Rockwell International

Collins instruction book

Collins Systems International, Inc.

820D-2
1-kW AM Transmitter

BROADCAST EQUIPMENT GUARANTEE

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INFORMATION NEEDED:

(A) Type number, name and serial number of equipment
(B) Date of delivery of equipment
(C) Date placed in service
(D) Number of hours of service
(E) Nature of trouble
(F) Cause of trouble if known
(G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
(H) Item or symbol number of same obtained from parts list or schematic
(I) Collins number (and name) of unit subassemblies involved in trouble
(J) Remarks

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(B) Collins part number (9 or 10 digit number) and description
(C) Item or symbol number obtained from parts list or schematic
(D) Collins type number, name and serial number of principal equipment
(E) Unit subassembly number (where applicable)

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820D-2

1-kW AM Transmitter

Collins Commercial Telecommunications Division
Rockwell International
Broadcast Engineering
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table of contents

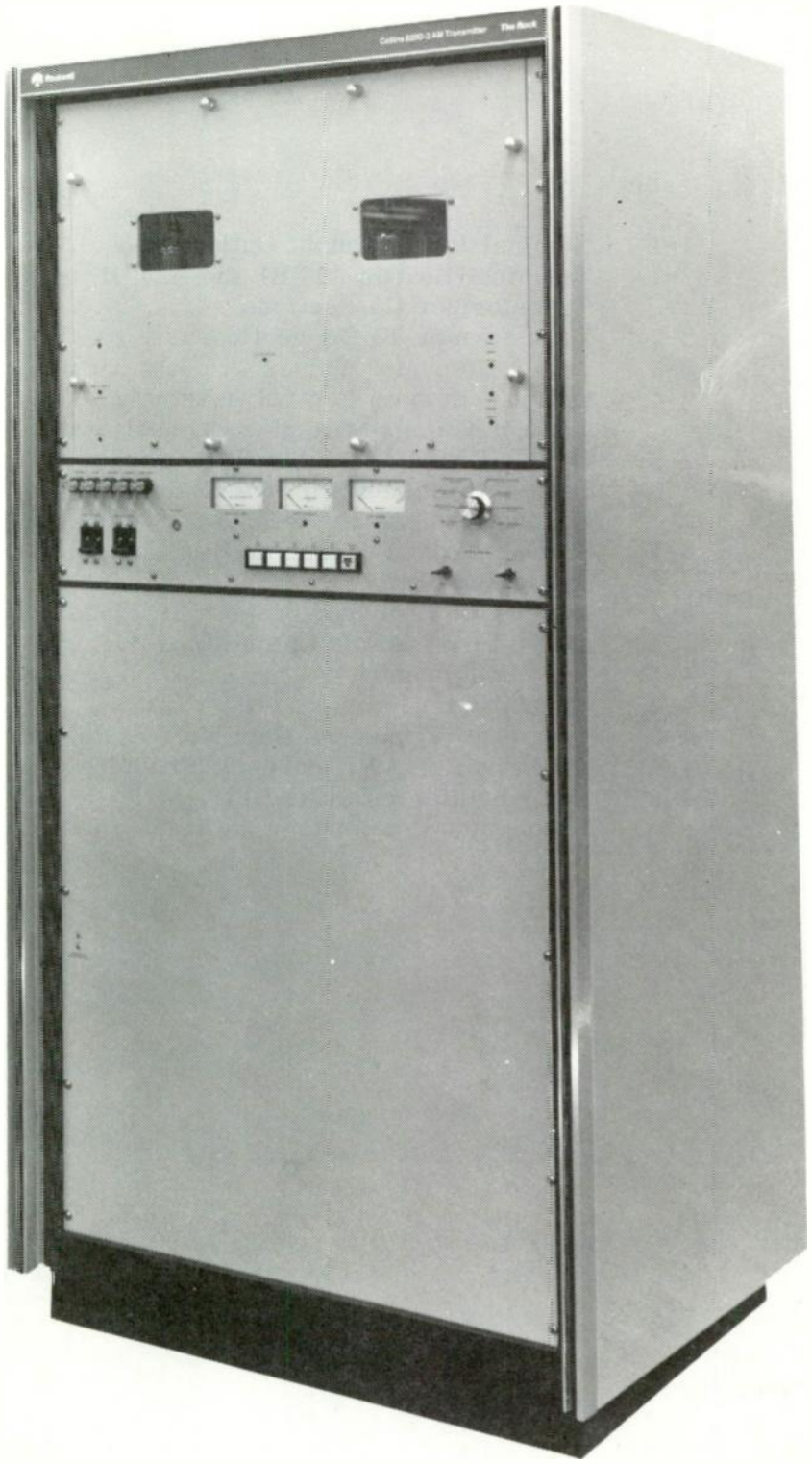


Figure 1-1. 820D-2 1-kW AM Transmitter.

1.1 INTRODUCTION

The 820D-2 1-kW AM Transmitter is an amplitude-modulated standard broadcast transmitter (figure 1-1) that operates in the 540- to 1600-kHz frequency range. The 820D-2 has two output power operating modes - high and low. The nominal power output in each mode is controlled by tap connections on the plate transformer and a fixed attenuator in the audio input circuit. Three nominal power options are available and are listed in table 1-1. Both the high and low power modes are adjustable by 10 percent using the power control on the control panel.

Table 1-1. Nominal Power Output Options.

OPTION	NOMINAL POWER OUTPUT	
	LOW POWER MODE	HIGH POWER MODE
1	250 watts	500 watts
2	250 watts	1000 watts
3	500 watts	1000 watts

1.2 PHYSICAL DESCRIPTION

The 820D-2 transmitter is completely self-contained in a steel-framed, sheet metal cabinet. The cabinet is structured for front and rear access with all access panels interlocked to remove high voltages upon opening. Compartments where sceen and plate voltages are exposed are equipped with high-voltage grounding switches that short-circuit the appropriate power supplies as panels are removed. An optional front door is available to enhance transmitter appearance. The front door is not interlocked.

The 820D-2 transmitter is divided into four major assemblies - RF Compartment A1, Power Supply Assembly A2, Control Circuits Assembly A3, and Control Panel A4. Each assembly is accessible by removing one or more of the access panels. The windowed upper front panel provides access to the rf and modulator compartment tubes and circuit cards. The lower front panel and rear cabinet panel provide access to the power supply assembly, power transformers, and control circuits assembly. An additional cover at the upper rear portion of the cabinet provides access to the rf output network.

One blower, mounted beneath the rf compartment, cools the RF and modulator tubes. A flushing fan draws air through the air filter mounted on the rear cabinet panel and blows the air through the rf compartment. All air outlets are located in the cabinet top cover.

1.3 TECHNICAL DESCRIPTION

Except for the high-voltage power supply transformers, filters, and large control components mounted on the 820D-2 transmitter cabinet floor (A5), all functional circuits are contained on the four major assemblies described in paragraph 1.2. The various components and assemblies are interconnected as shown in the block diagram, figure 5-1, and the overall schematic, figure 5-8. Functional descriptions of the individual circuits are provided in the following paragraphs.

1.3.1 RF Compartment A1

1.3.1.1 Audio Driver

The 820D-2 transmitter receives a +10 dBm ±2 dB, 150/600-ohm audio input signal at audio driver A1A1. The solid-state audio driver uses two stages of class A, push-pull amplification to drive the modulator tubes without an interstage transformer. The first stage uses 2N3053 transistors. The second stage, the audio driver output amplifier, uses 2N3585 transistors with outputs directly into the modulator grids. This final driver stage is supplied 290 volts dc to ensure ample collector swing capability. Feedback voltage (10 dB at 1 kHz) is derived from the modulator plates via resistor-capacitor ladder networks and is applied to the audio driver input to reduce distortion.

1.3.1.2 Modulator

The modulator for the 820D-2 consists of a circuit using two, push-pull, 5-500A pentode tubes that operate class AB_1. The circuit is a conventional modulation transformer/reactor circuit with the tubes operating at a nominal plate voltage of 3100 volts (for 1.1-kW power output). Individual controls are provided for adjustment of the modulator fixed bias, and for dynamic adjustment of the grid drive and filament voltage.

1.3.1.3 RF Exciter

A dual oscillator card, A1A3, with two independent crystal oscillator circuits is the rf excitation source for the 820D-2 transmitter. A selector switch determines which oscillator is used to excite the transmitter. The dual oscillator circuit provides backup support to reduce transmitter downtime in case of an oscillator failure.

For stability, both oscillators operate at four times the carrier frequency from 540 kHz to 1020 kHz or at two times the carrier frequency from 1080 kHz to 1600 kHz. The oscillator output is divided, amplified, and shaped in A1A3. The final output is transformer coupled to the rf driver. A potentiometer controls the duty cycle of the signal applied to the rf driver and determines the drive level to the power amplifier.

1.3.1.4 RF Driver

A single 2N5039 transistor on card A1A2 is the rf driver. This transistor operates class C and supplies drive to the power amplifier grids through a transformer with a tuned secondary.

1.3.1.5 Power Amplifier

The power amplifier (pa) consists of two parallel 5-500A tubes connected as tetrodes and operated class C with conventional plate modulation. The screen is self-modulated using dropping resistors in the screen voltage supply lead. Power output is controlled by the

voltage supplied to the pa plate. For a maximum carrier power level of 1.1 kilowatts at the antenna terminal, a nominal voltage of 3100 volts is supplied to the pa plate. Proportionate voltage levels are supplied for reduced maximum power outputs of 275 watts and 550 watts. Nominal plate impedance is 3250 ohms regardless of the power level.

The pa tubes operate with the cathodes grounded and the screens near rf ground potential. The -155-volt bias supply provides protective voltage during drive loss and combines with the grid operating bias of the tubes to supply the -200-volt grid voltage.

1.3.1.6 Output Network

The 820D-2 transmitter output network is a 3-node bandpass filter. All components, except for the pa tuning capacitor, are fixed tuned. The pa tuning capacitor, a vacuum variable capacitor adjusted from the control panel, varies the plate tuning. Filter nodes one and two are bottom coupled by an inductor. Nodes two and three are top coupled by an inductor that serves as a fixed loading adjustment. All nodes are tuned to the operating frequency with the coupling circuits providing 90° phase delay between nodes.

1.3.2 Power Supply Assembly A2

The power supply assembly contains most small circuit components for each of the 820D-2 transmitter power supplies. Large power supply components, including the power transformer, are mounted on the cabinet floor. All power transformers are provided with primary taps for transmitter operation at nominal input voltages of 208 to 240 volts ac.

1.3.2.1 28-Volt DC Power Supply

The 28-volt dc power supply supplies +28 volts to the control circuits, pilot lamps, oscillator, rf driver, and the first audio driver stages. Primary power from the low-voltage circuit breaker and fuse A4F1 is stepped down by a transformer, rectified by silicon rectifiers, and regulated by conventional series regulators.

1.3.2.2 PA and Modulator Filament Voltage Supplies

Separate transformers receive primary power from the low-voltage circuit breaker, reduce the voltage, and supply the pa and modulator tubes with filament voltage. The filament voltage is adjusted by transformer taps and series rheostats. An optional constant voltage transformer may be added at A3TB5 to improve tube life.

1.3.2.3 Bias Supply

The bias supply provides -155-volt bias for the pa and modulator control grids. A stepdown transformer receives primary power via the low-voltage circuit breaker and fuse A4F2, and supplies the bias voltages to full-wave silicon rectifiers and a conventional filter.

1.3.2.4 Screen Power Supply

The screen power supply receives primary power from the high-voltage circuit breaker and fuse A4F3, and employs a step-up transformer, silicon rectifier, and LC filter. Zener diodes connected across the screen supply provide the +290 volts required by the audio driver.

1.3.2.5 Plate Power Supply

The plate power supply uses a step-up transformer and a full-wave silicon rectifier with an L-section filter to provide the 3100 volts required (for 1.1-kW power output) at the pa plate. Since power output in the 820D-2 transmitter is controlled by varying the plate voltage, transformer taps are provided to reduce maximum power output to 550 or 275 watts. In addition, a 10-percent variation of power output is provided by a motor-driven rheostat in the power amplifier plate supply circuit. This rheostat is controlled by the RAISE/LOWER POWER CONTROL switch on the control panel or by the optional Automatic Power Control Assembly.

1.3.3 Control Circuit Assembly A3

The control circuit assembly contains a printed circuit board and relays used for 820D-2 transmitter control. Other circuits on the A3 assembly allow overload shutdown and push-button control of the filament and plate voltage. Overloads in the pa or modulator tubes are monitored by relays in the cathode circuit return. These relays remove transmitter control voltage in the A3 assembly. Automatic recycling of temporary overloads is provided to shorten transmitter downtime. The main control sequences for filament and plate voltages are pushbutton controlled from the control panel or a remote control system.

1.3.4 Control Panel A4

The control panel, mounted in the front center of the transmitter, contains all meters, operating controls, and status indicators. See section 3 of this instruction book for a description of operating controls.

1.4 820D-2 TRANSMITTER OPTIONS

1.4.1 Remote Control

The 820D-2 transmitter is suitable for installation at an unattended site and for operation from a remote control system in a studio. Optional remote control relays provide the following switching functions:

Filament ON/OFF

High Power ON/Plate OFF

Low Power ON/Plate OFF

Power Adjust Raise/Lower

Remote Control Failsafe

Manual/Automatic Power Control

The optional 8-relay assembly required is mounted on control circuits assembly A3. Each relay will operate with control voltages of 115 volts ac, 115 volts dc, 28 volts dc, or 48 volts dc.

Each transmitter contains built-in meter shunts for remote samples of plate voltage and current. Also, the modulation monitor sampling coil has two adjustable taps that are switched to a common output lead for equal-level sampling during reduced power operation.

1.4.2 Automatic Power Control

An optional automatic power control (APC) assembly provides unattended control of the power output. The APC assembly consists of a servo amplifier and a power output sensing unit. The sensing unit rectifies and filters a sample of rf output current and supplies the sample as a dc voltage to the servo amplifier. The servo amplifier determines the difference between the sample dc voltage and a reference voltage. This difference voltage becomes the servo input error signal. The error signal activates relays in the APC assembly that control the power adjust rheostat motor. (See paragraph 1.3.2.5.) The relays raise or lower power output until the error signal reduces to 0 ±10 millivolts dc.

Two potentiometer adjustments control the level of the reference input voltage. One potentiometer controls the reference voltage in the low power mode; the other controls the reference voltage in the high power mode. These potentiometers allow exact adjustment of the output power. Switching between the two potentiometers occurs automatically with mode change in the transmitter. The APC power is turned off when plate voltage is off to prevent the motor from running to a limit in the absence of an output sample. Automatic or manual power control is selected by a power control switch on control panel A4 or by a remote automatic power adjust control function.

1.5 TECHNICAL SPECIFICATIONS

Maximum Output Power Capability:	1100 watts
Output Impedance:	50 ohms, unbalanced
Frequency Range:	540 to 1600 kHz
Frequency Stability:	±5 Hz, 0° to +35°C (+32 to +95°F) ±10 Hz, -10° to +45°C (+14° to +113°F) ±20 Hz, -25° to +45°C (-13° to +113°F)
Audio Input Impedance:	150/600 ohms, balanced
Audio Input Level:	+10 dBm, ±2 dB
Audio Frequency Response:	±1 dB, 50 to 10,000 Hz
Audio Harmonic Distortion:	Less than 2%, 50 to 10,000 Hz (Typically 1% or less)
Carrier Shift	Less than 3%, 0% to 100% modulation, 400 Hz reference
Noise, Unweighted:	60 dB below 100% modulation at 1 kHz
Modulation Type:	High level plate
Ambient Temperature Range:	-25 to +45 C (-13 to +113 F)
Ambient Humidity Range:	95% maximum
Altitude:	7,500 ft (2,286 m) maximum

Power Source:	208/ 230/240 volts, single phase, 50/60 Hz
Permissible Combined Voltage Variation and Regulation :	5%
Power Requirement at 1100 Watts, 0% Modulation:	3500 watts maximum, 0.9 power factor
30% Modulation:	3600 watts maximum, 0.9 power factor
100% Modulation:	4400 watts maximum, 0.9 power factor

2.1 UNPACKING AND INSPECTING

2.1.1 Domestic Shipments

The uncrated transmitter is shipped on a shipping skid via a commercial air-ride van. Unpack the transmitter as follows:

CAUTION

Use care in moving the transmitter. Use appropriate lifting and moving equipment with at least 1250-lb (567-kg) capacity. Some components may be damaged if the transmitter is dropped or severely jarred.

a. Remove the transmitter from the van to a position near its installation site.

b. Lift the transmitter from the shipping skid.

c. Remove the two screws from the bottom of the rear access panel. Lift the panel from the transmitter.

d. Inspect the transmitter for loose hardware. Ensure that all controls operate freely. Examine the cabinet for dents and scratches.

e. Remove the four modulator and power amplifier tubes and chimneys from their separate containers. Inspect for damage.

f. File any damage claims properly with the transportation company. Retain all packing material if a claim is filed.

2.1.2 Foreign Shipments

The transmitter is shipped in a skid-type crate via a commercial transportation company. Unpack the transmitter as follows:

CAUTION

Use care in unpacking and moving the transmitter. Use appropriate lifting and moving equipment with at least 1250-lb (567-kg) capacity. Some components may be damaged if the transmitter is dropped or severely jarred.

a. Position the crated transmitter near its installation site.

b. Refer to the instructions stenciled on the side of the shipping crate and carefully uncrate the transmitter.

c. Remove the two screws from the bottom of the rear access panel. Lift the panel from the transmitter.

d. Inspect the transmitter for loose hardware. Ensure that all controls operate freely. Examine the cabinet for dents and scratches.

e. Remove the four modulator and power amplifier tubes and chimneys from their separate containers. Inspect for damage.

f. File any damage claims properly with the transportation company. Retain all packing material if a claim is filed.

2.2 LOCATION AND SPACING REQUIREMENTS

The 820D-2 transmitter may be installed in either an attended or, with remote control options installed, unattended location. Refer to figure 2-1 for transmitter dimensions and cable entry information. Observe the following siting practices to ensure optimum transmitter operation.

a. Allow at least 3.5 feet (1.1 m) of clearance at front and rear for servicing access.

b. Ascertain that environmental conditions are within the temperature, humidity, and altitude limits listed in paragraph 1.5.

c. Make certain that the transmitter site is clean and that the air is not excessively dusty or dirty.

NOTE

The air flow is approximately 500 CFM. If ducted to the outside, an equivalent volume of cool clean air must be provided to the transmitter to prevent air starvation and overheating.

The heat load to the room (if it is not ducted) is approximately 7200 BTU/HOUR for a transmitter output of 1100 watts, modulated at a 30% average level.

WARNING

HIGH VOLTAGE is used in this equipment.

DEATH ON CONTACT may result if you fail to observe safety precautions.

When working inside the equipment, be sure that all circuit breakers are OFF and that primary power is disabled at the wall disconnect or circuit breaker unless otherwise directed. If a procedure requires transmitter operation with access panels removed, do not allow bodily contact with any electrical component, tap, or terminal. Use heavily insulated tools to adjust variable components.

2.3 PRIMARY POWER

2.3.1 General

The 820D-2 transmitter requires a 208-, 230-, or 240-volt ±5-percent, single-phase, 50- or 60-Hz ac power source that delivers a minimum of 4500 watts of power at a 0.9 power

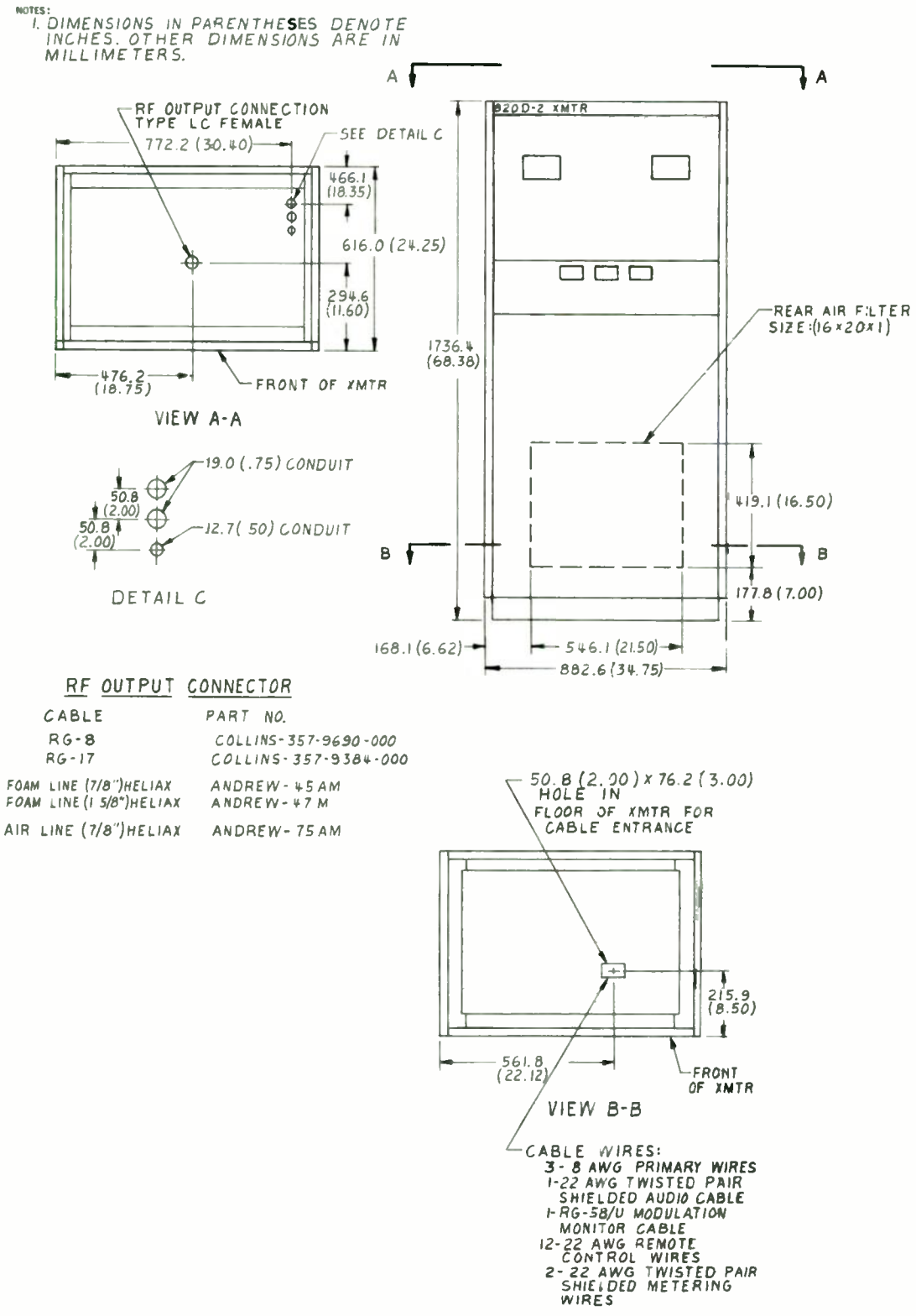


Figure 2-1. 820D-2 1-kW AM Transmitter Outline and Installation Diagram.

factor. Make provisions for a fused main power disconnect switch or circuit breaker capable of handling 50 amperes. Connect the primary power to terminal board A3TB6 with no. 8 AWG gauge wire as follows:

a. Connect the hot wires to A3TB6-1 and A3TB6-2.

b. Connect the neutral wire to A3TB6-3.

c. Connect the station ground to A3TB6-4.

CAUTION

Voltage between neutral and either hot wire must be between 110 and 125 volts ac. Measure and confirm the proper voltage before closing circuit breaker A4CB1.

2.3.2 Transformer Connections

The range of allowable voltage sources is made possible by the availability of different tap connections on terminal boards A1TB1, A1TB2, and A2TB1, and on plate transformer T1. The tap connections on the terminal boards are made to correspond to the primary power input (208, 230, or 240 volts). The tap connections on plate transformer T1 are made to correspond to both primary power input and rf power output requirements.

NOTE

All 830D-2 transmitters are factory adjusted at 240 V primary power and to specific customers frequency, and power output requirements. The following procedures are not to be performed if power source, frequency, and power output requirements are the same as the parameters listed in the production test data sheet supplied with each new transmitter.

CAUTION

If the constant filament voltage regulator option is factory installed, DO NOT change taps on transformers A1T1, A1T2, or A2T2.

2.3.2.1 Terminal Board A1TB1 Transformer Connections

Modulator tube filament transformer A1T2 tap connections are wired to the front side of terminal board A1TB1 terminals 33 through 36. Tap adjustments are made by moving the wires attached to the back side of A1TB1 terminal 34, 35, or 36. (The wire connected to A1TB1-33 is not moved.) If primary power source changes require tap adjustments, disconnect the tap adjustment wires and reconnect them as described in table 2-1.

Table 2-1. Terminal Boards A1TB1 and A2TB1 Transformer Connections.

TRANSFORMER	TERMINAL BOARD CONNECTIONS			
	COMMON	208	230	240
A1T1	NA	A1TB2-1	A1TB2-2	A1TB2-3
A1T2	A1TB1-33	A1TB1-34	A1TB1-35	A1TB1-36
A2T1	A2TB1-1	A2TB1-2	A2TB1-3	A2TB1-3
A2T2	A2TB1-6	A2TB1-5	A2TB1-4	A2TB1-4
A2T3	A2TB1-9	A2TB1-8	A2TB1-7	A2TB1-7

2.3.2.2 Terminal Board A1TB2 Transformer Connections

Power amplifier tube filament transformer A1T1 tap connections are wired to the front side of terminal board A1TB2 terminals 1, 2, and 3. Tap adjustments are made by moving the wire attached to the back side of A1TB2-1, 2, or 3. If primary power source changes require tap adjustments, disconnect the tap adjustment wire and reconnect it as described in table 2-1.

2.3.2.3 Terminal Board A2TB1 Transformer Connections

Screen power supply transformer A2T1 tap connections are wired to the top side of terminal board A2TB1 terminals 1, 2, and 3. Tap adjustments are made by moving the wire attached to the bottom side of A2TB1 terminal 2 or 3. (The wire connected to A2TB1-1 is not moved.) If primary power source changes require tap adjustments, disconnect the tap adjustment wire and reconnect it as described in table 2-1.

Bias supply transformer A2T2 tap connections are wired to the top side of terminal board A2TB1 terminals 4, 5, and 6. Tap adjustments are made by moving the wire attached to the bottom side of A2TB1 terminal 4 or 5. (The wire attached to A2TB1-6 is not moved.) If primary power source changes require tap adjustments, disconnect the tap adjustment wire and reconnect it as described in table 2-1.

The 28-volt power supply transformer, A2T3, tap connections are wired to the top side of terminal board A2TB1 terminals 7, 8, and 9. Tap adjustments are made by moving the wire attached to the bottom side of A2TB1 terminal 7 or 8. (The wire connected to A2TB1-9 is not moved.) If primary power source changes require tap adjustments, disconnect the tap adjustment wire and reconnect it as described in table 2-1.

2.3.2.4 Plate Transformer T1 Tap Connections

There are three tap connections on plate supply transformer T1. One connection is a common connection to terminal 1, 2, or 3. Another connection is a low power connection to terminal 5, 6, 7, 8, 9, or 10. The last connection is a high power connection to terminal 4, 5, 6, or 7. These tap connections are made to correspond to the primary source voltage and the desired nominal output option. (See paragraph 1.1.) If primary power source changes or output changes are required, adjust the T1 tap connections as follows:

a. Disconnect the three wires attached to the T1 terminals.

b. Use an ohmmeter to determine which of the three wires is connected to terminal board A3TB3 terminal 9. Label this wire HIGH POWER.

c. Use an ohmmeter to determine which of the two remaining wires is connected to terminal board A3TB3 terminal 10. Label this wire COMMON.

d. Label the last wire LOW POWER.

e. Refer to table 2-2 and reconnect the wires to the appropriate terminals.

2.4 AF INPUT AND RF OUTPUT CONNECTIONS

2.4.1 AF Input Terminal Board Connections

The 820D-2 transmitter accepts audio input at a level of +10 dBm ±2 dB from a source requiring a 150- or 600-ohm input impedance. Use no. 22 AWG gauge, shielded, twisted-pair wire (Belden 8451, or equivalent) to connect the audio input source to terminal board TB1. The audio "high" wire connects to terminal 1; the "common" wire connects to terminal 2; and, the shield connects to terminal 3.

Table 2-2. Transformer T1 Connections.

SOURCE VOLTAGE	LOW POWER OUTPUT	HIGH POWER OUTPUT	COMMON WIRE	LOW POWER WIRE	HIGH POWER WIRE
208	250 watts	500 watts	3	8	5
	250	1000	3	8	4
	500	1000	3	5	4
230	250	500	2	9	6
	250	1000	2	9	4
	500	1000	2	6	4
240	250	500	1	10	7
	250	1000	1	10	4
	500	1000	1	7	4

2.4.2 AF Input Strapping Connections

NOTE

All 820D-2 transmitters are factory adjusted at 240V primary power and to specific customer's frequency, and power output requirements. The following procedures are not to be performed if power source, frequency, and power output requirements are the same as the parameters listed in the production test data sheet supplied with each new transmitter.

a. Remove the upper front access panel.

b. Refer to the parts list in section 6 and locate resistors R6, R7, and R8 on audio driver card A1A1.

c. Check the values of the resistors and compare them with the values listed in table 2-3.

d. If the resistor values are different from the tabulated values, replace the resistors with 1/4-watt, 5-percent resistors with values equal to the tabulated values.

e. If the audio input source requires a 600-ohm impedance, strap A1A1-E2 to A1A1-E3.

2.4.3 RF Output Connection

Output connector A1J1 for the 820D-2 transmitter is a 50-ohm, type LC, female connector. Use standard 50-ohm coax to connect A1J1 to a balanced, 50-ohm antenna or dummy load capable of dissipating at least 1.5 kilowatts.

Table 2-3 Audio Attenuator Values.

LOW POWER OUTPUT	A1A1R6	A1A1R7	A1A1R8
500 watts	100 ohms	100 ohms	1800 ohms
250 watts	160 ohms	160 ohms	680 ohms

CAUTION

Do not operate the transmitter unless output connector A1J1 is properly connected.

2.5 MODULATOR AND POWER AMPLIFIER TUBE INSTALLATION

a. Remove the upper front access panel.

b. Insert the four 5-500A modulator and power amplifier tubes (V1 through V4) into sockets A1V1 through A1V4.

c. Install the four tube chimneys.

d. Connect the four tube caps to the four tubes.

e. Replace the upper front access panel.

2.6 OPTION INSTALLATION

2.6.1 Remote Control and Remote Monitoring

NOTE

If the remote control option was factory installed, skip to paragraph 2.6.1.2.

2.6.1.1 Remote Control Assembly A7 Installation

a. Remove the 820D-2 lower front access panel and the rear access cover.

b. Remove the straps between the following A3TB2 terminals: 1 and 2, 5 and 6, 7 and 8, 9 and 10, 21 and 22.

c. Refer to figure 5-6 and table 2-4. Strap the Remote Control Assembly, CPN 627-9721-001, for the control voltage provided by the customer-supplied remote control system.

d. Mount remote control assembly A7 to control circuits assembly A2.

e. Refer to figures 5-6 and 5-8. Connect the wires from the remote control assembly relays to the appropriate terminals on A3TB2.

Table 2-4. Optional Remote Control Assembly Control Voltage Strapping Connections.

SOURCE CONTROL VOLTAGE	STRAPPING CONNECTION	
	FROM	TO
24 Vdc, positive common	E1	E3
24 Vdc, negative common	E1	E4
48 Vdc, positive common	E1	E2
48 Vdc, negative common	E2	E4
115 Vac	E3	E4

2.6.1.2 Remote Control and Monitoring External Connections

Refer to figure 5-7 and make the remote control and monitoring external connections as follows:

a. Remove the lower front access panel and the rear access cover (if installed).

b. Connect the customer-supplied remote control panel to the remote control assembly terminal board (A7TB1).

c. Connect the customer-supplied remote plate voltage monitor to A1TB1-4 and 5.

d. Connect the customer-supplied remote plate current monitor to A1TB1-6 and 5.

e. Connect the customer-supplied modulation monitor to MOD MON connector A1J2.

f. Connect the customer-supplied frequency monitor to FREQ MON connector A1J3.

g. Replace all access panels.

2.6.2 Automatic Power Control A6

NOTE

If the APC option was factory installed, do not perform this procedure.

a. Remove the lower front access panel, the rear cabinet panel, and the output network access panel.

b. Remove the wire connected between A1L7 and rf output connector A1J1.

c. Mount APC sensor A6A2 to the rf output network chassis directly behind A1L5. (Refer to the silk-screened diagram on the output network access panel.)

d. Mount transformer A6T1 to control circuits assembly A3 just below the front end of A3TB2. (Refer to the silk-screened diagram on the lower front access panel.)

e. Mount APC servo board A6A1 to control circuits assembly A3 just behind A3TB2. (Refer to the silk-screened diagram on the lower front access panel.)

f. Refer to table 2-5 and connect the APC assembly as instructed.

g. Replace all access panels.

2.6.3 Filament Voltage Regulator Transformer Assembly A8

NOTE

If the constant filament voltage option was factory installed, do not perform this procedure.

a. Remove the lower front access panel and the rear cabinet cover.

b. Mount transformer T3 to transmitter floor with the hardware supplied.

c. Remove the jumpers between A3TB5-1 and 3, and A3TB5-2 and 4.

d. Connect the transformer terminals as described in table 2-6 using the 16 gauge wire supplied with the assembly.

e. Set tap connections on A1TB1 and A1TB2 for A1T1 and A1T2 at the 230-volt terminal. (See table 2-1.)

f. Replace all access panels.

2.7 INITIAL TURN-ON PROCEDURE

a. Ensure that all required installation procedures in paragraphs 2-1 through 2-6 are complete.

b. Ensure that all access panels are secured in place.

c. Apply primary power to transmitter.

d. Turn on the LOW VOLTAGE and HIGH VOLTAGE circuit breakers.

e. Press the FIL ON (filament on) pushbutton.

f. Set the AUTO/MANUAL POWER CONTROL to MANUAL.

g. Press the LP ON (low power on) pushbutton.

h. Adjust PA TUNE control (on control panel A4) for a minimum indication of PLATE CURRENT.

i. Readjust the PA TUNE control until PLATE CURRENT exceeds minimum current of step h. by 20 mA.

NOTE

Allow a 5-minute warmup period.

Table 2-5. Optional APC Assembly Connections.

WIRE COLOR	TO	FROM
Black	A2TB2-1	A6T1-1
Brown	A2TB2-2	A6T1-4
Red	A6T1-2	A6T1-3
Orange	A6T1-6	A6A1-12
Yellow	A6T1-5	A6A1-11
Shielded, Twisted Pair		
Red	A2TB2-16	A6A1-15
Black	A2TB2-15	A6A1-17
Shield	A2TB2-17	A6A1-16
Green	A2TB2-10	A6A1-13
Blue	A2TB2-11	A6A1-14
Violet	A2TB2-12	A6A1-1
Gray	A2TB2-17	A2TB2-12
White	A2TB2-13	A6A1-2
White/Black	A2TB2-14	A6A1-3
White/Brown	A2TB2-4	A6A1-6

Table 2-5. Optional APC Assembly Connections (cont).

WIRE COLOR	TO	FROM
White/Red	A2TB2-5	A6A1-4
White/Orange	A2TB2-6	A6A1-5
White/Green	A2TB2-7	A6A1-7
White/Blue	A2TB2-3	A6A1-10
White/Black/Red	A2TB2-8	A6A1-9
White/Black/Orange	A2TB2-9	A6A1-8
Shielded, Twisted Pair		
Red	A6A2-3	A1C20
Black	A6A2-4	A1C21
Shield	Ground	
1/2-in. Copper Strap	A1L7	A6A2-1
1/2-in. Copper Strap	A1J1	A6A2-2

Table 2-6. Optional Filament Voltage Regulator Connections.

WIRE COLOR	TO	FROM
Black	T3-H2	T3-H4
Brown	T3-H1	T3-H3
Red	A3TB5-1	T3-H1
Orange	A3TB5-2	T3-H4
Yellow	A3TB5-3	T3-X3
Green	A3TB5-4	T3-X1

j. Adjust the RAISE/LOWER POWER CONTROL until the desired low power output (250 or 500 watts) is indicated on the customer-supplied antenna or common point rf ammeter.

k. Compare the control panel meter readings with the values listed in table 3-2.

l. Press the HP ON (high power on) pushbutton.

m. Adjust the RAISE/LOWER POWER CONTROL until the desired high power output (500 or 1000 watts) is indicated on the customer-supplied antenna rf ammeter or wattmeter.

n. Compare the control panel meter readings with the values listed in table 3-2.

o. If the optional automatic power control option is installed, switch the AUTO/MANUAL POWER CONTROL switch to AUTO.

p. The 820D-2 is ready for normal operation.

3.1 CONTROLS AND INDICATORS

All controls and indicators required for normal transmitter operation are contained on control panel assembly A4. Refer to figure 3-1 and table 3-1 for locations and descriptions.

3.2 NORMAL TURN-ON PROCEDURE

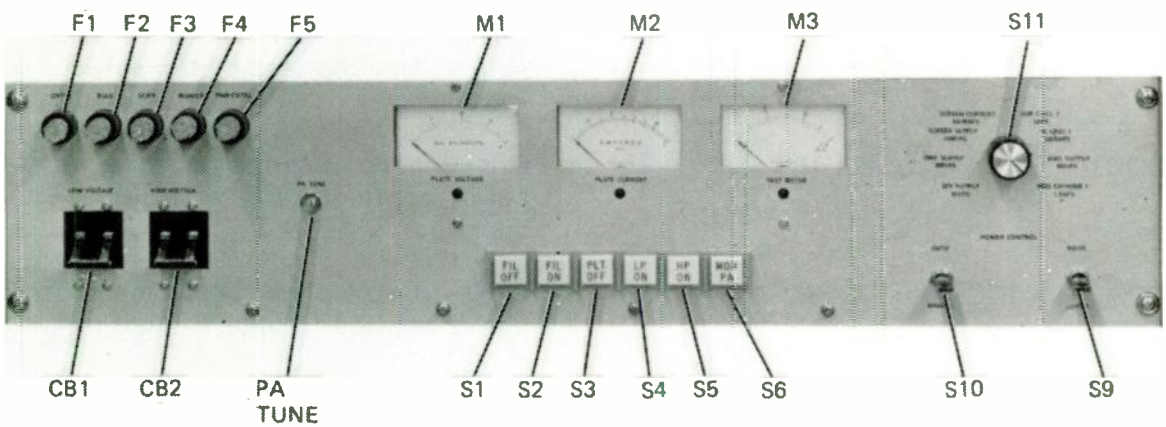
Initial (first-time) turn-on for the transmitter is accomplished by performing the procedures in paragraph 2.7. All subsequent transmitter turn-ons are accomplished by the following procedure:

a. Press FIL ON pushbutton. FIL ON indicator will light.

b. Press LP ON or HP ON pushbutton to allow low power or high power transmission. Appropriate indicator will light.

c. If manual power control is used, adjust POWER CONTROL RAISE/LOWER switch until the desired rf output is displayed on the customer-supplied rf ammeter or rf wattmeter. No power adjustment is necessary if the APC is installed and the POWER CONTROL AUTO/MANUAL switch is set to AUTO.

d. Compare control panel meter readings with those listed in table 3-2.



NOTE: ALL REFERENCE DESIGNATIONS ARE PRECEDED BY THE OVERALL CONTROL PANEL ASSEMBLY REFERENCE DESIGNATION A4.

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Figure 3-1. 820D-2 1-kW AM Transmitter Controls and Indicators.

Table 3-1. 820D-2 1-kW AM Transmitter Controls and Indicators.

REF DES	CONTROL OR INDICATOR NAME	FUNCTION
A2F1	28 VDC FUSE	3.0-ampere slow-blow fuse mounted internally, protects 28-volt power supply.
A4F1	CNTRL	0.5-ampere control fuse protects 28-volt power supply
F2	BIAS	0.5-ampere fuse protects bias power supply
F3	SCRN	1.0-ampere fuse protects screen power supply
F4	BLOWER	2.0-ampere fuse protects blower motors
F5	PWR CNTRL	1.0-ampere fuse protects power adjust rheostat motor
M1	PLATE VOLTAGE	Dc voltmeter displays amount of voltage across the pa plate
M2	PLATE CURRENT	Dc ammeter displays amount of current applied to pa plate
M3	TEST METER	Dc meter monitors one of eight internal voltage or current levels as selected by the test meter select switch
CB1	LOW VOLTAGE	6.0-ampere circuit breaker controls power applied to low voltage power supplies
CB2	HIGH VOLTAGE	30.0-ampere circuit breaker controls power applied to high voltage power supplies
S1	FIL OFF	Filament off indicator switch turns off the low voltage power supplies and shuts down the transmitter
S2	FIL ON	Filament on indicator switch turns on the low voltage power supplies and activates transmitter

Table 3-1. 820D-2 1-kW AM Transmitter Controls and Indicators (Cont).

REF DES	CONTROL OR INDICATOR NAME	FUNCTION
A4S3	PLT OFF	Plate off indicator switch turns off the high voltage power supplies and plate voltage
S4	LP ON	Low power on indicator switch activates the high voltage power supplies and places transmitter in low power output mode
S5	HP ON	High power on indicator switch activates the high voltage power supplies and places transmitter in high power output mode
S6	MOD PA	Modulator/power amplifier fault indicator/reset switch alerts operator that a fault has occurred and resets overload indicator circuits
S9	POWER CONTROL RAISE/LOWER	3-position spring-loaded toggle switch controls power adjust rheostat when AUTO/MANUAL switch is set to MANUAL
S10	POWER CONTROL AUTO/MANUAL	3-position spring-loaded toggle switch selects manual or optional automatic power control
S11	Test meter select switch	Selects one of eight voltages or currents to be displayed on TEST METER M3. Value listed under each switch position is the full-scale test meter value for that position.
NA	PA TUNE	Screwdriver control adjusts pa tuning capacitor A1C11.

Table 3-2. Normal Control Panel Meter Readings at Maximum Power Outputs.

METER	POWER OUTPUT		
	275 WATTS	550 WATTS	1100 WATTS
PLATE VOLTAGE	1550 V	2200 V	3000 V
PLATE CURRENT	235 mA	338 mA	490 mA
TEST METER			
28 V SUPPLY	28 ±2 V	28 ±2 V	28 ±2 V
290 V SUPPLY	290	290	290
SCREEN SUPPLY	750 V	750 V	750 V
SCREEN CURRENT	200 mA	175 mA	150 mA
DVR COLL I	1.0 to 1.5A, maximum	1.0 to 1.5A, maximum	1.0 to 1.5A, maximum
PA GRID I	50 to 75 mA	50 to 75 mA	50 to 75 mA
BIAS SUPPLY	-155 V	-155 V	-155 V
MOD CATHODE I	130 to 240 mA	150 to 340 mA	300 to 500 mA

Note: Except where specific tolerances are given, the above are approximations. The individual transmitters will vary with source voltage and installation.

3.3 EMERGENCY SHUTDOWN

Turn off LOW VOLTAGE and HIGH VOLTAGE circuit breakers or turn off primary power at source.

3.4 NORMAL SHUTDOWN

Make normal transmitter shutdowns as follows:

a. Press PLT OFF switch.

b. Press FIL OFF switch.

3.5 OVERLOAD RESETTING

The MOD PA overload indicator/reset switch on the control panel indicates a fault in either the modulator or pa circuits. The 820D-2 transmitter contains a recycle circuit that re-applies plate voltage for a maximum of three restarts in 10 seconds. The MOD PA indicator

will light to alert the transmitter operator that a fault has occurred and that the recycle circuits have restarted the transmitter. Pressing the MOD PA switch resets the indicator and turns the lamp off. If the transmitter recycle circuits do not restart the transmitter (more than three restarts in 10 seconds are required), the transmitter may be restarted by pressing the LP ON or HP ON pushbutton. Repeated complete transmitter shutdown indicates a transmitter malfunction.

3.6 FREQUENCY CHANGE

All 820D-2 transmitters are factory adjusted for the specific customer's frequency requirements. Frequency change requires test equipment not normally available to broadcast station technicians or engineers. Certain preliminary adjustment graphs and tables are provided in section 4 for reference. Do not make any frequency adjustments without consulting your Collins Broadcast Sales Engineer or:

Collins Commercial Telecommunications Division
Rockwell International
Broadcast Field Service Dept.
Dallas, Texas 75207
Phone: (214) 690-5055

3.7 POWER OUTPUT MODE CHANGE

The 820D-2 transmitter output power mode is switched by pressing the appropriate LP ON or HP ON switch. If MANUAL power control is used, adjust the POWER CONTROL RAISE/LOWER switch until the desired rf output is displayed on the customer-supplied rf ammeter or rf wattmeter. No POWER CONTROL adjustment is necessary if the optional automatic power control is installed and the POWER CONTROL AUTO/MANUAL switch is set to AUTO.

4.1 GENERAL

The 820D-2 has been carefully designed, inspected, and adjusted at the factory to reduce maintenance to a minimum. However, to ensure peak performance, adhere to a regular schedule of inspection and cleaning procedures. Refer to the parts list, section 6, for the location of components in the 820D-2.

WARNING

HIGH VOLTAGE is used in this equipment.

DEATH ON CONTACT may result if you fail to observe safety precautions.

When working inside the equipment, be sure that all circuit breakers are OFF and that primary power is disabled at the wall disconnect or circuit breaker unless otherwise directed. If a procedure requires transmitter operation with access panels removed, do not allow bodily contact with any electrical component, tap, or terminal. Use heavily insulated tools to adjust variable components.

CAUTION

Make certain all meters and test equipment are switched to appropriate measuring scales before connecting them to the transmitter. Connect test equipment only to the terminals designated in the procedure.

4.2 INSPECTION

Perform a periodic visual inspection of the 820D-2 at least once each week. Inspect all metal parts for rust, corrosion, and general deterioration. Check wiring and components for signs of overheating. Check the blower for normal operation. Check all operating controls for smoothness of operation. Check all connections and tighten loose nuts, bolts, or screws.

4.3 CLEANING

Clean the 820D-2 whenever dust accumulates at any point inside the equipment. A solvent consisting of the following mixture by volume may be used as a cleaning material: methylene chloride, 25 percent; perchloroethylene, 5 percent; and drycleaning solvent, 70 percent.

4.3.1 General Cleaning Procedure

a. Remove dust from chassis, panels, and components with a soft-bristled brush.

b. Remove any foreign matter from flat surfaces and accessible areas with a lintless cloth moistened with solvent. Dry with a clean, dry, lintless cloth.

c. Wash switch contacts and the less accessible areas with solvent lightly applied with a small soft-bristled brush.

d. Clean accumulated dust from the modular and power amplifier tubes with a lintless cloth moistened with solvent. Dry with a clean, dry, lintless cloth.

4.3.2 Air Filter

The air filter on the 820D-2 transmitter is a 16- by 20- by 1-inch disposable commercial filter. Replace the air filter whenever a noticeable quantity of dust or dirt restricts air flow. Replace the filter as follows:

a. Remove the two screws retaining the louvered filter panel to the rear cabinet panel.

b. Extract the filter from its holder and discard.

c. Install a new 16- by 20- by 1-inch disposable commercial filter.

d. Replace the louvered panel and two screws.

4.4 LUBRICATION

The 820D-2 transmitter requires no lubrication. All motor bearings are permanently lubricated and sealed.

4.5 TROUBLESHOOTING

If the transmitter fails to operate properly, isolate the malfunction to a particular circuit using the TEST METER readings (table 3-2), maintenance checks in paragraph 4.7, and diagrams in section 5. Check each circuit in the order that it is made operative. If a malfunctioning circuit has an adjustment procedure provided in paragraph 4.8, perform the adjustment. Refer to the circuit descriptions in section 1 for aid in troubleshooting. Refer to the parts list in section 6 for parts locations.

4.6 TEST EQUIPMENT

Table 4-1 lists test equipment necessary for transmitter maintenance checks and adjustments. The reference column lists the paragraph number of the maintenance check or adjustment procedure that requires the equipment.

4.7 MAINTENANCE CHECKS

WARNING

HIGH VOLTAGE is used in this equipment.

DEATH ON CONTACT may result if you fail to observe safety precautions.

When working inside the equipment, be sure that all circuit breakers are OFF and that primary power is disabled at the wall disconnect or circuit breaker unless otherwise directed. If a procedure requires transmitter operation with access panels removed, do not allow bodily contact with any electrical component, tap, or terminal. Use heavily insulated tools to adjust variable components.

Table 4-1. Test Equipment.

ITEM	RECOMMENDED MANUFACTURER/MODEL	REFERENCE
Dummy load, 50 ohms, 2.5-kW	Bird Model 8720	4.7, 4.8
Rf ammeter	Weston 743-60	4.7, 4.8
Multimeter	Triplett Model 630 N/A	4.7.1, 4.7.2, 4.7.3, 4.8.1, 4.8.5
Audio signal generator	Hewlett Packard Model 206A	4.8.3
Audio voltmeter	Hewlett Packard Model 403B	4.8.3
Modulation monitor	Belar Model AMM-1	4.8.3
Oscilloscope	Tektronix Model 545	4.8.3
Distortion analyzer	Hewlett-Packard Model 334A	4.8.3

CAUTION

Make certain all meters and test equipment are switched to appropriate measuring scales before connecting them to the transmitter. Connect test equipment only to the terminals designated in the procedure.

NOTE

(1) Initial control panel switch settings for all maintenance checks are as follows:

LOW VOLTAGE - ON

HIGH VOLTAGE - ON

PLT OFF

FIL OFF

(2) RF output jack A1J1 must be connected through an rf ammeter to a 50-ohm dummy load, or to the normal 50-ohm antenna system.

4.7.1 28-Volt DC Power Supply and Metering Circuit Check

a. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF.

b. Remove lower front access panel. Short all high voltage terminals with grounding stick. Block open the interlock switch.

c. Connect a multimeter (30-Vdc scale) positive lead to A2TB1-14 and negative lead to chassis ground.

d. Set primary power and LOW VOLTAGE circuit breaker ON. Note that FIL OFF indicator/switch lights.

e. Check multimeter for an indication of 28 ±2 volts dc.

f. Set the test meter select switch to 28V SUPPLY 30 VFS.

g. Compare the TEST METER indication with the multimeter indication. Note that the indications do not differ by more than 10 percent.

h. Set LOW VOLTAGE circuit breaker and primary power OFF. Short all high voltage terminals with ground stick.

i. Disconnect the multimeter. Replace the lower front access panel.

j. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON.

4.7.2 Bias Power Supply and Metering Circuit Check

a. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF.

b. Remove lower front access panel. Short all high voltage terminals with grounding stick. Block open the interlock switch.

c. Connect a multimeter (300-Vdc scale) negative lead to A2TB1-10 and positive lead to chassis ground.

d. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON. Press FIL ON pushbutton.

e. Check the multimeter for an indication of -155 ±10 volts dc.

f. Set the test meter select switch to BIAS SUPPLY 300 VFS.

g. Compare the TEST METER indication with the multimeter indication. Note that the indications do not differ by more than 5 percent.

h. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF. Short all high voltage terminals with grounding stick.

i. Disconnect the multimeter. Replace the lower front access panel.

j. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON.

4.7.3 Screen Power Supply and Metering Circuits Check

a. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF.

b. Remove lower front access panel. Short all high voltage terminals with grounding stick. Block open the interlock switch.

c. Connect a multimeter (1200-Vdc scale) positive lead to A2E1 and negative lead to A3E1.

d. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON. Press FIL ON and LP ON pushbuttons.

e. Check the multimeter for an indication of 750 ±20 volts dc.

f. Set the test meter select switch to SCREEN SUPPLY 1500 VFS.

g. Compare the TEST METER indication with the multimeter indication. Note that the indications do not differ by more than 5 percent.

h. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF. Short all high voltage terminals with grounding stick.

i. Disconnect the multimeter. Replace lower front access panel.

j. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON.

4.8 ADJUSTMENTS

All 820D-2 transmitters are factory adjusted to provide optimum transmitter operation at the specific customer's power output and frequency. All 820D-2 transmitters are factory adjusted at 240 VAC power input. Do not perform adjustments unless components are replaced, the transmitter fails to operate properly, power input or output requirements change, or frequency requirements change.

WARNING

HIGH VOLTAGE is used in this equipment.

DEATH ON CONTACT may result if you fail to observe safety precautions.

When working inside the equipment, be sure that all circuit breakers are OFF and that primary power is disabled at the wall disconnect or circuit breaker unless otherwise directed. If a procedure requires transmitter operation with access panels removed, do not allow bodily contact with any electrical component, tap, or terminal. Use heavily insulated tools to adjust variable components.

CAUTION

Make certain all meters and test equipment are switched to appropriate measuring scales before connecting them to the transmitter. Connect test equipment only to the terminals designated in the procedure.

NOTE

(1) Initial control panel switch settings for all adjustments are as follows:

LOW VOLTAGE - ON

HIGH VOLTAGE - ON

PLT OFF

FIL OFF

(2) Rf output jack A1J1 must be connected through an rf ammeter to a 50-ohm dummy load.

4.8.1 Filament Voltage Adjustment

a. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF.

b. Remove the rear access panel. Short all high voltage terminals with grounding stick. Block open the interlock switch.

c. Connect a multimeter (12-Vac scale) from A1T1-5 to A1T1-7.

d. Set LOW VOLTAGE circuit breaker and primary power ON. Press FIL ON pushbutton.

WARNING

3000 VOLTS is exposed when transmitter is operated with access panels removed.

DEATH ON CONTACT may occur if you fail to observe safety precautions.

e. Adjust A1R7 until 9.5 Vac is indicated on the multimeter.

f. Press FIL OFF pushbutton. Set LOW VOLTAGE circuit breaker and primary power OFF.

g. Move multimeter (12-Vac scale) leads to A1T2-5 and A1T2-7.

h. Set LOW VOLTAGE circuit breaker and primary power ON. Press FIL ON pushbutton.

WARNING

3000 VOLTS is exposed when transmitter is operated with access panels removed.

DEATH ON CONTACT may occur if you fail to observe safety precautions.

i. Adjust A1R8 until 9.5 Vac is indicated on the multimeter.

j. Press FIL OFF pushbutton. Set LOW VOLTAGE circuit breaker and primary power OFF. Short all high voltage terminals with grounding stick.

k. Remove multimeter and replace access door.

l. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON.

4.8.2 RF Tuning Adjustment

a. Press FIL ON and LP ON pushbuttons.

b. Set test meter select switch to PA GRID I 150 MAFS.

c. Adjust P. A. GRID TUNING capacitor A1C47 (at upper front access panel) until maximum grid current is displayed on the TEST METER. Note the grid current value.

NOTE

The P. A. GRID TUNING capacitor must be tuned at some point within its adjustment range and not at a fully open or fully closed position.

d. If the current value (noted in step c.) is 50 to 75 mA, skip the remainder of this procedure. If the grid current is not within the specified limits, adjust A1A3R17 as described in steps e. through k.

e. Press PLT OFF and FIL OFF pushbuttons. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF.

f. Remove the upper front access panel. Short all high voltage terminals with grounding stick.

g. Adjust A1A3R17 counterclockwise to lower the grid current or clockwise to raise the grid current.

h. Replace the upper front access panel.

i. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON. Press FIL ON and LP ON pushbuttons.

j. Check grid current displayed on the TEST METER.

k. Repeat steps f. through j. until grid current is 50 to 75 mA.

l. Press PLT OFF and FIL OFF pushbuttons.

4.8.3 Modulator Adjustments

4.8.3.1 Modulator Static Adjustments

NOTE

Access holes for the modulator adjustments are located on the upper front access panel.

a. Set L MOD BIAS and R MOD BIAS controls fully counterclockwise.

b. Set L MOD DRIVE and R MOD DRIVE controls fully clockwise.

c. Press FIL ON and HP ON pushbuttons.

d. Set test meter select switch to MOD CATHODE I 1.5AFS. Record TEST METER reading (I_o).

e. Adjust L MOD BIAS clockwise until 0.150 + $I_o/2$ amperes is displayed on the TEST METER.

f. Adjust R MOD BIAS clockwise until 0.300 ampere is displayed on the TEST METER.

g. Press PLT OFF and FIL OFF pushbuttons.

4.8.3.2 Modulation Monitor Voltage Adjustment

NOTE

Procedures in paragraph 4.8.3.1 must be performed before beginning this procedure.

a. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF.

b. Remove the rear cabinet panel. Short all high voltage terminals with grounding stick. Block open the interlock switch.

c. Connect a distortion analyzer, modulation monitor, and an oscilloscope with a X10 isolation probe to modulation monitor jack A1J2.

d. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON. Press FIL ON and HP ON pushbuttons.

WARNING

3000 VOLTS is exposed when transmitter is operated with access panels removed.

DEATH ON CONTACT may occur if you fail to observe safety precautions.

e. Observe the oscilloscope and determine the peak-to-peak voltage displayed. If the voltage is 12 ±2 volts peak-to-peak, skip to step j. If the voltage is not within acceptable limits, adjust A1L8 pin 4 as described in steps f. through i.

f. Press PLT OFF and FIL OFF pushbuttons. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF.

g. Remove the rf output network access cover. Short all high voltage terminals with grounding stick.

h. Pin 4 is the adjustable slide on the A1L8 shaft nearer the front of the transmitter. Slide pin 4 down to reduce the peak-to-peak voltage observed in step e.; slide pin 4 up to increase the voltage.

i. Replace the rf output network access cover. Repeat steps d. and e., and, if necessary, steps f. through h.

j. Press the LP ON pushbutton.

k. Observe the oscilloscope and determine the peak-to-peak voltage displayed. If the voltage is 12 ±2 volts peak-to-peak, skip to step q. If the voltage is not within acceptable limits adjust A1L8 pin 3 as described in steps l. through o.

l. Press PLT OFF and FIL OFF pushbuttons. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF.

m. Remove the rf output network access cover. Short all high voltage terminals with grounding stick.

n. Pin 3 is the adjustable slide on the A1L8 shaft nearer the rear of the transmitter. Slide pin 3 down to reduce the voltage in step k.; slide pin 3 up to increase the voltage.

o. Replace the rf output network access cover. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON. Press FIL ON pushbutton.

p. Repeat steps j. and k., and, if necessary, steps l. through n.

q. Press PLT OFF and FIL OFF pushbuttons.

4.8.3.3 Audio Frequency Distortion Adjustment and Audio Frequency Response Check

NOTE

Procedures in paragraph 4.8.3.2 must be performed before beginning this procedure.

a. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF. Short all high voltage terminals with grounding stick.

b. Connect an audio signal generator and an audio voltmeter to audio input terminals A1TB1-1, 2, and 3. Set the audio oscillator to 7500 Hz.

c. Set the LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON. Press the FIL ON and HP ON pushbuttons.

WARNING

3000 VOLTS is exposed when transmitter is operated with access panels removed.

DEATH ON CONTACT may occur if you fail to observe safety precautions.

d. Adjust the audio frequency generator level until 95-percent modulation is indicated on the modulation monitor.

e. Adjust the L MOD DRIVE control for minimum distortion as indicated on the distortion analyzer. Record the distortion level and return the L MOD DRIVE control fully clockwise.

f. Adjust the R MOD DRIVE control for minimum distortion as indicated on the distortion analyzer. Record the distortion level and return the R MOD DRIVE control fully clockwise.

g. Compare the distortion levels recorded in steps e. and f. Readjust the control with the lower recorded distortion level for minimum distortion as indicated on the distortion analyzer. Leave the remaining control fully clockwise.

h. Adjust the audio oscillator at 1.0 kHz to produce 25-percent modulation as indicated on the modulation monitor.

i. Record the input level (V_o) indicated on the audio voltmeter in decibels.

j. Readjust the audio oscillator to 50 Hz and 25-percent modulation. Record the input level (V_1) indicated on the audio voltmeter in decibels.

k. Calculate the audio response in decibels using the following formula:

$$\text{Audio Response (dB)} = V_1 - V_o$$

l. Repeat steps c. and d. at frequencies of 100, 400, 5000, 7500, and 10,000 Hz.

m. Repeat steps a. through e. at 50- and 100-percent modulation.

n. Note that the frequency response does not deviate more than ±1.0 dB in the 50-Hz to 10-kHz range.

o. Press the PLT OFF and FIL OFF pushbuttons. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF. Short all high voltage terminals with grounding stick.

p. Disconnect all test equipment. Replace all access panels.

q. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON.

4.8.4 PA Efficiency Adjustment

a. Press FIL ON and HP ON pushbuttons.

b. Adjust the PA TUNE control on the control panel for minimum indication on PLATE CURRENT meter. Record this plate current.

c. Readjust the PA TUNE control in the direction of maximum antenna or common point current until the PLATE CURRENT meter indication exceeds the recorded plate current by 20 milliamperes.

d. Press PLT OFF and FIL OFF pushbuttons.

4.8.5 Optional Automatic Power Control Adjustment

a. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF.

b. Remove the lower front access panel. Short all high voltage terminals with grounding stick.

c. Connect a multimeter between A2TB2 terminals 16 and 17.

d. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON. Press FIL ON and LP ON pushbuttons. Set POWER CONTROL AUTO/MANUAL to MANUAL.

e. Adjust the POWER CONTROL RAISE/LOWER until the transmitter output is at the customer's normal low power output requirement.

WARNING

3000 VOLTS is exposed when transmitter is operated with access panels removed.

DEATH ON CONTACT may occur if you fail to observe safety precautions.

f. Adjust A6A1R2 on the APC assembly for a zero indication on the multimeter.

g. Press the HP ON pushbutton.

h. Adjust the POWER CONTROL RAISE/LOWER until the transmitter output is at the customer's normal high power output requirement.

i. Adjust A6A1R3 on the APC assembly for a 0-millivolt indication on the multimeter.

j. Adjust SENSE adjustment A6A1R7 to approximately 3/4 full clockwise, to decrease dead zone (carrier null).

k. Press the PLT OFF and FIL OFF pushbuttons. Set the LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power OFF. Short high voltage terminals with grounding stick.

l. Disconnect the multimeter. Replace the lower front access panel.

m. Set LOW VOLTAGE and HIGH VOLTAGE circuit breakers and primary power ON.

4.9 FREQUENCY CHANGE AND FREQUENCY DEPENDENT COMPONENT DATA

All 820D-2 transmitters are factory adjusted for the specific customer's frequency requirements. Frequency change requires test equipment not normally available to broadcast station technicians or engineers. Do not make any frequency adjustments without consulting your Collins Broadcast Sales Engineer or:

Collins Commercial Telecommunications Divisions
Rockwell International
Broadcast Field Service Dept.
Dallas, Texas 75207
Phone: (214) 690-5055

Figures 4-1 through 4-9 and tables 4-2 through 4-5 provide frequency change and frequency dependent component data. This data is required for frequency change and may be required for replacement of damaged frequency dependent components. Refer to the output network simplified schematic in figure 4-1 for strap and node identification.

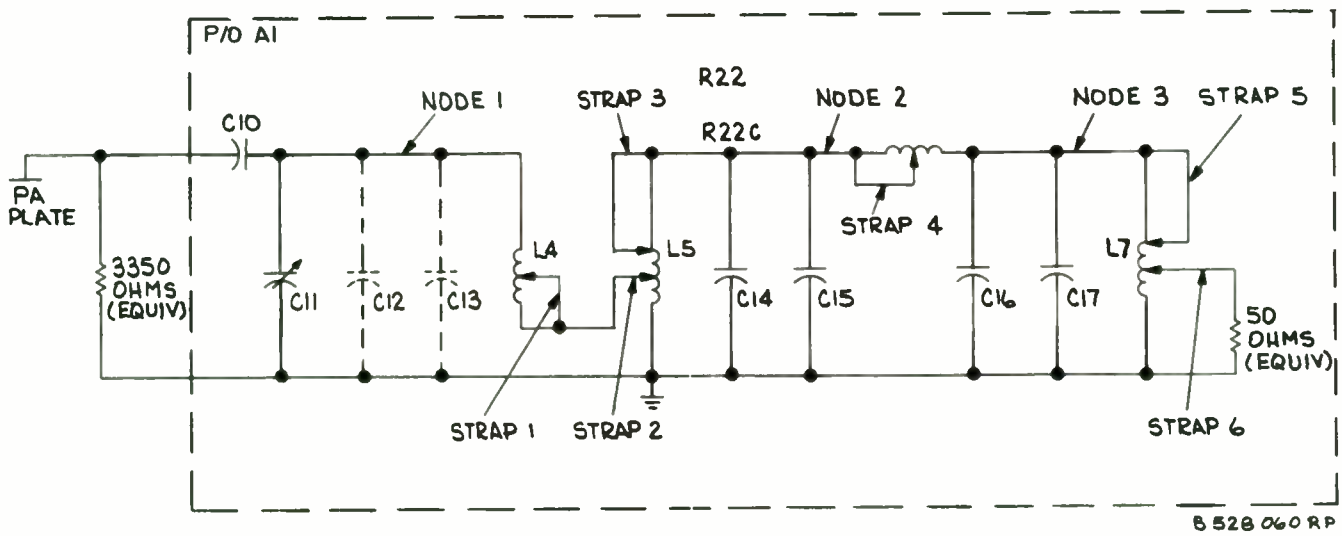


Figure 4-1. 820D-2 1-kW AM Transmitter Output Network Simplified Schematic.

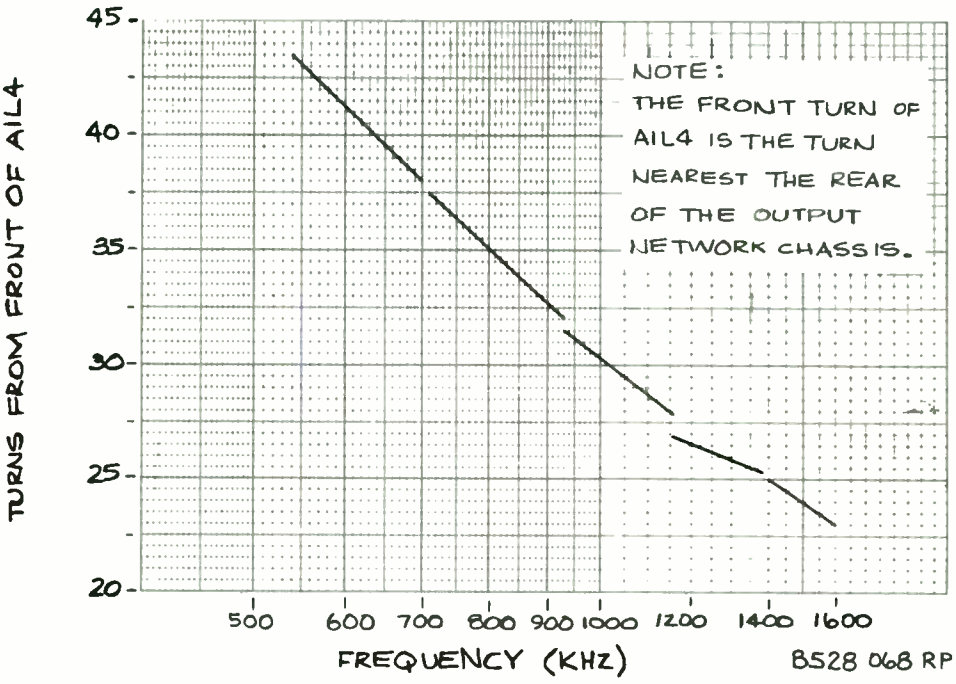


Figure 4-2. Approximate Settings for Output Network Strap 1 on A1L4.

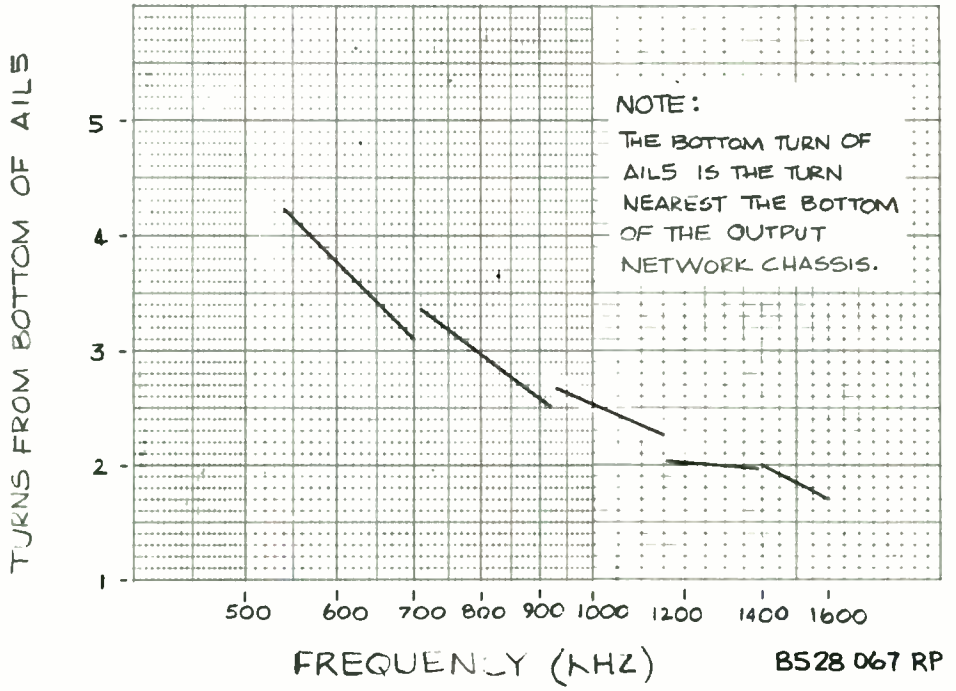


Figure 4-3. Approximate Settings for Output Network Strap 2 on A1L5.

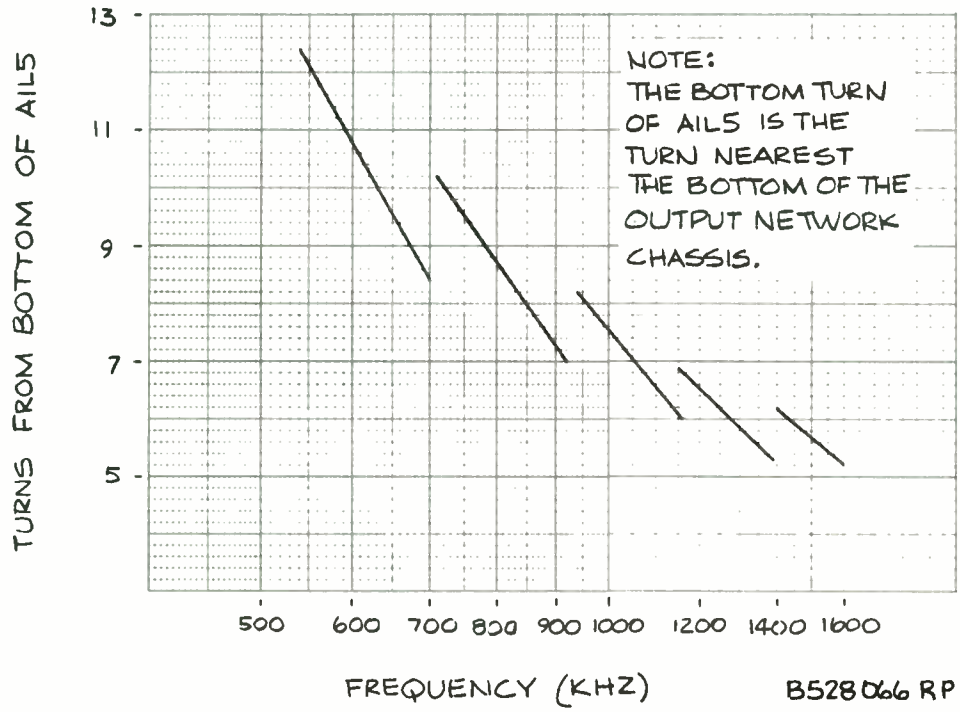


Figure 4-4. Approximate Settings for Output Network Strap 3 on A1L5.

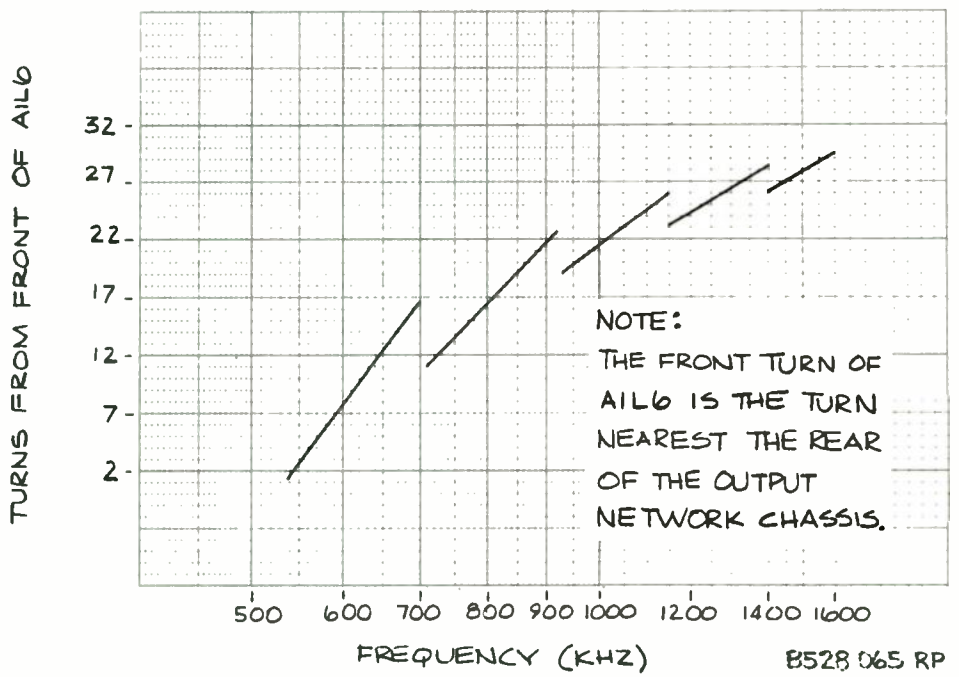


Figure 4-5. Approximate Settings for Output Network Strap 4 on A1L6.

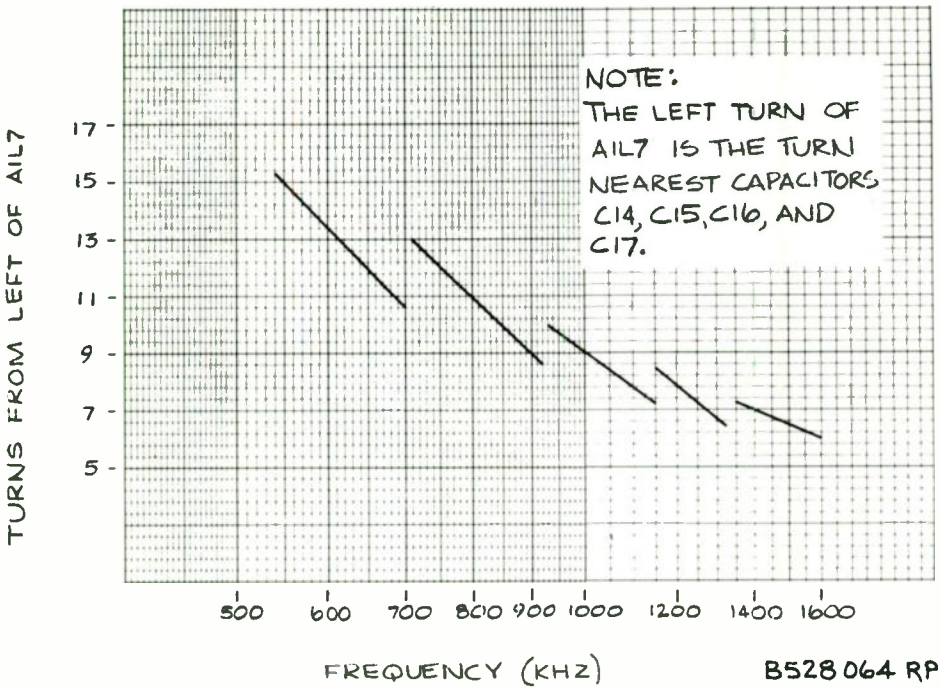


Figure 4-6. Approximate Settings for Output Network Strap 5 on A1L7.

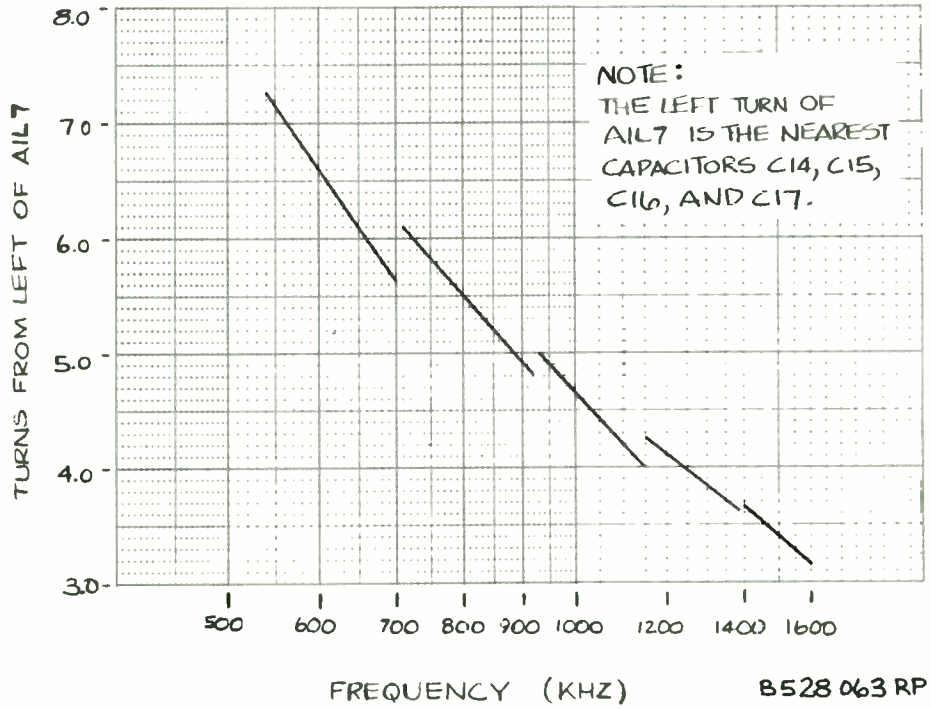


Figure 4-7. Approximate Settings for Output Network Strap 6 on A1L7.

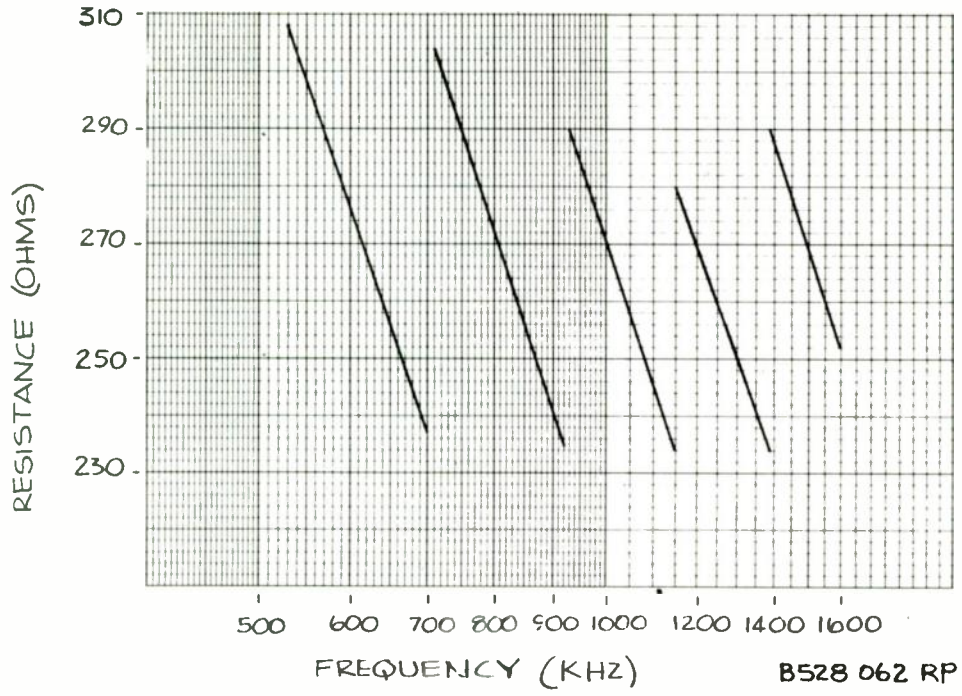


Figure 4-8. Resistance $R_{22} = R_{22c}$ Values.

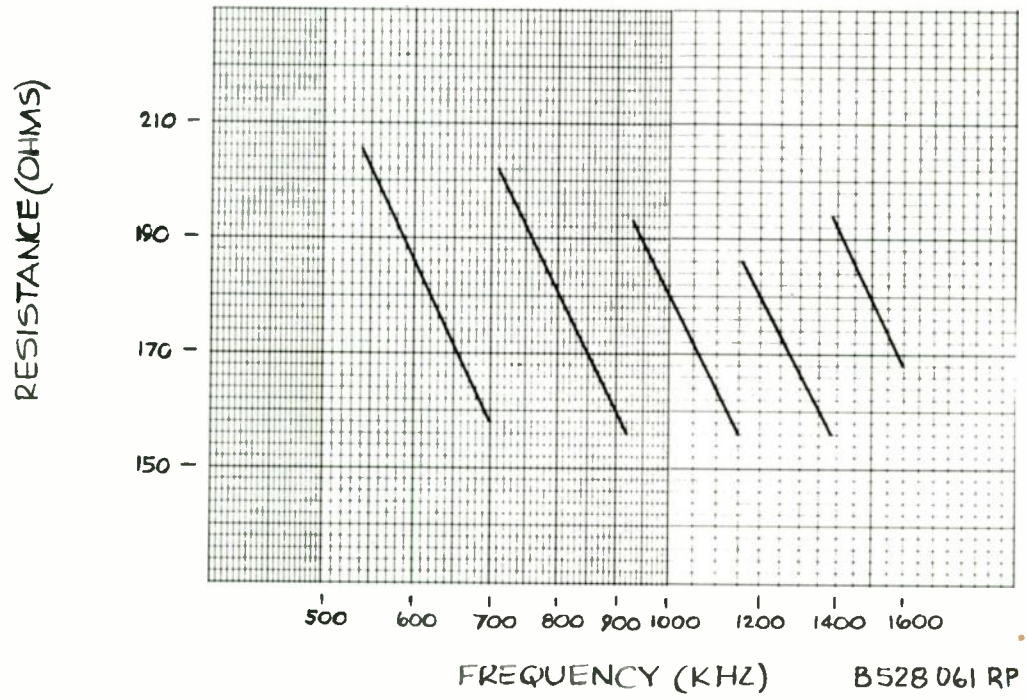


Figure 4-9. Resistance R_{33} Values.

Table 4-2. Crystal Part Numbers.

OPERATING FREQUENCY	COLLINS PART NUMBER	OPERATING FREQUENCY	COLLINS PART NUMBER	OPERATING FREQUENCY	COLLINS PART NUMBER
540	289-7021-010	960	289-7021-690	1380	289-7021-310
550	289-7021-030	970	289-7021-700	1390	289-7021-320
560	289-7021-050	980	289-7021-710	1400	289-7021-330
570	289-7021-070	990	289-7021-720	1410	289-7021-340
580	289-7021-090	1000	289-7021-730	1420	289-7021-350
590	289-7021-110	1010	289-7021-740	1430	289-7021-360
600	289-7021-130	1020	289-7021-750	1440	289-7021-370
610	289-7021-150	1030	289-7021-760	1450	289-7021-380
620	289-7021-170	1040	289-7021-770	1460	289-7021-390
630	289-7021-190	1050	289-7021-780	1470	289-7021-400
640	289-7021-210	1060	289-7021-790	1480	289-7021-410
650	289-7021-230	1070	289-7021-800	1490	289-7021-420
660	289-7021-250	1080	289-7021-810	1500	289-7021-430
670	289-7021-270	1090	289-7021-020	1510	289-7021-440
680	289-7021-290	1100	289-7021-030	1520	289-7021-450
690	289-7021-310	1110	289-7021-040	1530	289-7021-460
700	289-7021-330	1120	289-7021-050	1540	289-7021-470
710	289-7021-350	1130	289-7021-060	1550	289-7021-480
720	289-7021-370	1140	289-7021-070	1560	289-7021-490
730	289-7021-390	1150	289-7021-080	1570	289-7021-500
740	289-7021-410	1160	289-7021-090	1580	289-7021-510
750	289-7021-430	1170	289-7021-100	1590	289-7021-520
760	289-7021-450	1180	289-7021-110	1600	289-7021-530
770	289-7021-470	1190	289-7021-120		
780	289-7021-490	1200	289-7021-130		
790	289-7021-510	1210	289-7021-140		
800	289-7021-530	1220	289-7021-150		
810	289-7021-540	1230	289-7021-160		
820	289-7021-550	1240	289-7021-170		
830	289-7021-560	1250	289-7021-180		
840	289-7021-570	1260	289-7021-190		
850	289-7021-580	1270	289-7021-200		
860	289-7021-590	1280	289-7021-210		
870	289-7021-600	1290	289-7021-220		
880	289-7021-610	1300	289-7021-230		
890	289-7021-620	1310	289-7021-240		
900	289-7021-630	1320	289-7021-250		
910	289-7021-640	1330	289-7021-260		
920	289-7021-650	1340	289-7021-270		
930	289-7021-660	1350	289-7021-280		
940	289-7021-670	1360	289-7021-290		
950	289-7021-680	1370	289-7021-300		

Table 4-3. Frequency Dependent Capacitor List.

FREQUENCY RANGE	CAPACITOR					
	A1C12	A1C13	A1C14	A1C15	A1C16	A1C17
540 to 620 kHz	C	A	D	D	D	D
630 to 700 kHz	B	None	D	D	D	D
710 to 920 kHz	C	None	E	E	E	E
930 to 1150 kHz	A	None	F	F	F	F
1160 to 1380 kHz	G	None	H	H	H	H
1390 to 1600 kHz	None	None	I	I	I	I

Note: Capacitor values and part no. are as follows:

A-240 pF, 10 kV, 912-4126-100
B-390 pF, 10 kV, 912-4126-110
C-430 pF, 10 kV, 912-4126-150
D-3900 pF, 6 kV, 912-4140-180
E-3000 pF, 6 kV, 912-4140-170
F-2400 pF, 6 kV, 912-4140-160
G-180 pF, 10 kV, 912-4126-090
H-2000 pF, 6 kV, 912-4140-150
I-1600 pF, 6 kV, 912-4140-140

Table 4-4. RF Driver A1A2 Frequency Strapping.

FREQUENCY RANGE (kHz)	STRAPPING CONNECTION	
	FROM	TO
540 to 550	E5	E6
	E13	E14
560 to 580	E5	E6
	E7	E8
	E9	E10
	E11	E12
590 to 600	E7	E8
	E9	E10
	E11	E12
610 to 625	E5	E6
	E9	E10
	E11	E12
635 to 645	E9	E10
	E11	E12
655 to 675	E5	E6
	E7	E8
	E11	E12

Table 4-4. RF Driver A1A2 Frequency Strapping (Cont).

FREQUENCY RANGE (kHz)	STRAPPING CONNECTION	
	FROM	TO
685 to 710	E7 E11	E8 E12
720 to 735	E5 E11	E6 E12
745 to 780	E11	E12
790 to 850	E7 E9	E8 E10
860 to 890	E5 E9	E6 E10
900 to 965	E9	E10
975 to 1100	E5 E7	E6 E8
1110 to 1250	E7	E8
1260 to 1420	E5	E6
1430 to 1600	None	

Table 4-5. Dual Oscillator Card A1A3 Frequency Strapping.

FREQUENCY RANGE (kHz)	STRAPPING CONNECTION	
	FROM	TO
540 to 720	E1 E3 E5 E6	E2 E4 E6 E7
730 to 1080	E1 E3 E5	E2 E4 E6
1090 to 1200	E1 E5	E4 E6
1210 to 1600	E1	E4

Section 5

Diagrams

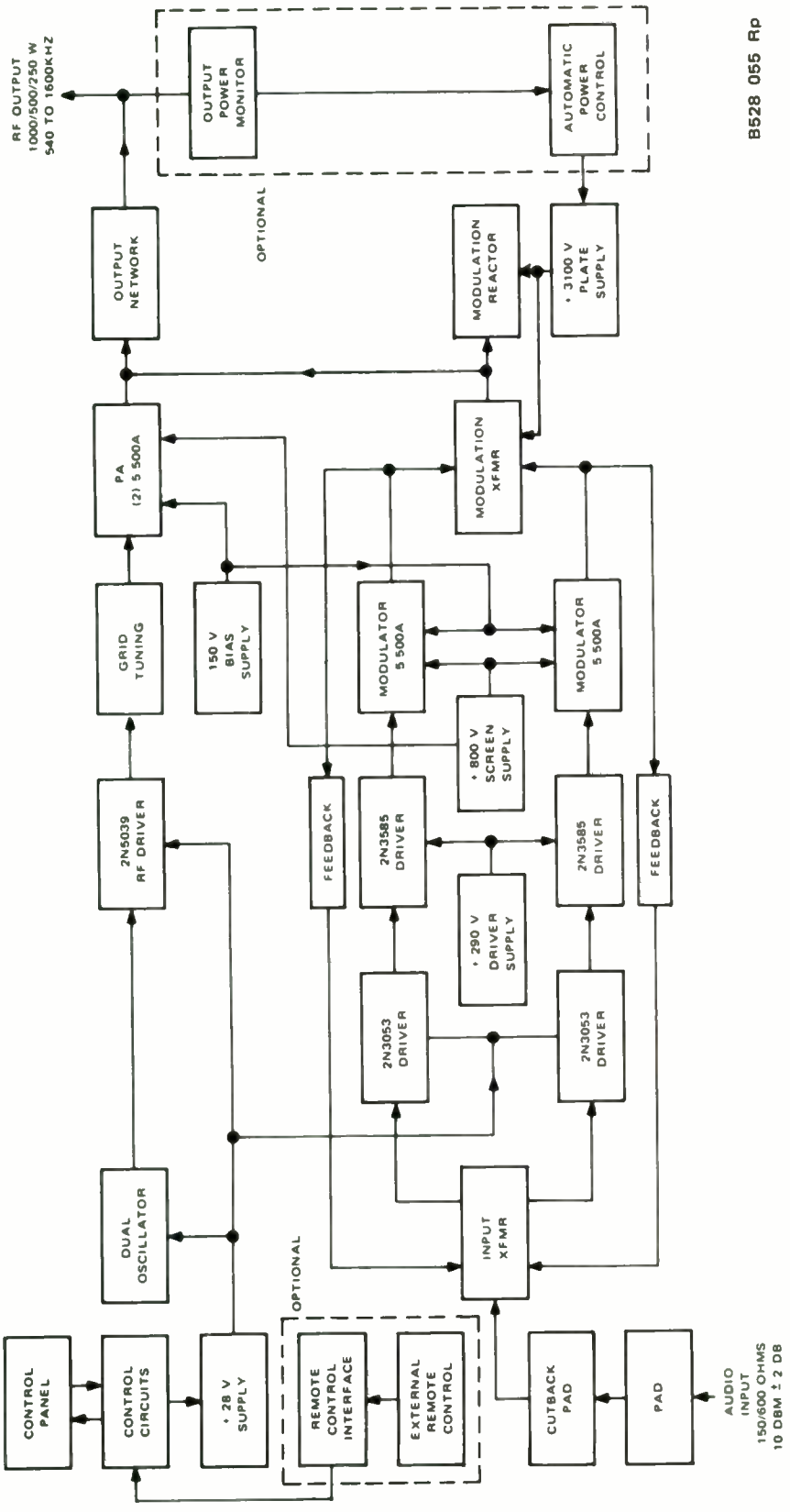


Figure 5-1. 820D-2 1-kW AM Transmitter Overall Block Diagram.

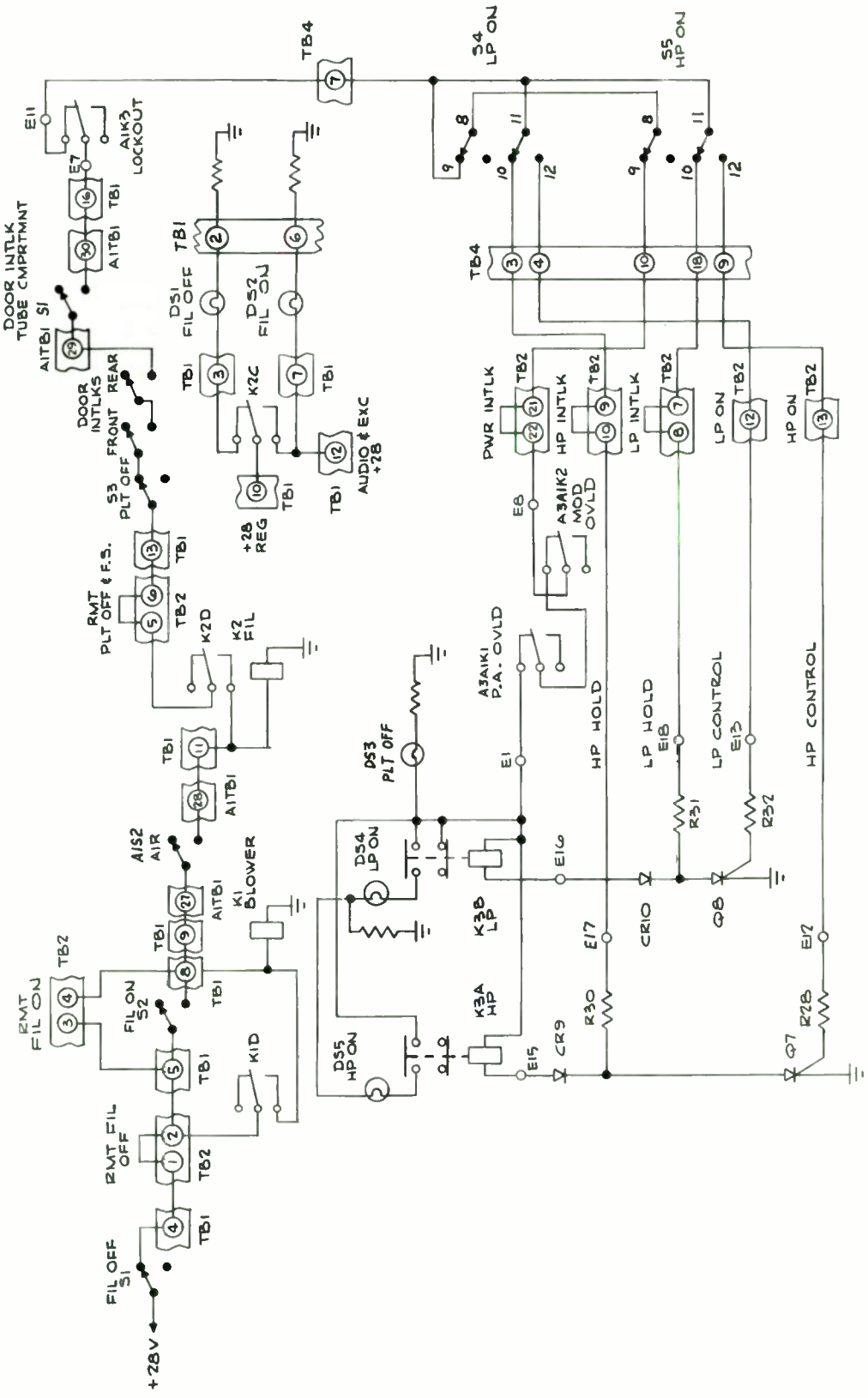


Figure 5-2. 820D-2 1-kW AM Transmitter Simplified Control Circuits Schematic Diagram.

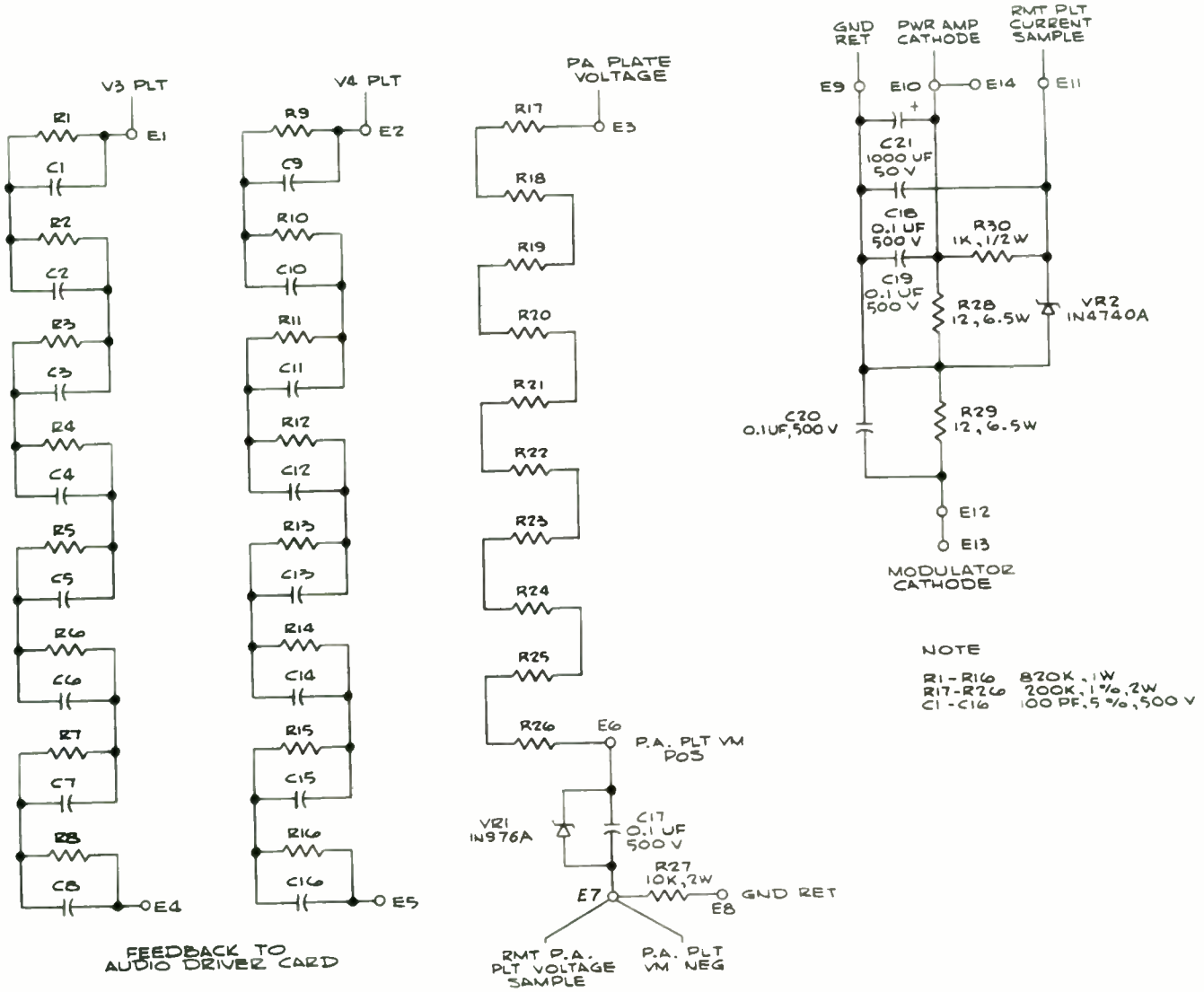


Figure 5-3. Feedback/Divider Board A1A4 Schematic Diagram.

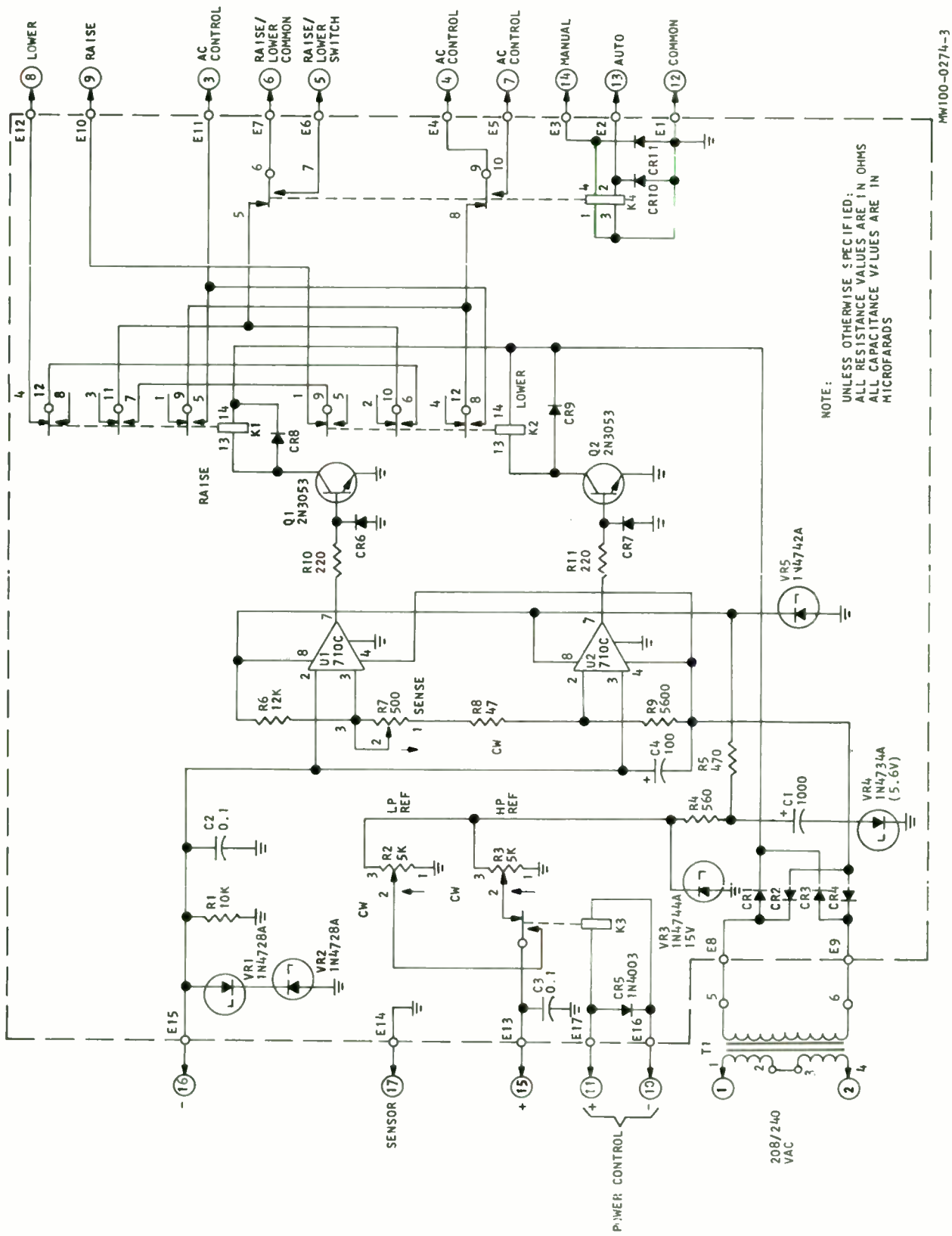
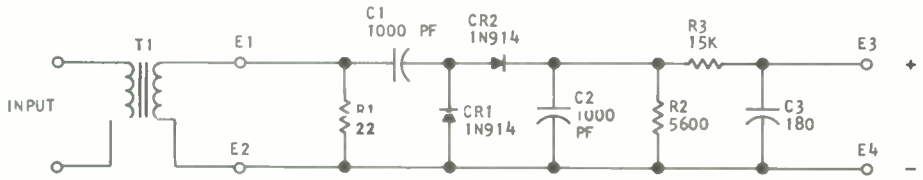


Figure 5-4. Optional Automatic Power Control Servo Card A6A1 Schematic Diagram.



NOTE:
UNLESS OTHERWISE SPECIFIED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROFARADS

MW100-0273-2

Figure 5-5. Optional Automatic Power Control RF Sensor A6A2 Schematic Diagram.

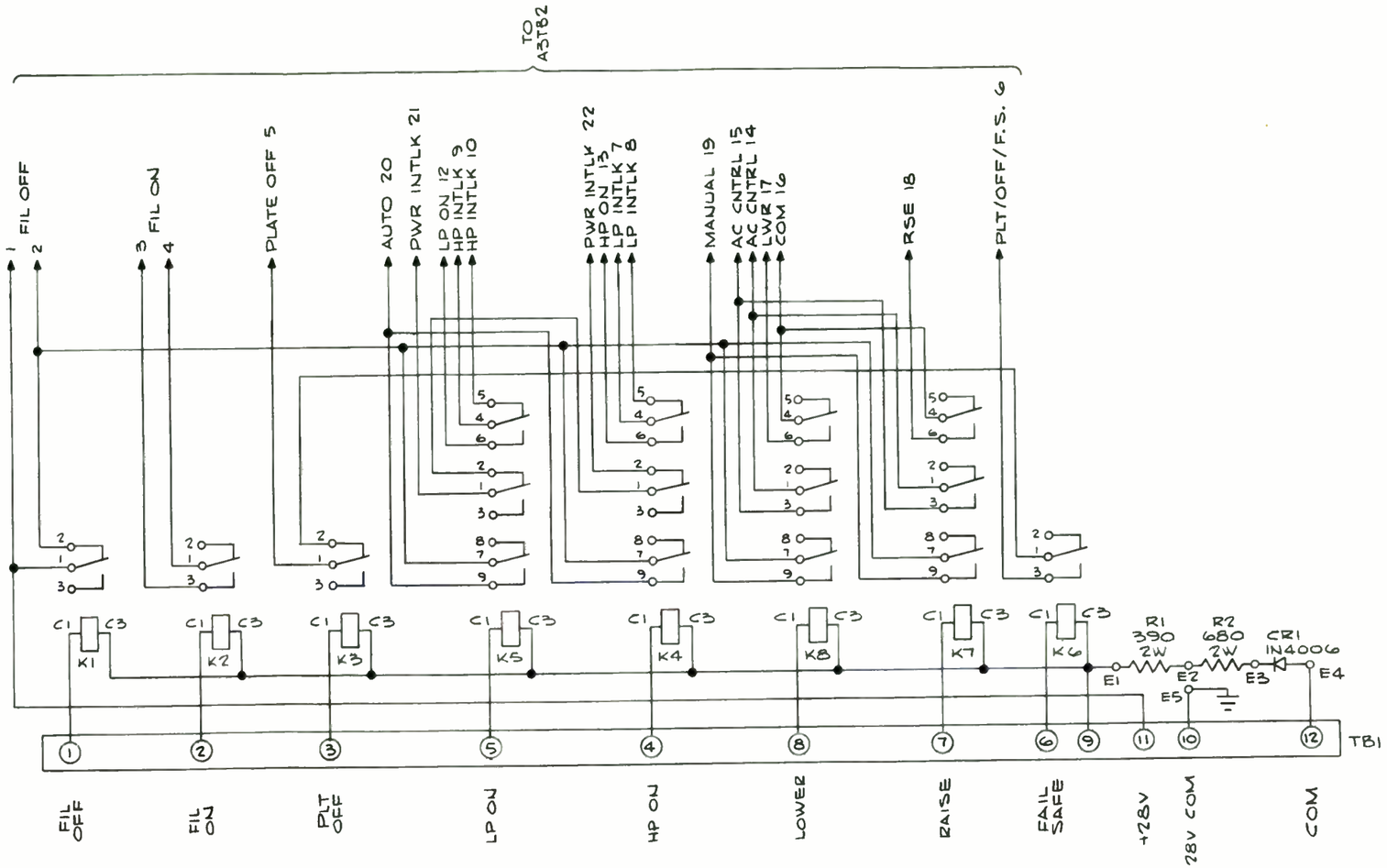


TABLE 1. STRAPPING CONNECTIONS

SOURCE CONTROL VOLTAGE	STRAPPING CONNECTION	
	FROM	TO
24 VDC, POSITIVE COMMON	E1	E3
24 VDC, NEGATIVE COMMON	E1	E4
48 VDC, POSITIVE COMMON	E1	E2
48 VDC, NEGATIVE COMMON	E2	E4
115 VAC	E3	E4

Figure 5-6. Optional Remote Control Assembly A7 Schematic Diagram.

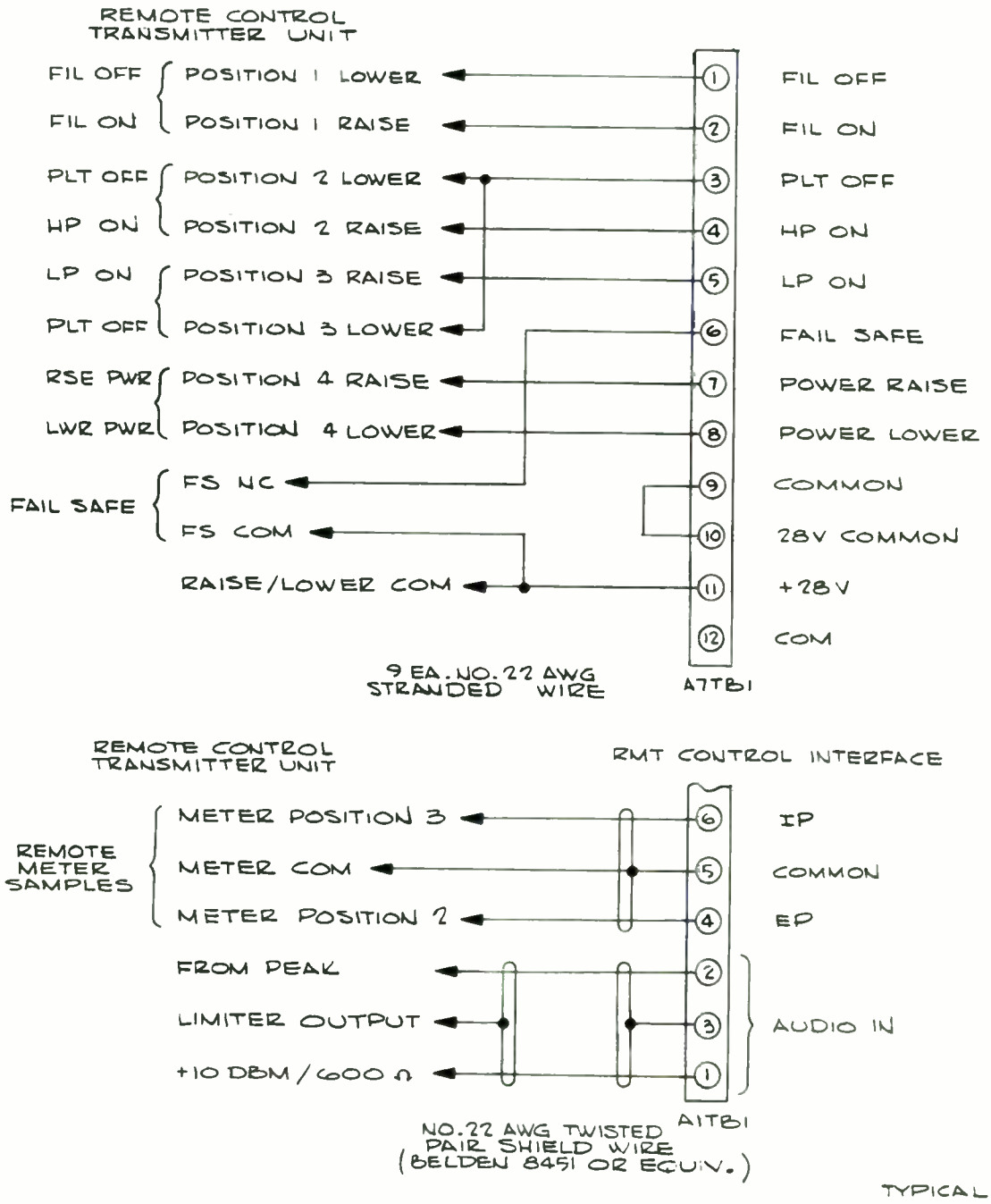


Figure 5-7. Optional Remote Control External Connections Schematic Diagram.

The 820D-2 1-kW AM Transmitter overall schematic diagram is folded and inserted in an envelope attached inside the back cover.

Figure 5-8. 820D-2 1-kW AM Transmitter Overall Schematic Diagram.

6.1 GENERAL

This section provides parts lists and parts locations for all electrical components of the 820D-2 transmitter. Figures 6-1 through 6-8 provide general views of the 820D-2 transmitter with various access panels removed. The remaining figures with their corresponding parts lists identify all electrical components. These figures and parts lists are in order according to assembly reference designation.

6.2 ORDERING REPLACEMENT PARTS

Refer to the information inside the front cover for instructions on how to order replacement parts.

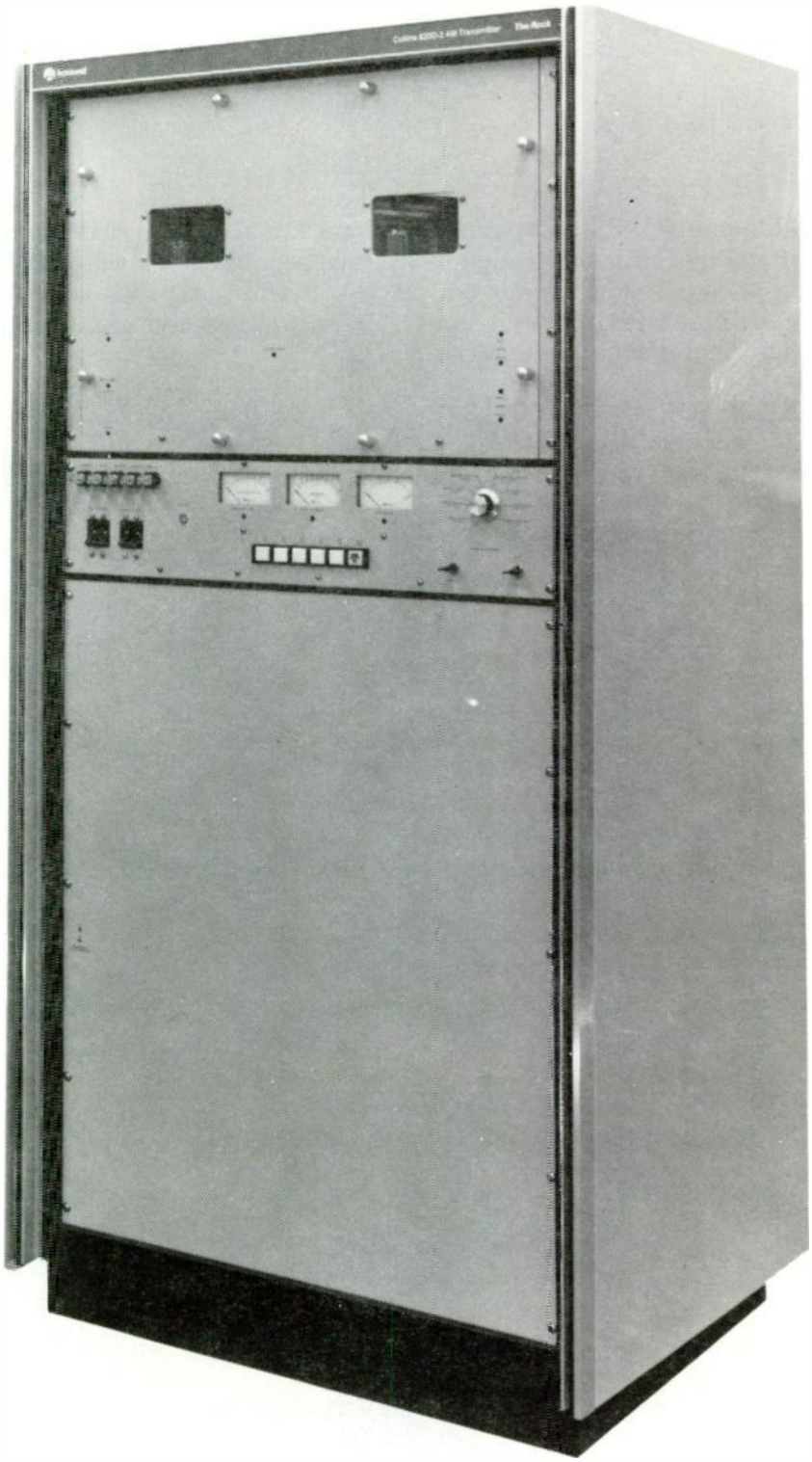


Figure 6-1. 820D-2 1-kW AM Transmitter, Front View.

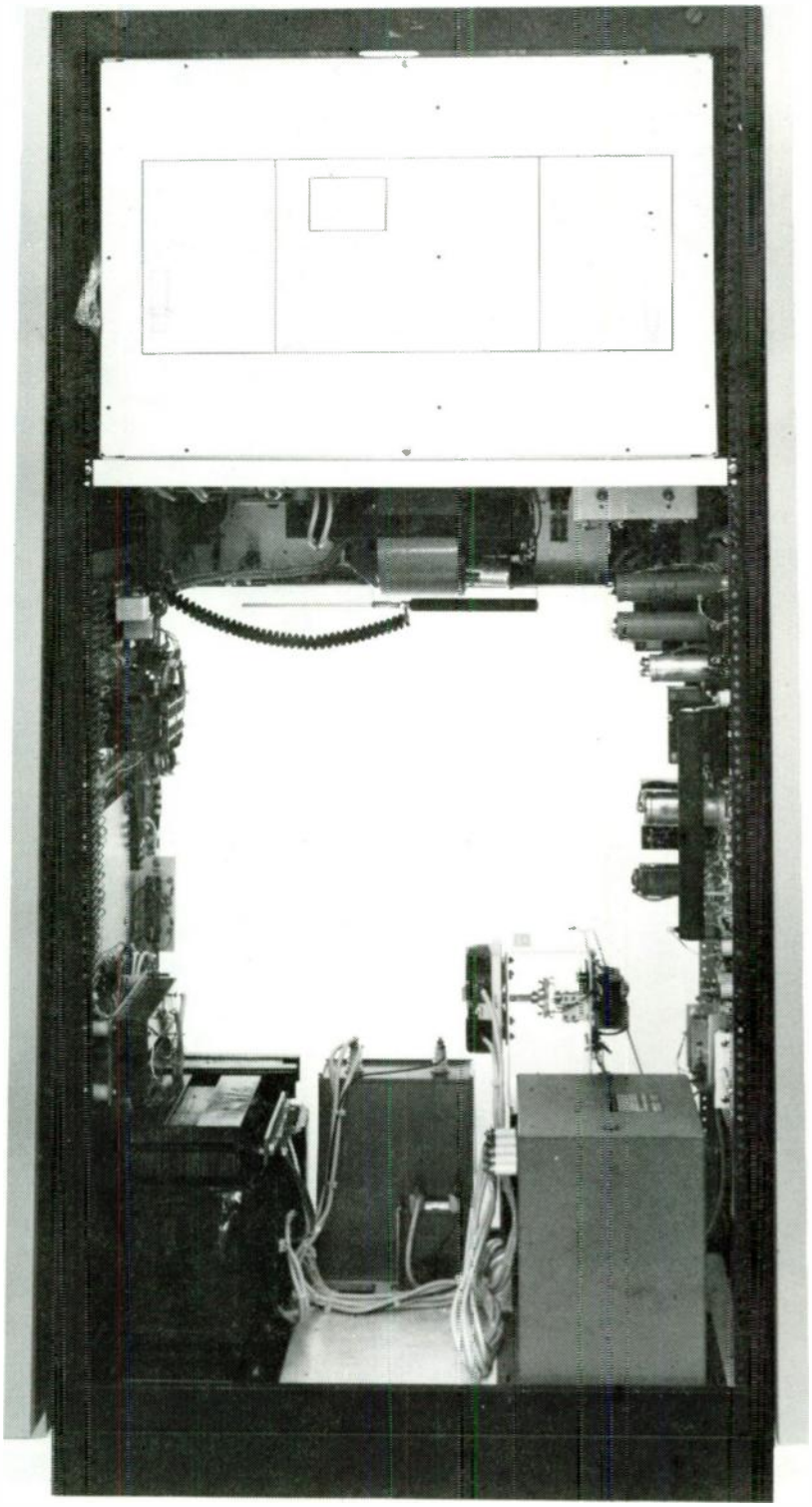


Figure 6-2. 820D-2 1-kW AM Transmitter, Rear View With Access Panel Removed

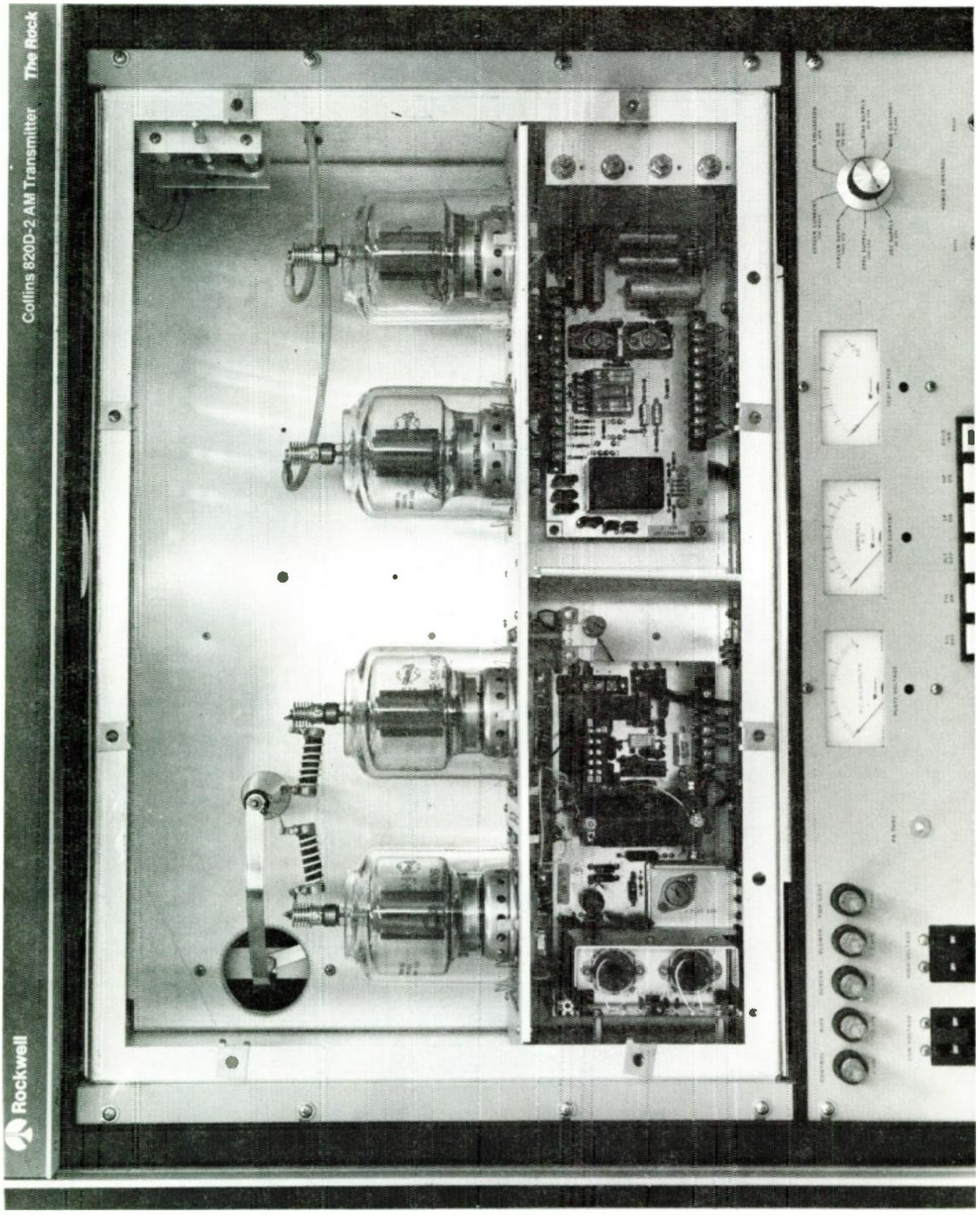


Figure 6-3. 820D-2 1-kW AM Transmitter, Top Front View With Access Panel Removed.

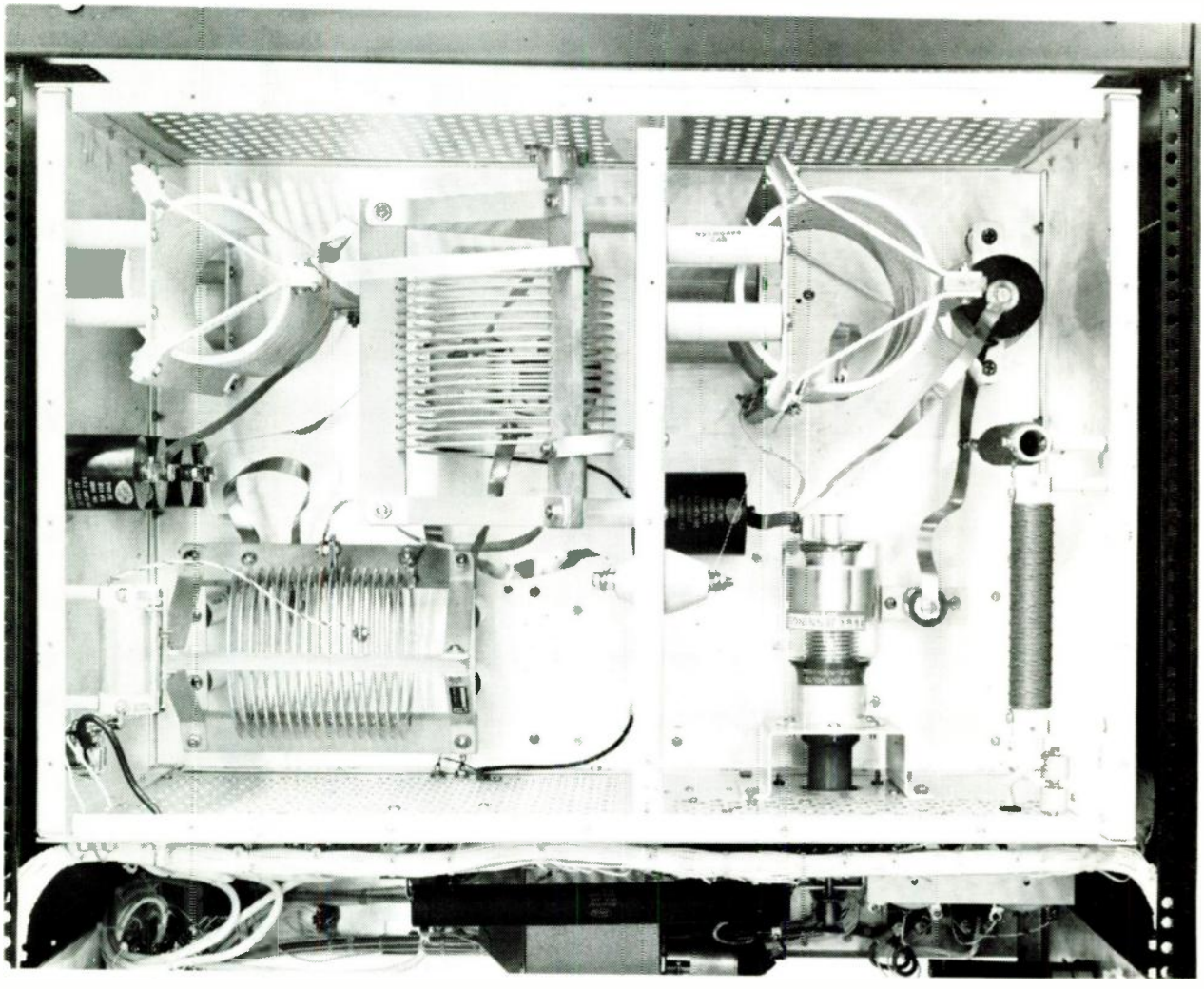


Figure 6-4. RF Output Network.

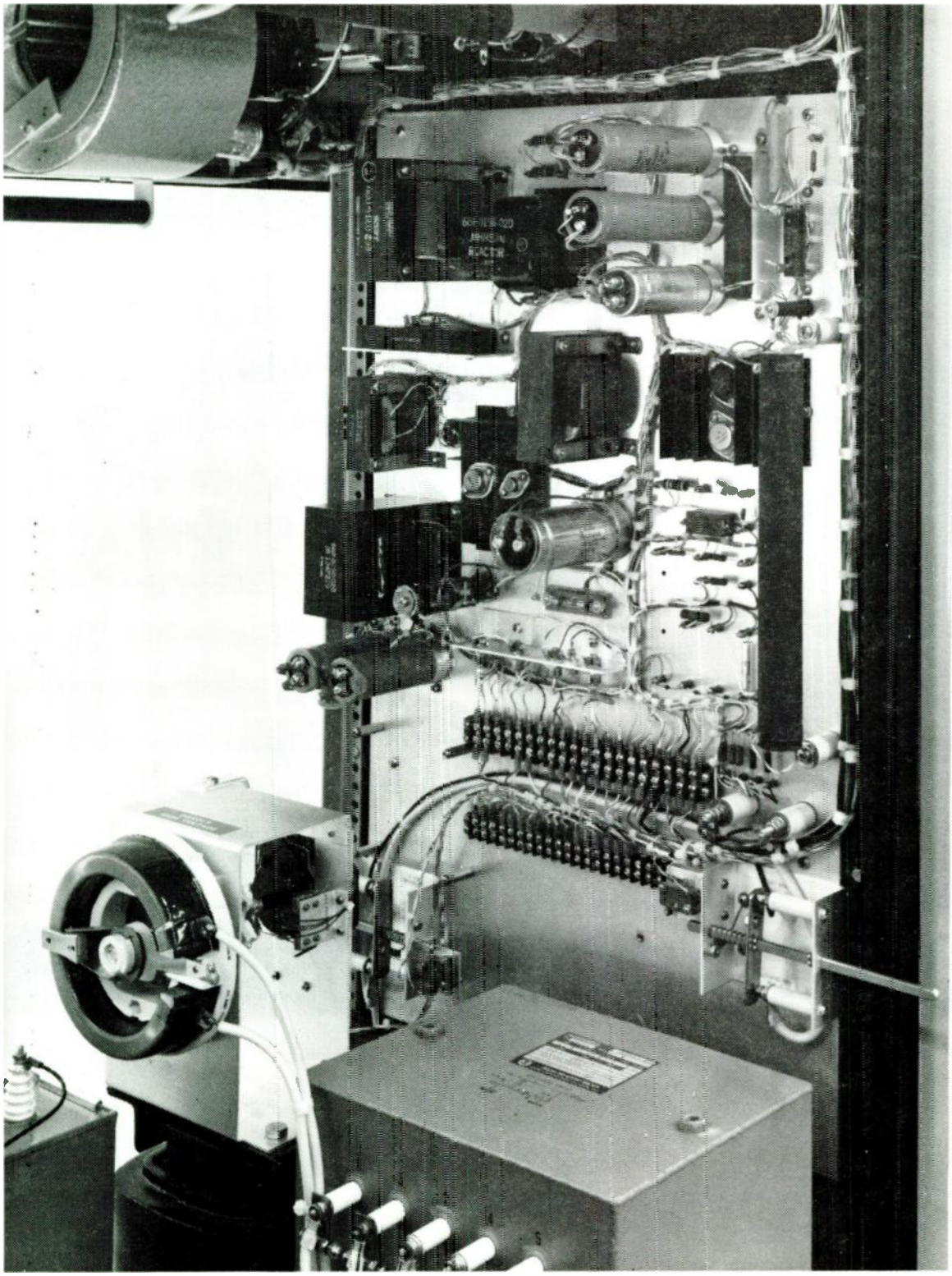


Figure 6-5. Low Voltage Power Supply Assembly A2.

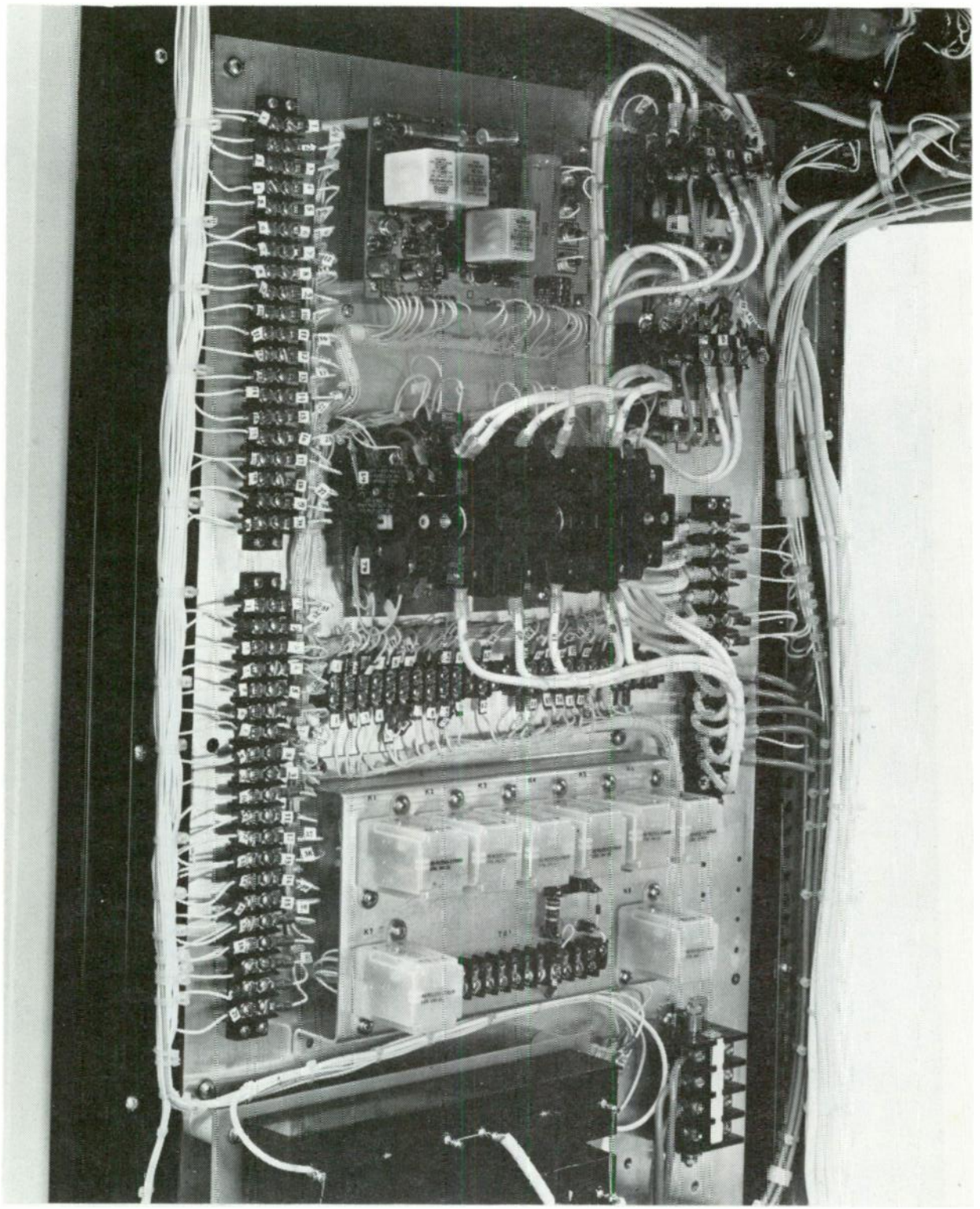


Figure 6-6. Control Circuits Assembly A3.

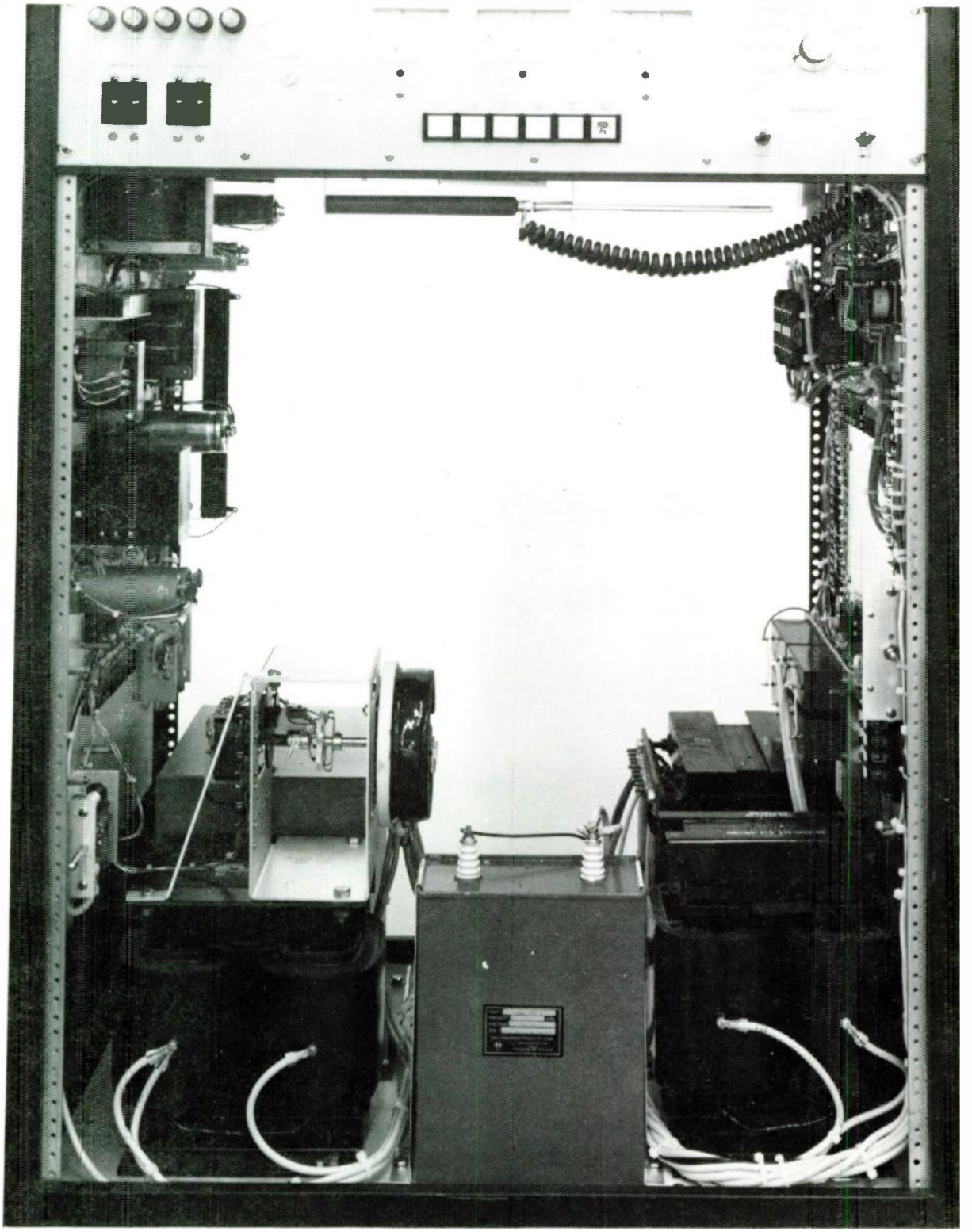


Figure 6-7. High Voltage Power Supply A5.

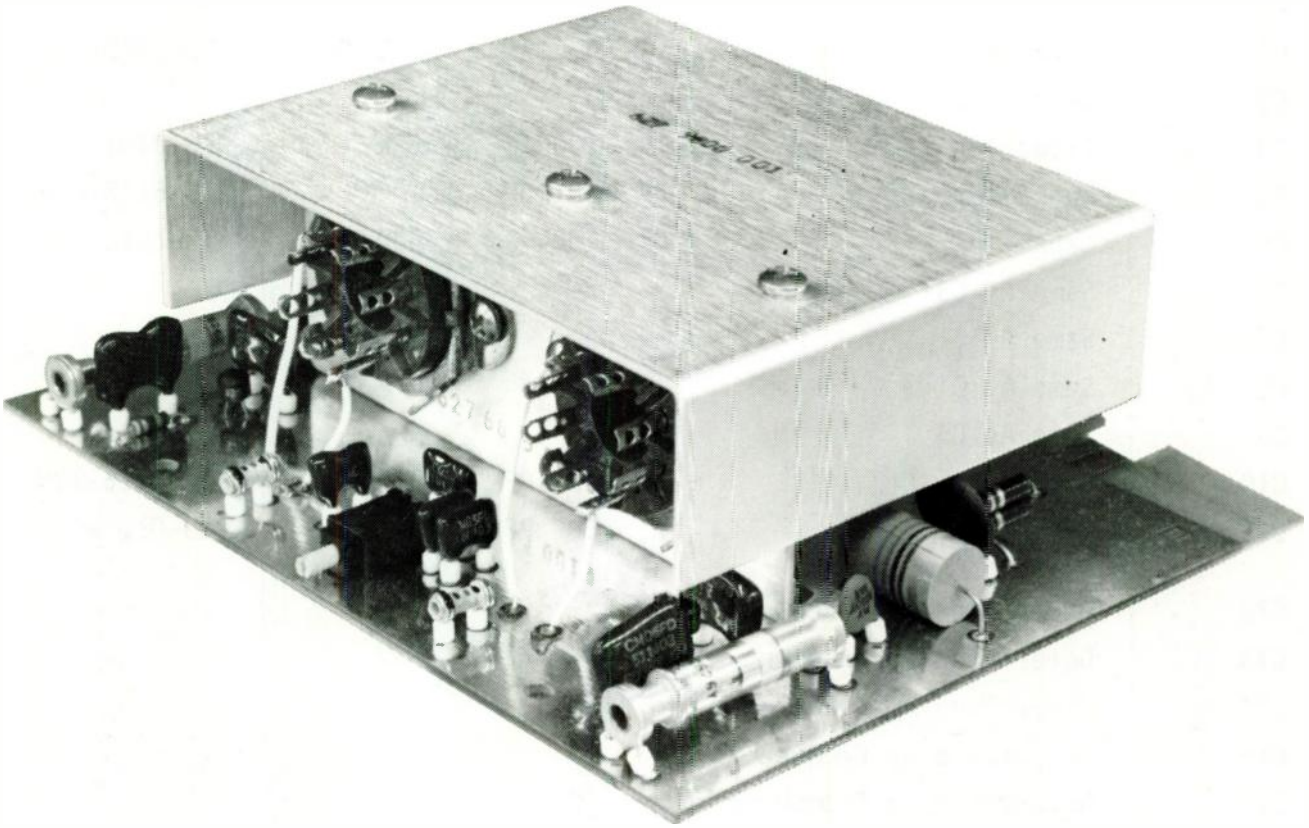


Figure 6-8. Oscillator Card A1A3.

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY:	A1 - TUBE COMPARTMENT			
A1A1	Audio Driver Circuit Board			627-6621-001
A1A2	RF Driver Circuit Board			627-6637-001
A1A3	Oscillator Circuit Board			627-6608-001
A1A4	Meter/Feedback Circuit Board			627-6568-001
B1	Blower			009-0209-000
C1	Capacitor	0.01µf	1.6 KV	913-3522-000
C2	Same As C1			
C3	Capacitor	1000 PF	5 KV	913-0101-000
C4	Capacitor	25 PF	10 KV	913-5113-020
C5	Capacitor	1000 PF	500 V	913-1292-000
C6	Same As C3			
C7	Same As C1			
C8	Same As C1			
C9	Same As C5			
C10	Capacitor	750 PF	10 KV	912-4126-130
C11	Capacitor	500 PF	Vacuum Variable	919-0129-000
C12	Determined by Frequency			
C13	Determined by Frequency			
C14	Determined by Frequency			
C15	Determined by Frequency			
C16	Determined by Frequency			
C17	Determined by Frequency			
C18	Capacitor	330 PF	500 V	912-2852-000
C19	Same As C18			
C20 THROUGH C27	Same as C5			
C28	Same As C1			
C29	Same As C1			
C30	Same As C3			

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
C31	Same as C1			
C32	Same As C1			
C33	Same as C3			
C34	Same As C3			
C35	Same As C3			
C36	Capacitor	0.1 µf	600 V	241-0006-000
C37				
THROUGH	Same As C37			
C43				
C44	Capacitor	1000 PF	2000 V	913-3120-020
C45	Capacitor	1500 PF	500 V	912-2741-000
C46	Not Used			
C47	Capacitor Var	13-320 PF		922-1400-000
CR1	Diode	1N4003		353-6442-030
CR2	Same As CR1			
J1	Connector Output			357-9385-000
J2	Connector Mod Mon			357-9112-000
J3	Connector Freq Mon			356-9112-000
K1	Relay			970-2437-080
K2	Same As K1			
L1	Inductor	10 MHY		240-2720-010
L2	Inductor	2.5 MHY		571-0460-100
L3	Same As L2			
L4	Inductor	120 µHY		980-0048-000
L5	Inductor	22 µHY		980-0133-000
L6	Inductor	82 µHY		980-0047-000
L7	Inductor	15 µHY		980-0132-000
L8	Inductor	17 MHY		549-5099-004
R1	Resistor	47	2 W	745-5596-000
R2	Resistor	2 K	25 W	710-4777-000
R3	Same As R2			
R4	Resistor	47	2 W	745-5596-000

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
R5	Same As R4			
R6	Same As R4			
R7	Resistor Var	50	75 W	735-0363-100
R8	Same As R7			
R9	Resistor	1	14 W	710-5076-010
R10	Resistor	2.5 K	55 W	710-3374-000
R11	Resistor	10	3 W	747-5320-000
R12	Resistor	82 K	210 W	746-6837-000
R13	Resistor Var	5 K	2 W	380-5793-000
R14	Same As R13			
R15	Resistor Var	10 K	2 W	380-5782-000
R16	Same As R15			
R17	Same As R15			
S1	Switch			260-0025-000
T1	Transformer, Filament			662-0361-010
T2	Same As T1			
TB1-A	Terminal Board			367-4200-000
TB1-B	Same As TB1-A			
TB2	Terminal Board			367-4030-000
V1	Tube	5-500 A		257-0600-020
V2	Same As V1			
V3	Same As V1			
V4	Same As V1			
XV1	Socket Tube			220-1016-000
XV2	Same As XV1			
XV3	Same As XV1			
XV4	Same As XV1			
YV1	Chimney, Tube	SK 406		192-1024-000
YV2	Same As YV1			
YV3	Same As YV1			
YV4	Same As YV1			
	Clip, Tube			192-1006-010

SYMBOL	DESCRIPTION	COLLINS PART NUMBER
Z1	Parasitic Suppressor	762-8820-001
Z2	Parasitic Suppressor	762-8820-001

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
RF OUTPUT	NETWORK FREQUENCY DETERMINING PARTS			
*C12/13	Capacitor	430 PF	10 KV	912-4126-150
	Capacitor	390 PF	10 KV	912-4126-110
	Capacitor	240 PF	10 KV	912-4126-100
	Capacitor	180 PF	10 KV	912-4126-090
*C14/C15 *C16/C17	Capacitor	3900 PF	6 KV	912-4140-180
	Capacitor	3000 PF	6 KV	912-4140-170
	Capacitor	2400 PF	6 KV	912-4140-160
	Capacitor	2000 PF	6 KV	912-4140-150
	Capacitor	1600 PF	6 KV	912-4140-140

* Select values from Table 1. below.

TABLE 1. OUTPUT NETWORK CAPACITOR VALUES

FREQUENCY	C12	C13	C14	C15	C16	C17
540-700	390 or 430 PF	240 PF	3900 PF	3900 PF	3900 PF	3900 PF
710-920	430 PF	NONE	3000 PF	3000 PF	3000 PF	3000 PF
930-1150	240 PF	NONE	2400 PF	2400 PF	2400 PF	2400 PF
1160-1380	180 PF	NONE	2000 PF	2000 PF	2000 PF	2000 PF
1390-1600	NONE	NONE	1600 PF	1600 PF	1600 PF	1600 PF

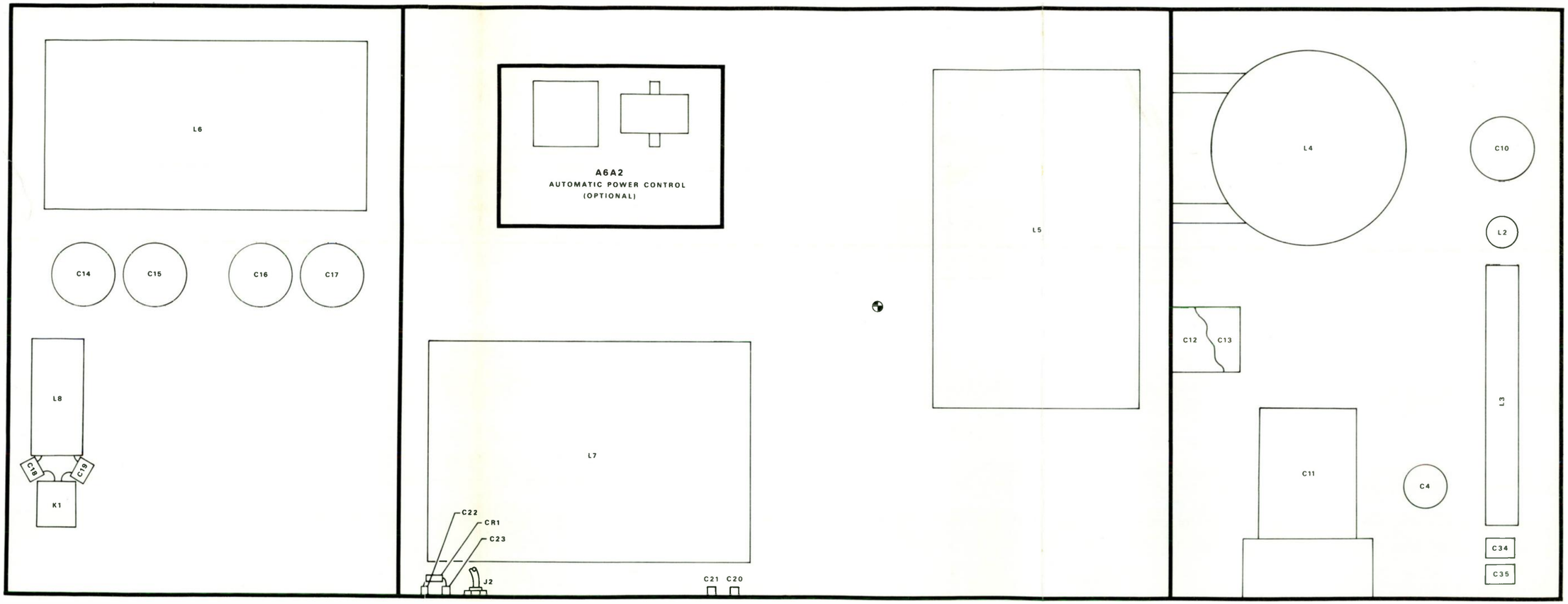


Figure 6-9. RF (Tube) Compartment A1
(Sheet 1 of 3).

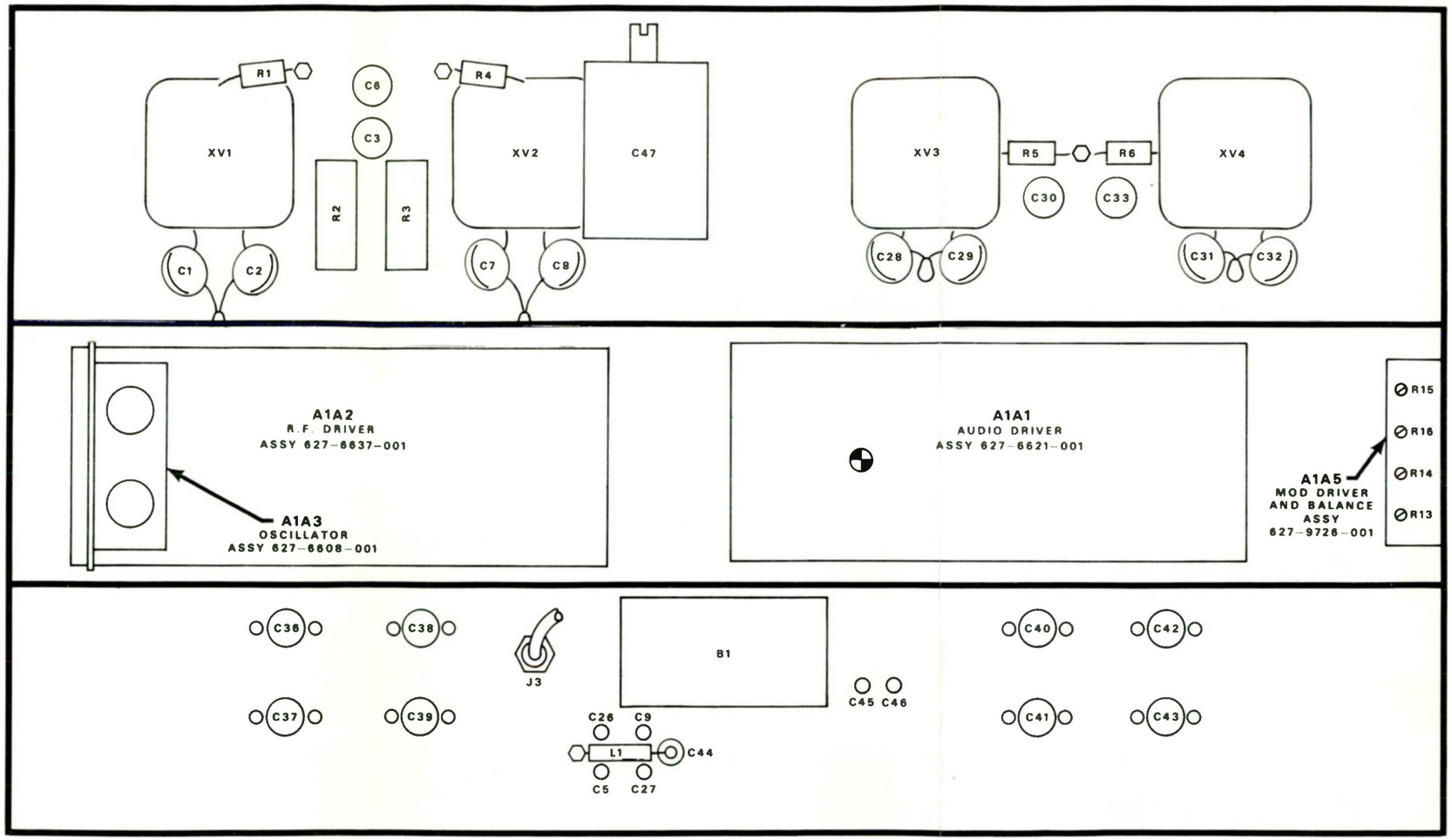
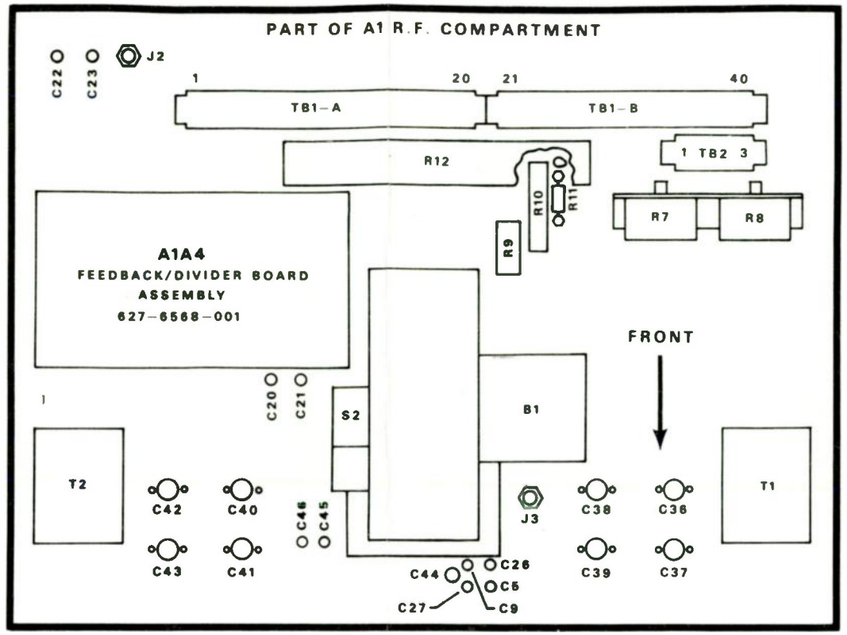


Figure 6-9. RF (Tube) Compartment A1 (Sheet 2 of 3).



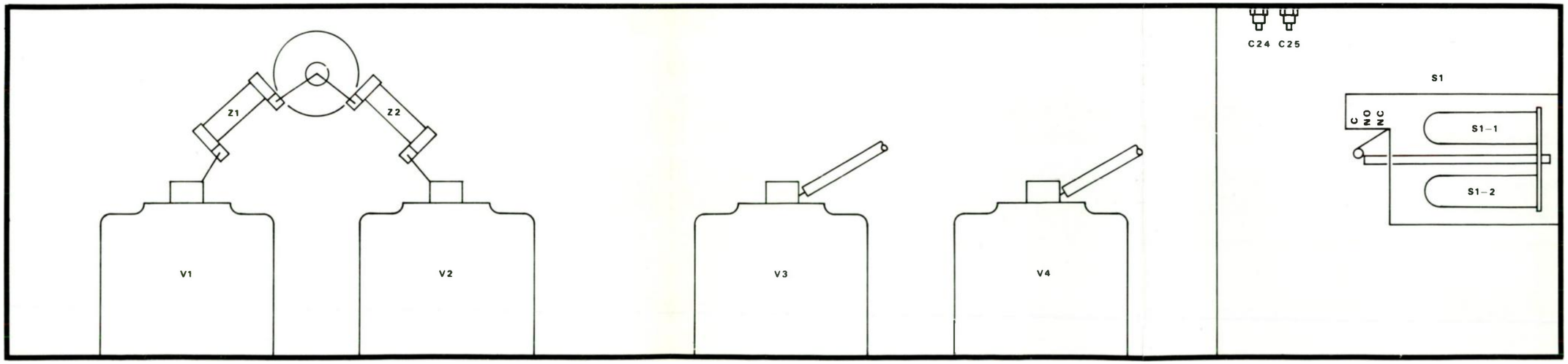


Figure 6-9. RF (Tube) Compartment A1 (Sheet 3 of 3).

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY:	A1A1 - AUDIO DRIVER CARD			
C1	Capacitor	20000µf	500 V	912-2747-000
C2	Capacitor	2.2µf	25 V	913-3812-000
C3	Same As C1			
C4	Same as C2			
C5	Capacitor	25µf	50 V	184-8677-000
C6	Same As C1			
C7	Same As C1			
C8	Same As C5			
C9	Capacitor	120 PF	500 V	912-2822-000
C10	Same As C9			
C11	Capacitor	2µf	600 V	951-1071-000
C12	Capacitor	.33µf	600 V	951-1066-000
C13	Capacitor	3µf	200 V	951-1045-000
C14	Same As C13			
C15	Same As C12			
C16	Same As C2			
C17	Same As C2			
CR1	Diode	1N4003		353-6442-030
K1	Relay			970-2420-040
Q1	Transistor	2N3053		352-0613-010
Q2	Same As Q1			
Q3	Transistor	2N3585		352-0711-030
Q4	Same As Q3			
R1	Resistor	180	1/4 W	745-0722-000
R2	Same As R1			
R3	Same As R1			
R4	Same As R1			
R5	Resistor	330	1/4 W	745-0731-000
R6	Resistor (250W Operation)	160	1/4 W	745-0720-000
R6	Resistor (500W Operation)	100	1/4 W	745-0712-000
R7	Same As R6			

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
R8	Resistor (250W Operation)	1 K	1/4 W	745-0748-000
R8	Resistor (500W Operation)	1.8 K	1/4 W	745-0757-000
R9	Not Used			
R10	Resistor	10 K	1/4 W	745-0785-000
R11	Not Used			
R12	Same As R10			
R13	Resistor	1.2 K	1/4 W	745-0752-000
R14	Resistor	2.2 K	1/4 W	745-0761-000
R15	Resistor	47 K	1/4 W	745-0809-000
R16	Same As R14			
R17	Same As R15			
R18	Same As R13			
R19	Resistor	120	1/4 W	745-0716-000
R20	Same As R19			
R21	Resistor	3.9 K	1/4 W	745-0770-000
R22	Not Used			
R23	Resistor	4.7 K	1/4 W	745-0773-000
R24	Resistor	270 K	1/2 W	745-1454-000
R25	Resistor	510	1/2 W	745-1864-420
R26	Same As R21			
R27	Not Used			
R28	Same As R23			
R29	Same As R24			
R30	Same As R25			
R31	Resistor	15 K	2 W	745-5701-000
R32	Same As R31			
R33	Resistor	100 K	1 W	745-3436-000
R34	Resistor	47	1 W	745-3296-000
R35	Resistor	2.7 K	1 W	745-3370-000
R36	Same As R33			
R37	Same As R34			
T1	Transformer, Audio Input			667-0187-030

SYMBOL	DESCRIPTION	COLLINS PART NUMBER
TB1	Terminal Board	367-0812-140
TB2	Terminal Board	367-0812-100
XK1	Socket, Relay	220-0027-010
XQ3	Socket, Transistor	220-0965-020
XQ4	Same As XQ3	

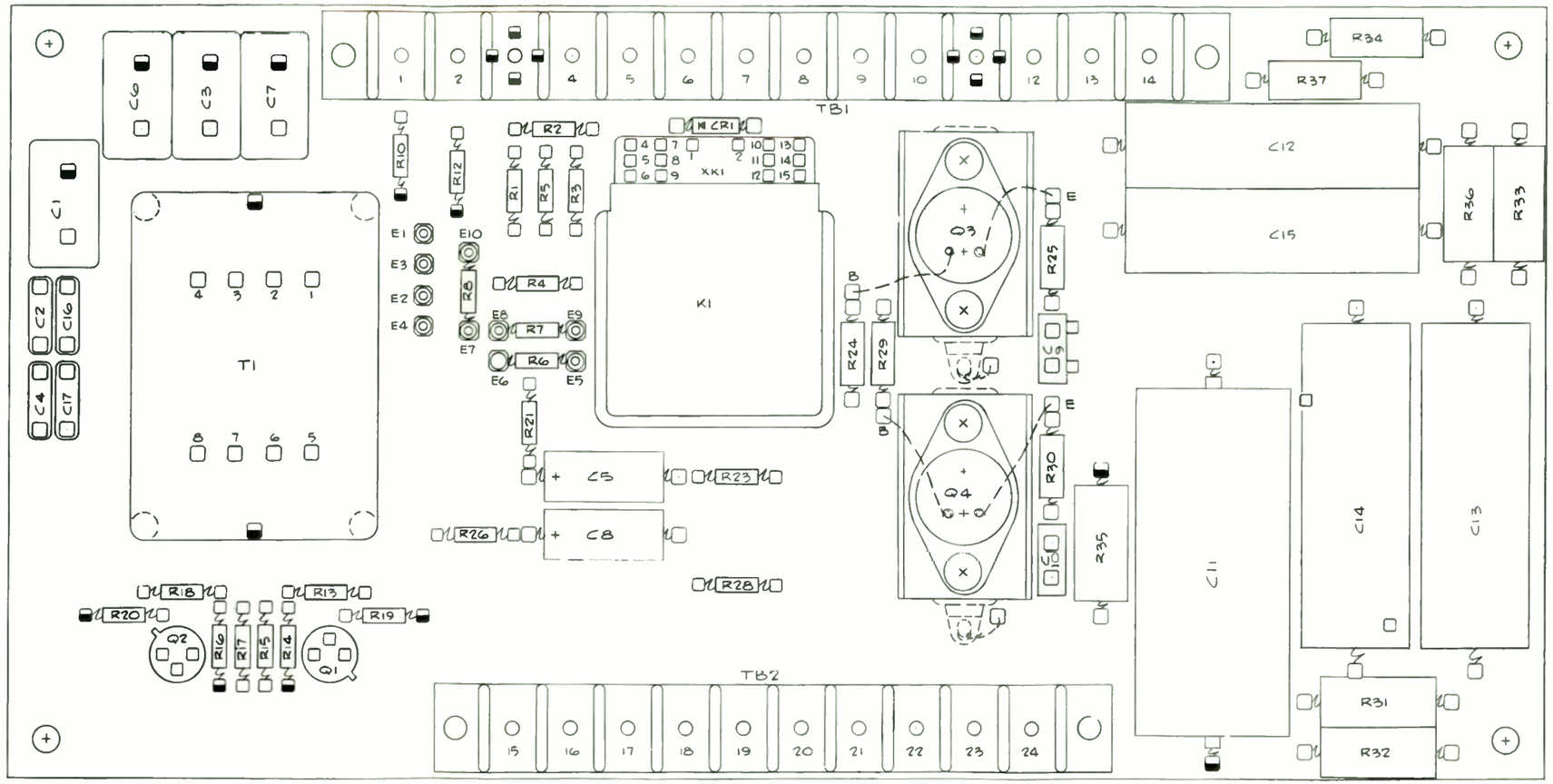


Figure 6-10. Audio Driver Assembly A1A1.

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY:	A1A2 - RF DRIVER CARD			
C1	Capacitor	0.1μf	500 V	913-3681-000
C2 THROUGH C9	Same As C1			
C10	Capacitor	1.0μf	200 V	933-1059-050
C11	Capacitor	200 PF	1000 V	912-4143-020
C12	Capacitor	200 PF	1 KV	912-4143-030
C13	Capacitor	390 PF	1 KV	912-4143-050
C14	Capacitor	820 PF	1 KV	912-4143-010
C15	Capacitor	1500 PF	1 KV	912-4143-170
C16	Same as C15			
C17	Not Used			
C18	Capacitor	5600 PF	500 V	912-2717-000
C19	Capacitor	10,000 PF	500 V	912-3068-000
C20	Capacitor	1000 PF	500 V	912-3001-000
C21	Not Used			
C22	Same As C10			
C23	Capacitor	300 PF	500 V	912-2849-000
CR1	Diode	1N914		353-2906-000
CR2	Same As CR1			
CR3	Same As CR1			
CR4	Same As CR1			
CR5	Diode	1N5615		353-6496-020
J1	Connector			372-2425-010
J2	Same As J1			
L1	Inductor	150μHY		240-0760-000
L2	Inductor	10 MHY		240-2720-010
Q1	Transistor	2N2102		352-0646-010
Q2	Same As Q1			
Q3	Transistor	2N5039		352-0749-040

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
R1	Resistor	1 K	1/4 W	745-0749-000
R2	Resistor	10	1/2 W	745-1268-000
R3	Resistor	2.2 K	1/4 W	745-0761-000
R4	Resistor	3.9 K	1/4 W	745-0770-000
R5	Same As R1			
R6	Same As R2			
R7	Same As R2			
R8	Resistor	10	1 W	745-3268-000
R9	Resistor	47	1 W	745-3296-000
R10	Resistor	270	2 W	745-5628-000
R11	Resistor	18	2 W	745-5579-000
R12	Same As R10			
R13	Resistor	22	2 W	745-5582-000
R14	Resistor	0.5	10 W	747-8587-000
R15	Resistor	220	1 W	745-3324-000
R16	Same As R8			
R17	Resistor	100	2 W	745-5610-000
R18	Resistor	0.68	6.5 W	747-5555-000
T1	Transformer RF Coupling			758-0328-002
T2	Transformer RF Driver			771-9118-001
TB1-A	Board Terminal			367-0812-040
TB1-B	Board Terminal			367-0812-070
XQ3	Socket, Transistor			220-0968-010

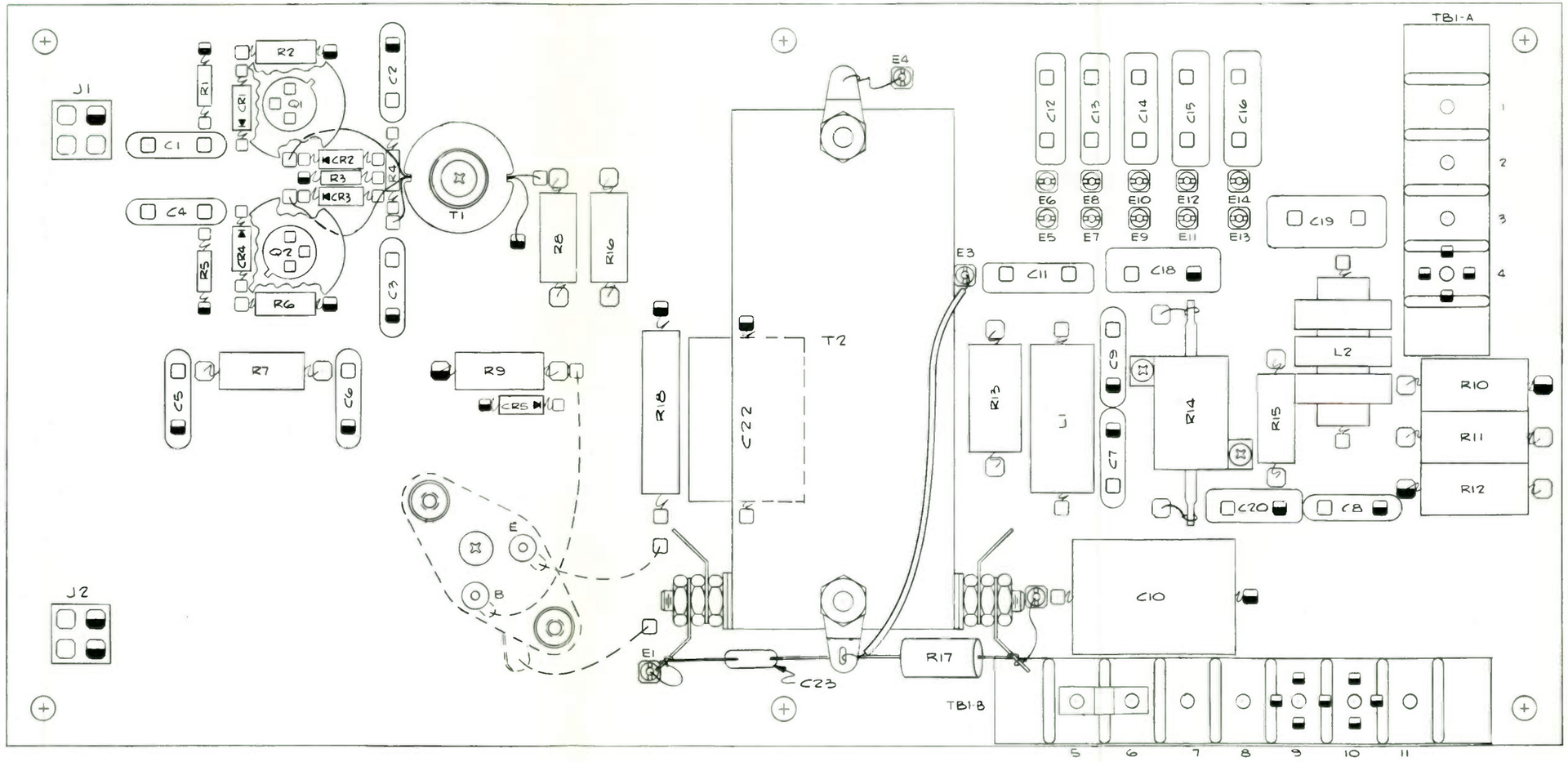


Figure 6-11. RF Driver Assembly A1A2.

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY:	A1A3 - OSCILLATOR CARD			
C1	Capacitor Var	1-60 PF		922-0609-000
C2	Not Used			
C3	Capacitor	15 PF	500 V	916-0671-000
C4	Capacitor	2200 PF	500 V	913-3011-000
C5	Capacitor	510 PF	500 V	912-2980-000
C6	Same As C5			
C7	Capacitor	.01µf	500 V	913-3013-000
C8	Capacitor	100 PF	500 V	912-2816-000
C9	Same As C1			
C10	Not Used			
C11	Same As C3			
C12	Same As C4			
C13	Same As C5			
C14	Same As C5			
C15	Same As C7			
C16	Same As C8			
C17	Same As C8			
C18	Same As C8			
C19	Same As C4			
C20	Same As C4			
C21	Capacitor	0.1µf	25 V	913-3806-000
C22	Same As C21			
C23	Capacitor	33 PF	500 V	912-2780-000
C24	Capacitor	10 PF	500 V	912-2754-000
C25	Same As C24			
L1	Inductor	10 MHY		240-0844-000
L2	Same As L1			
Q1	Transistor	2N3564		352-0631-010
Q2	Same As Q1			
Q3	Same As Q1			

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
R1	Resistor	22 K	1/4 W	745-0797-000
R2	Resistor	6.8 K	1/4 W	745-0779-000
R3	Resistor	10 K	1/4 W	745-0785-000
R4	Resistor	1.2 K	1/2 W	745-1356-000
R5	Resistor	5.6 K	1/4 W	745-0776-000
R6	Same As R1			
R7	Same As R2			
R8	Same As R3			
R9	Same As R4			
R10	Same As R5			
R11	Resistor	39 K	1/4 W	745-0806-000
R12	Same As R3			
R13	Same As R3			
R14	Resistor	2.2 K	1/4 W	745-0761-000
R15	Same As R14			
R16	Resistor	330	6.5 W	747-5525-000
R17	Resistor Var	10 K		380-3761-070
R18	Same As R5			
S1	Switch			266-7511-010
U1	Integrated Circuit	SN7473N		351-7640-010
U2	Integrated Circuit	SN74121N		351-7645-010
VR1	Zener Diode	1N4742A		353-6481-290
VR2	Same As VR1			
VR3	Zener Diode	IN4733A		353-6481-110
XY1	Socket, Crystal			220-1121-000
XY2	Same As XY1			

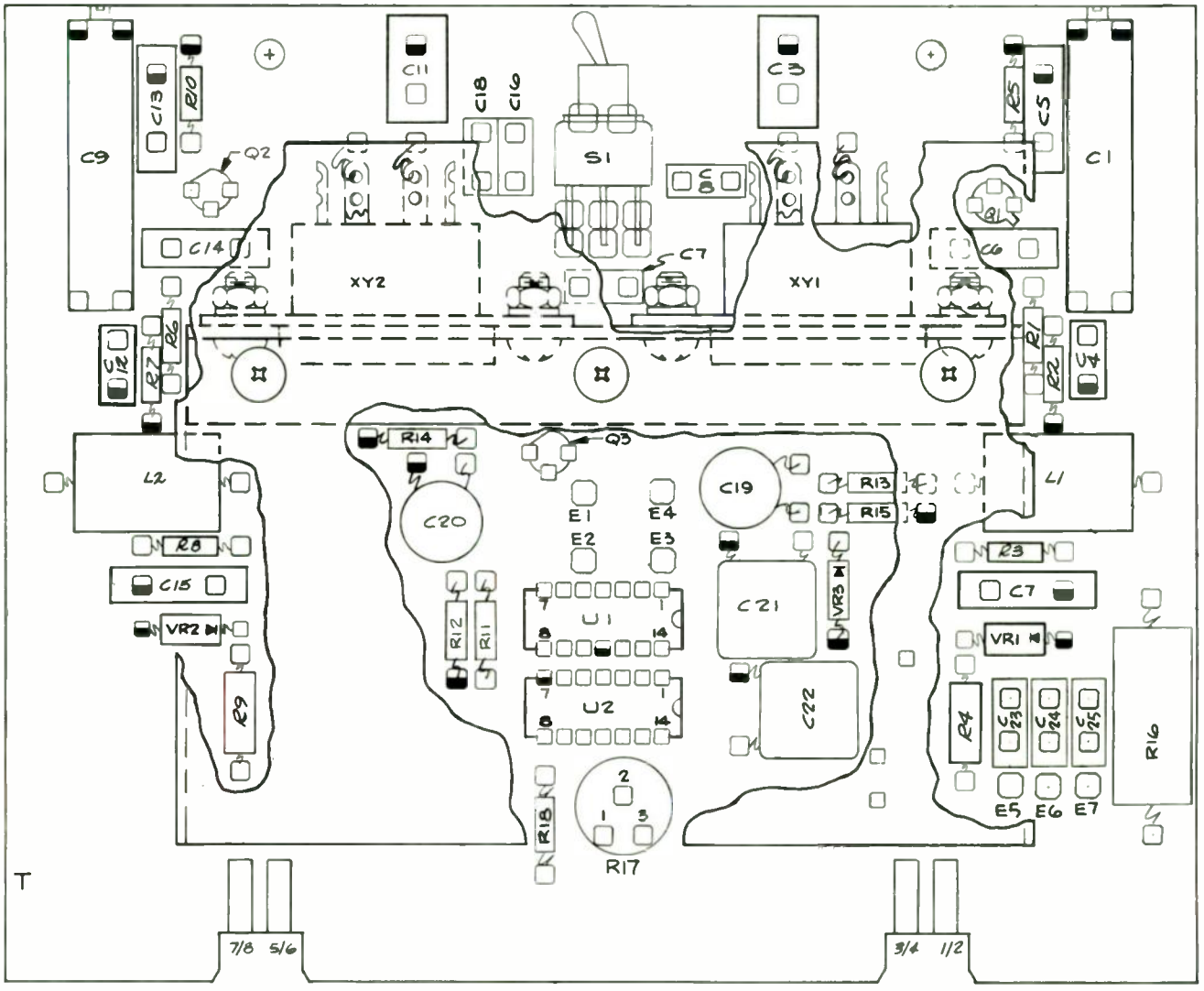


Figure 6-12. Oscillator Assembly A1A3.

SYMBOL	DESCRIPTION				COLLINS PART NUMBER
ASSEMBLY:	A1A4 - METER/FEEDBACK CARD				
C1	Capacitor		100 PF	500 V	912-2816-000
C2 THROUGH C16	Same As C1				
C17	Capacitor		0.1μf	500 V	913-3681-000
C18	Same As C17				
C19	Same As C17				
C20	Same As C17				
C21	Capacitor		1000μf	50 V	183-1282-140
R1	Resistor		820 K	1 W	745-3475-000
R2 THROUGH R16	Same As R1				
R17	Resistor	1%	200 K	2 W	705-1493-050
R18 THROUGH R26	Same As R17				
R27	Resistor		10 K	2 W	745-5694-000
R28	Resistor		12	6.5 W	747-5422-000
R29	Same As R28				
R30	Resistor		1 K	1/2 W	745-1352-000
VR1	Zener Diode		1N967A		353-3236-000
VR2	Zener Diode		1N4740A		353-6481-250

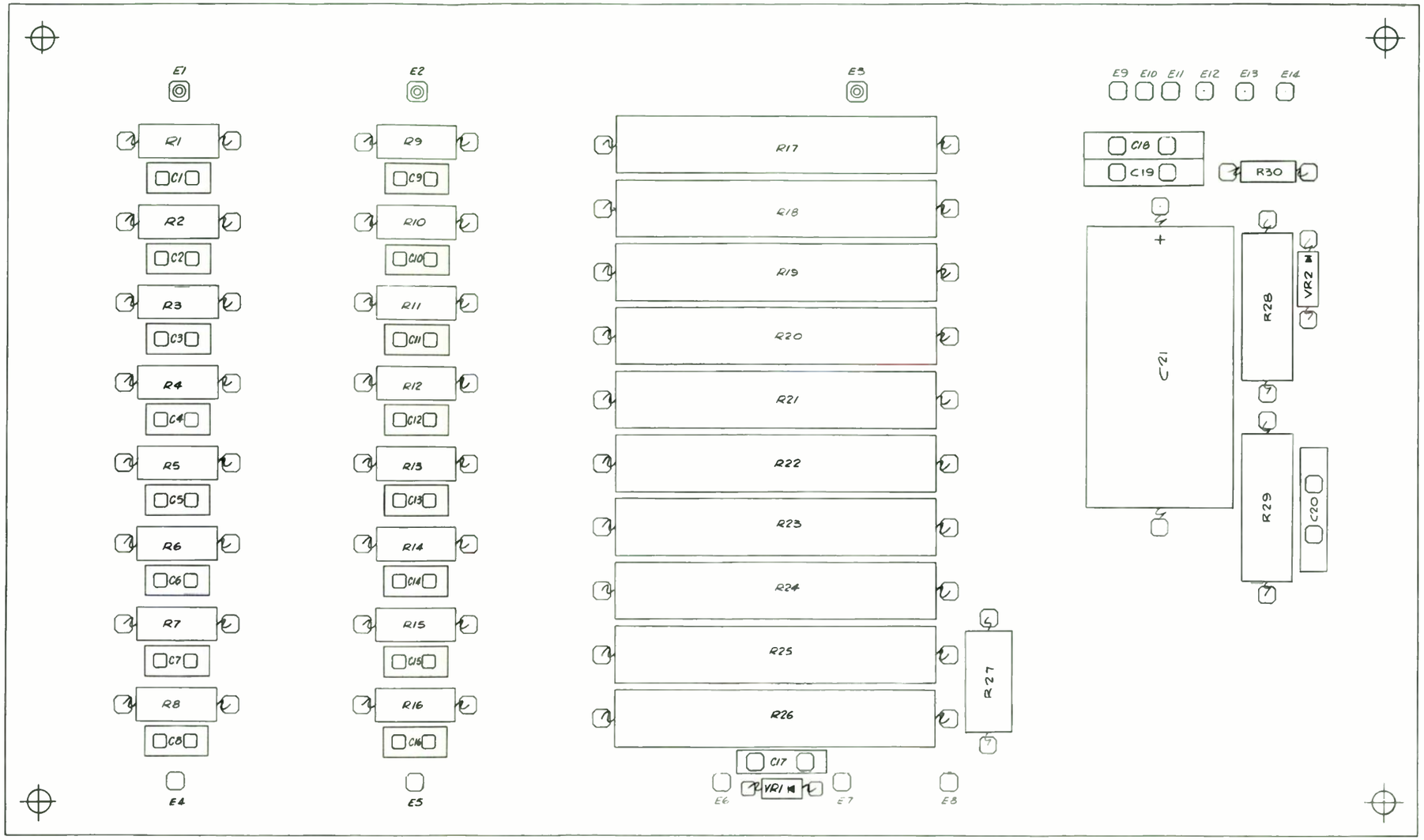


Figure 6-13. Feedback/Divider (Meter/Feedback) Board Assembly A1A4.

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY: A2 - LOW VOLTAGE POWER SUPPLY				
C1	Capacitor	.05µf	500 V	913-3153-000
C2	Capacitor	140µf	450 V	183-1278-530
C3	Same As C2			
C4	Capacitor	200µf	350 V	184-2540-000
C5	Same As C1			
C6	Capacitor	750µf	200 V	183-1297-060
C7	Capacitor	3900µf	50 V	183-1278-370
C8	Capacitor	100µf	50 V	183-1281-080
C9	Same As C7			
C10	Capacitor	0.1µf	200 V	913-3681-000
C11	Not Used			
C12	Same As C10			
CR1	Diode	5PF30		353-3655-020
CR2	Diode	6RS21SA15D15		353-0418-010
CR3	Diode	5CBR8		353-0420-060
CR4	Diode	6RS20AP5B2		353-6504-010
CR5	Diode	1N4384		353-6467-020
CR6	Diode	1N1184		353-6023-000
CR7	Same As CR6			
CR8	Same As CR6			
CR9	Same As CR6			
CR10	Diode	1N5552		353-3718-060
CR11	Same As CR10			
CR12	Same As CR10			
CR13	Same As CR10			
E1	Standoff Insulator			190-0025-000
E2	Same As E1			
E3	Terminal			306-0976-000
E4 THROUGH E39	Same As E3			

SYMBOL	DESCRIPTION				COLLINS PART NUMBER
F1	Fuse		3ASB		264-0306-000
L1	Inductor		8 HY		668-0155-020
L2	Inductor		10 HY		668-0156-010
Q1	Transistor		2N3054		352-0581-010
Q2	Transistor		2N3772		352-0690-020
R1	Resistor		180	2 W	745-5621-000
R2	Same As R1				
R3	Resistor		5.6 K	55 W	747-2762-000
R4	Resistor		15 K	25 W	710-3139-470
R5	Resistor		1.5 K	11 W	746-6161-000
R6	Resistor	1%	750 K	2 W	705-1493-020
R7	Resistor		1.54 K	1/2 W	705-7105-000
R8	Resistor		3 K	210 W	746-6811-000
R9	Resistor		47	2 W	745-5596-000
R10	Resistor	1%	150 K	1/2 W	705-7272-000
R11	Same As R7				
R12	Resistor		10	3 W	747-5320-000
R13	Resistor		4	100 W	710-5076-060
R14	Resistor		330	6.5 W	747-5525-000
R15	Resistor		0.12	3 W	747-5117-000
R16	Resistor		150	1/2 W	745-1317-000
R17	Resistor	1%	28.7 K	1/2 W	705-7166-000
R18	Same As R12				
R19	Not Used				
R20	Resistor	1%	200 K	2 W	705-7314-000
R21	Resistor	1%	3.01 K	1/2 W	705-7119-000
S7	Switch, Interlock				627-9743-002
S3	Same As S7				
T1	Transformer, Screen Pwr Supply				662-0316-020
T2	Transformer, Bias Pwr Supply				662-0348-020
T3	Transformer, Control Pwr Supply				662-0290-020
TB1	Terminal Board				367-4200-000

SYMBOL	DESCRIPTION		COLLINS PART NUMBER
TB2	Terminal Board		367-0131-000
VR1	Zener Diode	1N2842B	353-1447-000
VR2	Zener Diode	1N2844B	353-1443-000
VR3	Zener Diode	1N2989B	353-1369-000
XF1	Socket, Fuse		265-1265-010
XQ1	Socket, Transistor		220-0968-020
XQ2	Socket, Transistor		220-0966-010

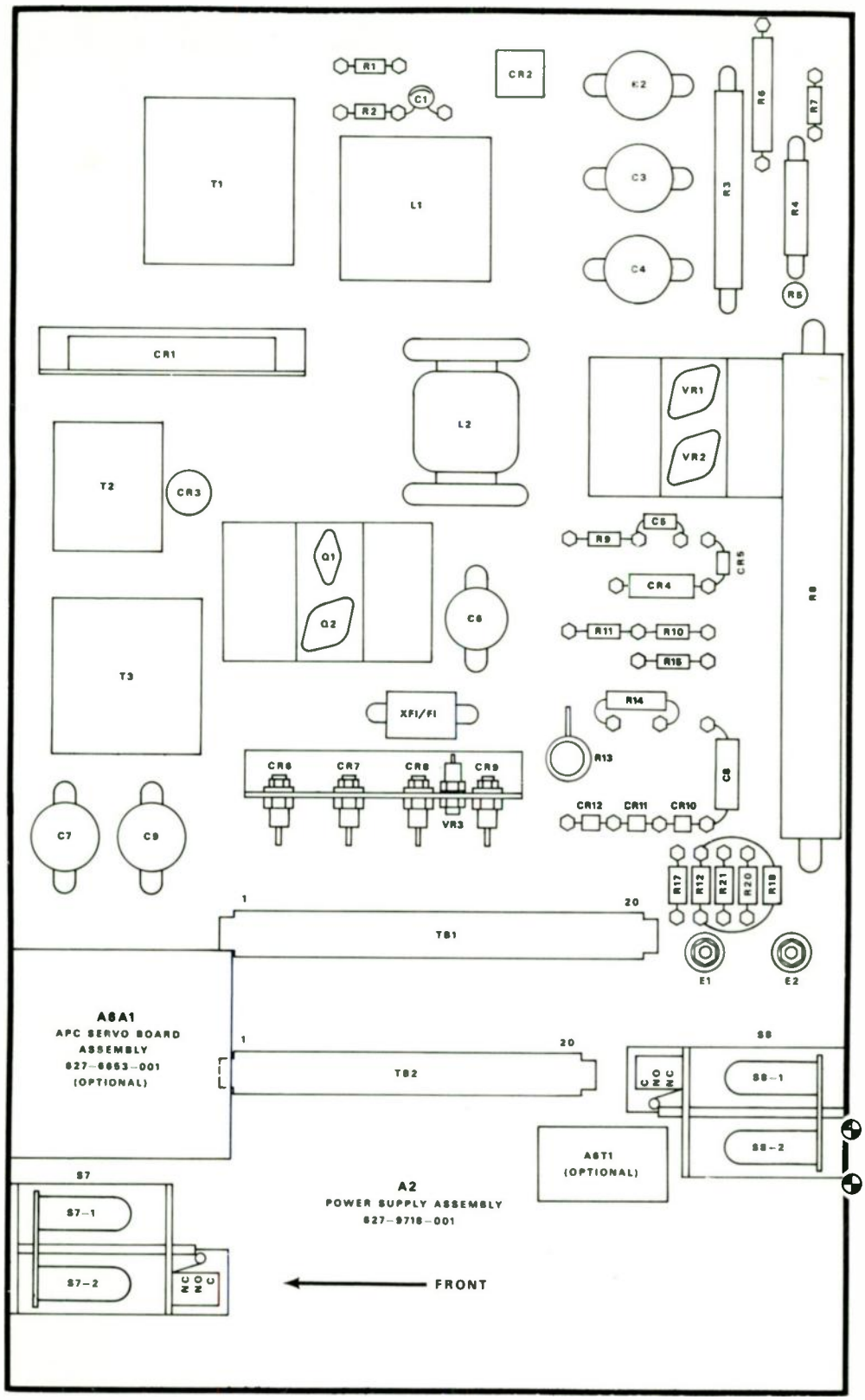


Figure 6-14. Low Voltage Power Supply Assembly A2.

SYMBOL	DESCRIPTION		COLLINS PART NUMBER
ASSEMBLY: A3 - CONTROL CIRCUITS			
A3A1	Control Circuit Board		627-6564-001
CR1	Diode	1N4003	353-6442-030
CR2	Same As CR1		
CR3	Same As CR1		
CR4	Same As CR1		
CR5	Diode HV Rectifier		353-0413-010
CR6	Same As CR5		
CR7	Same As CR5		
CR8	Same As CR5		
K1	Relay, Blower		970-2426-070
K2	Relay, Filament		970-2426-070
K3	Relay, HV Contactor		401-0015-010
TB1	Terminal Board		367-4200-000
TB2A	Terminal Board		367-0124-000
TB2B	Same As TB2A		
TB3	Terminal Board		367-5120-000
TB4	Same As TB1		
TB5	Terminal Board		367-4040-000
TB6	Terminal Board		306-0778-000

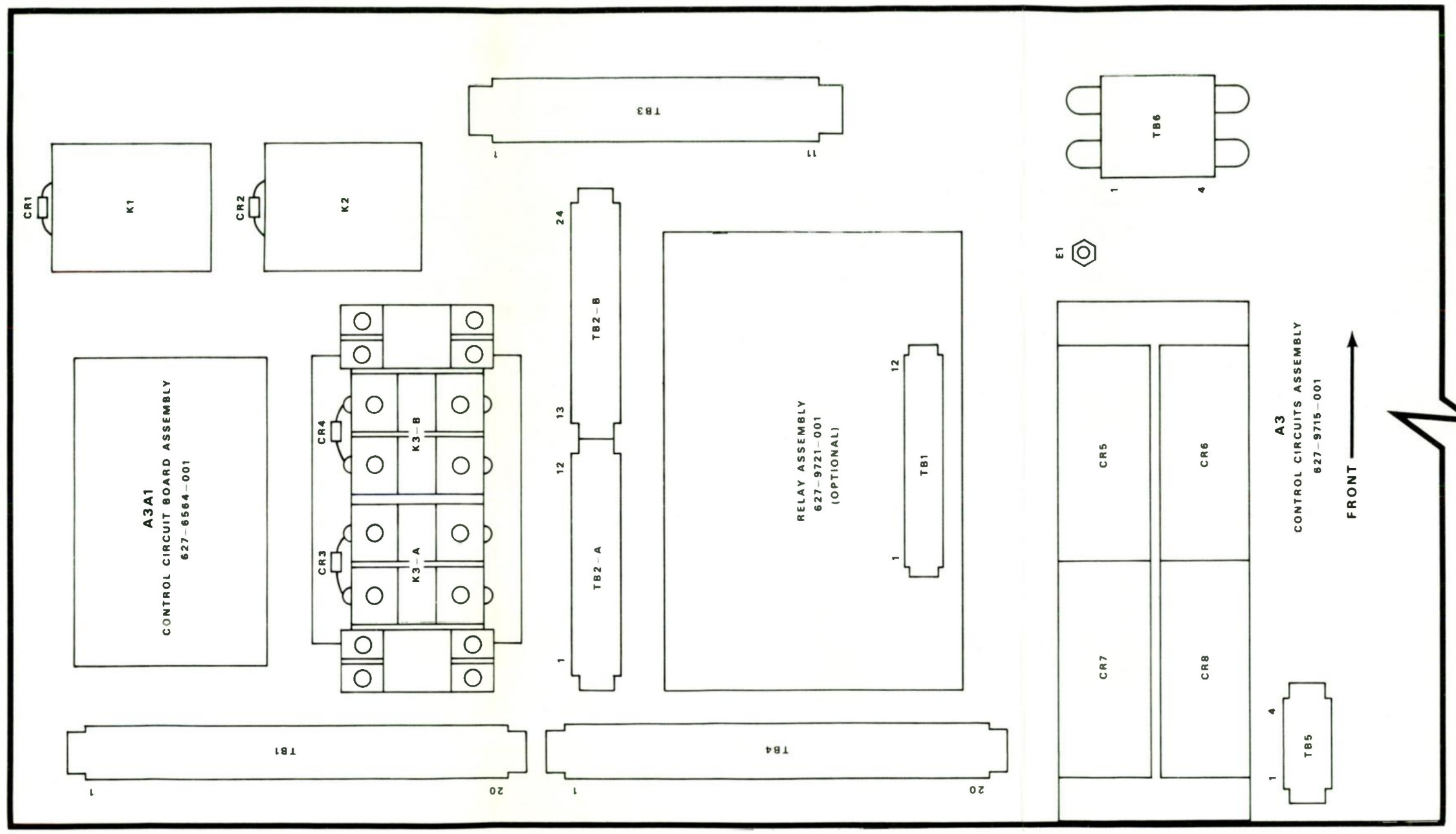


Figure 6-15. Control Circuits Assembly A3.

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY: A3A1 - CONTROL CIRCUIT BOARD				
C1	Capacitor	100µf	50 V	183-1281-080
C2	Capacitor	0.1µf	25 V	913-3806-000
C3	Same As C1			
C4	Same As C2			
C5	Same As C2			
C6	Same As C1			
C7				
THROUGH	Same As C2			
C10				
C11	Capacitor	1000µf	50 V	183-1282-140
CR1	Diode	1N4003		353-6442-030
CR2				
THROUGH	Same As CR1			
CR8				
CR9	Diode	1N1202A		353-1889-000
CR10	Same As CR9			
K1	Relay, PA Overload			970-0002-030
K2	Relay, Mod Overload			970-0002-030
K3	Relay, Overload Lockout			970-0002-030
Q1	Transistor	2N3053		352-0613-010
Q2	Same As Q1			
Q3	SCR	C6F		353-6468-010
Q4	Same As Q1			
Q5	Same As Q3			
Q6	Same As Q3			
Q7	SCR	2N1771A		353-1989-000
Q8	Same As Q7			
R1	Resistor	47	1/2 W	745-1296-000
R2	Resistor	2.2 K	1/2 W	745-1366-000
R3	Resistor	1 K	1/2 W	745-1352-000

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
R4	Resistor	470	1/2 W	745-1338-000
R5	Same As R4			
R6	Resistor Var	500		380-3761-180
R7	Resistor	270	1/2 W	745-1328-000
R8	Same As R1			
R9	Same As R2			
R10	Same As R3			
R11	Same As R4			
R12	Same As R4			
R13	Same As R6			
R14	Same As R7			
R15	Resistor	10	1/2 W	745-1268-000
R16	Resistor	27	1/2 W	745-1286-000
R17	Same As R3			
R18	Same As R2			
R19	Same As R4			
R20	Resistor	47 K	1/2 W	745-1422-000
R21	Same As R20			
R22	Same As R4			
R23	Resistor	4.7 K	1/2 W	745-1380-000
R24	Resistor	100	1/2 W	745-1310-000
R25	Same As R4			
R26	Same As R23			
R27	Same As R24			
R28	Same As R3			
R29	Same As R3			
R30	Resistor	1 K	3 W	745-3352-000
R31	Same As R30			
R32	Same As R3			
R33	Resistor	1 K	1/2 W	745-1352-000
R34 THROUGH	Same As R24			

SYMBOL	DESCRIPTION		COLLINS PART NUMBER
R37			
VR1	Zener Diode	1N4733A	353-6481-110
VR2	Same As VR1		
VR3	Same As VR1		
XK1	Socket, Relay		220-1582-010
XK2	Same As XK1		
XK3	Same As XK1		

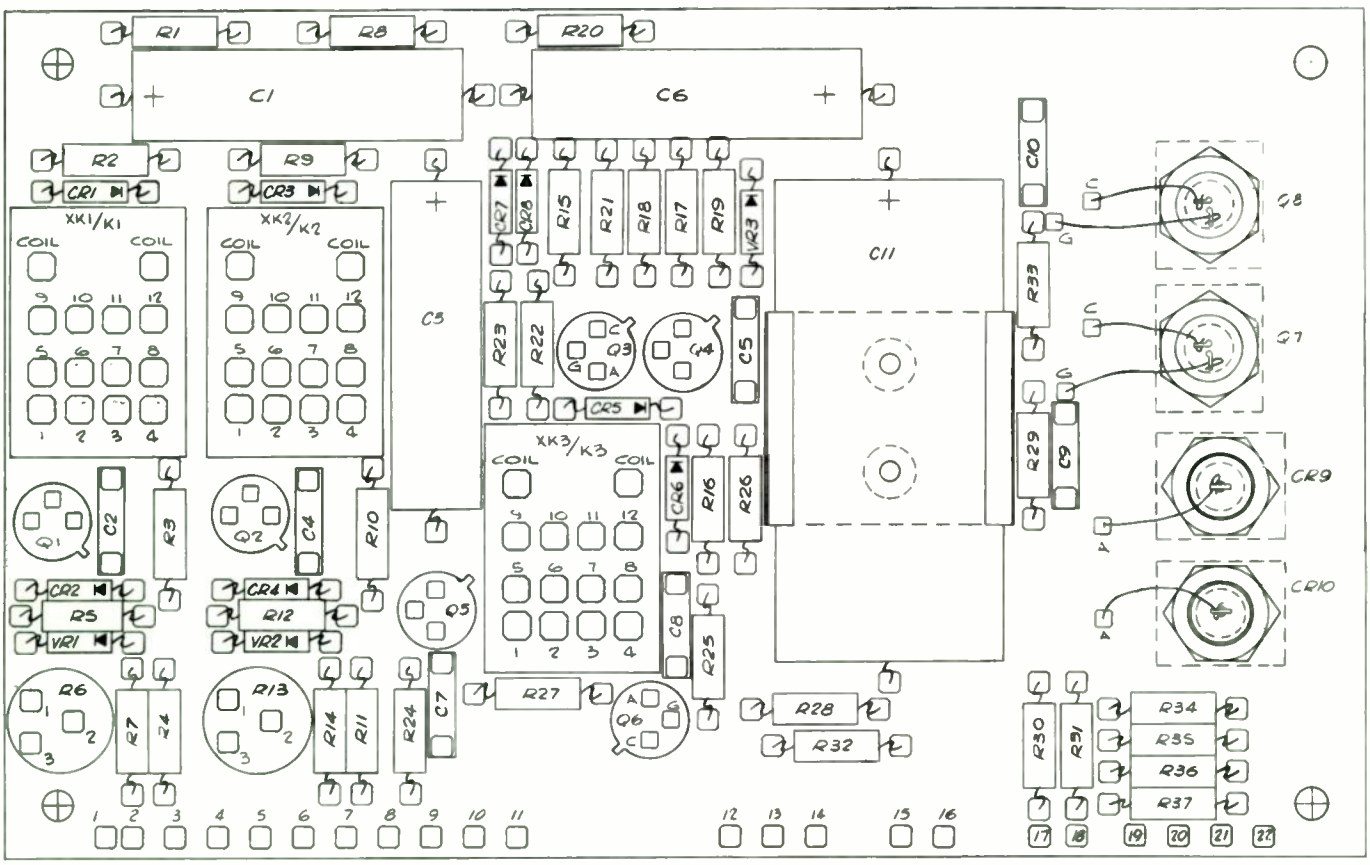


Figure 6-16. Control Circuit Board Assembly A3A1.

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY: A4 - CONTROL PANEL				
C1	Capacitor	.01μf	500 V	913-3013-000
C2	Same As C1			
C3	Same As C1			
CB1	Circuit Breaker L.V.	6 Amps		260-4052-040
CB2	Circuit Breaker H.V.	50 Amps		260-4052-020
DS1	Lamp			262-0179-010
DS2 THROUGH DS7	Same As DS1			
F1	Fuse	2.0 ASB		264-1172-000
F2	Fuse	0.5 ASB		264-1164-000
F3	Same As F1			
F4	Same As F1			
F5	Fuse	1.0 ASB		264-1168-000
M1	Meter, Plate Voltage			458-0783-110
M2	Meter, Plate Current			458-0783-190
M3	Meter, Test			458-0783-050
S1	Switch, Filament Off			266-7509-010
S2	Switch, Filament On			266-7509-010
S3	Switch, Plate Off			266-7509-010
S4	Switch, Low Power Plate			266-7509-010
S5	Switch, High Power Plate			266-7509-010
S6	Switch, Overload Indicator Reset			266-7509-010
S7	Switch, Interlock			260-0025-000
S8	Same As S7			
S9	Switch, Power Adjust			375-0199-010
S10	Switch, Power Control			375-0199-020
S11	Switch, Test Meter			295-2673-120
XF1	Fuse Holder			265-1241-090

SYMBOL	DESCRIPTION	COLLINS PART NUMBER
XF2 THROUGH XF5	Same As XF1	

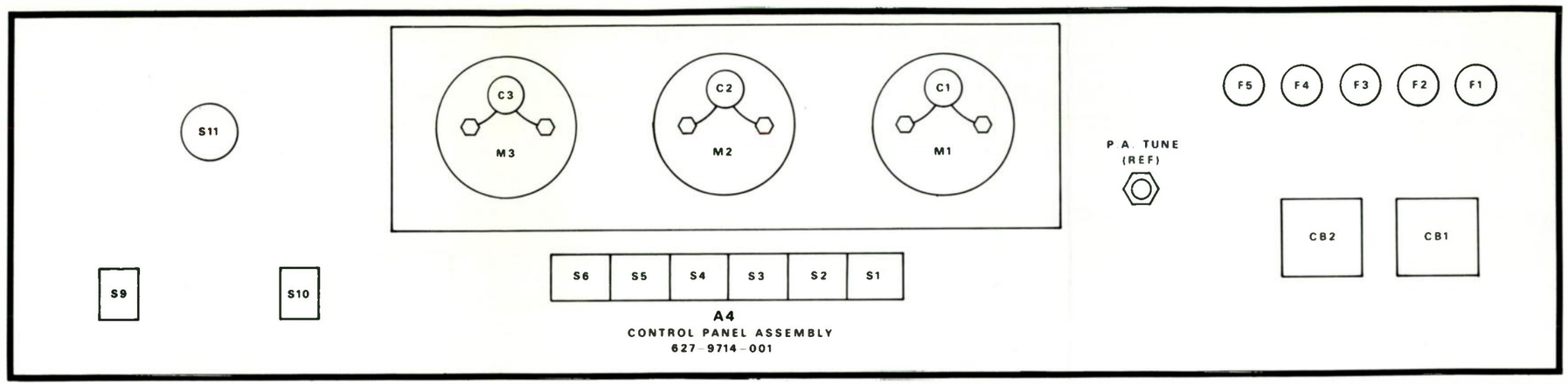
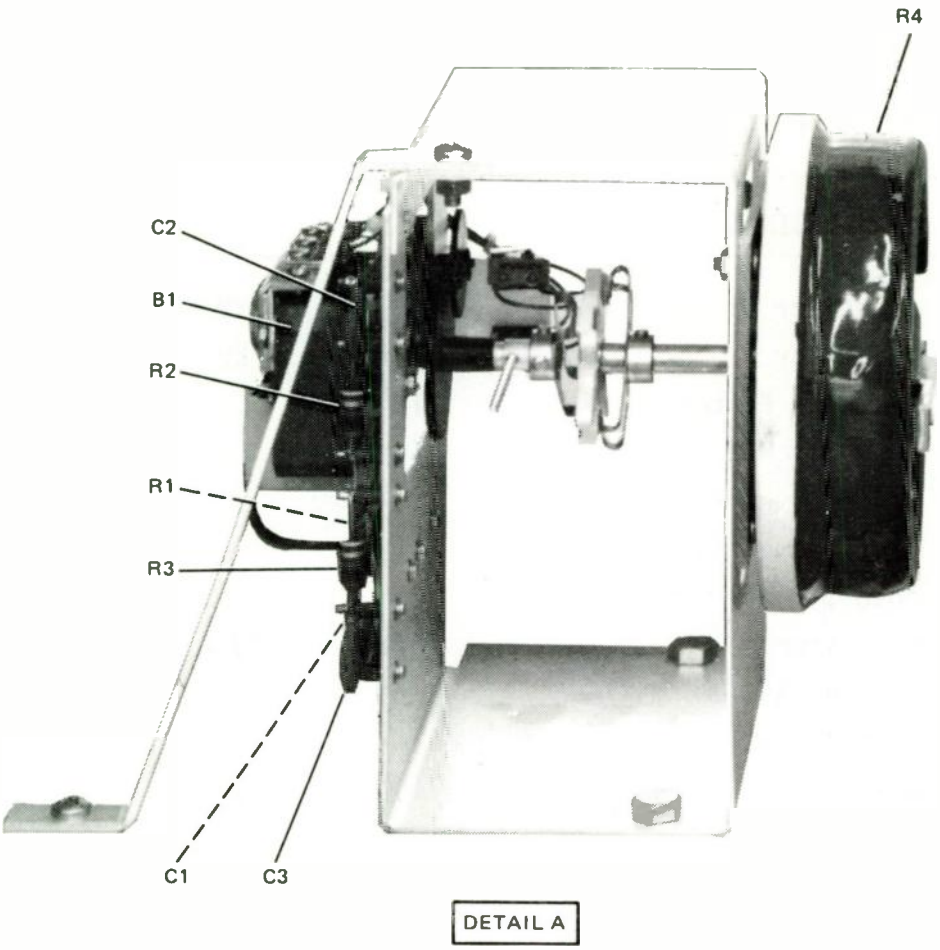


Figure 6-17. Control Panel A4.

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY:	A5 - CABINET FLOOR			
C1	Capacitor	20µf	4 KV	930-0774-030
C2	Capacitor	1µf	4 KV	930-0333-000
L1	Inductor Filter	10 HY		678-0625-000
L2	Inductor Mod	50 HY		678-0591-000
T1	Transformer Plt			662-0285-010
T2	Transformer Mod			667-0497-020
A5B1	Motor, Power Control			230-0517-000
A5C1	Capacitor	0.1µf	600 V	913-3234-000
A5C2	Same As A5C1			
A5C3	Same As A5C1			
A5R1	Resistor	100	2 W	745-5610-000
A5R2	Same As A5R1			
A5R3	Same As A5R1			
A5R4	Rheostat, Power Control	700	300 W	735-5200-010



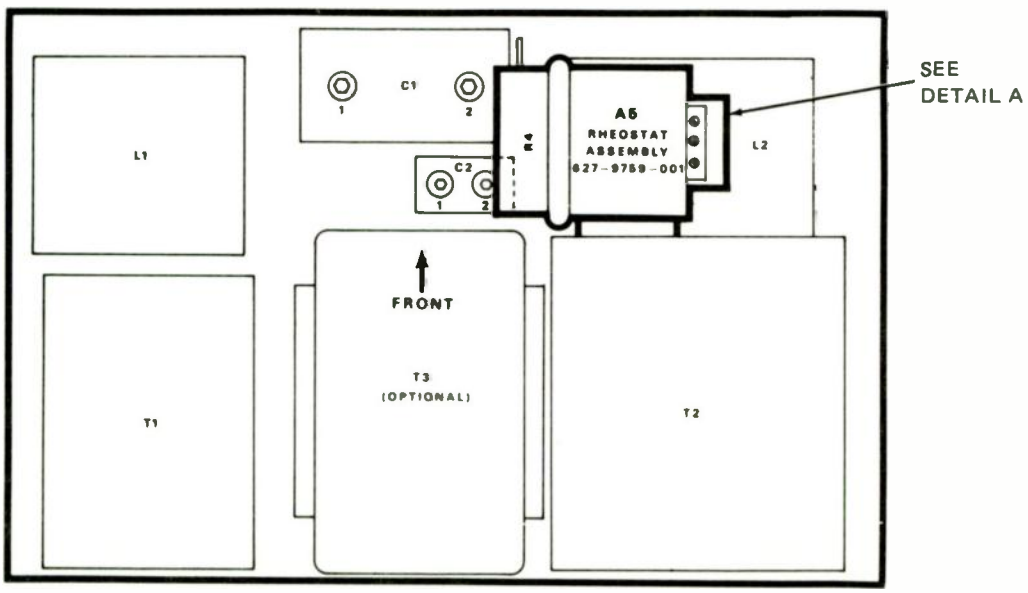


Figure 6-18. Cabinet Floor A5.

SYMBOL	DESCRIPTION	COLLINS PART NUMBER
ASSEMBLY:	A6 - AUTOMATIC POWER CONTROL	
A6A1	Board Assy - Servo Amp	627-6653-001
A6A2	Power Sensor Assembly	771-9207-001
T1	Transformer, Power	662-0057-000

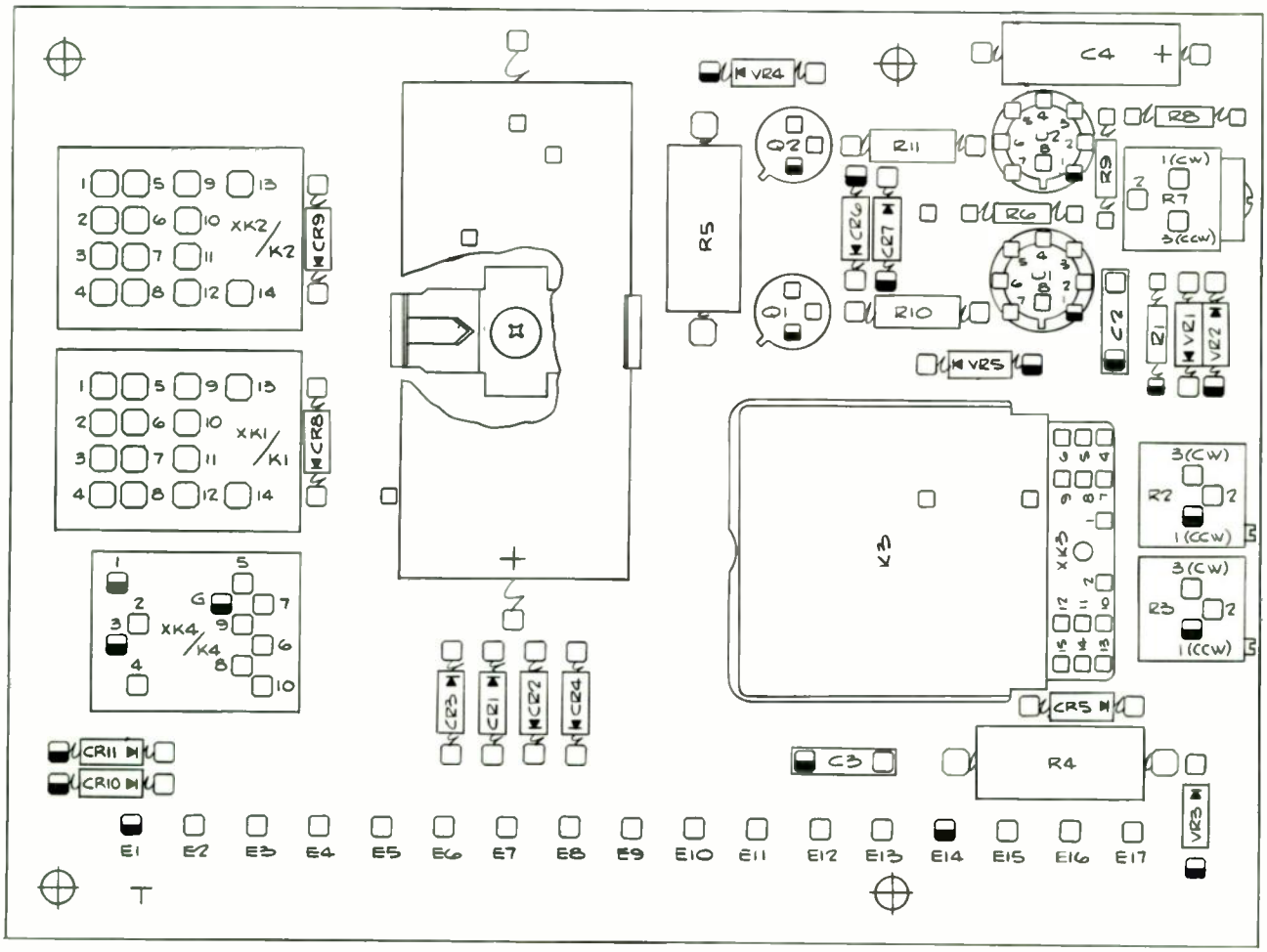
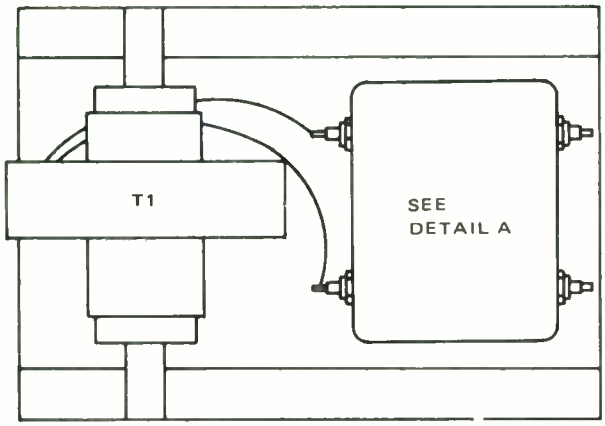
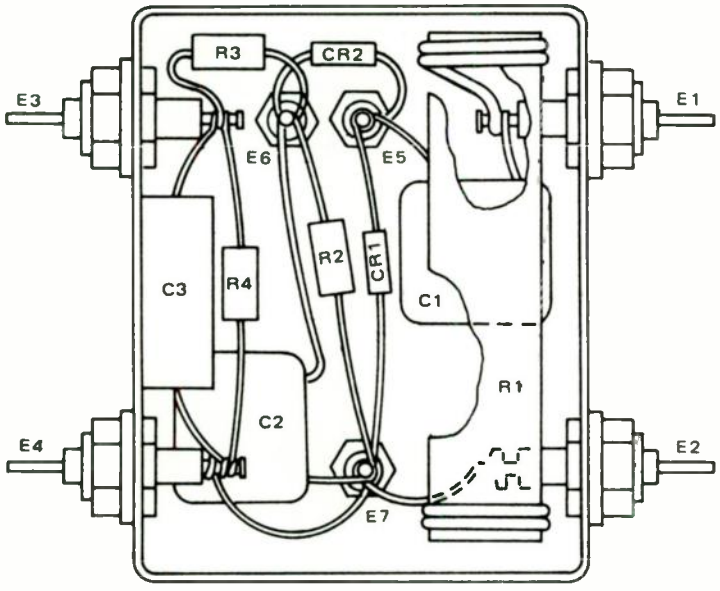


Figure 6-19. Automatic Power Control Servo Board Assembly A6A1.

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY:	A6A1 - AUTOMATIC POWER CONTROL CARD			
C1	Capacitor	1000µf	50 V	183-1282-140
C2	Capacitor	0.1µf		913-3806-000
C3	Same As C2			
C4	Capacitor	100µf	10 V	184-9086-210
CR1	Diode	1N4003		353-6442-030
CR2 THROUGH CR11	Same as CR1			
K1	Relay			970-0002-030
K2	Same As K1			
K3	Relay			970-2420-040
K4	Relay			970-0004-030
Q1	Transistor	2N3053		352-0613-010
Q2	Same As Q1			
R1	Resistor	10 K	1/4 W	745-0785-000
R2	Resistor, Var	5 K	10 Turn	381-1721-060
R3	Same As R2			
R4	Resistor	560	2 W	745-5642-000
R5	Resistor	470	2 W	745-5638-000
R6	Resistor	12 K	1/4 W	745-0788-000
R7	Resistor, Var	500		376-0254-030
R8	Resistor	47	1/4 W	745-0701-000
R9	Resistor	5.6 K	1/4 W	745-0775-000
R10	Resistor	220	1/2 W	745-1324-000
R11	Same As R10			
U1	Integrated Circuit	UA710C		351-7189-010
U2	Same As U1			
VR1	Zener Diode	1N4728A		353-6481-010
VR2	Same As VR1			
VR3	Zener Diode	1N4744A		353-6481-330

SYMBOL	DESCRIPTION		COLLINS PART NUMBER
VR4	Zener Diode	1N4734A	353-6481-130
VR5	Zener Diode	1N4742A	353-6481-290
XK1	Socket, Relay		220-1582-010
XK2	Same As XK1		
XK3	Socket, Relay		220-0027-010
XK4	Socket, Relay		220-1518-000





DETAIL A
ROTATED 180°

MW100-0280-1

Figure 6-20. Power Control Sensor A6A2.

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY : A6A2 - POWER CONTROL SENSOR				
C1	Capacitor	1000 PF	500 V	912-3001-000
C2	Same As C1			
C3	Capacitor	180µf	25 V	184-8664-000
CR1	Diode	1N914		353-2906-000
CR2	Same As CR1			
R1	Resistor	22	15 W	712-0011-000
R2	Resistor	5600	1/2 W	745-1384-000
R3	Resistor	15 K	1/2 W	745-1401-000
R4	Resistor	22 K	1/2 W	745-1408-000

SYMBOL	DESCRIPTION			COLLINS PART NUMBER
ASSEMBLY: A7 - REMOTE CONTROL INTERFACE				
CR1	Diode	1N4006		353-6442-000
K1	Relay, Filament Off			970-2454-270
K2	Relay, Filament On			970-2454-270
K3	Relay, Plate Off			970-2454-270
K4	Relay, LP On			970-2454-270
K5	Relay, HP On			970-2454-270
K6	Relay, Fail Safe			970-2454-270
K7	Relay, Raise			970-2454-270
K8	Relay, Lower			970-2454-270
R1	Resistor	390	2 W	745-5635-000
R2	Resistor	680	2 W	745-5645-000
TB-1	Terminal Board			367-0020-000
XK1	Socket, Relay			220-1399-010
XK2 THROUGH XK8	Same As XK1			
	Contacts, Relay Socket			304-0019-000