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HANDBOOK FOR THE CANADIAN MARCONI TM-11 TRANSMITTER

(Canadian Marconi Folder 132-108)

SPECIAL NOTICE

Owing to wartime material restrictions beyond our control, it has been necessary, in many cases, to use components different from those listed in the Parts List of this Instruction Folder. The substitute components employed do not prejudice operation of the unit in any way, but in some instances may detract from the neat appearance which was intended.

Should a replacement of any of these substitute components be necessary at any time, the proper types as specified in the Parts List should be ordered. These will be supplied if they are not available.

Canadian MARCONI Company
Montreal, September 21, 1942.

W A R N I N G

THE OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. PERSONNEL OPERATING THIS APPARATUS SHOULD AT ALL TIMES OBSERVE ALL SAFETY REGULATIONS. DO NOT ATTEMPT TO CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE THE UNIT WITH THE HIGH VOLTAGE SUPPLY ON. AT ALL TIMES EXERCISE EXTREME CAUTION, EVEN WHEN SAFETY DEVICES ARE IN OPERATION.

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HANDBOOK FOR CANADIAN MARCONI TM-11 TRANSMITTER

SECTION I - GENERAL

1.1 The Canadian Marconi TM-11 transmitter is a compact medium power set suitable for use in ships or shore stations.

1.2 There are four different assemblies of this equipment to permit operation from any one of the following combinations of power supplies:-

a) 230 V. AC or 24 V. DC (Type ZM-21-S #110-984)

b) 230 V. AC or 36 V. DC (Type ZM-21-T #110-602)

c) 230 V. AC or 220 V. DC (Type ZM-21-V #110-603)

d) 115 V. AC or 24 V. DC (Type ZM-22-S #110-620)

1.3 The approximate dimensions (in inches) exclusive of knobs and projections, and the weights (in pounds) of the units that make up the complete apparatus are as follows:-

Unit	Height	Width	Depth	Weight	Marconi No.
TM-11 Transmitter	36"	24"	17½"	200 lbs	110-983
ZM Power Unit	12-15/16"	19".	24⅝"	220 lbs	110-983
TM-11 Shock Mounting					110-597
SM-11 Control Unit	20"	9"	6½"		110-987
Telegraph Key (Signal R62)					
Rotary Converters	14½"	10½"	17¾"	(24V. 122-107) (36V. 122-107) (220V.122-107) (24V. 122-103)	
Automatic Starter	16½"	14"	10½"	(122-147)	
Inter Unit Cables	10 feet long			(110-702 110-703)	

1.4 The following valves are used in the transmitter section of the equipment:-

V1	Master Oscillator	RVC 1619	(CV)
V2	1st Buffer	RVC 1619	(CV)
V3	2nd Buffer	RVC 1619	(CV)
V4	Voltage Regulator	RVC VR 150-30	(CV 685)
V5	Power Amplifier	RVC 813	(CV 26)
V6	Modulator	RVC 1619	(CV)

The following valves are used in the Power Supply Unit:-

V1	High Voltage Rectifier	RVC 816	(CV)
V2	High Voltage Rectifier	RVC 816	(CV)
V3	High Voltage Rectifier	RVC 816	(CV)
V4	High Voltage Rectifier	RVC 816	(CV)
V5	Low Voltage Rectifier	RVC 5Y4G	(CV 1857)

1.5. GENERAL DISCUSSION.

Each equipment consists of the transmitter panel together with the appropriate power supply unit, the interconnecting cables, and the remote control unit. The circuits are so arranged that the whole apparatus will work in conjunction with a receiver having an output impedance of 2.5 ohms. The transmitter panel is so designed that each assembly unit can be withdrawn for servicing. The transmitter assembly consists of a single chassis and the controls for operation are grouped in a symmetrical manner around the calibrated master oscillator dial. The output and aerial circuits are in a separate assembly, situated above the transmitter assembly unit. Below the transmitter unit there is a drawer for storing ready use valves. The connections to the transmitter are made through plugs, sockets, and terminals located on the left hand side of the panel. The aerial connection is on the top of the panel. The assembly units in the panel are fitted with a system of "snatch plugs" which make contact with similar units in the interior of the panel; Connecting cables are provided so that operation can be continued when the transmitter-driver unit is withdrawn from the panel for test or servicing.

1.6 FREQUENCY RANGE - POWER OUTPUT

The frequency range of the transmitter is:-

375 to 515 kc/s
and 1500 to 13,500 kc/s.

This frequency range is divided into five bands which are colour coded to match the engraved sections on the master oscillator dial, the colours appearing on the window above the switch controlling the band setting. The ranges of these bands and the colours employed are as follows:-

BAND	COLOUR	RANGE kc/s
1	Blue	375 to 515
2	Yellow	1500 to 2600
3	Green	2600 to 4500
4	Mauve	4500 to 7800
5	Red	7800 to 13,500

Crystal control is provided on any six frequencies in the higher frequency bands i.e. bands 2,3,4 and 5, (1500 to 13,500 kcs).

Power Output

The power output of the transmitter is 100 watts on CW; 70 Watts on MCW; and 30 Watts on R/T transmission. The modulating frequency on MCW is 1000 cycles. With the addition of the remote control unit the transmitter can be operated, on R/T only, from the main W/T installation.

1.7 AERIALS

The transmitter is designed to operate into aerials whose characteristics fall within the following limits at the frequencies shown overleaf.

FREQUENCY KC/S	RESISTANCE	REACTANCE
375	5-15 ohms	350-1000 ohms capacitive
515	5-15 ohms	450-1000 ohms capacitive
1500	15-750 ohms	0-1000 ohms inductive or capacitive
2500	15-750 ohms	0-1000 ohms inductive or capacitive
3500	15-750 ohms	0-1000 ohms inductive or capacitive
5000	15-750 ohms	0-1000 ohms capacitive or inductive
10,000	15-750 ohms	0-1000 ohms inductive or 0-500 ohms capacitive
13,500	15-300 ohms 15-75 ohms	0-500 ohms inductive or 0-100 ohms capacitive

1.8 REMOTE CONTROL

The transmitter will operate from a point remote from the main W/T installation, on R/T transmission only, provided that the point from which remote operation is desired is not more than 100 feet distant from the transmitter. The SM-11 remote control unit will permit the transmitter to be started and stopped and R/T transmission carried out from the remote point. The remote control unit is equipped with an indicating light which will indicate when the unit is ready to transmit from the remote point, or, if already illuminated when the cover is opened, that the equipment is already in use by the W/T office and therefore, cannot be used. Control of the frequency of transmission and reception is made by means of the controls in the W/T office, and the transmitter and receiver will have to be adjusted by the W/T office staff before remote transmission and reception can be obtained.

1.9 POWER SUPPLY UNIT

The power supply unit is designed to supply all the necessary voltages to operate the transmitter, as well as an AC voltage to operate a receiver. It is contained in a single unit which houses rectifiers to supply the voltages to the transmitter, as well as a rotary converter to supply the AC for the receiver when the unit is operating from a DC supply, thus making it unnecessary to run the main rotary converter with consequent heavy drain on the battery during periods when the transmitter is inoperative.

1.10 BATTERY SUPPLY.

When the transmitter is to operate from a battery supply the input voltages on load, supplied to the terminals of the equipment should fall within the limits given below in order to obtain the maximum performance from the transmitter.

24 volt supply	22 to 23.5 volts	(At starter terminals)
36 volt supply	33 to 35.25 volts	(At starter terminals)

SECTION 2 - INSTALLATION

2.1 GENERAL

The larger and heavier of the components that make up the units of the transmitter are removed from the units for shipment. The units must, therefore, be assembled before being placed in the transmitting panel or the power supply chassis, and care should be taken during assembly to see that the units are clean, free from dust or packing material, and that there are no loose connections or slack nuts or screws.

2.2 FITTING OUT

The method of installing the equipment in any particular ship will normally be shown in the Fitting-Out Specification appropriate to that ship. A convenient layout would be one where the transmitter panel is placed on a table with the power unit placed under the table or alongside the transmitter unit; In either case the distance between the units should not exceed 10 feet, which is the maximum length of the plug terminated cables connecting the two units.

2.3 REASSEMBLING THE UNITS.

It will be noticed that the units in the transmitter panel and the power supply unit are arranged to slide in and out on guide rails. The following procedure should be adopted when inserting a unit into the panel:-

Place the unit in position with the guide rails on the unit in the correct position relative to the guide rails on the inside of the panel and gently slide the unit into the panel. When the unit has become properly engaged on the rails, lift the catches on the lower side of the unit and slide it further into the panel until the unit is almost in the "home" position. Assuming that the aerial unit is the first to be placed in the panel release the catches when the unit is about 2" from the "home" position and firmly push the unit into place, to ensure that the "snatch plugs" make good contact at the rear of the panel.

2.4 REASSEMBLING THE TRANSMITTER UNIT.

Before inserting the transmitter unit place all the valves and crystals in the sockets. The small valves for the master oscillator buffer and modulator stages will fit into the sockets without any additional fitting, but the plate cap will have to be removed from its mounting before the 813 Power Amplifier can be placed in the socket. It will be necessary to unclip the anode cap, to insert the valve in the socket and to replace the anode cap and springs, taking care not to expose the valve to the risk of damage due to excessive pressure on the glass seal around the anode. When the valves have been inserted, the unit should be placed in the panel in the same manner as was done with the aerial tuning unit. The storage drawer should be inserted and closed.

2.5 REASSEMBLING THE POWER SUPPLY UNIT.

Care must be taken when inserting the power units in the power supply chassis that the "snatch plugs" make adequate contact with their counterparts at the rear of the unit, and that the units are in the correct position to permit the cover being placed over the chassis so that the gate switches on the main HT rectifier are operated. It will also be necessary to set the switches on the rectifier units to either the AC or the DC side, depending on the type of supply to be used. Insert the rectifier valves, attach the plate caps, and replace the cover over the chassis, making sure that the gate switch is properly operated.

SECTION 3 - ADJUSTMENT

3.1 DANGEROUS VOLTAGES EXIST WITHIN THE UNIT. TO AVOID THE POSSIBILITY OF FATAL INJURY WHILE CARRYING OUT ADJUSTMENTS OR SERVICE WORK ON THE TRANSMITTER; WHILE THE UNITS ARE WITHDRAWN FROM THE PANEL, ALWAYS SEE THAT THE POWER SUPPLY IS DISCONNECTED BEFORE TOUCHING ANY PART OF THE TRANSMITTER.

3.2 PRELIMINARY

The following procedure should be followed to bring the transmitter into normal operation. There are two possible methods of frequency control for the transmitter; master oscillator or crystal. The master oscillator covers the entire frequency range of the transmitter while the crystals are employed in the high frequency section of the range i.e. from 1500 kc/s to 13,500 kc/s. When crystal control is employed a maximum of six crystals can be accommodated in the sockets in the transmitter unit, which will provide a maximum of eighteen crystal controlled frequencies in this range provided that the channels are harmonically related to the fundamental frequencies of the six crystals. The adjustment procedure, is therefore, slightly different when the two methods of frequency control are employed and is further slightly modified when the transmitter is being used on the lower frequency part of the frequency range. The method of setting up the transmitter on the lower frequency range will first be described.

3.3 M/F ADJUSTMENT OF THE TRANSMITTER (I)

Set the controls of the transmitter as follows:-

"FREQUENCY CONTROL" switch to "MO"
"RANGE" switch to "1, 375-515 kcs"
"TUNE" dial to the frequency required on the "BLUE"scale.
"RANGE" switch (in Aerial Unit) to position 1.
"COUPLING" to zero.
"ANTENNA LP TUNE" to zero.
"METER" switch to "PA GRID"

Note that the ranges of the "RANGE" switch in the Aerial Unit are not the same as those on the switch in the driver section. This switch has only four positions which cover the ranges on page 9.

POSITION	RANGE KC/S
1	375-515
2	1500-3100
3	3100-6400
4	6400-13,500

3.4 M/F ADJUSTMENT (II)

Apply power to the transmitter by turning the "CONTROL" switch to "C.W". This will cause the filaments to light, as well as half the pilot lights around the dial. A time delay is provided to protect the valves in the rectifier section of the equipment, and, after some 15 seconds delay, the remainder of the lights around the dial will light up, indicating that anode power can be applied. To apply anode power to the set, turn the "POWER" switch to "LOW" and press the key or the button on the monophone handle. Some current will be indicated on the meter, showing that grid current is applied to the PA valve. If grid current is not here, turn the switch to the PA"CATHODE" position, and some indication of cathode current should be noted. The anode circuit of the PA valve should now be resonated by turning the "ANODE TUNE" control until the reading of cathode current dips. Adjust the control until the lowest point of the dip is reached and then, turn the "POWER" switch to the "HIGH" position, and repeat the resonating process. Now proceed to load up the aerial circuit as follows. Move the "COUPLING" control to about 5° and rotate the "ANTENNA LF TUNE" control. At some point in the rotation of this control the PA cathode current will be observed to rise, which is an indication of the tune point. Next increase the value of the "COUPLING" control and readjust the "ANTENNA LF TUNE" control to the correct tune point. Continue this process, increasing coupling and retuning the aerial circuit, until the value of the PA cathode current reaches 200 milliamperes, which is the maximum allowable cathode current for the PA valve. During this process the "ANODE TUNE" control should not be readjusted. When the specified value of the cathode current has been reached, if the "METER" switch is turned to the position marked "ANTENNA" some indication of aerial current will be noted, which will be dependant on the characteristic of the aerial at the frequency in use (NOTE. The reading of the meter when the switch is in the "ANTENNA" position does not indicate the actual value of the aerial current, but it does indicate when maximum aerial current is obtained). If it is desired to obtain the maximum output from the transmitter, and time permits the transmitter

can be readjusted by moving the "ANODE TUNE", "COUPLING" and "ANTENNA LF TUNE" controls very slightly until the maximum indication of aerial current is obtained, provided that the PA cathode current does not rise above 210 ma during the process. This final adjustment should be very carefully made and the final readings of the various dials should not differ appreciably from those noted when tuning up in the normal manner. At the conclusion of the adjustments the following readings should be obtained for the various positions of the "METER" switch.

PA grid current:	5 to 7 milliamperes.
PA cathode current;	210 milliamperes maximum.
HT volts:	1250 to 1300 volts.
Antenna current:	Some indication depending on the characteristics of the aerial.

3.5 H/F ADJUSTMENT OF THE TRANSMITTER (I).

The process of adjustment employed when the transmitter is to operate on the higher frequency part of the range is slightly modified from that employed when working in the range from 375 to 515 kc/s which was described in the paragraphs immediately preceding. Two methods of controlling the frequency are available, master oscillator and crystal. Assuming that master oscillator control is to be employed, the adjustment of the driver section will be exactly the same as given under the heading of M/F ADJUSTMENTS, but the adjustment of the aerial circuits will be somewhat different. Before adjusting the transmitter, set the controls in the aerial unit as follows:-

"COUPLING" at minimum i.e. 0

"RANGE" to the correct position for the output frequency

"ANTENNA CIRCUIT" switch to the "PAR" position.

"ANTENNA HF TUNE 2" to minimum i.e. 100

"ANTENNA HF TUNE 1" to maximum i.e. 0.

Proceed with the tuning of the driver stage of the transmitter as outlined in the section on M/F adjustment. Then, with the "COUPLING" control set to not more than 5° rotate the "ANTENNA HF TUNE 1" control until some indication of increase in the PA cathode current is noted. If no increase in the current is noted, increase the value of the coupling a small amount and make another attempt to tune the circuit. When the tune point has been located, leave the "ANTENNA HF TUNE 1" switch in the position that gives the greatest increase in the PA cathode current, and rotate the "ANTENNA HF TUNE 2" control to increase this reading. Continue the process of increasing the coupling and retuning the circuit until the specified maximum current of 200 milliamperes is noted for the PA cathode current. It may be found, when working into certain types of aerials, where the resistance and the reactance are low, that the aerial circuit controls will have to be changed to match such aerials. In this case the "ANTENNA CIRCUITS" switch should be placed in the "SER" position and the "ANTENNA HF TUNE 2" control will be set to maximum i.e. 0 before the tuning process outlined above is carried out. Where at all possible, it is preferable to use the aerial circuit with the controls set for parallel operation, as the efficiency of the aerial circuit and the final stage are highest with this type of circuit.

3.6 HF ADJUSTMENT OF THE TRANSMITTER (II)

If it is desired to operate the transmitter on the high frequency range i.e. from 1500 to 13500 kc/s with increased frequency stability, provision is made for the frequency of the transmitter to be controlled by a quartz crystal in place of the variable master oscillator. On the right hand side of the interior of the driver unit, close to the front panel, six sockets are placed to hold crystals. The selection of the appropriate crystal is made by means of the "FREQUENCY" switch. The frequency of the crystals employed will lie between 1500 and 4500 kc/s; frequencies above 4500 kc/s being obtained either by doubling or tripling the fundamental frequency of the crystal. The crystals should be mounted in holders similar to Canadian Marconi type 98054-A in order to ensure that the pins will make adequate contact with the sockets. When using crystal control the operation of the driver stage differs slightly from that of master oscillator control. Turn the "FREQUENCY" switch to the letter indicating the appropriate crystal and turn the "TUNE" dial to the required frequency. This frequency will either be the same as the crystal or two or three times the crystal frequency. Place the transmitter in operation in the normal manner and then turn the "TUNE" dial to the point which gives the largest indication of current in the "PA Grid" position. Proceed with the tuning of the output circuit as has been described before under "HF ADJUSTMENT I."

3.7 OPERATION ON MCW TRANSMISSION.

While tuning the transmitter it will have been noticed that all the adjustments have been carried out with the "CONTROL" switch in the "CW" position. If, at the conclusion of the adjustments it is desired to use MCW, the "CONTROL" switch should be placed in the "MCW" position. The carrier will now be modulated by an internal valve oscillator which generates a frequency of 1000 cycles. It will be found that the readings of the meter in the various positions will remain approximately the same, with the exception of the indication of aerial current which will be lower due to the decrease in power output from the transmitter, due to the use of grid modulation.

3.8 OPERATION ON R/T

To operate the transmitter on R/T the "CONTROL" switch should be turned to the position marked "PHONE". If the button on the microphone is now pressed speech can be transmitted through the microphone. The button on the handle of the microphone must be held down all the time that transmission is taking place and should be released when the transmission is over or when it is desired to receive. The microphone should be held moderately close to the lips when transmitting, and care must be taken not to overload the speech input circuits by raising the voice, otherwise serious distortion may occur.

3.9 REMOTE CONTROL.

For Remote Control operation, the transmitter and the associated receiver should be tuned to the required frequencies. The transmitter should be tuned as has previously been described under the heading "ADJUSTMENT". All the switches and the controls should be left in the normal positions for operation with the exception of the "CONTROL" switch which should be turned to "OFF". The cover of the SM-11 remote control unit should be opened and the switched marked "TRANS ON/OFF" should be placed to the "ON" position. After the transmitter has come into action and the time delay circuit has operated, the second set of pilot lights will light up around the dial and at the same time the indicating light in the remote control unit will light up indicating that the transmitter is ready to transmit.

If the monophone is lifted off the hook and the button on the handle pressed, R/T transmission can be effected. To receive, or at the conclusion of the message, the button should be released. When the button on the monophone handle is in the released position, signals will be received in either the earpiece of the monophone or in the loudspeaker mounted on top of the remote control unit. A switch, fitted inside the unit, marked "SPKR-PHONES", permits the received signal to be transferred from the loudspeaker to the earpiece or the monophone or vice-versa. A Master Volume Control is fitted and is operated by a knob situated in the interior of the remote control unit. This control is designated "VOLUME" and will control the level of the signal in either the monophone earpiece of the loudspeaker. An additional volume control, screwdriver adjusted, identified as "PHONE VOL", enables the level of the signal in the earpiece to be adjusted in relation to the level of the loudspeaker. This control will be adjusted at the time of installation and controls the relative volume of the earpiece with respect to the loudspeaker volume regardless of the actual level of signal in the loudspeaker. The main volume control, therefore, will be used to adjust the volume of the signal in either the loudspeaker or the earpiece when actual operating conditions are in force.

IMPORTANT

Before operating by Remote Control:

(a) Make sure that the transmitter and receiver have been set to the required frequency.

(b) On opening the remote control unit, see whether the indicating light is burning. If it is, the set is not ready for remote control.

3.10 EMERGENCY OPERATION.

If, in an emergency, it is required to operate the transmitter without delay, an emergency feature is provided whereby the normal time delay period can be cut from 15 seconds to about 4 seconds, without immediate damage to the equipment. To operate in case of emergency the "POWER" switch should be turned to the left, to the position marked "EMCY", and, after some four seconds the second set of lights will indicate that the transmitter is ready for operation. Transmission can then be carried out without any further delay. This will result in no immediate damage to the transmitter but will materially shorten the life of the 816 valves in the power supply unit. Therefore this procedure should not be adopted except in cases of real emergency.

3.11 GENERAL NOTES ON ADJUSTMENT.

The operator at the transmitter can listen to the received signal by plugging a pair of headphones into the jack marked "PHONES" on the left side of the driver unit. Internal relays in the unit permit the signal to be silenced when the transmitter is sending, thus permitting "break-in" operation. The volume of the received signal can be adjusted to suit the operator by means of a screwdriver adjusted volume control on the right hand side of the driver unit, marked "VOL PHONES". This in no way interferes with the volume control on the receiver, and merely allows the relative level of the signal in the headphones to be set to the most suitable level for operating.

SECTION 4- FAULT TRACING.

4.1 GENERAL

The following section is intended to serve as a guide to the location of faults that may occur in the operation of the equipment. It is not intended to serve as a catalogue of the most probable faults, but merely to indicate the general paths to follow when testing for faults. It must be borne in mind that, when testing for faults, it may be necessary to operate with the safety devices rendered inoperative, and for this reason extreme care should be taken in using test instruments. The absence of certain readings does not indicate that there is no voltage applied to the transmitter, but it does indicate that some fault exists. When connecting test instruments in the circuit, always switch off the power at the main switch before making any connection and take precautions to prevent damage to the test instruments.

4.2 FILAMENTS AND PILOT LIGHTS WILL NOT LIGHT

Check/-

a) The connections to the power supply.

b) That the transmitter unit is in place in the cabinet and that the "snatch plugs" are making good contact at the rear.

c) That when the "CONTROL" switch is placed in any of the "ON" positions the relay E2 in the power supply unit closes.

d) That none of the fuses in the power supply unit is blown.

4.3 FILAMENTS AND PILOT LIGHTS LIGHT BUT THERE IS NO OTHER SIGN OF OPERATION.

Check/-

a) That the aerial tuning unit is in place and that the "snatch plugs" and the gate switch are making good contact at the rear of the cabinet.

b) That the cover is on the rectifier units in the power supply, that the gate switch is making good contact, and if the cover is not in place, that the lock switch is pulled forward.

c) That the rectifier valves are in the sockets, are alight, and that they have the anode caps attached.

d) That the meter switch is not in the wrong position and that the meter is operating.

e) That the aerial change over and the keying relays operate when either the monophone button or the key is pressed.

f) If the transmitter is operating on crystal control, that there is a crystal in the socket for which the switch is set.

4.4 SET WILL OPERATE BUT THERE IS NO INDICATION OF LOADING IN THE AERIAL.

Check/-

a) That the aerial is connected to the set and that the aerial exchange board, if one is used, is in the correct position.

b) That there is an aerial connected to the aerial insulator, and that there is continuity between the leading in insulator and the set.

c) That the "RANGE" switch in the aerial section is not set to the wrong range for the frequency in use.

d) That the spring contact at the rear of the aerial section of the transmitter is making good contact with the aerial terminal at the rear of the cabinet.

4.5 FLASHOVERS OCCUR WHEN THE ANTENNA UNIT IS BEING ADJUSTED.

Check/-

a) That there is no foreign material in the plates of the condensers in the aerial tuning unit.

b) That there is nothing intermittently fouling the aerial or lead in.

c) Tune the transmitter on some other frequency to check that the condition is not due to attempting to work the transmitter into an aerial whose characteristics are such that the aerial tuning unit will not match.

d) Change the setting of the "ANTENNA HF TUNE 1" control to a higher number and readjust the "ANTENNA HF TUNE 2" control to obtain the maximum loading.

4.6 MOTOR SECTION OF THE ROTARY CONVERTER RUNS - BUT WILL NOT COME UP TO FULL SPEED.

Check/-

a) That the voltage across the starting coil of the starter relay is at least 20 volts and that the voltage across the delay relay coil is at least 10 volts. If the voltages are not as high as the values given, the battery voltage is insufficient to close the relays and this condition, if allowed to persist will damage the starting resistors. which are designed for intermittent service only.

4.7 TRANSMITTER WILL OPERATE ON CW BUT WILL NOT OPERATE ON MCW OR R/T

Check/-

a) That the circuits of the input valve (V6 1619 Modulator) are correct and that all the transformers are operating.

NOTE: If the HT comes on the valve must be drawing the correct current.

b) That the microphone input circuits are not open or shorted.

c) That the "CONTROL" switch contacts are making good contact in these two positions.

4.8 TIME DELAY CIRCUIT WILL NOT OPERATE.

Check/-

a) That the modulator valve is not damaged or that the filament is open.

b) That the elements of the time delay circuit are all connected and are in good condition.

c) That the contacts of the time delay relay are making good contact.

d) That the gate switch circuit is complete, and that the gate switches in both the transmitter and the power supply unit are closed.

SECTION 5 - TECHNICAL DESCRIPTION.

5.1 GENERAL

The following is a general description of the transmitter circuits. It is advisable to study this section in conjunction with the illustrations and diagrams in this handbook, so that an accurate working knowledge of the paths and functions of the circuits may be obtained.

5.2 The transmitting equipment consists of four main units, the transmitting panel, the power supply unit, the remote control unit and the motor generator set. These four units are inter connected with lead cased wiring, installed to meet the service conditions and by additional flexible plug terminated cables of fixed lengths which are supplied as part of the equipment. The remote control unit permits the operation of the equipment on R/T only at a point not more than 100 feet distant from the main W/T installation.

5.3 INPUT VOLTAGES.

The equipment is designed to operate from any one of the four types of power supplies indicated in Section 1 of this handbook. The alternating current source should be commercially stable, and the voltage should not vary more then plus or minus 10% from the mean value. In cases where the alternating current source may be interrupted or where such supplies do not exist the equipment can operate from a battery source of supply. To accommodate the effect of partially discharged batteries or long lead lengths, the equipment is designed to operate from a source of supply of between 22 and 23.5 volts for a nominal 24 volt supply and between 33 and 35.25 volts for a nominal 36 volt supply. These voltages should be those that are delivered to the terminals of the starter, which should be placed as close as possible to the machine, suitable cable being used to minimize lead drop.

5.4 TRANSMITTER PANEL.

The transmitter unit contains two units and a storage drawer mounted one above the other and secured to the cabinet of the transmitter panel by means of a locking device on the front of the unit. The arrangement of the units in the transmitter panel is, from top to bottom of the panel: aerial tuning unit, driver unit, and storage drawer.

These units are arranged so that they can be partially removed from the panel for examination, test or service purposes. When required they can be completely withdrawn and placed on a bench or table, but for all normal purposes such as the insertion of valves or crystals and for routine maintenance work the position provided by the partial withdrawal is sufficient. When anyone of the units has been withdrawn to the normal position for servicing the sliding guide bars lock in and hold the unit in this position until it is replaced or completely withdrawn. A test cable is provided to permit the operation of the transmitter-driver unit in the partially withdrawn position. This cable does not carry the HT for the final PA valve of this stage so that operation is only possible on the lower power stages, when the unit is operated in the partially withdrawn position. The cable must be inserted in the correct plug in order that the control circuits may be connected up and for that reason the plugs to be used for test purposes and marked "TEST PLUG HERE ONLY". Any attempt to operate with the test cable in any other of the plugs will only result in the equipment becoming inoperative. Switches are provided on the antenna unit to remove the high voltage when the unit is withdrawn, so that persons operating the equipment are protected from accidental contact with the high voltage. The removal of the driver section removes all voltages, as all the control circuits are rendered inoperative, therefore a safety switch is not provided on this unit. When the test cable is inserted, matters are so arranged that the high voltage is not energized, so that the protection is maintained in this case.

5.6 POWER SUPPLY UNIT.

The power supply unit contains three units whose function is to supply the voltages for the transmitter as well as a source of alternating current for the operation of a receiver. These units are contained in a single chassis equipped with a cover which serves to protect the interior units from dust and dirt and also acts as a safety cover to protect the operating personnel from dangerous voltages. The inter-connections between the power supply unit and the transmitter panel are made by means of a multi conductor cable terminated in plugs. The length of this cable is such that the power unit may be placed not more than 10 feet from the transmitter panel, preferably under a bench or table. Switches are provided in the interior of the power supply unit to permit the operation of the unit from either an AC or DC supply source

5.6 TRANSMITTER UNIT.

The transmitter unit contains the valves and associated circuit components that make up the radio frequency generating, multiplying, and amplifying circuits of the transmitter. From an examination of the simplified diagrams of these circuits it will be seen that these circuits consist of the following arrangement of valves:- Master Oscillator, 1st Buffer, 2nd Buffer and Power Amplifier. All the circuit components for these valves are contained in the unit with the exception of those that comprise the anode circuit of the power amplifier valve, which are part of the aerial tuning unit. Also mounted in this unit is the single valve used as a modulator when the transmitter is operating on MCW or R/T as well as a voltage regulator valve to stabilize the supply for part of the earlier stages. The front panel of the unit carries the various switches and controls for the operation of the equipment.

5.7 MASTER OSCILLATOR UNIT (V1-1619).

The following detailed description of the transmitter circuits is intended to direct the attention to the various features of the circuits employed in the transmitter. The first valve performs the dual functions of a master oscillator or a crystal controlled oscillator, the type of control being selected by means of a switch on the front panel designated "FREQUENCY". When this valve is operating as a crystal controlled oscillator, the circuit employed is that of the well known Pierce type oscillator specially adapted for this type of transmitter. The crystals are connected between the anode and the grid of the valve with the element potentials being blocked off from the crystals by means of the condensers C20 and C21. When this valve is to function as a master oscillator, the tuned circuits consisting of the inductances L1, L2 and L3, together with the condensers C2, C3, C4 and C5, are connected in place of the crystal. These circuits are tuned to the correct frequency by means of the first two sections of the gang condenser C1-1 and -2. The anode circuit of this valve is shunt fed through the choke L11 and the screen voltage is supplied through the dropping resistors R5 and R6. By-pass condensers C17, C18, C19 and C45 are provided on the anode, screen and filament of the valve while R1 is used as a conventional grid leak to the stage.

5.8 1ST BUFFER CIRCUIT (V2-1619)

The output from the first valve is fed to the grid of the 1st buffer stage through the coupling condenser C22. This stage operates as an aperiodic amplifier when the transmitter is operating on the three lower frequency bands (i.e. 1,2 and 3) and on the two higher frequency bands as a frequency multiplier. When this stage is operating as a frequency multiplier it will be noticed that the master oscillator has been connected back to ranges 2 and 3 and that the tuned circuits of L4 and L5 in conjunction with the condensers C8 and C9 tuned by the third section of the gang condenser C1-3, have been connected in the anode circuit of the valve, thus changing its function from an aperiodic amplifier to a frequency multiplier. The anode, screen, and grid circuits of this valve are fed through the resistors R5 and R11 while bypass condensers C23, C24 and C25 are provided on the various elements. The condensers C26 and C27 are normally connected in series and act as a drive condenser to the following stage, except when frequency multiplication is taking place when they are used as an anode coupling and coupling condenser respectively.

5.9 2ND BUFFER CIRCUIT (V3-1619)

The second buffer stage is arranged to work as a tuned amplifier on all the five ranges of the transmitter, and for this purpose it is fitted with the five tuned circuits consisting of the inductances L6, L7, L8, L9 and L10 in conjunction with the condensers C12, C13, C14 and C15. These tuned circuits are tuned by means of the fourth section of the gang condenser C1-4. The anode circuit of this valve is, like all the other low power stages, shunt fed through a choke (L13). The elements of this valve are fed through the resistor networks of R8, R9 and R10 as well as being fitted with the customary by-pass condensers C28, C29 and C30.

5.10 VOLTAGE REGULATOR CIRCUIT (V4-150-30)

To ensure that the frequency stability of the transmitter, when operating with master oscillator control, is as high as possible the anode and screen supplies of the master oscillator valve as well as the screen supply for the two buffer stages are taken through a voltage regulator circuit. The circuit employed utilizes one of the common types of valve for this class of service the VR 150-30. As this type of circuit requires a series resistor to obtain the maximum efficiency the resistor R14 is employed in series with the valve.

It will be noticed that the anodes of the 1st and 2nd buffer stages are fed direct from the low voltage supply at a much higher voltage than that used to supply the anode and screens of the master oscillator and these valves. This ensures that the maximum efficiency is realized from these valves when acting as amplifier.

5.11 CALIBRATION ACCURACY.

To ensure that the calibration accuracy of the tuned circuits for the master oscillator and the buffer stages, which are all ganged together, is as high as possible, these stages are fitted with permeability adjusted coils and trimmer condensers, which permit the calibration to be made with great accuracy. When the circuits are aligned in the course of manufacture, the various components are adjusted so that the calibration accuracy is in excess of 0.5% of frequency at any part of the dial. This adjustment is carried out against precision standards, and should it ever be necessary to change the settings of any of the controls in these circuits after the equipment has been in service, it will be necessary to provide a precision standard of frequency to ensure that, when realigning these circuits, the calibration will be carried out with equal accuracy. The accuracy of the calibration can only be as accurate as the standard against which the calibration is carried out. To ensure that the drive to the power amplifier stage remains sensibly constant over the full range of the frequency spectrum employed in the transmitter, damper resistances (R33, R34 and R6) are connected across certain of the coils in the second buffer stage.

5.12 POWER AMPLIFIER STAGE (V5 813).

The output from the second buffer stage is fed to the grid of the power amplifier stage through the coupling condenser C32. The power amplifier valve is a beam pentode which is arranged to operate as a Class C amplifier when operating on CW and as a grid modulated stage when operating on MCW and R/T. The output circuit of this stage is contained in the aerial unit and the connection to the anode of the valve is made via a special form of terminal, attached to the anode cap of the valve, which makes contact with a spring terminal at the upper rear of the chassis and through it to the aerial unit and the high voltage supply. It will be noticed that this stage is series fed as distinct from the other valves in the RF train. The screen supply is taken from the low voltage supply through a suitable dropping resistor R15 and is by-passed by means of the condenser C40.

The grid circuit of this stage contains the secondary of the modulation transformer, and in series with it, an RF choke L5, to prevent the RF currents from entering the modulation transformer. Bias resistors R16 and R17 are provided and are suitably by-passed by the condenser C48. When this stage is operating on CW the secondary of the modulation transformer and part of the bias resistors are shorted out of the the circuit and the stage delivers its maximum power under these conditions. Conventional by-pass condensers are provided on the filaments to effectively hold the RF potentials to the proper point on the chassis. When changing from one type of transmission to another, which involves changing the voltages on the elements of the valve, additional control is provided by means of the cathode resistors R18 and R19.

5.13 MODULATOR STAGE.

The modulator valve (V6-1619) is arranged to take the audio input of the microphone (or other source of audio power) and to raise the level of the voltage to a suitable level to modulate the grid of the power amplifier stage. The input from the microphone is impressed on primary of the modulation transformer and through it to the grid of the modulator valve. The secondary of this transformer is shunted by the resistor R31 and one side of the condenser is by-passed to ground through the condenser C42. In the anode circuit of this valve is placed the primary of the modulation transformer and the coil of the relay K1; the function of which is described in detail in Section 5.17. The secondary of this transformer is connected in the grid circuit of the power amplifier stage. When it is desired to operate on MCW the secondary of the modulation transformer is connected back to the input side of the microphone transformer through a resistor and condenser network consisting of R21 and C45, the constants of which are so chosen that the desired modulating frequency is obtained.

5.14 AERIAL TUNING UNIT.

The output circuit of the power amplifier and the components that make up the aerial matching section are contained in a separate unit in the upper section of the transmitter panel, and are arranged to make contact with the remainder of the circuit by means of the same system of "snatch plugs" as is used elsewhere in the transmitter, supplemented by additional spring type connectors where required.

From an examination of the circuit it will be seen that the anode circuit of the power amplifier valve is made up of the tapped coil L18 and the condensers C50 and C51 which are arranged to work in conjunction with the switch S7-3, to cover the various frequency ranges of the transmitter. It will be noticed that two variable coupling coils are provided to transfor the radio frequency power from the anode circuit to the aerial circuit. These coils are mounted on a common shaft but are so controlled by means of the "RANGE" switch that the correct coupling coil is connected in circuit when the "RANGE" switch is manipulated to the various bands corresponding to the specified frequencies. When the transmitter is operating on the low frequency portion of the spectrum, the aerial circuit consists of the low frequency coupling coil in series with a variometer and the contacts of the aerial changeover relay. When operating on the high frequency portion of the range the other coupling coil is connected in the circuit and associated with it are the variable condenser C53 and the tapped inductance L19. Switches are provided to permit these two components to be connected either in a parallel arrangement or a series circuit, and thence through aerial changeover relay contacts to the aerial. The coil L19 is tapped at various points and these taps are connected to a switch on the front of the panel, so that any combination of turns can be used in conjunction with the variable condenser. As a general rule it will be found that the combination of inductance and capacity provided will match any aerial within the limits given in Section 1 when arranged in the parallel combination. In those cases where the aerial impedance is at, or near, the limits given in the section just referred to, it will sometimes be found that the series arrangement gives slightly better matching arrangements, but, in general, there will usually be some increase in the losses in the final circuit when using the series arrangement.

5.15 MEASUREMENT OF AERIAL CURRENT.

It will be noticed that, included in the aerial circuit, there are two small bandpass transformers associated with two copper oxide rectifiers. These rectifiers supply rectified radio frequency current to the multimeter and thus provide an indication of the presence of, and relative magnitude of the radio frequency current flowing in the aerial circuit. As it is not possible to construct a band pass transformer having a flat characteristic over the complete frequency range covered by this transmitter two rectifiers and the associated transformers are supplied to cover the ranges with the high possible efficiency.

These are shown on the diagram of connections as T4 and T5. This system of indicating aerial current can only indicate the relative magnitude of the aerial current and is not intended to be an absolute measurement of the current, but merely to indicate when the maximum current is flowing in the aerial circuit for any given frequency.

5.16 CONTROL CIRCUITS.

The control circuits for the whole transmitter are operated from the front panel of the driver section, through a series of multipoint switches, which either control the circuits direct or through the several relays mounted in various parts of the complete equipment. Reference to the diagrams in this handbook will disclose the locations of the various controls with relation to each other and also the sequence in which the various circuits come into operation. Described briefly these are:- Moving the "CONTROL" switch to anyone of the three positions marked "CW" "MCW" or "PHONE" will close the main contactor on the low voltage rectifier, and apply power from the AC source if it is being used, or if the source of supply is a battery, set into operation the automatic starter for the machine. This will result in the filaments and the low voltage rectifier becoming energized. When the low voltage rectifier has come into operation the time delay circuit for the high voltage rectifier will start operation and after a delay of some 15 seconds the high voltage can be applied by moving the "POWER" switch to either the "LO." or the "HIGH" position. When the high voltage rectifier has been switched on, transmission can be commenced, or the transmitter may be tuned. If adjustments are being made, at the conclusion of such adjustments the "CONTROL" switch will be placed to the position indicating the type of emission that it is desired to transmit. It will be observed that the circuits of the control section of the transmitter are so arranged that the various switches control the necessary changes to the element voltages on the valves. It will also be apparent that the control of the transmitter from the remote point is so arranged that the starting and HT switches are paralleled by the switch in the control unit. Thus when the unit is operated from the remote point the transmitter will start up automatically and will be placed in the correct condition to transmit from the remote point on R/T only.

5.17 TIME DELAY CIRCUIT.

Some explanation of the operation of the time delay circuit is necessary, as the operation of the circuit differs from those usually encountered, and the operation of the circuit is not immediately apparent from the circuit diagram. Reference to the diagram of connections will show that there is, in series with the anode of the modulator valve, the operating coil of a relay E1. It will further be noticed that in the grid circuit, between the microphone transformer secondary and the earth point on the chassis, a resistor network made up of the resistors R22, R23, R24, R25 and R26, in conjunction with the condenser C44. These components are so arranged that when the transmitter is first switched on, and the low voltage rectifier has commenced to deliver anode voltage, the bias on this valve will be very high and considerably beyond cut off value, due to the fact that the grid voltage is made up of the normal bias supplied by the cathode resistors, plus the additional bias caused by the charging current for the condenser C44 through the resistors of the network. The resistance and capacity of the circuit are so chosen that the time constant of the circuit is about 15 seconds. When the condenser is fully charged the increase of bias due to the drop in the resistor network will be removed and normal bias will be applied to the valve and anode current will start to flow. When anode current starts to flow the relay in the anode circuit will close and the contacts of the relay will short out the high resistance resistors in the grid circuit and again decrease the bias so that the plate current will increase still further to the normal operating value. When the relay closes an additional set of contacts will also close, and will permit the circuit to be completed through the gate switches and the coil of the high voltage contactor K1 in the power supply unit, and will thus make possible the application of anode voltage to the transmitter. When it is desired to bring the transmitter into operation with the minimum of delay the "POWER" switch will be placed to the side marked "EMCY" and will cut out of circuit the resistor R23 and will therefore shorten the delay period to some four seconds. When the switch is placed to the "EMCY" position an additional set of contacts closes the switch in the same manner as would be done if the "POWER" switch are placed to the side marked "HIGH" thus permitting transmission to take place on high power as soon as the short delay has operated. This will have no immediate effect on the rectifier valves other than to shorten the life expectancy, and for this reason should not be used except in cases of real emergency.

5.18 POWER SUPPLY UNIT.

The power supply unit contains all the necessary rectifiers to supply the power demands of the transmitter and the control circuits as well as supplying a source of AC to operate an additional receiver. The interior of the power supply unit contains three units:- The HT power unit, the LT Power Unit and the rotary converter to supply the AC to operate the receiver. These three units are arranged to supply the power demands for the equipment from either of the sourcesof supply for whioh the unit is designed. The LT power unit and the rotary converter unit are equipped with change over switches to arrange the circuits to operate from either type of supply. These three units are mounted on separate chasses and are arranged to slide into the main body of the power supply unit and to make contact with the rest of the circuit by means of the same system of "snatch plugs" as is used throughout the remeinder of the equipment. A terminal strip is provided on the exterior of the cabinet to connect to the cables running to the supply sources. The connections between the power supply unit and the transmitter unit are made by means of the flexible plug connected cables already mentioned in the section on the transmitter.

5.19 HT POWER SUPPLY UNIT.

This unit supplies the anode voltage for the power amplifier section of the transmitter. From an examination of the circuit it will be seen that the rectifier section is made up of a conventional full wave bridge circuit working from a single phase supply. The transformer T1 supplies the anodes of the mercury vapour rectifying valves (V1, V2, V3, V4 816). The filament voltage for these valves is supplied from the transformer T2 and the output from the rectifier is filtered by means of choke input filter, comprising L1 and C1 while R1 is provided as a bleeder across the filtered output of the rectifier, to stabilize voltage and to keep the filter condenser discharged when the unit is not operating. It will be seen that the primary circuit of the rectifier anode transformer, has a number of sections arranged that either the major parts of the winding, or a portion thereof, can be connected to the AC supply, thus varying the output from the transformer and consequentyly the DC output from the rectifier.

The selection of these taps on the primary of the transformer is controlled by the relay E1 the coils of which are controlled from the front panel of the transmitter by the "POWER" switch. The relay has two operating coils arranged to operate in a differential circuit so that positive control of the operation is obtained. As the output voltage developed by this rectifier is moderately high (1250-1300 volts under normal operating conditions) it is necessary to provide protection to the operating personnel. This is accomplished by means of a gate switch and a lock switch which are so arranged that the rectifier is rendered inoperative when the cover is removed from the whole power supply unit. The lock switch is provided so as to permit operation of the power supply unit with the cover removed, but replacing the cover opens the lock switch, so that to make the unit operate when the cover is next removed, the lock switch must once more be pulled forward.

5.20 LT POWER SUPPLY UNIT.

The LT power supply unit consists of two separate rectifying systems, which may or may not both be in operation at the same time depending on the type of supply power. One rectifier consists of a full wave, single phase valve rectifier employing a high vacuum valve type 5Y4G, supplied from a composite transformer T4, in conjunction with a choke input filter consisting of L2 and C2 and is equipped with the conventional bleeder resistor R2. The output of this rectifier is 400 volts and it supplies anode and screen voltage to the lower power stages in the transmitter. The contactor E2 in the primary circuit of the rectifier applies power from the supply source when the "CONTROL" switch on the transmitter is turned to "ON". This contactor also applies power to the automatic starter when the supply voltage is DC. The second rectifier on this unit consists of a dry plate metallic rectifier which supplies 24 volts DC to operate the various relays and contactors throughout the equipment when the input voltage is AC. When the unit is operating from a DC source this rectifier, is of course unnecessary and is cut out of circuit or through suitable dropping resistors depending on the value of the DC supply voltage. A switch on the body of the unit permits the input circuits to be set up for either type of supply. Connection to the rest of the circuit is by means of "snatch plugs".

5.21 RECEIVER POWER UNIT

The receiver power unit consists of a small rotary convertor which supplies AC for the operation of a receiver. The machine will only function when the supply voltage is DC, as when the supply is AC the receiver is run directly off the supply mains. A contactor E3 is provided to switch this rectifier on from the front panel of the receiver through a control switch provided by the manufacturer. In cases where no switch is provided an external switch will have to be mounted close to the receiver. A switch is provided on the chassis of the unit to enable the circuits to be set up for either a DC or an AC supply.

SECTION 6 - PARTS LIST

6.1 SPARES AND REPLACEMENTS.

When spare or replacement parts are required for this equipment, the following procedure should be followed in order that the components may be supplied with the minimum of delay. It must be remembered that any request for spare or replacement parts will pass through the hands of many people before reaching the Stores Department, and that not all of them are conversant with the needs for each individual type of equipment. To this end, the most complete information should be supplied with any request for spare or replacement parts, so that undue delays and lengthy correspondence may be eliminated. In particular, to state the value of a resistor, is useless; as the make and the wattage determine the correct replacement. It is therefore requested that orders for spare or replacement parts be made in the following form if undue delays and back references are to be eliminated .

1. Name and correct mailing or shipping address of the station.

2. The title of the equipment.

3. The Canadian MARCONI type No., serial number and "spec No." appearing on the nameplate of the equipment.

4. The title of the part.

5. The Canadian MARCONI type number of the part.

6. The serial number of the part (where one is on the part).

7. The reference number or component designation of the part with a full description of the part, which can be found in this Parts List.

8. Any other pertinent information such as size etc.

If the request for replacement material bears the above information in the most complete form possible, the replacement or the nearest equivalent, can be forwarded with the minimum delay. It is particularly requested that such informatinn be transmitted in the fullest possible manner when telegraphic orders are made.

6.11 TM-11 EQUIPMENT CONDENSERS.

Circuit Symbol	Function	Specification	Mfgr	Type No.
C1	Gang Tuning		Marconi	111-512
C2	Osc. Padder	260 mmfds plus or minus 5 mmfds N 750 M 260 plus or minus 5	Erie	
C3	Osc. Tracking	100 mmfds	CMC	108-242
C4	Osc. Padder	140 mmfds plus or minus 2 mmfds N 220 D 140 plus or minus 2	Erie	
C5	Osc Tracking	25 mmfds	CMC	111-261
C6	Osc. Tracking	25 mmfds	CMC	111-261
C7	Osc. Tracking	25 mmfds	CMC	111-261
C8	Buffer Track	25 mmfds	CMC	111-261
C9	Buffer Track	25 mmfds	CMC	111-261
C10	NOT USED			
C11	NOT USED			
C12	NOT USED			
C13	Buffer Track	50 mmfds	CMC	111-260
C14	Buffer Track	50 mmfds	CMC	111-260
C15	Buffer Pad	120 mmfds plus or minus 10% 1468-LS 500V W.	Aero-vox	

Circuit Symbol	Function	Specification	Mfgr.	Type No.
C16	Buffer Track	50 mmfds	CMC	111-260
C17	Osc. Filament Bypass	0.01 mfds plus or minus 20% 1467 300V W.D.C.	Aerovox	
C18	Osc. Filament Bypass	0.01 mfds plus or minus 20 % 1467 300V. W.D.C.	Aerovox	
C19	Osc. Screen Bypass	0.005 mfds plus or minus 20% 1467 500 V. W.D.C. 1000V test	Aerovox	
C20	Osc. Grid Coupling	50 mmfds plus or minus 10% 1468-LS 500 V. W. D.C.	Aerovox	
C21	Osc. Anode Coupling	150 mmfds plus or minus 10% 1468-LS 500 V W. D.C.	Aerovox	
C22	Buffer Grid Coupling	50 mmfds plus or minus 10% 1468-LS 500 V. W.D.C.	Aerovox	
C23	Buffer Fil Bypass	0.01 mfds plus or minus 20% 1467 300 V. W.D.C.	Aerovox	
C24	Buffer Fil Bypass	0.01 mfds plus or minus 20% 1467 300 V. W.D.C.	Aerovox	
C25	Buffer Screen	0.005 mfds plus or minus 20% 1467 600 V. W.D.C. 1000V test.	Aerovox	
C26	Buffer Anode Coupling	150 mmfds plus or minus 10% 1468-LS 500V W.D.C.	Aerovox	
C27	Buffer Grid Coupling	30 mmfds plus or minus 5% 1468-LS 500V W.D.C.	Aerovox	
C28	Buffer Fil Bypass	0.01 mfds plus or minus 20% 1467 300V. W.D.C.	Aerovox	

Circuit Symbol	Function	Specification	Mfgr.	Type No.
C29	Buffer Fil Bypass	0.01 mfds plus or minus 20% 1467 300V W.D.C.	Aerovox	
C30	Buffer Screen Bypass	0.005 mfds plus or minus 20% 1467 500V. W.D.C. 1000V test	Aerovox	
C31	Buffer Anode Coupling	150 mmfds plus or minus 10% 1468-LS 500V W.D.C.	Aerovox	
C32	PA Grid Coupling	60 mmfds plus or minus 5% 1468-LS 500v W.D.C.	Aerovox	
C33	Anode Filter	0.1 mfds plus or minus 20% M-689 600V W.D.C.	Aerovox	
C34	PA grid Bypass	0.005 mfds plus or minus 20% 1467 500 V W.D.C. 1000V D.C. test.	Aerovox	
C35	PA Filament Bypass	0.01 mfds plus or minus 20% 1467 300V W.D.C.	Aerovox	
C36	PA Filament Bypass	0.01 mfds plus or minus 20% 1467 300V.W.D.C.	Aerovox	
C37	Osc. & Buffer Fil. Bypass	0.01 mfds plus or minus 20% 1467 300V. W.D.C.	Aerovox	
C38	Osc. & Buffer Fil. Bypass	0.01 mfds plus or minus 20% 1467 300V W.D.C.	Aerovox	
C39	Mod. Filament Bypass	5.0 mfds plus 50 minus 10% 50 V. W.D. D-9112 Electrolytic.	Sprague	
C40	PA screen	0.005 mfds plus or minus 20% 1467 500V W.D.C. 1000V Test.	Aerovox	
C41	Relay Bypass	0.5 mfds plus or minus 20% #430, 400V. W.D.C.	Aerovox	
C42	Mod. Grid Bypass	0.001 mfds plus or minus 10% 1467 500V. W.D.C.	Aerovox	

Circuit Symbol	Function	Specification	Mfgr.	Type No.
C43	Spark Suppressor	0.1 mfds plus or minus 20% 600V. W.D.C. in $\frac{3}{4}$" x 2" insulated can. M689.	Aerovox	
C44	Time Delay	1.0 mfds plus or minus 20% #430 400V. W.D.C.	Aerovox	
C45	TG Feedback	0.1 mfds plus or minus 20% #630 600 V. W.D.C.	Aerovox	
C46	Osc. Screen Bypass	0.005 mfds plus or minus 20% 1467 500 V. W.D.C. 1000V Test.	Aerovox	
C47	Buffer Grid	0.5 mfds plus or minus 20% #430 400V. W.D.C.	Aerovox	
C48	PA Grid	0.5 mfds plus or minus 20% #430 400V. W.D.C.	Aerovox	
C49	Surge Suppressor	0.01 mfds plus or minus 20% 1467 300V. W.D.C.	Aerovox	
C50	PA Anode tube	2 x 225 mmfds variable	CMC	112-313
C51	PA Anode Tune	250 mmfds plus or minus 5% 1550-LS-204 2500 V. W.D.C.	Aerovox	
C52	PA Anode Blocking	0.005 mfds plus or minus 10% 2500V. W.D.C.	CMC	111-268
C53	Antenna Tune	2 x 225 mmfds variable	CMC	112-313
C54	Antenna Current Indicator Filter	2 x 0.1 mfds plus or minus 20% #230, 200V. W.D.C.	Aerovox	
C55	HT Bypass	0.001 mfds plus or minus 10% 1447-LS 2500 V. W.D.C.	Aerovox	
C56	NOT USED			
C57	RF Bypass	0.01 mfds plus or minus 20% 1467 300V. W.D.C.	Aerovox	

6.12 TM-11 EQUIPMENT RELAYS

Circuit Symbol	Function	Specification	Mfgr.	Type No.
K1	Time Delay	For positive operation on 20V D.C.	CMC	112-443
K2	Receiver Muting	For operation on 12V. DC	CMC	112-444
K3	Receiver Muting	For operation on 12V. DC	CMC	112-445
K4	Ant C/O and Keying	For operation on 24V. DC plus or minus 15%	CMC	114-666

6.13 TM-11 EQUIPMENT JACKS

J1-	Phone Jack	Yaxley 701	Yaxley	

6.14 TM-11 EQUIPMENT INDUCTANCES.

L1	Osc. Coil Range 1	CMC	106-670
L2	Osc. Coil Range 2	CMC	106-671
L3	Osc. Coil Range 3	CMC	106-672
L4	Buffer Coil Range 5	CMC	106-669
L5	Buffer Coil Range 4	CMC	106-668
L6	Buffer Coil Range 5	CMC	106-669
L7	Buffer Coil Range 4	CMC	106-668
L8	Buffer Coil Range 3	CMC	106-667
L9	Buffer Coil Range 2	CMC	106-666
L10	Buffer Coil Range 1	CMC	106-665
L11	Osc. Anode Choke	CMC	106-200
L12	Equalizer Choke	CMC	117-267

Circuit Symbol	Function	Specification	Mfgr.	Type No.
L13	Buffer Anode Choke		CMC	106-200
L14	Voltage Regulator Anode Choke		CMC	106-200
L15	Power Amplifier Grid Choke		CMC	106-200
L16	NOT USED			
L17	NOT USED			
L18	Power Amplifier Anode Coil		CMC	106-850
L19	Antenna Loading Coil		CMC (Part of ass'y 114-667)	106-885
L20	Antenna Variometer		CMC	114-833.

6.14 TM-11 EQUIPMENT METERS.

M1	Multimeter		CMC	112-300

6.15 TM-11 EQUIPMENT PILOT LIGHTS.

P1	Pilot Light	12-16 volts frosted Mazda #53	CGE
P2	Pilot Light	12-16 volts frosted Mazda #53	CGE
P3	Pilot Light	12-16 volts frosted Mazda #53	CGE
P4	Pilot Light	12-16 volts frosted Mazda #53	CGE

#1819 may be good substitute

6.16 TM-11 EQUIPMENT RESISTORS.

Circuit Symbol	Function	Specification	Mfgr.	Type No.
R1	Osc. Grid	50000 ohms plus or minus 10% BT½ ½ watt	IRC	
R2	NOT USED			
R3	Osc. Screen	100,000 ohms plus or minus 10% BT½ ½ watt.	IRC	
R4	Osc. Screen	50,000 ohms plus or minus 10% BT½ ½ watt.	IRC	
R5	Buffer Grid	100,000 ohms plus or minus 10% BT½ ½ Watt	IRC	
R6	Damper	10,000 ohms plus or minus 10% BT½ ½ watt	IRC	
R7	Buffer Screen	100,000 ohms plus or minus 10% BT½ ½ watt	IRC	
R8	NOT USED			
R9	Buffer Grid	5,000 ohms plus or minus 10% BT½ ½ Watt.	IRC	
R10	Buffer Grid	5,000 ohms plus or minus 10% BT½ ½ watt.	IRC	
R11	Buffer Anode	20,000 ohms plus or minus 10% BT1 1 watt	IRC	
R12	NOT USED			
R13	Cathode Bias	200 ohms plus or minus 10% AB C coating #1 terminals 4 watts.	IRC	
R14	Voltage Regulator	7,000 ohms plus or minus 10% EP C coating #1 terminals 20 watts.	IRC	

Circuit Symbol	Function	Specification	Mfgr.	Type No.
R15	PA Screen	4,000 ohms plus or minus 10% AB C coating #1 terminals 4 watts.	IRC	
R16	PA grid	8,000 ohms plus or minus 10% AB C coating #1 terminals 4 watts.	IRC	
R17	PA Grid	100 ohms plus or minus 10% WW3 with lugs 1 watt.	IRC	
R18	PA Cathode	1500 ohms plus or minus 10% EP C coating #3 terminals 20 watts.	IRC	
R19	PA Cathode	1500 ohms plus or minus 10% EP C coating #3 terminals 20 watts.	IRC	
R20	Buffer Cathode	5.0 ohms plus or minus 1% WW3 with lugs 1 watt.	IRC	
R21	Tone Generator	5000 ohms plus or minus 10% AB C coating #1 terminal 4 watts.	IRC	
R22	Time Delay	1.5 megohms plus or minus 10% F1 1 watt.	IRC	
R23	Time Delay	5.0 megohms plus or minus 10% F1 1 watt.	IRC	
R24	Time Delay	400 ohms plus or minus 10% BW½ ½ watt.	IRC	
R25	Time Delay	300 ohms plus or minus 10% BW½ ½ watt.	IRC	
R26	Mic. Input	100 ohms plus or minus 10% F½ ½ watt	IRC	
R27	PA Cathode	5,000 ohms plus or minus 10% AB C coating #1 terminals 4 watts.	IRC	

Circuit Symbol	Function	Specification	Mfgr.	Type No.
R28	Meter Series	2640 ohms plus or minus 2% WW3 with lugs 1 watt.	IRC	
R29	Volume Control	2500 ohms variable	CMC	111-265
R30	Receiver Output	1,000 ohms plus or minus 10% BT½ ½ watt.	IRC	
R31	Mod. Transformer	30,000 ohms plus or minus 10% BT½ ½ watt.	IRC	
R32	Spark Supp.	100 ohms plus or minus 10% F½ ½ watt.	IRC	
R33	Damper	20,000 ohms plus or minus 10% BT1 1 watt	IRC	
R34	Damper	20,000 ohms plus or minus 10% BT1 1 watt.	IRC	
R35	HT meter series	1.5 megohms plus or minus 1% WW2 1 watt.	IRC	
R36	HT Meter Series	1.5 megohms plus or minus 1% WW2 1 watt.	IRC	
R37	HT Meter Series	100,000 ohms plus or minus 10% BT1 1 watt.	IRC	
R38	Ant. Meter Series	5,000 ohms plus or minus 10% BT1 1 watt.	IRC	

6.17 TM-11 EQUIPMENT SWITCHES.

Circuit Symbol	Function	Specification	Mfgr.	Type No.
S1	Frequency		CMC	112-907
S2	Range		CMC	112-908
S3	Control		CMC	112-909
S4	Meter		CMC	112-910
S5	Power		CMC	112-911
S6	NOT USED			
S7	PA Range		CMC	114-649
S8	Antenna Tune		CMC (Part of ass'y 114-647)	
S9	Series Parellel		CMC	114-440
S10	Gate	Push Type normally open #3591	AH&H.	

6.18 TM-11 EQUIPMENT TRANSFORMERS.

T1	Modulation	CMC	97700
T2	Microphone	CMC	97701
T3	Filaments	CMC	~~10-668~~
T4	Meter	CMC	115-576
T5	Meter	CMC	115-638

6.19 TM-11 EQUIPMENT VALVES.

V1	Master Oscillator	RVC	1619
V2	1st Buffer	RVC	1619
V3	2nd Buffer	RVC	1619

Circuit Symbol	Function	Specification	Mfgr.	Type No.
V4	Voltage Regulator		RVC	VR-150-30
V5	Power Amplifier		RVC	813
V6	Modulator		RVC	1619

6.19 TM-11 EQUIPMENT MISCELLANEOUS MATERIAL.

Chassis Connectors.

SC6		Model A	CMC	111-292
SC7		Model B	CMC	111-292
PC6		Model D	CMC	111-292
PC7		Model H	CMC	111-292
PC1			CMC	112-200
PC2			CMC	112-201
PC3			CMC	112-202
PC4			CMC	116-482
SC1			CMC	112-539
SC2			CMC	112-540
SC3			CMC	112-541
SC4			CMC	114-678

Valve Sockets.

V1			CMC	68087
V2			CMC	68087
V3			CMC	68087
V4			CMC	68087

Circuit Symbol	Function	Specification	Mfgr.	Type No.
V5		237	Johnson	
V6			CMC	68087
Crystal Sockets		33-2	Amphenol	
Iron Cores for R.F. coils			CMC	69087
Test Cable			CMC	114-830
Antenna Leadout bushing		#480	Isolantite	
Feed through insulator		#502	Isolantite	
Feed through insulator		#55	Johnson	
Coupling		#250	Johnson	
Coupling		#251A	Johnson	
Insulator		#398 ½"	Isolantite	
Insulator		#394 1"	Isolantite	
Insulator		#1050	American Lava	
Insulator		#1052	American Lava	
Bushing		#20	IRC	

RCA 3W/273

6.20 ZM-22 POWER UNIT CONDENSERS

Circuit Symbol	Function	Specification	Mfgr.	Type No.
C1	HT Filter	4.0 mfds plus or minus 10% #2009-S 2000V W. D.C.	Aero-vox	
C2	LT Filter	8.0 mfds plus or minus 20% #609-S 600 V. W. D.C.	Aero-vox	
C3	Line Filter	2 x 0.1 mfds plus or minus 20% #630 600 V. W. D.C.	Aero-vox	
C4	Control Rect. Filter	100 mfds 50 V. W. D.C. Electrolytic	Aero-vox	
C5	NOT USED			
C6	NOT USED			
C7	Hash Filter	2 x 0.1 mfds plus or minus 20% #430 400v W. D.C.	Aero-vox	
C8	Hash Filter	2 x 0.5 mfds plus or minus 20% #430 400v W.D.C.	Aero-vox	
C9	Hash Filter	2 x 0.1 mfds plus or minus 20% #630 600 v W.D.C.	Aero-vox	
C10	Hash Filter	2 x 0.1 mfds plus or minus #630 300 V. W.D.C.	Aero-vox	

6.21 ZM-22 POWER UNIT RELAYS.

E1	High-low power	24V DC operation BJU-1	Allied Control
E2	LT primary	24V DC operation BO/7 D-35	Allied Control
E3	Converter	24V DC operation BO/7-D-35	Allied Control

6.22 ZM-22 POWER UNIT FUSES

Circuit Symbol	Function	Specification	Mfgr.	Type No.
F1	AC Line	7A250V Economy AF- 733	CGE	
F2	AC Line	7A250V Economy AF-733	CGE	
F3	Rec. Input	3A250 V Economy AF-333	CGE	
F4	Rec. Input	3A250 V Economy AF-333	CGE	
F5	Conv. Input	20A 250V Economy in 1-7/8" Adm. Patt. cartridge	CGE	
F6	Conv. Input	20A 250V Economy in 1 7/8" Adm. Patt. cartridge.	CGE	

6.23 ZM-22 POWER UNIT INDUCTANCES

L1	HT Filter Choke	CMC	97716
L2	LT Filter Choke	CMC	97718
L3	24V Filter Choke	CMC	97723
L4	NOT USED		
L5	NOT USED		
L6	NOT USED		
L7	Hash Filter	CMC	97732
L8	Hash Filter	CMC	97732
L9	Hash Filter	CMC	111-295
L10	Hash Filter	CMC	111-295

6.23 ZM-22 POWER UNIT RESISTORS

Circuit Symbol	Function	Specific tion	Mfgr.	Type No.
R1	HT Rect. Bleeder	100,000 ohms plus or minus 10% 40 watts C Coating #3 Terminals HA	IRC	
R2	LT Rect. Bleeder	50,000 ohms plus or minus 10% EP 20 watts C coating #3 terminals.	IRC	
R3	24V Rect. Bleeder	250 ohms plus or minus 10% AB 4 watts C coating #1 terminals	IRC	
R4	NOT USED			
R5	Conv. Battery	SEE TABLE BELOW		

ASSY	TYPE	VOLTAGE	TYPE OF CONVERTER	R5	F5 & F6
ZM-21-S	110-984	24	114-907	Shorted	20 amps
ZM-21-T	110-602	36	114-908	100 ohms 4 watt	15 amps.
ZM-21-T	110-603	220	114-909	2000 ohms 40 watt	3 amps.
ZM-22-S	110-620	24	114-910	Shorted	20 amps.

6.24 ZM-22 POWER UNIT TRANSFORMERS

T1	HT Anode	CMC	97717
T2	HT Rectifier Filament	CMC	97721
T3	LT Rectifier Composite	CMC	97719
T4	24 v rectifier	CMC	97720

6.25 ZM-22 POWER UNIT - SWITCHES.

S1	Lock Switch #3597	AH & H	
S2	Gate Switch #3591	AH & H	
S3	AC/DC switch 8745-K-5	Cutler Hammer	
S4	AC/DC switch 8745-K-5	Cutler Hammer	
S5	AC/DC switch 8745-K-5	Cutler Hammer	

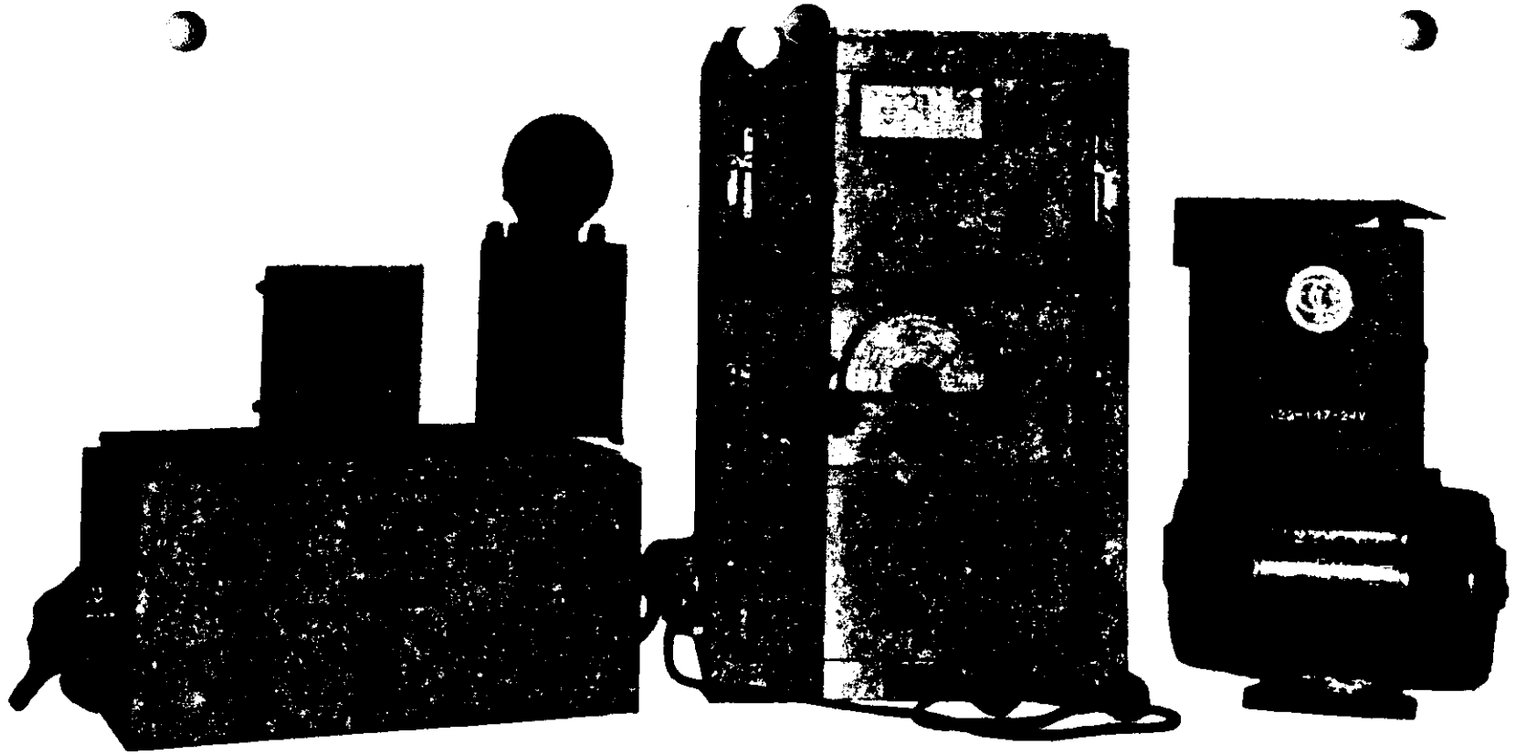
6.26 ZM22- POWER UNIT MISCELLANEOUS MATERIAL

Circuit Symbol	Function	Specification	Mfgr.	Type No.
		Socket and Chassis Connectors.		
SC7		Model C	CMC	111-292
SC8		Model G	CMC	111-292
PC1			CMC	102-280
PC2			CMC	102-279
PC3			CMC	102-278
PC4			CMC	102-277
PC5			CMC	102-276
PC6			CMC	102-275
SC1			CMC	104-583
SC2			CMC	104-585
SC3			CMC	105-581
SC4			CMC	104-584
SC5			CMC	104-586
SC6			CMC	104-582

Circuit Symbol	Function	Specification	Mfgr.	Type No.
		Valve Sockets.		
V1	MIP-4		Amphenol	
V2		MIP-4	Amphenol	
V3		MIP-4	Amphenol	
V4		MIP-4	Amphenol	
V5			CMC	68087
Selinium Rectifier			CMC	114-426

6.27 SM-11 CONTROL UNIT MISCELLANEOUS MATERIAL.

P1	Pilot Light 24V	Mazda 1139-B	CGE	
Pilot Light Socker		Variable intensity #421 colourless	Gothard	
R1	Volume Control	S4-010-072 500 ohms T pad	Centralab	
R2		450 ohms plus or minus 5% AB 4 watts C coating #1 terminals	IRC	
R3		50 ohms plus o. minus 10% AB 4 watts C coating #1 terminals	IEC	
R4	Volume control		CMC	111-265
S1	Speaker Phones	8803-K3	Cutler Hammer	
S2	ON-OFF	8816-K2	Cutler Hammer	
T1	Coupling transformer		CMC	97724
	Loudspeaker		CMC	95280

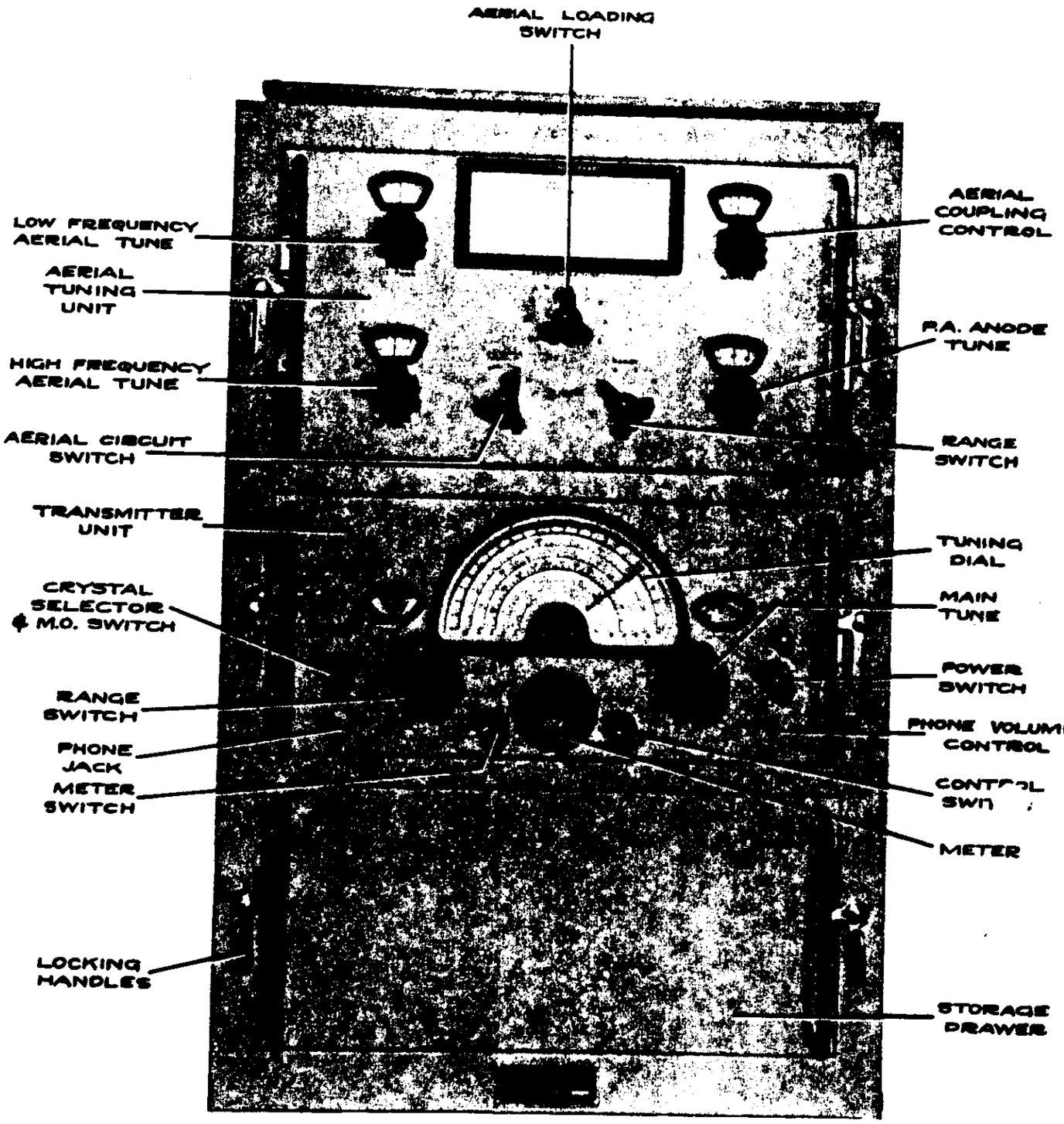


TM-11 EQUIPMENT

GENERAL VIEW OF COMPLETE APPARATUS

CANADIAN marconi

FIG-1

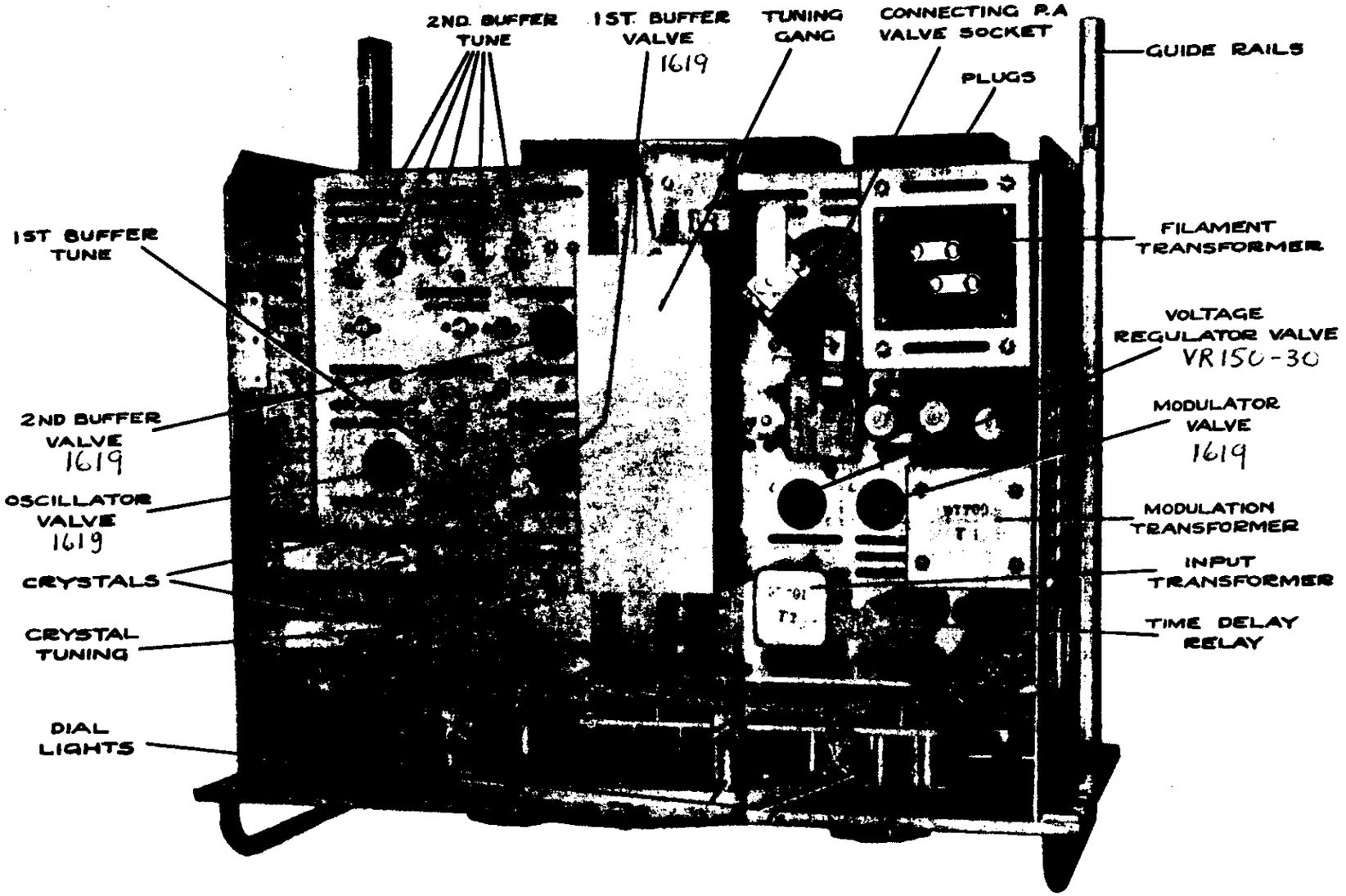


TM-11 TRANSMITTING EQUIPMENT

FRONT VIEW OF TRANSMITTER

CANADIAN Marconi COMPANY

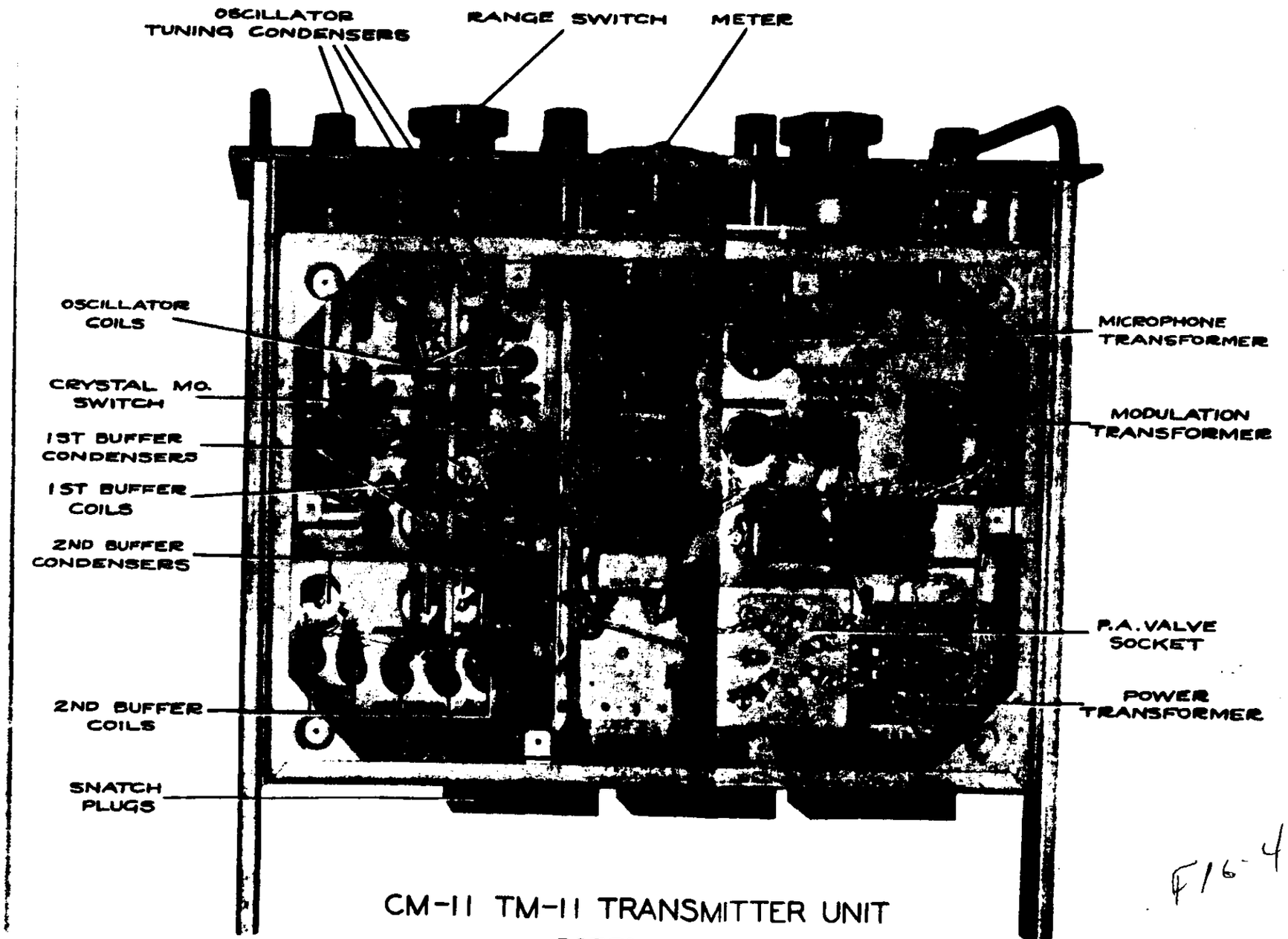
FIG. 2



CM-11 TM-11 TRANSMITTER UNIT

TOP VIEW

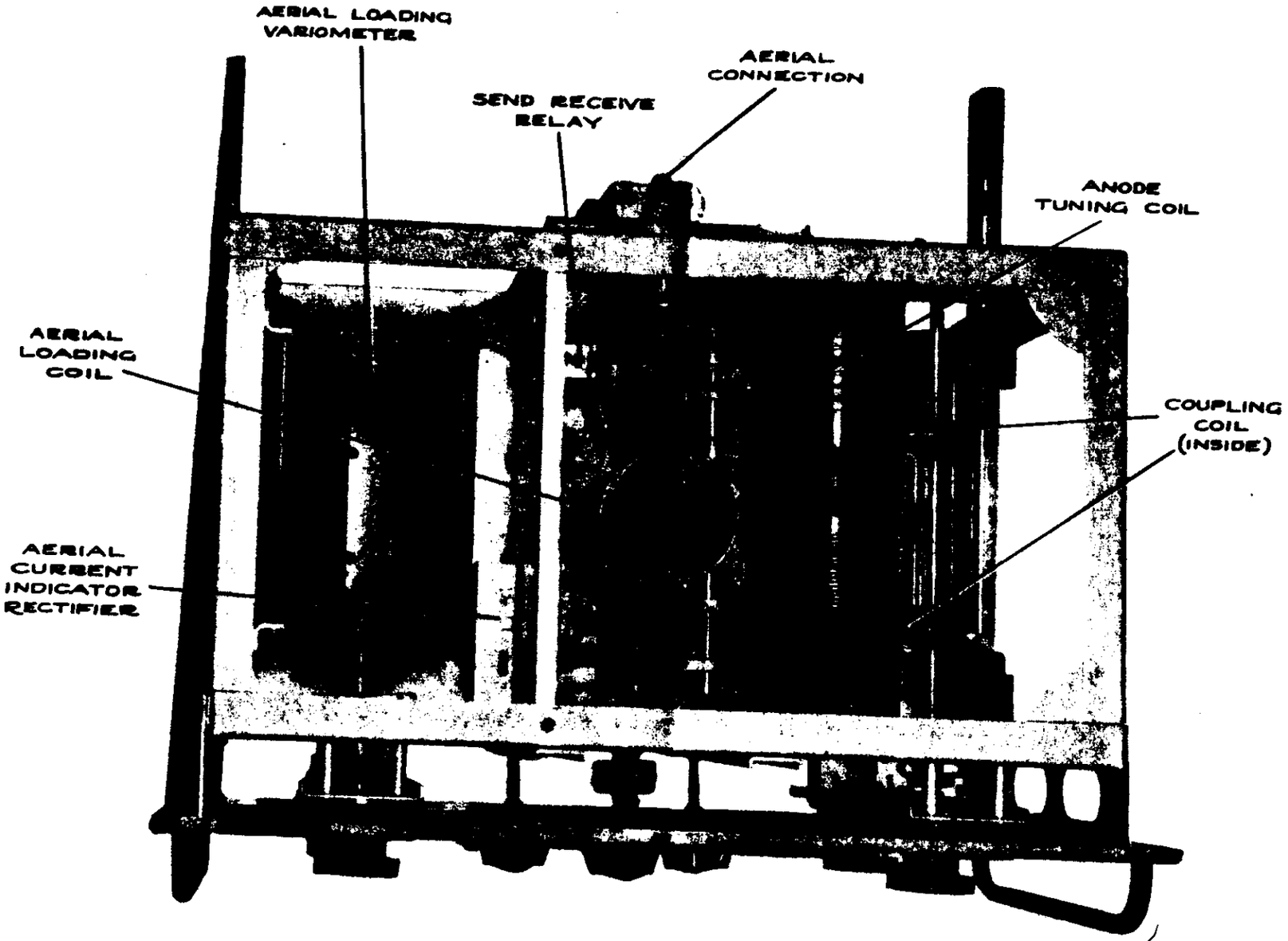
F1 6-3



CM-11 TM-11 TRANSMITTER UNIT

BOTTOM VIEW

F16-4



CM-11 TM-11 AERIAL TUNING UNIT

TOP VIEW

F10-5

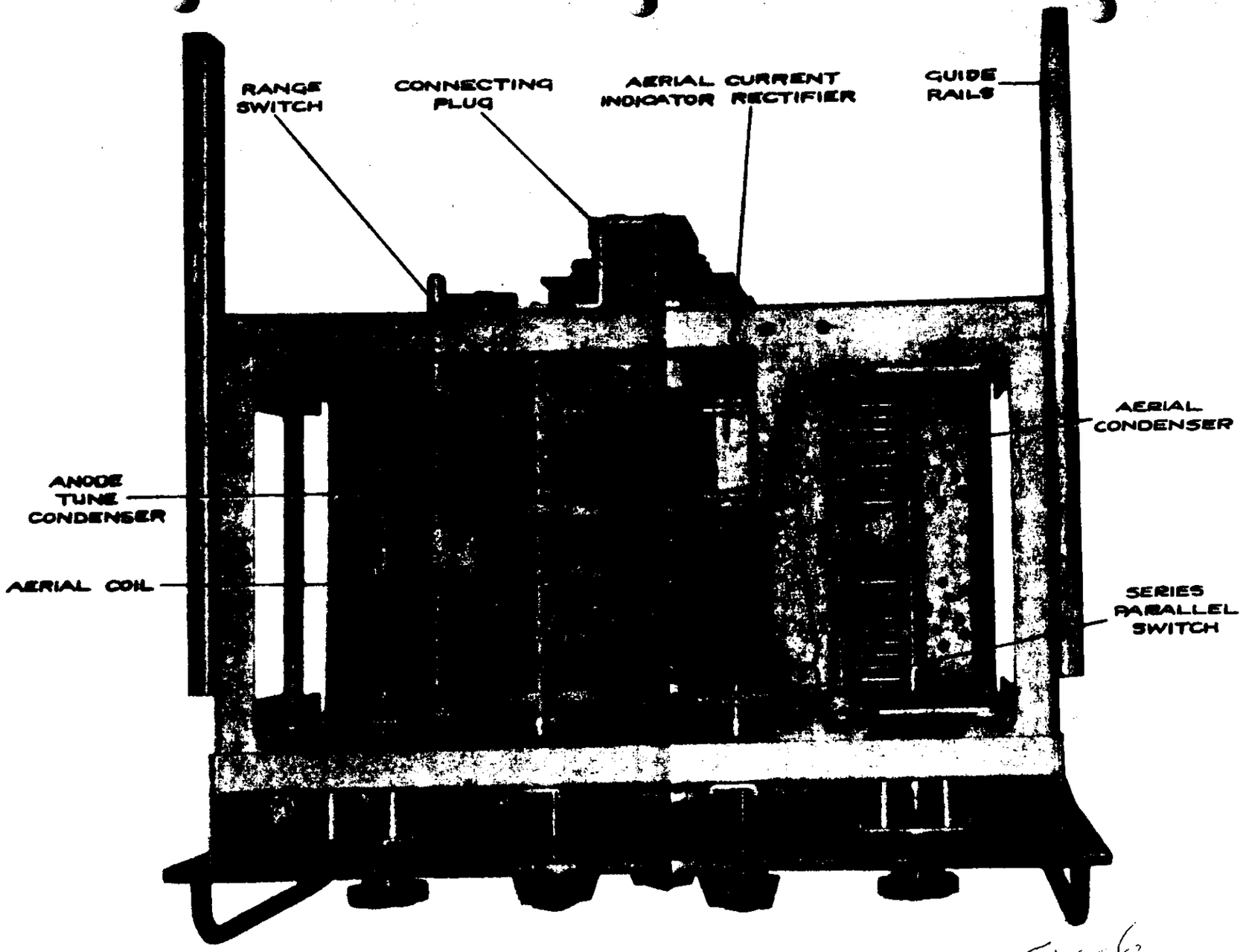
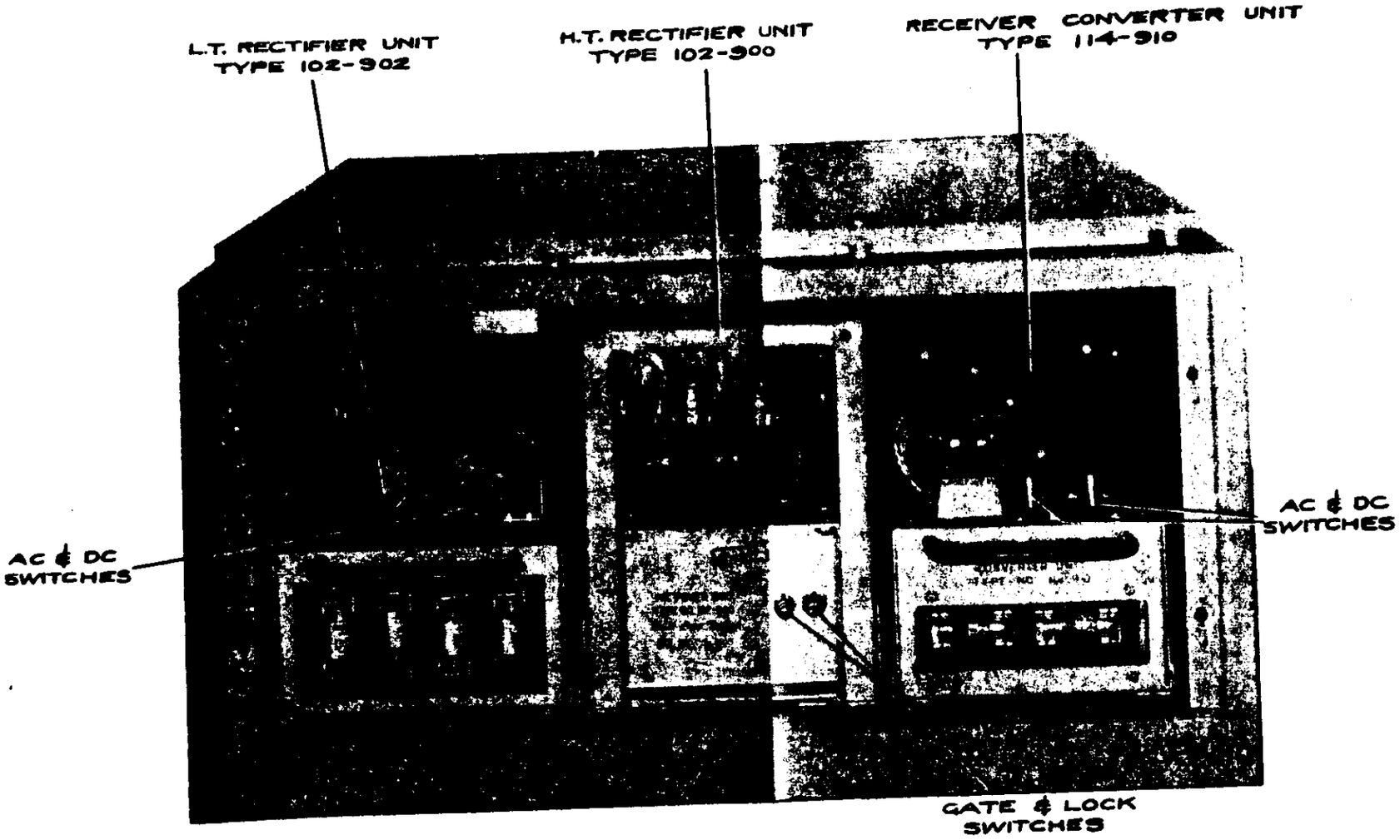


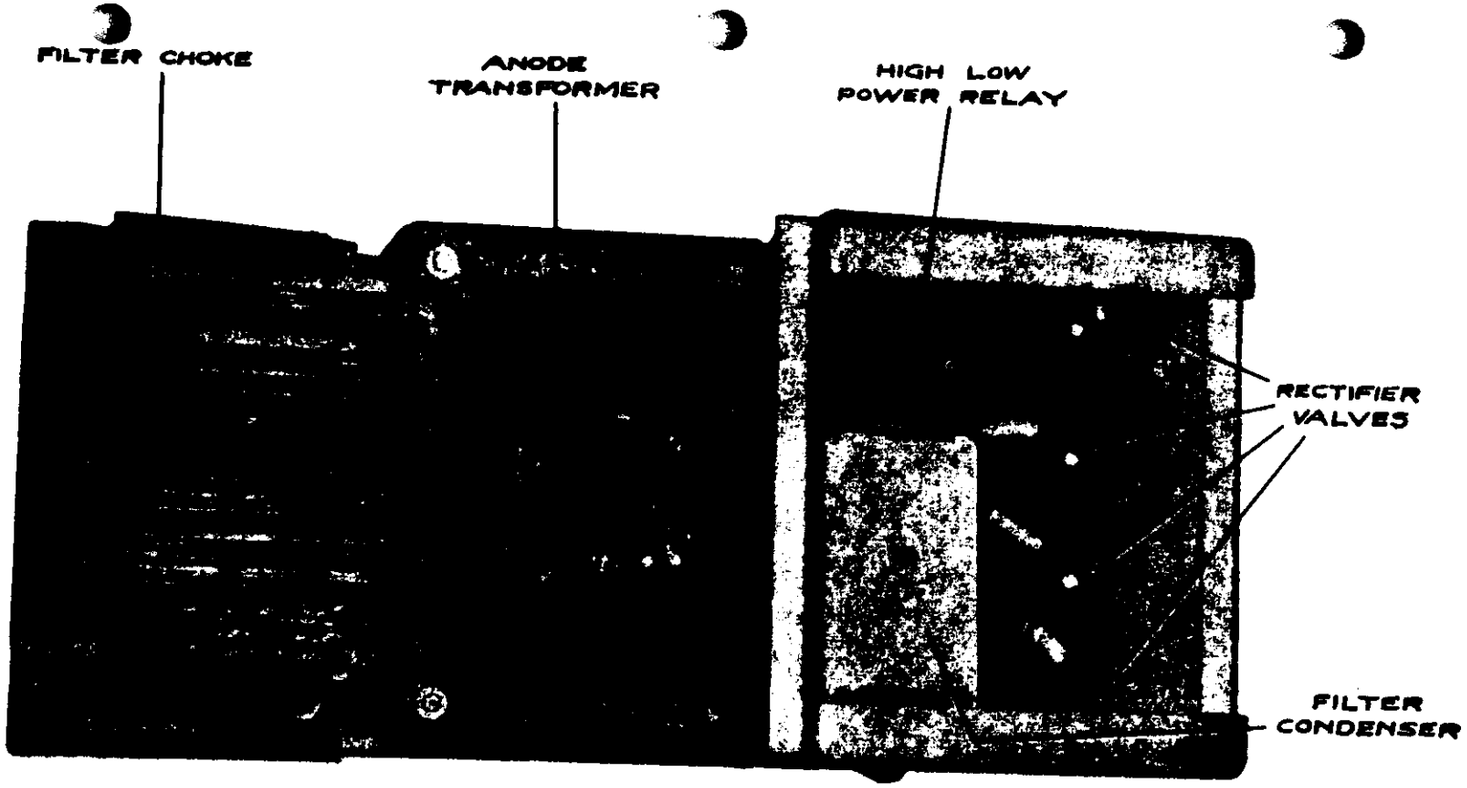
Fig 6

CM-11 TM-11 AERIAL TUNING UNIT
BOTTOM VIEW



ZM-22 POWER UNIT
FRONT VIEW

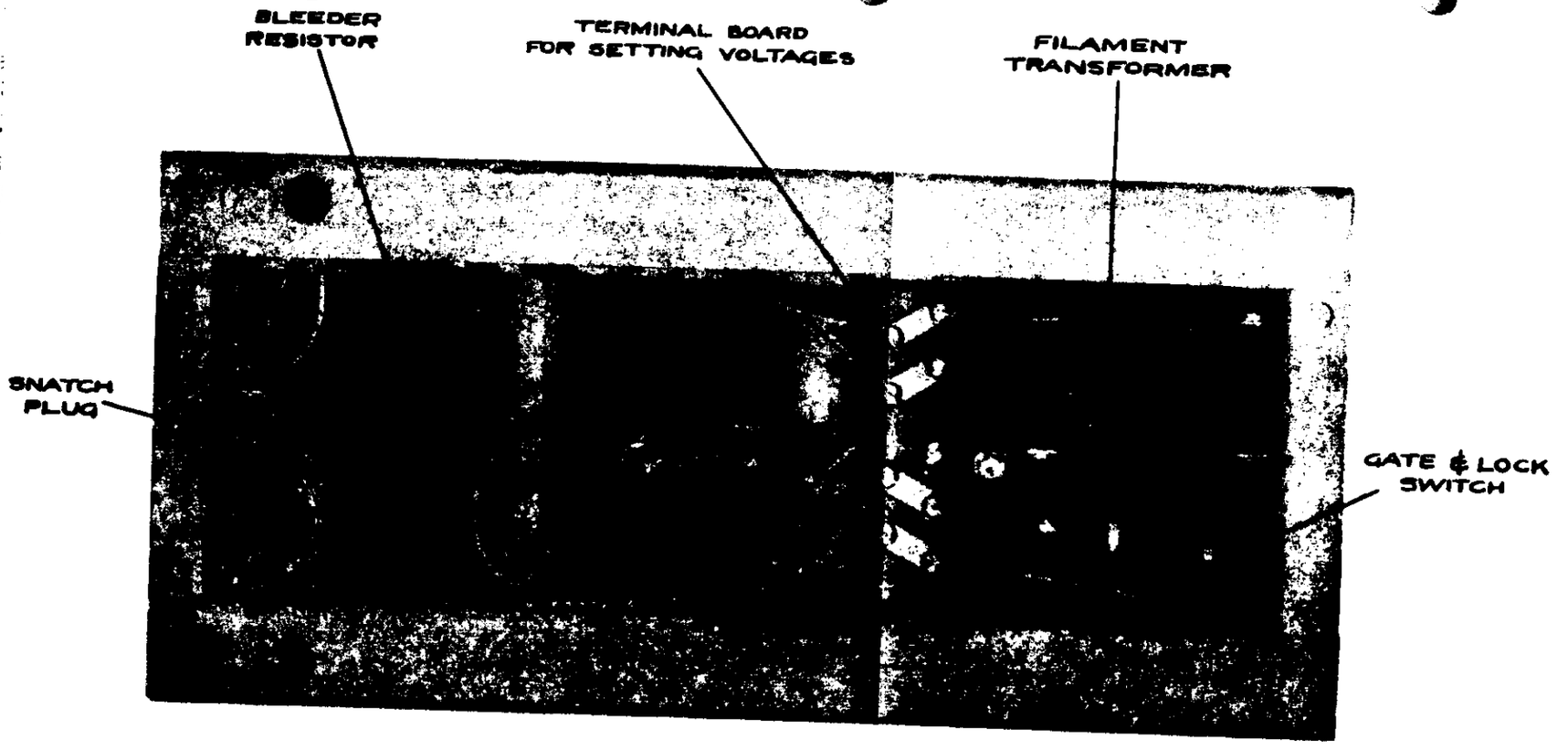
FIG. 7



CM-11 TM-11 EQUIPMENT
HIGH VOLTAGE RECTIFIER
TYPE 102-900 TOP VIEW

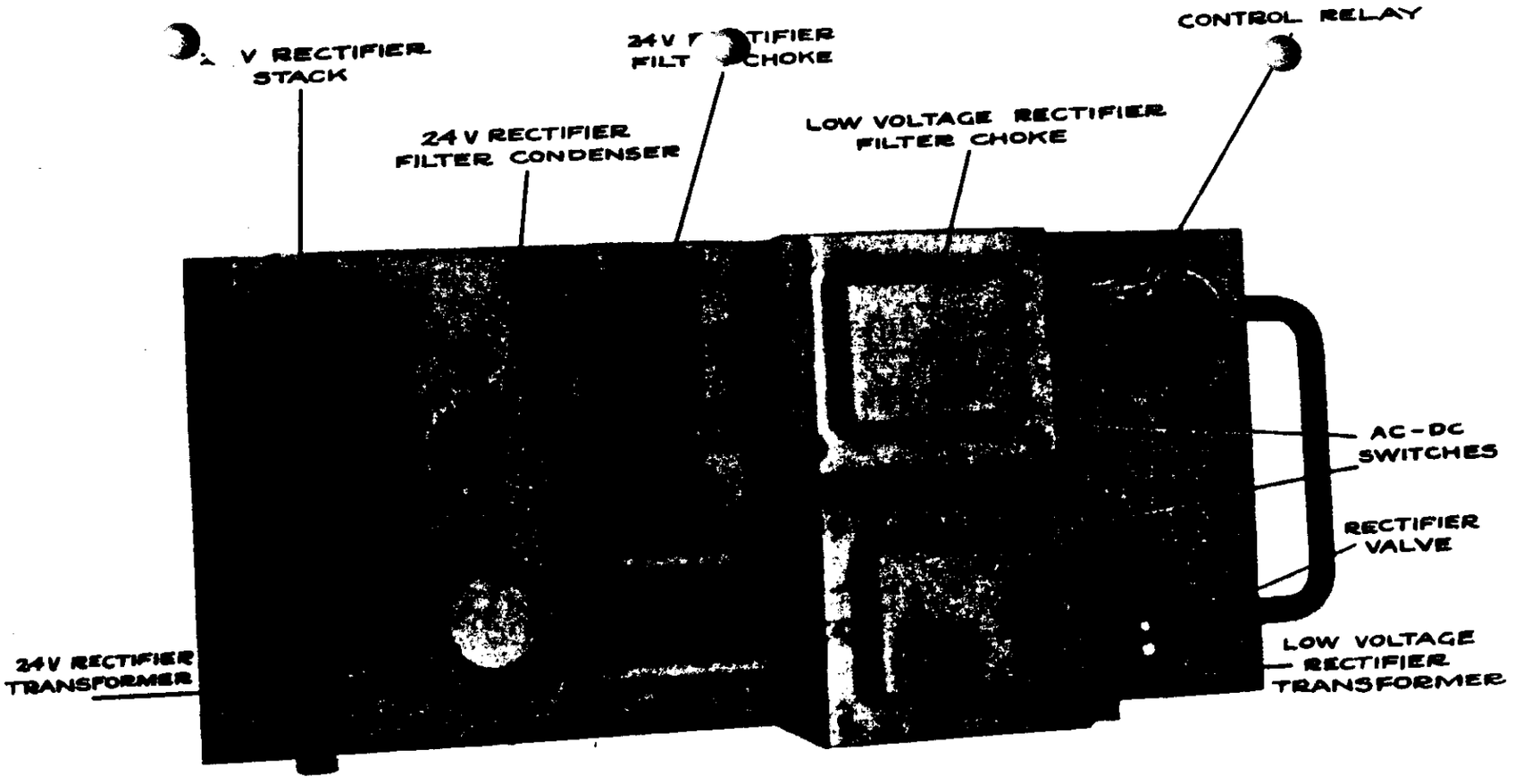
CANADIAN Marconi COMPANY

FIG. 8



CM-11 TM-11 EQUIPMENT
HIGH VOLTAGE RECTIFIER
TYPE 102-900 BOTTOM VIEW

FIG. 9



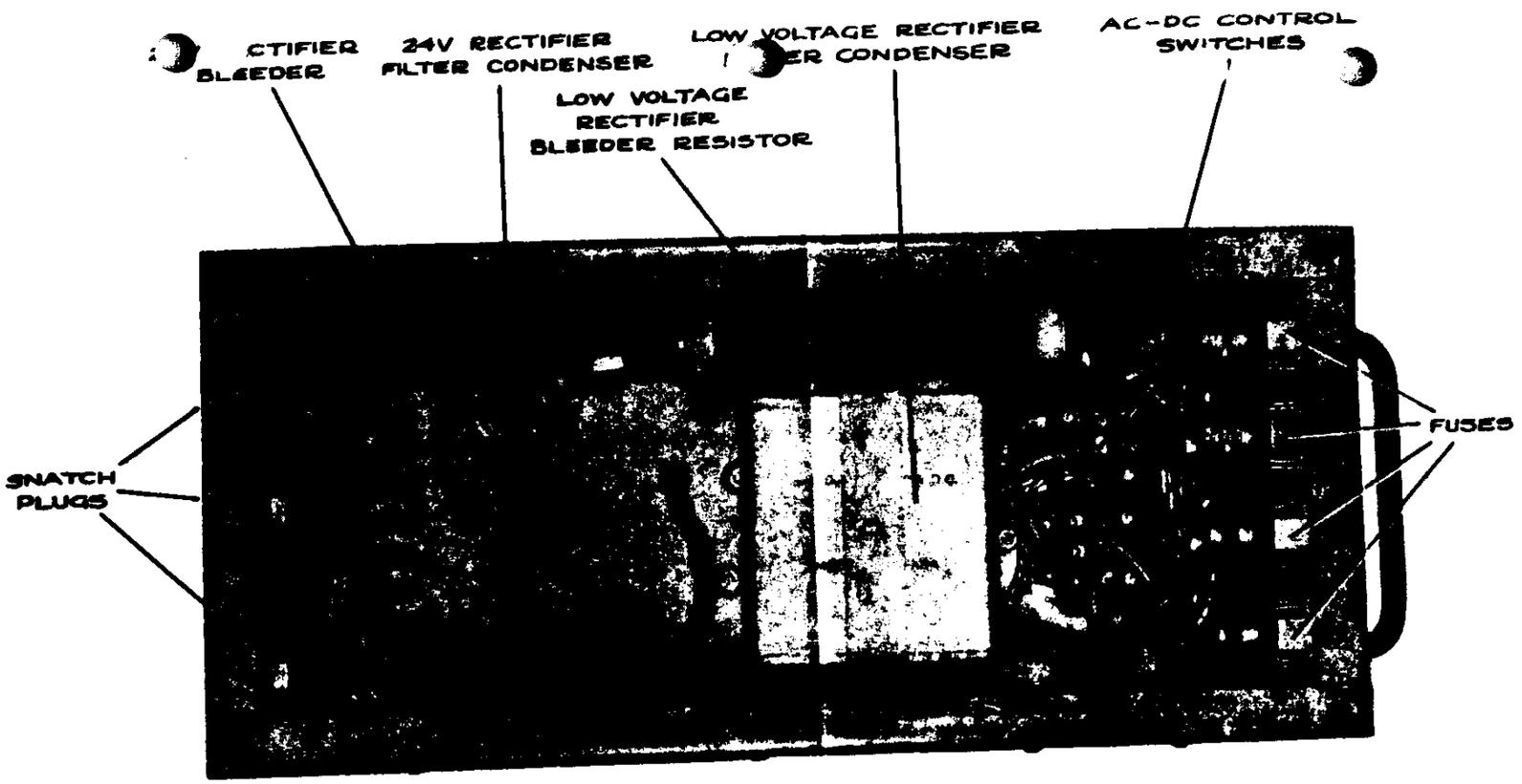
CM-11 TM-11 EQUIPMENT

LOW VOLTAGE RECTIFIER

TYPE 102-902 TOP VIEW

CANADIAN Marconi COMPANY

FIG. 10



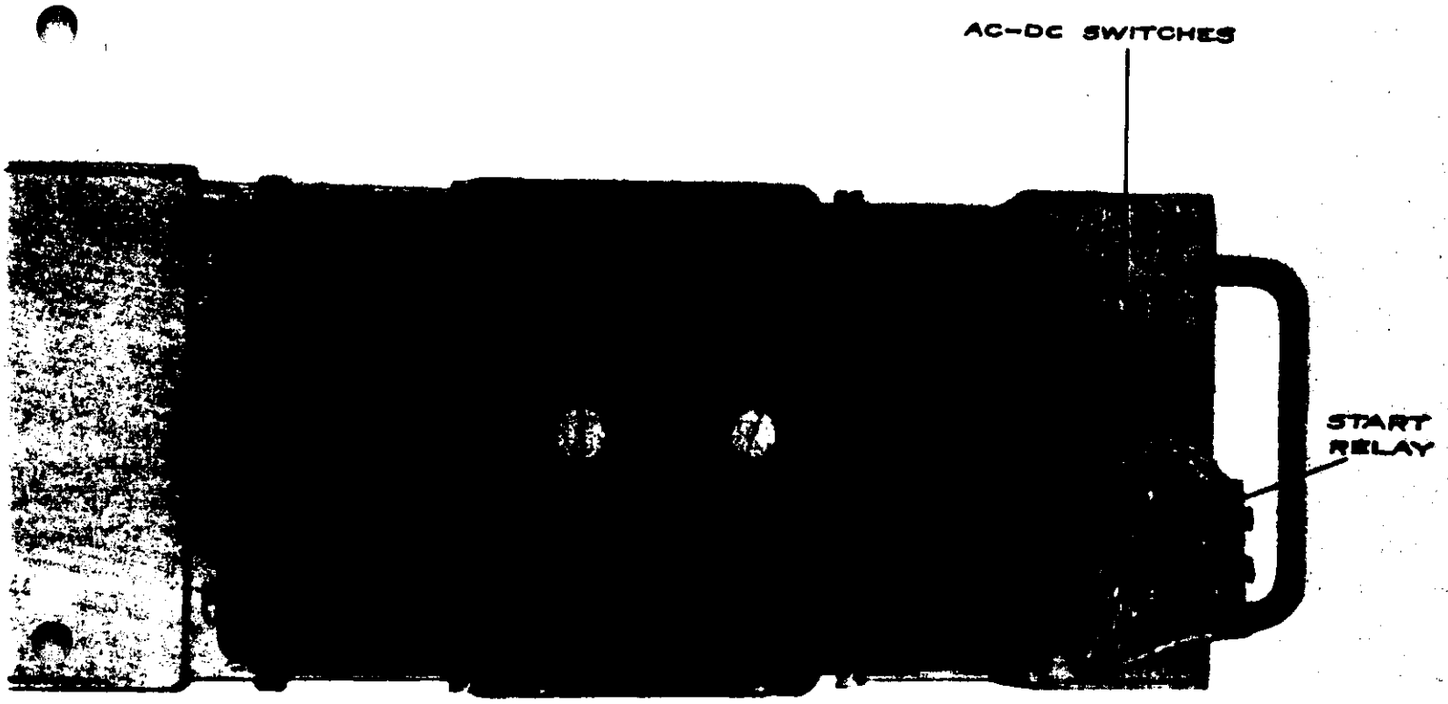
CM-11 TM-11 EQUIPMENT

LOW VOLTAGE RECTIFIER

TYPE 102-902 BOTTOM VIEW

CANADIAN Marconi COMPANY

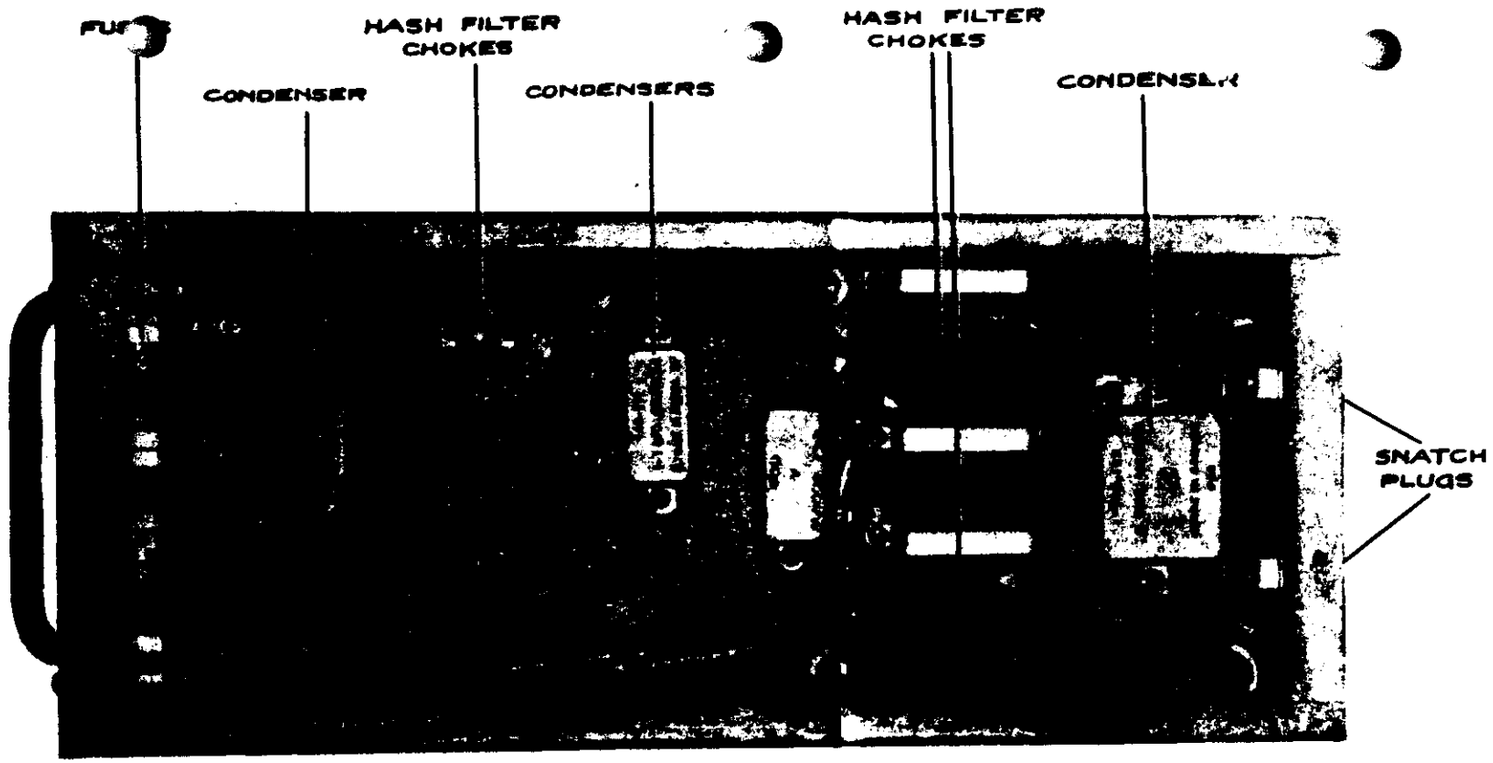
FIG. 11



TM-11 EQUIPMENT
RECEIVER CONVERTER UNIT
TYPE 114-910 — TOP VIEW

arconi COMPANY

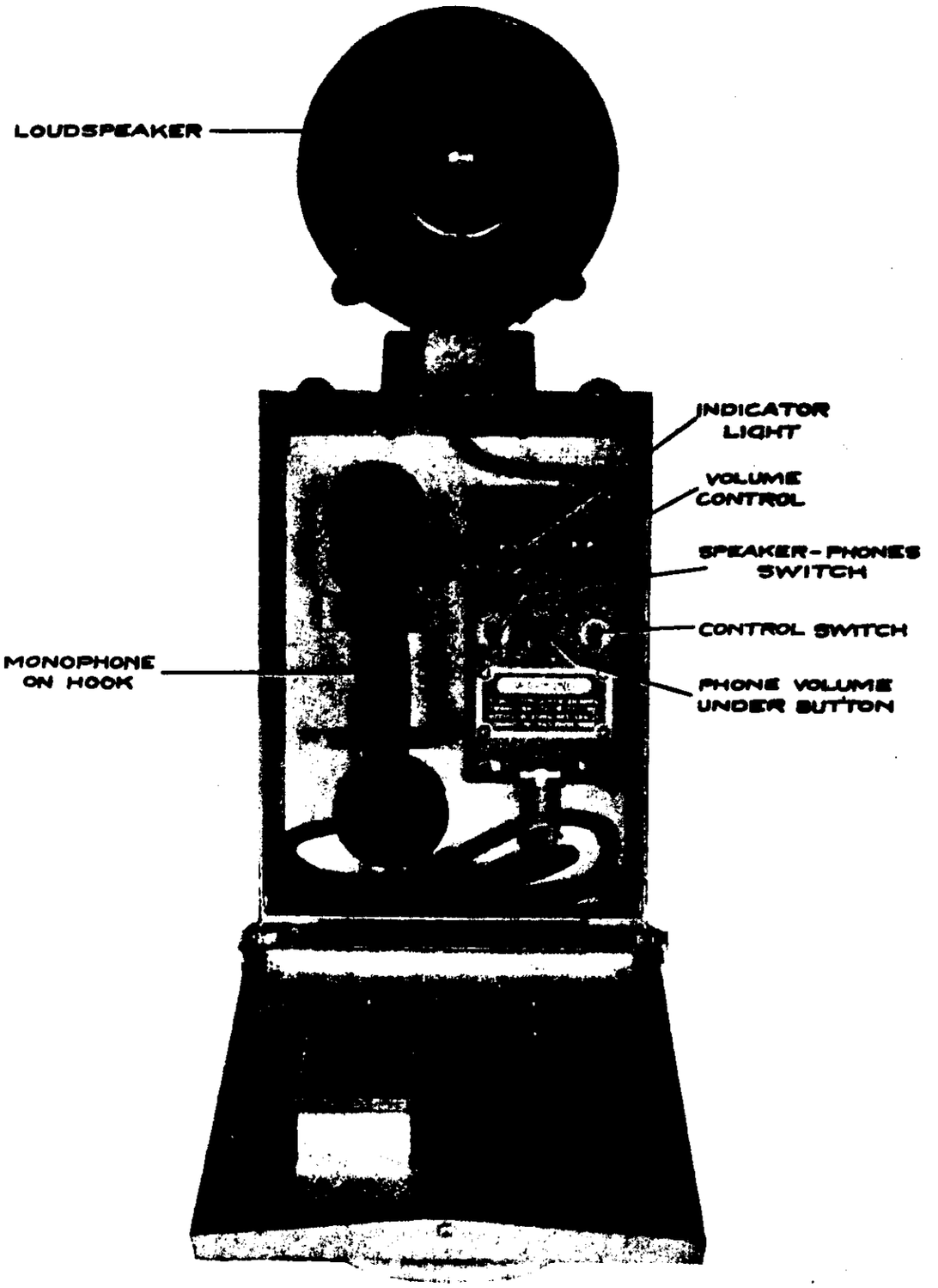
FIG. 11



TM-11 EQUIPMENT
RECEIVER CONVERTER UNIT
TYPE 114-910 BOTTOM VIEW

CANADIAN Marconi COMPANY

FIG. 13



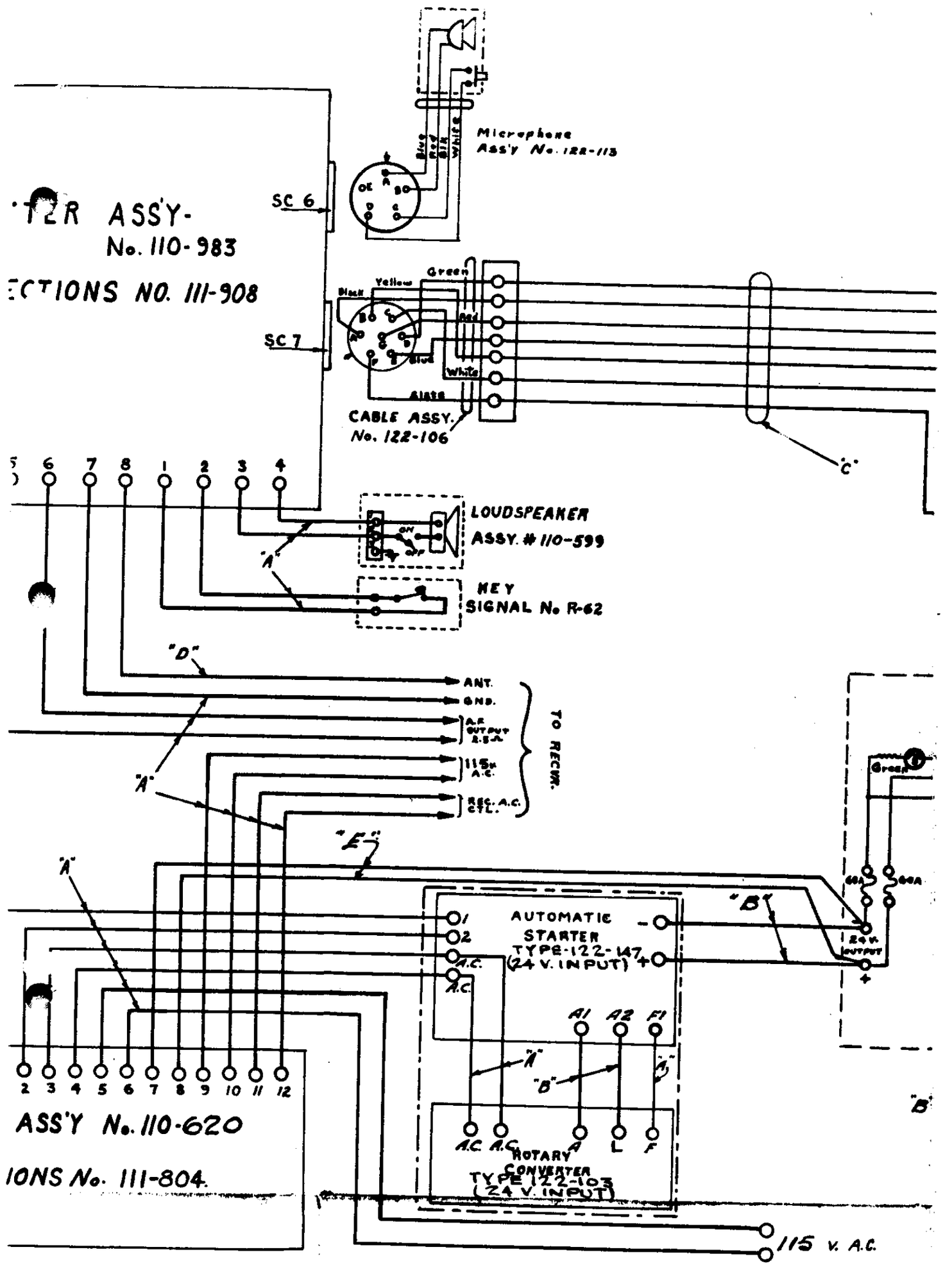
SM-11 REMOTE CONTROL UNIT

GENERAL VIEW

COVER OPEN

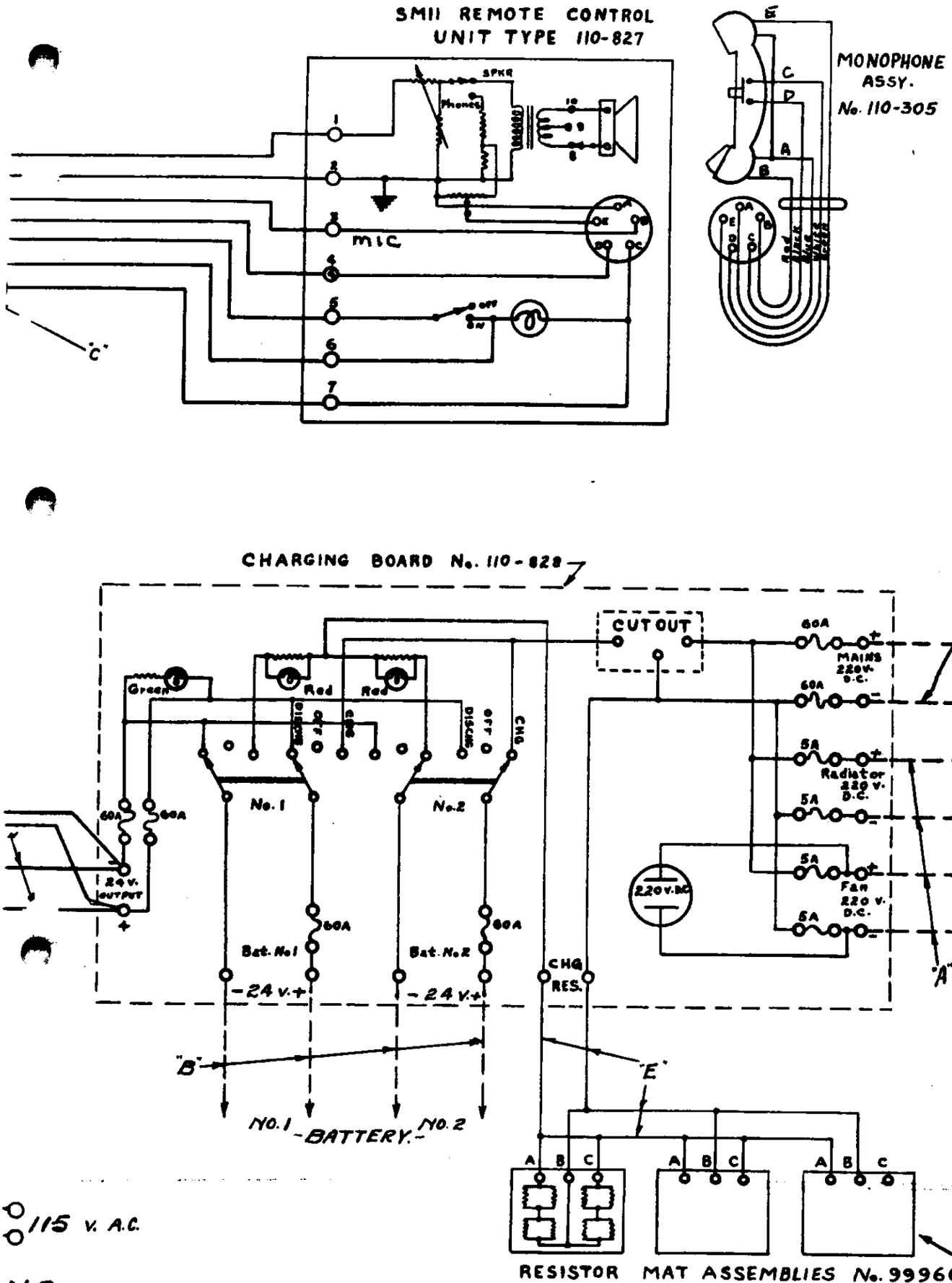
CANADIAN Marconi COMPANY

FIG. 14



WIRING.

"A" - LEAD SHEATHED CABLE, SING. COND., ADM
"B" - LEAD SHEATHED CABLE, SING. COND., ADM
"C" - LEAD SHEATHED CABLE, ADM. PATT. No. 252
"D" - CABLE, ADM. PATT. No. 13819 (PREFERRED)
"E" - LEAD SHEATHED CABLE, SING. COND., ADM.
— ALL LEAD SHEATHS TO BE GRO



NG.

SING. COND., ADM. PATT. No. 6195A.
SING. COND., ADM. PATT. No. 6191
ADM. PATT. No 2524 S OR EQUIVALENT
(PREFERRED) OR No. 5429
SING. COND., ADM. PATT. No. 6193.
ALL PATHS TO BE GROUNDED. -

STATION WIRING DIAGRAM
TM-II EQUIPMENT
115 V. AC. & 24 V. DC. INPUT

FIG. 21

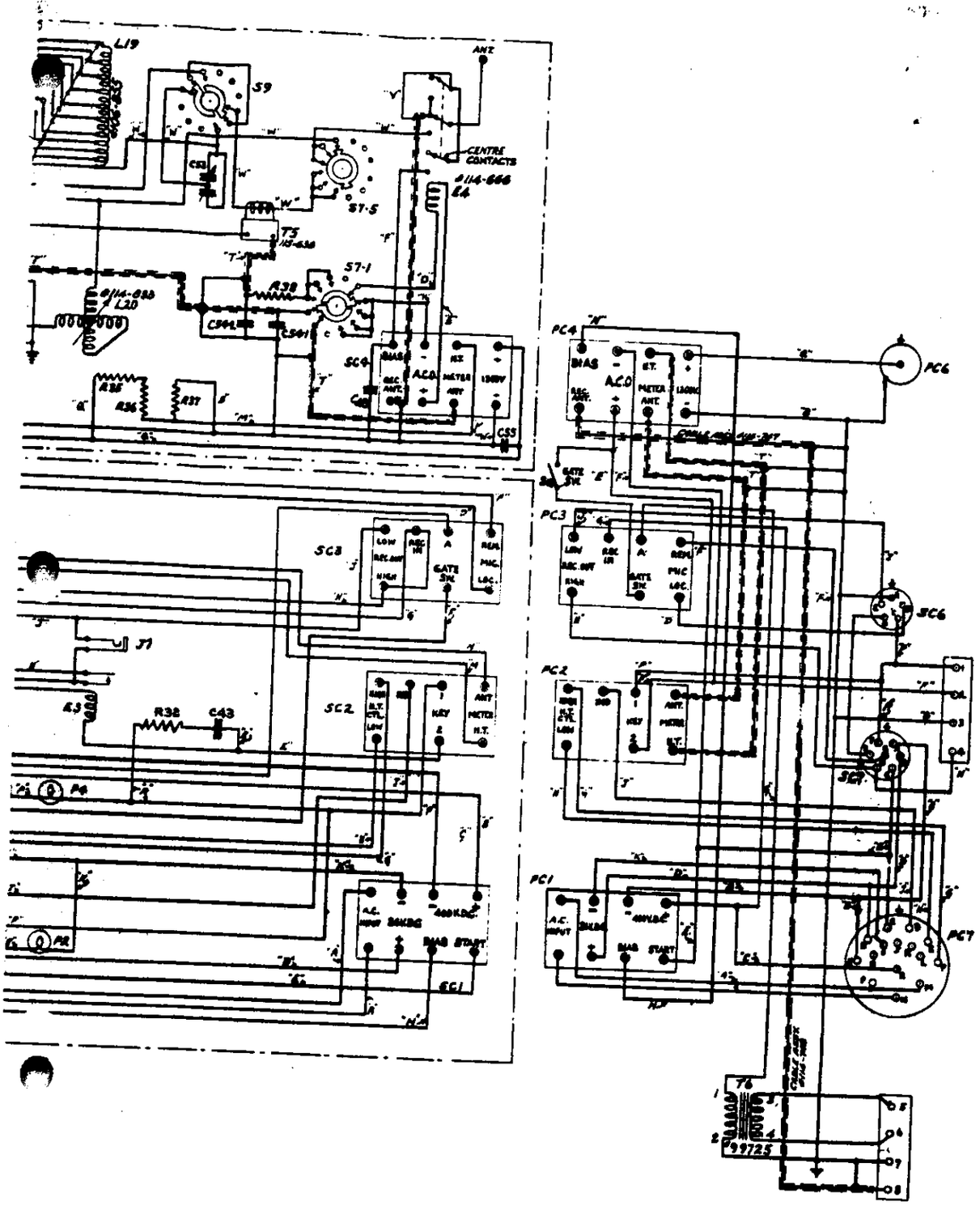
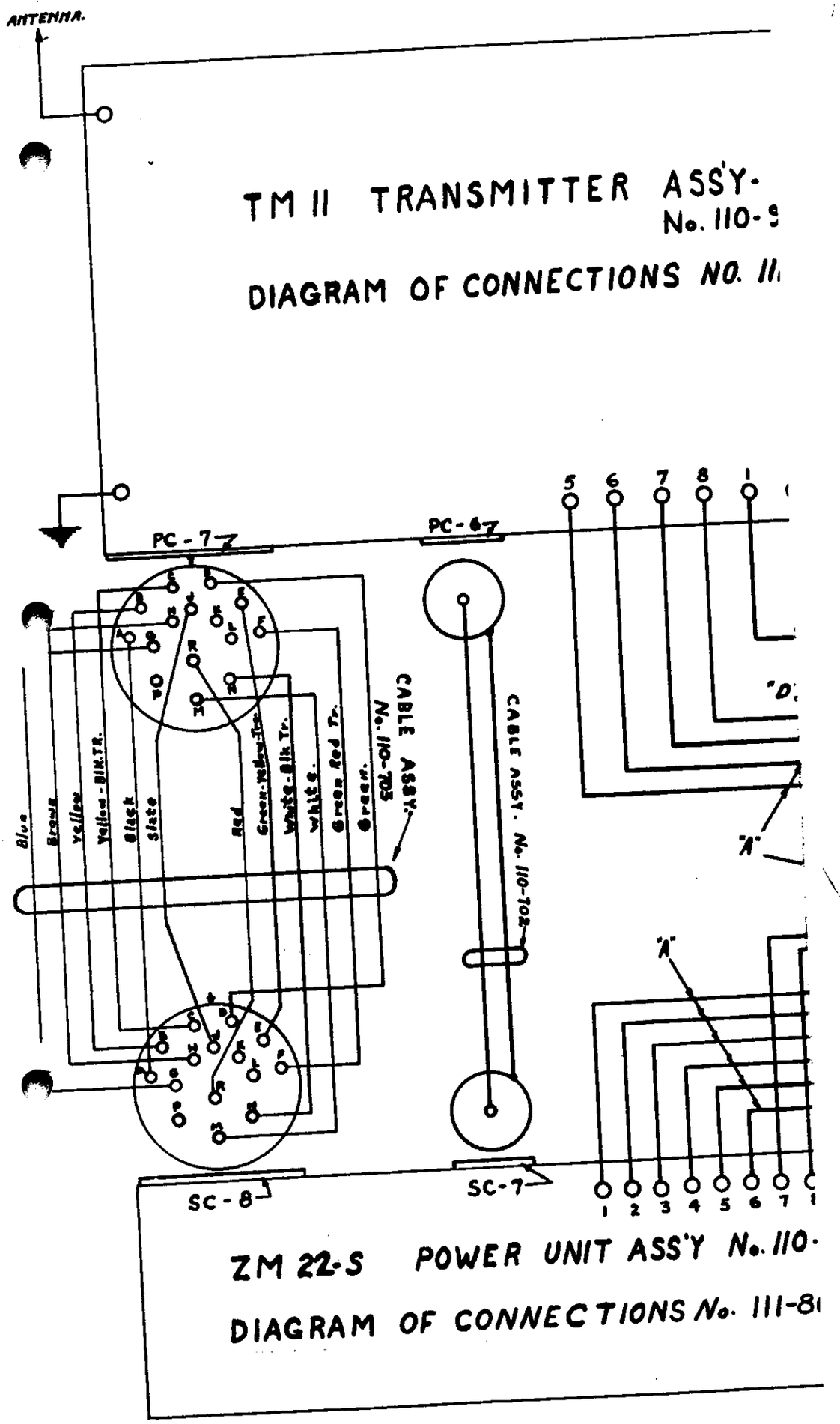


DIAGRAM OF CONNECTIONS
TM-II TRANSMITTER ASS'Y
TYPE 110-983

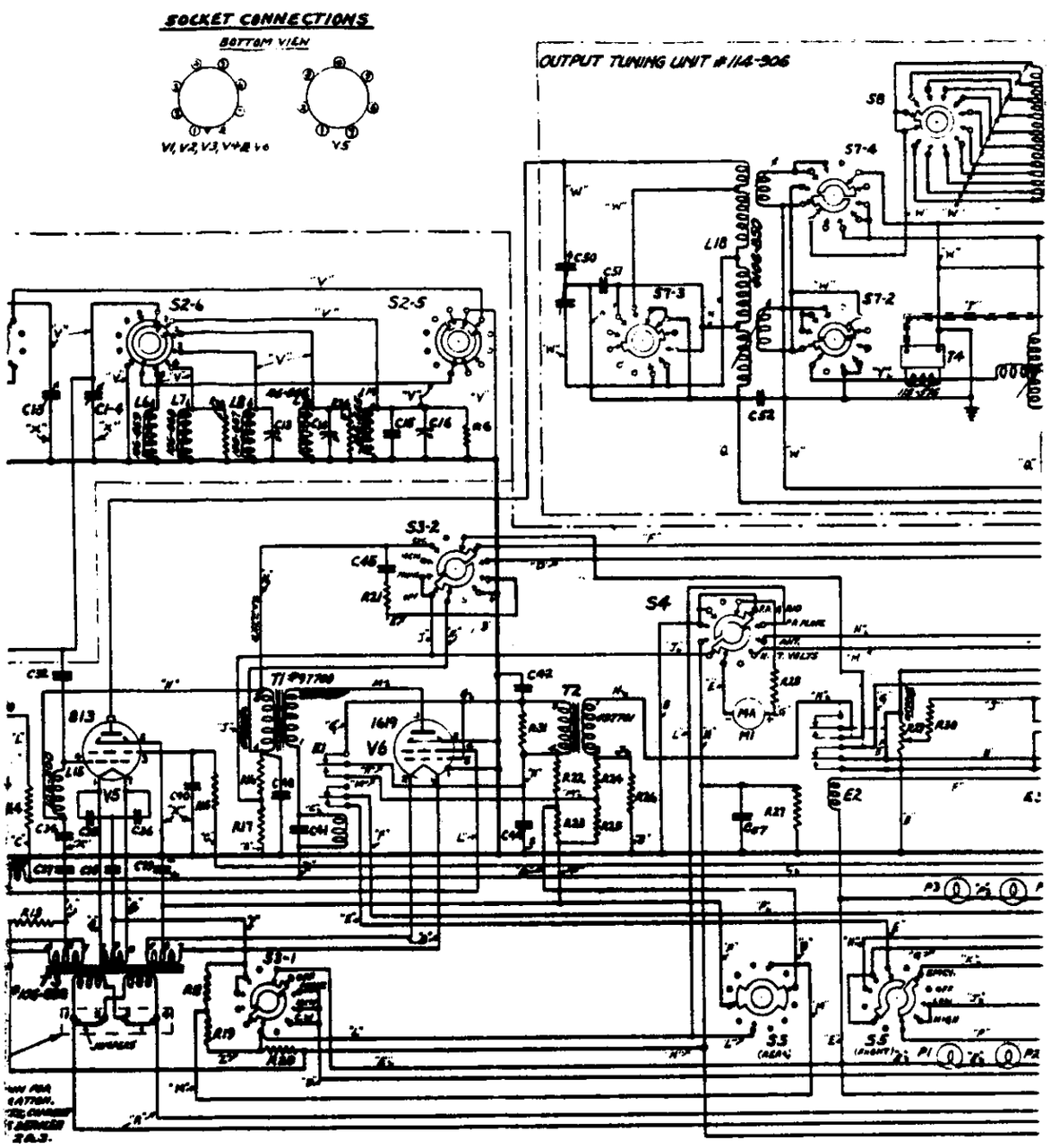
FIG. 19



NOTES.

1. THE USE OF CHARGING BOARD TYPE 110-828 AND ASSOCIATED CHA
UNITS IS OPTIONAL.

CANADIAN Marconi COMPANY



WIRE LEGEND

ALL WIRING TO BE AS PER SPEC. #108-528, UNLESS OTHERWISE SPECIFIED.

"A"	CODE # 1898 (WHITE)	
"B"	=	186-A (BLACK)
"C"	=	242-B (RED)
"D"	=	244-A (YELLOW)
"E"	=	273-A (YELLOW/BROWN)
"F"	=	274-A (YELLOW/GREEN)
"G"	=	266-A (GREEN/RED)
"H"	=	268-A (GREEN/YELLOW)
"J"	=	249-A (GREEN)
"K"	=	241-A (BROWN)
"L"	=	246-A (BLUE)
"M"	=	278-A (BLUE/RED)
"N"	=	276-A (BLUE/BROWN)
"P"	=	255-A (SLATE)
"R"	=	288-F (RED/WHITE)
"X"		
"S"		
"T"		SHIELDED CABLE #35897
"V"		#20 B+S GS BARE, TINNED, SOLID, CU. WIRE
"W"		#18 " " " " " " "
"Y"		#16 " " " " " " "

IF NOT OTHERWISE SPECIFIED, WIRING TO BE "B" "P" "V" OR "N" AS SUITABLE

NOTES

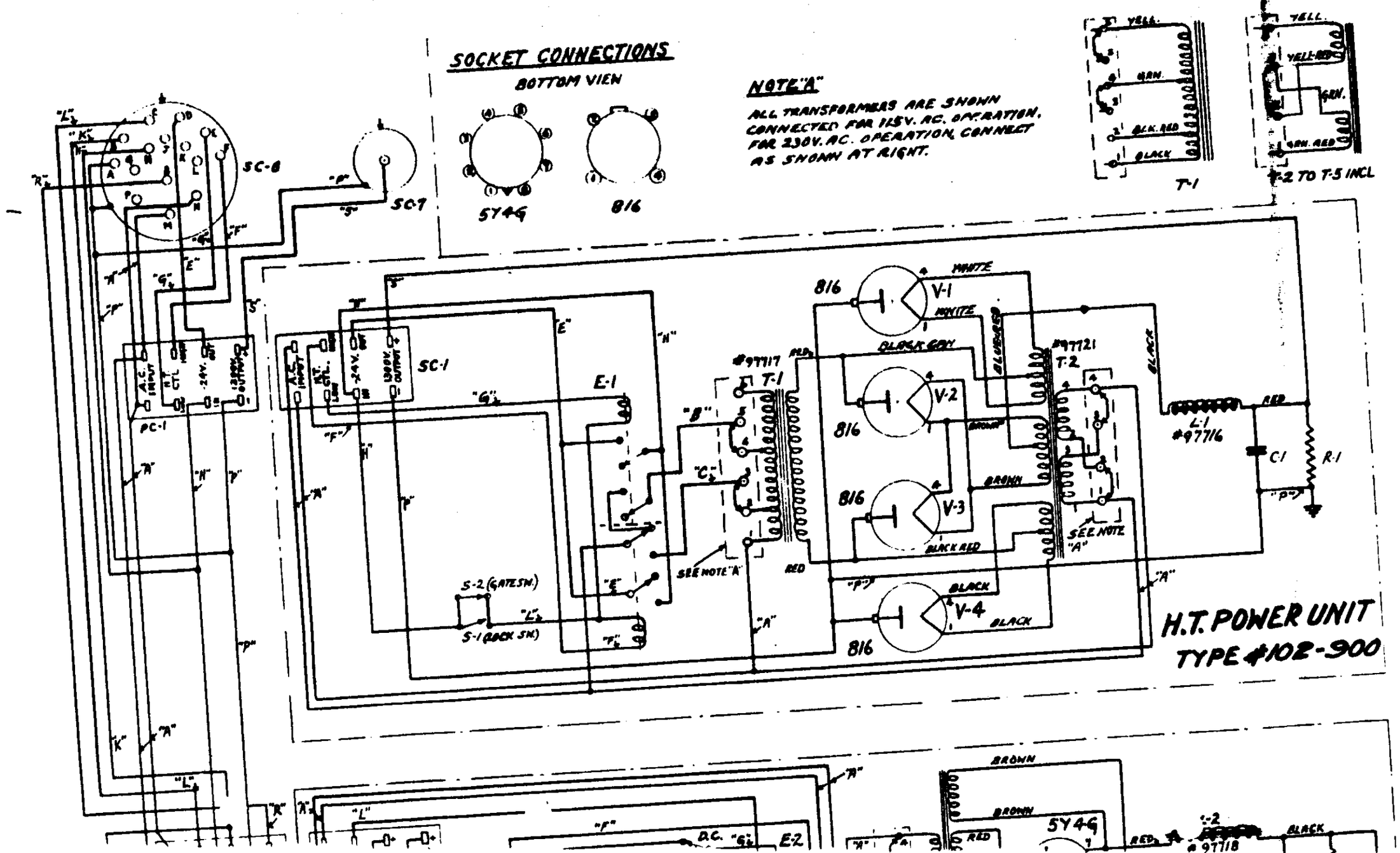
(1) ALL ROTARY TAP SWITCHES SHOWN IN EXTREME ANTI-CLOCKWISE POSITION, LOOKING FROM KNOB END OF SHAFT.

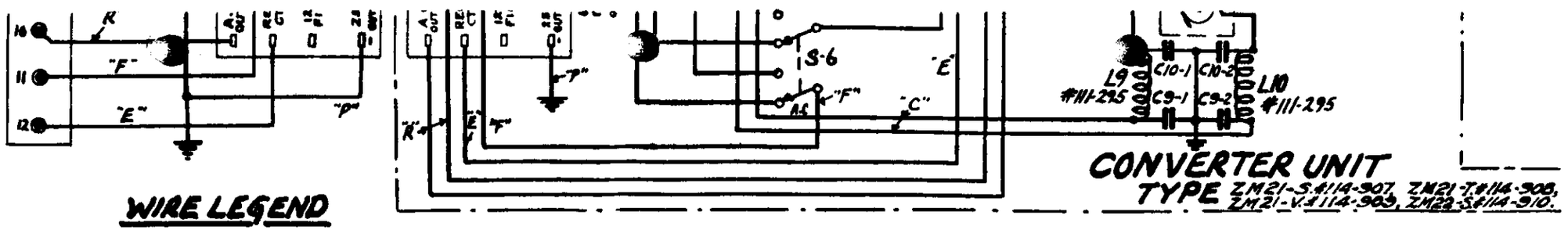
(2) ALL CONNECTORS TO BE WIRED ACCORDING TO DESIGNATIONS AS INDICATED.

(3) ALL INSULATED WIRES TO BE CABLED TOGETHER WHERE POSSIBLE, UNLESS OTHERWISE NOTED. ALL BARE WIRES TO BE AS SHORT AND STRAIGHT AS POSSIBLE.

(4) 3C1 TO 3C6 ARE SHOWN TERMINAL VIEW. PC1 TO PC6 ARE SHOWN PICTURE VIEW

(5) CONNECTIONS MARKED "X" TO BE GROUNDED TO A COMMON POINT ON THE CHASSIS.


SOCKET CONNECTIONS
BOTTOM VIEW
5Y4G
816
NOTE "A"
ALL TRANSFORMERS ARE SHOWN CONNECTED FOR 115V. AC. OPERATION. FOR 230V. AC. OPERATION, CONNECT AS SHOWN AT RIGHT.
T-1
T-2 TO T-5 INCL
SC-8
SC-7
SC-1
PC-1
E-1
E-2
#97117 T-1
#97121 T-2
L-1 #97716
C-1
R-1
V-1
V-2
V-3
V-4
S-2 (GATE SW.)
S-1 (DOOR SW.)
SEE NOTE "A"
H.T. POWER UNIT
TYPE #102-900



CONVERTER UNIT
TYPE ZM21-S #114-907, ZM21-T #114-908, ZM21-V #114-909, ZM22-S #114-910.

WIRE LEGEND

ALL WIRING TO BE AS PER SPECIFICATION #108-528 UNLESS OTHERWISE SPECIFIED.

"A"	CODE #211-B	(YELLOW-RED)	"M"	CODE #96-B	(BLUE-RED)
"B"	" 213-B	(YELLOW-BRN.)	"N"	" #100-B	(BLUE-GREY)
"C"	" 214-B	(YELLOW-GRN.)	"P"	" 180-B	(BLACK)
"D"	" 212-B	(YELLOW-WHITE)	"R"	" 202-B	(RED)
"E"	" 245-A	(GREEN)	"S"	" 126-F	(BLUE)
"F"	" 266-A	(GREEN-RED)			
"G"	" 268-A	(GREEN-YELL.)			
"H"	" 241-A	(BROWN)			
"J"	" 242-A	(RED)			
"K"	" 243-A	(ORANGE)			
"L"	" 273-A	(YELLOW-BLK.)			

NOTES

(1) ALL CONNECTORS WIRED ACCORDING TO DESIGNATIONS AS INDICATED.
(2) SC1 TO SC6 ARE SHOWN REAR OR TERMINAL VIEW.
(3) PC1 TO PC6 ARE SHOWN FRONT OR PRONG VIEW.
(4) ALL WIRING TO BE CABLED WHERE POSSIBLE.
(5) TRANSFORMER & CHOKE LEADS TO BE USED WHERE POSSIBLE.

DIAGRAM OF CONNECTIONS
POWER UNIT ASSEMBLY
ZM21-S, ZM21-T, ZM21-V OR ZM22-S

ASS'Y.	TYPE	D.C. INPUT VOLTS	CONVERTER UNIT TYPE	VALUE OF R5	SIZE OF F5 & F6
ZM21-S	110-984	24 —	114-907	SHORTED (NOT SUPPLIED)	20 AMPS.
ZM21-T	110-602	36 —	114-908	100 OHMS 4 W.	15 AMPS.
ZM21-V	110-603	220 —	114-909	2000 OHMS 40 W.	3 AMPS.
ZM22-S	110-620	84 —	114-910	SHORTED (NOT SUPPLIED)	20 AMPS

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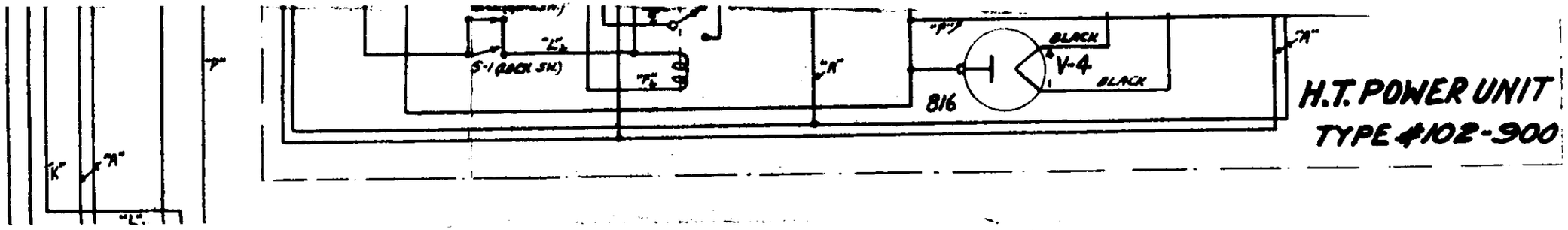
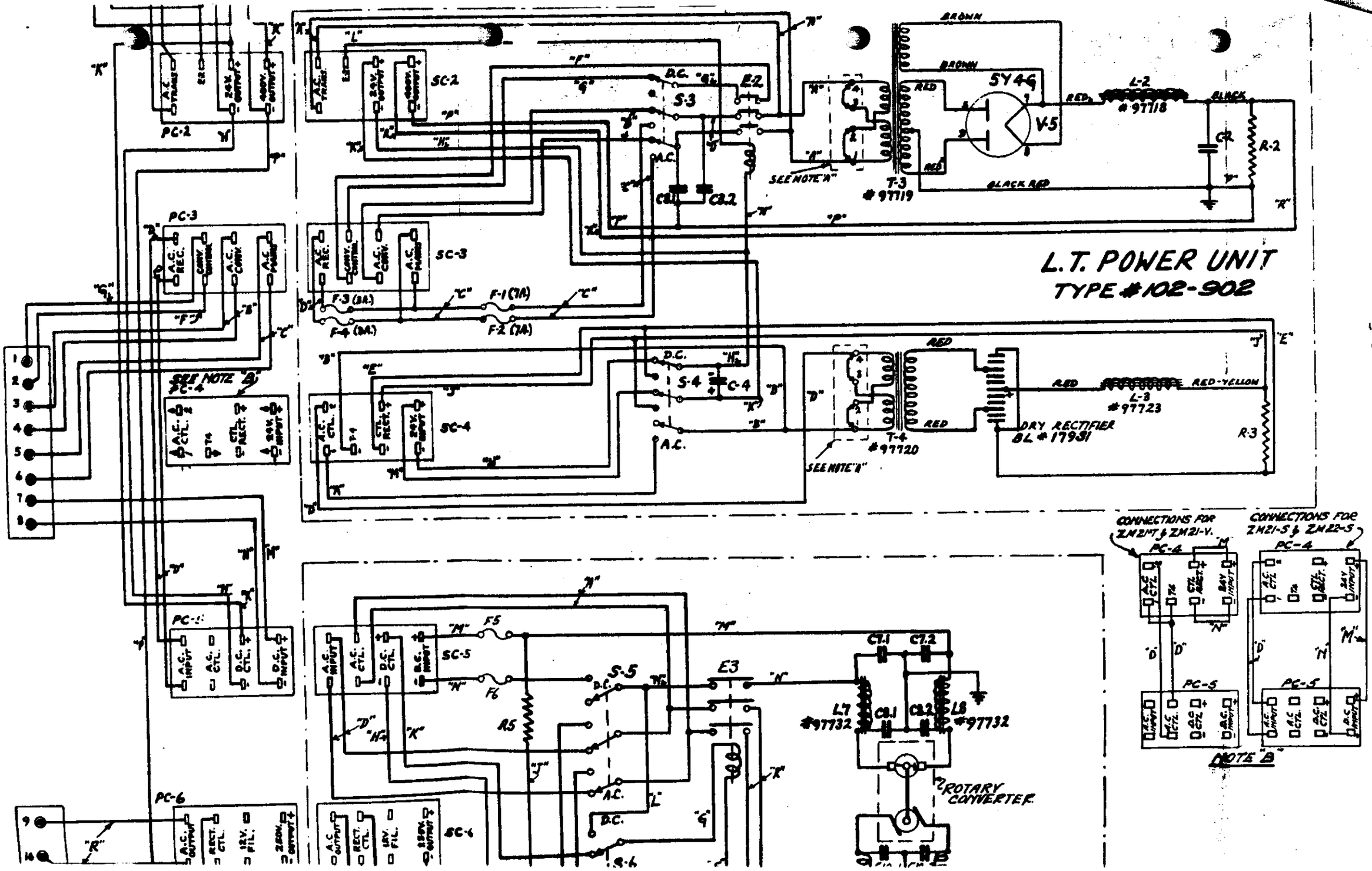
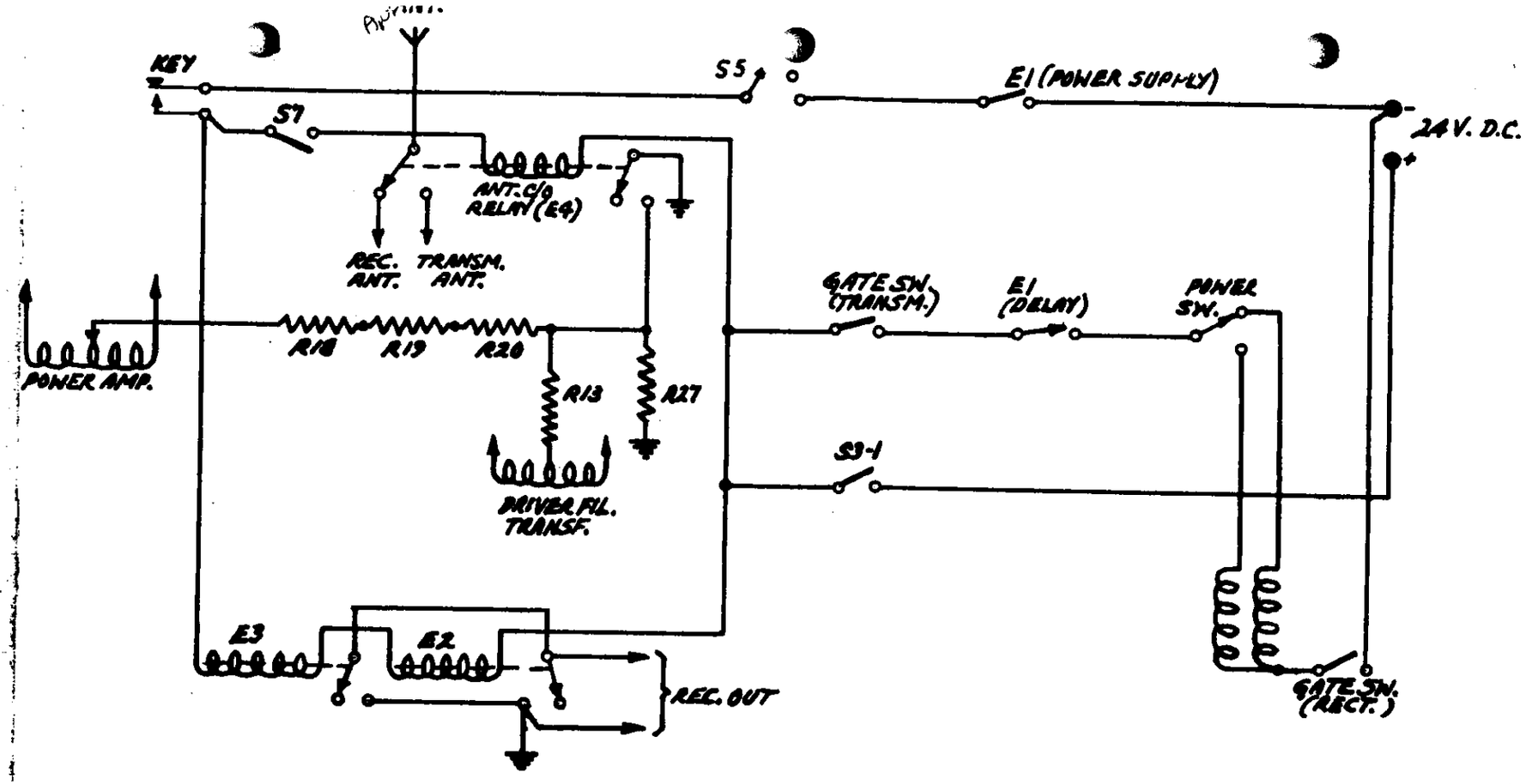
FIG. 20



H.T. POWER UNIT
TYPE #102-900

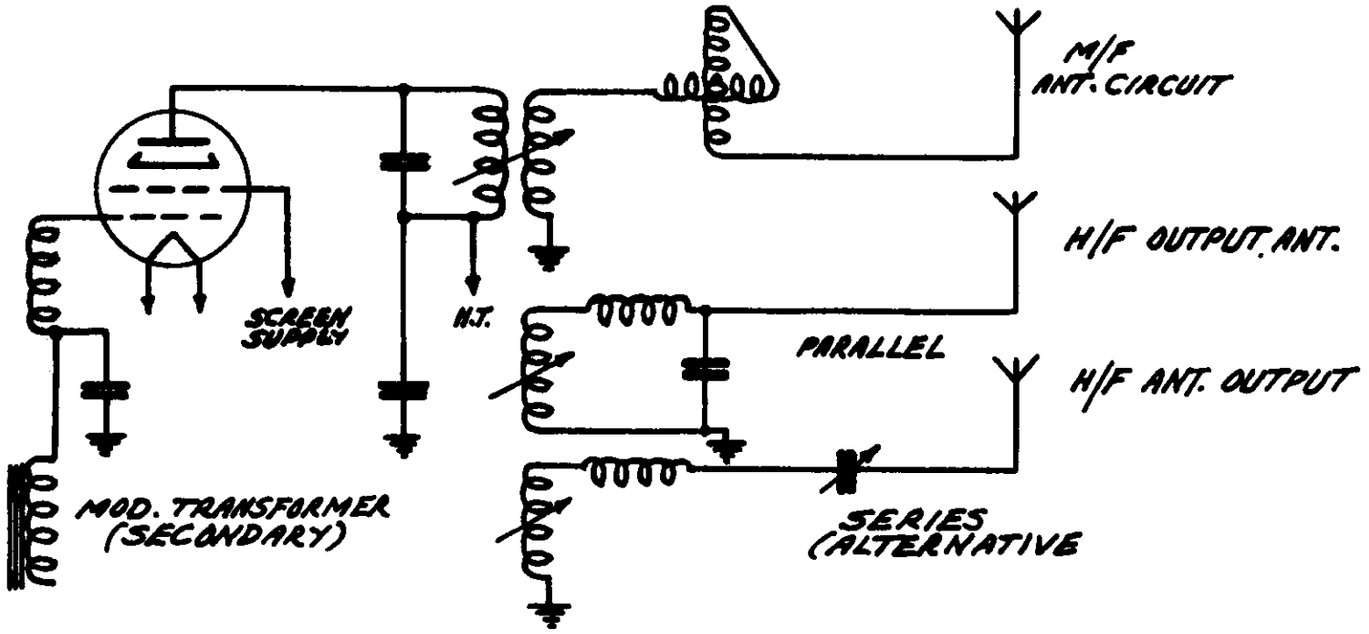

L.T. POWER UNIT
TYPE #102-902
PC-1
PC-2
PC-3
PC-4
PC-5
PC-6
SC-2
SC-3
SC-4
SC-5
SC-6
S-3
S-4
S-5
S-6
E2
E3
C-4
C3.1
C3.2
C7.1
C7.2
C8.1
C8.2
R-2
R-3
R5
L-2 #97718
L-3 #97723
L7 #97732
L8 #97732
T-3 #97719
T-4 #97720
5Y4G
V-5
F-1 (7A)
F-2 (7A)
F-3 (8A.)
F-4 (8A.)
F5
F6
DRY RECTIFIER BL #17931
SEE NOTE "A"
SEE NOTE "B"
ROTARY CONVERTER
CONNECTIONS FOR ZM21-T & ZM21-V.
CONNECTIONS FOR ZM21-S & ZM22-S
NOTE B
BROWN
RED
BLACK
BLACK-RED
RED-YELLOW



KEYING & CONTROL CIRCUITS
SCHEMATIC DIAGRAM
CM-11 & TM-11 TRANSMITTERS

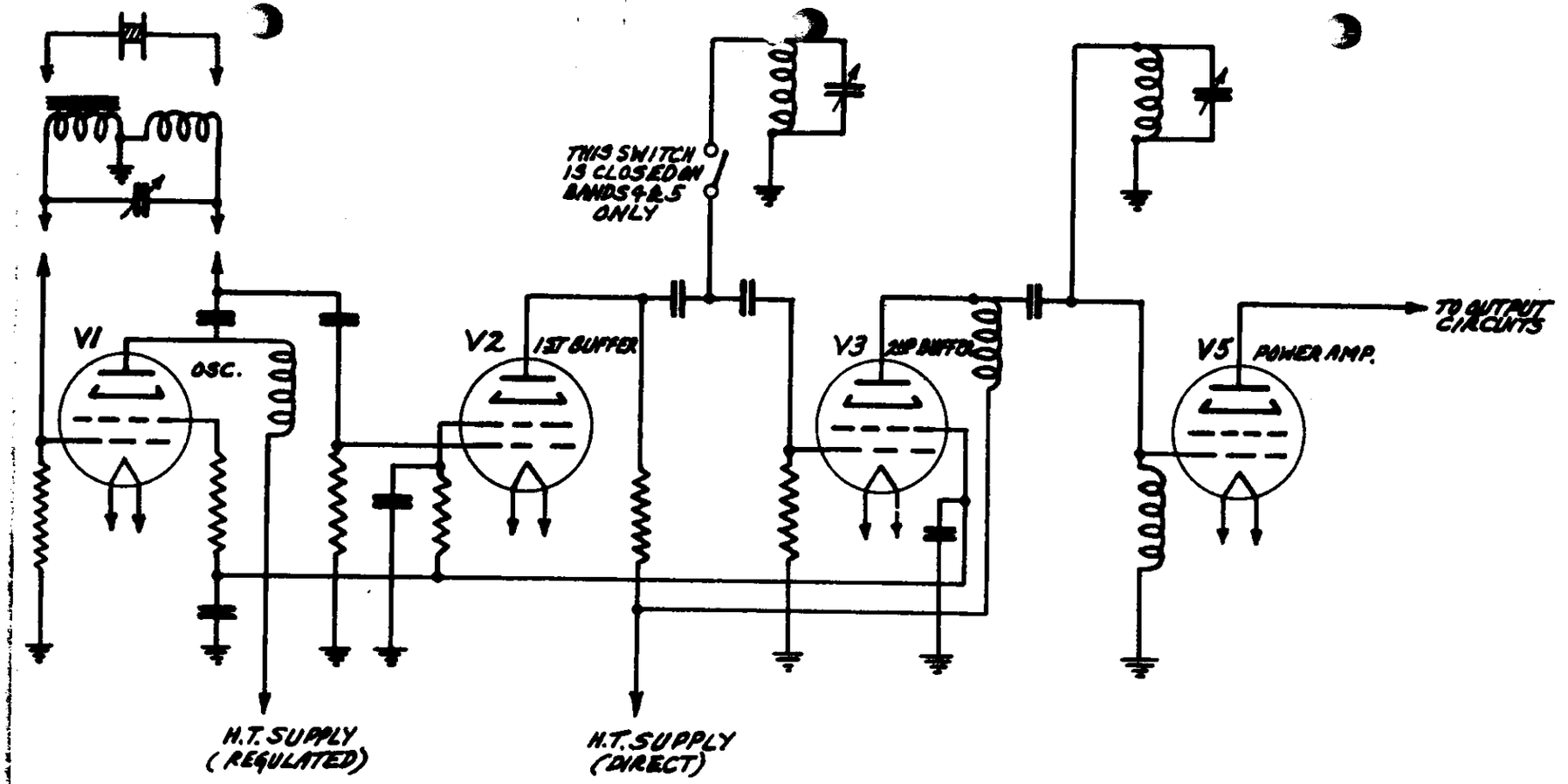
FIG-16

CANADIAN



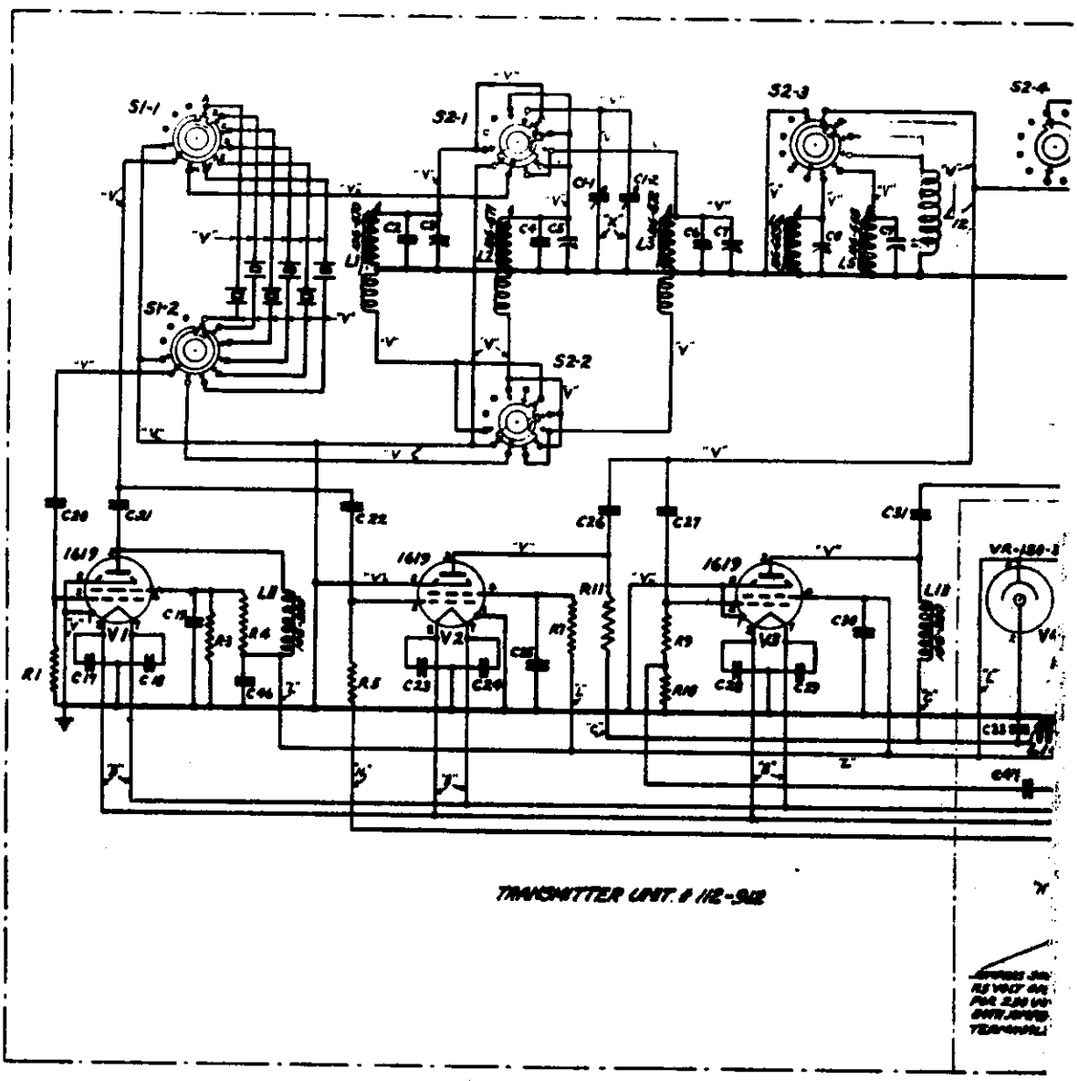
ANTENNA CIRCUITS
SCHEMATIC DIAGRAM
CM-11 & TM-11 TRANSMITTERS

Fig-17



R. F. TRAIN
SCHEMATIC DIAGRAM
CM-11 & TM-11 TRANSMITTERS

FIG-18



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