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Instructions for VTCM Model RCM-10 ..... Sec. 2.

TECHNICAL SUMMARY

Electrical Characteristics:

Type of Emission	Telephone
Carrier Output	1000 Watts
Frequency Range	530-1600 KC
Power Supply	210/230 Volts, 3 Wire, Single Phase 50-60 Cycle AC
Power Consumption (for 100% modulation)	5000 Watts
Radio Frequency Stability	±10 Cycles
Modulation	100% High Level
Audio Input (500-600 ohm source) for 100% modulation	Zero Level DB for 1 Milliwatt Reference Level
Average Program Level	-5 DB (1 Milliwatt Reference Level)
Audio Frequency Response	±1 DB from 30-10,000 Cycles
Audio Distortion (50-7500 Cycles)	Less than 2½% RMS for 95% Modulation
Noise Level	More than 60 DB below 100% Modulation
Output Circuit	Designed to feed 70-250 ohm transmission lines
Carrier Shift	Less than 3% from 0-100% modulation 50-7500 Cycles

Tube Complement:

Crystal Oscillator	6J5
Buffer	Class "A" 807
R-F Driver	Push-Pull 813's
R-F Power Amplifier	Push-Pull 833A's
First Audio	Push-Pull Class "A" 6J7's
Second Audio	Push-Pull Class "A" 6J5's
Audio Driver	Push-Pull Class "A" 845's
Modulator	Push-Pull Class "B" 833A's
R-F Exciter Power Supply	350 Volts 200 MA full wave 5U4G
Low Level Audio Power Supply	350 Volts 200 MA full wave 5U4G
Modulator Bias Power Supply	80 Volts 400 MA full wave 2 - 5U4G's
R-F and Audio Driver Power Supply	1500 Volts 425 MA 2 - 866A's
High Voltage Power Supply	2750 Volts 1.2 AMP 2 - 575A's

Mechanical Specifications:

Height	84 inches
Depth	34¼ inches
Width	48⅜ inches
Floor Area	11½ sq. ft.
Weight	2450 pounds

SECTION I

GENERAL DESCRIPTION

This transmitter is designed to operate at any frequency between 530 and 1600 Kc. It will deliver its rated power into a 70 to 250 ohm transmission line and provide reliable high fidelity operation with negligible distortion and carrier noise.

This equipment is operated from a 210/230 volt, 3 wire single phase 50-60 cycle power line. All transformers have 210-220-230 volt taps readily accessible for various power line voltages encountered.

Mechanical Construction. The complete transmitter is assembled into one spacious cabinet in such a way that all components are readily accessible for inspection and service if necessary. Chassis contruction is used wherever possible for isolation of circuits and to facilitate servicing. The transmitter is constructed in an inner cabinet with wiring between the walls which is readily accessible by hinged side panels or easily removable front panels making a unit that is neat and rugged yet easily accessible for inspection. Two large doors enclose the rear of the cabinet. Opening of these doors will operate high voltage interlock switches.

CIRCUIT DESIGN

Control Circuits. The control circuits in this transmitter serve to provide convenient operation and adequate protection to the tubes and other components. All power supplies have either fuses or over-load protection. All controls necessary for the operation of this transmitter are located on a recessed panel. On this control panel are six sets of push buttons. On the left are the "Filament Start", "Stop" push buttons which place the transmitter in the stand-by position. In the center are four sets of push buttons that control the reversible motors driving the radio-frequency tuning circuits. On the right are the "Plate Start", "Stop" push buttons controlling the high voltage power supplies. A "Filament" rheostat (7R-1) adjusts all filaments to take care of slight power line voltage changes. The "Plate" rheostat (7R-2) adjusts the power input to the radio-frequency power amplifier to maintain correct carrier level. Also located on the control panel are switches to select crystals and radio-frequency transmission lines feeding the antenna. The neutralizing "R-F Pick-up" jack and "Neutralizing" adjustment are located on the control panel. The liberal use of meters helps facilitate all adjustments. Five meters located on the control panel are in the low power radio-frequency and audio-frequency circuits. Eight large easy to read meters near the top of the cabinet are connected in the modulator, radio-frequency power amplifier and antenna circuits.

Four pilot lights located above the control panel and visible at all times indicate "Filament", "Crystal 1", "Crystal 2" and "Plate".

Power Supply Circuits. A power supply of 350 volts using a 5U4G rectifier assembled on the radio-frequency exciter chassis supplies power to the 6J5 crystal oscillator and 807 buffer amplifier. The audio amplifier power supply

chassis uses a 5U4G rectifier supplying 350 volts to the push-pull 6J7 and 6J5 tubes. A separate filament transformer on this chassis supplies the push-pull 845 tubes. The modulator bias supply uses two 5U4G rectifier tubes supplying a variable voltage to the Class "B" 833A modulator grids and fixed bias of 60 volts for the 813 r-f driver tubes.

Two 575A rectifier tubes supply 2750 volts to the radio-frequency power amplifier and the Class "B" modulator tubes. An intermediate power supply using two 866A rectifiers supplies 1500 volts for the push-pull 813's and push-pull 845 tubes.

Audio-Frequency Circuit. The audio-frequency amplifier consists of four stages of push-pull amplification that has an essentially flat response from 30-10,000 cycles. It is designed for 500/600 ohm balanced line zero level db input (1 milliwatt reference level). The first two push-pull stages consist of 6J7 tubes resistance coupled to push-pull 6J5 tubes and resistance coupled to push-pull 845 driver tubes. A transformer is used between the push-pull 845's and the Class "B" 833A modulator tubes. Negative feedback is connected over the last three stages which greatly improves the frequency response and distortion. The transmitter will work satisfactorily without the feedback network in case some trouble arises. There is ample power available to 100% modulate the transmitter with negligible distortion.

Radio-Frequency Circuit. Excellent frequency stability is attained by the use of temperature controlled, low temperature coefficient crystals connected in the conventional triode oscillator circuit using a 6J5 tube. Vernier frequency control is obtained by an adjustment of capacitors 1C-3 or 1C-4 (depending on the crystal in use). There are two stages of radio-frequency amplification between the crystal oscillator and the power amplifier. The first radio-frequency amplifier is an 807 tube Class "A" which reduces the possibility of any frequency drift due to loading of the crystal oscillator tube. The second radio-frequency amplifier consists of two 813 tubes in push-pull which have more than sufficient available power to drive the 833A power amplifier tubes. There are three tuned tank circuits in this transmitter and a variable radio-frequency line pick-up coil.

INSTALLATION

Location and Connections. The location of the transmitter should be carefully selected and provisions made for the external connections. There should be ample space around the cabinet to allow for plenty of air circulation and to facilitate inspection and servicing when necessary. It is important that the transmitter cabinet be securely grounded. For this purpose, a heavy copper strip connected to a good ground or buried counterpoise is recommended. Provisions for the antenna feed lines are at the top of the cabinet.

The transmitters are ordinarily shipped with the stationary contacts of 2K-1 wired to the two feed through insulators in the top of the cabinet. One side of the antenna coupling coil 2L-5 is grounded directly to the top of the cabinet. The transmission line can be connected to one insulator and the

ground connection. If desired, a dummy antenna load may be connected to the other insulator and ground. If it is desirable to run the coaxial cables directly into the transmitter, they may be connected through the two holes directly above 2K-1 and the internal wiring changed for this type of installation. The three wire single phase 210-230 volt a-c line can be brought in through holes in the rear or bottom of the cabinet and connected to terminal block 6TB-1 located on the left side of the transmitter. Access to this large terminal block is made by loosening the four one-half turn fasteners along the rear of the side panel and opening it like a door. Terminal block 6TB-2 has provisions for connecting wires to 4 remotely located push buttons that will control the power on-off to the transmitter.

The station frequency monitor is connected through a 70 ohm line to terminals G and H on terminal block 1TB-2 located on the radio-frequency exciter chassis. On terminal block 6TB-7 (located inside the cabinet near the top on the left side) terminals "A" - "B" are for audible monitoring purposes and terminals "C" - "D" should be connected to the station modulation monitor through a 70 ohm line. The wiring to the monitoring equipment can be brought in through holes in the rear of the transmitter base. A balanced audio-frequency line should be brought through the bottom or rear holes and connected to 3TB-1 terminals "A", "B" and "C". Terminal "B" is the ground or shield connection.

Preliminary Adjustments. As soon as power is applied to terminal block 6TB-1, the crystal indicator lights labeled "Crystal 1" and "Crystal 2" should light. These lights show when the crystal ovens are heating and will turn on and off after the crystal ovens have reached their operating temperature. Press the "Filament Start Button". This closes the main power contactor relay 6K-6. This contactor is protected by thermo-overload switches 6S-1 and 6S-2. Adjust the "Filament" rheostat until the a-c "Filament" voltmeter reads 10 volts. This "Filament" rheostat (7R-1) should now be at approximately 50% rotation. The "Filament" rheostat controls all the filaments. All tubes should now have their rated filament voltages; if not, the a-c power line should be measured and the taps on all the transformers changed to correspond to the line voltage available at 6TB-1.

The crystal frequency should be adjusted to zero beat with the frequency monitor. This consists of adjusting the condensers 1C-3 or 1C-4 located directly beneath the crystal in use. Note the readings on the meters labeled the "Oscillator Plate", "Buffer Plate" and "R.F. Driver Grid". These should be approximately the values shown in the table on meter readings.

Adjust 5R-3 for a reading of 60 volts between terminal E of 5TB-1 and chassis.

Adjust 5R-1 and 5R-2 until there is approximately minus 70 volts on each of the 833A modulator tubes. This can be measured directly on each grid or on terminals G and H of terminal block 5TB-1. Place switch 6S-5 in the off posision, this removes the high voltage from both the power amplifier and modulator tubes. This places the transmitter in readiness for neutralizing. At this time be sure the 575A and 866A rectifier tubes have been preheated long enough to drive all mercury vapor from their filaments. Press the plate start button. This will close contactor relay 6K-5 providing the following has occured:

(1) The rear doors are closed, operating interlock switches 6S-3, 6S-4.

(2) The modulator bias supply voltage has closed relay 6K-3.

(3) No excessive overload is operating the overload relays 6K-1, 6K-7.

(4) The time delay relay 6K-4 has operated.

The 813 grid and plate circuits should be tuned by pressing either the upper or lower push button depending on which direction it is necessary to adjust for maximum "Final Grid" current. Note the reading of the "R.F. Driver Plate" and "Final Grid" meters. These readings should be approximately the values given in the table on meter readings. Insert in the "R.F. Pick-up" jack located on the control panel a neutralizing indicator which may be a 1.5 volt 60 ma pilot light or vacuum tube voltmeter. Adjust the "833 Plate Tuning" for maximum reading on the r-f indicator. The "Neutralising Condenser" should be adjusted with a screw driver for minimum reading on the r-f indicator. This procedure should be repeated until the lowest possible indication is reached on the r-f pick-up indicator. The "813 Plate Tuning" should be checked for maximum "Final Grid" meter reading. The "Final Grid" meter should be adjusted for approximately 160 ma. Adjusting 6R-3 located near the 813 chassis adjusts the 813's screen voltage and regulates the reading of the "Final Grid" meter. The transmitter should now be neutralized and sufficient grid power applied to the 833A R.F. tubes.

Remove the plate power by pushing the red button "Plate Stop". The switch 6S-5 should be placed in the on position. Either the antenna or some dummy r-f load should be connected to the transmitter. Press the "Plate On" button and adjust "833 Plate Tuning" for minimum "Final Plate" meter current reading. Adjust "Plate" rheostat 7R-2 until the "Final Plate" voltmeter reads 2500 volts. This rheostat should now be at approximately 50% rotation. It may be necessary to change the primary tap on 6T-4 to bring the voltage within the prescribed setting of the rheostat. Adjust the "Antenna" tuning until the "Final" current meter reads 560 ma. These values of voltage and current are approximately correct for 1 KW output.

The "Modulation Plate" current meters should be adjusted for a static reading of 50 ma by means of 5R-1 and 5R-2 located on the modulation bias supply chassis.

An audio signal at zero level db should be fed into terminals "A", "B" and "C" of terminal board 3TB-1 and the signal noted on the audio monitor and modulation monitor. Radio-frequency driving power can be adjusted by means of resistor 6R-3 near the 813 chassis. Audio-frequency driver bias is adjustable by resistor 4R-2 located beneath the audio power supply chassis, and should be adjusted to 195 volts. The plate voltage for the audio-frequency driver tubes should be 1450 volts adjustable by the slider on resistor 6R-5 near the audio amplifier chassis.

The overload relay 6K-1 is adjusted by resistor 6R-8 located beneath the relay. This adjustment should be such that the normal current drawn by the Class "B" modulator and final amplifier tubes will not close 6K-1 relay and open

the plate power contactor 6K-5.

OPERATION

To start the transmitter, press the "Filament Start" button located on the control panel. The following approximate meter readings should now be noted:

P.A. FILAMENT.....	10 VOLTS
OSCILLATOR PLATE.....	8 MA
BUFFER PLATE.....	55 MA
R.F. DRIVER GRID.....	5 MA

After 30 seconds or more have elapsed, press the "Plate Start" button. The following approximate meter readings should be noted.

R.F. DRIVER PLATE.....	110 MA
A.F. DRIVER PLATE.....	160 MA
MODULATOR PLATE.....	50 MA
MODULATOR PLATE.....	50 MA
FINAL GRID.....	160 MA
FINAL PLATE.....	2500 VOLTS
FINAL PLATE.....	560 MA
R.F. LINE.....	DEPENDS UPON ANTENNA
ANTENNA.....	DEPENDS UPON ANTENNA DESIGN

The transmitter is now ready to operate and audio modulation may be applied.

MAINTENANCE

Once this equipment is properly installed, it will provide reliable trouble-free operation for long periods of time.

It is important that the transmitter be kept clean and free of dust, particularly the variable condensers and insulators.

A regular check should be made of the tubes in the transmitter. Any tube showing impaired filament emission should be replaced. Care should be taken with mercury filled tubes to see that they are kept in an upright position and that no mercury is splashed on the tube elements. Tubes of this type that have been shaken or tipped should be preheated before being placed into service. Tube prong and socket contacts should be given periodic inspection.

The equipment should be inspected periodically for poor contacts and loosened switch connections. Connections and contacts should be cleaned regularly and all mechanical connections, such as bolts, nuts, and screws should be kept tight.

The gear train and tuning motors should be greased every two years.

REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
-1-		EXCITER CHASSIS		
1C-1,2	2	Capacitor, .0025 mfd ±5% 500 V DCW Silver Mica Type 1R	Cornell-Dub.	50-L-63A
1C-3,4	2	Capacitor, 3-30 mmf variable air .050 spacing, special type J	Johnson	50-L-31B
1C-5AB,7ABC	2	Capacitor, 3x0.1 mfd 600 V DCW oil filled #A8451BA	J. Fast	50-L-25A
1C-6	1	Capacitor, ±10% 500 V DCW Ceramicon #NPOK 1600-1200 kc requires 2 mmf 1200-900 kc requires 3 mmf 900-540 kc requires 4 mmf	Erie	 50-L-95A 50-L-94A 50-L-81A
1C-9,10	2	Capacitor, 8 mfd 600 V DCW oil, type TJU6080	Cornell-Dub.	50-L-23B
1C-11	1	Capacitor, 4 mmf ±10% 500 V DCW Erie Ceramicon #NPOK	Erie	50-L-81A
1F-1	1	Fuse, 1½ amp. type 3AG	Jefferson	112-L-6A
1F-2	1	Fuse, ½ amp. type 3AG	Jefferson	112-L-4A
1K-1	1	Relay, DPDT 117 V AC #1177BF (Crystal change over)	Leach	235-L-2A
1L-1	1	Choke, 350 uh 3 pie R-F choke 200 ma DC #538-S (crystal oscillator plate)	S.W. Inductor	65-L-19A
1L-2	1	Choke, 350 uh 4 pie R-F choke with pick up winding, 200 ma DC #537-S (807 Buffer Plate & Freq. Monitor Coupling)	S.W. Inductor	65-L-20A
1L-3,4	2	Choke, 10 hy 0.2 amp (filter choke)	Raytheon	65-L-22A
1R-1	1	Resistor, 47000 ohm ±10% ½ W type EB	Allen Bradley	237-L-156
1R-2	1	Resistor, 100000 ohm ±10% ½ W type EB	Allen Bradley	237-L-160
1R-3	1	Resistor, 350 ohm 10 W WW type A-119	H. Hindle	237-L-774A

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REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
-1-		EXCITER CHASSIS		
1R-4	1	Resistor, 22000 ohm ±10% 1 W type GB	Allen Bradley	237-L-225
1R-5	1	Resistor, 15000 ohm 18 W WW ferrule type 2 15/16" adj. K bank, A20-9	H.Hindle	237-L-798A
1R-6	1	Resistor, 56 ohm ½ watt	Allen Bradley	237-L-121
1S-1	1	Switch, SPST toggle bat handle #8381K7 3 amp 250 V black oxidized	Cutler-Hammer	263-L-16A
1T-1	1	Transformer, Power 350 V .2 A; 5 V 3A; 6.3 V 6 A, #U-10590	Raytheon	291-L-70D
1TB-1,2	2	Terminal Board, #8-142YMS	H.B. Jones	290-L-18A
1V-1	1	Tube, 6J5 metal (Crystal Osc.)	R.C.A.	
1V-2	1	Tube, 807 (Buffer)	R.C.A.	
1V-3	1	Tube, 5U4G (Exciter Power Supply Rect.)	R.C.A.	
1X-1,3	2	Sockets, 8 pin octal 1½" mtg. centers Cinch #9859 mica filled	Cinch	256-L-10A
1X-2	1	Socket, 5 pin 1½" mtg. center #77MIP5 mica filled bakelite	Amphenol	256-L-7A
1X-4,5	2	Socket, RCA crystal type TMV-129B	R.C.A.	256-L-8A
1Y-1	1	Crystal, freq. as specified #129-B with oven type TMV crystal	R.C.A.	55-U-1B
1Y-2	1	Crystal, spare same as 1Y-1 (extra Cost)	R.C.A.	55-U-1B
-2-		R-F DRIVER & POWER AMPLIFIER SECTIONS		
2B-1,2,3,4	4	Motor, 1 RPM 115 V 60 Cycle Reversible	Electro-Eng.	188-L-1B
2C-1	1	Capacitor, .0005 mfd ±20% 600 V DCW Mica type H or type 4	Sangamo or Cornell-Dub.	50-L-51A

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REPLACEMENT PARTS LIST

SYMBOL NO. -2-	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
2C-2	1	Capacitor, 11-150 mmf variable air #150ED-30	Johnson	50-V-75A
2C-3,4,5,6, 10,12,13,14, 15,22,27	11	Capacitor, 0.01 mfd ±20% 600 V DCW Mica type H-1110	Sangamo	50-L-33A
2C-7	1	Capacitor, 22-150 mmf variable air #150 DD-45	Johnson	50-V-35A
2C-8,9	2	Capacitor, .0001 mfd ±20% 5000 V DCW Mica type 1654L	Aerovox	50-A-140A
2C-11	1	Capacitor, .005 mfd ±20% 500 V DCW Mica type HL or type 4	Sangamo or Cornell-Dub.	50-L-39A
2C-16,17	2	Capacitor, 12 mmfd variable #12C-110	E.F. Johnson	50-U-34A
2C-18	1	Capacitor, .005 mfd ±20% 7000 V Peak Working Voltage, type "E"	Sangamo	50-L-40A
2C-19,19	2	Capacitor, 32-103 mmf variable air #100C110	Johnson	50-V-79A
2C-20,21	As Req.	Capacitor, Ferrule type vacuum cond. (Capacity determined by transmitter frequency)	Gen. Elec. Jennings or Raytheon	50-U-71A
2C-23,24	2	Capacitor, Sangamo type A2L or Cornell type 9, 5000 V test. (Values determined by transmitter freq.)	Sangamo or Cornell-Dub.	
2C-25,26	2	Capacitor, type E (values determined by transmitter freq.)	Sangamo	
2K-1	1	Relay, DPDT 117 V KC #1527 (antenna change over)	Leach	235-L-3A
2L-1,2	2	Coil, 200 uh (fabricated) (813 grid and 813 plate)	Raytheon BED	4-U-68C
2L-3,4,7	3	Choke, 5 mh RFC 500 ma DC #278 (833's grid and 813 plate)	I.C.A.	65-L-21A

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REPLACEMENT PARTS LIST

SYMBOL -2-	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
2L-5	1	Coil, variable link inductor (R.F. Plate & Antenna Coupling) NOTE: Value depends upon frequency Frequency KC | Ind. MH. 1600-800 | 135 800-540 | 240	Johnson	48-U-2C 48-C-6A
2L-6	1	Choke, 2.8 mh RFC 1 amp DC #266 (833 R-F Plate)	I.C.A.	65-L-30A
2R-1	1	Resistor, 15000 ohm 18 W WW ferrule type mtg. 2 15/16" A20-9	H. Hindle	237-L-798A
2R-3,4	2	Resistor, 4000 ohm 45 W WW ferrule type mtg. 5 1/8" L20-13	H. Hindle	237-U-778A
2R-6	1	Resistor, 250 ohm 110 W WW ferrule type mtg. 7 7/16" V20-18	H. Hindle	237-U-779A
2R-7,8	2	Resistor, (Parasitic Suppressor) 50 ohm 0.3 uh #P-300	Ohmite	237-U-805A
2R-9	1	Resistor, 220000 ohm ±20% 2 watt	Allen Bradley	237-L-101
2R-10,11	2	Resistor, 100 ohm, 13 W ferrule type A20-9-2 3/8	H. Hindle	237-A-828A
2T-1	1	Transformer, Filament 10 V 10 A #M-109 33 (813 Filament)	Raytheon	291-L-7A
2T-2	1	Transformer, Filament 10 V 10 A; 10 V 10 A. #U-10930 (833 RF Filament)	Raytheon	291-L-3A
2TB-1	1	Terminal Board, #8-142-YMS	Jones	290-L-18A
2TB-2,3,4,5	4	Terminal Boards, #3-141-YMS	Jones	290-L-7A
2V-1,2	2	Tube, 813 (RF Driver)	R.C.A.	
2V-3,4	2	Tube, 833A (RF Power Amp)	R.C.A.	
2X-1,2	2	Socket, Wafer "813" #237	Johnson	256-L-4A
2X-3,4	2	Socket, "833A" #212	Johnson	256-L-118

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REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
-3-		AUDIO AMPLIFIER & MODULATOR		
3C-1,2,9,10, 11,12	6	Capacitor, 0.25 mfd 600 V DCW paper tubular, type DT #6P-25	Cornell-Dub.	50-L-34A
3C-3,4	2	Capacitor, .01 mfd 600 V oil #A8240BA	J. Fast	50-A-91A
3C-5,6,8,7	4	Capacitor, 0.01 mfd ±20% 600 V DCW mica #H-1110	Sangamo	50-L-33A
3R-1,2	2	Resistor, 27000 ohm ±10% ½ W type EB	Allen Bradley	237-L-153
3R-3,4,9	3	Resistor, 3300 ohm ±10% ½ W type EB	Allen Bradley	237-L-142
3R-5,6,10, 11	4	Resistor, 100,000 ohm ±10% ½ W type EB	Allen Bradley	237-L-160
3R-7,8,12, 13	4	Resistor, 270,000 ohm ±10% ½ W type EB	Allen Bradley	237-L-165
3R-14,15,16, 17,18,19,20, 21	8	Resistor, 2.2 meg. ±10% 2 W type HB	Allen Bradley	237-L-332
3R-22,23	2	Resistor, 47000 ohm ±10% 1 W type GB	Allen Bradley	237-L-229
3T-1	1	Transformer, Audio line to grid, #941 91 RC-75 Case	U.T.C.	291-L-52A
3T-3	1	Transformer, Driver 845's "A" to 833's "B" #U-10936	Raytheon	291-L-35A
3T-4	1	Transformer, Filament 10 V 10 A; 10 V 10 A #U-10930 (833 Modulator Fil.)	Raytheon	291-L-3A
3TB-1,2	2	Terminal Boards, #8-142-YMS	Jones	290-L-18A
3V-1,2	2	Tube, 6J7 Metal (1st A-F Amp)	R.C.A.	
3V-3,4	2	Tube, 6J5 Metal (2nd A-F Amp)	R.C.A.	
3V-5,6	2	Tube, 845 (PP A-F Driver)	R.C.A.	
3V-7,8	2	Tube, 833A (modulator)	R.C.A.	
3X-1,2,3,4	4	Socket, 8 pin octal, 1⅝" mtg. centers #9859 mica filled	Cinch	256-L-10A

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REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
-3-		AUDIO AMPLIFIER & MODULATOR		
3X-5,6	2	Socket, 50 watt #211	Johnson	256-L-1A
3X-7,8	2	Socket, 833A #212	Johnson	256-U-118
-4-		MODULATOR POWER SUPPLY		
4C-1,2	2	Capacitor, 8 mfd 600 V DCW oil, type TJL 6080	Cornell-Dub.	50-L-23B
4F-1	1	Fuse, 1½ Amp type 3AG	Jefferson	112-L-6A
4L-1,2	2	Choke, 10 hy, 0.2 amp #U-11023 (Filter Audio Power Supply)	Raytheon	65-L-22A
4R-1	1	Resistor, 5000 ohm 38 W WW ferrule type mtg. 4 7/16 L20-13	H. Hindle	237-L-777A
4R-2	1	Resistor, 2000 ohm 45 W. Adj. slider WW ferrule type mtg. 5 1/8 L20-13	H. Hindle	237-U-781A
4T-1	1	Transformer, Power 350 V 0.2 A; 5 V 3 A; 6.3 V 6A #U-10590 (Audio Power Supply)	Raytheon	291-L-70D
4T-2	1	Transformer, Filament 10 V 10 A; #M-10933 (845 filament)	Raytheon	291-L-7A
4TB-1,2	2	Terminal Boards, #8-142-YMS	Jones	290-L-18A
4V-1	1	Tube, 5U4G rectifier	R.C.A.	
4X-1	1	Socket, 8 pin octal with 1½" mtg. centers #9859 mica filled	Cinch	256-L-10A
-5-		MODULATOR BIAS SUPPLY		
5C-1,2	2	Capacitor, 8 mfd 600 V DCW oil type TJL 6080	Cornell-Dub.	50-L-23B
5F-1	1	Fuse, 1½ amp type 3AG	Jefferson	112-L-6A
5L-1,2	2	Choke, 3.5 hy 0.4 A DC #U-10929 (Modulator Bias Supply Filter)	Raytheon	65-L-1A

RA-1000
REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
-5-		MODULATOR BIAS SUPPLY		
5R-1,2	2	Resistor, 100 ohm 25 W Pot WW type A	H. Hindle	244-L-17B
5R-3	1	Resistor, 200 ohm 38 W adj. slider WW ferrule type 4 7/16 L20-13	H. Hindle	237-L-788A
5T-1	1	Transformer, Power 80 V DC 0.4A; 5 V 6 A; #U10932 (Modulator Bias Power)	Raytheon	291-L-6A
5TB-1	1	Terminal Board, #8-142-YMS	H.B.Jones	290-L-18
5V-1,2	2	Tube, 5U4G rectifier	R.C.A.	
5X-1,2	2	Socket, 8 pin octal, 1½" mtg. centers Cinch #9859 mica filled	Cinch	256-L-10A
-6-		HIGH V. POWER SUPPLY & RELAY CIRCUITS		
6B-1	1	Cooling fan: 10" ventilator fan #V510	Signal Elec.	115-C-1A
6C-1	1	Capacitor, 4 mfd 7500 V DCW oil Incco type WA	Indus. Cond.	50-V-80A
6C-2,3	2	Capacitor, (consists of two 2 mfd 5000 V DCW oil type TJL in parallel or 1 single 4 mfd type TJL DCW oil)	Cornell-Dub.	50-V-4A
6C-4,5	2	Capacitor, 4 mfd 3000 V DCW oil type TJL #T-30040	Cornell-Dub.	50-U-42A
6C-6AB	1	Capacitor, 2 x 0.1 mfd 600 V DCW dual type DYR #DYR-6011	Cornell-Dub.	50-L-55A
6F-1	1	Fuse, ½ amp. type 3AG	Jefferson	112-L-4B
6F-2,4	2	Fuse, 1½ amp. type 3 AG	Jefferson	112-L-6A
6I-1	1	Lamp, 6 W Candelbra 120 V type 6S-6	Mazda	177-L-6A
6K-1,7	2	Relay, DPST 3 V 6 ohm #1252 (H. V. overload & Med. H. V. overload)	Leach	235-L-10B
6K-3	1	Relay, DPST 60 V DC #1251 (Modulator Bias)	Leach	235-L-7A
6K-4	1	Relay, SPST 117 V AC 30 sec timer (front connected type TD-2) (Time Delay)	Cramer	235-V-12A

RA-1000
REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
-6-		HIGH V. POWER SUPPLY & RELAY CIRCUITS		
6K-5	1	Circuit Breaker, 2 pole contactor 117 V AC Size #1 type SCM #28568-U (Plate Power Contactor)	A.H. & H.	235-U-15A
6K-6	1	Circuit Breaker, 2 pole contactor 220 V AC Size #1 type SMC #28554-U-A (Fil. Power Contactor)	A.H. & H.	235-U-16B
6L-1	1	Choke, 5-9 hy (H.V. Filter Swing) @ 1.25 - .7A #U11412	Raytheon	65-A-38A
6L-2	1	Choke, 7 hy 0.7 A #U11411 (H.V. Filter)	Raytheon	65-A-37A
6L-3,4	2	Choke, 12 hy 0.5 A #U-11062 (Med. H.V. Filter)	Raytheon	65-A-23B
6L-5,6	2	Choke, PW-3 (A.C. Line R.F.)	Lectrohm	65-L-32A
6L-7	1	Choke, 60 hy 0.6 A (modulation reactor) #U-10935	Raytheon	65-L-10A
6R-1,2	2	Resistor, 30,000 ohm 110 W WW ferrule type 4 7/16 L20-13	H. Hindle	237-L-780A
6R-3	1	Resistor, 7000 ohm 110 W ferrule type mtg. with adj. slider type V20-18 7 7/16"	H. Hindle	237-U-792A
6R-4	1	Resistor, 7000 ohm 110 W ferrule type V20-18 7 7/16"	H. Hindle	237-U-793A
6R-5	1	Resistor, 2500 ohm 200 W ferrule type adj. slider 11½"	H. Hindle	237-U-804A
6R-6,7	2	Thermal overload heaters	A.H. & H.	133-L-1A
6R-8	1	Resistor, 3 ohm 18 W WW ferrule type adj. slider 2 15/16 A20-9	H. Hindle	237-L-782A
6R-9	1	Potentiometer, 20 ohm WW type T	Mallory	244-L-14B
6R-10	1	Resistor, 4 meg. vac. fer. type for use with 0-4 kv meter	Weston	237-U-775A
6R-11	1	Resistor, 2 ohm 10 W WW type A, Vitreous Enameled	H. Hindle	237-A-841A

RA-1000
REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
-6-		HIGH V. POWER SUPPLY & RELAY CIRCUITS		
6S-1,2	2	Thermal Overload Relay Block, #42555-A	A.H. & H.	263-L-20A
6S-3,4	2	Switch, SPST type YZ-RQ1 N. open (Interlocks)	Micro Switch	263-L-15A
6S-5	1	Switch, DPST, 20 A. 250 V. #7402K3 (Neutralizing)	Cutler-Hammer	263-A-25A
6T-1	1	Transformer, Modulation PP 833A's Class B 800 W #U-10937	Raytheon	291-U-36A
6T-2	1	Transformer, filament 5V 20A #M-10931 (575 Fil.)	Raytheon	291-L-4A
6T-3	1	Transformer, filament 2.5 V 10 A (866 Fil.)	Raytheon	291-L-12A
6T-4	1	Transformer, Med. H.V. plate, 1500 V DC @ 425 MA DC	Raytheon	291-A-87A
6T-5	1	Transformer, H.V. Plate 2750 V DC @ 1.25 A	Raytheon	291-A-88A
6TB-1	1	Terminal Board, #3-151-MS	Jones	290-L-58A
6TB-2	1	Terminal Board, #6-142-MS	Jones	290-L-32A
6TB-3,4,5,6	4	Terminal Board, AC distribution (Fab.)	Raytheon	4-U-297A
6TB-7	1	Terminal Board, #4-142-MS	Jones	290-L-42A
6TB-8,9,10	3	Terminal Board, #14-142-MS	Jones	290-A-168A
6V-1,2	2	Tube, 575-A (H-V Rectifier)	R.C.A.	
6V-3,4	2	Tube, 866-A (A-F and R-F Power Supply Rectifier	R.C.A.	
6X-1,2	2	Socket, "50" watt #211	Johnson	256-L-1A
6X-3,4	2	Socket, #209	Johnson	256-L-13A
-7-		CONTROL & METER PANELS		
7C-1 thru 13	13	Capacitor, .005 mfd ±20% 600 V DCW mica type HL or type 4	Sangamo or Cornell-Dub.	30-L-39A

RA-1000
REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
-7-		CONTROL & METER PANELS		
7I-1,2,3,4	4	Lamp, 6 W candelabra 120 V type 6S-6	Mazda	177-L-6A
7J-1	1	Jack, closed circuit type #2A	Utah	155-L-2A
7M-1,3	2	Meter, 0-15 ma DC #301-3½" rectangular case (Osc. Plate & R-F Driver Grid)	Weston	187-V-10A
7M-2	1	Meter, 0-100 ma DC #301-3½" rect. case (Buffer Plate)	Weston	187-V-8A
7M-4,11	2	Meter, 0-250 ma DC #301-3½" rect. case (7M-4 RF Driver Plate, 7M-11 - A.F. Driver Plate)	Weston	187-V-12A
7M-5	1	Meter, 0-250 ma DC #741-4½" rect. case (Final Grid)	Weston	187-V-20A
7M-6	1	Meter, 0-15 V AC #744-4½ rect. case (Filament)	Weston	187-C-35A
7M-7	1	Meter, 0-1A DC #741-4½" rect. case (Final Plate)	Weston	187-V-17A
7M-8	1	Meter, 0-4 KV DC #741-4½ rect. case (Final Plate)	Weston	187-V-16A
7M-9* supplied with trans.	(1	Meter, 0-1 ma movement #741-4½ rect. case, less scale (R.F. Line)	Weston	187-B-38A
	(1	Scale, 0-5 RF Amp. for #741 Meter	Ill. Test Lab.	272-B-1A
	(1	Vacuum Tube Current Meter Assembly	Raytheon	4-V-332C
7M-10* optional equip. at extra cost	(1	Meter, 0-1 ma movement #741-4½" rect. case less scale (antenna)	Weston	187-B-38A
	(1	Scale, 0-5 or 0-8 A RF as req. for #741 Meter	Ill. Test Lab.	272-B-1A or 272-B-2A
	(1	Vacuum Tube Current Meter Assembly	Raytheon	4-V-332B
7M-12,13	1	Meter, 0-500 ma DC #741-4½ rect. case (Modulator Plate)	Weston	187-V-19A

* Thermocouple type meter may be used here when available, replacing VTCM arrangement.

RA-1000
REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
-7-		CONTROL METERS & PANELS		
7R-1	1	Rheostat, 3 ohm 150 W WW type D	H. Hindle	246-L-1B
7R-2	1	Rheostat, 500 ohm 300 W WW type E	H. Hindle	246-U-5A
7S-1,2	2	Switch, SPST toggle 3 A 250 V bat handle #8381K7, black oxidized finish (Crystal change over & antenna change over)	Cutler-Hammer	263-L-16B
7S-4,6,8 thru 15	10	Switch, Push-button type B-1	A.H. & H.	263-L-18A
7S-5,7	2	Switch, Push-button, type B-3	A.H. & H.	263-L-19A
	2	Knobs, (Filament Plate)	John Mack	166-V-2A
		MISCELLANEOUS		
	4	Couplings, flexible #251A	Johnson	59-L-3A
	2	Couplings, flexible #250	Johnson	59-L-1A
	1	Drive, worm drive unit #10,000	Millen	90-L-1A
	2	Plate Caps, type 12	National	41-L-4A
	4	Plate Caps, type 36001	Millen	41-L-3A
	1	Plate Caps, type 36002	Millen	41-L-2A
	16	Cone Insulator, 3" #504	Johnson	145-L-5A
	2	Cone Insulator, 2" #503	Johnson	145-L-7A
	16	Cone Insulator, 1" #501	Johnson	145-L-8A
	32	Cone Insulators, 5/8" #500	Johnson	145-L-9A

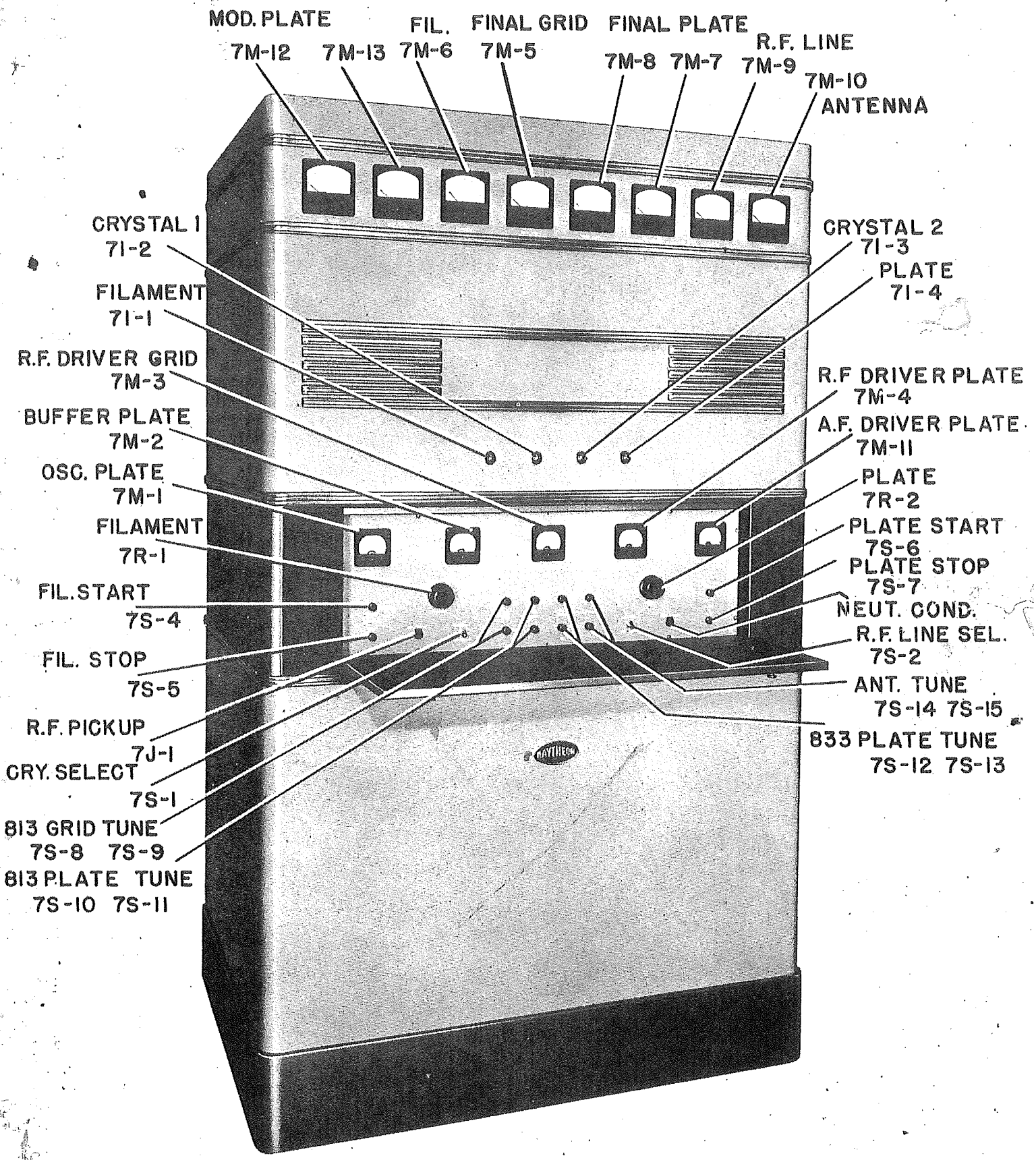
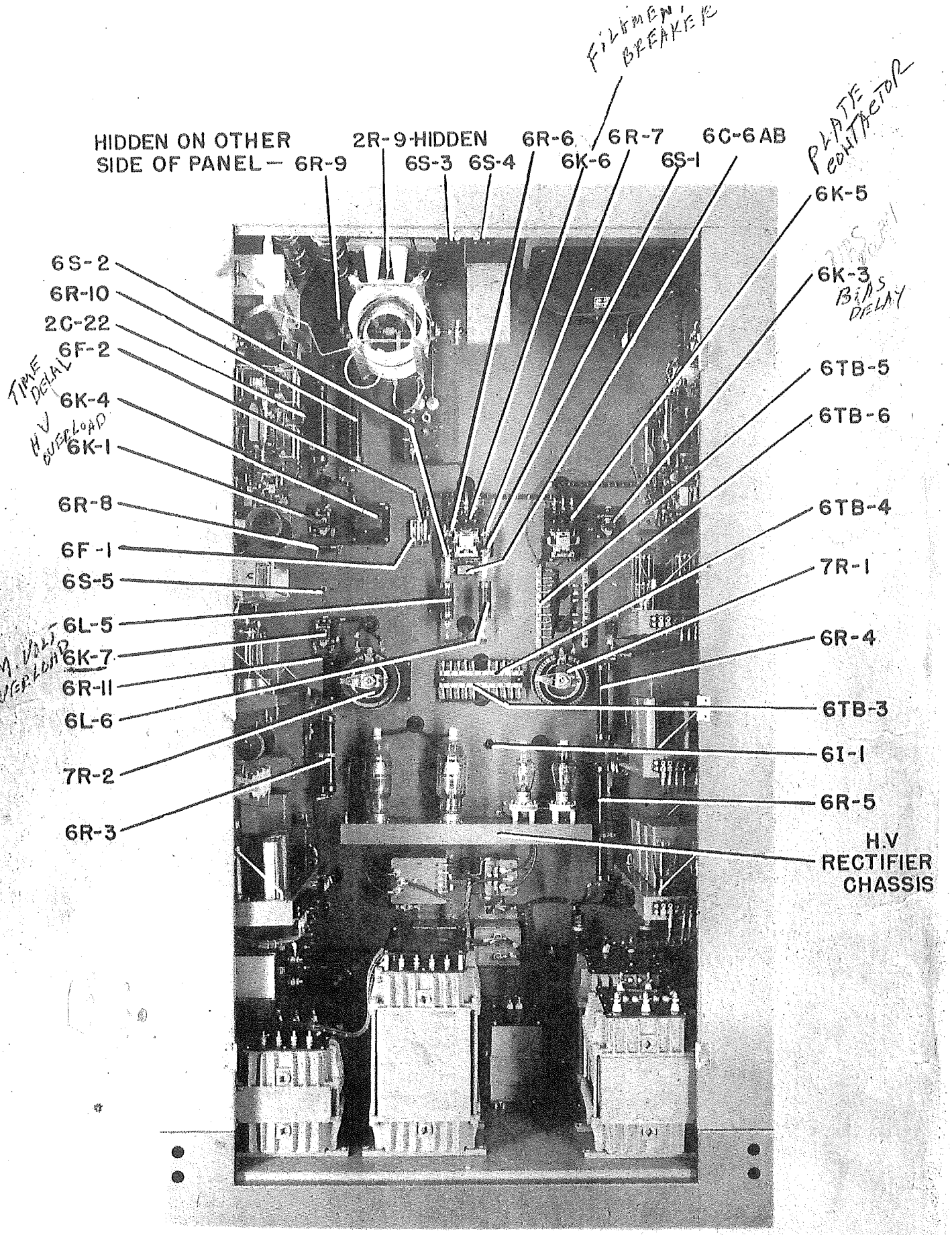


FIG. I. FRONT VIEW

PH-1



PH-2

FIG. 2 REAR VIEW

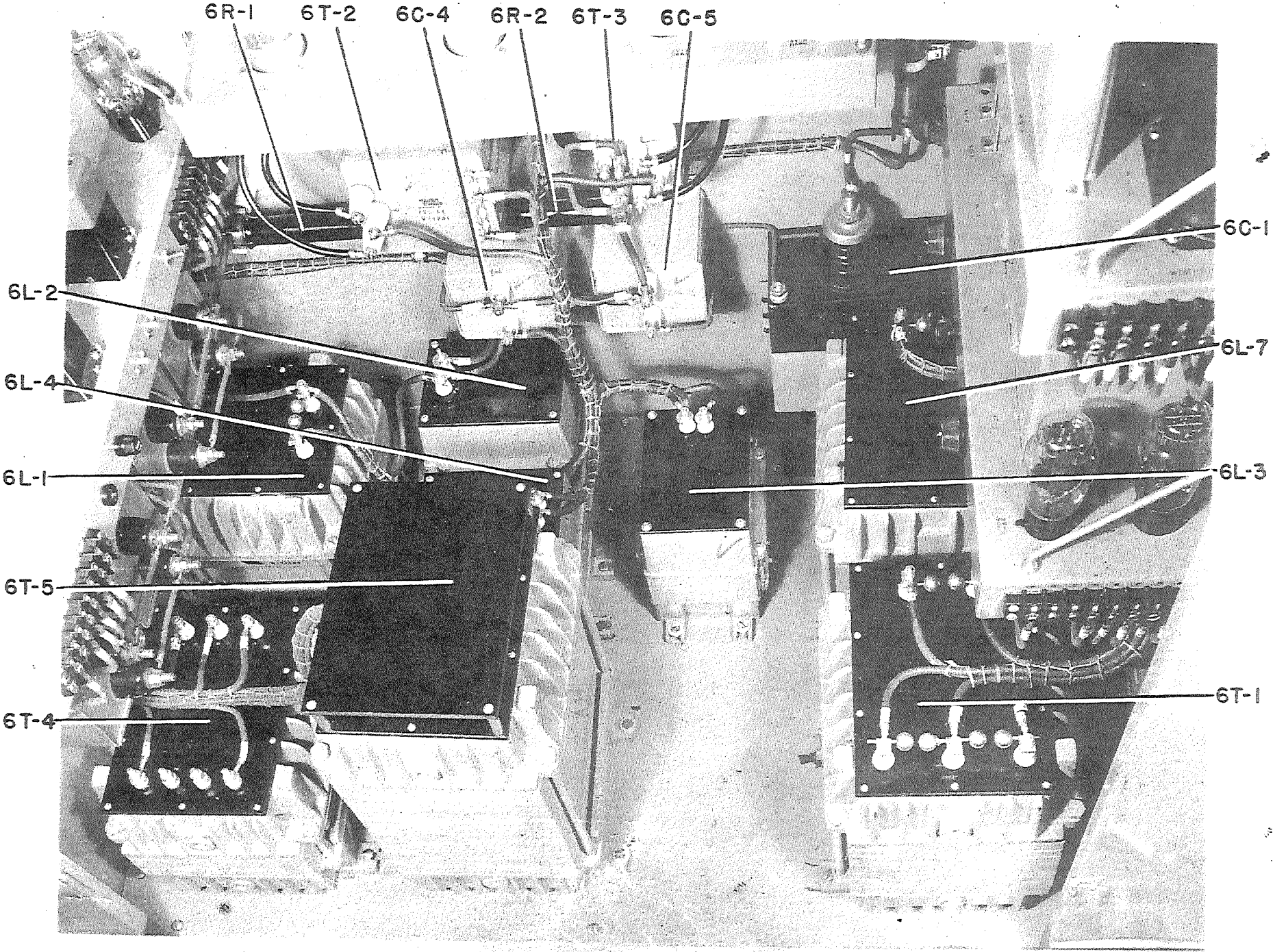


FIG. 3 H.V. POWER SUPPLY & MOD. COMP.

PH-3

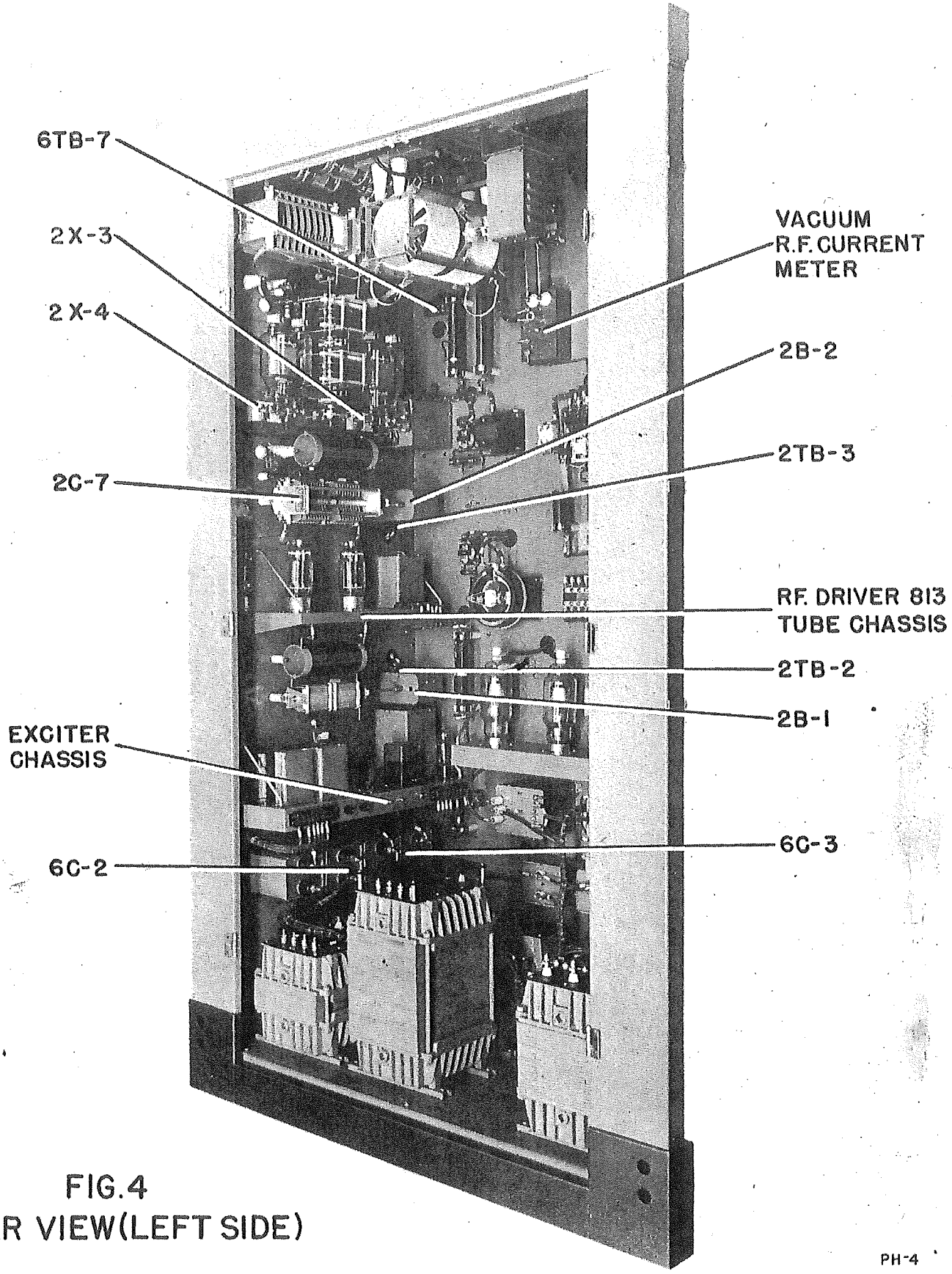


FIG.4
REAR VIEW(LEFT SIDE)

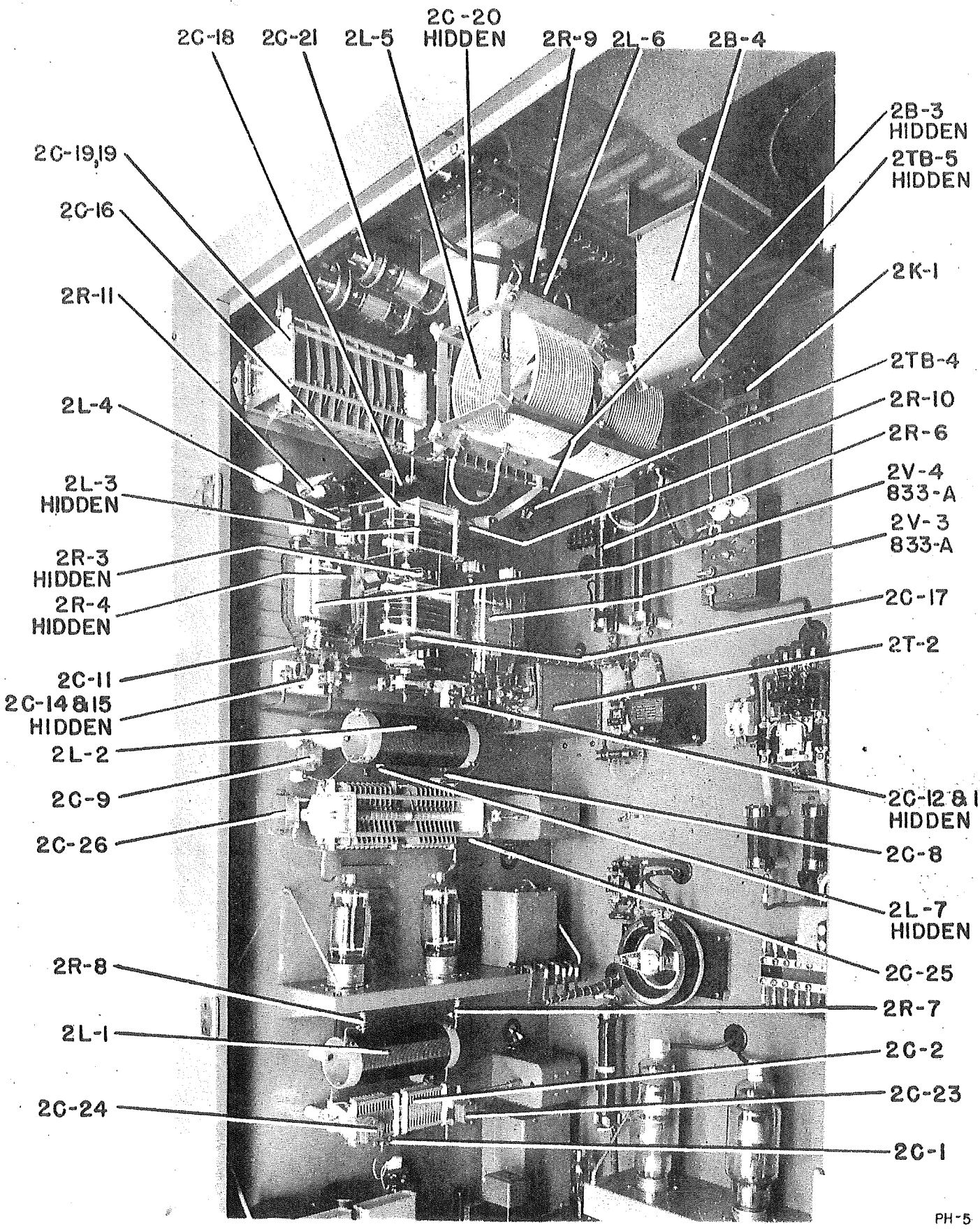
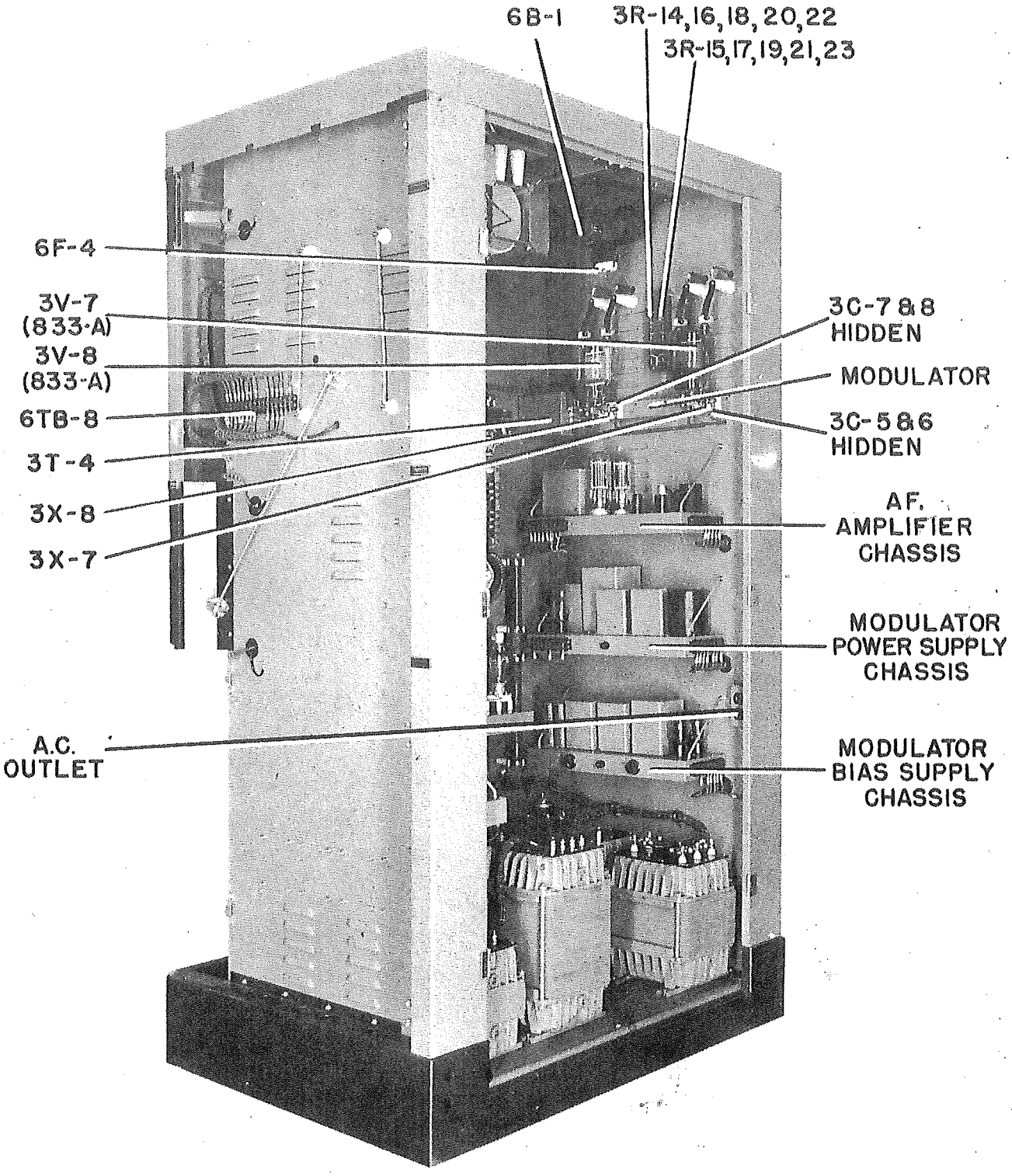


FIG. 5 RF POWER AMPLIFIER & DRIVER



PH-6

FIG.6
(RIGHT SIDE) REAR VIEW

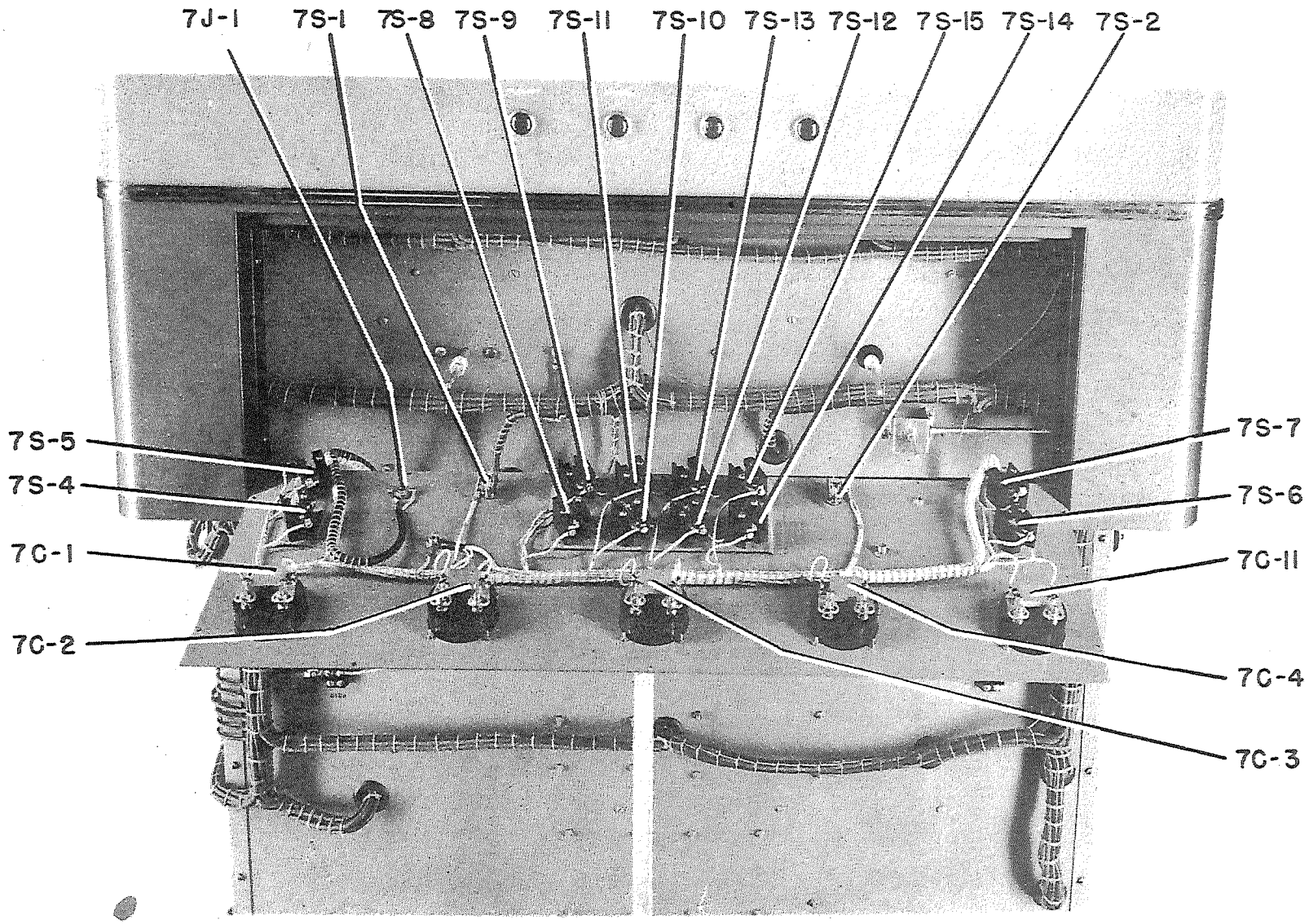


FIG. 7 CONTROL PANEL (REAR)

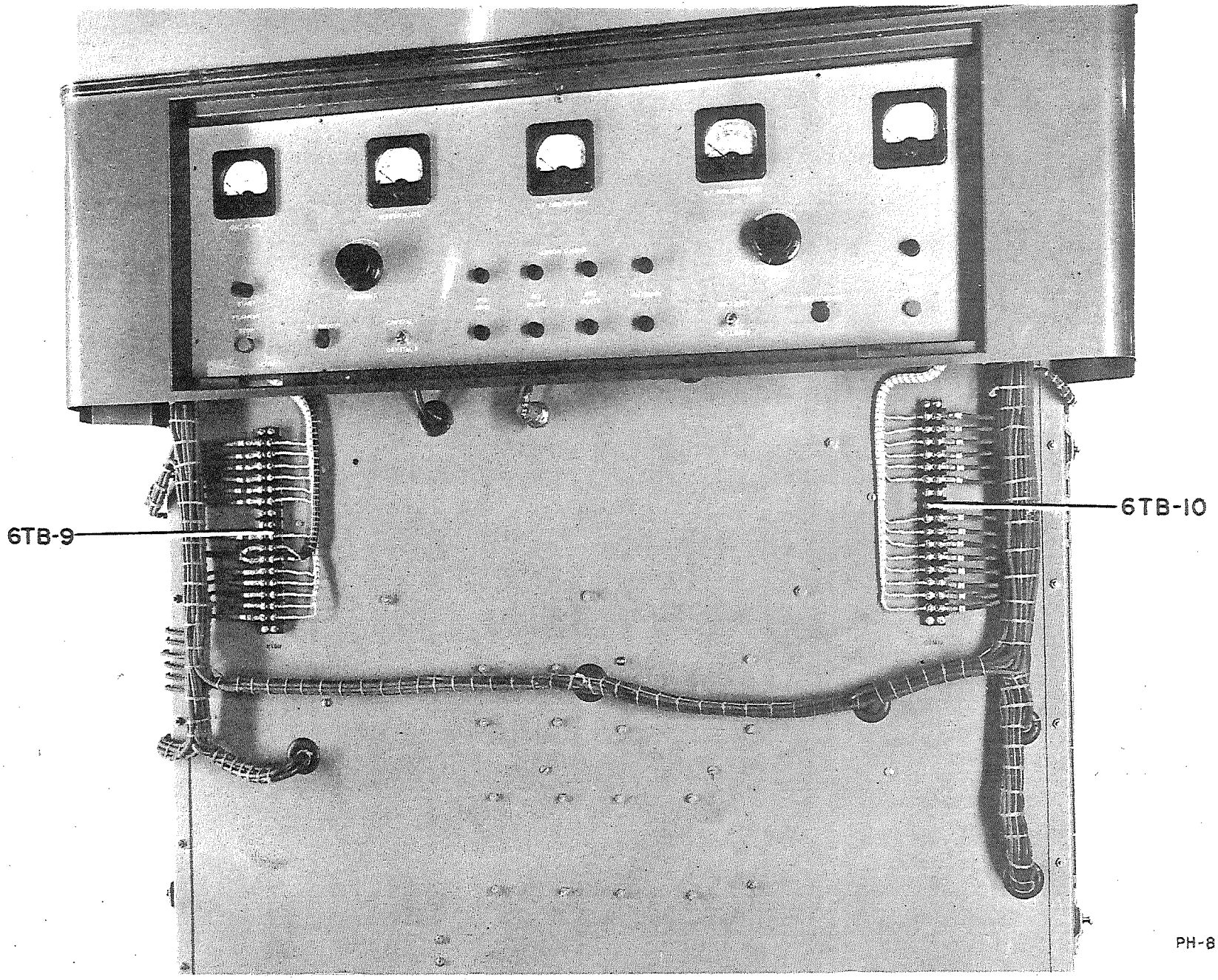
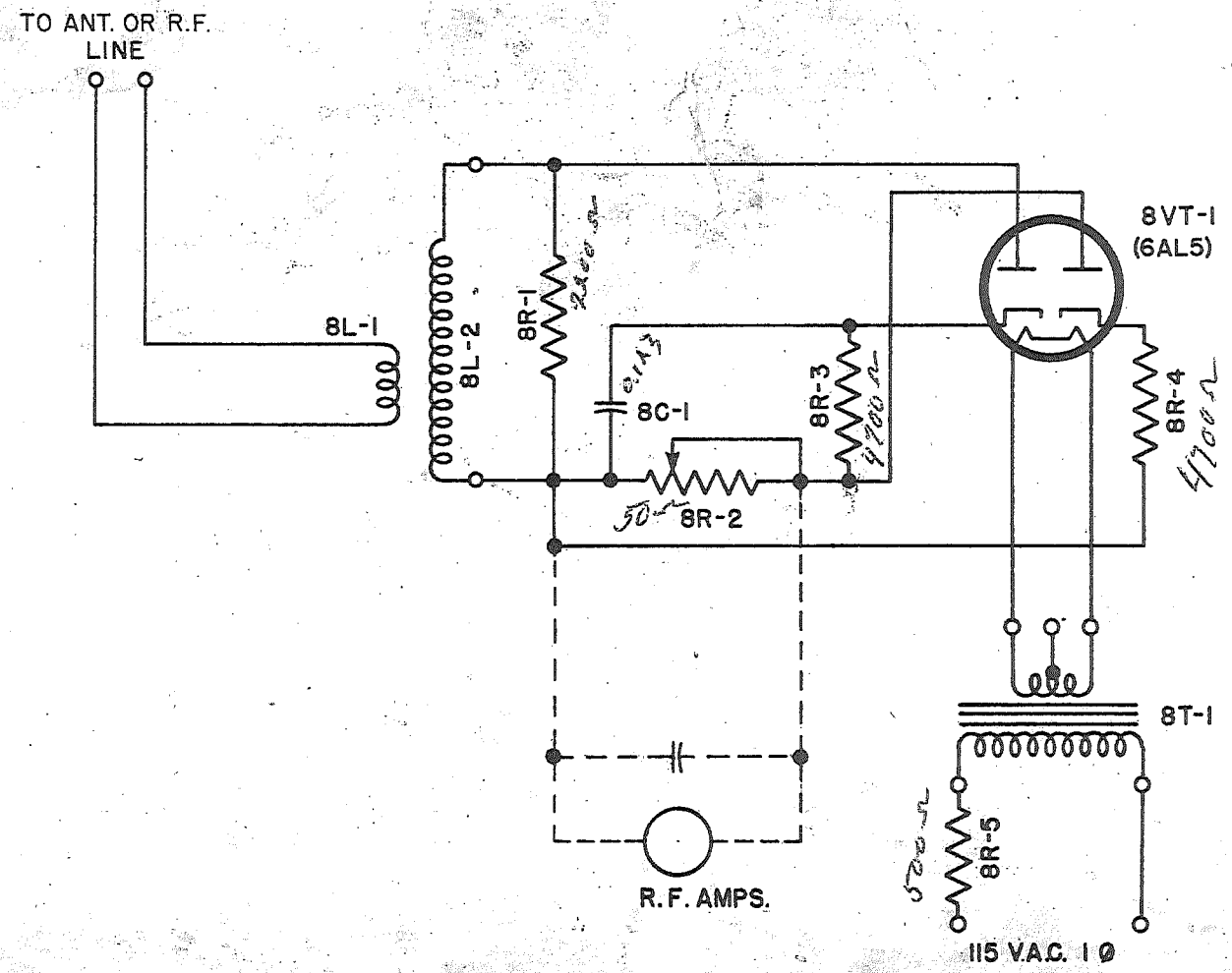


FIG. 7A FRONT VIEW (LOWER PANEL REMOVED)



ISSUE	REVISION	APP'D
B	C.O. #470 LINES TO R.F. AMPS. METER WERE SOLID. NOTE ON SCHEM. READ R.F. LINE	

SECTION 2
Fig. 1

DR. W. S. Rogers DATE 7-22-46 APP'D CHK. RAB

VACUUM TUBE R. F. CURRENT METER

FIRST USED ON 8579 RCM-10 SCHEMATIC DIAGRAM

RAYTHEON MFG. CO

REPLACEMENT PARTS LIST

SYMBOL NO.	NO. REQ.	DESCRIPTION	SUPPLIER	RAYTHEON PART NO.
8C-1	1	Condenser: 3x0.1 mfd 400 V DCW type BT oil filled	Mallory	50-L-82A
8L-1	1	Coil: 3 turns #12 tinned copper 7/8" I.D.	Raytheon	48-L-4A
8L-2	1	Coil: 300 T. universal #32 copper SSE	Raytheon	4-L-333A
8R-1	1	Resistor: 2200 ohms ½ W. ±10% type EB	Allen Bradley	237-L-140
8R-2	1	Potentiometer: 50 ohm WW type C50R	Mallory	246-L-6A
8R-3,4	2	Resistor: 4700 ohm ½ W. ±10% type EB	Allen Bradley	237-L-1
8R-5	1	Resistor: 500 ohm WW ±20% 5 W. type 1½L	Lectrohm	237-L-8
8T-1	1	Transformer: Pri. 6.3 V 1A. Sec. 115 V 60 Cy. #T-19F80	Thordarson	
8TB-1	1	Terminal Strip: Cinch #1623	Cinch	290-L-
8V-1	1	Tube: 6AL5	Raytheon	
	1	Socket: Miniature type #9328	Cinch	265-L-1
	1	Volume Control: Shaft Lock #10061	Millen	176-L-2A
	1	Shield: Miniature type #8680	Cinch	265-L-13A

SECTION 2.

INSTRUCTIONS

FOR

VACUUM TUBE CURRENT METER

MODEL RCM-10

USED ON

RA-250 TRANSMITTER
RA-1000 TRANSMITTER
RT-1000 ANTENNA TUNING UNIT

Manufactured
by

RAYTHEON MANUFACTURING COMPANY
BROADCAST EQUIPMENT DIVISION
CHICAGO, ILLINOIS

IB8-2(A)

S.O. 8579-8621

RAYTHEON

VACUUM TUBE CURRENT METER

MODEL RCM-10

TECHNICAL SUMMARY

Specifications

Frequency Range..... 540-1600 Kc

Scale..... Linear

Power..... 100-200 V 50-60 Cycles

Accuracy..... 2% when used with Weston type 301 meter.
1% when used with Weston type 741 meter.

GENERAL INFORMATION

The RCM-10 Vacuum Tube Current Meter comprises a type 6AL5 tube, filament transformer, coils and other associated parts on a bakelite panel and mounted in a metal housing. It is intended for use with the linear remote meters in existing transmitter equipment.

The Vacuum Tube Current Meter supplied with the RA-250 or RA-1000 transmitters for use as a line current meter is adjusted at the factory for the customer's specified frequency. Its accuracy is well within the 2% tolerance required by F.C.C. regulations.

When this unit is used as a remote reading antenna current meter in the Model RT-1000 Antenna Tuning Unit it should be adjusted in agreement with the thermocouple antenna current meter (M-13) which is part of RT-1000. The course adjustment of the remote reading meter can be made by varying rheostat 8R-2 located on RCM-10 next to the 6AL5 tube. This rheostat is provided with a shaft lock. The fine adjustment should be made by varying the remote meter adjustment potentiometer. This adjustment is located on the transmitter behind the antenna current meter and is accessible from the right hand side door.

The RCM-10 Meter is intended to read only average line or antenna current and it is provided with a suitable time constant circuit to prevent carrier modulation from being indicated. The meter will therefore not follow the modulated carrier and it can be read at any time for making log entries.

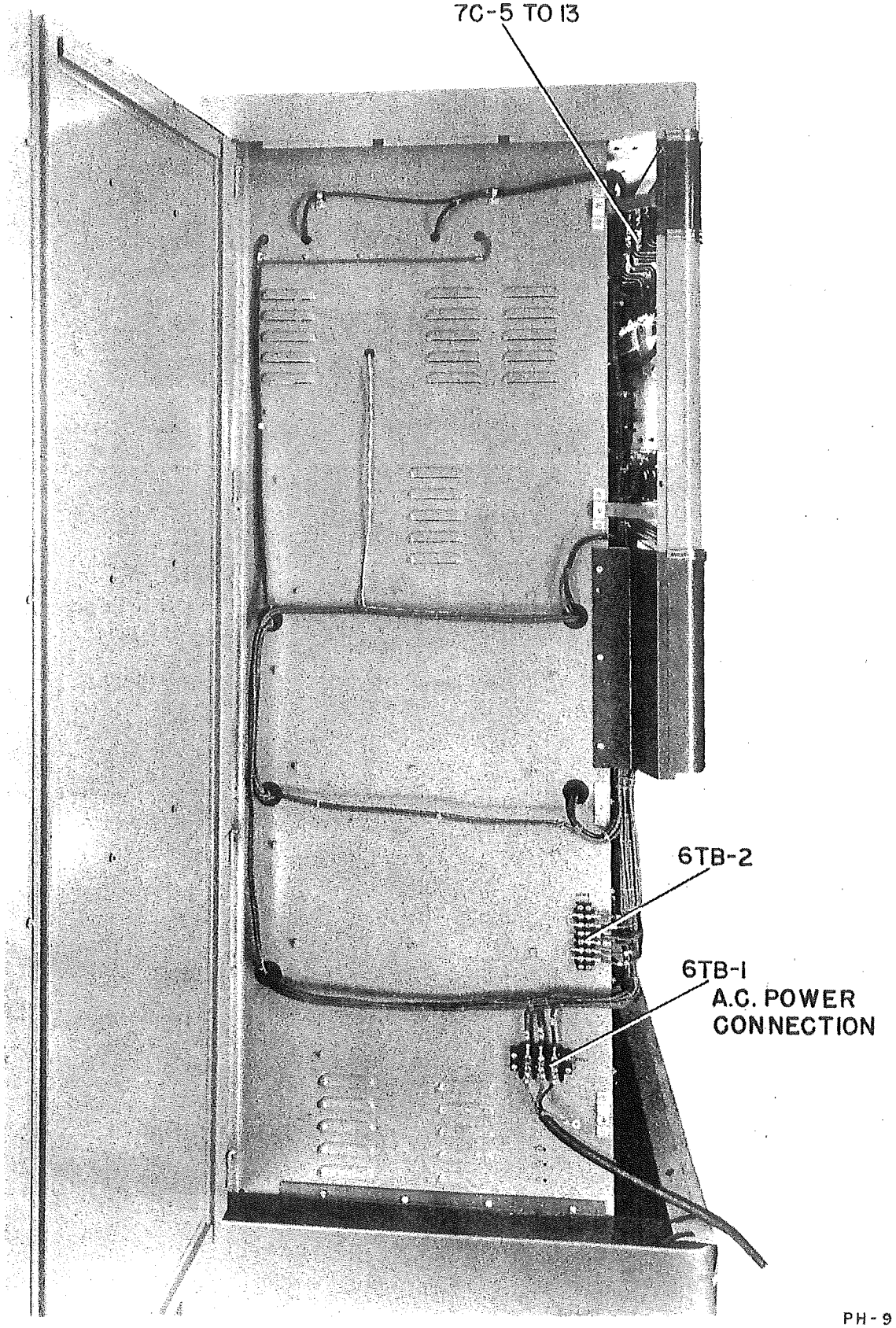


FIG. 8 SIDE VIEW (LEFT)

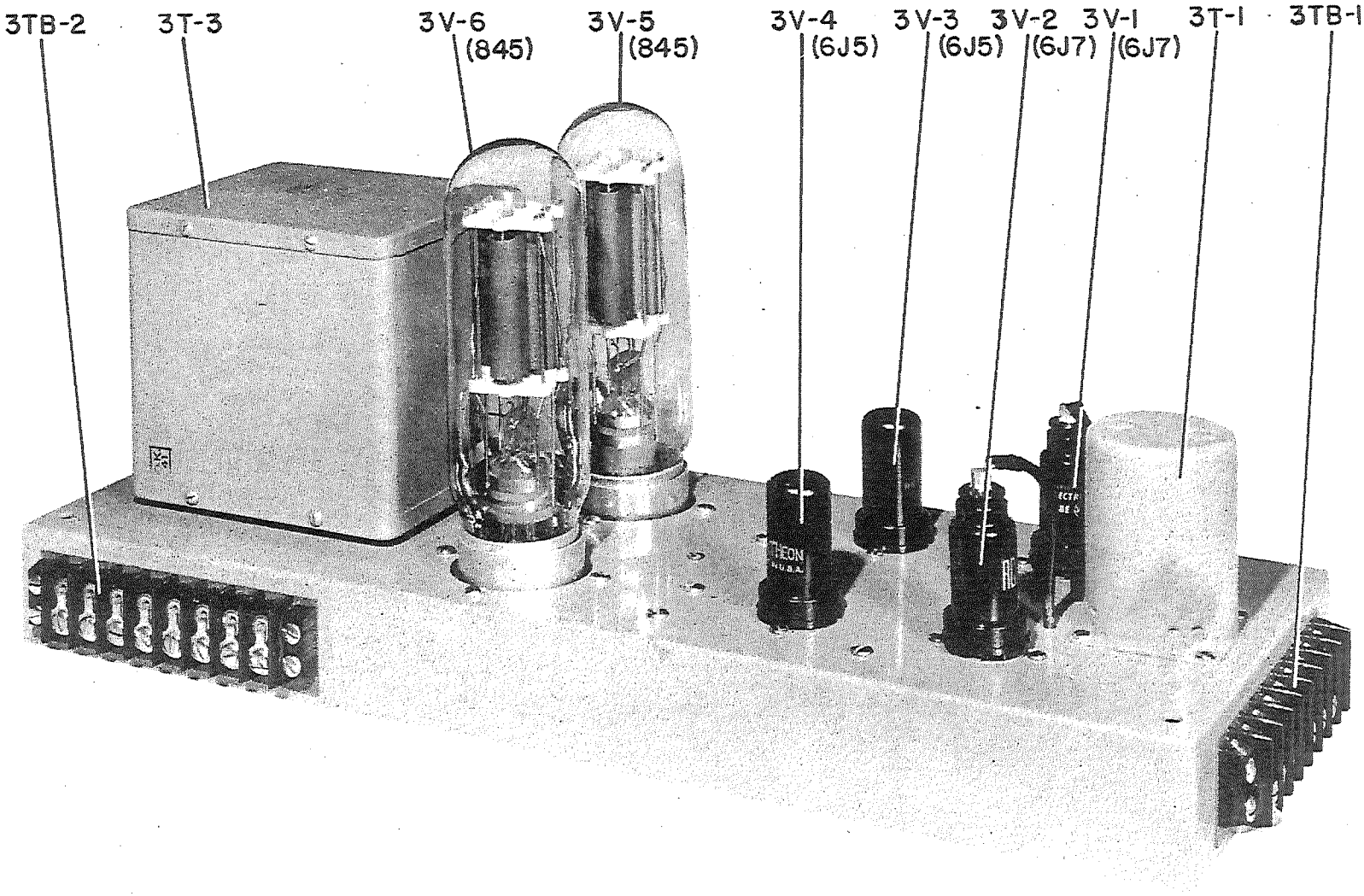


FIG. 9 AF AMPLIFIER CHASSIS (TOP)

PH-10

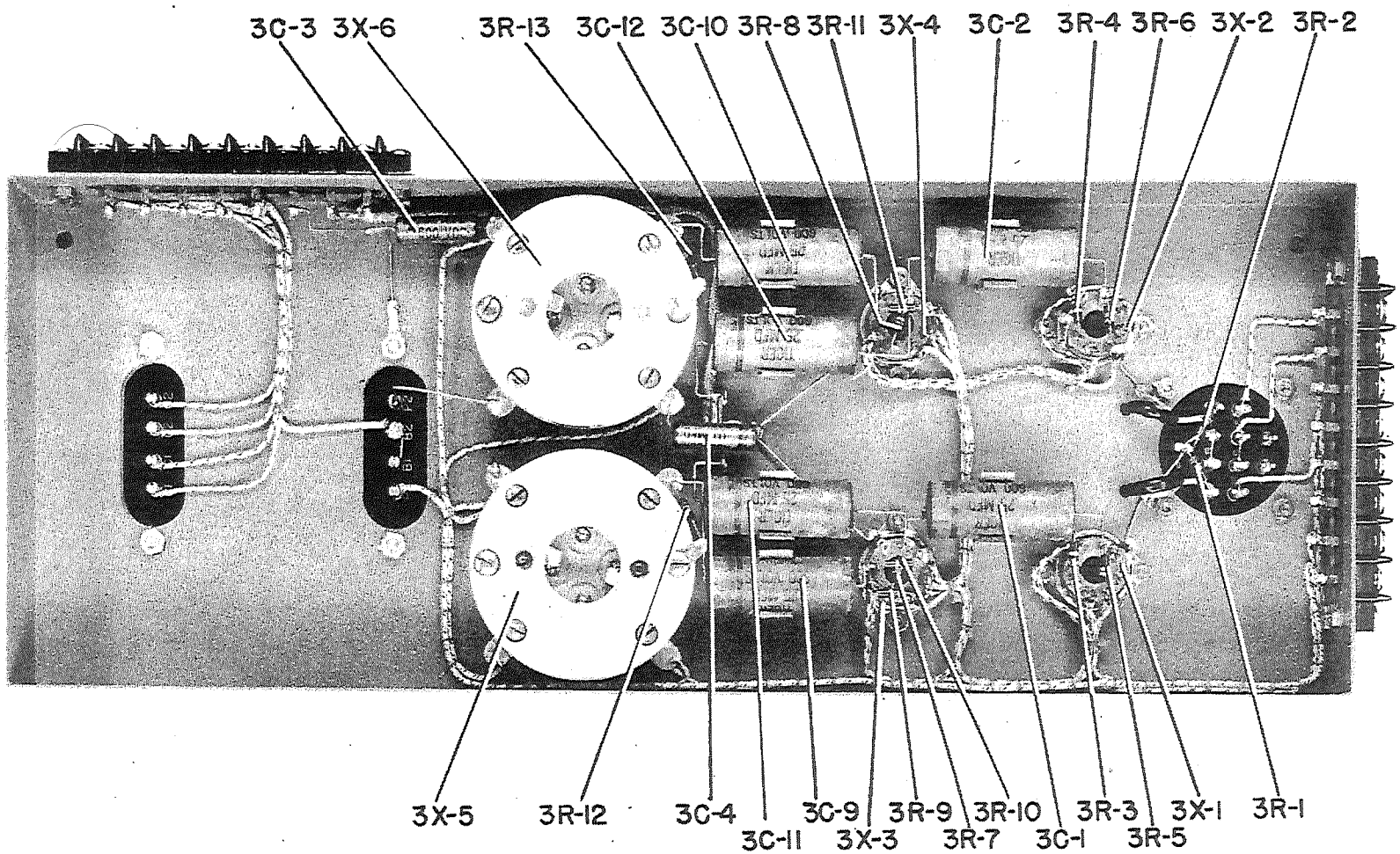


FIG. 10 AF AMPLIFIER CHASSIS (BOTTOM)

PH-11

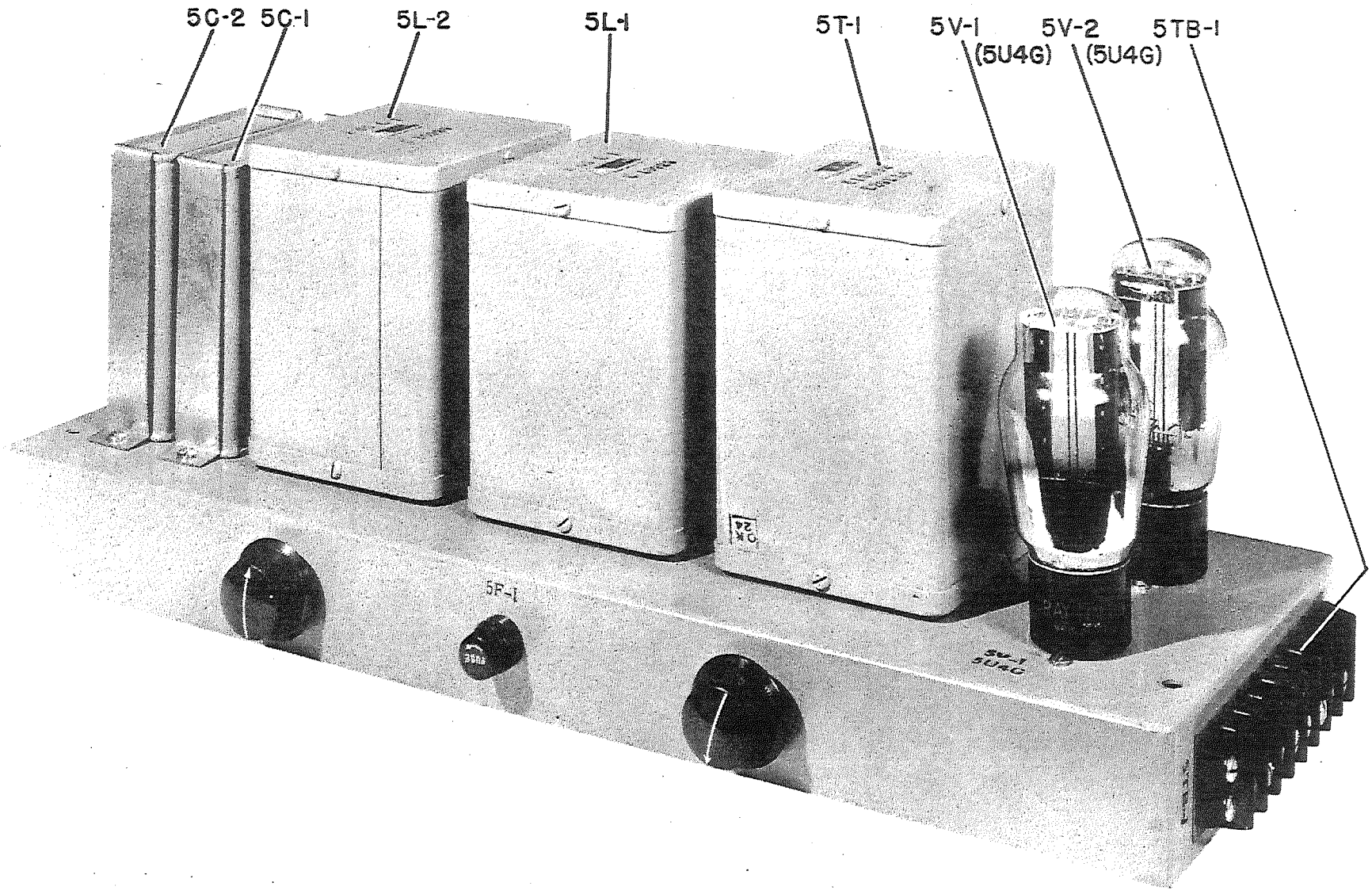
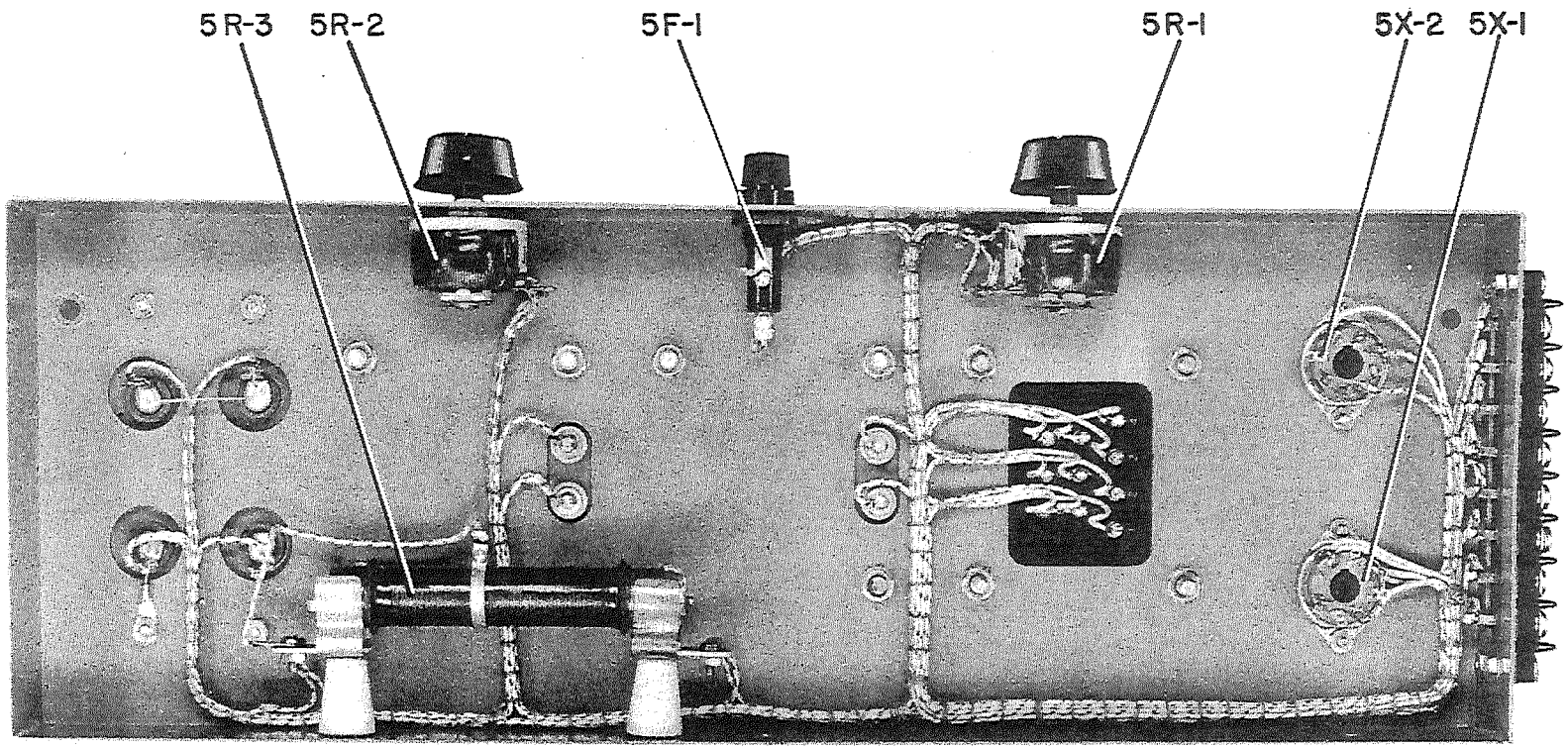


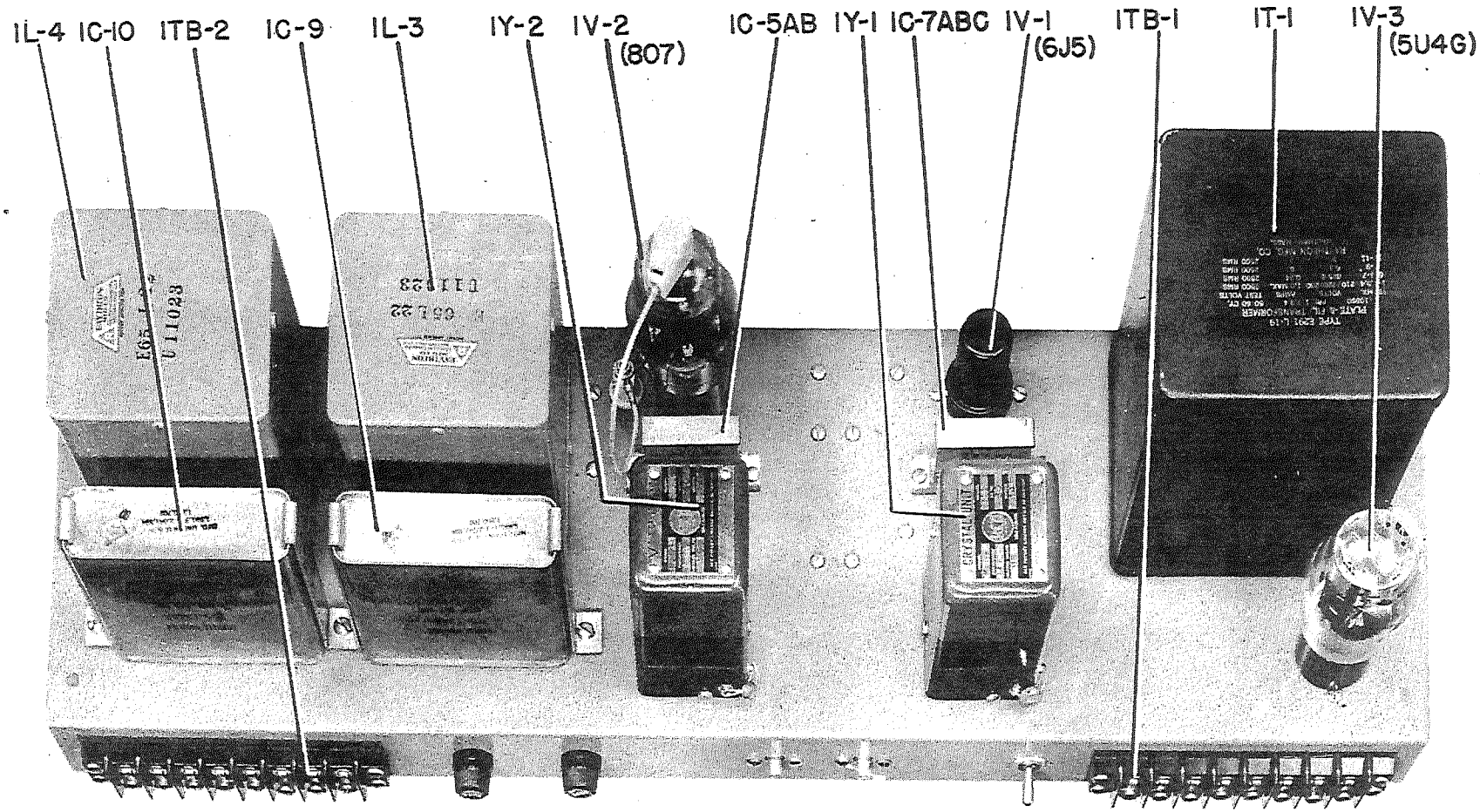
FIG. 11 MODULATOR BIAS SUPPLY (TOP)

PH-12



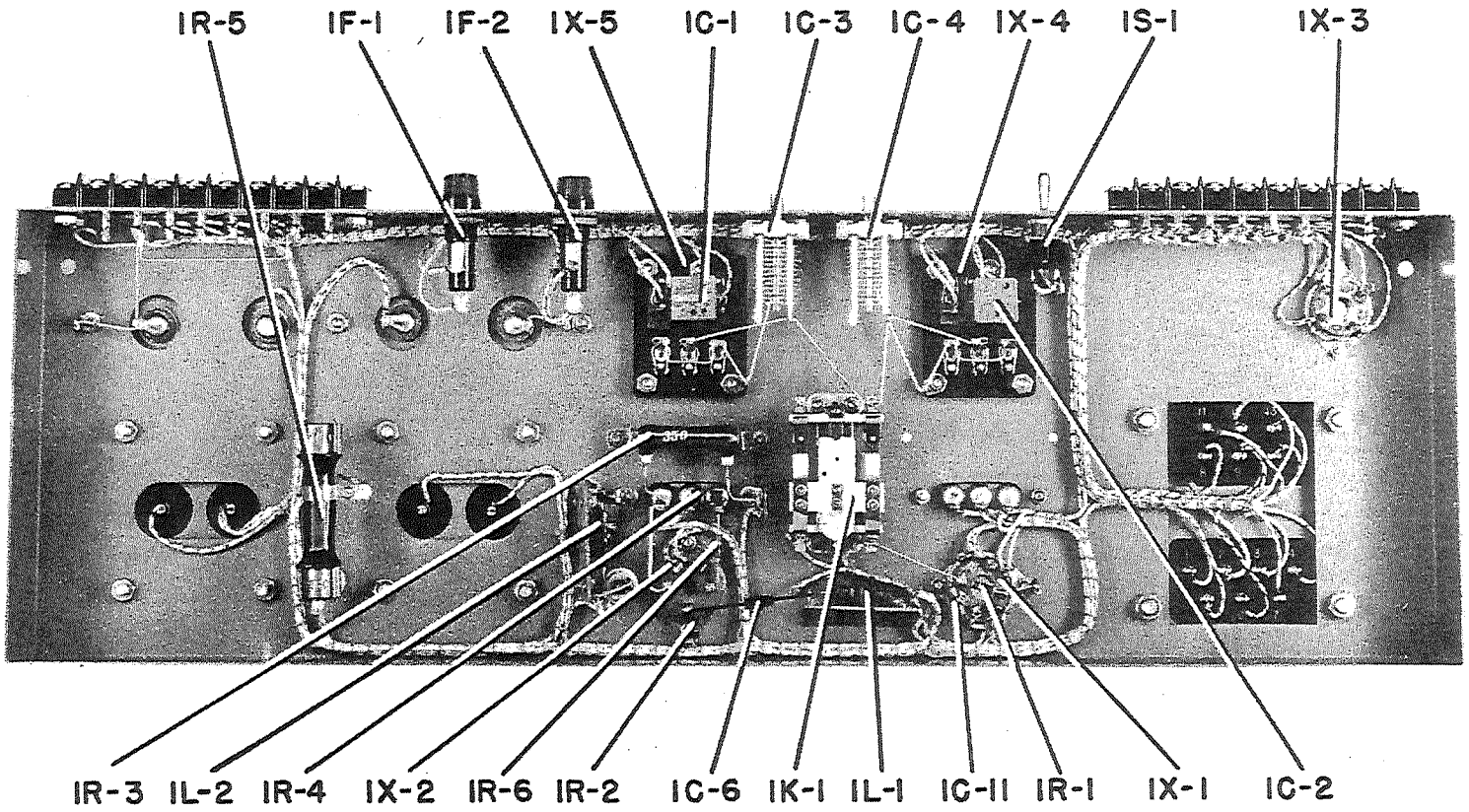
PH-13

FIG. 12 MODULATOR BIAS SUPPLY (BOTTOM)



PH-14

FIG 13 EXCITER CHASSIS (TOP)



PH-15

FIG. 14 EXCITER CHASSIS (BOTTOM)

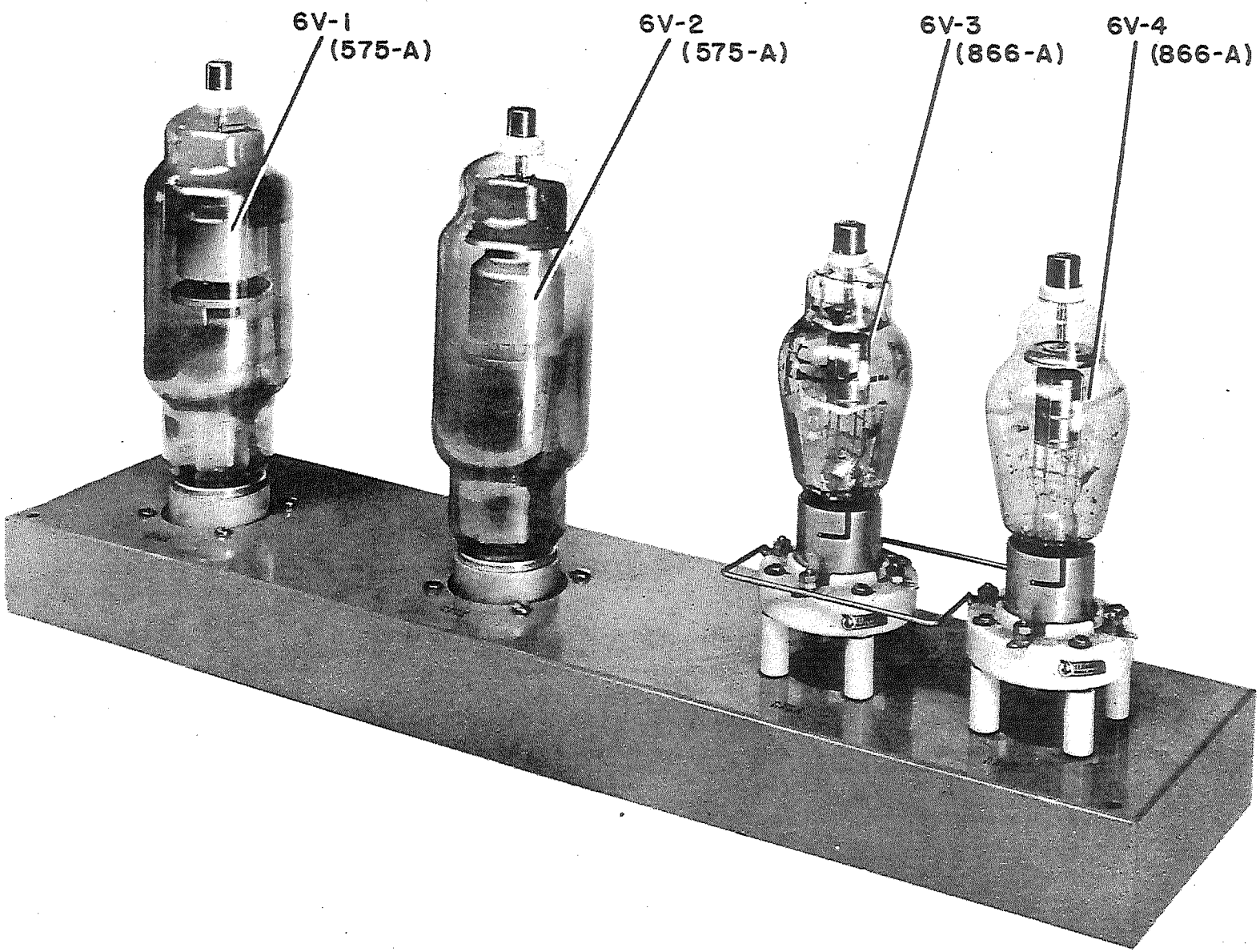
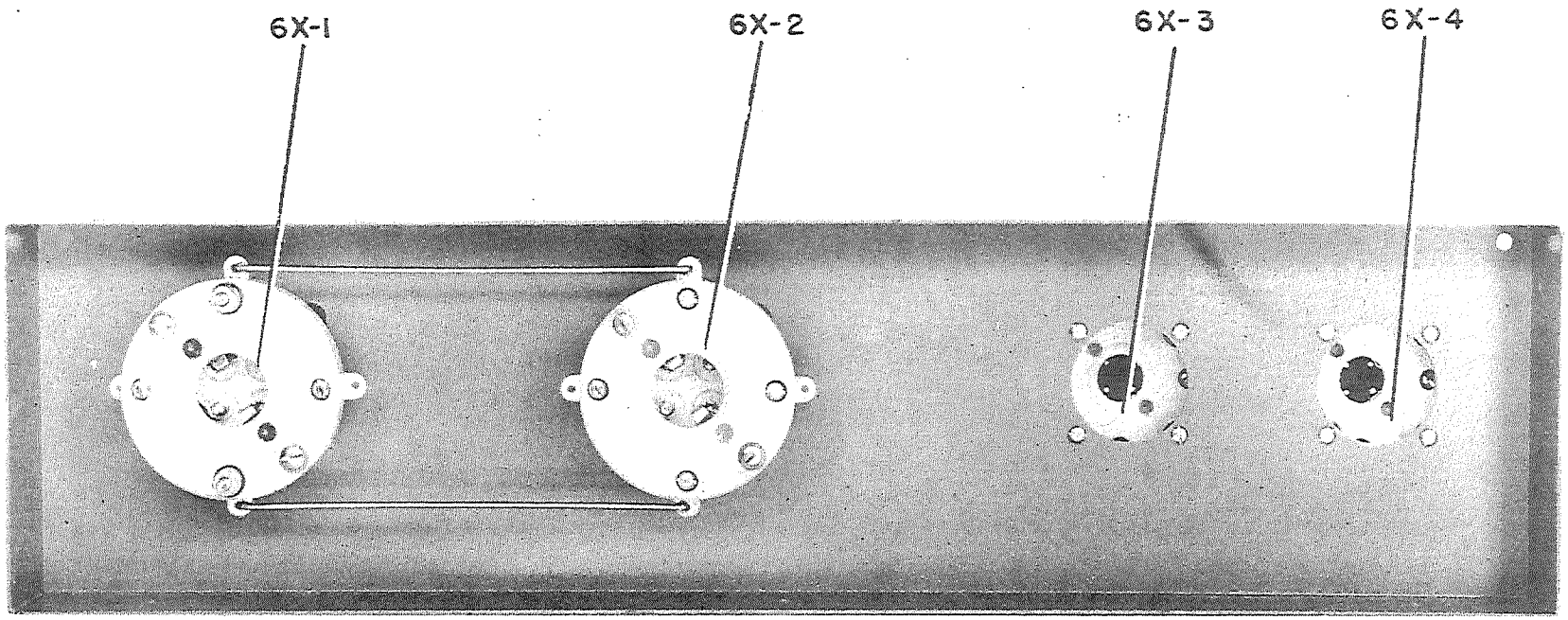


FIG. 15 HV. RECTIFIER CHASSIS (TOP)

PH-16



PH-17

FIG. 16 H.V. RECTIFIER CHASSIS (BOTTOM)

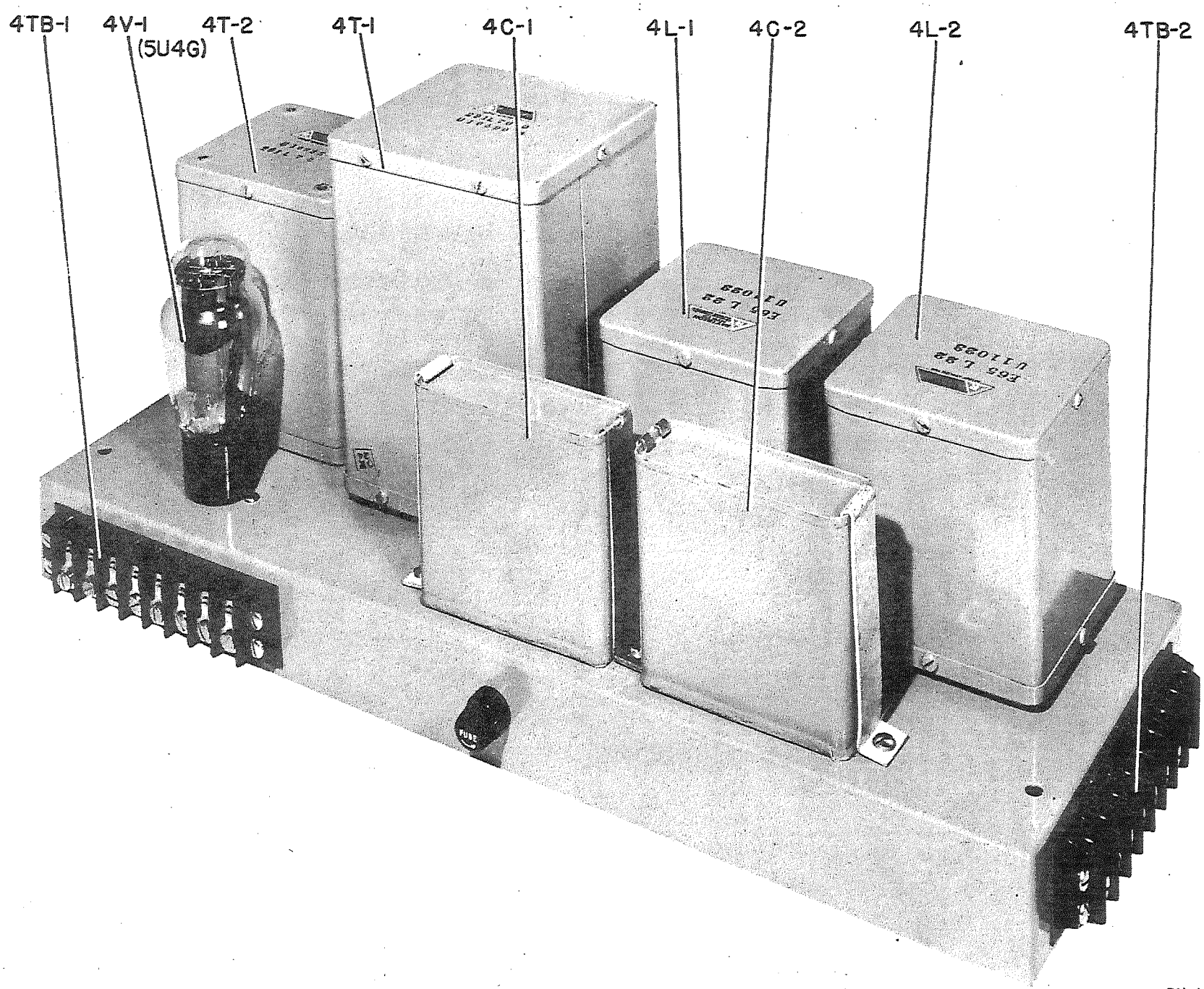


FIG. 17 MODULATOR POWER SUPPLY (TOP)

PH-18

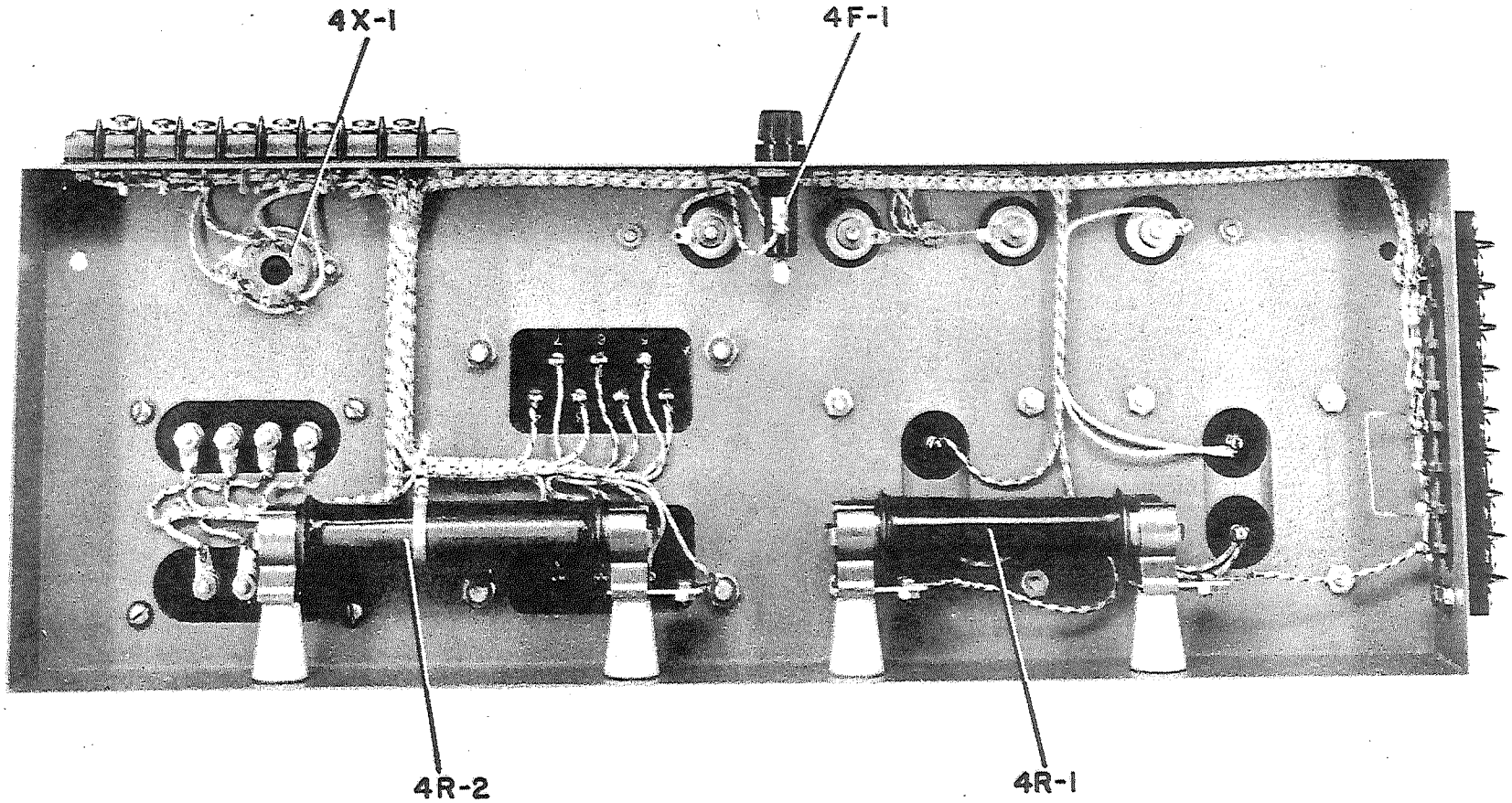


FIG. 18 MODULATOR POWER SUPPLY (BOTTOM)

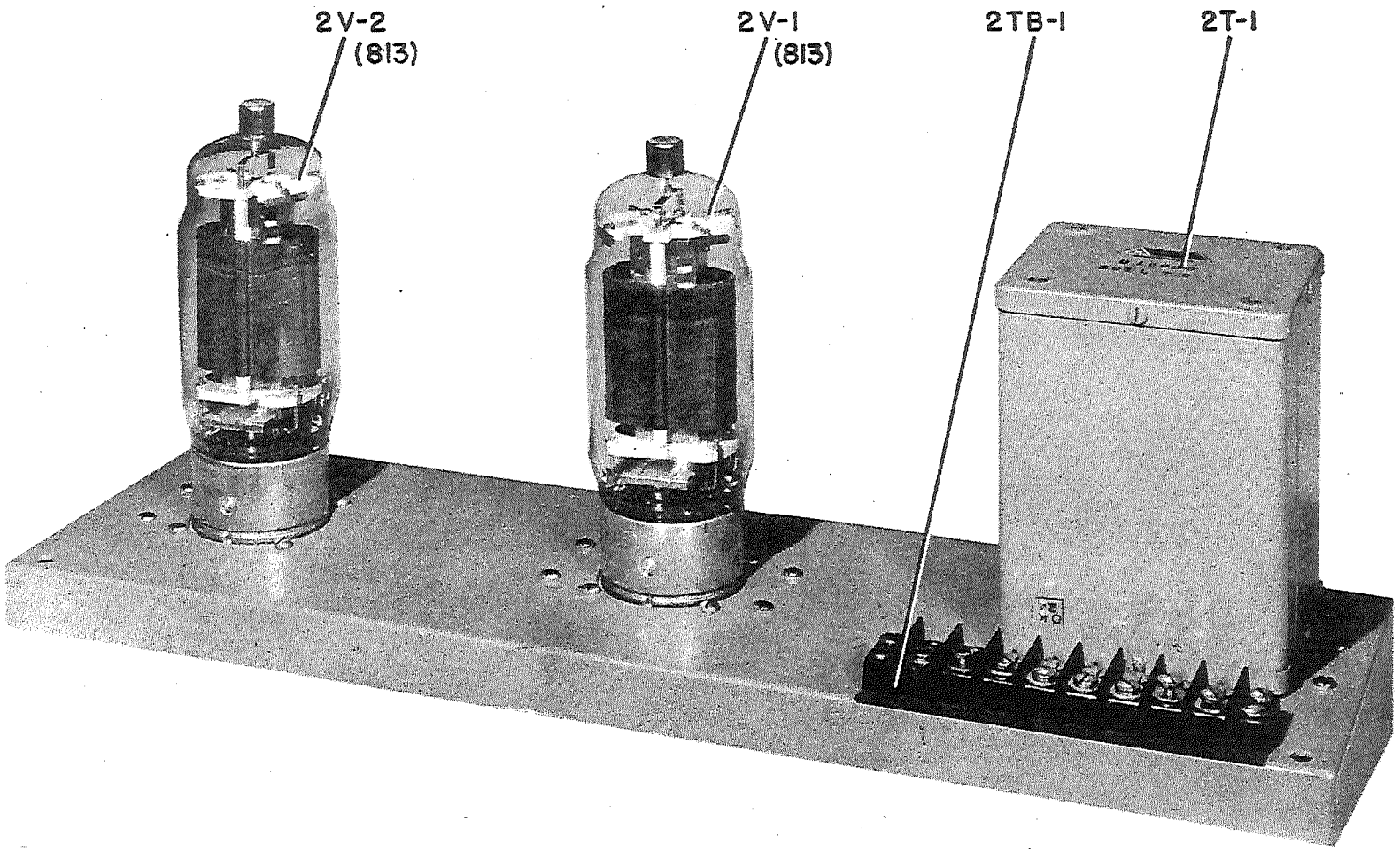
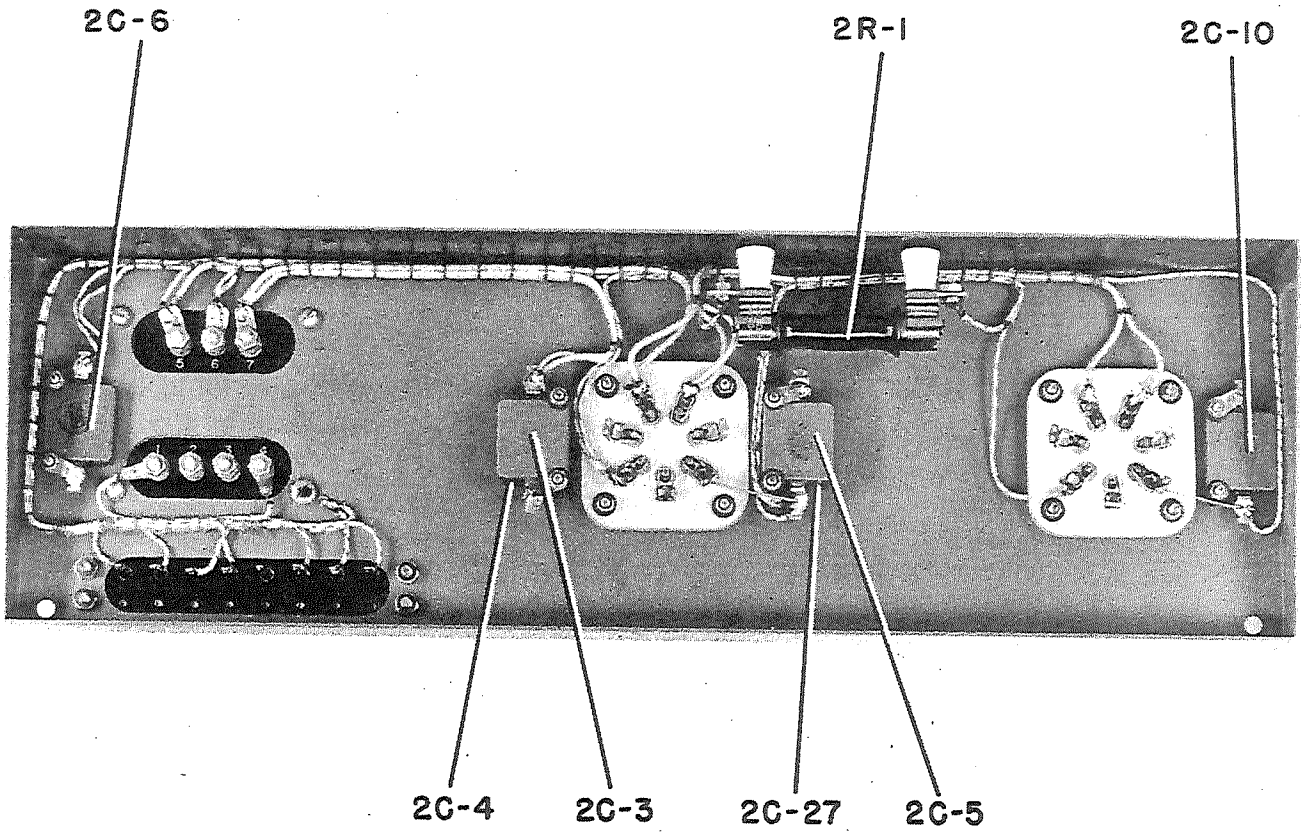
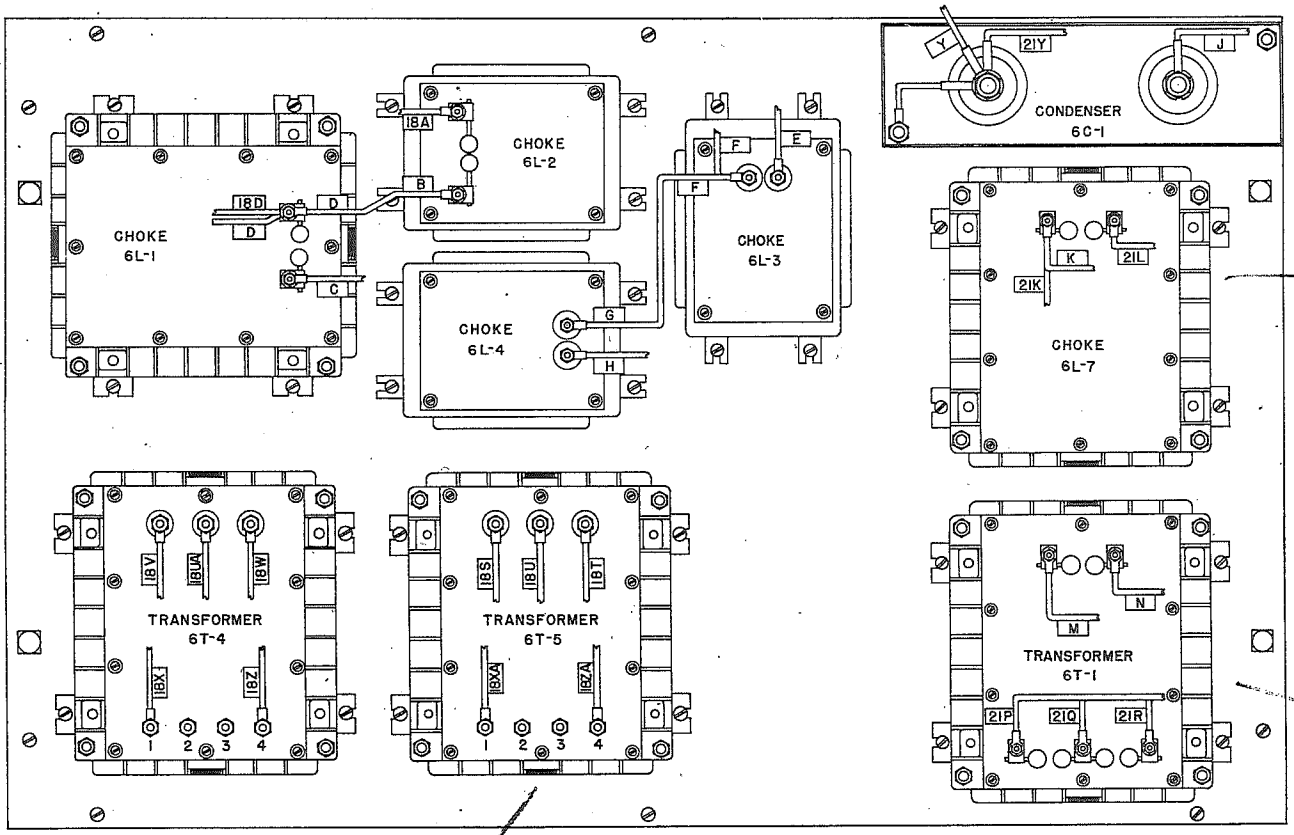


FIG. 19 RF DRIVER 813 TUBE CHASSIS (TOP)



PH-21

FIG. 20 RF. DRIVER 813 TUBE CHASSIS (BOTTOM)



MOD. REACTOR.

MODULATOR TRANSFORMER

H.V. TRANSFORMER

SUPERSEDES DRG. #88-W-25. 12-3-46-WP.

FIG. 2.1

DR. N. PFEIFFER DATE 12-3-46 APP'D CHK.

BASE PLATE WIRING DIAGRAM

FIRST USED ON 1 KW. A.M. TRANSMITTER (8519)

RAYTHEON MFG. CO. BROADCAST EQUIPMENT DIV.

88-D-33A

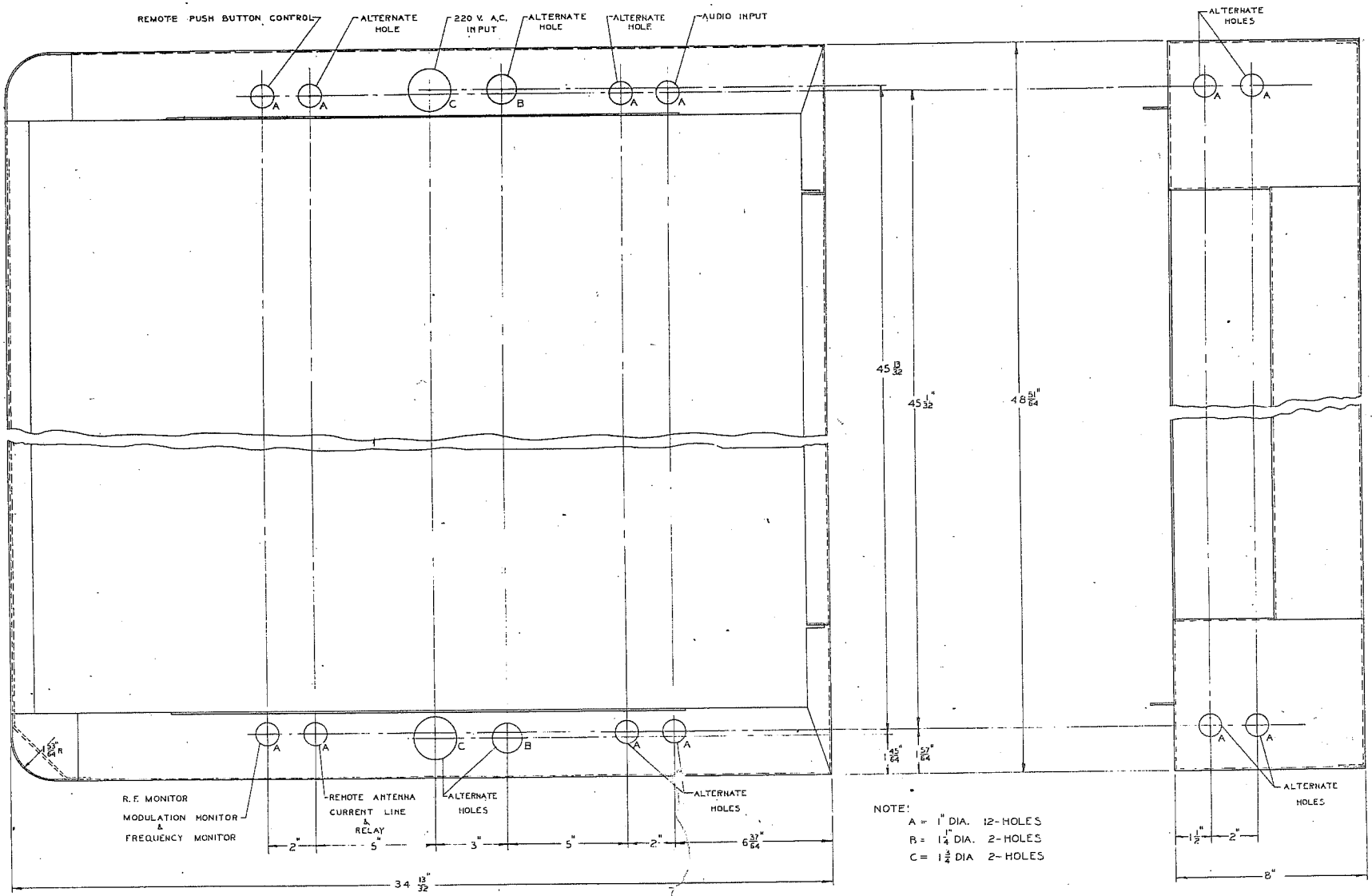
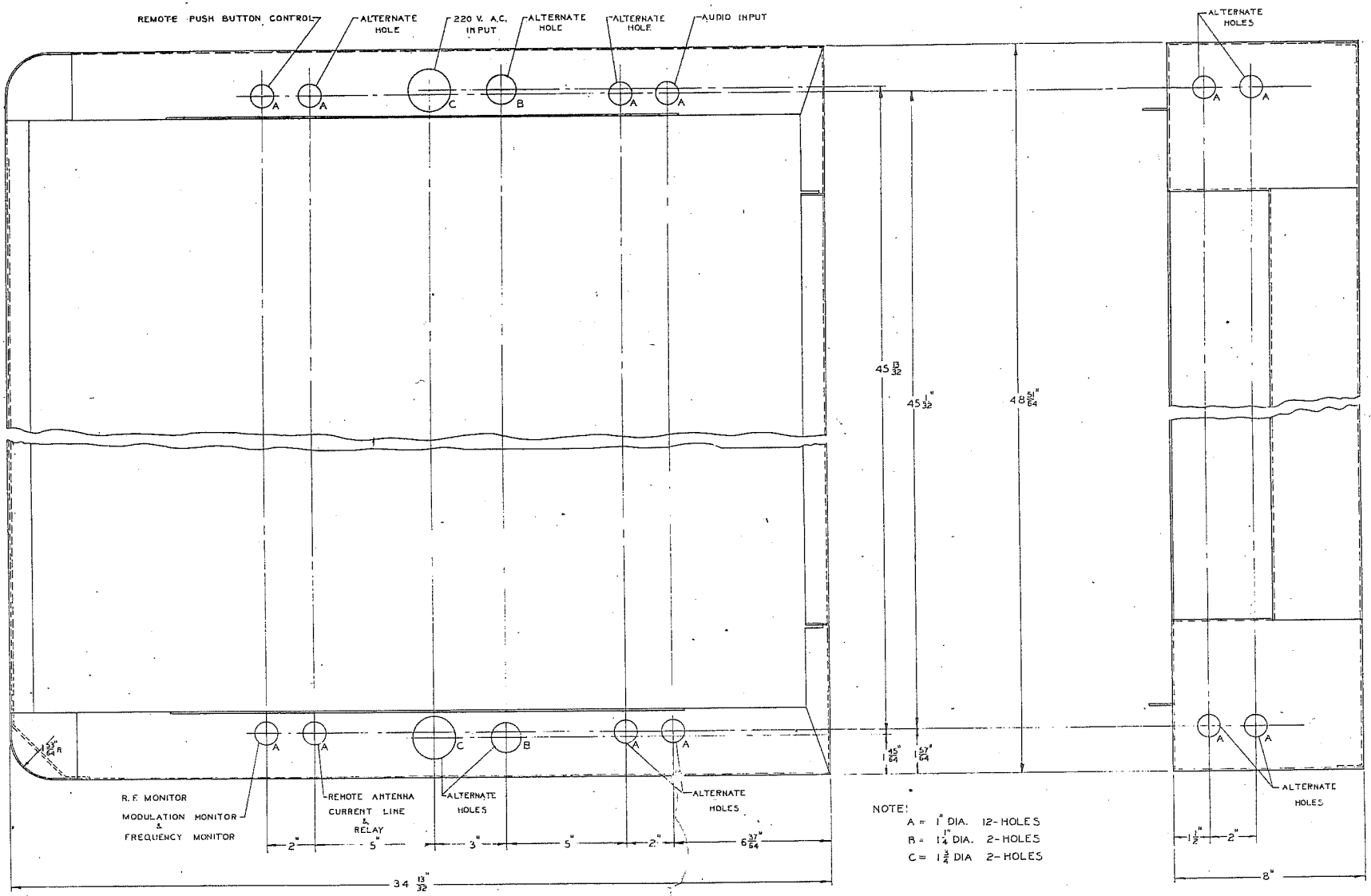


FIG. 22

DR. BUSHNOTT	DATE 8-9-46	APP.	CHK.
CONDUIT HOLES & PROPOSED WIRING LAYOUT			
FIRST USED ON 1 KW A.F. TRANS. 7519			SUB.
RAYTHEON MFG. CO. COMMUNICATION DIV. CHICAGO		L 88-D-26	



NOTE:
A = 1" DIA. 12-HOLES
B = 1 1/4" DIA. 2-HOLES
C = 1 3/4 DIA 2-HOLES

FIG. 22

DR. BUSHNOTT	DATE 8-9-46	APP.	CHK.
CONDUIT HOLES & PROPOSED WIRING LAYOUT			
FIRST USED ON 1 KW A.R. TRANS. 7519			SUB.
RAYTHEON MFG. CO. COMMUNICATION DIV. CHICAGO		L 88-D-26	