C.D. transmitter no. 2: description, operation, installation and maintenance.

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RADIO BRANCH

C. D. TRANSMITTER NO. 2

DESCRIPTION, OPERATION, INSTALLATION AND MAINTENANCE

OTTAWA

NOVEMBER, 1942

C.D. TRANSMITTER NO. 2

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INDEX

DRAWINGS & ILLUSTRATIONS

W A R N I N G

H I G H V O L T A G E

VOLTAGES SUFFICIENT TO CAUSE

D E A T H O N C O N T A C T S

are used in C.D. Transmitter # 2

Extremely dangerous potentials exist especially in the following units.

H.T. Unit #1
Transmitter Unit #4
Modulator Unit #5

EXERT ALL POSSIBLE SAFETY PRECAUTIONS

C.D. TRANSMITTER NO. 2

DESCRIPTION, OPERATION, INSTALLATION AND MAINTENANCE

C.D. Transmitter No. 2 is a pulse transmitter designed primarily for operation on a frequency of 200 Mc.

This unit, when used in conjunction with the associated receiving equipment (PRA #51) constitutes a basis for a coastal defence installation. The receiver and transmitter are designed to couple, by means of a 73 ohm coaxial cable, to a rotary billboard antenna assembly which is mounted on the top of a 70 foot tower. A complete description of the antenna system is given in report PRA #55. Rotation of the array and transmission of information is provided by a control system which utilizes D.C. motors and Selsyn generators (PRA #46). The combined assemblies constitute a fixed coastal defence installation from which accurate range and azimuth of vessels may be transmitted to one or more battery positions. At present two such stations are in operation on the Atlantic coast, one at Duncan's Cove, N.S., the other at Osborne Head, N.S. The equipment referred to in this report is in operation at the latter locality. The installation and testing of the transmitting equipment was completed on 1st May, 1942. During the period in which these sets were being designed and fabricated, work on transmitting and receiving equipment for operation in a high frequency spectrum reached a high level of development. While it is evident, in the light of these developments, that the design of future coast defence transmitting equipment will follow the new technique, it is desirable to have on file complete information on the existing equipment. This report, therefore, proposed to embody, as briefly as possible, data from which a 200 Mc. transmitter may be fabricated without undue engineering.

I. TECHNICAL SPECIFICATIONS AND DESCRIPTION

A. TECHNICAL SPECIFICATIONS

1. Power Source

This transmitter is designed to operate from 115 volt, 60 cycle mains. The supply voltage should be regulated to within ± 1 volt in order to ensure suitable operation. In the present installation a Raytheon regulator supplies both the transmitter and receiver cabinets. When fully loaded, the transmitter draws 14 amperes from the line.

2. Peak Power Output

The peak power output, as measured at the input to the antenna feeder system was 75 KW. The power measurement was made on the site using a 493 ohm open wire transmission line feeding two dipoles and a specially calibrated meter. The method employed is described in detail in K.A. MacKinnon's report "Measurements of Power at Ultra High Frequencies", PRA #9.

3. Frequency Range

The transmitter provides relatively constant power output over a range of 196 - 205 Mc. The normal operating frequency is 200 Mc. at which frequency the antenna and receiving equipment operate at maximum efficiency.

4. Repetition Frequency

Normally the transmitter is fired from the associated receiver at frequency of 1012 c.p.s. A local oscillator, whose frequency may be varied between 750 and 1500 c.p.s., is incorporated in the transmitter for test purposes.

5. Pulse Length

The pulse length varies between 1 and 3-1/2 μsecs. depending on the adjustment of the modulator proper and the extent to which the oscillator is coupled to the antenna. Most efficient operation is obtained with a pulse length of approximately 1.5 μsecs.

B. TECHNICAL DESCRIPTION

A basic circuit layout of the transmitter is shown in Fig. 13. A power supply capable of delivering 21,000volts at 20 m.a., and employing two Taytheon type RX235 rectifier tubes in a voltage doubler circuit, supplies plate voltage for the oscillator tubes. A Variac, adjustable from the front of the unit, provides a means of selecting the correct operating voltage. The oscillator consists of two Eimac 304 TH tubes (V401, V402) in a push-pull circuit. Variable condensers connected between grid and filament of the respective tubes, and adjustable from the front of the unit, provide control over the emitted frequency.

The antenna is coupled to the plate circuit by means of tuned lines, likewise adjustable from the front of the unit. Grid bias for the oscillator is supplied from a type 879 (V505) half-wave rectifier located in the modulator

proper. Variac control of this rectifier provides a voltage between 0 - 2000 volts which is applied between the oscillator grid and a point on the oscillator cathode which is at D.C. potential of approximately 200 volts above ground. This provides a means of selecting the correct operating point for maximum efficiency.

A system of cathode modulation is employed whereby, between pulses, the filament of the oscillator tubes are held at the D.C. potential of the modulator plate. The modulator tubes operate at a plate potential of approximately 3,500 volts above ground, and since the D.C. potential of the oscillator grid is somewhere in the neighbourhood of -1800 volts with respect to ground, the resultant grid-to-filament potential is such that the tubes are completely cut off. The modulator, aside from the bias rectifier mentioned previously, consists of an 884 driver (V501), an 84 diode (V502), an 813 modulator (V503), and an 879 (V506) half-wave rectifier. The rectifier supplies +1000 and +3500 volts respectively to the plate and screen of the modulator. Voltage for the driver is taken from a bleeder resistance on this same rectifier.

In normal operation two triggering pulses, spaced approximately 4 µsecs. apart, are supplied by the receiver. The first pulse, designated on all drawings as "Sync. Input", fires the sweep of the C.R. tube in the monitor. The operation of this unit is discussed in Section II.

The second pulse, designated "Transmitter", after looping through the monitor chassis, keys the modulator. This pulse has an amplitude of approximately 200 volts and is applied to the grid of the 884, causing it to fire. A positive round top wave about 3 µsecs. long, produced in the cathode circuit of the 884, is applied to the grid of the 813 modula tor. Diode action of the 84 tube prevents a second positive pulse. The modulator tube proper is normally biased to cutoff by a positive voltage of approximately 175 volts applied to this cathode circuit. When the 884 fires, the 813 grid is driven from cutoff to a positive region and plate current flows, discharging all condensers which are connected in the output circuit. For a period of approximately 3-1/2 µsecs., the potential of the modulator plate is reduced to approximately 800 volts above ground. The oscillator tube filaments take up this potential and oscillations occur. Removal of drive from the 813 cuts off the tube, and the potential rises to its D.C. value of 3500 volts. Diode action of an 879 (V504) (also located in the modulator) prevents a second pulse.

During oscillation, a plate current of approximately 14 amps. is drawn from the tank condenser, C301. Chokes and resistors (L101 - L104 - R106 - R107) isolate the high tension power supply from the pulse voltage, allowing the filament and plate potentials of the oscillator tubes to follow the modulator.

II. DESCRIPTION OF UNITS

The units which make up the general assembly shown in Fig. 14 are treated in some detail in the following section.

1. High Tension Power Unit #1

This unit delivers 21,000 volts at 20 mils. Two Raytheon type RX235 tubes are used in a voltage doubler circuit. These tubes are rated as follows:-

Filament 2.5 volts at 2.5 amps.	
Peak inverse voltage 30,000 volts	Order as RX235,
Peak current 350 m.a.	Revised RX232
Average D.C. current 100 m.a.	

The chassis of the H.T. unit, at a D.C. potential of 3500 volts above ground, is insulated from the cabinet by bakelite strips. The chassis layout and wiring diagram is shown in Fig. 15 and all components will be found listed in the parts list at the back of this report. The first numeral in any part number designates the unit to which it belongs, viz., C101 - condenser No. 1, unit No. 1.

Test Specifications

1. Circuit test as per diagram NRC-RE-198.
2. Apply 110 volts 60 cycle to plug P101 and check filament voltage. This should be 2.5 volts ±1%.
3. Remove 110 volts and connect a 0-1 milliammeter in series with the bleeder resistor R101 - R103.
4. Turn on 110 volt filament supply and with the variac set for minimum voltage apply 110 volts to plug P102.
5. Rotate variac until meter reads approximately 0.6 m.a. This indicates that the rectifier is delivering in excess of 20,000 volts, and is

therefore operating satisfactorily.

6. Remove 110 volt supply and short high tension filter condensers; leaving condensers shorted remove the milliammeter and connect the bleeder resistors in circuit. Remove short from H.T. condensers, and place unit in service.

2. Control Unit #2

This unit contains all relays and switches necessary for the application of primary voltage to the various units in the proper sequence. A panel lay-out and wiring diagram is shown in Figures #2 and #16.

The function of the various components is as follows: Closing the main switch (S201) applies 115 volts to delay relay E202, tube V201, pilot light #1 and to all sockets on the rear right hand side of the cabinet. All filament transformers are thus energized.

At the completion of approximately 7 seconds delay the second pilot light is illuminated, indicating that relay E202 has closed, completing a 115 volt circuit to all plugs on the left top rear of the cabinet. This energizes all the D.C. rectifiers with the exception of high tension unit #1. Resistors R206 and R207 constitute a bleeder on the 3500 volt rectifier in the modulator. A positive voltage of approximately 20 volts is taken from R207 and applied to the grid of tube V201. Plate current flowing in V201 energizes plate sequence relay E201, which completes the 115 volt circuit to the main switch on the high tension rectifier chassis. High tension may now be applied by closing E101. The meter M203, in series with the dropping resistor R201 to R205, is connected between the +3500 volt rectifier and the output of the bias rectifier, thus reading the total voltage applied between grid and filament of the oscillator tubes. Meters M201 and M202 indicate primary line voltage and line current, respectively.

Test Specification

Circuit test as per diagram NRC-RE-194.

3. Condensers Shelf Unit #3

This assembly consists of a bakelite panel supporting oscillator filament transformer (T301), tank condenser (C301), and a fan for cooling oscillator tubes. Refer to Fig. 17 for panel layout and wiring diagram.

Test Specification

Circuit test as per diagram NRC-RE-199.

4. Transmitter Unit #4

The components which make up this unit are completely enclosed in a copper box which may be removed through the front of the cabinet by removing the ground straps and connections to the antenna trombone. Connections to filament, grid, and plate of the oscillator tubes are made through large banana plugs which fit into jacks on a bakelite panel located in the centre of the cabinet. Two Eimac type 304 TH tubes, mounted vertically with their plate pins together, are located in the centre of the unit. Connection between plates is made by a telescopic connector fitted with small set screws which ensure good contact with plate pins. The high tension voltage is fed through a choke L403 to the centre of this connector. The antenna is inductively coupled to the plate line by a variable shorted line. Maximum power output is obtained with the closest possible coupling. The degree of coupling is limited by D.C. flash-over between the 20,000 volt plate line and the antenna, which is at D.C. ground potential due to the trombone connections. The antenna is matched by adjusting the shorting bar on a line which runs across the front of the unit. This line terminates in the coupling loop. Frequency control is obtained by variable condensers C404 and C405 located between grid and filament of the respective tubes. Connection between the tube grids and the rotor of their respective condensers is made through copper springs on the inside of the condenser assembly. When new tubes are received it is necessary to cut off the normal grid pin and file the surface smooth before attempting to place the tubes in service. The stators of the two condensers are connected by brass rods which run coaxial to the plate of the tubes. The filaments of the tubes are connected in series. Two short lines E and F, Fig. XVIII, looped over the rotor plates are secured to the stator the line joining the stators of the two condensers thus carries the filament current. The length of the filament connector is critical but remains fixed throughout the frequency range. Connection to the filament transformer is made through lines and chokes. The adjustment of these lines remains fixed over the frequency range. Grid connection is made through bus bar and R.F. chokes. The length of these lines is critical but once designed remain fixed over the operating range. Spacing between the grid line and the case should not be less than 3".

A layout and circuit is shown in Fig. XVIII and an assembly drawing in Fig. XIX.

Due to the copper box in which the components are located, the development of this circuit is very difficult. However, once designed the circuit provides very stable operation. It is possible that due to its small size the unit might be used in multi-channel transmitters employing several units and electrical switching.

Test Specification

1. Thorough mechanical inspection.

2. Check operation with complete assembly using luminine lamp as load. 3-40 watt lamps fully illuminated with a plate current not exceeding 20 mils indicates proper operation. Recurrence frequency should be approximately 1000 c.p.s. Pulse length 1.5 μsecs.

5. Modulator Unit #5

This unit is mounted directly above the oscillator filament transformer, and is securely grounded to the cabinet by a metal strap. The bias rectifier control is connected through a flexible coupling and bakelite shaft to a dial on the wavemeter panel. Control of the cathode bias of the type 884 driver stage is provided by potentiometer R525, accessible through the rear door of the cabinet. This control should be adjusted to give the voltage listed in the test specification, and left there. The pulse length may be shorted by tapping down on choke L503. The function of the various components has been outlined in Section I. The panel layout and wiring diagrams are shown in Figs. XVI and XX.

Test Specification

1. Circuit test as per diagram NRC-RE-194.

2. Apply 115 volts directly to plug P501 and through a D.P.S.T. switch to P502.

3. Close the D.P.S.T . switch and check that the following potentials exist:-

(a) (0 - 5000 voltmeter) R501 to ground should be at least +3500 volts.

(b) Adjust potentiometer R525 so that the cathode

voltage of the 884 to ground is +35 volts.

(c) R522 (Plate 884) to ground should be about 400 volts.

(d) 813 cathode to ground should be +175 volts.

(e) 813 screen voltage (from top of R513) should be +1000 volts ± 10%.

(f) Output voltage of the bias rectifier should not be less than 1800 volts with the variac control set at maximum. (Grid bias terminal on chassis).

6. Monitor Unit #6

This unit provides a means of examining the wave shape of the Transmitter Pulse, Modulator Output, and R.F. Envelope. In normal operation the "Sync. Input" pulse referred to in Section I, is applied through the RT-ST switch S603, to the grid of an 884 tube (V601). The output from this tube is taken from the cathode circuit and has an amplitude of approximately 100 volts. This voltage is applied to the grid circuits of two, type 884, sweep tubes (V602 and V603) and fires them simultaneously. The combined output of these tubes, Fig. 12 A and B is applied to the horizontal deflection plates of the C.R. tube, V607, giving a balanced sweep voltage. The voltage difference between the plates is of the form shown in Fig. 12C. The centre portion of this voltage, involving a change of approximately 600 volts over a period of about 4 μsecs, is very nearly linear and is used as the sweep voltage. The grid of the C.R. tube is negatively biased by about 50 volts until it is time to use the sweep. A positive voltage, developed across R619, is applied to the grid of a type 1852 tube. The output of this tube drives the grid of the C.R. tube to approximately -5 volts for a period of about 8 μsecs., during which time the screen of the C.R. tube is illuminated, and a timebase trace is visible. The deflection sensitivity of the 5AP1 C.R. tube is about 120 volts per inch, for one set of plates, and 150 volts per inch for the other set. The more sensitive set is used for the timebase deflection, the length of trace during the central 4 μsec. period of sweep is therefore 5". This length of trace exactly fits the diameter of the tube face. Normally, the transmitter pulse which fires the modulator lags the "Sync. Input" by approximately 4 μsecs. In order to view the input pulse on the screen, it is necessary to adjust the time

of recurrence of the sweep trace with respect to the transmitter pulse. This is accomplished by adjusting the delay control, R601.

A calibrator circuit consists of an 1852 2 mc. oscillator; is shock excited by the output of the sweep tubes and produces 1/2 μsec. calibration pips. The calibrator output, receiver output pulse, modulator output, or R.F. envelope (capacity pickup) may be coupled to the vertical plates by the rotary switch S602. Potentiometers R640, R642, R647 and R655, provide control of vertical centering, horizontal centering, intensity, and focus, respectively.

When a receiver is not available the S.T.R.T. switch is placed in the ST position and the 884 tube (V601) fires at a frequency between 750 and 1500 cycles, depending on the position of the potentiometer R668. In the self-trigger position, in addition to firing the sweep tube, the voltage developed in the cathode circuit of V601 is applied through a variable delay network (R625) to the grid of an 884 keyer tube. The output of this tube, taken from its cathode circuit, replaces the transmitter pulse, firing the modulator. The resistor R625 serves the same purpose as R601 in normal operation. All voltages for the operation of this unit are developed in the monitor power supply. The panel layout and wiring diagram are shown in Fig. 21.

Test Specification for Monitor Unit

1. Circuit test as per diagram NRC-RL-201

2. Connect the monitor to the associated power unit and securely ground both chasses.

3. Set the switch S603 in the ST position and turn on switch S601. Check to ensure that a time-base appears and that the vertical en centering and horizontal controls function properly.

4. Place S602 in position 2, and adjust resistors R668 and R625 until the pulse from the output of the keyer tube appears on the screen.

5. Set the selector switch in position 3, and adjust the calibrator circuit C622, C623 and R637 until the calibrator frequency is 2 mc., and and a sharp image appears on the screen.

7. Monitor Power Supply Unit #7

A type 80 full wave rectifier supplies approximately 320 volts D.C. for operation of the type 884 and 1852 tubes in the monitor. The second rectifier, employing a type 879 in a conventional half-wave rectifier circuit develops approximately 2000 volts for the C.R. tube. Filament voltages for all tubes in the monitor unit are also supplied by this unit. Layout and wiring diagram shown in Fig. 22.

Test Specification

1. Circuit test as per diagram NRC-RE-200.

2. Apply 115 volts to P709 and P710 and short plugs P707 and P708. Check that the following voltages are developed:

P706 to ground -2000 V.
P702 to ground +320 V.
P703 to ground 6.3 V. a.c.
P704 to P705 6.3 V. a.c.

8. Wavemeter Panel Unit #8

This unit provides a means of checking the emitted frequency.

III INSTALLATION

The position in which the transmitter is placed will vary with different building layouts, but it is advisable to mount the unit in a separate room from the receiving equipment. The transmitter should be placed with the front facing the receiver, and a window should be inserted in the partition separating the transmitter and receiving rooms so that the results of transmitter adjustments may be viewed on the screen of the receiver.

The cabinets should be securely grounded by a lead not smaller than #12 gauge and the A.C. brought in through conduit using at least #12 wire.

The 115 volt line should be checked by means of a voltmeter and if one side is found to be permanently grounded, the following test should be carried out before placing any units in the cabinet.

Plug in 115 volt circuit and tie down the control

panel gate switch. Connecting a 0-150 A.C. voltmeter between "A" (NRC-RE-194) and ground, turn on the main switch S201. If the voltmeter reads, reverse the A.C. input so as to place the point at ground potential. When the correct position for the input is found the plug should be marked so that if removed at some future time it will be replaced in the proper manner. If the A.C. line is not grounded the point "A" should be securely fastened to the cabinet by a length of #14 gauge insulator wire. At the completion of this work the antenna trombone should be mounted so that approximately 12 inches of wire is required between the transmitter output and the trombone input. Connection between these points should be made with copper wire not smaller than #12 and spaced the same distance as the trombone input terminals. The trombone should be securely grounded to the cabinet.

IV. OPERATING INSTRUCTIONS

Assuming that the transmitter is installed and the associated receiver is in operation, proceed with adjustments as follows:

1. Make sure the high tension contactor, S101, is in the Off position and the high tension variac control set at the extreme anti-clockwise position. Open the rear doors and remove the A.C. plug (P502) which feeds the high tension rectifiers in Unit 5. Leave the rear doors open as a precautionary measure and close the main A.C. switch. All filaments should now light. The line voltage should be checked, and if it is below 117 volts the taps on the Raytheon regulator should be altered. The filament voltage of the oscillator tubes should now be checked by connecting a 0-10 A.C. voltmeter across the filament of each tube. This voltage should be 5.1 or 5.2 volts. If the voltage is much below these figures, the taps on the filament transformer should be altered. Under load conditions the filament voltage should be 4.9 or 5 volts for maximum output. Since it is impossible to measure the voltage under these conditions, a no-load voltage of the order 5 to 5.2 volts is satisfactory.

2. If the tubes are operating at the correct filament potential, close the cabinet door and turn on the monitor. Set the R.T.S.T. switch in the R.T. position and adjust the controls until a time-base is visible on the C.R. tube. Place the selector switch in Position 1 and adjust the delay control until the receiver input pulse is visible. If no pulse appears, check and ensure that the receiver is providing the two pulses with the proper

separation. This is accomplished by closing the switch on the receiver and viewing the two pulses on the range t tube. The procedure for adjusting the time of occurrence of these pulses is outlined in Report PRA 51. Place the selector switch in Position 3 and check the operation of the calibrator.

3. Plug in the 115 volt circuit to the modulator rectifiers, (P501) and close the cabinet doors. After approximately 7 seconds' delay the second pilot light in Unit #3 should come on, indicating that the A.C. circuit to the modulator is complete. Almost simultaneously the third pilot light should come on, indicating that relay E201 has closed, completing the circuit to the high tension rectifier contactor. Press the bias voltmeter switch and adjust the bias control until the total bias voltage is approximately 4500 volts. We now have the modulator in operation and a neon lamp held near the filament lines of the oscillator tubes should light up, indicating that the oscillator is being pulsed. As the oscillator filaments are at a D.C. potential of 3500 volts above ground, the bulb should be fastened to the end of a bakelite rod approximately 2 feet long.

4. Adjust condensers 301 and 304 until their gap is approximately 1/2". Connect the trombone to the transmitter and set the antenna coupling at maximum. The antenna tuning control should be set at approximately mid-position. Turn on the high tension switch and slowly bring the high tension voltage up to approximately 10,000 volts. A new set of tubes will require conditioning and the voltage should be increased slowly until all signs of internal spitting cease. At a plate voltage of approximately 10,000 volts the tubes will start oscillating. This is indicated by the tubes drawing a D.C. plate current of approximately 10 mils. R.F. output may be checked by holding a neon lamp near the feeders.

Once in oscillation, the plate voltage should be gradually increased, at the same time adjusting the bias to keep the D.C. plate current below 20 ma. Once the tubes are seasoned, the set should be carefully tuned to 200 mc. When adjusting the frequency, points should be observed as follows:

(a) Adjust the two controls marked "Frequency" so that the circuit is balanced. This is indicated when, for example, both tubes show the same colour. If the frequency is too low the spacing between the conductors must be increased. If increasing both condensers together causes one tube to show more colour than the

other, move one condenser in and the other out until a balance is obtained, and then move both conductors out simultaneously. If it is found that the condensers have widely different spacing in order to obtain a balance, shut down the set, and after shorting the plate and grid wires to ground, and plate to filament, make sure that the telescopic plate line is so adjusted that the plate voltage is applied at its geometrical centre.

(b) During adjustment of the frequency controls the coupling should be backed off slightly. Once the set is nearly on frequency, all four controls (two frequency controls, coupling, and antenna tune) should be adjusted to give maximum output. During these adjustments the monitor screen and D.C. plate meter should be watched, as maximum plate current does not necessarily mean that maximum power is being delivered to the antenna. It will be found that with a given degree of coupling two antenna tune positions will be found which produces the same D.C. plate current. At one point the pulse length will be almost double the other. The controls should be adjusted for stable operation, with maximum degree of coupling, the shortest pulse length, plate current not exceeding 20 ma., and a plate voltage 20 kv. When a satisfactory adjustment is obtained on 200 mc. the receiver should be tuned as described in PRA #51.

(c) When the preliminary adjustments are completed the antenna should be tuned to a fixed echo (Sambro Lighthouse) and the transmitter controls adjusted to give maximum possible signal. When this is accomplished the frequency should be again checked and the receiver tuning again adjusted.

(d) Transmitter and receiver should be left running for twenty-four hours, during which time periodic checks should be made on a fixed point. If the signal drops off, check the transmitter frequency if the latter has drifted retune to 200 mc. If the signal strength is still below that obtained when the set was first tuned, retune the receiver. After several days of operation the operating personnel will be able to determine in what manner the receiver and transmitter drifts in frequency during the initial warm up period, and will be prepared to compensate for it.

A careful study of the operation of the equipment over a period of weeks will enable the personnel to take steps to keep the equipment operating at maximum efficiency at all times. A good procedure to follow is

always to tune the transmitter to 200 mc., adjust the receiver for a maximum signal and then retune the transmitter. Since the antenna system is designed for maximum efficiency at 200 mc. it is important to keep the transmitter operating as close to that frequency as possible at all times.

V. MAINTENANCE

The following general rules should be observed.

1. Check the frequency and pulse shape at least every four hours. During this periodic check up, record all meter readings. This will provide a log which will be very useful in spotting a serious breakdown before it actually occurs. One person should take these readings, leaving the other man to operate the receiver constantly.

2. Turn on the monitor only during these checkups or when the transmitter is suspected of giving trouble. It is a piece of test equipment and not meant for continuous operation.

3. Blow all dust out of the transmitter cabinet at least once a week.

4. In extremely hot weather, see that there is a good circulation of air in the transmitter room.

5. Keep a good stock of spare tubes etc. It is recommended that the following minimum spares be kept on hand at all times.

4 Eimac 304 TH tubes
6 Raytheon RX235
12 Type 884
6 Type 879
6 Type 84
4 Type 1852
2 Type 813
1 of each of the following transformers:
T101, T102, T301, T401, T701
1 doz. of each of the following fuses:
F101, F501, F701, F901

Condensers

6 C501
2 C503
6 C507

Condensers

1 C510
1 C511

Resistors

2 R105
2 R201
2 R207
1 R208
1 R209
4 R501
4 R505
4 R509
2 R519
2 R527
2 of each of the following 2 watt resistors:- 50,000 ohms, 100,000, 200,000, 500,000

PARTS LIST "C" - CONDENSERS

Designation	Description	Specification
		Unit #1 H.T. Power Supply
C101	H.T. Filter	.25 mfd 20,000 v. d.c.
C102	" " "	Same as C101
		Unit #2 Control Panel
C201	Electron relay filter	8 mfd 400 v. d.c.
C202	Same as C201	
C203	Same as C201	
		Unit #3 Condenser Shelf Assembly
C301	Main H.T. Condenser	.05 mfd 20,000 v. d.c. operating
		Unit #4 Oscillator Unit
C401	Filament Bypass	.01 mfd 400 v. d.c.
C402	Same as C401	
C403	Bypass	.01 mfd. 400 v. d.c.
C404	Main Tuning)	See Dwg. NRC-RE-195
C405	Same as C404)	
C406	Antenna Condenser	Plate 2" Diameter Spaced 1/2"
		Modulator Unit #5
C501	Pulse Input	.001 mfd. 400 v. d.c.
C502	Plate Driver 884 tube	Same as C501
C503	Cathode bypass driver	16 mfd. 400 v. d.c.
C504	Same as C503	" " " " " "
C506	Plate bypass 884 Driver	.5 mfd. 600 v. working
C507	Cathode bypass 813	1 mfd. 600 v. d.c. working
C508	Cathode bypass 813	" " " " " " " "
C509	Filter on 2000 volt bias rectifier unit	2 mfd. 1500 v. d.c. operating 3000 v. test
C510	Filter on 4000 volt rectifier unit	1 mfd. 7500 v. d.c. working
C511	Ditto	.5 mfd. 7500 v. d.c. working
C512	Screen bypass modulator	1 mfd. 2000 v. d.c.
C513	" " "	.01 mfd. 2500 v. d.c.

PARTS LIST "C" - CONDENSERS

Designation	Description	Specification
		Modulator Unit #5
C514	Filament bypass	.01 Rec. type 400 v. d.c.
C515	Same as C514	" " " " " " "
		Monitor Unit #6
C601	Pulse input from rec.	.001 mfd. 400 v. d.c. Rec. type
C602	Osc. Grid bypass	.0001 mfd. 400 v.
C603	Oscillator Plate	.004 mfd. 400 v. d.c. Rec. type
C604	Osc. Cathode bypass	.1 mfd. 600 v. d.c. working
C605	Sweep Coupling	.01 mfd. 600 v. d.c. working
C606	Sweep Cathode bypass	8 mfd. 600 v. d.c. electrolytic
C607	" " "	.1 mfd. 600 v. d.c. working
C608	Sweep Plate	.001 mfd. 400 v. d.c. Mica
C609	Sweep	" " " " " " "
C610	Coupling Horizontal Plates C.R.T.	.1 mfd. 600 v. working
C611	Plate Keyer 884	.001 mfd. 400 v. d.c. Mica
C612	Cathode bypass 884 Keyer	.1 mfd. 600 v. d.c.
C613	Coupling Osc. to Keyer	.01 mfd. 400 v. d.c.
C614	Grid of Keyer	.001 mfd. 400 v. d.c.
C616	Screen bypass Blanking tube 1852	.1 mfd. 600 v. d.c. operating
C617	Same as C616	8 mfd. electrolytic 600 v. d.c.
C618	Cathode bypass - 1852 blanking tube	Same as C616
C619	Same as C618	Same as C606
C620	Coupling to Grid of 5AP1 C.R.T.	.015 mfd. 5000 v. d.c.
C621	Coupling to 1852 blanking tube	Same as C613
C622	Coupling to Calibrator	10 mmfd. variable
C623	Calibrator Tune	35 mmfd. variable
C624	Cathode bypass 1852 Calibrator	.5 mfd. 600 v. d.c.
C625	Cathode bypass 1852 Calibrator	Same as C616
C626	Cathode Resistor bypass	Same as C614
C627	Screen bypass 1852 Calibrator	Same as C613
C628	Coupling Vertical Plate C.R.T.	Same as C613
C629	Bypass Vertical Centering Control	Same as C616
C630	ditto	" " "

PARTS LITS "C" - CONDENSERS

Designation	Description	Specification
		Monitor Unit #6
C631	Filament bypass C.R.T.	Same as C613
C632	Grid Cathode Condenser C.R.T.	.25 mfd. 600 v. working
C633	C.R.T. Plate Cathode bypass	Same as C616
C634	C.R.T. Cathode bypass	.01 mfd. 2000 v. d.c.
C635	Intensity control bypass	Same as C632
		Monitor Power Supply Unit #7
C701	300 v. rectifier filter	8 mfd. 450 v. d.c. working, dry electrolytic
C702	Same as C701	ditto
C703	2000 v. supply filter	.25 mfd. 3000 v. d.c. working
C704	Same as C703	

PARTS LIST - FUSES

		Unit #1 H.T. Power Supply
F101	H.T. Plate Transformer Primary	5 amperes 110 v. Littel fuse
		Unit #5 Modulator
F501	4000 v. d.c. Rectifier Primary Circuit	2 amperes 110 v. Littel fuse
		Unit #7 Monitor Power Supply
F701	Monitor H.T. Rectifier 2000 v. Primary circuit	3 amperes 110 v.
F702	300 v. d.c. and filament circuits monitor	3 amperes 110 v. Littel fuse
		Unit #9 Cabinet Assembly
F901	Primary fuse for whole assembly	15 amperes 110 v.
F902	Same as F601	Same as F701

PARTS LIST - INDUCTANCES

		Unit #1 H.T. Power Supply
L101	Negative H.T. Pulse isolating	45 mh. 5 section choke
L102	Same as L101	ditto
L103	Positive H.T. Pulse isolating	ditto
L104	Same as L103	Same as L103

PARTS LIST - INDUCTANCES

Designation	Description	Specification
		Unit #4 Oscillator
L401	Oscillator Filament	10 turns #12 wire wound on 1" diameter.
L402	Same as L401	ditto
L403	Plate Isolating	10 turns #12 wire wound on 1" diameter
L404	Grid Circuit Isolating	12 turns #12 wire wound on diameter
L405	Same as L304	Same as L304
		Unit #5 Modulator
L501	884 Cathode	10 mh.
L502	Same as L401	10 mh.
L503	Modulator Output	40 mh. Tapped at 30 mh.
		Unit #6 Monitor
L601	Calibrator Tank Coil	No. 20 D.C.C. wire wound on 2" dia. 3 1/2" winding length
L602	Pulse Delay to Keyer tube	80 mh.
L603	Plate Circuit of Sweep tube - V602	10 mh.
L604	Plate Circuit of Sweep tube - V603	10 mh.
		Unit #7 Monitor Power Supply
L701	Low Voltage Filter	Hammond #157 30 h. 65 ma.
L702	High Voltage Filter	Hammond #470

PARTS LIST - JACKS

		Unit #1 H.T. Power Supply
J101	Common to Metering Circuit	To take small banana plug
J102	Ammeter Circuit	To take small banana plug
J103	Voltmeter Circuit	To take small banana plug
J104	Negative H.T.	To take small banana plug

PARTS LIST - JACKS

Designation	Description	Specification
		Unit #1 H.T. Power Supply
J105	Positive H.T.	To take small banana plug
		Unit #3 Condenser Shelf Assembly
J301	Modulator Output	To take small banana plug
		Unit #6 Monitor
J613	2000 v. Cathode Ray tube	3" stand off insulators
J614	Filament Cathode Ray tube	3" stand off insulators
J615	" " " "	3" stand off insulators

PARTS LIST - METERS

		Unit #2 Control Panel
M201	A.C. Voltmeter	Model 476 0-150 volts a.c.
M202	A.C. Ammeter	Model 476 0-15 amps. a.c.
M203	A.C. Grid-Cathode Volts	Model 506 0-1 ma. d.c.
M204	Plate Kilovolts	Model 699 Galvanometer 30-0-30
M205	D.C. Average Current Osc. Tubes	Model 301 0-30 ma. d.c.
		Unit #8 Wavemeter Assembly
M801	Wave Meter	Thermo Galvonometer Model 507 0-100 Res. = 5.2 ohms

PARTS LIST - PLUGS

		Unit #1 H.T. Power Supply
P101	Filament Rx235	A.C. Male
P102	A.C. Input Power Transformer	A.C. Male
		Unit #3 Condenser Shelf Assembly
P301	A.C. Input Oscillator Filament Transformer	A.C. Male
		Unit #4 Transmitter
P401	Oscillator Grid Bias	Large Banana
P402	Oscillator Grid Bias	Large Banana
P403	Oscillator Filament	Large Banana
P404	Oscillator Filament	Large Banana
P405	Oscillator H.T.	Large Banana Plug on 3" Insulator

PARTS LIST - PLUGS

Designation	Description	Specification
		Unit #5 Modulator
P501	Modulator Filament A.C. Input	Male A.C. Plug
P502	Modulator H.T. A.C. Input	Male A.C. Plug
		Unit #6 Monitor
P601	Cathode CRT	Small banana plug
P603	Deflection Plate	Small banana plug
P604	Anode Plate	Small banana plug
P605	Anode Plate	Small banana plug
P606	Deflection Plate	Small banana plug
P607	Plate CRT	Small banana plug
P608	Deflection Plate	Small banana plug
P609	Deflection Plate	Small banana plug
P610	Grid CRT	Small banana plug
P611	Filament and Cathode CRT	Small banana plug
P612	Control Circuit + 320 v. d.c. Filament 884 1852 tubes	Five prong tube socket
		Unit #7 Monitor Power Supply
P701	Filament 884 1852 tube	Small banana plug
P702	+ 320 volts d.c.	Small banana plug
P703	Filament 884 1852 tube	Small banana plug
P704	Filament CRT V607	Small banana plug
P705	" " "	Small banana plug
P706	-2000 volts for CRT	Small Banana plug
P707	110 v. Control	Small banana plug
P708	110 v. Control	Small banana plug
P709	110 v. Primary of 2000 v. Supply	Male A.C. Plug
P710	110 v. Primary Filament 320 volt Supply	Male A.C. Plug

PARTS LIST - RELAYS

		Unit #1 H.T. Power Supply
E101	Primary Overload and Main Switch	4 amps. 110 v. 60 cycles Present relay 3 amps. shunted with resistor trips at 4.5 amps.

PARTS LIST - RELAYS

Designation	Description	Specification
		Unit #2 Control Panel
E201	H.T. Interlock	Guardian Serial #28096 Code #70 32 v. coil 32 ma.
E202	Delay	Dunco type TD-97
		Unit #7 Monitor Power Supply
E701	Monitor Main Control	DPDT 110 v. a.c. coil Leach #1137

PARTS LIST "R" - RESISTORS

		Unit #1 H.T. Power Supply	
R101	H.T. Bleeder	12 meg. ohms 20 w. Type MVA	IRC
R102	" " "	ditto	IRC
R103	" " "	ditto	IRC
R104	Voltmeter Shunt	25 ohms 4 w. adjustable	IRC
R105	Ammeter Shunt	1000 ohms 2 w.	IRC
R106	Pulse isolating	10,000 ohms 10 w.	IRC
R107	" "	ditto	IRC
		Unit #2 Control Panel	
R201	Meter (Bias) Series	1 meg. 4 w. Type MVC	IRC
R202	" " "	ditto	IRC
R203	" " "	ditto	IRC
R204	" " "	ditto	IRC
R205	" " "	ditto	IRC
R206	Dropping resistor for electron relay	two 2 meg. 4 watt in series	IRC
R207	Pot. for electron relay	50,000 ohm variable 1 w.	IRC
R208	Cathode 117N7 GT tube	1,000 ohms 10 watts	IRC
R209	Screen 117N7 GT tube	2,000 ohms 10 watts	IRC
		Unit #5 Modulator	
R501	Bleeder 4000 v. supply	500,000 ohms 1 w. Type BT1	
R502	ditto	ditto	
R503	ditto	ditto	
R504	ditto	ditto	
R505	ditto	200,000 ohms 1 w. Type BT1	
R506	ditto	ditto	
R507	ditto	ditto	
R508	ditto	ditto	
R509	ditto	200,000 ohms 2 w. Type BT2	

PARTS LIST "R" - RESISTORS

Designation	Description	Specification
		Modulator Unit #5
R510	Bleeder 4000 v. supply	200,000 ohms 2 w. Type BT2
R511	ditto	ditto
R512	ditto	ditto
R513	ditto	ditto
R514	ditto	ditto
R515	ditto	ditto
R516	ditto	ditto
R517	ditto	ditto
R518	ditto	100,000 ohms 2 w. Type BT2
R519	ditto	30,000 ohms 2 w. Type BT2
R520	ditto	250,000 ohms 2 w. IRE Type BT2
R521	ditto	ditto
R522	ditto	ditto
R523	ditto	100,000 ohms 2 w. Type BT2
R524	ditto	30,000 ohms 2 w. Type BT2
R525	884 Cathode Bias Control	50,000 ohms pot.
R527	Bleeder 2000 v. Bias rectifier	2 meg. ohms 4 watts
R528	Filter 4000 v. rectifier	20,000 ohms 4 watts
R529	Grid Resistor 884 driver tube	50,000 ohms 1 w. IRE Type BT1
R530	Grid 884 driver tube	500,000 ohms 1 w. Type BT1
R531	Plate 884 driver	200,000 ohms
		Monitor Unit #6
R601	Delay Control	250,000 ohm pot. 1 w.
R602	Parallel to delay	250,000 ohms 1/2 w.
R603	Rec. trigger bias osc. 884	Same as R602 1 w.
R604	Grid osc. tube	100,000 ohms 1 w.
R605	Cathode oscillator	3,000 ohms 1 w.
R606	ditto	6,000 ohms 1 w.
R607	ditto	3,000 ohms 1 w.
R608	Fixed bias osc. 884 tube	100,000 ohms 1 w.
R609	Osc. Plate dropping	500,000 ohms 1 w.
R610	ditto	200,000 ohms 1 w.
R611	Fixed bias sweep	40,000 ohms 4 w.
R612	Cathode bias Sweep	3,000 ohms 1 w.
R613	Cathode bias Sweep	500 ohms 1 w.
R614	Input Sweep	100,000 ohms 1 w.
R615	Grid Voltage Divider Sweep	50,000 ohms 1 w.
R616	ditto	ditto

PARTS LIST "R" - RESISTORS

Designation	Description	Specification
		Unit #6 Monitor
R617	Plate Load Sweep	25,000 ohms 1 w.
R618	ditto	ditto
R619		100 ohms 1 w.
R620	Coupling to C.R.T.	1 meg. 1 w.
R621	Plate of Keyer tube	500,000 ohms 1 w.
R622	Cathode of Keyer	5,000 ohms 1 w.
R623	" " "	15,000 ohms 1 w.
R624	Grid of Keyer	150,000 ohms 1 w.
R625	Local Keyer Delay	50,000 ohms variable pot.
R626	Grid Bias Keyer	200,000 ohms 1 w.
R627	Fixed Bias Keyer	10,000 ohms 1 w.
R628	" " "	100,000 ohms 2 w.
R629	Screen dropping blanking 1852	30,000 ohms 1 w.
R630	ditto	100,000 ohms 2 w.
R631	Cathode of 1852 Blanking	160 ohms 1 w.
R632	Plate Blanking	15,000 ohms 1 w.
R633	Grid of Blanking	1000 ohms 1 w.
R634	Plate of 1852 Calibrator	400 ohms 1 w.
R635	Screen of Calibrator	100,000 ohms 1 w.
R636	Bias Calibrator	40,000 ohms 1 w.
R637	Cathode of Calibrator Variable	0-1000 ohms 2 w.
R638	Vertical Centering Series	1 meg. 1 w.
R639	ditto	1 meg. 1 w.
R640	Vertical Centering	Dual Pot. 500,000 ohms 1 w.
R641	Horizontal Centering series	1 meg. 1 w.
R642	Horizontal Centering control	500,000 ohms Pot. 1 w.
R643	Intensity Control Series	100,000 ohms
R644	Voltage Divider on regulator tubes. VR 150	30,000 ohms 1 w.
R645	ditto	ditto
R646	300 volt supply series resistor	1500 ohms 10 w.
R647	Intensity Control	50,000 ohms pot.
R648	Voltage Divider	50,000 ohms 1 w.
R649	" "	20,000 ohms 2 w.
R650	" "	5000 ohms 2 w.
R651	" "	3000 ohms 2 w.
R652	" "	100,000 ohms 2 w.
R653	" "	50,000 ohms 2 w.
R654	" "	150,000 ohms 2 w.

PARTS LIST "R" - RESISTORS

Designation	Description	Specification
		Monitor Unit #6
R655	Focus Control	250,000 ohms 1 w.
R656	Voltage Divider	1 meg. 2 w.
R657	" "	ditto
R658	" "	ditto
R659	" "	50,000 ohms 10 w.
R660	" "	30,000 ohms 1 w.
R661	" "	20,000 ohms 4 w.
R662	" "	Same as R660
R663	" "	5,000 ohms 2 w.
R664	" "	50,000 ohms 2 w.
R665	" "	Same as R664
R666	Bleeder Screen 1852 blanking tube	20,000 ohms 2 w.
R667	ditto	50,000 ohms 2 w.
R668	Recurrent Frequency	1 meg. pot. 1 w.
		Unit #7 Monitor Power Supply
R701	Bleeder 300 v. Supply	20,000 ohms 20 w.
R702	Bleeder 2000 v. Supply	6.5 ohms 1 w.

PARTS LIST - SWITCHES

		Unit #2 Control
S201	Main A.C. Switch	Double pole; single throw 30 amps.
S202	A.C. Meter Switch	Yaxley jack make-break contacts
S203	Bias Meter Shunt	ditto
S204	D.C. Meter Switch	ditto
		Unit #6 Monitor
S601	Monitor Control	Single pole; single throw toggle
S602	Selector Switch	4 position rotary
S603	Self trigger - Receiver trigger	DPDT toggle

PARTS LIST - TRANSFORMERS

		Unit #1 H.T. Power Supply
T101	Rectifier Filament	Primary 110 v. 60 cycles Secondary 2.5 volts at 5 amps 20,000 volts insulation Hammond #13748
T102	ditto	ditto

PARTS LIST - TRANSFORMERS

Designation	Description	Specification
		Unit #1 H.T. Power Supply
T103	Rectifier Plate	Primary 115 volts 60 cycles Secondary 7000 v. 50 ma. Insulated for 20,000 volts Hammond #15558
		Unit #3 Condenser Shelf Assembly
T301	Oscillator Filament	Primary 100, 110, 115, 120 v. 60 cycles Secondary 10 v. 26 amps. Insulation 4500 volts d.c. working. Low Capacity. Not greater than 50 μμf. Similar to Hammond #13841
		Unit #5 Modulator
T501	Modulator H.T.	Hammond #5546 Primary 110 v. 60 cycles Secondary 3000 volts
T502	Bias Transformer	Primary 110 v. 60 cycles Secondary 2000 volts
T503	Filament Transformer 813	Primary 0-100-115 volts Secondary 10 volts 4 amperes Center-tapped Hammond #1140
T504	Filament	Primary 110 v. 60 cycles Secondary 2.5 v. 3 amps. " 2.5 v. 6 amps. " 6.3 v. 2 amps. Hammond #12329
		Unit #7 Monitor Power Supply
T701	Power Transformer 320 volt supply	Hammond #274 6.3 v. 4 amps. 5 v. at 3 amps. 375-0-375 at 100 ma. 110 v. 60 cycles Primary
T702	Filament Transformer	Hammond #12637 2.5 v. at 2 amps. 5000 v. insulation 6.3 v. at 2 amps. 2000 v. insulation 2000 volts insulation between windings. 110 v. 60 cycles Primary

PARTS LIST - TRANSFORMERS

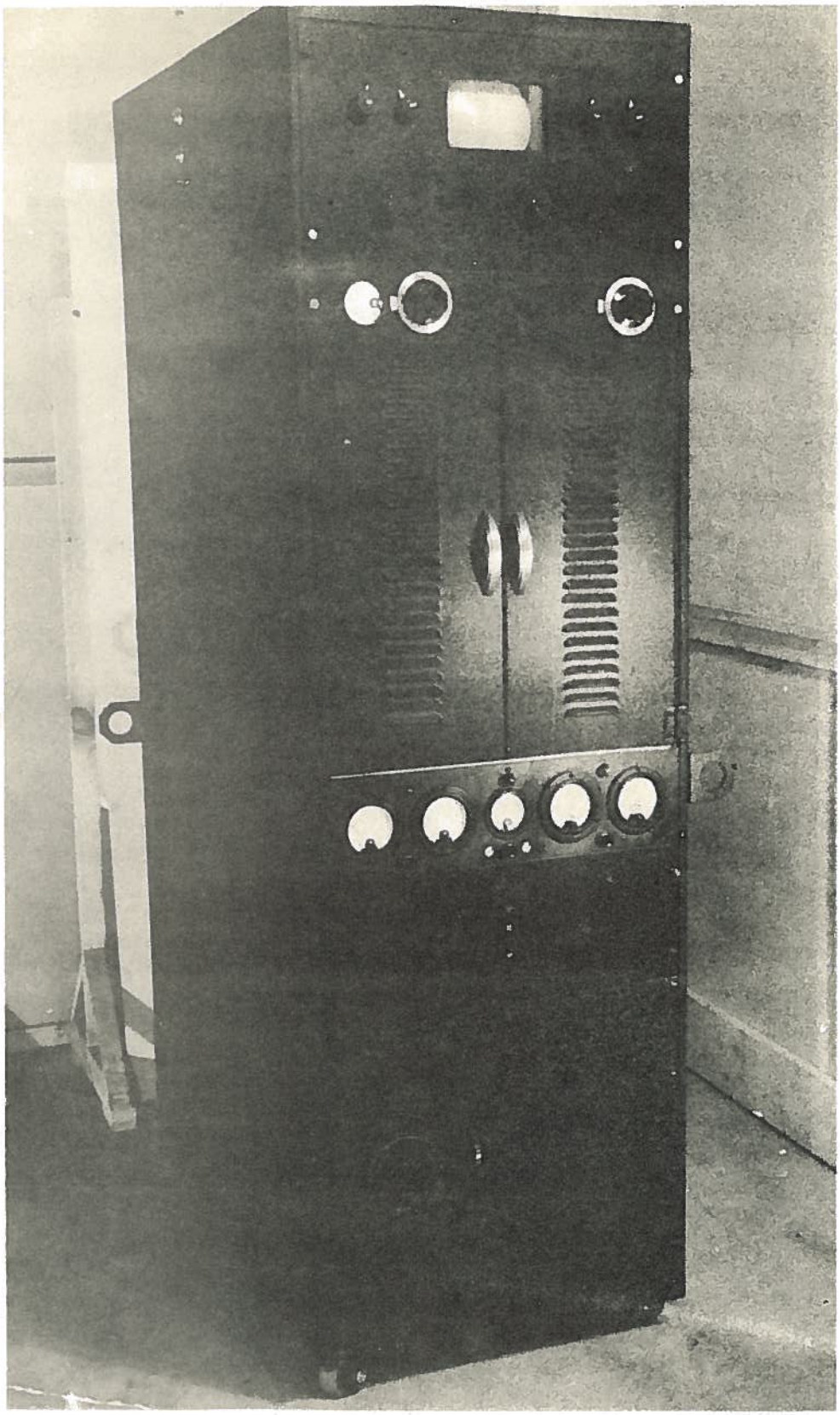
Designation	Description	Specification
		Unit #7 Monitor Power Supply
T703	Plate Transformer for 2000 v. supply	Hammond #13424 110 v. 60 cycles Primary 2000 v. .015 A Secondary

PARTS LIST - VALVES

		Unit #1 H.T. Power Supply
V101	H.T. Rectifier Tubes	Rx235 Raytheon
V102	ditto	ditto
		Unit #2 Control Panel
V201	Electronic Relay	117 N7GT
		Unit #4 Transmitter
V401	Oscillator	Eimac Type 304TH
V402	Oscillator	ditto
		Unit #5 Modulator
V501	Modulator Driver	RCA 884
V502	Negative pulse suppressing	RCA 84
V503	Modulator	RCA 813
V504	Positive pulse suppressing	RCA 879
V505	Bias Rectifier	RCA 879
V506	4000 v. Rectifier	RCA 879
		Unit #6 Monitor
V601	Oscillator	RCA 884
V602	Sweep	RCA 884
V603	Sweep	RCA 884
V604	Keyer	RCA 884
V605	Blanking	RCA 1852
V606	Calibrator	RCA 1852
V607	Cathode Ray	RCA 1802 - 5AP1 or 5AP4
V608	Voltage Regulator	RCA VR 150
V609	ditto	ditto
		Unit #7 Monitor Power Supply
V701	320 volt Rectifier	RCA 80
V702	2000 volt Rectifier	RCA 879

PARTS LIST - VARIACS

Designation	Description	Specification
		Unit #1 H.T. Power Supply
VT101	H.T. Primary Control	0-135 volts 5 amperes
		Unit #5 Modulator
VT501	Bias Rectifier Primary Control	115 v. 60 cycles 1 ampere G.R. Type 200 B



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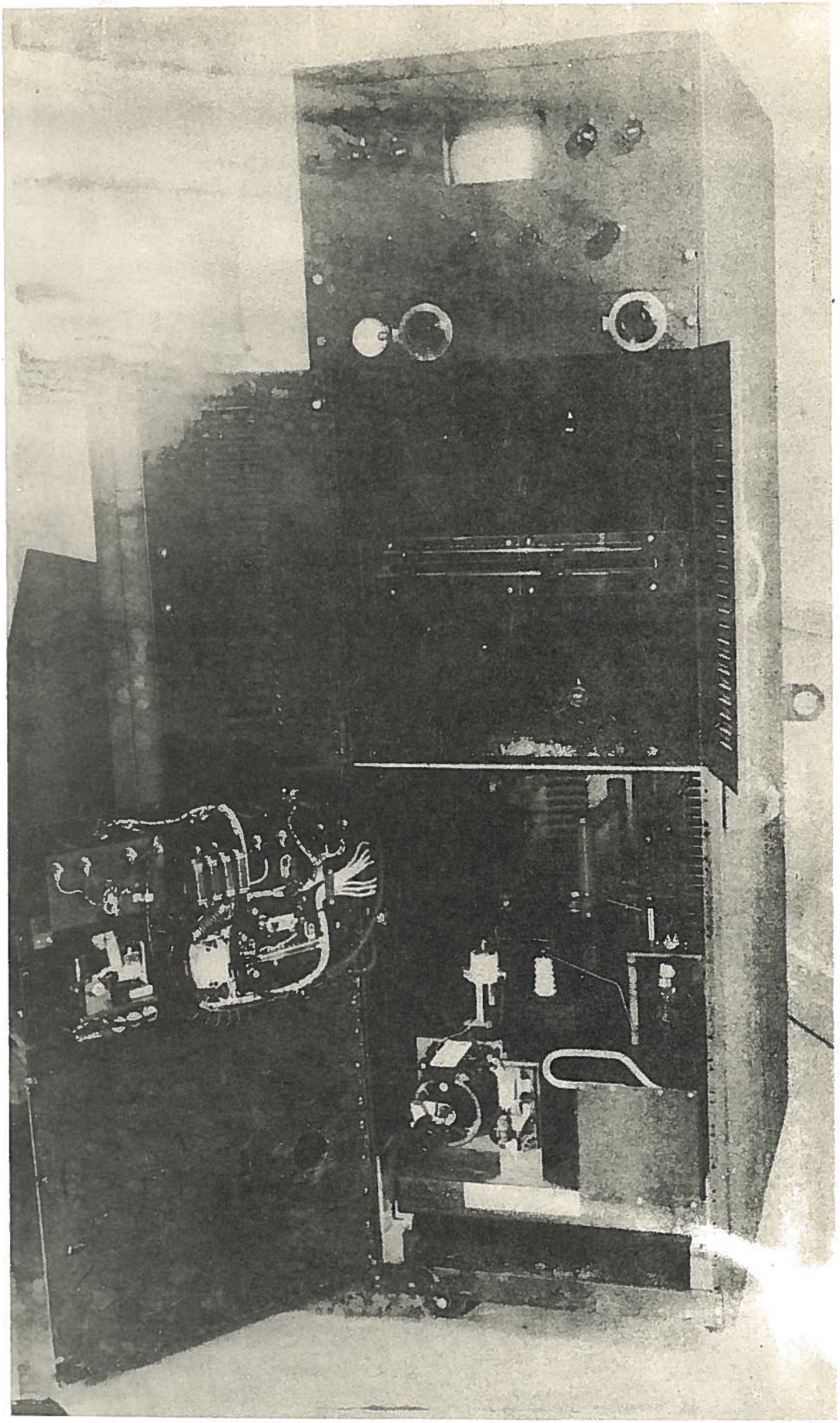
C.D. Transmitter #2
Complete Assembly - Front View

FIG. I



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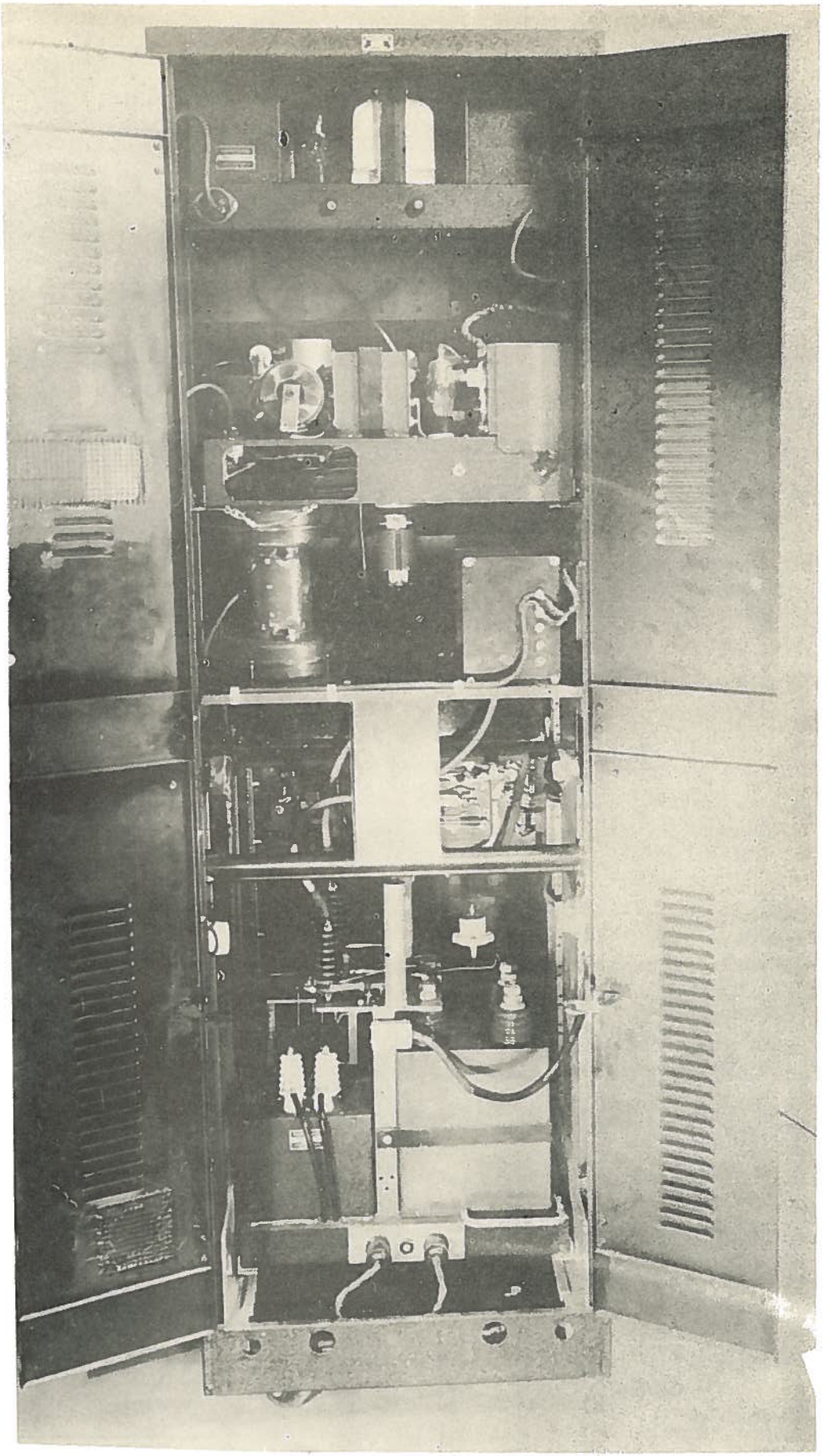
C.D. Transmitter #2
Front View - Doors Open

FIG.II



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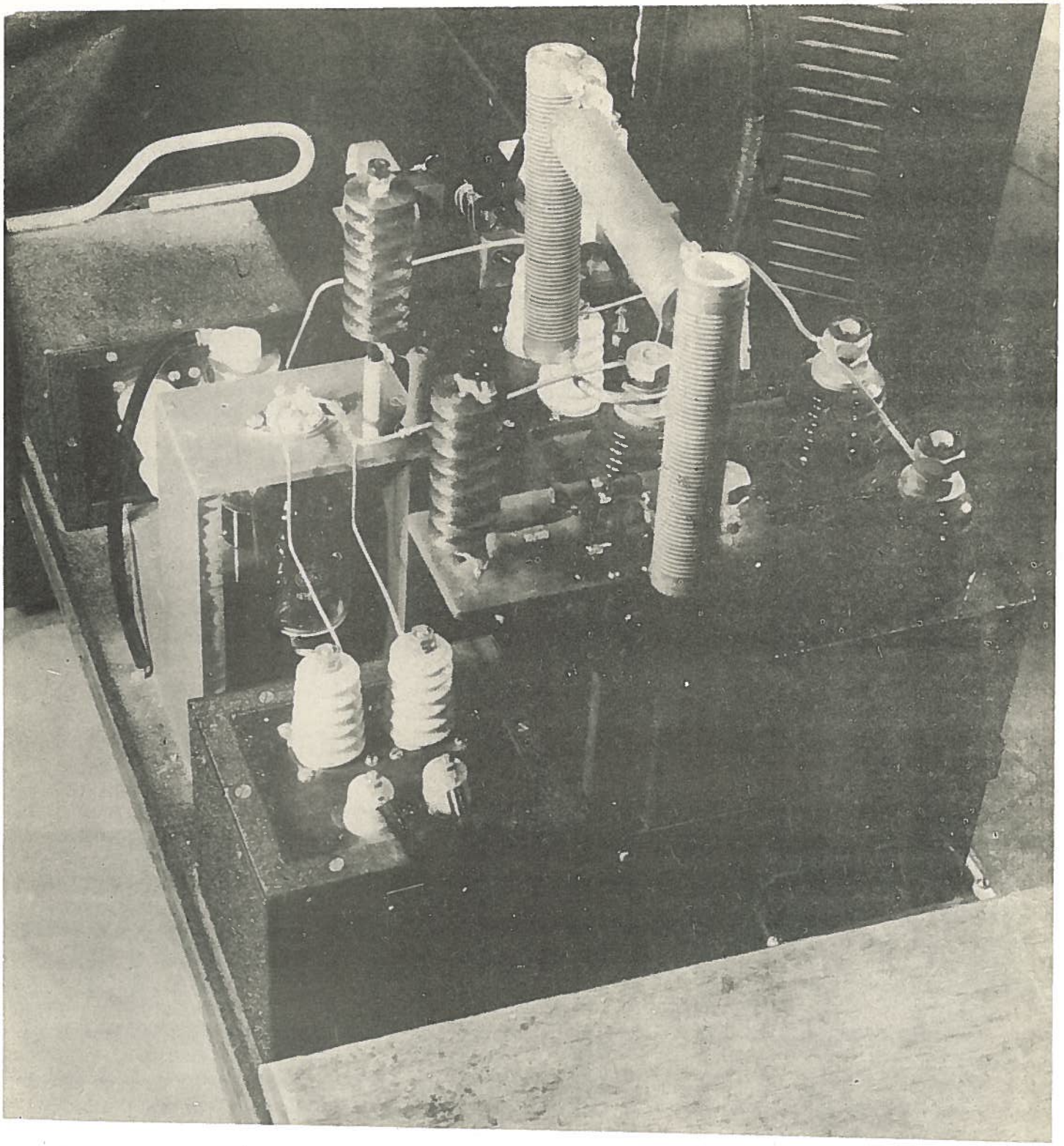
C.D. Transmitter #2
Rear View - Complete Assembly

FIG. III



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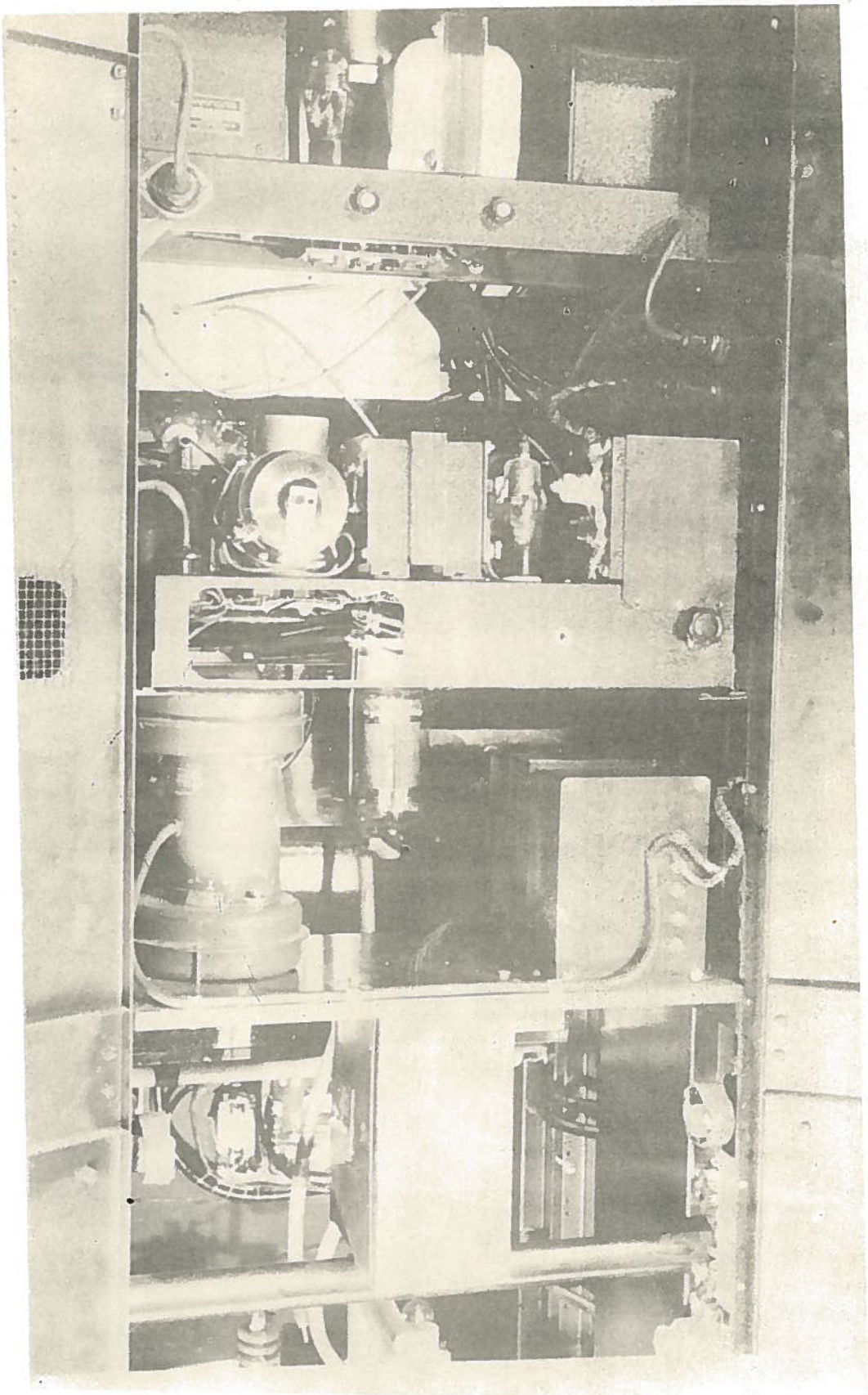
C.D Transmitter #2
H.T. Unit

FIG. IV



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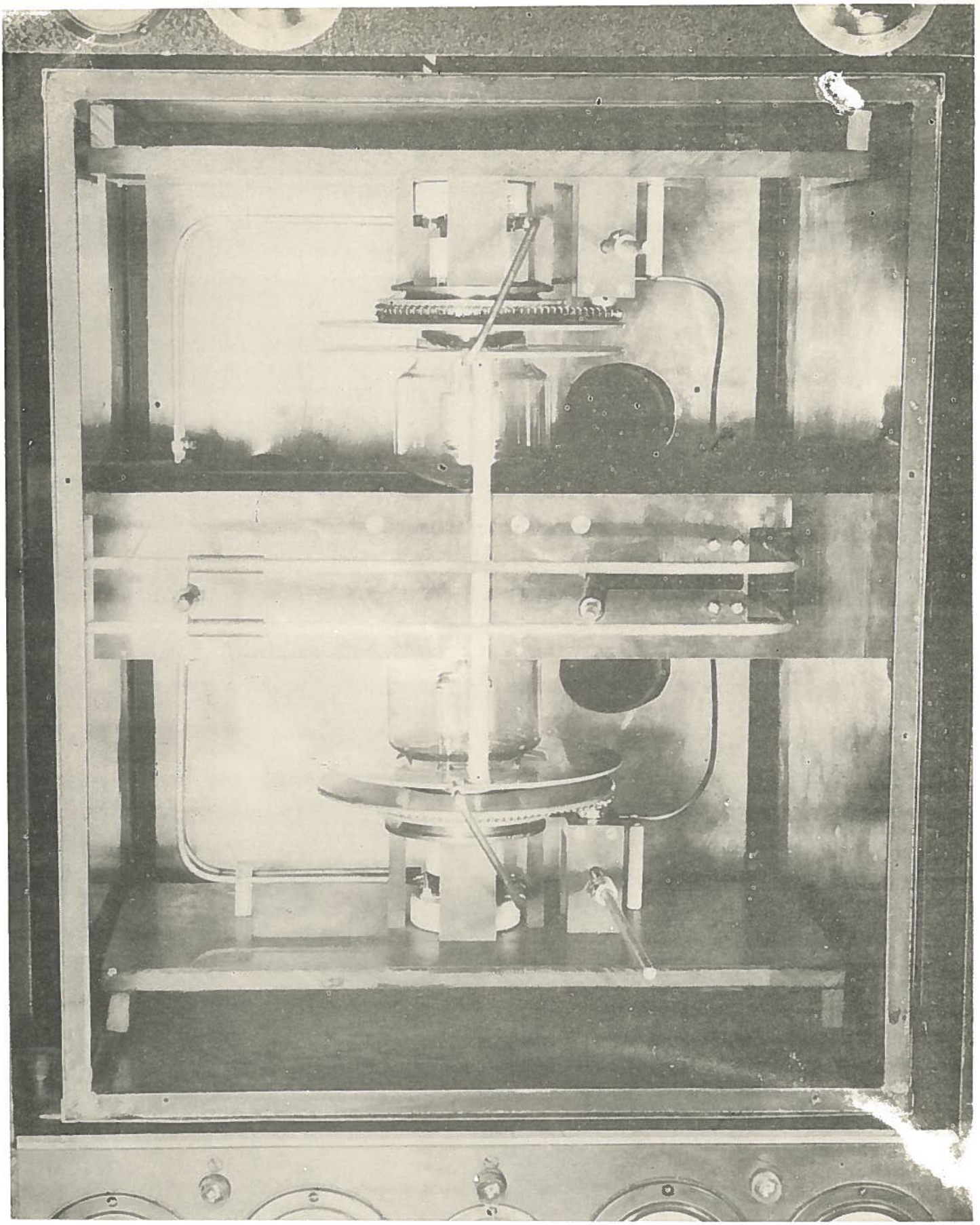
C.D. Transmitter #2
Condenser Shelf Assembly & Monitor Power Supply FIG.V



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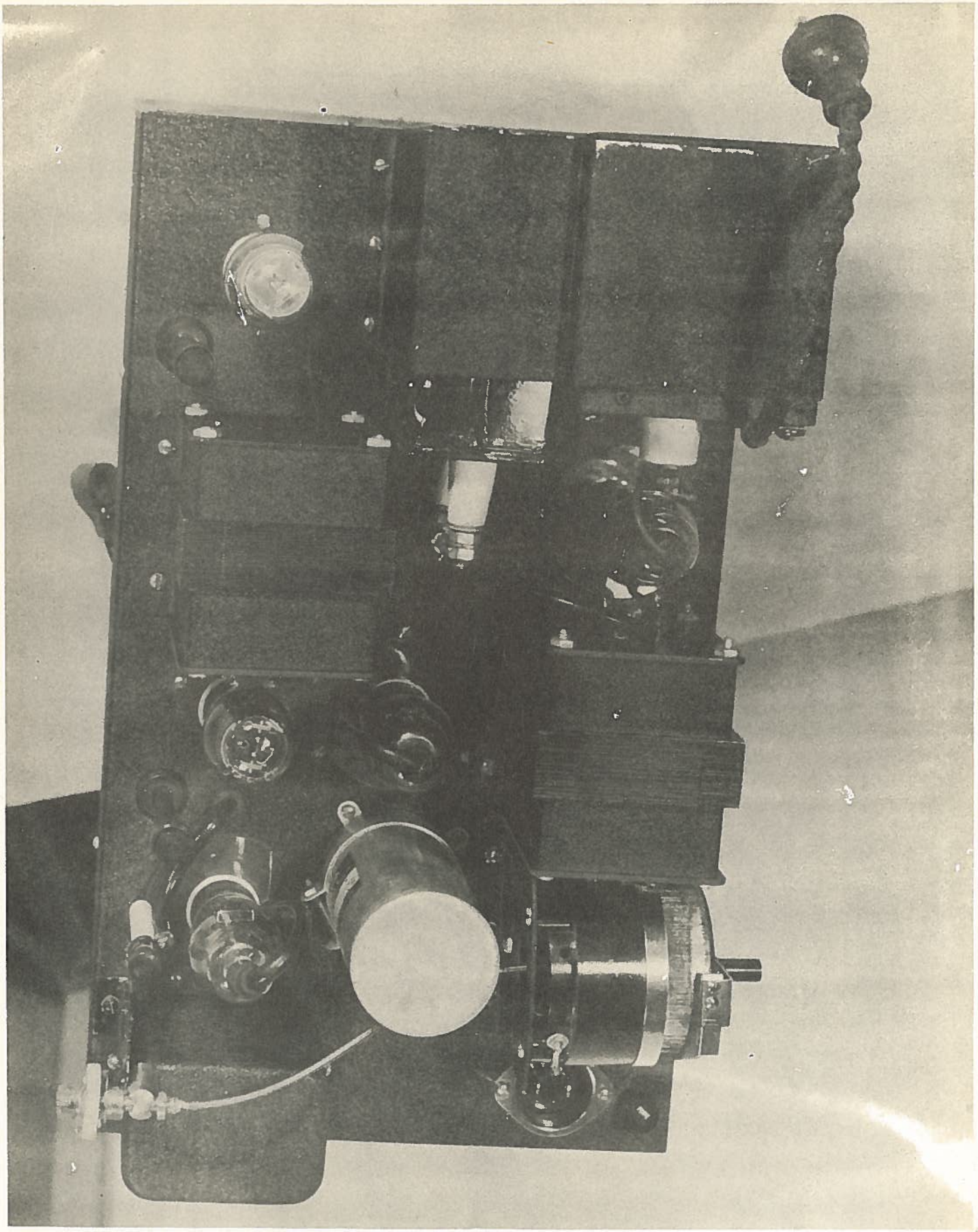
C.D. Transmitter #2
Oscillator - Unit #4

FIG. VI



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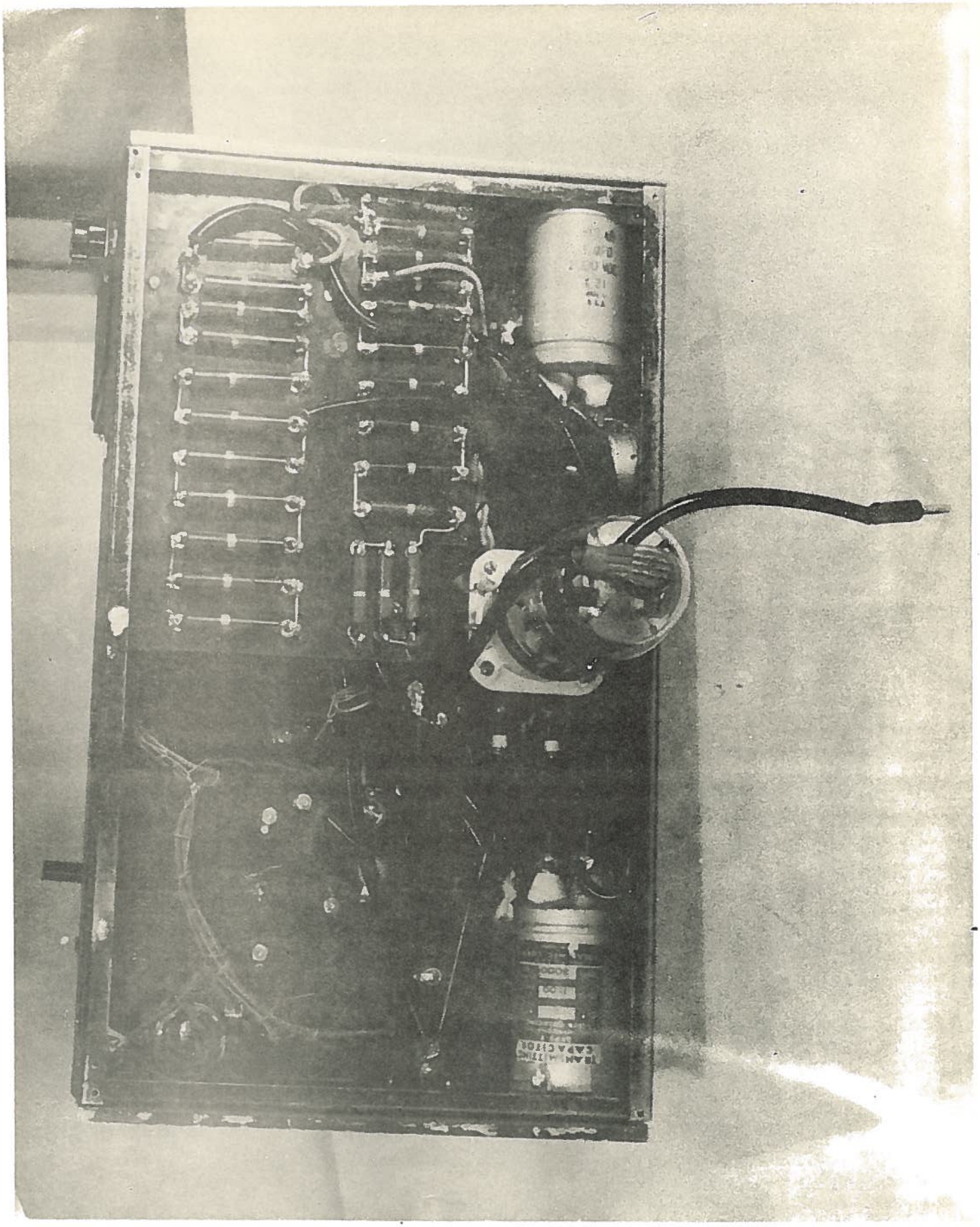
C.D. Transmitter #2
Modulator - Unit #5 - Top View

FIG. VII



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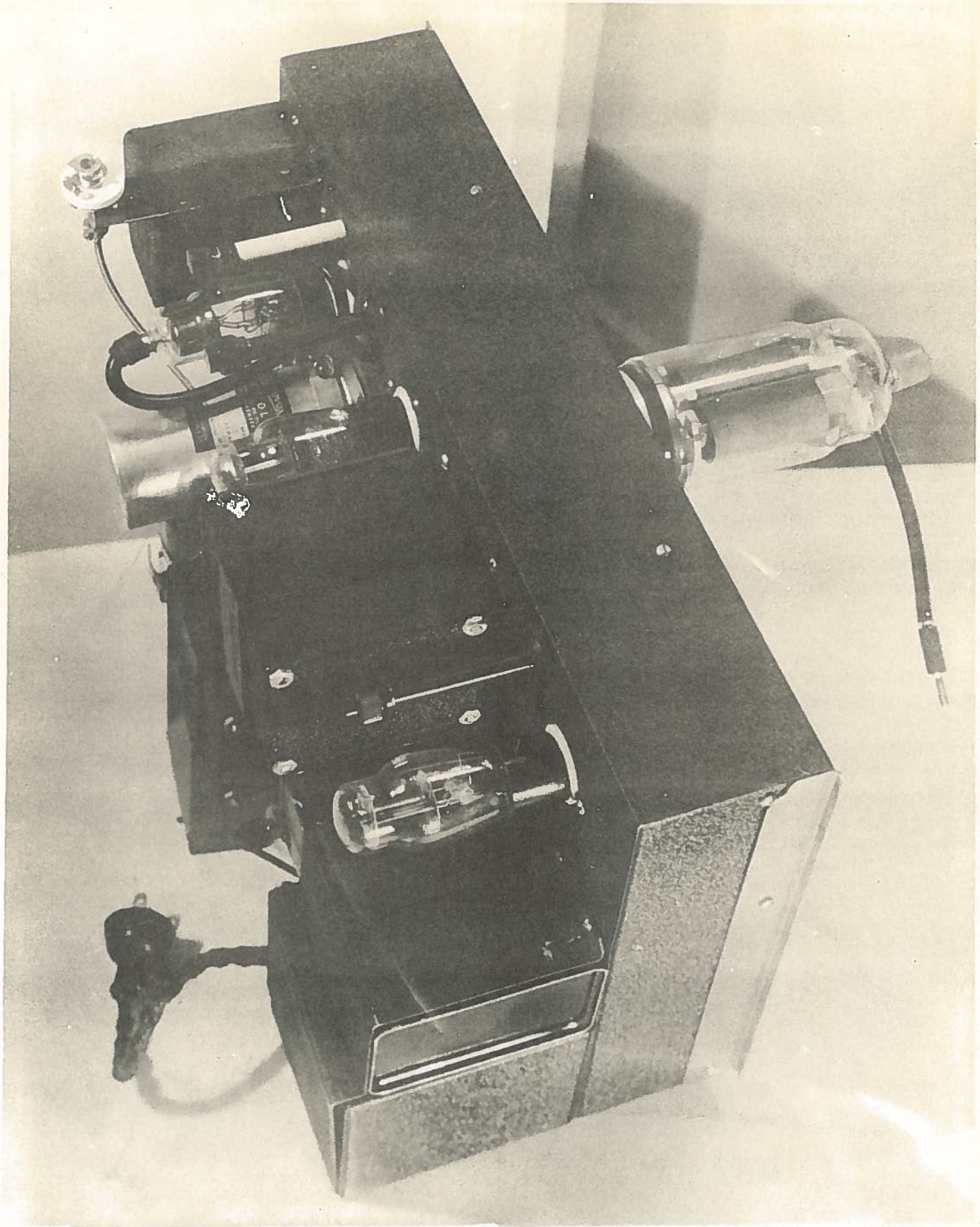
C.D. Transmitter #2
Modulator - Unit #5 - Bottom View

FIG. VIII



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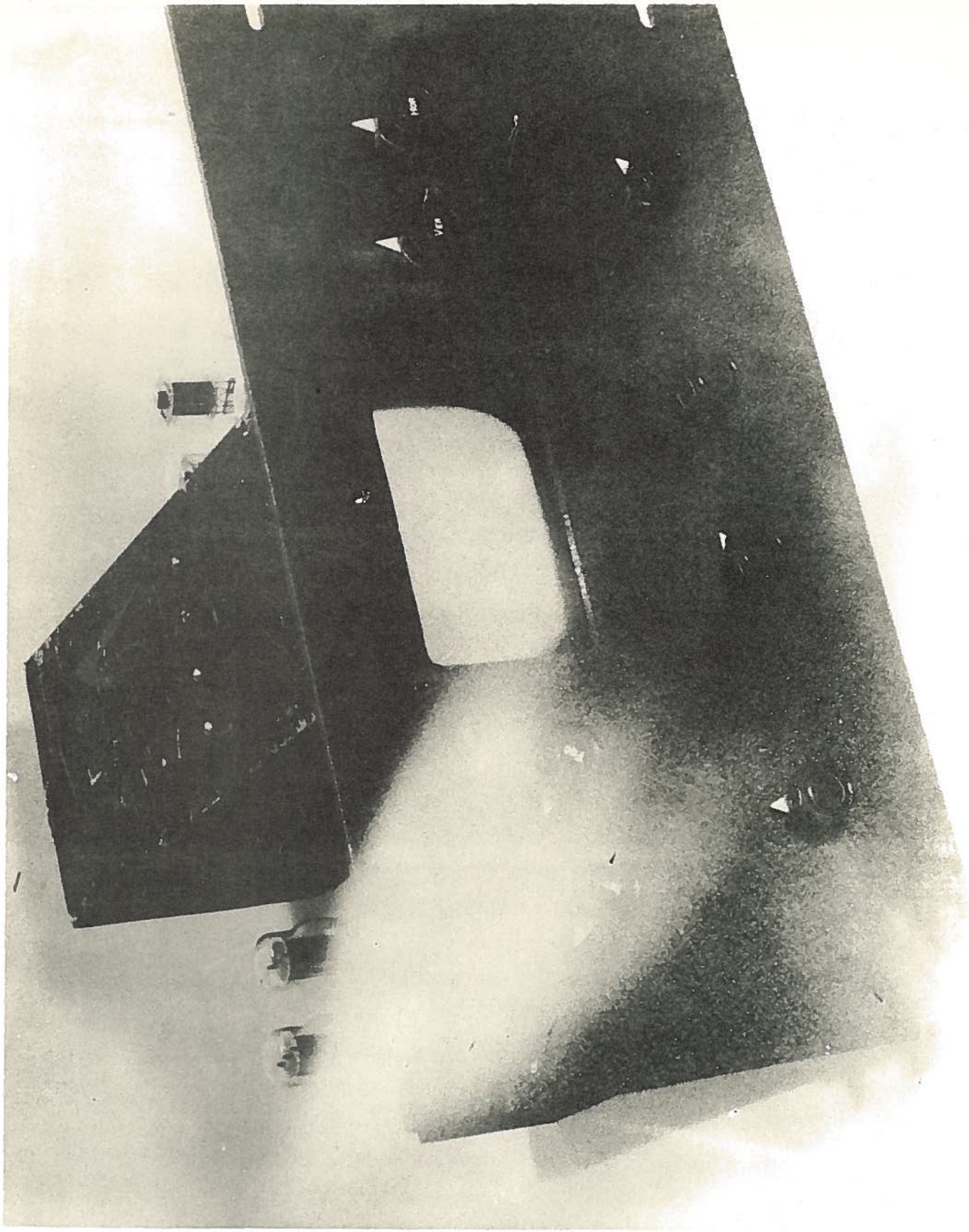
C.D. Transmitter #2
Modulator - Unit #5 - Side View

FIG. IX



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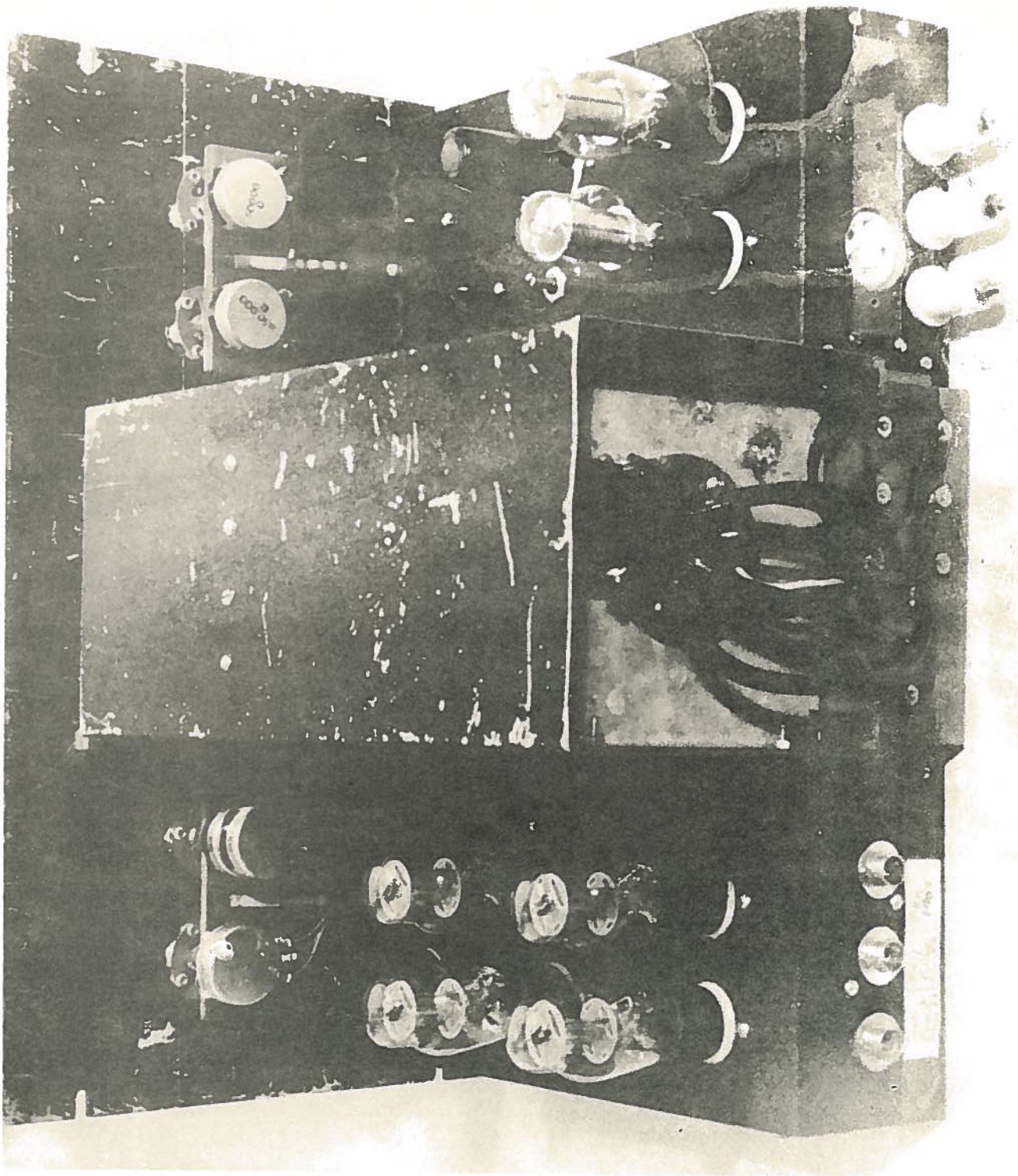
C.D. Transmitter #2
Monitor - Unit #6 - Front View

FIG. X



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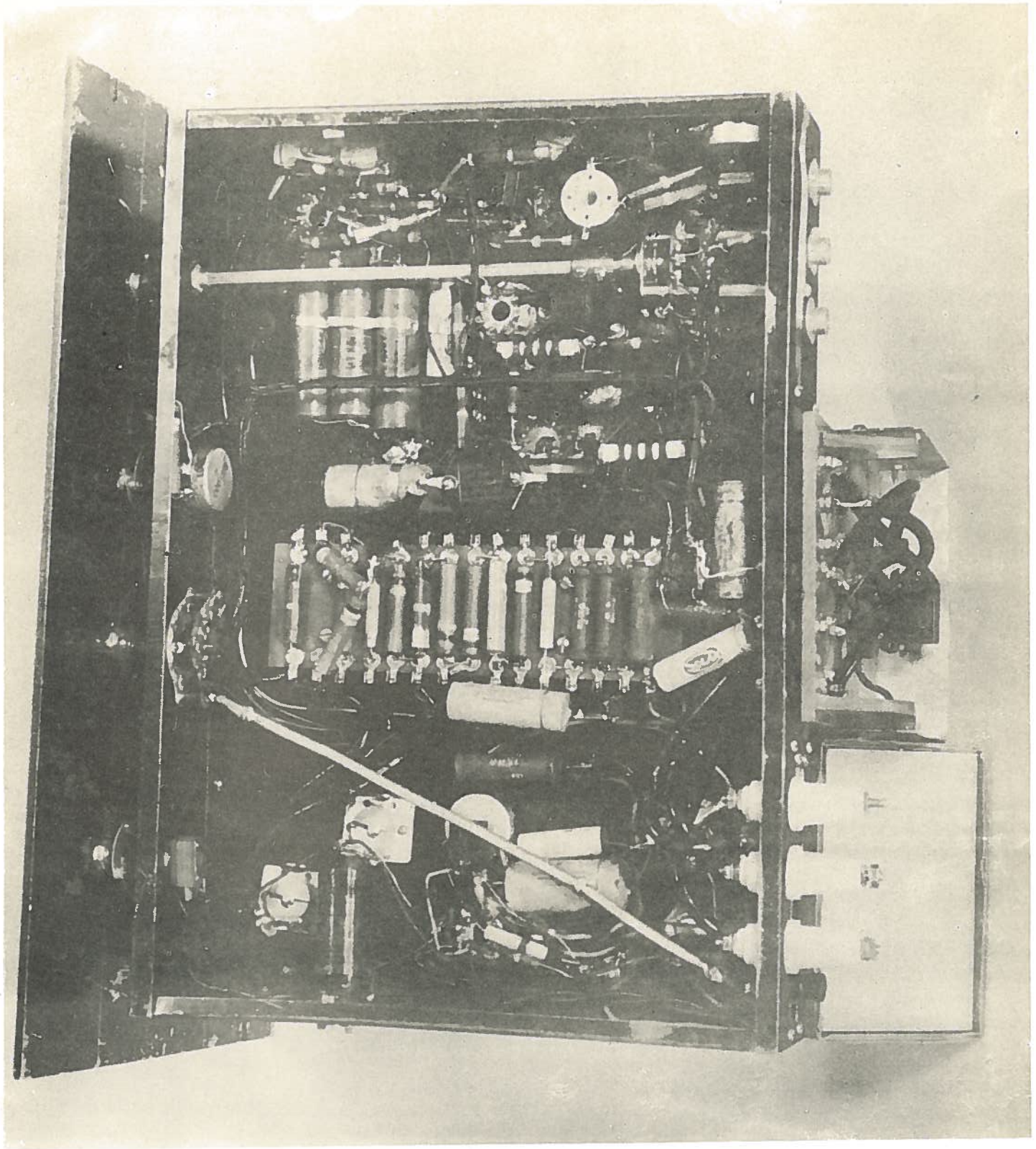
C.D. Transmitter #2
Monitor - Unit #6 - Back View

FIG. XI



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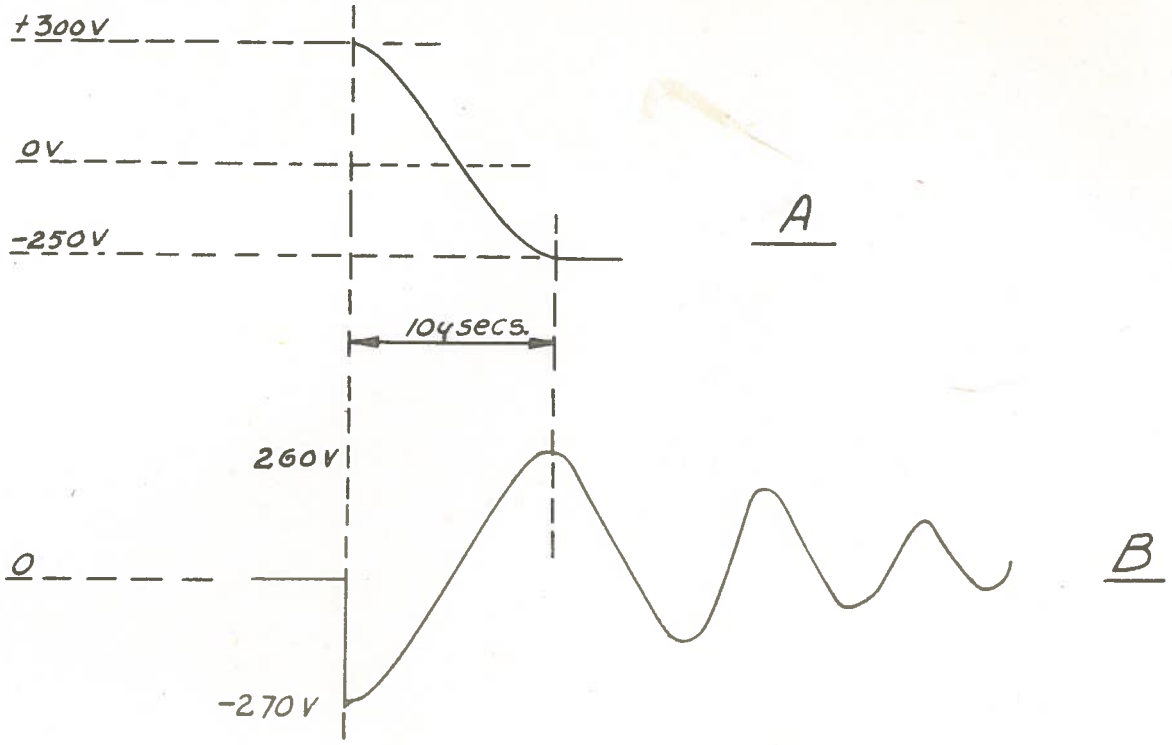
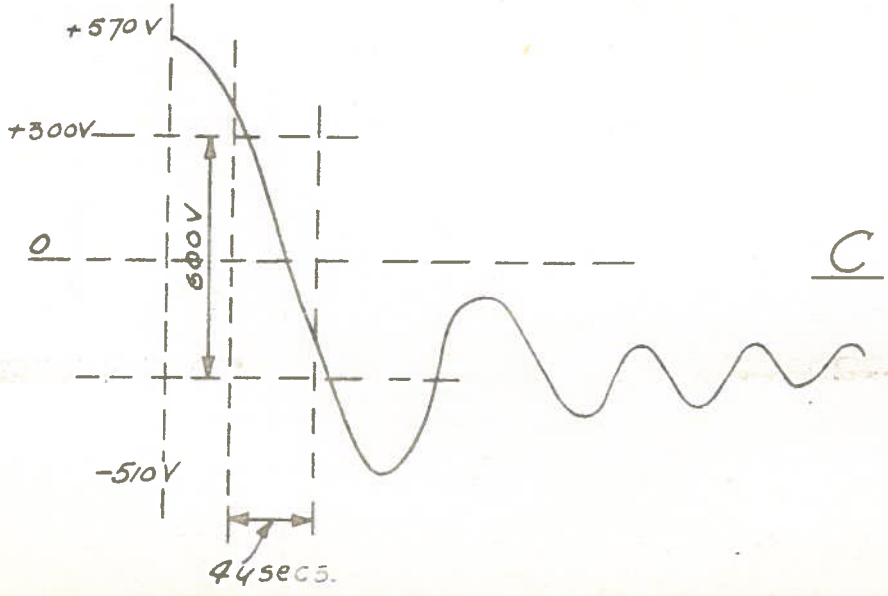
C.D. Transmitter #2
Monitor - Unit #6 - Bottom View FIG. XI



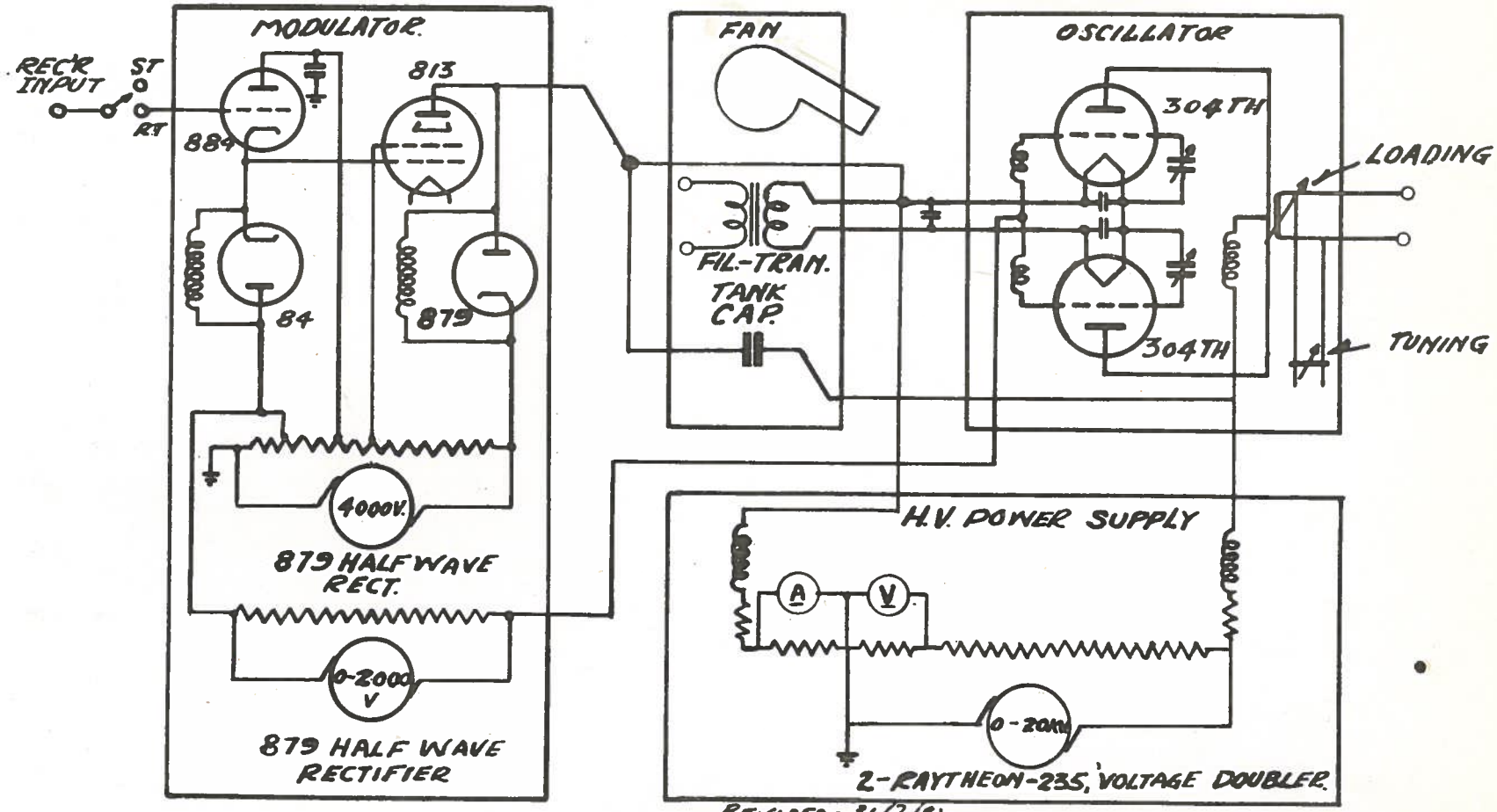


ITEM	PART No.	QUAN.	MAT'L	DESCRIPTION
DRAWN BY W. Johnson		DATE 29/6/41		SUPERSEDES
CHECKED W.C. Dilkinson		DATE		SCALE
ENG. APP. W.C. Dilkinson		DATE		FINISH.

NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

NAME: WAVE FORMS MONITOR

DWG. NO. NRC - RE-215



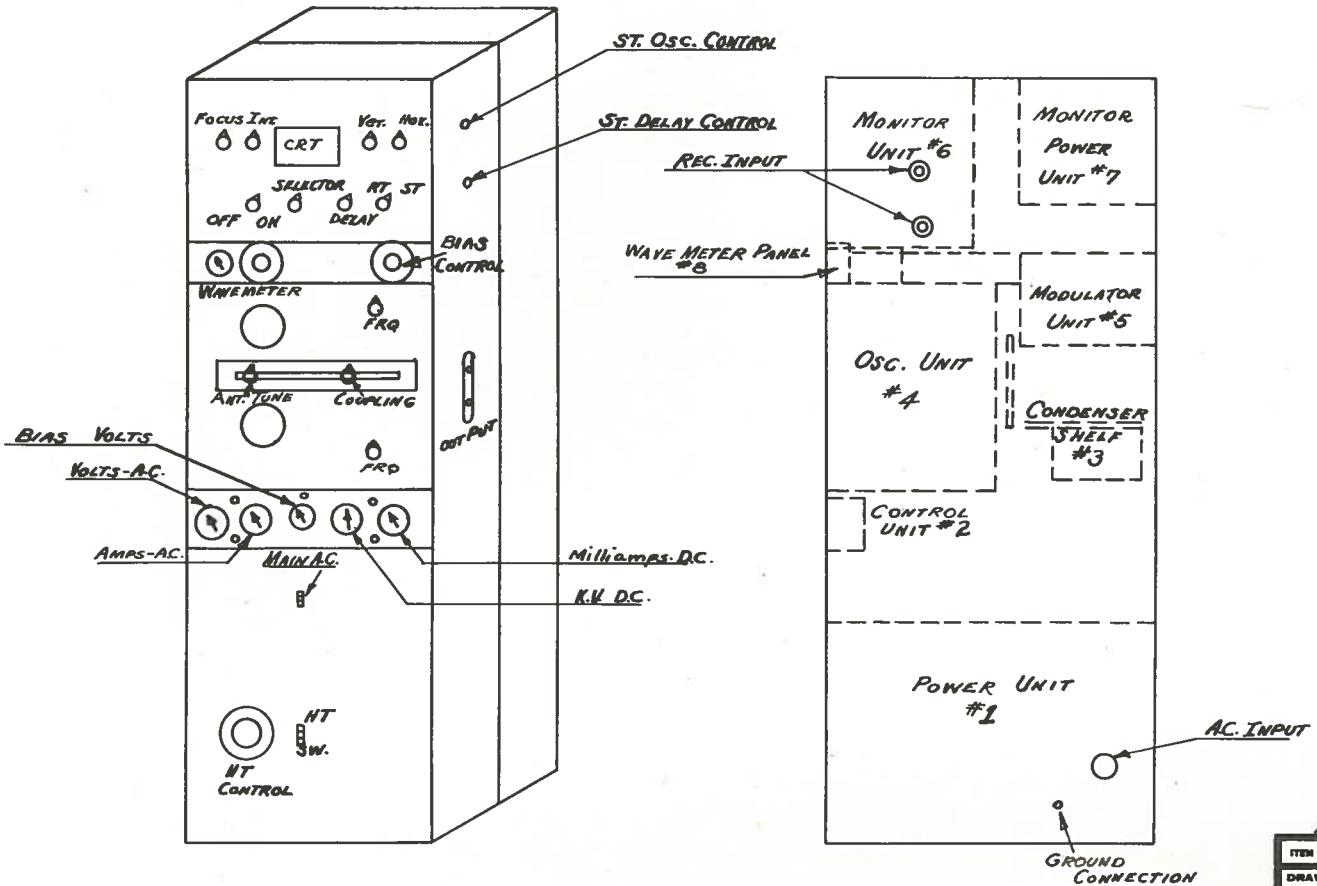
REVISED - 31/7/42

ITEM	PART No.	QUAN.	MAT'L	DESCRIPTION
DRAWN BY W Johnson.		DATE FEB-25-42		SUPERSEDES
CHECKED WR McBinson		DATE May 14. 42.		SCALE
ENG. APPROV [illegible]		DATE May 16-42.		FINISH.

NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

NAME CD #2 TRANSMITTER
BASIC CIRCUIT

DWG. NO.
NRC-RE-212



FRONT VIEW - OSC. PANEL REMOVED

LEFT SIDE VIEW

UNIT #1 - POWER UNIT - SEE DRG. #198
UNIT #2 - CONTROL UNIT - SEE DRG. #
UNIT #3 - SHELF ASSEMBLY - SEE DRG. #199
UNIT #4 - OSC. ASSEMBLY - SEE DRG. #195
UNIT #5 - MODULATOR - SEE DRG. #214
UNIT #6 - MONITOR UNIT - SEE DRG. #201
UNIT #7 - MONITOR POWER SUPPLY - SEE DRG. #200

NOTE: CABINET CONSISTS OF TWO STANDARD HAMMOND #1462 MOUNTED BACK TO FRONT.

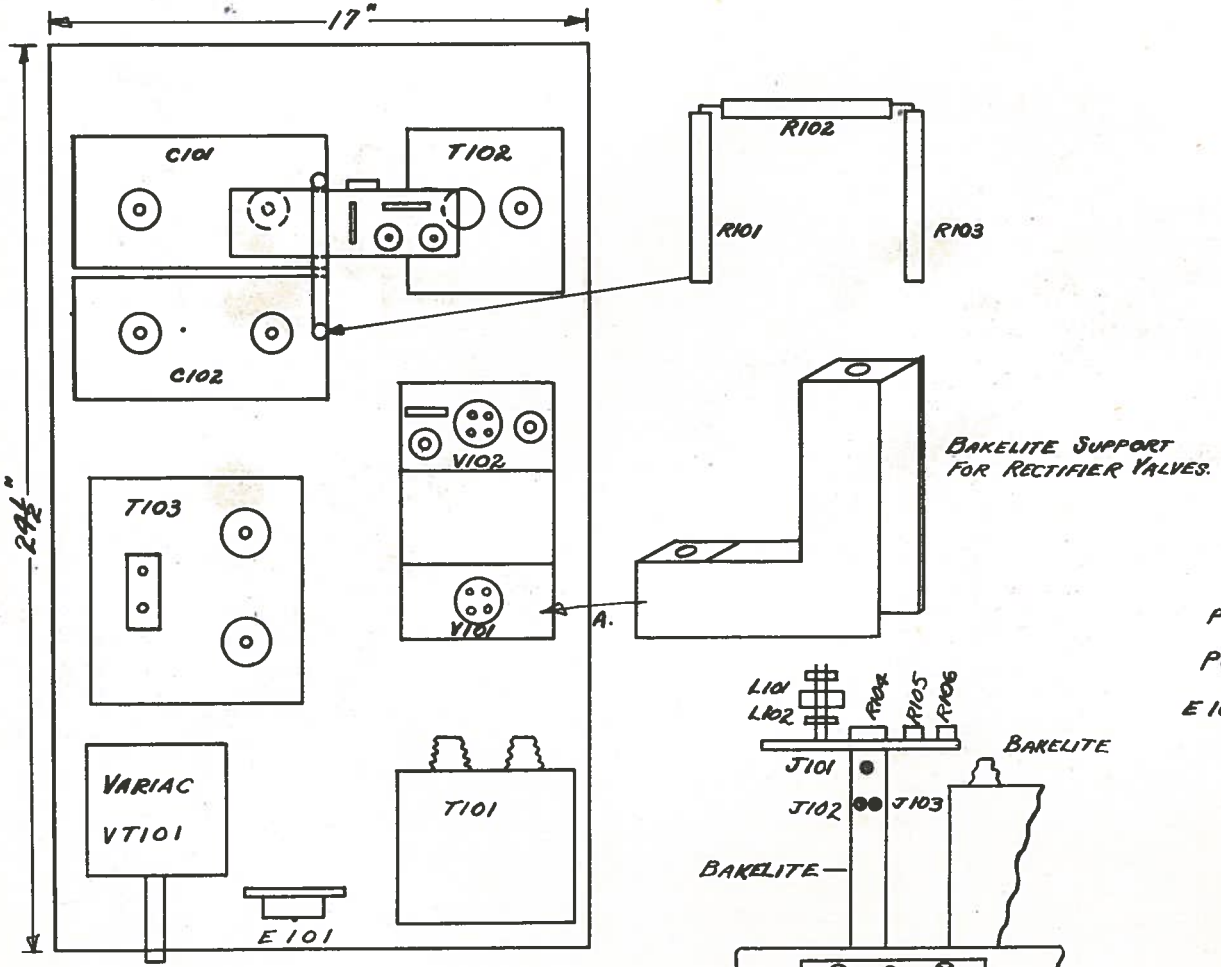
REVISED - 31/7/42

ITEM	PART NO.	QUAN.	MAT'L	DESCRIPTION
DRAWN BY E.H.B.	DATE APRIL 20-42	SUPERSEDES		
CHECKED W. Johnson	DATE APR-25-42	SCALE Traced-1/4-30/5/42		
ENG. APPROV. [illegible]	DATE June 8-42.	FINISH.		

NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

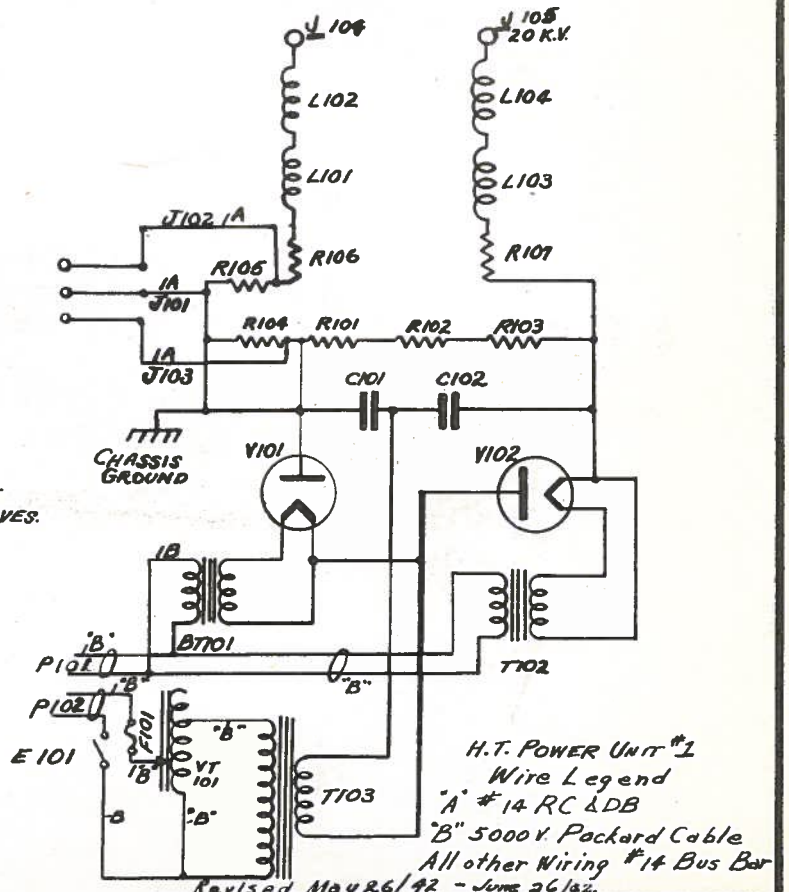
NAME C.D. #2 TRANSMITTER GENERAL ASSEMBLY

DWG. NO. NRC-RE-196



FRONT OF UNIT

SECTION-REAR OF UNIT



ITEM	PART NO.	QUAN.	MATL	DESCRIPTION
DRAWN BY ENB		DATE APR-22-1942		SUPERSEDES
CHECKED W Johnson		DATE APR-25-42		SCALE Tracing 3/8 3/5/42
ENG. APPROV. W Wilkins		DATE May 27 42		FINISH.

NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

NAME CD #2 TRANSMITTER . H.T. POWER UNIT #1

DWG. NO. NRC-R[illegible] 98

MONITOR UNIT #6

MODULATOR UNIT #5

OSCILLATOR UNIT #4

MONITOR POWER UNIT #7

CONTROL UNIT #2

H.T. POWER UNIT #1

SHELF UNIT #5

Transm. Mor Pulse from rec

RF Acknd

Wires up Right hand Rear of Cabinet

Wires up Left hand Rear of Cabinet

Main Fuses back of Cabinet

Main AC Input

Gate Switch Normally Closed

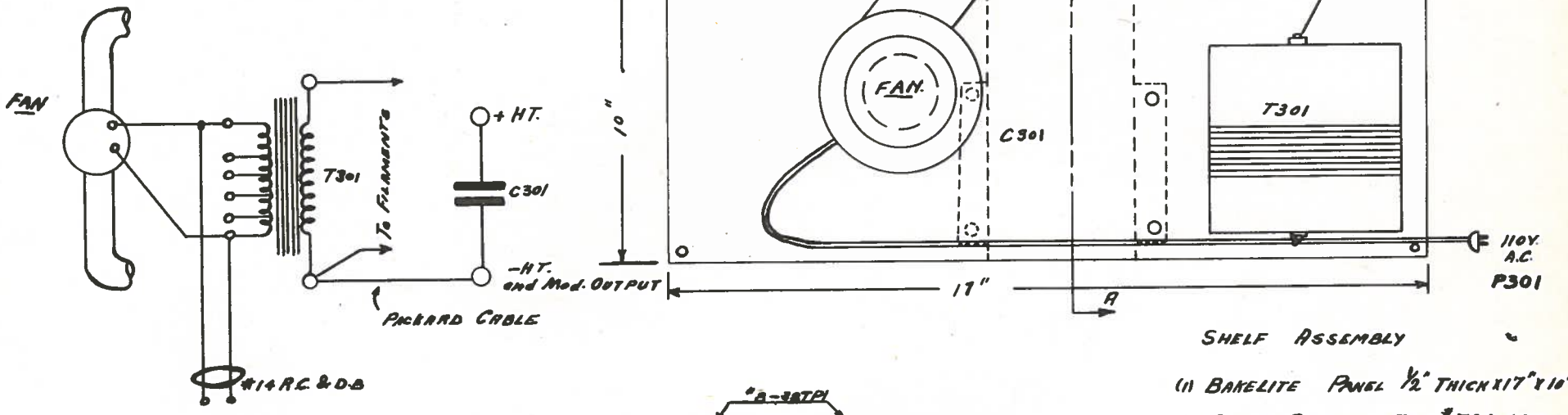
E201 Normally Open

Chassis Ground

NATIONAL RESEARCH COUNCIL-RADIO SECTION

C 302 TRANSMITTER COMPLETE WIRING

WE-65-194

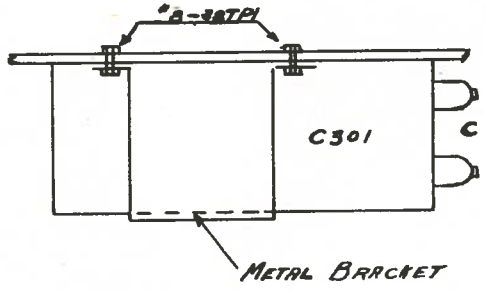


SHELF ASSEMBLY

(1) BAKELITE PANEL ½" THICK X 17" X 10"

(2) SEARS ROEBUCK FAN #726.120

(3) RUBBER HOSE 2" I.D



SECTION A-A

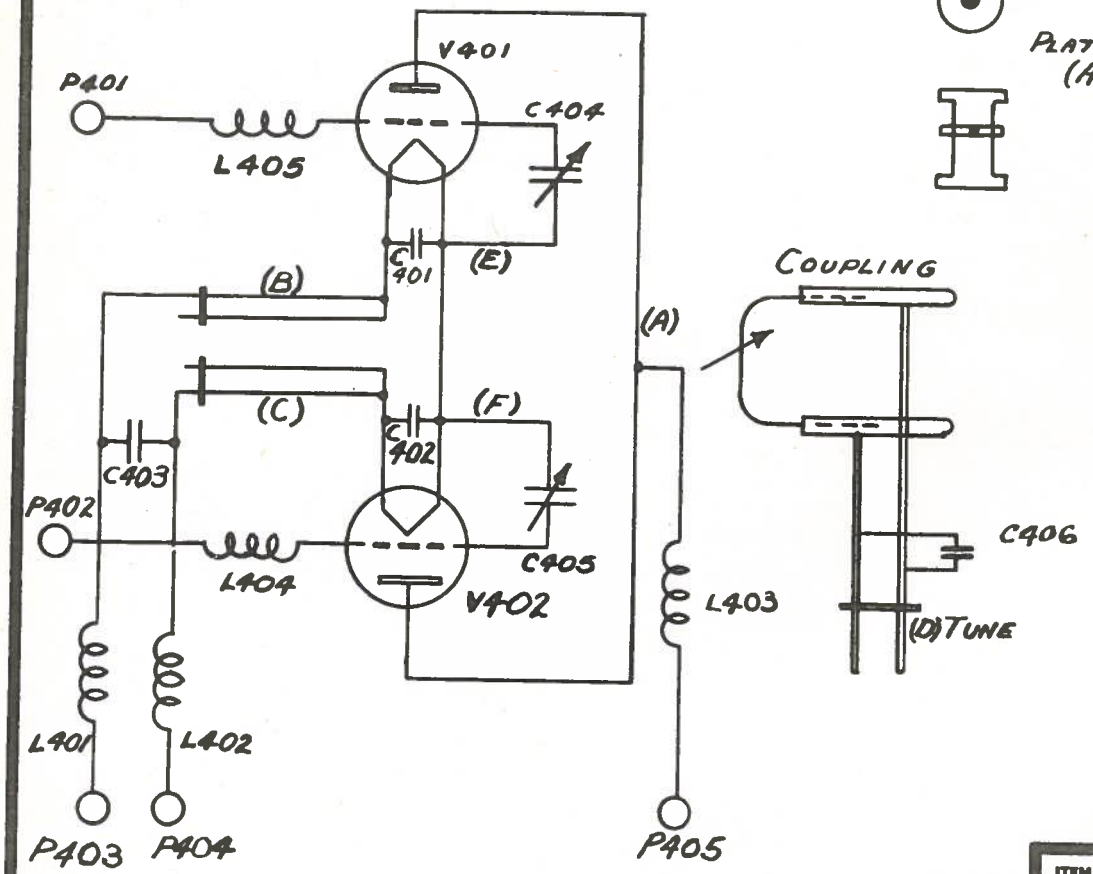
Revised May 26/42

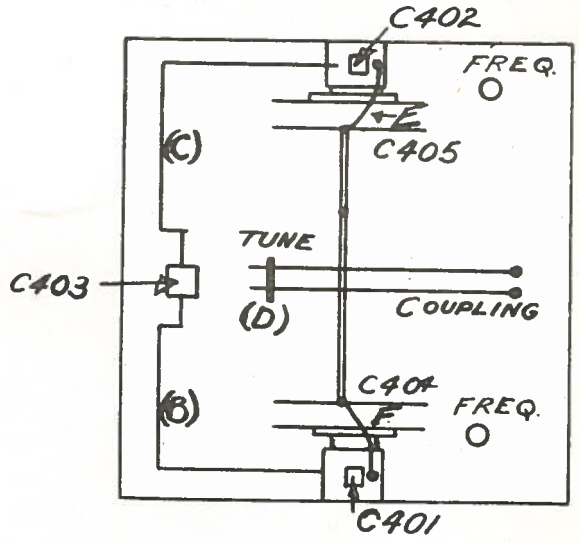
ITEM	PART NO.	QUAN.	MAT'L	DESCRIPTION
DRAWN BY EHB		DATE APRIL 20, 1942		SUPERSEDES
CHECKED W Johnson		DATE APR. 26-42		SCALE —
ENG. APPROV. WC Wilkinson		DATE May 27/42		FINISH. —

NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

NAME CO#2 TRANSMITTER CONDENSER SHELF UNIT #3

DWG. NO. NRC-RE-199





FRONT VIEW OSCILLATOR

REAR VIEW OSC. ASSEMBLY

NOTE: SEE ASSEMBLY DRG. FOR DETAILS. NRC-RE-195

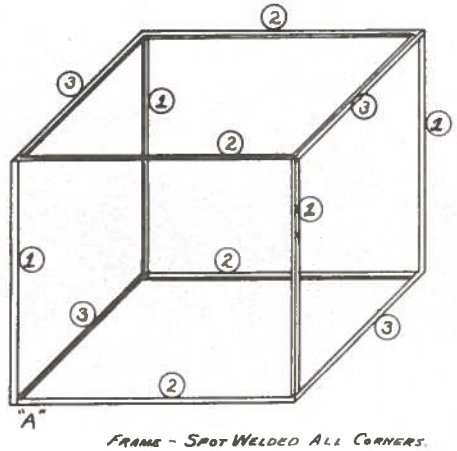
REVISED - 31/7/42

ITEM	PART NO.	QUAN.	MAT'L	DESCRIPTION
DRAWN BY E.H.B		DATE APRIL 30 1942		SUPERSEDES
CHECKED W. Johnson		DATE APR-25-42		Traced 2/5/92
ENG. APPROV W.W. Watkinson		DATE June. 8-42.		FINISH.

NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

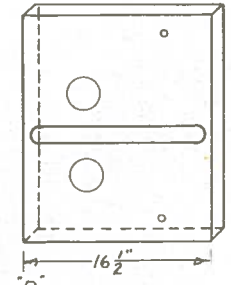
NAME CD #2 TRANSMITTER
OSC. UNIT #4

DWG. NO. NRC-RE-197

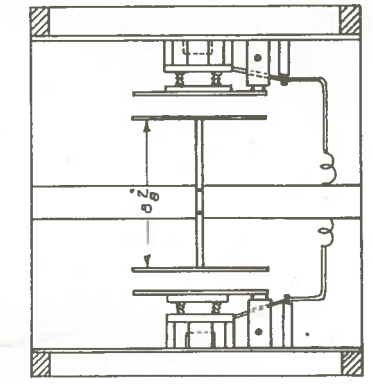


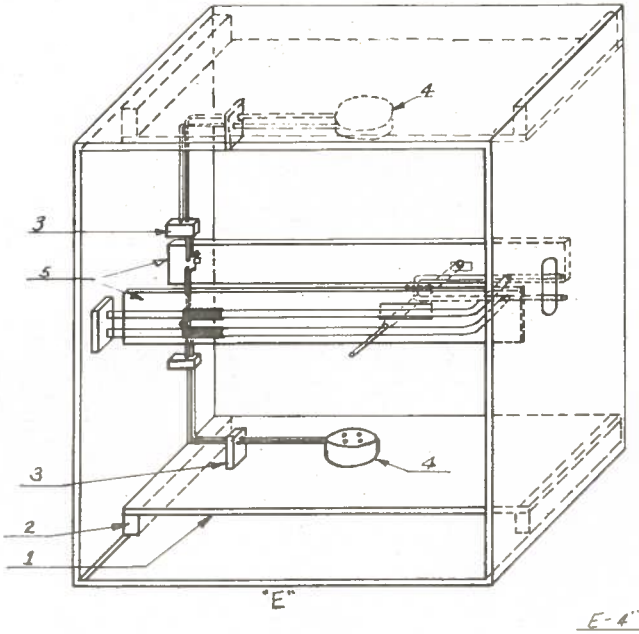
FRAME - SPOT WELDED ALL CORNERS.

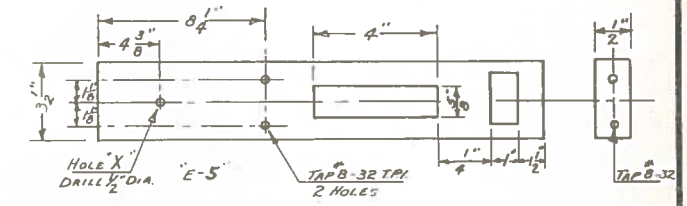
PART	ANGLE SIZE	LENGTH
A-1	L 1½" x 1½" x ⅛"	20 INCHES
A-2	L 1½" x 1½" x ⅛"	16 ¼ INCHES
A-3	L 1½" x 1½" x ⅛"	17 INCHES



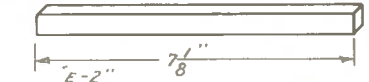
FRONT PANEL



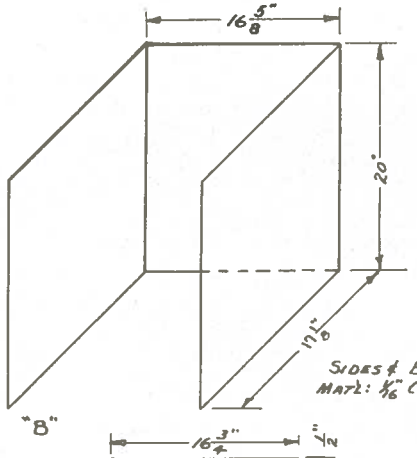




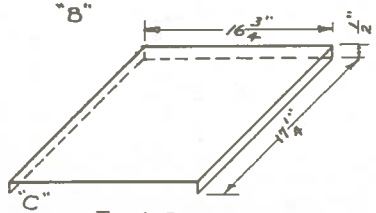
E-5 - 2 REQ'D PER UNIT
MAT'L: NATURAL BAKELITE
NOTE: HOLE "X" IS OMITTED IN BACK PIECE



4 REQ'D PER UNIT
MAT'L: 1" x ¾" BAKELITE

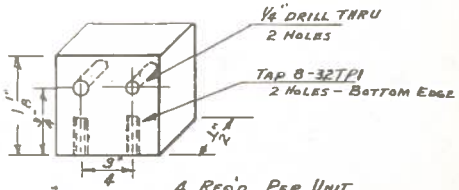


SIDES & BACK
MAT'L: 1/16" COPPER

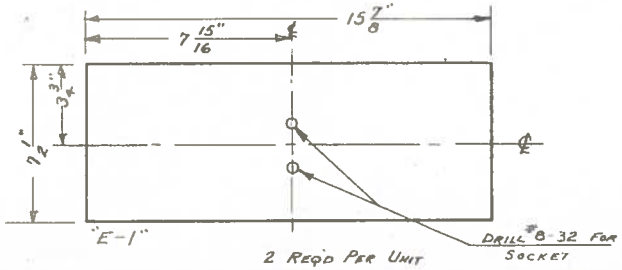


TOP & BOTTOM
MATERIAL: 1/16" COPPER

E-4" - EIMAC SOCKETS



4 REQ'D PER UNIT
MAT'L: POLYSTYRENE



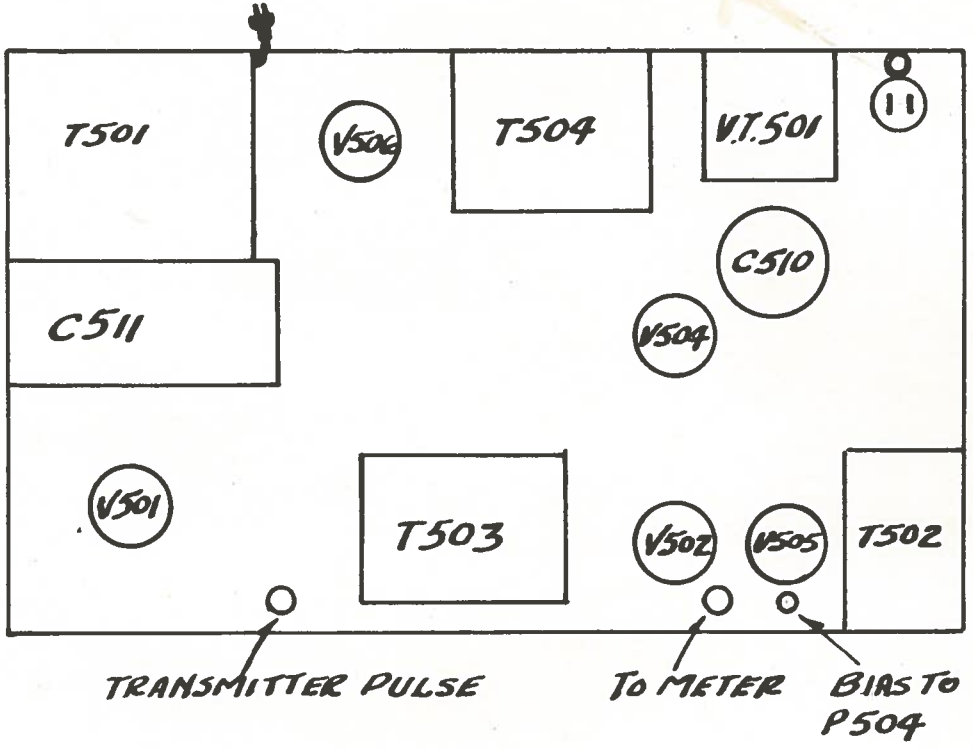
2 REQ'D PER UNIT
MAT'L: ½" BAKELITE

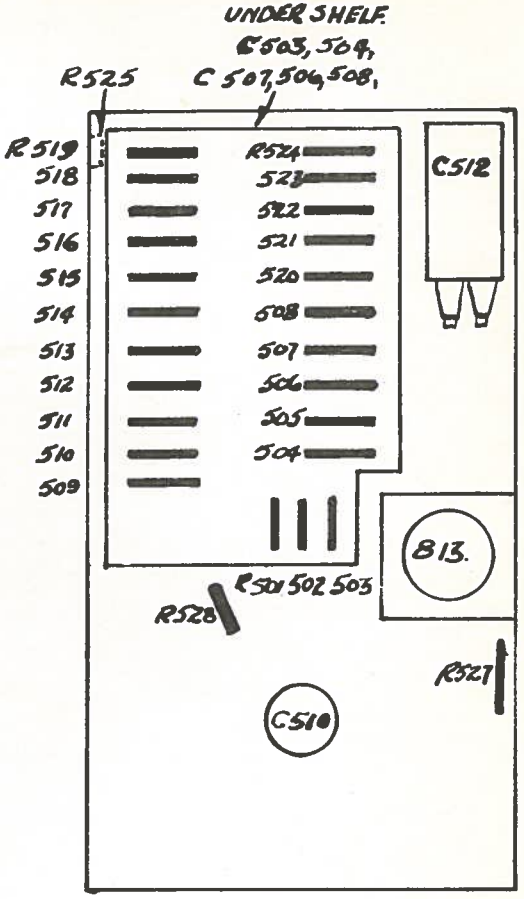
ITEM	PART NO.	GRADE	MAT'L	DESCRIPTION
DRAWN BY E.H.B.	DATE 25/3/42	SUPERSEDES T.M.A.F.P.: G.M.3/442		
CHECKED	DATE	SCALE Not to scale		
ENG. APPROV.	DATE	FINISH		

NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

NAME CD 2 TRANSMITTER OSCILLATOR ASSEMBLY

DWG. NO. NRC-RE-195





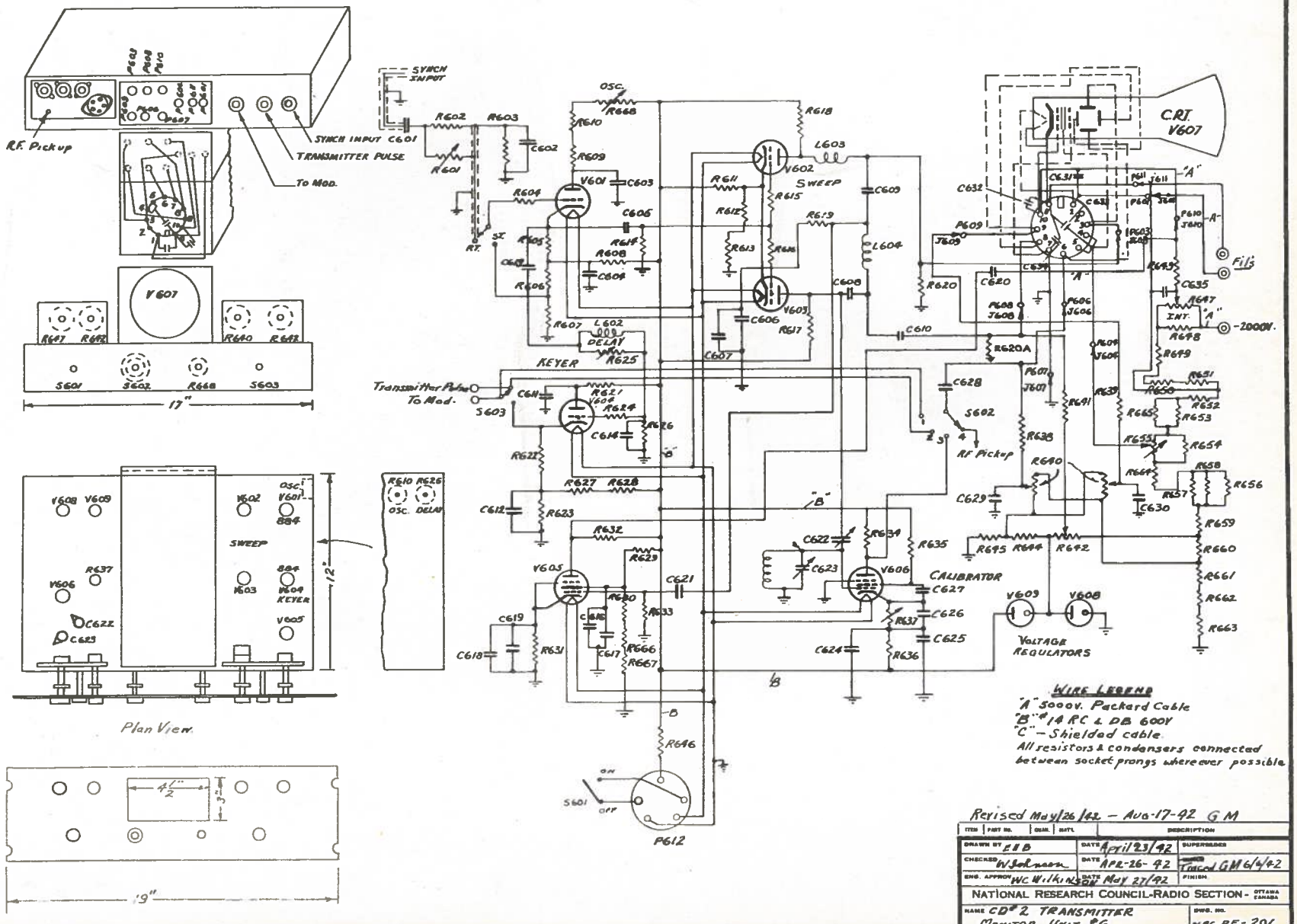
See NRC-RE 194 for wiring. - REVISED - 31/7/41

ITEM	PART NO.	QUAN.	MAT'L	DESCRIPTION
DRAWN BY W Johnson		DATE June/26/42		SUPERSEDES —
CHECKED		DATE "		SCALE —
ENG. APPR.		DATE "		FINISH. —

NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

NAME: LAYOUT OF MODULATOR UNIT 5

DWG. NO. RE-214



WIRE LEGEND

"A" 5000v. Packard Cable
"B" #14 RC & DB 600V
"C" – Shielded cable.
All resistors & condensers connected between socket prongs wherever possible.

Revised May/26/42 – Aug-17-42 G M

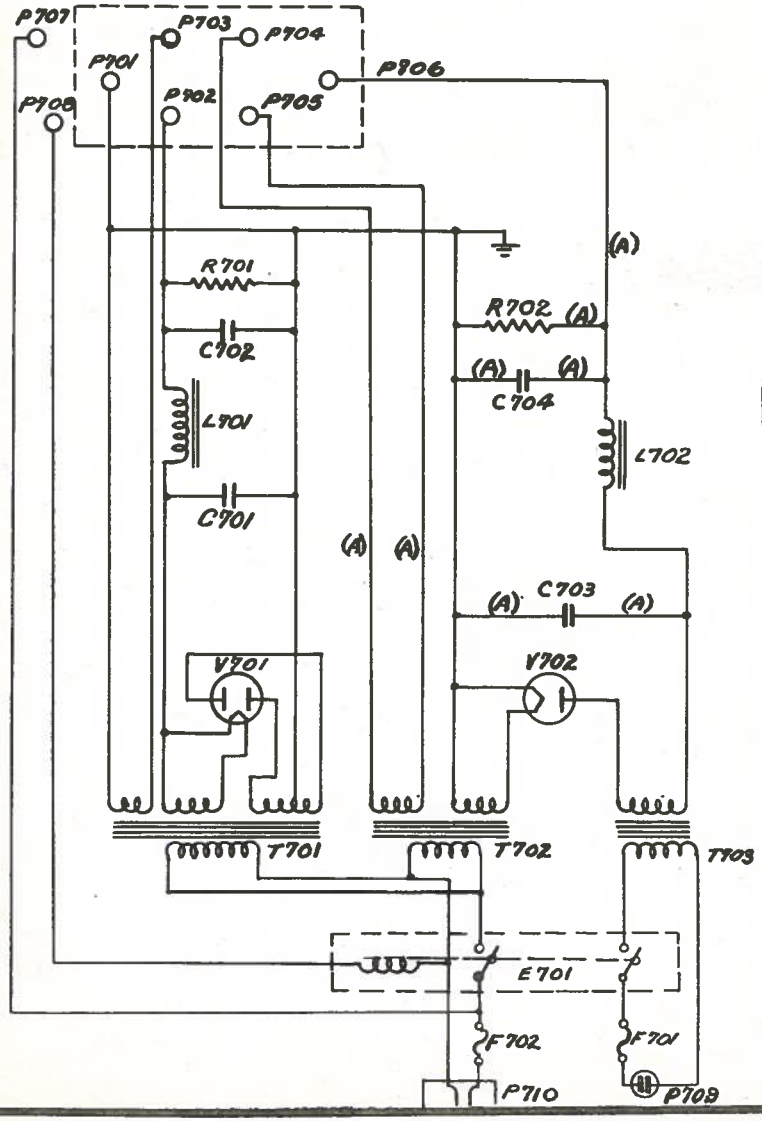
ITEM	PART No.	QUAN.	DATE	DESCRIPTION

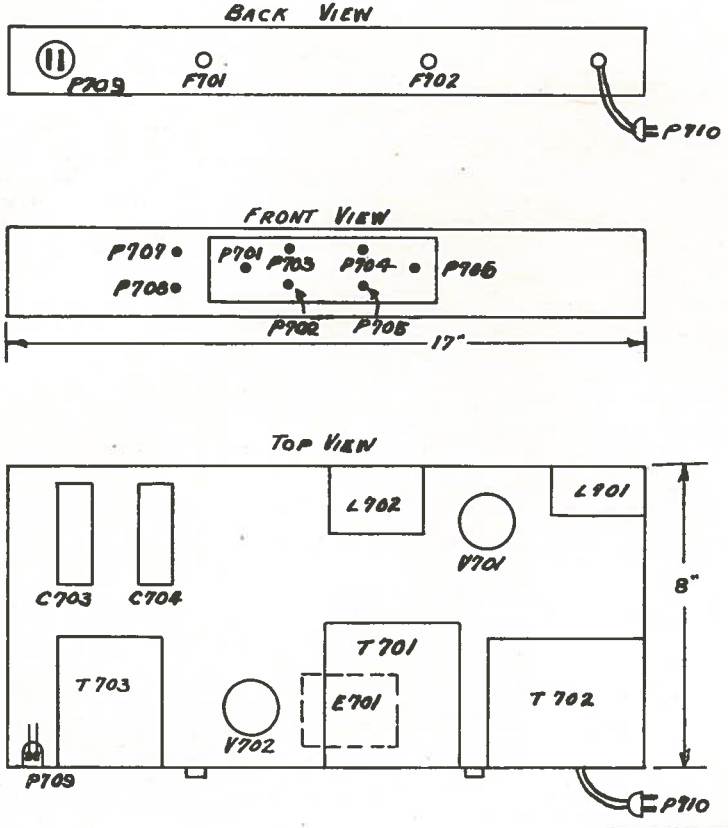
DRAWN BY E.E.B	DATE April 23/42	SUPERSEDES
CHECKED W.Johnson	DATE Apr-26-42	TRACED GM 6/4/42
ENG. APPROV. W.C. Wilkinson	DATE May 27/42	FINISH

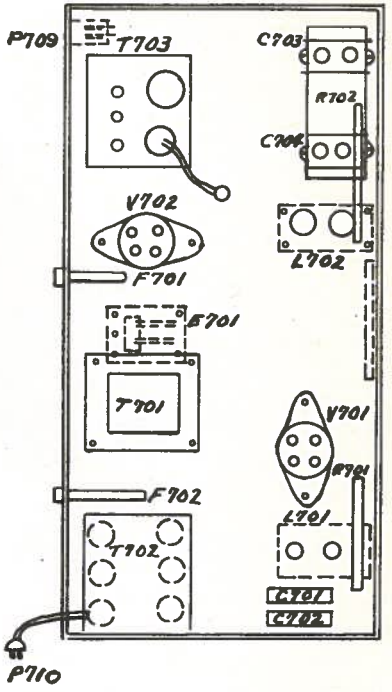
NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

NAME CD# 2 TRANSMITTER MONITOR UNIT #6

DWG. NO. NRC-RE-201







Voltage P706 to Chassis -200V.
Voltage P702 to Chassis +350V.

— Wire Legend —

A - Packard Cable 5000 Volt Test
All Other Wiring #14 RC & DB 600 Volt Test.

ITEM	PART No.	QUAN.	MATL	DESCRIPTION
DRAWN BY EHB		DATE APR-20-42		SUPERSEDES
CHECKED W Johnson		DATE APR-25-42		SUPERSEDED Traced 31/5/42
ENG. APPROV.		DATE		FINISH.

NATIONAL RESEARCH COUNCIL-RADIO SECTION - OTTAWA CANADA

NAME CD #2 Transmitter Monitor Power Unit #7

DWG. No. NRC-RE 200