INSTRUCTION BOOK

COLLINS

COLLINS RADIO COMPANY • CEDAR RAPIDS, IOWA

VHF TRANSMITTER

242F-5CL

GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory, transportation prepaid, provided

(a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins instructions.

(b) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins designs are subject to only such adjustments as Collins may obtain from the supplier thereof.

(c) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal or proper manner.

Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

No other warranties, expressed or implied, shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause.

HOW TO RETURN MATERIAL OR EQUIPMENT.

If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in the handling of your returned merchandise.

ADDRESS:

Collins Radio Company
Service Division
Cedar Rapids, Iowa

INFORMATION NEEDED:

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

HOW TO ORDER REPLACEMENT PARTS.

When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

ADDRESS:

Collins Radio Company
Service Division
Cedar Rapids, Iowa

INFORMATION NEEDED:

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

VHF TRANSMITTER

242F-5CL

INSTRUCTION BOOK

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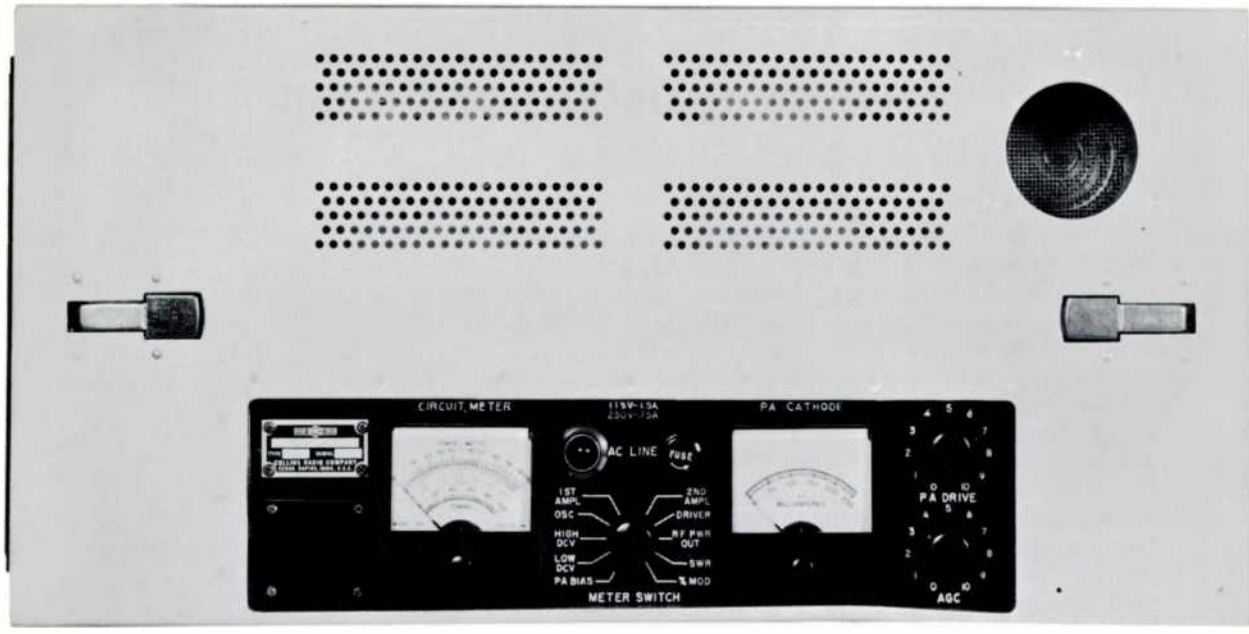
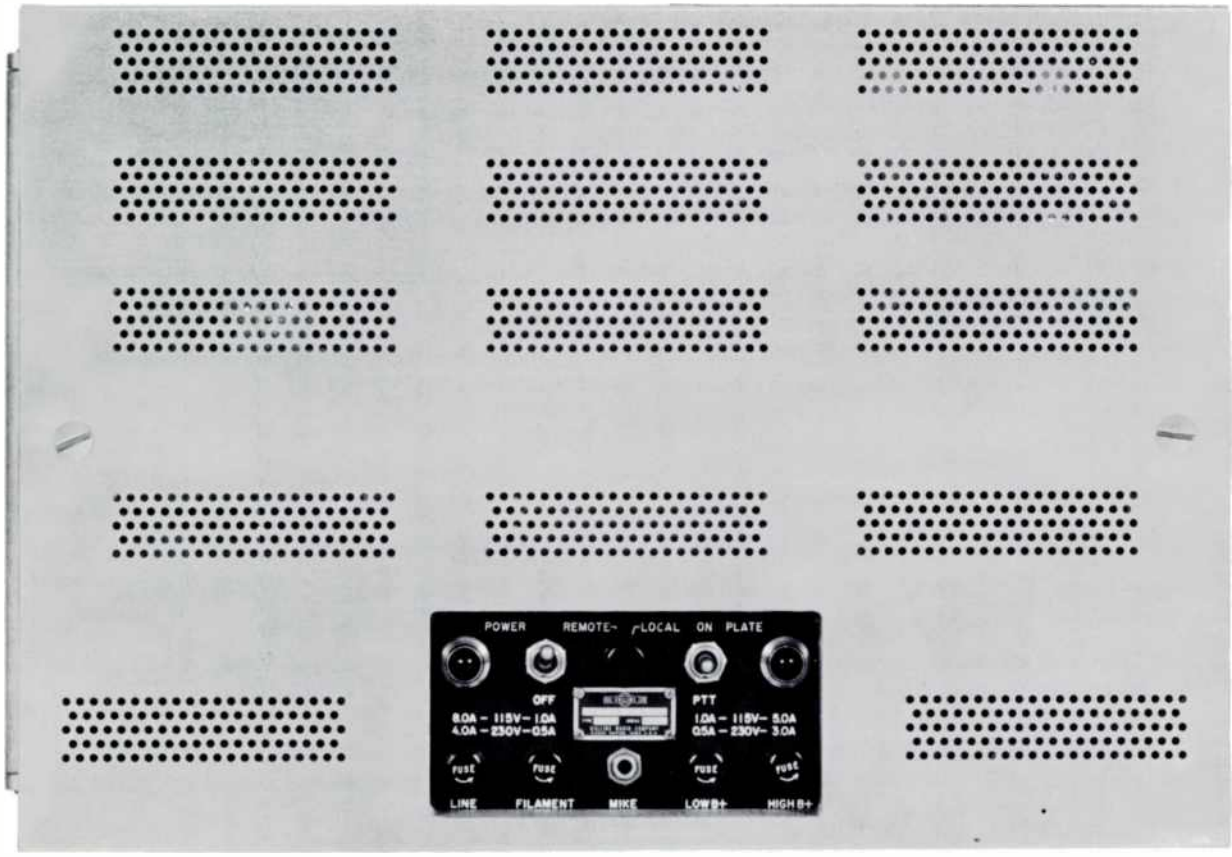


R-F UNIT



MODULATOR-POWER SUPPLY UNIT

Figure 1-1. VHF Transmitter 242F-5CL

SECTION I
GENERAL DESCRIPTION

1.1 PURPOSE OF INSTRUCTION BOOK.

This instruction book provides information for the identification, installation, operation, and maintenance of VHF Transmitter 242F-5CL.

Three different models of this transmitter are designated by F, R, or H following the type number. The 242F-5CLF is designed for flush mounting on a standard rack, the 242F-5CLR for recessed midrail-type mounting, and the 242F-5CLH for hinged mounting.

1.2 PURPOSE OF EQUIPMENT.

The Collins type 242F-5CL equipment, figure 1-1, is a 50-watt, single-channel, vhf ground transmitter for communications service.

The transmitter is intended for continuous duty in the frequency range from 108 to 152 megacycles. Low-level amplitude modulation of the carrier is possible up to 100 percent.

The equipment normally is supplied for single-frequency operation. Operation on one of two, three, or four channels within a 500-kc spectrum can be obtained as an optional feature.

1.3 EQUIPMENT SUPPLIED.

The equipment listed in table 1-1 is supplied with Transmitter 242F-5CL.

TABLE 1-1. EQUIPMENT SUPPLIED

NAME OF UNIT	COLLINS PART NUMBER	OVER-ALL DIMENSIONS (inches)			WEIGHT (lb)
		WIDTH	HEIGHT	DEPTH	
R-F Unit of 242F-5CLF	542-0348-005	19	8-3/4	7	10
R-F Unit of 242F-5CLH	542-0346-005	19	8-3/4	7	10
R-F Unit of 242F-5CLR	542-0347-005	19	8-3/4	7	10
Modulator-Power Supply Unit of 242F-5CLF	544-7786-005	19	12-1/4	7	51
Modulator-Power Supply Unit of 242F-5CLH	544-7784-005	19	12-1/4	7	51
Modulator-Power Supply Unit of 242F-5CLR	544-7785-005	19	12-1/4	7	51
Power line cord	426-1463-00				
Line power connector (twist lock)	368-0015-00				
Interconnecting cable	542-0331-003				
High-voltage interconnecting cable	542-0330-003				
Remote control 20-pin connector	372-1071-00				
Remote control connector cover assembly	372-1073-00				
2 type N coaxial connectors for antenna relay	357-9040-00				

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The following equipment is required in a normal installation of Transmitter 242F-5CL but is not supplied:

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

ITEM	TYPE	FUNCTION	DESCRIPTION
Crystal	CR-23/U	Frequency generation	A crystal with a fundamental frequency in the range of 54.0 mc to 76.0 mc is used. (The transmitter carrier frequency is two times the frequency of the crystal used.) The standard CR-23/U crystal will provide an over-all stability of 0.005% under normal conditions. A modified CR-23/U crystal will provide an over-all stability of 0.002% in the 0°C to 60°C range.
Antenna		Radiate transmission	50 ohm, vhf
Microphone	T-17 or equivalent	Voice input	82-ohm, low-impedance, carbon, three-wire circuit
Coaxial Cable	RG-8A/U	Couple transmitter output to antenna and receiver to antenna relay in transmitter	52 ohm

1.5 PERFORMANCE DATA.

1.5.1 GENERAL.

Ambient temperature range. . . . . -35°C to +60°C for continuous commercial service with dust covers in place.

Ambient humidity range . . . . . 0 to 95% relative humidity.

Altitude . . . . . Sea level to 15,000 feet.

Power source . . . . . 115 or 230 volts a-c ±10%, 50/60 cycles, single phase. See note 3 on main schematic, figure 8-1, for wiring changes to accommodate 230 volts line power.

Power requirements . . . . . Standby power: 175 watts at 80% lagging power factor.
Transmit power: 530 watts at 87% lagging power factor.

1.5.2 R-F UNIT.

Power output . . . . . 50 watts minimum with 100% modulation. Carrier can be adjusted to any level from 10 to 50 watts.

Output impedance	The output is unbalanced and nominally rated at 52 ohms. Proper loading can be obtained into any transmission device having a standing-wave ratio of 3:1 or less.
Frequency range	The range of 108 mc to 152 mc is covered continuously.
Channels	The equipment normally is supplied for single channel operation. Operation on one of two, three, or four channels within a 500-kc spectrum can be accomplished by installation of a four-frequency conversion kit. For details on the modification, see paragraph 1.7.3.
Oscillator	An overtone crystal oscillator doubler is used to double the crystal frequency. No further multiplication is used.
Frequency stability	For any natural combination of service conditions with standard CR-23/U crystals, the over-all stability is 0.005%. Modified CR-23/U crystals will produce 0.002% over-all stability in the 0°C to +60°C range.
Harmonic and other spurious radiation	The second harmonic is at least 80 db below the carrier level. The third harmonic is at least 90 db below the carrier level. All other harmonic and spurious outputs are at least 100 db below the carrier level.

1.5.3 MODULATOR SECTION.

Keying characteristics	The 242F-5CL keying is rapid enough for vox operation.
Modulation characteristics	Low-level modulation is employed. A 100% modulation of the carrier is possible over the range 300 to 5000 cps.
Audio inputs	Local carbon microphone input on front panel of modulator-power supply unit. Remote carbon microphone input on remote connector. A 600-ohm balanced audio input on remote connector.
Audio-frequency response	The carbon microphone input response is flat within ±3 db with respect to 1000 cps over the range of 300 to 5000 cps. The 600-ohm balanced input response is flat within 2 db from 300 to 5000 cps.
Audio-frequency distortion	The distortion at 95% modulation in the range of 300 to 5000 cps is less than 5%.
Audio compression characteristics	A modulation limiter of the compression type feeds a negative control voltage to the grid of the audio input stage when a predetermined audio level is exceeded. The attack time is in the order of 10 milliseconds.
Carrier shift	The carrier shift is less than 10%.
Noise level	Carrier noise is at least 45 db below 90% modulation.

1.6 VACUUM-TUBE, DIODE, FUSE, AND LAMP COMPLEMENT.

Table 1-3 contains a complete listing of all vacuum tubes, crystal rectifier diodes, fuses, and indicator lamps by item number, type, and circuit function.

TABLE 1-3. VACUUM-TUBE, DIODE, FUSE, AND LAMP COMPLEMENT

ITEM NUMBER	TYPE	CIRCUIT FUNCTION
CR101	1N198	Germanium diode. Rectifies driver grid current for CIRCUIT METER indication.
CR102	1N463	Silicon diode. Keeps agc voltage from going positive.
CR104		Selenium half-wave rectifier. PA bias supply.
CR105	1N198	Germanium diode. Rectifies reflected line current in filter coupler unit for SWR indication at CIRCUIT METER.
CR106	1N198	Germanium diode. Rectifies incident line current for power out indication at CIRCUIT METER.
CR107	1N198	Germanium diode. Detects rectified r-f output for percent modulation indication at CIRCUIT METER.
F101	1-1/2-amp slow blow glass cartridge	AC LINE fuse. Protects r-f unit power supply transformer.
F201	8-amp, 32-volt time delay glass cartridge	LINE fuse. Protects all power supplies in the transmitter.
F202	1-amp, 250-volt glass cartridge	FILAMENT fuse. Protects transformer T201.
F203	1-amp, 250-volt glass cartridge	LOW B+ fuse. Protects plate transformer T202 of low B+ power supply.
F204	5-amp, 32-volt time delay cartridge	HIGH B+ fuse. Protects plate transformer T203 of high B+ power supply.
F205	1/2-amp, 2500-volt cartridge	High-voltage power amplifier plate fuse. Protects 4X250-B.
I101	T-3-1/4, clear	AC LINE indicator lamp on r-f unit.
I201	T-3-1/4, clear	PLATE indicator lamp on modulator-power supply unit.
I202	T-3-1/4, clear	POWER indicator lamp on modulator-power supply unit.
V101	5670	Oscillator doubler tube.
V102	5654	First r-f amplifier tube.
V103	5654	Second r-f amplifier tube.

TABLE 1-3. VACUUM-TUBE, DIODE, FUSE, AND LAMP COMPLEMENT (Cont)

ITEM NUMBER	TYPE	CIRCUIT FUNCTION
V104	5686	Driver amplifier tube.
V105	7034/4X150A	Power amplifier tube.
V106	5726	Agc detector tube.
V107	6626	Voltage regulator tube.
V201	5R4GY	Low B+ rectifier tube.
V202	*866-A	High B+ rectifier tube.
V203	*866-A	High B+ rectifier tube.
V204	6386	Audio amplifier.
V205	5686	Modulator.
V206	5686	Modulator.
V207	5726	Audio compressor rectifier.

*Type 866-A rectifiers are recommended for use in the range +15°C to +40°C. For operation over wider temperature ranges, use type 3B28 tubes.

1.7 DESCRIPTION OF MAJOR COMPONENTS.

1.7.1 R-F UNIT.

1.7.1.1 PHYSICAL CHARACTERISTICS. (Refer to figure 1-2.) The r-f unit of Transmitter 242F-5CL is a vertically mounted chassis with front and rear dust covers. With respect to its mounted position, it is 19 inches wide, 8-3/4 inches high, and 7 inches deep. The unit weighs 10 pounds and occupies approximately 0.67 cubic foot of space. The fully interlocked dust covers protect all components leaving the control panel on the front exposed and the interconnecting, high-voltage receiver and antenna jacks exposed on the rear. A round, screen-covered blower exhaust opening is located in the front dust cover, and the blower intake opening is located in the rear dust cover.

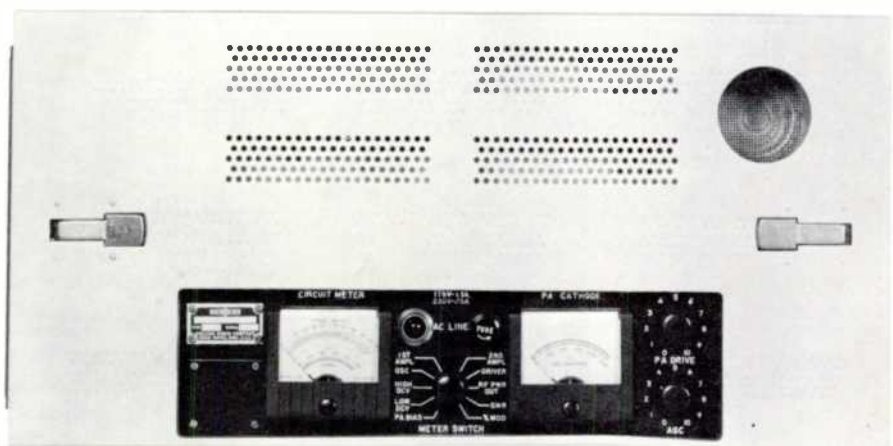


Figure 1-2. R-F Unit

Quick removal type fasteners hold the front dust cover in place, and screws secure the rear dust cover to the chassis. Removing the front dust cover gives access to controls that are not often adjusted, the output tuning cavity, and all r-f tubes. Removing the rear dust cover exposes the r-f "bathtub" type subassembly with screw-held cover, power amplifier blower assembly and duct, wiring, and other components. The antenna relay also is located in the rear. No connections are made to the front of this unit.

1.7.1.2 FUNCTION OF R-F UNIT. The r-f unit generates the r-f carrier signal, amplifies it, feeds it to an output tuning and loading cavity, filters its harmonics, and couples it to a 52-ohm line. In addition, the r-f unit provides automatic gain control, power amplifier bias, its own filament power, and a voltage regulator. A circuit meter in the r-f unit monitors various circuit conditions for tuning and checking purposes.

1.7.2 MODULATOR-POWER SUPPLY UNIT.

1.7.2.1 PHYSICAL CHARACTERISTICS. (Refer to figure 1-3.) The modulator-power supply unit is a vertically mounted chassis with front and rear dust covers. With respect to its mounted position, it is 19 inches wide, 12-1/4 inches high, and 7 inches deep. The unit weighs 51 pounds and occupies approximately 0.94 cubic foot of space. The fully interlocked dust covers protect all components leaving the control panel on the front exposed and the interconnecting, remote control and line power connectors exposed on the rear.

Quick removal type fasteners hold the front dust cover in place, and screws fasten the rear dust cover to the chassis. Removing the front dust cover reveals additional controls that are seldom adjusted, all tubes, transformers, and modular components. Removing the rear dust cover exposes wiring and components including the high B+ voltage power supply fuse. All other fuses are on the front control panels. All connections to this unit are made on the rear, except to the local microphone input jack which is on the front control panel.

1.7.2.2 FUNCTION OF MODULATOR-POWER SUPPLY UNIT. The modulator-power supply unit accepts all local and remote audio and voice signals used to modulate the carrier, amplifies them, and imposes the modulation signal on the plate of the second r-f amplifier. The modulation is limited by a compressor-type limiter. All remote control lines are connected to this unit as it sets up the transmitter for local or remote operation with the control circuits. The unit accepts line power and with its power supplies provides all necessary voltages in the transmitter except PA bias and r-f unit filament voltage.

1.7.3 TRANSMITTER 242F-5CL, FOUR-CHANNEL TYPE.

Upon request by the customer, Transmitter 242F-5CL is furnished with the r-f unit modified to provide four-channel operation instead of single channel. Changes to the equipment include the addition of three crystals and sockets, three relays, components, a four-position rotary switch, and rearrangement of wiring. The only visible external modification is the addition of the four-position channel selector switch which is located in the lower left portion of the r-f unit control panel. For the theory of operation of four-frequency selection, see paragraph 4.3.4. Also refer to figure 4-11 for schematic diagram of the control arrangement.

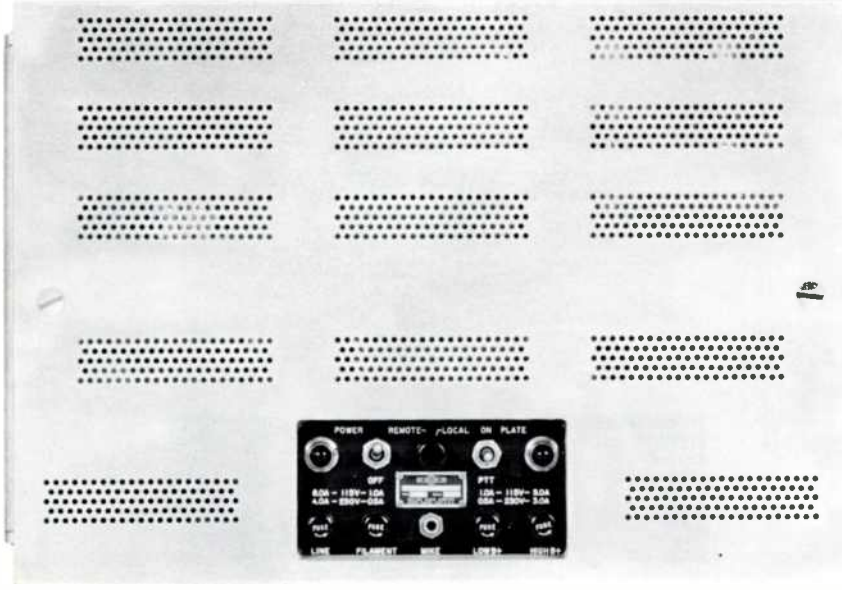


Figure 1-3. Modulator-Power Supply Unit

TABLE 1-4. MOUNTING MODIFICATION KITS

UNIT	MODIFICATION	KIT PART NO.
Modulator Power Supply	Recess to flush	544 4973 003
	Flush to recess	544 4972 003
	Hinged to flush	544 4971 003
	Flush to hinged	544 4970 003
R-F Unit	Recessed to flush	544 4969 003
	Flush to recessed	544 4968 003
	Hinged to flush	544 4967 003
	Flush to hinged	544 4966 003

1.7.4 TRANSMITTER 242F-5CL, EXTERNAL OSCILLATOR TYPE.

Upon request by the customer, Transmitter 242F-5CL is furnished with the r-f unit modified to provide operation from an external frequency standard instead of the internal oscillator. Changes to the equipment include component changes to allow the oscillator-doubler circuit to operate as a doubler-doubler circuit. The external frequency standard input is applied at the rear of the unit. For theory of operation of the modified 242F-5CL, refer to paragraph 4.3.5; tuneup procedures are given in paragraph 2.4.5.

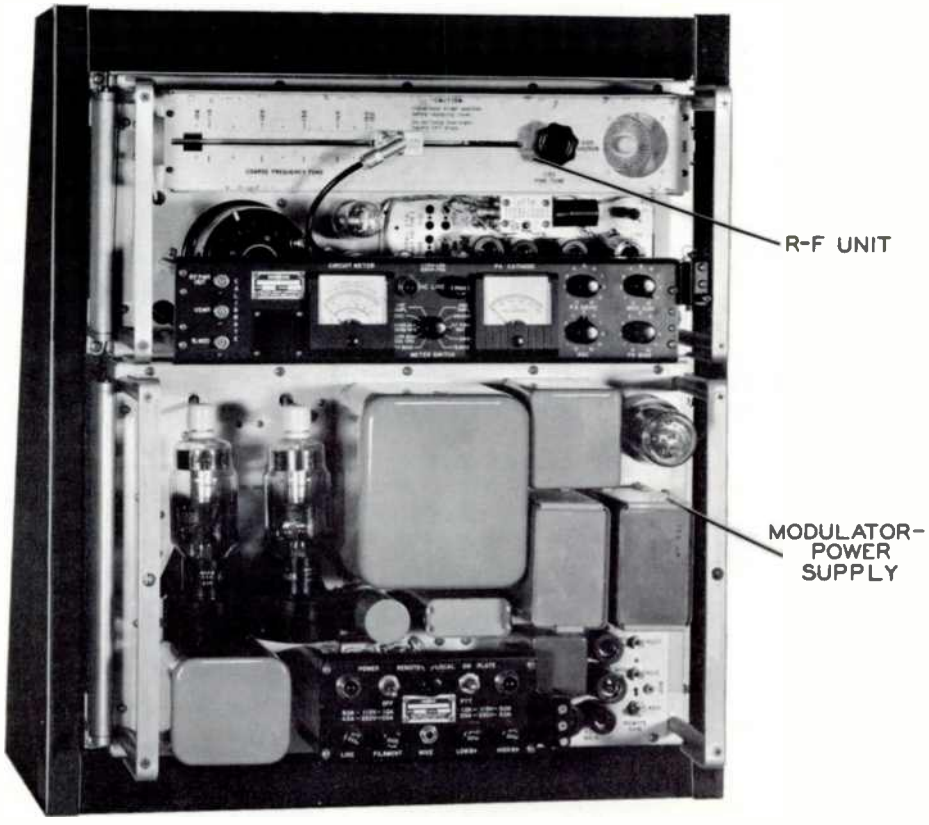


Figure 2-1. VHF Transmitter 242F-5CL, Hinge Mounted

SECTION II
INSTALLATION

2.1 UNPACKING.

Carefully unpack the equipment. Remove the packing material, and lift the units out of their cartons. Remove the front and rear dust covers on each unit, and inspect all components for breakage or damage. Install tubes which are packed separately. Check all switches and control knobs for proper mechanical operation and meter faces for broken glass. All claims for damage should be filed promptly with the transportation company. If a claim is to be filed, the original packing carton and the packing material must be preserved.

2.2 MOUNTING AND LOCATION.

The r-f unit and modulator-power supply unit of Transmitter 242F-5CL are designed to be mounted on a standard nineteen-inch rack. The r-f unit is mounted directly above the modulator-power supply unit. Hinged, recessed, and flush mountings are available, and the factory supplies the type specified. See figures 2-2, 2-3, 2-4, and 2-5. The r-f unit requires 8-3/4 inches of rack space, and the modulator-power supply unit requires 12-1/4 inches. The over-all depth required for the two units varies between 7 inches and 7-7/8 inches depending on the method of mounting.

The hinge-mounted units, figure 2-1, are exactly like the midrail units except for the hinges on the left side (looking at the units from the front) and a flange on the right to hold the units to the rack. Two 10-32 screws on each unit fasten the hinge assembly to the rack. Six 10-32 screws fasten the right flange of the two units to the rack.

The recessed- or midrail-mounted model and the flush-mounted model have flanges on both sides. In both cases twelve 10-32 screws and twelve no. 10 flat washers are used to fasten the units to the rack.

Consideration should be given to the location of the transmitter with particular regard to line power source location, antenna location, service access space, and ventilation. Since the 242F-5CL uses forced air cooling, it is desirable to have a reasonably

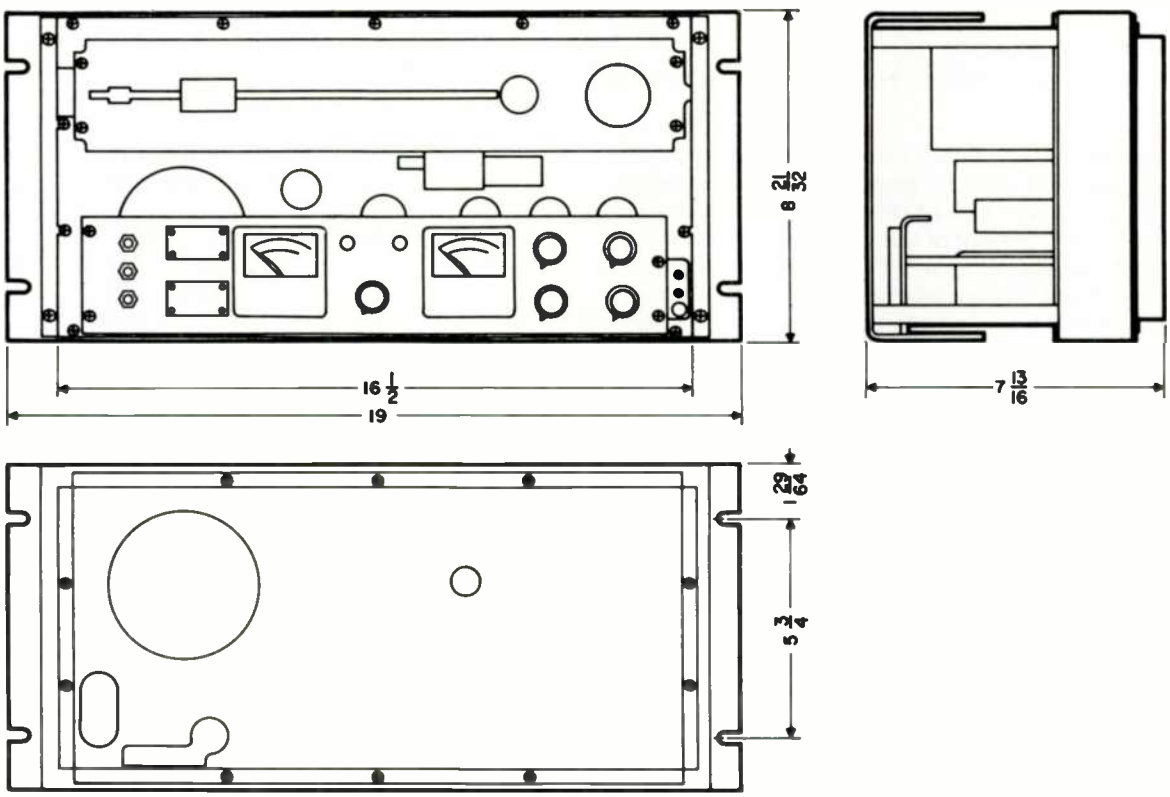


Figure 2-2. R-F Unit, Midrail Installation Diagram

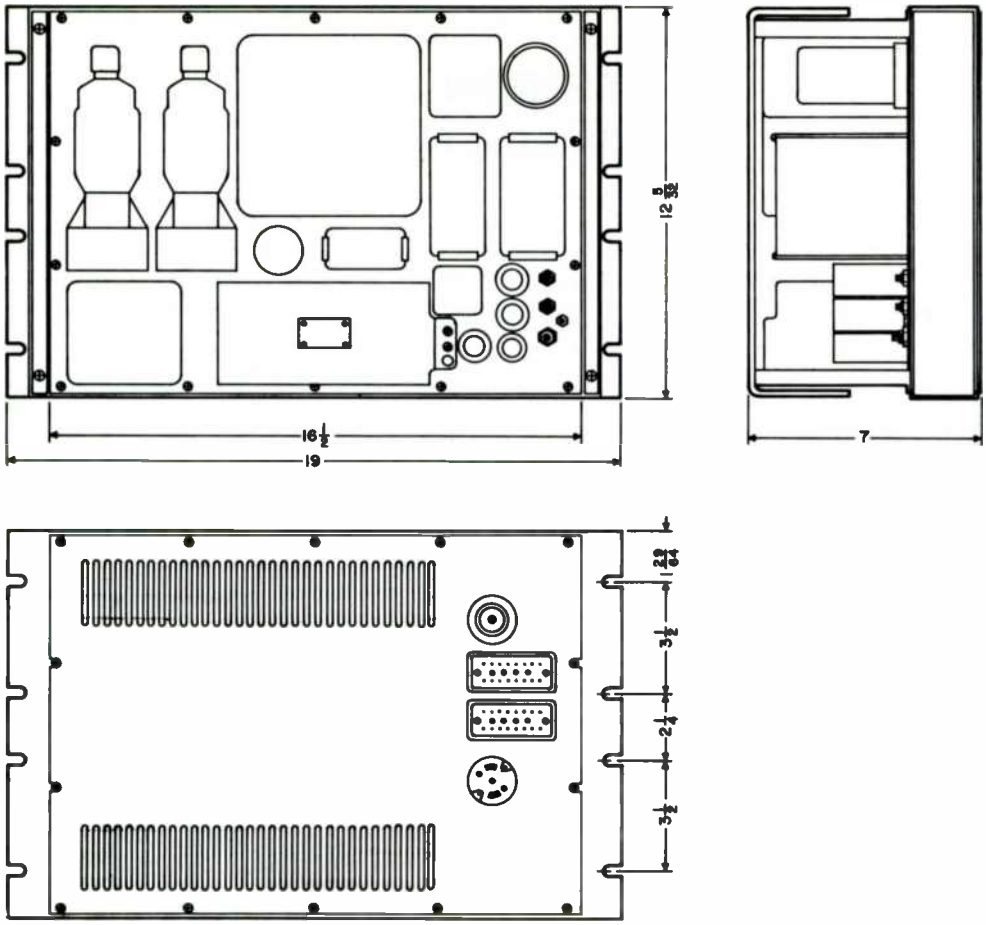


Figure 2-3. Modulator-Power Supply, Midrail Installation Diagram

clean atmosphere. In dusty locations a special filter on the blower inlet may be required. The equipment should be located as close as possible to the antenna to prevent excessive losses in the coaxial cable between the r-f unit and the antenna. Even though convection and forced cooling are incorporated in the transmitter, the ambient room temperature must in no case exceed +60°C. High ambient temperatures result in shorter component life and should be avoided when possible.

2.3 CABLING CONNECTIONS.

If the transmitter is to be used for communications and all control is to be entirely at the transmitter, five cables must be connected. These include the a-c line cord, the main interconnecting cable between the two units, the interconnecting high-voltage cable, the antenna cable, and the receiver cable. All but the antenna and receiver cable are furnished with the equipment. Refer to figure 2-7 for proper connection of cables. A low-impedance carbon microphone is connected at the MIKE jack on the front control panel of the modulator-power supply unit.

If remote control of filaments and plate or remote signal input are required, remote jack J202 is used. See figure 8-1 for proper connections on connector P202. Refer to figure 2-6 for instructions on assembling the coaxial connectors supplied and the RG-8A/U coaxial cable.

NOTE

The transmitter normally is wired for communications service and 115-volt a-c line input. If 230-volt a-c line power is to be used, see note 3 on the main schematic diagram, figure 8-1, in section VIII.

2.4 INITIAL TUNING AND ADJUSTMENT PROCEDURES.

Transmitter 242F-5CL is calibrated and adjusted at the factory according to the operating frequency requested by the customer. However, after the equipment has been mounted, the necessary cables connected, and the output terminated properly, the tuning procedure in this section should be performed to ensure optimum performance.

If the transmitter has been modified for four-channel operation, normal tuning only is required since the frequencies all lie within a 500-kc spectrum. This tuning should be done near the center frequency of the four being used. The audio adjustments also are described in this section. For adjustment and calibration of the transmitter after it has been in operation, see section VI, corrective maintenance.

2.4.1 TUNING AND ADJUSTMENT CONTROLS.

The controls listed in table 2-1 and illustrated in figure 2-8 are for tuning and initial adjustment of Transmitter 242F-5CL.

TABLE 2-1. TUNING AND ADJUSTMENT CONTROLS

CONTROL	LOCATION	IDENTIFICATION	FUNCTION
Oscillator tuning control	Front of r-f unit chassis	OSC TUNE (L101)	Tunes oscillator plate coil.
First r-f amplifier tuning control	Front of r-f unit chassis	1ST AMPL TUNE (C106)	Tunes first amplifier grid.
Second r-f amplifier tuning control	Front of r-f unit chassis	2ND AMPL TUNE (C113)	Tunes second amplifier grid.
Driver tuning control	Front of r-f unit chassis	DRIVER TUNE (C120)	Tunes driver grid.
Power amplifier tuning control	Front of r-f unit chassis	PA GRID TUNE (C135)	Tunes power amplifier grid.
Output cavity coarse tuning control	Front of output cavity	COARSE FREQUENCY TUNE shorting bar	Coarse tunes the output cavity.
Output cavity fine tuning control	Front of output cavity	FINE TUNE (C150)	Fine tunes the output cavity.
PA bias control	R-f unit control panel	PA BIAS (R124)	Controls power amplifier bias voltage.
Agc control	R-f unit control panel	AGC (R138)	Controls level of automatic gain control voltage.
PA drive control	R-f unit control panel	PA DRIVE (R117)	Controls power amplifier drive level.
Audio balance control	Front of modulator-power supply unit chassis	BAL (R216)	Balances push-pull audio.
Modulation limiter control	Front of modulator-power supply unit chassis	MOD LIM (R227)	Controls level at which modulation is limited.
Remote gain control	Front of modulator-power supply unit chassis	REMOTE GAIN (R215)	Controls level of remote audio input signal.
Microphone gain control	Front of modulator-power supply unit chassis	MIKE GAIN (R212)	Controls level of microphone input.
Loading control	Front of output cavity	LOAD	Matches output to load.

NOTE

The modulation equalizer control (MOD EQU, R116) located on the r-f unit control panel is used when more than one r-f unit is being used with the same modulator. This control also can be used to compensate for small variations in the audio line level or variations in the audio level required to modulate the r-f unit.

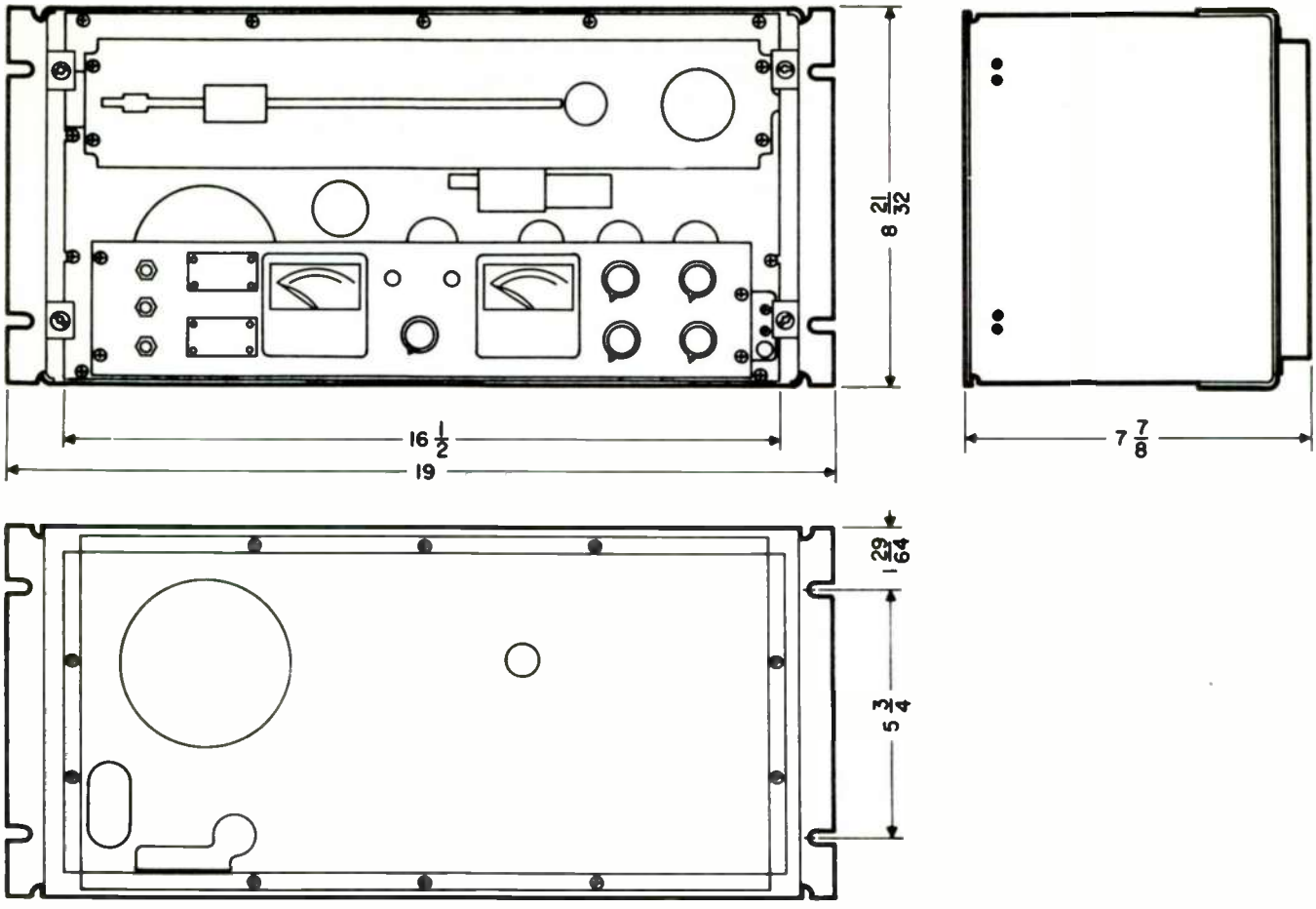


Figure 2-4. R-F Unit, Flush Mounting Installation Diagram

2.4.2 TUNING PROCEDURE.

The CIRCUIT METER, M101, used in the tuning procedure indicates relative readings between 0 and 100 (full-scale deflection) on all positions of the METER SWITCH, except the output power (RF PWR OUT) position which reads directly on the black scale and the standing-wave ratio (SWR position) which reads directly on the red scale. For PA BIAS, full-scale deflection represents 100 volts d-c; for LOW DCV, 500 volts d-c; and for HIGH DCV, 2500 volts d-c. As an example: A reading of 65 on the CIRCUIT METER would indicate 65 volts d-c PA BIAS, 325 volts d-c LOW DCV, or 1625 volts d-c HIGH DCV.

NOTE

Before any attempt is made to tune the transmitter, it should be established that the equipment is mounted properly and the cabling is connected. Check to see that the output is terminated in a suitable load.

a. Set the following controls to the indicated positions:

MOD EQU control - fully clockwise
PA BIAS control - fully clockwise
AGC control - fully clockwise
PA DRIVE control - fully counterclockwise
LOCAL-REMOTE switch - LOCAL
METER SWITCH - PA BIAS position

b. Turn on POWER switch. CIRCUIT METER should read approximately 100 volts PA BIAS.

c. Turn on PLATE switch, and wait for plate time-delay relay to close.

d. When plate power is applied, turn METER SWITCH to LOW DCV position. Meter should read 350 volts ±10%.

e. Remove r-f unit front dust cover. Turn METER SWITCH to HIGH DCV position, and adjust the PA BIAS control for 140 ma on the PA CATHODE meter. CIRCUIT METER should read 1700 volts ±10%.

f. Adjust PA BIAS control to give 60 ma on the PA CATHODE meter before proceeding.

g. Turn off PLATE switch.

h. Close manually front r-f unit interlock, and turn on PLATE switch (pull out).

i. Turn METER SWITCH to OSC position, and adjust OSC TUNE control for a peak reading on the

TABLE 2-2. OSCILLATOR TUNING CHART (OSC TUNE CONTROL)

TRANSMITTER OUTPUT FREQUENCY MC (2 TIMES CRYSTAL FREQUENCY)	APPROXIMATE NUMBER OF CCW TURNS FROM FULL CW POSITION
108	4-1/2
130	7-1/2
152	11

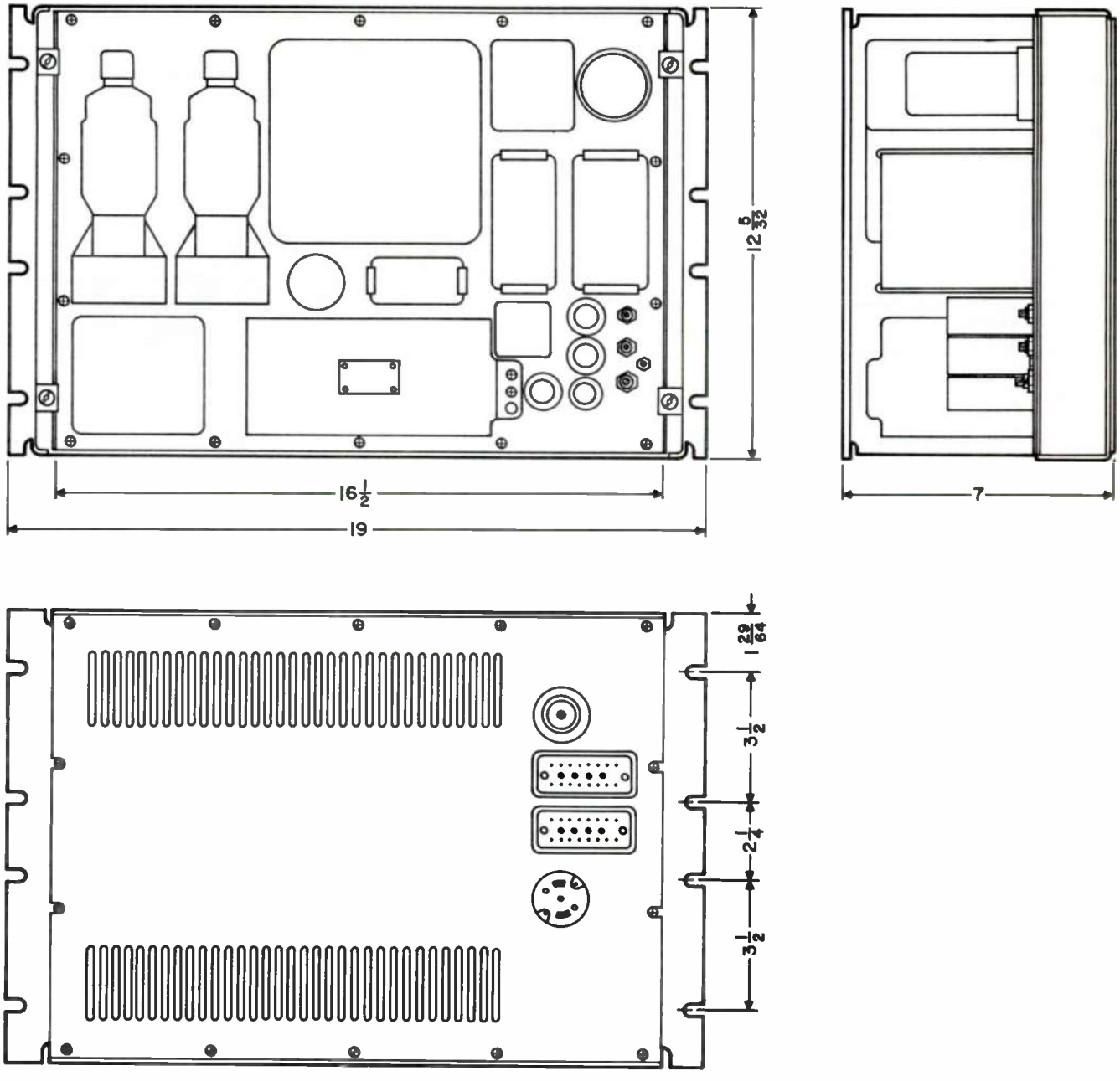


Figure 2-5. Modulator-Power Supply, Flush Mounting Installation Diagram

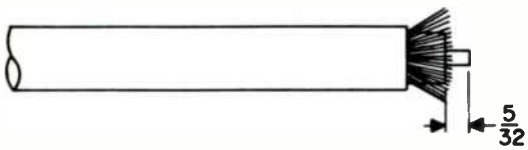
CIRCUIT METER. Oscillator screw should be approximately in position indicated in table 2-2.

j. Turn METER SWITCH to 1ST AMPL position, and adjust 1ST AMPL TUNE control for a peak reading on the CIRCUIT METER.

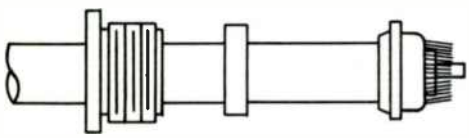
k. Turn METER SWITCH to 2ND AMPL position, and adjust 2ND AMPL TUNE control for a peak reading on the CIRCUIT METER.

l. Turn METER SWITCH to the DRIVER position. Turn PA DRIVE control fully clockwise, and adjust

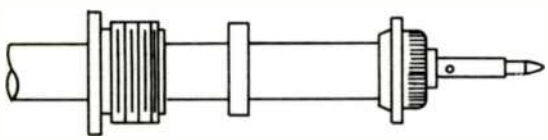
1. CUT OFF JACKET 9/32 INCH FROM END, BEING CAREFUL NOT TO NICK BRAID.



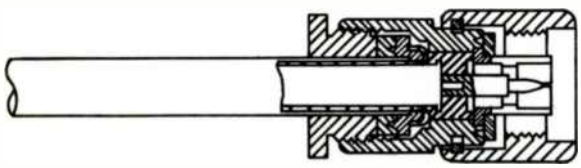
2. COMB OUT COPPER BRAID. CUT OFF CABLE DIELECTRIC 5/32 FROM END. TIN CENTER CONDUCTOR.



3. TAPER BRAID. SLIDE NUT AND GASKET OVER VINYL JACKET. PLACE CLAMP OVER BRAID AND PUSH BACK OVER CABLE JACKET. BE SURE INNER SHOULDER OF SLEEVE FITS SQUARELY AGAINST END OF CABLE JACKET.



4. FOLD BRAID BACK OVER CLAMP AND TRIM. TIN INSIDE HOLE OF CONTACT. SLIP CONTACT INTO PLACE AND SOLDER. REMOVE EXCESS SOLDER. BE SURE CABLE DIELECTRIC IS NOT HEATED EXCESSIVELY AND SWOLLEN EXCESSIVELY SO AS TO PREVENT DIELECTRIC ENTERING BODY.



5. INSERT CABLE AND PARTS INTO CONNECTOR BODY SO THAT CONTACT ENTERS HOLE IN INSULATOR. FACE OF DIELECTRIC MUST BE FLUSH AGAINST INSULATOR. MAKE SURE SHARP EDGE OF CLAMP SEATS PROPERLY IN GASKET. SLIDE NUT INTO BODY AND SCREW INTO PLACE WITH WRENCH NUT SHALL BE ROTATED INTO CONNECTOR BODY UNTIL SUFFICIENT PRESSURE IS APPLIED TO SPLIT GASKET AND INSURE GOOD CONTACT BETWEEN CLAMP AND NUT.

THE ASSEMBLY FOR PLUGS IS THE SAME AS ABOVE EXCEPT FOR THE USE OF FEMALE CONTACTS AND A JACK BODY.

Figure 2-6. Assembly Instructions for Improved Type N Coaxial Connectors

the DRIVER TUNE control for a peak reading on the CIRCUIT METER. (Back down PA DRIVE control if PA CATHODE current exceeds 100 ma.)

m. Turn METER SWITCH to open position (pointer straight up).

n. Adjust PA GRID TUNE control for a peak reading on PA CATHODE meter. Keep PA CATHODE current below 100 ma by adjusting PA DRIVE control.

o. Adjust COARSE FREQUENCY TUNE, shorting plate in cavity to approximate frequency on cover scale (see figure 2-8). Turn METER SWITCH to RF PWR OUT position, and adjust FINE TUNE control on the output cavity for a peak indication on the CIRCUIT METER. If no peak is found, readjust COARSE FREQUENCY TUNE shorting plate in the cavity, and peak the output with the FINE TUNE control. Peak the power output with the LOAD control slider. Adjust the power to 100 watts with PA DRIVE, and repeat LOAD control and FINE TUNE adjustments. Readjust power output to 100 watts with PA DRIVE control, and repeat power with FINE TUNE and LOAD control. Reduce power to 50 watts by turning AGC control ccw. (See paragraph 6.6.1.)

NOTE

If trouble is encountered in tuning transmitter, consult section VI, corrective maintenance.

2.4.3 TUNING CHART.

The tuning chart, table 2-3, contains typical CIRCUIT METER tuning indications for the indicated frequencies.

TABLE 2-3. TUNING CHART (TYPICAL READINGS)

FREQUENCY MC	PA BIAS	LOW DCV	HIGH DCV	OSC	1ST AMPL	2ND AMPL	DRIVER	PA CATHODE CURRENT MA	RF PWR OUT
108	62	70	62	48	58	50	48	115	50 watts
131	62	70	62	34	44	53	47	115	50 watts
152	62	70	62	40	52	50	52	115	50 watts

2.4.4 AUDIO ADJUSTMENTS.

The screwdriver adjustments to set up audio input and modulation levels are located on the front of the modulator-power supply unit chassis under the dust cover. They include the audio balance control (BAL, R216), the local microphone gain control (MIKE GAIN, R212), the remote gain control (REMOTE GAIN, R215), and the modulation limiting control (MOD LIM, R227). The following procedure will set these adjustments for the 600-ohm balanced input:

a. Connect a vtvm to J206. Turn MIKE GAIN (R212) and REMOTE GAIN (R215) fully counterclockwise. Adjust BAL (R216) until oscillation, as shown on the vtvm, ceases. Set this control in the center of the range over which there is no oscillation and lock control. If there is no oscillation evident at any setting, set the control to midrange and lock.

b. Set the MOD EQU control (R116) on the r-f unit to midrange.

c. Connect an audio oscillator across the 600-ohm balanced remote input (pins 9 and 12 on J202). Use an input level of -30 dbm. Attach a vtvm to J206.

d. Turn REMOTE GAIN (R215) to maximum. Adjust MOD LIM (R227) until a slight bias voltage is developed at J206.

e. Increase audio oscillator input to -20 dbm, and record the bias voltage at J206.

f. Increase audio oscillator input to a voltage equal to the remote line input voltage. Adjust REMOTE GAIN (R215) until the voltage at J206 is equal to the voltage recorded in step e.

g. Increase audio oscillator input by 10 db, and adjust MOD EQU control on r-f unit for an indication of 100 percent modulation of 50 watts r-f power.

h. Connect the balanced remote audio input lines to pins 9 and 12 of J202. The audio compressor circuit in the modulator-power supply will control the modulating voltage to within 3 db for a 10-db change in line voltage.

i. Insert a carbon microphone in MIKE jack (J203). Talk into microphone in a normal tone of voice while adjusting MIKE GAIN (R212) for a peak indication of 100 percent modulation of 50 watts r-f power.

2.4.5 TUNING PROCEDURES FOR USE WITH AN EXTERNAL OSCILLATOR.

The following describes the procedure necessary for tuning a 242F-5CL which has been modified for use with an external oscillator. This procedure should be used in place of the tuning procedure given in paragraph 2.4.2.

The CIRCUIT METER, M101, permits measurement of the PA bias, B+ voltages, drive levels, power output, standing-wave ratio, and percent modulation and is used for tuning and trouble shooting. Three scales are provided: a black POWER scale, 0-150 WATTS; a red SWR scale, 1.0-5.0; and a black TUNING scale 0-100. Table 2-4 describes the operation of the CIRCUIT METER and METER SWITCH.

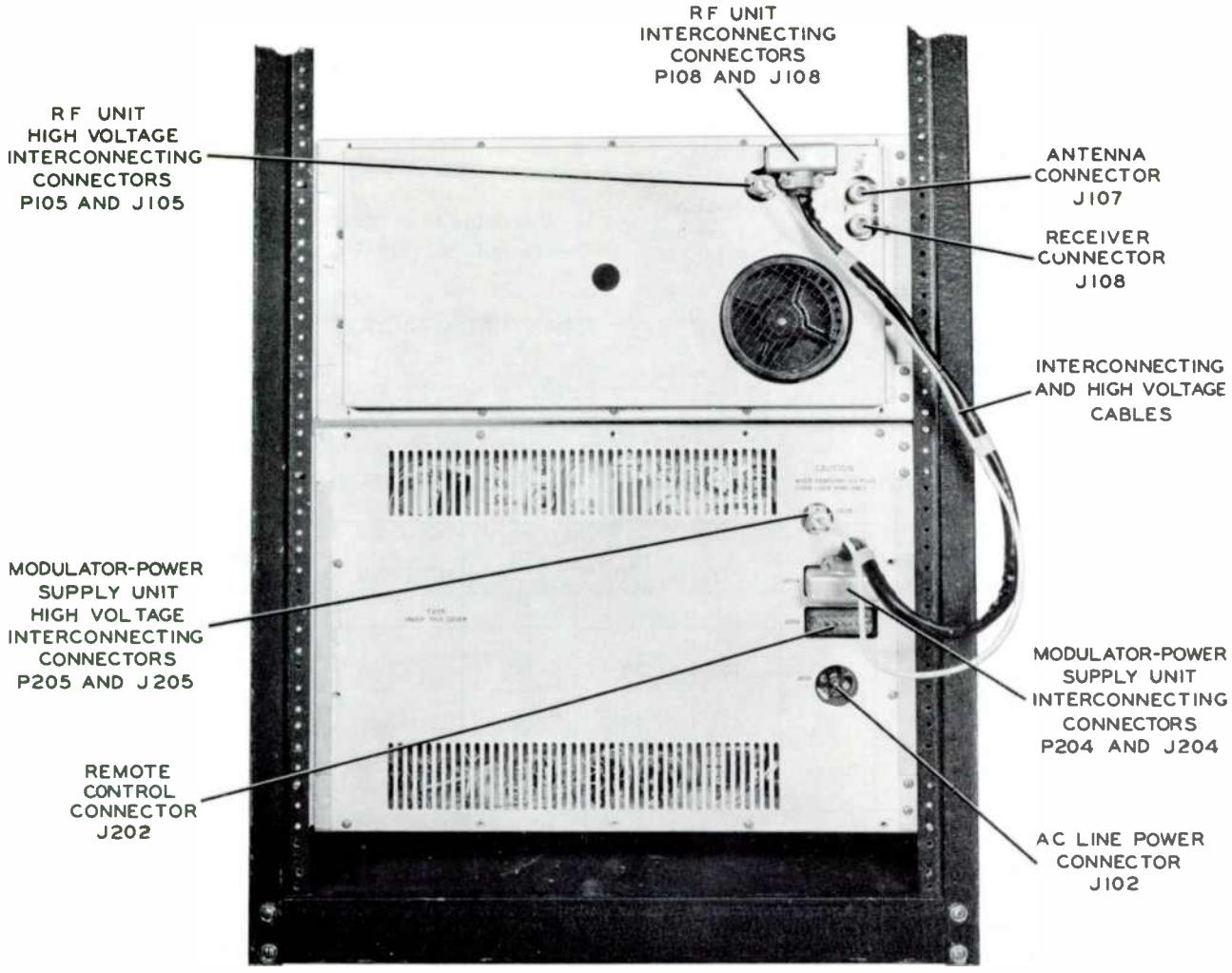


Figure 2-7. VHF Transmitter 242F-5CL, Cabling Connections

NOTE

Before any attempt is made to tune the transmitter, it should be established that the equipment is mounted properly, that all packing material has been removed from the PA cavity and from the rectifier tubes, and that the cabling (including the cable to the antenna or other r-f load) is connected. The external oscillator output should be turned off until steps a through i of the tuning procedure have been completed.

a. Remove the r-f unit front dust cover.

b. Set the following controls to the indicated positions:

MOD EQU control - fully clockwise
PA BIAS control - fully clockwise
AGC control - fully clockwise
PA DRIVE control - fully counterclockwise
LOCAL-REMOTE switch - LOCAL
PLATE switch - OFF

c. Turn POWER switch to on. The green indicator lights on the r-f unit and the modulator-power supply unit should light, and the PA blower should start. Turn METER SWITCH to the PA BIAS position. The CIRCUIT METER should read full scale or above.

d. Pull out interlock switch, S103, at the right end of the control panel. Turn on PLATE switch, and wait for plate time-delay relay to close. The time-delay relay should close within 60 seconds after the POWER switch is turned on in step c.

CAUTION

Do not reach or insert metal tools behind the panel while the interlock is disabled as 350 volts d-c is present behind the control panel.

e. Turn METER SWITCH to LOW DCV position. CIRCUIT METER should read 70 ±7 on the TUNING scale (black, 0-100); this indicates a low B+ of 350 volts ±35 volts.

TABLE 2-4. CIRCUIT METER OPERATION FOR THE 242F-5CL

METER SWITCH POSITION	CIRCUIT FUNCTION MEASURED	CIRCUIT METER SCALE USED	CIRCUIT METER SCALE INTERPRETATION	NORMAL READING AFTER COMPLETE TUNING	READINGS FOR SERIAL NUMBER _____ *
PA BIAS	PA bias v d-c	TUNING (black 0-100)	Direct reading volts	55 to 75 (55 v to 75 v)	
LOW DCV	Low B+ voltage	TUNING	Full scale equals 500 v d-c	70 ±7 (350 ±35)	
HIGH DCV	High B+ voltage	TUNING	Full scale equals 2500 v d-c	68 ±7 (1650 ±165)	
OSC	V101 d-c grid voltage	TUNING	Relative	20 to 40	
1ST AMPL	V102 d-c grid voltage	TUNING	Relative	40 to 80	
2ND AMPL	V103 d-c grid voltage	TUNING	Relative	45 to 75	
DRIVER	V104 r-f grid voltage	TUNING	Relative	30 to 60	
RF PWR OUT	Incident r-f power output	POWER (black 0-150)	Direct reading in watts	50	
SWR	Standing-wave ratio	SWR (red 1.0-5.0)	Direct reading in swr	Depends on load, should ordinarily be below 2.0.	
% MOD	Percent modulation	TUNING	Direct reading in percent	Depends on audio input.	

*Meter readings vary somewhat between transmitters. It is recommended that this column be filled in with actual meter readings immediately after installation and tuning. This information will be very useful for preventive maintenance and repair.

f. Turn METER SWITCH to the HIGH DCV position, and adjust the PA BIAS control for a 125 ma reading on the PA CATHODE meter. The CIRCUIT METER should read 68 ±7 on the TUNING scale. This corresponds to a high B+ of 1650 volts ±165 volts.

g. Adjust the PA BIAS control to give a reading of 60 ma on the PA CATHODE meter. Turn METER SWITCH to PA BIAS position. The CIRCUIT METER reading on the TUNING scale should range from 55-75; a reading below 55 indicates a weak PA tube.

h. Adjust the input coil and OSCILLATOR TUNE (L101) to approximate tuning as estimated from table 2-2.

i. Turn METER SWITCH to OSC position.

j. Turn on external oscillator, and adjust its output to give an indication on the circuit meter.

k. Tune the input coil and OSCILLATOR TUNE control, L101, for maximum reading on the circuit meter.

l. Adjust the output of the external oscillator to give a reading of 20 on the TUNING scale of the CIRCUIT METER.

m. Turn METER SWITCH to 1ST AMPL position, and adjust 1ST AMPL TUNE control for a peak reading on the CIRCUIT METER. The reading on the TUNING scale should range from 40 to 80. If reading is low, refer to step 6 of table 6-1 for possible causes.

n. Turn METER SWITCH to 2ND AMPL position, and adjust 2ND AMPL TUNE control for peak reading on the CIRCUIT METER. The reading on the TUNING scale should range from 45 to 75. If reading is low, refer to step 7 of table 6-1 for possible causes.

o. Turn METER SWITCH to the DRIVER position. Turn PA DRIVE control fully clockwise, and adjust the DRIVER TUNE control for a peak reading on the CIRCUIT METER (back down PA DRIVE control if PA CATHODE current exceeds 100 ma).

p. Adjust PA GRID TUNE control for a peak reading on the PA CATHODE meter. Keep the PA CATHODE current below 100 ma by adjusting the PA DRIVE control.

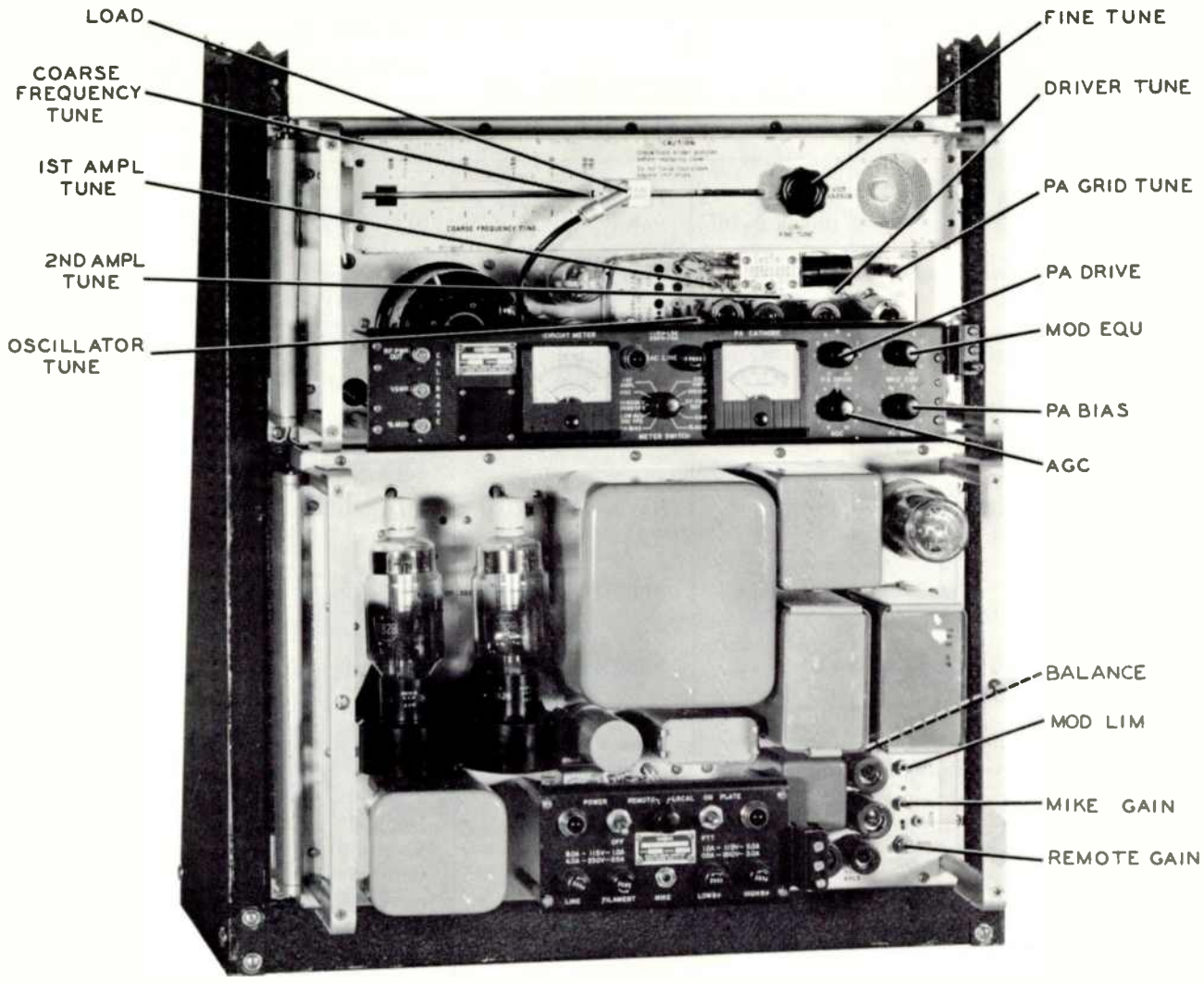


Figure 2-8. Tuning and Adjustment Controls

q. Adjust (COARSE FREQUENCY TUNE) by sliding the cavity shorting plate (see figure 2-8) to approximate frequency on cover scale. Keep the LOAD control slider within two inches of the shorting plate at all times to prevent damage to the LOAD control slider contact. Turn METER SWITCH to RF PWR OUT position, and adjust the FINE TUNE control on the PA cavity for a peak indication on the CIRCUIT METER. If no peak is found, readjust COARSE FREQUENCY TUNE shorting plate until a peak is obtained by tuning the FINE TUNE control.

r. Adjust the LOAD control slider for a peak reading on the CIRCUIT METER, and readjust the FINE TUNE control for a maximum reading on the CIRCUIT METER. Adjust the power output to 100 watts with PA DRIVE control, and readjust the LOAD control slider and FINE TUNE control for a peak on the CIRCUIT METER. Repeat this procedure until the CIRCUIT METER reads 100 watts with the LOAD control slider and FINE TUNE control adjusted for peak power output.

NOTE

For maximum accuracy, the r-f power output meter should be calibrated for the particular operating crystal frequency of the unit. This is necessary because the operation of the filter coupler unit is dependent on the frequency. When the transmitter is used with four crystals, the frequencies are close enough to present only a small error in the r-f power output meter readings. See paragraph 6.6.1.

s. Reduce the power output to 50 watts by turning the AGC control counterclockwise. The PA CATHODE meter should read 105 to 125 ma.

t. Turn the METER SWITCH to the SWR position. The standing-wave ratio should read less than 1.5 into a good 50-ohm load and less than 3.0 into a reasonably good antenna.

u. Replace r-f unit dust cover.

SECTION III
OPERATION

3.1 GENERAL.

VHF Transmitter 242F-5CL is a 50-watt, crystal-controlled type equipment designed for ground station communications. It is rated for continuous duty and may be operated attended or unattended in the local or remote control positions.

In both LOCAL and REMOTE operation, the POWER switch must be turned on at the equipment. In order to control the filaments remotely in the REMOTE function, an external power supply to energize filament relay K201 must be used. If remote control of filaments is not required, no external power supply is required, but a jumper shorting the contacts of K201 must be installed. See note 7 on the main schematic diagram, figure 8-1. Plate control is accomplished with PLATE switch in the LOCAL position (or push-to-talk button on the local microphone) and with a push-to-talk switch on a microphone in the REMOTE position. VOX operation is accomplished by providing a closing contact at the REMOTE position.

3.2 OPERATING CONTROLS.

A list of all operating controls, their location, identification, and function is contained in table 3-1. Refer to figure 3-1. All of these controls are exposed with the dust covers in place.

TABLE 3-1. OPERATING CONTROLS

CONTROL	LOCATION	IDENTIFICATION	FUNCTION
Line power on-off switch	Modulator-power supply unit control panel	POWER (S201)	Controls line power to the filaments, blower, control circuits power supply, and bias supply.
Channel selector (4 freq models only)	R-f unit control panel	CHANNEL	Changes channel.
Local-remote switch	Modulator-power supply unit control panel	LOCAL-REMOTE (S202)	Transfers control of the transmitter from local to the remote connector J202.
Plate push-to-talk switch	Modulator-power supply unit control panel	PLATE ON-PTT (S203)	Keys transmitter by applying plate power. Switch holds in ON position, momentary action in PTT position.
Power amplifier drive control	Control panel of r-f unit	PA DRIVE (R117)	Controls the amount of drive to the power amplifier.
Agc level control	Control panel of r-f unit	AGC (R138)	Controls the level of agc voltage fed back to driver to control the carrier level.
Circuit meter selector switch	Control panel of r-f unit	METER SWITCH (S101)	Select circuit to be metered by CIRCUIT METER for tuning adjustment and test indications.

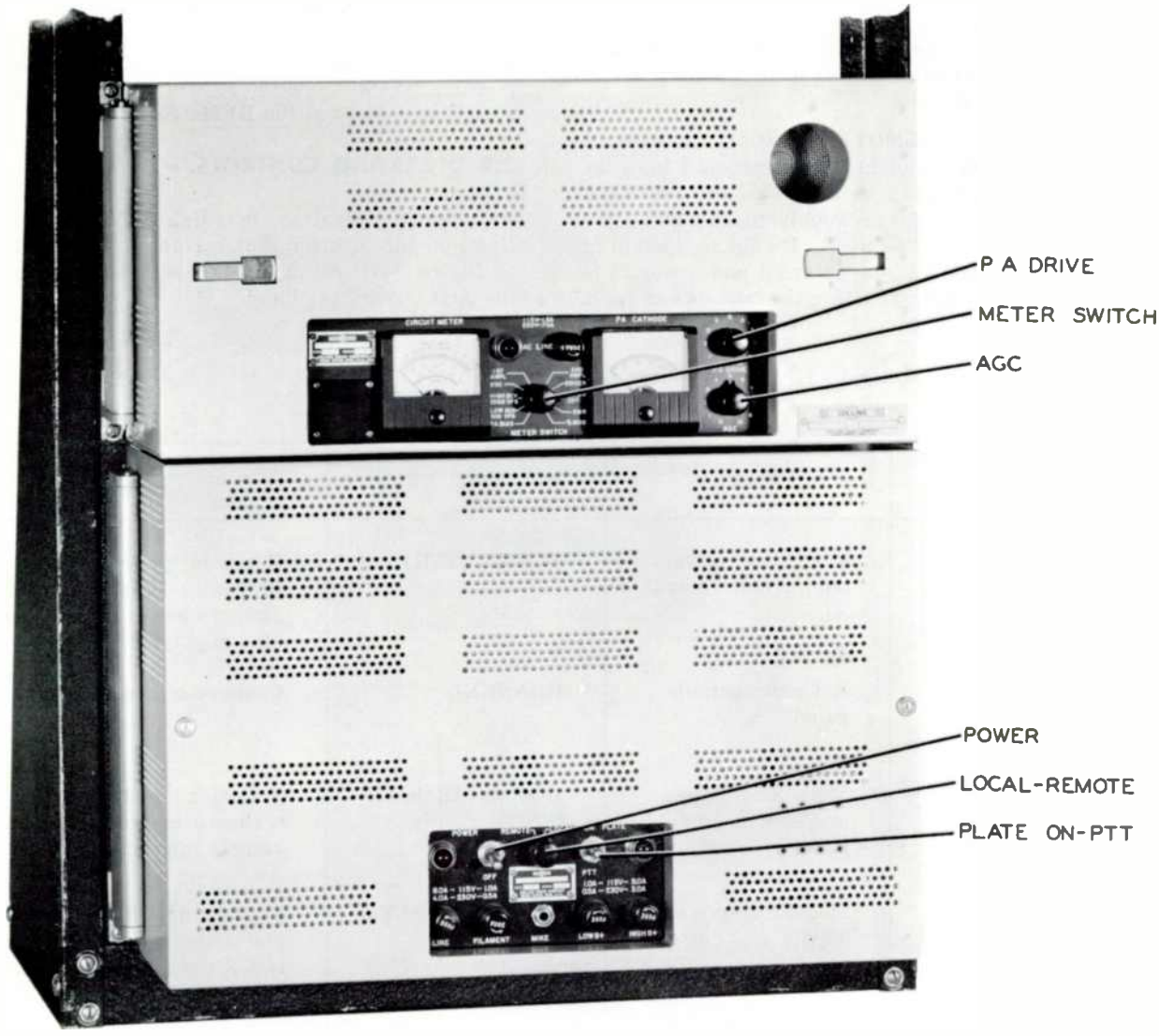


Figure 3-1. VHF Transmitter 242F-5CL, Operating Controls

3.3 OPERATING PROCEDURE.

The following steps prescribe the operating procedure for Transmitter 242F-5CL.

CAUTION

Before operating the equipment, make sure the units are connected properly, that the output is terminated in a suitable load, and that the adjustments in section II have been made. Never operate the equipment with the high-voltage interunit cable disconnected.

3.3.1 LOCAL OPERATION PROCEDURE.

a. Set LOCAL-REMOTE switch to LOCAL position.
b. Set PLATE switch to center (off) position.
c. Turn POWER switch to on position.
d. After allowing approximately 60 seconds warm-up time, key transmitter by turning the PLATE switch to the up (on) position.
e. Check the readings of the CIRCUIT METER on all positions of the METER SWITCH. These indications should be approximately the same as those listed in the tuning chart, table 2-3, in section II. Tune using tuning procedure in paragraph 2.4.2 if required.
f. Check modulation by speaking into the microphone and observing tuning meter in the % MOD position.

3.3.2 REMOTE OPERATION PROCEDURE.

a. Perform steps a through e of paragraph 3.3.1, the local operation procedure, with the LOCAL-REMOTE switch in the LOCAL position.
b. Turn the LOCAL-REMOTE switch to the REMOTE position, and key the transmitter from the remote station.
c. Modulate transmitter from the REMOTE position, and have observer check reading of tuning meter in the % MOD position.

SECTION IV
PRINCIPLES OF OPERATION

4.1 INTRODUCTION.

The purpose of this section is to describe the principles of operation of VHF Transmitter 242F-5CL. The first portion of the section provides a general description of the principles of operation based on a block diagram of the transmitter, figure 4-1. The general description is followed by a detailed discussion of each circuit supplemented by sections of the main schematic diagram, figure 8-1. The sequence of this information is based on general signal and voltage paths.

4.2 GENERAL PRINCIPLES OF OPERATION.

(Refer to figure 4-1.)

The r-f unit of Transmitter 242F-5CL derives a frequency from a crystal oscillator, doubles it, amplifies it, and feeds it to a tuned cavity. A sliding tap on the center conductor of the cavity picks up the r-f output and feeds it to the filter coupler unit which incorporates a reflectometer and a harmonic filter. The output of the filter coupler unit is designed to feed a nominal 52-ohm line and will work satisfactorily into loads up to 3:1 vswr.

The r-f unit contains an agc detector circuit which samples the r-f energy in the tuned cavity and feeds back to the driver stage a rectified portion of the r-f in the form of a negative control voltage.

A voltage regulator stage in the r-f unit provides a stable plate voltage for the oscillator doubler and plate and screen voltage for the first r-f amplifier. The voltage regulator also provides a reference potential for the agc detector circuit. In addition, the r-f unit contains its own filament power supply and bias supply for the power amplifier.

The modulator-power supply unit in Transmitter 242F-5CL accepts all audio inputs, amplifies them, and supplies the modulation voltage to the plate of the second r-f amplifier providing low-level modulation. The inputs provided for include 600-ohm balanced remote audio, remote carbon microphone, and local carbon microphone.

Four power supplies are contained in the modulator-power supply unit. The high B+ supply provides plate voltage for the power amplifier. The low B+ supply provides 350 volts for the plates and screens of the low-level tubes and the screen of the PA tube. The d-c microphone and relay supply provides voltage for a carbon microphone and for control relays. A separate secondary winding of the filament transformer supplies filament voltage for the audio and modulator tubes.

The function of the control circuits is determined by the position of the LOCAL-REMOTE switch. When the switch is in the LOCAL position, all control is at the transmitter which can be keyed with either the push-to-talk button on the local microphone or the PLATE switch on the control panel. When the LOCAL-REMOTE switch is in the REMOTE position, all control except turning on the filaments is shifted to the remote jack. For the filaments to be turned on in the REMOTE position, a jumper must be installed across the contacts of relay K201, or an external power supply (48 volts d-c) must be used to close the relay. In remote control, the transmitter is keyed with the push-to-talk button on the remote microphone or with a voice-operated closing contact.

4.3 CIRCUIT ANALYSIS.

4.3.1 R-F UNIT.

4.3.1.1 OSCILLATOR FREQUENCY DOUBLER. Figure 4-2 shows the frequency-generating stage of the r-f unit. The output frequency of this cathode-coupled, overtone-type oscillator is equal to the second harmonic of the overtone crystal used. The oscillator tube, V101, is a type 5670 dual triode with a grounded shield element, pin 5.

One triode of V101, pins 2, 3, and 4, forms a grounded-grid amplifier which is driven by the other triode, pins 6, 7, and 8, a cathode follower. Crystal Y104 and coil L102 are in parallel between the two cathodes.

Coil L102 is used to compensate for the inherent capacitance of the crystal and the crystal holder. The plate tank of the grounded-grid section is formed by slug-tuned coil L101 and the associated tube and stray capacitance. The tank circuit is tuned for parallel resonance at the crystal frequency and provides low impedance to ground to all other frequencies. The output of this section of V101 is coupled to the grid of the cathode follower section through C103.

Voltage developed across the cathode resistor R103 is coupled to the cathode of the grounded-grid amplifier section through the series resonant crystal, Y104. Since there is zero phase shift through the grounded-grid amplifier and through the cathode follower which supplies the feedback, this circuit will oscillate. Because the crystal impedance is high at frequencies off resonance, the oscillation frequency will be equal essentially to the crystal resonant frequency.

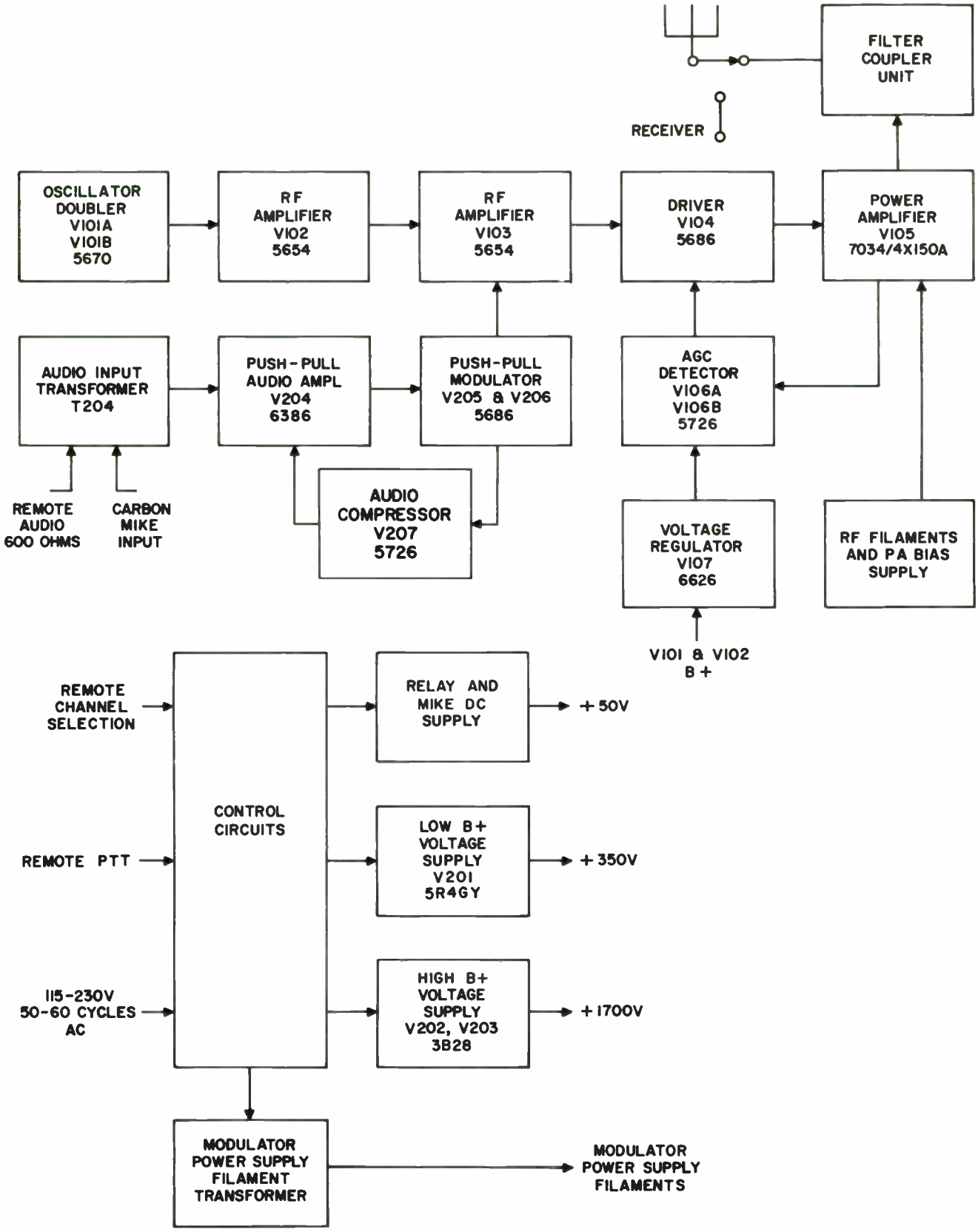


Figure 4-1. VHF Transmitter 242F-5CL, Block Diagram

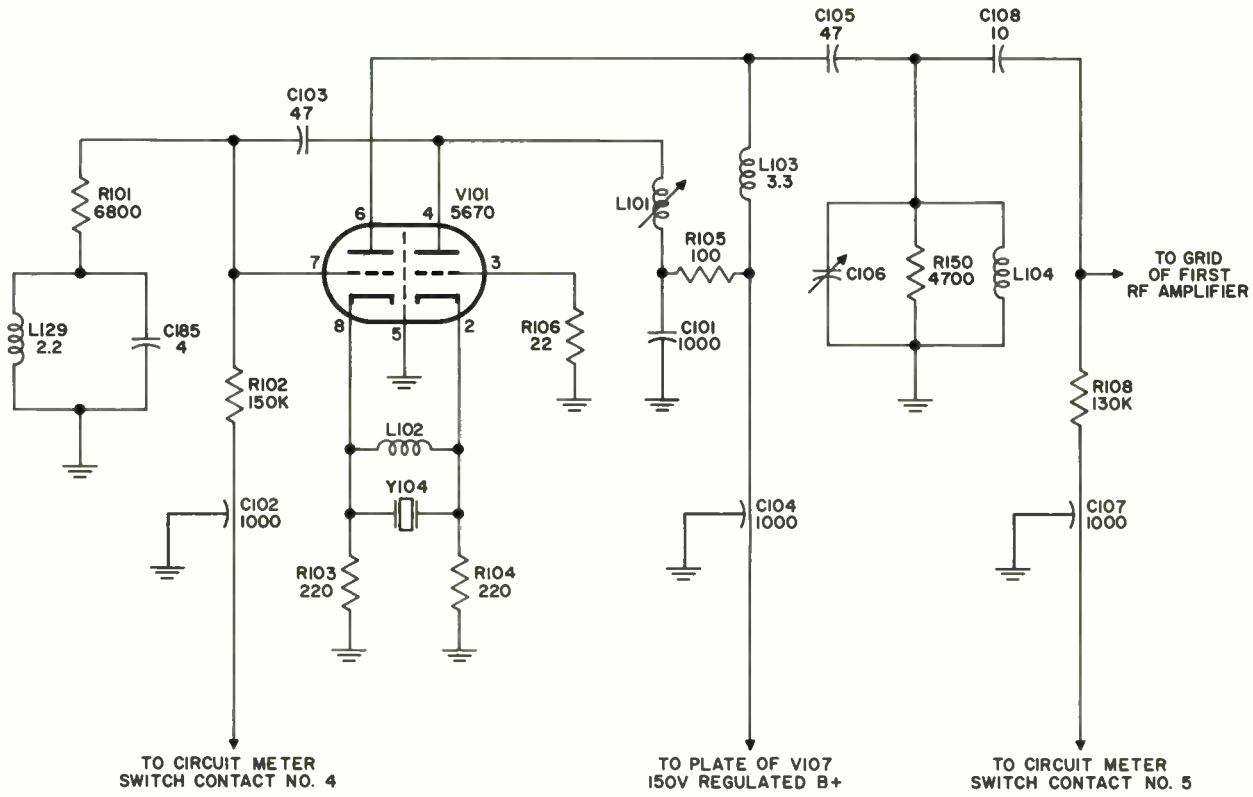


Figure 4-2. Oscillator-Frequency Doubler

The plate of the cathode follower section is capacitively coupled to a parallel-resonant tank circuit which is tuned to the second harmonic of the crystal frequency by variable capacitor C106. This tank is a low impedance to the crystal frequency and has little effect on the oscillator frequency. The harmonic output is capacitively coupled by C108 to the control grid of V102, the first r-f amplifier.

Coil L129 and capacitor C185 in the oscillator doubler circuit form a compensation network which offers relatively low impedance to ground to the higher crystal frequencies and a higher impedance to ground to the lower crystal frequencies. This arrangement prevents the crystal from being overdriven at higher frequencies.

The grid current of the cathode follower section of the oscillator doubler is metered at contact 4 (OSC position) of the CIRCUIT METER selector switch, S101-A, and the output of the second harmonic tank circuit or the first r-f amplifier grid current is metered at contact 5 (1ST AMPL position) of switch S101-A.

The plate voltage for both sections of the oscillator doubler is taken from the voltage regulator tube, V107. Capacitors C102, C104, and C107 are feedthrough bypass capacitors which prevent r-f from being coupled out of the oscillator compartment onto the meter and B+ leads.

4.3.1.2 FIRST R-F AMPLIFIER. (Refer to figure 4-3.) The r-f signal from the oscillator is applied through C108 to the control grid of the first r-f amplifier, V102, a type 5654 pentode operating class C. The supressor grid and the cathode, pins 2 and 7, are connected internally. Plate and screen voltage for this stage is taken from the low B+ power supply and is regulated by VR tube V107. Capacitor C110 is a screen bypass, and L105 is an r-f choke used for shunt feed of the plate. The plate tank circuit is composed of L106 and the tuning capacitor, C113. Capacitor C112 is a blocking capacitor to prevent grounding of the d-c plate voltage through L106. The tank circuit voltage is capacitively coupled through C115 to the next stage. The grid current of V103 is metered at contact 7 (2ND AMPL position) of METER SWITCH S101-A. Capacitors C111 and C114 are feedthrough bypass capacitors used to prevent r-f voltage from being fed out of the first amplifier compartment onto the meter and B+ leads.

4.3.1.3 SECOND R-F AMPLIFIER. (Refer to figure 4-3.) The signal from the first r-f amplifier is applied through C115 to the control grid of the second

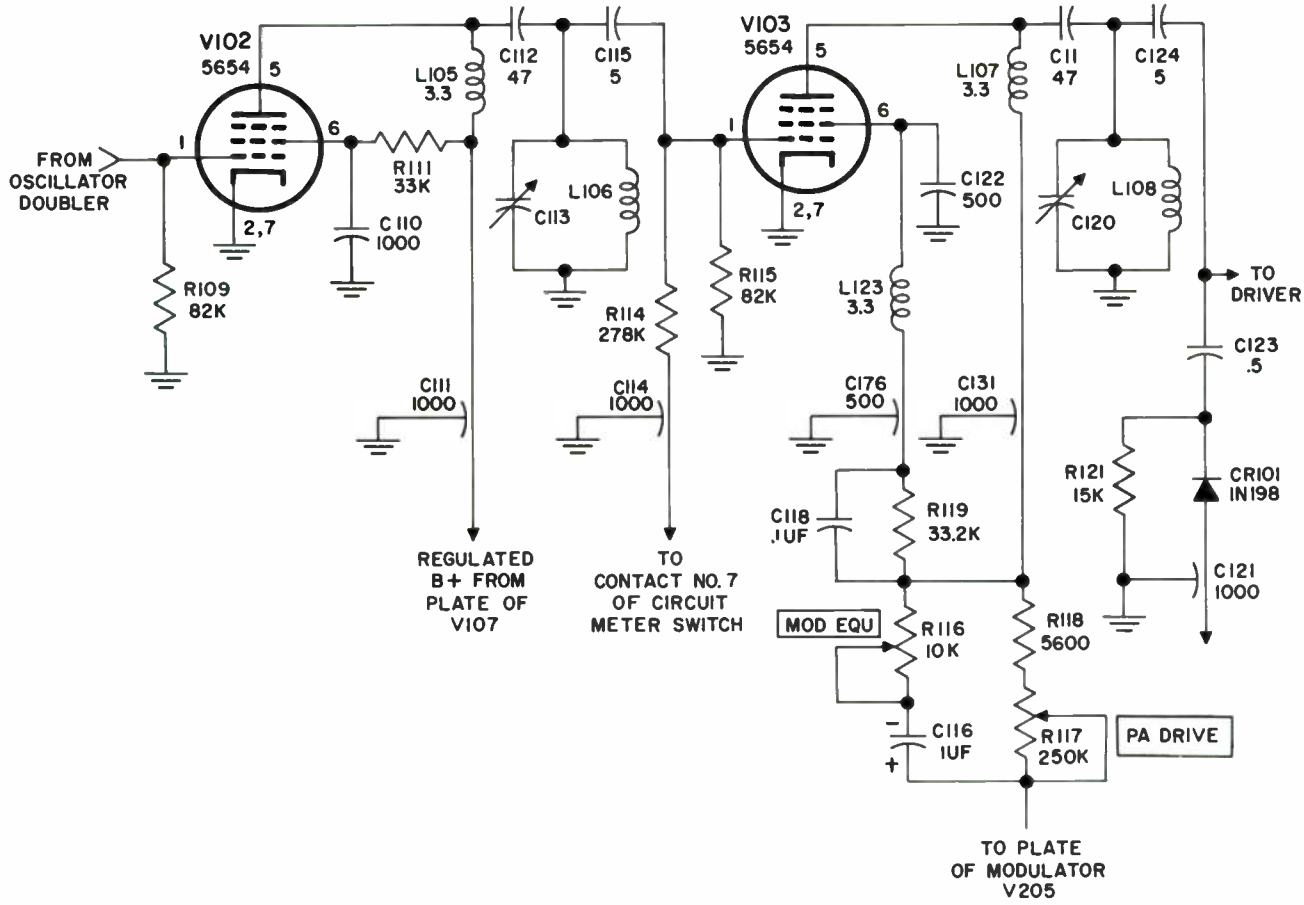


Figure 4-3. First and Second R-F Amplifiers

r-f amplifier, V103, a type 5654 pentode operating in class C. Low-level modulation is accomplished in this stage by applying the modulation voltage to the plate and screen grid. The d-c voltage and the modulation signal are coupled to V103 from the plate of the modulator tube, V205; through J204; the interconnecting cable, J108; and a network composed of a variable resistor R117 and resistor R118. Variable resistor R117 adjusts the d-c voltage level on the plate and screen and serves as the PA DRIVE control. Control of power output of the transmitter at this stage is possible because the driver and power amplifier are operated linearly in class AB. Capacitor C116 and resistor R116 provide a means of changing the a-c modulation voltage relative to the d-c voltage at the plate and screen of V103 to provide equal modulation on different r-f units when more than one r-f unit is used with a single modulator-power supply unit.

The output of the amplifier is developed across a shunt-fed, parallel-resonant, plate tank circuit which is tuned to the carrier frequency. Variable capacitor C120 and coil L108 make up the tank which is capacitively coupled through C124 to the control grid of the next stage. Coils L123 and L107 serve as r-f chokes and C176, C131, and C121 are r-f feedthrough bypass capacitors.

The driver grid current is metered at contact 8 (DRIVER position) of METER SWITCH S101-A. Crystal rectifier CR101 and resistor R121 rectify a portion of the r-f signal at the grid of V104 and provide direct current proportional to the driver grid voltage for the circuit meter. Capacitor C123 is the coupling capacitor for the metering network.

4.3.1.4 R-F DRIVER. (Refer to figure 4-4.) The modulated r-f signal is fed through C124 to the control grid of V104, the r-f driver tube. The tube is a type 5686 pentode operating in class AB linear. Plate and screen voltages for this stage are supplied by the +350-volt power supply. Coil L124 with C129 and C130 form an r-f bypass network for the screen grid. Coil L110 is an r-f choke in the plate supply lead. Feedthrough capacitors C125 and C133 are used to bypass stray r-f to ground.

The agc voltage from the agc detector unit is applied to the control grid of the driver. This voltage is, under normal conditions, at a negative level which varies inversely with any variation in the power output of the transmitter. Crystal rectifier CR102 is connected between the agc line and ground to prevent a positive agc voltage from appearing on the driver grid. If the output power increases, the agc voltage

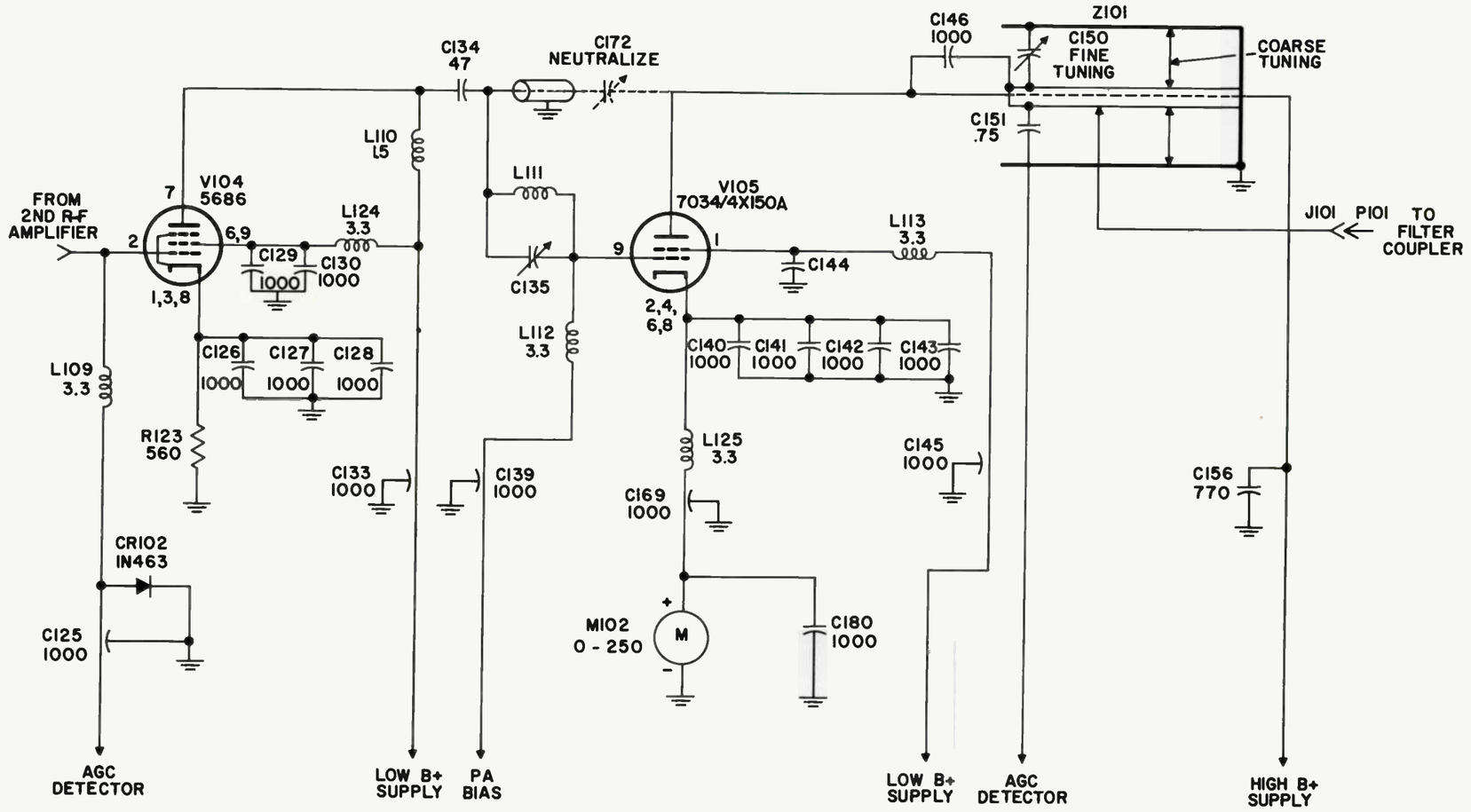


Figure 4-4. Driver, Power Amplifier, and Output Cavity

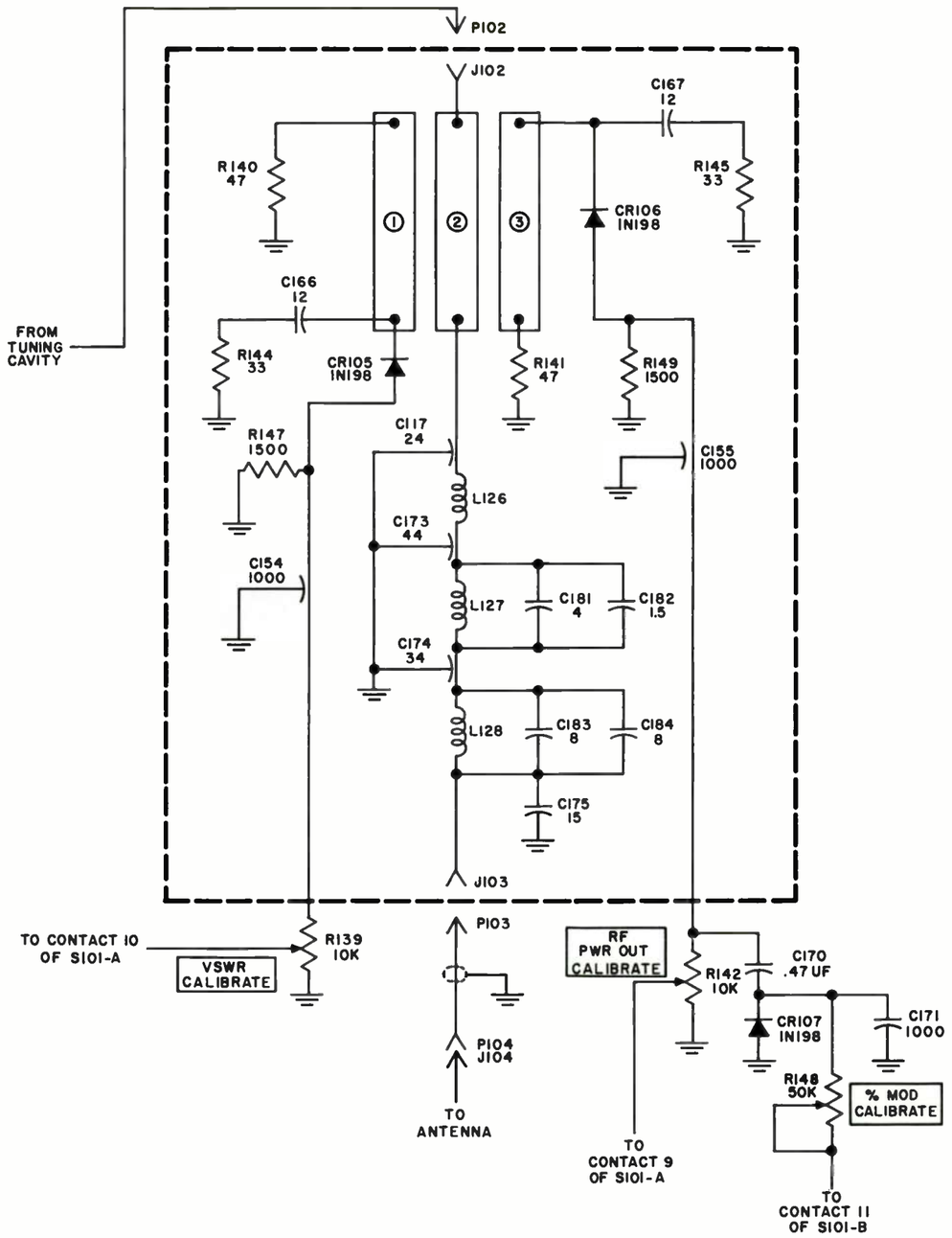


Figure 4-5. Filter Coupler Unit

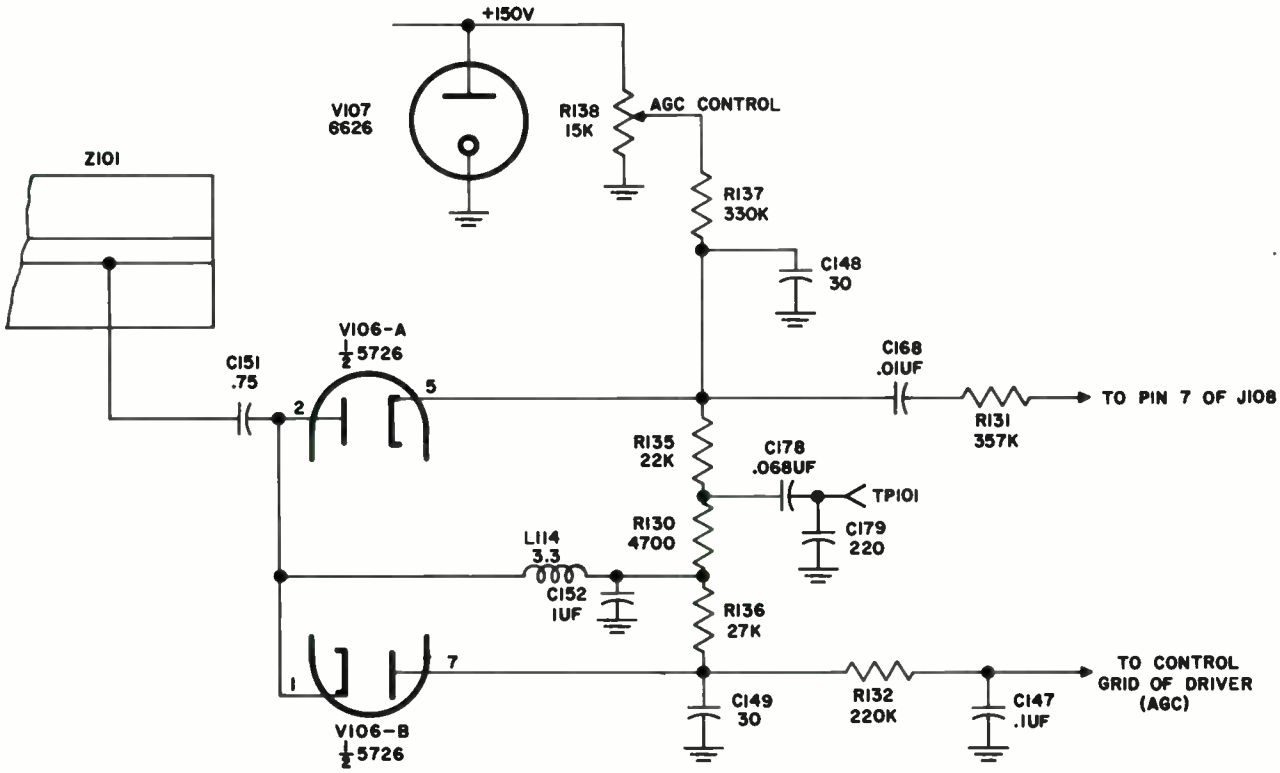


Figure 4-6. AGC Detector Unit

lowers (becomes more negative) tending to reduce the gain of the driver which tends to keep the output power constant.

The output of the driver is coupled through a pi network to the control grid of the power amplifier. The network is composed of the output tube capacitance of the driver, coil L111, variable capacitor C135, and the input tube capacitance of the power amplifier.

4.3.1.5 POWER AMPLIFIER AND OUTPUT CAVITY. (Refer to figure 4-4.) The r-f energy from the driver is applied to the control grid of the power amplifier V105, a type 7034/4X150A tetrode operating in class AB linear. The high B+ power supply furnishes 1700 volts d-c to the power amplifier plate by means of a wire running through the hollow center conductor of plate cavity Z101. The low B+ power supply furnishes 350 volts d-c which passes through r-f choke L113 to the screen grid of V105.

Variable bias for the power amplifier is developed in the r-f unit by a separate power supply. The voltage is varied with resistor R124 which forms the PA BIAS control. The bias voltage is metered at contact 1 (PA BIAS position) of METER SWITCH S101-A. Coil L112 and feedthrough capacitor C139 prevent r-f from entering the bias supply.

A milliammeter M101 in the cathode of V105 meters the cathode current continuously. This meter is marked PA CATHODE and is located on the front panel of r-f unit. Capacitors C140, C141, C142, and C143 form a cathode r-f bypass network. Feedthrough capacitors C139, C169, and C145 are used to ground stray r-f. Choke coil L125 provides r-f filtering in the meter lead.

The r-f output cavity, Z101, consists of grounded sheet-metal outer conductor and a tubular center conductor. The cavity may be tuned to resonance for frequencies from 108 to 152 mc. Coarse tuning is accomplished with a shorting bar between the outer conductor and the center conductor which, when moved, changes the electrical length of the cavity. Fine tuning is accomplished with variable capacitor C150. The r-f output is taken from a loading control, which is a sliding tap on the center conductor. A portion of the r-f plate voltage is capacitively coupled by C151 to the agc detector unit.

The power amplifier stage is neutralized with a coaxial probe in one end of the output cavity. The neutralizing capacitance is represented as a variable capacitor, C172, shown in dotted lines in figure 4-4.

4.3.1.6 FILTER COUPLER UNIT. (Refer to figure 4-5.) The r-f output from the cavity is coupled to jack J102 of the filter coupler unit. Jack J102 is connected to the center element, marked 2, of the directional coupler. The other end of the center element is connected through the r-f line filter network to jack J103 which leads to the antenna. The r-f filter network greatly attenuates all carrier harmonic output.

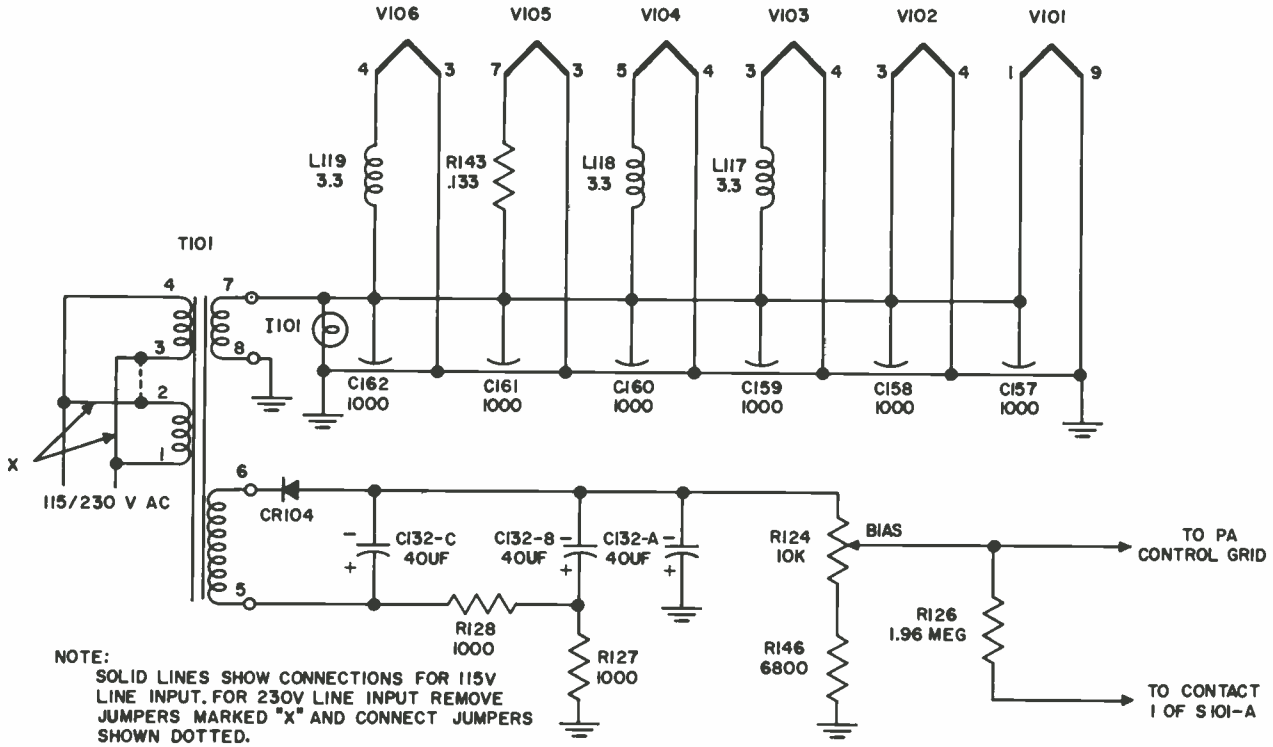


Figure 4-7. R-F Filament and Power Amplifier Bias Power Supplies

The forward power induces two currents into each of the coupling elements marked 1 and 3. One of the currents is due to capacitance coupling, and the other is the result of inductive coupling. The phases of these currents are such that they add in the RC network containing R145 and C167. The voltage across this network is rectified by CR106 and is metered by the CIRCUIT METER connected to contact 9 (RF PWR OUT position) of METER SWITCH S101-A. Resistor R142 permits calibration of the meter.

The capacitive and inductive currents induced into coupling elements 1 and 3 by the reflected power are such that they add across R144 and C166. The voltage across this network is rectified by CR105 and fed to contact 10 (SWR position) of METER SWITCH S101-A. Resistor R139 permits calibration of this meter function. The transmitter must be putting out 50 watts (forward power) for the vswr indication to be correct.

The detected output of CR106 is capacitively coupled by C170 to a circuit which rectifies the positive modulation peaks. This signal is metered at contact 11 (% MOD position) of METER SWITCH S101-A. Resistor R148 is a control to calibrate the meter to read percent modulation at 50 watts carrier output.

4.3.1.7 AGC DETECTOR UNIT. (Refer to figure 4-6.) The agc detector unit samples the r-f output of the transmitter, detects the signal, and provides an automatic gain control voltage for the control grid of the driver stage.

A sample of r-f voltage is tapped from the center conductor of the output cavity and coupled through C151 to the plate of one section and the cathode of the other section of V106. This voltage is then detected by V106 which is a voltage-doubler-type detector. The load circuit for the detector is R135, R130, and R136. The whole detector circuit is returned to ground through AGC control resistor R138. The net voltage applied to the control grid of the driver tube is the algebraic sum of the positive control voltage set at AGC control R138 and the negative-detected voltage developed across the detector load circuit.

Under normal conditions, the voltage applied to the driver grid is of negative polarity and of a magnitude depending on the setting of R138 and the power output.

C152, R132, and C147 filter the modulation component from the detected voltage. Coil L114 is a d-c return for diodes V106A and V106B.

The audio component of the detected voltage is coupled through C168 and R131 and is coupled to pin 7 of J108. Voltage at pin 7 of J108 may be used as a source of detected audio voltage to a high-impedance load if desired.

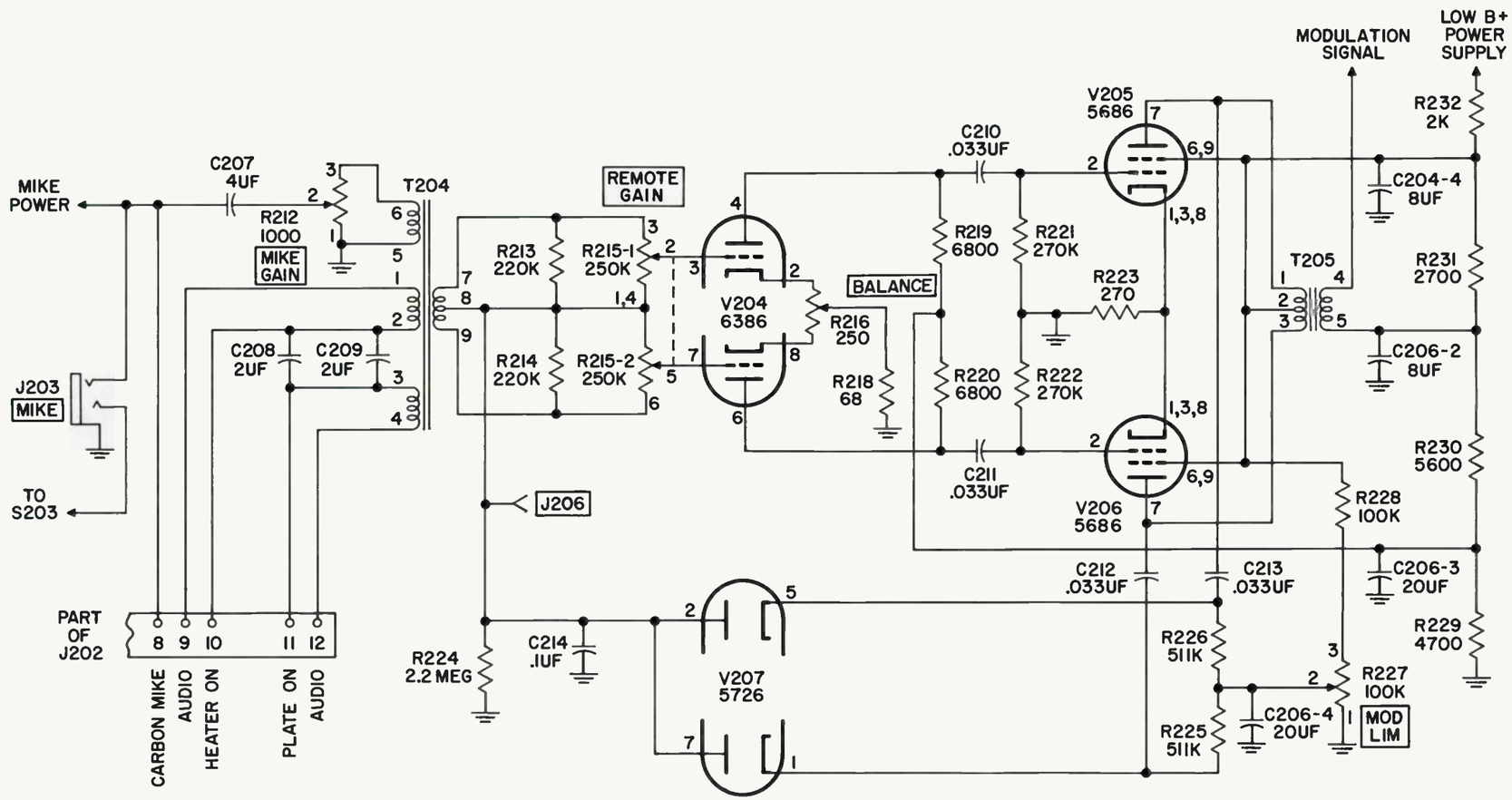


Figure 4-8. Audio Amplifiers and Modulator

Capacitors C178 and C179 for a capacitive divider for test point TP101, which is another low-impedance source of detected audio voltage. The load for TP101 should be at least 100K ohms.

4.3.1.8 R-F FILAMENT AND PA BIAS POWER SUPPLIES. (Refer to figure 4-7.) The primary of T101 is shown with its two windings in parallel for 115 volts a-c input. By removing jumpers marked "X" and adding the jumper shown by the dotted line, the two windings can be connected in series for 230 volts a-c line input. The filament voltage for all tubes in the r-f unit is supplied by one winding of the secondary of T101. The AC LINE indicator lamp I101 and all filaments are connected in parallel.

The other secondary winding of T101 furnishes the a-c power for a half-wave rectifier consisting of rectifier CR104 and a two-section RC filter network. The circuit develops a negative bias voltage across resistors R146 and variable tapped resistor R124 which forms the PA BIAS control. Bias voltage is applied to control grid of power amplifier and is metered by circuit meter connected to contact 1 (PA BIAS position) of circuit meter selector switch S101-A.

4.3.2 MODULATOR-POWER SUPPLY UNIT.

4.3.2.1 AUDIO INPUTS. (Refer to figure 4-8.) All signal inputs used to modulate the r-f carrier of Transmitter 242F-5CL are applied through the modulator-power supply unit. The modulating signal is applied either at J202 or J203, the local microphone input jack.

The local MIKE input, jack J203, for a low-impedance carbon microphone, is connected to the microphone-relay power supply, ground, and the push-to-talk circuit which controls relay K204. The signal from the local microphone input is fed through MIKE GAIN control R212 to the 5-to-6 primary winding of T204. Pin 8 of J202 is for a remote carbon microphone input which is fed through the MIKE GAIN control to the 5-to-6 primary winding of T204. Pins 9 and 12 of J202 are for a remote balanced 600-ohm audio input which is fed to the 1-to-4 primary winding of T204. The output from the secondary of transformer T204 is fed to the grids of push-pull audio amplifier V204.

4.3.2.2 AUDIO AMPLIFIER. (Refer to figure 4-8.) Input voltages on the primary windings of T204 are coupled to the secondary and applied to the control grids of V204. Potentiometers R215-1 and R215-2 are ganged to assure that equal signal voltages will be applied to each half of the tube. BAL control R216 corrects unbalance between V204A and V204B. The amplified output of this stage is capacitively coupled to the input of the modulator stage. An audio compression voltage is applied from grid to ground and is controlled by V207.

4.3.2.3 MODULATOR STAGE. (Refer to figure 4-8.) The amplified audio signal is coupled to the grids of V205 and V206, which form the push-pull modulator circuit. Plate and screen voltages are supplied by the low B+ power supply. The amplified output of the modulator stage is fed to the plate circuit of the second r-f amplifier in the r-f unit. A portion of the modulator output signal is coupled to a modulation limiting stage, V207. Conduction of V207 occurs when strong signals are present in the modulator section. When V207 conducts, a bias voltage is applied to the grid of V204 thus preventing overmodulation. Threshold for the modulation limiting stage, V204, is controlled by variable resistor R227.

4.3.2.4 MICROPHONE AND RELAY POWER SUPPLY. (Refer to figure 4-9.) Input power for the microphone and relay power supply is developed across taps 14 and 15 on the secondary of transformer T201. A full-wave, bridge type rectifier, CR201, converts the a-c input to approximately 50 volts d-c. Power for control of relay K202 and the carbon microphone is supplied by this voltage which is filtered by C201. A pi-type RC filter network also is used in this power supply. The filtered output is used for the microphone input voltage and to raise the d-c level of the audio and modulator tube filaments to reduce hum. The output of the power supply is available at pin 3 of J202 for remote operation.

4.3.2.5 HIGH B+ POWER SUPPLY. (Refer to figure 4-9.) Two diode rectifier tubes, V202 and V203, form a full-wave rectifier to produce 1700 volts d-c output for the high B+ power supply. Type 866 tubes are used in the temperature range +15°C to +40°C; type 3B28 tubes are required over wider temperature ranges. Filament voltage for the rectifiers is developed across taps 11 and 13 in the secondary of transformer T201. The plate voltage for the rectifiers is developed across taps 5 and 7 of the secondary of transformer T203. Resistor R203 and capacitors C202 and C205 filter the high-voltage output. The 1700-volt high B+ is applied to the plate of the power amplifier, V105.

4.3.2.6 LOW B+ POWER SUPPLY. (Refer to figure 4-9.) Tube V201, a type 5R4 full-wave rectifier, furnishes 350 volts d-c for all plate and screen voltages, except the PA plate in the r-f unit, and for the modulator section of the modulator-power supply unit. This voltage is bled down or regulated by the VR tube as each circuit requires. The filament power for V201 is developed across taps 8 and 10 in the secondary of transformer T201, and the plate power is developed across taps 5 and 7 in the secondary of transformer T202. The output of this supply is filtered by a two-section pi-type RC filter network.

4.3.2.7 AUDIO AND MODULATOR FILAMENT POWER SUPPLY. (Refer to figure 4-9.) A separate winding on the secondary of transformer T201, taps 5 and 7, furnishes filament voltage for the audio amplifiers and the modulator tubes. The center tap 6 of the secondary winding is connected to the 50-volt power supply to raise the d-c level of the filament voltage to reduce hum. POWER indicator lamp I202 is connected in parallel with the filaments powered by this supply. When the transmitter is keyed and K202 is energized, PLATE indicator lamp I201 is connected in parallel with the filaments.

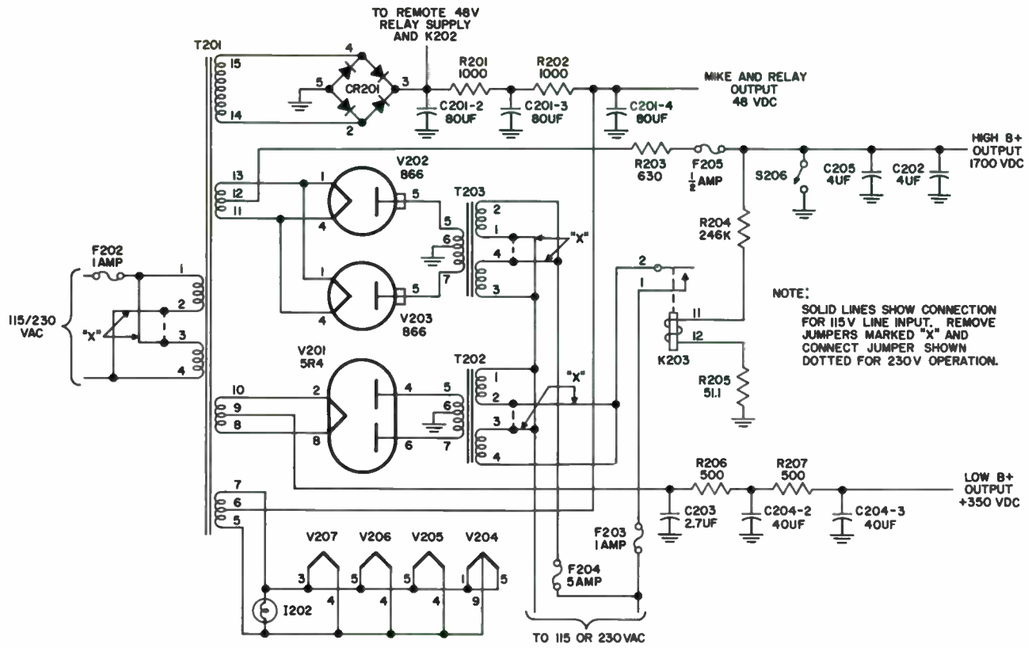


Figure 4-9. Power Supplies

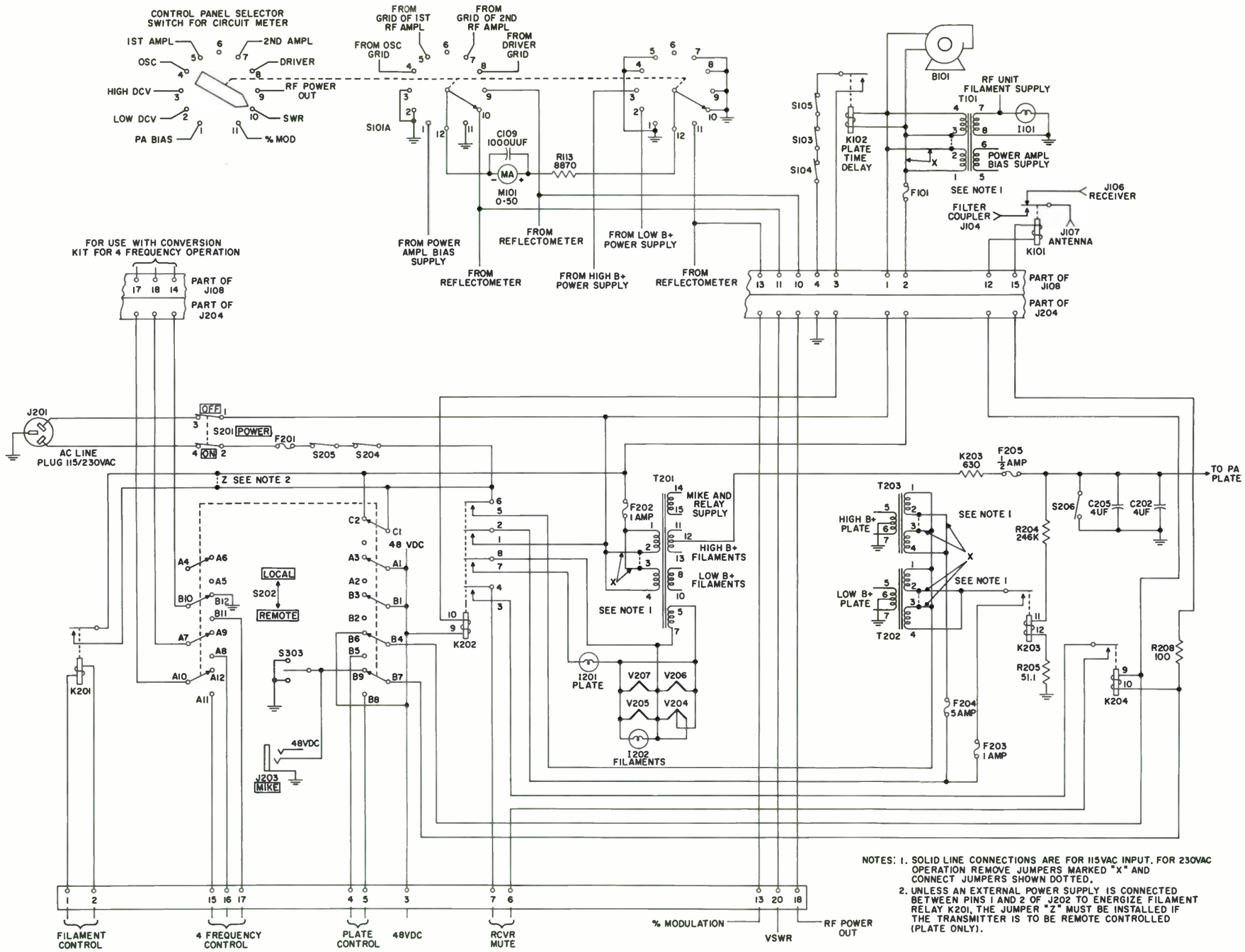
4.3.3 CONTROL CIRCUITS.

4.3.3.1 POWER DISTRIBUTION. (Refer to figure 4-10.) The a-c line power is connected to the transmitter at J201 and fed through the POWER ON-OFF switch, S201. A three-wire line power cord is used. One leg, the "hot" side of the line, is fused by LINE fuse F201 and passes through front and rear dust cover safety interlock switches S205 and S204. The ground wire is connected to the center pin. The remaining description of the power distribution circuits pertains only to the arrangement provided when the LOCAL-REMOTE switch, S202, is in the LOCAL position. When the POWER ON-OFF switch is closed, line voltage is applied to the primaries of transformers T201 and T101 thus providing power to the r-f unit filaments, power amplifier bias, modulator-power supply unit filaments, the microphone and relay supply, blower B101, plate time-delay relay K102, AC LINE indicator lamp I101, and POWER indicator lamp I202. Transformer T101 is fused by F101, and T201 is fused by F202. Switches S103, S104, and S105 are safety interlock switches for the r-f unit front dust cover, rear dust cover, and output cavity. When any of these switches are opened, all B+ power is disabled. Sixty seconds after application of filament power the contacts of K102 close, and plate control relay K202 is energized. When K202 closes, PLATE indicator lamp I201 comes on; primary power is applied to transformer T203; K203 is energized by the high B+; and primary power is applied to T202. Primary power to the r-f unit is interlocked through K204 which is controlled by S203. Placing S203 in either the ON or PTT positions applies primary power to the r-f unit and energizes K101, which couples the transmitter output to the antenna. Transformer T203 is fused by F204, and transformer T202 is fused by F203.

If the high B+ power supply should fail during operation, the contacts of interlock relay K203 open disabling the low B+ supply. This action prevents the power amplifier tube, V105, from drawing excessive screen grid current when no plate voltage is available.

Figure 4-10 shows the primary windings of transformers T101, T201, T202, and T203 connected in parallel for 115-volt a-c line voltage. If 230-volt line power is used, the primary windings of these transformers are connected in series. For 230-volt operation, remove all jumpers marked "X," and connect the jumpers shown by dotted lines.

Another safety interlock switch, S206, is located in the rear of the modulator-power supply unit. Removing the rear dust cover of this unit actuates the switch which grounds any charge on the high-voltage capacitor, C202.



NOTES: 1. SOLID LINE CONNECTIONS ARE FOR 115VAC INPUT. FOR 230VAC OPERATION REMOVE JUMPERS MARKED "X" AND CONNECT JUMPERS SHOWN DOTTED.
2. UNLESS AN EXTERNAL POWER SUPPLY IS CONNECTED BETWEEN PINS 1 AND 2 OF J202 TO ENERGIZE FILAMENT RELAY K201, THE JUMPER "Z" MUST BE INSTALLED IF THE TRANSMITTER IS TO BE REMOTE CONTROLLED (PLATE ONLY).

Figure 4-10. Control Circuits

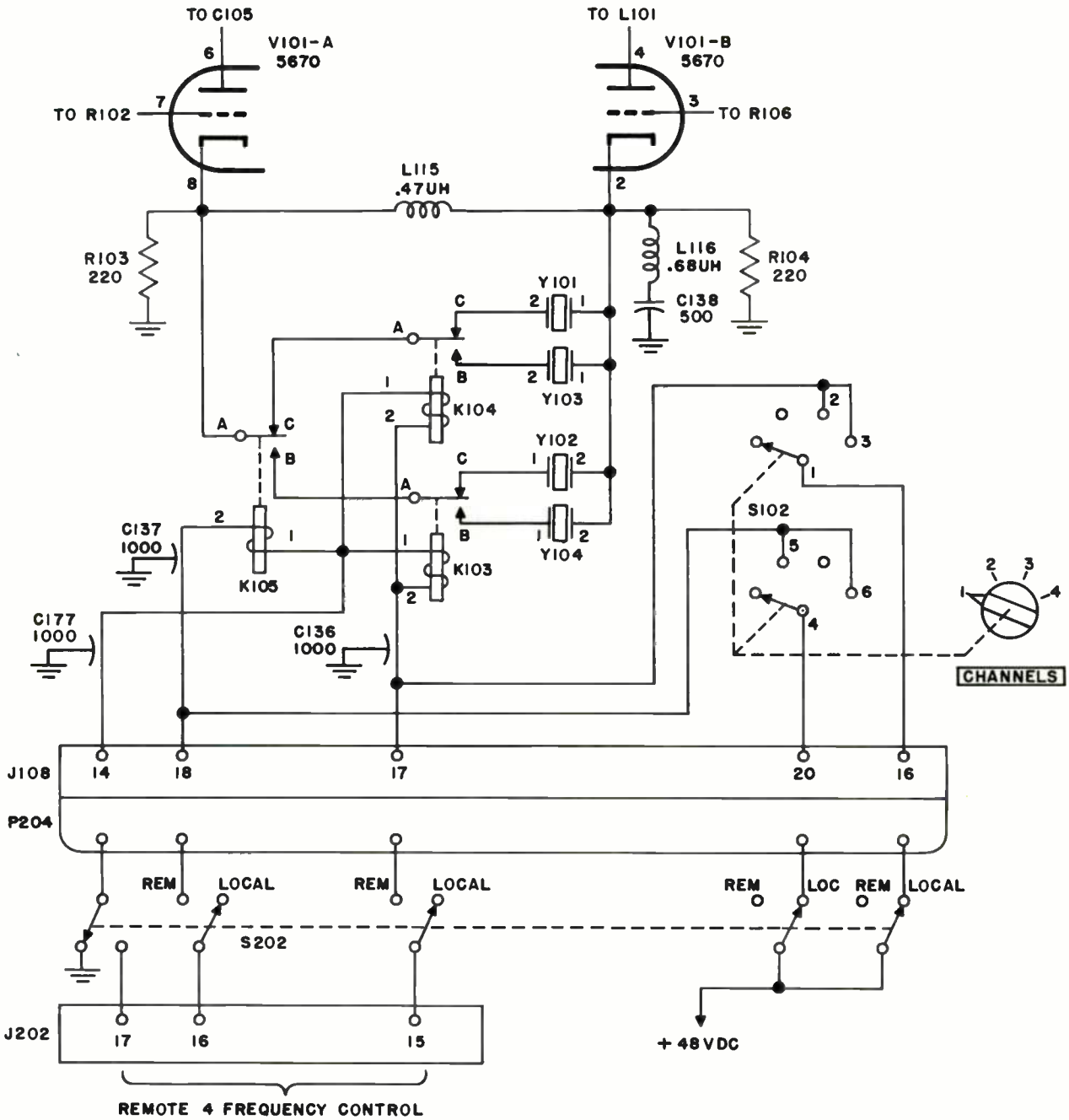


Figure 4-11. Four-Frequency Modification

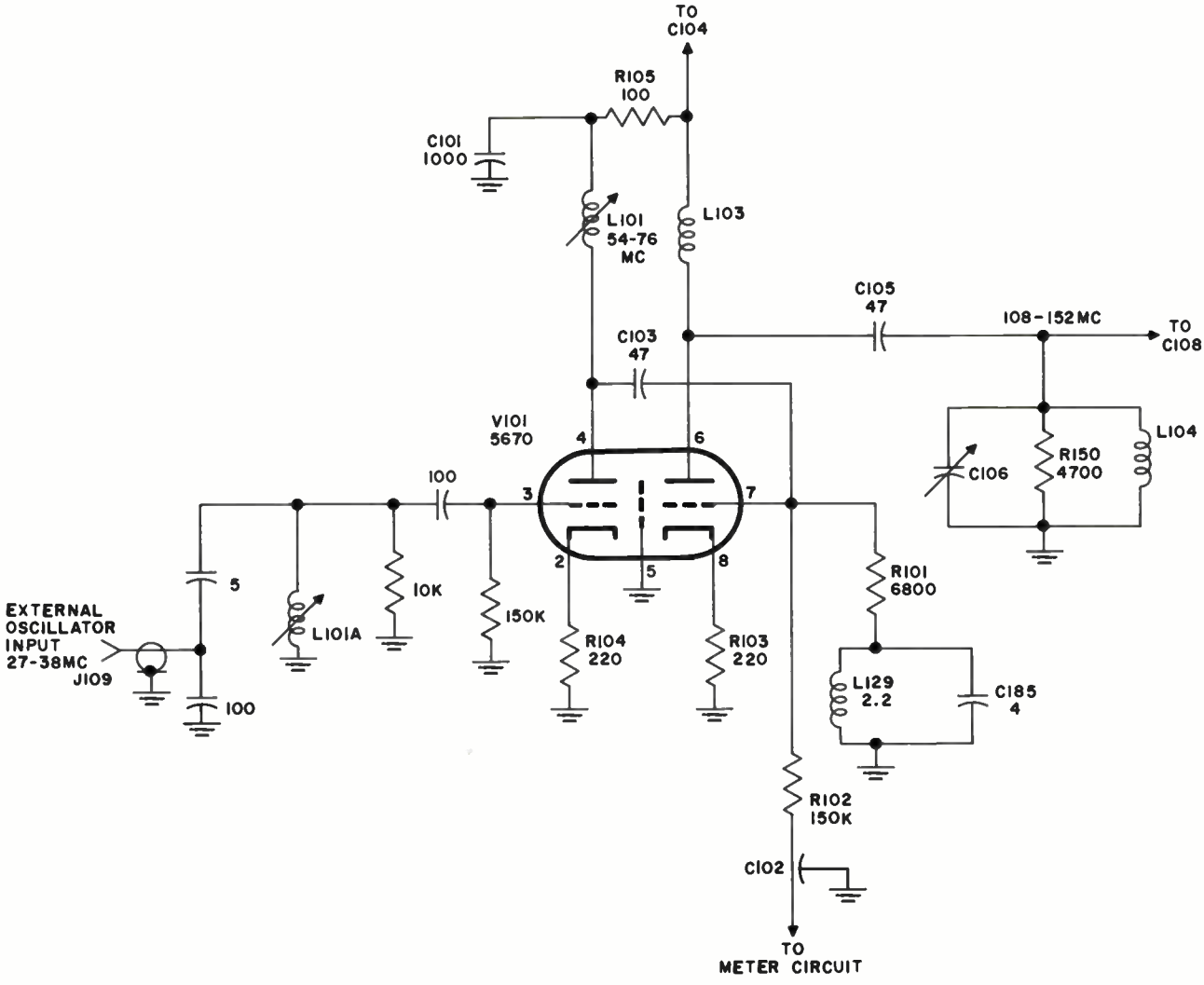


Figure 4-12. External Oscillator Modification

4.3.3.2 REMOTE CONTROL CIRCUITS. (Refer to figure 4-10.) With LOCAL-REMOTE switch S202 in the REMOTE position, control of the transmitter is shifted to jack J202. Remote audio inputs to this jack have been described in paragraph 4.3.2.1.

For remote control of both filament ON-OFF and PTT, an external 48-volt power supply is required. Using the internal d-c supply and installing jumper "Z" in figure 4-10 between the contacts of relay K201 permits remote control of only PTT in the REMOTE position.

All relay control leads are available at J202. A split primary is provided on T204 so that remote control can be accomplished over the remote audio line if desired.

Plate control, for keying the transmitter remotely, is accomplished by use of pins 3, 4, and 5 on jack J202 which are connected to a remote PTT switch, a remote microphone with a PTT button, or to a voice-operated set of relay contacts.

A pair of contacts are provided on K202 for receiver muting; these are connected to pins 6 and 7 of jack J202.

Pins 15, 16, and 17 of J202 are connected through switch S202 in REMOTE position to the r-f unit for four-frequency operation. A remote channel selector switch can be connected to these pins.

Pins 13, 18, and 20 of J202 are connected to the metering circuits in the r-f unit to provide the equipment with remote metering facilities.

4.3.4 TRANSMITTER 242F-5CL, FOUR-FREQUENCY CIRCUITS. (Refer to figure 4-11.)

Modified type 242F-5CL transmitters providing four-frequency operation have circuitry changes in the oscillator stage. Three relays K103, K104, and K105, are used to select one of four crystals for the oscillator which includes V101-A and V101-B. For local operation, refer to CHANNEL switch S102 in figure 4-11. With S102 in channel 1 position, none of the crystal select relays is energized causing crystal Y101 to be switched into the oscillator circuit. In channel 2 position, K105 is energized switching Y102 into the circuit. In channel 3 position, K103 and K104 are energized switching Y103 into the circuit; and in channel 4 position, all the relays are energized switching in Y104. The carrier frequencies resulting from the use of the four crystals must lie within a 500-kc spectrum.

If remote four-frequency control is required, three control wires connected to pins 15, 16, and 17 of remote connector J202 are used. A remote control channel selector switch equivalent to S102 is used with the three control wires. An external source of +48 volts d-c is applied to the crystal-selecting relays through the remote channel switch, pins 15 and 16 of remote connector J202; the LOCAL-REMOTE switch, S202, in the REMOTE position; and pins 17 and 18 of connector J108 on the r-f unit. A ground is provided through the external selector switch, pin 17 of connector J202; the LOCAL-REMOTE switch in the REMOTE position; and pin 14 of connector J108 on the r-f unit.

4.3.5 TRANSMITTER 242F-5CL, EXTERNAL OSCILLATOR TYPE CIRCUITS. (Refer to figure 4-12.)

For use with an external oscillator, the 242F-5CL is modified to convert V101 from oscillator-frequency doubler operation to doubler-doubler operation. This modification requires the deletion of crystal Y104 and coil L102 and the addition of an input jack and a tuned circuit. Circuit operation is as follows.

An input signal in the range of 27 to 38 megacycles, from an external frequency standard, is coupled through J109 to a tuned circuit consisting of L101A and its paralleled capacitors; this tuned circuit is resonated at the fundamental frequency of the external standard. The input signal is applied to V101-A whose plate is tuned to the second harmonic of the input signal. The output of V101-A is applied to V101-B whose plate circuit is tuned to the fourth harmonic frequency of the external standard frequency, thus providing an output signal in the range of 108 to 152 megacycles.

SECTION V
INSPECTION AND PREVENTIVE MAINTENANCE

5.1 GENERAL.

This section contains a routine inspection and lubrication procedure to be performed at regular intervals consistent with the customer's preventive maintenance schedule. The procedure is intended to prevent malfunctions and ensure optimum performance of the equipment. For corrective maintenance procedures, calibration and adjustment, see section VI, corrective maintenance.

5.2 ROUTINE INSPECTION AND LUBRICATION PROCEDURE.

The steps in the following procedure prescribe methods and provide data for cleaning, lubricating, and inspecting Transmitter 242F-5CL. A technician familiar with the equipment should carry out this operation.

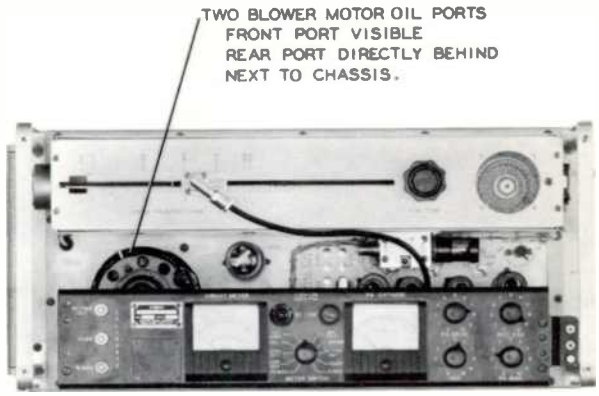


Figure 5-1. R-F Unit Blower Motor Lubrication Points

TABLE 5-1. ROUTINE INSPECTION, CLEANING, AND LUBRICATION PROCEDURE

STEP	SPECIAL DATA
1. Shut off all power at transmitter.	
2. Disconnect all plugs on interconnecting and external cables.	
3. Remove front and rear dust covers, and inspect all safety interlock switches and high-voltage shorting switch. Inspect all controls, meter faces, indicator lamps, transformer and capacitor cans, vacuum tubes, and all components. Inspect carefully for defective or overheated parts, and clean thoroughly.	See illustrations in section VII for parts identification.
4. Disassemble output cavity. Remove V105. Inspect and clean cavity and V105 anode cooler.	See section VI for disassembly procedure.
5. Remove rear cover plate on r-f subassembly. Inspect and clean all components, tube sockets, and diodes.	
6. Lubricate blower motor.	Both bearings (see figure 5-1) at one-month intervals using UNIVIS P-38 oil.
7. Inspect and clean all relay contacts as required.	
8. Reassemble output cavity, and replace r-f subassembly cover plate and dust covers.	
9. Connect all cabling.	
10. Perform operating procedure prescribed in section II.	

SECTION VI
CORRECTIVE MAINTENANCE

WARNING

Operation of this equipment involves the use of high voltages (1700 volts) which are dangerous to life. Observe every precaution even when power switch is off.

6.1 GENERAL.

This section contains a trouble-shooting procedure to isolate a malfunction in the transmitter, details on removal and disassembly of the major subassemblies, voltage and resistance measurements, and adjustment and calibration procedures.

For assistance in trouble isolation and location of parts, refer to the main schematic diagram, figure 8-1, and the keyed illustrations and parts list in section VII.

The neutralization and filter coupler unit alignment and tuning should be seldom, if ever, necessary as they are performed at the factory prior to shipment. If any of these procedures should become necessary, only a trained technician should perform them.

6.2 TEST EQUIPMENT REQUIRED.

The following test equipments or their equivalents are required to perform the trouble isolation procedure, adjustments, and calibrations in this section:

Dummy Antenna, 52 ohms 200 watts or 52-ohm antenna

Thruline Wattmeter, Bird Model 43

Dummy Microphone, 82 ohms, see figure 6-8.

Audio Oscillator, 200-12,000 cps, less than 1% distortion up to 5 volts output, output impedance of 600 ohms, Hewlett-Packard, Model 200AB

Oscilloscope, for r-f envelope observation, DuMont 208B

A-C Voltmeter, 0-150 volt range, 1% accuracy, Weston Model 433

Vacuum-Tube Voltmeter, Hewlett-Packard 400D

Ohmmeter, Triplett Model 630

Crystals for operation at desired frequency

Grid Dip Meter or Megacycle Meter, Measurements Model 59

6-db Attenuator Pad, Measurements part no. 80-ZH3

Frequency Meter, capable of measuring 108 through 152 mc

A-C Wattmeter, 0-1000 watts

A-C Ammeter, 0-10 amperes

6.3 TROUBLE ISOLATION.

The procedure in table 6-1 contains steps to isolate troubles in Transmitter 242F-5CL to specific stages or minor units such as the agc detector unit. Each step includes control settings, test equipment, test point, and normal indications for the test. If the indication is normal, a certain stage or stages are eliminated as a source of trouble, and proceeding to another step is prescribed. If the indication is not normal, the probable cause of trouble is indicated. As the procedure makes maximum use of the CIRCUIT METER to indicate the condition of various stages, the possibility that the meter itself is defective should not be ruled out entirely.

Before starting the trouble isolation procedure, turn off all power; make sure all cables are connected properly; and see that all dust covers are securely in place. A record of tuning meter indications at the operating frequency of the transmitter is helpful. See tuning chart, table 2-3, in section II.

WARNING

Use extreme caution if it becomes necessary to block any safety interlock switch in order to check circuits in operation with the dust covers removed.

6.4 VOLTAGE AND RESISTANCE MEASUREMENTS.

Figures 6-1 and 6-2 contain voltage and resistance measurements at all tube pins in the transmitter except the high and low B+ rectifier tubes. The conditions under which the measurements are made are indicated on the diagrams.

6.5 DISASSEMBLY PROCEDURES.

The following procedures are used for the disassembly and removal of the indicated parts.

6.5.1 R-F SUBASSEMBLY.

a. Remove Phillips-head screws holding rear dust cover on r-f unit.

TABLE 6-1. TROUBLE-SHOOTING PROCEDURE

STEP	CONTROL SETTING	TEST EQUIPMENT	TEST POINT	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
1	LOCAL-REMOTE switch in LOCAL, PLATE switch off. Turn on POWER switch.	Visual	POWER indicator	Indicator lamp comes on.	Check F201, F202, I202, and T201. If indication is normal, proceed to step 2.
2	Same as step 1.	Visual	AC LINE indicator lamp I101 and blower B101	Indicator lamp and blower are on.	Check F101, B101 motor, and T101. If indication is normal, proceed to step 3.
3	Same as step 1. Circuit meter switch to PA BIAS position.	Visual	CIRCUIT METER M101	Meter indicates value of PA BIAS proportional to the setting of the PA BIAS control between 40 and 100 volts.	Check CR104 and associated filter network. If indication is normal proceed to step 4.
4	Close PLATE switch (up to hold): Set METER SWITCH to LOW DCV position.	Visual	CIRCUIT METER M101 and PLATE indicator lamp.	PLATE indicator lamp is on, and CIRCUIT METER reads 350 ±10% volts d-c.	Check S103, S104, S105, K102, K202, and I101. If the meter reading is abnormal, check F203, V201 and its associated filter, K203, T202, and CR201 and its associated filter network. If indication is normal, proceed to step 5.
5	Same as step 4. Turn METER SWITCH to HIGH DCV position.	Visual	CIRCUIT METER M101	Meter reads 1700 ±10% volts d-c.	Check F204, F205, V202, V203, T203, and components associated with the high B+ supply. If indication is normal, all power supplies are functioning properly. Proceed to step 6.
6	Same as step 4. Turn METER SWITCH to OSC position.	Visual	CIRCUIT METER M101	Meter reads approximate value given in table 2-3, section II.	Check tuning of OSC TUNE. Check V101 and the associated components in the stage. Check V107. If reading is normal, proceed to step 7.
7	Same as step 4. Turn METER SWITCH to 1ST AMPL position.	Visual	CIRCUIT METER M101	Meter reads approximate value given in table 2-3, section II.	Check tuning of 1ST AMPL TUNE. Check V102 and the associated components in the stage. If indication is normal, proceed to step 8.
8	Same as step 4. Turn METER SWITCH to 2ND AMPL position.	Visual	CIRCUIT METER M101	Meter reads approximately the same as the tuning chart, table 2-3, in section II.	Check tuning of 2ND AMPL TUNE. Check V103 and associated components in the stage, and check V107. If all these are normal, proceed to step 9.

TABLE 6-1. TROUBLE-SHOOTING PROCEDURE (Cont)

STEP	CONTROL SETTING	TEST EQUIPMENT	TEST POINT	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
9	Same as step 4. METER SWITCH to DRIVER position.	Visual	CIRCUIT METER M101	Meter reads approximately the same as the tuning chart, table 2-3, in section II.	Check tuning of DRIVER TUNE. Check V104 and associated components in the stage. Check CR101. The agc feedback may be defective. If indication is normal, proceed to step 10.
10	Same as step 4. Turn CIRCUIT METER to RF PWR OUT position.	Visual	CIRCUIT METER M101	Meter indicates approximately 50 watts out.	Meter may need calibration, or tuning adjustments to r-f channel may be required. Check filter coupler unit. If these measures do not produce a good meter indication, proceed to step 11. If metering circuit appears defective, check power out with a calibrated wattmeter.
11	Same as step 4. Turn METER SWITCH to % MOD position.	Microphone to modulate carrier.	CIRCUIT METER M101	Approximately 40% reading on CIRCUIT METER with normal speech.	Check setting of AUDIO GAIN control. Check audio waveform at TP101 with an oscilloscope. Check audio tubes and associated circuits.

b. Remove dust cover.
c. Remove 20 Phillips-head screws holding L shaped subassembly cover plate, and remove plate.
d. Reassemble in reverse order.

6.5.2 DISASSEMBLY OF R-F OUTPUT CAVITY AND REMOVAL OF POWER AMPLIFIER TUBE, V105. (Refer to figures 6-3 and 6-4.)

a. Remove connector P101 from sliding LOAD control on front of cavity by turning and pulling out.
b. See that COARSE FREQUENCY TUNE shorting bar in cavity and sliding LOAD control are no more than 1-1/2 inches apart.
c. Remove 4 Phillips-head screws holding front plate of cavity. Remove plate by pulling straight out so that LOAD control rod that clamps to the center conductor of the cavity will not be bent.

CAUTION

Always short PA plate to ground before touching.

d. Loosen Phillips screw that holds the clamp around the power amplifier enough so that the clamp may be turned counterclockwise.

CAUTION

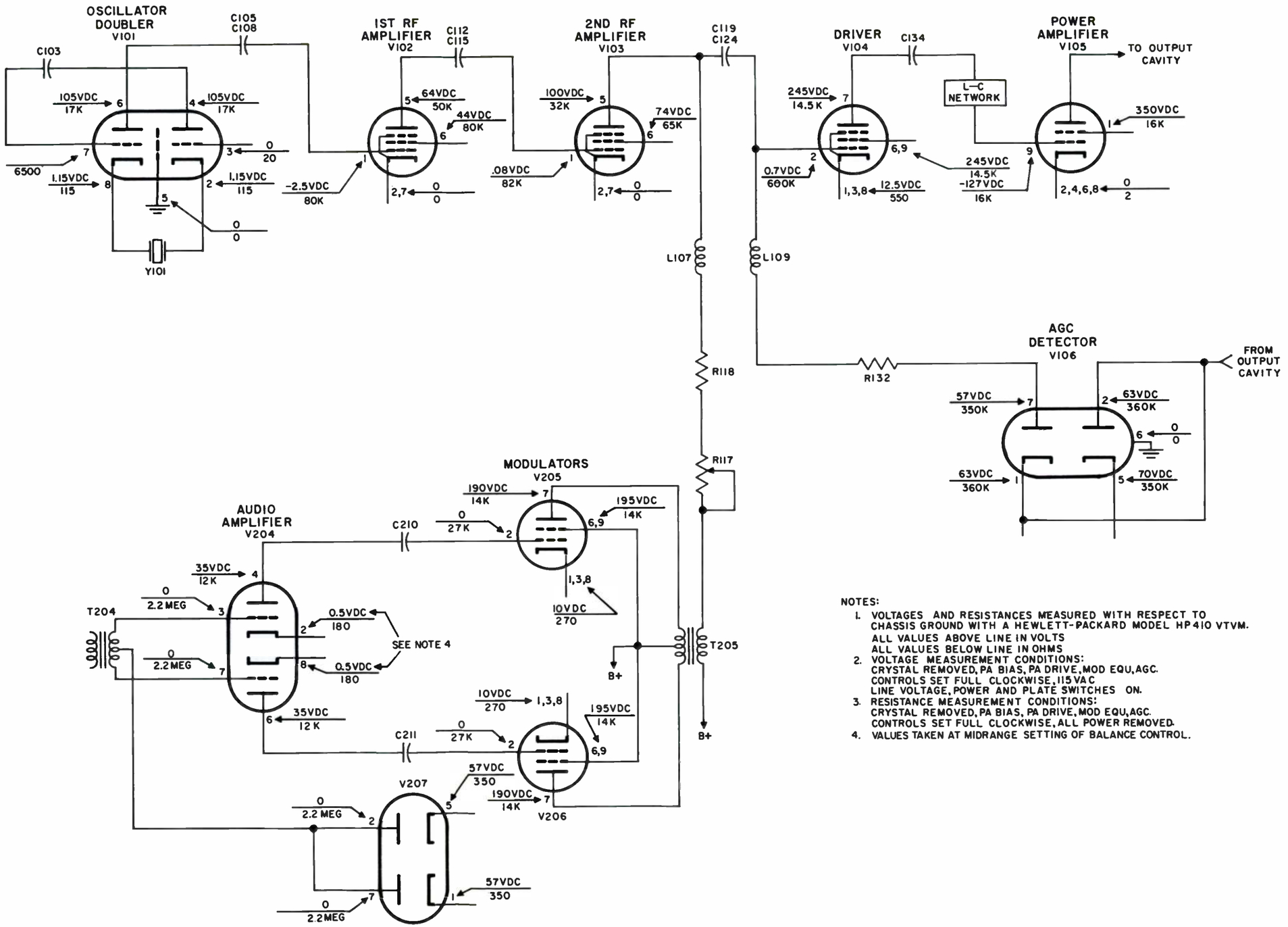
Do not apply excessive pressure to screw. Support from rear with fingers of left hand if necessary.

e. Turn clamp assembly to disengage the holding screw, and pull out.
f. Pull power amplifier tube straight out.
g. Remove ceramic chimney around the tube socket.
h. Reassemble in reverse order making sure that chimney is in place before PA tube is reinstalled. Use fingers to support clamp assembly when tightening holding screw. Do not exert unnecessary pressure on this screw. Also make sure that the LOAD control is within 1-1/2 inches of the COARSE FREQUENCY TUNE shorting bar before cover plate of cavity is replaced.

6.5.3 AGC DETECTOR UNIT. (Refer to figure 6-3.) Remove 4 Phillips-head screws from cover plate, and remove plate. Practically all parts are accessible through this opening.

6.5.4 FILTER COUPLER UNIT. (Refer to figure 6-5.)

a. Remove coaxial connectors P102 and P103 from ends of filter coupler unit.



NOTES:

1. VOLTAGES AND RESISTANCES MEASURED WITH RESPECT TO CHASSIS GROUND WITH A HEWLETT-PACKARD MODEL HP410 VTVM.
   ALL VALUES ABOVE LINE IN VOLTS
   ALL VALUES BELOW LINE IN OHMS
2. VOLTAGE MEASUREMENT CONDITIONS:
   CRYSTAL REMOVED, PA BIAS, PA DRIVE, MOD EQU, AGC. CONTROLS SET FULL CLOCKWISE, 115 VAC LINE VOLTAGE, POWER AND PLATE SWITCHES ON.
3. RESISTANCE MEASUREMENT CONDITIONS:
   CRYSTAL REMOVED, PA BIAS, PA DRIVE, MOD EQU, AGC. CONTROLS SET FULL CLOCKWISE, ALL POWER REMOVED.
4. VALUES TAKEN AT MIDRANGE SETTING OF BALANCE CONTROL.

Figure 6-1. Voltage and Resistance Measurements

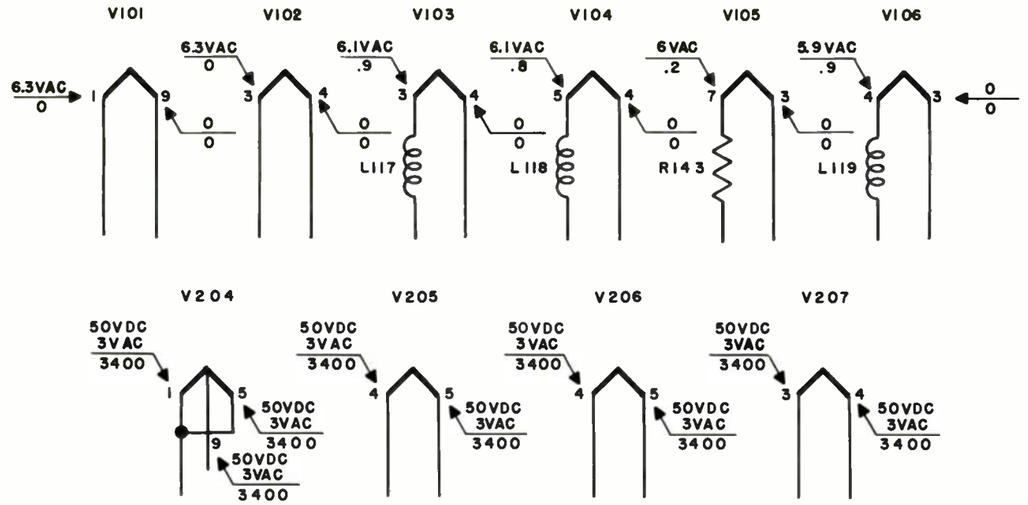


Figure 6-2. Filament Voltage and Resistance Measurements

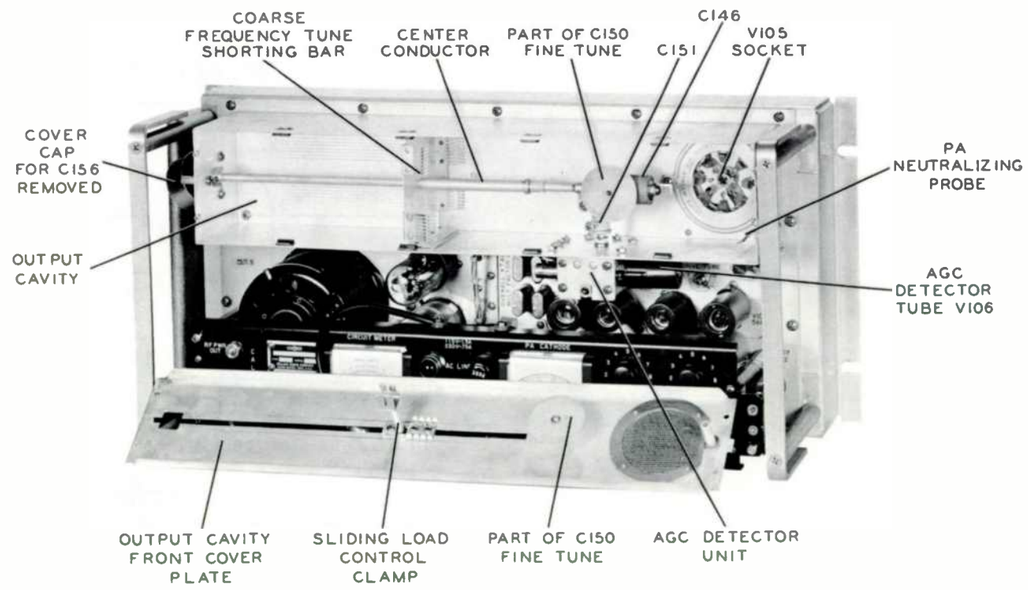


Figure 6-3. R-F Output Cavity Disassembled

Figure 6-4. Power Amplifier Tube Assembly

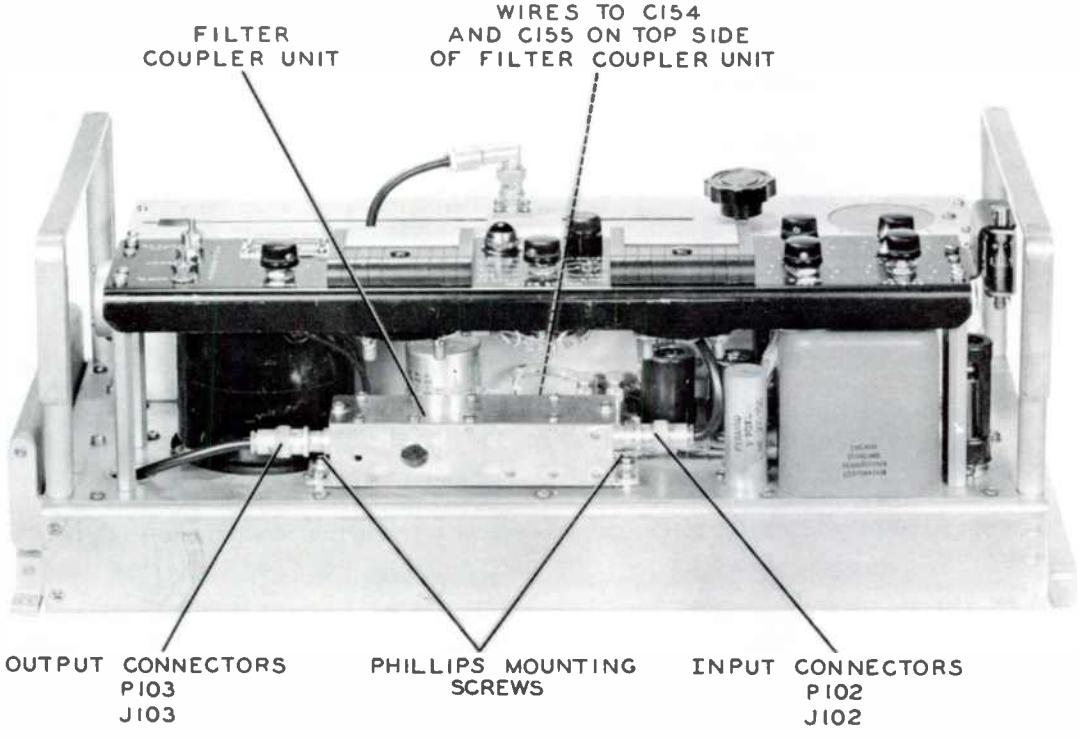


Figure 6-5. R-F Unit, Bottom View Showing Filter Coupler Unit

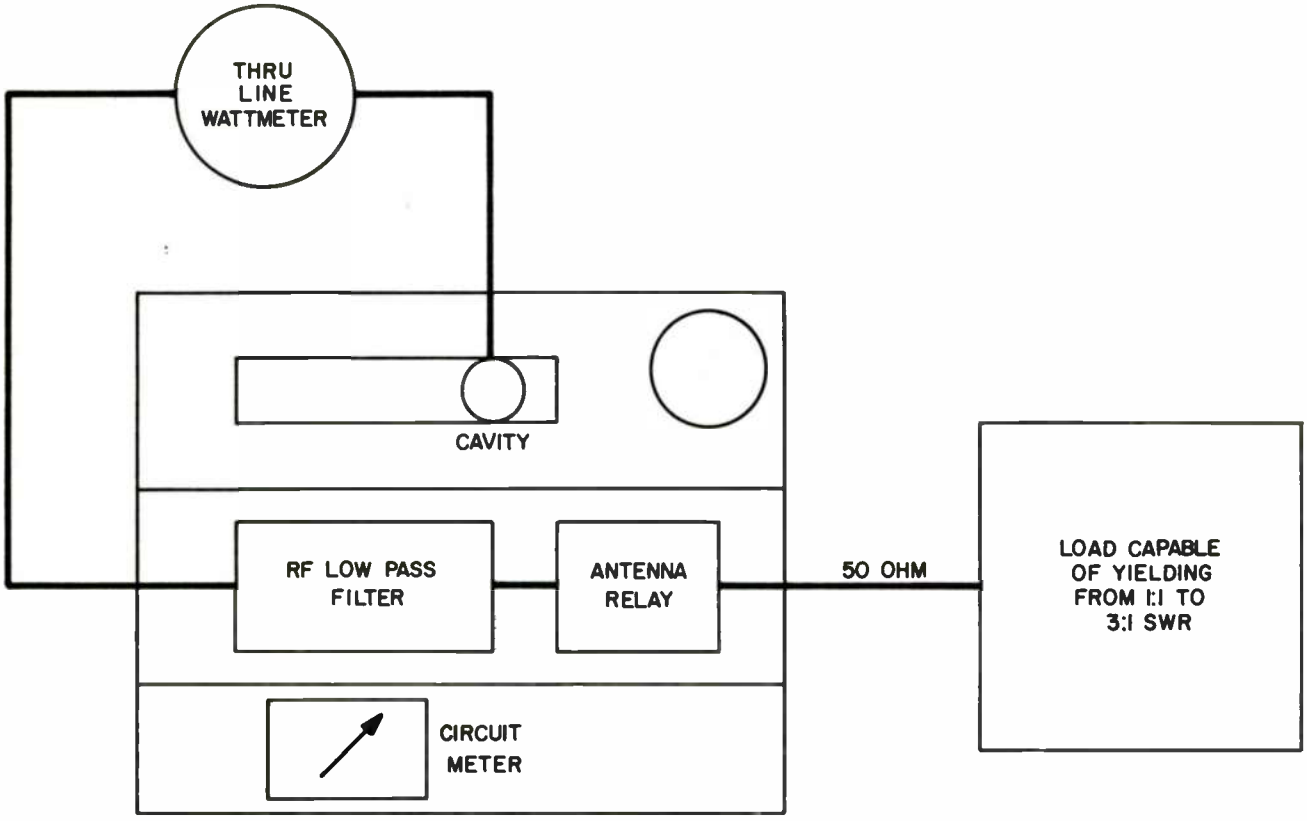


Figure 6-6. R-F Power Out and VSWR Indicators, Calibration Test Setup

b. Remove wires from C154 and C155 on upper side of filter coupler unit.

c. Remove 4 Phillips screws holding filter coupler unit, and remove unit.

d. Remove 10 Phillips screws on cover plate, and remove plate.

e. Reassemble in reverse order.

6.6 CALIBRATIONS AND ADJUSTMENTS.

The following procedures prescribe steps to calibrate the CIRCUIT METER, neutralize the power amplifier and adjust and tune the low-pass filter in the filter coupler unit.

6.6.1 POWER OUT AND VSWR INDICATOR CALIBRATIONS. (Refer to figure 6-6.)

The test equipment required to perform the following procedure includes:

Load yielding a 1:1 swr
Thruline wattmeter
Coaxial cable and connectors

NOTE

For maximum accuracy, the r-f power output meter should be calibrated for the particular operating crystal frequency of the unit. This is necessary because the operation of the filter coupler unit is dependent on the frequency. When the transmitter is used with four crystals, the frequencies are close enough to present only a small error in the r-f power output meter readings.

a. Connect the transmitter to a load yielding a 1:1 swr.

b. Connect a Thruline wattmeter between the cavity and r-f filter coupler unit.

c. Tune the transmitter at the operating frequency, and adjust for 50 watts forward power.

d. Turn METER SWITCH to RF PWR OUT position.

e. Adjust the RF PWR OUT CALIBRATE control (screwdriver adjustment on extreme left of r-f unit control panel) so that the CIRCUIT METER reads 50 watts. This calibrates the meter to read forward r-f power out on the cable to the load.

f. Measure reflected power on the Thruline wattmeter.

g. With the METER SWITCH in the SWR position, set the VSWR CALIBRATE control so that the CIRCUIT METER reads (on the power scale) six times the value obtained in step f (on the Thruline wattmeter). This calibrates the SWR meter. Note that this meter reads vswr into the harmonic filter, not true antenna vswr.

6.6.2 PERCENT MODULATION INDICATOR CALIBRATION. (Refer to figure 6-7 and figure 6-8.)

NOTE

The calibration procedure in this paragraph may be necessary in some cases; however, before performing the procedure, the audio waveform at TP101 should be checked. This waveform starts to clip at approximately 95% modulation. Setting the % MOD position on the CIRCUIT METER to read 95% at the level where clipping starts should be a sufficiently accurate calibration.

The test equipment required to perform the following procedures includes:

82-Ohm Dummy Carbon Microphone
Audio Signal Generator
A-C VTVM
Oscilloscope
1- or 2-turn coaxial pickup loop
Components indicated in figures 6-7 and 6-8

a. Tune the transmitter for the operating frequency and 50 watts r-f power out as indicated by the CIRCUIT METER.

b. Connect the 82-ohm dummy microphone to the MIKE input jack, and apply 1000-cps audio input.

c. Turn the METER SWITCH to the % MOD position.

d. Connect coaxial test cable with pickup loop to oscilloscope, and insert pickup loop in slot in output cavity. Observe envelop waveform on scope.

e. Adjust the audio input so that the r-f envelope is 100% modulated.

f. Adjust the % MOD CALIBRATE control (extreme left side of r-f unit control panel) so that the CIRCUIT METER reads 100% modulation. This calibrates the percent modulation indicator to read percent modulation of the transmitter carrier at 50 watts forward power only.

6.6.3 POWER AMPLIFIER NEUTRALIZING ADJUSTMENT.

The neutralizing procedure is carried out at the factory and need not be performed in the field unless

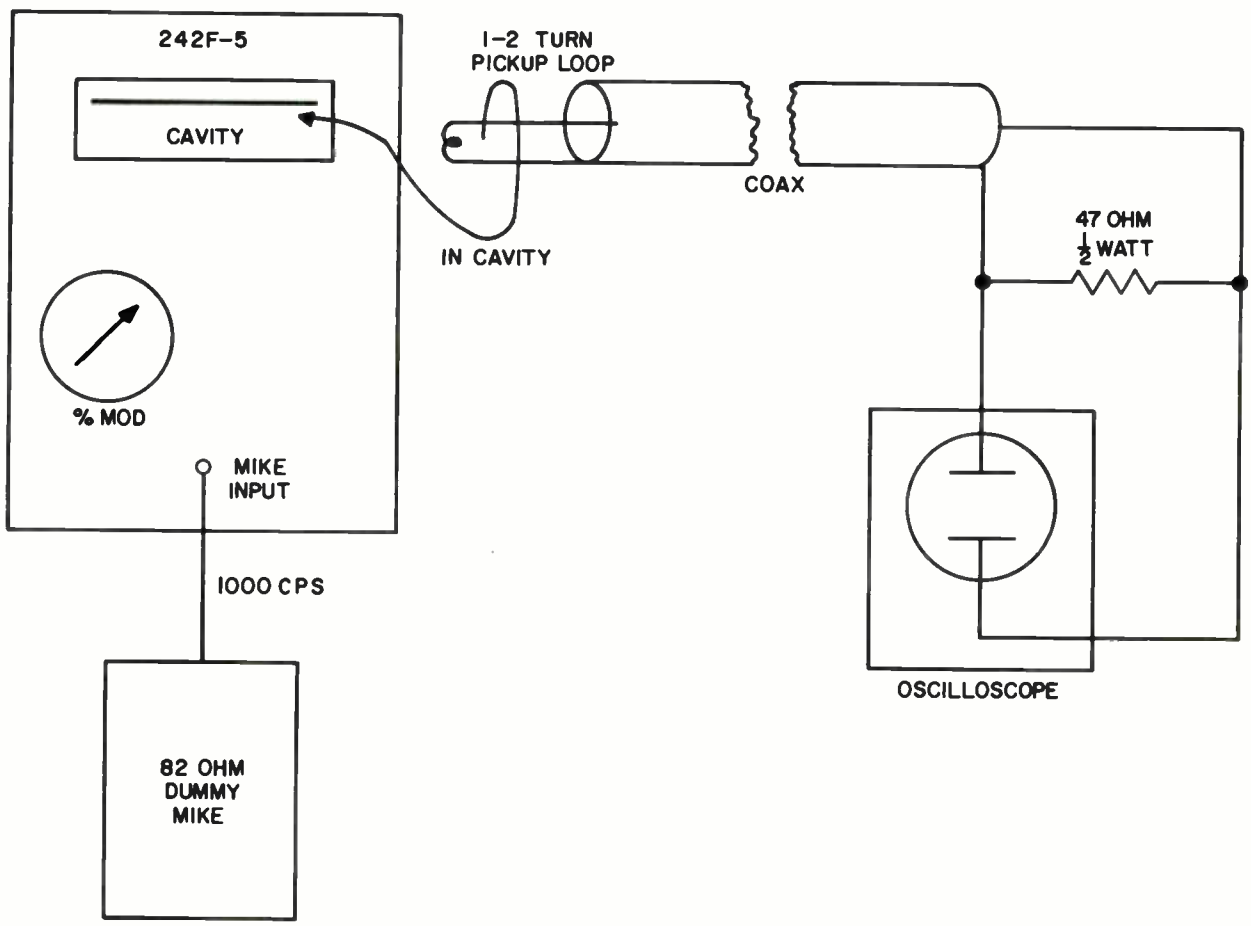


Figure 6-7. Percent Modulation Indicator, Calibration Test Setup

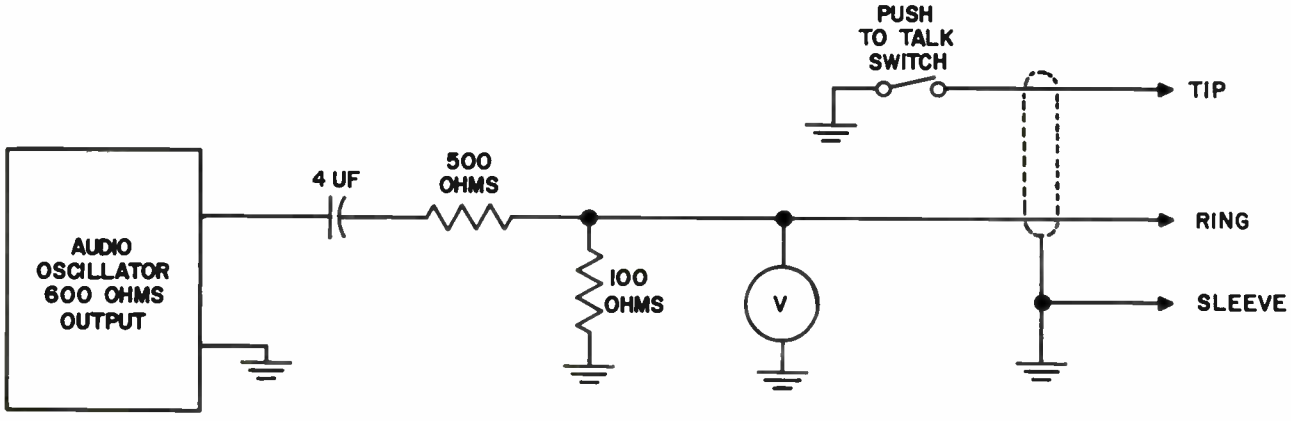


Figure 6-8. 82-Ohm Dummy Carbon Mike for Percent Modulation Meter Calibration, Test Setup

the neutralizing probe is bent accidentally. The test equipment required to perform the procedure includes:

Grid Dip Meter
1- or 2-turn coaxial pickup loop

a. Tune the transmitter for the operating frequency. Peak all controls for maximum indications with the AGC and PA DRIVE controls full cw.

b. Remove all power.

c. Remove the high-voltage fuse (HIGH B+) from the front control panel of the modulator-power supply unit.

d. Unsolder the B+ to the screen grid of power amplifier tube V105 at C145, and place so that the wire will not short to ground.

e. Block power supply interlocking relay K203 closed.

f. Replace the modulator-power supply unit rear dust cover, and close the front and rear interlock switches on the r-f unit.

g. Remove coaxial connector on LOAD control, and replace with a 1- or 2-turn pickup loop connected between the center connector and the chassis as a means of measuring the r-f feedthrough to the cavity.

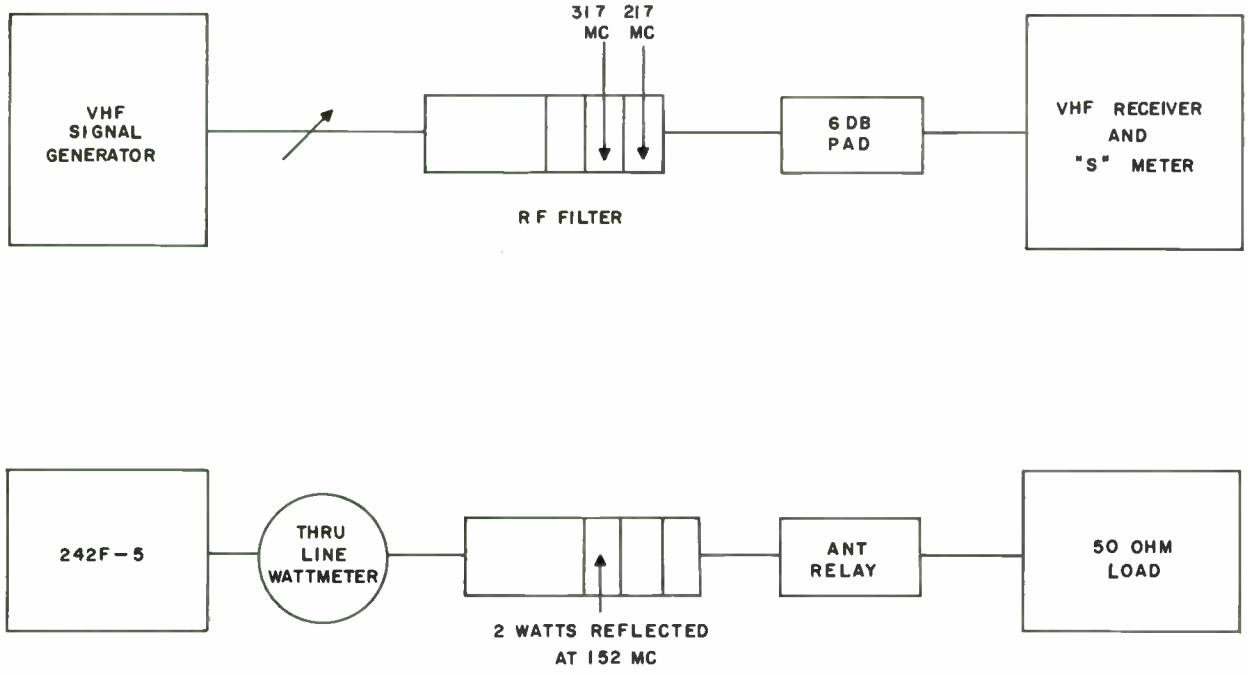


Figure 6-9. R-F Low-Pass Filter Adjustment and Tuning Test Setup

h. Using the grid dip meter as an indicating device, repeak the PA GRID TUNE control for a maximum indication of r-f from the pickup loop.

i. Readjust the FINE TUNE control for maximum r-f indication.

j. Remove the button plug on the right-hand end of the cavity, and adjust the coaxial neutralizing probe by bending it slightly for minimum indication of r-f feedthrough. See neutralizing probe in figure 6-3.

k. Return the transmitter to its normal condition.

6.6.4 R-F LOW-PASS FILTER ADJUSTMENT AND TUNING. (Refer to figure 6-9.)

This procedure is performed at the factory and should not be necessary in the field unless filter coupler unit has been damaged. The test equipment used to perform the procedure includes:

VHF Signal Generator
6-Db Attenuator Pad
VHF Receiver
Signal Strength Meter
Thruline Wattmeter
50-Ohm Load
Insulated Tuning Wand

a. Remove the filter coupler unit from the transmitter. See paragraph 6.5.4.

b. Connect a vhf generator to the input end.

c. Connect a 6-db attenuator pad between the output end of the filter unit and a vhf receiver with a signal strength meter.

d. Use an insulated tuning wand to adjust the coil in the output section for maximum attenuation through the filter at 217.0 mc. Adjustment access holes are in the cover.

e. Similarly, adjust the coil in the next section from the output for maximum attenuation through the filter at 317.0 mc.

f. Reinstall the filter coupler unit in the transmitter connecting all cables and wires.

g. Connect a Thruline wattmeter between J101 on the output cavity and the filter coupler unit.

h. Using the tuning procedure in paragraph 2.4.2, tune the transmitter at the desired operating frequency for 50 watts of forward power.

i. Adjust the coil in the remaining section (input side) for a reflected power of 2 watts or less with a forward power of 50 watts; use the bottom hole in the filter assembly as an access hole.

j. Remove wattmeter, and return transmitter to normal condition.

SECTION VII
PARTS LIST

VHF Transmitter 242F-5CL

ITEM	DESCRIPTION	COLLINS PART NUMBER
	VHF TRANSMITTER 242F-5CLF	522-1407-003
	VHF TRANSMITTER 242F-5CLR	522-1406-003
	VHF TRANSMITTER 242F-5CLH	522-1405-003
	R-F UNIT	542-0348-005
B101	BLOWER ASSEMBLY: ac type, input 115 v ac single phase, 60 cps, 0.70 amps; 3050 rpm ±300, continuous cycle	009-1350-00
	BLOWER HOUSING: used with motor and impeller assy 009 1350 00, 20 ga cold rolled steel, 2-3/16 by 5-27/32 by 6-5/16 overall with 3-21/32 in. id, irregular shape	009-3000-00
C101	CAPACITOR: ceramic, 1000 uuf, +100% -20%, 500 v dc	913-1186-00
C102	CAPACITOR: ceramic; 1000 uuf guaranteed min tolerance, 500 v dc	913-1476-00
C103	CAPACITOR: tubular ceramic; 47 uuf, ±5%, 500 v dc	916-4362-00
C104	CAPACITOR: same as C102	913-1476-00
C105	CAPACITOR: same as C103	916-4362-00
C106	CAPACITOR: variable air; 3.6 uuf max min, 30.0 uuf min max; 850 v peak ac, 60 cps	922-0370-00
C107	CAPACITOR: same as C102	913-1476-00
C108	CAPACITOR: tubular ceramic; 10.0 uuf, ±1/4 uuf, 500 v dc	916-0137-00
C109	CAPACITOR: same as C101	913-1186-00
C110	CAPACITOR: same as C101	913-1186-00
C111	CAPACITOR: same as C102	913-1476-00
C112	CAPACITOR: same as C103	916-4362-00
C113	CAPACITOR: variable air; 2.7 uuf max min, 22.0 uuf min max, 850 v peak ac, 60 cps	922-0392-00
C114	CAPACITOR: same as C102	913-1476-00
C115	CAPACITOR: tubular ceramic, 5.0 uuf, ±1/4 uuf; 500 v dc	916-0117-00
C116	CAPACITOR: tantalum; 1 uf, +75% -15%, 150 vdc	184-7227-00
C117	CAPACITOR: mica; 24 uuf, ±1 uuf, 500 v dc	912-0674-00
C118	CAPACITOR: paper; 0.1 uf, ±20%, 100 v dc	931-2503-00
C119	CAPACITOR: same as C103	916-4362-00
C120	CAPACITOR: same as C113	922-0392-00
C121	CAPACITOR: same as C102	913-1476-00
C122	CAPACITOR: ceramic; 500 uuf, ±10%, 500 v dc	913-0998-00
C123	CAPACITOR: ceramic, 0.5 uuf, ±1/4 uuf, 500 vdc	916-0067-00
C124	CAPACITOR: same as C115	916-0117-00
C125	CAPACITOR: same as C102	913-1476-00
C126	CAPACITOR: same as C101	913-1186-00
C127	CAPACITOR: same as C101	913-1186-00
C128	CAPACITOR: same as C101	913-1186-00
C129	CAPACITOR: same as C101	913-1186-00
C130	CAPACITOR: same as C101	913-1186-00
C131	CAPACITOR: same as C102	913-1476-00
C132	CAPACITOR: electrolytic; triple section, 40 uf 150 v ea section, +100% -10%	183-0181-00
C133	CAPACITOR: same as C102	913-1476-00
C134	CAPACITOR: same as C103	916-4362-00
C135	CAPACITOR: variable air; 3.7 uuf max min, 28.0 uuf min max	922-0402-00
C136	CAPACITOR: same as C102	913-1476-00
C137	CAPACITOR: same as C102	913-1476-00
C138	CAPACITOR: mica, 500 uuf, ±20%, 500 v dc	912-0937-00
C139	CAPACITOR: same as C102	913-1476-00
C140 thru C143	CAPACITOR: same as C101	913-1186-00
C144	CAPACITOR: part of XV105	
C145	CAPACITOR: same as C102	913-1476-00
C146	CAPACITOR: ceramic, 1000 uuf, ±20%, 5000 v dc	913-0101-00
C147	CAPACITOR: paper, 0.10 uf, ±20%, 100 v dc	931-0588-00
C148	CAPACITOR: ceramic, 30 uuf, ±2%, 500 v dc	916-4336-00
C149	CAPACITOR: same as C148	916-4336-00
C150	Part of PA cavity assembly	
C151	CAPACITOR: ceramic, 0.75 uuf, ±10%, 2000 v dc	913-3004-00
C152	CAPACITOR: paper, 1.0 uf, ±20%, 300 v dc	931-1855-00
C153 thru C155	CAPACITOR: same as C102	913-1476-00
C156	CAPACITOR: ceramic, 770 uuf, ±20% at +25 deg C, 2500 v dc	913-3005-00
C157 thru C164	CAPACITOR: same as C102	913-1476-00
C165	CAPACITOR: mica, 100 uuf, ±20%, 500 v dc	912-0669-00
C166	CAPACITOR: tubular ceramic, 12.0 uuf, ±5%, 500 v dc	916-0141-00
C167	CAPACITOR: same as C166	916-0141-00
C168	CAPACITOR: paper, 0.01 uf, ±20%, 200 v dc	931-2537-00
C169	CAPACITOR: same as C102	913-1476-00
C170	CAPACITOR: paper, 0.47 uf, ±20%, 100 v dc	931-2507-00
C171	CAPACITOR: same as C101	913-1186-00
C172	CAPACITOR-NEUTRALIZER: shielded wire; single conductor, no. 24 AWG solid copper, silver pl, 2-3/16 in. lg overall; metal shield, copper tubing	542-0302-00
C173	CAPACITOR: mica, 44 uuf, ±1 uuf, 500 v dc	912-0673-00
C174	CAPACITOR: mica, 34 uuf, ±1 uuf, 500 v dc	912-0672-00
C175	CAPACITOR: tubular ceramic, 15 uuf, ±2%, 500 v dc	916-4179-00
C176	CAPACITOR: mica, 500 uuf, ±20%, 500 v dc	912-0667-00
C177	CAPACITOR: same as C102, for 4 frequency model only	913-1476-00
C178	CAPACITOR: paper, 0.068 uf, ±20%, 200 v dc	931-2542-00
C179	CAPACITOR: mica, 220 uuf, ±2%, 500 v dc	912-0517-00
C180	CAPACITOR: same as C101	913-1186-00
C181	CAPACITOR: tubular ceramic, 4.0 uuf, ±1/4 uuf, 500 v dc	916-0113-00
C182	CAPACITOR: tubular ceramic, 1.5 uuf, ±1/4 uuf, 500 v dc	916-0072-00
C183	CAPACITOR: tubular ceramic, 8.0 uuf, ±1/4 uuf, 500 v dc	916-0129-00
C184	CAPACITOR: same as C183	916-0129-00
C185	CAPACITOR: same as C181	916-0113-00
CR101	SEMICONDUCTOR DEVICE, DIODE: germanium, type 1N198	353-0160-00
CR102	SEMICONDUCTOR DEVICE, DIODE: silicon; type 1N463	353-0203-00
CR103	NOT USED	
CR104	RECTIFIER, METALLIC: selenium; 115 v rms nom. input; 65 ma dc output	353-0259-00
CR105	SEMICONDUCTOR DEVICE, DIODE: same as CR101	353-0160-00
CR106	SEMICONDUCTOR DEVICE, DIODE: same as CR101	353-0160-00
CR107	SEMICONDUCTOR DEVICE, DIODE: same as CR101	353-0160-00
DS101	LENS, INDICATOR LIGHT: clear, green, 21/32 in. dia. by 5/8 in. lg.; w/chrome plated brass holder threaded 9/16-27 x 3/16 in. lg for mtg	262-2180-00
E101	TERMINAL, FEEDTHRU, INSULATED: tubular conductor accommodation; glass insulation; 5/16 in. dia by 0.368 in. lg	306-0155-00
E102	TERMINAL, STUD: brass, 1/4 in. hex by 0.632 in. lg overall	306-0234-00
E103	TERMINAL, FEEDTHRU, INSULATED: Teflon insulation, tin plated brass conductor	306-0324-00
E104	TERMINAL, FEEDTHRU, INSULATED: same as E103	306-0324-00
E105	TERMINAL, FEEDTHRU, INSULATED: same as E103	306-0324-00
E106	TERMINAL, FEEDTHRU, INSULATED: brass; 5/32 in. hex; 13/32 in. lg, 2-56 NC-2 tap 5/64 in. deep for mtg	306-0348-00
E107	TERMINAL, FEEDTHRU, INSULATED: same as E106	306-0348-00
E108	TERMINAL, STUD: same as E102	306-0234-00
E109 thru E111	TERMINAL, FEEDTHRU, INSULATED: same as E106	306-0348-00
E112	INSERT, ELECTRON TUBE SOCKET: cadmium plated copper, 0.094 in. od by 2-25/32 in. lg, 8 tabs bent at 40 degree angle	541-6533-003
E113	INSERT, ELECTRON TUBE SOCKET: same as E112	541-6533-003
E114 thru E117	NOT USED	

VHF Transmitter 242F-5CL

ITEM	DESCRIPTION	COLLINS PART NUMBER
E118	SLEEVE, TUBE SOCKET: for 7 pin tube; cadmium plated copper; 0.005 in. by 13/32 in. by 2-5/16 in.; 7 tabs bent to 40 degree angle	541-6532-003
E119	SLEEVE, TUBE SOCKET: same as E118	541-6532-003
E120	SLEEVE, TUBE SOCKET: same as E118	541-6532-003
E121	NOT USED	
E122	NOT USED	
E123	SHIELD, ELECTRON TUBE: 7 pin miniature, cylindrical w/flared end; closed top; brass, incl copper insert	541-6550-003
E124	SHIELD, ELECTRON TUBE: same as E123	541-6550-003
E125	SHIELD, ELECTRON TUBE: same as E123	541-6550-003
E126	SHIELD, ELECTRON TUBE: 9 pin noval, cylindrical, w/flanged end; open top, brass, incl copper insert	541-6553-003
E127	NOT USED	
E128	SHIELD, ELECTRON TUBE: brass or copper alloy, cadmium plate; cylindrical can w/inside spring	141-0377-00
F101	FUSE, CARTRIDGE: 1-1/2 amp, 250 v; one time; glass body; ferrule term	264-4060-00
H101	NOT USED	
H102	NOT USED	
H103	PIN, GROOVED, HEADLESS: steel, 0.317 in. lg, 0.0615 in. dia to 0.069 in. dia, three grooves (qty 4)	012-1031-00
H104	STUD, FASTENER: steel; 11/32 in. dia. x 3/32 in. h head; 0.375 in. lg.; locating pin hole (qty 4)	012-1234-00
H105	RECEPTACLE, TURNLOCK FASTENER: steel, 55/64 in. lg by 5/8 in. w, 1/8 in. thk, 7/16 in. dia stud hole (qty 4)	012-1967-00
I101	LAMP, INCANDESCENT: 6.3 v, 0.15 amp, miniature bayonet base; T-3-1/4 bulb, clear, tungsten filament; 1-1/8 in. lg	262-3240-00
J101	CONNECTOR, RECEPTACLE: single female contact; irregular shape; panel mtg	357-9129-00
J102	CONNECTOR, RECEPTACLE: single rd female contact; beryllium copper contact; straight shape	357-9106-00
J103	CONNECTOR, RECEPTACLE: same as J102	357-9106-00
J104	CONNECTOR: part of K102	
J105	CONNECTOR, RECEPTACLE: socket insert, single contact high voltage miniature receptacle connector	372-1805-00
J106	CONNECTOR: part of K102	
J107	CONNECTOR: part of K102	
J108	CONNECTOR, PLUG, ELECTRICAL: 20 rd male contacts, 500 v ac; 1 connector mating end; 4 large, 15 amp; 16 small, 5 amp	372-1069-00
K101	RELAY, ARMATURE: spdt, 1 C arrangement, 500 w r-f power; 570 ohms, ±20% dc coil resistance; 130 v ac max operating voltage; 1 type BNC and 2 type N receptacles	410-0145-00
K102	RELAY, THERMAL: time delay, 1 min ±15%, normally open; 3 amp at 150 v dc or 250 v ac dc to 1000 cps ac nom heater voltage; incl J104, J106, J107	402-0225-00
K103	RELAY, ARMATURE: 1 C contact arrangement; crystal switching; 48 v dc coil voltage; 52 v dc max operating voltage; coil resistance 3000 ohms; 4 freq model only	972-1431-00
K104	RELAY, ARMATURE: same as K103	972-1431-00
K105	RELAY, ARMATURE: same as K103	972-1431-00
L101	COIL, RADIO FREQUENCY: 7-3/4 turns, single wound 24 ga enamel; steatite coil form with adjustable iron core	542-0303-002
L102	COIL, RADIO FREQUENCY: 1800 ma current rating; 1.00 uh, ±20%; 0.15 dc resistance ohm	240-0154-00
L103	COIL, RADIO FREQUENCY: 600 ma current rating; 3.30 uh, ±10%; 1.40 ohms resistance	240-0158-00
L104	COIL, RADIO FREQUENCY: 2-1/2 turns, single layer wound; 18 ga tinned copper wire; air core; 5/16 in. id	542-0309-002
L105	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L106	COIL, RADIO FREQUENCY: 2-1/2 turns, single layer wound; 18 ga tinned copper wire; air core; 3/8 in. id	542-0306-002
L107	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L108	COIL, RADIO FREQUENCY: same as L106	542-0306-002
L109	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L110	COIL, RADIO FREQUENCY: 1300 ma current rating; 1.50 uh, ±20%; 0.28 ohm resistance	240-0155-00
L111	COIL, POWER AMPLIFIER: 3 turns, single layer wound; 14 AWG annealed copper wire, tinned; 5/16 in. id	542-0307-002
L112	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L113	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L114	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L115	COIL, RADIO FREQUENCY: 2000 ma current rating; 0.47 uh, ±20%; 0.08 dc resistance ohms; (4 freq model only)	240-0060-00
L116	COIL, RADIO FREQUENCY: 1470 ma current rating; 0.68 uh, ±20%, 0.15 dc resistance ohms; (4 freq model only)	240-0061-00
L117	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L118	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L119	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L120	NOT USED	
L121	NOT USED	
L122	NOT USED	
L123	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L124	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L125	COIL, RADIO FREQUENCY: same as L103	240-0158-00
L126	COIL, RADIO FREQUENCY: 3 turns single layer wound; no. 18 AWG tinned copper wire; 9/32 in. id	542-0312-002
L127	COIL, RADIO FREQUENCY: 3 turns single layer wound; no. 18 AWG tinned copper wire; 1/4 in. id	542-0313-002
L128	COIL, RADIO FREQUENCY: 2 turns single layer wound; no. 18 AWG tinned copper wire; 9/32 in. id	542-0317-002
L129	COIL, RADIO FREQUENCY: 1000 ma current rating; 2.20 uh, ±20%; 0.50 dc resistance ohms	240-0156-00
M101	AMMETER: permanent magnet moving, coil type dc microammeter; 0-50 microamps; 50 scale divisions	458-0357-00
M102	AMMETER: permanent magnet moving, coil type dc milliammeter, 0-250 ma; 50 scale divisions	458-0356-00
P101	CONNECTOR, PLUG: 1 rd male contact; right angle; approx 1 in. by 1-1/2 in.; silver plated	357-9169-00
P102	CONNECTOR, PLUG, ELECTRICAL: 1 mating end; 1 rd male contact; 50 ohms; straight shape; bayonet type locking	357-9018-00
P103	CONNECTOR, PLUG, ELECTRICAL: same as P102	357-9018-00
P104	CONNECTOR, PLUG: same as P101	357-9169-00
P105	CONNECTOR, RECEPTACLE: 1 rd female contact, straight; 3/4 in. lg by 0.468 in. hex; 10,500 v dc	372-1806-00
P106	CONNECTOR, PLUG, ELECTRICAL: 1 mating end; 1 rd male contact, 50 ohms; straight shape	357-9040-00
P107	CONNECTOR, PLUG, ELECTRICAL: same as P106	357-9040-00
P108	CONNECTOR, RECEPTACLE, ELECTRICAL: 20 rd female contacts, 1 connector mating end	372-1071-00
R101	RESISTOR: comp; 6800 ohms, ±10%, 1/2 w	745-1387-00
R102	RESISTOR: film; 0.150 megohm, ±1%, 1/2 w	705-2183-00
R103	RESISTOR: comp; 220 ohms, ±10%, 1/2 w	745-1324-00
R104	RESISTOR: same as R103	745-1324-00
R105	RESISTOR: comp; 100 ohms, ±10%, 1/2 w	745-1310-00
R106	RESISTOR: comp; 22 ohms, ±10%, 1/2 w	745-1282-00
R107	RESISTOR: comp; 3900 ohms, ±10%, 2 w	745-5677-00
R108	RESISTOR: film; 0.130 megohm, ±1%, 1/2 w	705-2182-00
R109	RESISTOR: comp; 82,000 ohms, ±10%, 1/2 w	745-1433-00
R110	NOT USED	
R111	RESISTOR: comp; 33,000 ohms, ±10%, 1/2 w	745-1415-00
R112	RESISTOR: comp; 33,000 ohms, ±10%, 1 w	745-3415-00
R113	RESISTOR: film; 8250 ohms, ±1%, 1/4 w	705-7140-00
R114	RESISTOR: film; 287,000 ohms, ±1%, 1/2 w	705-2346-00
R115	RESISTOR: same as R109	745-1433-00
R116	RESISTOR: variable comp; 50,000 ohms, ±20%, 1 w	380-1302-00
R117	RESISTOR: variable comp; 250,000 ohms, ±20%, 1 w	380-0686-00
R118	RESISTOR: comp; 5600 ohms, ±10%, 1/2 w	745-1384-00
R119	RESISTOR: film; 33,200 ohms, ±1%, 1/2 w	705-2167-00
R120	RESISTOR: film; 10,000,000 ohms, ±1%, 1 w	705-3032-00
R121	RESISTOR: comp; 15,000 ohms, ±10%, 1/2 w	745-1401-00
R122	RESISTOR: film; 0.162 megohm, ±1%, 1/2 w	705-2184-00
R123	RESISTOR: comp; 560 ohms, ±10%, 1/2 w	745-1342-00
R124	RESISTOR: variable ww; 10,000 ohms, ±10%, 2 w	750-8104-00
R125	NOT USED	
R126	RESISTOR: film; 1,960,000 ohms, ±1%, 1/2 w	705-2355-00
R127	RESISTOR: comp; 1000 ohms, ±10%, 1 w	745-3352-00
R128	RESISTOR: same as R127	745-3352-00
R129	NOT USED	
R130	RESISTOR: comp; 4700 ohms, ±10%, 1/2 w	745-1380-00
R131	RESISTOR: film; 0.357 megohm, ±1%, 1/2 w	705-2192-00
R132	RESISTOR: comp; 0.22 megohm, ±10%, 1/2 w	745-1450-00
R133	RESISTOR: wire wound; 2000 ohms, ±5%, 10 w	747-0543-00
R134	RESISTOR: wire wound; 2500 ohms, ±5%, 14 w	747-0772-00
R135	RESISTOR: comp; 22,000 ohms, ±10%, 1/2 w	745-1408-00
R136	RESISTOR: comp; 27,000 ohms, ±10%, 1/2 w	745-1412-00
R137	RESISTOR: comp; 0.33 megohm, ±10%, 1/2 w	745-1457-00
R138	RESISTOR: variable comp; 15,000 ohms, ±10%, 4 w	750-8186-00

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ITEM	DESCRIPTION	COLLINS PART NUMBER
R139	RESISTOR: variable comp; 10,000 ohms, ±20%, 1/2 w	380-6277-00
R140	RESISTOR: comp; 47 ohms, ±10%, 1/2 w	745-1296-00
R141	RESISTOR: same as R140	745-1296-00
R142	RESISTOR: same as R139	380-6277-00
R143	RESISTOR: wire wound; 0.133 ohm, ±3%, 2 w	747-9638-00
R144	RESISTOR: comp; 33 ohms, ±10%, 1/2 w	745-1289-00
R145	RESISTOR: same as R144	745-1289-00
R146	RESISTOR: comp; 6800 ohms, ±10%, 1 w	745-3387-00
R147	RESISTOR: comp; 1500 ohms, ±10%, 1/2 w	745-1359-00
R148	RESISTOR: variable comp; 50,000 ohms, ±20%, 1/2 w	380-6279-00
R149	RESISTOR: same as R147	745-1359-00
R150	RESISTOR: comp; 4700 ohms, ±10%, 1/2 w	745-1380-00
S101	SWITCH, ROTARY: 2 section, 11 positions, 30 degrees detent, 2 moving contacts, 24 fixed contacts, 2 pole; phenolic insulation	259-0795-00
S102	SWITCH, ROTARY: 1 section, 4 positions, 30 degrees detent, 2 moving contacts, 6 fixed contacts, 2 pole, phenolic insulation, 4 freq model only	259-0807-00
S103	SWITCH, INTERLOCK: ac, dc, 10 amp, 125 or 250 v ac; 0.5 amp, 125 v dc; 0.25 amp, 250 v dc; spdt	266-0013-00
S104	SWITCH, INTERLOCK: same as S103	266-0013-00
S105	SWITCH, SENSITIVE: dt, snap action, beryllium copper spring, stainless steel plunger; movement differential 0.007 operating force 3-6 oz; 3 terminals	260-0839-00
T101	TRANSFORMER, STEP-DOWN: 2 primary windings 115 v ea, when connected 250 v; 50/60 cps; 2 secondary windings, secondary 1, 90 v; secondary 2, 6.3 v, 4.5 amp	662-0239-00
TB101	TERMINAL BOARD: glass base epoxy, 1.900 in. lg by 1.218 in. w, four 0.094 in. dia mtg holes, mounted on a brass bracket, incl 4 rivets, 4 terminals	542-0294-002
TB102	TERMINAL BOARD: laminated plastic, 1/16 in. thk, 1-13/16 in. lg by 1-5/16 in. w, incl one aluminum support, 4 eyelets, 8 terminals	542-0300-002
TP101	TIE POINT	
V101	ELECTRON TUBE: type 5670	253-0002-00
V102	ELECTRON TUBE: type 5654	253-0001-00
V103	ELECTRON TUBE: same as V102	253-0001-00
V104	ELECTRON TUBE: type 5686	253-0009-00
V105	ELECTRON TUBE: tetrode 7034/4X150A	256-0093-00
V106	ELECTRON TUBE: type 5726	253-0003-00
V107	ELECTRON TUBE: voltage regulator 6626	257-0173-00
XF101	FUSEHOLDER: for 3 AG fuses, 1-1/4 by 1/4; Bakelite, 1/16 in. locking slug incl	265-1002-00
XI101	LIGHT, INDICATOR: w/o lens; for miniature bayonet base, T-3-1/4 bulb; 6 to 8 v	262-1260-00
XK102	SOCKET, ELECTRON TUBE: type B octal tube socket; plastic	220-1157-00
XV101	SOCKET, ELECTRON TUBE: 9 contact miniature; copper nonmagnetic alloy contacts, plated; phenolic insulation	220-1244-00
XV102	SOCKET, ELECTRON TUBE: 7 contact miniature; rd shape; phenolic insulation	220-1273-00
XV103	SOCKET, ELECTRON TUBE: same as XV102	220-1273-00
XV104	SOCKET, ELECTRON TUBE: same as XV101	220-1244-00
XV105	SOCKET, ELECTRON TUBE: socket for 4X150A tube; beryllium copper contacts, silver pl (incl C144)	220-1174-00
XV106	SOCKET, ELECTRON TUBE: same as XV102	220-1273-00
XV107	SOCKET, ELECTRON TUBE: same as XV102	220-1273-00
XY101	SOCKET, CRYSTAL: 2 contact positions spaced 0.486 in. c to c; silver pl brass contacts; steatite body, for 4 freq use only	292-0059-00
XY102	SOCKET, CRYSTAL: same as XY101	292-0059-002
XY103	SOCKET, CRYSTAL: same as XY101	292-0059-00
XY104	SOCKET, CRYSTAL: same as XY101	292-0059-00
Y101 thru Y104	NOT USED	
	MODULATOR-POWER SUPPLY UNIT	544-7786-005
C201	CAPACITOR: electrolytic; triple section 80 uf, 150 v each section	183-0436-00
C202	CAPACITOR: film; 4 uf, ±10%, 3000 v dc	933-0129-00
C203	CAPACITOR: paper; 2.7 uf, 600 v dc	962-9052-00
C204	CAPACITOR: electrolytic; triple section, section 1, 40 uf, 450 v; section 2, 40 uf, 450 v, section 3, 8 uf, 450 v	183-0183-00
C205	CAPACITOR: same as C202	933-0129-00
C206	CAPACITOR, FIXED, ELECTROLYTIC: triple section; section 1, 8 uf, 350 v; section 2, 20 uf, 250 v; section 3, 20 uf, 150 v	183-0435-00
C207	CAPACITOR, FIXED, ELECTROLYTIC: 4 uf -0% +100%; 150 v dc	183-1359-00
C208	CAPACITOR: paper; 2 uf, -20% +20%; 100 v dc	931-0034-00
C209	CAPACITOR: same as C208	913-0034-00
C210	CAPACITOR: paper; 33,000 uuf, ±20%; 200 v dc	931-4504-00
C211	CAPACITOR: same as C210	931-4504-00
C212	CAPACITOR: paper; 33,000 uuf, ±20%; 400 v dc	931-4546-00
C213	CAPACITOR: same as C212	931-4546-00
C214	CAPACITOR: paper 0.1 uf, ±20%; 100 v dc	931-4488-00
CR201	RECTIFIER, METALLIC: single phase, full wave; 78 v max input; 0.120 amp at 25 degrees C, 0.065 amp at +80 degrees C, max dc output current	353-0134-00
DS201	LENS, INDICATOR LIGHT: red, clear, glass; 21/32 in. dia.	262-2160-00
DS202	LENS, INDICATOR LIGHT: green, clear, glass; 21/32 in. dia	262-2180-00
E201	SHIELD, ELECTRON TUBE: 9 pin noval, cylindrical w/flanged end; open top; brass; incl. copper insert	541-6554-003
E202	SHIELD, ELECTRON TUBE: same as E201	541-6554-003
E203	CLIP, ELECTRON TUBE: beryllium copper, tinned, 1-1/2 in. lg. x 13/16 in. w x 25/32 in. thk.	301-1005-00
E204	CLIP, ELECTRON TUBE: same as E203	301-1005-00
E205	INSERT, ELECTRON TUBE SOCKET: copper; 0.094 in. od x 2-25/32 in. lg., 8 tabs bent at 40 degree angle	541-6533-003
E206	INSERT, ELECTRON TUBE SOCKET: same as E205	541-6533-003
E207	INSERT, ELECTRON TUBE SOCKET: same as E205	541-6533-003
E208	SHIELD, ELECTRON TUBE: 9 pin noval, cylindrical w/flanged end; open top, brass; incl. copper insert	541-6533-003
E209	SHIELD, ELECTRON TUBE: 7 pin miniature, cylindrical w/flared end; closed top; brass; incl. copper insert	541-6550-003
E210	SLEEVE, TUBE SOCKET: for 7 pin tube; copper; 7 tabs bent to 40 degree angle (qty 4)	541-6532-003
F201	FUSE, CARTRIDGE: dual element, time delay, 8 amp, 32 v, glass-body; ferrule terminal; 1-1/4 in. lg by 7/32 in. od	264-0112-00
F202	FUSE, CARTRIDGE: 250 v; 1.0 amp current; normal instantaneous operating; ferrule term, glass body; 1-1/4 in. lg by 0.250 in. dia	264-4050-00
F203	FUSE, CARTRIDGE: 250 v; 1 amp ferrule term; glass body; 1-1/4 in. lg by 1/4 in dia overall; H time lag	264-4280-00
F204	FUSE, CARTRIDGE: 5 amp, 32 v, time delay speed, 6 sec blowing time at 300% load; 2 ferrule type terminals, ; glass body	264-0010-00
F205	FUSE, CARTRIDGE: 1/2 amp, 2500 v, high voltage fuse, fiber enclosed; 4-1/2 in. lg	264-0253-00
*F101	FUSE, CARTRIDGE: cylindrical, glass body, brass, nickel or bright alloy plated, 0.750 amp	264-4270-00
*F201	FUSE, CARTRIDGE: cylindrical, dual element, glass body, 4 amps, 32 v, 1/4 in. dia by 1-1/4 in. lg	264-0110-00
*F202	FUSE, CARTRIDGE: cylindrical, 1/2 amp, 250 v max; glass body, ferrule term	264-4030-00
*F203	FUSE, CARTRIDGE: cylindrical, glass body, 0.500 amp, 250 v, 1.75 ohms resistance, ferrule term	264-4260-00
*F204	FUSE, CARTRIDGE: 3 amp, 125 v dc; time delay, 6 sec min at 300%; ferrule terminal	264-0009-00
H1	PIN, GROOVED, HEADLESS: steel; 0.317 in. lg, 0.0615 in. dia. to 0.069 in. dia; three grooves (qty 4)	012-1031-00
H2	STUD, FASTENER: steel; 11/32 in. dia. x 3/32 in. h. head; 0.375 in. lg.; locating pin hole (qty 4)	012-1234-00
H3	RECEPTACLE, TURNLOCK FASTENER: steel; 55/64 in. lg by 5/8 in. w, 1/8 in. thk.; stud hole (qty 4)	012-1967-00
I201	LAMP, INCANDESCENT: 6.3 v, 0.15 amp miniature bayonet base; T-3-1/4 bulb clear, tungsten filament; 1-1/8 in. lg	262-3240-00
I202	LAMP, INCANDESCENT: same as I201	262-3240-00
J201	CONNECTOR, RECEPTACLE: 3 male contacts, straight, 10 amp 250 v, 15 amp 125 v, black Bakelite body twist lock flush base	368-0016-00

*Used in 230 v Fuse Kit

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ITEM	DESCRIPTION	COLLINS PART NUMBER
J202	CONNECTOR, PLUG, ELECTRICAL: 20 rd. male contacts, 1 connector mating end; 4 large contacts, 15 amp, 16 small contacts, 5 amps; 500 v ac	372-1069-00
J203	JACK, TELEPHONE: spring leaf; 0.728 in. lg. x 49/64 in. dia.; 2 conductor plug, 23/32 in. lg. x 1/4 in. dia. shank	358-1050-00
J204	CONNECTOR, RECEPTACLE, ELECTRICAL: 20 rd female contacts, 1 connector mating end; 4 large, 15 amp; 16 small, 5 amp; 500 v ac	372-1071-00
J205	CONNECTOR, PLUG: 1 rd. male contact; 10,500 v dc; phenolic insert; 38-24 UNF-2A thd.	372-1805-00
J206	JACK TIP: phone tip; nylon insulation; copper contact	360-9006-00
K201	RELAY, ARMATURE: small telephone type; contact arrangement L-2A, R-2A; contact rating 8 amp 115 v ac; coil resistance 3000 ohms; coil 48 v	972-1327-00
K202	RELAY, ARMATURE: same as K201	972-1327-00
K203	RELAY, ARMATURE: st normally open contact, 230 v ac, 1 amp; 1 inductive winding, 5000 ohms resistance, 27 v dc, 0.0054 amp	405-0614-00
K204	RELAY, ARMATURE: small telephone type; contact arrangement 5A; contact rating 4A-8 amp 115 v ac; coil resistance 2000 ohms; coil 48 v	972-1328-00
MP1	PIN, GROOVED, HEADED: CRES: 1.812 in. lg., 0.140 in. dia., one groove; 1/4 in. dia. head	542-0202-002
MP2	PLATE, SHORTING: brass; 27/32 in. lg. x 1/2 in. w, 0.140 in. dia. mtg. hole	542-0203-00
MP3	WASHER, FLAT: aluminum; 3/4 in. od, 0.144 in. id, 0.040 in. thk	541-1236-003
P201	CONNECTOR, PLUG: male contact, contact rating 10 amp 250 v, 15 amp 125 v; 3 wire midget twist lock connectors	368-0015-00
P202	CONNECTOR, RECEPTACLE, ELECTRICAL: 20 rd female contacts, 1 connector mating end; 500 v ac;	372-1071-00
P203	NOT USED	
P204	CONNECTOR, PLUG, ELECTRICAL: 20 rd male contacts, 1 connector mating end; 500 v ac;	372-1069-00
P205	CONNECTOR, RECEPTACLE: 1 rd female contact, straight; 10,500 v dc; phenolic insert	372-1806-00
R201	RESISTOR: comp; 1000 ohms, ±10%, 1 w	745-3352-00
R202	RESISTOR: same as R201	745-3352-00
R203	RESISTOR: wire wound; 630 ohms, ±5%; 30 w	747-2076-00
R204	RESISTOR: film; 246,000 ohms, ±2%, 25 w	714-1813-00
R205	RESISTOR: film; 51.1 ohms, ±1%, 1/4 w	705-7034-00
R206	RESISTOR: wire wound; 250 ohms, ±5%, 14 W	747-0752-00
R207	RESISTOR: same as R206	747-0752-00
R208	RESISTOR: composition; 100 ohms, ±10%, 2 w	745-5610-00
R209	DELETED	
R210	RESISTOR: same as R201	745-3352-00
R211	RESISTOR: same as R201	745-3352-00
R212	RESISTOR: variable, comp; 1000 ohms, ±20%, 1/2 w	380-6274-00
R213	RESISTOR: composition; 0.22 megohms, ±10%, 1/2 w	745-1450-00
R214	RESISTOR: same as R213	745-1450-00
R215	RESISTOR: variable; comp; two section; 250,000 ohms, ±20% ea. section; 1/4 w	376-2166-00
R216	RESISTOR: variable; 250 ohms, ww	381-0907-00
R217	NOT USED	
R218	RESISTOR: comp; 68 ohms, ±10%, 1/2 w	745-1303-00
R219	RESISTOR: comp; 6800 ohms, ±5%, 1/2 w	745-1386-00
R220	RESISTOR: same as R219	745-1386-00
R221	RESISTOR: comp; 0.27 megohms, ±10%, 1/2 w	745-1454-00
R222	RESISTOR: same as R221	745-1454-00
R223	RESISTOR: comp; 270 ohms, ±10%, 1 w	745-3328-00
R224	RESISTOR: comp; 2.2 megohms, ±10%, 1/2 w	745-1492-00
R225	RESISTOR: film; 511,000 ohms, ±1%, 1/4 2	705-7226-00
R226	RESISTOR: same as R225	705-7226-00
R227	RESISTOR: variable; comp; 100,000 ohms, ±20%, 1/2 w	380-6280-00
R228	RESISTOR: comp; 100,000 ohms, ±10%, 1/2 w	745-1436-00
R229	RESISTOR: comp; 4700 ohms, ±10%, 2 w	745-5680-00
R230	RESISTOR: comp; 5600 ohms, ±10%, 4 w	745-9729-00
R231	RESISTOR: comp; 2700 ohms, ±10%, 4 w	745-9715-00
R232	RESISTOR: wirewound; 2000 ohms, ±5%, 14 w	747-0770-00
R233 thru R244	NOT USED	
S201	SWITCH, TOGGLE: dpst; 2 positions; 30 amp	266-3057-00
S202	SWITCH, ROTARY: 2 section; 2 positions; 8 moving contacts; 24 fixed contacts, 8 pole; 230 v, 0.025 amp ac, dc; spst, 3 amp at 125 v ac; 1 amp at 25 v ac	259-0796-00
S203	SWITCH, TOGGLE: dpdt; continuous current capacity; 30 amp; max overall depth 1-7/32 in.	266-3064-00
S204	SWITCH, INTERLOCK: 10 amp, 250 v ac; 0.5-0.25 amp, 125 v-250 v dc; shorting type spdt contact; 13/32 in. by 1 in. by 1-3/8 in. overall	266-0013-00
S205	SWITCH, INTERLOCK: ac, dc, 10 amp, 125 or 250 v ac; 0.5 amp, 125 v dc; 0.25 amp, 250 v dc; spdt;	266-0012-00
S206	Part of chassis	
T201	TRANSFORMER, POWER, STEP-DOWN: primary one, 115 v; primary two, 115 v; when connected 230 v; secondary one 6.3 v CT, 1 amp; secondary two 5 v, CT, 2 amp, secondary three 2.5 v, CT, 10 amp; secondary four 50 v	662-0235-00
T202	TRANSFORMER, POWER, STEP-UP: primary one, 115 v; primary two, 115 v, when connected 230 v; secondary one, 2960 v, CT	662-0360-00
T203	TRANSFORMER, POWER, STEP-UP: primary one, 115 v; primary two, 115 v; when connected 230 v; secondary one, 2960 v, CT	662-0237-00
T204	TRANSFORMER, AUDIO FREQUENCY: line type; 1st pri, 600 ohms, CT, 50 ma; second pri, 50 ohms, 25 ma; secondary, 240,000 ohms, CT	667-0357-00
T205	TRANSFORMER, AUDIO FREQUENCY: plate coupling type; primary, 30,000 ohms, CT, 30 ma; secondary 10,000 ohms, 15 ma	667-0358-00
TB201	TERMINAL BOARD: plastic; 1/16 in. thk., 2-1/8 in. x 2-1/8 in.; incl. 8 terminals	544-7777-002
V201	ELECTRON TUBE: type 5R4GY	257-0020-00
V202	ELECTRON TUBE: type 866A/866 OR ELECTRON TUBE: type 3B28 OR ELECTRON TUBE: type 1616	256-0049-00 256-0096-00 257-0136-00
V203	ELECTRON TUBE: same as V202	
V204	ELECTRON TUBE: type 6386	253-0015-00
V205	ELECTRON TUBE: type 5686	253-0009-00
V206	ELECTRON TUBE: same as V205	253-0009-00
V207	ELECTRON TUBE: type 6AL5	253-0003-00
XF201	FUSEHOLDER: extractor post type; 125 v, 5 amp; accommodates 3AG cartridge fuse;	265-1002-00
XF202	FUSEHOLDER: same as XF201	265-1002-00
XF203	FUSEHOLDER: same as XF201	265-1002-00
XF204	FUSEHOLDER: same as XF201	265-1002-00
XI201	LIGHT, INDICATOR: w/o lens; for miniature bayonet base, T-3-1/4 bulb; 6 to 8 v	262-1260-00
XI202	LIGHT, INDICATOR: same as XI201	262-1260-00
XV201	SOCKET, ELECTRON TUBE: octal tube socket; plastic; 1-7/64 in. dia. body accommodation hole	220-1121-00
XV202	SOCKET, ELECTRON TUBE: 4 contact tube socket; molded construction, plastic; 3 tapped 10-32 NF-2B inserts; retaining device incl	220-1218-00
XV203	SOCKET, ELECTRON TUBE: same as XV202	220-1218-00
XV204	SOCKET, ELECTRON TUBE: 9 pin miniature tube socket; molded plastic body	220-1103-00
XV205	SOCKET, ELECTRON TUBE: same as XV204	220-1103-00
XV206	SOCKET, ELECTRON TUBE: same as XV204	220-1103-00
XV207	SOCKET, ELECTRON TUBE: 7 pin miniature tube socket; molded construction, plastic	220-1111-00

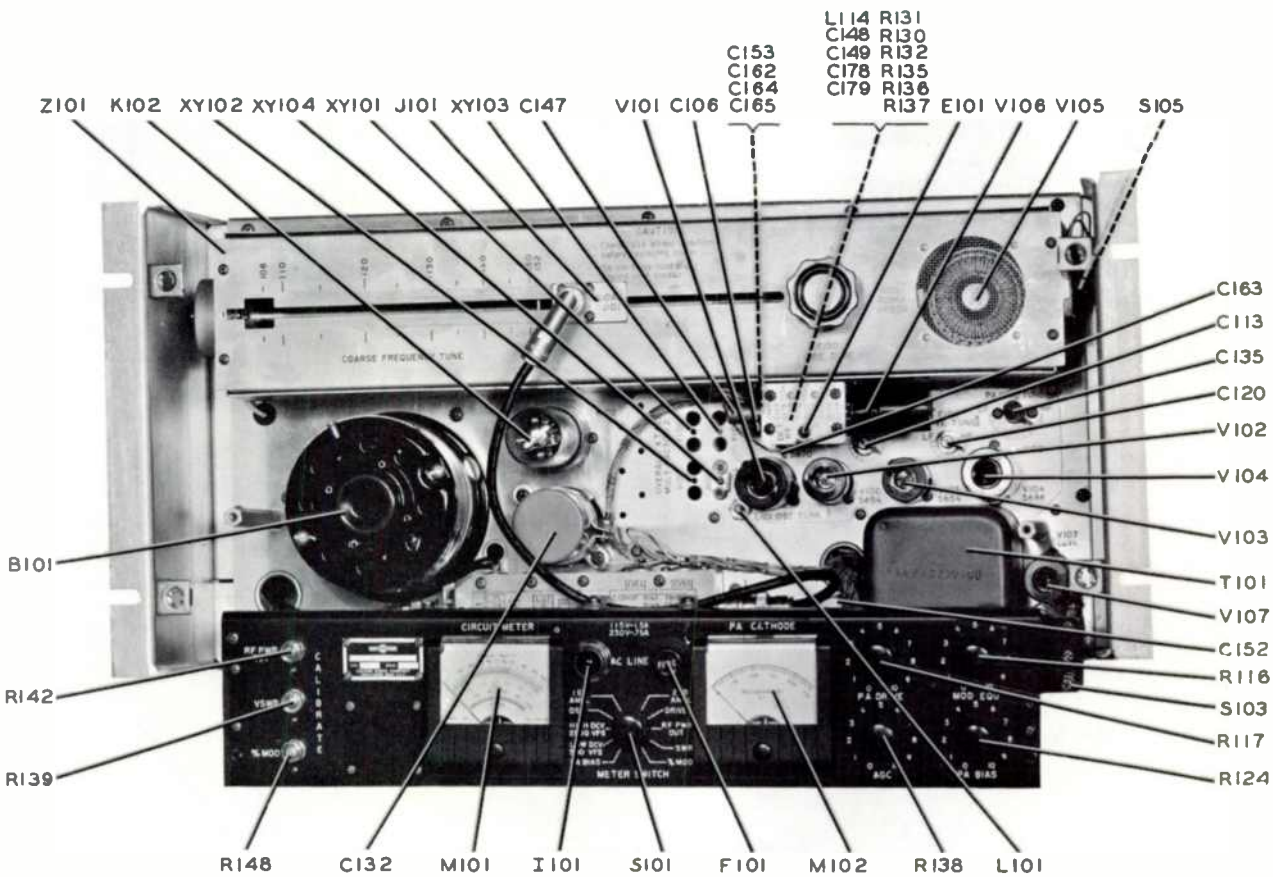

Figure 7-1. R-F Unit, Front View, Dust Cover Removed, Control Panel Dropped

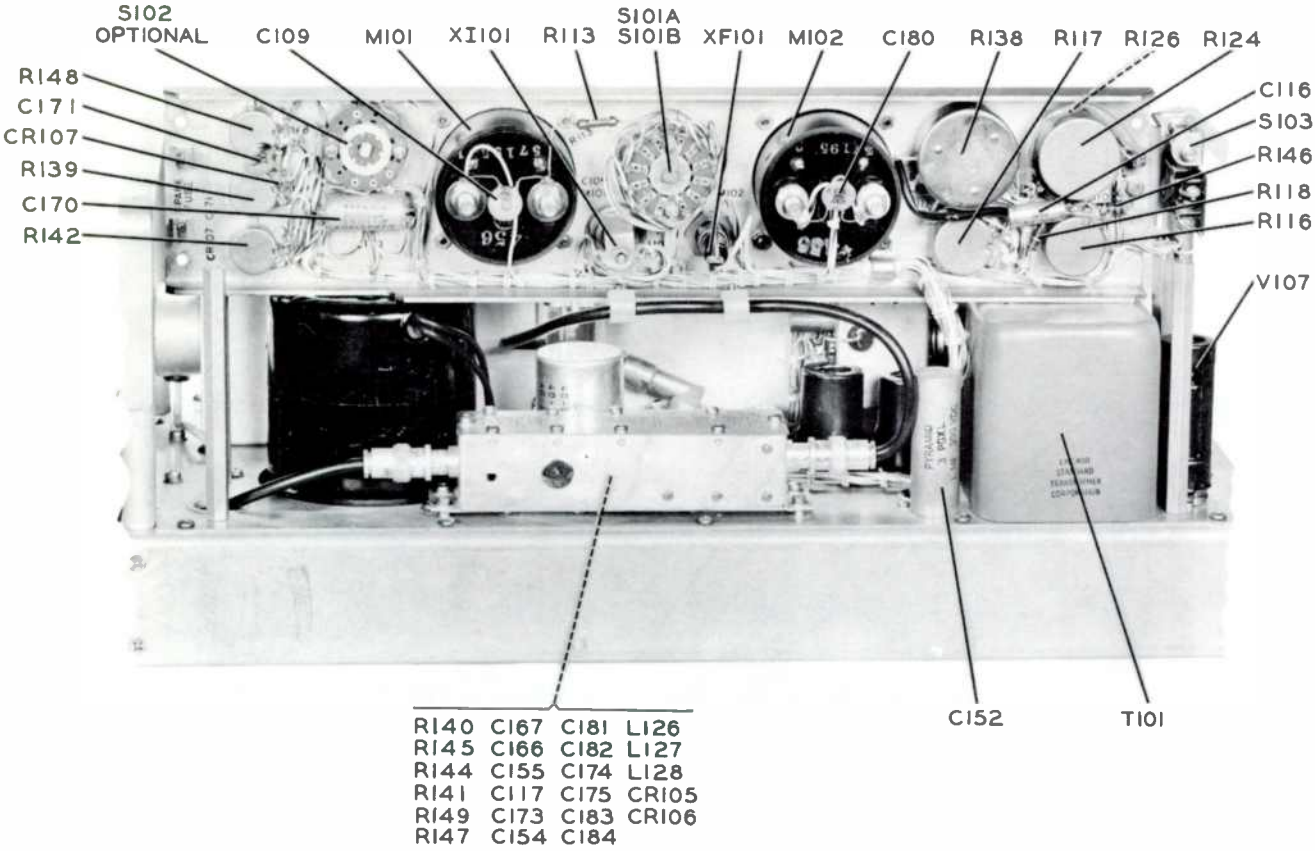

Figure 7-2. R-F Unit, Bottom View, Dust Cover Removed, Back View of Control Panel

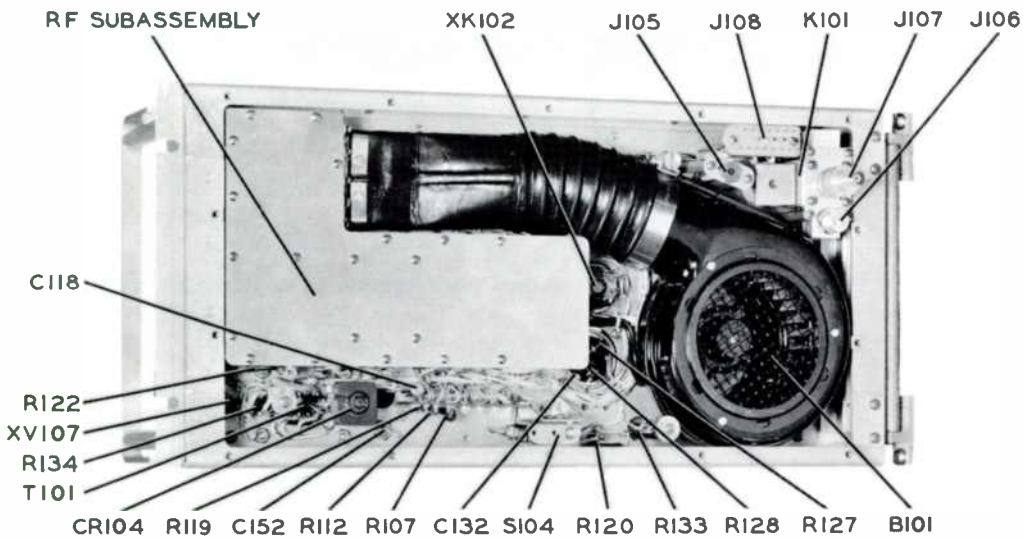

Figure 7-3. R-F Unit, Rear View, Dust Cover Removed

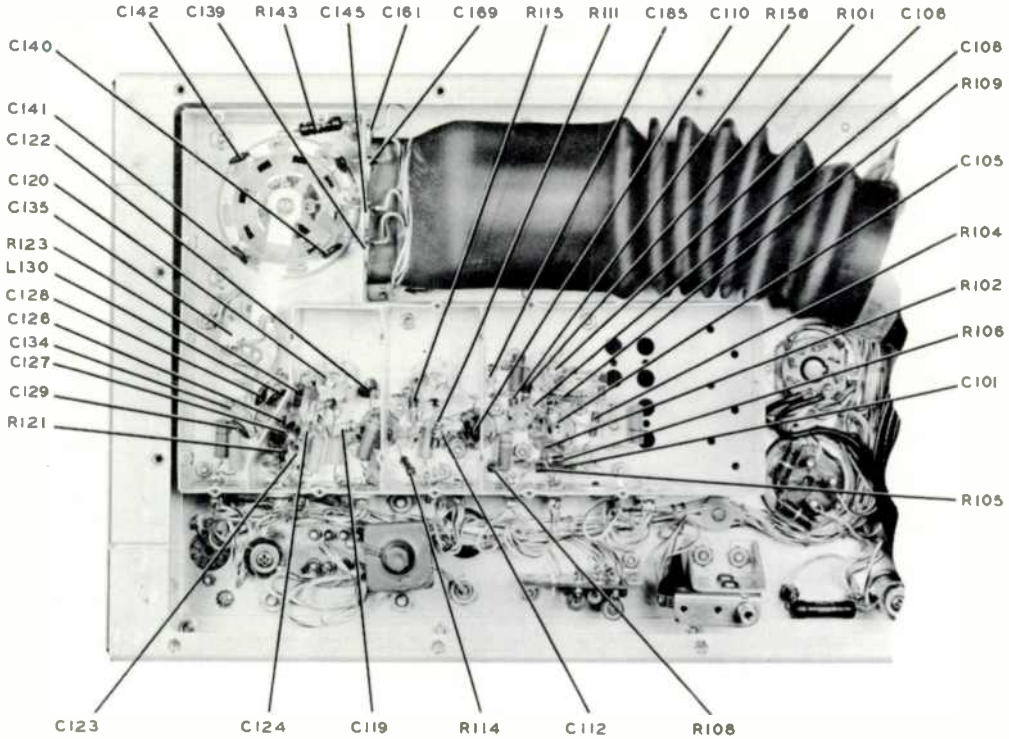

Figure 7-4. R-F Unit Subassembly, Cover Plate Removed

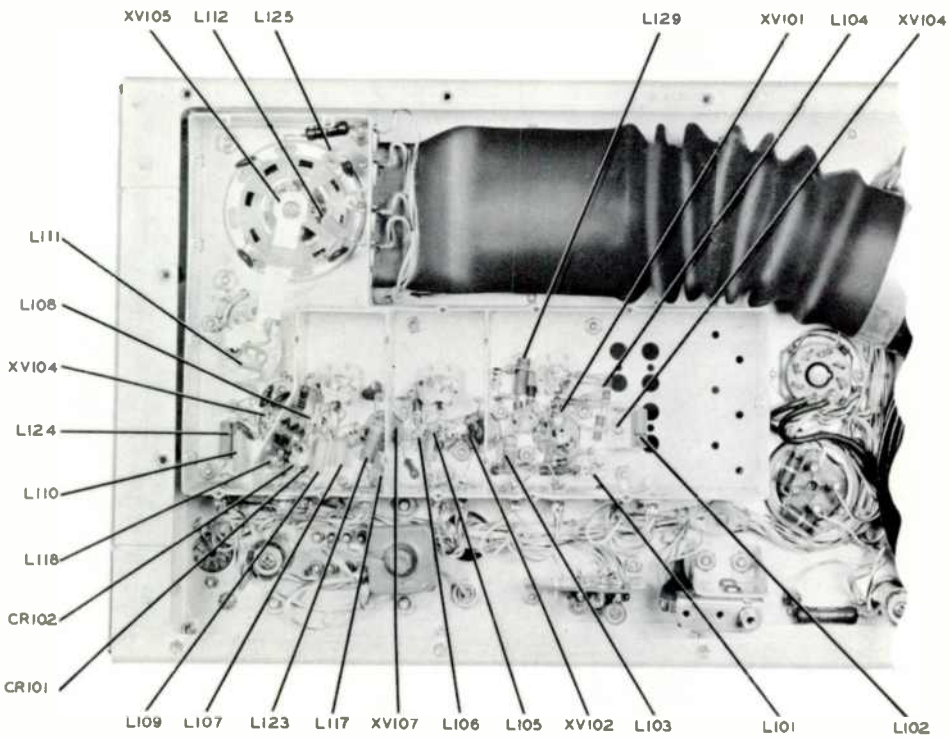

Figure 7-5. R-F Unit Subassembly, Cover Plate Removed

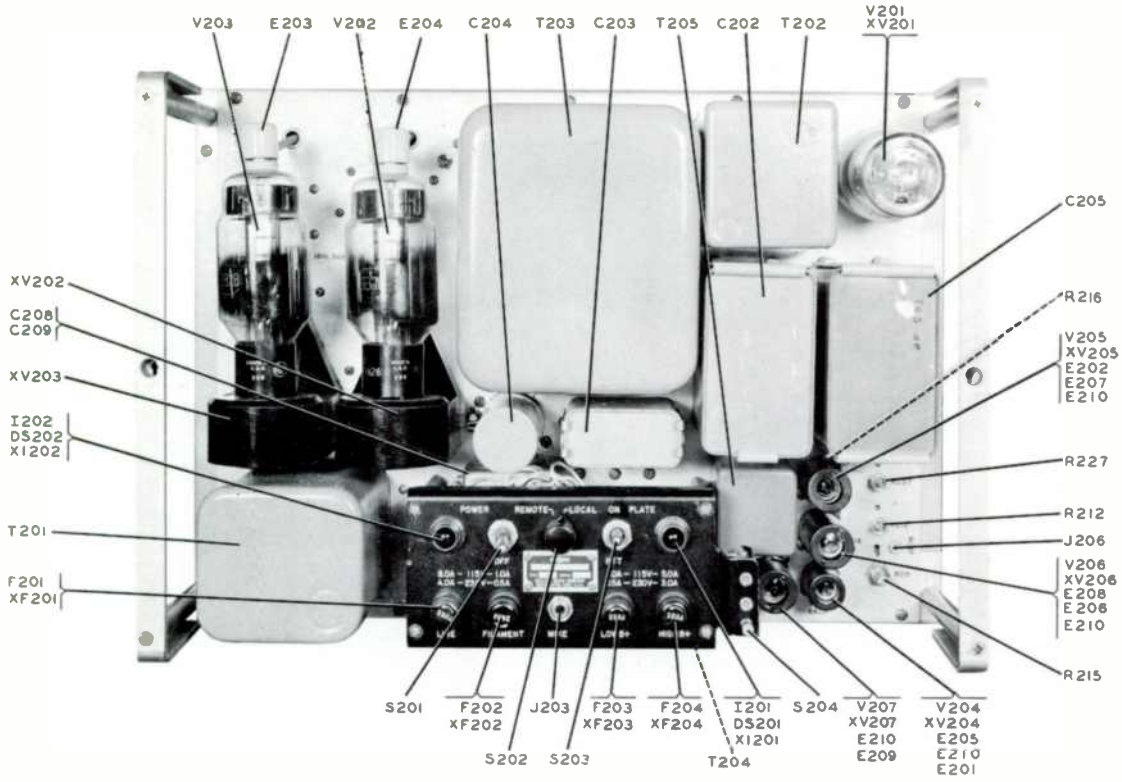

Figure 7-6. Modulator-Power Supply, Front View Dust Cover Removed

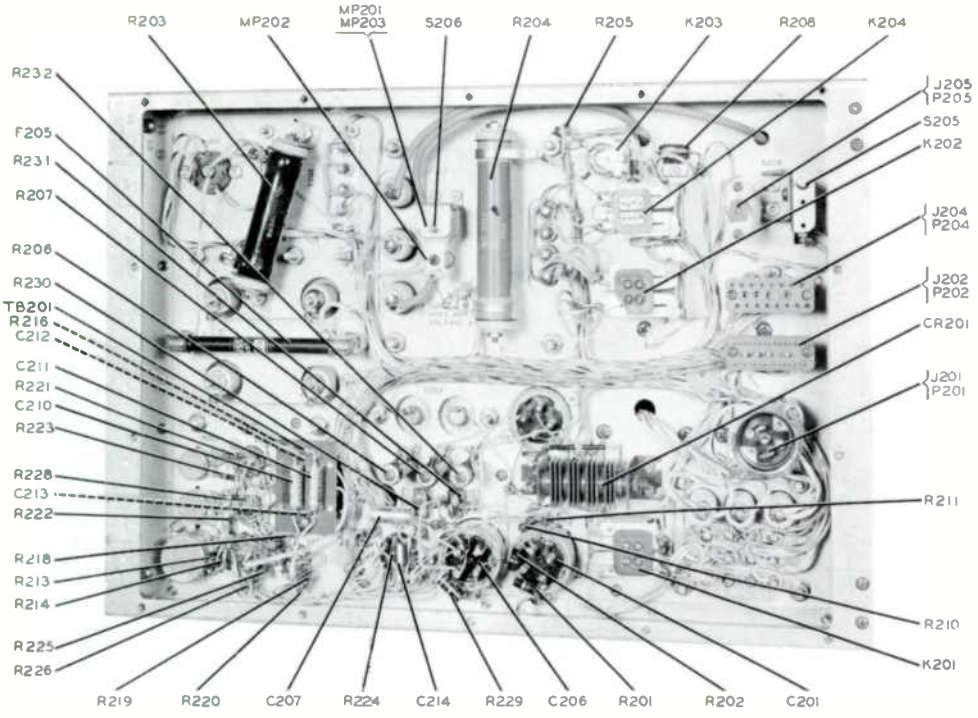

Figure 7-7. Modulator-Power Supply, Rear View, Dust Cover Removed

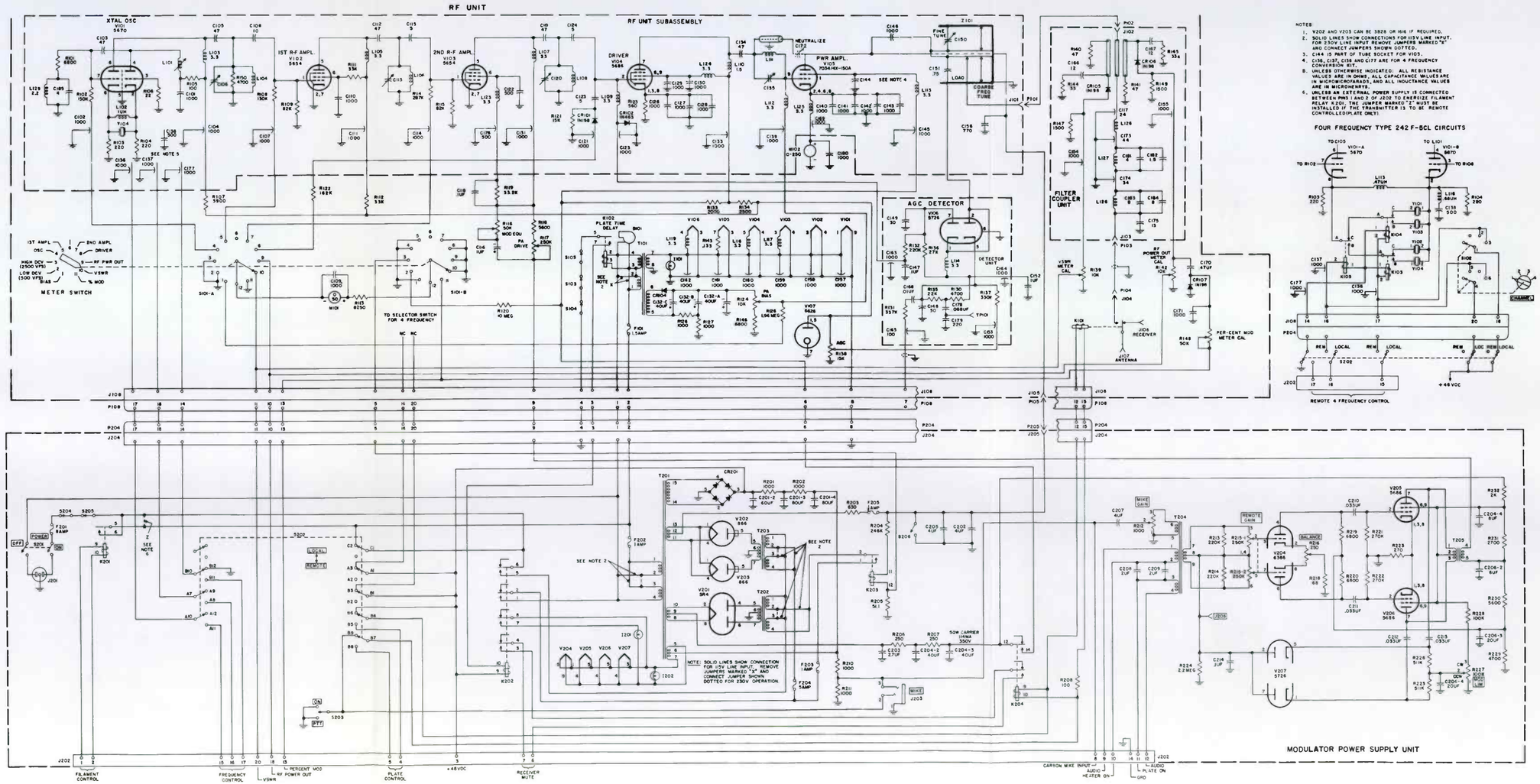

Figure 8-1. VHF Transmitter 242F-5CL, Main Schematic

ELECTRICAL WIRE CODE

EXAMPLES

UNSHIELDED WIRE, MIL TYPE B #22 AWG, WHITE WITH RED AND GREEN TRACERS:

D	A	9	25	—	4-1/4
Type of Wire	Size of Wire	Color of Body	Color of Tracers		Length of Wire in Inches (Includes Stripping & Tinning)

SHIELDED WIRE (SINGLE), MIL TYPE C, #15 AWG, WHITE WITH RED AND GREEN TRACERS:

R	D	S	9	25	—	4-1/4
Type of Wire	Size of Wire	Shielded	Color of Body	Color of Tracers		Length of Wire in Inches (Includes Stripping & Tinning)

SHIELDED WIRE (MULTIPLE), MIL TYPE B, #22 AWG, WHITE, AND WHITE WITH RED TRACER:

D	A	S	(9)	(92)	—	4-1/4
Type of Wire	Size of Wire	Shielded	First Conductor	Second Conductor		Length of Wire in Inches (Includes Stripping & Tinning)

TYPE OF WIRE CODE		
LETTER	TYPE OF WIRE	FAMILY USUALLY FOUND IN
A	Cotton Braid Over Plastic (Formerly AN-J-C-48)	440 Plain 443 Shielded
B	Busbar, Round Tinned	421
C	MIL-W-16878 Type B (#20 and Larger) (600 Volts)	439
D	Miniature Wire, MIL-W-16878 Type B (#22 & Smaller)	439-7000 Series
E		
F	Extra Flexible Varnished Cambric	423
G		
H	Kel-F (Monochloro-trifluoroethylene)	422
J		
K	Neon Sign Cable (15,000 Volts)	423 0004 00
L	Silicone	425 0942 00
M		
N	Single Conductor Stranded (Not Rubber Covered)	422
P	Single Conductor Stranded (Rubber Covered)	423
Q		
R	MIL-W-16878 Type C (1000 Volts)	439 1000 Series
T	Teflon, MIL-W-16878 Type E (600 Volts)	439 4000 Series
V	MIL-W-16878 Type D (3000 Volts)	439 3000 Series
W	Teflon, MIL-W-16878 Type EE (1000 Volts)	439 0000 Series
X		
Y		
Z	Acetate Yarn Telephone Type	428

SIZE OF WIRE CODE	
LETTER	SIZE
A	#22 AWG
B	#20
C	#18
D	#16
E	#14
F	#12
G	#10
H	#8
J	#6
K	#4
L	#2
M	#1
N	#0
P	#00
Q	#000
R	#0000
T	#28
V	#26
W	#24
X	#19
Y	#30
Z	

COLOR CODE	
NUMBER OR LETTER	COLOR
0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Gray (Slate)
9	White
a	Clear
b	Tan
c	Pink
d	Maroon
e	Light Green
f	Light Blue