TYPE 316F/315F

AM BROADCAST TRANSMITTER WITH SOLID STATE EXCITER

INSTRUCTION MANUAL

107500-4

Continental Electronics MFG. CO.
4212 S. BUCKNER BLVD. DALLAS, TEXAS 75227

ET1-5-24

TYPE 316F/315F

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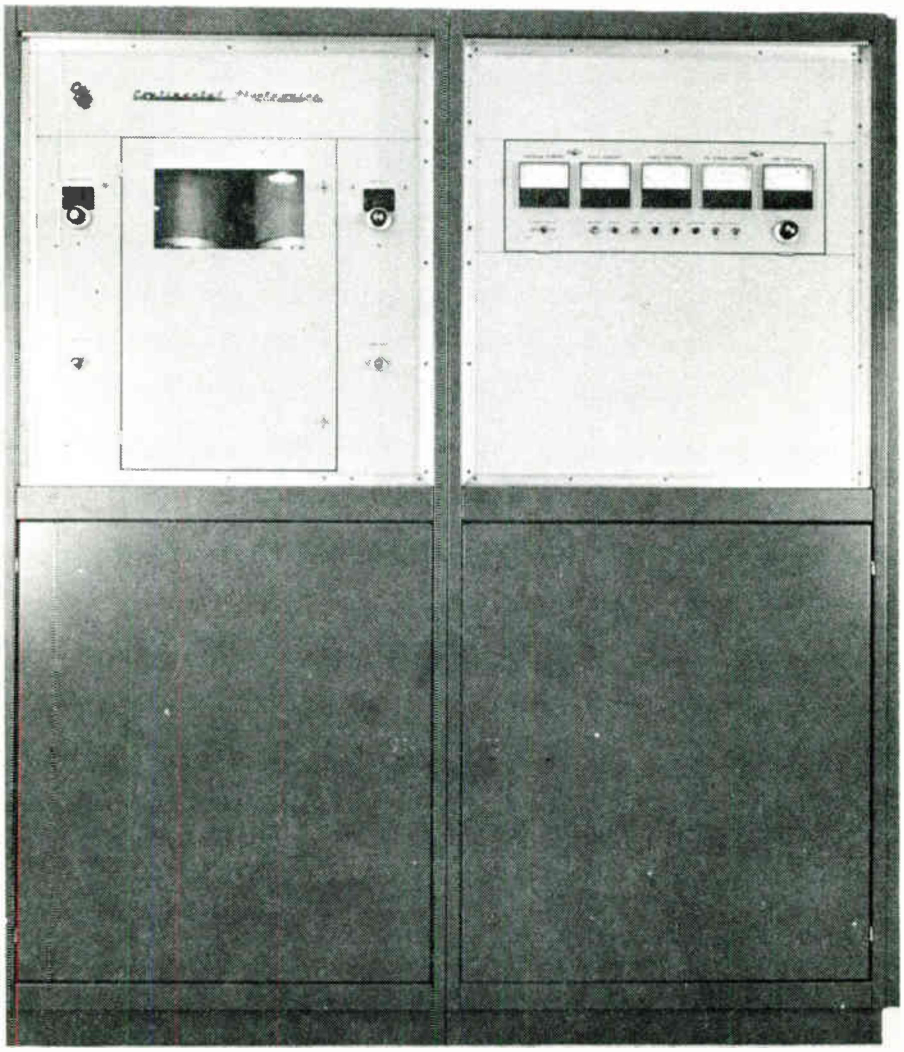

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CHANGE NOTICE

CHANGE NO. 10

TO

TYPE 316F/315F

AM BROADCAST TRANSMITTER

INSTRUCTION MANUAL

This Change No. 10 is effective for all 316F/315F Transmitters. Remove the old page and insert the new page. Insert this Change Notice just after the Title Page.

NEW PAGE		OLD PAGE	
2-1/2-2	C10/C5	2-1/2-2	C5/C5

11 July 1984

Continental Electronics Mfg. Co.
4212 South Buckner Blvd.
Dallas, Texas 75227-4299

RECORD OF CHANGES

CHANGE NO.	EFFECTIVE DATE	EFFICTIVITY
1, 2 & 3	1 June 1974	S/N 2 and ABOVE
4	1 July 1975	S/N 2 and ABOVE
5	1 October 1980	S/N 188 and ABOVE
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7	1 October 1981	S/N 212 and ABOVE
8	3 November 1981	S/N 212 and ABOVE
9	3 February 1982	S/N 232 and ABOVE

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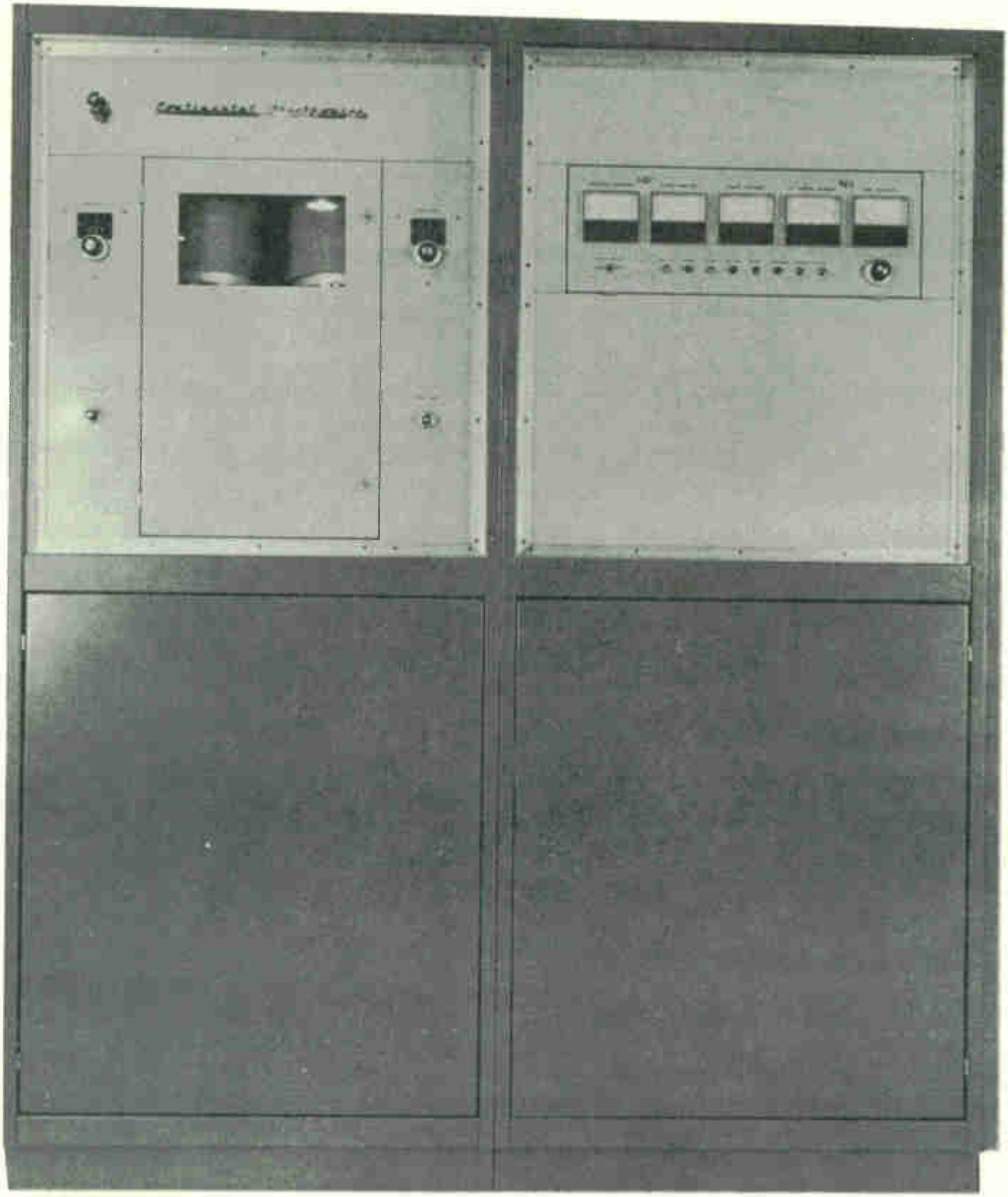

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Figure 1-1. Type 316F/315F AM Broadcast Transmitter, Front View

SECTION 1

GENERAL INFORMATION

1-1. INTRODUCTION.

This technical manual contains instructions for the installation, operation and maintenance of the Continental Electronics Type 316F and Type 315F AM Broadcast Transmitters. The Type 316F provides a nominal rf output power of 10 kW while the Type 315F Transmitter provides a nominal output power of 5 kW. These transmitters are essentially identical mechanically and electrically.

The Type 316F/315F Transmitter is completely self-contained, in that, no external driver, exciter, or power supply units are required. Only an audio input, a transmitting antenna, and a source of 230/208 volt, three-phase, ac primary power are required for operation.

The Type 316F/315F Transmitter is tunable to any fixed operating frequency between 535 kHz and 1620 kHz. Since the transmitter is housed in a compact cabinet which measures 77" high, 67" wide and 25" deep, it occupies only 12-square feet of floor space.

Additional features included in the transmitter are the built-in, solid-state Magniphase® antenna protection circuit; on-the-air operation in five seconds from a cold start; vacuum capacitors used in rf output network; solid-state rectifiers; simplified control circuit for overload recycling and automatic cooling hold-over after shutdown; wired for operational remote control and availability of power cutback options.

1-2. OPTIONAL EQUIPMENT AND CIRCUITRY.

The Type 316F and 315F Transmitters can be provided with optional remote operation, and/or power-cutback circuits, which facilitate instantaneous operational changes. The power cutback circuitry normally provides a reduction from 10 kW to 5 kW in the Type 316F Transmitter and from 5 kW to 1 kW in the Type 315F Transmitter. However, other levels of power cutback are available by special order.

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When the Type 316F/315F is purchased for any other mode of operation, other than the standard 316F or 315F, the necessary information and material are supplied for the additional options.

These transmitters also may be supplied for 50-cycle primary power operation.

1-3. GENERAL DESCRIPTION (Refer to Figures 1-1 through 1-3).

The Type 316F/315F (10 kW/5 kW) Transmitter is basically composed of a solid-state exciter followed by a high-efficiency linear amplifier. The solid-state exciter utilizes 19 transistors to obtain a fully modulated 40-watt carrier output, which drives the high-efficiency linear amplifier utilizing two air-cooled tetrodes. Six transistors are used in the Magniphase antenna protective circuit.

The Type 316F Transmitter uses two type 4CX15,000A tetrode tubes operating at a plate voltage of 9 kVdc to produce a carrier output power of 10,600 watts. The Type 315F Transmitter uses two type 4CX10,000D tetrode tubes operating at 7 kVdc to produce a carrier output power of 5,500 watts. Since the major difference between the 316F and the 315F is the screen supply, the PA filament transformers, and the HV plate transformer, a single description is suitable for both transmitters.

To facilitate servicing of the transmitter, easy access to the cabinet interior is provided by two full-length rear doors, two front doors covering the lower compartments, and another door on the upper left-front of cabinet, which allows easy removal of the PA tubes and access to the PA grid networks. In addition, the controls, indicator lamps and meters are mounted on a hinged swing-down panel, located on the upper right-front position of cabinet. Furthermore, the exciter and Magniphase units are also mounted on a hinged swing-down panel, thus exposing wiring and components behind the panel.

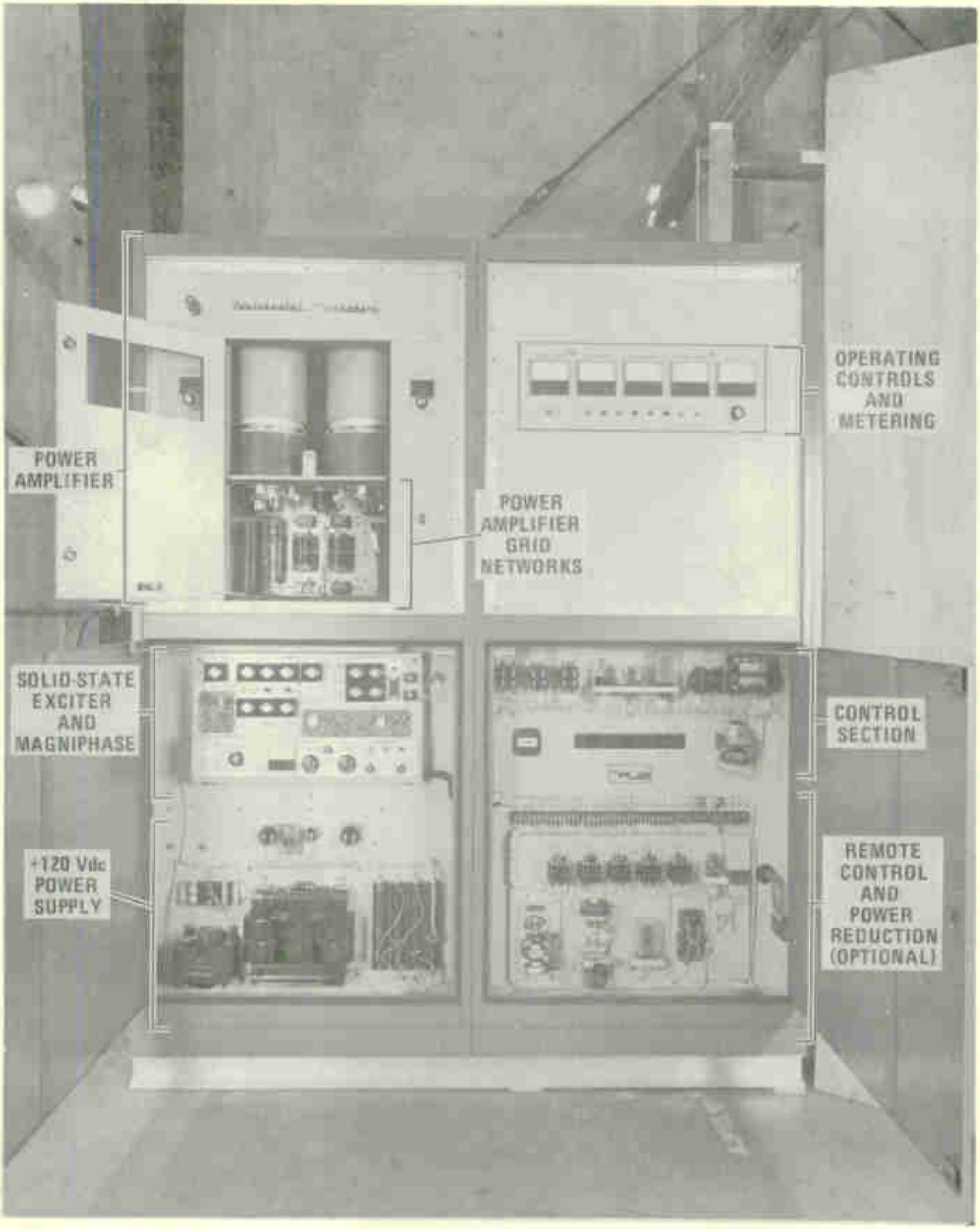

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Figure 1-2. Type 316F/315F AM Broadcast Transmitter, Showing Major Sections, Doors Open, Front View

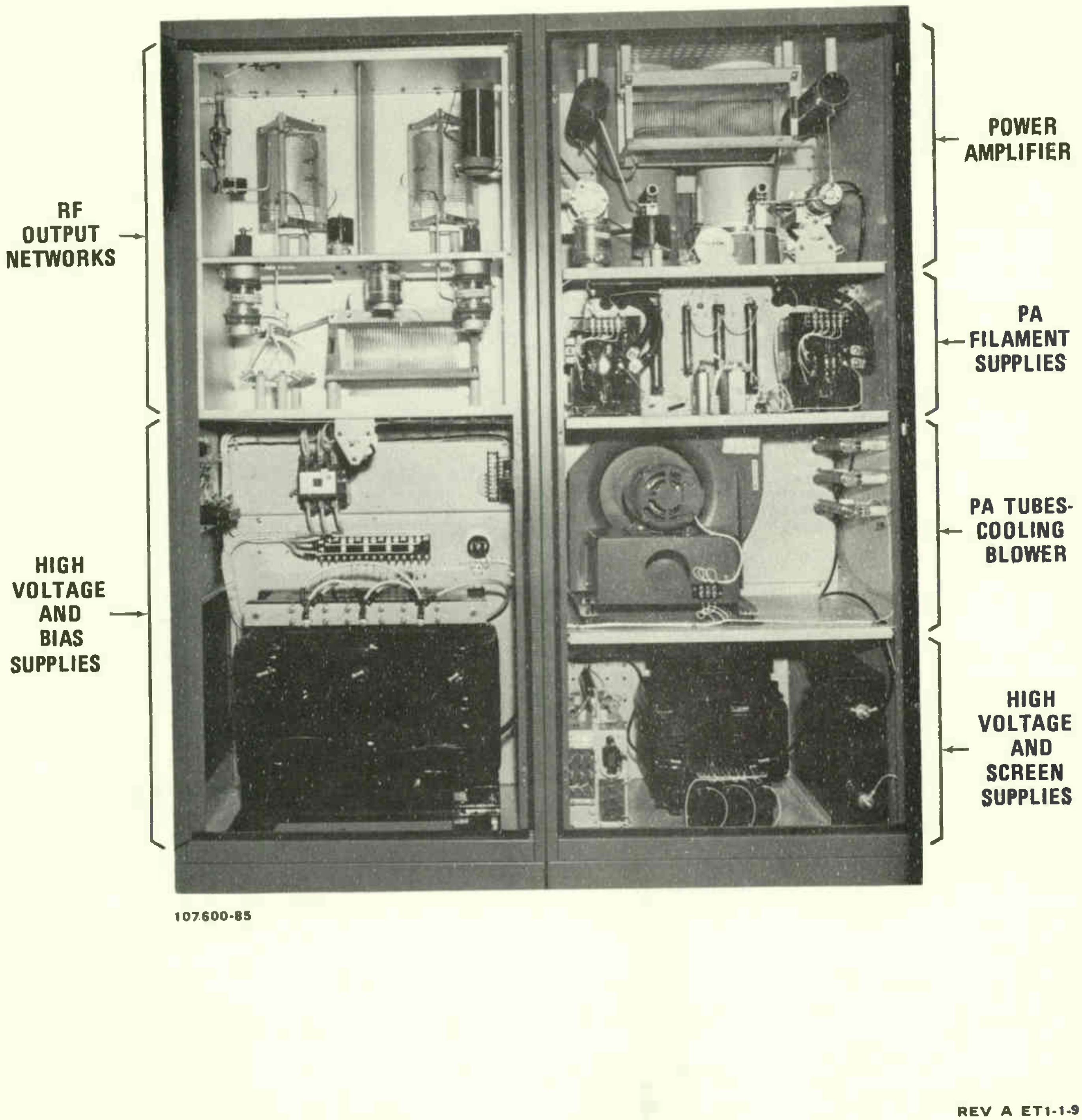

Figure 1-3. Type 316F/315F AM Broadcast Transmitter, Showing Major Sections, Doors Open, Rear View

1-4. SOLID-STATE EXCITER.

The solid-state exciter includes a crystal oscillator with provision for switching in either one of two vacuum-type ovenless crystals, four rf buffer amplifier stages, the 40-watt power amplifier output stage, audio amplifiers driving the modulator, envelope feedback rectifier and the Magniphase antenna protective circuit.

The modulation technique is similar to plate modulation of vacuum tube amplifiers in that a class B modulator is used to modulate the collector voltage of the rf output stage. The rf stage driving the 40-watt modulated amplifier is also collector modulated to improve linearity.

The system employs a unique class B modulator circuit in which no modulation transformers or reactors are required. The modulator is driven from a direct-coupled phase inverter and since the entire system is devoid of audio coupling transformers, negative feedback, derived from the output rf envelope, can be used to further improve the audio performance characteristics of the transmitter.

As mentioned earlier, the exciter includes the Continental Electronics Magniphase Antenna Protective Circuit. A coupling device placed in the rf output line of the transmitter, effectively measures the impedance at that point and the derived samples of voltage and current are used to null the output of a diode rectifier circuit when normal conditions prevail. A change in load conditions such as lightning strikes, static discharges or antenna component arc-overs will cause the diode circuit to conduct instantaneously. The voltage derived from the diode circuit will then drive a one-shot multivibrator, which generates a rectangular pulse of 150-millisecond duration, which in turn, removes the rf excitation from the transmitter. The 150-millisecond rf cut-off period is sufficient for the antenna arc to clear itself, but short enough in time to be heard only as a slight click on the transmitted program.

1-5. POWER AMPLIFIER.

Each transmitter uses only two tubes of a single type as previously mentioned. The two PA tubes are arranged in a high-efficiency linear amplifier circuit in which one tube, called the carrier amplifier, supplies essentially all of the transmitter output power in the absence of modulation. As modulation is applied, the other tube, called the peak amplifier, begins to contribute power until at 100% modulation, each tube is supplying one-half the peak power output of the transmitter. Unlike the conventional linear amplifier, which operates at only 30% plate efficiency, the high-efficiency linear amplifier operates at 60% plate efficiency by utilizing the carrier amplifier at its most efficient condition of rf plate voltage swing. The carrier tube operates as a class AB_1 amplifier. That is, it has a plate current conduction angle greater than 180° and is not driven into grid current conduction. With no modulation applied, the carrier tube is driven to its maximum rf plate voltage swing.

The peak tube operates as a class C amplifier, that is, it has a plate current conduction angle of less than 180°, but unlike most class C amplifiers, the peak tube is not driven into grid current conduction. With no modulation applied, the peak tube is driven just slightly into plate conduction, drawing a small plate current and contributing only slightly to the transmitter power output. As modulation is applied, the plate current and power output increase until at 100% modulation, the peak tube is driven to its maximum rf plate voltage swing and is operating at about 75% plate efficiency.

Refer to the Theory of Operation, Section 4, for a detailed theoretical description of the high-efficiency linear amplifier under the title of Power Amplifier.

1-6. HARMONIC FILTER.

The output harmonic filter network is enclosed in an aluminum shield box within the transmitter cabinet. The shield box is insulated from the cabinet and grounded at only one point near the PA tube sockets. This aluminum box plus the cabinet shell, produces double rf shielding, which minimizes rf radiation from the transmitter enclosure. In addition to the low-pass 90° interplate "Pi" network, the harmonic filter also utilizes another "Pi" network coupled with a "Tee" network. The shunt element, of the "Tee" network, is a series-resonant circuit-tuned to the second harmonic of the transmitter operating frequency. The output inductor of the "Tee" network has a portion of its turns parallel resonated with a fixed condenser at the third harmonic of the operating frequency. Vacuum condensers are used in all of the shunt elements of the harmonic filter to conserve space and minimize arcing.

1-7. FORCED AIR COOLING.

A single cooling blower provides adequate cooling for all components in the transmitter. It is located in an acoustically treated inlet plenum below the power amplifier tube compartment. The blower exhausts upward into the PA grid circuit plenum box where the tube sockets also are mounted. Most of the air is exhausted through the anode coolers of the tubes and out their exhaust chimneys through the top of the transmitter. Some of the air is exhausted from the grid plenum box downward onto the transistor heat sinks which are mounted on the exciter panel. When the lower left-hand compartment door is closed in front of the exciter, this air is drawn back into the inlet plenum through small holes in the bottom of the lower left-hand vertical panel. The temperature rise of the inlet air, due to this recirculation, is negligible because of the small air volume involved.

The blower inlet air is drawn through air filters located on the bottom of the rear doors and across components located in the lower-rear compartments of the transmitter. A small amount of the inlet air is drawn through the shielded rf box which contains the output harmonic filter network.

The blower location, in the sound-deadened inlet plenum, results in a very-low-level acoustical noise output from the transmitter.

1-8. POWER SUPPLIES.

All transmitter power supplies are of the three-phase, full-wave type. The supplies utilize silicon rectifiers which have adequate safety margins of the operating peak inverse voltages. They also have surge current ratings well in excess of possible fault currents. The transmitter contains four dc power supplies:

1. The +120 volt supply provides operating voltages for the solid-state exciter and the majority of the control relays. This supply includes a +24 volt zener regulated source tapped down on the bleeder resistor for some of the solid-state circuits.

2. The -750 volt bias supply provides bias voltage to each of the power amplifier tubes. A resistance divider network, connected across the output of this supply, contains the individual bias adjustment potentiometers for the peak and carrier tubes.

3. The +1800 volt screen supply provides screen voltage for the power amplifier tubes. Taps on the screen supply transformer will provide +1500 volts for use in the 5 kW, Type 315F Transmitter.

4. A +9000 volt plate supply provides plate voltage for the 10 kW, Type 316F Transmitter, while +7000 volts is provided for the 5 kW, Type 315F Transmitter. A current overload relay in the negative return lead of this supply is used, in conjunction with a delayed automatic reclosing circuit, to remove PA plate voltage in the event of an overcurrent fault. If the fault persists after the first reclosure of the plate contactor, the circuit will interrupt and remain off until reclosed manually. An indicating lamp provides visual indication of the locked-out plate voltage condition.

1-9. PROGRAM PEAK CLIPPER

A program Peak Clipper is installed on Transmitters S/N 152 and above. The addition of Program Peak Clipper and change in value of the Coupling Capacitors limits the low energy random peak at adjustable thresholds such as 95% negative and 125% positive. The overall net result is and increase in Program loudness.

1-10. TECHNICAL CHARACTERISTICS (Refer to Table 1-1).

Listed in the referenced table are the technical characteristics of the 10 kW, Type 316F and the 5 kW, Type 315F Transmitters.

1-11. TUBE AND SEMICONDUCTOR COMPLEMENT (Refer to Table 1-2).

The semiconductor devices and the two power amplifier tubes utilized in the 10 kW, Type 316F and 5 kW, Type 315F, are included in the referenced table showing their function and quantity used.

TABLE 1-1. TECHNICAL CHARACTERISTICS

ELECTRICAL:	TYPE 316F (10 KW)	TYPE 315F (5 KW)
Audio Input Impedance	150/600 ohms	150/600 ohms
Audio Input Level (100% Modulation)	+10 ±2 dBm	+10 ±2 dBm
Audio Frequency Response		
50 - 7,500 Hz	±1 dB	±1 dB
30 - 15,000 Hz	±1.5 dB	±1.5 dB
Audio Distortion, 30 - 10,000 Hz	Less than 3%	Less than 3%
Noise, Below 100% Modulation	-60 dB	-60 dB
Carrier Shift, 100% Modulation	Less than 3%	Less than 3%
Type of Modulation	Collector Modulation of RF Driver	
Frequency Range	535-1620 kHz	535-1620 kHz
Type of Emission	A3	A3
Frequency Stability	±5 Hz	±5 Hz
Output Impedance	50 to 250 ohms unbalanced	50 to 250 ohms unbalanced
Output Capability	10,600 watts	5,500 watts
Maximum Ambient Operating Temperature	+45°C/+113F	+45°C/+113F
Input Power	208/230 Volts 3 phase, 60 Hz (50 Hz available)	208/230 Volts 3 phase, 60 Hz (50 Hz available)

TABLE 1-1. TECHNICAL CHARACTERISTICS - Cont.

ELECTRICAL:	TYPE 316F (10 KW)	TYPE 315F (5 KW)
Power Consumption		
100% Modulation	28.4 kW	14.2 kW
30% Modulation	24.1 kW	11.5 kW
0% Modulation	23.6 kW	11.2 kW
Power Factor	92%	94%
Permissible Combined Voltage Variation and Regulation	±5%	±5%
MECHANICAL:		
Height	77-1/8 inches	77-1/8 inches
Width	66-1/8 inches	66-1/8 inches
Depth	25-1/2 inches	25-1/2 inches
Weight (unpacked)	1650 lbs.	1500 lbs.

TABLE 1-2. TUBE AND SEMICONDUCTOR COMPLEMENT

FUNCTION	TYPE 316F(10KW)		TYPE 315F(5KW)	
	QTY.	TYPE	QTY.	TYPE
Oscillator	1	2N697	1	2N697
1st Buffer	1	2N697	1	2N697
2nd Buffer	1	2N697	1	2N697
3rd Buffer	1	DTS-423	1	DTS-423
RF Driver	1	DTS-423	1	DTS-423
RF Output	4	DTS-423	4	DTS-423
Power Amplifier	2	4CX15,000A	2	4CX10,000
1st Audio	1	2N697	1	2N697
Phase Inverter	1	DTS-423	1	DTS-423
Bias Regulator	1	2N697	1	2N697
Modulator	6	DTS-423	6	DTS-423
Fault Pulse Amplifier	1	2N697	1	2N697
One-Shot Pulse Gen.	3	2N697	3	2N697
Indicator Lamp Circuit	2	2N697	2	2N697
Feedback Rectifier	1	1N661	1	1N661
Magniphase Rectifiers	4	1N661	4	1N661
+24 Volt Regulator	1	1N5359B	1	1N5359B
+120 Volt Rectifier	6	SOD400D	6	SOD400D
Meter Protection	1	SOD400K	1	SOD400K
Bias Rectifier	6	MV-20A	6	MV-20A
Screen Rectifier	6	SCH5000	6	SCH5000
High Voltage	6	67C200H20TTS	6	67C200H20TTS

SECTION 2

INSTALLATION

2-1. INTRODUCTION.

This section includes the necessary instructions for unpacking and inspection, customer-furnished input power equipment required, installation, replacement of fragile and heavy components (shipped separately) in transmitter cabinet, preliminary adjustments, and a pre-operational checkout.

2-2. GENERAL (Refer to Dwg. 114099).

The above referenced installation drawing is supplied for determining cabinet dimensions, conduit, wiring, air filters and air plenum information of the transmitter.

Sufficient floor space should be provided in the transmitter building to allow ample working area in the front and rear of the transmitter when doors are fully opened. In addition, the ceiling height should be enough to accommodate heating ducts, if desired. Ensure that electric power facilities are adequate and available near the transmitter. Additional overall information is provided in Maintenance, Section 5, in the form of preventive maintenance, alignment procedures and transmitter adjustments following component replacement. In addition, components are identified in photographs showing their location, reference designator and function name. It is suggested that a thorough study of this material and the Theory of Operation, Section 4, be made to promote a better overall understanding of the transmitter.

2-3. CUSTOMER FURNISHED EQUIPMENT REQUIRED.

The required primary supply voltage for the Type 316F/315F Transmitter is nominally 230/208-volts, 3-phase, 60-cps. The transmitter primary power should be routed through a customer-furnished power panel containing a disconnect switch with a
* capacity of 100 amperes, fused with 100-ampere superlag 240-volt fuses.

The wiring from the power panel to the transmitter must be in accordance with the local electrical wiring code to match the type of disconnect switch used. Do not use wire smaller than No. 3 for transmitter primary power connections. The 208/230-volt power feeder line is terminated in the lower right-hand front corner of the cabinet on a three-point terminal strip, TB2.

WARNING

DANGEROUS POTENTIAL EXISTS IN TRANSMITTER WHEN THE POWER PANEL DISCONNECT SWITCH IS SET TO THE ON POSITION. 230/208-VOLT POWER IS THEN APPLIED TO THE BUS BARS CONNECTED TO THE REAR OF THE TRANSMITTER CONTROL CIRCUIT BREAKERS.

The speech input, remote control and monitor wiring cables are routed into the lower right-hand front corner, near the transmitter power feeder conduit.

2-4. UNPACKING AND INSPECTION.

Components that are subject to damage in shipment are removed from the transmitter cabinet at the factory and packed in separate boxes. Heavy iron-core items, such as transformers and chokes are removed and shipped separately. If there is any evidence of damage to any part of the shipment, file a claim with the transportation company immediately.

2.5 ASSEMBLY PROCEDURE (Refer to Figures 2-1, 2-2; also schematic drawings and other remote or cutback drawings as applicable).

Use the following procedure to assemble the transmitter for operation.

1. Set the cabinet in position.

2. If the floor is not level, place shims under the base of the cabinet as necessary for leveling.

3. Remove all shipping tape and packing material from the wiring and components inside the cabinet.

4. Remove left-rear, bottom door stop.

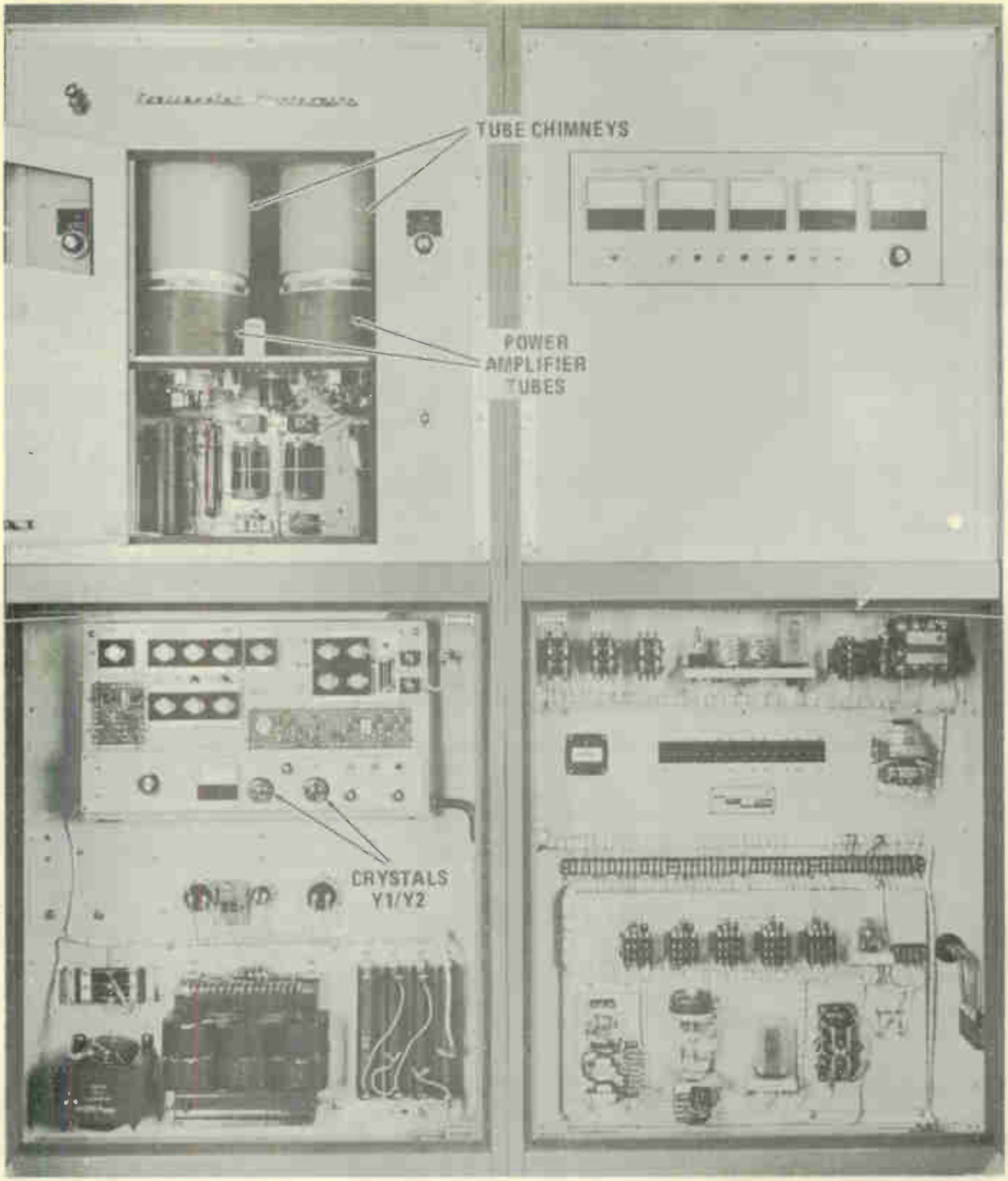

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Figure 2-1. Transmitter, Overall Front View,
Showing Components Removed for Shipment, Front View

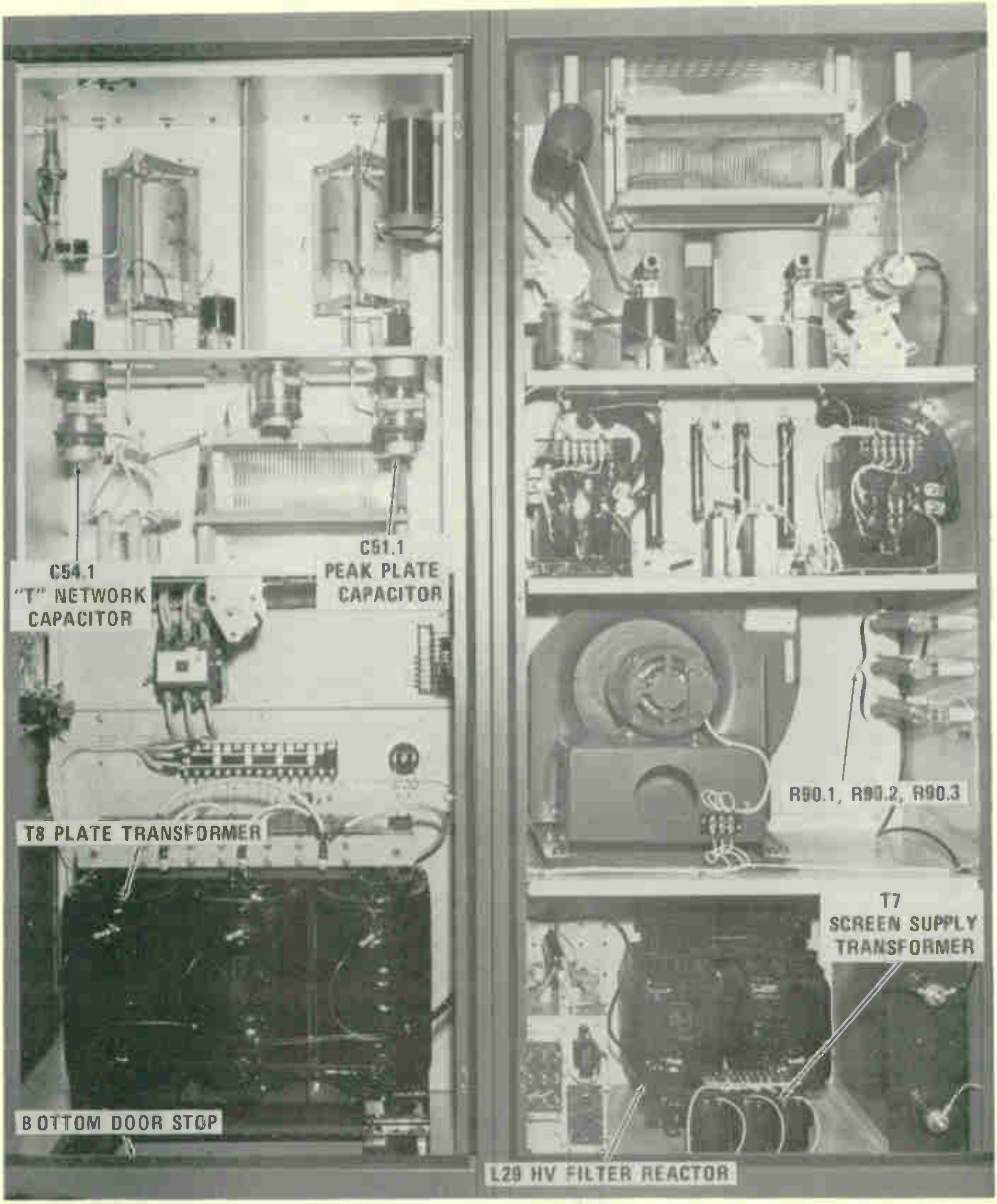

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Figure 2-2. Transmitter Overall Rear View, Showing Components Removed for Shipment

5. Install HV plate transformer T8, with terminals facing the rear of cabinet. Connect the wiring as shown in the referenced schematic diagram. If transmitter contains the power-cutback feature, connect wiring as shown in the appropriate power-cutback schematic.

6. Reinstall the bottom door stop, which was removed in Step 4.

7. Place filter reactor L29 in the lower right-rear compartment, then install mounting hardware and wiring.

8. If removed for shipping, install screen supply transformer T7 in the same lower right-rear compartment in its designated place, then install mounting hardware and wiring.

9. Install all vacuum variable glass capacitors which have been removed for shipping. All these capacitors are shipped adjusted to the operating frequency. Where counter dials are used with the vacuum variable capacitors; install the capacitor without changing its setting, then set the counter dial per the factory test data before connecting to capacitor.

10. Install all fixed glass capacitors which may have been removed for shipping.

11. Install both filament transformers T3 and T4.

12. Install metering resistors, R90.1, R90.2, R90.3.

13. Install any other parts which may have been removed for shipping.

14. Install the crystals in the solid-state exciter (Magniphase mounted on same panel).

15. Install the power amplifier tubes.

CAUTION

WHEN INSTALLING THE TYPE 4CX15,000A and 4CX10,000D POWER AMPLIFIER TUBES, USE A STRAIGHT UP OR DOWN TWISTING MOTION. NEVER USE A ROCKING MOTION. ROCKING MOTIONS CAN CAUSE DAMAGE TO THE TUBES AND THEIR SOCKETS.

16. Install the power amplifier tube chimneys. One end of the chimneys are designed to fit the 4CX15,000A tube and the other end of the chimney to fit the 4CX10,000D tube.

17. Ensure that all bus and wiring is connected according to wiring tags or schematics.

2-6. TRANSMITTER COOLING AND AIR EXHAUST.

The transmitter cooling air enters the transmitter through filters, located on lower portions of the rear doors. The air is exhausted from the top of transmitter above the power amplifier.

Heat dissipated by the transmitter cooling system can be used to heat the transmitter building during the wintertime. This heating method is feasible by using ductwork and special fixtures attached to the air exhausts above the transmitter cabinet.

2-7. EXTERNAL CONNECTIONS TO 316F/315F.

TB2-1	208/230 VAC	From customer
2		Supplied Fused Disconnect
3	3Ø 50/60 Hz	or Circuit Breaker

TB1

7	External Plate Interlock for Use	
8	with Antenna Switching.	
12	Neutral	Customer Supplied 115 VAC for Transmitter
50	Hot	Power Adjust when supplied with Remote Control
30	R/C Power Cutback-High - 115 VAC Momentary	
31	R/C Power Cutback-Low - 115 VAC Momentary	
32	R/C Plate ON Control - 115 VAC Momentary	
33	R/C Plate OFF Control - 115 VAC Momentary	
34	R/C Failsafe Voltage - 115 VAC	
35	R/C Master ON Control - 115 VAC Momentary	
36	R/C Master OFF Control - 115 VAC Momentary	

37	R/C Total Plate Current Metering Output
38	R/C Plate Voltage Metering Output
42	R/C Metering Common
39	Freq. Mon. Output - RG58 Coax
40	Shield Connection for 39 & 41
41	Modulation Monitor Output - RG58 Coax
43	Shield - Audio input line
44	Audio Input
45	600/150 ohm
46	R/C Line Voltage Metering Output
47	R/C Power Adjust-Raise - 115 VAC Momentary
48	R/C Power Adjust-Lower - 115 VAC Momentary
49	R/C Overload Reset - 115 VAC Momentary

2-8. PRE-OPERATIONAL CHECKOUT.

Perform the following tasks prior to initial operation.

1. Ensure that customer-furnished main disconnect switch is OFF.

2. Set all transmitter circuit breakers to their OFF positions before power is applied to transmitter.

3. Set main disconnect switch (Step 1) to ON (closed) position.

4. Set BLOWER breaker CB1 to the ON position.

5. Check the phase-to-phase voltage on line voltage meter M1. Select each phase with line voltage switch S14 and monitor the voltage of each phase on M1. The phase-to-phase voltage should be either 208 or 230 Vac ±5%.

6. Set MASTER switch S5 to the ON position. This closure energizes the +120 supply relay K1.

7. Set TEST METER switch S3 to the +120 volt position.

8. Set +120 VOLT breaker CB3 to the ON position. Approximately 120 volts should be indicated on test meter M6. Blower holdover relay K3 is now energized, which in turn energizes blower MB1. After a time delay of approximately 5 seconds, bias relay K5 energizes and Ready indicator lamp DS2 should light green.

9. If READY lamp DS2 fails to light green, check for defective bulb. If bulb is good, next determine if the blower motor is rotating in the correct direction.

10. Set FILAMENTS breaker CB2 to the ON position. The power amplifier transformers are now energized.

11. Set the MASTER switch S5 to the OFF position. The blower will continue to run until blower holdover time delay relay K3 times out and de-energizes blower motor.

12. Set the BLOWER breaker CB1 to the OFF position.

WARNING

ENSURE THAT BLOWER MOTOR MB1 IS DE-ENERGIZED BEFORE REMOVING BLOWER PROTECTION COVER.

13. Open right-hand rear door of cabinet, then remove the rear panel covering the blower compartment.

WARNING

DANGEROUS POTENTIALS EXIST INSIDE THE BLOWER COMPARTMENT. PERSONNEL SHOULD EXERCISE THE UTMOST PRECAUTION WHILE PERFORMING THE FOLLOWING STEPS.

14. Set BLOWER breaker CB1 to the ON position.

15. Set MASTER switch S5 to the ON position. As a result of this action, the blower motor starts running.

16. Observe if the blower impeller is rotating in a counterclockwise direction to force the air upward into the plenum.

17. If the blower is not rotating in the correct counterclockwise direction, de-energize the blower motor by setting the MASTER switch to the OFF position. The blower will continue to run until blower holdover time delay relay K3 times out, thus removing power from the blower motor.

18. Set BLOWER breaker CB1 to the OFF position.

19. If blower was not rotating in the correct counterclockwise direction, reverse any two of the three-phase power leads connected to the motor.

20. Blower should now rotate in the correct direction, therefore replace blower compartment cover.

21. Ensure that the three interlocked doors, upper left-front and both rear doors are closed.

22. Reactivate blower - with the blower air flow switch S10 now actuated and interlocked doors closed, the READY lamp DS2 should light green.

23. Set test meter switch S3 to the -750 volt position to test the PA bias supply. Set BIAS circuit breaker CB4 to the ON position. An indication of approximately -740 volts for Type 316F and -680 volts for Type 315F Transmitters should appear on the meter.

24. Set the +1800 V Screen Supply breaker CB5 to the ON position. Screen supply will not be energized until plate contactor K7 is energized.

25. The transmitter is now ready for the application of power amplifier plate voltage. Check the high voltage before applying rf excitation to the power amplifier tubes.

26. Set CRYSTAL SELECT switch S4 to the OFF position.

27. Set MASTER switch S5 and PLATE switch S6 to the ON position. The high voltage contactor K7 should energize and can be heard as it closes. An indication in excess of 9 kV should be indicated on PLATE VOLTAGE meter M3. HV indicator lamp DS3 should also light red.

28. Set TEST METER switch S3 to the +1800V Screen Supply position. An indication of approximately +1800 volts for the 316F and 315F should show on the meter.

29. Set the PLATE switch S6 to the OFF position. The HV ON indicator lamp DS3 should extinguish.

30. Set CRYSTAL SELECT switch S4 to Crystal 1 position.

31. Rotate output potentiometer R50 fully counterclockwise in the non-remote controlled transmitters. For the remote controlled transmitters, set the power adjust switch S15 to lower position and hold until the power adjust potentiometer, located on the remote control panel, is driven to its low power position. Either action will lower the rf driver collector voltage and allow operation at reduced power for initial checks. When transmitter is equipped with optional power-cutback circuitry, depress the LOW POWER CHANGE switch S8 to activate other control circuit functions which cause further reduction in power.

32. Set PLATE switch S6 to the ON position. Verify the transmitter output indication on an externally connected modulation-monitor carrier-level meter.

33. For transmitters equipped with optional power-cutback circuitry, depress POWER CHANGE switch S9 marked HIGH. This action causes the plate contactor K7 to de-energize, thus removing plate voltage during the change of power. The HIGH power and LOW power switches S9 and S8, respectively, are of the momentary contact type. High voltage is removed as long as either switch is depressed. Power is easily increased or decreased in a matter of seconds, by simply depressing the proper switch and then releasing it.

34. To obtain a specific output power, rotate the manual power adjust potentiometer R50 or energize power adjust motor with LOWER/RAISE switch until the desired level is reached.

35. Verify all meter indications, including all test meter positions, against those listed in the Factory Test Data provided in this manual.

CAUTIONS

1. DO NOT USE THE MAIN PRIMARY-POWER DISCONNECT SWITCH (CUSTOMER FURNISHED) TO DE-ENERGIZE THE TRANSMITTER, EXCEPT IN AN EMERGENCY. REPEATED REMOVAL OF COOLING AIR AT THE SAME TIME THE TRANSMITTER IS DE-ENERGIZED CAN DAMAGE THE POWER AMPLIFIER TUBES.

2. WHEN THE MAIN PRIMARY POWER DISCONNECT SWITCH (CUSTOMER FURNISHED) IS USED TO SHUT THE TRANSMITTER DOWN, BE SURE TO SET THE PLATE SWITCH S6 TO ITS OFF POSITION, SO THAT HIGH VOLTAGE WILL NOT BE REAPPLIED WHEN THE MAIN PRIMARY-POWER DISCONNECT SWITCH IS RETURNED TO THE ON POSITION.

2-9. INITIAL ADJUSTMENTS.

a. Crystal Oscillator (No. 1 and No. 2 Frequency Adjustments-C10, C11).

b. Power Supplies - Output Voltage Adjustments.

c. Blower Air Flow - Currect rotation.

Refer to the Factory Test Data for specific values under various operating conditions and Tuning Charts, where applicable.

2-10. ALIGNMENT/CALIBRATION PROCEDURES.

Refer to Section 5, Maintenance, for procedures covering specific circuits and components. Additional reference information is included in the Factory Test Data and Alignment (Tuning) Charts for specific circuits and components.

2-11. TURN-ON PROCEDURE (From prepared condition).

"Prepared condition: is defined as the condition existing: when all circuit breakers are left in their ON positions. In this "prepared condition" all circuits are ready for the application of power. Consequently, the transmitter can be energized to an on-the-air status in approximately 5 seconds.

1. Set MASTER switch S5 to the ON position. Wait approximately 5 seconds until READY lamp DS2 lights (indicates that cooling, +120 V, filaments and bias supplies are in the READY condition).

2. Set PLATE switch S6 to the ON position - high voltage is now applied to PA, as indicated by the lighted HV ON lamp DS3. The transmitter is now on-the-air.

2-.2. TURN-OFF PROCEDURE (Down to prepared condition).

During normal day-to-day operation, the transmitter is generally left in the "prepared condition". The transmitter is de-energized to this "prepared condition" status in the following manner.

1. Set PLATE switch S6 to the OFF position. HV ON lamp DS3 extinguishes, thus indicating the removal of the plate and screen voltages from the PA tubes.

2. Set MASTER switch S5 to the OFF position.

The transmitter is now de-energized, except that the cooling blower will continue to operate until the blower holdover relay K3 times out, thus removing power from the blower motor.

2-13. EMERGENCY TURN-OFF PROCEDURE (Complete shutdown).

In an emergency, it is necessary to de-energize the entire transmitter instantaneously, therefore:

1. Set the Main Primary-Power Disconnect Switch (customer furnished) to the OFF position. This action removes power from the entire transmitter (except for the 115 Vac power supplied to the power adjust motor on transmitters which are remote control equipped.

2. Set the 115 Vac Disconnect Switch, (customer furnished) mounted on building wall, to the OFF position.

When this energency turn-off procedure is used, perform the following step to prevent possible transmitter damage when the main primary-power disconnect switch (customer furnished) is returned to the ON position.

3. Set PLATE switch S6 to the OFF position. This action prevents reapplication of high voltage to the transmitter when the main power is restored to transmitter.

SECTION 3

OPERATION

3-1. INTRODUCTION.

Operation of the type 316F/315F transmitter is extremely simple. The transmitter is designed to operate on a single frequency within the broadcast band of 535 kHz to 1620 kHz and can be made operational from a cold start in a matter of a few seconds. The transmitter contains only five circuit breakers that require actuation, even from a complete shutdown condition: These circuit breakers are mounted on the control panel in the lower right-hand compartment, behind a noninterlocked hinged compartment door. In addition, either one of two preset crystal controlled operating frequencies may be selected instantaneously as the transmitter operating frequency.

3-2. PREPARATION FOR OPERATION (From Complete Shutdown).

This information concerning preparation of the transmitter prior to operation is based upon the assumption the transmitter has previously been in operation, but has been completely shutdown. "Complete shutdown" is defined as: all circuit breakers on transmitter are open or set to the OFF positions, including the customer-furnished Main Disconnect Switch, which is also set to its OFF position.

Close the following Disconnect Switch and circuit breakers preparation to transmitter operation.

MAIN Disconnect Switch (customer furnished) (External to Transmitter) Transmitter Circuit Breakers:

BLOWER	-	CB1
FILAMENTS	-	CB2
+120V power supply	-	CB3
-750V power supply	-	CB4
+1800V screen supply	-	CB5

3-3. TURN-ON PROCEDURE (From Prepared Condition)

For normal day-to-day operation, complete shutdown of the transmitter is not necessary. Therefore, the transmitter is only de-energized down to the "prepared condition" level (all circuit breakers are left in their ON positions). The control circuit is arranged to provide "on-the-air" operation approximately five seconds after a cold start. This short time interval is made possible by the use of solid-state components which are utilized in the power supplies and exciter. The power amplifier tubes are ready for plate voltage after a five second warm-up. Perform the following steps to energize transmitter:

1. Set MASTER switch S5 to the ON position. In approximately 5 seconds, the READY lamp DS2 lights, thus indicating that the cooling, +120-volts, PA filaments, and bias supplies are in the READY condition, also the five-second thermal time delay relay is energized. When the time delay relay closes after five seconds, the READY lamp lights green.

2. Set PLATE switch S6 to the ON position. The plate high voltage followed by screen grid voltage are now applied to the PA tubes, as indicated by the lighted HV ON lamp DS3. The transmitter is now on-the-air.

3-4. TURN-OFF PROCEDURE (Down to Prepared Condition).

During normal day-to-day operation, the transmitter is generally left in the "prepared condition". The transmitter is de-energized to this "prepared condition" status in the following manner.

1. Set PLATE switch S6 to the OFF position. HV ON lamp DS3 extinguishes, thus indicating the removal of the plate and screen voltages from the PA tubes.

2. Set MASTER switch S5 to the OFF position.

The transmitter is now de-energized, except that the cooling blower will continue to operate until the blower holdover relay K3 times out, thus removing power from the blower motor.

3-5. EMERGENCY TURN-OFF PROCEDURE (Complete Shutdown).

In an emergency, it is necessary to de-energize the entire transmitter instantaneously, therefore:

1. Set the Main Primary-Power Disconnect Switch (customer furnished) to the OFF position. This action removes power from the entire transmitter, except for the 115 Vac remote control power supplied to the power adjust motor.

2. Set the 115 Vac Disconnect Switch, (customer furnished), mounted on building wall, to the OFF position.

When this emergency turn-off procedure is used, perform the following step to prevent possible transmitter damage when the main primary-power disconnect switch (customer furnished) is returned to the ON position.

3. Set PLATE switch S6 to the OFF position. This action prevents reapplication of high voltage to the transmitter when the main power is restored to transmitter.

3-6. OPERATING CONTROLS AND INDICATORS (Refer to Tables 3-1 through 3-4).

The transmitter operating controls and indicators are identified in the referenced tables by symbol designator, control or indicator, the name, and the function of each item. The locations of these Controls/Indicators, are shown on specific photographs. The applicable photo figure numbers are referenced under the heading of the applicable Controls/Indicators tables.

TABLE 3-1. POWER AMPLIFIER AND GRID NETWORKS - CONTROLS/INDICATORS
(Refer to Figure 3-1)

REFERENCE DESIGNATOR	CONTROL/INDICATOR	FUNCTION
C49	CARRIER PLATE Tuning Capacitor	Tunes the carrier tube plate circuit.
C51.1	PEAK PLATE Tuning Capacitor	Tunes the peak tube plate circuit.
C44.1	CARRIER GRID Tuning Capacitor	Tunes carrier grid circuit.
C43.1	PEAK GRID Tuning Capacitor	Tunes peak grid circuit (inter-grid capacity).

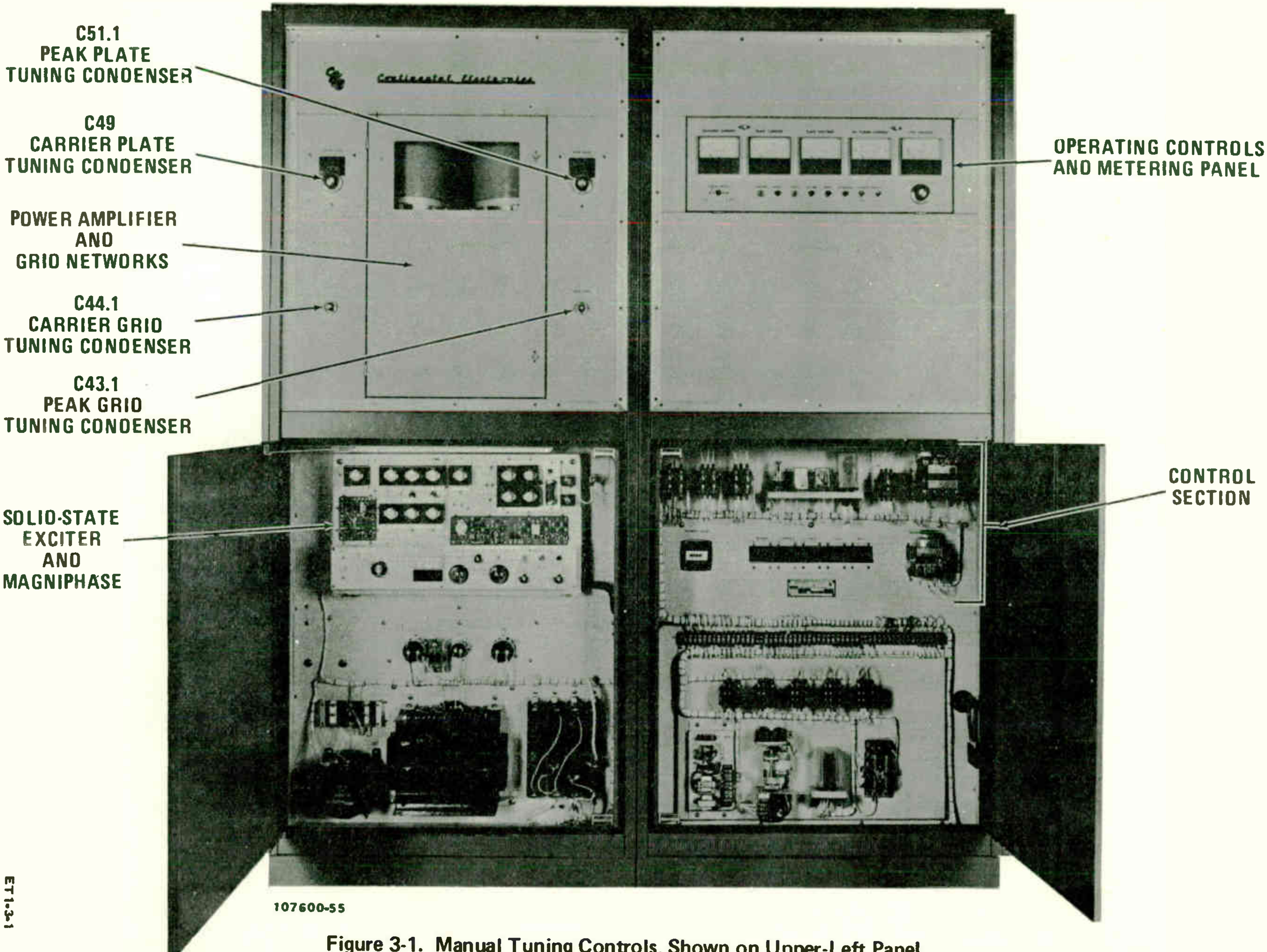

Figure 3-1. Manual Tuning Controls, Shown on Upper-Left Panel, Lower Doors Open, Front View

TABLE 3-2. OPERATING CONTROLS AND METERING - CONTROLS/INDICATORS
(Refer to Figure 3-2)

REFERENCE DESIGNATOR	CONTROL/INDICATOR	FUNCTION
DS1	OVERLOAD lamp	Lamp indicates high voltage lockout relay has energized, after two dc overloads, removing high voltage from PA tubes.
DS2	READY lamp	Indicates cooling system, 120 volt supply, filaments and bias supply are in READY condition.
DS3	HV ON lamp	Indicates high voltage supply is energized.
M1	208/230 Volt Supply meter	Indicates line voltage designated and switched by line voltmeter switch S14. Meter range 0-300 Vac.
M2	PA SCREEN CURRENT meter	Indicates screen current of both carrier and peak tubes in the rf power amplifier. Meter range 0-500 mA dc.
M3	PA PLATE VOLTAGE meter	Indicates output voltage of high voltage power supply (PA plate voltage). Meter range 0-15 kV dc.
M4	PA PLATE CURRENT meter	Indicates plate current of both carrier and peak tubes in rf power amplifier. Meter range 0-5 amperes dc.
M7	ANTENNA CURRENT meter	Indicates rf output current. Adjusted using R139 circuit. Meter range 0-20 rf amperes. 0-1 mA basic movement.

TABLE 3-2. OPERATING CONTROLS AND METERING - CONTROLS/INDICATORS - Cont.
(Refer to Figure 3-2)

REFERENCE DESIGNATOR	CONTROL/INDICATOR	FUNCTION
S5	MASTER switch (on/off)	Switch energizes cooling system and +120 volt supply, then filaments and, after time delay, energizes bias supplies.
S6	PLATE switch (on/off)	Switch applies plate voltage, then energizes screen supply if preceding control circuit sequence is complete.
S7	RESET switch	Switch resets dc overload circuit after an overload has occurred.
S8	POWER CHANGE switch (LOW)	Switch initiates control circuit functions in transmitter for reduced power operation. (Effective with power-cutback transmitter only.)
S9	POWER CHANGE switch (HIGH)	Switch initiates control circuit functions in transmitter for full power operation.
S14	LINE VOLTAGE switch	Switches 208/230 line voltage meter M1 into the appropriate circuits to obtain the following indications:
	Positions: (Left-to-Right)	
	OFF	Disconnects meter.
	A-B	Indicates line voltage across lines A and B.
	B-C	Indicates line voltage across lines B and C.
	C-A	Indicates line voltage across lines C and A.

TABLE 3-2. OPERATING CONTROLS AND METERING - CONTROLS/INDICATORS - Cont.
(Refer to Figure 3-2)

REFERENCE DESIGNATOR	CONTROL/INDICATOR	FUNCTION
S15	POWER ADJUST switch (LOWER/RAISE) (with remote control)	When transmitter is remote controlled, switch S15 is used to adjust rf power output. (Not used in non-remote controlled transmitters.)
or		
R50	POWER ADJUST manual pot (no remote control)	When transmitter is not remote controlled, R50 is used to adjust rf power output. (Not used in this location when transmitter is remote controlled.)

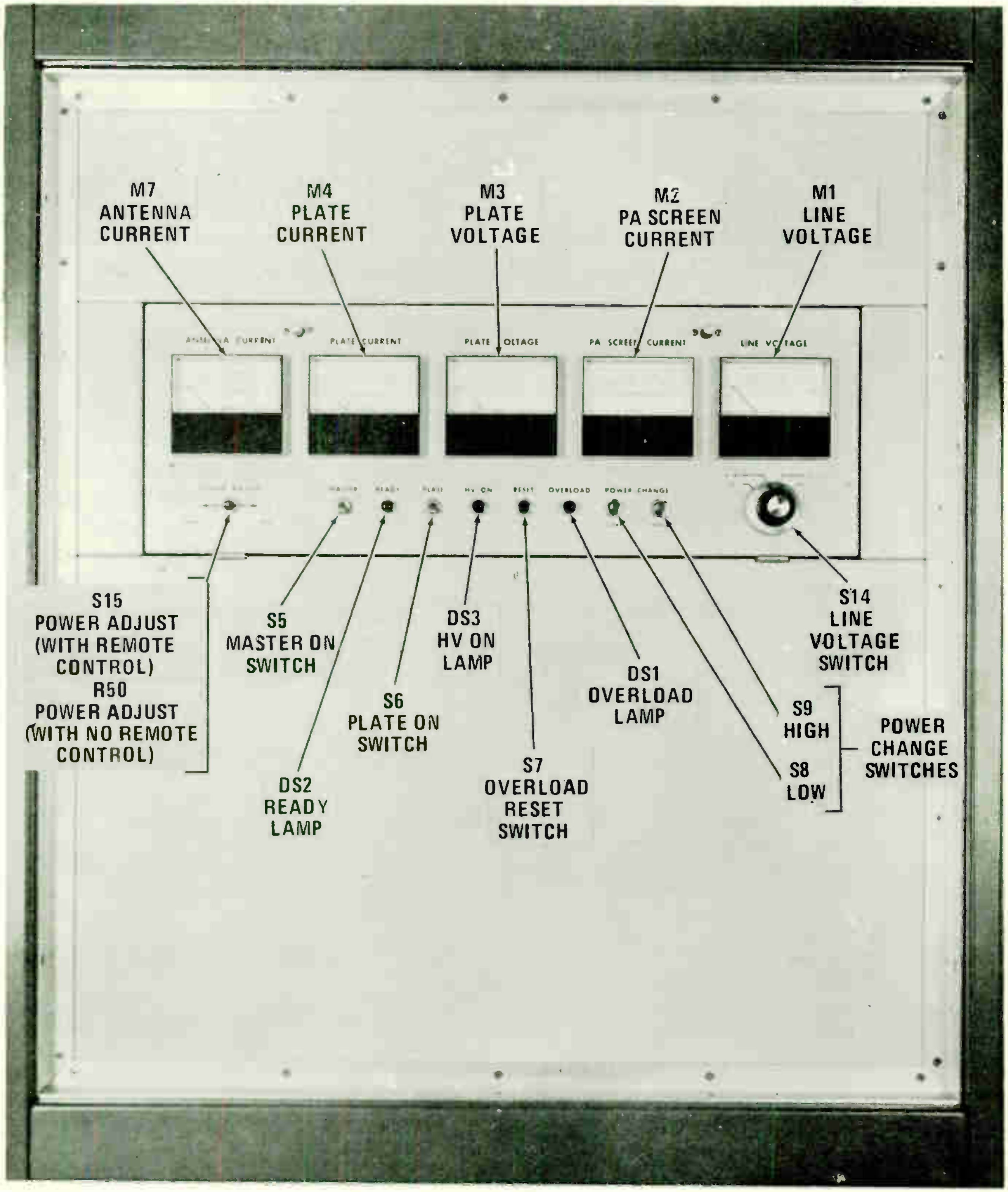

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Figure 3-2. Operating Controls and Metering Panel, Front View

TABLE 3-3. SOLID-STATE EXCITER AND MAGNIPHASE - CONTROLS/INDICATORS
(Refer to Figure 3-3)

REFERENCE DESIGNATOR	CONTROL/INDICATOR	FUNCTION
C1	PHASE	Provides a precise adjustment of phase of the magniphase bridge input signal to obtain a balance across the bridge circuit.
C2	MAGNITUDE	Permits amplitude adjustment of the magniphase input signal to obtain balance across the magniphase bridge circuit.
C10	NO. 1 FREQUENCY	Provides fine control of crystal oscillator for precise frequency adjustment when crystal Y1 is in use.
C11	NO. 2 FREQUENCY	Provides fine control of crystal oscillator for precise frequency adjustment when crystal Y2 is in use.
DS4	TRIP Lamp	Lamp indicates operation of magniphase unit when unbalance occurs.
L3	3RD BUFFER Inductor	3rd buffer collector circuit inductor - fixed tuned to operating frequency.
L6	RF DRIVER Inductor	RF driver collector circuit inductor - fixed tuned to operating frequency.
M6	TEST METER	Provides indications as selected by test switch S3.

TABLE 3-3. SOLID STATE EXCITER AND MAGNIPHASE - CONTROLS/INDICATORS - Cont.
(Refer to Figure 3-3)

REFERENCE DESIGNATOR	CONTROL/INDICATOR	FUNCTION
R85	CARRIER BIAS	Provides screwdriver bias adjustment for carrier tube static current.
R119	MODULATOR BIAS	Provides screwdriver bias adjustment for modulator collector current.
S1	DISABLE switch	Disables magniphase unit during testing and adjustments.
S2	LAMP RESET	Resets magniphase trip lamp.
S3	Selector switch for TEST METER	Switching of TEST METER M6 into the appropriate circuits to obtain the following indications:
NOTE The full scale figures shown for the various positions of switch S3 must be used to obtain realistic indications on M6.		
	Positions Left-to-Right:	
	PEAK CATH CURRENT (5A)	Indicates cathode current of the Peak Tube V2.
	+120 V SPLY (500 V)	Indicates +120 volt supply voltage.
	-750 V SPLY (1000 V)	Indicates -750 volt supply voltage.
	+1800 V SPLY (5000 V)	Indicates +1800 volt supply voltage.

TABLE 3-3. SOLID STATE EXCITER AND MAGNIPHASE - CONTROLS/INDICATORS - Cont.
(Refer to Figure 3-3)

REFERENCE DESIGNATOR	CONTROL/INDICATOR	FUNCTION
S3 - Cont.	Positions (Cont.) Left-to-Right:	
	RF DRVR COLL VOLTAGE (100 V)	Indicates rf driver collector voltage.
	+24 V REGULATED (100 V)	Indicates +24 volt regulated supply voltage.
	MOD BALANCE VOLTAGE (100 V)	Indicates modulator balance voltage.
	MOD COLLECTOR CURRENT (5 A)	Indicates modulator collector current.
	DRVR COLLECTOR current (5 A)	Indicates driver collector current.
	FEEDBACK RECT CURRENT (10 mA)	Indicates current through feed-back rectifier CR7.
	MAGNIPHASE NULL (1 mA)	Indicates null setting of magni-phase bridge circuit.
S4	CRYSTAL SELECTOR switch	Permits selection of either crystal, Y1 or Y2.
Y1	Crystal	Provides precise carrier fre-quency for crystal oscillator number one (1).
Y2	Crystal	Provides precise carrier fre-quency for crystal oscillator number two (2).

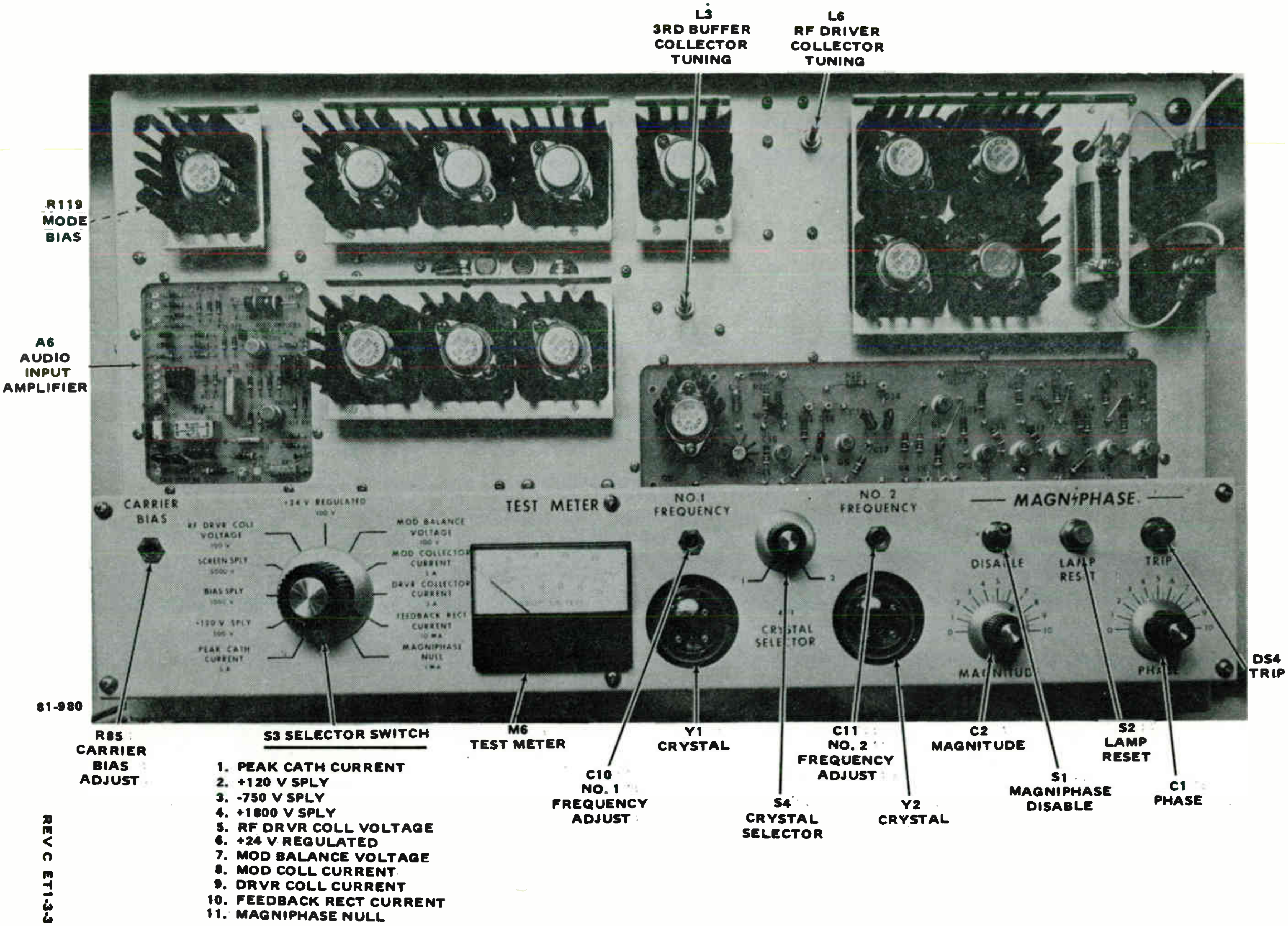

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Figure 3-3. Solid State Exciter & Magniphase Control/Indicators, Front View

TABLE 3-4. CONTROL SECTION - CONTROLS/INDICATORS
(Refer to Figure 3-4)

REFERENCE DESIGNATOR	CONTROL/INDICATOR	FUNCTION
CB1	BLOWER	Protects cooling-air blower and 208/230 volt control circuits.
CB2	FILAMENTS	Protects primary of peak and carrier tube filament transformer.
CB3	+120 Volt supply	Protects primary of +120 volt supply.
CB4	-750 V Bias supply	Protects primary of the -750 volt bias supply.
CB5	+1800 V Screen supply	Protects primary of the +1800 volt screen supply.
K2	Blower relay	Protects blower motor with thermal overload protection. Also has thermal overload reset buttons.
K3	BLOWER HOLDOVER relay	Provides adjustable time for blower holdover.
M5	FILAMENT HOURS	Indicates operating time in which filament voltage is applied to power amplifier tubes.

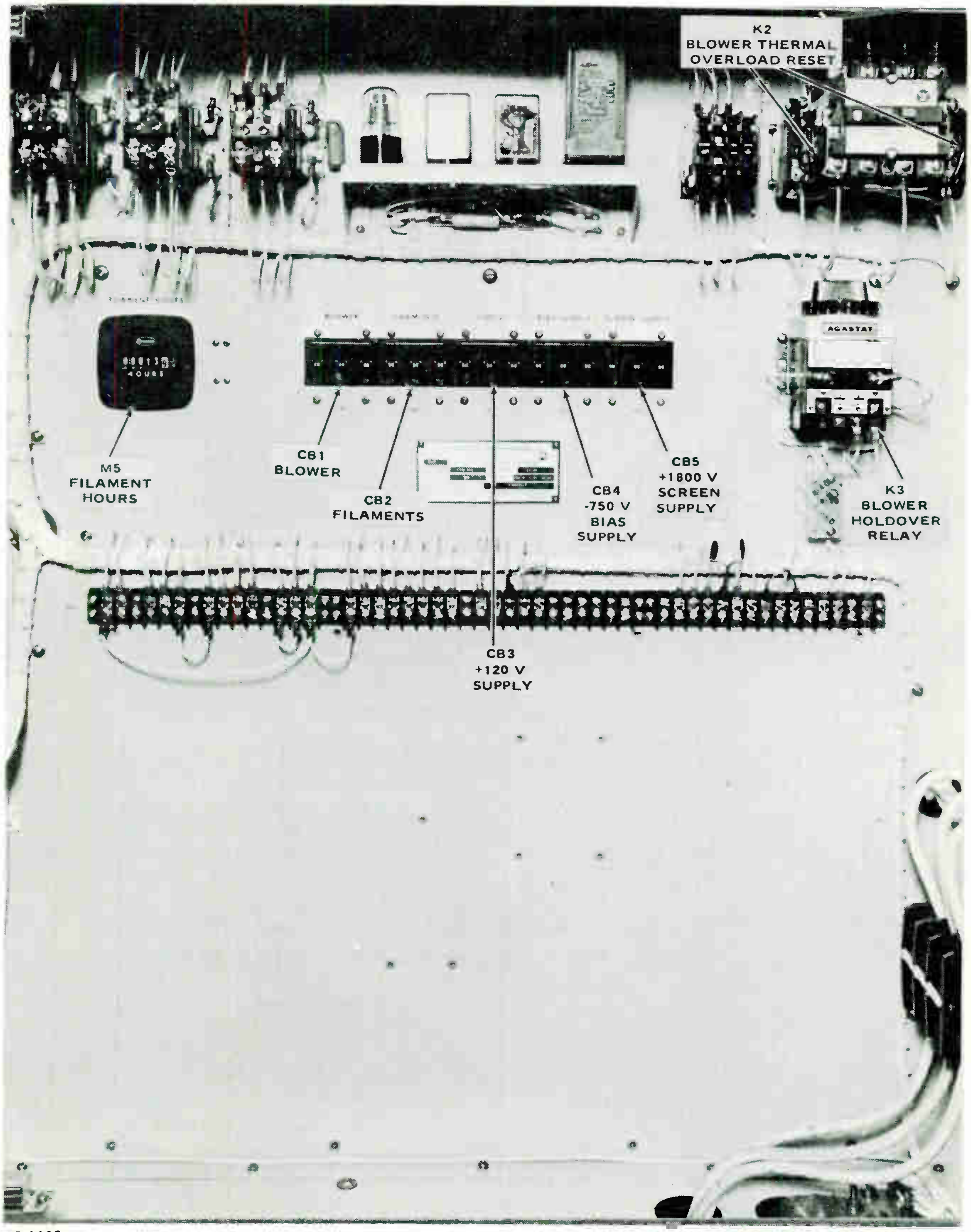

Figure 3-4. Control Section, Showing Circuit Breakers, Front View

3-7. OPERATING VOLTAGES AND CURRENTS (Refer to Table 3-5).

The following table lists typical operating values of voltages and currents as indicated on the panel meters of the Type 316F/315F transmitter during operation. These indications are only approximations. They are intended as average values in a normal situation with the transmitter operating in CW mode at 10 kW or 5 kW average power output (no modulation applied), except when otherwise specified. For specific operating values, refer to the Factory Test Data which is supplied with each individual transmitter.

TABLE 3-5. TYPICAL VOLTAGE AND CURRENT VALUES

METER TITLE AND SYMBOL DESIGNATOR	METER - FULL SCALE VALUE	TYPICAL VALUES	
		10 kW	5 kW
ANTENNA CURRENT	0-20 A		
0% Modulation		*	*
95% Modulation		*	*
PLATE CURRENT	0-5 A dc		
Meter M4			
0% Modulation		2.15 A	1.2 A
95% Modulation		2.8 A	1.6 A
PLATE VOLTAGE	0-15 kV dc		
Meter M3			
0% Modulation		9200 kV	7400 Vdc
95% Modulation		9000 kV	7300 Vdc
PA SCREEN CURRENT	0-500 mAdc		
Meter M2			
0% Modulation		71 mA	15 mA
95% Modulation		210 mA	65 mA
LINE VOLTAGE	0-300 Vac		
Meter M1			
0% Modulation		230 V/ Phase	230 V/ Phase
95% Modulation Primary line voltage is switched and selected with LINE VOLTAGE switch S14.		230 V/ Phase	230 V/ Phase
Positions of Line Voltmeter switch, S14:			
A-B		230/208 Vac	
B-C		230/208 Vac	
A-C		230/208 Vac	

*Dependent upon Antenna Impedance.

TABLE 3-5. TYPICAL VOLTAGE AND CURRENT VALUES - Cont.

METER TITLE AND SYMBOL DESIGNATOR	METER - FULL SCALE VALUE	TYPICAL VALUES	
		10 kW	5 kW
TEST METER M6 Left-to-Right (Positions)	Marked 0-1 and 0-5		
Current and voltages are switched and selected with TEST METER switch S3.			
Positions of Test Meter switch, S3:			
PEAK CATHODE CURRENT	0-5 Adc		
0% Modulation		0.45 A	.25 A
95% Modulation		1.2 A	.7 A
+120 V SPLY	0-500 Vdc		
0% Modulation		130 V	130 V
95% Modulation		129 V	130 V
-750 V SPLY (Bias Supply)	0-1000 Vdc		
0% Modulation		740 V	680 V
95% Modulation		740 V	680 V
+1800 V SPLY (Screen Supply)	0-5000 Vdc		
0% Modulation		1850 V	1850 V
95% Modulation		1800 V	1830 V
RF DRVR COLL VOLTAGE	0-100 Vdc		
0% Modulation		46 V	32 V
95% Modulation		48 V	34 V
+24 V REGULATED Supply	0-100 Vdc		
0% Modulation		23 V	24 V
95% Modulation		23 V	24 V
MOD BALANCE VOLTAGE	0-100 Vdc		
0% Modulation		58 V	58 V
95% Modulation		56 V	56 V

TABLE 3-5. TYPICAL VOLTAGE AND CURRENT VALUES - Cont.

METER TITLE AND SYMBOL DESIGNATION	METER - FULL SCALE VALUE	TYPICAL VALUES	
		10 kW	5 kW
Positions of Test Meter switch S3 - Cont.:			
MOD COLLECTOR CURRENT	0-5 A		
0% Modulation		0.2 A	0.1 A
95% Modulation		0.9 A	0.6 A
DRVR COLL CURRENT	0-5 A		
0% Modulation		1.9 A	1.4 A
95% Modulation		1.8 A	1.3 A
FEEDBACK RECT CURRENT	0-10 mA		
0% Modulation		2.2 mA	
95% Modulation		2.2 mA	
MAGNIPHASE NULL	0-1 mA		
0% Modulation		0	0
95% Modulation		0	0

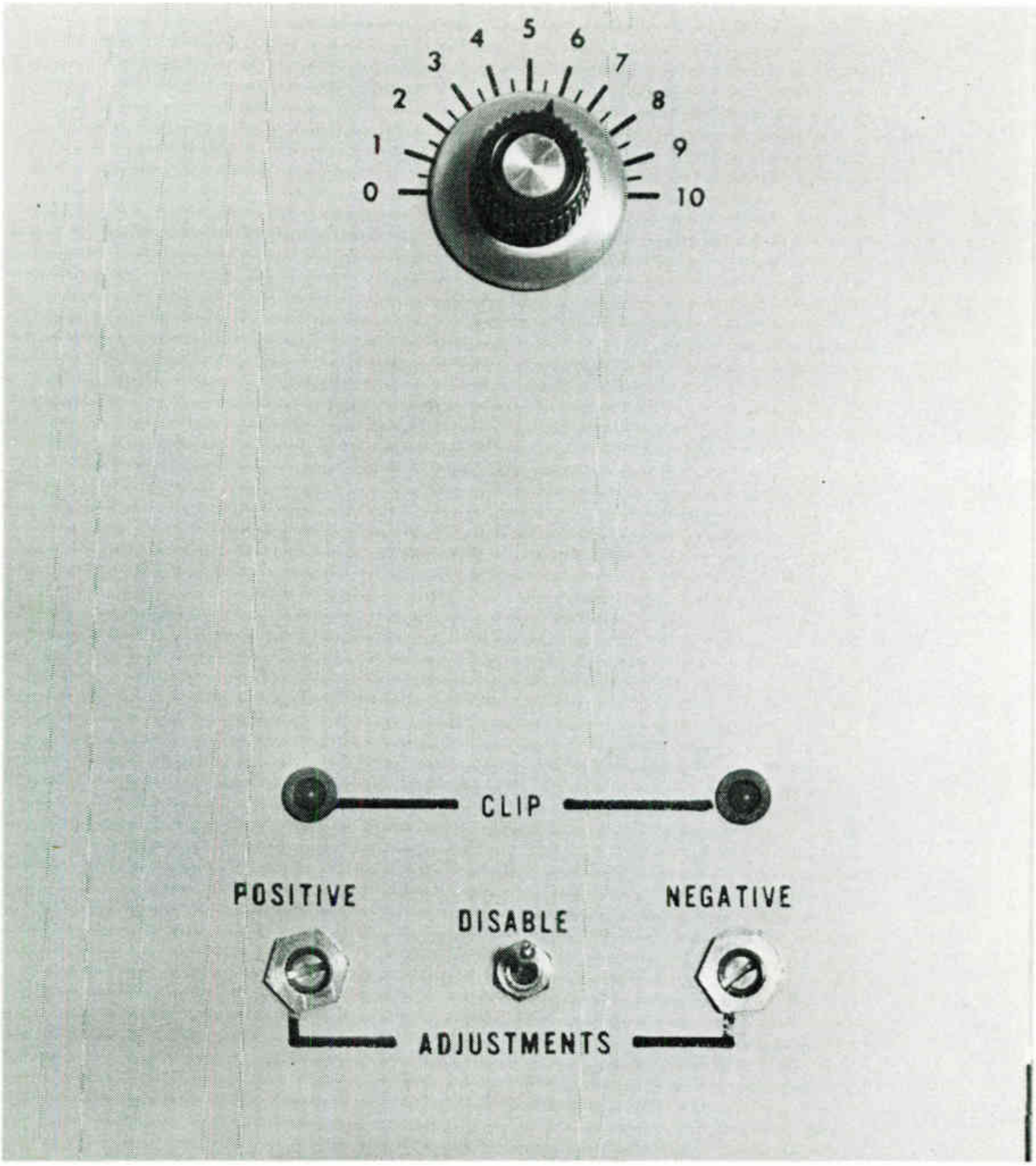

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Figure 3-5. Peak Clipper Controls

SECTION 4

THEORY OF OPERATION

4-1. INTRODUCTION.

The Theory of Operation, Section 4, contains information necessary for an understanding of the various circuit functions and overall operation of the transmitter. Included in this information are comprehensive circuit descriptions, supported by simplified circuits, to illustrate specific points.

A thorough understanding, of the technical descriptions and their supporting diagrams, is required as a prerequisite for successful trouble shooting and maintenance of the transmitter.

4-2. SOLID-STATE EXCITER (Refer to Figure 4-1).

The Exciter consists of three basic sections, the rf section, audio section, and Magniphase® section. The rf section consists of a transistorized crystal oscillator, buffer amplifiers and modulated power amplifier. The audio section consists of 1st audio amplifier, audio driver, modulator, and rf envelope feedback rectifier. The Magniphase section consists of fault amplifier, cut-off pulse generator and lamp indicator circuit. The three equipment sections are discussed separately and then treated as a composite group which provides the modulated output signal.

In addition to the solid state circuits, the exciter panel contains a test meter, selector switch and other operating controls which will be explained later.

4-3. RF SECTION.

Illustrated in the referenced block diagram of the exciter, is the rf section which contains an rf oscillator, three buffer stages and RF driver to provide the required power gain and isolation for the oscillator, and the modulated power amplifier stage to provide the 40-watt carrier output. The dc collector supply is a +120 volt dc supply with a zener regulated +24 volt tap on the bleeder resistor.

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4-4. CRYSTAL OSCILLATOR.

The rf crystal controlled oscillator utilizes the type 2N697 NPN silicon transistor. Collector dc voltage is obtained from the +24 volt regulated source. Provision is made for the selection of either one of two crystals by a selector switch. Each crystal has a trimmer condenser in parallel with it for the exact setting of the desired carrier frequency. The trimmer will provide a trim range of approximately ±7 cycles for low frequency crystals and ±20 cycles for high frequency crystals. Oven-less type vacuum crystals which have a long record of proven stability are used. Day-to-day variations of five cycles or less can be expected over an ambient temperature range of 0° to +50° centigrade while variations of one cycle or less can be expected in the controlled ambient of the typical transmitter building.

The 2N697 oscillator transistor operates with a collector voltage of +4 volts dc and a collector current of 2 mA. The 10,000 ohm collector load resistor provides the 20 volt drop from the 24 volt regulated source. The rf collector voltage swing is 8 volts peak-to-peak and the rf voltage from base to ground, from which the output is taken, is 6 volts peak-to-peak.

4-5. 1ST BUFFER AMPLIFIER.

The 1st rf amplifier is a 2N697 in a common collector, or emitter follower circuit. Output from the crystal oscillator is fed to the base through a blocking condenser and series resistor to provide additional isolation between oscillator and buffer. The 4700 ohm series resistor reduces the oscillator output voltage of 6 volts P-P to about 4 volts P-P at the buffer base.

The collector of the buffer is tied directly to the +24 volt regulated supply. The base bias circuit (R20-R21) places the stage in the class A region with the emitter current of 4 mA causing a drop of about 9 volts across the 2200 ohm emitter resistor. Although the stage provides only about unity voltage gain, (emitter output voltage is about 4 volts P-P) it does provide an impedance transformation of about 20/1, raising the 700 ohm input impedance of the 2nd buffer to about 15,000 ohms at the base of the 1st buffer. With unity voltage gain, the power gain is then proportional to the impedance transformation.

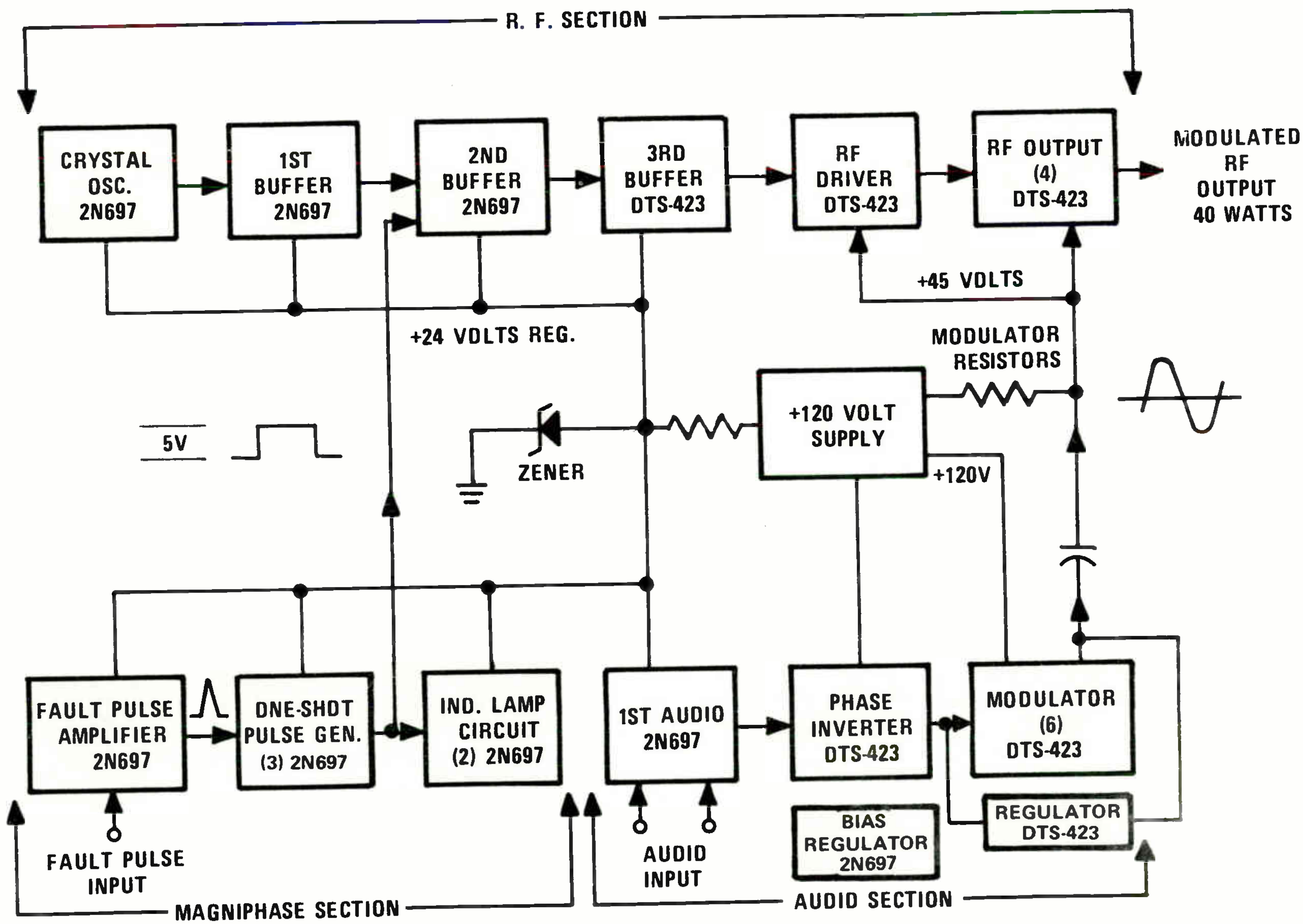


Figure 4-1. Solid-State Exciter, Type 316F/315F Transmitter, Block Diagram

4-6. 2ND BUFFER AMPLIFIER.

The second buffer amplifier is also a 2N697 in a class A common collector circuit. The collector is connected directly to the +24 volt regulated supply and the emitter impedance consists of an inductor L2 in series with a resistor R25. The base bias circuit (R23, R24) establishes class A operation with collector current of about 19 mA. In addition to providing power gain, this stage functions as the rf excitation cut-off switch when the magniphase cut-off pulse is applied across the 560 ohm emitter resistor R25. The cut-off pulse is a positive 5 volt rectangular wave of about 150 milliseconds duration. The +5 volts applied to the emitter is sufficient to cut off the collector current with 4 volts P-P rf excitation applied to the base. The generation of this pulse is discussed in the description of the magniphase circuit. The 2nd buffer also has unity voltage gain and the emitter output voltage is therefore about 4 volts P-P.

4-7. 3RD BUFFER AMPLIFIER.

The third buffer is a DTS-423 transistor in a class A common emitter circuit. Collector voltage is fed from the 24V regulated supply through a resistor and rf choke (R32, L4). The base bias circuit (R26, R27) establishes class A operation with a collector current of approximately 40 mA. A 10 ohm emitter resistor (R28) is used for bias stabilization. The collector rf voltage swing is about 40 volts P-P and is coupled to the "L" network coupling circuit through blocking condenser C17. The "L" network (C18, L3) transforms the 400 ohm collector load impedance down to approximately 25 ohms at the base input circuit of the RF driver. Power output from the 3rd buffer is approximately 400 milliwatts at a collector efficiency of 40%. Device dissipation is 0.6 watts. The "L" network inductor (L3) is a slug tuned coil which is tuned to the operating frequency to provide maximum drive (maximum collector current) to the modulated rf power amplifier.

4-8. FREQUENCY MONITOR.

A resistance voltage divider (R29, R30) connected to the input to the "L" network provides 1-volt rms rf voltage for driving the station frequency monitor.

4-9. RF DRIVER.

The RF driver is a DTS-423 in a common emitter circuit operated as a class C amplifier. Class C, as referred to here, means that the collector supply voltage is the only dc voltage applied, with the base and emitter being at dc ground potential. With no base bias applied, the collector current is cut off in the absence of base rf drive. Collector voltage of approximately 40-45 volts dc is applied from the 120-volt supply through the modulation resistors to the rf output (modulated power amplifier) and the RF driver so that modulation from the RF driver is applied simultaneously with the modulation applied to the collectors of the modulated power amplifier (RF output).

The collector current is from 150-200 mA so that the power input is from 6 to 8 watts depending on carrier frequency. Power output is from 4 to 6 watts depending on frequency. The variation in output due to frequency is due mainly to the variation in impedance transformation of the "L" coupling network (C20, L6) over the frequency range which it tunes since only the inductor is variable. This inductor is likewise tuned to provide maximum drive to the modulated power amplifier. Of the 4 to 6 watts taken from the RF driver about one-half is used as drive power and one-half is dissipated in the modulated amplifier base current limiting resistors.

4-10. MODULATED POWER AMPLIFIER (RF OUTPUT).

The modulated PA consists of four DTS-423 transistors in parallel in a class C common emitter circuit. Collector voltage of 40-45 volts is applied from the 120-volt supply through the modulation resistors. Power output capability of this stage is about 60 watts maximum (unmodulated carrier) and can be adjusted by variation of collector supply voltage. Two of the modulation resistors (R45 & R46) are adjustable so that collector voltage can be set to what is required for nominal transmitter output. A rheostat connected in series with the modulation resistors provides a front panel adjustment of transmitter power output over about a ±5% range.

The modulated power amplifier operates at a collector efficiency of about 80%. At nominal 40 watts output and 40 volts collector voltage the collector current will be 1.25 amps. The total device dissipation is about 10 watts or 2.5 watts per transistor. This will increase to 15 watts total dissipation at 100% modulation.

The output is coupled to the power amplifier grid circuit through the "L" matching network C24 and L7 and dc blocking condenser C23.

All of the 40 watts output is dissipated in the 500 ohm non-inductive grid loading resistor R97. Impdeance matching of the 35 ohm collector output load into the 90° intergrid circuit is described in paragraph 5-9, step 7, under the title of PA Grid Network - Initial Alignment.

4-11. AUDIO SECTION.

The audio section is a three stage amplifier which raises the +10 dBm program input signal to about 40 watts. Included as part of the audio section is the rf envelope feedback rectifier.

4-12. AUDIO INPUT AMPLIFIER, A6

The Input Audio Amplifier is a separate wire in assembly. See Figure 3-11. A differential Amplifier U1 Input is connected directly to the Audio Input Line. Its output is fed through a set of relay contacts to a transistor amplifier which in turn drives a second transistor amplifier.

Resistor R-16 provides Attenuation of the output from U1 when Relay A6R1 is actuated. Relay A6K1 is energized during Power cutback. Power of +6 VDC and -6 VDC is applied to Amplifier U1. Power of 24 VDC is applied to Transistors A6Q1 and A6Q2. The +6 VDC and -6 VDC is received from the Peak Clipper Power Supply.

Output of the Audio Input Amplifier Board is applied to the 2nd Audio Amplifier and Modulator Stage.

4-13. 2ND AUDIO AMPLIFIER AND MODULATOR.

The second audio amplifier is a DTS-423 transistor in a class A common emitter circuit. This stage functions not only as a current amplifier but also as a phase inverting amplifier. Collector voltage is taken directly from the +120 volt supply.

The modulator consists of six DTS-423 transistors in a class B, "single ended-push-pull" amplifier. In order to better understand how class B operation is accomplished without transformers, it is necessary to describe the 2nd amplifier and modulator in combination, or as a single circuit.

The modulator transistors actually consists of Q21 and Q22 in parallel and Q18 and Q19 in parallel. These parallel combinations are in series across the +120 volt supply. Q17 and Q20 are connected in a Darlington current multiplier configuration to raise the base input impedance of the modulator transistors to a level suitable for driving from the single DTS-423 phase inverter (2nd amplifier).

Eliminating the Darlington transistors and showing the parallel modulator transistors as single transistors results in the simplified circuit shown in Figure 4-2. The modulator emitter equalizing resistors are also omitted for clarity. The load resistance R_L, is the load presented to the modulator by the modulated rf amplifier and has a numerical value of $R = \frac{E}{I}$

$$= \frac{40V}{1.25A} \equiv 32 \text{ ohms}$$

E and I (40 volts and 1.25 amps) are the collector voltages and current of the modulated rf amplifier. Since the rf driver is also modulated, the resistance load that it presents to the modulator is approximately, $R = \frac{E}{I} = \frac{45V}{0.2A} = 225$ ohms.

The modulating resistors, R45, R46 and R47 are also across the modulator output and may have a total resistance as low as 50 ohms. The parallel combination of these three loads will then be in the order of 18 ohms. This will vary according to rf drive conditions for 5kW or 10 kW output and the actual value of modulator load is unimportant as far as modulator operation is concerned.

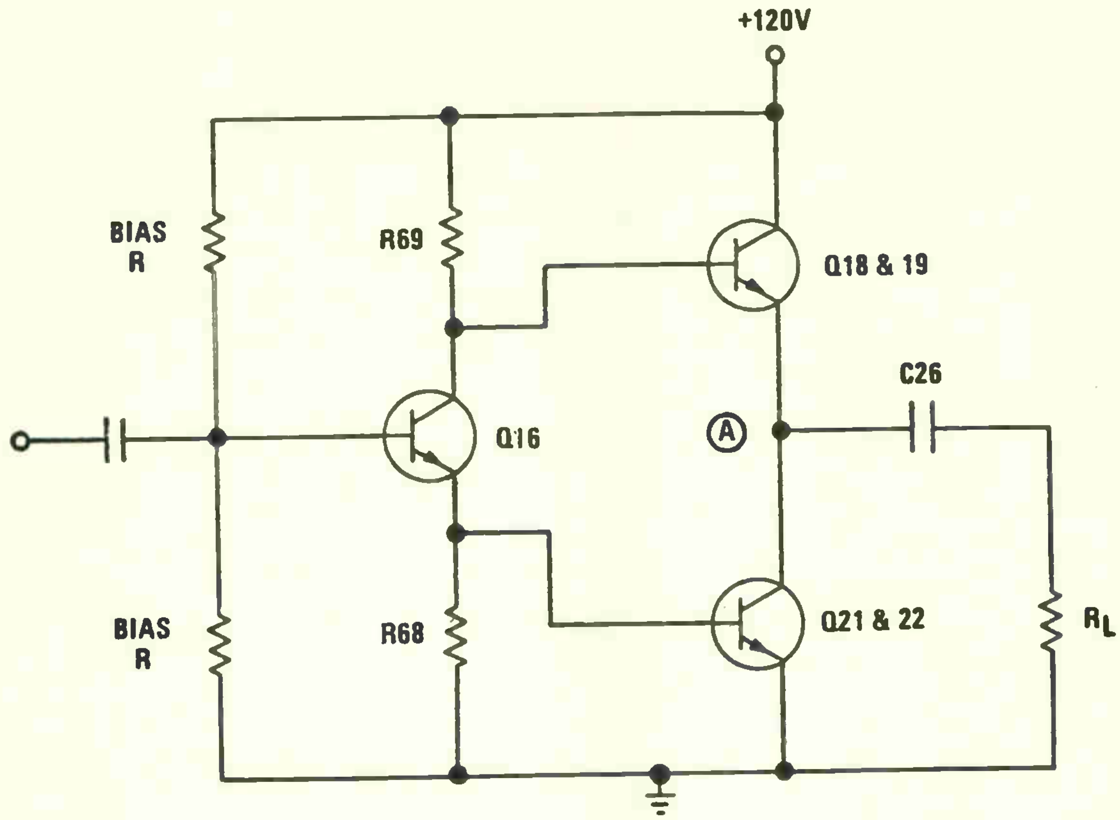


Figure 4-2. Modulator and 2nd Amplifier, Simplified Schematic

In operation, the dc voltage at point A should be approximately 1/2 the dc supply voltage or 60 volts. This is referred to as modulator balance voltage. In order to establish this condition, consider first that an NPN silicon transistor will begin to draw collector current when the base-emitter junction has about 0.5 volts forward (positive) bias at which point the collector current will be proportional to base current and the base-emitter voltage will rarely exceed 1.0 volt. For class B operation, the modulator transistors should draw a small static or idling collector current so that no crossover distortion will appear on the output waveform. Let's say that we wish to draw 0.2 amperes static current. With this fact in mind, assume that the lower modulator transistor (Q21 and Q22) is a resistor with a numerical value of;

$$R = \frac{E}{I}$$

$$= \frac{\text{60V (Balance voltage)}}{\text{0.2A (Static current)}} = 300 \text{ ohms}$$

The circuit would then become an emitter follower (Q18 & Q19) driven by a common emitter driver (Q16). If we adjust the bias resistors of Q16 so that it draws a collector current of 0.3 amperes through the 200 ohm collector load resistor (R69), the resultant 60 volt drop will put 60 volts at the collector of Q16. Since this is direct coupled to the base of Q18-19 which has a base-emitter drop of 0.5 volts, then the balance voltage will be +59.5 volts and the collector current of Q18-19 will be 0.2 amperes.

Now if we replace the imaginary 300 ohm resistance with the lower modulator transistors (Q21-22) and bias them so that they draw a collector current of 0.2 amperes, then the dc circuit conditions will be the same. This bias is adjusted by making the resistance of the driver emitter resistor (R68) a value that will result in a 0.5 volt drop with 0.3 amperes driver emitter current, or;

$$R = \frac{E}{I}$$

$$= \frac{0.5}{0.3} = 1.67 \text{ ohms}$$

The actual value is greater than this for reasons to be explained later.

Now consider what would happen if the base of the driver transistor Q16 were driven alternately positive and negative. As it is driven positive, the collector current will increase which will increase the drop across the collector resistor R69 lowering the modulator balance voltage. When the driver collector current reaches 0.6 amperes (twice the 0.3A static current), the full supply voltage will be dropped across R69 (0.6 X 200 ohms = 120 volts) and the balance voltage will be zero. In practice this is impossible since the transistors will not draw current at zero collector voltage, but will draw large currents at collector voltages as low as 1.0 volt.

If the base of Q16 is now driven negative, the collector current will decrease thus causing the drop across R69 to correspondingly decrease, until at zero collector current, the balance voltage will increase to +120 volts (supply voltage).

The balance voltage (modulator output voltage) will then swing from almost zero volts to almost +120 volts. Naturally in order to accomplish this, the modulator transistors must be alternately switched on and off. On the positive peak of modulator output, the upper transistors Q18 and 19 must become a virtual short circuit while the lower transistors become an open circuit. These functions are reversed on the negative peak and are accomplished by alternately driving the upper and lower modulator bases positive and negative. The peak collector current is;

$$I = \frac{E}{R}$$

$$= \frac{60\text{V (peak output voltage)}}{18\text{ ohm (load resistance)}}$$

$$= 3.3 \text{ amperes}$$

In practice, the modulator output voltage will swing about 110 volts peak-to-peak before clipping.

It was stated earlier that the emitter resistor (R68) of the driver should be 1.67 ohms in order to properly bias the lower modulator transistors. Since a Darlington circuit is used between the modulators and the second amplifier, the base-emitter drop of this transistor must be added to the 0.5 volt bias for the lower modulator which doubles the value of R68 to about 3.3 ohms.

The modulator power output at 110 volts P-P across 18 ohms will be;

$$P = \frac{E_{RMS}^2}{R}$$

$$= \frac{38^2}{18} = 80 \text{ watts}$$

The peak collector current will be;

$$I_{PK} = \frac{E_{PK}}{R}$$

$$= \frac{55\text{V}}{18} = 3.05 \text{ amps}$$

The dc collector current will be;

$$I_{DC} = \frac{I_{PK}}{\pi \text{ (for Class B)}}$$

$$= .97 \text{ amperes}$$

The power input will be;

$$P = E_{DC} \times I_{DC}$$

$$= 120 \times .97 = 116 \text{ watts}$$

The collector efficiency will be;

$$\eta = \frac{80}{116} \times 100$$

$$= 68\%$$

The total collector dissipation is;

$$P_{Diss.} = 116 - 80 = 36 \text{ watts}$$

When the modulated rf amplifier collector voltage is 40 volts dc, it will require only 80 volts peak-to-peak audio output from the modulator to 100% modulate the rf carrier. At 110 volts P-P audio output, the carrier will be modulated 137% on positive peaks. At 100% modulation, the modulator dc collector current will of course be less than 0.97 amperes (see typical meter readings).

The total harmonic distortion at 80 watts output from the modulator is generally less than 1.5% from 30 cycles to 10,000 cycles without negative feedback. This low distortion is made possible due to the fact that the phase inverter driver is inherently degenerative because of the unbypassed emitter resistor which results in about 6 dB inverse feedback on that stage and because on positive peaks of modulator output, the upper modulator transistors Q18 and Q19 operate as an emitter follower which is also inherently degenerative. Direct coupling between phase inverter and modulator results in excellent low frequency response while the elimination of coupling transformers extends the high frequency response many octaves above the audio spectrum and makes possible the use of negative feedback derived from the rectified rf output envelope.

4-14. FEEDBACK RECTIFIER CIRCUIT.

A sample of the rf output modulation envelope is taken from a tap on the static drain choke L21 and is fed to a series rectifier circuit on the Audio Input Amplifier, A6. The envelope is rectified by rectifier A6CR1 and the rf is filtered out by A6R32 and A6C10. The resultant audio voltage is applied in series with the program input across R33 and R34. The audio has approximately 8 dB of feedback.

This will generally result in harmonic distortion less than 1% in the middle audio frequencies and less than 2% at the extreme high and low frequencies.

4-15. MAGNIPHASE SECTION.

The Magniphase antenna protective circuit is essentially a device which measures the impedance of the circuit into which it is connected, in this case, the point at which the transmission line is connected to the transmitter output. The magniphase coupling unit, or coupler, takes a sample of voltage and current at the transmission line feed point and these are fed by small coaxial cable to the balancing unit on the exciter panel. The voltage sample is obtained by capacitive coupling to the inner conductor of the coupler by the cylindrical outer capacity plate. The current sample is obtained by inductive coupling of the inner conductor to a toroidal inductor which encircles the coupler assembly. An electrostatic shield between the toroidal inductor and the capacity plate minimizes capacitive coupling to the toroid.

The magnitude and phase of the two samples are adjusted by panel controls (C1 and C2) on the exciter and are applied to the anode and cathode of a germanium rectifier (CR1) in a manner that makes the rectifier nonconducting under normal conditions. A change in impedance at the sampling point caused by a fault in the antenna system will alter the voltage/current relationship at the rectifier diode thereby causing it to conduct. The diode current is drawn through a resistor (R3) in a direction that causes a positive pulse to be applied to the base of the fault pulse amplifier Q1 which is connected in an emitter follower configuration to provide isolation between the diode circuit and the one-shot multivibrator Q2, Q3 and Q24. Q2, which is cut off due to lack of base bias, is driven into conduction by the pulse from the fault amplifier and in turn drives Q3, which is in saturation, toward cut-off. Q24, also in saturation, is cut off allowing C4 to charge thru R10, which gives the time constant. When C4 has charged sufficiently to cause Q3 to go into saturation, the timing cycle is completed. A positive rectangular pulse of 5 volt amplitude and approximately 150 milliseconds duration appears at the collector of Q3 during its cutoff interval. This 5-volt pulse is applied to the emitter of the 2nd rf buffer stage Q8 which removes rf excitation as explained earlier. A toggle switch S1 (DISABLE) is used to disable the multivibrator by grounding the base of Q2. This is done to prevent inadvertent carrier interruptions while adjusting the magnitude and phase controls to null the magniphase diode current.

The 5-volt pulse from Q3 is also coupled to the base of Q4. Q4 and Q5 are connected in a direct coupled multivibrator with a 28-volt lamp used as the collector load for Q4 which is normally cut off. Q5 is in saturation due to bias provided by R15. As Q4 is driven into conduction by the pulse from Q3, the two transistors (Q4 and Q5) reverse operating modes and the trip lamp (DS4) is lighted by the collector current of Q4. They remain in this condition until the lamp reset switch (S2) is pushed which grounds the base of Q4 and restores the transistors to their original operating conditions.

All six transistors in the magniphase circuit are 2N697s and are supplied power from the regulated +24 volt supply.

4-16. COOLING AIR.

The heat sinks for all DTS-423 transistors (except for 3rd rf buffer Q9) are located in the path of a direct air blast from the power amplifier tube plenum chamber above the exciter panel. When the lower left-front door is closed, this air is re-circulated through holes in the lower portion of the vertical mounting panel into the lower rear compartment where it mixes with cool incoming air from the rear door filters. The air temperature rise due to recirculation is negligible because about 95% of the total air mixture is cool air.

The exciter panel is hinged at the bottom and will swing down for access to components, by removing the two retaining screws at the upper corners and disconnecting the wire feeding rf drive into the grid circuit. The exciter should never be operated for more than a few minutes in the down (open) position because of the absence of cooling air in that position.

4-17. HIGH-EFFICIENCY LINEAR AMPLIFIER (Refer to Figure 4-3).

4-18. GENERAL DESCRIPTION.

The principle by which the two power amplifier tubes can operate at high plate efficiency while functioning as a linear amplifier is known as "impedance modulation", whereby the increase in power output during positive modulation is brought about by a sinusoidal decrease in the carrier amplifier plate load impedance while maintaining a constant rf plate voltage swing. During negative modulation, the carrier tube functions as a conventional linear amplifier whereby the rf plate voltage is proportional to the rf grid drive voltage.

The decrease in carrier amplifier plate loading, during positive modulation, is made possible by separating the plates of the two tubes by a 90° network, or quarter wave line. Such a network has an impedance inverting property so that an increase in load resistance at one end of the network will result in a decrease in the resistance seen at the other end.

For purpose of illustration, let us say that the plate of the peak amplifier is connected to a 650-ohm load resistance. Further, if we wish to operate the carrier amplifier at 10 kW output at a plate voltage swing of 7200 volts peak, then it must have a 2600 ohm rf load impedance. If we separate the plates of the two tubes by a quarter-wave line having a characteristic impedance of 1300 ohms, then the 650 ohm load resistance will look like 2600 ohms at the plate of the carrier tube. If the quarter-wave interplate network is terminated in its characteristic impedance of 1300 ohms (rather than 650 ohms) then the carrier tube load impedance will decrease from 2600 to 1300 ohms and since it is maintaining a constant rf voltage across its plate load, the power output would double to 20 kW. The decrease in load impedance is brought about by the action of the peak tube.

With no modulation applied, the peak tube is contributing very little current into the 650 ohm load connected at its plate but the carrier tube is delivering 10 kW into the 650 ohm load. As modulation is applied, the peak tube delivers current into the load proportional to the degree of modulation. At 100% modulation, the current in the 650 ohm load doubles, one-half being contributed by the peak tube and the other half by the carrier tube. To the peak tube, which is directly connected to the 650 ohm load, it would appear that the load is really 1300 ohms because it is

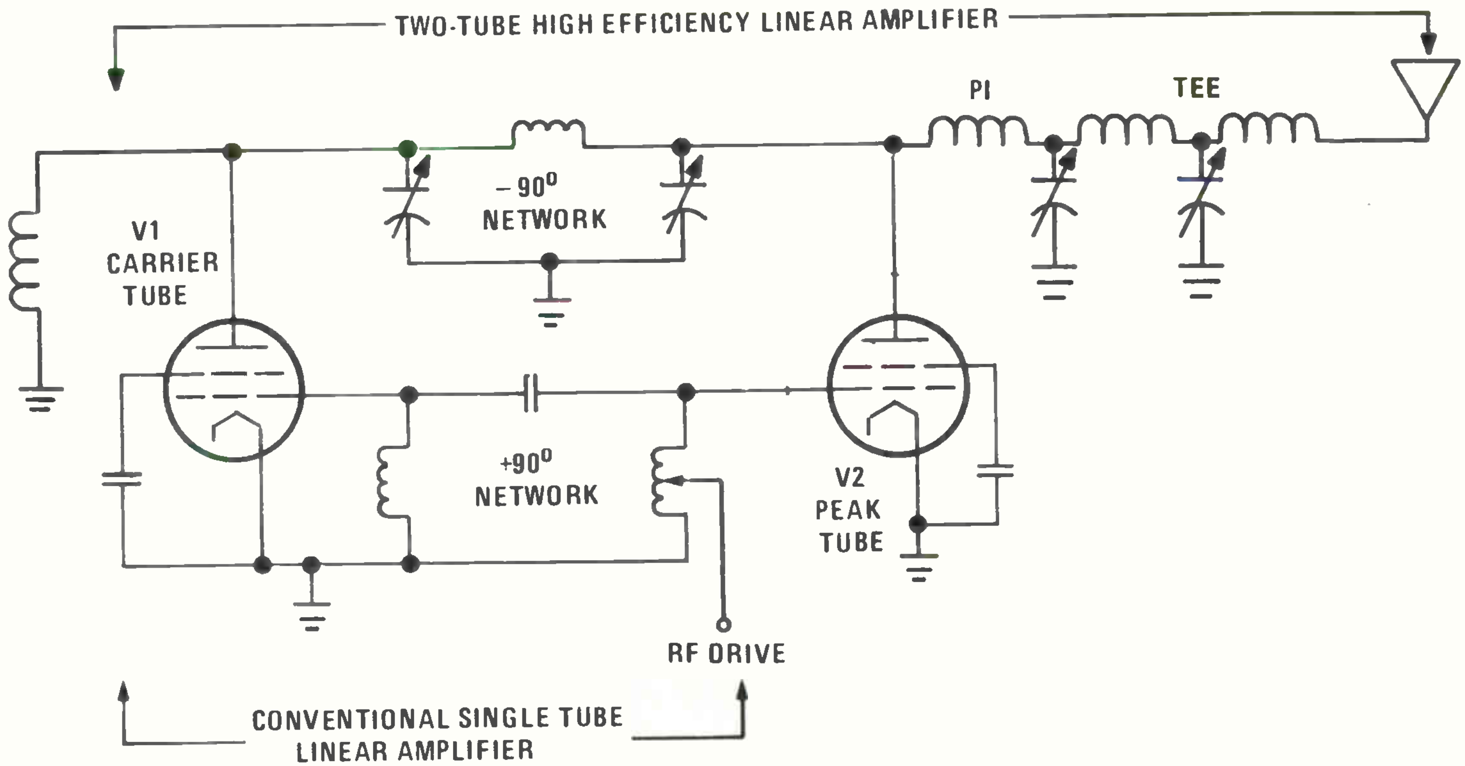


Figure 4-3. High-Efficiency Linear Power Amplifier, Type 316F/315F Transmitter, Simplified Diagram

contributing only half the load current. On the other hand, to the carrier tube it would appear that its load has decreased from 2600 ohms to 1300 ohms because of the inverting property of the quarter wave interplate network. Under these peak instantaneous conditions of 100% positive modulation, each tube is contributing 20 kW to the load for a total of 40 kW peak power which is required for 100% modulation of the 10 kW carrier.

The current contributed by the carrier tube must be in phase with the peak tube current and since it is retarded by 90° due to the interplate network, the grid drive to the carrier tube is advanced 90° to compensate for it.

The linearity of the power amplifier is enhanced by using cathode degeneration in each tube. The cathode resistance is low enough to be unaffected by the filament bypass capacitance in parallel with it.

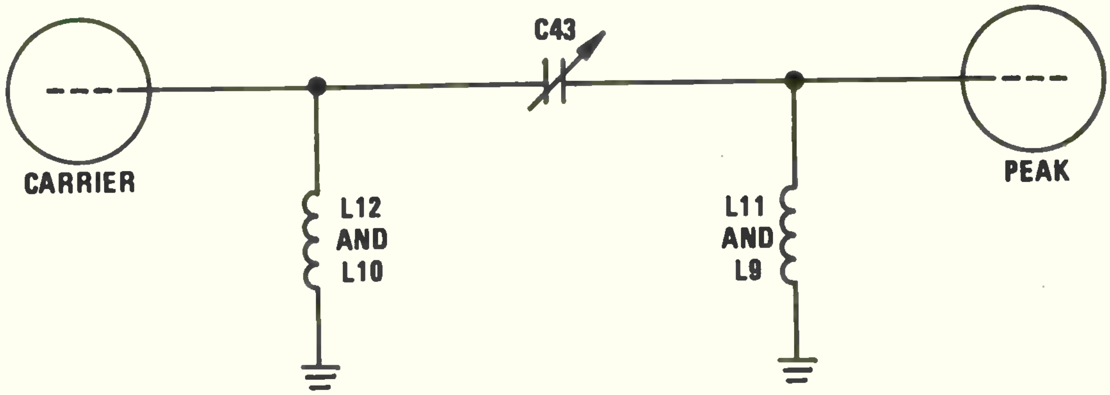
Both power tubes are supplied screen grid voltage from a common screen power supply and share a common rf bypass condenser. Individual grid bias potentiometers are used to set the static operating plate currents and a control is provided for adjusting the grid drive ratio to the two tubes to compensate for minor differences which might be found in various power tubes.

Power amplifier grid excitation is supplied by the completely solid-state, amplitude modulated exciter having a carrier output power of 40 watts. Since the power tubes are not driven into grid current conduction, they require zero drive power. The grid circuit is loaded with a non-inductive swamping resistor to provide a broad bandwidth grid circuit which provides uniform load and phase-shift characteristics for a grid excitation envelope modulated with frequencies up to 30 kHz. The loading resistor dissipates all of the 40-watt output from the exciter.

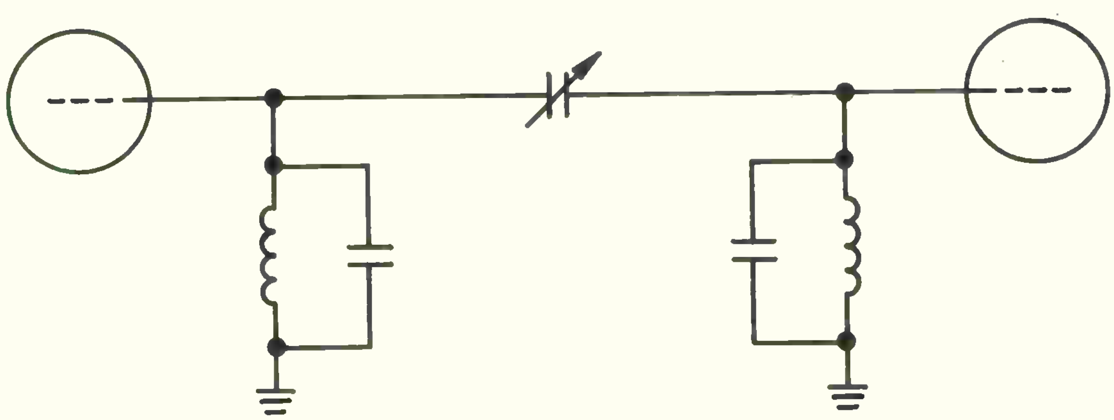
4-19. POWER AMPLIFIER GRID CIRCUIT DESCRIPTION.

The high efficiency linear power amplifier requires that the phase of the rf excitation fed to the carrier tube be advanced 90° relative to the excitation to the peak tube. Furthermore, the amplitude of peak tube excitation must be about double that fed to the carrier tube. The PA grid circuit then consists of a 90° pi network with a leading phase angle and a 2/1 voltage transformation ratio. Since neither tube is driven into grid current, the network must be terminated in a resistance in order to establish the 90° phase angle. The value of resistance is determined by drive power available, bandwidth required and grid drive voltage amplitude.

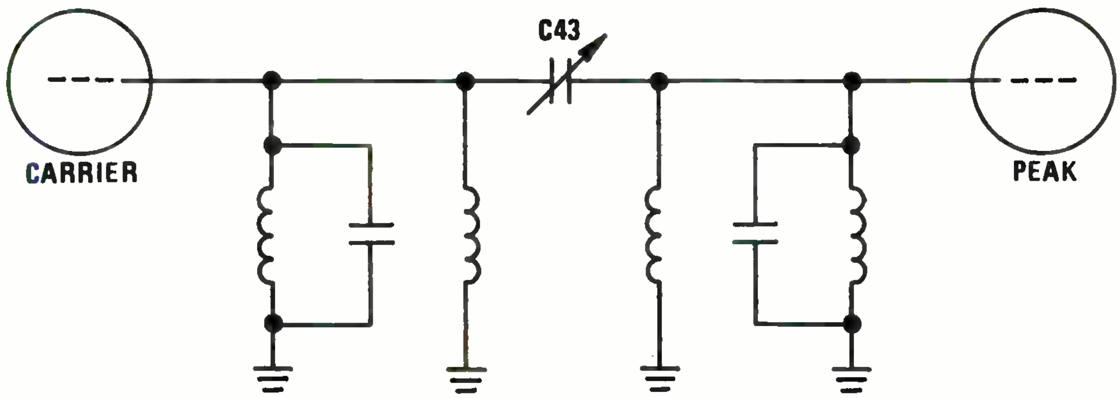
The components which make up the grid network are the shunt inductive components L9 - L11 and L10 - L12, and the series capacitive element C43, which is designated "peak grid" because it is used to adjust the peak tube grid drive. Since the input capacitance of the tubes is in parallel with the shunt inductive elements, they become parallel tank circuits. In simplified form, the grid network is as shown:



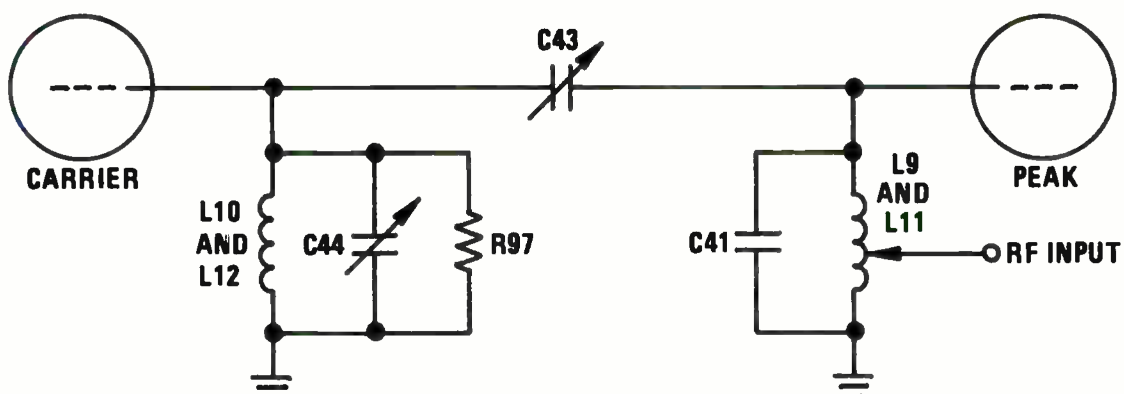
This is the basic 90° network. If capacitance is placed in parallel with the inductances, the network becomes:



If the parallel tank circuits are at resonance, they become infinite impedances and take themselves out of the circuit. Now to complete the 90° network, we must add inductance as shown:



Since the shunt grid inductances on each side of C43.1 are parallel, they can become one coil equal to the parallel combination of the two. Adding the terminating resistance opposite the driven end of the network and tapping in the drive on the peak tank coil, the circuit now becomes:



The simplified circuit doesn't show the bias connections which are series fed at the low voltage ends of the grid tank coils as shown in the complete schematic drawing.

It was determined that a terminating resistance (R97) of 500 ohms would give the network a broadband characteristic; that is, it would provide the 90° phase shift over a wide frequency range and would make the circuit insensitive to differences in input capacity of various power amplifier tubes. For ten kilowatts power output, the carrier tube grid excitation voltage, without modulation, is sufficient to dissipate about 40 watts in the 500 ohm non-inductive load resistor (R97). This increases to 60 watts at 100% modulation. For 5 kW output, the drive voltage is reduced about 30% and the power dissipation of R97 is halved.

The rf drive voltage to the peak tube grid must be approximately twice that applied to the carrier grid. To satisfy this condition, the 90° network must have an input/output voltage ratio of 2/1. In terms of resistance transformation, it must then have a resistance ratio of 4/1, which means that the 500 ohm termination will be transformed to 2000 ohms at the network input (peak grid). The characteristic impedance of the 90° network is then:

$$Z_o = \sqrt{500 \times 2000}$$
$$= 1000 \text{ ohms}$$

and each element will have a reactance of 1000 ohms.
See note on bottom of page 5-21.
In order to provide a sinusoidal driving waveshape to the grids, the two tank circuits are designed to have a loaded Q (or ratio of circulating volt-amperes to output watts) of about 2 for the carrier grid tank and 6 for the peak grid tank. The reactance values for the grid tank components then become those shown on the tuning charts.

4-20. CATHODE DEGENERATION.

The filaments of the power amplifier tubes are returned to ground from the center taps of the filament transformers through 25 ohm non-inductive resistors. For the carrier tube, two parallel 50 ohm resistors are used (R98.1 and R98.2). For the peak tube, a single 25 ohm resistor (R96) is used. The negative feedback caused by these resistors yields a significant improvement in the linearity of the power amplifier tubes.

4-21. SCREEN VOLTAGE.

The screen grids of the two power amplifier tubes are connected together to a common rf bypass condenser and are fed from a common dc power supply. For the 10 kW 316F and 5 kW 315F Transmitters, the screen voltage is +1800 volts.

4-22. POWER AMPLIFIER PLATE CIRCUIT DESCRIPTION.

The high efficiency linear power amplifier requires that the plates of the two tubes be separated by a 90° network, or quarter wave line. This could be either a leading or lagging network, but the latter is used for two reasons:

1. The lagging network, being a low-pass filter, will provide harmonic attenuation.

2. The series inductive element provides a dc connection between the plates of the two tubes so that dc plate voltage can be applied to both tubes with only one connection point.

Since a lagging interplate network is used, a leading inter-grid network is necessary so that the power output of the two tubes will be in phase in the output load circuit.

The components which make up the 90° interplate network are the interplate inductance L14 (with L13 in series with it) for frequencies below 1350 KHz the carrier plate tuning condenser C49, and the peak plate tuning condenser C51.1. Before describing the tuning procedure for this network, it is best to define the functions of the other components in the plate output circuit.

The output circuit consists of two basic networks, a "pi" network and a "tee" network. Each network has two functions:

1. To provide harmonic attenuation.

2. To transform the transmitter load impedance (50-230 ohms) up to the resistance required at the plates of the two tubes.

4-23. TEE NETWORK DESCRIPTION (Refer to Section 5, Par. 5-11).

The "tee" network consists of L17, L18, and C54 with L19 and C53 used to further attenuate the 2nd and 3rd harmonic energy. L19 in series with C54 is series resonant at the second harmonic, while simultaneously providing the capacitive reactance necessary for proper operation of the network at the fundamental operating frequency. C53 in parallel with some of the turns on L18 is parallel resonant at the third harmonic, which puts a high impedance in series with the load at the third harmonic.

These harmonic traps are tuned at the factory, using a sensitive detector in conjunction with a rf oscillator and frequency counter.

The "tee" network is used to transform the output load impedance, which might be anything from 50 to 230 ohms, to 150 ohms resistance at the input to L17. The reactance values necessary to perform this transformation are listed on the alignment charts for either 50 or 230 ohms. For loads other than this, the reactances are noted on the transmitter test data.

4-24. PI NETWORK DESCRIPTION (Refer to Section 5, Par. 5-11).

The "pi" network consists of L16, C51 and C52. It will be noted that C51 was described earlier as being part of the 90° interplate network. Since the output shunt element of the "pi" network, the two become one condenser, that is, C51. The "pi" network, in addition to providing harmonic filtering, transformers the 150 ohm "tee" network input resistance up to about 650 ohms at the plate of the peak tube. The reactance valves necessary to accomplish this transformation are shown on the alignment charts.

4-25. PROGRAM PEAK CLIPPER & IMPROVED LOW FREQUENCY PHASE RESPONSE.

Asymmetry in program waveform due to audio processing requires that the transmitter must pass clipped or negative peak limited content without tilt which would cause negative overmodulation. The most harmful effect of low frequency tilt is that it forces operation at program levels one or two dB below what should be attainable if no tilt were present. The net effect is of course loss of one or two dB of average modulation density or loudness. This deficiency is overcome by changing the value of coupling capacitors C30 to 1000 mfd and C31 to 100 mfd. The feedback decoupling capacitor C32 is also changed to 1000 mfd. These capacitors changes were factory installed on S/N 144 and above transmitters.

These improvement in low end phase response also allows for the use of a Program Peak Clipper which limits low energy random peaks at adjustable thresholds such as 95% negative and 125% positive, so that program level can be further increased. The overall net result of the change is a loudness increase of two or three dB without a perceptible loss of signal quality. The Program Peak Clipper is factory installed in Serial Nos. 152 and above transmitter.

SECTION 5

MAINTENANCE

5-1. INTRODUCTION.

The Maintenance Section 5 contains information necessary to understand the basic control circuits of the transmitter. This information, in turn, serves as a valuable asset to personnel when trouble shooting circuitry or when repairing or replacing components. Additional information in the form of photographs shows the location and symbol designator of the components.

Alignment/calibration procedures are also presented in this section and supported by alignment charts of the tunable components for various operating frequencies.

5-2. PREVENTIVE MAINTENANCE.

Very little preventive maintenance is required for the Type 316F/315F transmitter, since the exciter is composed of all solid-state components, and only two power amplifier vacuum tubes are used. Basically, only the air input filters will require attention. The air filters are located in the rear doors and are easily accessible. Replace or clean filters periodically according to location and climatic conditions. Remove dust accumulation, as required from high potential areas and from blower, tubes and chimneys.

5-3. CONTROL CIRCUITS.

As an aid in tracing circuits during trouble shooting of the transmitter an understanding of the control circuits of the Type 316F/315F Transmitter will be helpful when trying to localize control malfunctions. Refer to the various tables of controls/indicators in the Operation section of this manual which lists the symbol designator, operating controls and indicators with their associated functions. In addition, refer to transmitter schematic and control ladder diagram.

5-4. CONTROL VOLTAGES.

There are two sections to the transmitter control circuits. When the blower breaker CB1 is set to the ON position, the 230 Vac section is energized. The +120 Vdc section is energized when circuit breaker CB3 is set to the ON position and master start relay K1 is energized. Indicator lamp voltages are supplied from the secondary of the lamp transformer T9. Control voltages are supplied to all sections of the transmitter when the master on switch is set to the on position.

5-5. TRANSMITTER STARTING SEQUENCE.

Set blower circuit breaker CB1, filaments CB2, +120 volt CB3, Bias CB4 and Screen CB5, to their ON positions. When master ON switch S5 is set to on position, 230 volt control voltage is applied to the coil of K1, energizing the +120 volt supply. When +120 volt supply is energized, blower holdover timer relay K3 is energized, applying 230 Vac to the coil of blower relay K2. Blower holdover timer relay K3 keeps the blower running for a period of time after the transmitter is shut down to allow the tubes to cool slowly after operation. The time delay period of K3 is adjustable from 0.5 to 10 minutes. When blower contactor K2 is energized, blower motor MB1 will be energized and cooling air is supplied to the PA grid plenum. Air flow switch S10 will operate, applying +120 DC control voltage to the coil of K4, PA filament contactor. When the filament contactor is energized, filament voltage is applied to the two PA tubes.

The coil of plate time-delay relay K12 is also energized when air flow switch S10 operates. When energized, relay K12 starts its timing cycle. The time-delay period of relay K12 is 5 seconds. When K12 completes its timing cycle, its normally open contacts closes, applying +120 control voltage to three door interlock switches. When the doors are closed, bias contactor K5 is energized, applying primary voltage to bias transformer T6. Normally open contacts on K5 will close, Ready lamp DS2 will light green.

When S6, Plate On switch is set to ON position, it applies 230 Vac control voltage to the coil of plate contactor K7. When K7 closes one set of normally open auxiliary contacts on K7 lights DS3 and another set of auxiliary contacts on K7 applies +120 volt control voltage to the coil of K6. When K6 energizes it applies primary power to screen supply transformer T7.

At this point, the transmitter starting sequence is complete and the transmitter is in operation.

The transmitter can be shut down by switching the plate switch S6 to off position. When MASTER switch S5 is switched to the off position, K1 is de-energized removing coil voltage from blower holdover timer K3. When K3 coil becomes de-energized, it begins its timing cycle. Normally open contacts of relay K3 remain closed, causing the blower to continue to run after the transmitter has been shut down, until relay K3 reaches the end of its timing cycle. At this point the control circuit shutdown sequence is complete.

5-6. OVERLOAD AND LOCKOUT CIRCUITS.

The dc overcurrent relay K11, protects the two power amplifier tubes and the high voltage power supply. Relay K11 is located in the negative return lead of the high voltage power supply. The dc overload relay is a small, sensitive relay with a fixed Nichrome wire resistor in shunt with its operating solenoid. The normally-closed contacts of the DC overload relay is in series with the coil of plate contactor K7. The normally open contacts of K11 operate the latch coil of K8 which removes the coil voltage from plate contactor K7. If an overload occurs the DC overcurrent relay will operate and remove coil voltage from the plate contactor K7, thereby shutting down the high voltage power supply. At the same time a set of normally open contacts operate on relay K8. This applies dc voltage to a R/C time constant of approximately 2 seconds. After the delay, K9 operates resetting K8 to its normal position. When K8 is in its normal position, the coil of the plate contactor, K7 is now energized. One set of K9 contacts applies coil voltage to K10, which is held energized through its own contacts. When the next overload occurs K11 operates K9, K8 cannot be automatically reset. The normally open contacts of K10 prevents K8 from being reset. A second set of normally open contacts on K8 will close, lighting overload lamp DS1. High voltage will remain off until the overload reset switch S7 is depressed. When the overload reset switch S7 is depressed the relay coils of K9 and K10 are de-energized, thus returning K8 to its original operating position. This reapplies coil voltage to plate contactor K7.

Interlock and grounding switches are provided for protection of operating personnel from accidently contacting any energized circuit carrying a high voltage potential. All doors and panels which provide access to high voltages are equipped with interlock switches which remove these voltages when doors and panels are opened. The doors are equipped with shorting switches which instantly ground the high voltages when the doors are opened.

WARNING

WHEN FILAMENT POWER IS ON, 230-VOLT FILAMENT TRANSFORMER POWER, THE +120 VOLT SUPPLY AND +120 VOLT CONTROL VOLTAGES ARE PRESENT IN THE TRANSMITTER, SINCE THEY ARE NOT SHORTED BY GROUNDING SWITCHES.

5-7. COMPONENT IDENTIFICATION AND LOCATIONS
(Refer to Photographs - Figures 5-1 through 5-15).

Photographs are provided in this maintenance section as an aid in familiarizing personnel with the location of components, accompanied by their appropriate symbol designators. This material is especially valuable when trouble shooting, repairing or replacing components. Refer to Operation, Section 3, for the functions of specific operating controls which are listed in Tables 3-1 through 3-4. Typical voltage and current values are also listed in the Operation, Section 3, of Table 3-5.

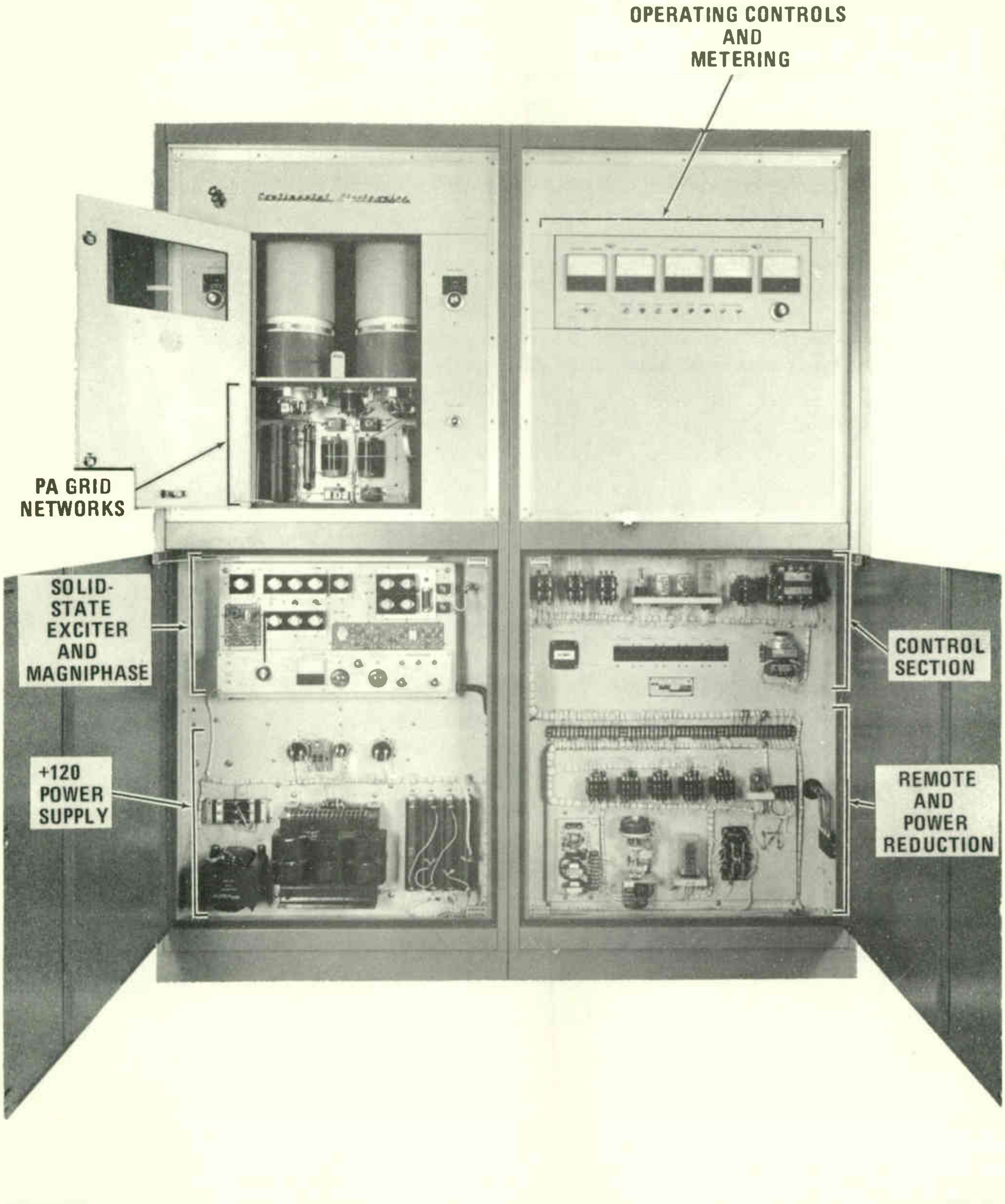


Figure 5-1. Transmitter Overall Front View, Showing Major Sections, Doors Open

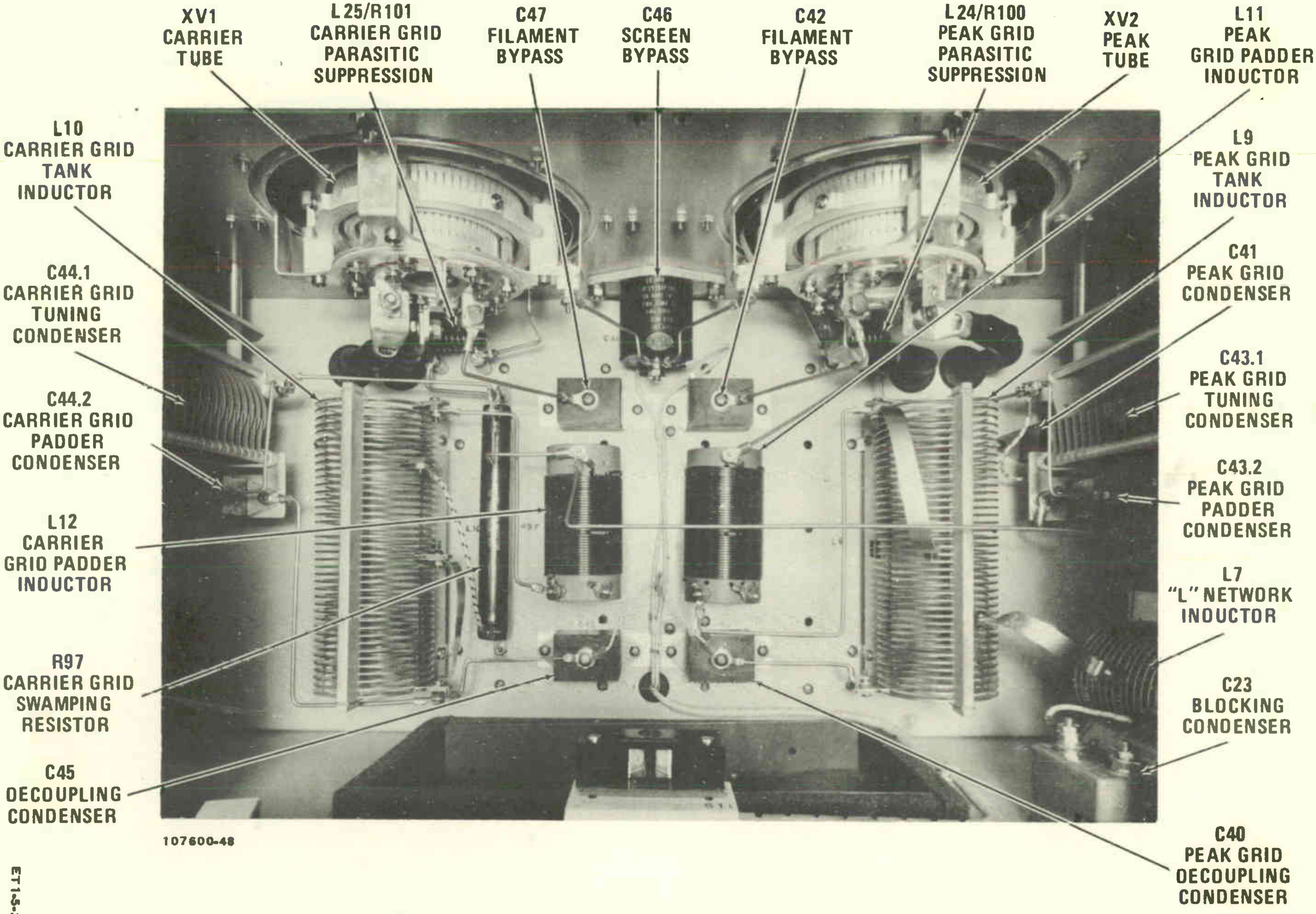
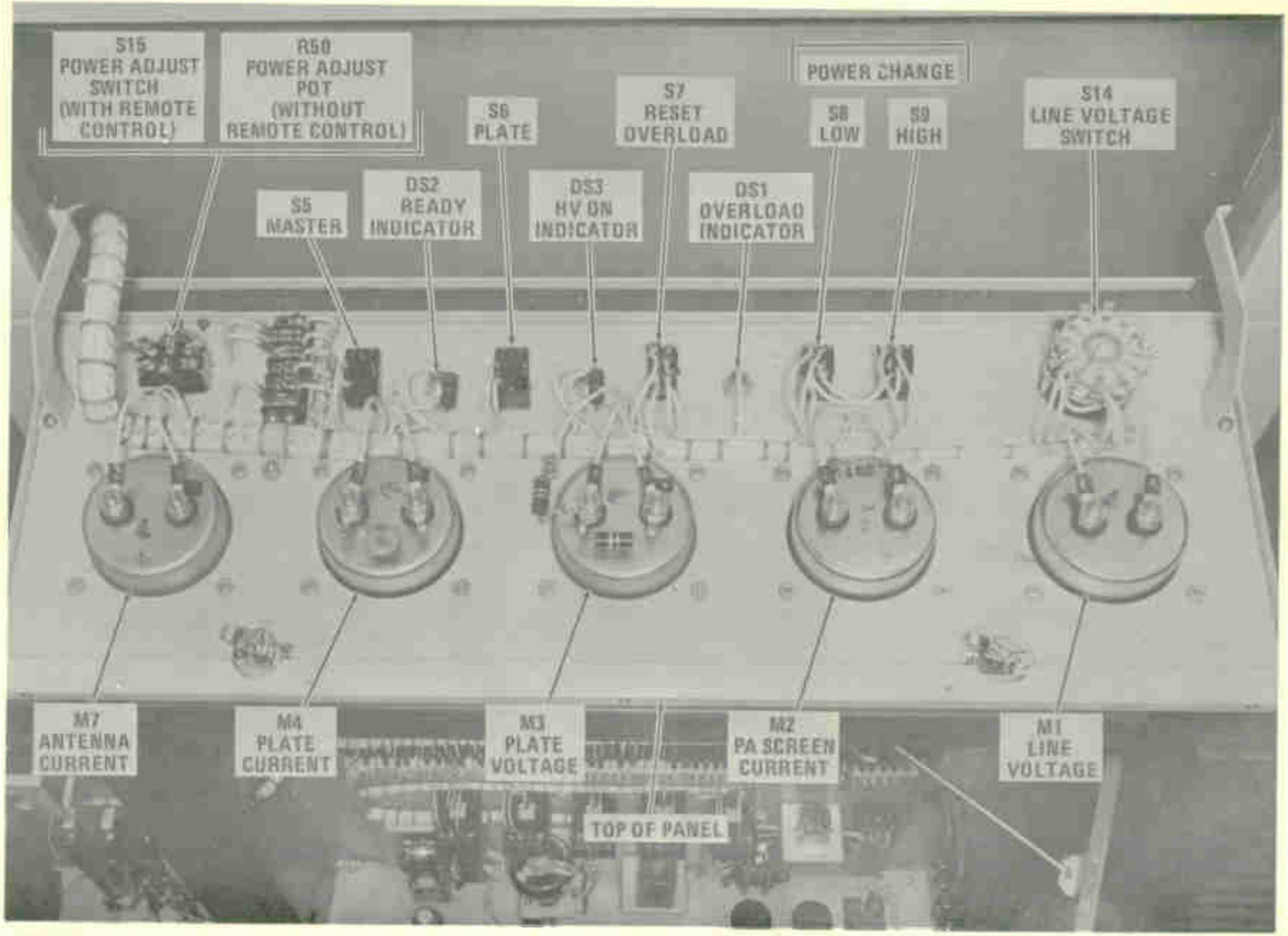


Figure 5-2. PA Grid Networks, Showing Carrier Tube Components (Left Half) and Peak Tube Components (Right Half), Internal Front View



107600-31

Figure 5-3. Operating Controls and Metering, Hinged Front Panel, Rear View

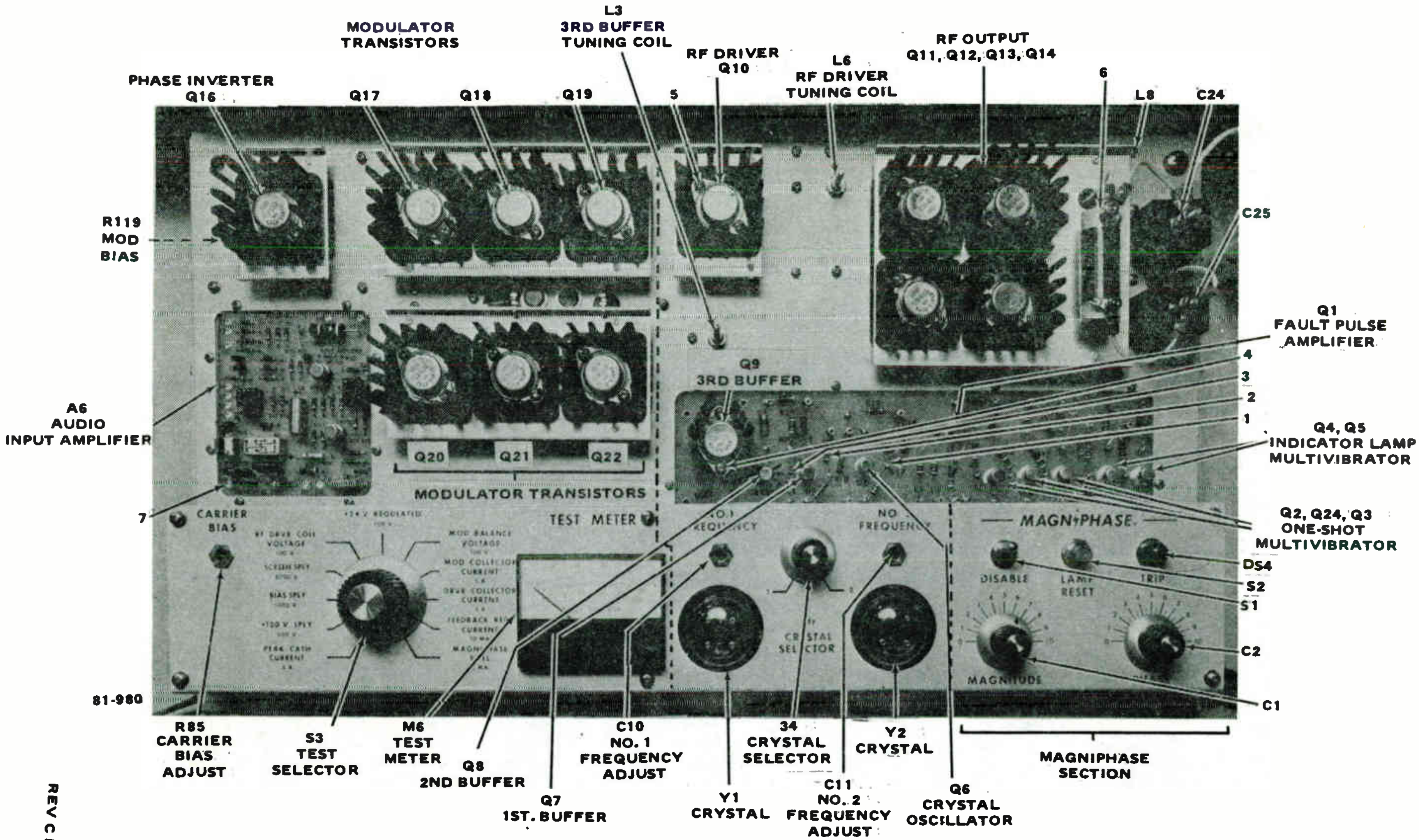


Figure 5-4. Solid State Exciter & Magniphase Panel
Showing Component Locations, Front View

REV C ET1-5-4

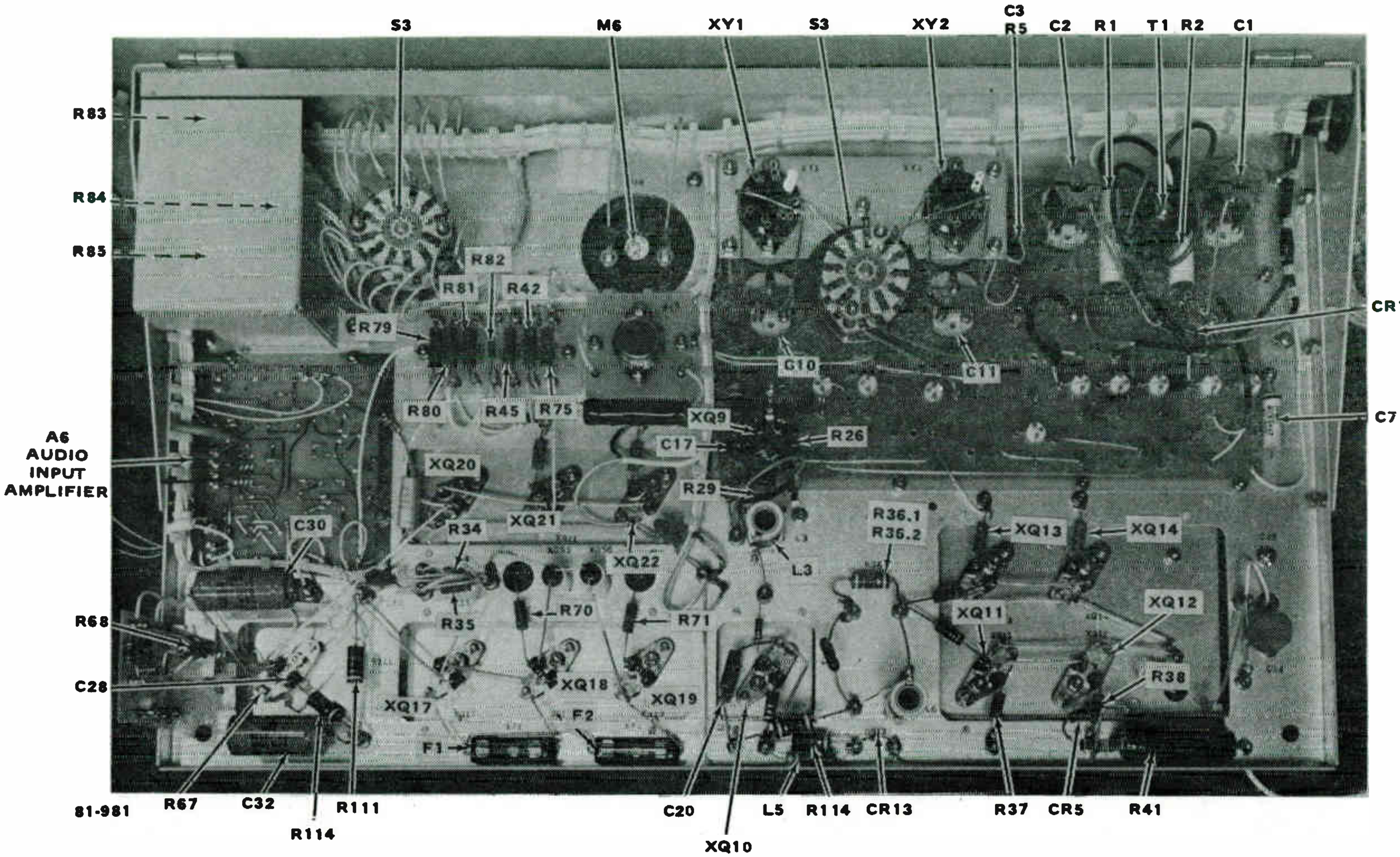
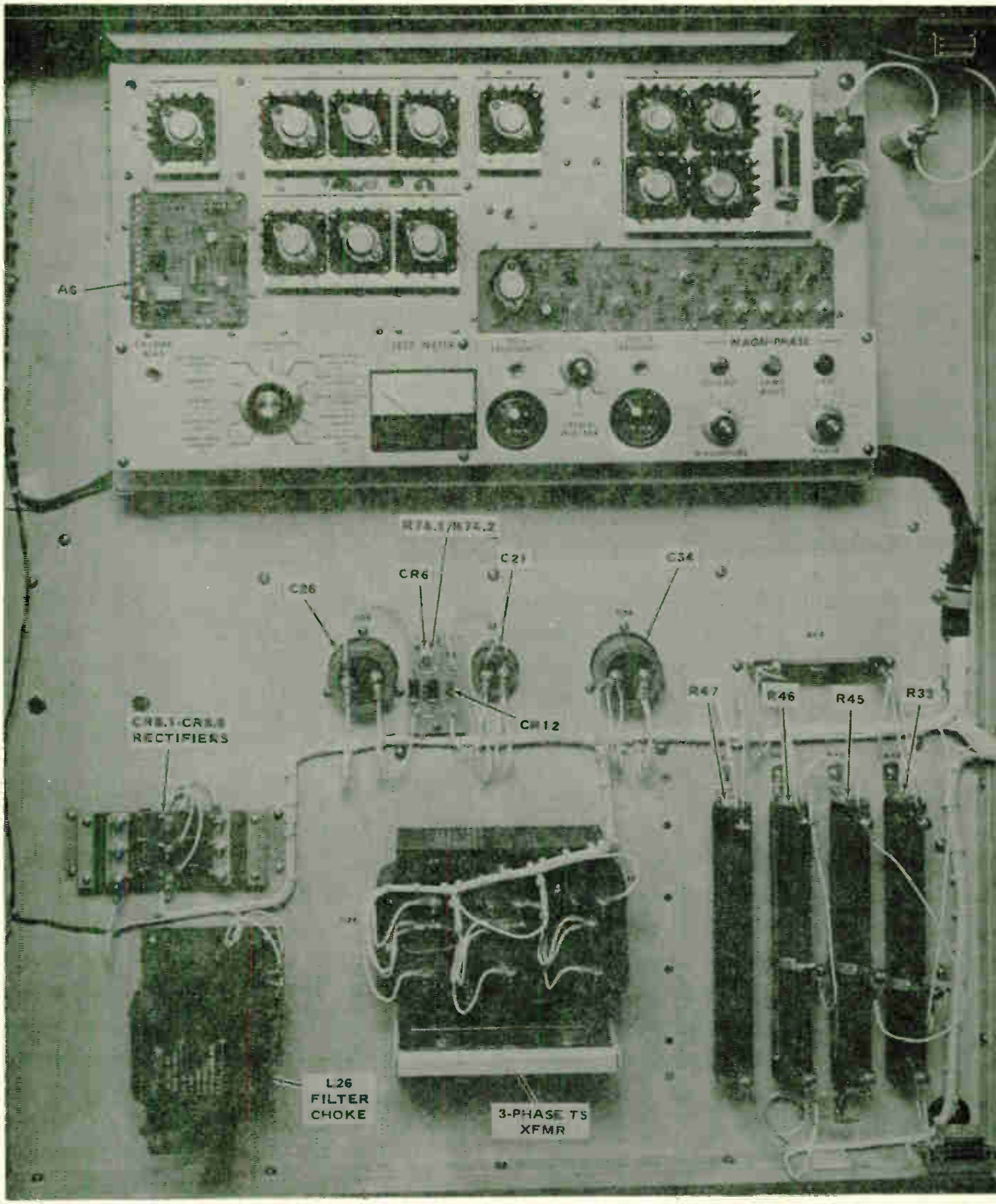


Figure 5-5. Solid State Exciter & Magniphase Panel,
Showing Component Locations, Rear View

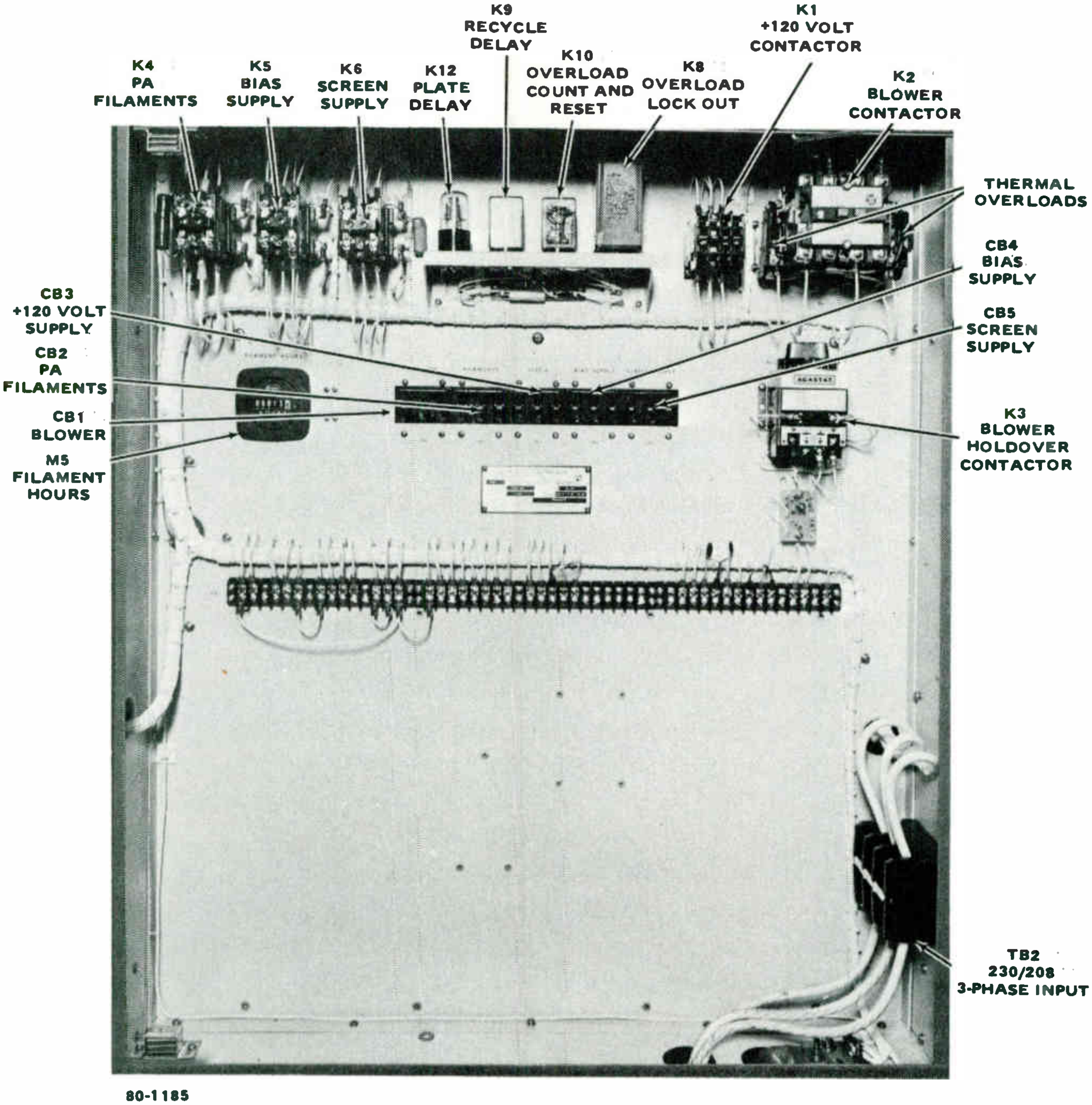
REV B ET1-5-5



81-982

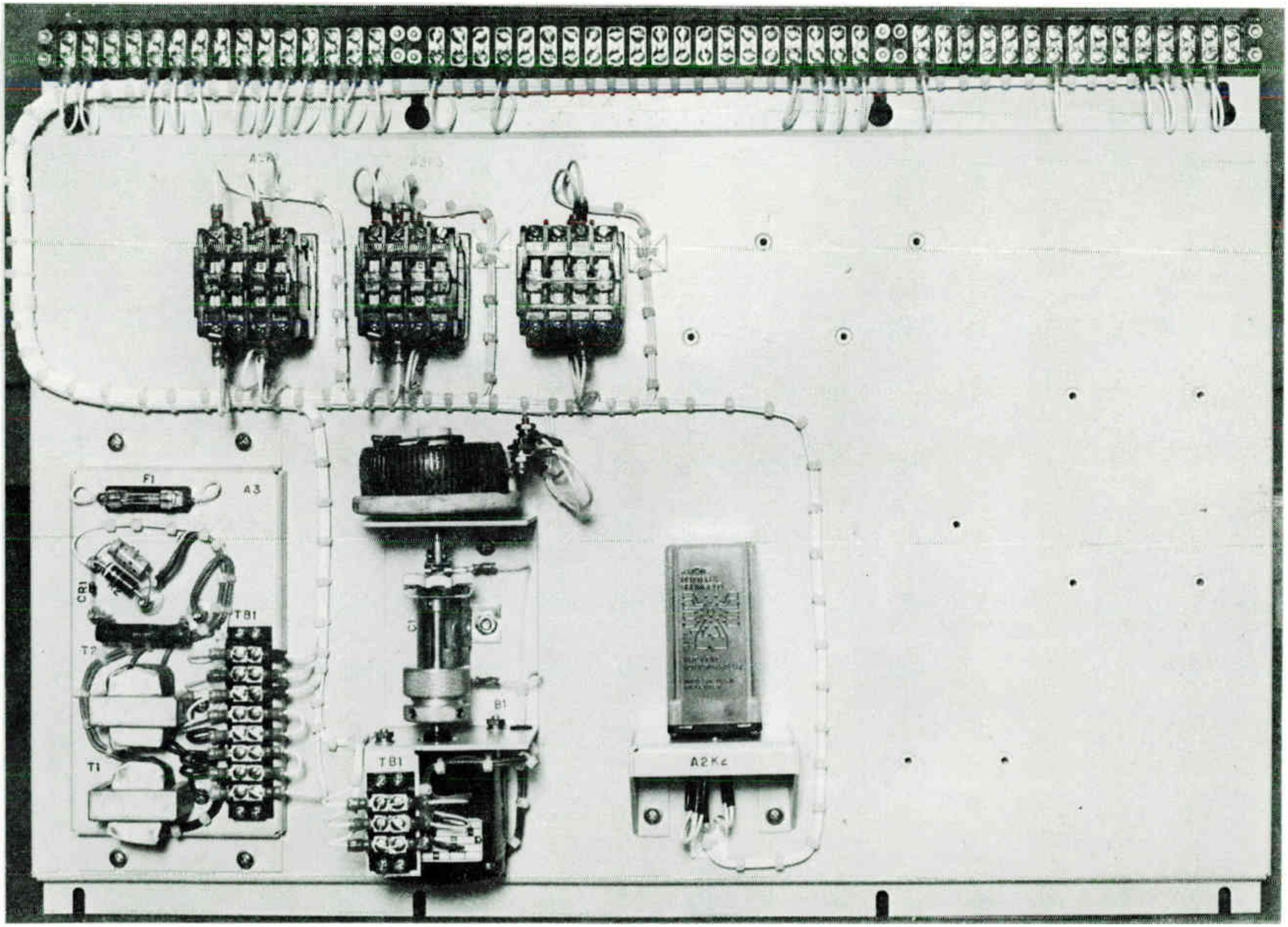
Figure 5-6. +120 Volt Power Supply,
Showing Component Locations, Front View

REV B ET1-5-6



REV A ET1-5-7

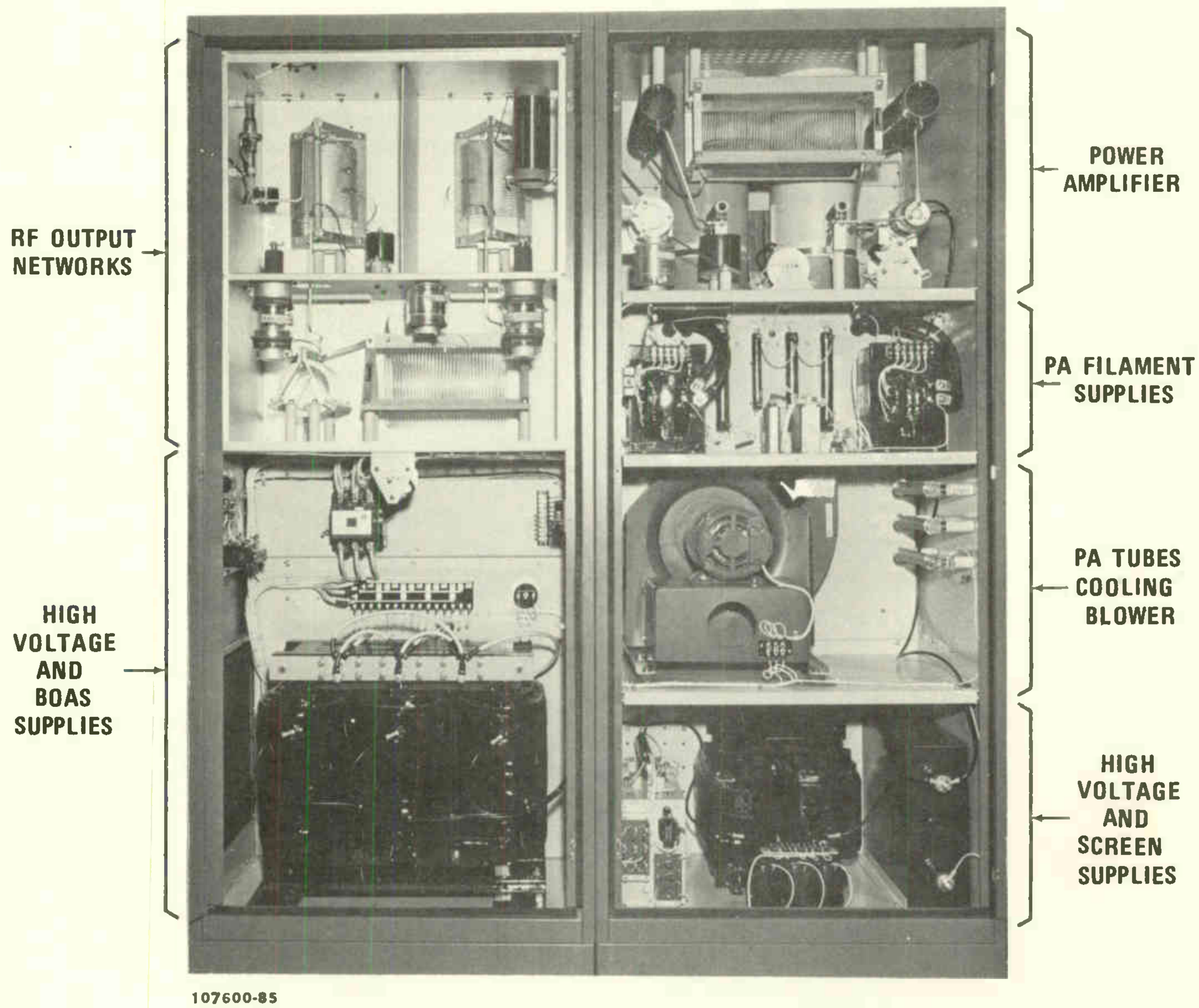
Figure 5-7. Control/Remote Compartment, Showing Circuit Breakers and Component Locations, Front View



ET1-5-29

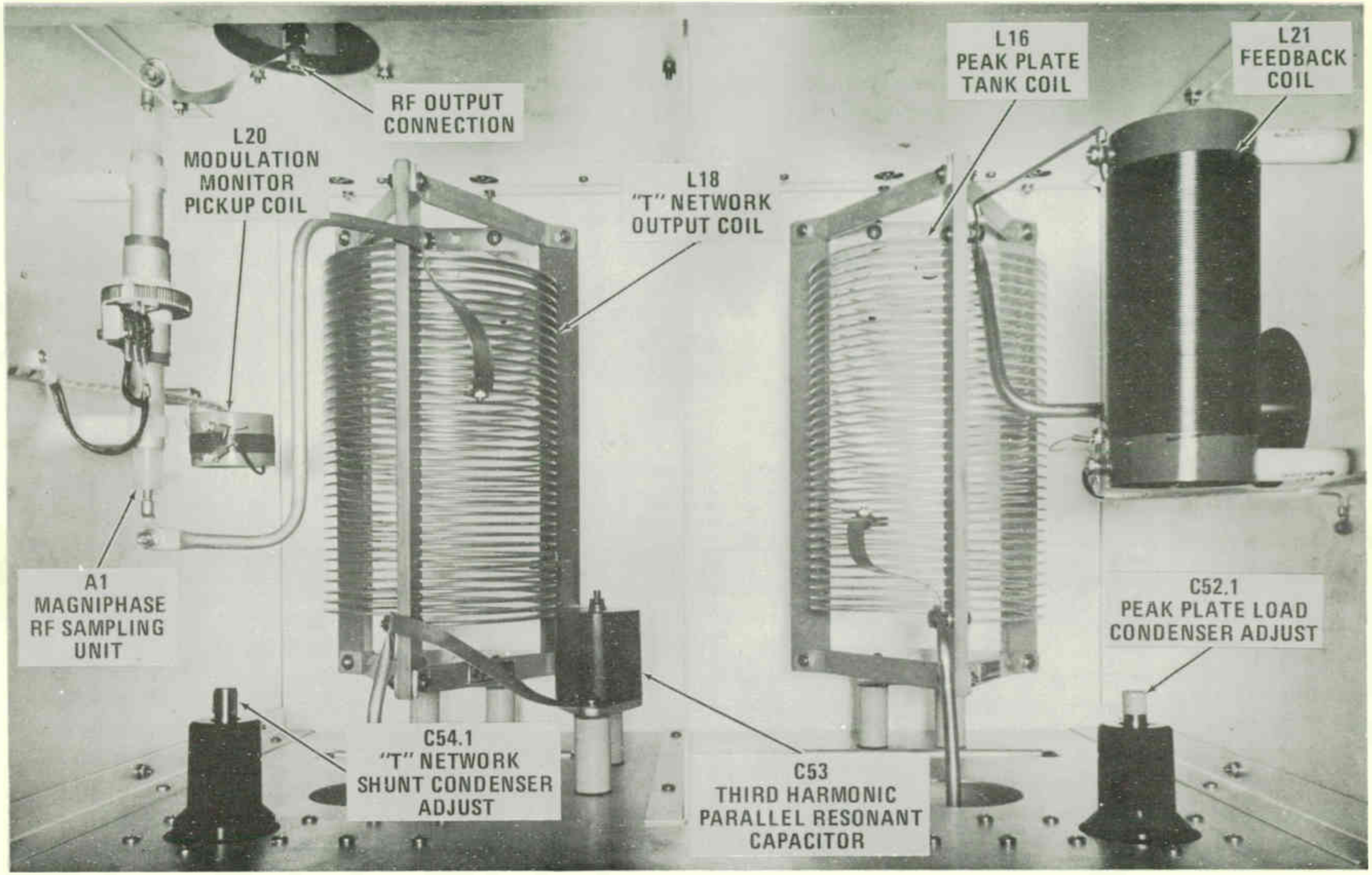
80-1188

Figure 5-7.1 Remote Control & Power Reduction Components - Optional Equipment



REV A ET1-5-8

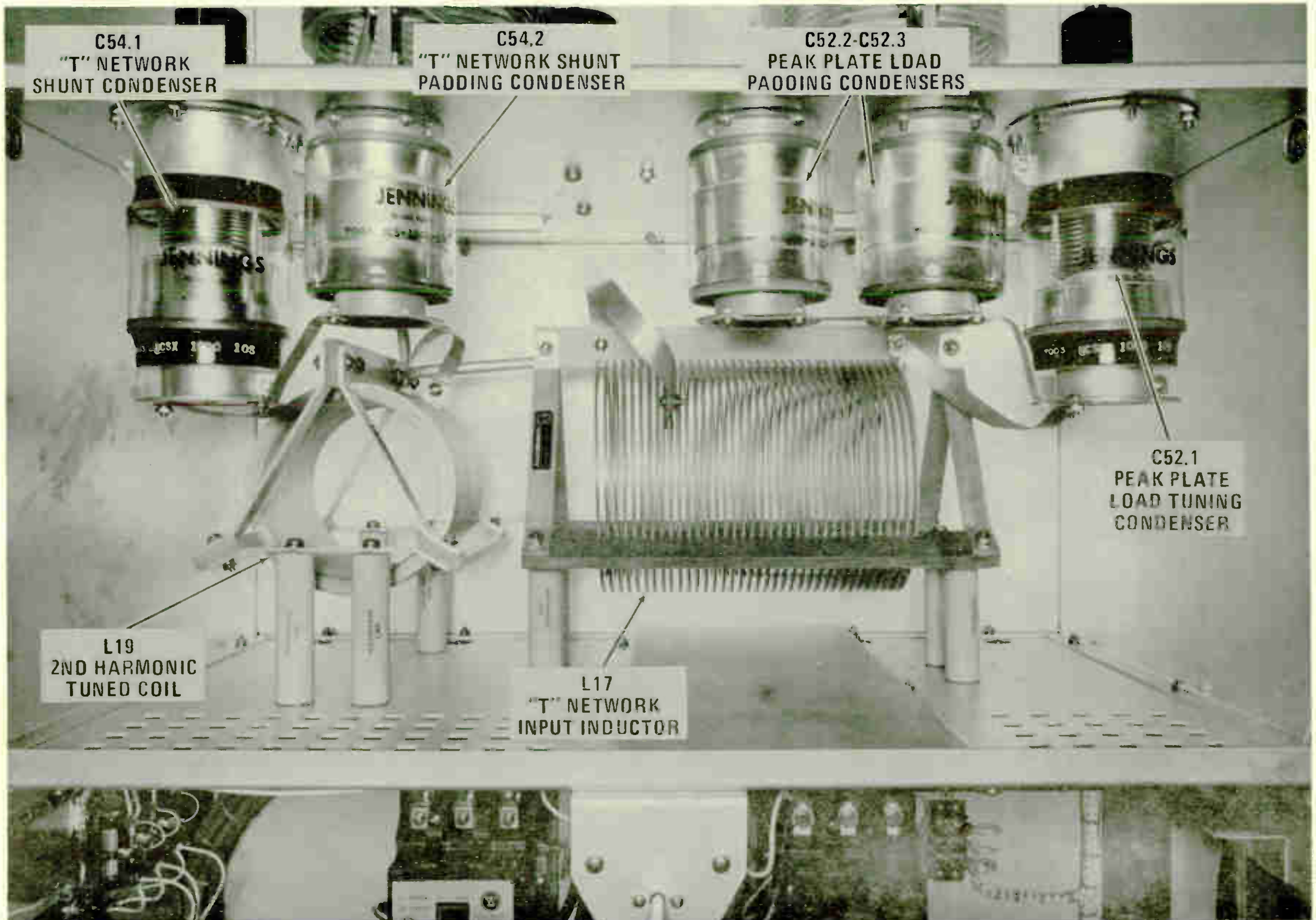
Figure 5-8. Transmitter Overall Rear View, Showing Major Compartment Areas, Doors Open



107600-42

ET 1-5-9

Figure 5-9. RF Output Network, Showing Peak Plate and Tee Network Inductors, Upper Left-Hand Compartment, Viewed from Rear



ET1-5-10

Figure 5-10. RF Output Network, Showing Tee Network Inductors and Condensers, Viewed from Rear

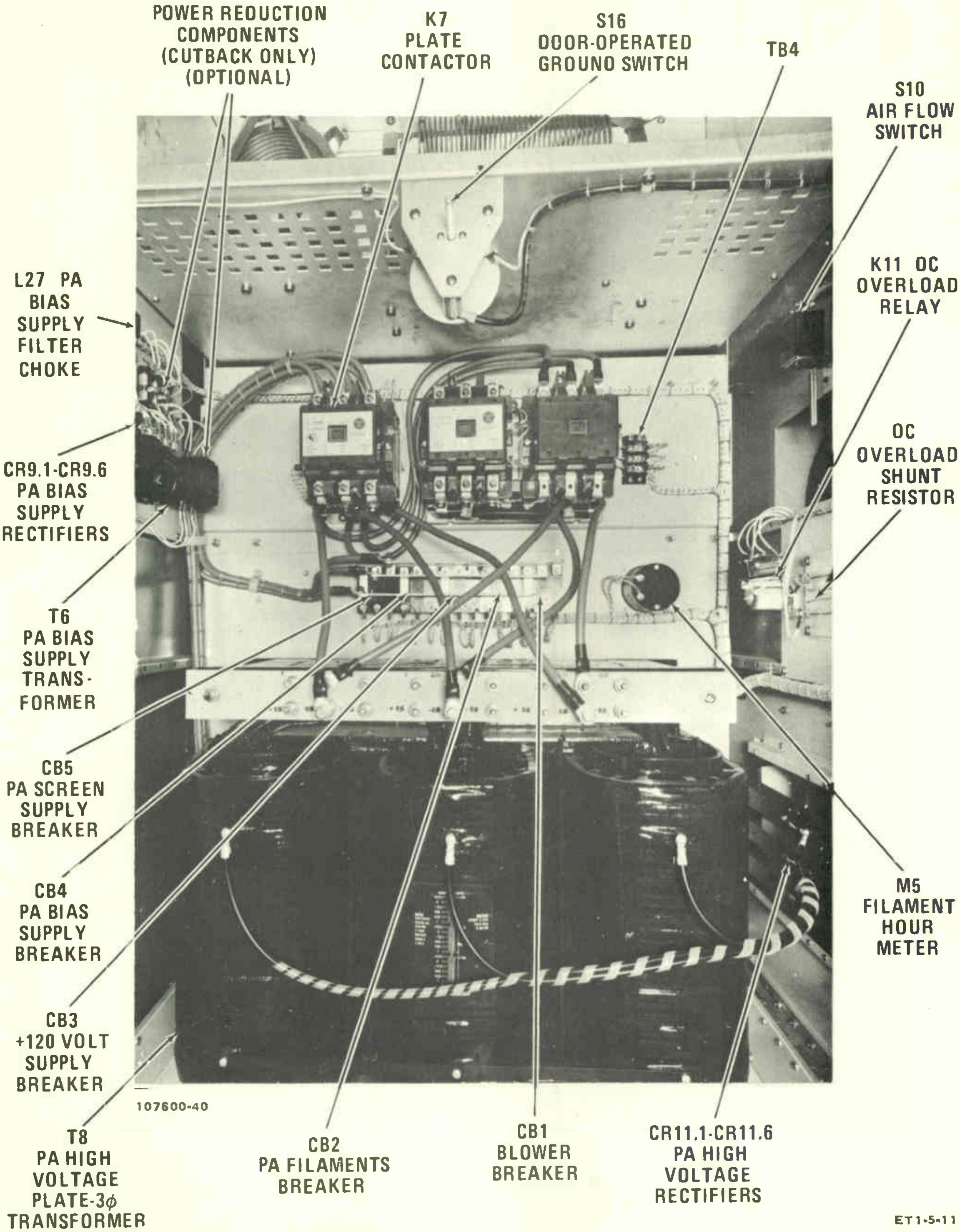
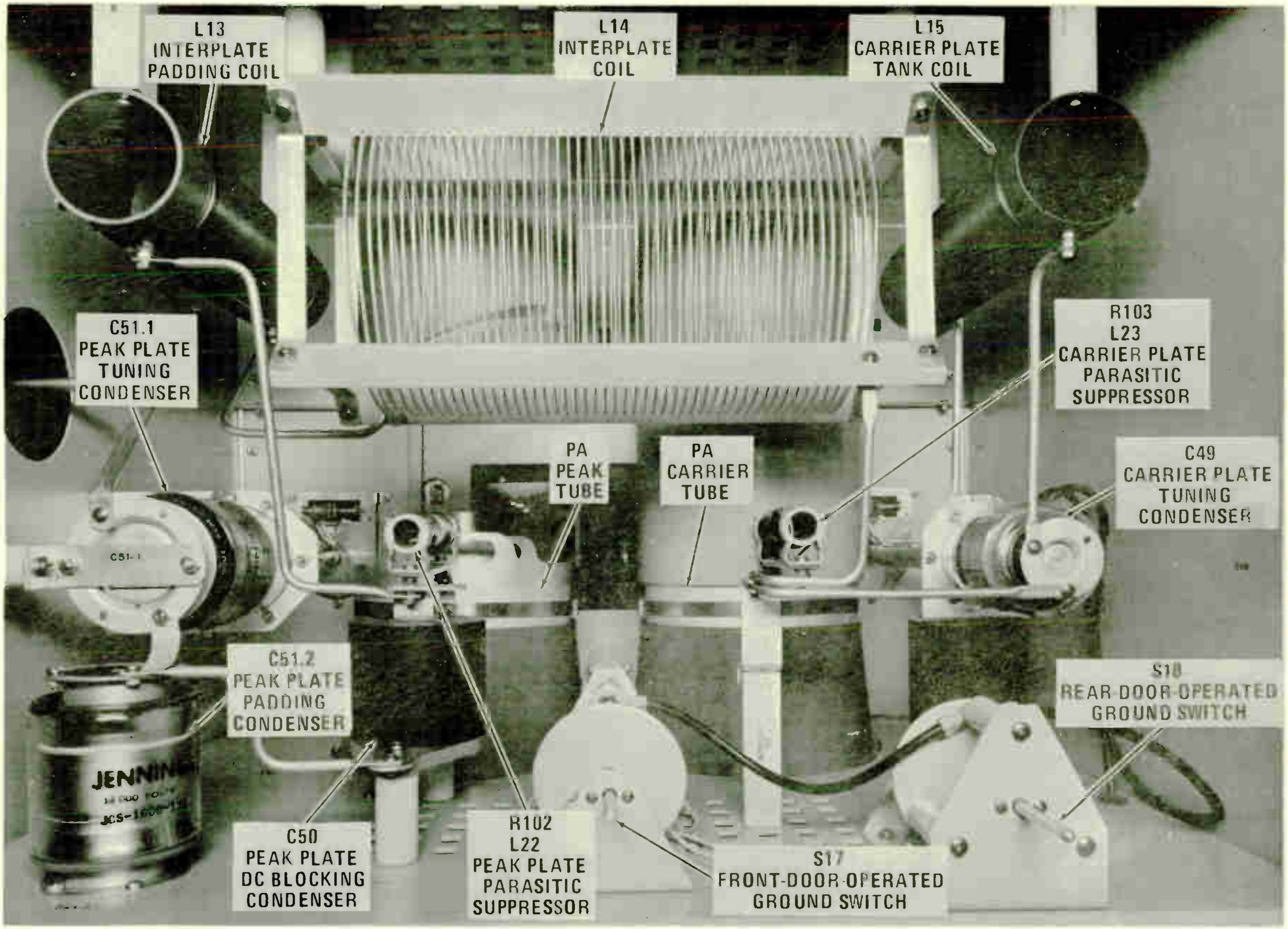


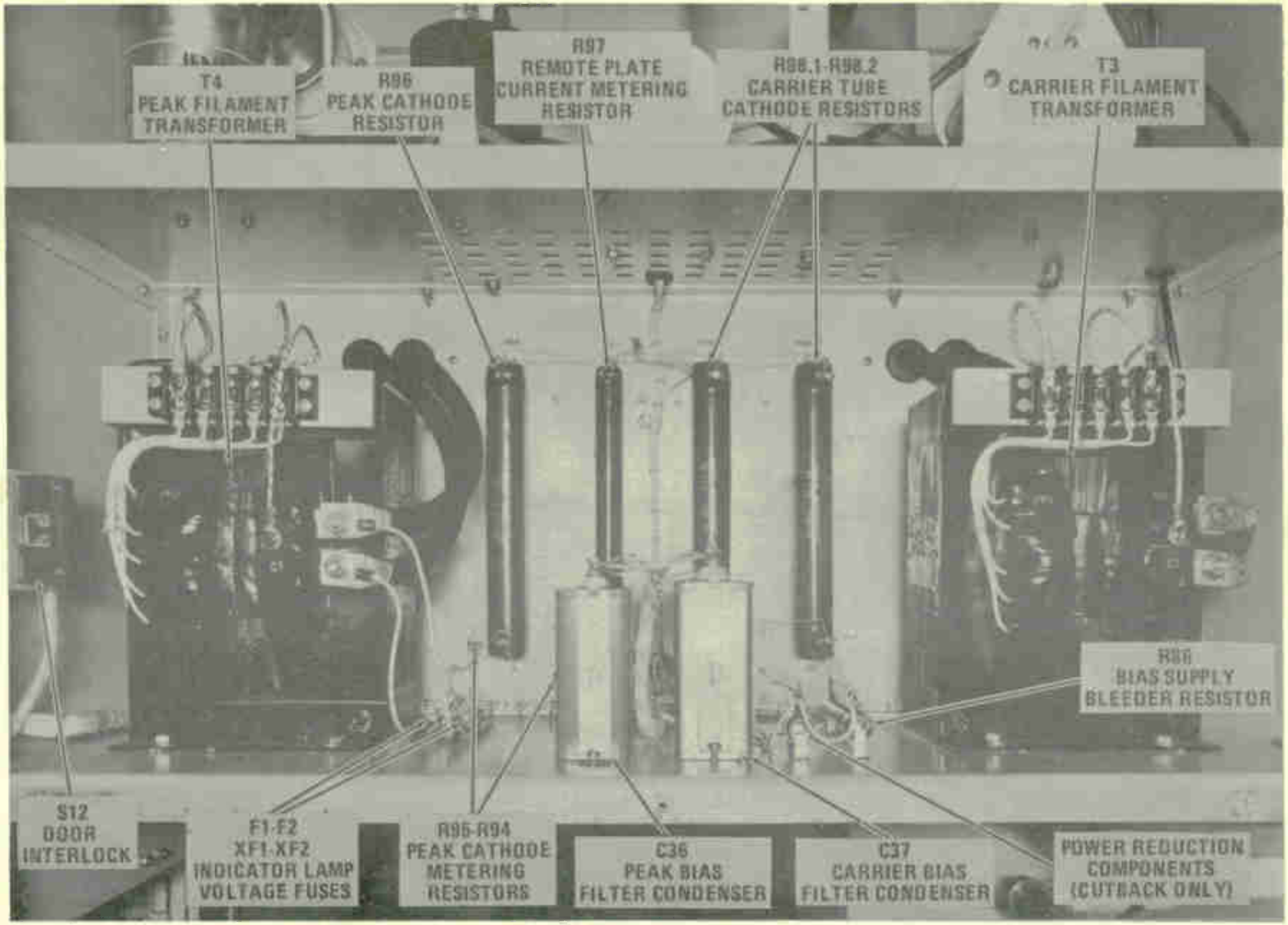
Figure 5-11. High Voltage Plate Transformer and Bias Supply, Lower Left-Hand Compartment, Viewed from Rear



ET1-5-12

107600-54

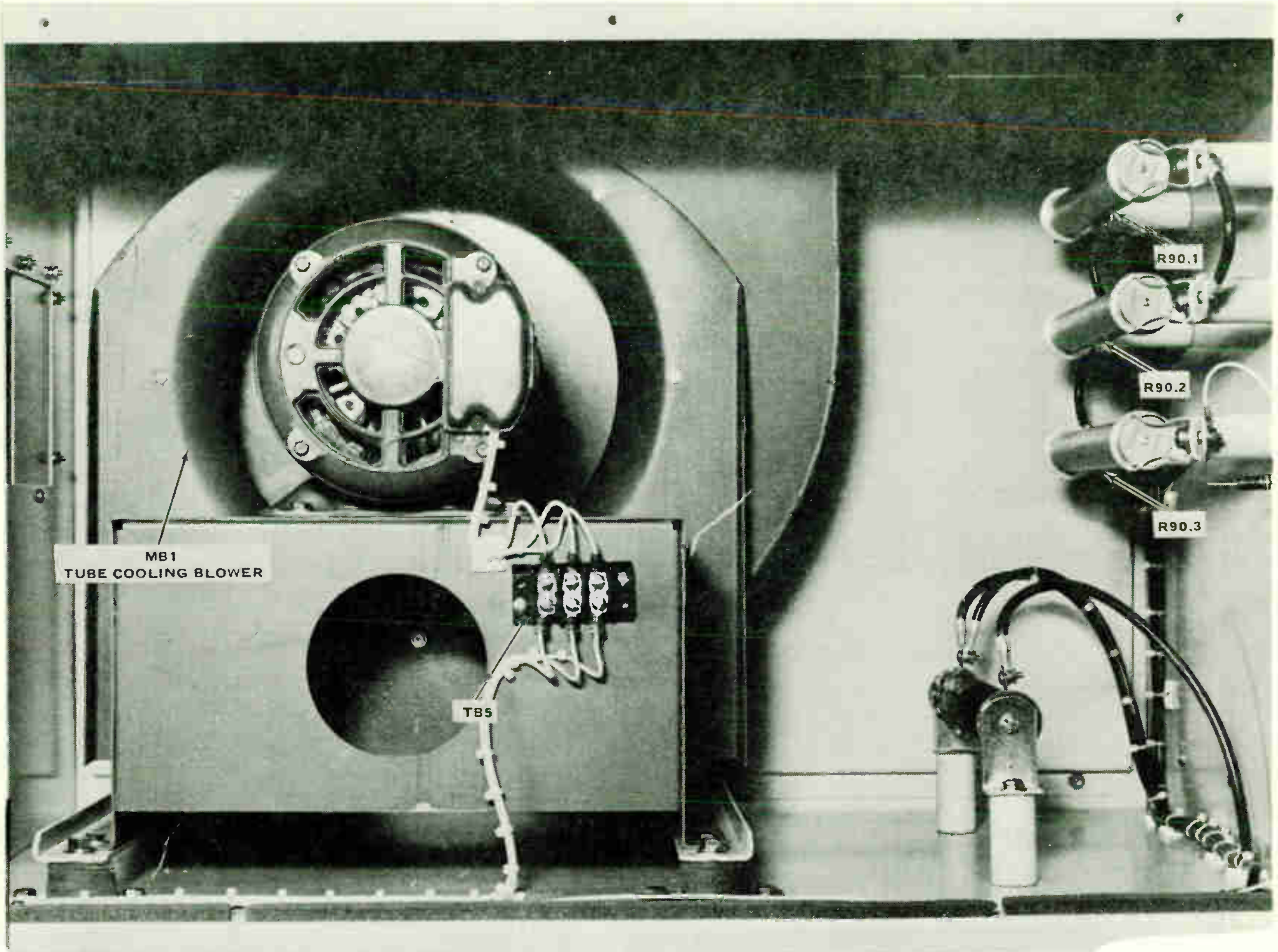
Figure 5-12. Power Amplifier Tubes and Manually Operated Tuning Condensers, Viewed from Rear



ET1-5-13

107600-53

Figure 5-13. Power Amplifier Filament Transformers, Viewed from Rear



80-1190

Figure 5-14. Cooling Blower for Power Amplifier Tubes, Viewed from Rear

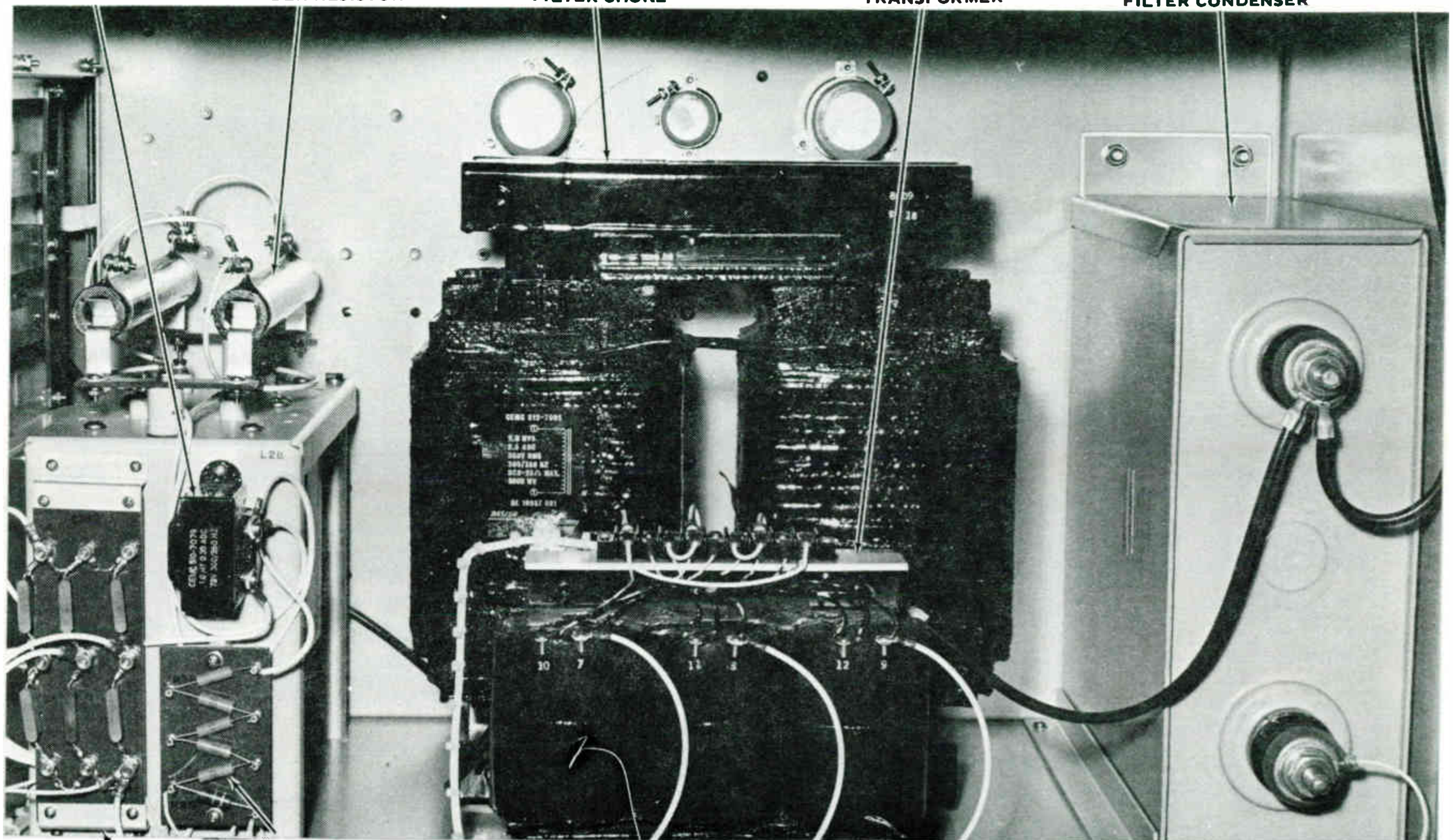
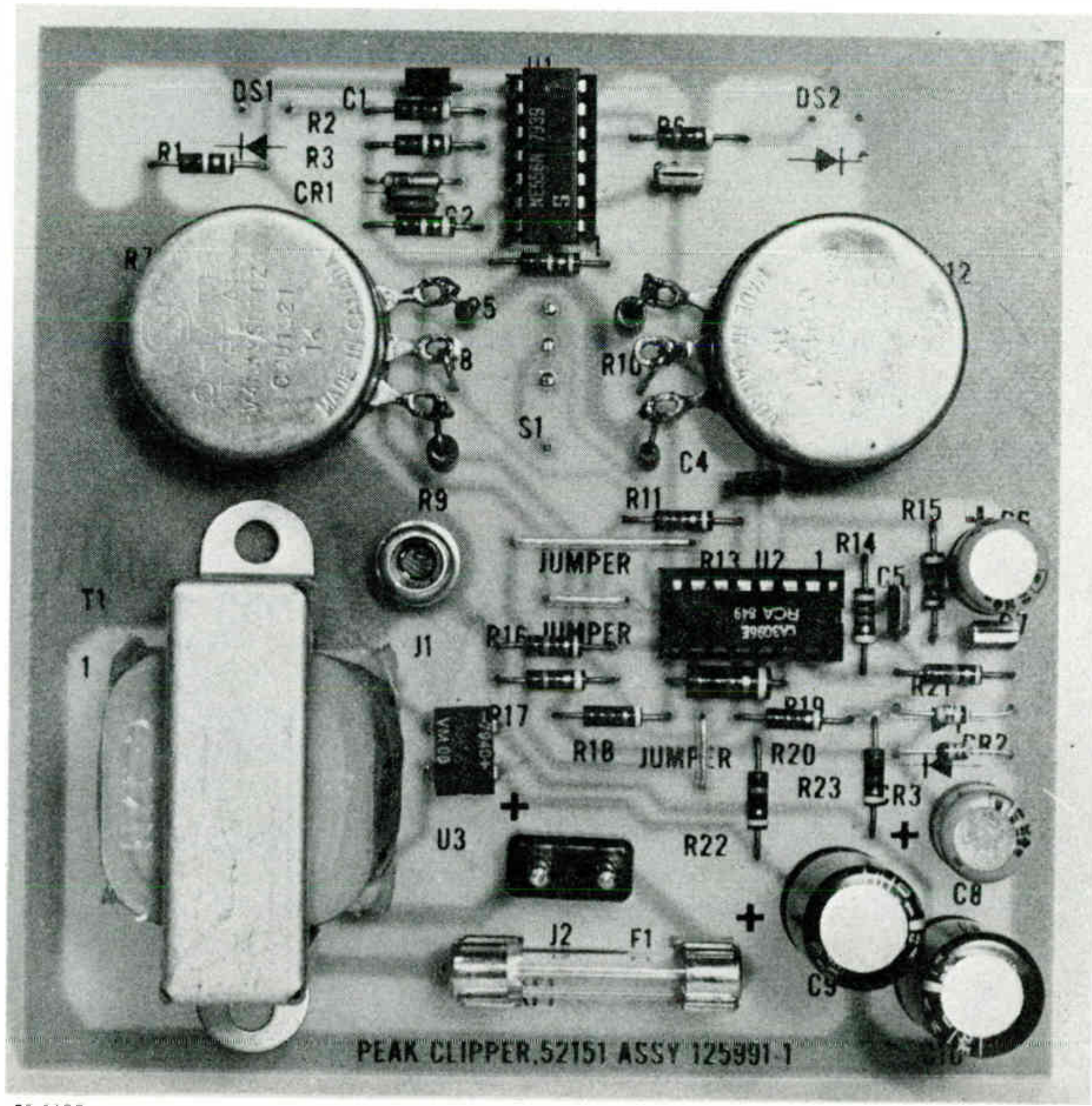
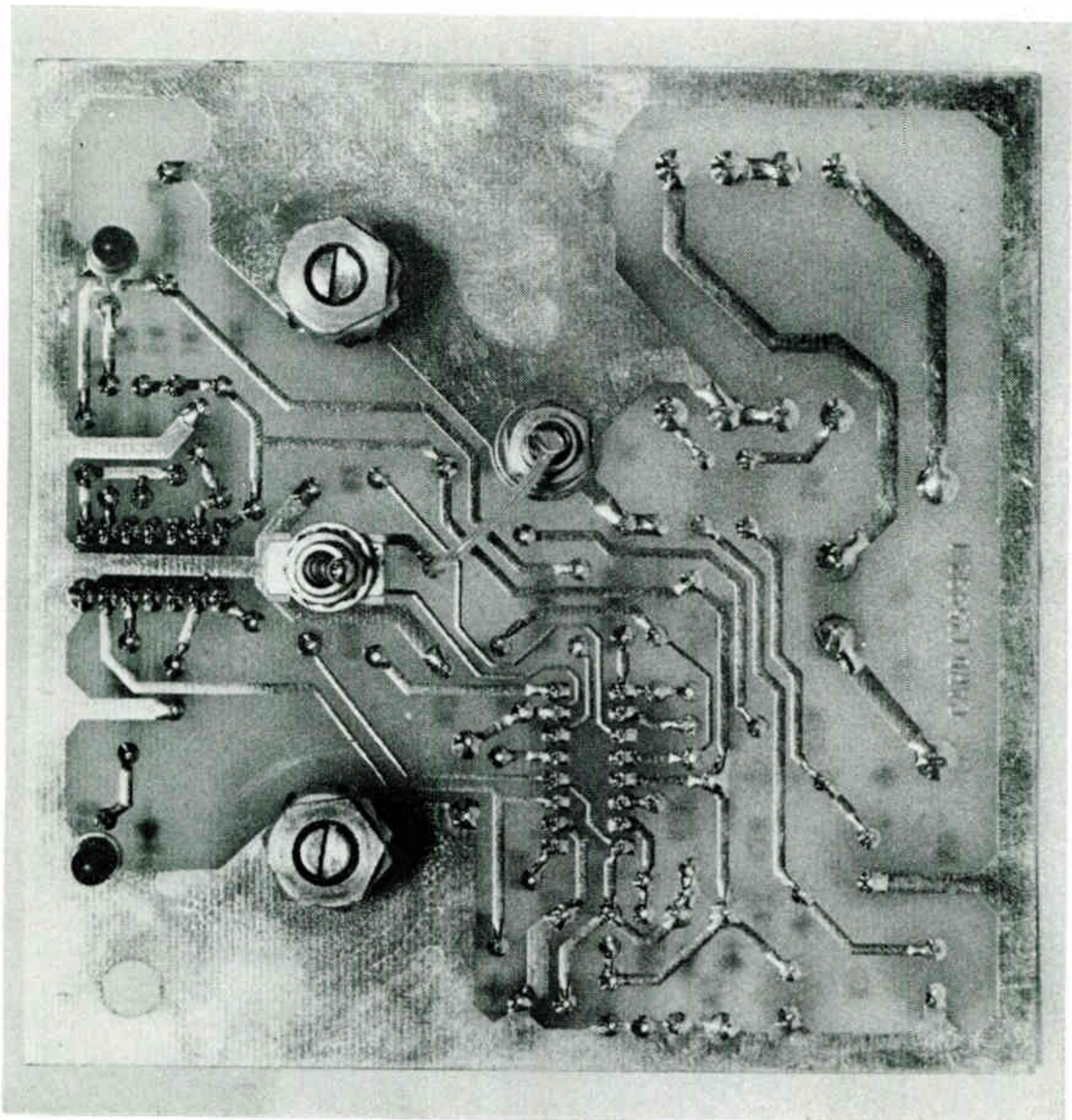


Figure 5-15. High Voltage Plate & Screen Supply Components, Viewed from Rear



80-1192

Figure 5-15.1 Peak Clipper Assembly



80-1182

Figure 5-15.2 Peak Clipper Assembly

ET1-5-27

5-8. ALIGNMENT/CALIBRATION PROCEDURES.

Alignment/calibration procedures are included in the following paragraphs.

5-9. RF DRIVER AND MODULATED POWER AMPLIFIER (RF OUTPUT).

For initial tuning of this section or for changing frequency, it is essential to refer to the schematic and EPL in order to have the proper values of several components that are dependent on frequency. Namely C17, C18, C19, C20, C24, L3, L6, L8, R109, R115, R116, R133, R134. Values of the above components are listed in the EPL, except L3 and L6 which are listed below.

L3 and L6 inductance values should be as follows:

49 turns of #25 GA wire (535 - 700 KHz)
40 turns of #24 GA wire (700 - 920 KHz)
33 turns of #22 GA wire (920 - 1210 KHz)
25 turns of #22 GA wire (1210 - 1620 KHz)

After the correct components are mounted in the circuit, the only adjustment needed to be made is when the transmitter is turned on. L3 and L6 should be tuned for maximum drive and saturation of the output transistors, and for minimum distortion of the transmitter output.

5-10. PA GRID NETWORK - INITIAL ALIGNMENT (TUNE UP).

The grid network is tuned at the factory with an RF bridge on the customers operating frequency and need never be touched unless the frequency is changed. The tuning procedure is quite simple and is performed as follows:

1. Short the grid of the peak tube to ground with a clip lead.

2. Disconnect the peak grid condenser (C43.1) from the carrier grid coil L12 and set with the bridge to 1100 ohms reactance.

3. Reconnect the peak grid capacitor in the circuit and leave the grid of the peak tube shorted to ground.

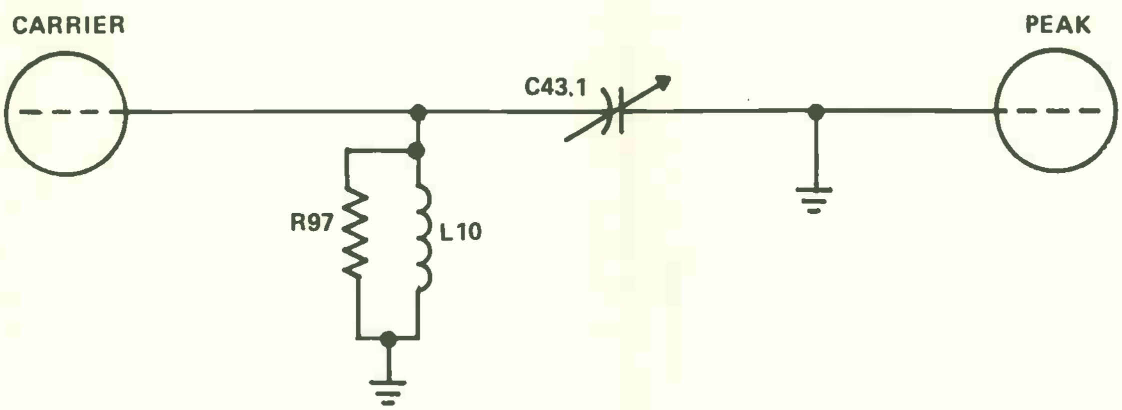
4. Measure the impedance at the grid of the carrier tube, and adjust the carrier grid condenser and the taps on the tank coil L10 to obtain the following reading:

600 ohms +j0	(535 KHz - 750 KHz)	For 316F
640 ohms +j0	(750 KHz - 1100 KHz)	10 KW
680 ohms +j0	(1100 KHz - 1620 KHz)	Output

or

500 ohms +j0	(535 KHz - 750 KHz)	For 315F
550 ohms +j0	(750 KHz - 1100 KHz)	5 KW
600 ohms +j0	(1100 KHz - 1620 KHz)	Output

Adjustment of the tap on L10 is made to place C44.1 in the proper range of adjustment. It can be seen by the following simplified diagram that by shorting the grid of the peak tube to ground, the peak grid condenser C43.1 will parallel resonate the net shunt inductance of the carrier grid coil and the impedance measurement will be pure resistance.



5. Remove the short from the peak tube grid and connect a 1000 ohm non-inductive resistor (a small composition resistor is suitable) from peak tube grid to ground.

6. Remove the drive tap from the bottom end of the peak grid coil (L9) and measure the impedance at the grid of the peak tube. Adjust the shorting tap at the top of L9 for a resistance measurement of around 660-700 ohms with zero reactance. It can be seen that when this is done, the input to the 90° network is a pure resistance of 2000-2300 ohms. The 660-700 ohms measured is the net resistance of 2000-2300 ohms in parallel with 1000 ohms. The 1000 ohm resistor is used because the highest measurable resistance on the bridge is 1000 ohms.

7. Select a drive tap on the bottom of L9 that results in a resistance measurement of 20 to 30 ohms resistance. There may be some inductive reactance in this measurement, but it is unimportant because it will effectively be in series with the output inductor L9.

8. Measure the impedance at the collector of the output RF transistors (Q11-Q14) and set the tap on L7 for a resistance of 35 to 40 ohms. Since the tank condenser (C24) of the transistor output network is fixed, there may be a slight reactance in this measurement. This reactance is insignificant since the network is extremely broadband and C24 is changed in only three steps from 550-1600 kc.

5-11. PA OUTPUT CIRCUIT.

The output circuit consists of two basic networks, a "pi" network and a "tee" network.

The "T" network is used to transform the output load impedance which might be anything from 50 to 230 ohms, to 150 ohms resistance at the input to L17. The "pi" network is used to transform 150 ohms to 650 ohms at the plate of the peak tube. For initial tuning of the "T" network, the reactance values of the components are listed on the alignment charts for either 50 or 230 ohms. For antenna loads other than this, the reactances are noted on the transmitter Test Data, or will have to be calculated by the customer in case of a frequency change.

5-12. "T" NETWORK TUNE UP.

1. Disconnect C53 and L18 from L17 and L19.

2. Connect a bridge at the input of C53 and L18 and resonate the circuit to parallel resonance at the third harmonic by adjusting the tap on L18.

3. Use the second tap on L18 to set the reactance of the branch to the given or calculated value at the fundamental operating frequency.

4. Disconnect L19 from L18 and L17 and series resonant it with C54 at the second harmonic, while maintaining the right inductance value at the fundamental frequency.

NOTE

These Harmonic Traps should be tuned using a sensitive detector in conjunction with an RF oscillator and frequency counter.

5. Connect C53, L18, L19 and L17 back together.

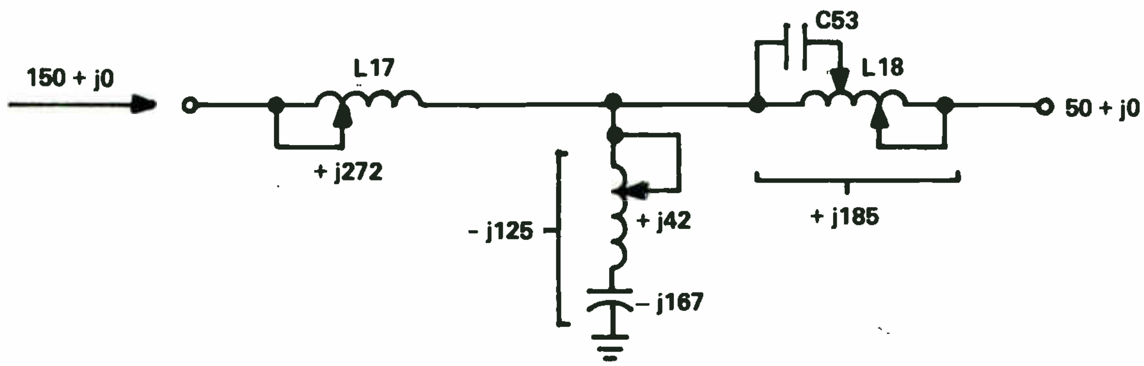
6. Disconnect L17 from L16 and C52.

7. Connect the bridge to the input of L17 and short its output to ground with clip lead.

8. Adjust the tap on L17 to obtain the correct reactance value.

9. Remove the short from L17 output and the bridge should read 150 ohms +j0. It might be necessary to adjust taps on L17 and L18 slightly to obtain the desired impedance of 150 ohms +j0 at the input of L17.

Values for the "T" network are calculated to transform the antenna impedance to 150 ohms with a phase shift of -135° for antenna impedances of 50 to 150 ohms. For 150 - 230 ohm loads, components are figured for "T" of (120° - 90°) phase shift.



Typical reading for 50 ohm load.

5-13. "PI" NETWORK TUNE UP.

The pi network is calculated to transform 150 ohms to 650 ohms with a phase shift of -135°.

1. Disconnect C52 from the circuit, and using a bridge set its value to (-j 90 ohms).

2. Reconnect L17, C52 and L16 together.

3. Short the output of L16 with a clip lead to ground and disconnect its input from C51. Using a bridge set its inductance to (+j 210 ohms).

4. Remove the short from L16 output and reconnect L16 to C51.

5-14. PA INTERPLATE NETWORK - INITIAL ALIGNMENT.

For any specific frequency, the number of turns required on the interplate coil L14 is given on the tuning chart, which also states which fixed padding coil (L13) is required. When the interplate inductance is properly set and the plate network properly loaded (650 ohms at plate of peak tube), all that is required is to tune the carrier plate tuning condenser (C49) for maximum output power. For initial tuning with an RF bridge, the following procedure is used.

1. Make sure to have the right value of L13 interplate padding coil (if used) in the circuit.

2. Disconnect the interplate coil from C50.

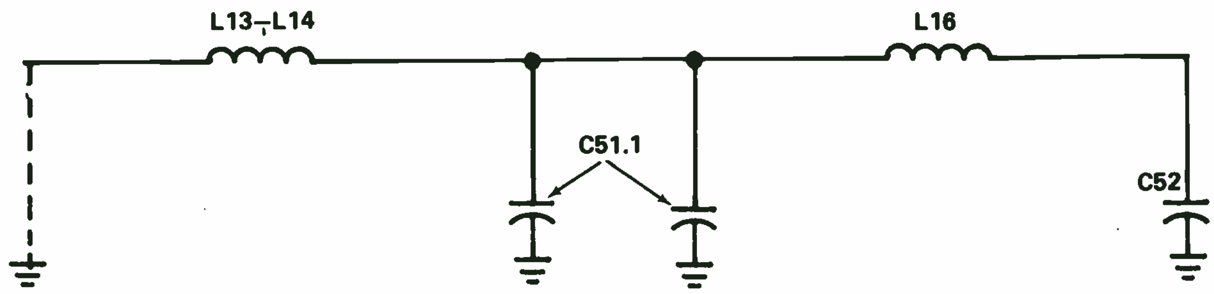
3. Using a clip lead, place a short from the otuput of L14 (junction with R103 and L23) to ground.

4. With a bridge looking at the input of L14 (and L13 if used) set it to 1800 ohms. Reconnect L14 into the circuit after measuring and remove the short from its output.

5. Short the plate of the carrier tube to ground with a clip lead.

6. Measure with the bridge at the plate of the peak tube and set to 650 ohms resistance and zero reactance. If the resistance is low, increase the capacity of C52.1 by turning the shaft counter clockwise or vice versa if the resistance is higher than 650 ohms. Turning the peak plate tuning condenser (C51.1) will tune out the reactance. This measurement can only be made after the tee network has been properly set and when the tap on L16 is set according to the tuning chart and when the proper padding condensers are installed in the C51 and C52 positions.

It can be seen by the following simplified diagram that by shorting the plate of the carrier tube to ground, the interplate inductance will parallel resonate the portion of C51 required as the output capacitance of the 90° interplate network and will thus remove itself from the circuit making the measurement purely resistive (650 ohms).



7. Remove the clip lead short circuit from the plate of the carrier tube.

8. Set the carrier plate tuning condenser (C49) to the dial reading corresponding to the operating frequency as shown on the tuning chart. If desired, the carrier plate condenser can be tuned with the bridge by measuring at the plate of the carrier tube and tuning C49 for zero reactance. The resistance will be around 4000 ohms and if the bridge will measure only up to 1000 ohms, then a parallel non-inductive resistor will have to be used as described in the PA Grid Network - Initial Alignment (tune up) procedure, Step 5.

9. The proper setting of C49 is at the point where maximum output power occurs which will closely correspond to a peak in the screen current (M2).

10. After the transmitter is turned on, it might be necessary to readjust the interplate coil for proper loading of the PA circuit. An indication of correct loading is the screen current, along with plate current. Proper values are around 40 ma for screen (I) and 2.2-2.3 ampere for plate (I). If the screen current is low, more interplate coil is needed, and visa versa.

5-15. ALIGNMENT CHARTS (Refer to Figures 5-16 through 5-23).

Individual alignment charts are provided for initial settings of the inductors and capacitors which form the various tunable networks. Each chart includes curves and instructions for the various components of the "pi" network, "tee" network, carrier plate condenser, interplate coil, grid tank circuits, peak grid condenser, etc.

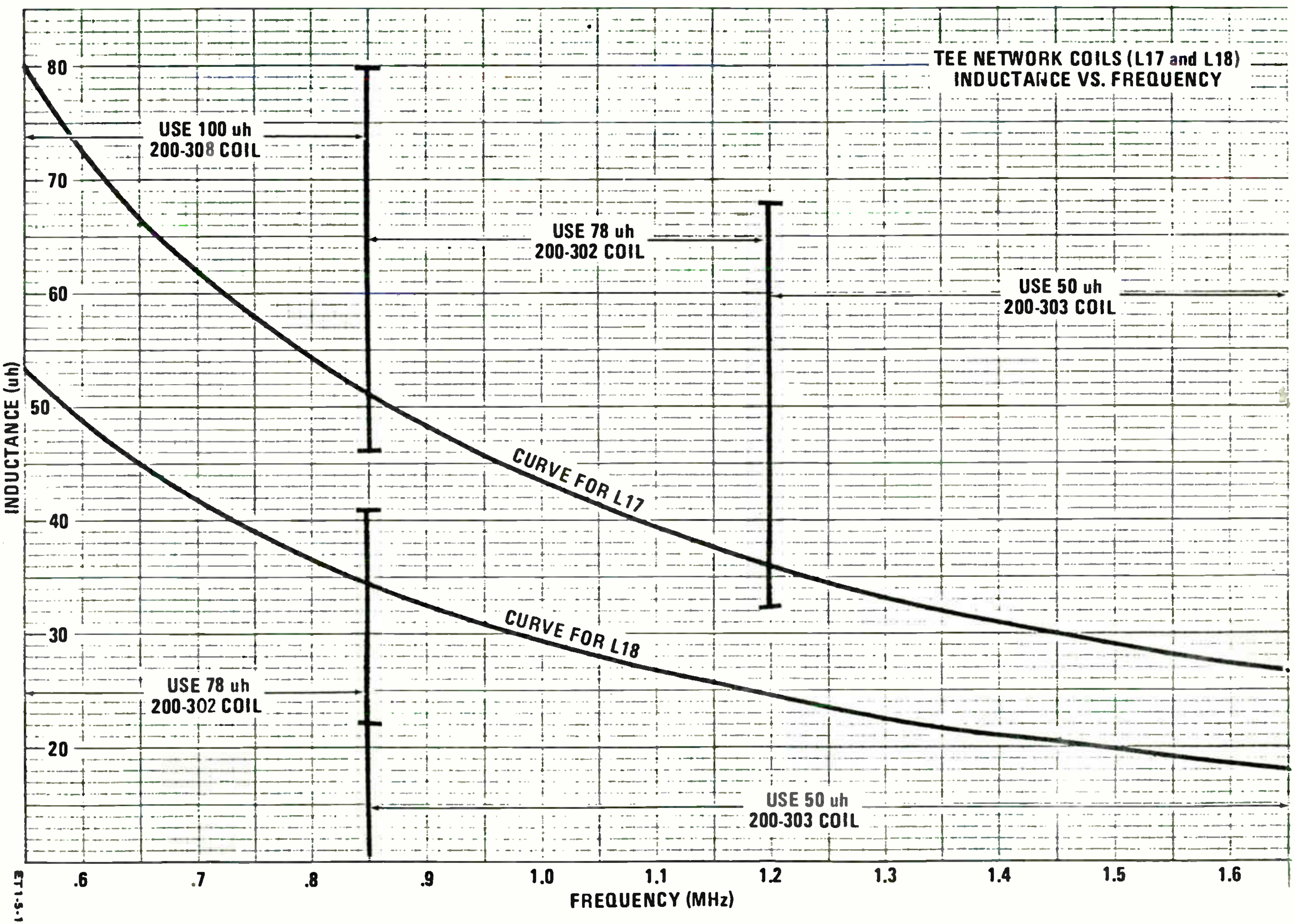
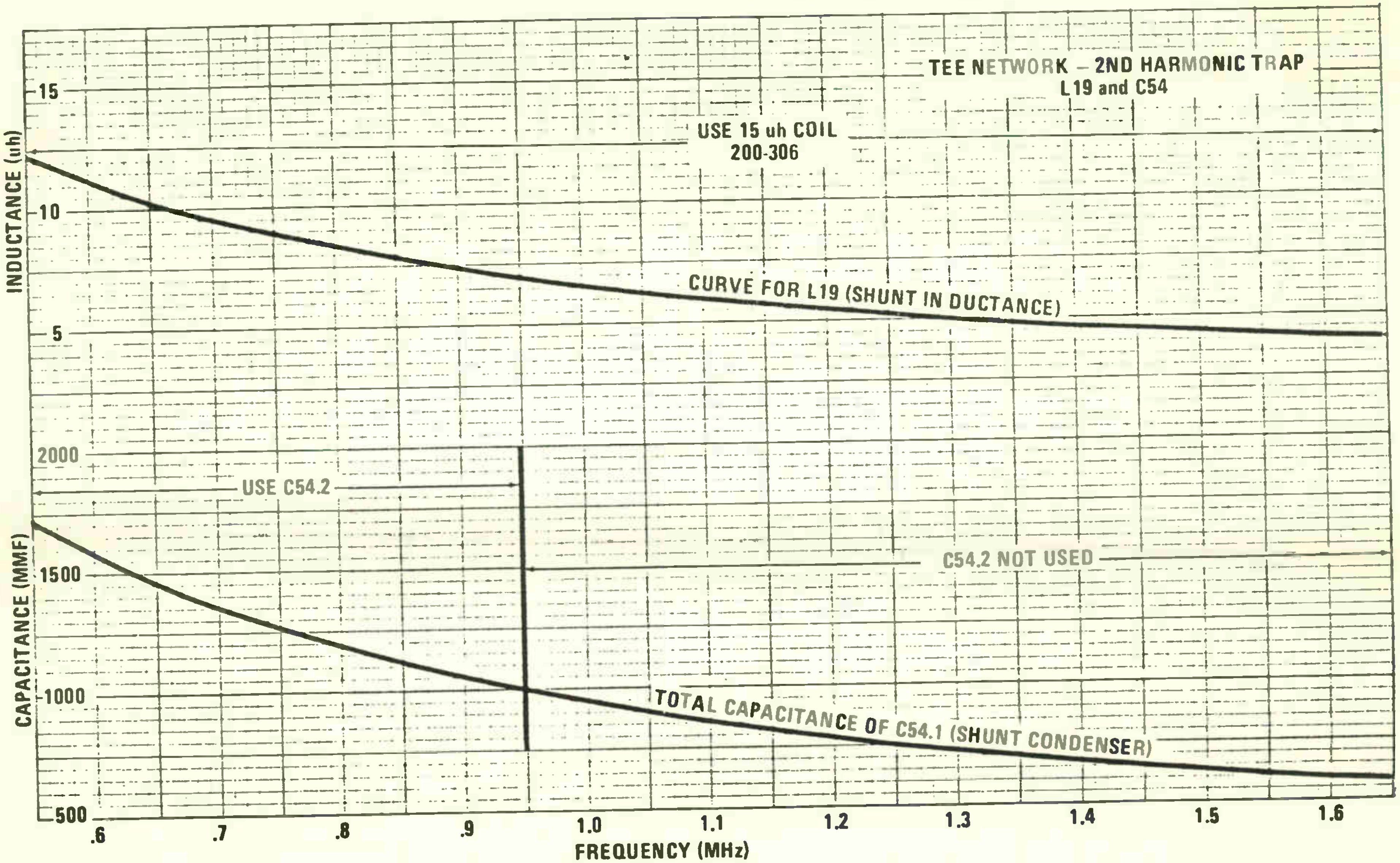


Figure 5-16. Tee Network Coils (L17 and L18) — Alignment Chart



ET1-5-17

Figure 5-17. Tee Network - 2nd Harmonic Trap (L19 and C54) - Alignment Chart

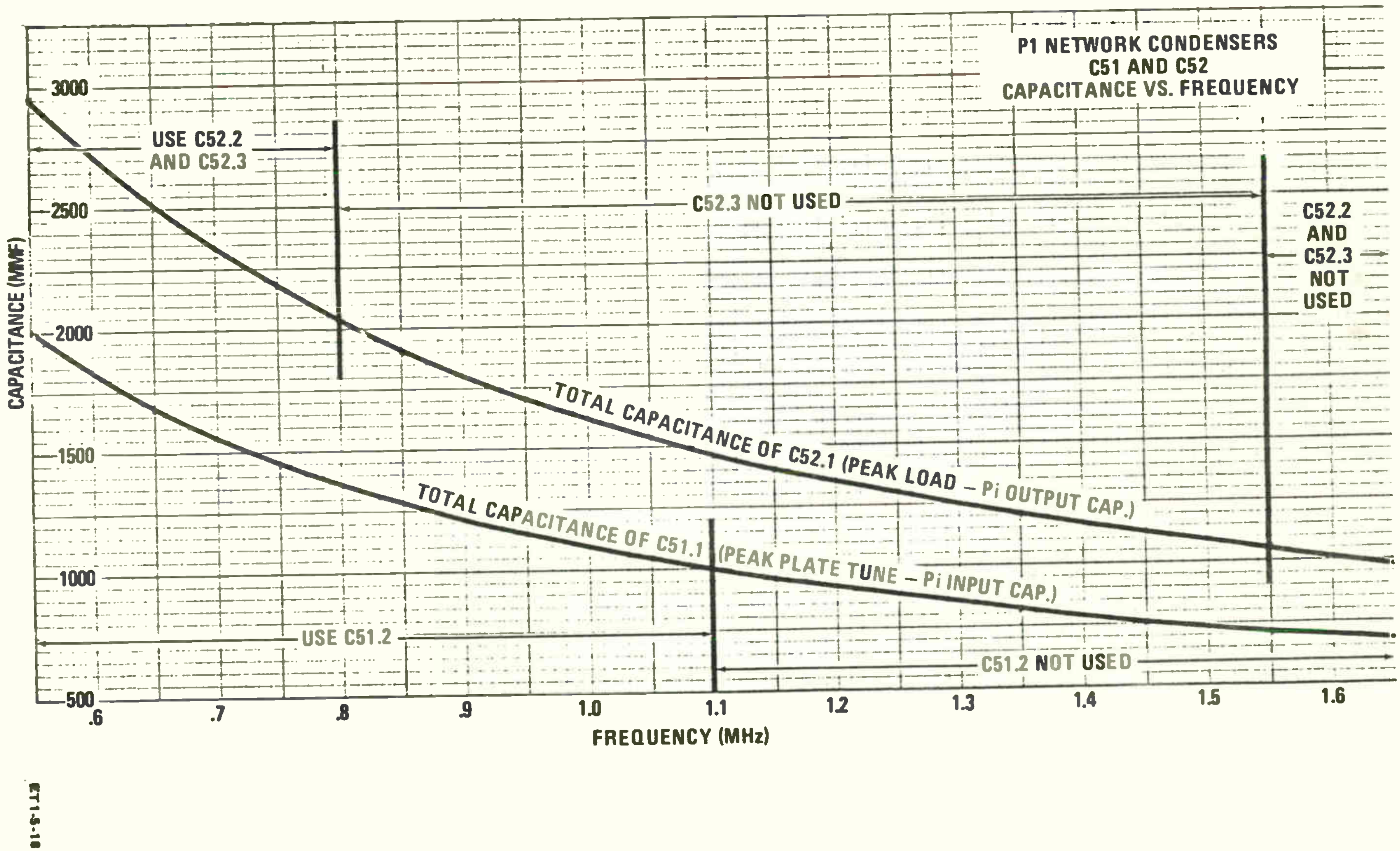


Figure 5-18. Pi Network Condensers (C51 and C52) – Alignment Chart

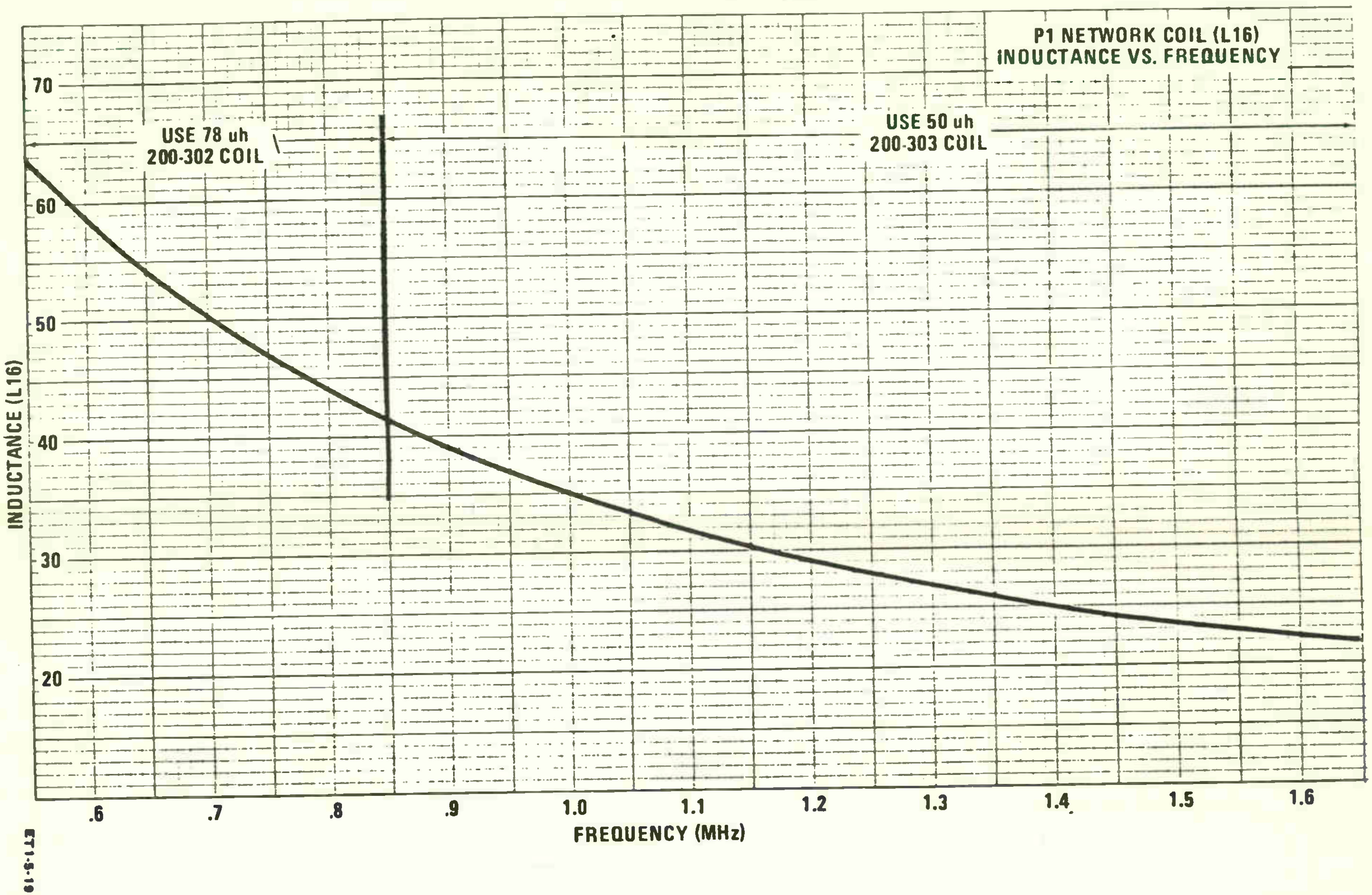
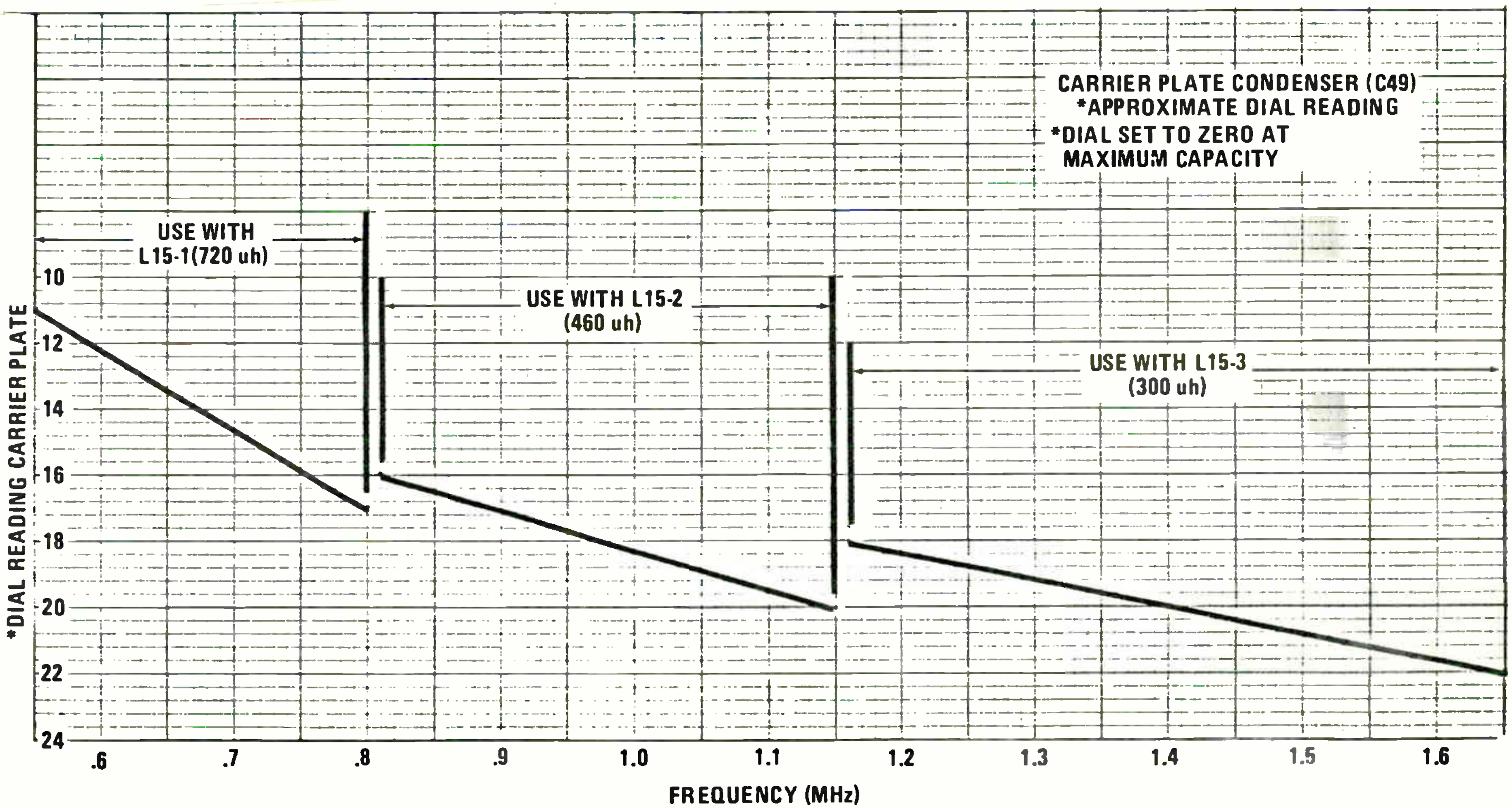
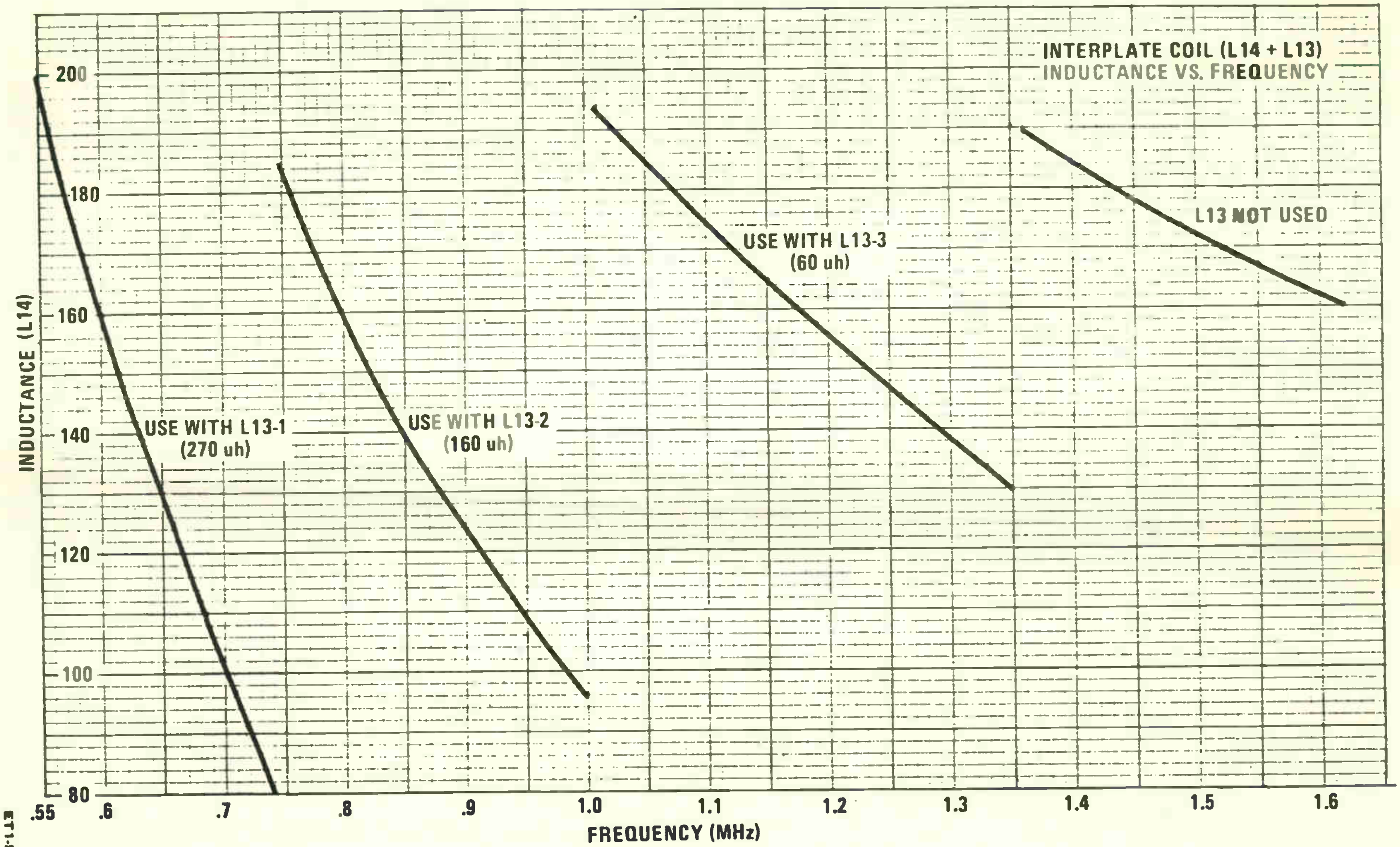


Figure 5-19. Pi Network Coil (L16) — Alignment Chart



ET1-5-20

Figure 5-20. Carrier Plate Condenser (C49) — Alignment Chart



ET1-5-21

Figure 5-21. Interplate Coil (L14 and L13) — Alignment Chart

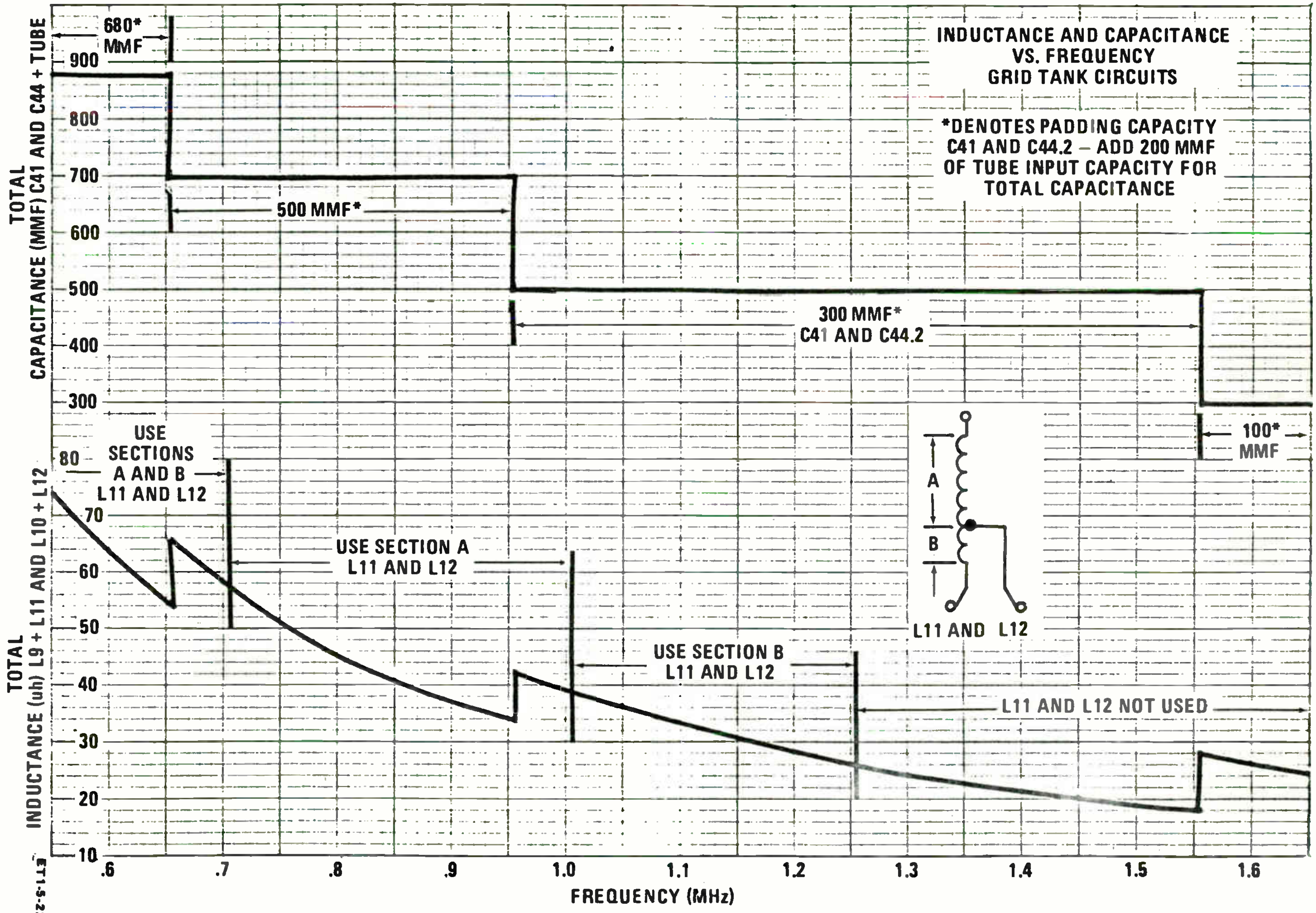
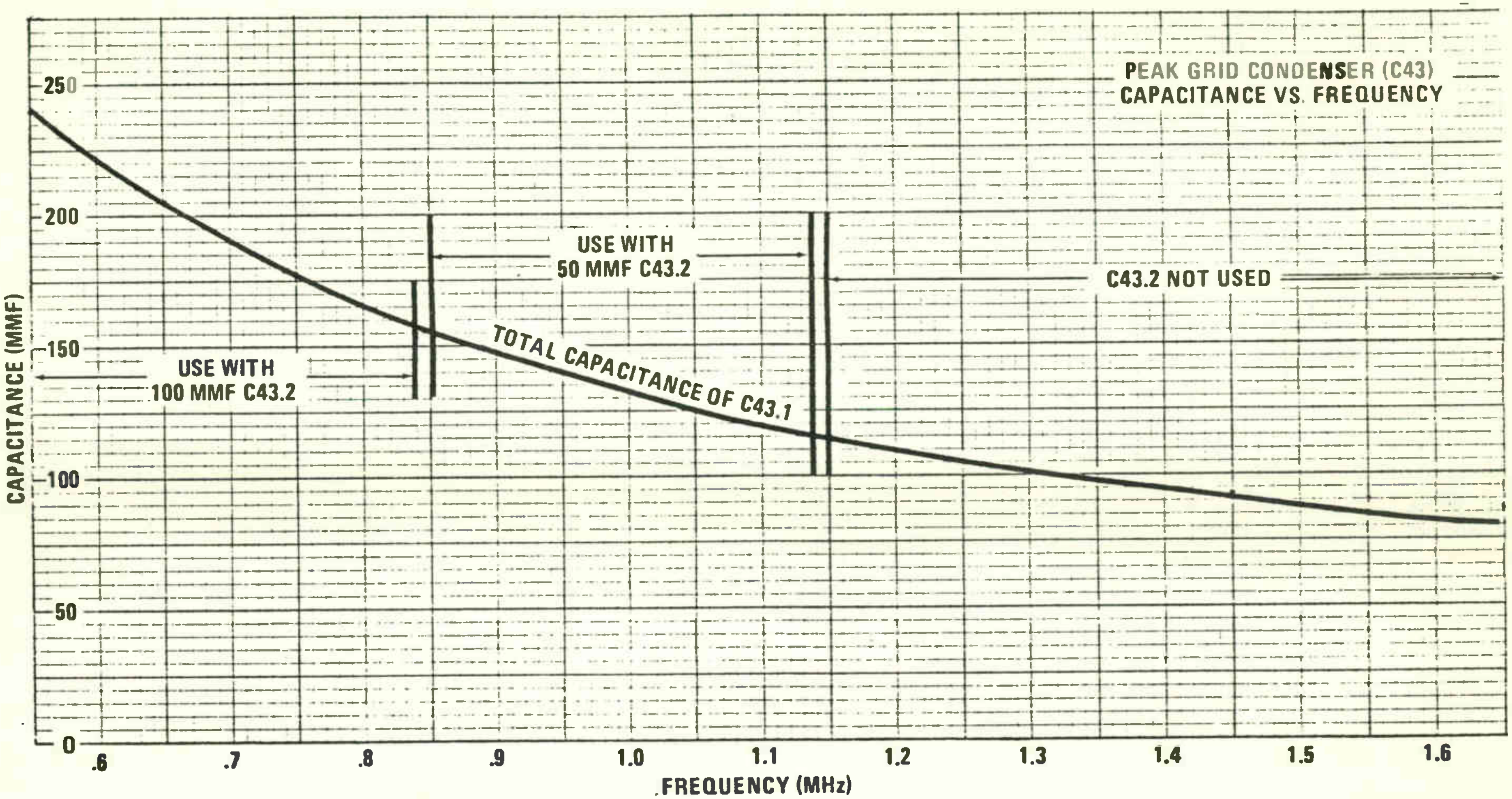


Figure 5-22. Grid Tank Circuits – Alignment Chart



ET1-5-23

Figure 5-23. Peak Grid Condenser (C43) - Alignment Chart

5-16. MODULATION MONITOR DRIVE

Inductor L20 is provided in the 315F/316F Transmitter for the purpose of driving a modulation monitor. This inductor, or pick-up coil, is inductively coupled to the output "T" network coil L18. The amount of coupling can be varied by rotating inductor L20 on its mounting arm. Still further variation can be obtained by moving the mounting arm around its pivot point. When starting tune-up, inductor L20 should be moved to a de-coupled position. This is done by rotating L20 to a position where its turns are 90° to the turns of inductor L18 and by moving L20 away from L18 by moving the mounting arm of L20.

By adjustment of L20, 5 to 30 volts, RMS across 50 ohms (dependent on frequency) is provided at TB1-41. This large range is provided because some older type monitors require considerable drive while newer types require very litte. Therefore, for newer monitors, in conjunction with de-coupling of L20, it may be necessary to add additional loading to L20 to keep the voltage within the maximum allowed by the monitor being used.

With L20 de-coupled, after initial tune-up of the transmitter and the application of RF power, the voltage pick-up from L20 should be observed on the carrier level meter of the modulation monitor. If the carrier level is low, gradually increase the coupling of L20 to L18. If, with minimum coupling adjustment of L20, too much carrier level is obtained on the monitor, it is suggested that resistive loading of the L20 output be added or increased.

5-12. DRAWINGS AND SCHEMATICS.

The following drawings and schematics are enclosed as appropriate.

C114006	Line Voltage Metering Unit
C114007	Motor & Clutch Assembly
B114008	Magniphase Line Coupler
C114009	Lamp & Control Ladder
C114099	Installation Information
E114033	Schematic 10KW - S/N 42 and above
E114034	Schematic 5KW - S/N 42 and above
D125520	Relay Terminal Arrangement
125993	Program Peak Clipper

Power cutback and Remote Control Schematic are included when appropriate.

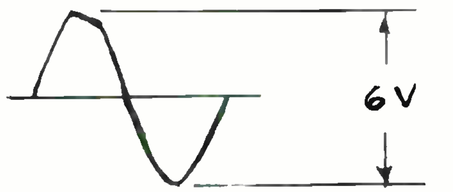
PARTS LIST:

110040	Transmitter	316F/315F SN2 & above
133450	Peak Clipper	316F/315F SN152 & above

11/21/79

5-16. TEST POINTS. (All Referenced to Chassis Ground)

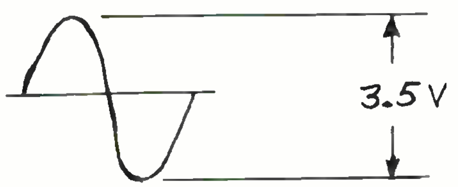
(1) Base of Q6



Limits

5 to 7 Volts

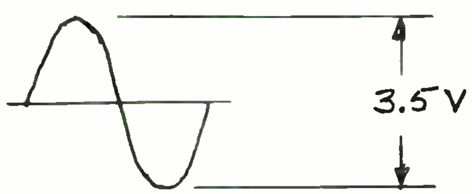
(2) Base of Q7



Limits

2.75 to 4.0 Volts

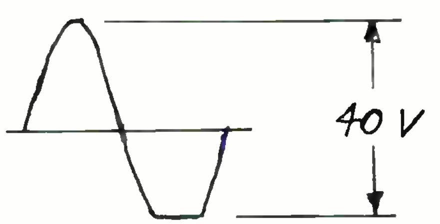
(3) Base of Q8



Limits

2.75 to 4.0 Volts

(4) Collector of Q9



Limits

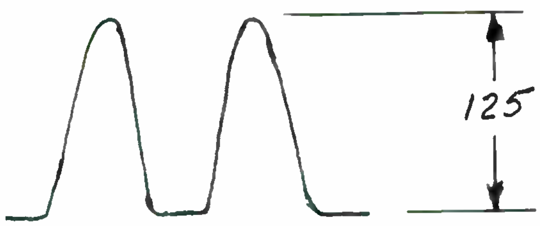
30 to 50 Volts

NOTE: If collector voltage swing is less than 30 volts peak to peak, decrease the value of emitter resistor R28 to 5 ohms (Two 10 ohm, 1/2 watt in parallel).

Measure the DC voltage drop across the collector decoupling resistor R32. The measuring points are available on the front of the exciter panel. This should measure from 0.4 to 0.6 volts DC indicating a collector current of 40 to 60 milliamperes. If less than this, decrease the value of bias resistor R26. Do not use less than 6800 ohms for R26.

If the collector voltage swing is still less than 30 volts peak to peak, check that the value of C17 is no more than 1600 mmf. up to 950 kc and no more than 1000 mmf. from 960 to 1600 kc. Larger values will cause reduced swing due to overcoupling.

5 Collector of Q10



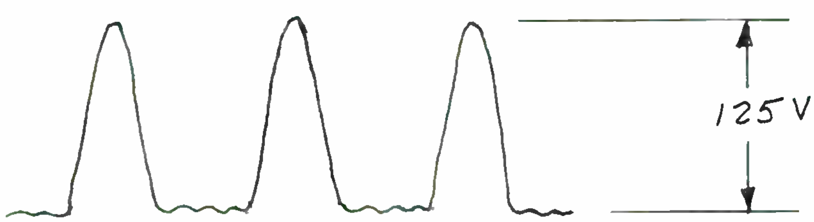
* Limits are 2.5 to 3.5 times the collector DC supply voltage (position No. 5 on the test meter). For example, if the collector voltage is 40 VDC, the RF swing should be from 100 to 140 volts peak to peak. The flattened negative portion is the transistor "ON" time and should be from 30 to 50% of a full cycle.

To assure operation within these limits, set the value of base current limiting resistor R109, approximately as follows:

550 - 700 kc	-	22 ohms
710 - 1100 kc	-	10 ohms
1110 - 1600 kc	-	0 ohms

R31 should always be 33 ohm and emitter resistor R44 should always be 5 ohms.

6 Collectors of Q11-Q14



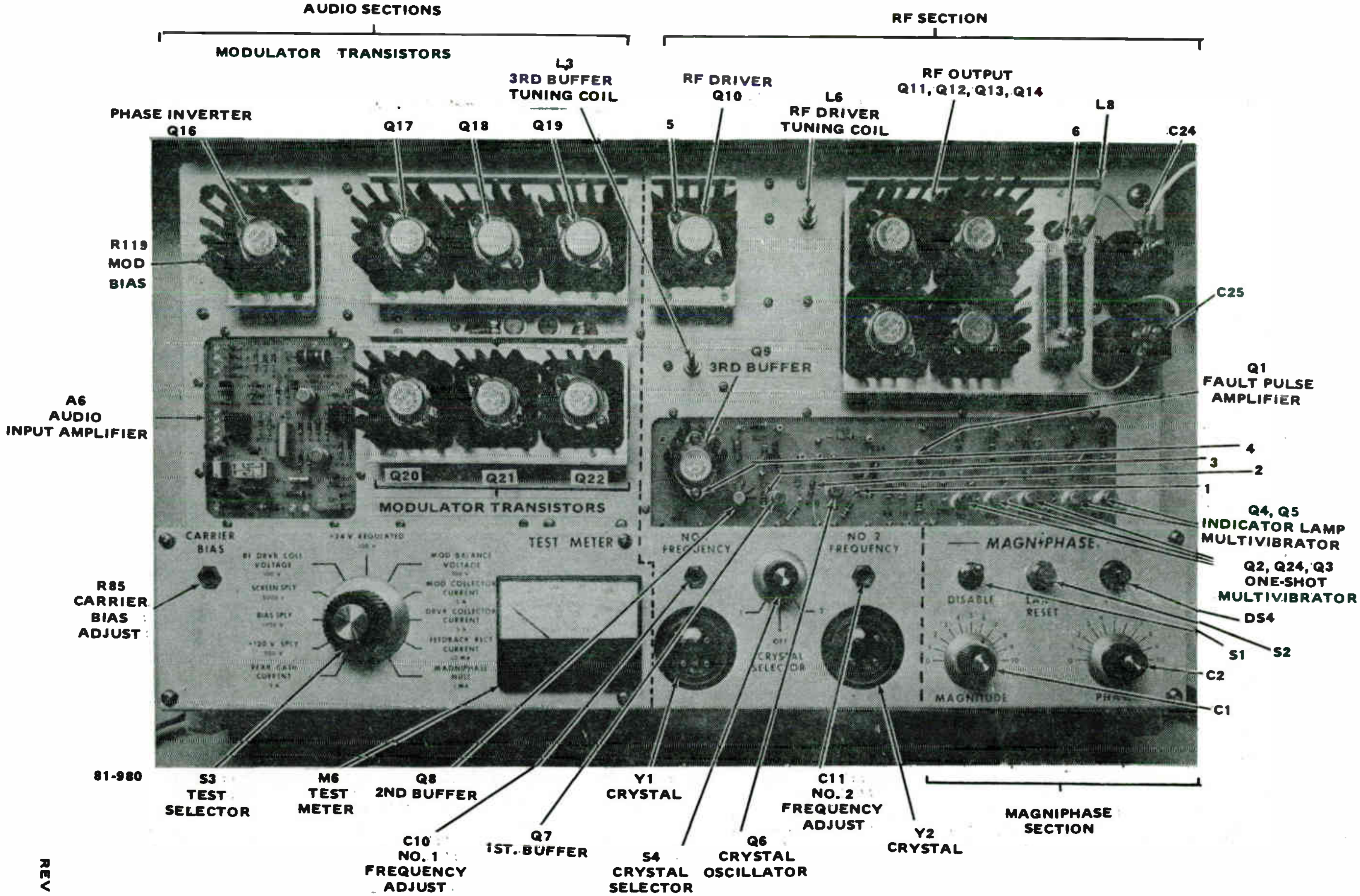


Figure 5-24. Solid State Exciter & Magniphase Panel
Showing Component Locations, Front View

* Limits are the same as for Q10 collector (Test Point 5) except that the transistor "ON" time should be from 40 to 60% of a full cycle.

The base current limiting resistors (R115 & R116) should be approximately:

550 - 700 kc	-	4.7 ohm
710 - 1100 kc	-	2.7 ohm
1110 - 1600 kc	-	0 ohm

The collector RF load resistance should be approximately 30 ohms (limits are 25 to 35 ohms) with no more than 10 ohms of reactance. This is determined by P.A. grid circuit tuning and by the setting of the drive tap on the lower end of L9.

Load resistance lower than 25 ohms will display the effects of overcoupling, that is, rounding of positive peaks, failure to achieve high positive peaks, failure to achieve the lower limits required at Test Point 6 and higher than normal collector current for Q11-Q14.

Load resistance higher than 35 ohms will result in higher than normal positive peaks, insufficient RF drive to the P.A. grids, operation at higher than the upper limits for Test Point 6 and higher than normal DC collector voltage for Q11-Q14.

The load resistance is set by the drive tap on the lower end of L9. The resistance is raised by raising the tap higher from the bottom of the coil and vice versa. This adjustment should always be made only one turn at a time. Above 1200 kc, where the tap is only 4 or 5 turns above the lower end of the coil, the adjustment should be no more than one-half turn at a time. L7 can be used as a fine adjustment but should never be moved more than two turns from factory setting unless an RF bridge is available for tuning out reactance by some other means.

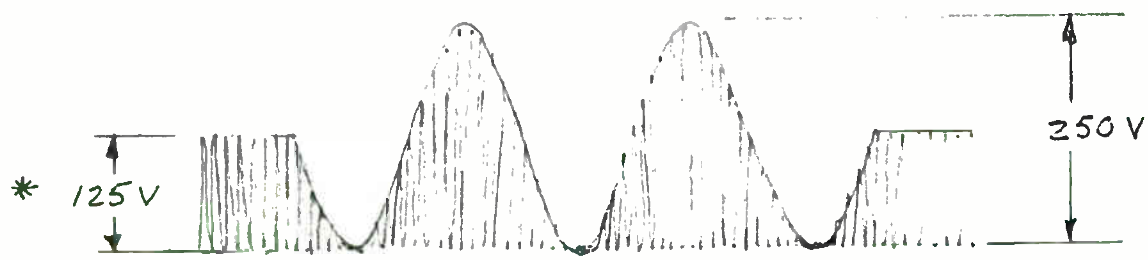
5-17. ADJUSTMENT OF L3 & L6 (Exciter)

The adjustment of the exciter RF interstage coupling network coils (L3 & L6) should result in the wave forms and voltage amplitudes shown for Test Points 5 & 6. It will be found that tuning L3 will have only a very slight effect on these wave forms and that tuning L6 will, on the other hand, greatly affect them. Initial adjustment of these coils is made as follows.

A. Close all circuit breakers (CB1 thru CB5) and turn on the master switch. Do not turn on the P.A. plate voltage.

B. Put the oscilloscope probe on Test Point 6 .
NOTE: The oscilloscope vertical amplifier should have response from DC to 4 Mc.

C. Modulate the exciter 100% with a 1000 cycle tone.
NOTE: The audio input level required for 100% modulation will be 8 or 10 dB less than normal because there will be no overall feedback applied without P.A. plate voltage. Synchronize the scope to observe several cycles of the 1000 cycle modulation envelope.



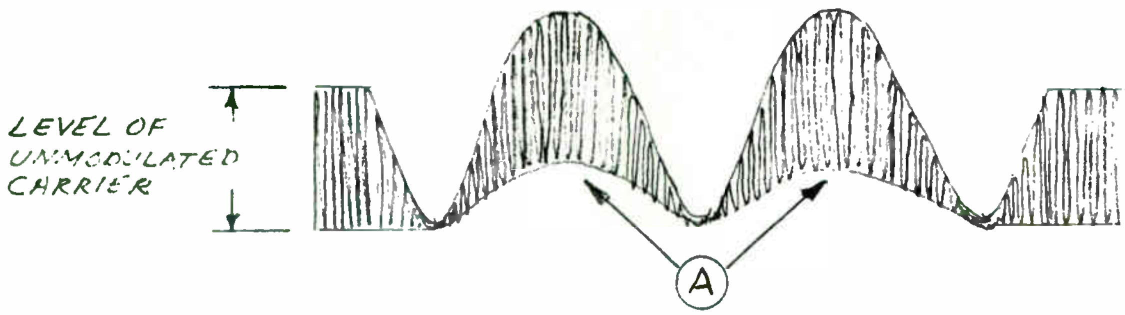
* Level of unmodulated carrier.

D. Tune L6 to maximize the positive peak voltage. This might be anything from 200 to 300 volts depending on transmitter power level. At any rate, it should be twice the voltage of the unmodulated carrier.

E. Tune L3 to maximize the positive peak voltage. It will be found that tuning L3 has very little effect.

F. Move the oscilloscope probe to Test Point 5 . The same modulation envelope should be seen here, that is, the peak positive voltage should be twice the value of the unmodulated carrier. The absolute value of peak voltage may be less than that observed at Test Point 6 .

G. Severe overcoupling of Q10 or of Q11-Q14 or insufficient base drive to Q10 or Q11-Q14 will result in the following modulation envelope at Test Points 5 & 6 .



At point A in the modulation cycle, the transistors have insufficient base drive to maintain saturation at the time the DC collector voltage doubles its unmodulated value (100% modulation).

If this envelope is observed, then it means that the waveforms and voltage limits described earlier have not been achieved.

H. Final adjustment of L6 will be described later.

5-18. ADJUSTMENT CONTROLS (Power Amplifier)

1. Carrier Bias (R85)

With transmitter operating normally, remove the modulation input and remove the RF excitation by placing the crystal selector switch halfway between the No. 1 and No. 2 crystal positions. The CARRIER BIAS control is adjusted to set the carrier tube static current as read on the plate current meter (M4) to the following:

315F, 5KW	-	0.7 amperes
316F, 10KW	-	1.0 amperes

The transmitter should have been operating at least 5 minutes before this adjustment is made.

2. Modulator Bias (R119)

This control, a small screwdriver adjusted rheostat, is mounted on the upper left hand corner of the exciter. With the transmitter operating normally and after a 5-minute warm-up time, remove the modulation input and adjust the MODULATOR BIAS control for a modulator collector current of 0.15 amperes as noted on the MODULATOR COLLECTOR CURRENT position on the exciter test meter (position #8).

3. Carrier Grid (C44.1)

This control is factory adjusted with an RF bridge (see tuning instructions) to establish a 90° phase difference between the RF drive to the two P.A. tubes. It will be found that the adjustment of this control has very little, if any, effect on the transmitter performance due to the broadband nature of the carrier amplifier grid tank circuit. There is no need to change the setting of this control even when changing tubes.

5-19. TUNING FOR MINIMUM DISTORTION

A. Remove the overall feedback by putting a short clip lead across A6E10 (shown as Point 7).

B. Be sure that all adjustments previously described have been done and that the results have been as described.

C. Turn on the transmitter and set the power output to 5 or 10 kilowatts (as required) after a five minute warm-up period.

D. Put the oscilloscope probe across the modulation monitor terminals (terminals 40 & 41 on TB1) or some other place to observe the transmitter output envelope.

E. Modulate the transmitter with 1000 cycle tone to 85 or 90% on negative peaks and use the modulation monitor for measuring the relative amplitude of the positive peak. It should be noted that the positive peak is 5 to 10% higher than the negative peak. For example, if the negative peak was set for 90% modulation, the positive should be 95 to 100%.

F. Measure the harmonic distortion. It will be from 2.5 to 3.5%.

G. With the transmitter modulated, and while watching the distortion meter, INCREASE the inductance of L6 by turning the adjusting slug CLOCKWISE until the distortion drops to about 1.0 to 1.3%. This should require no more than 2 or 3 turns of the tuning screw on L6. The positive peaks should be about 1 or 2% higher than the negative. Continued clockwise rotation of the tuning screw on L6 may result in still lower distortion at 1000 cycles but would increase the 7500 cycle distortion.

NOTE: Decreasing the inductance of L6 by anti-clockwise rotation of the tuning slug would result in symmetrical peaks but would give higher distortion due to overcoupling of Q10.

H. If the above results are obtained, no tuning of L3 is necessary. If not, tune L3 in either direction to minimize distortion. Lock the tuning shafts on L3 & L6.

NOTE: If the minimum distortion obtained in Step G (above) is greater than 1.5%, increase the carrier tube static plate current to 1.1 amps (see carrier bias adjustment) for 10KW and 0.8 amps for 5KW. There will be no benefit from increasing static current above these values.

J. Remove the clip lead short circuit from A6E10 to restore overall feedback. The distortion of 1000 cycles and 95% modulation should be 0.7% or less.

5-20. ADJUSTMENT OF 24 VOLT SUPPLY

In order to assure that the 24 volt regulated supply will be regulated, the 24 volt zener diode (CR12) must draw about 50 to 60 MA of current under normal conditions, that is, with all transistors on the 24 volt supply drawing current. An exception would be Q4, the magniphase lamp transistor, which will draw 40 MA when lighted.

A. Disconnect one end of zener diode CR12 and insert a milliammeter of at least 100 MA full scale.

B. Turn on the transmitter and note the zener current on the milliammeter. It should be 50-60 MA. If not, loosen the slider on R33 and adjust for the above reading.

C. Take out the milliammeter and reconnect the wire to CR12.

D. Light the magniphase trip lamp by momentarily shorting the base of Q5 to ground. The 24 volt supply voltage should reduce by no more than 0.25 volts.

E. Extinguish the magniphase lamp by pushing the lamp reset switch. After about 5 minutes running, the 24 volt zener (CR12) should be uncomfortably warm to the touch.

NOTE: If no milliammeter is available, the slider on R33 can be set by adjusting until CR12 is quite warm. (Quite warm would be on the order of 140° to 170°F (60 to 70°C).

5-21. MODULATION MONITOR DRIVE

Inductor L20 is provided in the 315F/316F Transmitter for the purpose of driving a modulation monitor. This inductor, or pick-up coil, is inductively coupled to the output "T" network coil L18. The amount of coupling can be varied by rotating inductor L20 on its mounting arm. Still further variation can be obtained by moving the mounting arm around its pivot point. When starting tune-up, inductor L20 should be moved to a de-coupled position. This is done by rotating L20 to a position where its turns are 90° to the turns of inductor L18 and by moving L20 away from L18 by moving the mounting arm of L20.

By adjustment of L20, 5 to 30 volts, RMS across 50 ohms (dependent on frequency) is provided at TB1-41. This large range is provided because some older type monitors require considerable drive while newer types require very litte. Therefore, for newer monitors, in conjunction with de-coupling of L20, it may be necessary to add additional loading to L20 to keep the voltage within the maximum allowed by the monitor being used.

With L20 de-coupled, after initial tune-up of the transmitter and the application of RF power, the voltage pick-up from L20 should be observed on the carrier level meter of the modulation monitor. If the carrier level is low, gradually increase the coupling of L20 to L18. If, with minimum coupling adjustment of L20, too much carrier level is obtained on the monitor, it is suggested that resistive loading of the L20 output be added or increased.

5-22. DRAWINGS AND SCHEMATICS.

The following drawings and schematics are enclosed as appropriate:

C114006	Line Voltage Metering Unit
C114007	Motor & Clutch Assembly
B114008	Magniphase Line Coupler
C114009	Lamp & Control Ladder
C114099	Installation Information
E114066	Schematic-S/N 232 and above
D125520	Relay Terminal Arrangement
B125993	Program Peak Clipper
C114037	Audio Input Amplifier, A6

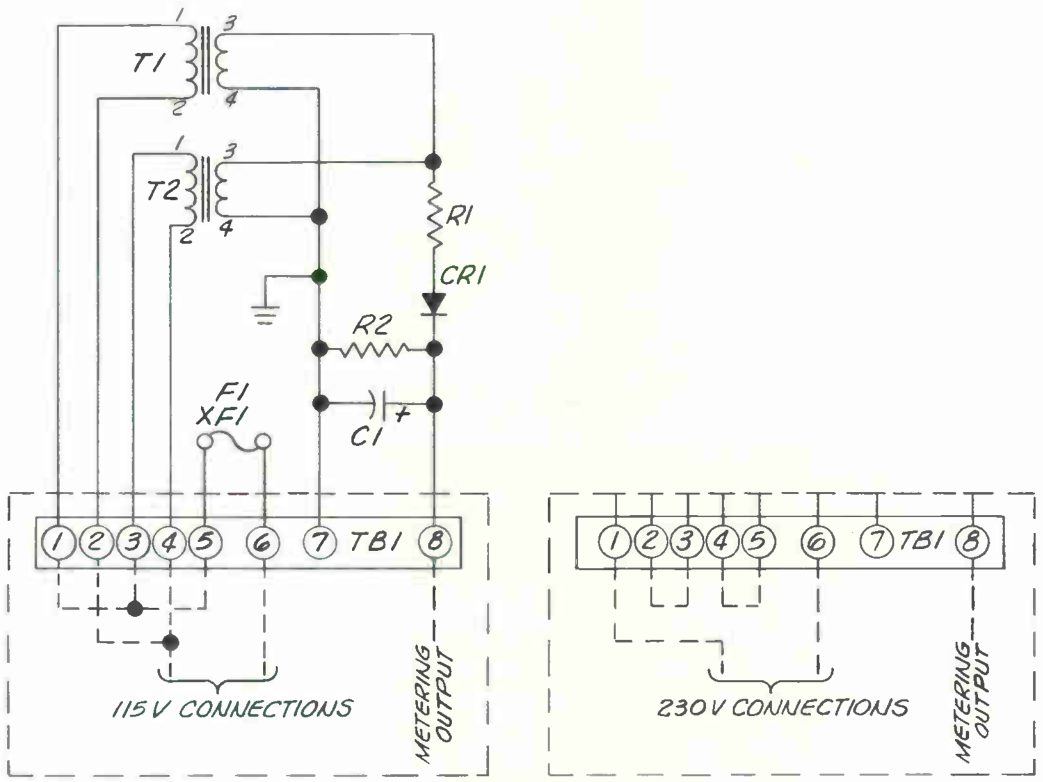
Power cutback and Remote Control Schematic are included when appropriate.

PARTS LIST:

110678	Transmitter	316F/315F S/N 212 and above
110677	Audio Amplifier	316F/315F S/N 212 and above
133450	Peak Clipper	316F/315F S/N 152 and above

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	CORRECTED TO DATE	20 MAY 75	ONEY



ELECTRICAL PARTS LIST

PART	NO.	MFG.
C1	TC39	MALLORY
CR1	1N2071	T.I.
F1	313.062, 1/16 AMP	LITTELFUSE
R1	50Ω, 12W	OHMITE #1718
R2	10K, 2W, ±10%	OHMITE
T1	PG465	C.T.C.
T2	PG465	C.T.C.
TB1	670-8	KULKA
XF1	357001	LITTELFUSE

NOTES:
1. ALL WIRE IS 22 GA EXCEPT TRANSFORMER LEADS.

QTY REQD PER DASH NO.	ITEM	ZONE	PART OR IDENTIFYING NO.	DWG SIZE	NOMENCLATURE OR DESCRIPTION	CODE IDENT

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	DWG SIZE	USED ON
114098	C	J904-AAAB

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON: FRAC ±
2 PLACE DEC ± 3 PLACE DEC ± ANGLES ±
MACHINED SURFACE FINISH 125
ALL DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH.
REMOVE ALL BURRS AND SHARP EDGES.

DRAWN M. GRESHAM DATE 12-9-70
CHECKED
MECH DSGN
ELEC ENGR J. SAINTON
APPROVED

Continental Electronics MANUFACTURING COMPANY DALLAS TEXAS

SCHEMATIC
LINE VOLTAGE
METERING UNIT

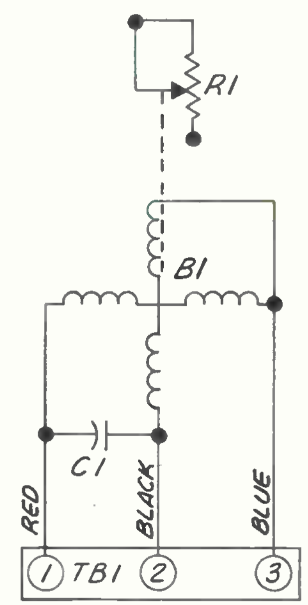
SIZE C CODE IDENT NO. 08440 114006
SCALE: WT SHEET 1 OF 1

114006

CEMC FORM 386B

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	CORRECTED TO DATE	20MAY75	ONEY



ELECTRICAL PARTS LIST

PART	NO.	MFG.
B1	B8192E-600M	BODINE
C1	K-45 (PART OF B1)	BODINE
R1	0445	OHMITE – 7.5Ω 100W, ADJ.
TB1	670-3	KULKA

QTY REQD PER DASH NO.	ITEM	ZONE	PART OR IDENTIFYING NO.	DWG SIZE	NOMENCLATURE OR DESCRIPTION	CODE IDENT

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	DWG SIZE	USED ON
114097	C	J904-AAAB

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON: FRAC ±
2 PLACE DEC ± 3 PLACE DEC ± ANGLES ±
MACHINED SURFACE FINISH 125√
ALL DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH.
REMOVE ALL BURRS AND SHARP EDGES.

		DATE
DRAWN	M. GRESHAM	12-9-70
CHECKED		
MECH DSGN		
ELEC ENGR	J. SAINTON	
APPROVED		

Continental Electronics MANUFACTURING COMPANY DALLAS TEXAS

SCHEMATIC MOTOR & CLUTCH ASSY

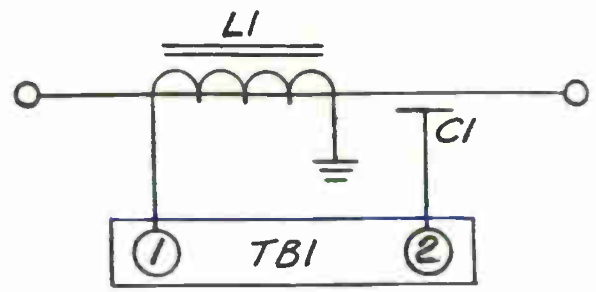
SIZE C | CODE IDENT NO. 08440 | 114007

SCALE: | WT | SHEET 1 OF 1

114007

CEMC FORM 3069

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



ELECTRICAL PARTS LIST

PART	NO.	MFG.	CEMC SPEC NO.
C1	PART OF 114096-1	CEMC	
L1	114274-1	CEMC	
TB1	440-2	GEN PRO	

114008

QTY REQD PER DASH NO.	ITEM	PART OR IDENTIFYING NO.	DWG SIZE	NOMENCLATURE OR DESCRIPTION	CODE IDENT
				LIST OF MATERIAL OR PARTS LIST	

NEXT ASSY	DWG SIZE	USED ON
114096	D	J904-AAAB

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON: FRAC ± 2 P DEC 3 P DEC ANGLES ± ± ±
MACH. SURFACE FIN 125√
ALL DIM. ARE IN INCHES AND INCLUDE APPLIED FIN.
REMOVE ALL BURRS AND SHARP EDGES.

DRAWN: GRESHAM — DATE: 12-14-70
CHECKED:
ENGR: J. SAINTON

Continental Electronics MANUFACTURING COMPANY DALLAS TEXAS

SCHEMATIC
MAGNIPHASE LINE COUPLER

SIZE	CODE IDENT NO.	
B	08440	114008

SCALE: WT SHEET 1 OF 1

CEMC FORM 385 8

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
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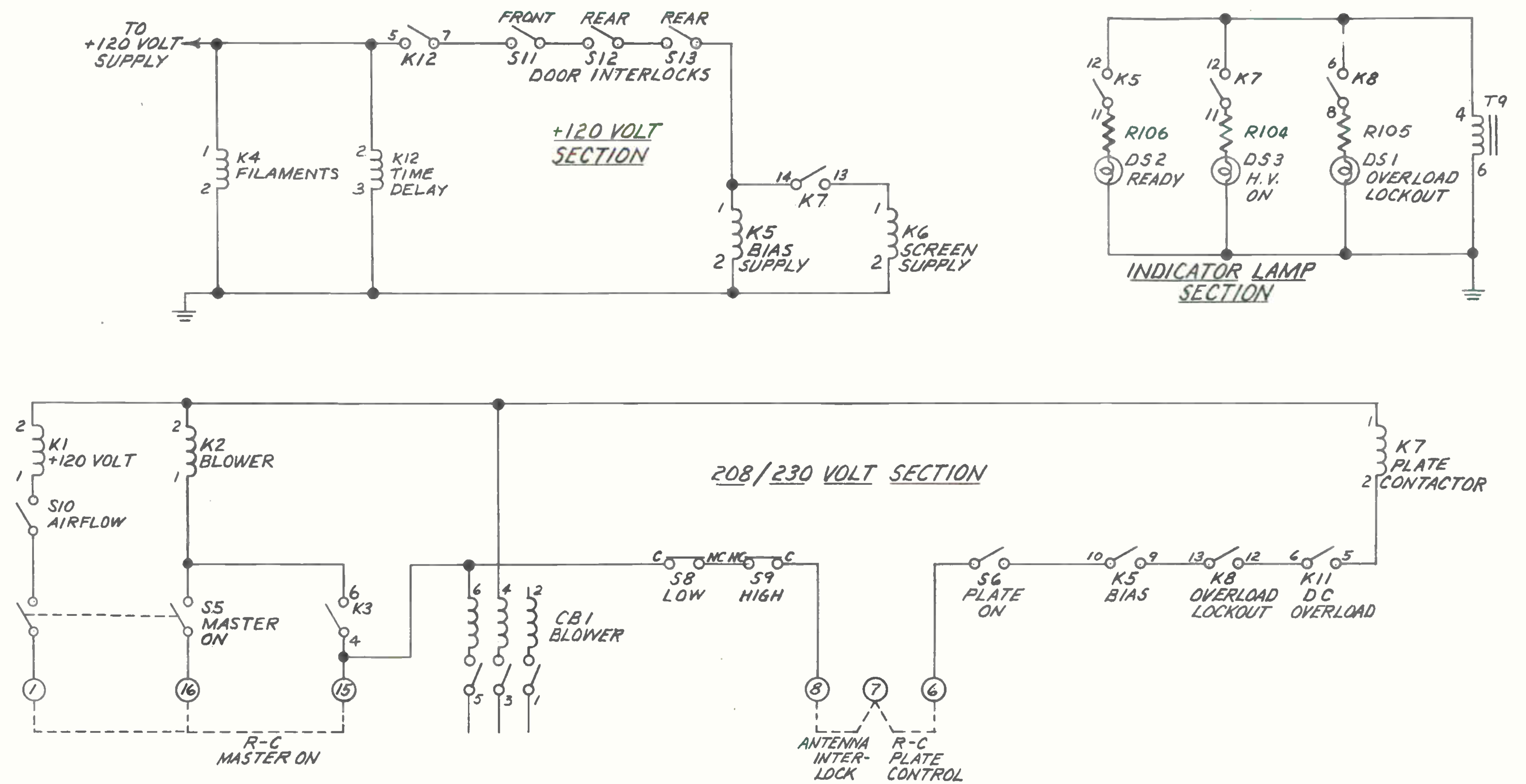
	B	CHANGES AS PER MARKED UP PRINT	9-24-80	S KEPLAR



ITEM	ZONE	PART OR IDENTIFYING NO.	DWG SIZE	NOMENCLATURE OR DESCRIPTION	CODE IDENT

QTY REQD PER DASH NO. — LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	DWG SIZE	USED ON
114001	F	J681-B888

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON: FRAC ±
2 PLACE DEC ± 3 PLACE DEC ± ANGLES ±
MACHINED SURFACE FINISH 125
ALL DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH.
REMOVE ALL BURRS AND SHARP EDGES.

DRAWN C. C-EY
DATE
CHECKED
MECH DSGN
ELEC ENGR J. SAINTON
APPROVED

Continental Electronics MANUFACTURING COMPANY DALLAS TEXAS

LAMP & CONTROL LADDER TYPE 316F/315F BROADCAST TRANSMITTER

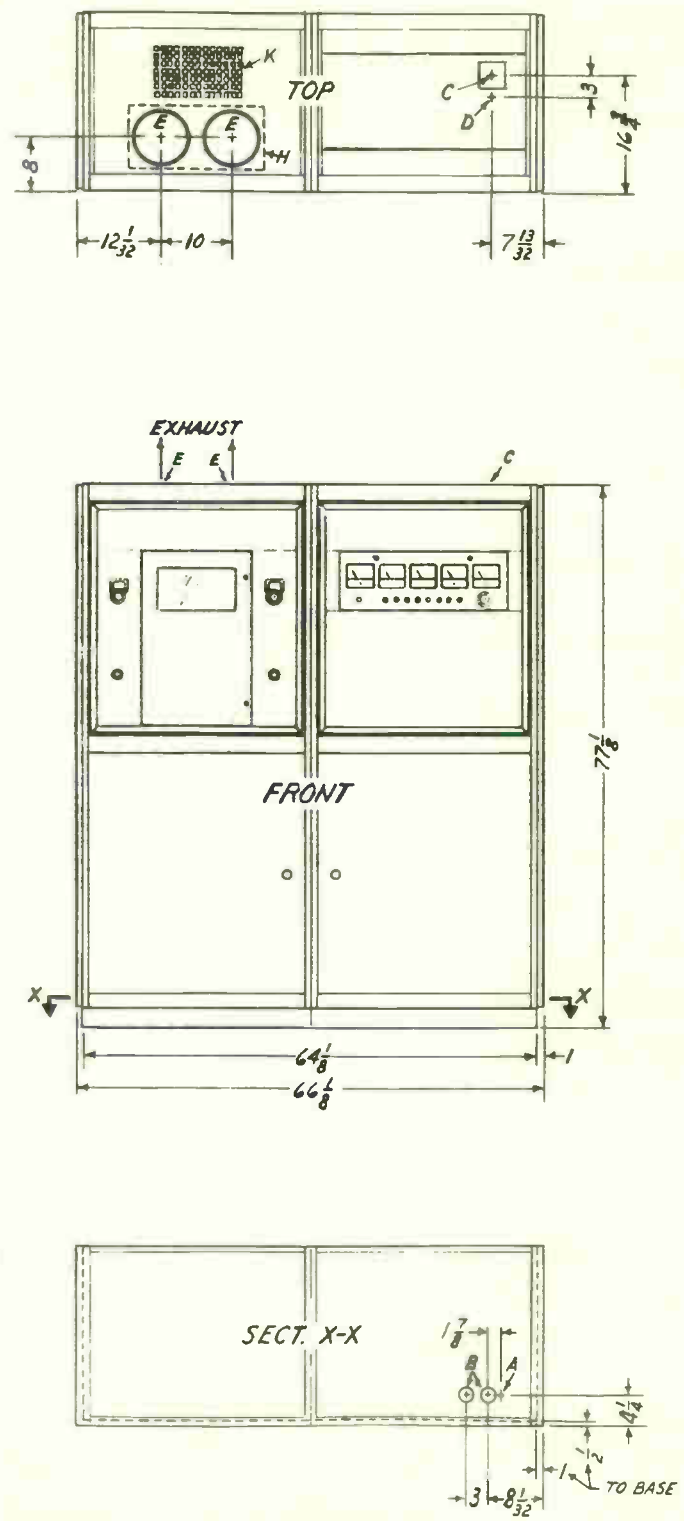
SIZE C CODE IDENT NO. 08440 114009
SCALE: WT SHEET 1 OF 1

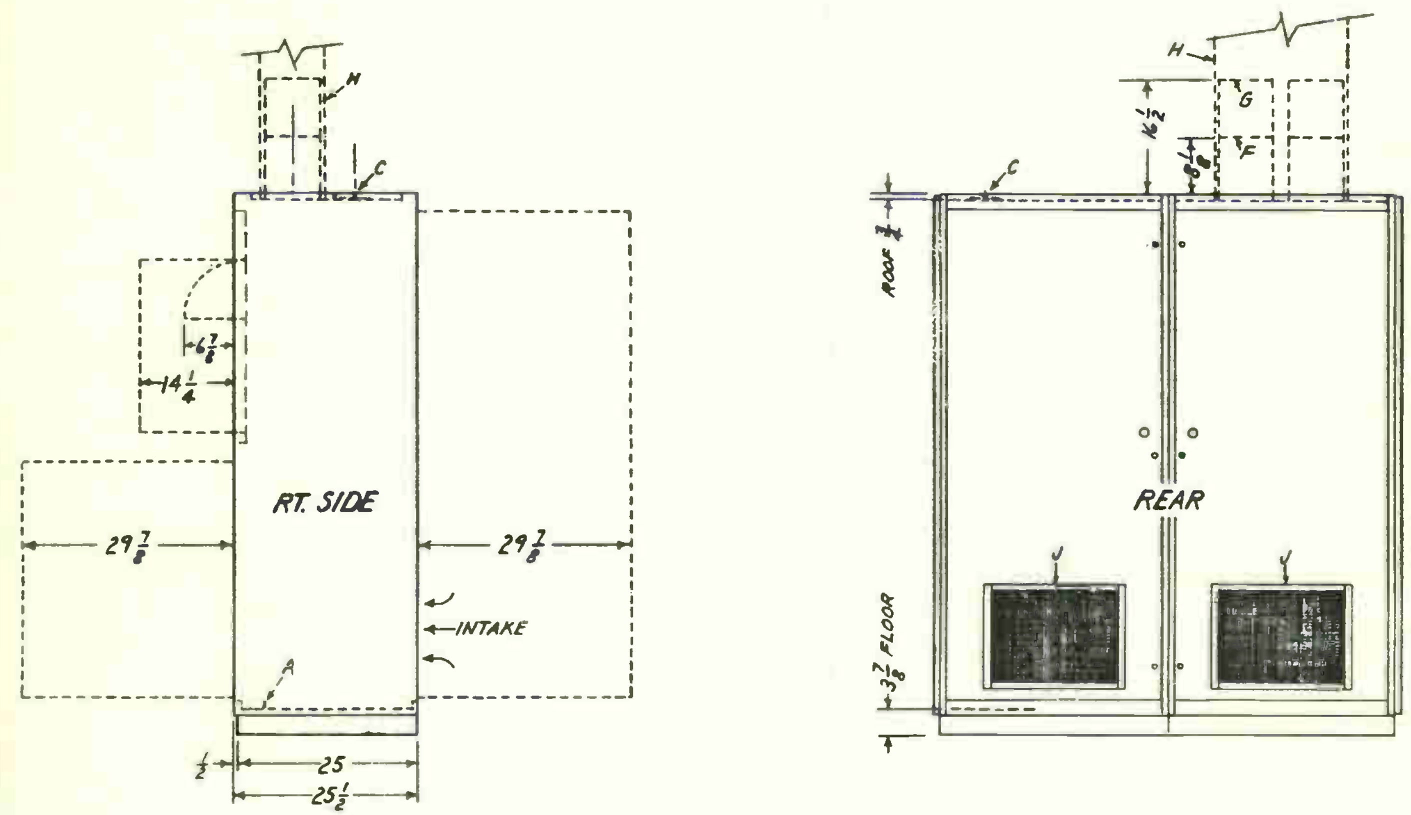
114009

CEMC FORM 3068

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

A—$\frac{1}{4}$-20 STUD FOR STATION GROUND CONNECTION.
B—2" DIA. HOLES FOR CONDUIT & CABLE (30 KVA MAX. LOAD FOR 10KW)(16 KVA MAX LOAD FOR 5 KW).
C—$\frac{1}{4}$-20 STUD FOR TRANSMISSION LINE CONNECTION.
D—$\frac{1}{4}$-20 STUD FOR TRANSMISSION LINE GROUND CONNECTION.
E—$7\frac{13}{16}$" DIA. EXHAUST CHIMNEY.
F—CHIMNEY HEIGHT FOR TUBE CHANGE.
G—HEIGHT REQ'D. FOR CHIMNEY CHANGE.
H—9" x 19" DUCT TO EXTERIOR FOR EXHAUST AIR
J—1" x 15" x 20" FILTER FOR AIR INTAKE (1000 CFM TOTAL).
K—CABINET VENT TO BE FREE OF OBSTRUCTION.





				ITEM	ZONE	PART OR IDENTIFYING NO.	DWG SIZE	NOMENCLATURE OR DESCRIPTION	CODE IDENT
QTY REQD PER DASH NO.				LIST OF MATERIAL OR PARTS LIST					

NEXT ASSY	DWG SIZE	USED ON
114000		J904-AAAB

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON: FRAC ±
2 PLACE DEC ± 3 PLACE DEC ± ANGLES ±
MACHINED SURFACE FINISH 125
ALL DIMENSIONS ARE IN INCHES AND INCLUDE APPLIED FINISH.
REMOVE ALL BURRS AND SHARP EDGES.

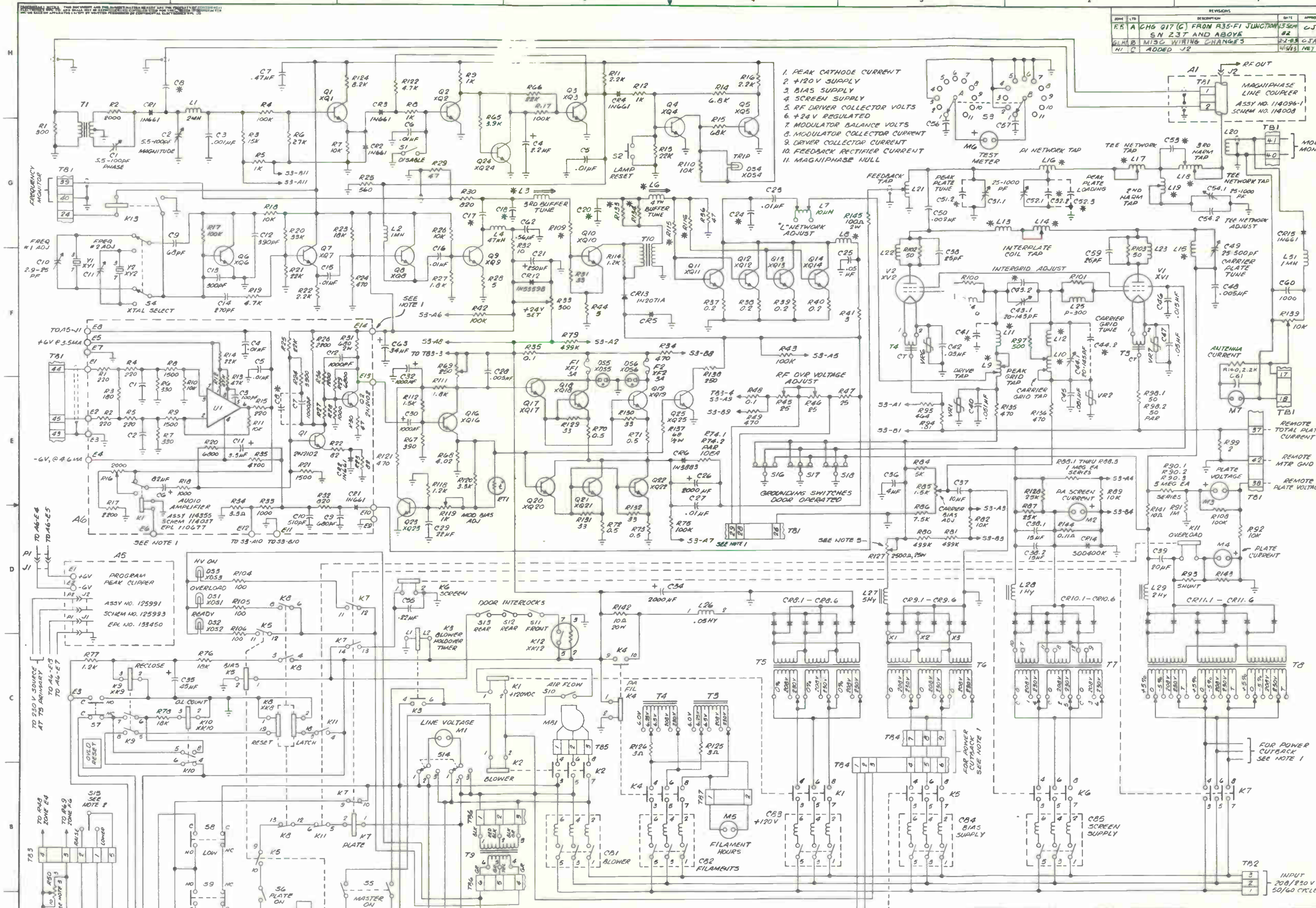
		DATE
DRAWN	C. A. ONEY	7 JULY 70
CHECKED		
MECH DSGN		
ELEC ENGR	J. B. SAINTON	
APPROVED		

Continental Electronics MANUFACTURING COMPANY DALLAS TEXAS

INSTALLATION INFORMATION
TYPE 316F/315F
10/5 KW TRANSMITTER

SIZE C CODE IDENT NO 114099
SCALE WT SHEET OF

CEMC FORM 3868



NOTE:

1. FOR 316F/315F CUTBACK SEE SCHEMATIC NO. 114042, 114043, 114044, 114045, 114046 OR 114065 WHERE APPLICABLE.
2. S15 USED ONLY WITH REMOTE CONTROLLED TRANSMITTER.
3. R50 USED ONLY WITH NON-REMOTE CONTROLLED TRANSMITTERS. A4R1 USED WITH REMOTE CONTROLLED TRANSMITTERS.
4. * FREQUENCY DETERMINED PARTS, SEE EPL & FACTORY TEST DATA FOR VALUES.
5. USED ON 315F ONLY.

114010	B	
114000	B	
114100	E	2581
NEXT ASSY		USED ON

DRAWN: JAMES IVEY — DATE: 9-2-81
ELEC ENGR: J. SAINTON

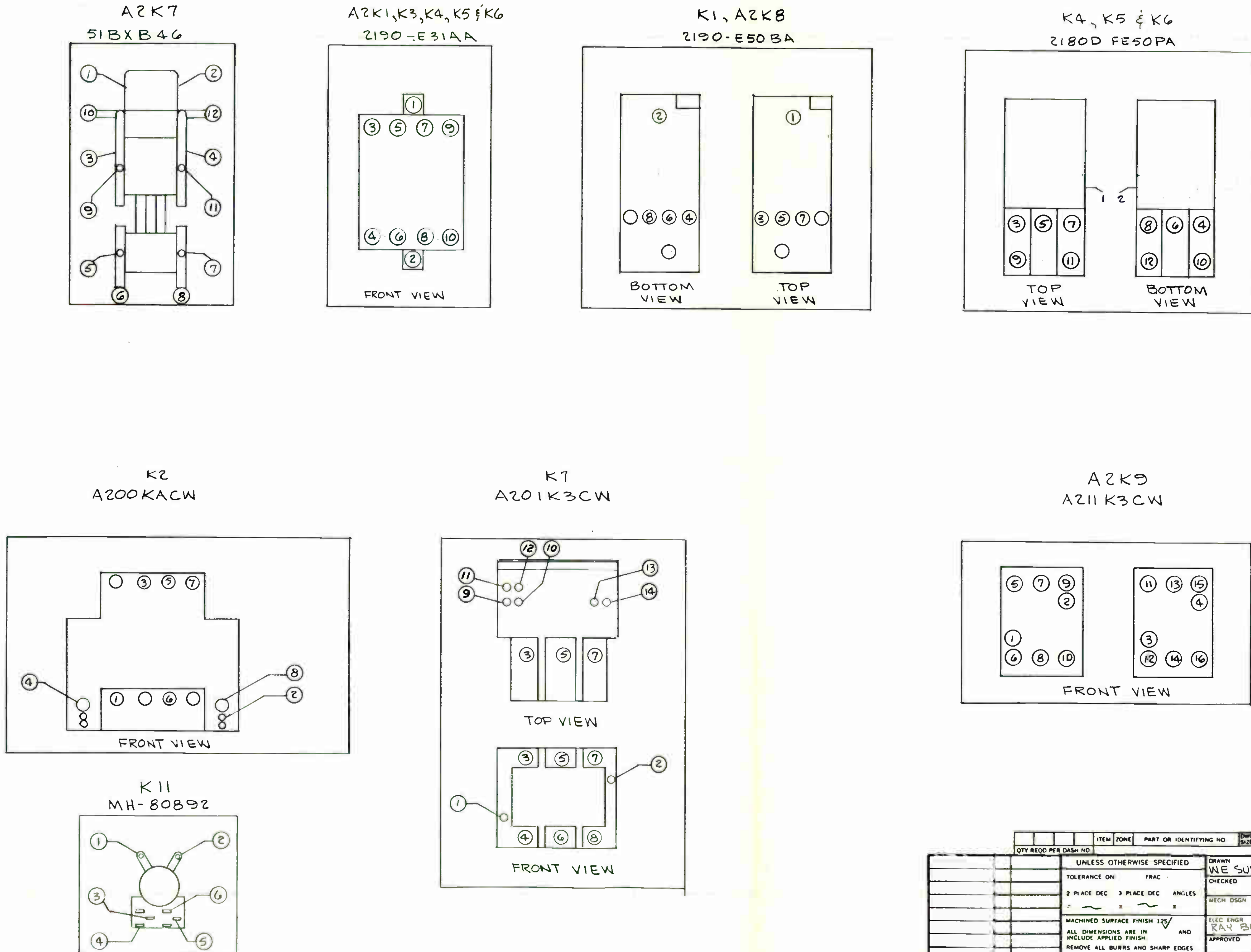
Continental Electronics MFG CO

SCHEMATIC, TYPE 315F/316F BROADCAST TRANSMITTER SERIAL NO. 232 AND ABOVE

SIZE E — CODE IDENT NO 52151 — 114066 — SHEET 1 OF 1

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
B6	A	IN K7 REVERSED NOS. 9&11; 10&12	1-3-81	J. CLARK



ITEM	ZONE	PART OR IDENTIFYING NO	DWG SIZE	NOMENCLATURE OR DESCRIPTION	CODE IDENT

QTY REQD PER DASH NO. — LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	DWG SIZE	USED ON
		2521-001

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON FRAC ±
2 PLACE DEC ± ~ 3 PLACE DEC ± ~ ANGLES ±
MACHINED SURFACE FINISH 125✓
ALL DIMENSIONS ARE IN AND INCLUDE APPLIED FINISH
REMOVE ALL BURRS AND SHARP EDGES

		DATE
DRAWN	WE SUMNERS	10-28-77
CHECKED		
MECH DSGN		
ELEC ENGR	RAY BRACKEN	
APPROVED		

Continental Electronics MFG. CO.
DALLAS TEXAS

RELAY TERMINAL ARRANGEMENT
315/316F XMITTER 5/10KW

SIZE	CODE IDENT NO	
D	52151	125520

SCALE: ~ WT SHEET 1 OF

125520

CEMC FORM 3878

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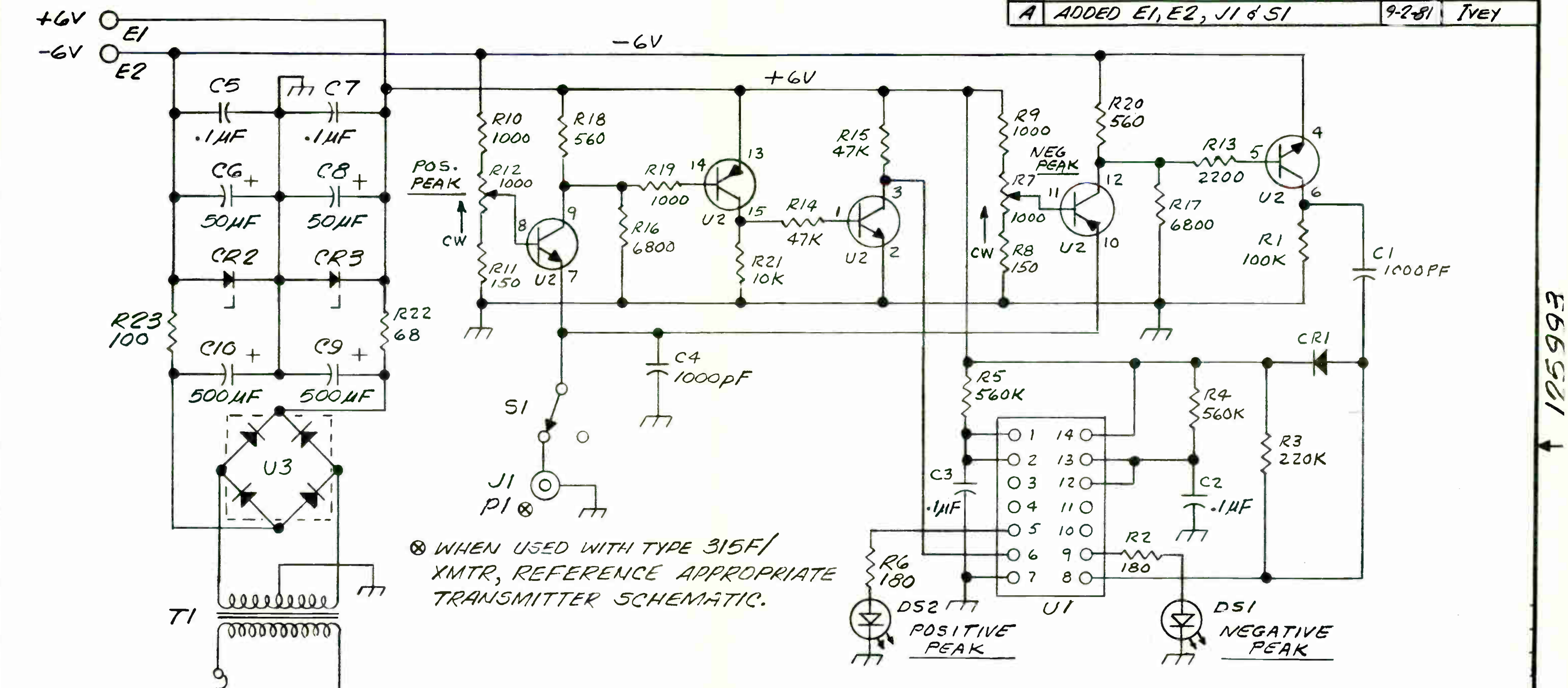
REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	ADDED E1, E2, J1 & S1	9-2-81	IVEY



⊗ WHEN USED WITH TYPE 315F/ XMTR, REFERENCE APPROPRIATE TRANSMITTER SCHEMATIC.

* WHEN USED WITH TYPE 315F/316F XMTR J2 TO BE CONNECTED TO 230VAC AT PRIMARY OF T5.

QTY REQD PER DASH NO.	ITEM	PART OR IDENTIFYING NO.	DWG SIZE	NOMENCLATURE OR DESCRIPTION	CODE IDENT

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	DWG SIZE	USED ON
125991	D	2538

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON: FRAC ± 2 P DEC 3 P DEC ANGLES ± ~ ± ~ ± ~
MACH. SURFACE FIN. 125
ALL DIM. ARE IN AND INCLUDE APPLIED FIN.
REMOVE ALL BURRS AND SHARP EDGES.

DRAWN | DATE
CHECKED
ENGR J. SAINTON

Continental Electronics MFG. CO.
DALLAS TEXAS

SCHEMATIC DIAGRAM
PROGRAM PEAK CLIPPER

SIZE	CODE IDENT NO.	
B	52151	125993

SCALE: ~ WT ~ SHEET 1 OF 1

CEMC FORM 386 B

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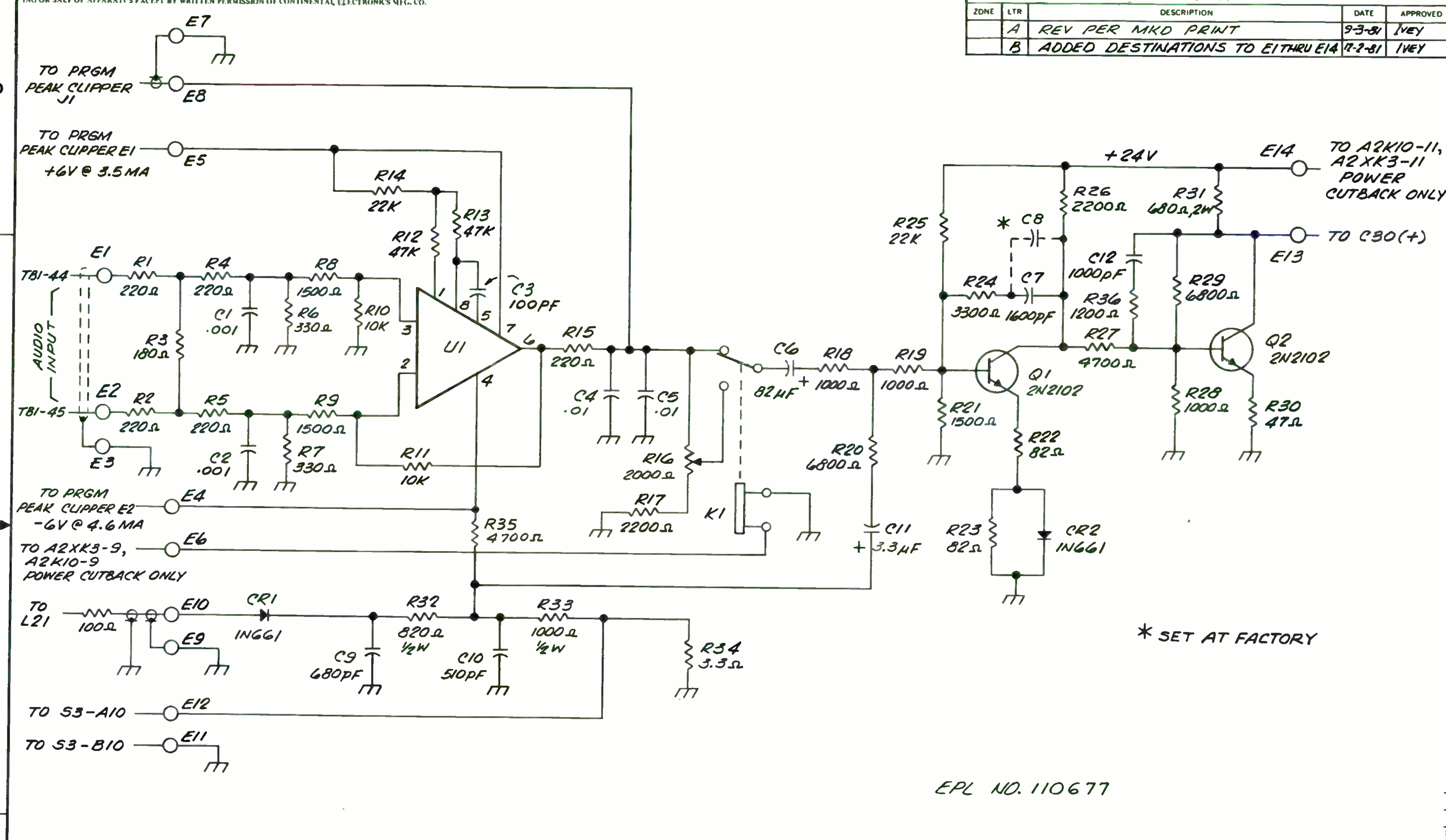
REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	REV PER MKO PRINT	9-3-81	IVEY
	B	ADDED DESTINATIONS TO E1 THRU E14	11-2-81	IVEY



QTY REQD PER DASH NO.	ITEM	ZONE	PART OR IDENTIFYING NO	DWG SIZE	NOMENCLATURE OR DESCRIPTION	CODE IDENT

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	DWG SIZE	USED ON
114355	C	2793

UNLESS OTHERWISE SPECIFIED
TOLERANCE ON: FRAC
2 PLACE DEC · 3 PLACE DEC · ANGLES
MACHINED SURFACE FINISH 125
ALL DIMENSIONS ARE IN AND INCLUDE APPLIED FINISH
REMOVE ALL BURRS AND SHARP EDGES

DRAWN: JAMES IVEY — DATE: 4-15-81
CHECKED:
MECH DSGN:
ELEC ENGR: J. SAINTON
APPROVED:

Continental Electronics MFG. CO. DALLAS TEXAS

SCHEMATIC, AUDIO INPUT AMPLIFIER 315F – 316F TRANSMITTER

SIZE: C — CODE IDENT NO: 52151 — 114037
SCALE: ~ — WT: ~ — SHEET 1 OF 1

CEMC FORM 3868

ELECTRICAL PARTS LIST

Continental Electronics MFG. CO.

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. E114039,114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
		NOTE: Parts marked (*) are to be ordered for fabrication from mechanical assembly lists.		
*A1	Coupler	MAGNIPHASE LINE COUPLER, Per CEMC Dwg. D-114096	114096-1	CEMC
A2		REMOTE CONTROL AND CUTBACK, (Optional)	114092-1	CEMC
A3		LINE VOLTAGE METERING UNIT, (Optional)	114098-1	CEMC
A4		MOTOR AND CLUTCH, (Optional)	114097-1	CEMC
A5		PEAK CLIPER, EPL No. 133450 Schematic No. 125993-B Assembly Dwg. 125991-D	125991-1	CEMC
A6		AUDIO AMPLIFIER, EPL No. 110677 Schematic No. 114037-C Assembly Dwg. 114355-C	114355-1	CEMC

Continental Electronics MFG. CO.

SHEET 2
OF
REV

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. E114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C1	Phase Adjust	CAPACITOR, VARIABLE, AIR, 5.5-100 pf., 600 DCWV (Cardwell No. APC-100B)	144-0255	CEMC
C2	Magnitude Adjust	Same as C1		
C3	Bypass	CAPACITOR, FIXED, CERAMIC, 1,000 pf., 200 VDC, subminiature type	CK05BX102K	Erie
C4	Magniphase Timing	CAPACITOR, FIXED, 2.2 mfd., ±10%, 50 DCWV	MS39003/01-2122	
C5	Bypass	CAPACITOR, FIXED, CERAMIC, 10,000 pf., 200 VDC, subminiature type	CK06BX103K	Erie
C6	Bypass	Same as C5		
C7	Filter	CAPACITOR, FIXED, DIPPED PAPER, .47 mfd., 200 DCWV (C-D No. MCR2P47)	142-1792	CEMC
C8	Magniphase Coupling	CAPACITOR, FIXED, MICA, Value depends on impedance and frequency 10 pf., ±5%, 500 DCWV, 39 pf., ±5%, 500 DCWV 100 pf., ±5%, 500 DCWV	 CM15ED100J03 CM15ED390J03 CM15ED101J03	 El Menco- Arco

Continental Electronics MFG. CO.

SHEET 3
OF
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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C9	Oscillator Feedback	CAPACITOR, FIXED, MICA, 68 pf., 500 DCWV	CM15ED680J03	Elmenco-Arco
C10	Frequency Trimmer	CAPACITOR, VARIABLE, AIR, 2.9 - 25 pf. (Cardwell No. APC-25B)	144-0252	CEMC
C11	Frequency Trimner	Same as C10		
C12	Bypass	CAPACITOR, FIXED, MICA, 390 pf., 500 DCWV	CM15ED391J03	Elmenco-Arco
C13	Feedback	CAPACITOR, FIXED, MICA, 300 pf., 500 DCWV	CM15ED301J03	Elmenco-Arco
C14	Coupling	CAPACITOR, FIXED, MICA, 270 pf., 500 DCWV	CM15ED271J03	Elmenco-Arco
C15	Coupling	Same as C5		
C16	Coupling	Same as C5		
C17	Coupling	CAPACITOR, FIXED, MICA, Frequency determined		
		1600 pf., 500 DCWV (535 KHz - 750 KHz)	CM06FD162J03	Elmenco
		1000 pf., 500 DCWV (750 KHz - 1620 KHz)	CM19E102J	Arco
			140-1700	CEMC

Continental Electronics MFG. CO.

SHEET 4
OF
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NOMENCLATURE 5/10 KW MF Transmitter — ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039,114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C18	Coupling Network	CAPACITOR, FIXED, MICA, Frequency determined.	140-1680	CEMC
		5000 pf., 500 DCWV (535 KHz - 750 KHz)	CM30E502J03	Elmenco-Arco
		3600 pf., 500 DCWV (750 KHz - 1100 KHz)	CM30E362J03	Elmenco-Arco
		2200 pf., 500 DCWV (1100 KHz - 1620 KHz)	CM30E222J03	Elmenco-Arco
C19	Coupling	CAPACITOR, FIXED, MICA, Frequency determined.		
		5000 pf., 500 DCWV (535 KHz - 750 KHz)	CM30E502J03	Elmenco-Arco
		2200 pf., 500 DCWV (750 KHz - 1100 KHz)	CM30E222J03	Elmenco-Arco
		1000 pf., 500 DCWV (1100 KHz - 1620 KHz)	CM19E102J	Elmenco-Arco
		(Not Used on S/N 232 & above)	140-1700	CEMC
C20	Coupling Network	Same as C18		
C21	Filter	CAPACITOR, FIXED, ELECTROLYTIC,	36D251F200AA2A	Sprague
		250 mfd., 200 DCWV with brackets	4586-97A	Sprague
C22		Not Used		
C23	DC Blocking	CAPACITOR, FIXED, MICA, .01 mfd., 2000 V peak	3423-6L	C-D

Continental Electronics MFG. CO.

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OF
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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C24	Network	CAPACITOR, FIXED, MICA, .003 mfd., 2000 V peak (Sangamo No. 27120B302J0-0, Style O mounting) 500 KHz to 800 KHz	140-1441	C#MC
		CAPACITOR, FIXED, MICA, .002 mfd., 3000 V peak (Sangamo No. 27130B202J0-0, Style O mounting) 800 KHz to 1100 KHz	140-1439	CEMC
		CAPACITOR, FIXED, MICA, .001 mfd., 3000 V peak (Sangamo No. 27130B102J0-0, Style O mounting) 1100 KHz to 1600 KHz	140-1438	CEMC
C25	Bypass	CAPACITOR, FIXED, MICA, .05 mfd., 250 V peak (Sangamo No. 27102B503J0-0, Style O mounting)	140-1440 or CM08F513K03	CEMC
C26	Audio Coupling	CAPACITOR, FIXED, ELECTROLYTIC, 2000 mfd., 150 DCWV with mounting brackets	36D212F150BC2A 4586-48	Sprague Sprague
C27	Bypass	CAPACITOR, FIXED, CERAMIC, .01 mfd., 1000 WVDC (Centralab No. DD1032)	140-1162	CEMC

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C28	Bypass	CAPACITOR, FIXED, CERAMIC, .005 pf., 1000 WVDC (Centralab No. DD502) or (5HK-D50)	140-1214	CEMC
C29	Filter	CAPACITOR, FIXED, ELECTROLYTIC, 22 mfd., ±10%, 15 DCWV	MS39003/01-2271	
C30	Audio Coupling	CAPACITOR, FIXED, ELECTROLYTIC, 1000 mfd., 35 DCWV	WBR1000-35V	C-D
C31		Not Used		
C32	Filter	Same as C30		
C33		Not Used		
C34	+120V Filter	Same as C26		
C35	Timing Delay	CAPACITOR, FIXED, 45 mfd., 65 VDC, 90 VDC surge (Sangamo No. 556DG450W065B)	144-0491	CEMC

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C36	Bias Filter	CAPACITOR, FIXED, PAPER DIELECTRIC, 4 mfd., 1000 DCWV oil filled, with footed mounting brackets	A0C1M4ES	Condenser Products
C37	Bias Filter	CAPACITOR, FIXED, PAPER DIELECTRIC, 10 mfd., 600 DCWV, oil filled, with footed mounting brackets	AOC6C10ES	Condenser Products
C38.1	Screen Voltage Filter	CAPACITOR, FIXED, PAPER DIELECTRIC, 15 mfd., 3000 DCWV oil filled	KMOC3M15ES	Condenser Products
C38.2	Screen Voltage Filter	Same as C38.1		
C39	High Voltage Filter	CAPACITOR, FIXED, PLASTIC DIELECTRIC, 20 mfd., 10,000 DCWV, 85^{o}C oil filled (C-D No. TKM100W20 with one mounting bracket)	142-1586	CEMC
C40	Peak Grid Bypass	CAPACITOR, FIXED, MICA DIELECTRIC, 51,000 pf., 2000 volts peak (Sangamo No. 29220B513J0-1, Style 1 mounting)	140-1499 or 2392-CM81	CEMC C-D

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
*C41	Peak Grid Tune	CAPACITOR, FIXED, MICA DIELECTRIC, 500 pf., 3000 volts peak (Sangamo No. 27130B501J0-1, Style 1 mounting) 800 KHz and above - no padder	140-1454	CEMC
C42	Peak Filament Bypass	CAPACITOR, FIXED, MICA DIELECTRIC, .05 mfd., 1500 volts peak	3448-6L	C-D
C43.1	Intergrid	CAPACITOR, VARIABLE, AIR DIELECTRIC, 20-145 pf., 4500 volts peak, Type E, (Cardwell No. 154-15) single section	144-0338	CEMC
C43.2	Padder	CAPACITOR, FIXED, MICA DIELECTRIC, 200 pf., 3000 volts peak (Sangamo No. 27130B201J0-1, Style 1 mounting) 550 KHz to 800 KHz	140-1453	CEMC
		CAPACITOR, FIXED, MICA DIELECTRIC, 100 pf., 3000 volts peak (Sangamo No. 27130B101J0-1, Style 1 mounting) 800 KHz to 1300 KHz, 1300 KHz and above - no padder	140-1452	CEMC
C44.1	Carrier Grid Tune	Same as C43.1		

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C44.2	Padder	Same as C41 550 KHz to 800 KHz, 800 KHz and above - Not Used		
C45	Carrier Grid Bypass	Same as C40		
C46	Screen Bypass	CAPACITOR, FIXED, MICA DIELECTRIC, .015 mfd., 3000 volts peak	2176-CM77	C-D
C47	Carrier Filament Bypass	Same as C42		
C48	HV Bypass	CAPACITOR, FIXED, MICA DIELECTRIC, .005 mfd., 15,000 volts peak	2861-CM92	C-D
C49	Carrier Plate Tune	CAPACITOR, VARIABLE, VACUUM DIELECTRIC, 25 - 500 pf., 15 KV peak test volts (Jennings No. UCS25-500-15_	144-0483	CEMC
C50	Plate Blocking	CAPACITOR, FIXED, MICA DIELECTRIC, .002 mfd., 15,000 volts peak	2550-CM87	C-D

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C51.1	Peak Plate Tune	CAPACITOR, VARIABLE, VACUUM DIELECTRIC, 25 - 1000 pf., 15 KV peak test voltage (Jennings No. UCSX-25-1000-15)	144-0489	CEMC
C51.2	Padder	CAPACITOR, FIXED, VACUUM DIELECTRIC, 1000 pf., 12 KV peak test voltage 535 KHz to 950 KHz	CFDS-1000-12S	Jennings
C52.1	Peak Plate Loading	CAPACITOR, VARIABLE, VACUUM DIELECTRIC, 25 - 1000 pf., 10 KV peak test voltage (Jennings No. UCSX-25-1000-10)	144-0488	CEMC
C52.2	Padder	CAPACITOR, FIXED, VACUUM DIELECTRIC, 1000 pf., 10 KV peak test voltage	CFDS-1000-10S	Jennings
C52.3	Padder	Same as C52.2 535 KHz to 950 KHz		
C53	3rd Harmonic	CAPACITOR, FIXED, MICA DIELECTRIC, 1000 pf., 10,000 volts peak 535 KHz to 950 KHz	2280-CM82	C-D
		CAPACITOR, FIXED, MICA DIELECTRIC, 5000 pf., 10,000 volts peak 950 KHz to 1620 KHz	2250-CM82	C-D

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C54.1	Tee Network Tune	Same as C52.1		
C54.2	Padder	Same as C52.2 535 KHz to 950 KHz		
C55	Bypass	CAPACITOR, FIXED, .22 mfd., 400 VDC	4PS-P22	Sprague
C56	Bypass	Same as C27		
C57	Bypass	Same as C27		
C58	Trap	CAPACITOR, FIXED, CERAMIC, 25 mmf., 5000 DCWV	850S-25	Centralab
C59	Trap	Same as C58		
C60	Antenna Metering	CAPACITOR, FIXED, CERAMIC, 1000 pf., 1000 WVDC	DD1022	Centralab

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter
ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C61	Antenna Metering	Same as C27		
C62	Bypass	CAPACITOR, FIXED, CERAMIC, 560,000 pf., 50 VDC, subminiature type	CK06BX564K	Erie
C63		CAPACITOR, FIXED, ELECTROLYTIC, 34 mfd., 35 DCWV	556D0340W040B	Sangamo

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
CB1	Blower Breaker	CIRCUIT BREAKER, Three pole companion trip. Rated 6 amperes per pole, 250 volts, 60 Hz, curve 2 (Heinemann No. AM3-A3-6-2)	150-0986	CEMC
CB2	Filament	CIRCUIT BREAKER, Three pole common trip. Left coil 8 amperes, center coil 16 amperes, right coil 8 amperes, 250 volts, 60 Hz, curve 10	AM3-A8-L8-C-16-R8-10	Heinemann
CB3	+120 VDC Breaker	CIRCUIT BREAKER, Three pole companion trip. Rated 5 amperes per pole, 250 volts, 60 Hz, curve 3 (Heinemann No. AM3-A3-5-3)	150-0987	CEMC
CB4	Bias Supply Breaker	CIRCUIT BREAKER, Three pole common trip. Rated 0.5 amperes per pole, 250 volts, 60 Hz, curve 3 (Heinemann No. AM3-A3-0.5-3)	150-0985	CEMC
CB5	Screen Supply Breaker	Same as CB3		

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
CR1	Bridge Rectifier	SEMICONDUCTOR DEVICE, DIODE, Silicon, 200 ma, 200 volt peak inverse voltage	1N661	Texas Instruments
CR2	Clipping Diode	Same as CR1		
CR3	Isolation Diode	Same as CR1		
CR4	Isolation Diode	Same as CR1		
CR5	Clipping Diode	SEMICONDUCTOR DEVICE, DIODE, Silicon, 0.25 ampere, 800 volt PIV (Solitron No. CER72C)	171-2152	CEMC
CR6	Isolation Diode	SEMICONDUCTOR DEVICE, DIODE, 6 ampere, 400 volt, fast recovery, stud mounted	1N3883	Motorola
CR7		Not Used		
CR8.1 thru CR8.6	+120 VDC Rectifiers	SEMICONDUCTOR DEVICE, DIODE, Silicon, 400 volts PIV, 3 amperes DC, axial leads	1N4142	

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter
ELECTRICAL PARTS LIST NO. 110678
UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
CR9.1 thru CR9.6	Bias Rectifier	SEMICONDUCTOR DEVICE, DIODE, Silicon, 2000 volts PIV, 50 mA average current, insulated body	1N2376	
CR10.1 thru CR10.6	Screen Rectifier	SEMICONDUCTOR DEVICE, DIODE, 5000 volts PIV, .33 amperes average forward current at 100°C	SCHC5000	Semtech
CR11.1 thru CR11.6	HV Rectifier	RECTIFIER, SEMICONDUCTOR DEVICE, Encapsulated silicon rectifier assembly 20 KV PRV 1.25 ampere DC, half wave with threaded mounting and connecting inserts (IRV No. 67C200H20TTS)	171-2176	CEMC
CR12	+24 Volt Regulator	SEMICONDUCTOR DEVICE, DIODE, 24 volts, silicon zener diode	1N5359B	Motorola
CR13	Isolation Diode	SEMICONDUCTOR DEVICE, DIODE, 0.75 amperes, 600 PIV	1N2071A	Texas Instruments
CR14	Meter Protection	RECTIFIER, SEMICONDUCTOR DEVICE, 400 PRV, 6 amperes DC	60S4	International Rectifier
CR15	Antenna Metering	Same as CR1		

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
DS1	Overload Indicator	LAMP, INCANDESCENT, 28 volt, T-1-3/4 midget flanged base	387	G.E.
DS2	Ready Indicator	Same as DS1		
DS3	HV ON Indicator	Same as DS1		
DS4	Magniphase Trip Indicator	Same as DS1		
DS5	Modulator Indicator	LIGHT, INDICATOR, Flush lens - 110-125 VAC, amber, one piece nylon housing (Leecraft No. 32-2313T)	591-0190	CEMC
DS6	Modulator Indicator	Same as DS5		

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
F1	Modulator Protection	FUSE, CARTRIDGE, Type 3AG, 3 ampere, 250 volt	312003	Littelfuse
F2	Modulator Protection	Same as F1		

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
J1		CONNECTOR, RECEPTACLE, ELECTRICAL, Female	274-202	Radio Shack
J2		TERMINAL, END, 1-5/8", 50 ohm coaxial	2061	Andrews

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
K1	Master Start	RELAY, SOLENOID, Type E, 5 pole, 10 amperes, 300 V contactor with 208/240 V 50/60 Hz coil (Rowan No. 2190-E50BA)	343-5418	CEMC
K2	Blower Starter	RELAY, ARMATURE, Open type starter, 3 pole, size 00 with 240/220, 60/50 Hz coil, including two (2) No. H29 heaters	A200KACW H29	Westinghouse Westinghouse
K3	Blower Holdover Timer	RELAY, SOLENOID, Coil voltage 120 volts DC, continuous, with DPDT contacts rated 15 amperes at 240 VAC. Timing range 0.5 to 10 minutes with front mounting brackets	7022PF	Agastat
K4	PA Filament	RELAY, SOLENOID, Type FE, 5 pole, 15 amperes, 300 VAC, contacts with 125 VDC coil (Rowan No. 2180D-FE50PA)	343-5417	CEMC
K5	Bias	Same as K4		
K6	Screen	Same as K4		

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter
ELECTRICAL PARTS LIST NO. 110678
UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
K7	Plate Voltage	RELAY, ARMATURE, Open type contactor, 3 pole, size 3, 100 ampere, open rating with 240/220 volt 60/50 Hz coil (Westinghouse No. 201K3CW)	343-5420	CEMC
		Interlock for A201 contactor with one N.O. and one N.C. contacts. (Westinghouse No. L56)	501-0008	CEMC
K8	Overload Lockout	RELAY, ARMATURE, LATCHING, Dual coil latch relay, 4PDT with 110 VDC coils both latch and release (Potter & Brumfield No. KBP17DG)	342-0032	CEMC
K9	Reclose	RELAY, ARMATURE, Series 42, DPDT with octal base and cover, coil resistance 12,000 ohms, operating current 4 mA DC (Sigma No. 42RO-12000-G/SIL0	344-0005	CEMC
K10	Overload Count	Same as K9		

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
K11	Overload	RELAY, CURRENT, SENSITIVE, Coil resistance 0.75 ohms ±10%, pull-in current 0.8 ampere DC or less, 2 Form C contacts	MH80892	Botter & Brumfield
K12	Plate Delay Timer	RELAY, THERMAL, 5 second thermal time delay, SP N.O. contacts rated 3 amperes, 115 VAC, 115 VDC coil (Amperite No. 115NO5)	341-5073	CEMC
K13		RELAY, ARMATURE, 4 sets of "C" contacts, 3 amperes, 24 VDC coil	KHU17D11-24VDC	Potter & Brumfield

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039,114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
L1	RF Isolation	COIL, RADIO FREQUENCY, 2000 microhenry, series 2500 at 99 mA	1312-26J	Airco
L2	2nd Buffer Emitter	COIL, RADIO, FREQUENCY, 1000 microhenry, series 2500 at 107 mA (Delevan No. 2500-28 or Airco No. 1331-35J)	350-0145	CEMC
*L3	3rd Buffer Tune	COIL, RADIO FREQUENCY, Per CEMC Dwg. No. B-114308	114308-1	CEMC
L4	Collector RF Choke	COIL, RADIO FREQUENCY, 47 microhenry, 640 mA (Delevan No. 2890-36)	350-0165	CEMC
L5	1st RF Tune	Same as L4 (Not Used on S/N 232 & above)		
*L6	1st RF Collector Choke	COIL, RADIO FREQUENCY, Per CEMC Dwg. No. B-114308	114309-1	CEMC
L7	"L" Network	COIL, RADIO FREQUENCY, 10 microhenry, 7 amperes, 1/4 x .054 edgewise strip with two (2) LC4 coil clips (Cardwell No. 232-626, C #235-804)	350-0103 351-0002	CEMC CEMC

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
*L8	RF Output Collector RF	COIL, RADIO FREQUENCY, Per CEMC Dwg. B-114306 See Factory Test Data for Value	114306-1	CEMC
L9	Peak Grid Inductor	COIL, RADIO FREQUENCY, 31 microhenry, 7 amperes, 1/2" x .054" edgewise strip with three (3) LC4 coil	350-0102	CEMC
		clips (Cardwell No. 232-610, Clip No. 235-804)	351-0002	CEMC
L10	Carrier Grid Inductor	Inductor Same as L9 Four (4) LC4 coil clips	351-0002	CEMC
*L11	Padder	COIL, RADIO FREQUENCY, Per CEMC Dwg. C-114311	114311-1	CEMC
*L12	Padder	Same as L11		
*L13	Interplate Padder	COIL, RADIO FREQUENCY, Per CEMC Dwg. D-114316 300 microhenry - 535 KHz to 720 KHz	114316-1	CEMC

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
*L13	Interplate Padder	COIL, RADIO FREQUENCY, Per CEMC Dwg. D-114317 170 microhenry - 720 KHz to 970 KHz	114317-1	CEMC
		COIL, RADIO FREQUENCY, Per CEMC Dwg. 114318 70 microhenry - 970 KHz to 1300 KHz 1300 KHz to 1620 KHz - no padding	114318-1	CEMC
L14	Interplate Coil	COIL, RADIO FREQUENCY, 200 microhenry, 10 amperes, 1/4" x .054" edgewise strip, with one (1) coil clip	200-407-001 235-804	Cardwell Cardwell
*L15	Carrier Plate	COIL, RADIO FREQUENCY, Per CEMC Dwg. C-114313 720 microhenry - 535 KHz to 800 KHz	114313-1	CEMC
		COIL, RADIO FREQUENCY, Per CEMC Dwg. C-114314 460 microhenry - 800 KHz to 1150 KHz	114314-1	CEMC
		COIL, RADIO FREQUENCY, Per CEMC Dwg. C-114315 300 microhenry - 1150 KHz to 1620 KHz	114315-1	CEMC

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
L16	Pi Network Inductor	COIL, RADIO FREQUENCY, 79 microhenry, 20 amperes, 1/2" x .090" edgewise strip with Clip No. 235-808 or CEMC Dwg. 125125	M79-20 351-0004 125125-2	Cardwell CEMC CEMC
L17	Tee Network Inductor	COIL, RADIO FREQUENCY, 107 microhenry, 20 amperes, 1/2" x .090" edgewise strip with Clip No. 235-808 535 KHz to 850 KHz or CEMC Dwg. 125125	M107-20 351-0004 125125-3	Cardwell CEMC CEMC
		COIL, RADIO FREQUENCY, 79 microhenry, 20 amperes, 1/2" x .090" edgewise strip with Clip No. 235-808 850 KHz to 1200 KHz or CEMC Dwg. 125125	M79-20 351-0004 125125-2	Cardwell CEMC CEMC
		COIL, RADIO FREQUENCY, 50 microhenry, 20 amperes, 1/2" x .090" edgewise strip with Clip No. 235-808 1200 KHz to 1620 KHz	M47-20 351-0004	Cardwell CEMC
L18	Tee Network	COIL, RADIO FREQUENCY, 78 microhenry, 20 amperes, 1/2" x .090" edgewise strip with Clip No. 235-808 535 KHz to 850 KHz or CEMC Dwg. 125125	M79-29 351-0004 125125-2	Cardwell CEMC CEMC

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NOMENCLATURE 5/10 KW MF Transmitter   ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above   TYPE 315F/316F   REF. DWG. NO. 114039   ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
L18		COIL, RADIO FREQUENCY, 50 microhenry, 20 amperes, 1/2" x .090" edgewise strip with Clip No. 235-808 850 KHz to 1620 KHz	M47-20 351-0004	Cardwell CEMC
L19	2nd Harmonic Inductor	COIL, RADIO FREQUENCY, 15 microhenry, 20 amperes, 1/2" x .090" edgewise strip with Clip No. 235-808 535 KHz to 1620 KHz, or CEMC Dwg. 125125	500-303 351-0004 125125-1	CSP CEMC CEMC
*L20	Modulation Monitor Pickup	COIL, RADIO FREQUENCY, Per CEMC Dwg. B-114250	114250-1	CEMC
*L21	Feedback and Static Drain Choke	COIL, RADIO FREQUENCY, Per CEMC Dwg. C-114199	114199-1	CEMC
*L22	Parasitic Trap	COIL, RADIO FREQUENCY, Per CEMC Dwg. C-114187 8 turns #14 GA. wire around 50 ohm 3/4 x 6" Globar	114187-1	CEMC

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
*L23	Parasitic Trap	Same as L22		
L24	Parasitic Trap	SUPPRESSOR, PARASITIC, (Ohmite No. P300)	231-6021	CEMC
L25	Parasitic Trap	Same as L24		
L26	+120 VDC Filter Choke	REACTOR, 0.05 henry ±10%, 4.5 amperes, 120 DCWV, 500 volts test, dry type	510-7011	CEMC
L27	Bias Filter Choke	REACTOR, 5 henry ±10%, 0.07 amperes, 750 DCWV, 2 KV test, dry type	510-7013	CEMC
L28	Screen Voltage Filter Choke	REACTOR, 1.0 henry ±10%, 0.35 amperes, 1800 DCWV 5 KV test, dry type	510-7079	CEMC
L29	Plate Voltage	REACTOR, 2.0 henry ±10%, 2.5 amperes, 9000 DCWV 20 KV test, dry type	512-7001	CEMC

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
L30		Not Used		
L31	Antenna Current Meter	Same as L2		

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
M1	Line Voltage	VOLTMETER, 3-1/2" self contained, rectifier type 0-300 VAC, 3% accuracy, taut band suspension 50/60 Hz, surface mount. Series S	3S-AVV-300	Modutec
M2	PA Screen Current	METER, 3-1/2" 0-500 MADC, 2% accuracy, taut band suspension. Minimum of 50 scale divisions. Surface mount S series, with external shunt	833-882	Modutec
M3	Plate Voltage	METER, 3-1/2" 0-1 MADC, 2% accuracy, taut band suspension with scale marked 0-15 and labeled DC KILOVOLTS. Minimum of 60 scale divisions, surface mount S series	831-914	Modutec
M4	Plate Current	METER, 3-1/2" .0-5 amperes DC, 2% accuracy, taut band suspension, minimum of 50 scale divisions, surface mount S series with external shunt	833-881	Modutec

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
M5	Filament Hours	METER, TIME TOTALIZING, Elapsed time meter. 99,999.9 hours without reset, 220 volts (Cramer No. 635SS100AB0010A for 60 Hz) (Cramer No. 635SS100AB0021A for 50 Hz)	 378-0773 378-0775	 CEMC CEMC
M6	Test Meter	METER, 2-1/2" 0-1 MADC, 2% accuracy, taut band suspension, with dual scale marked 0-1 and 0-5 and labeled TEST METER. Minimum of 50 scale divisions, surface mount S series	2S-DMA-001	Modutec
M7	Antenna Current	METER, 3-1/2" 0-1 MADC, 2% accuracy, taut band suspension with scale marked 0-20 and labeled RF AMPERES. Minimum of 40 scale divisions. Surface mount S series 3S-DMA-001	831-915	Modutec

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
MB1	Blower	FAN, CENTRIFUGAL, Direct drive blower with 1.0 HP, 208/230V, 60 Hz, 1450/1750 RPM, 3 phase motor, counterclockwise vertical upblast discharge (Peerless Electric No. D11E)	120-0018	CEMC
		Motor only	3N012	Grainger

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UNIT S/N 212 & above — TYPE 315F/316F — REF. DWG. NO. 114039 — ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
P1		CONNECTOR, PLUG, ELECTRICAL, Male	274-201	Radio Shack

CEMC 524 2/73

REV A H1-45

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
Q1	Fault Amplifier	TRANSISTOR, NPN type (Texas Instrument Type 2N697)	450-0007	CEMC
Q2	Multivibrator	Same as Q1		
Q3	Multivibrator	Same as Q1		
Q4	Lamp Multi-vibrator	Same as Q1		
Q5	Lamp Multi-vibrator	Same as Q1		
Q6	Oscillator	Same as Q1		
Q7	1st Buffer	Same as Q1		
Q8	2nd Buffer	Same as Q1		
Q9	3rd Buffer	TRANSISTOR, NPN silicon power transistor (Delco No. DTS-423)	450-0047	CEMC
Q10	RF Driver	Same as Q9		
Q11	RF Output	Same as Q9		
Q12	RF Output	Same as Q9		

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
Q13	RF Output	Same as Q9		
Q14	RF Output	Same as Q9		
Q15		Not Used		
Q16	2nd Audio	Same as Q9		
Q17	Darlington Driver	Same as Q9		
Q18	Modulator	Same as Q9		
Q19	Modulator	Same as Q9		
Q20	Darlington Driver	Same as Q9		
Q21	Modulator	Same as Q9		
Q22	Modulator	Same as Q9		
Q23	Modulator Bias Amplifier	Same as Q1		
Q24	Magniphase Timing	Same as Q1		
Q25	dulator	Same as Q9		

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039,114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R1	Loading	RESISTOR, FIXED, WIREWOUND, NON-INDUCTIVE, 300 ohms, 10 watts, Koolohm (Sprague No. 457E3015)	463-5120 or 78EN300R00J	CEMC Ohmite
R2	Loading	RESISTOR, FIXED, WIREWOUND, NON-INDUCTIVE, 2000 ohms, 10 watts, Koolohm (Sprague No. 457E2025)	463-5119 or 78EN2000R00J	CEMC Ohmite
R3	Metering	RESISTOR, FIXED, COMPOSITION, 15,000 ohms, ±5%, 1/2 watt	RCR20G153JS	
R4	Isolation	RESISTOR, FIXED, COMPOSITION, 100,000 ohms, ±5%, 1/2 watt	RCR20G104JS	
R5	Metering	RESISTOR, FIXED, COMPOSITION, 1000 ohms, ±5%, 1/2 watt	RCR20G102JS	
R6	Base	RESISTOR, FIXED, COMPOSITION, 39,000 ohms, ±5%, 1/2 watt 27,000 ohms, ±5%, 1/2 watt (S/N 232 & above)	RCR20G393JS RCR20G273JS	
R7	Emitter	RESISTOR, FIXED, COMPOSITION, 10,000 ohms, ±5%, 1/2 watt	RCR20G103JS	

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R8	Isolation	Same as R5		
R9	Collector Load	Same as R5		
R10	Time Constant	RESISTOR, FIXED, COMPOSITION, 47,000 ohms, ±5%, 1/2 watt	RCR20G473JS	
R11	Collector Load	RESISTOR, FIXED, COMPOSITION, 2200 ohms, ±5%, 1/2 watt	RCR20G222JS	
R12	Isolation	Same as R5		
R13	Base	RESISTOR, FIXED, COMPOSITION, 22,000 ohms, ±5%, 1/2 watt	RCR20G223JS	
R14	Feedback	RESISTOR, FIXED, COMPOSITION, 6.8K ohms, ±5%, 1/2 watt	RCR20G682JS	
R15	Coupling	RESISTOR, FIXED, COMPOSITION, 68,000 ohms, ±5%, 1/2 watt	RCR20G683JS	

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R16	Collector Load	Same as R11		
R17	Oscillator Bias	Same as R4		
R18	Collector Load	Same as R7		
R19	Isolation	RESISTOR, FIXED, COMPOSITION, 4700 ohms, ±5%, 1/2 watt	RCR20G472JS	
R20	Bias	RESISTOR, FIXED, COMPOSITION, 33,000 ohms, ±5%, 1/2 watt	RCR20G333JS	
R21	Base	Same as R13		
R22	Emitter	Same as R11		
R23	Bias	RESISTOR, FIXED, COMPOSITION, 18,000 ohms, ±5%, 1/2 watt	RCR20G183JS	
R24	Base	RESISTOR, FIXED, COMPOSITION, 470 ohms, ±5%, 1/2 watt	RCR20G471JS	

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R25	Emitter	RESISTOR, FIXED, COMPOSITION, 560 ohms, $\pm 5\%$, 1/2 watt	RCR20G561JS	
R26	Bias	Same as R7		
R27	Base	RESISTOR, FIXED, COMPOSITION, 1800 ohms, $\pm 5\%$, 1/2 watt	RCR20G182JS	
R28	Emitter	RESISTOR, FIXED, COMPOSITION, 5 ohms, $\pm 5\%$, 1 watt	RCR32G5R1JR	
R29	Frequency Output Divider	RESISTOR, FIXED, COMPOSITION, 47 ohms, $\pm 5\%$, 1/2 watt	RCR20G470JS	
R30	Frequency Output Divider	RESISTOR, FIXED, COMPOSITION, 820 ohms, $\pm 5\%$, 1/2 watt	RCR20G821JS	
R31	Base	RESISTOR, FIXED, COMPOSITION, 33 ohms, $\pm 5\%$, 1/2 watt	RCR20G330JS	

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R32	Current Limiting	RESISTOR, FIXED, COMPOSITION, 10 ohms, ±5%, 1/2 watt	RCR20G100JS	
R33	Divider	RESISTOR, ADJUSTABLE, WIREWOUND, 500 ohms, ±10%, 175 watts (Ohmite No. 1161)	463-5532	CEMC
R34	Metering	RESISTOR, FIXED, WIREWOUND, 470 ohms, 1% tolerance, 3 watts	460-1873 XXtA-470T1 OR 41F470	CEMC Lectrohm Ohmite
R35	Metering	RESISTOR, FIXED, WIREWOUND, 0.1 ohm, 1% tolerance, 2.5 watts (Ohmite Type 80013)	460-2900	CEMC
R36	RF Output Base	RESISTOR, FIXED, COMPSOTION, 47 ohms, ±5%, 2 watts	RCR42G470JS	
R37	Emitter	RESISTOR, FIXED, WIREWOUND, 0.2 ohm, ±1% tolerance, 2.5 watts (Ohmite Type 80053)	460-2902	CEMC
R38	Emitter	Same as R37		

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R39	Emitter	Same as R37		
R40	Emitter	Same as R37		
R41	Dropping	RESISTOR, FIXED, WIREWOUND, 3 ohms, 25 watt (Ohmite No. 0200L)	463-5648	CEMC
R42	Metering	RESISTOR, FIXED, FILMM 100,000 ohms, 1% tolerance, 1 watt T-O Temp.	RN70D1003F	
R43	Metering	Same as R42		
R44	Emitter	Same as R28		
R45	Modulation Drive Adjust	RESISTOR, ADJUSTABLE, WIREWOUND, 25 ohms, 175 watts (Ohmite No. 1158)	463-5528	CEMC

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R46	Modulation Drive Adjust	Same as R45		
R47	Modulation	RESISTOR, FIXED, WIREWOUND, 25 ohms, 175 watts (Ohmite No. 0701)	463-5591	CEMC
R48	Metering	Same as R35		
R49	Metering	Same as R34		
R50	Power Adjust	RESISTOR, VARIABLE, WIREWOUND, 10 ohms, 100 watts (Ohmite Model K, Series A, No. 0446)	463-5823	CEMC
		Bracket per CEMC Dwg. B-114319	114319-1	CEMC
		Coupling per CEMC Dwg. B-114320	114320-1	CEMC
R51 thru R64		Not Used		

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R65	Coupling	RESISTOR, FIXED, COMPOSITION, 3900 ohms, ±5%, 1/2 watt	RCR20G392JS	
R66	Coupling	Same as R13		
R67	Base	RESISTOR, FIXED, COMPOSITION, 390 ohms, ±5%, 1/2 watt	RCR20G391JS	
R68	Emitter	RESISTOR, FIXED, WIREWOUND, 4.02 ohms, 1% tolerance, 3 watts	80753	Ohmite
R69	Collector Load	RESISTOR, VARIABLE, WIREWOUND, 250 ohms, 25 watt	0568	Ohmite
R70	Emitter	RESISTOR, FIXED, WIREWOUND, 0.5 ohm, ±1% tolerance, 2.5 watts (Ohmite No. 80123)	460-2901	CEMC
R71	Emitter	Same as R70		
R72	Emitter	Same as R70		

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R73	Emitter	Same as R70		
R74.1	Isolation	RESISTOR, FIXED, COMPOSITION, 10 ohms, ±5%, 2 watt	RCR42G100JS	
R74.2	Isolation	Same as R74.1		
R75	Metering	Same as R42		
R76	Timing	RESISTOR, FIXED, COMPOSITION, 18,000 ohms, ±5%, 2 watt	RCR42G183JS	
R77	Loading	RESISTOR, FIXED, COMPOSITION, 1200 ohms, ±5%, 1/2 watt	RCR20G122JS	
R78	Dropping	Same as R76		
R79	Metering	RESISTOR, FIXED, FILM, 499,000 ohms, 1% tolerance, 1 watt T-O Temp. Coefficient	RN70D4993F	

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R80	Metering	Same as R79		
R81	Metering	Same as R79		
R82	Metering	Same as R7		
R83		Not Used		
R84	Dropping	RESISTOR, FIXED, WIREWOUND, 5000 ohms, 20 watt	1836	Ohmite
R85	Carrier Bias Adjust	RESISTOR, VARIABLE, WIREWOUND, 1500 ohms, 25 watt (Ohmite Model H, Series A, No. 0159)	463-5506	CEMC
R86	Dropping	RESISTOR, FIXED, WIREWOUND, 7500 ohms, 50 watt (Ohmite No. 0412)	463-5552	CEMC
R87	Bleeder	RESISTOR, FIXED, WIREWOUND, 25,000 ohms, 225 watt (Ohmite No. 0919)	463-5571	CEMC

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UNIT S/N 212 & above — TYPE 315F/316F — REF. DWG. NO. 144039 — ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R88.1 thru R88.5	Metering	RESISTOR, FIXED, FILM, 1,000,000 ohms, 1% tolerance, 1 watt, T-O Temp. Coefficient	RN70D1004E	
R89	Metering	Same as R7		
R90.1 thru R90.3	Metering	RESISTOR, FIXED, METER MULTIPLIER, 5 megohms, ±1/2%, with ferrule ends (Weston No. MFA-505)	463-0033	CEMC
R91	Protection	RESISTOR, FIXED, COMPOSITION, 1 megohm, ±5%, 2 watt	RCR42G105JS	
R92	RC Metering	RESISTOR, FIXED, COMPOSITION, 10,000 ohms, ±5%, 2 watt	RCR42G103JS	
*R93	PA Plate O/L Relay Shunt	SHUNT, RELAY OVERLOAD, Per CEMC Dwg. B-114336	114336-1	CEMC
R94	Metering	RESISTOR, FIXED, WIREWOUND, 0.1 ohm, 1% tolerance, 10 watt (Dale No. RS10)	463-5452	CEMC

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UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R95	Metering	Same as R34		
R96	Peak Cathode	RESISTOR, FIXED, WIREWOUND, NON-INDUCTIVE, 25 ohms, 175 watt (Ohmite No. 2403) Not Used S/N 232 & above	463-5535	CEMC
R97	Grid Loading	RESISTOR, FIXED, WIREWOUND, NON-INDUCTIVE, 500 ohms, 100 watt (Ohmite No. 2209)	463-5837	CEMC
R98.1 and R98.2	Carrier Cathode	RESISTOR, FIXED, WIREWOUND, NON-INDUCTIVE, 50 ohms, 175 watt (Ohmite No. 2404)	463-5533	CEMC
R99	RC Metering	RESISTOR, FIXED, WIREWOUND, 2 ohms, 100 watt (Ohmite No. 0600D)	463-5556	CEMC
R100	Parasitic Suppressor	Part of L24		
R101	Parasitic Suppressor	Part of L25		

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R102	Parasitic Suppressor	RESISTOR, FIXED, COMPOSITION, 50 ohm Globar, 10%, 1" dia. x 6" long (Carborundum No. 887SP-50)	460-1865	CEMC
R103	Parasitic Suppressor	Same as R102		
R104	Dropping	RESISTOR, FIXED, COMPOSITION, 100 ohms, ±5%, 2 watt	RCR42G101JS	
R105	Dropping	Same as R104		
R106	Dropping	Same as R104		
R107		Not Used		
R108	Protection	RESISTOR, FIXED, COMPOSITION, 100,000 ohms, ±5%, 2 watt	RCR42G104JS	

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
*R109	Isolation	RESISTOR, FIXED, COMPOSITION, 22 ohms, ±5%, 1/2 watt (535 - 750 KHz)	RCR20G220JS	
		RESISTOR, FIXED, COMPOSITION, 10 ohms, ±5%, 1/2 watt (750 - 1100 KHz) Deleted and replaced with a short (1100 - 1620 KHz)	RCR20G100JS	
R110	Collector Load	Same as R7		
R111	Dropping	RESISTOR, FIXED, COMPOSITION, 1800 ohms, ±5%, 2 watt	RCR42G182JS	
R112	Bias	RESISTOR, FIXED, COMPOSITION, 1500 ohms, ±5%, 2 watt	RCR42G152JS	
R113		Not Used		
R114	Loading	RESISTOR, FIXED, COMPOSITION, 1200 ohms, ±5%, 2 watt	RCR42G122JS	

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R115	Isolation	RESISTOR, FIXED, COMPOSITION, 4.3 ohms, ±5%, 1 watt (550 - 750 KHz)	RCR32G4R3JS	
		RESISTOR, FIXED, COMPOSITION, 2.7 ohms, ±5%, 1 watt (750 - 1100 KHz) Deleted and replaced with a short (1100 - 1620 KHz)	RCR32G2R7JS	
R116	Isolation	Same as R115		
R117	Isolation	Same as R4		
R118	Base	Same as R107		
R119	Modulator Bias Adjust	RESISTOR, VARIABLE, COMPOSITION, 1000 ohms, 1/2 watt with locking nut and screwdriver slot (Ohmite Type AS3604)	RV6LAYSA-102A	
R120	Bias	RESISTOR, FIXED, COMPOSITION, 3300 ohms, ±5%, 1/2 watt	RCR20G332JS	

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R121	Collector Load	Same as R24		
R122	Feedback	Same as R19		
R123		Not Used		
R124	Collector Load	RESISTOR, FIXED, COMPOSITION, 8200 ohms, ±5%, 1/2 watt	RCR20G822JS	
R125	Surge Limiting	RESISTOR, FIXED, WIREWOUND, 3 ohms, 100 watt	0600E	Ohmite
R126	Surge Limiting	Same as R125		
R127	Dropping	RESISTOR, VARIABLE, WIREWOUND, 2500 ohms, 25 watt (Not used on Type 316F)	0378	Ohmite
R128	Bleeder	Same as R87		

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R129	Loading	Same as R31		
R130	Loading	Same as R31		
R131	Loading	Same as R31		
R132	Loading	Same as R31		
*R133	Loading	See Factory Test Data for values		
*R134	Loading	See Factory Test Data for values		
R135	Isolation	RESISTOR, FIXED, COMPOSITION, 470 ohms, ±5%, 2 watt	RCR42G471JS	
R136	Isolation	Same as R135		
R137	Base	RESISTOR, FIXED, COMPOSITION, 68 ohms, ±5%, 1/2 watt	RCR20G680JS	

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R138	Loading	RESISTOR, FIXED, WIREWOUND, 250 ohms, 40 watt	1811	Ohmite
R139	Antenna Metering	RESISTOR, VARIABLE, COMPOSITION, 10,000 ohms, 1/2 watt with locking nut and screwdriver slot	AS3607	Ohmite
R140	Antenna Metering	Same as R11		
R141		RESISTOR, FIXED, WIREWOUND, 10 ohms, 300 watt	2521	Ohmite
R142		RESISTOR, FIXED, WIREWOUND, 10 ohms, $\pm 5\%$, 20 watt	1804	Ohmite
R143		EXTERNAL SHUNT, For M4	S50-005	Modutec

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R144		RESISTOR, FIXED, PRECISION, 0.11 ohms, ±1%, 2 watt (Furnished on M2)	LVR-2	Dale
R145		Same as R104		

CEMC 524 2/73

REV A H1-48

NOMENCLATURE 5/10 KW MF Transmitter
ELECTRICAL PARTS LIST NO. 110678
UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
RT1	Temperature Sensing	THERMISTOR,	2D302	G.E.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
S1	Magniphase Disable	SWITCH, TOGGLE, DPDT, single hole mounted, solder lug terminal (Cutler Hammer No. 8373K8)	502-0082	CEMC
S2	Lamp Reset	SWITCH, PUSH, MOMENTARY ACTION, Two single pole double throw circuits with red button (Microswitch No. 2PB12-T2)	501-2460	CEMC
S3	Test Meter Selector	SWITCH, ROTARY, 2 poles, 2-11 positions, 2 sections, non-shorting, 30° detent (Centralab No. 2513)	503-0037	CEMC
S4	XTAL Select	Same as S3		
S5	Master ON	Same as S1		
S6	Plate ON	Same as S1		
S7	Overload Reset	Same as S2		

CEMC 524 2/73 REV A H1-45

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
S8	Low Power	SWITCH, PUSH, MOMENTARY ACTION, Two SPDT circuits with black button (Microswitch No. 2PB11-T2)	501-2459	CEMC
S9	High Power	Same as S8		
S10	Air Flow	SWITCH, AIR FLOW, SPDT, 5 ampere contacts with Vane No. 1000 (Rotron No. 2A-1000)	500-4005	CEMC
S11	Door Interlock	SWITCH, INTERLOCK SPDT, 15 amperes, 125 VAC	23AC7	Microswitch
S12	Door Interlock	Same as S11		
S13	Door Interlock	Same as S11		
S14	Line Voltage Selector	Same as S3		
S15	Power Raise-Lower	SWITCH, TOGGLE, DPDT, off center, down and up momentary, used when transmitter is remote controlled (Cutler Hammer No. 8834K5)	502-0008	CEMC

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
*S16	Grounding	SWITCH, GROUND, Per CEMC Dwg. D-114286	114286-3	CEMC
*S17	Grounding	SWITCH, GROUND, Per CEMC Dwg. D-114286	114286-2	CEMC
*S18	Grounding	SWITCH, GROUND, Per CEMC Dwg. D-114286	114286-1	CEMC

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
*T1	Magniphase	COIL, TOROID, Assembly per CEMC Dwg. 19804-B	19804-1	CEMC
T2		Not Used		
T3	PA Filament	TRANSFORMER, POWER, STEP-DOWN, Primary: 208/230 V, 50/60 Hz, single phase, taps to provide 6.25 and 6.0 V on secondary. Secondary: 6.5V at 160 ampere with center tap for 2 ADC. Open frame, dry type (Basler No. BE-10958001) (Type 316F only)	512-0428	CEMC
		TRANSFORMER, POWER, STEP-DOWN, Primary: 208/230 V, 50/60 Hz, single phase. Secondary: 7.7 V at 75 ampere center tap. Open frame, dry type (Basler No. BE-11610001) (Type 315F only)	510-0549	CEMC
T4	PA Filament	Same as T3		
T5	+120 V	TRANSFORMER, POWER, STEP-DOWN, Primary: 208/230 V, 50/60 Hz, 3 phase, delta connected. Secondary: 98 V at 3.6 amperes delta connected. Open frame, dry type	510-0608	CEMC

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
T6	Bias	TRANSFORMER, POWER, STEP-UP, Primary: 208/230 VAC, 50/60 Hz, 3 phase delta connected. Secondary: 550 VAC line to line, delta connected to supply 750 VDC at 0.07 amperes from a 3 phase full wave bridge rectifier. Minimum impedance 4%, maximum impedance 8%	510-0542	CEMC
T7	Screen	TRANSFORMER, POWER, STEP-UP, Primary: 208/230 V, 50/60 Hz, 3 phase delta connected. Secondary: 1480 V or 1290 V wye connected. Single unit, open frame, dry type	510-0609	CEMC
T8	Plate	TRANSFORMER, POWER, STEP-UP, Primary: 208/230 VAC 50/60 Hz, 3 phase delta connected with ±5% taps and additional tap for 5200 volts from secondary. Secondary: 6700 or 5200 VAC line to line, wye connected to supply 9000 VDC at 2.5 amperes or 7000 VDC at 1.04 amperes. Minimum impedance 8%, maximum impedance 12%	512-0427	CEMC
T9	Lamp	TRANSFORMER, POWER, STEP-DOWN, Primary: 115/230 volts, 50/60 Hz Secondary: 25.2 volts CT, 2 amperes	F-341X	Triad

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REV B

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039,114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
T10		TRANSFORMER, Primary: 10 turns #26 Formax Secondary: 10 turns #26 Formax Two (2) each Ferrocube core type 3C8-768T188 Per CEMC Dwg. 114067 For S/N 232 & above	114067-1	CEMC

Continental Electronics MFG. CO.

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REV B

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
TB1	Main Terminal	TERMINAL BOARD, 15 terminal barrier strip (Qty. 2) 20 terminal barrier strip (Qty. 1) (Kulka No. 671-15 & No. 671-20)	 520-0724 520-0729	 CEMC CEMC
TB2	Input Power	TERMINAL BOARD, Extra heavy duty sectional terminal blocks. Molded black phenolic. Tubular screw contacts for direct or channel mounting (Buchanan No. XHD426-3)	520-0835	CEMC
TB3	Metering Panel Interconnect	TERMINAL BOARD, 5 terminal barrier strip (Kulka No. 670-5)	520-0335	CEMC
TB4	Cutback Interconnect	TERMINAL BOARD, 10 terminal barrier strip (Kulka No. 671-10)	520-0719	CEMC
TB5	Blower	TERMINAL BOARD, 3 terminal barrier strip (Kulka No. 672-3)	520-0254 CEMC	
TB6	Lamp Trans-former	TERMINAL BOARD, 6 terminal barrier strip	671-6	Kulka
TB7	Meter	TERMINAL BOARD, 2 terminal barrier strip	670-2	Kulka

Continental Electronics MFG. CO.

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REV B

NOMENCLATURE 5/10 KW MF Transmitter

ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
V1	Final Amplifier	TUBE, POWER, Tetrode (Type 316F only)	8281/4CX15,000	Eimac
		TUBE POWER, Tetrode (Type 315F only)	4CX10,000D	Eimac
V2	Final Amplifier	Same as V1		

Continental Electronics MFG. CO.

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REV B

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039,114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
VR1	Transient	VARISTOR, METAL OXIDE, 575 V, 80 joules	V575LA80B	G.E.
VR2	Transient Suppressor	Same as VR1		
VR3		Not Used		
VR4		Not Used		
VR5		Not Used		
VR6	Suppressor	Same as VR1		
VR7	Suppressor	Same as VR1		

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XDS1	Overload	LIGHT, INDICATOR, Lamp socket for T-1-3/4 bulb with red lens	RAB6010 RA210RT OR 923-405X 410-RT	Eldema Littelfuse
XDS2	Ready	LIGHT, INDICATOR, Lamp socket for T-1-3/4 bulb with green lens	RAB6010 RA210GT OR 923-405X 410-GT	Eldema Littelfuse Littelfuse
XDS3	HV ON	Same as XDS1		
XDS4	Trip Lamp	Same as XDS1		
XDS5	Modulator	Part of DS5		
XDS6	Modulator	Part of DS6		

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039,114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XF1	Modulator	FUSEHOLDER ASSEMBLY, 3AG single fuse mounting	357001	Littelfuse
XF2	Modulator	Same as XF1		

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XK1 thru XK7		Not Used		
XK8	Overload Lockout	SOCKET, ELECTRON TUBE, Black phenolic dielectric, top mounting, 20 pin (Amphenol No. 77MIP-20)	590-0105	CEMC
XK9	Reclose	SOCKET, ELECTRON TUBE, 8 pin mica filled phenolic dielectric, top mounting (Amphenol No. 77MIP8T)	590-0209	CEMC
XK10	Overload Count	Same as XK9		
XK11		Not Used		
XK12	Plate Delay	Same as XK9		
XK13		SOCKET, RELAY, 3/8" pierced terminals with retainer	27E006 24A032	Potter & Brumfield

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter
ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XQ1 thru XQ8		SOCKET, TRANSISTOR, 3 contacts, use Heat Sink with XQ8 ONLY	8058-1G25 205-CB	Augat Wakefield
XQ9	3rd Buffer	SOCKET, TRANSISTOR, Heat Sink Socket No.	6016B 8080-1G3	Thermalloy Augat
XQ10	RF Driver	HEAT SINK-SOCKET, SEMICONDUCTOR DEVICE, Socket No.	680-1.25A 8080-1G3	Wakefield Augat
XQ11 thru XQ14	RF Output	Same as XQ10		
XQ15		Not Used		
XQ16 thru XQ22	Modulator	Same as XQ10		
XQ23		Same as XQ1		
XQ24		Same as XQ1		
XQ25	Modulator	Same as XQ10 except DO NOT use Heat Sink		

Continental Electronics MFG. CO.

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039 114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XV1	Final Amplifier	SOCKET, ELECTRON TUBE, Tube socket for 4CX15,000A tube with air chimney (Eimac No. SK-300A & SK-316) (316F only)	590-0159 590-0230	CEMC CEMC
		SOCKET, ELECTRON TUBE, Tube socket for 4CX10,000A tube with air chimney (Eimac No. SK-300A & SK1306) (315F only)	590-0159 590-0141	CEMC CEMC
XV2	Final Amplifier	Same as XV1		

NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039,114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XY1	Crystal Socket	Same as XK9		
XY2	Crystal Socket	Same as XK9		

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NOMENCLATURE 5/10 KW MF Transmitter ELECTRICAL PARTS LIST NO. 110678

UNIT S/N 212 & above TYPE 315F/316F REF. DWG. NO. 114039,114066 ENGR. Joe Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
Y1	Crystal	CRYSTAL, Unheated, vacuum, on carrier frequency	T12A	Northern Engineering
Y2	Crystal	Same as Y1		

FO-2755/318.5C
Unit 2A7

Continental Electronics MFG. CO.

SHEET 1 OF 14 REV A

NOMENCLATURE Peak Clipper ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE 316F,317C-1(MOD) 318.5C REF. DWG. NO. 125993 ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C1	Coupling	CAPACITOR, FIXED, CERAMIC, 1000 pf., 200 DCWV, Type CKR05	M39014/01-1317	
C2	Timing	CAPACITOR, FIXED, CERAMIC, .1 mfd., 50 DCWV, Type CKR05	M39014/01-1553	
C3	Timing	CAPACITOR, FIXED, CERAMIC, .1 mfd., 50 DCWV, Type CKR05	M39014/01-1553	
C4	Bypass	CAPACITOR, FIXED, CERAMIC, 1000 pf., 200 DCWV, Type CKR05	M39014/01-1317	
C5	Bypass	CAPACITOR, FIXED, CERAMIC, .1 mfd., 50 DCWV, Type CKR05	M39014/01-1553	
C6	Bypass	CAPACITOR, FIXED, ELECTROLYTIC, 50 mfd., 25 DCWV, vertical PC mount	PC50-25	Cornell Dubilier
C7	Bypass	CAPACITOR, FIXED, CERAMIC, .1 mfd., 50 DCWV, Type CKR05	M39014/01-1553	
C8	Bypass	CAPACITOR, FIXED, ELECTROLYTIC, 50 mfd., 25 DCWV, vertical PC mount	PC50-25	Cornell Dubilier
C9	Filter	CAPACITOR, FIXED, ELECTROLYTIC, 500 mfd., 16 DCWV, vertical PC mount	PC500-16	Cornell Dubilier
C10	Filter	CAPACITOR, FIXED, ELECTROLYTIC, 500 mfd., 16 DCWV, vertical PC mount	PC500-16	Cornell Dubilier

Continental Electronics MFG. CO.

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OF
REV

NOMENCLATURE Peak Clipper ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE 316F,317C-1(MOD) 318.5C REF. DWG. NO. 125993 ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
CR1	Clamp	SEMICONDUCTOR DEVICE, DIODE, Silicon, 200 ma, 200 PIV	1N661	
CR2	Zener	SEMICONDUCTOR DEVICE, DIODE, 6.2 volt, ±5%, 400 milliwatt, zener	1N753A	
CR3	Zener	SEMICONDUCTOR DEVICE, DIODE, 6.2 volt, ±5%, 400 milliwatt, zener	1N753A	

NOMENCLATURE Peak Clipper ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE ~~316F, 317C-1(M~~OD) ~~318.5C~~ REF. DWG. NO. 125993 ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
DS1		DIODE, LIGHT EMITTING, Diffused led lamp with snap-in mount	521-9165 (Red) 515-0005	Dialight Dialight
DS2		Same as DS1		

Continental Electronics MFG. CO.

SHEET 4
OF
REV

NOMENCLATURE Peak Clipper

ELECTRICAL PARTS LIST NO. 133450

UNIT

TYPE 316F,317C-1(MOD) 318.5C

REF. DWG. NO. 125993

ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
F1		FUSE, CARTRIDGE, 3AG, 1/4 ampere, 250 volt	312.250	Littelfuse

Continental Electronics MFG. CO.

SHEET 5
OF
REV C

NOMENCLATURE Peak Clipper

ELECTRICAL PARTS LIST NO. 133450

UNIT

TYPE 316F,317C-1(MOD) ~~318.5C~~

REF. DWG. NO. 125993

ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
J1		JACK, PHONO, Front mount	3501FP	Switchcraft
J2		CONNECTOR, RECEPTACLE, ELECTRICAL,	372-9606-010	CEMC

Continental Electronics MFG. CO.

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OF
REV C

NOMENCLATURE Peak Clipper ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE 316F,317C-1(MOD) ~~318.5C~~ REF. DWG. NO. 125993 ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
P1		CONNECTOR, PLUG, ELECTRICAL, 3 ft. shielded wire with molded in phono plug on one end only	42-2370	Radio Shack
P2		CONNECTOR, PLUG, ELECTRICAL, With two (2) terminals	372-9606-020 372-0064-070	CEMC CEMC

Continental Electronics MFG. CO.

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NOMENCLATURE Peak Clipper ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE 316F,317C-1(MOD) 318.5C REF. DWG. NO. 125993 ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R1	Collector	RESISTOR, FIXED, COMPOSITION, 100,000 ohms, +5%, 1/4 watt	RCR07G104JS	
R2	Led	RESISTOR, FIXED, COMPOSITION, 180 ohms, +5%, 1/4 watt	RCR07G181JS	
R3	Bias	RESISTOR, FIXED, COMPOSITION, 220,000 ohms, +5%, 1/4 watt	RCR07G224JS	
R4	Timing	RESISTOR, FIXED, COMPOSITION, 560,000 ohms, +5%, 1/4 watt	RCR07G564JS	
R5	Timing	RESISTOR, FIXED, COMPOSITION, 560,000 ohms, +5%, 1/4 watt	RCR07G564JS	
R6	Led	RESISTOR, FIXED, COMPOSITION, 180 ohms, +5%, 1/4 watt	RCR07G181JS	
R7	Negative Peak Adjust	RESISTOR, VARIABLE, COMPOSITION, 1000 ohms, 2 watt	CMU1021	Ohmite
R8	Divider	RESISTOR, FIXED, COMPOSITION, 150 ohms, +5%, 1/4 watt	RCR07G151JS	
R9	Divider	RESISTOR, FIXED, COMPOSITION, 1000 ohms, +5%, 1/4 watt	RCR07G102JS	
R10	Divider	RESISTOR, FIXED, COMPOSITION, 1000 ohms, +5%, 1/4 watt	RCR07G102JS	

Continental Electronics MFG. CO.

SHEET 8
OF
REV

NOMENCLATURE Peak Clipper ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE 316F,317C-1(MOD) 318.5C REF. DWG. NO. 125993 ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R11	Divider	RESISTOR, FIXED, COMPOSITION, 150 ohms, $\pm5\%$, 1/4 watt	RCR07G151JS	
R12	Positive Peak	RESISTOR, VARIABLE, COMPOSITION, 1000 ohms, 2 watt	CMU1021	Ohmite
R13	Base	RESISTOR, FIXED, COMPOSITION, 2200 ohms, $\pm5\%$, 1/4 watt	RCR07G222JS	
R14	Base	RESISTOR, FIXED, COMPOSITION, 47,000 ohms, $\pm5\%$, 1/4 watt	RCR07G473JS	
R15	Collector	RESISTOR, FIXED, COMPOSITION, 47,000 ohms, $\pm5\%$, 1/4 watt	RCR07G473JS	
R16	Divider	RESISTOR, FIXED, COMPOSITION, 6800 ohms, $\pm5\%$, 1/4 watt	RCR07G682JS	
R17	Divider	RESISTOR, FIXED, COMPOSITION, 6800 ohms, $\pm5\%$, 1/4 watt	RCR07G682JS	
R18	Collector	RESISTOR, FIXED, COMPOSITION, 560 ohms, $\pm5\%$, 1/4 watt	RCR07G561JS	
R19	Base	RESISTOR, FIXED, COMPOSITION, 1000 ohms, $\pm5\%$, 1/4 watt	RCR07G102JS	
R20	Collector	RESISTOR, FIXED, COMPOSITION, 560 ohms, $\pm5\%$, 1/4 watt	RCR07G561JS	

NOMENCLATURE Peak Clipper

ELECTRICAL PARTS LIST NO. 133450

UNIT

TYPE 316F,317C-1(MOD) 318.5C

REF. DWG. NO. 125993

ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R21	Collector	RESISTOR, FIXED, COMPOSITION, 10,000 ohms, ±5%, 1/4 watt	RCR07G103JS	
R22	Zener	RESISTOR, FIXED, COMPOSITION, 68 ohms, ±5%, 1/4 watt	RCR07G680JS	
R23	Zener	RESISTOR, FIXED, COMPOSITION, 100 ohms, ±5%, 1/4 watt	RCR07G101JS	

Continental Electronics MFG. CO.

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NOMENCLATURE Peak Clipper ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE 316F,317C-1(MOD) 318.5C REF. DWG. NO. 125993 ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
S1		SWITCH, TOGGLE, SPDT, miniature	MTA-106D-WW	Alco Switch

Continental Electronics MFG. CO.

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NOMENCLATURE Peak Clipper ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE 316F,317C-1(MOD) 318.5C REF. DWG. NO. 125993 ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
T1	Power	TRANSFORMER, POWER, STEP-DOWN, Primary: 115/230 volts, 50/60 Hz Secondary: 16 volts at .28 amperes	F-349XP	Triad

Continental Electronics MFG. CO.

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NOMENCLATURE Peak Clipper
ELECTRICAL PARTS LIST NO. 133450

UNIT
TYPE 316F,317C-1(MOD) 318.5C
REF. DWG. NO. 125993
ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
U1	Timer	MICROCIRCUIT, Dual timer	NE556F	Signetics
U2	Clipper	MICROCIRCUIT, 3 NPN, 2 PNP transistor array	CA3096E	RCA
U3	Rectifier	MICROCIRCUIT, 1 ampere, 50 PIV, bridge rectifier	VM08	Varo

Continental Electronics MFG. CO.

SHEET 13
OF
REV

NOMENCLATURE Peak Clipper ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE ~~316F~~, 317C-1 (MOD) 318.5C REF. DWG. NO. 125993 ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XF1		FUSEHOLDER, PC mount, 3AG size	102069 (Qty. 2)	Littelfuse

Continental Electronics MFG. CO.

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NOMENCLATURE Peak Clipper

ELECTRICAL PARTS LIST NO. 133450

UNIT TYPE 316F,317C-1(MOD) 318.5C

REF. DWG. NO. 125993

ENGR. J. Sainton

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XU1		SOCKET, MICROCIRCUIT, 14 pin DIP	C921400	Texas Instruments
XU2		SOCKET, MICROCIRCUIT, 16 pin DIP	C921600	Texas Instruments

Continental Electronics MFG. CO.

NOMENCLATURE Audio Amplifier ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C1		CAPACITOR, FIXED, CERAMIC, .001 mfd., 200 VDC	M39014/01-1317	
C2		Same as C1		
C3		CAPACITOR, FIXED, MICA DIELECTRIC, 100 pf., 500 VDC	CM04FD101J03	
C4		CAPACITOR, FIXED, CERAMIC, .01 mfd., 200 VDC	M39014/02-1298	
C5		Same as C4		
C6		CAPACITOR, FIXED, ELECTROLYTIC, 82 mfd., 20 VDC	M39003/01-2060	
C7		CAPACITOR, FIXED, MICA DIELECTRIC, 1600 pf., 500 VDC	CM06FD162J03	
C8		CAPACITOR, FIXED, MICA DIELECTRIC, (Factory selected)		
C9		CAPACITOR, FIXED, MICA DIELECTRIC, 680 pf., 500 VDC	CM06FD681J03	
C10		CAPACITOR, FIXED, MICA DIELECTRIC, 510 pf., 500 VDC	CM06FD511J03	

Continental Electronics MFG. CO.

SHEET 2
OF
REV

NOMENCLATURE Audio Amplifier

ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
C11		CAPACITOR, FIXED, ELECTROLYTIC, 3.3 mfd., 50 VDC	M39003/01-2125	
C12		Same as C1		

Continental Electronics MFG. CO.

SHEET 3
OF
REV

NOMENCLATURE Audio Amplifier

ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
CR1		SEMICONDUCTOR DEVICE, DIODE, 200 milliamperes, 200 PIV	1N661	
CR2		Same as CR1		

REV A H1-4[5]

NOMENCLATURE Audio Amplifier

ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
K1		RELAY, DPDT, 26.5 VDC	S6A1-26.5VDC	Allied Controls

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NOMENCLATURE Audio Amplifier
ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
Q1		TRANSISTOR, NPN	2N2102	
Q2		Same as Q1		

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NOMENCLATURE Audio Amplifier — ELECTRICAL PARTS LIST NO. 110677

UNIT A6 — TYPE 315/316F — REF. DWG. NO. C114037 — ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R1		RESISTOR, FIXED, COMPOSITION, 220 ohms, ±5%, 1/4 watt	RCR07G221JS	
R2		Same as R1		
R3		RESISTOR, FIXED, COMPOSITION, 180 ohms, ±5%, 1/4 watt	RCR07G181JS	
R4		Same as R1		
R5		Same as R1		
R6		RESISTOR, FIXED, COMPOSITION, 330 ohms, ±5%, 1/4 watt	RCR07G331JS	
R7		Same as R6		
R8		RESISTOR, FIXED, COMPOSITION, 1500 ohms, ±5%, 1/4 watt	RCR07G152JS	
R9		Same as R8		
R10		RESISTOR, FIXED, COMPOSITION, 10,000 ohms, ±5%, 1/4 watt	RCR07G103JS	
R11		Same as R10		

Continental Electronics MFG. CO.

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OF
REV

NOMENCLATURE Audio Amplifier ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R12		RESISTOR, FIXED, COMPOSITION, 47,000 ohms, ±5%, 1/4 watt	RCR07G473JS	
R13		Same as R12		
R14		RESISTOR, FIXED, COMPOSITION, 22,000 ohms, ±5%, 1/4 watt	RCR07G223JS	
R15		Same as R1		
R16		RESISTOR, VARIABLE, NON-WIREWOUND, 2000 ohms	RJ24FW202	
R17		RESISTOR, FIXED, COMPOSITION, 2200 ohms, ±5%, 1/4 watt	RCR07G222JS	
R18		RESISTOR, FIXED, COMPOSITION, 1000 ohms, ±5%, 1/4 watt	RCR07G102JS	
R19		Same as R18		
R20		RESISTOR, FIXED, COMPOSITION, 6800 ohms, ±5%, 1/4 watt	RCR07G682JS	
R21		Same as R8		
R22		RESISTOR, FIXED, COMPOSITION, 82 ohms, ±5%, 1/4 watt	RCR07G820JS	

Continental Electronics MFG. CO.

SHEET 8
OF
REV

NOMENCLATURE Audio Amplifier ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R23		Same as R22		
R24		RESISTOR, FIXED, COMPOSITION, 3300 ohms, ±5%, 1/4 watt	RCR07G332JS	
R25		Same as R14		
R26		Same as R17		
R27		RESISTOR, FIXED, COMPOSITION, 4700 ohms, ±5%, 1/4 watt	RCR07G472JS	
R28		Same as R18		
R29		Same as R20		
R30		RESISTOR, FIXED, COMPOSITION, 47 ohms, ±5%, 1/4 watt	RCR07G470JS	
R31		RESISTOR, FIXED, COMPOSITION, 680 ohms, ±5%, 2 watt	RCR42G681JS	
R32		RESISTOR, FIXED, COMPOSITION, 820 ohms, ±5%, 1/2 watt	RCR20G821JS	
R33		RESISTOR, FIXED, COMPOSITION, 1000 ohms, ±5%, 1/2 watt	RCR20G102JS	

Continental Electronics MFG. CO.

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OF
REV A

NOMENCLATURE Audio Amplifier

ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
R34		RESISTOR, FIXED, PRECISION, 3.32 ohms, ±1%, 3 watt	80673	Ohmite
R35		Same as R27		
R36		RESISTOR, FIXED, COMPOSITION, 1200 ohms, ±5%, 1/4 watt	RCR07G122JS	

Continental Electronics MFG. CO.

SHEET 10
OF
REV

NOMENCLATURE Audio Amplifier

ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
U1		MICROCIRCUIT,	NE5534N	

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OF
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NOMENCLATURE Audio Amplifier

ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XQ1		SOCKET, SEMICONDUCTOR DEVICE, For use with TO-5 size transistor, printed circuit type	05-3338-01	Sealectro
XQ2		Same as XQ1		

Continental Electronics MFG. CO.

SHEET 12
OF
REV

NOMENCLATURE Audio Amplifier ELECTRICAL PARTS LIST NO. 110677

UNIT A6 TYPE 315/316F REF. DWG. NO. C114037 ENGR. R. Bracken

SYMBOL	FUNCTION	NAME OF PART AND DESCRIPTION	PART NO.	SOURCE/FSCM
XU1		SOCKET, MICROCIRCUIT, 8 pin DIL with solder tail terminals	C920800	Texas Instruments