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INSTALLING AND OPERATING INSTRUCTIONS

COASTAL DEFENCE TRANSMITTER-RECEIVER

CD-12 TYPE 88416.

I N D E X.

RADIO
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3035
1940

Canadian MARCONI Company,
Montreal, October 7, 1940.

INSTALLING AND OPERATING INSTRUCTIONS

COASTAL DEFENCE TRANSMITTER-RECEIVER

CD-12 TYPE 88416.

GENERAL DESCRIPTION.

The CD-12 is a low power transmitter-receiver unit designed for general military communication service in the frequency range of 2.0 to 4.0 megacycles. It employs single chassis construction and is housed in a rugged, weatherproof steel cabinet which is made semi-portable by the provision of carrying handles. A hinged front cover provides protection of all panel controls against damage during transit, and against rain and snow during operation. The unit mounts a signalling key for the transmission of either c-w or m-c-w telegraph signals, and includes a press-to-talk monophone handset for the transmission and reception of voice signals. Also contained in the unit case are a built-in loudspeaker, a pair of featherweight headphones, battery cable, and a set of spare valves, fuses and pilot lamps.

The transmitter section of the standard model is arranged for three-channel operation in the frequency range of 2.0 to 4.0 megacycles. Two of these channels are wired for crystal control, while the third channel is arranged for master oscillator operation on any frequency within the specified frequency range. This latter channel, while provided mainly for emergency telephonic use, is reasonably stable when once adjusted, and may be keyed without excessive chirp.

Selection of any one of these three transmitting channels is made by operation of a three-position channel switch and by subsequent re-adjustment of three transmitter tuning controls. The transmitter is capable of delivering from 12 to 15 watts of unmodulated carrier power to the output tuning circuits, this carrier being capable of essentially 100 percent modulation on either phone or m-c-w. The amount of power delivered to the antenna will, of course, depend on the dimensions of the antenna in use. Antennae of any length up to 60 feet can be accommodated by the incorporated antenna tuning circuit providing this length does not exceed 1/4 wavelength on the operating frequency.

The receiver section of the unit employs a five-valve superheterodyne circuit designed for the reception of frequencies between 300 and 600 kc, and between 1460 and 3800 kc in two bands, the usual broadcast band being eliminated in this model. Automatic volume control is incorporated on both bands and is combined with the manually operated volume control. A beat frequency oscillator is also incorporated for the reception of c-w signals.

All the r-f and i-f coil assemblies in the receiver section are double impregnated using a high grade bakelite varnish and wax, the completed assemblies then being baked to prevent losses due to excesses of humidity and temperature. In addition, the r-f and oscillator coils utilize high grade bakelite formers, solid wires being used for the short-wave band and litz wire for the long wave.

The plate voltages required by the valves in both the transmitter and receiver are normally supplied by a built-in dynamotor which is suitably filtered for both r-f hash and a-f ripple. This dynamotor bears a continuous rating when the unit is used on "Receive", but an intermittent rating when used for transmitting of five minutes "Transmit" - five minutes "Receive."

For "Stand-By" use, special provision is made to enable the disconnection of the transmitter valve filaments and the dynamotor from the main 12-volt supply, and to supply plate voltage for the receiver section from an external 180-volt d-c source. Since all dynamotors operate at relatively poor efficiency at light loads, this increases the life of the main 12-volt batteries considerably, especially if the "Stand-by" periods are of long duration.

A detailed technical description of all sections of the unit follows, during the study of which, reference to the diagram of connections 90133 is recommended.

TRANSMITTER CIRCUIT DESCRIPTION

The transmitter section of the unit employs four RVC type 6L6 valves, which perform functions as follows. One 6L6 valve is used as an oscillator for both crystal and m-o operation. For crystal operation, this oscillator is untuned; having the crystal connected between the grid and plate of the oscillator valve in a conventional "Pierce" circuit. For m-o operation, the circuit is changed by the CHANNEL switch, and in this condition a tank circuit comprising a variable air-dielectric condenser, a mica padding condenser, and a plug-in coil, is connected between the grid and plate of the valve in place of the crystal. A tap on the coil connects to ground so that the voltage on the grid will be out of phase with that on the plate, and so comply with the conditions necessary for oscillation. Plate voltage for this valve is supplied through an r-f choke so that the d-c plate voltage can be blocked off from the crystals and the m-o tank. To prevent the generation of excessive r-f voltage across the crystals, the plate voltage is reduced to approximately 125 volts by a series dropper comprising a resistance and the coil of the send-receive relay. The operation of this latter relay will be described in detail below.

Another 6L6 valve is used in the power amplifier stage, this valve being capacitively coupled to the output of the oscillator stage. Bias is obtained by a combination of grid leak and cathode bias, the value of the latter being limited to that which will prevent excessive plate dissipation should the grid drive be removed. The p-a stage is panel tuned by a conventional coil and condenser combination. The low r-f voltage end of the coil is tapped at frequent points, these taps being connected to an eleven-point tap switch whose panel control is designated COUPLING. The tapping arm of this switch is connected through a condenser, which blocks off the d-c plate voltage, to a section of the CHANNEL switch which selects one of three flexible leads arranged to connect to screw terminals set into one end of the large loading coil mounted above the chassis. These terminals connect to fairly widely spaced taps on the loading coil, and serve to provide coarse control of antenna loading. Fine control of antenna loading is provided by closely spaced taps at the other end of the coil, which latter taps connect to an eleven-point tap switch whose panel control is designated LOADING. The tap selected by this switch connects through contacts of the send-receive relay and through the antenna ammeter to the antenna terminal on the front panel.

From the foregoing it will be seen that the antenna circuit is tapped directly to the p-a tuning coil, and that the r-f voltage developed between this tap and ground forces a current through the antenna tuning circuit, which comprises merely a loading coil having fine and coarse taps with which to obtain an inductive reactance equal in magnitude but opposite in sign to the capacitive reactance reflected by the antenna.

The p-a stage is plate modulated through a modulation transformer by a pair of 6L6 valves connected in push-pull. These valves are driven directly from the microphone through a high voltage-gain transformer. In order to avoid placing a ground on the 12-volt d-c supply (as is desirable to provide the utmost flexibility), it is not convenient to utilize this supply for a source of microphone current. Such current is therefore obtained from the cathode circuit of the modulator valves; that is, the modulator plate current flowing in the common cathode circuit of these two valves is routed through the primary of the microphone transformer to ground. In this way, the microphone circuit forms part of the cathode biasing resistor for the modulator valves. It will be seen that when the monophone is removed from its connector in the front panel, the modulator cathode circuit is broken and plate current cannot flow. When this occurs, the cathodes automatically assume a positive potential with respect to the grids that is sufficient to completely cut off the flow of plate current. Thus when the monophone is not connected, the load on the dynamotor is automatically reduced, and so, due to the inherent regulation of the machine, results in a somewhat higher plate voltage for the r-f valves for c-w operation, and therefore a higher output power.

For m-c-w operation of the transmitter, the modulator stage is made to oscillate at a frequency of approximately 1000 cycles, this note being readily audible. The oscillation is produced by feeding back a portion of the modulator output voltage to the primary of the microphone transformer. The feedback is made through the MCW switch on the front panel, this switch also breaking the microphone connection and inserting a resistor in the cathode circuit of the modulator valves to take the place of the return circuit through the monophone.

As previously mentioned, the coil of the send-receive relay is connected in series with the plate supply to the oscillator valve. No current normally flows through this circuit, however, since the oscillator valve cathode is open-circuited through the SEND-RECEIVE switch and the KEY (or the contacts of the press-to-talk switch in the monophone). The relay thus stays unoperated and its contacts connect the dynamotor output and the antenna to the receiver. If, however, the key is now pressed, the oscillator valve draws plate current. This simultaneously sets the valve into oscillation and energizes the send-receive relay which operates to transfer the antenna and the dynamotor output to the transmitter section. When the key is released, the plate current ceases and the relay drops back to the receive position. Thus, "break-in" telegraph operation is possible; that is, the distant operator can interrupt a message at any time since his signals can be received between characters of the local transmission.

An alternate method of keying is provided by the SEND-RECEIVE switch, the above method being obtainable when this switch is in its RECEIVE position. In the SEND position, the oscillator valve cathode is permanently connected to ground, and the signalling key is reconnected to bridge a break in the p-a cathode circuit. Thus, on switching to SEND, the relay operates to transfer the power supply and the antenna to the transmitter, and oscillations are established in the oscillator stage. No p-a plate current flows, however, and hence no power is radiated, until the key is pressed. At the conclusion of a transmission, the SEND-RECEIVE switch is returned to RECEIVE and the relay again drops back to the receive position. This latter method of keying is particularly desirable for m-o operation, as the slight keying chirp which might otherwise occur on some frequencies will not be experienced.

Since the press-to-talk switch in the monophone handle is permanently connected in parallel with the key jack, the functions described above for the key can equally well be performed by the press-to-talk switch. However, for telephone operation, the SEND-RECEIVE switch will always be left in the RECEIVE position to simplify the operation of the unit.

The m-o coil is housed in a cylindrical metal can whose lower end is fitted with a special six-prong plug. The assembly plugs into a special socket located with the crystals at the front right-hand side of the chassis. The coil carries taps which connect to certain of the prongs in such a way that when the assembly is plugged into its socket one way, the whole of the coil is in circuit and one of the taps is grounded. If the coil assembly is now removed, rotated through 180 degrees, and again plugged into its socket, part of the coil is short-circuited and another appropriately located tap is connected to ground. In this way, two ranges are provided with the one coil. The top of the shield is fitted with a knob to facilitate its re-orientation, and the shield itself is marked with the frequency range which can be covered in each position. This marking is so placed in conjunction with a pointer fixed to the front panel of the unit that no mistake as to the correct position for each range can be made. The two ranges covered by this unit in conjunction with the capacity incorporated in the circuit are approximately 2.0 to 2.8 megacycles, and 2.8 to 4.0 megacycles.

The m-o tuning condenser control is located behind a small snap-in button immediately above the battery cable connector at the lower right-hand corner of the front panel. To adjust this control, first remove this button by prying with a screwdriver, and then use an insulated screwdriver or hexagonal socket wrench on the shaft so exposed.

RECEIVER CIRCUIT DESCRIPTION.

On all ranges of the receiver section of the CD-12, the circuit consists of one stage of r-f amplification, a tuned frequency changing rectifier combined with a high frequency oscillator as a conversion stage, one stage of intermediate frequency amplification using iron-cored transformers, diode second detector, one stage of audio amplification, and a pentode power output stage. The dual purpose valves employed are the converter valve which is used for the tuned rectifier and tuned oscillator; the i-f valve which is also used for the a-f amplifier, and the diode detector valve which is also used for the beat frequency oscillator circuit.

Referring to diagram of connections 90133, the input from the antenna is connected to the r-f section of the receiver band switch via the antenna portion of the SEND-RECEIVE relay E1 and a low capacity shielded lead. Here the required r-f transformer for the range desired is selected, the primary connected to the antenna and the tuned secondary to the signal grid of the 6K7 r-f valve through the coupling condenser C1. The r-f input transformers are designed for operation with a standard open antenna, high impedance primaries being used which give high signal-to-noise ratios and good pick-up.

The incoming r-f signals selected and amplified by the r-f transformer and the pentode r-f amplifier valve are fed through the detector transformer to the signal grid of the 6A8 pentagrid converter. The detector transformers, one for each range, are designed with a view to the suppression of image frequencies and of obtaining high gain. They are choke-capacity coupled to the plate of the 6K7 through C11 and L1.

The triode portion of the 6A8 valve performs the function of the high frequency conversion oscillator in conjunction with the tuned oscillator transformers, and is shunt fed. The oscillator transformers employ plate reactance and are designed to supply signals at a frequency 260 kc higher than the signals being received from the antenna. These two signals, one from the antenna and the other from the local oscillator, are mixed in the converter valve. The output signals from the plate of this valve at 260 kc are passed through the first i-f transformer T1 to the tetrode grid of the 6F7 i-f amplifier. In turn, the 6F7 plate feeds through the second i-f transformer T2 to the diode plates of the 6Q7 detector.

The two i-f transformers, each with two tuned circuits peaked at 260 kc, provide the greater portion of the selectivity and gain of the complete receiver. They utilize high grade powdered iron cores, litz wound coils, and mica compression type trimmers. The signals on reaching the diode detector are demodulated and converted to audio frequencies which appear across the diode load resistances R12 and R13. From this point they are fed back to the triode portion of the 6F7 where they are amplified and passed to the grid of the 6K6G pentode power output valve. The output signals from the plate of this valve are impressed across the earpiece of the monophone headset or the speaker through the output transformer T3 and the SPEAKER-PHONES switch S3. Also from the phones position is connected the headphone jack for the headphones.

The signals fed to the monophone are attenuated by the "T" pad made up of resistances R37, R38, R39, and to the headphones by resistances R33, R41, so that a comfortable level in the earpieces will give a reasonably strong signal in the loudspeaker when the SPEAKER-PHONES switch is operated, without readjustment of the volume control. The maximum undistorted output available in the speaker is 400 milliwatts, with 1 watt maximum, the output to the monophone earpiece and the headset being held between 6 to 9 milliwatts maximum.

From the centre tap of the diode load resistances is brought out the AVC circuits feeding to the r-f and i-f valve grids. The AVC system is combined with the volume control R7 and at full volume holds the output level within 10 db when the input signals vary 80 db. Thus, rapidly changing signal strengths are maintained at an almost constant level in the loudspeaker, headphones or monophone earpiece. The volume control is connected in series with the bias resistances R2 and R10 in the cathodes of the r-f and i-f valves and the main high voltage supply through R8, giving control over the bias voltages on these valves and thus over the r-f and i-f amplification.

The triode section of the 6Q7 diode detector is utilized for the beat frequency oscillator which is required for reception of c-w signals, these oscillations at i-f frequency being developed in the B-F-O transformer L11. For quick reference, the general characteristics and data relative to the receiver section of the CD-12 are listed below.

VALVES:

1 - RVC 6K7 - Tuned r-f amplifier.
1 - RVC 6Q7 - Diode detector and B-F-O.
1 - RVC 6A8 - Tuned converter.
1 - RVC 6F7 - I-F amplifier and audio amplifier.
1 - RVC 6K6G - Pentode power output.

FREQUENCY RANGE:

L-W - 300 kc to 615 kc.
S-W - 1460 kc to 3800 kc.

I-F FREQUENCY:

260 kc.

ANTENNA INPUT:

High impedance for Marconi type antenna.

OUTPUT IMPEDANCE:

80 ohms for monophone, speaker and headphones.

MAXIMUM OUTPUT:

400 milliwatts undistorted, 1 watt maximum to speaker; 6 to 9 milliwatts maximum to headphones and monophone.

SENSITIVITY FOR 50 MILLIWATTS OUT:

L-W - Average 7 microvolts.
S-W - Average 6.5 "

SELECTIVITY IN KC OFF RESONANCE:

L-W - Average 60 db down at 12 kc.
S-W - Average 60 db down at 14 kc.

IMAGE RESPONSE IN DB DOWN:

L-W - Average 90 db.
S-W - Average 50 db.

I-F INTERFERENCE RATIO:

L-W - Average of -55 db.
S-W - Average of -65 db.

A-V-C:

Combined with the volume control. Holds the output within 10 db when the input varies 80 db.

AUDIO CHARACTERISTICS:

Within plus or minus 2 db from 200 to 4000 cycles.

APPROXIMATE CALIBRATION.

Dial Division	S-W.	L-W.
0	3800 kc.	615 kc.
10	3680 kc.	600 kc.
20	3300 kc.	560 kc.
30	2950 kc.	520 kc.
40	2650 kc.	482 kc.
50	2350 kc.	440 kc.
60	2080 kc.	400 kc.
70	1835 kc.	365 kc.
80	1680 kc.	336 kc.
90	1550 kc.	315 kc.
100	1460 kc.	297 kc.

DYNAMOTOR CIRCUIT DESCRIPTION

For normal operation, the high voltages required for the operation of the unit are supplied by a single built-in dynamotor which operates from the main 12-volt d-c supply.

From the panel connector, the d-c input voltage is fed through the main ON-OFF switch and through the supply fuse to the valve heater circuit. To this point also connects the dynamotor input circuit which includes chokes and condensers for the suppression of r-f hash generated at the dynamotor brushes. The output circuit of the dynamotor also includes an r-f choke and condenser for the suppression of secondary circuit hash, and also a large electrolytic condenser to smooth out the commutation ripple. This point is connected by the send-receive relay either to the transmitter plate supply circuits directly, or to the receiver plate supply circuits through a voltage dropping resistor with an additional smoothing condenser.

All filter networks in the dynamotor input and output circuits are connected in the shortest possible manner to a common ground point on the chassis of the unit. This precaution is essential in the minimizing of hash interference with the receiver.

The fuse is mounted in a special holder which permits it to be extracted from the front panel.

Special instructions covering the maintenance of the dynamotor are included under this cover. (Inst. 311).

For "Stand-by" operation of the receiver, a 180-volt battery may be connected to the leads of the battery cable so designated, the main switch being left in its OFF position and the NORMAL - Stand-BY switch placed on STAND/BY. This disconnects the transmitter valve filaments and the dynamotor input from the main 12-volt supply (leaving the receiver valve filaments connected to it) and transfers the receiver plate supply circuits from the dynamotor output to the external 180-volt battery.

This "Stand-by" feature is particularly desirable when it is required to leave the set in operation for long periods to listen for a call, and when it is necessary to conserve the drain on the main batteries as much as possible.

It should be noted that neither pole of the main 12-volt supply is connected directly to the frame or case of the unit. Thus the existence or absence of ground connections on the supply itself will not affect the operation of the unit.

ANTENNA AND GROUND.

The receiver will operate with almost any size of Marconi antenna, but the size of the antenna into which the transmitter will operate is limited by the frequencies on which it is desired to transmit. Since the antenna tuning circuits in the transmitter consist solely of an adjustable loading inductance, antennae over 1/4 wavelength long cannot be accommodated without some external tuning capacity. However, sufficient loading coil inductance is provided to permit operation into almost any antenna shorter in length than 1/4 wavelength. In all cases the antenna should be made as long as the tuning facilities and available space permit, since then a maximum power will be radiated. The ground for the unit will preferably take the form of one or more metal plates or roda buried or driven in moist earth. If such is not possible, satisfactory operation will usually be obtained if the unit itself is merely rested on the ground, although the radiated power will not be as great, andit may not be possible to tune such extremes of antenna length. Ground connections to the unit should be kept as short as possible.

SETTING UP

After choosing the operating position, the front cover should be opened by releasing the two draw-bolts on the sides of the cabinet. The cover should be held open by securing the two straps provided for this purpose to the studs in the top of the cover. The flaps at the sides of the cabinet covering the ventilation louvres should be propped open to allow the escape of heated air from the interior.

The battery cable may now be removed from the pocket inside the cover and fitted to the receptacle at the right-hand side of the front panel. The lugs on the two heavy leads at the end of this cable should be solidly bolted to a source of 12 volts d-c. Since neither side of the 12-volt supply circuit is grounded to the unit frame, the operation will not be materially affected by the presence or absence of ground connections on the supply itself. CARE MUST BE OBSERVED, HOWEVER, THAT THE LEAD POLARIDY AS STAMPED ON THE CABLE LUGS IS MAINTAINED IN AGREEMENT WITH THE POLARITY OF THE SUPPLY. The two small wires in the battery cable may be connected to a 180-volt battery or to any other available source of 180 volts d-c, care again being observed that the lead polarity is maintained in agreement with the supply polarity.

The antenna and ground wires should be led in through the eyeletted holes in the side flaps attached to the cover to their respective terminals on the front panel.

The key may be released from its clip, swung down, and pushed forward into its guide bracket to hold it securely, and its cable plugged into the key jack. If telephone transmissions are to be made, the monophone handset may also be taken down from its supporting clips inside the cover, and its cable fitted into the receptacle at the lower left-hand side of the front panel.

Providing the crystals and the m-o coil are in place in their proper sockets inside the unit, and the preliminary adjustments to be described in the following section have been made, the unit is now ready for operation.

PRELIMINARY ADJUSTMENT.

The unit is put into normal operation by moving the main ON-Off switch to ON. The other toggle switches should be left in their normal positions; i.e. RECEIVE, MCW-OFF, BFO-OFF, SPEAKER, and NORMAL. As soon as the valves have reached operating temperature, the receiver is ready for operation and may be checked as follows.

The required frequency band is selected by means of the RANGE switch; the position marked L-W (Long Wave) covers frequencies between 300 and 615 kc; and the position marked S-W (Short Wave) covers frequencies between 1460 and 3800 kc. The individual frequencies within the range required are selected by means of the RECEIVER MAIN TUNING dial located to the left of the speaker. This dial is calibrated in figures from 0 to 100, of which 0 represents the highest frequency of easy range and 100 the lowest. The approximate relation between dial numbers and frequency in each range will be found in the table at the end of the section headed "receiver Circuit Description" on page 10.

The loudnessof the signals in the speaker or in the earpiece of the monophone is controlled by the VOLUME control which is so connected that the automatic volume control circuits will tend to maintain the signals at a constant volume around the average level for which the manual volume control is set.

The Beat Frequency Oscillator is turned on by the switch designated BFO, and is factory set so that it is at zero beat when the receiver r-f circuits are in resonance with the incoming signal. The note may be varied, however, by manipulation of the main tuning control to obtain any desired pitch.

When the unit is first installed, it is a good practice to check the adjustments of the receiver antenna circuits. At the factory these antenna circuits are adjusted with a universal dummy antenna, but since the characteristics of the actual antenna may depart markedly from those of this dummy, it is desirable that the two antenna circuits in the receiver be trimmed for maximum sensitivity with the particular antenna in use. A weak signal or the prevailing noise level may be used for the purpose of judging antenna resonance.

The adjustments are made after first removing the chassis from the cabinet. This is done by removing the four knurled screws holding the chassis in place, and then by lifting the lower edge of the front panel out of the groove in which it rests. The chassis will then slide out.

The antenna and ground wires should be connected to their respective terminals, the main tuning dial set to a position around 15 divisions, and the volume control set so that a weak signal or noise is heard in either the loudspeaker or telephone headset. Using a small screwdriver, adjust the following trimmers for resonance, i.e. maximum output.

L-W range - C3.
S-W range - C5.

These two condensers are located behind holes in the side of the small shielded compartment at the left-hand side of the chassis, each condenser being stamped with its part number as indicated.

This completes the preliminary receiver adjustments.

Assuming that two crystals are to be used in the transmitter and that these have been shipped separately, they should first be plugged into their sockets which are located at the front of the chassis immediately behind the front panel. These sockets are wired to channels 1 and 2 of the CHANNEL switch, these numbers appearing beside the appropriate socket. Channel 3 is used solely for m-o operation; the m-o coil should be in its socket beside the crystal sockets.

After suitably locating the crystals, the semi-fixed loading taps must also be set to provide approximately the correct antenna loading on each operating frequency for the antenna to be used. As a first approximation, connect the loading tap leads which are fastened to insulators beside the right-hand end of the loading inductance, to loading coil terminals which appear likely to provide the required amount of loading. This will be approximately minimum inductance on frequencies around 4.0 mc, maximum inductance around 2.0 mc, and intermediate values for intermediate frequencies. The channel number corresponding to each tap lead is stamped on the chassis beside each insulator.

After switching the set on and allowing the valves to reach operating temperature, set the CHANNEL switch to the position corresponding to the crystal of the higher frequency, and set the COUPLING and LOADING switches to tap No.1. Press the key and quickly rotate the TRANSMITTER TUNING dial to obtain p-a resonance as indicated by a minimum current reading in the p-a plate current meter located immediately above the dial referred to. Now advance the COUPLING CONTROL one or two notches and rotate the LOADING switch, watching for a marked rise in the value of the p-a plate current. If this plate current rise occurs at either end of the loading coil range, or if no such rise is obtained, it will be necessary to move the appropriate semi-fixed loading tap lead to another terminal on the loading coil. If the rise is greatest at loading switch position 1, the amount of loading coil in circuit should be decreased. Conversely, if the rise is greatest at position 11, the tap lead should be moved to a terminal which will include more of the loading coil winding. The p-a circuit must be kept in tune during this porcedure, by keeping the tuning dial set at a position that corresponds to the centre of a dip in the plate current reading.

After obtaining such a position of antenna resonance, the actual value of the p-a plate current should be noted. When delivering maximum power to the antenna, this current (at p-a resonance) will have a value of between 75 and 90 milliamperes. The unit should not be operated for long period with a plate current reading in excess of 100 ma, as this may permanently damage the valve. If the observed plate current value is lower than those stated, the COUPLING switch should be advanced a point at a time, retuning after each change until the current falls within the limits stated.

During this procedure a reading should appear on the antenna ammeter and, when properly adjusted as above, this antenna current reading should reach a maximum. The exact value of this reading cannot be stated since it is dependent upon the characteristics of the antenna in use. For this same reason, the reading cannot be used as a measure of the power being transmitted unless the antenna characteristics are known.

Having obtained correct operationas outlined above, the switch and dial readings should be noted to permit easy return to them, and the CHANNEL switch then moved to select the second crystal. The adjustments for this second channel should be carried out in the same manner as has been outlined for the first channel.

If m-o operation is desired, set the CHANNEL switch to position 3, and check that the pointer indicates the range on the top of the m-o coil in which the desired frequency falls. Remove the snap button over the M-O control in the front panel, and prepare a small insulated socket wrench or screwdriver with which to adjust it. Set the COUPLING and LOADING switches at position 1.

Refer to the p-a dial calibration curve No. 4393, found under this cover, and from it determine the approximate p-a dial setting for the desired frequency. Having then set the dial to this point, press the key and adjust the M-O control until a sharp dip in p-a plate current is noted. Set the M-O condanser very carefully to the centre of the dip, and then leaving it set at this point, proceed to adjust the output circuits as though a crystal were being used in this channel.

The method of adjustment outlined above presupposes that very little or no coupling exists between the p-a stage and the antenna circuit, as such coupling might reflect antenna reactance back into the p-a tank circuit which would upset its component values and make the approximate calibration chart grossly in error.

Having completed these m-o adjustments, the emitted frequency should be checked using an accurately calibrated wavemeter or receiver, and any small errors corrected by minute re-adjustment of the M-O control. It should be noted that manipulation of the p-a tuning control will cause a small change in the output frequency of the order of a few hundred cycles. This may be used as a sort of vernier control of frequency if very precise adjustments are necessary, but care should be taken that the p-a stage is not taken very far off resonance as then the plate dissipation of the p-a valve may exceed its maximum safe value.

When adjustments are complete on all active channels, the chassis may be returned to the cabinet. On re-checking p-a antenna resonances it will probably be found that the presence of the cabinet has a slight detuning effect on these circuits. The variation should not be great, however, and it should be simple to amend the control settings previously determined. It is recommended that a permanent record of all tuning control settings be made at this time for future reference.

The preliminary adjustments are now complete, and should not change appreciably unless the length or disposition of the antenna is changed.

ROUTINE OPERATION.

After having made the foregoing preliminary adjustments for a given antenna, the routine operation of the unit is very simple.

After preparing the unit for operation as outlined in the section headed "Setting up", the unit is started by operating the main ON-OFF switch, leaving the NORMAL - STAND-BY switch in its NORMAL position. The receiver range switch is set to the band in which reception is desired, and the receiver tuning dial adjusted for the required frequency in that band. The BFO stage may be switched on if required either for the reception of c-w code signals, or to aid in locating a telephone carrier.

If a chart was made of the transmitter tuning control settings for each transmitting frequency, these controls can now be set at their pre-determined positions for the frequency desired. If c-w transmissions are to be made, merely manipulate the signalling key. Unless use is to be made of the m-c channel, the SEND-RECEIVE switch should be left on RECEIVE; otherwise the transmissions may be improved if this switch is first placed on SEND. As previously stated, keying with the above switch on RECEIVE allows "break-in" operation. If m-c-w transmissions are desired, switch to MCW and proceed as for c-w operation. For phone transmissions, plug in the monophone handset, leave the MCW switch in its OFF position, and the SEND-RECEIVE switch on RECEIVE. The SPEAKER-PHONES switch may be moved to PHONES if desired. To talk, press the button in the monophone handle, releasing it again to listen.

Note that when transmitting, the unit is rated for intermittent operation of 5 minutes "Transmit" - 5 minutes "Receive". This rating should not be disregarded as otherwise the dynamotor is liable to overheat. Continuous operation on "Receive" is, of course, permissible.

For "Stand-by" operation of the receiver, leave the main switch in its OFF position and move the NORMAL - STAND-BY switch to STAND-By. The receiver will now operate as before except that the pilot on the transmitter portion of the front panel will not light.

When shutting down the unit, make certain that the NORMAL - STAND-BY switch is in the NORMAL position, and that the main supply switch is OFF, as otherwise the batteries will be left on discharge.

SERVICING INSTRUCTIONS.

RECEIVER SECTION.

A good check on the operation of the receiver section of the CD-12 unit is provided by voltage measurements at various points in the circuit. All voltage measurements should be taken to ground with a 1000-ohms-per-volt meter and should be within plus or minus 10% of the voltages given below for a supply voltage of 12.6 volts.

Junction of R19 and stand-by switch	-	170 volts
Junction of R42 and C34 (BFO switch ON)	-	30 "
Junction of R9 and C25	-	80 "
Pin 3 of 6K6G valve socket	-	155 "
Pin 6 of 6A8 " " (osc. working)	-	125 "
Pin 5 of 6A8 " " (" not ")	-	100 "
Pin 4 of 6F7 " "	-	55 "
Junction of R7 and R8 (at mac. volume)	-	45 "
Junction of R7 and R8 (at min. volume)	-	55 "
Pin 8 of 6K7 valve socket	-	1.1 "
Pin 8 of 6A8 " "	-	2.0 "
Pin 6 of 6F7 " "	-	1.6 "
Pin 8 of 6K6G " "	-	12.0 "

When checking voltages at other points in the circuit, allowances should be made for voltage drop through resistances and transformer coils.

COMPLETE ALIGNMENT.

For complete alignment of the receiver section it is necessary to have an accurately calibrated signal generator and a 2000-ohms-per-volt a-c voltmeter. This voltmeter should be connected between ground and the junction of R38 and the speaker-phones switch, which should be placed in the phones position, and both the monophone and headset disconnected from the panel receptacles.

I-F ALIGNMENT.

Connect the signal generator to the grid of the 6A8 valve and any convenient ground, leaving the grid cap in place. The high side of the signal generator should have a .1 or a .05 uf condenser connected in series with it and the grid cap. The controls should be set as follows:-

Range switch on B-C.

Volume control full clockwise.

Tuning dial at 0 divisions.

B-F-O switch in the off position.

With the signal generator set to a frequency of 260 kc and modulated 30% at 400 cycles, adjust the four small trimmers, two in each i-f transformer until the meter reads maximum output. The overall sensitivity of the i-f circuits for 1 volt output will be 120 microvolts if the signal generator is reliable. This 1 volt output is equivalent to 50 milliwatts across the speaker and approximately 1 milliwatt to phones and monophone earpiece.

The selectivity of the i-f amplifier should be approximately 40 db down at 10 kc off resonance.

For purposes of checking, the signal generator input may be connected to the 6F7 i-f amplifier grid through a .1 or .05 uf condenser, leaving the grid cap on. An input of 11,000 microvolts should produce an output reading of 1 volt.

After the i-f amplifier has been accurately adjusted, the B-F-O transformer can be adjusted to zero beat with the i-f signal. The modulation from the signal generator should be turned off during this adjustment.

The r-f, detector and oscillator stages may now be adjusted.

Connect the signal generator to the antenna and ground terminals; the high side should be connected to the antenna post through a 250 uuf condenser when on long wave (L-W) and through a 400-ohm resistor when on short wave (S-W), or if available, a "Universal dummy" may be used for both ranges; leave the output meter connected as for the i-f adjustment.

The procedure to be used when adjusting any particular range is as follows:-

Set the range switch to the desired band, i.e. L-W or S-W. Set the signal generator to the trim frequency given in Table I and the receiver dial to 15 divisions; then, by means of the output meter, adjust the trimmer condensers to give maximum output. The signal generator is then set to the frequency shown in Table I for tracking and the receiver dial adjusted to pick up the signal; this should be around 85 dial divisions. The tracking condenser should now be adjusted for maximum output while rocking the tuning condenser back and forth across the signal. These trimming and tracking adjustments should be repeated until the correct adjustment of the trimmer does not affect the correct adjustment of the tracker when they are tuned for maximum output. Usually, if the receiver has been correctly trimmed the signal generator may be dispensed with when tracking, as the noise level will provide an adequate indication of resonance as the tracker is adjusted.

The following table shows the frequencies and adjustments for both ranges:-

TABLE I.

RANGE	DIAL SETTING	SIG. GEN. FREQUENCY	ADJUST FOR MAX. OUTPUT	SENSITIVITY FOR 1 V. OUT
L-W	15 divisions	580 kc	Trimmers C3, C15, C18.	5 uv.
L-W	85 "(approx.)	325 kc	Tracker C21	9 uv.
S-W	15 "	3400 kc	Trimmers C5, C17 & C20	6 uv.
S-W	85 "(approx)	1620 kc	Tracker C23	12 uv.

The table shows the dial divisions and frequencies which should be adhered to as much as possible. The sensitivity, however, will vary, depending on the type of signal generator used, so that if the sensitivities are approximately as listed, the receiver should be considered correctly adjusted.

REPLACING VALVES.

When changing valves which are used in any part of the circuit that has a tuning adjustment associated with it, that particular adjustment should be checked for maximum sensitivity, this being done if a signal generator is not available, by adjusting for maximum noise level. If, however, the 6A8 conversion valve is changed, it will be necessary to tune the two ranges at 15 divisions to their calibration frequencies to compensate for any variation in valve capacity.

TRANSMITTER SECTION.

Very little trouble should be experienced with the transmitter section, as the tuned circuits incorporated therein are all adjusted from the panel front and day-to-day variations can readily be taken up. The only components which are at all subject to failure are the valves. These can be checked periodically by replacing them with ones known to be good and noting the resulting operation for possible improvement.

If crystal failure is at any time suspected, one of the leads to the p-a plate current meter can be disconnected and a 0-25 milliampere d-c meter connected across the signalling key leaving the contacts of the latter open. With the SEND-RECEIVE switch in the RECEIVE position, the meter will indicate current in the cathode circuit of the oscillator valve which has a normal value of from 18 to 24 ma. Moving the switch to SEND moves the meter to the cathode circuit of the p-a valve. Since the plate supply circuit was opened by the disconnection of one of the meter leads, the only current in this cathode circuit will be that flowing through the grid circuit. This current normally has a value of from 4 to 8 ma, depending on the frequency, and will not be present if the crystal is not oscillating. Absence of grid current at this point may, of course, also be due to a defective oscillator or p-a valve, or to the failure of a circuit component. The latter possibility can usually be eliminated by usual circuit testing methods.

PARTS LIST.

CONDENSERS.

PART NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
C1	250 uuf mica	Aerovox	1468
C2	.1 uf 400 v.	Marconi	82897
C3	3-30 uuf		
C4	3-30 uuf	Marconi	87744
C5	5-70 uuf		
C6	13-442 uuf		
C7	13-442 uuf	Marconi	86640
C8	13-442 uuf		
C9	7.5 uuf mica	Aerovox	1468
C10	250 uuf mica	"	1468
C11	.002 uf mica	"	1467
C12	.1 uf 400 v. (Part of C2)		
C13	250 uuf mica	"	1468
C14	100 uuf mica	"	1468
C15	20-100 uuf		
C16	3-30 uuf	Marconi	82546
C17	20-100 uuf		
C18	55-250 uuf		
C19	3-30 uuf	Marconi	82547
C20	3-30 uuf		
C21	170-600 uuf	Marconi	82548
C22	170-600 uuf		
C23	1500-3000 uuf	Marconi	45483

PART NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
C24	.1 uf 400 v. (Part of C2)		
C25	.1 uf 400 v.)		
C26	.1 uf 400 v.)	Marconi	82897
C27	.1 uf 400 v.)		
C28	.002 uf mica	Aerovox	1467
C29	.01 uf 200 v.	"	284
C30	10 uf 25 v. elect.	"	PR-25
C31	250 uuf mica	"	1468
C32	7.5 uuf mica	"	1468
C33	250 uuf mica	"	1468
C34	.1 uf 400 v. (Part of C2)		
C35	10 uf 50 v. elect.	"	PR-50
C36	10 uf 50 v. elect.	"	PR-50
C37	.1 uf 400 v. (Part of C25)		
C38	.1 uf 600 v.	"	684
C39	Not used		
C40	.01 uf mica	"	1467
C41	10 uf 450 v.) Dual Elec.	Mallory	FP Dual
C42	10 uf 450 v.)		
C43	1.0 uf 200 v.	Aerovox	284
C44	10 uuf mica	"	1467
C45	.01 uf mica	Cornell Dubilier	1-W
C46	.002 uf mica	"	1-W
C47	.002 uf mica	"	1-W
C48	.01 uf mica	"	1-W

PART NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
C49	.002 uf mica	Aerovox	1467
C50	.002 uf mica	"	1467
C51	.02 uf mica	"	1450
C52	350 uuf variable	Hammond	8135
C53	75 uuf mica plus or minus 2%	Aerovox	1450
C54	.02 uf mica	Cornell-Dubilier	9-21020
C55	.1 uf 600 v.	Aerovox	684
C56	.1 uf 600 v.	"	684
C57	15 uuf mica	"	1468
C58	500 uuf mica	"	1468
C59	.05 uf 400 v.	"	484
C60	.5 uf 200 v.	"	284
C61	.5 uf 200 v.	"	284
C62	140 uuf variable	Hammarlund	APC-140
C63	25 uuf mica	Aerovox	1468
C64	.5 uf 200 v.	"	284
C65	.05 uf 200 v.	"	284

INDUCTANCES.

PART NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
L1	R-F Choke	Marconi	82569
L2	L-W r-f coil	"	D-86450
L3	B-C " "	"	82555
L4	S-W " "	"	D-86456
L5	L-W Det.Coil	"	D86457
L6	B-C " "	"	82557
L7	S-W " "	"	D-86459
L8	L-W Osc. Coil	"	D86460
L9	Not used		
L10	S-W Osc. Coil	"	D86462
L11	B-F-O Coil Assy	"	90602
L12	Coil Assy	"	83449
L13	R-F Choke	I.C.A.	2277
L14	Not used		
L15	R-F Choke	I.C.A.	2277
L16	Not used		
L17	Osc. Coil Assy	Marconi	90120
L18	Not used		
L19	P-A Coil Assy	Marconi	90112
L20	Not used		
L21	Loading Coil Assy	Marconi	90113
L22	Coil Assy	"	83449

RESISTORS.

PART NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
R1	1 megohm, 1/2 watt	I.R.C.	BT
R2	100 ohms, 1/2 "	"	BT
R3	1 megohm, 1/2 "	"	BT
R4	200 ohms, 1/2 "	"	BT
R5	50,000 ohms, 1/2 watt	"	BT
R6	15,000 ohms, 1/2 "	"	BT
R7	15,000 ohms, Volume Control	Marconi	D-86451
R8	35,000 ohms, 1 watt	I.R.C.	BT
R9	15,000 ohms, 1 "	"	BT
R10	200 ohms, 1/2 "	"	BT
R11	1 megohm, 1/2 "	"	BT
R12	1/4 " 1/2 "	"	BT
R13	1/4 " 1/2 "	"	BT
R14	50,000 ohms, 1/2 watt	"	BT
R15	Not used		
R16	100,000 ohms, 1/2 watt	I.R.C.	BT
R17	500,000 ohms, 1/2 "	"	BT
R18	1,000 ohms, 1/2 "	"	BT
R19	5,000 ohms 10 "	Ohmite	Brown Devil
R20	100 ohms, 1/2 "	I.R.C.	BT
R21	100 ohms, 1/2 "	"	BT
R22	50 ohms, 1 "	"	BW
R23	200 ohms, 10 "	"	AB
R24	10,000 ohms, 1 "	"	BT

PART NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
R25	25,000 ohms 2 watts	I.R.C.	F
R26	5,000 " 10 "	"	AB
R27	400 " 1 "	"	BT
R28	100,000 " 1/2 "	"	BT
R29	5,000 " 1 "	"	BT
R30	300 " 10 "	"	AB
R31	10,000 " 2 "	"	BT
R32	Not used		
R33	1,000 ohms 1/2 watt	I.R.C.	BT
R34	Not used		
R35	15 ohms, 10 watt	I.R.C.	AB
R36	100,000 ohms 1/2 watt	"	BT
R37	25 ohms, 1/2 watt	"	BT
R38	100 ohms, 1/2 watt	"	BT
R30	100 ohms, 1/2 watt	"	BT
R40	100 ohms, 1/2 watt	"	BT
R41	200 ohms, 1/2 watt	"	BT
R42	100,000 ohms, 1/2 watt	"	BT

SWITCHES.

PART NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
S1	Receiver Band	Marconi	86459
S2	B-F-O	"	86655
S3	Speaker-Phones	"	86654
S4	15 Amp. 125 Volts	A.H.& H.	80302
S5	M-C-W	Marconi	86654
S6	Channel	"	90126
S7	Loading	"	90150
S8	Coupling	Centralab	2503
S9	Send-Receive	Marconi	86654
S10	Normal-Stand-by	"	86654
TRANSFORMERS.			
T1	1st I-F	Marconi	D-86470
T2	2nd I-F	"	D-86478
T3	Output	"	85999
T4	Microphone	"	79008
T5	Modulation	"	79007
VALVES.			
V1	R-F Amplifier	R.V.C.	6K7
V2	Converter	"	6A8
V3	I-F Amplifier	"	6F7
V4	Detector	"	6Q7
V5	Output	"	6K6G
V6	Modulator	"	6L6
V7	Modulator	"	6L6
V8	Crystal Oscillator	"	6L6
V9	Power Amplifier	"	6L6

MISCELLANEOUS.

PART NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
M1	0-150 ma d-c meter	Simpson	127-S
M2	0-1.5 amp. r-f meter	"	137-S
E1	Relay, d-p, d-t, 6000-ohm coil	Leach	1407-MX
J1	Key Jack	Yaxley	701
J2	Phones Jack	"	A-1
P1	Pilot Lamp, 120-16 volts	Mazda	Min.screw Base.
P2	Pilot Lamp, 12-16 volts	"	"
	Pilot Lamp Mounting (2 required)	Yaxley	330
F1	Fuse 30 Amp.	Littelfuse	1099
	Fuse Mounting	"	1212-A
CC-1	Cable Connector (Power)	Amphenol	92-4C with male element.
CC-2	Cable Connector (Audio)	Amphenol	PC-4M
Speaker	"Permag"	Oxford	30YMP
Dynamotor	12 volts d-c to 350 volts -.225 amp. d-c intermittent dury	Pioneer	EA-3
	Osc. Coil Socket	Amphenol	56-6-B
	Crystal Sockets	Marconi	83037
	Valve Sockets (Octal)	"	68087
	Valve Socket (7 Pin)	Amphenol	MIP-7-S
	Valve Shield	Goat	G-841
	Ant. Insulator	Johnson	42
	Base Insulators	Johnson	55

FR-12 NAVAL TRANSMITTER - RECEIVER

OVERALL SPECIFICATIONS.

PURPOSE:- For Semi-portable service on small vessles.

SIZE:-
Height - 11"
Width - 17-1/2".
Depth - 15".

WEIGHT:- 67 pounds (approx.)

POWER SUPPLY:- Two models are available - one for 12 volt D.C. operation and one for 32 volt D.C. operation.

POWER CONSUPTION:-

	12 V Model	32 V Model
Receive -	6 Amps	3. Amps.
Transmit -	11 Amps.	5. Amps.

RATING:- Continuous on Receive.
Intermittent on Transmit.

ANTENNA:- Single Antenna required for both Transmitting and Receiving. Input capacity must not be less than 150 uuf.

CONTROLS:- All controls on unit front panel.

CONSTRUCTION:- Single chassis in overall steel cabinet. Panel exposed by lifting a lid on the front of the cabinet. Battery connection by cable and plug on the front panel. Monophone handset, Key Assy. and Battery cable housed inside front cover. Cabinet is effectively spray-proof.

RECEIVER SECTION:-

VALVES:-
1 - R.V.C. 6K7 - Tuned R.F. Amplifier.
1 - R.V.C. 6A8 - Tuned Converter.
1 - R.V.C. 6F7 - I.F. Amplifier and 1st Audio.
1 - R.V.C. 6R7 - Diode Detector and B.F.O.
1 - R.V.C. 6K6G-Output Amplifier.

FREQUENCY RANGE:-
L.W. - 300 to 615 K.C.
B.C. - 550 to 1520 K.C.
S.W. -1460 to 3800 K.C.

I.F. FREQUENCY:-	260 K.C.	
SENSITIVITY:-	440 K.C.	- 7 u/v for 50 mw out.
	890 K.C.	- 4 u/v for 50 mw out.
	2350 K.C.	- 5 u/v for 50 mw out.
SELECTIVITY:-	440 K.C.	- 60 db down at 11.5 K.C. off resonance.
	890 K.C.	- 60 db down at 12. K.C. off resonance.
	2350 K.C.	- 60 db down at 12.5 K.C. off resonance.
IMAGE RATIO:-	440 K.C.	- 4600 to 1.
	890 K.C.	- 3900 to 1.
	2350 K.C.	- 410 to 1.
NOISE RATIO:-	440 K.C.	- 33 to 1.
	890 K.C.	- 10 to 1.
	2350 K.C.	- 100 to 1.
I.F. DISCRIMINATION:-	440 K.C.	- 540 to 1.
	890 K.C.	- 2300 to 1.
	2350 K.C.	- 1600 to 1.
MAXIMUM OUTPUT:-	400 milliwatts undistorted. 1 watt maximum.	
A.V.C.:-	Combined with Sensitivity Control; on at all times. Holds the output within 10 db when the input varies 80 db.	
B.F.O.:-	Fixed. On or off by panel switching.	
AUDIO OUTPUT:-	Either to built-in loudspeaker or earpiece of monophone by panel switching.	

TRANSMITTER SECTION:-

VALVES:-	1 - R.V.C. 6L6	- Crystal Controlled Oscillator.
	1 - R.V.C. 6L6	- Plate Modulated Power Amplifier.
	2 - R.V.C. 6L6	- Push-pull Modulator.
FREQUENCY RANGE:-	375 to 500 K.C. 1200 to 3000 K.C.	
NO. OF CHANNELS:-	Four. Tow in Long Wave band and two in Short Wave band. Other combinations available on special order.	

METHOD OF FREQUENCY CHANGE:- By channel selector switch and by panel readjustment of P.A. tuning, P.A. coupling and antenna loading.

POWER OUTPUT:- 15 watts (carrier level) to the P.A. Tank circuit on C.W. Slightly less on 'Phone and M.C.W.

A.F. INPUT:- From microphone section of monophone handset.

METERING:- Incorporated meters indicate P.A. plate current and Antenna current.

CARRIER CONTROL:- From Press-to-Talk switch in Monophone handle on 'Phone. From Send-Receive switch on Panel front on telegraph. Break-in keying is also possible in the high frequency range.

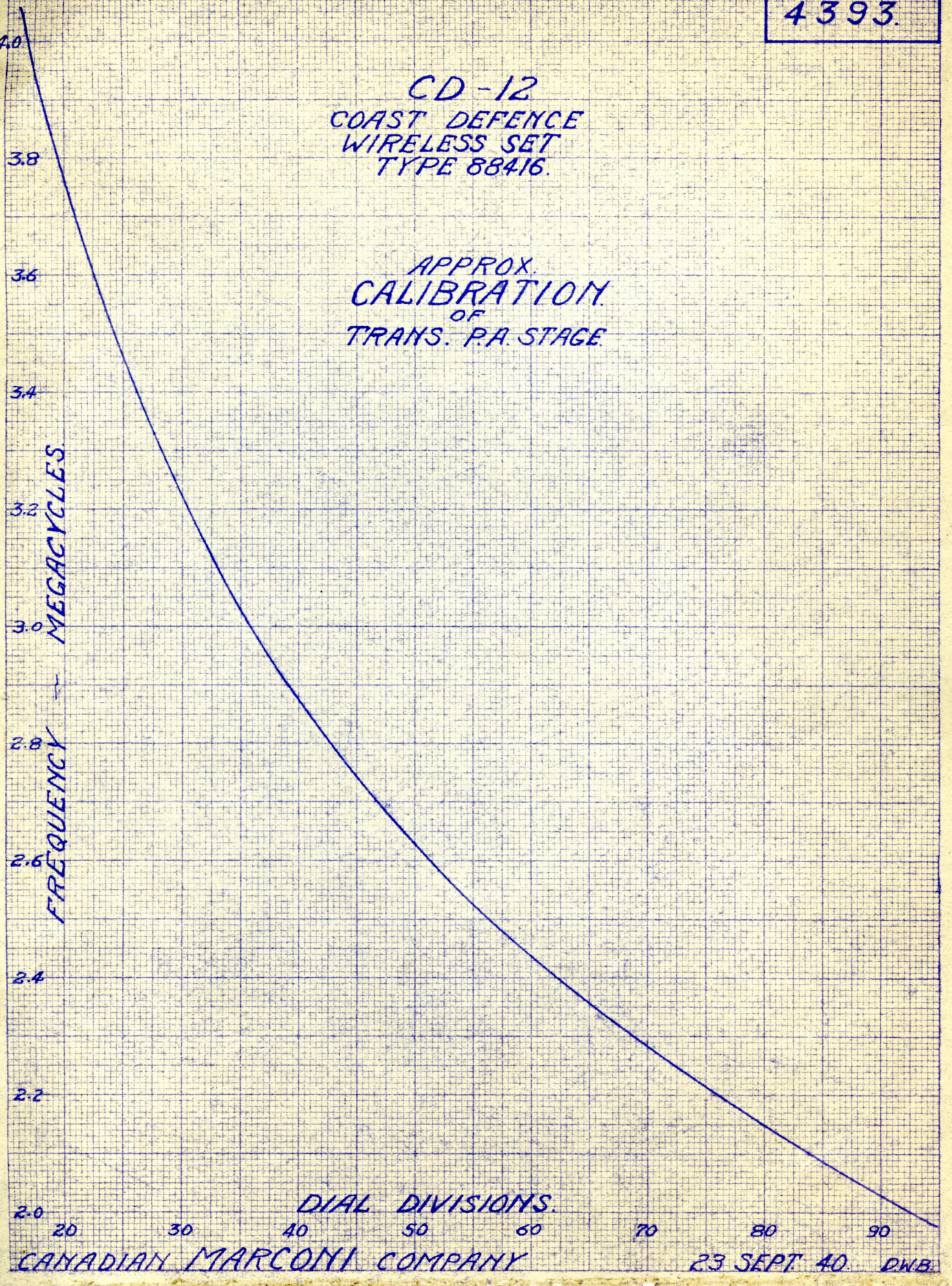
POWER UNIT:- Consists of a single built-in dynamotor equipped with suitable hash and ripple filters. Both sides of the D.C. supply circuit are insulated from ground. Supply circuit fused at 30 amperes by panel mounted fuse.

MANUFACTURED BY RENOUF PUBLISHING CO., MONTREAL FORM 100

4393.

CD-12
COAST DEFENCE WIRELESS SET TYPE 88416.

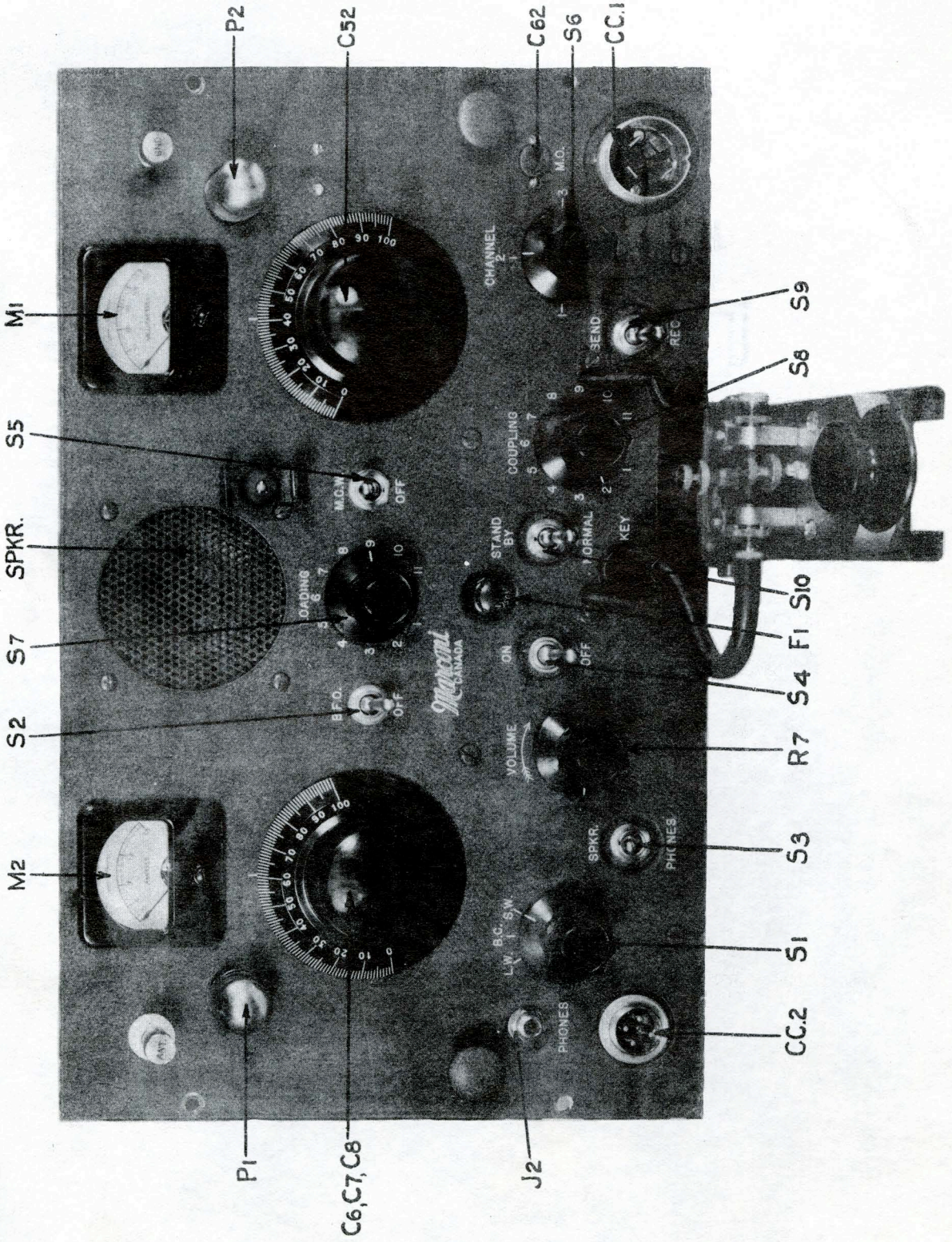
APPROX. CALIBRATION OF TRANS. P.A. STAGE.



CANADIAN MARCONI COMPANY 23 SEPT 40 DWB.

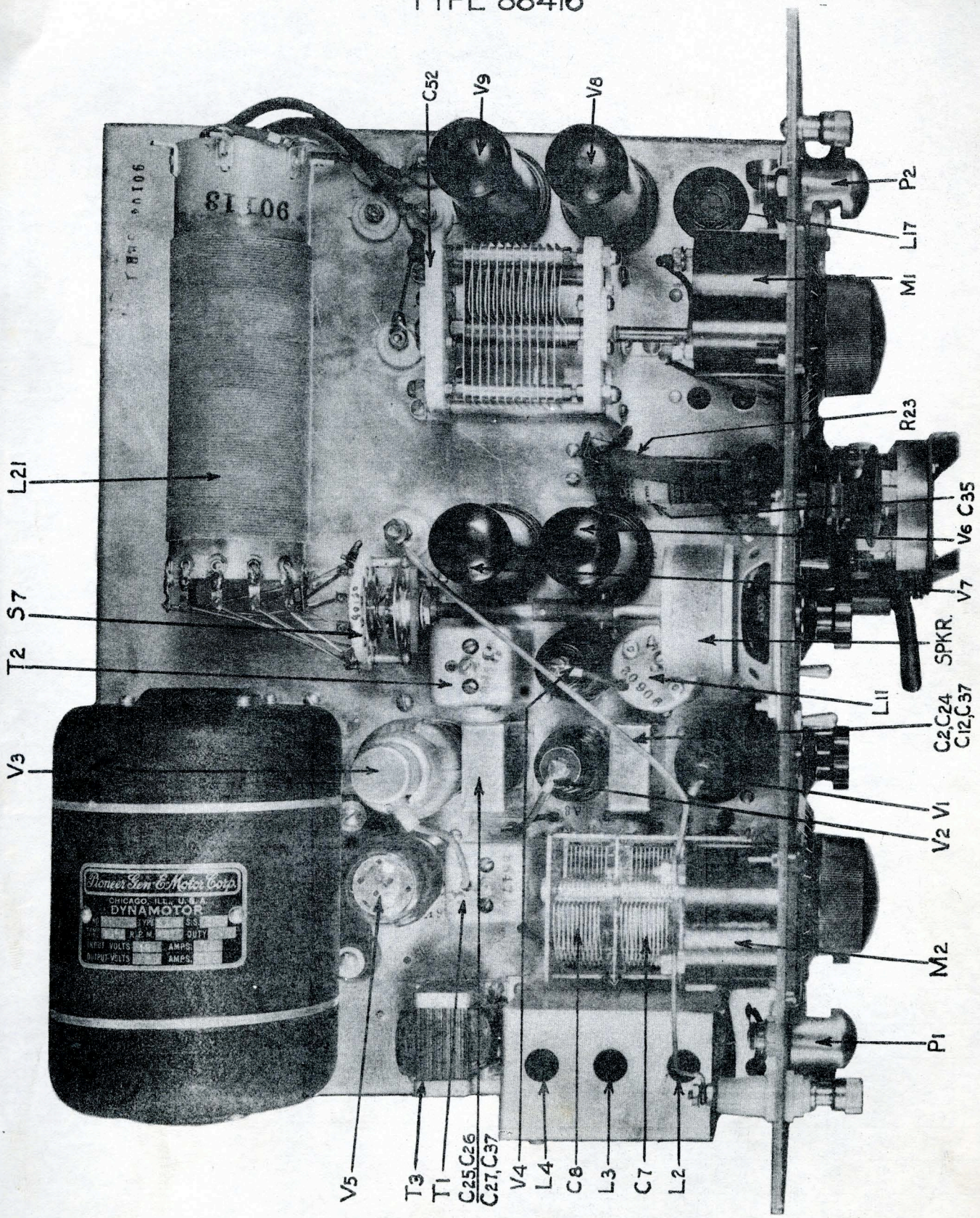
THIS MARGIN RESERVED FOR BINDING.
IF SHEET IS READ THIS WAY (HORIZONTALLY) THIS MUST BE TOP.
IF SHEET IS READ THE OTHER WAY (VERTICALLY), THIS MUST BE LEFT-HAND SIDE.

MARCONI C D-12 TRANSMITTER RECEIVER
TYPE 88416



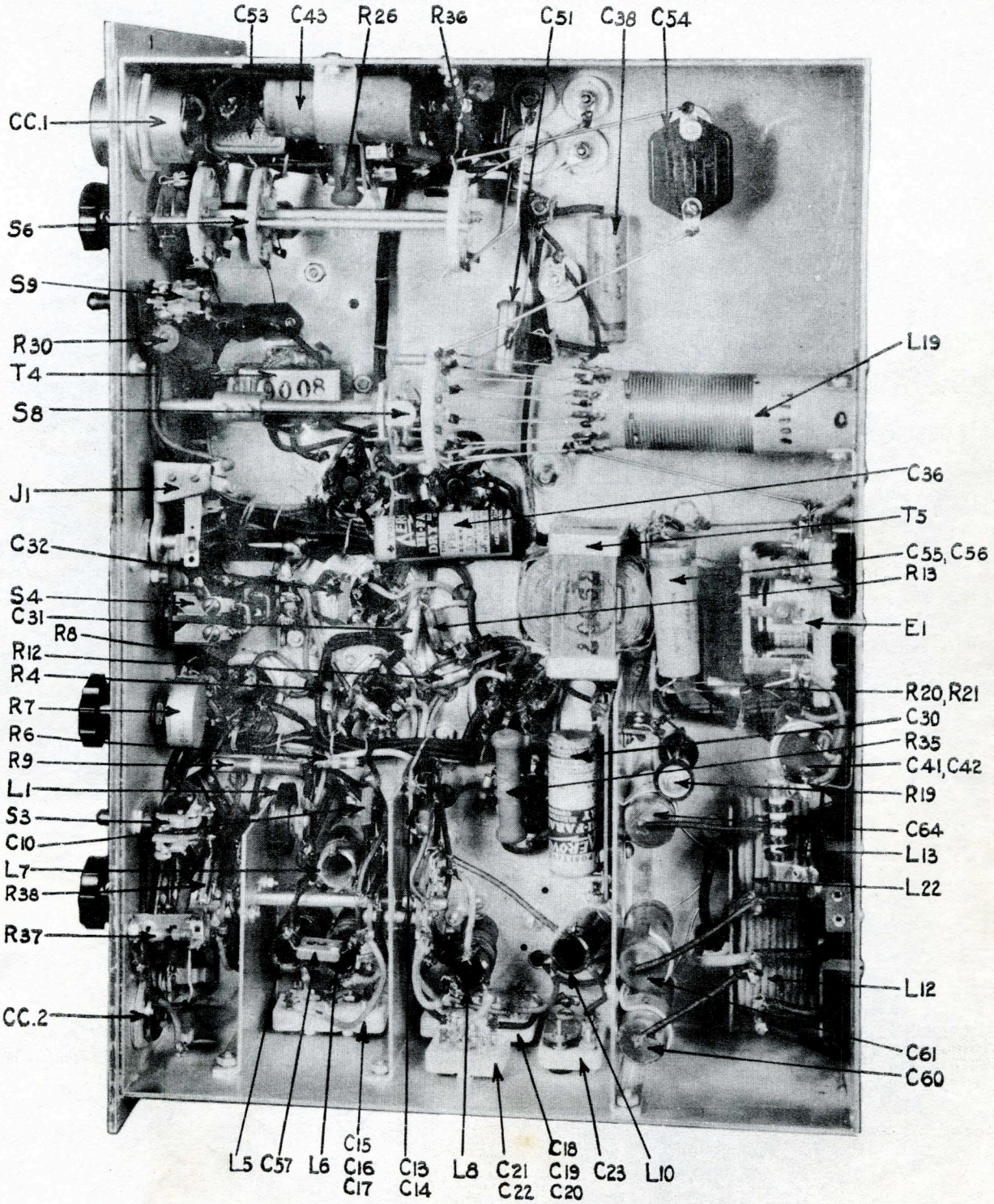
CHASSIS ASSY
FRONT VIEW

MARCONI C.D.-12 TRANSMITTER RECEIVER
TYPE 88416



CHASSIS ASSY
TOP VIEW

MARCONI CD-12 TRANSMITTER RECEIVER
TYPE 88416



CHASSIS ASSY
BOTTOM VIEW

REDRAWN.
ISSUE 10:- OCT. 24/40 SGT
144 WAS 6R7 - C59 ADDED
ISSUE 11:- OCT. 29/40
PIN Nos (V4) CORRECTED
C25 & C34 INTERCHANGED.
NOTE "B" ADDED
ISSUE 12:- NOV-16/40

USED ON | REQ | TYPE No

90133

SCHEMATIC DIAGRAM

TRANS.-RECEIVER COASTAL DEFENSE SET

C.D-12. - TYPE # 88416

CANADIAN MARCONI COMPANY

DR. | CK. D.W.B. | AP. A.A.B.

DATE:- JULY-31-40

V1 6K7 · V2 6A8 · V3 6F7 · V4 6Q7 · V5 6L6 · V6 6L6 · V7 6L6 · V8 6L6 · V9 6L6

D86470 T1 · D86478 T2 · 79008 T4 · 79007 T5 · 82569 L1 · 82555 · D86456 · D-86457 · 82557 · D86458 · D86450 · D-86460 · D-86462 · 82497

S1 · S2 · S3 · S4 · S5 · S6 · S7 · S8

WHITE · BLUE · YELLOW · BROWN · GREY · GRN. · BRN. · RED · BLACK

ANT · A · TAP LEADS #20 FLEX 3/64 R.C.&B COLORED AS SHOWN FITTED WITH SHAKE-PROOF SPADE LUGS

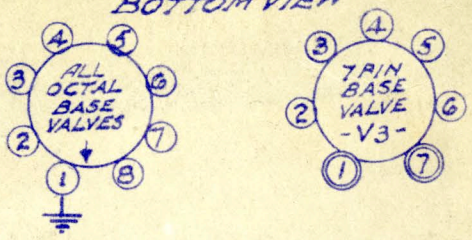
L21 #90113 · 90112 L19 · L17 #90120 · BOTTOM VIEW OF SOCKET · RED PAINT SPOT NEAREST PANEL · XTALS · D or E · I.C.A. 2277 L15

M1 MA · SEND · REC · M.C.W · OFF

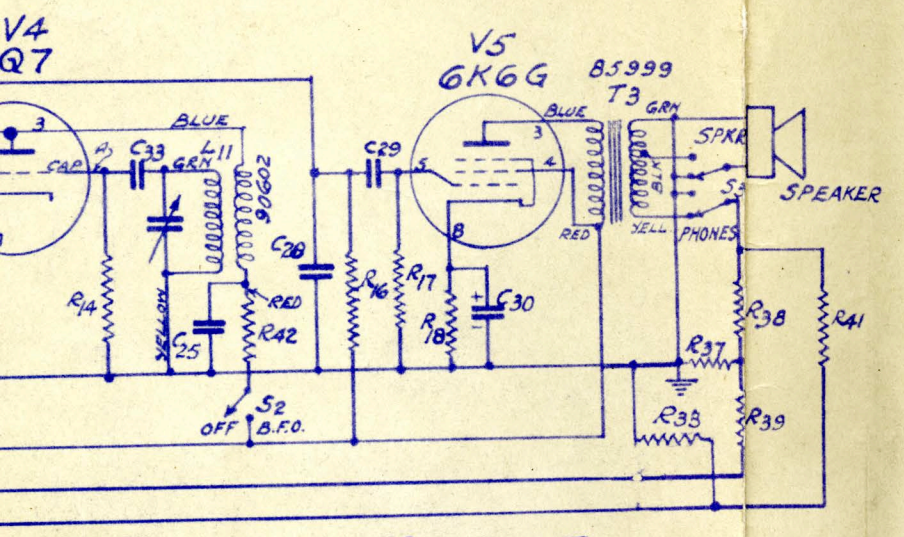
J1 · J2 · C.C-2 · FRONT VIEWS OF CONNECTORS · YELLOW · MICROP… · GREE… · RED · BLA…

NOTE:- S6 SECTIONS ARE NUMBERED FROM FRONT TO REAR OF CHASSIS

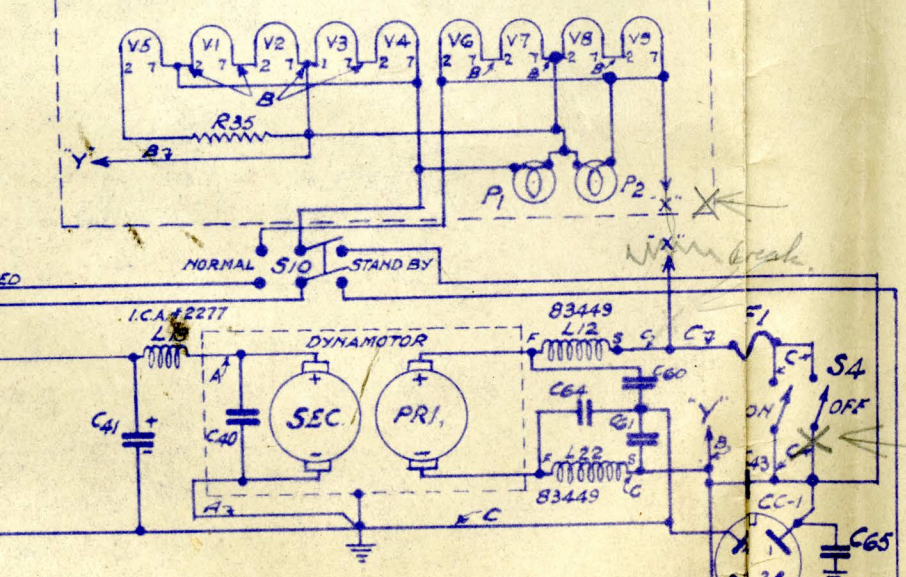
VALVE SOCKET CONNECTIONS
BOTTOM VIEW

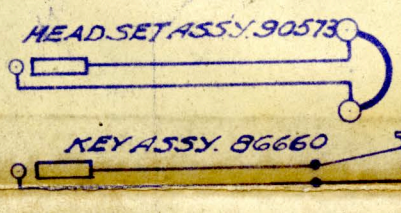


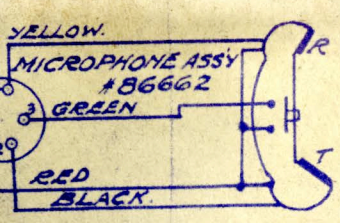
FOR LIST OF CONDENSERS & RESISTORS
SEE DWG. #90133-L



VALVE HEATER CIRCUIT







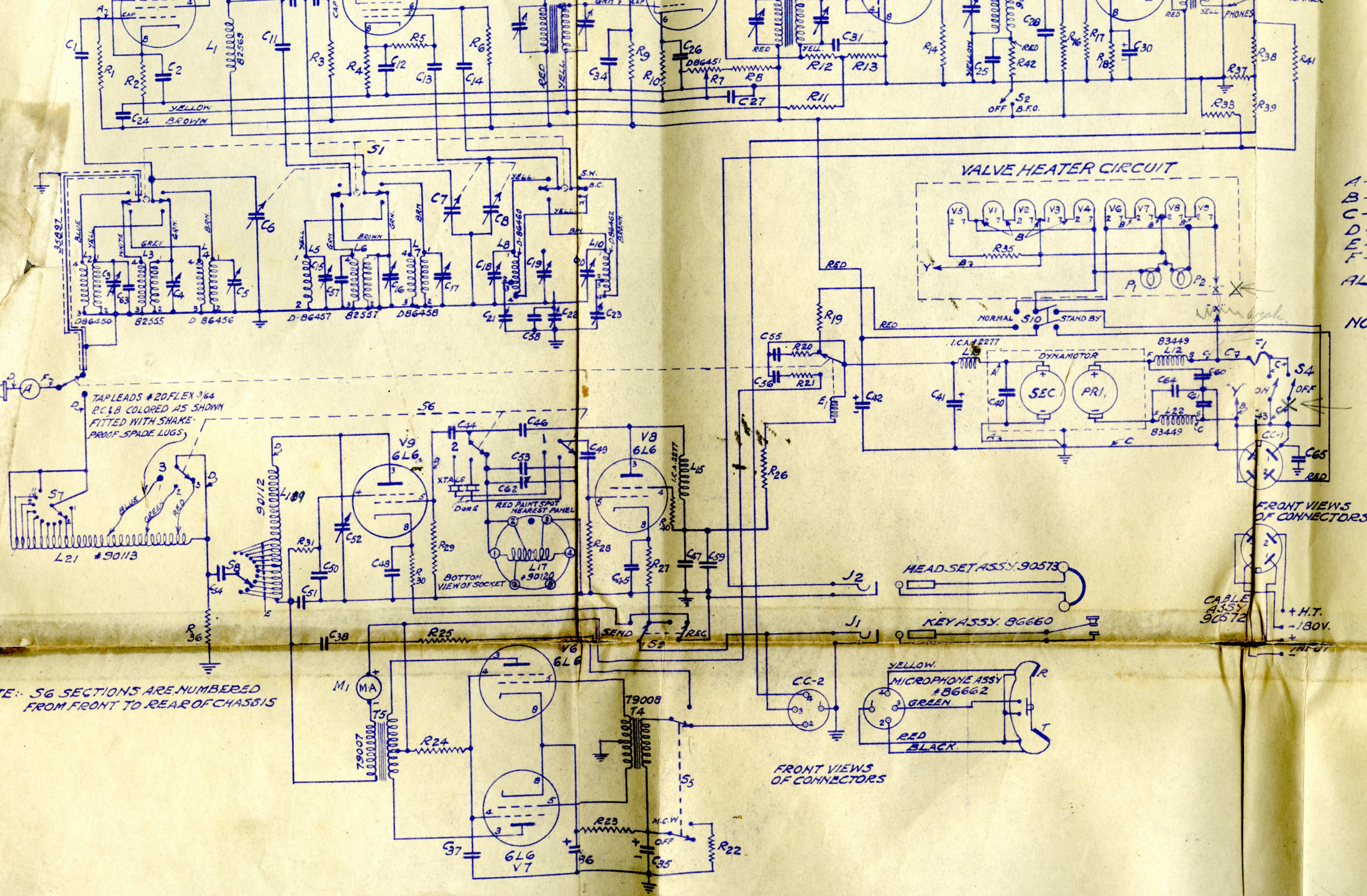
WIRING

A - #20 Ge FLEX. V.H.R. 64 - COLOURED.
B - #14 Ge " SING. BRAID. - NO RUBBER.
C - #12 Ge " " " " "
D - #14 Ge. SOLID BARE TINNED
E - #20 Ge " " "
F - #10 Ge " " "

ALL OTHER WIRING TO BE #20 Ge. SOLID. V.H.R. 32.

NOTE. "A"
P1 IS PILOT LAMP ABOVE RECEIVER DIAL.

"B"
LEAD FROM C25 TO BE AS SHORT AS POSSIBLE & KEPT CLOSE TO THE BASE & UNDER ALL WIRES WHICH CROSS IT.



NOTE:- S6 SECTIONS ARE NUMBERED FROM FRONT TO REAR OF CHASSIS