Model 625A
FM Transmitter

TECHNICAL MANUAL

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SPARTA
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A DIVISION OF COMPUTER EQUIPMENT CORPORATION

WARNING

THIS UNIT CONTAINS HIGH VOLTAGE, HIGH CURRENT POWER SUPPLIES.

Potentials up to **8000 volts*** at lethal current levels are present and exposed to maintenance personnel working with power on and interlocks defeated.

When maintenance requires working with power on and unit open, exercise extreme caution. Stand on insulated surface. Work with only one hand inside unit. Use only high voltage insulated tools. Have second person standing by at all times.

* Depending upon transmitter being used.

SPARTA
ELECTRONIC CORPORATION

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SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

This manual contains information required to install, operate, and maintain the SPARTA Model 625A FM Transmitter. Section I describes the transmitter and lists its specifications, Section II provides installation instructions, Section III contains operating procedures and Section IV describes the principle of operation. Maintenance procedures and troubleshooting diagrams are contained in Section V, and replaceable parts are identified and listed in Section VI. A complete operating and servicing manual covering the Model 680 FM Exciter and Model 602 FM transmitter is provided separately.

1-2. GENERAL DESCRIPTION

The Model 625A FM Transmitter (Figure 2-2) provides an output of 25 kilowatts in the frequency range from 88 to 108 MHz, and is type-accepted by the Federal Communications Commission under Part 73, Broadcast Services.

As shown in figure 1-1, the transmitter consists basically of three sections. The left-hand section contains the FM exciter and driver, together with associated metering, control and power circuitry. This section is denominated DRIVER throughout this instruction book and consists of a complete and independent one 2.5 KW transmitter, model 602A.

The second section contains the power amplifier (PA) and its associated metering, control, and high voltage filtering components. The right-hand section is the transformer vault and it contains the plate transformer, H.V. rectifiers and contactors plate.

The PA cavity is cooled by a high-speed blowers and each of the two cabinet sections are scavenged of incidental warm air by ventilating fans. The circuit design of the blower furnishing air to the PA cavity is such that it will continue to run for a preset interval after the transmitter is shut down to remove residual heat.

The Model 625A design includes such features as automatic power control and automatic overload recycling. Once the transmitter has been tuned to its authorized rated power output, the automatic power control circuit maintains this RF output level regardless of mains power fluctuations. The overload recycle circuit automatically restores the transmitter to normal operation following a momentary current overload in the monitored circuits. Consecutive recycling is limited to three times within 30 seconds following the operation of any overload relay. If the overload exists after a maximum of 3 recycles, the transmitter high-voltage circuits will remain off until the overload is reset manually. Tally lights mounted on the driver and PA control panels are triggered by their associated overload relay. These lamps will remain lighted after a momentary overload to identify the circuit where the overload occurred. Only three transmitting tubes are used in the high-level stages: a 4X150A tetrode (driver), a 5CX1500A pentode (driver), and a 3CX15000A7 triode (PA).

RF excitation is provided by the Model 680 FM Exciter, which is an all-solid-state unit that provides monaural, stereophonic and Subsidiary Communications Authorization (SCA) modes of operation in accordance with FCC and international standards. The Modulation method is "direct FM" with no mixers or multipliers after the modulated oscillator.

Connections are provided to allow remote transmitter master start, plate power on-off, and power trim. Provisions are also included for remote metering of PA plate voltage, plate current and power output.

1-2.1. Physical Characteristics

Physical characteristics of the Model 625A excluding the Model 680 FM Exciter, are given in table 1-1. Physical characteristics of the Model 680 and Model 602A are given in paragraph 1-2.1 of its individual operating and servicing manual.

Table 1-1. Physical Characteristics

Cabinet Dimensions:	75 inches high, 68 inches wide, 24 inches deep
Transformer Vault:	36 inches high, 34 inches wide, 24 inches deep
Weight:	2750 pounds
Cabinet Style:	Two enclosed steel cabinets; access provided through hinged front panels and rear cabinet doors. One transformer vault.
Input/Output Connections	
a. RF Output:	3-1/8 inch coaxial line flange
b. Audio Inputs:	Barrier strip
Cooling Provisions	
a. Driver Cavity:	One 1-phase 530 cfm blower
b. PA Cavity:	Two 1-phase 530 cfm blower
c. Cabinet:	One 1-phase 750 cfm fan (PA section) One 1-phase 750 cfm fan (Transformer vault)
Ambient Temperature:	To 50° C, (122°F); continuous duty at rated power output
Altitude:	To 7,500 feet; continuous duty at rated power output
Humidity:	0 to 95%

1-2.2. Functional Characteristics

Functional characteristics of the Model 625A excluding the Model 680 FM Exciter, are given in table 1-2. Functional characteristics of the Model 680 are given in paragraph 1-2.2 of its individual operating and servicing manual.

Table 1-2. Functional Characteristics

Frequency Range:	88 to 108 MHz
Type of Emission:	F3, F9 frequency modulation
RF Power Output:	25 Kilowatts
RF Power Output Capability:	25 Kilowatts maximum; adjustable down to 17 kilowatts as measured at output of the harmonic filter
Output Impedance:	50 Ohms, nominal
VSWR:	1.75/1 maximum
Frequency Stability:	± 1 KHz
Modulation Capability:	± 75 KHz (100%)
RF Bandwidth:	± 750 KHz at 3 DB points
Harmonic Attenuation:	-80 DB minimum below carrier amplitude
FM Noise Level:	65 DB below 100% modulation at 400 Hz
AM Noise Level:	55 DB rms below a reference of 100% AM carrier
Input Line Voltage:	200 to 250 vac, 3-phase, 60 Hz., 4-wire (50 Hz on special order)
Permissible Line Voltage Variation:	± 5% from nominal
Power Line Input:	39 KW maximum at 0.9 power factor
Tube Complement:	One 4X150A; one 5CX1500A (driver); and one 3CX15000A7
Controls and Indicators:	See table 3-1
Remote control and Metering:	Terminal board provided for remote control and metering connections
Overload Relay Protection:	Overload relays protect against excess current in the following circuits: 1. DR Plate (Driver Section) 2. Final Screen (Driver Section) 3. Final Plate (Driver Section) 4. PA Grid

Table 1-2. Functional Characteristics (Continued)

	5. PA Plate
	6. VSWR
Overload Indicators:	One overload indicator and six overload tally lights. (See table 3-1)
Other Protective Devices:	Eight Panel-mounted fuses and two internal circuit breakers. Two additional fuses mounted on rear panel of exciter.

1-3. MODULE EQUIPMENT

The Model 680 FM Exciter is standard equipment and provides the capability of monaural FM operation.

The following units, which are available from SPARTA ELECTRONIC CORPORATION provide the Model 625A with the capability of stereophonic and SCA operation:

a. Stereo Generator - Model 682

b. SCA Generator - Model 683 (41 or 67 KHz)

When operating in the monaural mode, the 41 KHz and 67 KHz SCA units may be used individually or simultaneously. When operating in the stereophonic mode, the 41 KHz generator must be muted. However, the 67 KHz generator can be used in combination with the stereo generator in any mode of operation without program interruption if an optional 5 KHz filter kit is installed.

The 5 KHz filter kit (091-5971-01) may be specified for initial installation by SPARTA ELECTRONIC CORPORATION or it can be added to the SCA module at a later date. The kit consists of a low-pass filter which limits the SCA input band-width to 5 KHz. In addition to the input filter, the sub-carrier deviation should be limited to 6% to avoid interference with the stereo channel.

SECTION II
INSTALLATION

2-1. INSTALLATION PLANNING

Dimensions essential to know for proper installation of the Model 625A FM Transmitter are shown in figures 2-1 and 2-2.

2-1.1. Environmental Requirements

Location of the Model 625A must be within the following environmental requirements:

a.	Maximum altitude:	10,000 feet
b.	Maximum temperature:	+ 50° C (+ 122° F)
c.	Minimum temperature:	-25° C (-45° F)
d.	Maximum humidity:	95%

2-1.2. Space Requirements

When installing the Model 625A it is important that sufficient space be left at the front and rear to permit full opening of the front access panels and rear cabinet doors. As shown in figure 2-1, at least 27 inches of space must be allowed in front of the cabinet and the unit should be placed with the rear no closer than 30 inches from the wall.

Adequate overhead space must be provided to permit the RF output connection to be made and to allow for adequate dispersal of cooling air discharged at the top of the cabinet. A minimum distance of two feet from the cabinet top to the ceiling is recommended.

2-1.3. Power Requirements

Requirements for input power and power consumption are specified in table 1-2, functional characteristics, in Section I.

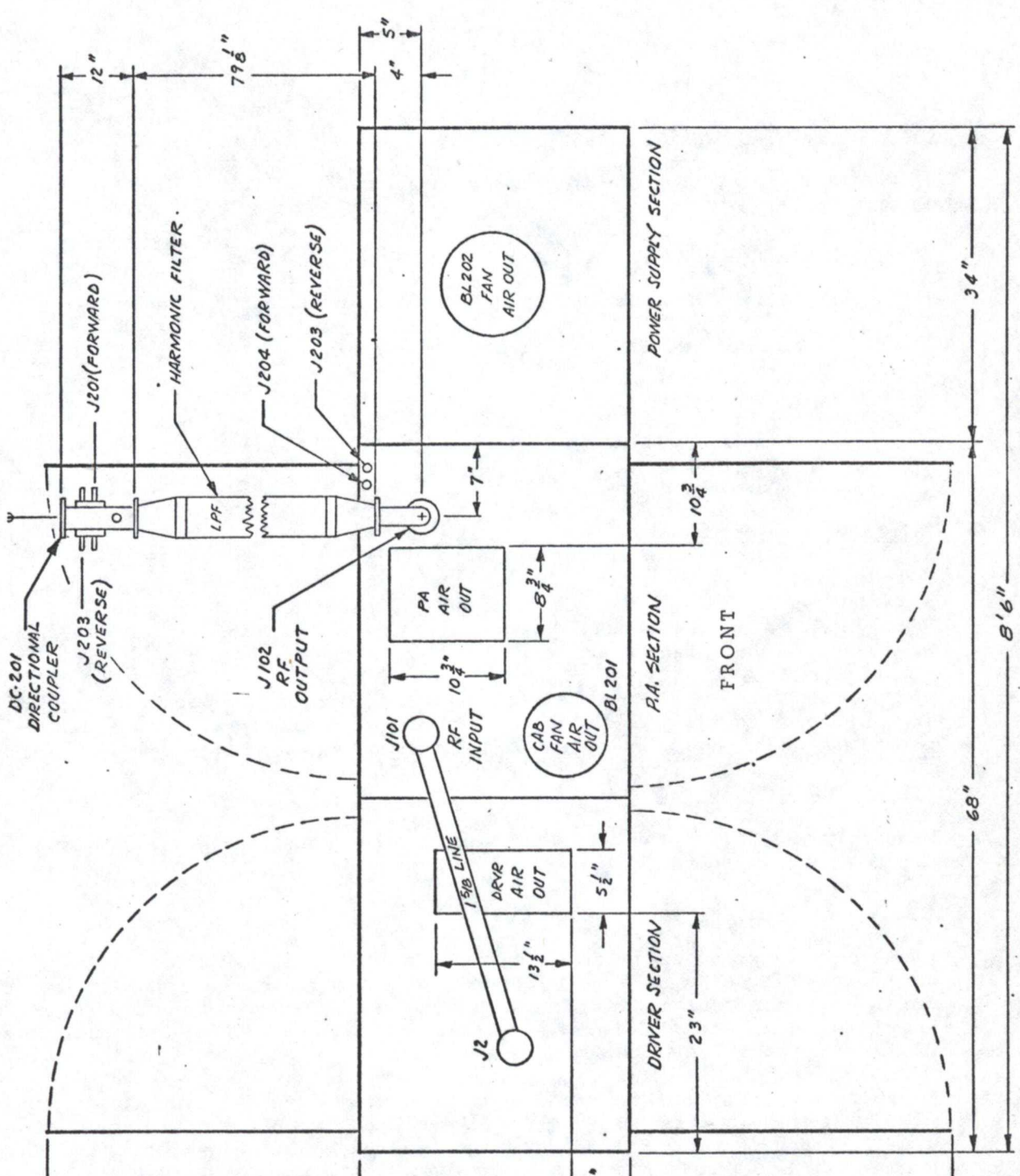
2-1.4. Cooling Requirements

There are no external cooling requirements for the Model 625A. The unit is cooled by three single-phase blowers and two single-phase fans, which draw in air through filtered openings in the rear cabinet doors. PA blowers BL101 and BL102 draw in air at a rate of 530 cfm each; driver blower draws in air at a rate of 530 cfm; and PA cabinet fan BL201 draws in air at a rate of 750 cfm. Space provisions for opening the rear cabinet doors will ensure an adequate intake of cooling air.

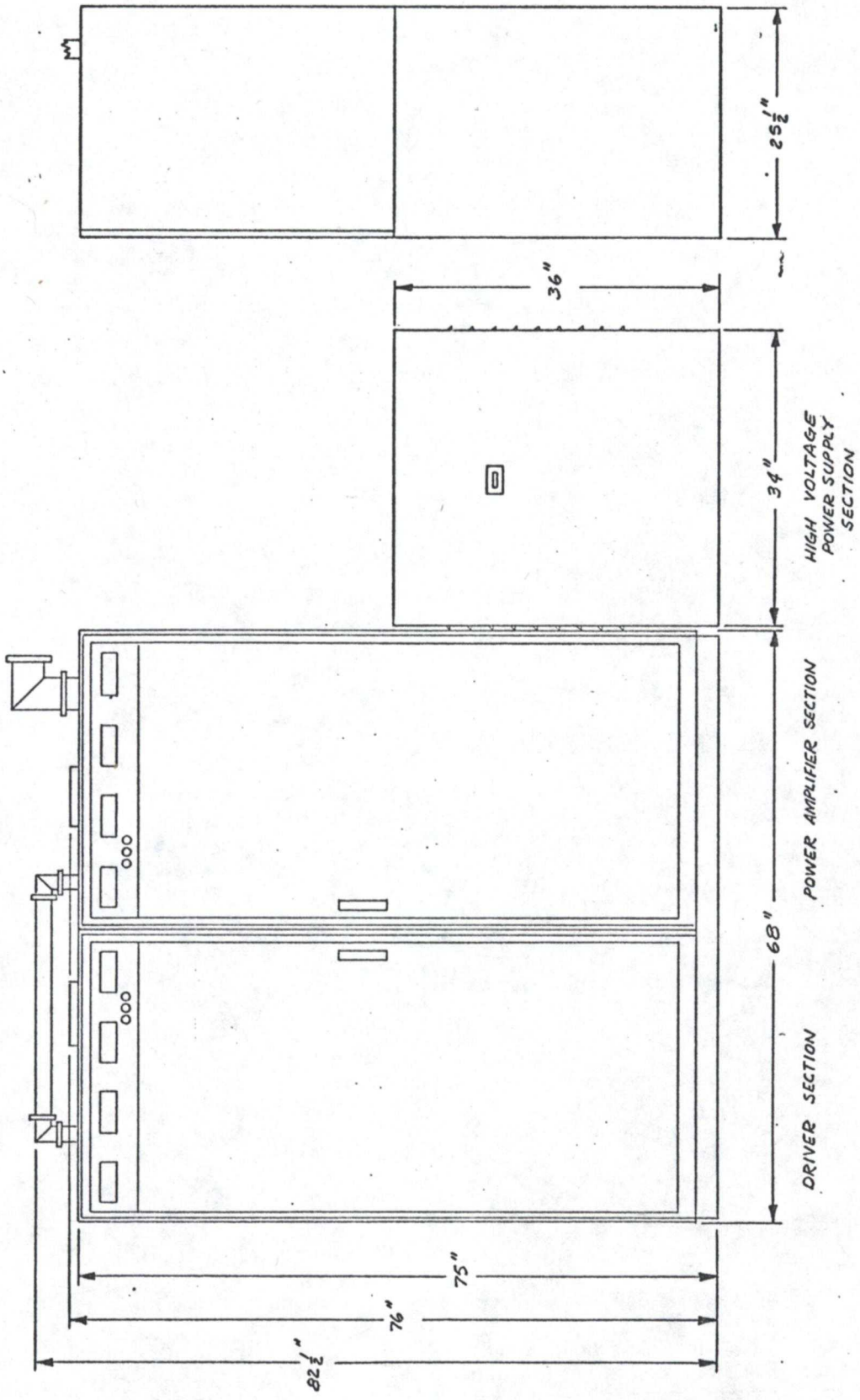
A minimum overhead space of two feet will normally be adequate for dispersing air exhausted by the driver blower and cabinet fan; however, the air exhausted by the PA blower will require an external vent. As a minimum it is recommended that 9-inch-diameter sheetmetal air conditioning duct be used to convert the PA blower exhaust to the outside vent. This will require the fabrication of a 9-inch-diameter sheetmetal transition measuring 8-9/16 inches by 10-5/8 inches at the air output flange. This ducting should be limited to a maximum of 10 feet to prevent excessive back pressure.

2-2. UNPACKING AND INSPECTION

Inspect the equipment for shipping damage as soon as it is unpacked. Check for broken knobs, tubes, meter faces, and connectors. Inspect surfaces for dents and scratches. If the equipment is damaged in any way, contact the carrier immediately and report the circumstances.



Model 625A FM Transmitter
Top View - Floor Space
Fig. 2-1



Model 625A FM Transmitter
Front and Side View
Figure 2-2

2-3. HIGH-VOLTAGE POWER SUPPLY INSTALLATION

The high-voltage power supply, transformer and filter choke due to its heavy weight, is crated separately for shipment. After the transmitter enclosure has been positioned to its operational location, install the high-voltage power supply as follows:

a. If packaged, uncrate high-voltage power supply and remove wooden pallets.

b. At rear of transmitter, remove kickplate at bottom of PA section.

c. Install high-voltage power supply filter choke L201 into PA cabinet with terminals facing the rear. (Figure 3-4).

d. Install HV plate transformer with terminals facing front of transformer vault (Figure 3-4). Make filter choke connections following numbered wires.

e. Make connections of high-voltage power supply as follows:

(1) Connect the one 14 AWG gauge HV wire to B+ terminal (wire and terminal #1).

(2) Connect the one 14 AWG wire to B- terminal (wire and terminal #2).

f. Refer to figure 2-3 and schematic diagram S263A and connect primary leads of high-voltage transformer to contactors K201-K202 and secondary leads to H.V. rectifiers CR201 thru CR206.

2-3.1. Refer to Model 602A Instruction Book for installation details.

2-4. INPUT AND OUTPUT CONNECTIONS

With the exception of the RF output and the power monitor inputs from the directional coupler, all inputs and outputs of the Model 625A are routed into the unit through the two 3-inch diameter openings, one to the right and one to the left, on the base of the cabinet. The RF output termination is a 3-1/8 inch coaxial line flange and the power monitor inputs from the directional coupler are BNC receptables; these connectors are located on top of the cabinet. (See Figure 2-1).

2-4.1. RF Input/Output Connections

The RF input and output connections of the Model 625A are made as follows (See Figure 2-1):

CAUTION

Do not allow the combined weight supported by the RF output termination to exceed 30 pounds. Use an overhead cable hanger, if necessary to absorb most of the weight.

a. Connect and bolt in place a 90-degree, 3-1/8 inch coaxial coupling to the RF output termination on top of the cabinet (J102).

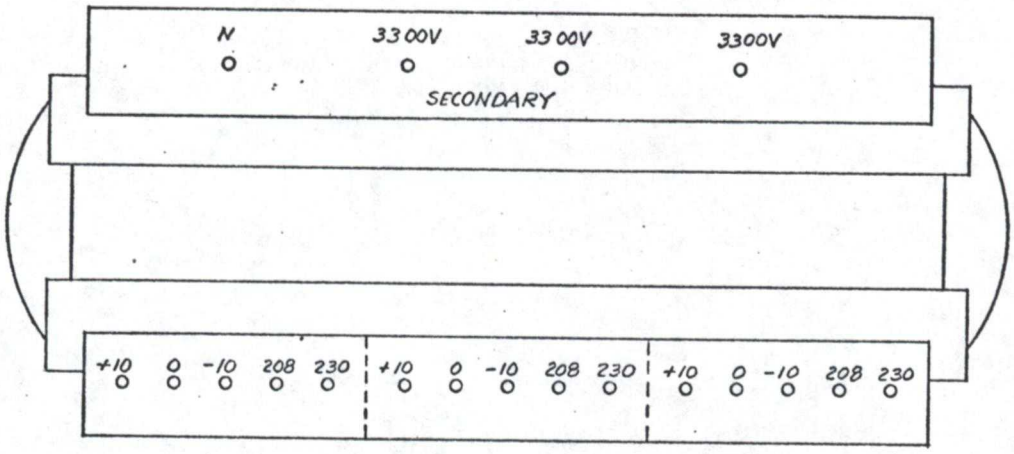
b. Connect and bolt in place low-pass filter LPF to 90-degree coaxial coupling.

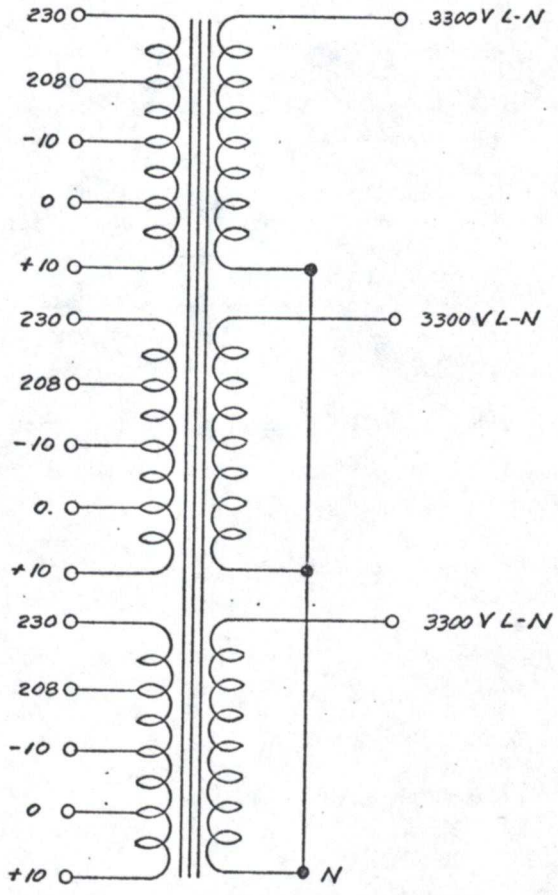
c. Connect and bolt in place directional coupler DC201 to low pass filter LPF.

d. Using 3-1/8 inch coaxial cable, connect RF output of directional coupler DC201 to transmitting antenna.

CAUTION

Ensure that the antenna has a VSWR of 1.7:1 or less otherwise the high reflected power could damage the R.F. cavity.





H.V. Transformer - T-203
Figure 2-3

e. Using 1-5/8 rigid line section proceed to connect DRIVER OUTPUT (J2) to PA input connector J101 (See Figure 2.1)

f. Connect J201 and J204 on directional coupler DC201 to transmitter as follows (Use RG58/U cables and BNC connectors)

J201 to J204 for forward power
J203 to J202 for reflected power

g. Connect J103 RF sample on PA cavity to station monitor

h. Make sure coaxial cable between FM Exciter and DRIVER cavity in DRIVER section, is in place.

2-4.2. PA Primary Power and Grounding

Mains power to the Model 625A should be routed through a 200 ampere safety disconnect switch with a 150 ampere fuse protecting each phase. (See schematic S-263A) The mains power input cable connects to TB203 which is located on the left-hand wall of the transformer vault section as viewed from the rear.

It is essential that the exact mains voltage be determined at this point so that appropriate taps are connected on the primary windings of high voltage transformer T203 and controls transformer T201. (Figure 3-13 and 2-3). Connect the station ground to both cabinets.

> WARNING
>
> 230V AC is present on one side of primary of HV transformer T203 when safety disconnect switch is closed.

2-4.3. DRIVER Primary Power

It is recommended to use a separate 60 amp. safety disconnect switch as indicated in the Model 602A instructions.

2-4.4. Exciter Input Signal Connections

All input signal connections to the exciter are made to TB1, which is a 10-terminal barrier strip accessible at the rear of the 680 exciter. Refer to Figure 2-2 in the 680 Instruction Manual.

Use twisted-pair shielded cable for audio connections. For monaural operation, connect audio signal leads to TB1-9 and TB1-10 and connect line shield to TB1-8 (GND).

For stereo operation, consult the Model 682 Instruction Book.

For SCA operation, refer to the Model 683 Instruction Book.

2-4.5. Cabinets Interconnections

Interconnections between the PA cabinet and DRIVER cabinet are carried out between terminal blocks TB202 and TB201 located in the PA cabinet and TB11 in the DRIVER SECTION, as follows:

TB202-5 (Plate)	to	TB11-5
TB202-6 (Plate)	to	TB11-6
TB202-11 (OL from Driver)	to	TB11-11
TB202-12 (115 VAC)	to	TB11-12
TB202-9 (Low power)	to	TB11-8

TB201-9 (Cabinet Interlock)	to	TB11-14
TB201-10 (Cabinet Interlock)	to	TB11-15

Interconnections between PA cabinet and transformer vault are carried out by means of terminal block TB402 located in PA cabinet and TB401 in the transformer vault, as follows:

TB401-1 (Interlock)	to	TB402-1
TB401-2 (Interlock)	to	TB402-2
TB401-3 (230V to T202)	to	TB402-3
TB401-4 (230V to M205)	to	TB402-12
TB401-5 (Plate DRIVER)	to	TB402-5
TB401-6 (to K201)	to	TB402-6
TB401-7 (230V to M205)	to	TB402-7
TB401-8 (Plate DRIVER)	to	TB402-8
TB401-9 (Plate DRIVER Low Power)	to	TB402-9
TB401-10 (230V to M205)	to	TB402-10
TB401-11 (to K202)	to	TB402-11
TB401-12 (230V to T202)	to	TB402-4
TB401-13 Not Used		
TB401-14 Not Used		
TB401-15 Ground	to	TB402-15

2-4.6. PA Tube Installation

Proceed to install PA tube V101 into socket. The tube should be lowered into position vertically and aligned concentrically with the coaxial capacitor. Care must be exercised in order to properly sit the base of the tube over the socket contact rings. Then exert pressure downward until the tube rests on four metal stops. Connect the plate choke.

2-5. REMOTE CONTROL CONNECTIONS

2-5.1. Stereo/SCA remote control

Refer to the 682/683 Instruction Manuals for remote control operation of these units.

2-5.2. PA Remote Control

Local-Remote switch S211 (See figure 3-1) allows operation from a local or remote position. When S211 is set to REMOTE all front panel controls are disabled and power control functions are transferred to terminal block TB201. A contact closure between these connections provides the following functions:

a. TB201, 3 and 4: Remote master on and off

b. TB201, 5 and 6: Remote plate on and off

c. TB201, 7 and 8: Remote HI-LO

d. TB201, 11 and 12: Remote overload reset

2-5.3. PA Remote Metering

Connections are available at TB201 and TB202 as follows:

a. TB201-1 (Ground) and TB201-15: PA plate voltage readout

b. TB202-1 and TB202-2: PA Plate current readout

2-5.4. DRIVER Section

Refer to Model 602A instructions.

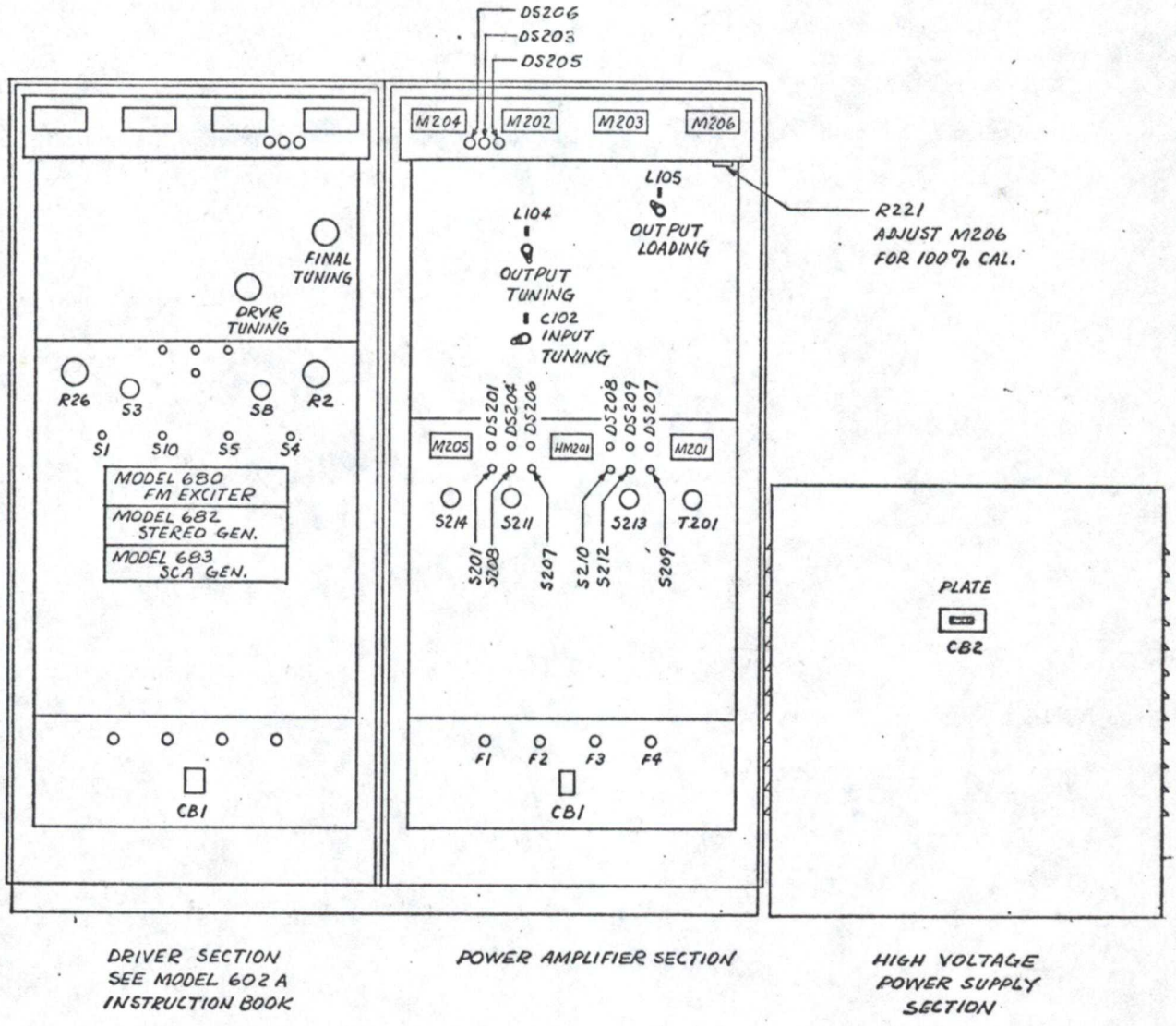
SECTION III
OPERATION

3-1. PA CONTROLS AND INDICATORS

As shown in figures 3-1 and 3-2, all operational controls and indicators are located at the front of the unit. Table 3-1 lists these operating controls and indicators and gives their reference designation and a brief functional description of each.

3-1.1. DRIVER Section

For controls and indicators located in the DRIVER section, refer to Model 625A Instruction Book.



Front View - Component Location
Figure 3-1

Table 3-1. Operating Controls and Indicators PA Section

Ref. Des.	Panel Nomenclature	Function
	PA METER PANEL (Figure 3-1)	
DS202	FIL	Indicates power applied to filament contactor K204 and consequently to PA Filament when lit.
DS203	INTERLOCKS	Indicates time delay complete and PA cabinet interlock switches closed when lit.
DS205	PLATE	Indicates Plate Voltage applied to V101 when lit.
M204	PA GRID CURRENT	Provides continuous readout of PA grid current.
M203	PA PLATE CURRENT	Provides continuous readout of PA plate current.
M202	PA PLATE VOLTAGE	Provides continuous readout of PA plate voltage.
M206	PA POWER OUT	As selected by PA POWER OUT switch S213 provides readouts of PA forward and reflected RF power output. (VSWR). (See section 4-6.2.)
	PA CAVITY FRONT PANEL (FIGURE 3-1)	
L104	OUTPUT TUNING	Tunes V101 plate to resonance.
L105	OUTPUT LOADING	Adjust V101 plate loading.
C102	INPUT TUNING	Tunes the input circuit of V101 to resonance.
	PA CONTROL PANEL (FIGURE 3-1)	
M205	AC LINE VOLTAGE	As selected by AC Line Voltage switch S214, provides readouts of phase to phase AC line voltage.
HM201	HOURS	Provides cumulative transmitter operating time.
M201	PA FILAMENT VOLTAGE	Provides continuous readout of PA filament voltage.
T201	PA FILAMENT ADJUSTMENT	Adjust PA filament voltage as monitored by M201.

Table 3-1. Operating Controls and Indicators PA Section

Ref. Des.	Panel Nomenclature	Function
	PA CONTROL PANEL (Cont'd)	
DS201	MASTER	Indicates mains power applied to control transformer T202 and consequently 115 VAC to the control ladder.
DS204	HIGH	Indicates high power operation.
DS206	PA AIR	Indicates PA air interlock switch S203 closed and normal air flow.
DS207	PLATE	Tally light. Indicates PA plate current overload has occurred when lit; remains lit until LAMP RESET switch S209 is operated.
DS208	VSWR	Tally light. Indicates high reflected RF power output overload. It remains lit until LAMP RESET S209 is operated.
S201	MASTER	Applies mains power to control transformer T202 which in turn energizes control circuits, PA filament transformer and blowers contactors.
S208	HIGH-LOW POWER	Select high or low power operation. When set on high the transmitter has step-start mode.
S207	PLATE	Applies main power to contactors K201 and K202.
S210	OVERLOAD RESET	Manually resets transmitter overload. Does not affect tally lights.
S212	AUTOMATIC POWER CONTROL	Activates automatic power leveling circuit.
S209	LAMP RESET	Extinguishes all lit tally lights.
S211	LOCAL-REMOTE	Allows the transmitter to be operated in the local or remote modes. When set to remote all control panel switches become inoperative (except LAMP RESET).
S213	PA POWER OUTPUT	Selects PA forward or reflected power output for readout on meter M206 - to read VSWR see paragraph 4-6.2.
	CIRCUIT BREAKER PANEL (FIGURE 3-1)	
F201	CONTROL	Provides protection for control circuit - illuminates to indicate blown fuse.

Table 3-1. Operating Controls and Indicators PA Section

Ref. Des.	Panel Nomenclature	Function
	CIRCUIT BREAKER PANEL (FIGURE 3-1) (Cont'd).	
F202	BLOWER AND FAN	Provides protection for blower and fan; illuminates to indicate blown fuse.
F203	PA FILAMENT	Provides protection for PA filament transformer T101; illuminates to indicate blown fuse.
F204	SPARE	Provides protection for PA cabinet fan BL201.
CB1	CB1	Energizes control ladder and filament circuits.
CB2	CB2	Energizes H.V. plate transformer

3-2. INITIAL TURN-ON PROCEDURES

WARNING

This unit contains high voltage, high current power supplies.
Potentials up to 7600 volts at lethal current levels are present and exposed to maintenance personnel working with power on and interlocks defeated.

Exercise extreme caution when maintenance requires working with power on and unit open. Stand on insulated surface. Work with only one hand inside unit and the other hand in your pocket. Use only high voltage insulated tools. Have second person standing by at all times.

3-2.1. Preliminary Checks

Before placing transmitter 625A in operation, perform the following checks and adjustments:

a. Verify proper fuse is installed on the FM exciter rear panel. Fuse F1 should be rated at 1/2 ampere. Check that RF output of exciter is connected to DRIVER cavity J1.

b. Verify that cabinet interconnecting wires between TB202 and TB201 in PA section and TB11 in DRIVER section are properly connected. Verify that cabinet interconnecting wires between TB402 in PA section and TB401 in transformer voult are properly connected.

c. Verify that power line input connections are firmly in place and tight in transformer vault and DRIVER unit. Check for proper grounding of all three cabinet and connect to station ground.

> WARNING
>
> 230V AC is present on one side of primary of HV transformer T203 as soon as safety disconnect switch is closed.

Check connections on primary of HV transformer T203 and on contactors K201 and K202

d. Make sure a 50 ohms RF load of at least 25 KW capability is connected to J102.

e. Check for full closure of all interlocked access panels and rear cabinet doors.

f. Set both CONTROL switches (S10 in DRIVER and S211 in PA section) to LOCAL.

g. Close both external safety disconnect switches, then turn ON both circuit breakers located on power distribution panel and transformer vault. Check for no glow of all front panel fuses.

h. Observe three phase line voltage on AC LINE VOLTAGE meter M205, then check that appropriate taps are connected on the primary windings of transformers in PA and DRIVER sections.

3-2.2. Initial Turn ON

Proceed as follows:

a. Turn ON MASTER switch in DRIVER section, S1, and observe that when blower B1 builds up air pressure DRIVER air switch closes and filament voltage is applied to DRIVER section. FIL ON lamp DS1 should lite.

Measure V2 filament voltage (set MULTIMETER switch S3 to FINAL FIL VOLTS) and adjust to 5V. After approximately 30 sec., INTERLOCK lamp DS2 should lite.

b. Turn ON MASTER switch S201 in PA section. Blowers BL101, BL102 and cabinet fan BL201 and BL202 should start and filament voltage applied to PA tube V101 after air switch is closed. FIL lamp DS202 should lite. Check PA FIL VOLTAGE meter M201 and adjust to 6.3V. After approximately 30 sec., INTERLOCK lamp DS203 should lite.

c. Turn OFF FM Exciter in DRIVER cabinet and set MULTIMETER switch to DR PLATE MA.

d. Open DRIVER front panel so that power control motor B3 and screen potentiometer R13 can be observed. Press and hold POWER control switch S5 in DRIVER on LOWER until R13 is in its minimum voltage position. Release POWER switch S5 and close access panel.

e. Set DRIVER PLATE switch S4 to ON. This will close the plate interlock circuitry in DRIVER section.

f. Set HI-LO switch S208 to HIGH in the PA section.

g. Turn ON PLATE switch S207 in PA section. At this time all plate and screen power supplies should be ON (no power output should be indicated).

h. Observe the following meter displays.

1) Multimeter M1 (DRIVER section) should read approximately 125 MA. If incorrect, adjust potentiometer R2 (DRIVE).

2) Plate voltage meter M3 (DRIVER section) should read between 3000 and 3600V.

3) PA Plate voltage meter M202 on PA section should read between 5000 and 5600V.

4) PA Plate current meter M203 should indicate approximately 100 MA.

i. Turn OFF PA PLATE switch S207.

NOTE: Plate ON and OFF of the 625A is carried out from the PA section. Plate switch in DRIVER section should remain ON.

3-3. TUNING PROCEDURE

a. Turn ON FM Exciter Model 680

b. Set PA dials INPUT TUNING, OUTPUT TUNING and OUTPUT LOADING to the settings indicated in the check out sheet shipped with the transmitters. Set PA POWER OUTPUT switch S213 in PA section to FORWARD.

c. Turn the MULTIMETER switch S3 in DRIVER section to read FINAL GRID MA.

d. Turn ON PLATE switch S207 in PA section and adjust DRIVER TUNING dial in DRIVER section for maximum FINAL GRID current of TUBE V2.

NOTE: At this point some power output should be indicated by PA POWER OUTPUT meter M206 in PA section

e. Adjust FINAL TUNING control in DRIVER section for maximum PA grid current indicated on PA GRID CURRENT METER.

f. Adjust INPUT TUNING control in PA section for maximum PA grid current indicated on PA GRID CURRENT meter. This should correspond with maximum PA PLATE current and power output

g. Power output should be between 10 and 17 KW in this condition.

h. IMPORTANT: Check REFLECTED power.
VSWR reading should be below 1.7:1 (see paragraph 4-6.3 for VSWR calibration and reading)
If reflected power is higher shut down transmitter and proceed to adjust antenna and transmission line to obtain nominal VSWR

j. To increase power to 100%, set RAISE-LOWER power switch S5 to RAISE and observe PA GRID and PA PLATE current increase at the same time that output power increases.

Tune the power amplifier adjusting OUTPUT TUNING control for minimum plate current and maximum power output.

k. Adjust OUTPUT LOADING control for proper loading, turning CW to decrease loading and CCW to increase loading.

l. Both TUNING and LOADING controls are readjusted in sequence increasing the DC plate current consistent with increases in the output power and exercising care not to exceed the plate dissipation of the tube.

m. Re-adjust INPUT TUNING control for maximum grid and plate current at intervals during the plate tuning.

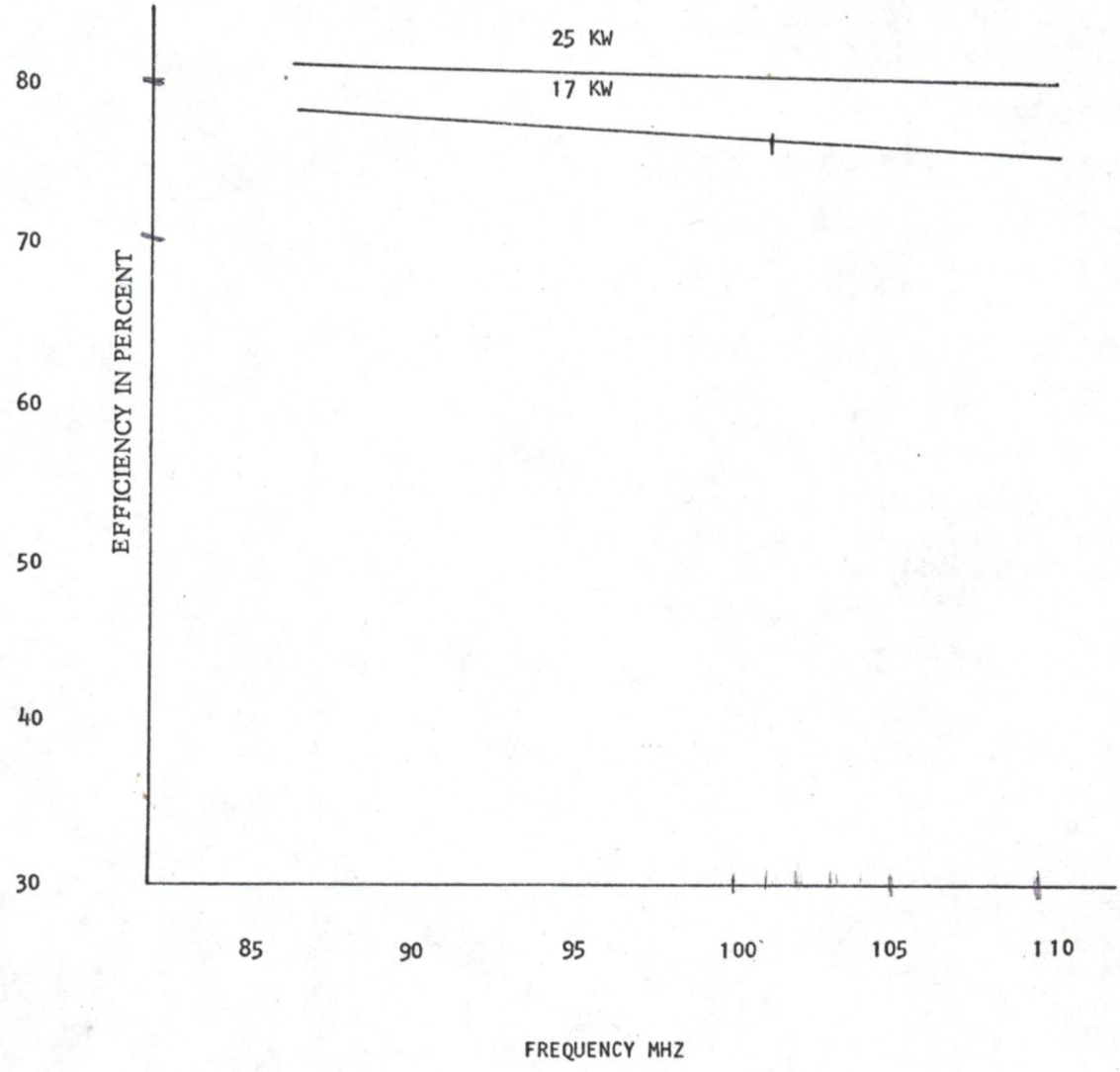
n. There is interaction between the input and output circuit, thus to successfully tune the amplifier, all three amplifier controls should be adjusted properly and the plate tuning of the DRIVER maintained at resonance.

o. Now increase the DRIVER power output (RAISE) to obtain the desired level of drive to the PA INPUT circuit. The required IPA screen voltage will, of course, depend on the amount of drive required by the PA to obtain the desired power output. Typical voltages and currents to be expected are given in Table 3-2.

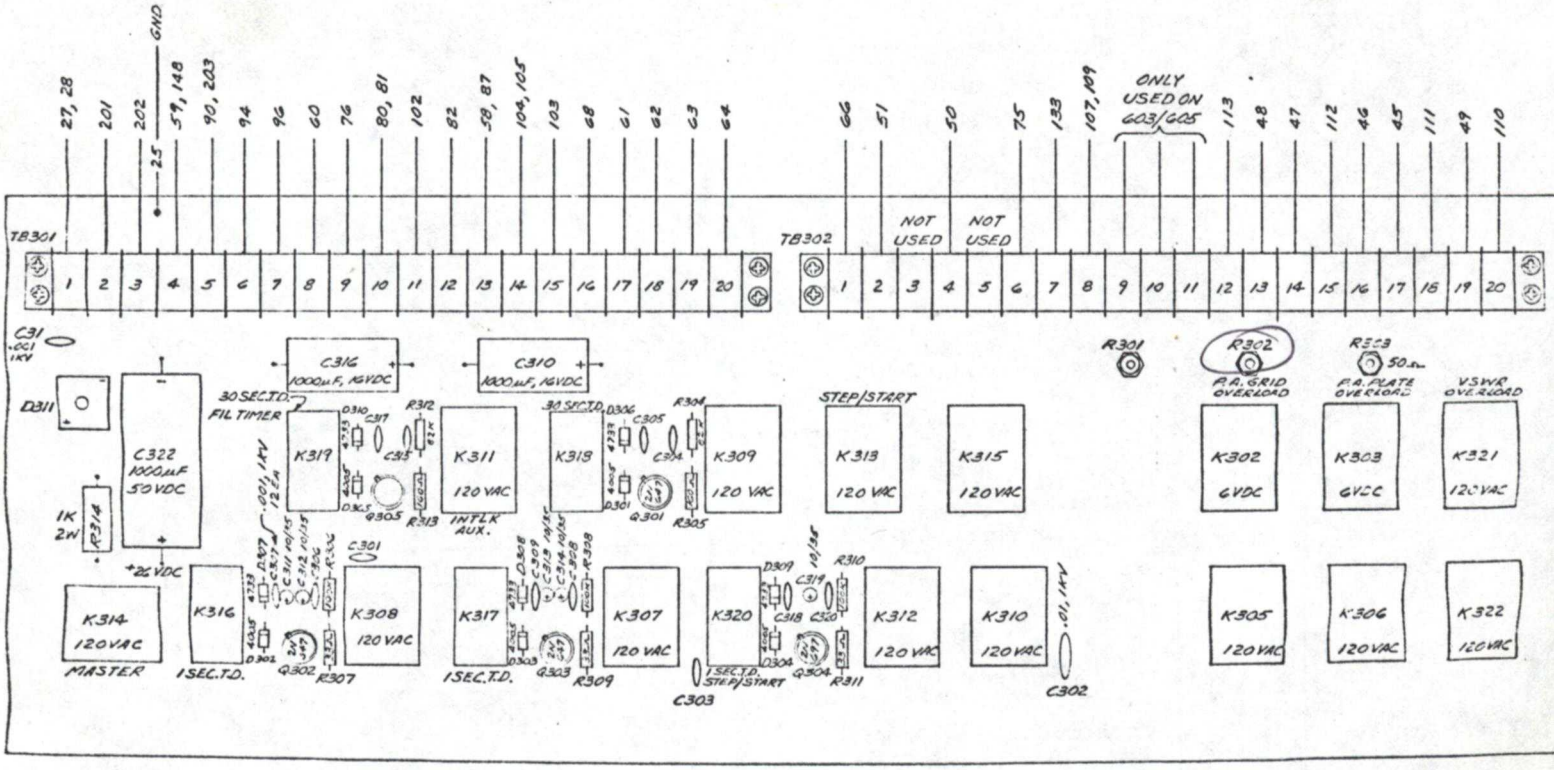
p. The final tuning condition is obtained when the plate current meter indicates approximately 4.1 ADC and the power output is 2.5 KW. In this condition the PA grid current should be between 500 and 700 MA, and the nominal plate voltage approximately 7500V. The efficiency for a properly tuned amplifier should be around 79%.

Table 3-2. Model 625A Typical Operating Voltages and Currents

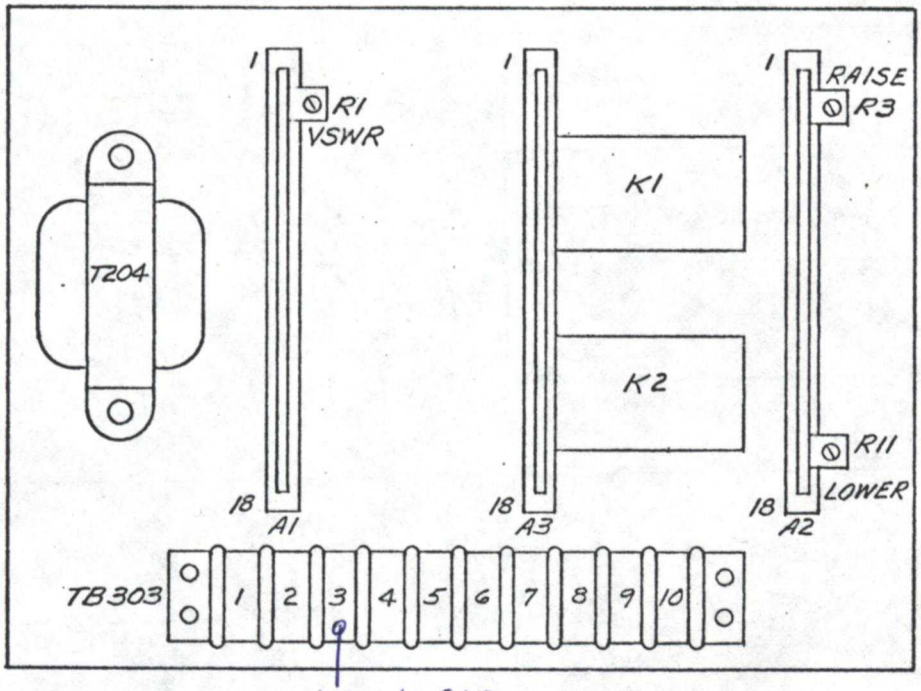
	P_o = 17 KW	P_o = 25 KW
DRIVER SECTION		
DR PLATE VOLTS	1450 V	1450 V
DR PLATE MA	100 MA	89 MA
FINAL FIL VOLTS	5 VAC	5 VAC
FINAL SCREEN VOLTS	350 V	410 V
FINAL SCREEN CURRENT	50 MA	80 MA
FINAL GRID VOLTS	-160 V	-155 V
FINAL GRID MA	30 MA	35 MA
FINAL PLATE VOLTAGE	2500 V	4600 V
FINAL PLATE CURRENT	420 MA	490 MA
POWER MONITOR	1000 W	1800 W
POWER AMPLIFIER SECTION		
PA GRID CURRENT	320 MA	680 MA
PA PLATE VOLTAGE	7500 V	7500 V
PA PLATE CURRENT	2.95 A	4.15 A
PA POWER OUTPUT	17 KW	25 KW
AC LINE VOLTAGE 3 Ø	236/240/238	238/240/239
PA FIL VOLTAGE	6.3 VAC	6.3 VAC



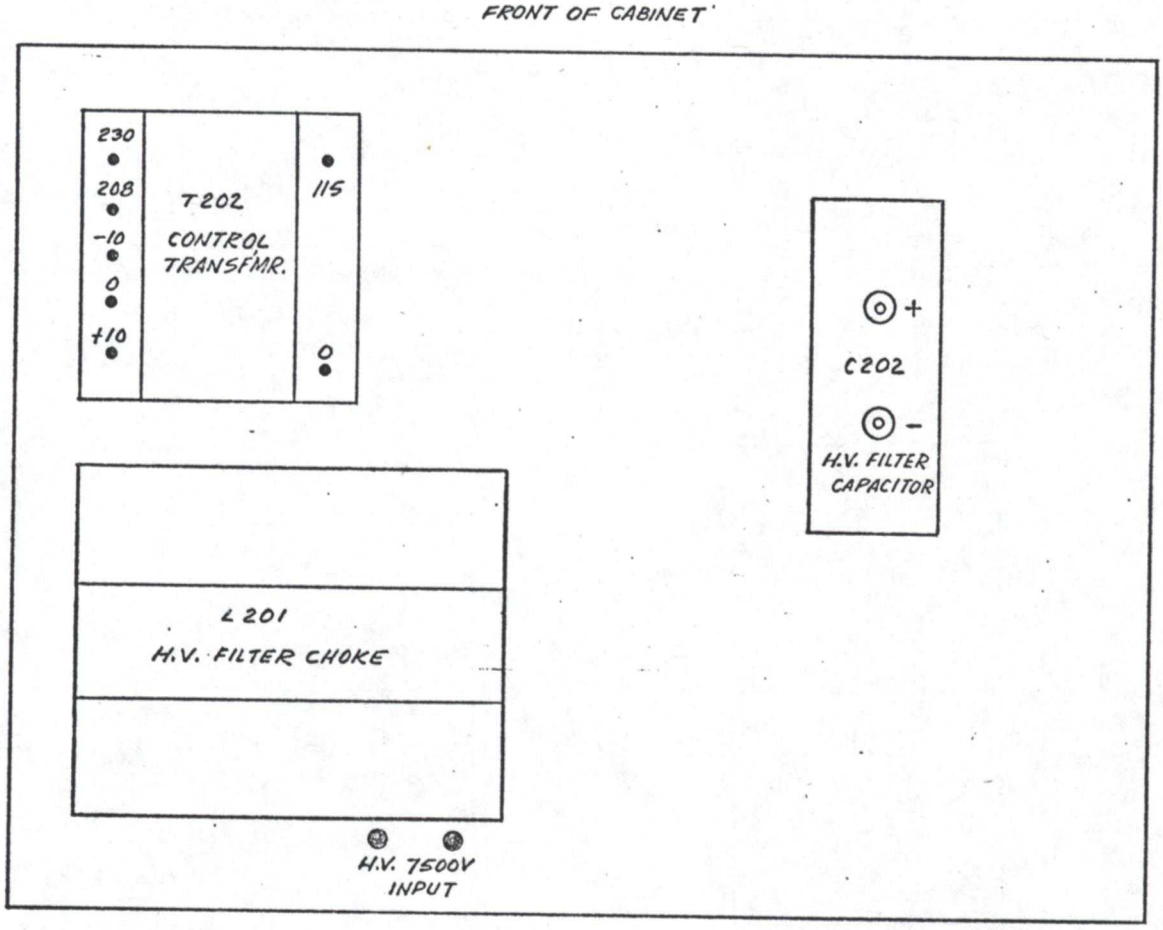
Efficiency Curve
Fig. 3-3



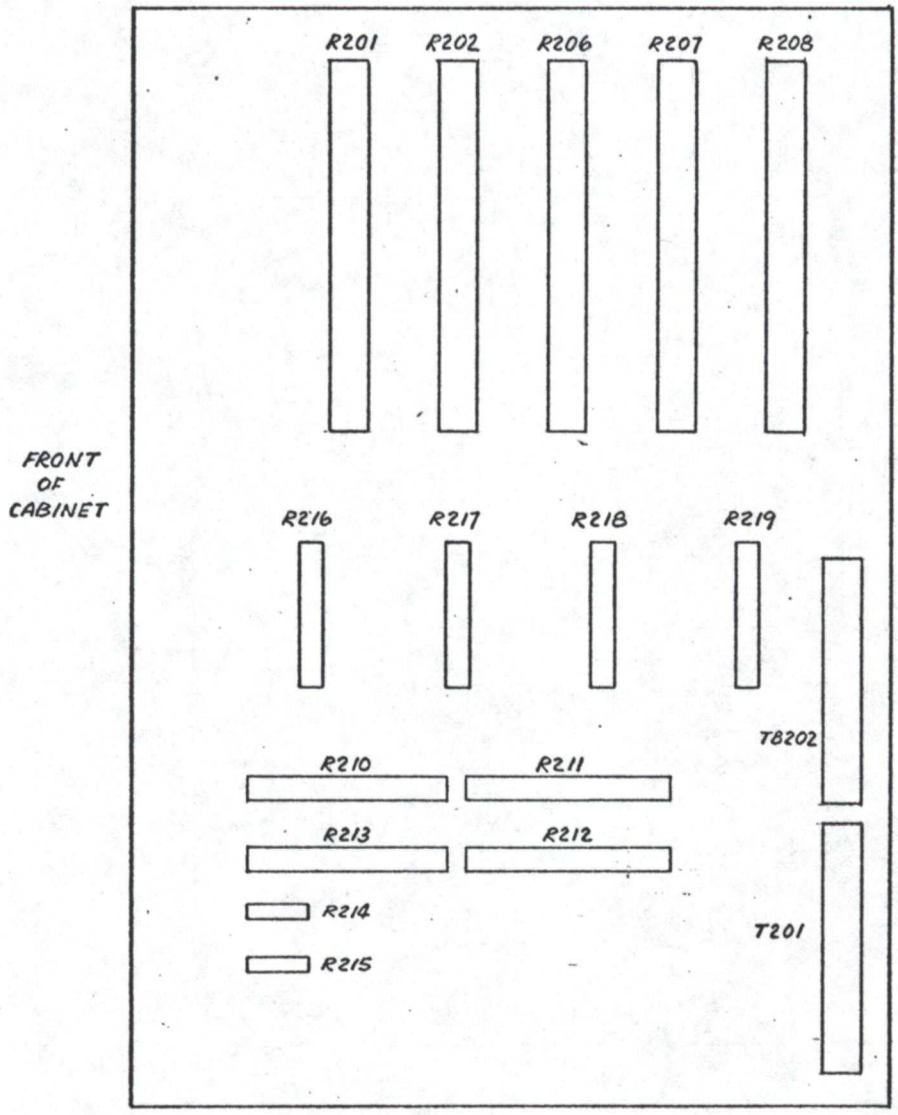
Control Chassis
Component Location
Figure 3-2



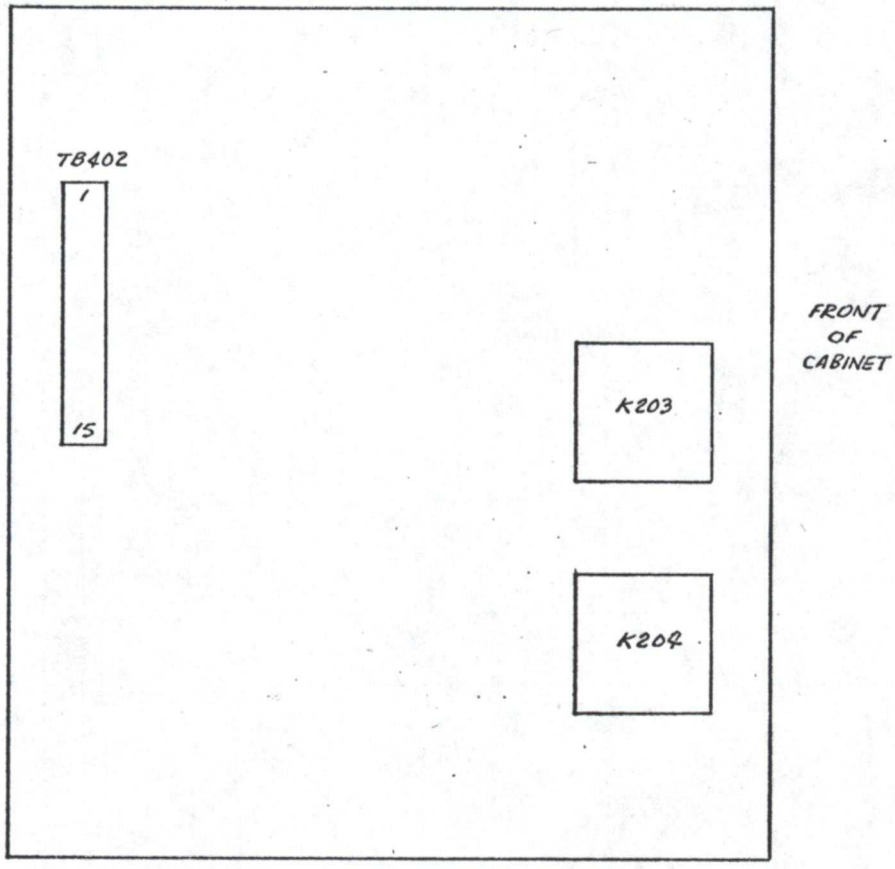
VSWR Protection Board A-1
Automatic Power Control Board A-2
Motor Drive Board A-3
Figure 3-3



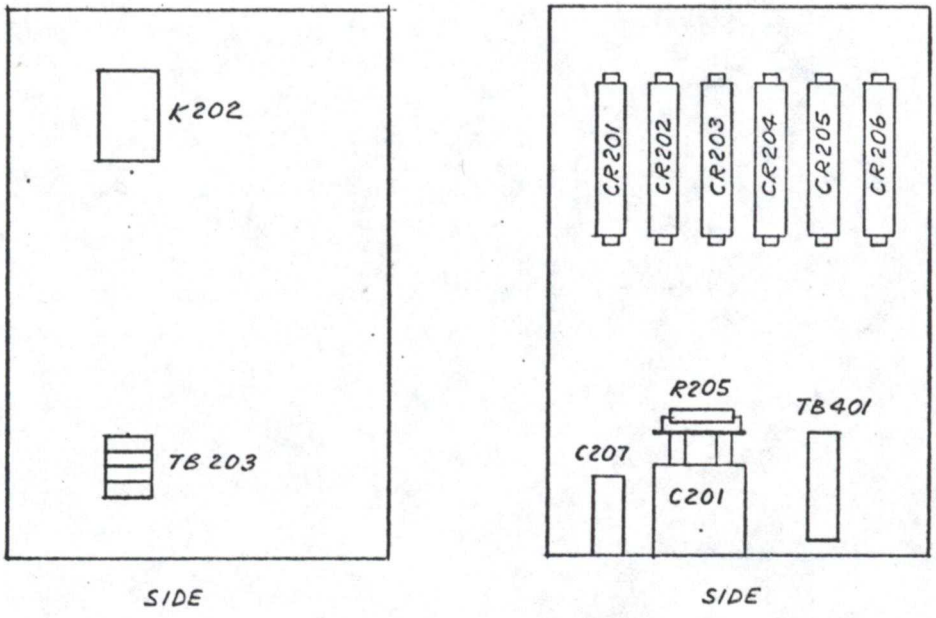
Base Plate Assembly
Figure 3-4



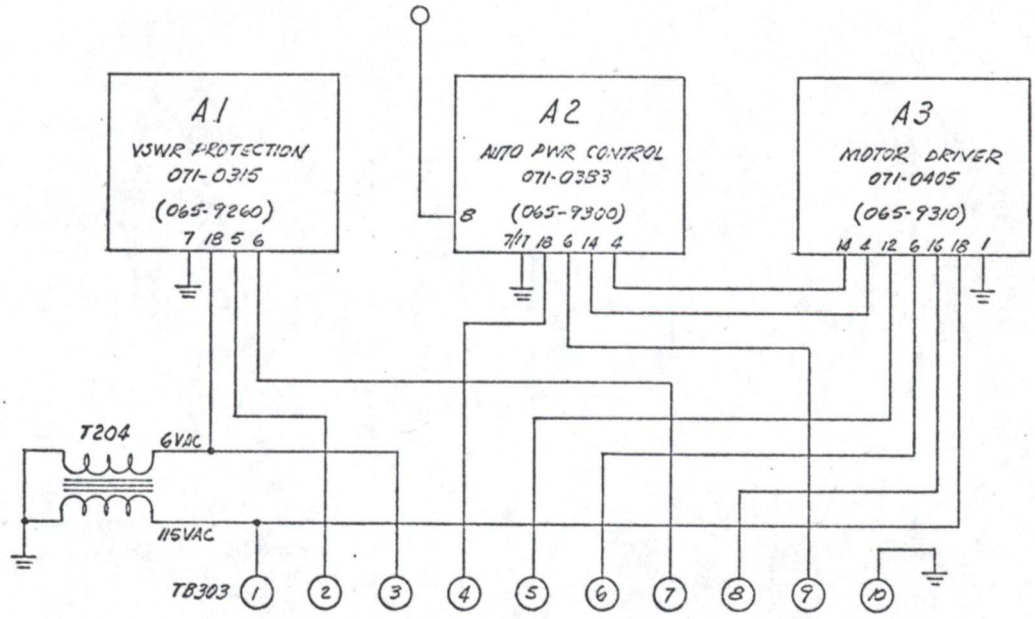
Resistor Panel
Figure 3-5



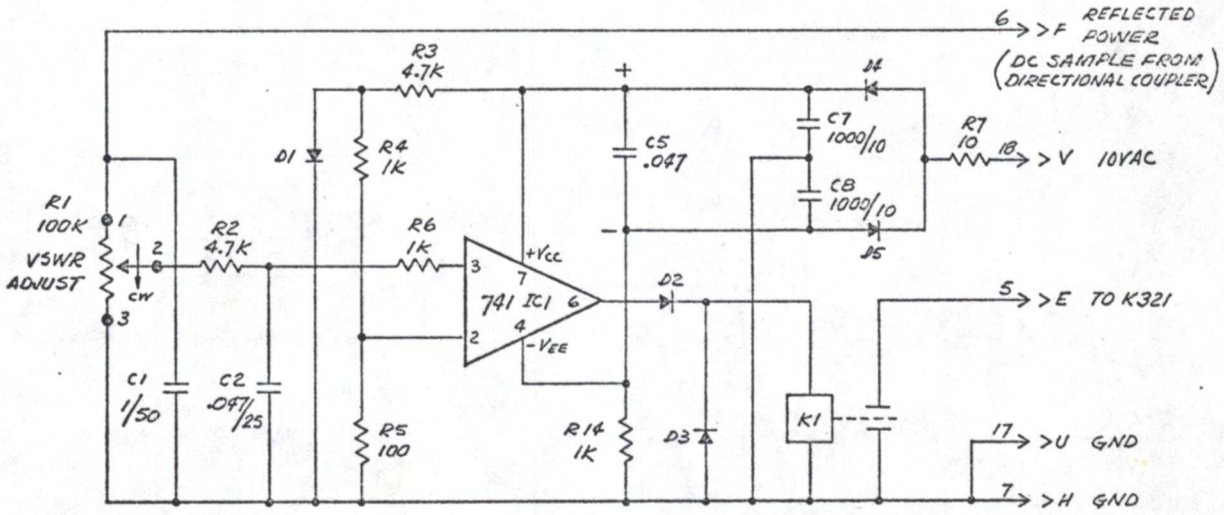
Contactor Panel
Figure 3-6



Transformer Vault
Figure 3-7

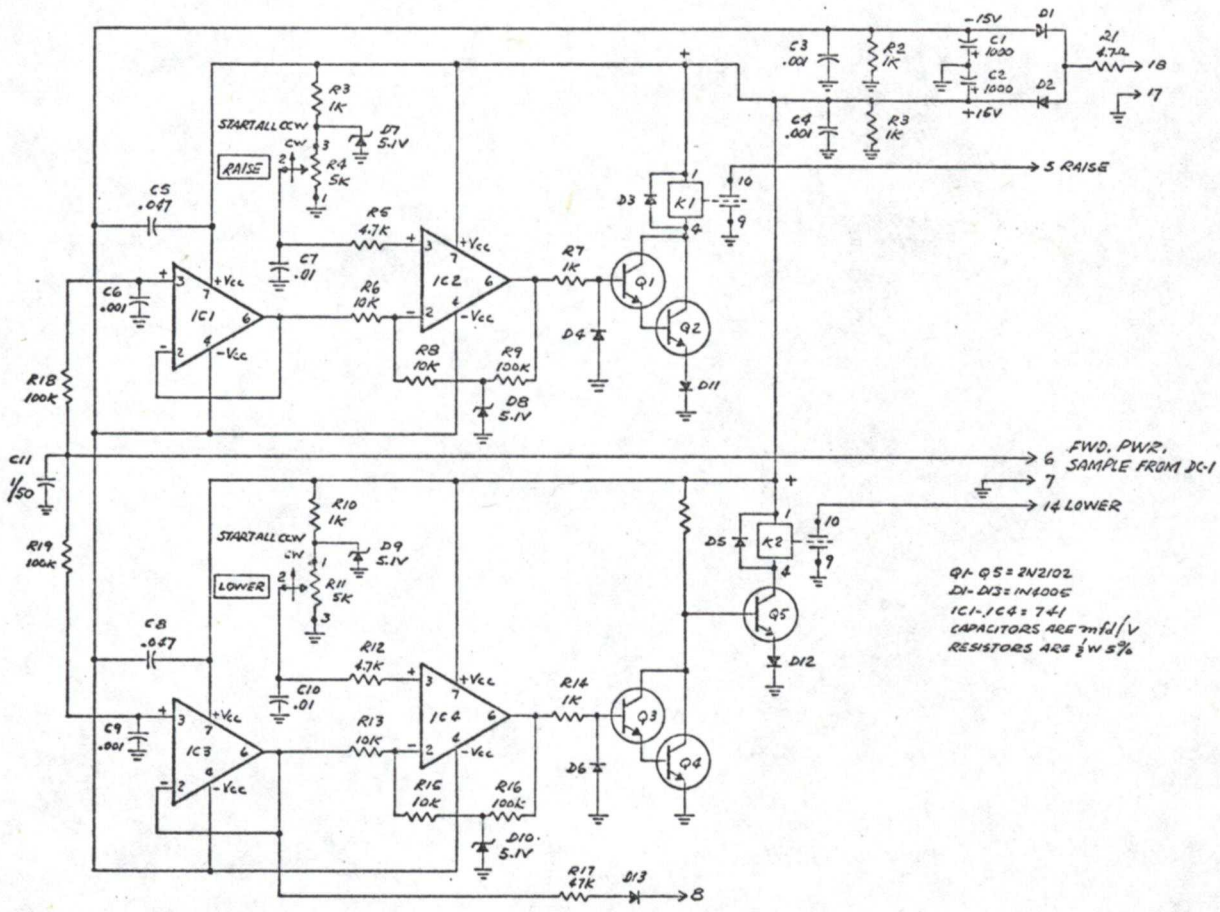


A1 - A2 - A3 Mother Board
Figure 3-8

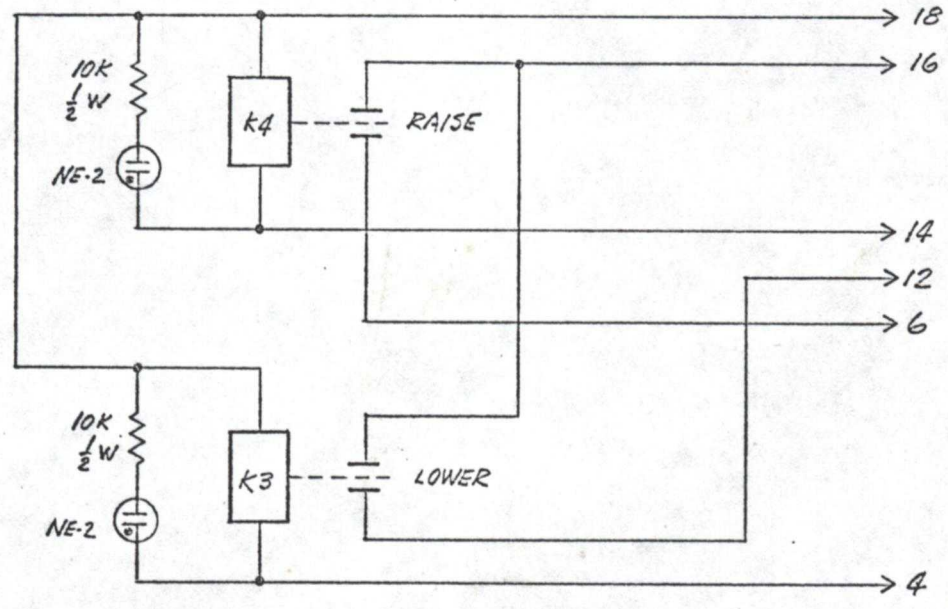


RESISTORS IN OHMS, ½ W, 5% UNLESS NOTED
CAPACITORS IN MICROFARADS/VOLTS UNLESS NOTED
DIODES ARE IN4005

A1 VSWR Protection Circuit
Figure 3-9



A2 Automatic Power Control
Figure 3-9



A3 Motor Driver
Figure 3-10

SECTION IV
PRINCIPLES OF OPERATION

4-1. GENERAL

The Model 625A is divided into the following functions: (1) control ladder and overload protection circuits, (2) power supplies, (3) PA RF cavity, (4) metering circuits, (5) power control. The Model 680 FM Exciter and DRIVER Model 601A are functionally analyzed in their individual operating and servicing manual.

4-2. CONTROL AND OVERLOAD PROTECTION CIRCUITS

Refer to schematics S-263A, S-265A, and S-264A and Fig. 3-2.

Primary power is applied through the customer's 200 ampere safety disconnect switch to circuit breakers CB1 (CONTROL) and CB2 (PLATE).

Through CB1, 230 VAC primary power is applied to isolation control transformer T202 which supplies 115 VAC for the control ladder through fuse F201 and to open contacts of PA blower contactor K203 and PA Filament contactor K204 (See schematic S-251).

Placing MASTER switch S201 (see schematic S-265A) in the ON position, energizes master relay K314, which applies 115 VAC to the control ladder.

MASTER switch S201 starts the transmitter energizing PA Blower and FAN contactor K203 through N.O. (Normally Open) contacts 8-12 of Master relay K314. The status of the control ladder is indicated by lamp DS201 MASTER ON.

Blower BL101 will start to rotate and the air flow switch S203 (PA Air Switch) will close applying 115 VAC LINE to FIL CONTACTOR K204 through N.C. (Normally Close) contacts of THERMAL switch S202.

Lamp DS206 PA AIR indicates normal air flow and lamp DS206 FIL indicates that FIL contactor is energized. After FIL contactor K204 is energized, 230 VAC is applied through N.O. contacts 1-2 and 3-4 (see schematic S-263A to ELAPSED TIME indicator HM-201 and PA filament transformer T101. Contacts 5-6 of K204 will also close (see schematic S-265A) and apply 20 VDC to FILAMENT TIMER circuit formed by Q305 and miniature relay K319.

After 30 seconds warm-up time, relay K319 (5-3) will close energizing Interlock Aux relay K311 and applying 115 VAC LINE to door interlock switches S205 and S206.

If all doors and panels are closed INTERLOCKS lamp DS203 will lite indicating that transmitter is ready to turn plate circuits ON, after 30 seconds of filament warm up time.

When PLATE switch S207 is turned ON, 115 VAC LINE is applied to PLATE Aux relay K310. When PLATE Aux relay K315 is energized, it applies 115 VAC LINE through its N.O. Contacts 7, 8 - 11, 12 to two sets of contacts of STEP START relay K313. In this manner Plate contactor K202 is energized through N.C. contacts 10-2 of STEP START relay K313 as soon as PLATE switch S207 is closed (see schematics S-263A and S-265A) energizing primary of High Voltage transformer T203 in "Y" configuration for Low power condition.

PLATE lamp DS205 will lite in this condition.

Setting POWER HI-LO switch S208 to HI, will cause STEP START relay K313 to be energized after one second and close its N.O. contacts 7, 8 - 11, 12 (opening 10-12) energizing HIGH PLATE contact K201 and de-energizing K202 (LOW).

Contactor K201 will energize the primary of High Voltage transformer in "DELTA" configuration for nominal 7500V plate voltage.

Plate contactors K202 (LOW) and K201 (HIGH) are interlocked through their own N.C. auxiliary switches, making it impossible for both to be energized at the same time.

In normal operating condition POWER HI-LO switch is set to HI, then when PLATE switch S207 is turned ON, the transmitter will step-start in low power and one second later will automatically switch to high power. A set of auxiliary contacts of the plate contactors is used to close the plate circuit of the DRIVER unit.

Step-Start one second time delay circuit is formed by Q304 and miniature relay K320. Relay K312 is used to feed +26 VDC to the timer.

Over temperature thermal switch S202 is a 180° F thermal switch with N.C. contacts, which allows plate voltage to be removed in the event of excessive heat present in the cooling air exhaust. It is mounted in the air exhaust stack on top of the cavity.

After cooling thermal switch S204 is a 105° F thermal switch with N.O. contacts also located in the air exhaust stack, which allows blower BL101 to continue running to remove the residual heat from the PA tube and cavity after the transmitter has been shut down.

4-3. OVERLOAD AND AUTOMATIC RECYCLE CIRCUITS

The RF amplifier circuits are protected against plate current overload, grid current overload and against overload cause by high reflected RF output power. Relays associated with these protective functions are: (see schematic S-265A)

a. PA GRID CURRENT, relay K301, 6 VDC coil

b. H.V. PA PLATE CURRENT, relay K302 6 VDC coil

c. VSWR, VSWR protection card A1 (see schematic S-263A) and relay K321 115 VAC coil

Relay K302, PA GRID overload samples the voltage drop across resistor R219 in the grid current measurement circuit. Resistor R302 is to set the threshold at which K30 actuate. Relay K303, PA PLATE, samples the voltage drop across R216 - R217 in the PA plate current return and adjusted with R303. Relay K321 is connected to 115 VAC. A ground connection is placed to pin 13 of K303 by card A1 when a VSWR overload is present, energizing the relay.

When an overload occurs in any of three circuits the overload sensing relay closes energizing the overload indicating relay K304, K305, or K322 and the automatic recycle circuit through N.O. contacts 6-10.

The O.L. indicating relays are self-latching through their N.O. 4-5 contacts and remain energized after an overload until OL LAMP RESET is manually deppressed. Lamps DS207, DS208, and DS209 indicate in which circuit the overload has occured.

The O.L. VOLTAGE LINE (see schematic S-265A) will carry 115 VAC whenever an overload sensing relay closes, and will immediately energize OVERLOAD Aux relay K310 which will open its N.C. contacts 1-9 and de-energize the plate circuit.

Overload aux relay K310 is maintained energized for approximately one second after every overload.

After one second the plate ON condition is restored and if no other overload (or no more than two) occur during the following 30 seconds the system clears itself.

Three overloads in less than 30 seconds will shutdown the transmitter and to restore plate ON condition the operator must depress O.L. RESET switch S210.

The Automatic recycle circuit starts to operate after the first overload energizes first register relay K307 through contacts 5-4 of one second time delay relay K317.

K307 will latch through its contacts 6-10 and apply +Vcc (26V) through its contacts 8-12 to first one second TD timer and through contacts 4-12 of K309 to 30 second TD CLEARING which starts its 30 second timing.

After one second K317 is energized and closes its contacts 3-5 opening contacts 5-4 and de-energizing K310 overload aux relay.

The O.L. LINE VOLTAGE is transferred now to relay K315 pin 5.

A second overload will apply 115 VAC from the O.L. VOLTAGE LINE to #2 register relay K308 through N.C. contacts 5-4 of relay K316. Relay K308 latches through its contact 6-10 and applies Vcc voltage to #2 one second TD timer.

Overload aux relay K310 will remain energized for one second until #2 one second relay K316 is energized, after which plate ON condition is restored.

The O.L. VOLTAGE LINE is now transferred through contacts 3-5 of K316 to coil of third register relay K309.

A third overload will place now 115 VAC directly to pin 13 of third register K309 (through contacts 3-5 of first and second timers).

When third register relay K309 is energized it will latch and energize overload aux relay K310 which will remove plate ON condition permanently. Relay K309 also de-energizes 30 second TD clearing timer.

In this condition plate ON can only be restored by depressing O.L. RESET switch S210.

If the time elapsed between overloads exceed 30 seconds, the 30 second TD relay K318 will be energized, opening its contact 5-4 and de-energizing all three registers clearing the system.

4-4. POWER SUPPLIES

The Model 625A utilizes a +7500 VDC power supply.

Transformer T203 and rectifiers CR201 to CR206 are utilized in a three-phase full wave bridge rectifier configuration, energized thru circuit breaker CB2. R.C. network R205/C201 provide transient suppression to protect rectifiers. These components and contactors K201 and K202 are located in a 36" H x 24" D x 34" W Transformer Vault. Filter Choke L201 and capacitor C202 form the H.V. filtering section and they are installed in the PA cabinet.

The primary of H.V. transformer T203 is energized through contactors K201 and K202, which allow "Y" or "DELTA" configuration.

One side of each leg of the primary is directly connected to the three phase line while the 230V end is connected by either K202 or K201. In LOW power condition, only contactor K202 closes and the primary is fed in "Y" configuration for lower power output.

In HIGH power condition only contactor K201 closes and the primary is connected in "DELTA" for nominal power output.

This supply has primary taps to allow operation from three phase 240V (+10; 230V), 230V (0; 230V), 220V (-10; 230V), 218V (+10; 208V) (0; 230V) and 198V (-10; 208V).

Transformer T301 and rectifier bridge CR301 and capacitor C318 supply approximately -26 VDC (Vcc) utilized to operate all electronic timers in the transmitter.

4-5. RF AMPLIFIER CIRCUIT ANALYSIS

A detailed circuit analysis of the Model 680 FM Exciter and Model 602A transmitter used as a DRIVER are provided in Section IV of their individual operating and servicing manuals. The FM exciter provides a RF output of 10 watts to the input of the DRIVER section.

The 625A power amplifier is capable of operation in the 88 to 108 MHz FM broadcast band with a continuous power output capability of 25,000 watts.

The power amplifier utilizes a zero bias triode type 3CX15000A7 in a grounded grid configuration, housed in an aluminum enclosure which provides excellent RF shielding. Access to the interior of the aluminum enclosure is through a removable rear cover.

The input circuit of the amplifier uses a matching network, formed by L101, L102 and variable air capacitor C102, to transform the input impedance of tube V101 to 50 ohms resistive at input jack J101.

Filament voltage is applied through RF filament chokes RFCH1 and RFCH2, which effectively isolate the filament supply from the RF standpoint. The control grid is operated at DC ground.

RF input power from the DRIVER section is applied through jack J101 to the matching network which couples the RF driving power into the cathode of V101. The design parameters of this input network are such that coverage of the 88-108 MHz band is obtained with only one setting of the sliding shorting bar of L101 and L103. This adjustment is made at the factory by tuning L101, L102 and C102 for minimum VSWR reading on a directional coupler connected to J101. Capacitor C102, which is available as a front panel control, is then simply tuned for maximum PA grid current in the field.

Plate voltage (7500V) is applied to V101 through RF plate chokes RFCH3 and RFCH4. The power amplifier plate circuit consists of L103, L104, L105 and L106 which are connected to the plate through DC blocking capacitor C114. The output tuning capacitance is provided by the tube itself.

Inductor L103 is a semi-fixed shunt plate and L104 is a variable inductor with front panel control, used as fine output tuning. L103 and L04 effectively modify the output capacitance of the tube to a value suitable to resonate L105 and L106 at the operating frequency. Both inductors L105 and L106 form an inductive divider, with the 50 ohm output load actually connected across L106. The ratio L105/L106 determines the plate impedance presented to V101. L106 is the output loading control.

An effective low-pass filter with associated directional coupler is provided for mounting externally in the 3-1/8 inch coaxial line from the output of the final amplifier, jack J102.

4-6. METERING CIRCUITS ANALYSIS

4-6.1. P.A. Meter Circuits

Meters providing continuous monitoring of the PA status include: M204 (PA GRID CURRENT), M203 (PA PLATE CURRENT), M202 (PA PLATE VOLTAGE), M206 (PA POWER OUTPUT), and M201 (PA FIL VOLTAGE).

The grid current meter M204 is connected in the return lead from ground to filament. It has a 1-ampere movement.

The plate current meter M203 is connected in the return lead from filament to negative of H.V. power supply. A 1-ohm resistor (R218) is used as a source for remote PA plate current readout available at TB201-15.

Meter M202 (PA PLATE VOLTS) is connected in series with multiplier resistors R210 to R213. The voltage drop across R215 is used for remote plate voltage readout at TB201-15.

4-6.2. Power Output and VSWR Measurement

PA POWER OUT meter M206 provides a readout of both forward and reflected RF power output as sensed and detected by directional coupler DC201 and selected by PA POWER OUT switch S213.

The top scale indicates power in percent and lower scale indicates VSWR from 1:1 to 3:1.

The meter is factory calibrated to read 100% for nominal FORWARD power output by means of R220 (not accesible from front panel).

To read VSWR at any power output, PA POWER OUTPUT switch S213 is first turned fully clockwise to CAL, then meter M206 is set to read 100% by adjusting potentiometer R221 located underneath meter on meter panel, then switch S213 is set to REFLECTED. The display is now calibrated to read VSWR directly.

4-6.3. PA Filament and Elapsed Time Meter Circuits

PA FIL VOLTAGE meter provides a readout of filament voltage of PA tube V101. Resistor R221 compensates for voltage drop in filament chokes, thus reading is accurate measurement of filament voltage.

Filament voltage is adjusted within $\pm$ 5% by means of PA FIL ADJUST variac T201.

Elapsed Time indicator HM-201 (HOURS) is connected on primary of PA filament transformer T101 and provides a cumulative read out in hours of filament operation of final tube V101.

4-7. POWER CONTROL

Once the transmitter is tuned and placed in operation, the power output can be adjusted manually by control switch S5 located in DRIVER section, or the power output can be automatically maintained at the authorized level by the automatic power control circuit. Control switch S5, which is spring loaded and returns to off (center) when released, applies ground to the proper winding of motor B3 to cause it to rotate in the desired direction. The shaft of B3 is mechanically coupled to a power rheostat in the DRIVER screen voltage supply. (See Model 602A instruction book).

The power supply voltage required to operate the automatic power control module A2 is furnished by T204 through Power Control switch, S212. This voltage is rectified by D1 and D2 then filtered by C1 and C2, providing $\pm$ 15 volts to power the operational amplifiers IC1 thru IC4 and transistors Q1 thru Q5. (Refer to Figure 3-10).

The operation of the automatic power control is as follows. The transmitted power output is sampled by directional coupler DC1 which provides a positive voltage proportional to RF output power. This DC voltage is fed to the inputs of IC1 and IC2, used as unity gain buffers driving the "RAISE" and "LOWER" comparators IC2 and IC3. R3, R4, and D7 provide a reference DC voltage for the "RAISE" comparator and R10, R11, and D9 provide the DC reference voltage for the "LOWER" comparator.

Under normal power output the positive voltage on pin 2 of IC2 is greater than the voltage on pin 3. This causes the output of IC2 to be negative, keeping transistors Q1 and Q2 off and relay K1 off. Should the RF power output decrease the sample from DC1 would also decrease and the positive voltage on IC2 pin 2 goes below the voltage on pin 3. The output of IC2 will saturate positive, turning on Q1 and Q2, operating K1 closing contacts 9 and 10. Relay K1 contacts 9 and 10 complete the coil circuit for relay K3 (RAISE) on the motor drive P.C.Board. K3's normally open contacts close, causing power control motor B3 to rotate in the "RAISE" direction.

Motor B3 will continue to rotate until the RF power output increases to a level where the DC sample at IC2 pin 2 is again greater than the reference voltage at pin 3, turning off Q1, and Q2 and opening K1 and K3 which turns off power control motor B3.

During normal power output the sample voltage on IC4 pin 2 is less than the reference voltage at pin 3. This causes the output of IC4 to be saturated positive, turning on Q3 and Q4 which shorts out base drive for Q5 keeping Q5 and relay K2 off.

SECTION V
MAINTENANCE

5-1. PERIODIC INSPECTION AND MAINTENANCE

> **WARNING**
>
> Even if the transmitter is completely shut down, be extremely cautious whenever adjustment or maintenance is required to be conducted in the vicinity of components that are normally energized with high potentials. To ensure safety, use the insulated shorting supplied and ground all high-voltage capacitors, plate lines, etc.

Only the cabinet cooling air filters and the tube anode coolers require periodic special attention. Otherwise, periodic inspection, cleaning, and maintenance requirements for the Model 625A are in accordance with standard practice for maintaining any communications equipment to provide optimum performance with minimum failures.

5-1.1. Air Filters

The cabinet cooling air filters for the Model 625A are located on the rear cabinet doors. If these filters are permitted to become clogged with dust and dirt particles the flow of air to the blowers may become so restricted that airflow interlock switch S203 will not close, rendering the unit inoperative. Periodically, as determined by their condition, the filters should be cleaned to ensure a free flow of clean air through the unit. Remove the filters and immerse and agitate them in hot soapy water. When clean, rinse filters and allow to dry before replacing them in the unit.

5-1.2. Anode Coolers

To ensure proper cooling of amplifier tube V101, the anode coolers of this tube should be periodically inspected for particles of dirt or dust that might interfere with effective cooling. To remove and replace V101, refer to paragraph 5-2 of this section. Once removed from the RF amplifier cavity, the anode coolers of these tubes may be cleaned by simply blowing a jet of air through the cooling fins.

5-2. REMOVAL AND REPLACEMENT OF AMPLIFIER TUBES

Certain precautionary steps should be taken to ensure the safety of maintenance personnel when removing and replacing the amplifier tubes as well as to ensure proper handling of the tubes. To remove and replace the amplifier tubes, proceed as follows:

a. Set PLATE switch S207 to the OFF position.

b. Set MASTER switch S201 to OFF and open transmitter safety disconnect switch.

c. Remove back cover of PA cavity.

d. Remove V3 as follows:

(1) Remove the plate choke connection and move it to the side.

(2) Grasp tube by the two half rings and lift tube stratight up out of its socket.

e. Replace V3 as follows:

(1) Grasp tube half rings and insert tube, bottom end first, into coaxial capacitor.

(2) Carefully lower tube into its socket and ensure that it is fully seated.

(3) Replace the plate connection.

f. Replace back cover of PA cavity, as appropriate, and close rear cabinet door.

5-3. OVERLOAD RELAY ADJUSTMENT

The only test equipment required to adjust the overload relays are an ohmmeter and an adjustment (0 to 25 vdc) power supply capable of delivering 5 amperes.

5-3.1. Driver Section Overload Relay Adjustment

See model 602A Instruction Book

5-3.2. PA Grid Current Overload

To adjust the overload threshold of K302 (figure 3-2 and schematics A-263A and S-265A), proceed as follows:

a. Turn OFF PLATE.

b. Connect negative lead of power supply to chassis ground and positive lead to terminal TB302-14 on control panel.

c. Energize 25V adjustable power supply and adjust its output for an indication of 950 MA as observed on PA GRID CURRENT meter M204.

d. Adjust potentiometer R302 to the point where K302 actuates and PA GRID overload tally indicator DS209 lights.

e. Disconnect adjustable power supply.

f. Depress OVERLOAD lamp reset switch momentarily to extinguish DS209.

5-3.3. PA Plate Current Overload

To adjust the overload threshold of K303, proceed as follows:

a. Turn OFF PLATE.

b. Connect negative lead of adjustable power supply to terminal TB302-17 on control panel. Connect poristive lead to TB302-14 on control panel.

c. Energize 0-25V adjustable power supply and adjust its output for an indication of 3 amperes as observed on PA PLATE CURRENT meter M203.

d. Adjust potentiometer R303 (figure 3-2) to the point where K303 actuates and PA PLATE overload tally indicator DS 208 lights.

e. Disconnect adjustable supply.

f. Set OVERLOAD LAMP RESET switch momentarily ON to extinguish DS208.

5-3.4. Automatic Power Control Adjustment

a. Locate R4 (top section of PC board) and turn all the way counter clockwise.

b. Locate R11 (bottom section of PC board) and turn all the way clockwise.

c. Turn plate ON. In this condition the output of both op-amplifiers is negative and no effect on power can result.

d. Establish the maximum and minimum power output. Set automatic power control switch off and increase output power by means of power trim S6 over the desired maximum.

e. Turn On automatic power control switch S212 and turn CCW lower control R11 until desired maximum output is reached.

f. Turn OFF switch S212 and adjust power trim S5 below the desired minimum output power.

g. Turn ON switch S212 and turn RAISE control R4 CW, until desired minimum output is obtained. This completes the adjustment procedure.

NOTE: Disable automatic power control operation before changing power manually.

5-3.5. VSWR Adjustment

a. Turn plate OFF.

b. Adjust R1 fully CW (See schematic S-263A, VSWR Board A1)

c. Turn plate ON and reduce power to about 4% of full power output. Obtain this low power condition by reducing to minimum DRIVER power and simply detuning INPUT TUNING control in PA section.

d. Swap FORWARD and REFLECTED cables from directional coupler to BNC connector J203 and J204 on top of cabinet (See figure 2-1).

f. Turn plate OFF and re-connect FORWARD and REFLECTED cables to corresponding BNC connectors.

This setting will turn the transmitter off for a VSWR of approximated 1.5 to 1 in the transmission line.

SECTION VI
REPLACEABLE PARTS

6-1. ORDERING INFORMATION

When ordering parts for the Model 625A FM Transmitter, give the model number and the serial number of the equipment and the reference designation and Sparta part number. To order a part not listed in paragraph 6-3 of this section, give a complete description of the part including function and location.

All parts should be ordered from:

SPARTA ELECTRONIC CORPORATION
5851 Florin-Perkins Road
Sacramento, California 95828
Telephone: (916) 383-5353
Telex: 377-488
Cable Address: SPARTA

6-2. PARTS LOCATION

The location of parts listed in table 6-2 are shown in figures 3-1 through 3-6.

6-3. TABLES OF REPLACEMENT PARTS

Table 6-1 contains a listing of replaceable parts for the Model 625A.

Table 6-1. List of Manufacturers

Code No.	Manufacturer	Address
CAPE	Capewell Machine Screw Products	Maple Shade, NJ
01121	Allen Bradley Co.	Milwaukee, WI
01238	Energy Systems	Palo Alto, CA
02660	Amphenol Corporation	Broadview, IL
03522	Mc Clean Engineering Labs.	Princeton, NJ
04713	Motorola Semiconductor Products, Inc.	Phoenix, AZ
06980	Varian Associates, Eimac Division	San Carlos, CA
11502	I R C	Boone, NC
12969	Unitrode Corporation	Watertown, MA
14604	Elmwood Sensors, Inc.	Cranston, RI
27264	Molex Products Company	Downers Grove, IL
29505	Temple Industries	Tecate, CA
32171	Modutec, Inc.	Norwalk, CT
44655	Ohmite Manufacturing Co.	Skokie, IL
52090	Rowan Controller Co.	Westminster, MD
53021	Sangamo Electric Co.	Pickens, SC
56289	Sprague Electric Co.	N. Adams, MA
58474	Superior Electric Co.	Bristol, CT
71400	Bussman Mfg. Division of Mc Grow - Edison Company	St. Louis, MO
71590	Globe Union Inc. - Centralab Division	Milwaukee, WI
71628	Phelps Dodge Comm. Co.	Marlboro, NJ
71744	Chicago Miniature Lamp Works	Chicago, IL
71785	Cinch Mfg. Co. - Howard B. Jones Division	Chicago, IL
72619	Dialight Corporation	Brooklyn, NY
72982	Erie Tech. Products	Erie, PA
74193	Heinemann Electric Co.	Trenton, NJ
74970	E.F. Johnson	Waseca, MN
77342	Potter and Brumfield	Princeton, IN
81073	Grayhill Inc.	La Grange, IL
81095	Triad Transformer Corporation	Venice, CA
82389	Switchcraft Inc.	Chicago, IL
82877	Rotron Mfg. Corporation	Woodstock, NY
91637	Dale Electronics Inc.	Columbus, NB
91929	Honeywell Inc. Micro Switch Division	Freeport, IL
73445	Amperex Electronic Corporation	Hicksville, NY

TABLE 6-2 REPLACEABLE PARTS LIST

CABINET ASSEMBLY

DESIG.	DESCRIPTION	SPARTA PART NUMBER	MFR.	MFR. PART NO.	TOTAL
A1	VSWR Protection Board		23265		1
A2	Auto, Power Control Board		23265		1
A3	Motor Driver Board		23265		1
BL201, BL202	Fan, 115 VAC	231-0085	82877	CL2T2	2
C201	Capacitor, oil paper, .1mfd 10 kv	103-2013-08	53021	702012-5002	1
C202	Capacitor, oil paper, 5mfd, 10 kv	103-2013	53021		1
C203 thru C211	Capacitor, cer, disc, .01, 1 kv	110-0230	71590	DD-1032	9
C212	Capacitor, electrolytic 2600 mfd, 50V	112-1430	56289	30D505G050BB4	1
CB202(CB1)	Circuit Breaker, 240V, 20A	280-0095	74193	2263S	1
CB201 (CB2)	Circuit Breaker, 3ph, 240V 125A	280-0091	74193	CJ3-A3125-240-9	1
CR201 thru CR206	Rectifier diode 15kv, 5A	161-1200	Amperex	RS5-110155	6
DC201	Directional coupler 3-1/8	433-0329	71628	4431850	1
DS201 thru DS209	Lamp, Neon	244-0094	71744	NE51	9
F201 thru F204	Fuse 5A, 250vac, Slo-Blo	261-0087	71400	MDA5	4
HM201	Elapsed time indic.	268-9164	32171		1
J1 to J10	Connector	286-1378-01	27264	1375R	1
J203-J204	Connector BNC Female	287-0034-01	02660	UG1094A/U	2
K201	Contactor 3ph, 240/100A 115V coil, w/NC-NO auxiliary switch	180-0510-12	01121	702LDOD93	1
K202	Contactor 3ph, 240/60A, 115V coil, w/NC-NO, auxiliary switch	180-0510-08	01121	702LCOD93	1
K203, K204	Contactor 3ph, 240/30A	180-0415-05	52090	2200-EB330AA	2

TABLE 6-2 REPLACEABLE PARTS LIST

CABINET ASSEMBLY (Cont'd)

DESIG.	DESCRIPTION	SPARTA PART NUMBER	MFR.	MFR. PART NO.	TOTAL
LPF	Harmonic filter	433-0531	71628	42-318-50	1
L201	Choke filter 3H, 5A	317-0231	QUAL	2103	1
M201	Meter 0-10 VAC	368-9163	32171		1
M202	Meter, 1MA Movement, 0-10kv, scale	368-9165	32171		
M203	Meter, 0-6 ADC	368-9166	32171		
M204	Meter, 0-1 ADC	368-9168	32171		
M205	Meter, 0-300 VAC	368-9162	32171		
M206	Meter, 0-1000A Movement 0-110% Power 1 to 3:1 VSWR scale	368-9169	32171		
P1 to P10	Plug	286-1377-01	27264	1375P-2	10
R201, R202	Resistor, WW, 50, 225W	131-0377	44655		2
R203, R204	Not used				
R205	Resistor WW, 25K, 50W	131-0281	44655	0418	1
R206 thru R208	Resistor WW, 100K, 225W	131-0400-01	44655	0925	3
R209	Not used				
R210 thru R213	Resistor WW, 2.5M, 1%, 5W	134-2902-02	91637	DC-5	4
R214	Resistor Comp., 100K, 10% 2W	136-1596	11502		1
R215	Resistor Comp., 10K, 10% 2W	136-1572	11502		1
R216, R217, R218	Resistor WW, 1, 5%, 50W	131-0252	44655		3
R219	Resistor WW, 10, 5%, 50W	131-0257	44655	0400B	1
R220, R221	Resistor, comp, var, 10K 2W	130-0058	01121	CLU 1031	2
R222	Resistor, comp, 1K, 10%, 2W	136-1548	11502		1
R223	Selected of factory, 1/2W				1
S201	Switch, lever	296-0421-02	82389	13001L	2
S202	Switch Thermal (NC) open 230 ± 5°, close 207 ± 5°	305-0030	14604	3100-3-665	1

TABLE 6-2 REPLACEABLE PARTS LIST

CABINET ASSEMBLY (Cont'd)

DESIG.	DESCRIPTION	SPARTA PART NUMBER	MFR.	MFR. PART NO.	TOTAL
S203	Switch, air	305-0001	03522	S1278	1
S204	Switch, thermal (NO) CLOSE 130 ± 5° , 110 ± 5°	305-0029	14604	3100	1
S205, S206	Switch, interlock	296-0311	91929	2AC6	2
S207	Same as S201				
S208	Switch, Lever, 2PST	296-0421-11	82389	13005L	1
S209, S210	Push button, NC, w/guard	296-0300-02	81073	4002	2
XS209, XS210	Guard, push button switch	302-0014-02	81073		2
S211	Switch rotary, 8 poles, 2 pos non shorting	295-0006	71590	CRL1419	1
S212	Switch lever 2PDT	296-0421-09	82389	1300GL	1
S213, S214	Switch lever, 4 poles, 3 pos	295-0137	71590	2515	2
T201	Transformer, variable, 0-40vac 7 amp	326-0200	58474	10B-40	1
T202	Transformer prim 230, sec 115	326-0421	QUAL	2211	1
T203	Transformer, HV, 3 phase 230 V	326-0422	01238		1
T204	Transformer, prim 230, sec 6 VAC	326-0050	81095	F13X	1
TB201, TB202	Terminal block 20 contact	477-0050	71785	20-141	2
XDS201 thru XDS209	Lampholder with lens	247-1415-02	72619	135-0463-311	9
XF201 thru XF204	Fuse indicating	263-0039-01	71400	HKL-415A	4

TABLE 6-2 REPLACEABLE PARTS LIST

CONTROL LADDER AND OVERLOAD PROTECTION CIRCUITS

DESIG.	DESCRIPTION	SPARTA PART NUMBER	MFR.	MFR. PART NO.	TOTAL
C301 thru C303	Capacitor, cer, disc, .01 mfd, 1kv	110-0230	56289	5GAS10	3
C304 thru C309	Capacitor cer disc, .001 mfd, 1kv	110-0013	71590	DD102	6
C310	Capacitor, 1000mfd, 16V	112-0008	29505		1
C311 thru C315	Capacitor, Tantalum, 10mf, 35V	104-0010	29505		6
C316 thru C318	Same as C304				
C319, C221	Same as C311				
C320	Same as C304				
C322	Capacitor, 1000mfd 50V	112-0009			1
D301 thru D305	Diode, rectifier	161-0007	04713	IN4005	5
D306 thru D310	Diode, Zener, 5.1V, 1W	161-0022	04713	IN4733	5
D311	Diode, rectifier, bridge	161-0010	83003	VS448	1
K301, K302	Relay 4PDT, coil 6VDC	180-0405	77342	P & B KHP17011	2
K303 thru K313	Relay 4PDT, coil 115VAC	180-0403	77342	P & B KHU17A11	11
R301, R302	Resistor, WW, variable 50 ohms	137-0895-12	44655	0110	2
R303	Not used				
R304, R312	Resistor, comp., 82K 10%, 1/2W	136-0083	11502		2
R305, R313	Resistor, comp., 160, 10%, 1/2W	136-0020	11502		2
R306, R308, R310	Resistor, comp., 100K 10%, 1/2W	136-0085	11502		3
R307, R309, R311	Resistor, comp., 33, 10%, 1/2W	136-0008	11502		3
R314	Resistor, comp., 1K, 10%, 2W	136-1548	11502		1

TABLE 6-2 REPLACEABLE PARTS LIST

CONTROL LADDER AND OVERLOAD PROTECTION CIRCUITS (Cont'd)

DESIG.	DESCRIPTION	SPARTA PART NUMBER	MFR.	MFR. PART NO.	TOTAL
T301	Transformer, prim., 115, sec 20V, 300 MA		81095	F91X	1
TB301, TB302	Terminal block 20 terminals		71785	20-140Y	2
Q301, thru Q305	Transistor	149-0003	04713	2N2102	5
XK301 thru XK313	Socket, relay				13

TABLE 6-2 REPLACEABLE PARTS LIST

RF AMPLIFIER ASSEMBLY

DESIG.	DESCRIPTION	SPARTA PART NUMBER	MFR.	MFR. PART NO.	TOTAL
BL101	Blower	231-0080-02	82877	CXH33A33A	1
C100, C101	Capacitor, cer., 100pf 15kv	110-0338	71590	857-100N	4
C102	Capacitor, air var, 9-38pf	109-0101	74970	154-0011-001	1
C103 thru C107	Capacitor, cer., 1000pf 5kv	110-0390-01	71590	858S	9
C108, C109	Capacitor, feed thru 500pf, 1kv	110-1070-01	72982	CK70AW10ZM	2
C110 thru C113	Same as C103				
C114	Capacitor	022-4130	CAPE	022-4130	1
C115, C116	Same as C100				
J101	Connectors, input anchor assembly to 1-5/8" line	022-4173	23265		1
J102	Connector, output anchor assembly to 3-1/8" line	022-4174	23265		1
J103	Connectors, BNC	287-0034-01	02660	UG1094 A/U	1
L101	Inductor, input	022-4170	23265	022-4170	1
L102	Inductor, input	022-4171	23265	022-4171	1
L103	Inductor, plate shunt	022-4211	23265	022-4211	1
L104, L105	Inductor, variable	022-224-134	COX	022-224-134	2
L106	Inductor, output	022-4172	23265	022-4172	1
L107	Sampling loop		23265		1
RFCH1, RFCH2	Choke, Fil	022-4181	23265	022-4181	2
RFCH3	Choke, plate	022-4182	23265	022-4182	1
RFCH4	Choke, plate	022-4183	23265	022-4183	1
T101	Transformer, 6.3 VCT, 160A		QUAL		1
TB101	Terminal block	477-0050	71785	10-140	1
TB102	Terminal block	477-0017	71785	5-140	1
V101	Tube, PA	353-0456	06980	3CX15000A7	1
XV101	Socket PA tube	396-1032	06980	SK1320	1

SPARTA
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August 1, 1973