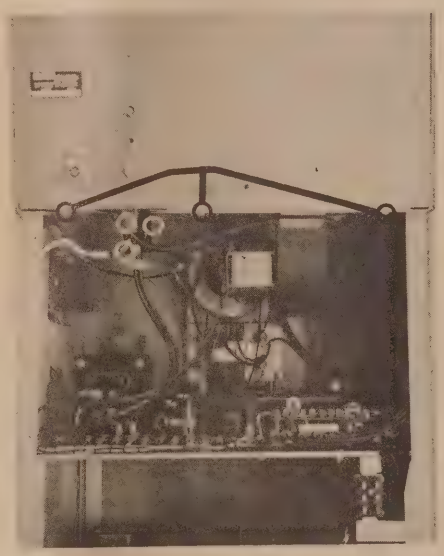


Figure 4. Rear View of the 3K-A Power Supply

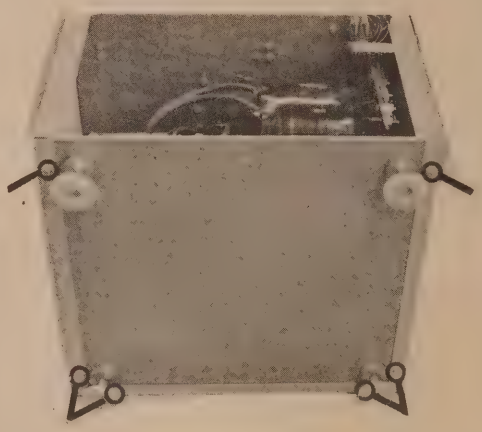


Figure 6. 3K-A Bottom Plate.

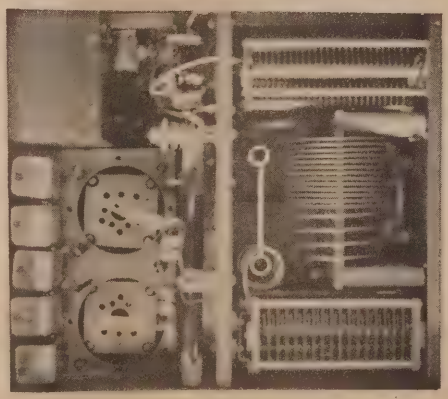


Figure 5. 3K-A RF Deck — Top View.

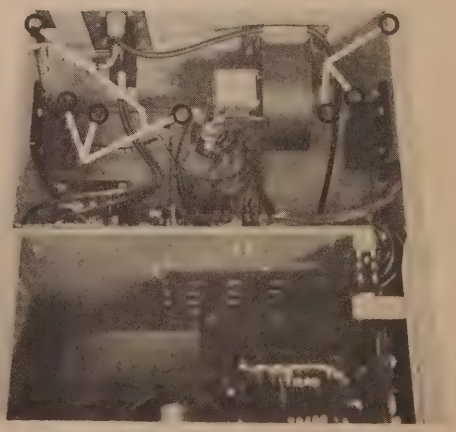
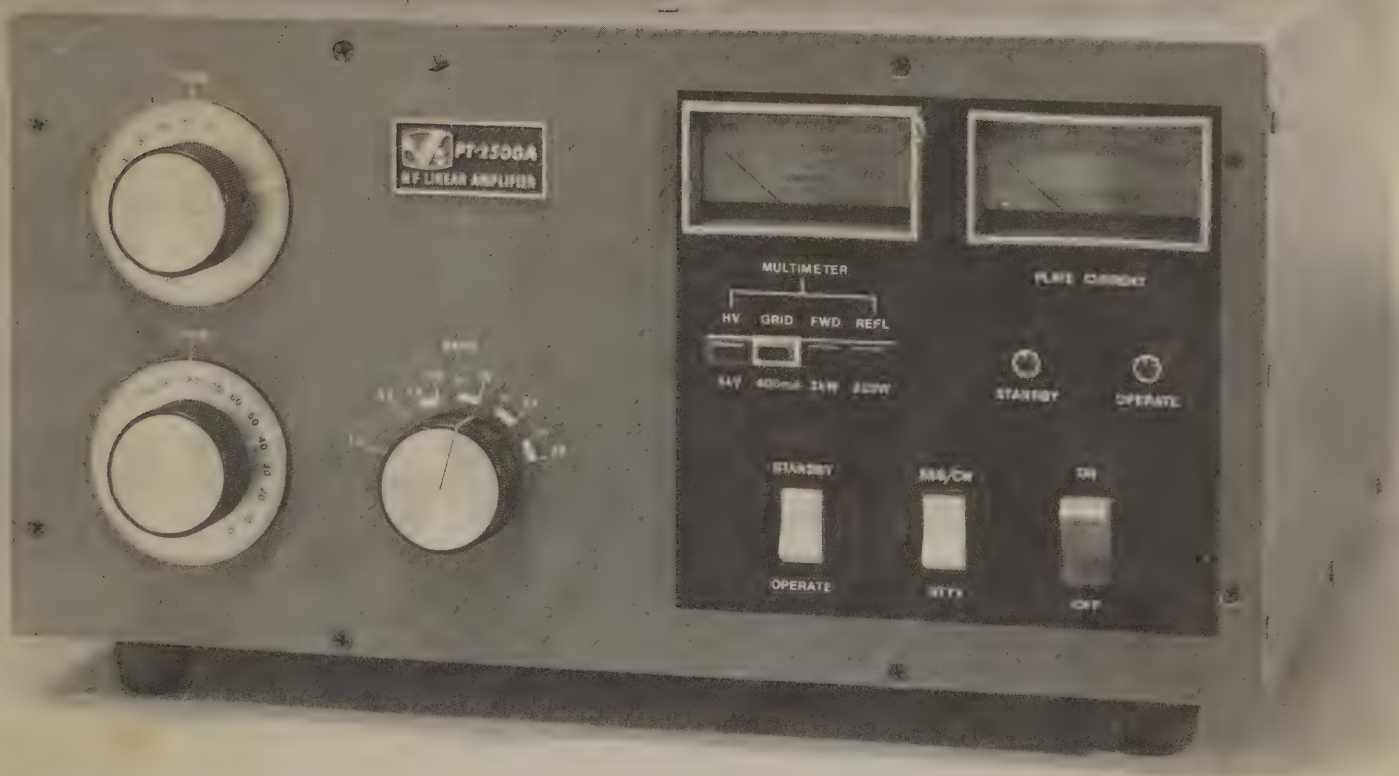


Figure 7. View of the Bottom of the 3K-A's RF Deck

2/2/86 SON
5/13/87 ARCING CORRECTED (FILED & KRYLON SPRAYED



Viewstar Inc.

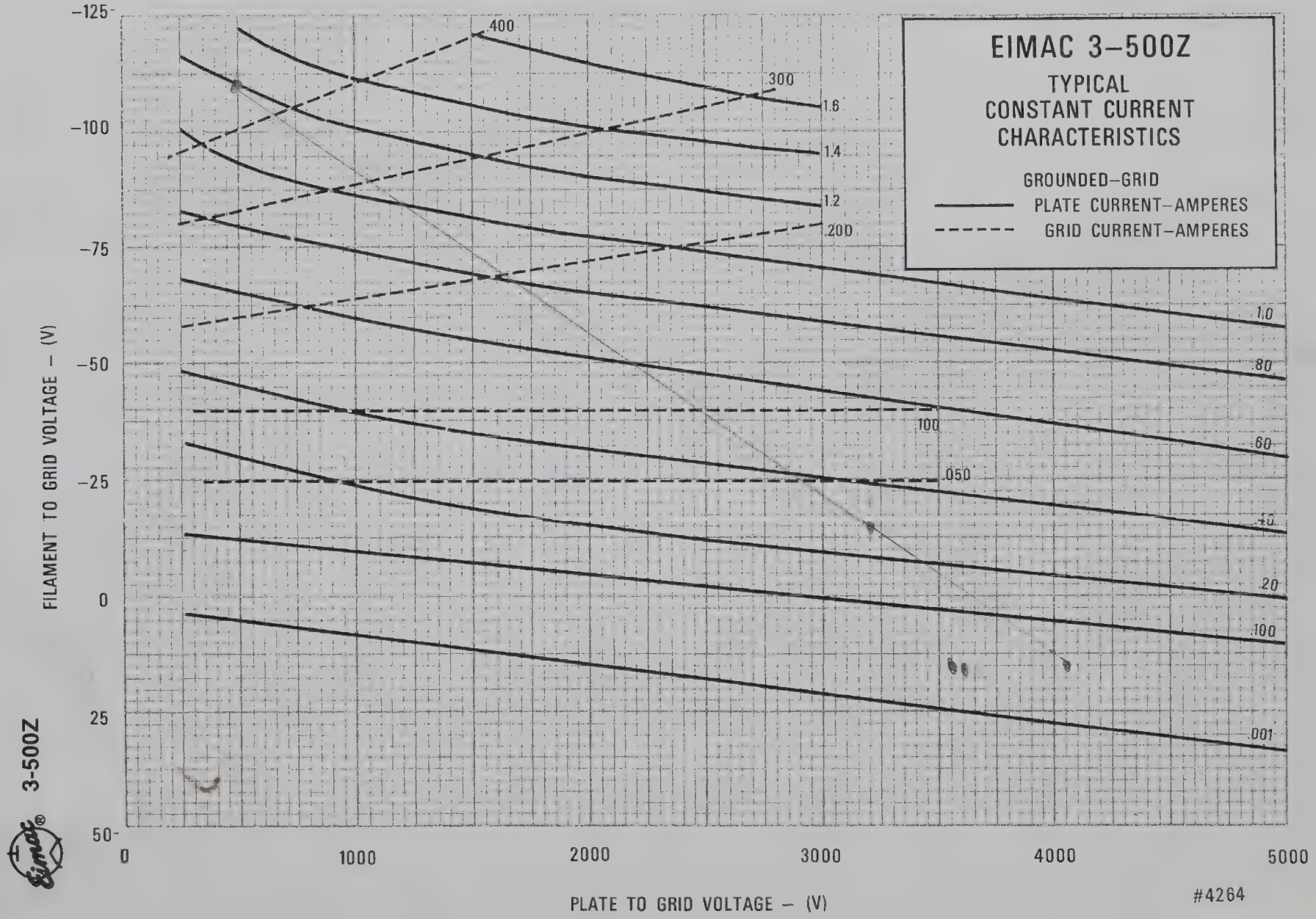
VECTRONICS
1-416-289-4637

HF Linear Amplifier PT-2500A Instruction Manual

set at MAX 3/25/88 TUNE 20 LOAD 70
1.8

Index

Viewstar PT-2500A 6 meters
1470 watt 700ma plate current
220ma grid current 3200 V
63.6% efficiency



3-500Z

For 2 3-5002 3600v NL SSB
3100v NL RTTY
100ma idle current

Resonant load impedance: 2500Ω

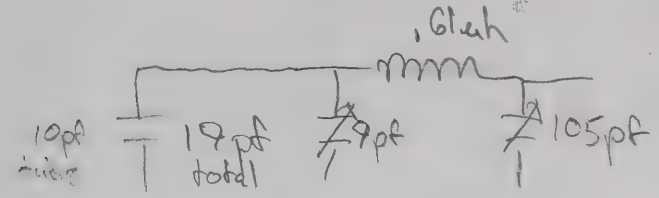
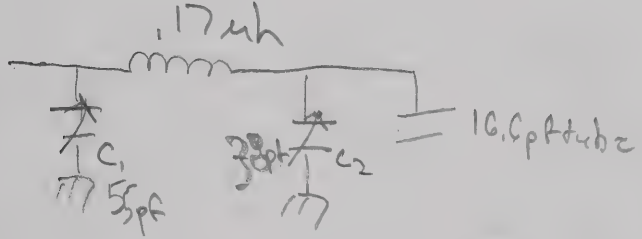


plate choke 6.5uh
40 turns space wound on
3/4" dia [illegible] winding length
in series with 15uh
vhf suppressor choke
13 turns #20 wire close wound

Driving impedance 57.5Ω



trifilar wound filament
choke 6.4uh, 10 turns on
1/2" dia core 2" long

3 3/4 turns of 3/16 tubing
on 1 1/2" form

$$C_2 = \frac{2}{(2\pi 50)57.5} = 55 \text{ pf} \quad 111\text{pf} \quad \text{caps } 2 \times 0.1\mu f\ 450v$$

$$C_1 = \left(\sqrt{\frac{50(1^2+1)}{57.5}} - 57.5\right)\frac{1}{(2\pi 50)50} \quad 116\text{pf} \quad 55 \quad .86 \times = 55\text{pf}$$

$$L = \frac{2(57.5) + (2\pi 50c_2)\frac{1}{116} - 2(50)(57.5)}{2(2\pi 50c_1)} = .5\mu h$$

X_c 49.4Ω

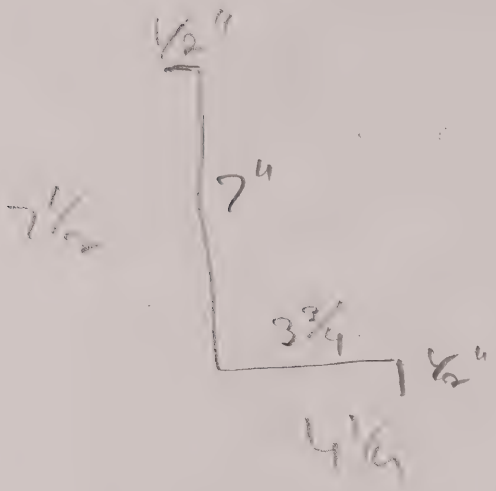
X_c = 125Ω (5% of plate load imp

blocking 100pf

64.6
-3.25 dbm = 1168 watts
61.35 220ma grid
3150v 750ma

420 = 250 4 Feb

$L = \frac{1}{(2\pi f)^2 C}$



1'3 15/32" 1/4λ @ 50.1 RG142

3200v
750 ma plate
190 ma grid
drive 7 /
1000w out

2nd harmonic ~~-50~~ -45 dB
with 1/4λ shorted stub

-42.6 -42.6
output +28.4 dbw

3200v
650ma plate
220 ma grid
drive 6

1.0 Specifications

1.1 RF Specifications

Frequency Range

160 meters	1.8 to 2.0	MHz
80 meters	3.5 to 4.0	MHz
40 meters	7.0 to 7.3	MHz
30 meters	10.1 to 10.15	MHz
20 meters	14.0 to 14.35	MHz
17 meters	18.068 to 18.168	MHz
15 meters	21.0 to 21.45	MHz
12 meters	24.85 to 24.95	MHz
10 meters	28.0 to 29.7	MHz

} not available in U.S.A.*

Drive Power
100 W nominal to 125 W maximum for full output

RF Output Power
SSB 1.5 KW PEP continuous
CW 1.5 KW Average continuous

Plate Voltage (Operate position)
RTTY/AM/ATV SSB/CW 3.0 KV VDC

Efficiency
60% minimum on all bands.

Input Impedance
50 ohms. Tuned impedance matching circuit, SWR <1.5:1 (16 db return loss)

Output Impedance
50 ohms SWR <2:1

Harmonic Suppression
50 db minimum

Intermodulation Distortion Products
33 dB down minimum

1.2 General Information

Power Tubes
Two Eimac 3-500Z zero bias triodes

Circuit Type
Class AB_2 grounded grid

Tube Cooling
Pressurized plenum and chimney cooling system. 60 cubic ft. per minute. Low noise squirrel cage blower. Optional muffin fan for extended continuous service.

*FCC rules permit any properly licensed amateur to modify his own amplifier for 10 meter use. Consult the factory for details. If this modification is done with reasonable skill and care, the warranty will not be void.

Type of Emission
SSB, CW, RTTY, AM, ATV

Duty Cycle
Continuous duty in all modes

ALC Circuit
Negative, adjustable to -30 VDC

Antenna Relay
DC relay for hum-free operation

Metering
1 Meter measures plate current
2nd Meter measures plate voltage, grid voltage, output power, reflected power

Output Circuit
Pi-L network (silver plated air coil) and dual section 6KV tuning capacitor for full efficiency at 10 meters.

Input Circuit
Pi network input for each band for maximum drive and linearity.

Protective Devices
AC line fuses, cathode zener fuse, SCR crowbar grid protect circuit

Safety Feature
Interlock for AC line input.

Power Requirements
115/230 VAC, 30/15 amps (230 VAC factory wired and recommended)

Power Transformer
Special Hammond power transformer designed for continuous service. Rated at 1300 VA 60 Hz. Weight 40 lb (18.2 kg) Separate filament transformer.

Dimensions
17" W x 8-1/2" H x 19" D (including dials)
(43.2 x 21.6 x 49.3 cm)

Weight
80 lb (36.3 kg). Shipped in three cartons.

Optional muffin fan kit available.
Optional QSK kit available.

1.3 Tube Specifications

Filament

Voltage	5.0V
Current	14.2A

Direct Interelectrode Capacitances (grounded grid)

Input	8.3pF
Output	4.7pF
Feedback	0.07pF

Frequency of Maximum Rating

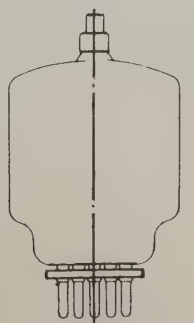
CW	110 MHz
Operating Position	Vertical, base down or up

Maximum Operating Temperature

Plate Seal	225° C
Base Seals	200° C
Cooling	Radiation and forced air
Base	5 Pin Special

Maximum Ratings

DC Plate Voltage	4000 Volts
DC Plate Current	0.40 Ampere
Plate Dissipation	500 Watts
Grid Dissipation	20 Watts



(tube basing)

2.0 Introduction

The PT-2500A Linear Amplifier is a one stage, class AB_2 Linear Amplifier using two glass envelope, high performance Eimac 3-500Z power tubes. It is a completely self-contained table-top unit capable of 1500 watts PEP or CW output, designed to provide reliable, stable, high RF output power. It is equipped with a pressurized plenum cooling system to ensure optimum operation for extended periods of continuous use. The circuit and components are conservatively designed and selected for effortless operation under all conditions.

2.1 Features

2.1.1 Designed for SSB, CW, RTTY, AM or ATV operation on the amateur bands between 1.8 MHz and 21 MHz. (Including WARC bands and MARS operation.) May be customer modified to cover the 28 MHz band. Please consult the factory. REQUESTED 10/11/84 SAT RETURNED 11/27/84 MOH

2.1.2 Can be modified for frequencies outside the amateur bands for commercial or military use. Please consult the factory.

*Canadian and other non-U.S.A. models supplied with 10 meter band.

2.1.3 Fast heating high performance 3-500Z triodes ensure rapid turn-on time.

2.1.4 Continuous duty squirrel cage blower plus optional muffin fan for extreme extended use.

2.1.5 The Pi-L circuit features;
a) Heavy duty, 7KV rotary switch with silver plated contacts.
b) A high quality, dual section 6KV plate tuning capacitor which maintains constant Q from 1.8 to 30 MHz**.

**Above 21.450 MHz non U.S.A. only.

2.1.6 Pi network input for each band.

2.1.7 The power supply features a special heavy duty (40 lb.) "continuous" rated 1300 VA power transformer, a separate filament transformer and computer grade filter capacitors for maximum reliability.

2.1.8 Power transformer transient protected.

2.1.9 By-Pass standby switch on front panel.

2.1.10 Adjustable ALC Control (up to —30V).

2.1.11 Dual backlit meter system to monitor all critical voltages and currents.

2.1.12 Mode switch for optimum efficiency in all modes of operation.

2.1.13 Vernier tuning for smooth and accurate settings on all bands.

2.1.14 Safety interlock disconnects AC line voltage when the top cover is removed.

2.1.15 SCR actuated grid protect circuit.

2.1.16 Optional muffin fan kit available.

2.1.17 Optional QSK kit available.

3.0 Installation

PLEASE READ THE INSTRUCTIONS carefully and fully before attempting to operate the amplifier.

CAUTION: There are very dangerous voltages present inside the amplifier when the power is on. Two interlock switches will automatically disconnect the AC line voltage when the top cover is removed. Use the utmost caution and care if AC power must be on while the top cover is removed.

3.1 Unpacking

Remove the amplifier from the shipping carton and examine for damage, (notify the transport company immediately if any damage is present.)

Save the carton for future shipment to another location or storage.

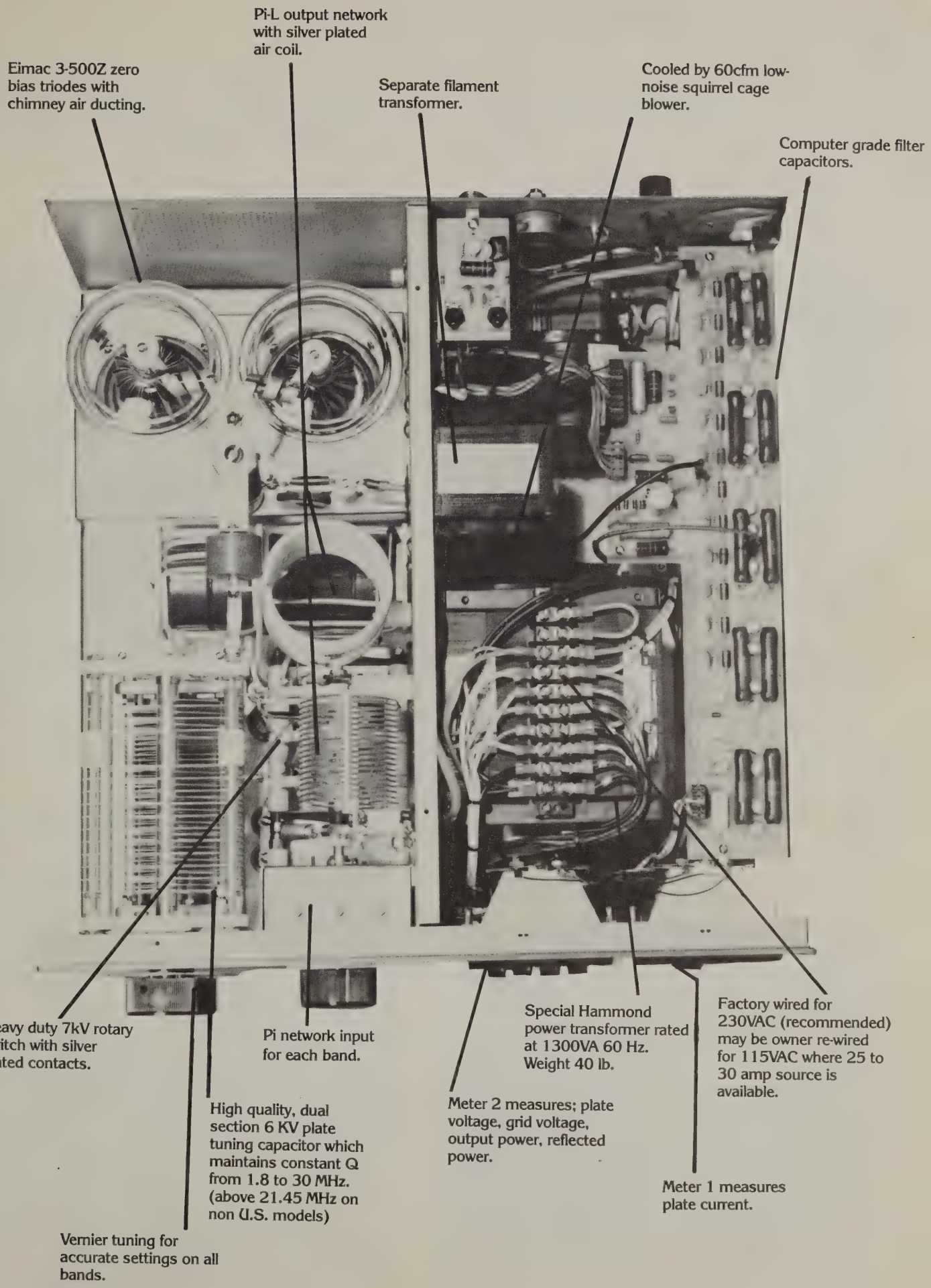
The 3-500Z triode tubes and the power transformer are shipped separately and must be installed before operating the amplifier in any way.

The following accessories are included with your PT-2500A amplifier:

1. Instruction Manual
2. Warranty Card
3. Two 3-500Z Tubes
4. Two Glass Chimneys (packed in amplifier)
5. Power Transformer
6. Control Cable (2)
7. AC Power Cord
8. Jumper Wire
9. Two Plate Cap Heat Sinks
10. Extra Fuses (One Zener - AGC 8/10 and two ABC15)
11. 7/16" T Wrench
12. Two Long Rubber Feet (C/W #8-32 Mounting Screws)
13. Three 1/4-20 Hex Nuts
14. Extra Cabinet Screws

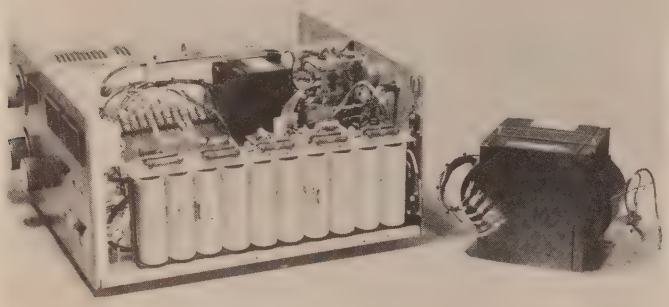
3.2 Operating Location

The amplifier must be located in an open area such that the flow of air from the top (and back for optional muffin fan) is unrestricted. Location should be as close as possible to a reliable 115/230 VAC source to minimize any AC voltage drop.

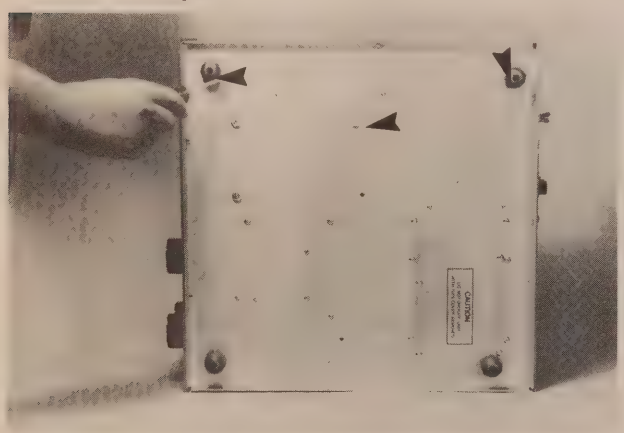

Pi-L output network with silver plated air coil.
Eimac 3-500Z zero bias triodes with chimney air ducting.
Separate filament transformer.
Cooled by 60cfm low-noise squirrel cage blower.
Computer grade filter capacitors.
Heavy duty 7kV rotary switch with silver plated contacts.
Pi network input for each band.
Special Hammond power transformer rated at 1300VA 60 Hz. Weight 40 lb.
Factory wired for 230VAC (recommended) may be owner re-wired for 115VAC where 25 to 30 amp source is available.
High quality, dual section 6 KV plate tuning capacitor which maintains constant Q from 1.8 to 30 MHz. (above 21.45 MHz on non U.S. models)
Meter 2 measures; plate voltage, grid voltage, output power, reflected power.
Meter 1 measures plate current.
Vernier tuning for accurate settings on all bands.

3.3 Power Transformer Installation

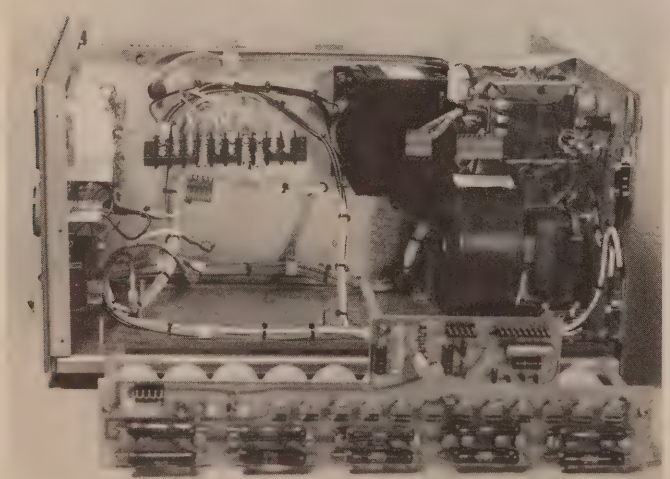
1. Remove the cabinet. Remove all cabinet screws. Note that all screws along base are machine screws while all others are self-tapping screws.
2. Remove the packing material found in the RF and power supply sections and remove the packed chimneys.



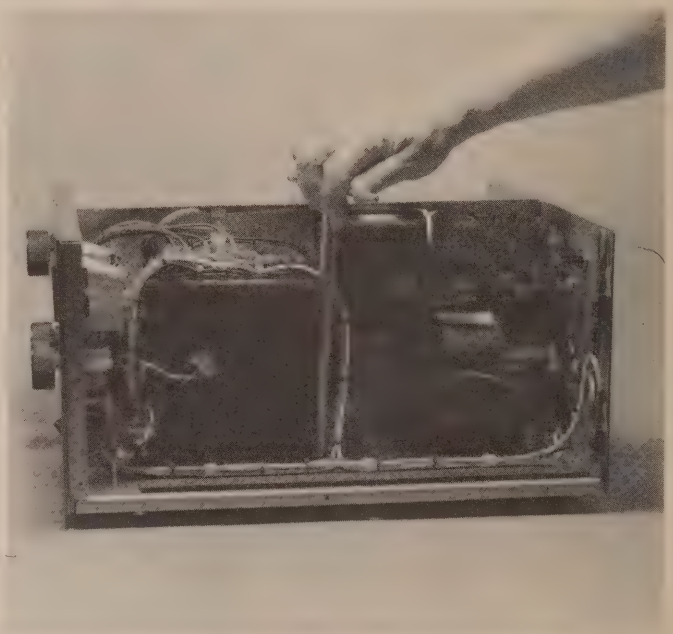
3. Disengage the filter capacitor assembly by removing 3 - #8-32 machine screws found under the base plate. Place the filter assembly on the work surface along side the amplifier.



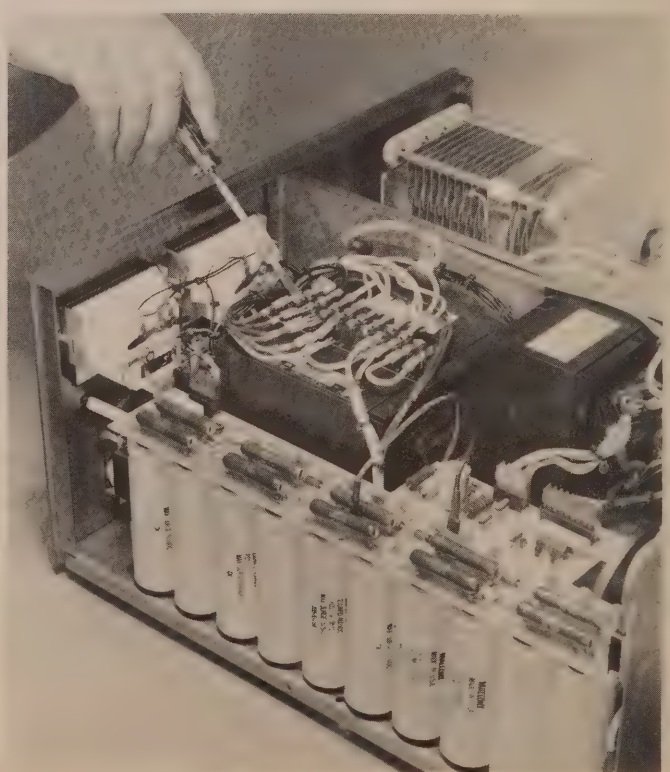
4. Position the terminal block with attached harness to allow clear access to the transformer area.



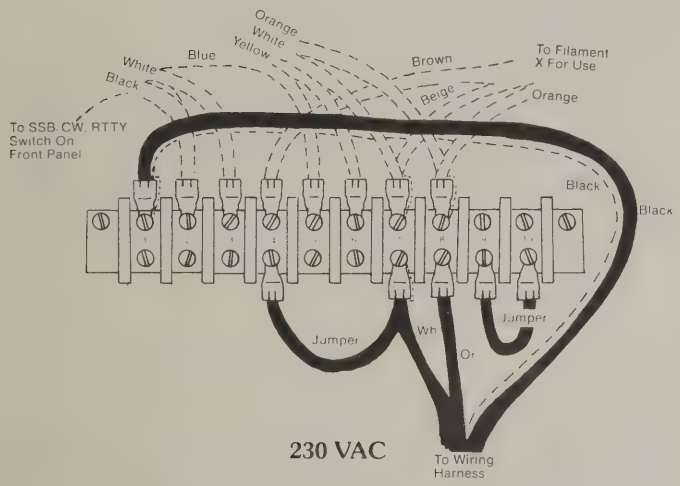
5. Carefully place the transformer over the 3 1/4-20 transformer mounting studs. To install 1/4-20 hex. nuts, press a nut into the driver end of "T" wrench supplied with the amplifier. The nut will remain in the wrench until nut/stud threads are started.



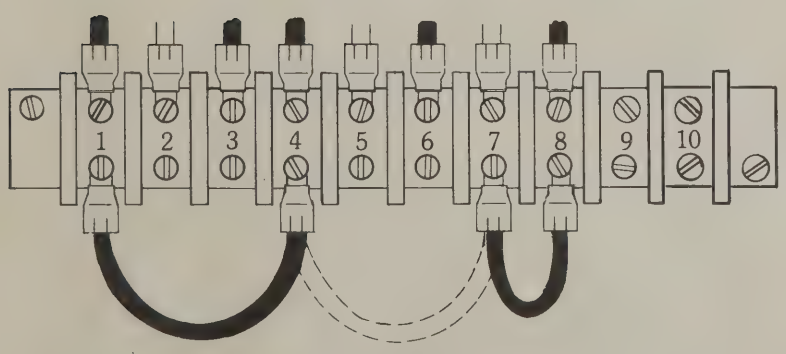
6. Remove 2 - #6-32 machine screws holding the terminal I.D. board on the top of the transformer.
   (a) Place the terminal block over the I.D. board and secure both to the transformer with the 2 #6-32 screws.



(b) Attach the 6 transformer primary leads and plate harness leads to the terminal block contacts. The transformer leads are numbered to correspond with terminal block numbering. Do not over-tighten terminal block screws.



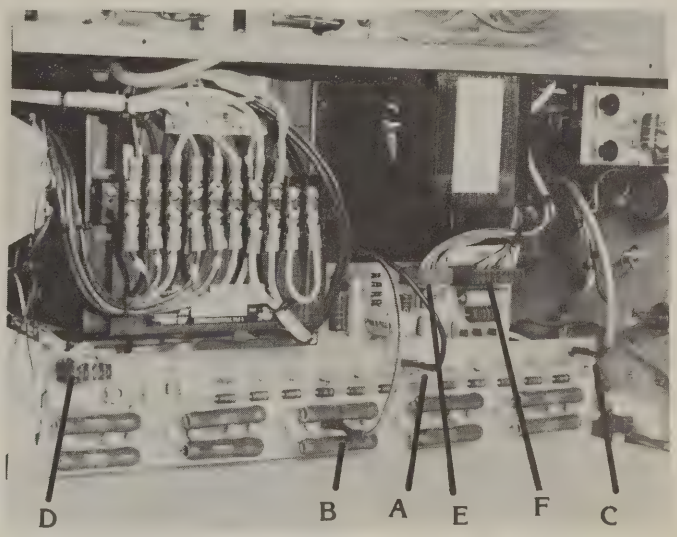
7. The terminal block is wired for 230 VAC operation. For 115 VAC operation (not recommended unless 25 - 30 amp source is available), remove the jumper connected between terminals 4 and 7 on the terminal block and connect it between terminals 1 and 4. Take a short jumper from the accessory kit and connect it between terminals 7 and 8.



8. Re-attach the filter assembly to the base plate using 3 #8-32 machine screws.

9. Connect the black lead from the power resistor mounted on the plate transformer to the terminal indicated on the filter capacitor board. (Lead A in photo below.)

10. The last step is the connection of the plate transformer secondary start lead (red) and high voltage lead (red). This is done with the use of male-female slip-on lugs.



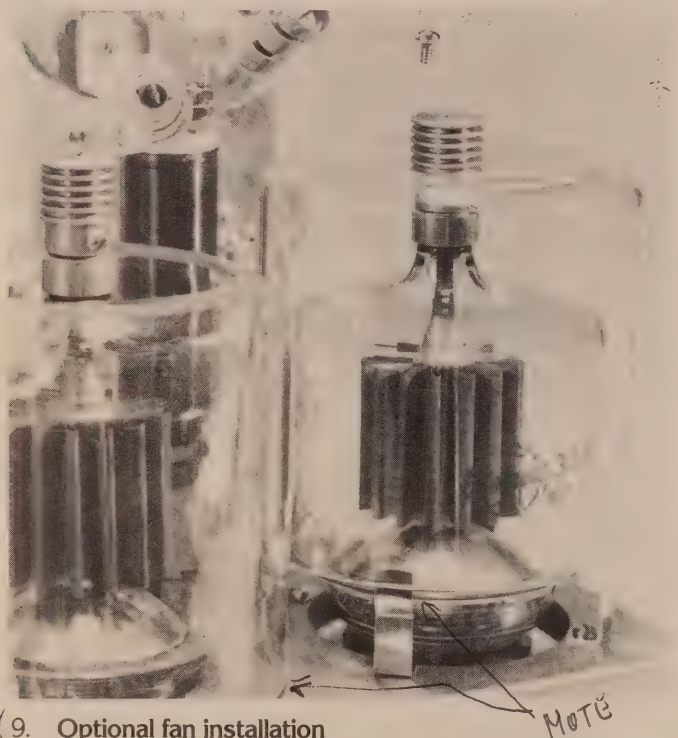
11. Connect the black lead A, red lead B, and red high voltage lead C as indicated in the photograph. Reconnect the three multipin connectors D, E and F as shown. Be sure to establish positive contact for all connections. This completes the transformer installation. Double check all connections to avoid possible damage.

3.4 Power Tubes Installation

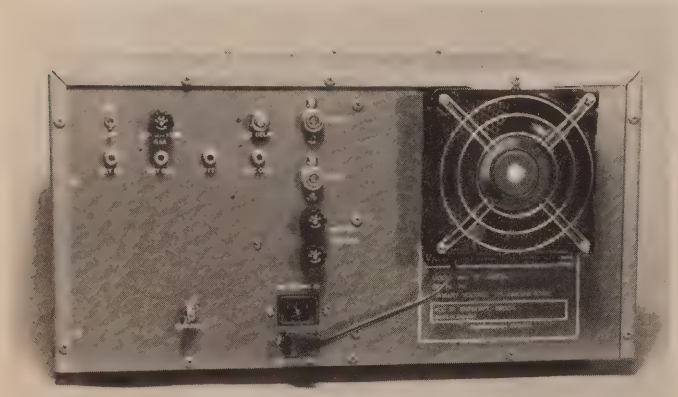
For the power tube installation you will need;
Two 3-500Z tubes (packed separately)
Two glass chimneys (packed inside the amplifier)
Two plate cap heat sinks (provided in accessory kit)

1. Unpack all items and inspect for damage. Any damage should be reported to the carrier.
2. If cabinet not yet removed, see Steps 1. and 2. in Section 3.3 for instructions on cabinet removal.
3. Carefully install the two power tubes in their sockets. **Be very careful not to exert lateral or twisting pressure on the glass portion of the tubes. They are very easily damaged. Excessive pressure can cause a hairline fracture in the tube's glass envelope, destroying the tube. The pins are also particularly delicate and can easily break if the tube is not inserted and removed very carefully.**

4. Carefully set the glass chimneys in place over the power tubes making sure all holding clips are **inside** the chimneys.
5. Set the plate cap heat sinks in place on the anode connectors of the power tubes. Gently tighten the set screws.
6. Remove the screws and lock washers from the tops of the heat sinks and attach the parasitic chokes. **Caution:** Hold the heat sinks firmly when attaching these leads to avoid transferring any twisting pressure to the power tubes.
7. This completes the power tubes installation.
8. You are now ready to re-assemble the cabinet. If you have purchased the optional external fan, it must be installed before the cabinet is re-assembled.



9. **Optional fan installation**
The fan is mounted on the outside of the cabinet and is attached with 4 #6-32 screws (supplied). The screws are inserted from the inside of the cabinet with 4 lockwashers and nuts. See Below. Power for the fan is provided at the 110 VAC outlet on the back panel.



10. **Re-assemble the cabinet**
Before re-assembly, note the red safety lock micro-switches mounted on the rear panel. The switch buttons must be engaged by the underside of the cabinet. When positioning the cabinet over the amplifier, listen for the click of the microswitches to ensure they are engaged.
11. Attach the cabinet screws near the microswitches first, then install the remainder of the screws ensuring that the machine screws go in the tapped holes at the chassis base.
12. The amplifier is supplied with equal height legs installed. As an option two additional legs are supplied in the accessory kit if it is desired to raise the front height of the amplifier. To implement remove the front legs supplied with the amplifier, using a slot head screwdriver. The machine screws securing the front feet are long enough to accept the additional leg. Mate the flat side of the additional leg with the original one supplied and reinstall. Repeat the above procedure for the other front leg assembly.

3.5 Cabling

All the following cables must be connected before the amplifier is operated.

3.5.1 AC Power Cable:

Your PT - 2500A amplifier comes from the factory wired for operation from a 230 VAC single phase, 60 Hz power source. For 115 VAC operation, several jumper connections on the power transformer terminal strip have to be changed. See page 5.

The green wire in the power cord is the ground wire and **MUST BE CONNECTED TO THE GROUND PIN (GREEN SCREW) OF THE PLUG THAT YOU SELECT FOR CONNECTION INTO THE POWER LINE.** The socket of the AC cord plugs directly into the back panel AC input plug.

> **CAUTION:** The amplifier will be damaged if the green wire is connected incorrectly. Be sure to disconnect the AC plug from the amplifier before changing jumpers on the terminal strip.

3.5.2 Antenna Coax: Use only RG 8/U coax (or its equivalent) to connect the PT-2500A to the antenna. The antenna connector mates with the connector marked RF OUT, on the rear panel of the amplifier.

> **CAUTION:** Do not operate the amplifier without a load or into a load with SWR greater than 2:1. Measure the antenna's SWR with an SWR meter or in-line Watt-meter and determine that the SWR is in fact less than 2:1.

3.5.3 Input Cable: A cable must be connected from the output of your exciter to the RF IN connector on the back panel of the amplifier.

3.5.4 ALC (automatic level control) Cable: Plug the ALC cable into the phono jack located on the back panel (marked ~~ALC~~) and into the ALC feedback connection (or equivalent) on the exciter. If the exciter does not have provision for feedback of ALC voltage from the amplifier, then simply omit the use of the cable.

3.5.5 Antenna Relay: A control cable should be plugged into the phono socket marked ANT RELAY on the back panel of the amplifier. This cable connects the keying signal from the exciter to switch the amplifier to the transmit condition and must be plugged into the socket or connector marked Antenna Relay (or equiv.) on the exciter. The exciter need only supply a shorting relay contact (during transmit) to key the amplifier.

CAUTION: Do not apply any voltage to the antenna relay phono jack. The internal relay is activated by a self-contained power supply.

4.0 Operating Controls

4.1 Front Panel Controls:

4.1.1 Off/On Power Switch: Used to turn the amplifier on and off.

4.1.2 Multimeter Switch: Four section pushbutton switch selects the multimeter functions as described below.

HV: With this pushbutton depressed, the meter monitors the amplifier's plate voltage. The full scale reading in this mode is 4000 VDC. Normal plate voltage with the amplifier in the standby position (unkeyed) is about 3500 VDC for SSB/CW operation and 2400 VDC for RTTY operation. Line voltage variations will cause corresponding variations in the plate voltage. **(Note: Reading for plate volts is X10.)**

GRID: With this pushbutton depressed, the meter monitors the amplifier's grid current. The full scale meter reading in this mode is 400 ma DC. The nominal grid current during SSB on peaks is approximately 100 ma.

Maximum tune-up grid current in SSB or CW single tone is 240 ma marked on the dial as a red bar.

FWD: In this mode, the meter monitors the output power of the amplifier - maximum reading is 2000 watts.

REFL: In this mode, the meter monitors the reflected power. The full scale reading of the reflected power scale is 200 watts.

4.1.3 SSB/CW/RTTY Switch: This 2 position switch selects the two plate voltages to ensure correct loading and output for each type of emission.

4.1.4 Standby/Operate Switch: This switch allows the exciter bypass feature i.e. in the STANDBY position, the power of the exciter bypasses the linear amplifier and appears unchanged at the output connector. In the OPERATE mode the linear amplifier is ready for transmitting.

4.1.5 Standby/Operate Lights: These pilot lights marked "Standby" and "Operate" indicate the status of the STANDBY/OPERATE switch. In the STANDBY mode, the red light is on and in the OPERATE mode, the green light is on.

Tune and Load Settings

These are approximate settings for a 52 ohm load, mid band, CW mode, with 100 watts drive.

Frequency	Tune	Load
1.8	60	65
3.5	40	20
6.5	40	45
7	35	50
10	30	55
14	10	80
18	50	80
21	15	88
24	14	88
28	8	90

4.1.6 Load Control: This control matches the amplifier's output network to the load. Refer to table above for the approximate initial settings for the frequency range desired. A load setting of 0 corresponds to maximum capacitor mesh and 100 represents minimum capacitor setting.

4.1.7 Tune Control: The TUNE control is a vernier dial connected to an air variable capacitor in the RF section. The disc dial is screened 100 to 0 indicating that maximum capacitance is at 100 and minimum at zero. Approximate settings for the tune control for the amateur bands are given in the table above for your convenience.

4.1.8 Band Switch: The band switch selects the applicable input and output circuits for the PT-2500A to operate in any one of the following bands:

(a) 160 meters 1.8 to 2.0 MHz
(b) 80 meters 3.5 to 4.0 MHz
(c) 40 meters 7.0 to 7.3 MHz
(d) 30 meters 10.1 to 10.15 MHz
(e) 20 meters 14.0 to 14.35 MHz
(f) 17 meters 18.068 to 18.168 MHz
(g) 15 meters 21.0 to 21.45 MHz
(h) *12 meters 24.85 to 24.95 MHz
(i) *10 meters 28.0 to 29.7 MHz
*Not supplied on USA models as shipped.

NOTE: The amplifier has the capability to transmit on many frequencies outside the above bands by switching the amplifier to the band closest in frequency to the desired operating frequency. For services other than amateur use, this may be applicable.

CAUTION: Never move the band switch while the linear amplifier is keyed or operating.

4.2 Back Panel (See also Section 3.5, Cabling Pg. 7)

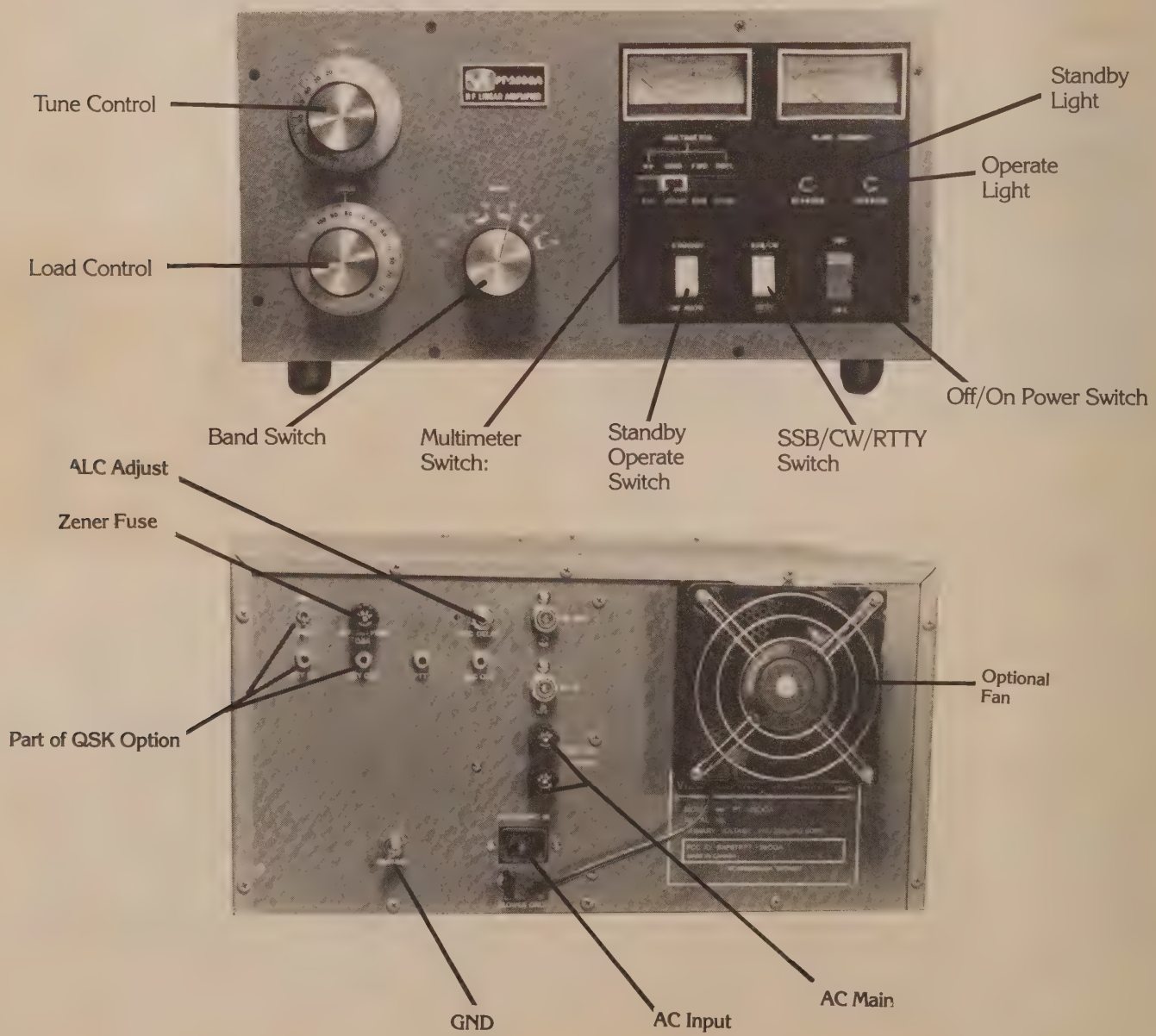
4.2.1 Zener Fuse: Protects the cathode circuit from overcurrent. It is a 8/10 amp fast-blo type.

4.2.2 ALC Adjust: Controls the delay of the PT-2500A's ALC circuit.

4.2.3 AC Main: Two fuses for the 115/230 VAC line input. They are ABC ceramics and must not be substituted by any other types.

GND: This lug is provided to ground the amplifier. It should be connected to a good earth ground to minimize radiated interference or the danger of electrical shock.

4.2.4 AC Input: This is the AC line input plug that accepts a heavy duty power cord. Note the 3 pin arrangement on the plug and the fact that the center pin is ground. Push the socket of the power cord when ready for use so that it is fully seated in the plug. The use of another cord is not recommended.



5.0 Operation:

NOTE: Use a 50 ohm dummy load only for all the following adjustments. Adjustments into an antenna can result in illegal output power levels and/or interference on the amateur bands.

5.1 Preliminary Settings	Setting
1. STANDBY/OPERATE switch	STANDBY
2. SSB/CW/RTTY switch	RTTY
3. Multimeter switch	GRID
4. ON/OFF switch	OFF

Activate the ON switch and the red STANDBY pilot lamp and the meters should light. Look into the interior of the amplifier to make sure that the tube filaments are lit and that there is a flow of air from the top of the cabinet. This can be done by putting your hand over each tube from the top to feel the flow of air.

5.2 Operation

The 3-500Z requires no warm-up time.

1. Push the HV pushbutton on the MULTIMETER switch bank. The meter should read approximately 2.80 indicating a plate voltage of 2800 in the RTTY mode.
2. Set the SSB/CW/RTTY switch to SSB/CW 2800. This should give a corresponding reading of 3800 VDC.
3. Set the SSB/CW/RTTY switch back to RTTY position.
4. Push GRID on the MULTIMETER switch bank.
5. Set the BAND switch to the desired band.
6. Pre-set the TUNE and LOAD vernier dials to that referred to in calibration chart below.

Frequency	Tune	Load
1.8	60	65
3.5	40	20
6.5	40	45
7	35	50
10	30	55
14	10	~~80~~ 37
18	50	80
21	15	88
24	14	88
28	8	90

5.2.1 SSB Operation:

1. Set the STANDBY/OPERATE switch to OPERATE. The green OPERATE lamp should light.
2. With the exciter adjusted for zero output, press the PTT switch of the exciter causing the PT2500/A and the exciter to go into the transmit mode.
3. The amplifier's plate current meter should register approximately 40 ma. (Note SSB/CW/RTTY switch in RTTY). Set the SSB/CW/RTTY switch to SSB/CW. This shoudl register a plate current reading of approximately 100 ma. Set the SSB/CW/RTTY switch back to CW.
4. Increase the RF output of the exciter until the amplifier's grid current is about **90 ma.** Adjust the TUNE control for a minimum plate current reading indicating resonance. If the LOAD control is set properly, the plat current will be approximately **400 ma.** If the plate current is less than 400 ma increase the load slightly by moving the LOAD control to a higher number on the dial. If the plate current is more than 420 ma, decrease the load slightly by moving the LOAD control to a lower number.

   Do not forget to re-dip the **TUNE control** each time the LOAD control is changed.

   Check that the grid current reading is approximately 80-90 ma. If not, re-adjust the exciter output to give the required 80 ma ± 10% grid current reading. Under normal conditions, there will be some interaction between the TUNE control, LOAD and the grid current.

NOTE: The tuning, loading and exciter control adjustments may have to be repeated several times until the ratio of 80 ma grid to 400 ma plate current is obtained. Note that at higher frequencies, the adjustments are sharper while at lower frequencies they are broad.

5. To verify the peak power condition increase the RF output of the exciter for a plate current reading of 800 ma. With the full drive, the grid current should be 240 ma (red mark on dial). Single tone adjustments while tuning should be made such that the grid current **never** exceeds 240 ma. This very quickly reduces the life of the tubes. (Use dummy load only for these measurements.)

NOTE: It is normal for the 3-500Z tubes to show colour, glowing a pale red with 400 ma of plate current and possibly a brighter cherry red at 800 ma. When operated in this manner, the tubes are within their ratings and can be operated in this way only if the plate circuit is at resonance (plate current dipped to a minimum with tune control). The amplifier should never be operated for any length of time in an off resonance condition.

CAUTION: Under no circumstances should the plate current exceed 800 ma nor the grid current exceed 240 ma.

6. Release the PTT switch of the exciter to allow the amplifier and exciter to go into the unkeyed status. Place the exciter into the SSB/CW mode and while speaking into a microphone, adjust the audio gain control for voice peak plate current readings of around 350 ma. Since the meter is average reading and cannot follow the peaks (which are about 800 ma), the meter will indicate the highest average plate current. The grid current peaks, should be around 50 - 100 ma. Check for proper output power with a monitor scope if one is available.

5.2.2 CW Operation: Set the SSB/CW/RTTY switch to SSB/CW and tune the amplifier as above in 5.2.1.

5.2.3 AM Operation: SSB/CW/RTTY switch should be in RTTY position. Do not apply modulation. If not already tuned as per 5.2.2, tune the amplifier as per 5.2.1, Step 4 with plate current at 650 ma max. and grid current at approximately 200 ma. Reduce the carrier output so that plate current is 1/2 of previous reading. grid current will be approximately 100 ma. Apply 1000 Hz tone at 100% modulation. Plate current should not exceed previous maximum value. If it does, reduce the mic. gain, as necessary. If an oscilloscope or modulation monitor is available, check that the modulation does not exceed 100%.

5.2.4 RTTY Operation: SSB/CW/RTTY switch should be in RTTY position. The PT-2500A is designed to operate at the 1 kilowatt level continuously. If not already tuned for CW (5.2.2), tune the amplifier as per 5.2.4 Step 1 with plate current at 650 ma max and grid current at approximately 200 ma.

5.2.5 ALC Adjustment: Loosen the ALC control lock nut. The control should be in the minimum voltage, or clockwise position. Drive the amplifier to the desired output level and then rotate the ALC control (CCW) until the grid current just begins to decrease.

5.2.6 Power Readings: When the FWD push-button is depressed, the MULTIMETER reads the output power into a dummy load or antenna. The full scale reading is 2000 watts. When the REFL push-button is depressed, the MULTIMETER reads the reflected power. The full scale reading is 200 watts.

The amplifier should never be operated into a load with an SWR greater than 1.5:1, which represents approximately 5% reflected power. The SWR should be regularly checked when connected to an antenna. If VSWR of less than 1.5:1 cannot be achieved, a Viewstar SPC Transmatch, Model VS 1500A, or equivalent, should be connected between the amplifier and the antenna.

5.2.6 Grid Protection Circuit: The PT-2500A is equipped with a grid protection circuit. If during tune up or normal operation a momentary grid current of 400 ma is exceeded, the amplifier will shut down and automatically switch to the bypass mode. The operate pilot lamp will be extinguished. To restore amplifier operation, reduce input drive to the unit, press the standby/operate switch to standby and then back to operate.

NOTE:

With the STANDBY/OPERATE switch in the STANDBY position, the exciter output will bypass the amplifier and feed directly to the antenna. The amplifier does not have to be off to accomplish this bypass.

Warranty

All goods sold hereunder are warranted to be free from defects in material and workmanship, for a period of one year from date of shipment, and this express warranty is in lieu of and excludes all other warranties whether expressed or implied by operation of law or otherwise including any warranty on the merchantability or fitness for a particular purpose. Defective material may be returned to the seller after inspection by the seller and upon receipt of definite shipping instructions by the seller. Goods so returned will be replaced or repaired without charge, but the seller shall not be liable for loss, damage or expense directly or indirectly arising from the use of material or from any other cause, the exclusive remedy against the seller being to require the replacement or repair of defective material. Every claim on account of defective material or workmanship or from any other cause shall be deemed waived by the purchaser unless made in writing prior to the expiry date of the warranty.

NOTE:

The 3-500Z tubes are warranteed on a one year pro-rata basis by the tube manufacturer. Any warranty claims must be accompanied by the tube warranty claim form packaged with your new tubes. All claims must be filed with tube manufacturer. Warranty claims on the amplifier must be accompanied by proof of purchase and purchase date.

Specifications and/or improvements subject to change without prior notice or obligation.

10m R

TECHNICAL SPEC SHEET
Viewstar Amplifiers

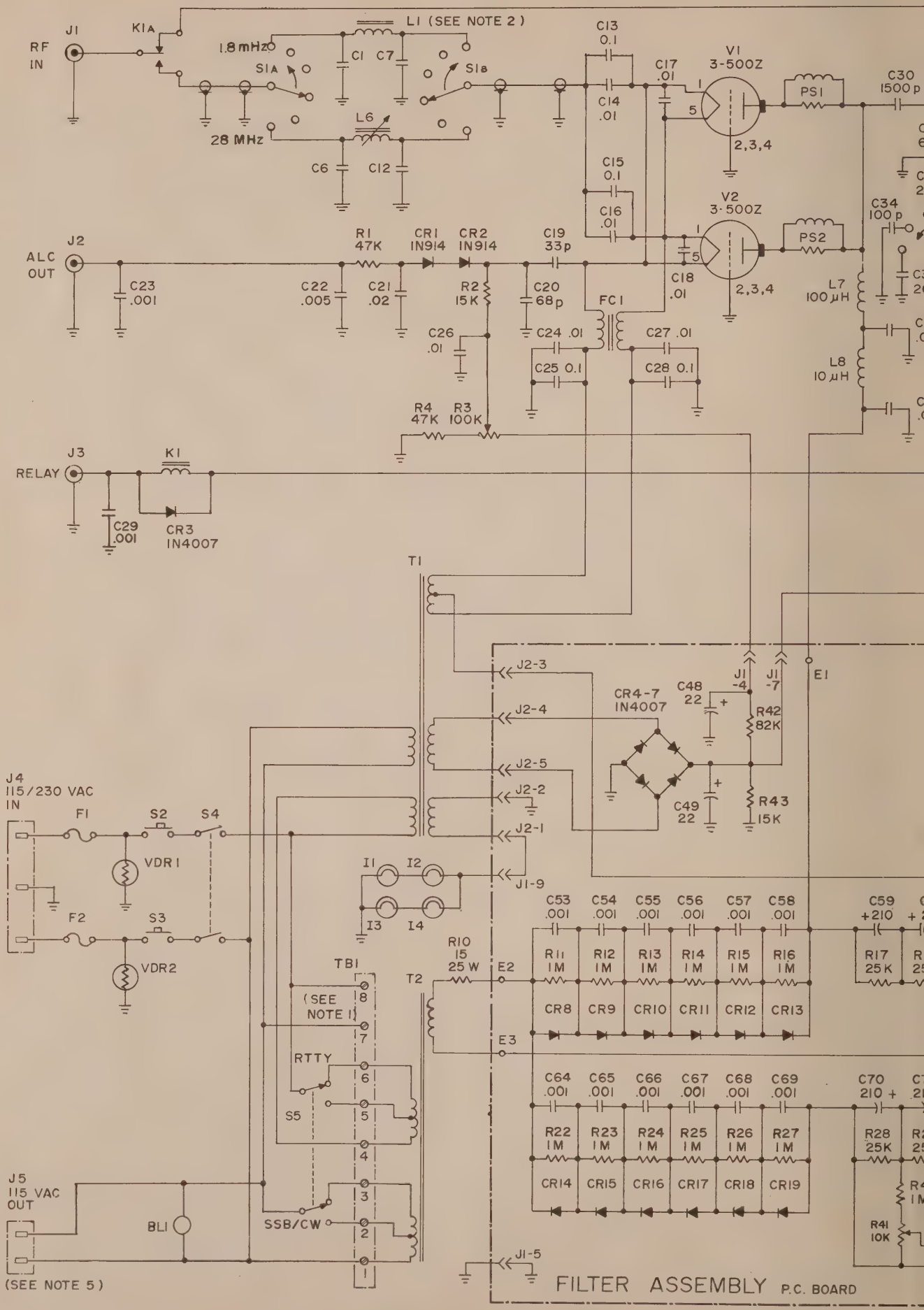
MODEL: PT 2500A
SERIAL #: 8351-014
TECH.: S.L
DATE: 5 April 84

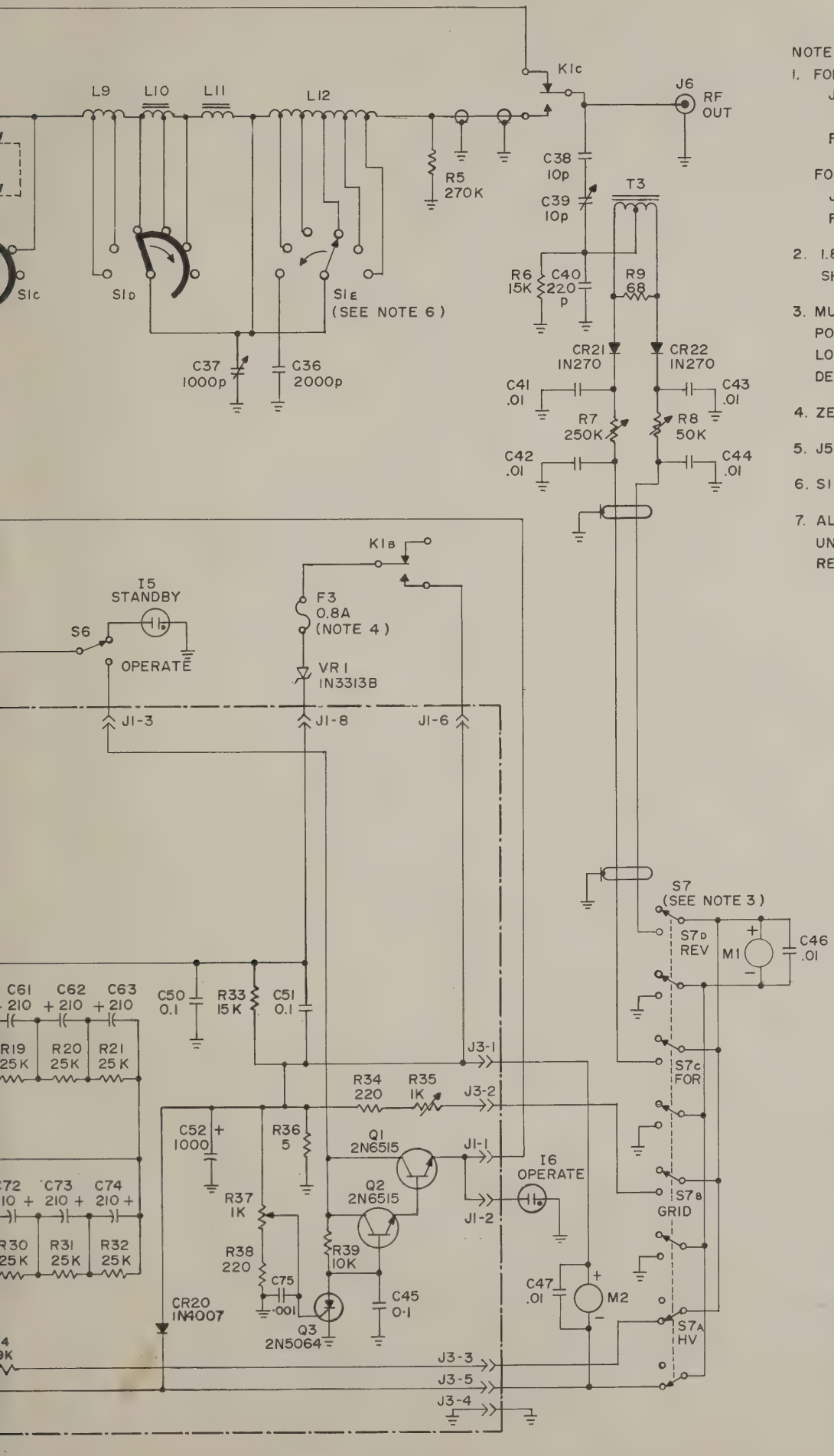
CALIBRATIONS:
Wattmeter ✓
High Voltage ✓
Grid I ✓
Grid Trip 500mA ✓
ALC Pre-Set ✓

H.V. READINGS	CW	SSB
High Voltage	3200	3800
IP Idle	60	110

Freq. (MHz)	Dial Setting Tune	Dial Setting Load	Two Tone Pout	CW Pout	VSWR In	IG	IP
1.8	50	25		1500	1.5	240	800
2.0	20	65		1500	1.2	240	800
3.5	45	20		1500	1.1	240	800
4.0	20	40		1500	1.4	240	800
7.2	30	57		1500	1.1	240	800
14.2	10	80		1500	1.2	240	800
21.2	22	87		1500	1.3	240	800
28.0							
28.5	15	89		1500	1.2	240	800
29.0							
29.7							

COMMENTS: Unit OK tested full SSB & CW


J1
RF IN
K1A
1.8 mHz
S1A
28 MHz
L1 (SEE NOTE 2)
C1
C7
S1B
L6
C6
C12
C13 0.1
C14 .01
C15 0.1
C16 .01
C17 .01
V1 3-500Z
V2 3-500Z
2,3,4
PS1
PS2
C30 1500 p
C34 100 p
J2
ALC OUT
R1 47K
CR1 IN914
CR2 IN914
C19 33p
C23 .001
C22 .005
C21 .02
R2 15K
C20 68p
C18 .01
FC1
C26 .01
C24 .01
C27 .01
C25 0.1
C28 0.1
L7 100 µH
L8 10 µH
R4 47K
R3 100K
J3
RELAY
K1
C29 .001
CR3 IN4007
T1
J2-3
J2-4
J2-5
J2-2
J2-1
J1-9
J1-5
J1 -4
J1 -7
E1
CR4-7 IN4007
C48 22
C49 22
R42 82K
R43 15K
J4
115/230 VAC IN
F1
F2
S2
S3
S4
VDR1
VDR2
I1
I2
I3
I4
TB1
(SEE NOTE 1)
RTTY
S5
SSB/CW
T2
R10 15 25 W
E2
E3
C53 .001
C54 .001
C55 .001
C56 .001
C57 .001
C58 .001
R11 1M
R12 1M
R13 1M
R14 1M
R15 1M
R16 1M
CR8
CR9
CR10
CR11
CR12
CR13
C59 +210
R17 25K
C64 .001
C65 .001
C66 .001
C67 .001
C68 .001
C69 .001
R22 1M
R23 1M
R24 1M
R25 1M
R26 1M
R27 1M
CR14
CR15
CR16
CR17
CR18
CR19
C70 210 +
R28 25K
R41 10K
J5
115 VAC OUT
BL1
(SEE NOTE 5)
FILTER ASSEMBLY P.C. BOARD



NOTES :

1. FOR 115 VAC OPERATION (NOT RECOMMENDED)
   JUMPER TB1-1 TO TB1-4
   TB1-7 TO TB1-8
   F1 AND F2 30 A. MDA CERAMIC ONLY.

   FOR 230 VAC OPERATION (RECOMMENDED)
   JUMPER TB1-4 TO TB1-7
   F1 AND F2 15 A. MDA CERAMIC ONLY.
2. 1.8 mHz AND 28 mHz INPUT NETWORKS SHOWN ONLY FOR CLARITY.
3. MULTIMETER SWITCH, S7, SHOWN IN HV POSITION. ALL POSITIONS ARE INTERLOCKED, ie, ONLY ONE SWITCH MAY BE DEPRESSED.
4. ZENER FUSE, F3, IS 0.8A FAST BLOW ONLY.
5. J5 FOR OPTIONAL MUFFIN FAN ONLY.
6. S1 SHOWN IN 14 mHz POSITION.
7. ALL CAPACITOR VALUES SHOWN IN Mfd UNLESS OTHERWISE SHOWN. ALL RESISTOR VALUES ARE IN OHMS.

DIMENSIONS ARE IN MILLIMETRES (INCHES)
TOLERANCES: (UNLESS OTHERWISE SPECIFIED)

	METRIC	IMPERIAL
ONE DECIMAL	± 0.3	± .020
TWO DECIMALS	± 0.13	± .010
THREE DECIMALS		± .005
HOLES	± 0.8	± .003
ANGLES	± 1/2°	± 1/2°

DO NOT SCALE

VIEWSTAR INC.
705 Progress Ave., Unit 63
Scarborough, Ontario M1H 2X1

TITLE: SCHEMATIC - PT 2500A LINEAR AMPLIFIER

MATERIAL	DRAWN BY	SHEET
	EJS	1 OF 1
	CHECKED BY	DRAWING NUMBER
SCALE —	DATE 14 NOV. '83	

Parts List

Circuit Designation	Description
C1	Silver Mica Capacitor, 2634 PFD, 1KV, 5%
C2	Silver Mica Capacitor, 1000 PFD, 1KV, 5%
C3	Silver Mica Capacitor, 820 PFD, 1KV, 5%
C4	Silver Mica Capacitor, 47 PFD, 1KV, 5%
C5	Silver Mica Capacitor, 36 PFD, 1KV, 5%
C6	Silver Mica Capacitor, 10 PFD, 1KV, 5%
C7	Silver Mica Capacitor, 2710 PFD, 1KV, 5%
C8	Silver Mica Capacitor, 1068 PFD, 1KV, 5%
C9	Silver Mica Capacitor, 1000 PFD, 1KV, 5%
C10	Silver Mica Capacitor, 120 PFD, 1KV, 5%
C11	Silver Mica Capacitor, 120 PFD, 1KV, 5%
C12	Silver Mica Capacitor, 91 PFD, 1KV, 5%
C13	Film Capacitor, 0.1 MFD, 250V
C14	Silver Mica Capacitor, .01 MFD, 500V
C15	Film Capacitor, 0.1 MFD, 250V
C16	Silver Mica Capacitor, .01 MFD, 500V
C17	Disc Ceramic Capacitor, .01 MFD, 1.4KV
C18	Disc Ceramic Capacitor, .01 MFD, 1.4KV
C19	Silver Mica Capacitor, 33 PFD, 500V
C20	Silver Mica Capacitor, 68 PFD, 500V
C21	Disc Ceramic Capacitor, .02 MFD, 100V
C22	Disc Ceramic Capacitor, .005 MFD, 100V
C23	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C24	Disc Ceramic Capacitor, .01 MFD, 1.4KV
C25	Film Capacitor, 0.1 MFD, 250V
C26	Disc Ceramic Capacitor, .01 MFD, 100V
C27	Disc Ceramic Capacitor, .01 MFD, 1.4KV
C28	Film Capacitor, 0.1 MFD, 250V
C29	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C30	Transmitting Ceramic Capacitor, 1000 PFD, 6KV
C31	Air Variable Capacitor, Dual, 60PFD-200PFD, 6KV
C32	Disc Ceramic Capacitor, .01 MFD, 5KV
C33	Disc Ceramic Capacitor, .001 MFD, 6KV
C34	Transmitting Ceramic Capacitor, 100 PFD, 6KV
C35	Transmitting Ceramic Capacitor, 200 PFD, 6KV
C36	Transmitting Ceramic Capacitor, 1300 PFD, 2KV
C37	Air Variable Capacitor, 1000 PFD, 2.5KV
C38	Disc Ceramic Capacitor, 10 PFD, 1KV
C39	Air Variable Capacitor, 20 PFD, 250V
C40	Silver Mica Capacitor, 220 PFD, 500V
C41	Disc Ceramic Capacitor, .01 MFD, 100V
C42	Disc Ceramic Capacitor, .01 MFD, 100V
C43	Disc Ceramic Capacitor, .01 MFD, 100V
C44	Disc Ceramic Capacitor, .01 MFD, 100V
C45	Film Capacitor, 0.1 MFD, 250V
C46	Disc Ceramic Capacitor, .01 MFD, 1.4KV
C47	Disc Ceramic Capacitor, .01 MFD, 1.4KV
C48	Electrolytic Capacitor, 22 MFD, 160V, Axial
C49	Electrolytic Capacitor, 22 MFD, 160V, Axial
C50	Film Capacitor, 0.1 MFD, 250V
C51	Film Capacitor, 0.1 MFD, 250V
C52	Electrolytic Capacitor, 1000 MFD, 16V, Radial
C53	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C54	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C55	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C56	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C57	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C58	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C59	Electrolytic Capacitor, 210 MFD, 450V
C60	Electrolytic Capacitor, 210 MFD, 450V
C61	Electrolytic Capacitor, 210 MFD, 450V
C62	Electrolytic Capacitor, 210 MFD, 450V
C63	Electrolytic Capacitor, 210 MFD, 450V
C64	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C65	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C66	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C67	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C68	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C69	Disc Ceramic Capacitor, .001 MFD, 1.4KV
C70	Electrolytic Capacitor, 210 MFD, 450V
C71	Electrolytic Capacitor, 210 MFD, 450V
C72	Electrolytic Capacitor, 210 MFD, 450V

Circuit Designation	Description
C73	Electrolytic Capacitor, 210 MFD, 450V
C74	Electrolytic Capacitor, 210 MFD, 450V
C75	Disc Ceramic Capacitor, .001 MFD, 1.4KV
R1	Resister, Carbon, 47 KΩ, ¼W, 5%
R2	Resister, Carbon, 15 KΩ, ¼W, 5%
R3	Potentiometer, Locking, 100 KΩ
R4	Resister, Carbon, 47 KΩ, ¼W, 5%
R5	Resistor, Carbon, 270 KΩ, 1W, 5%
R6	Resistor, Carbon, 15 KΩ, ½W, 5%
R7	Potentiometer, 250 KΩ
R8	Potentiometer, 50 KΩ
R9	Resistor, Carbon, 68 Ω, 2W, 5%
R10	Resistor, Wirewound, 15 Ω, 25W
R11	Resistor, Carbon, 1MΩ, ½W, 5%
R12	Resistor, Carbon, 1MΩ, ½W, 5%
R13	Resistor, Carbon, 1MΩ, ½W, 5%
R14	Resistor, Carbon, 1MΩ, ½W, 5%
R15	Resistor, Carbon, 1MΩ, ½W, 5%
R16	Resistor, Carbon, 1MΩ, ½W, 5%
R17	Resistor, Wirewound, 25 KΩ, 10W
R18	Resistor, Wirewound, 25 KΩ, 10W
R19	Resistor, Wirewound, 25 KΩ, 10W
R20	Resistor, Wirewound, 25 KΩ, 10W
R21	Resistor, Wirewound, 25 KΩ, 10W
R22	Resistor, Carbon, 1MΩ, ½W, 5%
R23	Resistor, Carbon, 1MΩ, ½W, 5%
R24	Resistor, Carbon, 1MΩ, ½W, 5%
R25	Resistor, Carbon, 1MΩ, ½W, 5%
R26	Resistor, Carbon, 1MΩ, ½W, 5%
R27	Resistor, Carbon, 1MΩ, ½W, 5%
R28	Resistor, Wirewound, 25 KΩ, 10W
R29	Resistor, Wirewound, 25 KΩ, 10W
R30	Resistor, Wirewound, 25 KΩ, 10W
R31	Resistor, Wirewound, 25 KΩ, 10W
R32	Resistor, Wirewound, 25 KΩ, 10W
R33	Resistor, Carbon, 15 KΩ, 2W, 5%
R34	Resistor, Carbon, 4.7 KΩ, ¼W, 5%
R35	Potentiometer, 22 KΩ
R36	Resistor, Wirewound, 5 Ω, 5W, 10%
R37	Potentiometer, 1 KΩ
R38	Resistor, Carbon, 220 Ω, ¼W, 5%
R39	Resistor, Carbon, 10 KΩ, 2W, 5%
R40	Resistor, Carbon, 1 MΩ, ½W, 5%
R41	Potentiometer, 10 KΩ
R42	Resistor, Carbon, 82 KΩ, ¼W, 5%
R43	Resistor, Carbon, 15 KΩ, 2W, 5%
R44	Resistor, Carbon, 3.9 KΩ, ¼W, 5%
VDR1	Resistor, Voltage Dependant, 250V
VDR2	Resistor, Voltage Dependant, 250V
CR1	Diode, IN914
CR2	Diode, IN914
CR3	Diode, IN4007
CR4	Diode, IN4007
CR5	Diode, IN4007
CR6	Diode, IN4007
CR7	Diode, IN4007
CR8	Diode, MR510
CR9	Diode, MR510
CR10	Diode, MR510
CR11	Diode, MR510
CR12	Diode, MR510
CR13	Diode, MR510
CR14	Diode, MR510
CR15	Diode, MR510
CR16	Diode, MR510
CR17	Diode, MR510
CR18	Diode, MR510
CR19	Diode, MR510
CR20	Diode, IN4007
CR21	Diode, IN60, IN270
CR22	Diode, IN60, IN270
VR1	Diode, Zener, IN3313B
L1	Inductor, Toroidal, Input, 1.8 MHz
L2	Inductor, Toroidal, Input, 3.5 MHz

Circuit Designation	Description
L3	Inductor, Toroidal, Input, 7.0 MHz
L4	Inductor, Variable, Input, 14 MHz
L5	Inductor, Variable, Input, 21 MHz
L6	Inductor, Variable, Input, 28 MHz
L7	Choke, 100 μH, 750 MA
L8	Choke, 10 μH, 1.5 AMP.
L9	Inductor, 28 / 21 / 14 MHz
L10	Inductor, 7 / 3.5 MHz
L11	Inductor, 1.8 MHz
L12	Inductor, Loading
FC1	Choke, Filament, 30 AMP.
T1	Transformer, Filament, Low Voltage
T2	Transformer, Power
T3	Transformer, Power Meter
Q1	Transistor, 2N6515
Q2	Transistor, 2N6515
Q3	Transistor, SCR, 2N5064
F1	Fuse, (230VAC), 15 AMP. SLO BLO
	(115VAC), 30 AMP. SLO BLO
F2	Fuse, (230VAC), 15 AMP. SLO BLO
	(115VAC), 30 AMP. SLO BLO
F3	Fuse, 0.8 A, FAST BLO
BL1	Blower, 115VAC, 60 CFM
V1	Tube, 3-500Z
V2	Tube, 3-500Z
M1	Meter, 200 μA
M2	Meter, 1 AMP.
I1	Pilot Light, 6V
I2	Pilot Light, 6V
I3	Pilot Light, 6V
I4	Pilot Light, 6V
I5	Pilot Light Assy, Neon, 115V, RED
I6	Pilot Light Assy, Neon, 115V, GREEN
PS1	Parasitic Suppressor Assy.
PS2	Parasitic Suppressor Assy.
K1	Relay, 3PDT, 120 VDC
S1AB	Switch, DP6T, Rotary
S1C.D.E	Switch, 3P6T, Rotary, High Voltage
S2	Switch, SPDT, Microswitch
S3	Switch, SPDT, Microswitch
S4	Switch, DPDT, Rocker, Power
S5	Switch, DPDT, Rocker, Mode
S6	Switch, DPDT, Rocker, Standby
S7	Switch, Pushbutton, 4 Section, DPDT
TB1	Terminal Board, 8 Position
J1	Connector, UHF Type, Female, Bulkhead
J2	Connector, Phono Type, Female, Panel Mount
J3	Connector, Phono Type, Female, Panel Mount
J4	Connector, Power, Plug
J5	Connector, Power, Socket
J6	Connector, UHF Type, Femal, Bulkhead

NOTE: C1 through C12 may vary from unit to unit as determined by test.

Viewstar Inc..
55 Milner Avenue
Scarborough, Ontario
M1S 3P6
Phone: (416) 298-9919
Telex: 065-26242

mfg Re mod. Pa 2

975

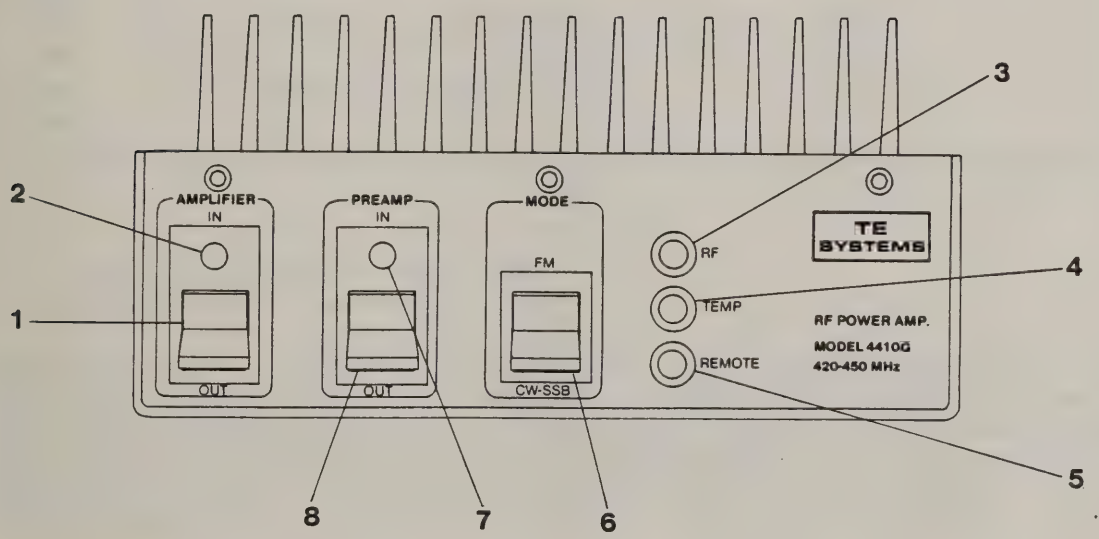
Dellingham
Toronto Can

416-256-7125 ONTARIO
MMCED 1/4/90

TURNING ON THE AMPLIFIER SWITCH HAS NO EFFECT UPON RECEIVE, BUT WILL SWITCH-IN THE POWER AMPLIFIER DURING TRANSMIT. THE GREEN STATUS LIGHT SHOULD ILLUMINATE TO VERIFY THE "IN" READY CONDITION OF THE AMPLIFIER. PLEASE REFER TO THE SPECIFICATIONS FOR THE PARTICULAR MODEL TO DETERMINE THE LEVELS OF RF INPUT AND OUTPUT POWER. ALSO MAKE SURE A PROPER ANTENNA LOAD IS CONNECTED.

THE AMPLIFIER SWITCHES "IN" WHEN IT SEES A RF TRANSMITTED SIGNAL APPLIED FROM THE TRANSCEIVER. THIS TECHNIQUE IS KNOWN AS RF SENSING, WHEREIN, THE TRANSMITTED SIGNAL ACTIVATES THE AMPLIFIER'S RELAY SWITCHING CIRCUITS. ALTERNATIVELY, THE PTT REMOTE CONNECTION MAY BE USED TO "HARD KEY" THE AMPLIFIER. IN THIS CASE THE AMPLIFIER IS SWITCHED IN ANYTIME THE TRANSCEIVER GOES INTO TRANSMIT. SOME USERS MAY FIND THIS ADVANTAGEOUS TO ELIMINATE RF SWITCHING DURING NO RF PERIODS SUCH AS PAUSES IN SSB TRANSMISSION. THE ACTUAL RF SWITCHING TIME IS MINIMIZED TOO WITH PTT CONTROL (THE MODE SWITCH SHOULD BE IN THE FM MODE FOR MINIMUM TIME DELAY).

FRONT VIEW



FRONT PANEL DESCRIPTION TABLE	
1.	RF POWER AMP IN/OUT SWITCH
2.	RF POWER AMP IN/OUT STATUS LIGHT (GREEN)
3.	RF LIGHT(RED) - ILLUMINATES WHEN THE UNIT GOES INTO THE RF POWER AMPLIFYING CONDITION
4.	TEMP LIGHT(RED) - ILLUMINATES WHEN THE UNIT'S HEATSINK TEMPERATURE RISES ABOVE +65 DEG CENTIGRADE
5.	REMOTE LIGHT(RED) - ILLUMINATES WHEN THE REMOTE PTT INPUT HAS BEEN KEYED
6.	MODE SWITCH - CONTROLS RELAY SWITCH DELAY
7.	PREAMP IN/OUT STATUS LIGHT (GREEN)
8.	PREAMP IN/OUT SWITCH

B) RECEIVE PREAMP TURN-ON:

WITH THE UNIT CONNECTED AS SHOWN IN THE OPERATIONAL/TEST SETUP DIAGRAM SHOWN ABOVE, NEXT REFER TO THE FRONT VIEW DIAGRAM. WITH ALL CONTROL SWITCHES IN THE OFF POSITION, THE AMPLIFIER WILL NOT BE FUNCTIONED ON AND, THEREFORE, IT WILL ACT AS A STRAIGHT THROUGH INTERCONNECTION PROVIDING NO SIGNAL AMPLIFICATION.

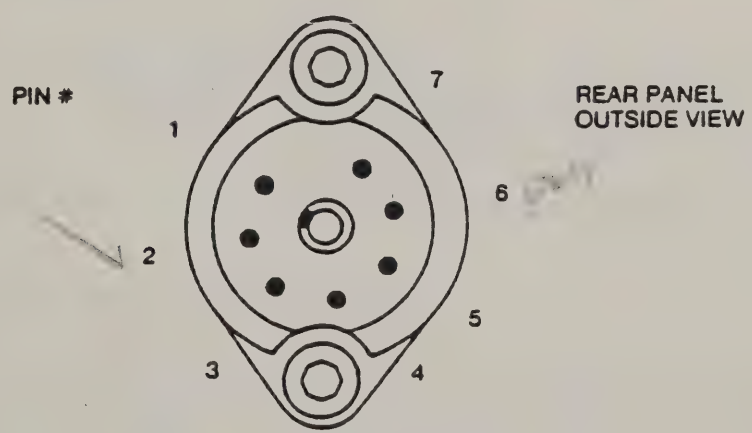
TURNING ON THE PREAMP SWITCH CAUSES THE INTERNAL LOW-NOISE AMPLIFIER (LNA) TO BE SWITCHED IN DURING RECEIVE AND TO BE KEYED OUT DURING TRANSMIT. THIS SWITCH MAY BE USED TOGETHER OR SEPARATELY FROM THE AMPLIFIER IN/OUT SWITCH. WHEN SWITCHED "IN" THE GREEN STATUS LIGHT SHOULD ILLUMINATE AND THE PREAMP SHOULD FUNCTION PER THE SPECIFICATIONS. UPON TRANSMIT, THE RF SENSING CIRCUIT SWITCHES OUT THE PREAMP TO PREVENT DAMAGE TO THE LNA SYSTEM, AND UPON RECEIVE THE PREAMP IS SWITCHED BACK IN.

C) MODE CONTROL

WITH THE MODE SWITCH UPWARDS IN THE "FM" POSITION, THE T/R SWITCHING DELAY TIME IS AT A MINIMUM. THIS ALLOWS FM OPERATION WITH FAST TWO-WAY TRANSMISSONS AND NO NOTICABLE AMPLIFIER SWITCHING TIME.

WHEN THE MODE SWITCH IS IN THE "CW-SSB" POSITION, A TIME DELAY IS INCORPORATED IN THE T/R SWITCHING, AND THE DELAY TIME IS ADJUSTABLE FROM THE POTENTIOMETER LOCATED ON THE REAR PANEL. THIS DELAY FUNCTIONS TO HOLD THE AMPLIFIER IN THE AMPLIFY (TRANSMIT) MODE DURING PAUSES IN VOICE TRANSMISSON OR BREAKS BETWEEN CODE SENDING. DELAY PERIODS OF UP TO 2-4 SECONDS ARE AVAILABLE. NOTE THAT THE AMPLIFIER IS ALWAYS OPERATING IN THE LINEAR MODE REGARDLESS OF THE MODE SWITCH SETTING.

REMOTE CONTROL FEATURES



REMOTE ACCESSORY SOCKET

REMOTE ACCESSORY SOCKET PINOUT

1. FM/SSB EXTERNAL CONTROL
   WITH FRONT PANEL IN CW-SSB POSITION
   GROUND FOR FM, OPEN FOR CW-SSB

2. DIRECT KEYING (PTT)
   GROUND FOR PA AMPLIFY MODE

3. NO CONNECTION

4. NO CONNECTION

5. REMOTE CONTROL OPERATION
   WHEN UNGROUNDED, PA CANNOT BE ACTIVATED.
   (CUT INTERNAL GROUND TO ENABLE THIS)

6. GROUND

7. LED READOUT CONTROL
   WHEN UNGROUNDED, FRONT LED LIGHTS ARE
   INOPERATIVE, EXCEPT FOR "RF" LED.
   (CUT INTERNAL GROUND TO ENABLE THIS)

GENERAL COMMENT ON PTT OPERATION:

FOR HARD KEYING THE AMP, PUT FRONT PANEL MODE SWITCH IN "FM" MODE. THEN CONNECT PIN 2 OF THE REMOTE PLUG TO YOUR XCVR'S PTT OUTPUT AND PIN 6 TO GROUND. THE XCVR'S PTT SHOULD GROUND ON XMIT AND REMAIN NEAR +12V ON RECEIVE. KEYING THE XCVR'S MIC WILL KEY THE POWER AMPLIFIER INTO THE "RF ON" CONDITION AND RETURN THE AMPLIFIER TO "RF OFF" IMMEDIATELY UPON UNKEYING.

TEMPERATURE CONSIDERATIONS

NORMAL OPERATION OF THE AMPLIFIER USING INTERMITTENT DUTY (ICAS RATINGS) WILL ALLOW THE DISSIPATED POWER TO ADEQUATELY CONVECTION COOL TO THE AIR VIA THE HEATSINK FINS. THE FINS MUST BE MOUNTED FACING UPWARDS TO PERMIT THE COOLING, AND ADEQUATE AIR SPACE MUST BE ALLOWED (SEE INSTALLATION - MOUNTING). IT IS IMPORTANT THAT THE AMPLIFIER'S HEATSINK TEMPERATURE REMAIN WITHIN ACCEPTABLE LEVELS IN ORDER TO ALLOW PROPER AMPLIFIER OPERATION AND TO PREVENT DAMAGE TO INTERNAL COMPONENTS. THE ACCEPTABLE DUTY LEVELS ARE 50% OR LESS WITH TRANSMISSON DURATIONS LESS THAN 1 MINUTE AND HEATSINK TEMPERATURES LESS THAN +60 DEGREES CENTIGRADE.

IF THE HEATSINK TEMPERATURE DOES RISE ABOVE +65 DEGREES CENTIGRADE DURING OPERATION, A TEMPERATURE THERMOSTAT SWITCH WITHIN THE UNIT SWITCHES OFF THE POWER AMPLIFYING MODE. UPON SWITCHING, THE UNIT MUST COOL DOWN 15 DEGREES BEFORE THE SWITCH RESETS TO ALLOW THE AMPLIFIER TO AGAIN OPERATE. THIS FAILSAFE FEATURE PREVENTS ACCIDENTAL KEYING OR EXTENDED OPERATION FROM CAUSING AMPLIFIER DAMAGE.

IF LONG TRANSMISSONS ARE REQUIRED, THE UNIT'S HEATSINK MUST BE COOLED BY EITHER FORCED AIR OR CONDUCTIVELY COOLED TO A COOL BODY. FORCED AIR IS THE BEST MEANS AND CAN BE PERFORMED WITH A SMALL BOXER TYPE FAN. TE SYSTEMS SUGGESTS ACTIVATING THE FAN FROM THE REMOTE ACCESSORY SOCKET AND INCORPORATING A TIME DELAY TO ALLOW THE FAN TO RUN SLIGHTLY OVER THE TOTAL TRANSMISSON TIME. CONTACT TE SYSTEMS OR ITS AGENT FOR APPLICATION ASSISTANCE ON THIS.

SECTION IV

THEORY OF OPERATION

RF POWER AMPLIFICATION:

WHEN A TRANSMITTED SIGNAL FROM A TRANSCEIVER IS APPLIED TO THE "XCVR" PORT AND THE UNIT IS SWITCHED ON, A SMALL AMOUNT OF SIGNAL IS COUPLED OFF, DETECTED, AND ACTIVATES THE T/R SWITCHING CONTROL CIRCUITRY. THE T/R RELAYS THEN CLOSE AND THE INCOMING SIGNAL TRAVELS TO THE RF POWER AMPLIFIER STAGES. UPON TERMINATION OF THE TRANSMITTER'S SIGNAL, THE T/R SWITCHING CIRCUITRY SENSES THE LOSS OF RF AND THE RELAYS RETURN TO THEIR NORMALLY CLOSED POSITION AND RF AMPLIFICATION IS TERMINATED.

THE RF POWER AMPLIFICATION SCHEME IS ONE STAGE DRIVING TWO PARALLEL CONNECTED STAGES. THE FIRST STAGE AMPLIFYS THE INCOMING SIGNAL, WHEREUPON, IT IS DIVIDED AND DRIVES EACH SECOND STAGE EQUALLY. THE TWO OUTPUT STAGE POWERS ARE ADDED IN PHASE AND THE RESULTANT SIGNAL PASSES THROUGH THE T/R RELAY, THE OUTPUT FILTER, AND TO THE "ANTENNA" CONNECTOR.

EACH AMPLIFIER STAGE IS RUN IN A CLASS A-B BIASED CONFIGURATION THAT ALLOWS GREATLY IMPROVED LINEARITY AND SMOOTH POWER TRANSFER PERFORMANCE. THE BIAS ARRANGEMENT IS HARD BIASED TO MAKE BIAS CHANGES LESS SENSITIVE TO RF LEVELS AND SILICON DIODES ARE USED TO PROVIDE THERMAL BIAS TRACKING IN THE RF POWER TRANSISTORS.

TE SYSTEMS HAS DESIGNED EACH STAGE TO HAVE A LOW Q PERFORMANCE. THIS ALLOWS WIDER RF RESPONSE WHILE KEEPING RF LOSSES AT A MINIMUM. THE RESULT IS A RF POWER AMPLIFIER WITH PERFORMANCE OVER A LARGE SEGMENT OF THE BAND WITHOUT RETUNING. EFFICIENCY IS KEPT HIGH BY STATE-OF-THE-ART DESIGN AND QUALITY COMPONENTS THAT MINIMIZE HEAT DISSIPATION AND REDUCE CURRENT CONSUMPTION.

ALL DC CONTROL CIRCUITS ARE APPROPRIATELY BYPASSED TO ELLIMINATE POSSIBLE RF SPURIOUS PRODUCTS. LOW FREQUENCY FEEDBACK CIRCUITS ARE INSTALLED WHERE NEEDED TO PREVENT LOW FREQUENCY SPURIOUS PRODUCTS ATTRIBUTABLE TO COMMON EMITTER VHF/UHF POWER TRANSISTORS.

FINALLY, THE AMPLIFIED SIGNAL IS APPLIED TO THE AMPLIFIER'S LOW PASS FILTER AND ON TO THE ANTENNA PORT CONNECTOR. EACH MODEL INCORPORATES A LOW PASS FILTER DESIGNED SPECIFICALLY FOR THE FREQUENCY RANGE WHICH ALLOWS MAXIMIZATION OF THE STOPBAND ATTENUATION FOR THE HARMONICS AND MINIMIZATION OF THE LOSS INBAND.

RECEIVE LNA:

WHEN THE FRONT PANEL PREAMP SWITCH IS ACTIVATED TO THE "ON" POSITION, THE INCOMING SIGNAL IS FED INTO THE RECEIVE PREAMP. THE SIGNAL IS APPLIED TO THE LOW NOISE GAAS FET DEVICE BY IMPEDANCE MATCHING THE SIGNAL TO THE GATE OF THE DEVICE. IN THIS CASE, IMPEDANCE MATCHING IS ACTUALLY NOISE FIGURE MATCHING SUCH THAT A MINIMUM NOISE FIGURE PERFORMANCE IS ACHIEVED. THE AMPLIFIED SIGNAL IS THEN FREQUENCY MATCHED INTO A BANDPASS FILTER AND THEN TO THE 50 OHM OUTPUT (ANTENNA PORT).

SELECTIVITY IS ACHIEVED BY THE FREQUENCY SELECTIVE INPUT MATCH AND THE SINGLE POLE FILTER AT THE DEVICE'S OUTPUT. THE USE OF THE ADDITIONAL OUTPUT SELECTIVITY FURTHER ENHANCES OUT-OF-BAND SIGNAL REJECTION WITH ONLY MINIMAL IN-BAND SIGNAL ATTENUATION. THE GAIN VARIATION IS TYPICALLY 1 - 2 DB WITHIN 10% OF THE CENTER BAND. THIS IS SUFFICIENT ENOUGH TO NOT CAUSE RECEIVING VARIATIONS WITHIN THE BAND.

PROPRIETARY CIRCUITRY IS EMPLOYED TO INHIBIT THE TRANSMIT SIGNAL FROM DAMAGING THE SENSITIVE LOW-NOISE GAAS FET DEVICE. THEREFORE, THE APPLICATION OF HIGH POWER TRANSMIT SIGNALS CANNOT CAUSE GAAS FET DEVICE FAILURE. UPON TRANSMITTING, THE T/R RELAYS ACTIVATE IMMEDIATELY TO SWITCH THE TRANSMITTED SIGNAL AWAY FROM THE PREAMP AND INTO THE RF POWER AMPLIFIER SECTION. ADDITIONALLY, SINCE THE PREAMP IS PROTECTED FROM RF BURNOUT, OTHER ATMOSPHERIC SIGNAL TRANSCIENTS COMING FROM THE ANTENNA ARE LESS LIKELY TO CAUSE GAAS FET DEVICE FAILURE.

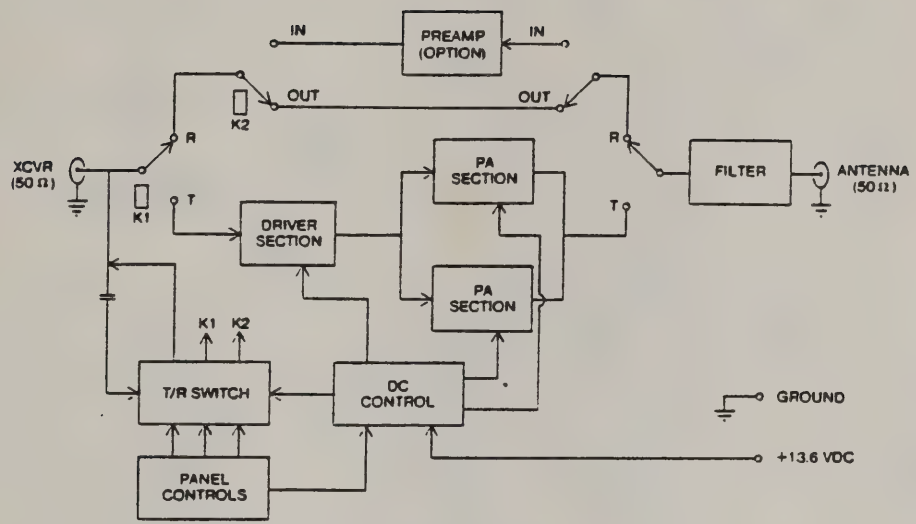
T/R SWITCHING

AS MENTIONED IN THE SECTION "RF POWER AMPLIFICATION" THE AMPLIFIER'S TRANSCEIVE SWITCHING IS DONE BY RELAYS DRIVEN BY THE T/R SWITCHING DC CONTROL CIRCUIT. WITH NO TRANSMITTED SIGNAL APPLIED, THE MAIN T/R RELAY REMAINS ALWAYS IN THE RECEIVE POSITION AND (WITH THE PREAMP OPTION) THE RECEIVE PREAMP RELAY MAY OR MAY NOT BE SWITCHED IN.

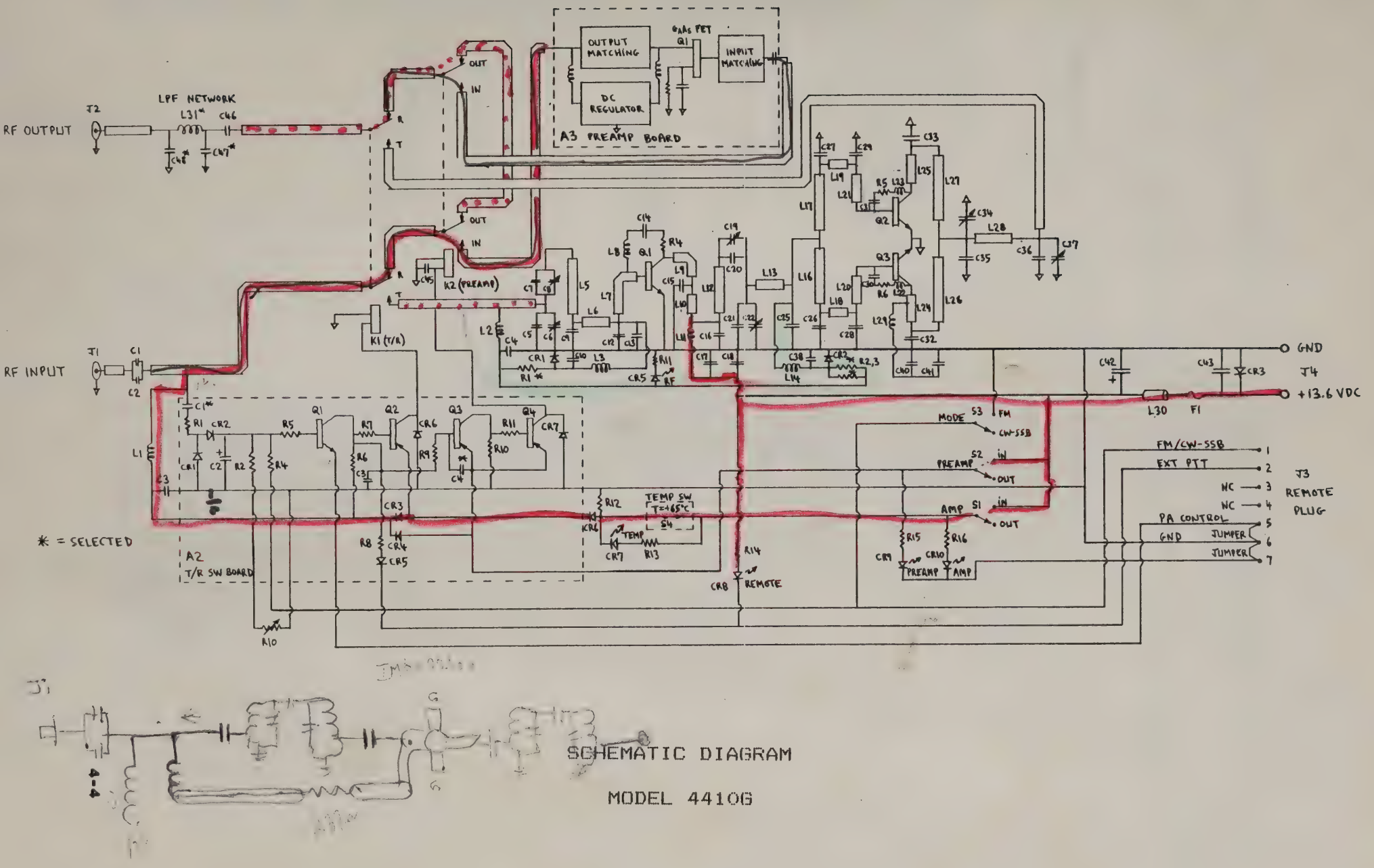
WHEN TRANSMISSION COMMENCES, THE MAIN T/R RELAY IS DRIVEN TO SWITCH THE INCOMING SIGNAL TO THE AMPLFYING STAGES. IF OPTIONED, THE PREAMP RELAY IS SIMULTANEOUSLY DRIVEN TO SWITCH OUT THE PREAMP AND DISCONNECT ITS DC VOLTAGE.

IN ALL FRONT PANEL SWITCHING CONFIGURATIONS, THE RECEIVE GAAS FET PREAMP IS PROTECTED FROM RF BURNOUT ATTRIBUTABLE TO THE INCOMING RF SIGNAL OR THE AMPLIFIED SIGNAL. THIS UNIQUE FEATURE ALLOWS THE USAGE OF HIGH QUALITY, LOW-NOISE GAAS FET DEVICES IN THE RECEIVE PREAMP YIELDING SUPERIOR RECEIVING PERFORMANCE UNOBTAINABLE HERETOFORE.

BLOCK DIAGRAM



SYSTEM BLOCK DIAGRAM



SCHEMATIC DIAGRAM

MODEL 4410G

****
**** ****** NUMBER: PL4410G, REV - *******
**** PARTS LIST ****** TE SYSTEMS *******
**** ****** *******
****

REF. DESIGNATION	QUANTITY	DESCRIPTION
A1	1	MAIN PC BOARD
A2	1	T/R SWITCH PC BOARD
A3	1	GAAS FET PREAMP(VHF)
A1C1,A1C2,A1C3	3	500PF CHIP CAP.
A1C4,A1C10,A1C38	3	.001MF DISC CAP.
A1C8,A1C37	2	20PF VARIABLE CAP.
A1C12,A1C15,A1C28 A1C29,A1C32,A1C33	6	40PF SM CAP.
A1C14,A1C30,C1C31	3	.05UF DISC CAP.
A1C16,A1C25	2	10PF METAL CAP.
A1C17	1	1000PF SM CAP.
A1C20,A1C40,A1C46	3	1000PF METAL CAP.
A1C35	1	8PF METAL CAP.
A1C18,A1C41,A1C43	3	.01UF DISC CAP.
A1C42	1	470UF ELECTROLYTIC
A1C47	1	SELECTED METAL CAP.
A1C48	1	SELECTED METAL CAP.
A1C5,A1C6,A1C7,A1C9, A1C13,A1C19,A1C21,A1C22,A1C26,A1C27,A1C34,A1C36		NOT USED
A2C1	1	SELECTED DISC CAP.
A2C2	1	5UF ELECTROLYTIC
A2C3	1	.001UF DISC CAP.
A2C4	1	SELECTED CAP.
A1CR1,A1CR2	2	SILICON DIODE, 3A
A1CR3	1	SILICON DIODE, 6A
A1CR5,A1CR7,A1CR8	3	LED-RED
A1CR6	1	SILICON DIODE, 1A
A1CR9,A1CR10	2	LED-GREEN
A2CR1,A2CR2,A2CR5	3	SILICON SW DIODE
A2CR3,A2CR4,A2CR6,A2CR7	4	SILICON DIODE, 1A
A1F1	1	35A FUSE
A1FH1	1	FUSEHOLDER
A1H1	12	4-40X1/4 SHCS
A1H2	6	4-40X5/16 SHCS
A1H3	12	4-40X3/8 SHCS
A1H4	4	4-40X1/2 SHCS
A1H5	38	#4 SPLIT LKWSHRS
A1H6	2	#4 FLAT WASHERS .016
A1H7	18	#4 FLAT WASHERS .032
A1H8	8	4-40X1/4 BLACK OX
A1J1-2	2	RF CONNECTOR(SELECTED)
A1J3	1	DC REMOTE JACK(F)

A1J4	1	DC POWER PLUG(M)
A1J5	1	DC REMOTE PLUG(M)
A1J6	1	DC POWER PLUG(F)
A1J6,A1J7,A1J8	3	LED MOUNT ASSY
A1K1	1	RELAY 2FORMC
A1K2	1	RELAY 2FORMC
A1L1,A1L2,A1L3,A1L14	4	RF CHOKE
A1L8,A1L22,A1L23	3	RF CHOKE
A1L11,A1L29	2	COIL CHOKE
A1L30	1	LARGE FB CHOKE
A1L31	1	COIL, SELECTED
A1MP1	1	HEATSINK
A1MP2	1	FRONT PANEL 4410G
A1MP3	1	REAR PANEL
A1MP4	1	COVER
A1MP5	1	HEAT PLATE
A1MP6	2	CONN SPACER
A1Q1	1	TRANSISTOR NPN TES44100
A1Q2-3	2	TRANSISTOR NPN SELECTED
A2Q1	1	TRANSISTOR NPN SW
A2Q2,A2Q3,A2Q4	3	TRANSISTOR PNP SW
A1R1	1	RESISTOR, SELECTED
A1R2,A1R3	2	RESISTOR, SELECTED
A1R4	1	RESISTOR 3.9 OHM
A1R5,A1R6	2	RESISTOR 15 OHM, 1W
A1R10	1	POT 500K, .5W
A1R11-16	6	RESISTOR 1K, .25W
A2R1	1	RESISTOR 100, 1W
A2R2	1	RESISTOR 22K, .25W
A2R4	1	RESISTOR 5.6K, .25W
A2R5,A2R9	2	RESISTOR 4.7K, .25W
A2R6	1	RESISTOR 1K, .25W
A2R7,A2R11	2	RESISTOR 10K, .25W
A2R8,A2R10	2	RESISTOR 470, .25W
A1S1,A1S2	2	SWITCH SPDT W/LED
A1S3	1	SWITCH SPDT
A1S4	1	THERMOSTAT 65 DEG C

SECTION V

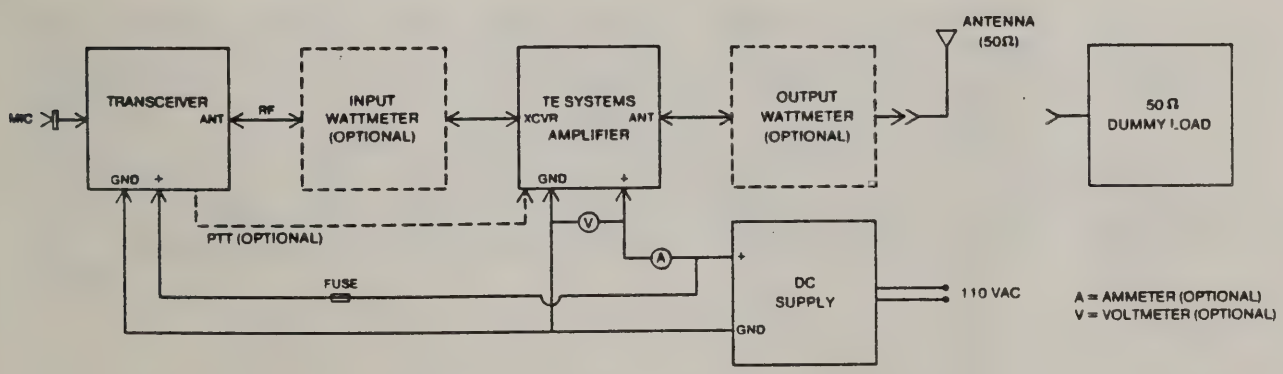
MAINTENANCE

INTRODUCTION

THIS SECTION OF THE MANUAL CONTAINS PERFORMANCE TEST AND ADJUSTMENT PROCEDURES DESIGNED TO ALLOW FIELD CHECKS AND ADJUSTMENT OF THE UNIT. AS WITH ALL ELECTRONIC EQUIPMENT, SUCH ADJUSTMENTS MAY BE NECESSARY FROM TIME TO TIME TO ALLOW THE UNIT TO PERFORM AT ITS OPTIMUM PERFORMANCE LEVEL. THE FOLLOWING TESTS AND ADJUSTMENTS SHOULD BE PERFORMED BY PERSONS TECHNICALLY KNOWLEDGEABLE IN THE SPECIFIC AREA OF CONCERN. ACCURACY OF RESULTS WILL DEPEND ON THE QUALITY OF MEASUREMENT EQUIPMENT; THEREFORE, THE USE OF HIGH-GRADE, LAB QUALITY TEST EQUIPMENT IS ENCOURAGED.

RF PA ADJUSTMENT

REMOVE THE EIGHT SCREWS THAT SECURE THE AMPLIFIER COVER AND LIFT OFF THE U-SHAPED COVER. NOTE THE FRONT AND BACK OF THE COVER SO THAT IT CAN BE EASILY REFITTED AFTER TESTING. THIS IS DESIRABLE SINCE THE COVER IS NOT SYMMETRIC AND REFITTING IS MORE EASILY FACILITATED WITH THE PROCEDURE OUTLINED. MOUNT THE AMPLIFIER UNDER TEST WITH THE FINS DOWNWARD AND THE INTERNAL COMPONENTS FACING UPWARDS.



OPERATIONAL / TEST SET-UP FOR AMPLIFIER

NEXT CONNECT THE AMPLIFIER UNDER TEST AS SHOWN IN THE OPERATIONAL/TEST DIAGRAM ABOVE. THE FOLLOWING TECHNICAL POINTS OF INTEREST SHOULD BE NOTED BEFORE ACTUAL RF TESTING COMMENCES:

A) CAPABILITY OF MEASURING THE VOLTAGE APPLIED TO THE UNIT DURING FULL POWER DRIVE IS NECESSARY IN ASSURING PROPER OPERATION OF THE UNIT. IF THE DC VOLTAGE IS NOT 13.6 VDC UNDER FULL LOAD, A SIGNIFICANT POWER OUTPUT DROP MAY BE EVIDENT, THEREBY, ASSURING SPECIFICATION NONCOMPLIANCE.

B) ALL CABLE CONNECTIONS SHOULD BE DONE WITH HIGH QUALITY LOW LOSS 50 OHM CABLES THAT USE GOOD QUALITY RF CONNECTORS USABLE AT THE TEST FREQUENCY. BNC AND N STYLE CONNECTORS ARE EXCELLENT AND UHF CONNECTORS MAY BE USED ALSO IF PROPER ATTENTION IS GIVEN TO THEIR ASSEMBLY AND CONNECTION.

C) THE ANTENNA OR 50 OHM LOAD SHOULD PRESENT A VERY LOW VSWR TO THE AMPLIFIER SO THAT TUNING ADJUSTMENT CAN BE OPTIMIZED FOR A 50 OHM SYSTEM AND MAXIMUM FORWARD POWER IS OBTAINABLE.

PERFORMANCE CHECKS

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1. OUTPUT POWER

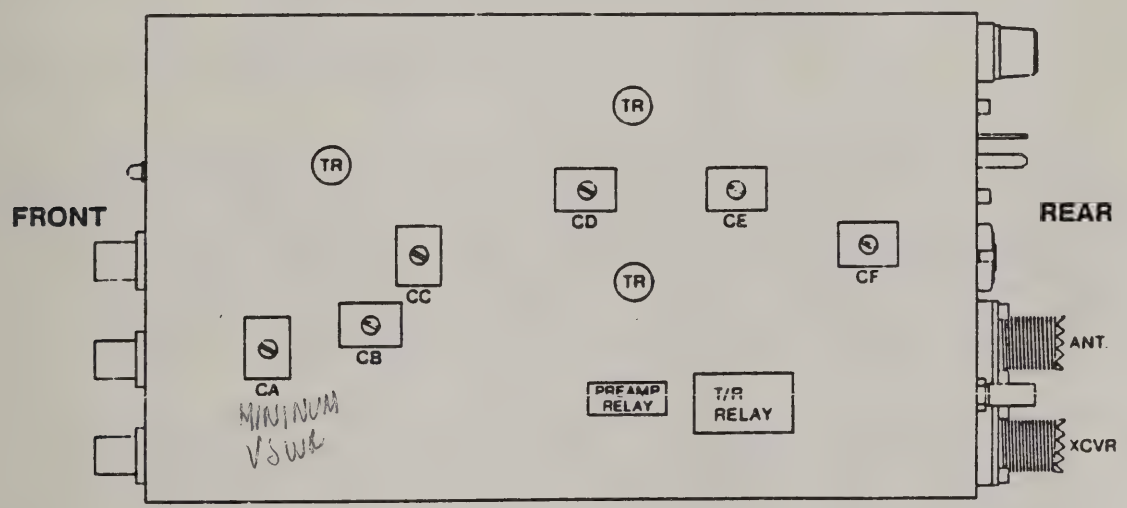
WITH THE SYSTEM CONNECTED AS SHOWN ABOVE IN THE OPERATIONAL/TEST SET-UP DIAGRAM AND ALL SWITCHES "OFF", APPLY DC VOLTAGE AND FULL RF DRIVE. THE OUTPUT POWER METER SHOULD SHOW POWER OUT SLIGHTLY LESS THAN THE INPUT DRIVE POWER.

NEXT MAKING SURE A LOW VSWR ANTENNA LOAD IS CONNECTED, TURN THE AMPLIFIER IN/OUT SWITCH TO "ON". THE OUTPUT POWER METER SHOULD RISE GREATLY TO THE SPECIFIED POWER OUT AND THE CURRENT METER (IF CONNECTED) SHOULD INDICATE THE APPROXIMATE SPECIFIED CURRENT. THE INPUT POWER METER SHOULD INDICATE THE LEVEL OF APPLIED INPUT POWER AND SHOW VERY LITTLE, IF ANY, REFLECTED POWER. IF THE POWER SPECIFICATIONS ARE NOT MET WITHIN 5%, THE UNIT CAN BE CHECKED FURTHER PER THE TUNING ADJUSTMENTS SECTION BELOW.

2. TUNING ADJUSTMENTS

THE FOLLOWING DIAGRAM AND CHART SHOW THE TUNING ADJUSTMENTS THAT CAN BE PERFORMED TO THE AMPLIFIER UNIT. THE UNIT SHOULD BE CONNECTED AS DESCRIBED ABOVE AND CALIBRATED, ACCURATE TEST INSTRUMENTATION BE USED.

TOP VIEW WITH COVER REMOVED



CA	INPUT VSWR TUNING ADJUSTMENT
CB	NOT USED
CC	NOT USED
CD	NOT USED
CE	NOT USED
CF	OUTPUT POWER TUNING ADJUSTMENT

A. INPUT VSWR

WITH THE AMPLIFIER UNDER TEST CONNECTED AS SHOWN ABOVE IN THE OPERATIONAL/TEST SET-UP DIAGRAM AND INPUT POWER APPLIED AT THE FREQUENCY SPECIFIED, ADJUST TRIMMER CAPACITOR "CA" FOR MINIMUM REFLECTED POWER AS MEASURED ON THE INPUT POWER METER. THE FINAL INPUT VSWR SHOULD BE $<1.5:1$ ACROSS THE BAND.

B. OUTPUT POWER

NEXT CHECK THE UNIT FOR OUTPUT POWER AS MEASURED BY THE OUTPUT POWER METER. THE READING SHOULD BE WITHIN 5% OF THE SPECIFIED LEVEL. IF IT IS NOT, THE TRIMMER CAPACITORS "CC" AND "CF" CAN BE ADJUSTED FOR MAXIMUM OUTPUT POWER. WHILE THE AMPLIFIER IS FACTORY TUNED FOR MAXIMUM POWER INTO A VERY LOW VSWR OUTPUT LOAD, SOME INSTALLATIONS CAN BE FURTHER OUTPUT POWER OPTIMIZED BY PERFORMING THE ABOVE ADJUSTMENT. AS A FINAL CHECK, THE AMPLIFIER SHOULD BE CHECKED FOR SPECTRUM CLEANLINESS USING A HIGH QUALTIY LABORATORY SPECTRUM ANALYZER.

RECEIVE LNA ADJUSTMENT:

PROPER ALIGNMENT OF THE LNA CAN ONLY BE PERFORMED USING INSTRUMENTATION CAPABLE OF MEASURING AMPLIFIER NOISE FIGURE AND ASSOCIATED GAIN. EQUIPMENT SUCH AS THE HEWLETT PACKARD 8970A OR THE EATON 2075 ARE IDEAL FOR SUCH MEASUREMENTS. ALTERNATIVELY, SEPARATE GAIN AND NOISE FIGURE MEASUREMENTS CAN BE MADE USING OTHER EQUIPMENT BUT THE MEASUREMENT ACCURACY MAY NOT BE GOOD, ESPECIALLY WITH NOISE FIGURES BELOW 1 DB.

ASSUMING RECENT NOISE FIGURE INSTRUMENTATION IS AVAILABLE, THE NOISE SOURCE IS CONNECTED TO THE "ANTENNA" PORT OF THE AMPLIFIER UNDER TEST, AND THE INSTRUMENTS I.F. INPUT IS CONNECTED TO THE AMPLIFIER'S "XCVR" PORT. USING A SWEPT OSCILLOSCOPE DISPLAY ACROSS THE SPECIFIED FREQUENCY BAND, ALL THE TRIMMERS AND TUNING COILS ARE ADJUSTED FOR MINIMUM NOISE FIGURE AND MAXIMUM ASSOCIATED GAIN. THE FINAL TUNING RESULTS SHOULD AGREE WITH THE SPECIFIED DATA TO THE FOLLOWING TOLERANCE PERCENTAGES: NOISE FIGURE 20%, GAIN 10%. NOTE THAT THE INPUT TRIMMERS CAN BE TUNED EITHER SIDE OF MAXIMUM GAIN WITH THE NOISE FIGURE MINIMIZATION OCCURING ON ONLY ONE SIDE. THE INPUT TRIMMER(S) SHOULD ALWAYS BE TUNED FOR MINIMUM NOISE FIGURE AT THE FREQUENCY OF INTEREST.

TE SYSTEMS LNA DESIGN EMPLOYS AN ADDITIONAL OUTPUT SELECTIVITY SECTION TO ENHANCE OUT-OF-BAND SIGNAL REJECTION. THIS INCREASED AMPLIFICATION Q HAS MINIMAL IN-BAND GAIN-REDUCTION BUT GREATLY REMOVES THE POSSIBILITY OF ADJACENT OUT-OF-BAND SIGNAL MIXES OCCURRING FROM UNDESIRED SIGNAL OVERLOADING.