INSTALLING AND OPERATING INSTRUCTIONS

FOR

MARCONI 150 WATT 3 CHANNEL
LONG WAVE MARINE TRANSMITTER
TYPE LTT-1.

INDEX

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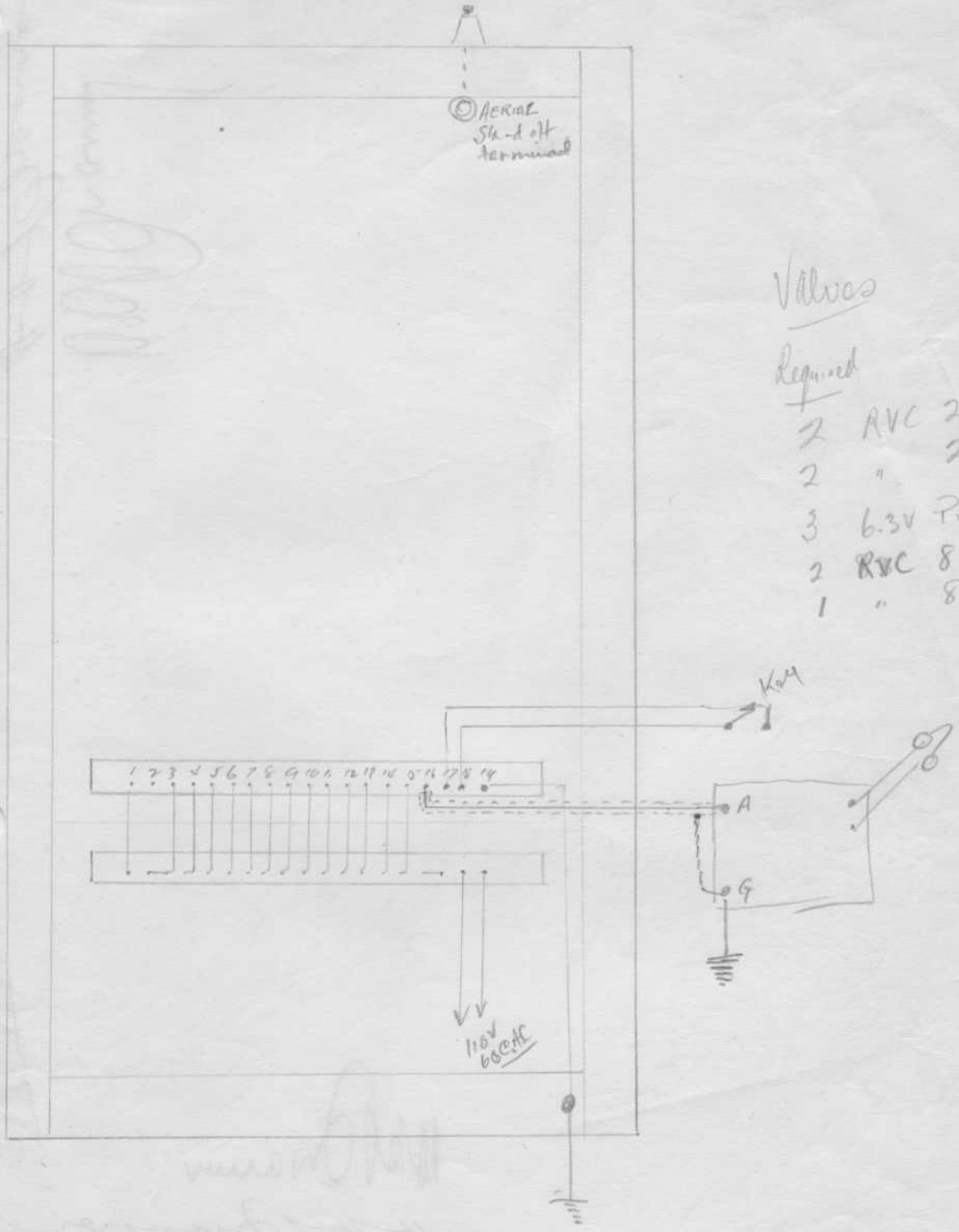

Valves

Required

2 AVC 211
2 " 210
3 6.3V Pilot lights
2 RVC 836 plus mut
1 " 83V " "

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INSTALLING AND OPERATING INSTRUCTIONS FOR MARCONI 150 WATT LONG WAVE 3 CHANNEL MARINE TRANSMITTER TYPE LTT-1.

I. General Description.

The Type LTT-1 radio transmitter is a transmitter of modern design for general marine communication purposes. It provides for operation on three preselected frequencies anywhere in the range of 260-520 kc/s.(approximately 1150-580 metres) by means of a single wave-change switch lever. Another switch permits operation on either continuous waves or modulated continuous waves, the mominal power output being 150 watts on C.W. and 110 watts on M.C.W. The modulating tone may be any one of the three frequencies 500,700 or 1000 c.p.s. as selected by means of another switch. This is made possible by the use of a small valve (RVC-10) as a tone generator and grid modulator, in place of the old style mechanical chopper with its associated rotating machinery.

The use of a master oscillator provides improved stability of carrier frequency and reduces the effect of variation of aerial constants (such as is produced by rolling, pitching,and tossing of ships in stormy weather)on the wavelength, so that even though the power output may vary considerably under such conditions the received beat note will not shift very much. The keying relay provides for "break-in" operation at speeds up to 75 words per minute. This means that no "send-receive" switch is necessary and the radio station communicated with can interrupt at any time during operation instead of waiting until the end of the transmission.

The transmitter is completely A.C.operated and requires a maximum power input of approximately 5.8 amps.115v.60 c.p.s., at a power factor of 90%. D.C.voltage required for high tension and keying relay circuits are provided by vacuum type valve rectifiers. The complete transmitter and rectifiers are mounted in a grey painted sheet iron cabinet, with a hinged door in front permitting access to all units. This door is provided with a lock and when closed leaves accessible only the essential operating controls. All tuning controls and other permanent adjustments are inside the door and hence are protected against accidental or unauthorized shifting. Valves are accessible for removal or replacement from the front only and both transmitter and power units are conveniently removable from the front for inspection or servicing.

The cabinet is about 24 inches wide by 20 inches deep by 44 inches high and is designed to be secured by heavy bolts to a table or desk. It weighs approximately 360 pounds complete and unpacked. Where a suitable A.C.supply is not available the source of power may be a rotary converter providing an output of say 750 or 1000 v.a. at 115v.60 c.p.s., with an input of 32v.,110v., or 220v. D.C. as required.

II. Transmitter Description.

The circuit of the transmitter comprises a self-controlled master oscillator stage using an RVC-10 valve, driving a neutralized amplifier stage using two RVC-211 valves in push pull. A second RVC-10 valve acts as a tone generator stage and is transformer coupled to the grid circuit of the power amplifier.

Keying is accomplished by means of a high resistance(R6 in Dwg.57970-3098) in the negative plate return lead to all valves, which biasses off T.G.,M.O., and P.A.stages when the key is open and is short-circuited by the keying relay contacts when the key is closed. When using C.W., the CW-MCW switch disconnects both filament and H.T. supply from the T.G. valve and also short circuits the secondary of the modulation transformer in the P.A. grid circuit. It also reduces the value ofthe P.A.grid leak resistance by short circuiting a portion of it for C.W. operation.

A Leach keying relay provides break-in operation by automatically connecting the aerial to the receiver (by means of a normally closed back contact) every time the key is opened. The two pairs of heavy contacts on this relay are so arranged that the right hand pair closes the aerial circuit to the transmitter (at its ground end) first, and the left hand pair then closes the H.T. circuit by shorting the bias resistor. Upon opening the key the relay keying contacts (i.h.s.) first open de-energising the transmitter, the aerial circuit contacts (r.h.s.) then open, and finally the back contacts close reconnecting the aerial circuit to the receiver. Upon closing the hand key this sequence is reversed, the receiver aerial connection being first broken, the transmitter aerial connection then made and the transmitter finally energized. As long as the relay contacts remain in proper adjustment so that this sequence of operation is maintained, no sparking should occur at either of the aerial contacts and but very slight sparking at the keying circuit contacts. A spark suppressor circuit (R9.C19) is connected across the keying circuit contacts to absorb any transients which might cause arcing. Another condenser (c30) is connected across the relay coil to absorb the inductive surges due to keying and hence to reduce sparking at the hand key contacts.

Wavechange switching is accomplished by means of a single nickelplated lever which rotates a shaft linked to the two five-plate sections of the switch proper. This switch connects or disconnects both condensers and coil taps in the M.O. and P.A. tank circuits,taps in the aerial link and leading circuits, and selects the aerial tuning variometer belonging to the desired channel. A red,green or yellow pilot lamp lights as the wavechange switch is placed in position for channel A,B or C. A designation strip is mounted on the front door to permit lettering on a strip of bristol board the wavelength or frequency in use on each channel, or any other suitable indication desired.

In addition to the blades connected in the various radio frequency circuits and the pilot lamps switch, the wavechange switch also incorporates a high tension interlock switch. The contacts on this interlock switch are connected in series with the operating coil of the H.T. relay in the power unit and are closed only when the wavechange lever is in dead centre position for any one of the three channels,A.B.or C. In moving from one position to another the contacts open as soon as the lever starts to move and remain open until the next position is reached, thus preventing any possibility of damage to the switch elements or other parts of the circuits due to arcing at the switch contacts. Thus the wavechange switch may be operated with high tension turned on without causing any damage.

The M.O.valve is located in the left hand side RVC-10 socket and the T.G.valve in the right hand side RVC-10 socket,the P.A. valves being located in the two RVC-211 sockets. The three M.O.tuning condensers are provided with scales which may be calibrated,and are designated A,B and C to identify the three channels. The P.A.tuning condensers and aerial variometers are similarly designated A,B and C and are provided with simple scales which indicate their approximate positions. Maximum variometer inductance occurs at maximum dial reading.

Flexible tap leads permit connecting each channel to any portion of the M.O., P.A., and aerial loading coils and are also designated A, B and C. A variable aerial coupling coil facilitates aerial circuit testing and adjustment. Locks are provided on all controls requiring them.

A .002 mfd. fixed condenser is provided in series with the aerial circuit of Channel A only, so that if a very large aerial is being used the shortest wavelengths within the working range of the transmitter may still be reached and tuned properly. A short circuiting link permits placing this condenser out of circuit when it is not required. The aerial ammeter is also provided with a short circuiting switch. Fine tuning in the aerial circuit is accomplished by means of variometers, one of which is provided in each channel.

The aerial coupling and loading circuits are adequate for aerials of 10 to 50 ohms resistance; .001 mfd. or greater self-capacity, and resonant frequency 3000 KC/s or less. Aerial resistances down to 4 ohms or even less, and shorter aerials with capacity down to .0005 mfd. or so may also be used,but the power output begins to fall somewhat as very low values of resistance or capacity are reached.

The tone generator and modulator valve is transformer coupled to the P.A.grid circuit. Three modulating frequencies are provided by means of taps on the tone transformer, the three taps being brought out to a switch designated 500,700 and 1000, these being the three frequencies available. Plate supply for the RVC-10 modulator valve is obtained from the 1000V rectifier through a dropping resistor R8. The MO RVC-10 valve plate supply is obtained from the same source through a separate potential dropping resistor,R2.

A meter is provided which may be plugged into jacks connected in M.O., P.A., or T.G.cathode circuits, or in the P.A.grid circuit. Note the cathode current is read, not plate current, the cathode current being the sum of grid and plate currents. If it is desired to determine the actual plate current to the P.A.stage, the grid current as registered in Jack No.3 must be substracted from the cathode current as registered in Jack No.4, the difference being the true not plate current.

III. Power Unit Description.

The power unit incorporated two valve rectifiers, one for the keying relay and one for the high tension circuits. The rectifier for the keying relay circuit uses a small full-wave vacuum tube rectifier, type RVC-83V, to provide a D.C.output of approximately one quarter of an ampere at 32 volts for the Leach keying coil circuit. The negative side of the output (and one side of the signalling key) are grounded. A 4 mfd.condenser provides the only filter in this rectifier. Both heater and plate voltages for the RVC-83V valve are provided from one transformer which also supplies all other filaments, so that the keying relay can be operated whether H.T. is switched on or not.

The high tension rectifier provides an output of approximately 500 m.a. at 1000 volts D.C., from two RVC-836 half-wave vacuum tube rectifiers. These are heater type valves and require a delay between heater and H.T.switching of approximately 40 seconds. This interval is provided by means of a thermal type time delay relay whose contacts are in series with the H.T.relay. An overload relay is provided in the negative H.T.line with an adjustable resistor shunted across its coil to vary the value of current at which it trips. This relay is connected inside the filter condenser so that it will operate in case of condenser breakdown. The filter condenser has a capacity of only 1 mfd. so as to assist in preventing the key thumps sometimes caused by the use of large condensers in keyed circuits. Radio frequency choke coils are connected in the rectifier valve plate leads so as to permit the use of RVC-866 or RVC-866A mercury vapour

valves in place of the RVC-836 vacuum rectifiers. The 866 type valve is not intended to be used in the horizontal position and so cannot be recommended as a replacement for the 836, but it can be used in an emergency as the filament voltage and current is the same in both cases.

Line fuses are provided to protect against very severe overloads such as might be caused by accidental short circuiting of high tension or main line connections. A main line switch is provided and also a high tension switch. Door switches are connected in the H.T.relay coil circuit, so that H.T. is automatically removed whenever the door is opened. A toggle switch is arranged so that H.T.can be re-applied with the door open for test purposes. This switch is automatically opened when the door is closed again, so that normal gate switch protection is restored. Two terminals are provided (Nos.16,17) in series with the H.T.relay coil to permit connecting an external switch at a remote point for H.T.switching, if desired. If main line switching is also required at a remote point it may be obtained by inserting a switch in the A.C.line and locating it at the desired point. Where a rotary converter is used as the source of A.C.power supply, an external switch, hand starter, or automatic starter and push button, must be provided to control the converter.

IV Installing Instructions

A.GENERAL INSTALLATION PROCEDURE.

When the Type LTT-1 transmitter is packed for shipment, the power unit, due to the weight of its components, is removed from the cabinet and packed separately, to safeguard the frame of the cabinet against possible damage from careless handling in transit. The power unit must therefore be remounted in the cabinet as shown on the transmitter assembly drawing. Before doing this, the cabinet should be securely bolted into position on the table or desk provided for it. Four 3/8" diameter holes will be found near the corners of the bottom of the cabinet for this purpose. Access to the two rear holes(located near the back of the side members of the framework) is obtained from the front through the space where the power unit will be mounted. The bolts can be dropped through these holes and the holes previously drilled in the table and tightened from underneath. If more convenient access to these mounting holes is desired, the two sides of the cabinet can be removed. The door will also come off at the same time.

In locating the transmitter it is not necessary that space be allowed behind the cabinet. The rear wall of the cabinet is welded to the frame and cannot be removed, hence access to the rear is not necessary. Since all controls are located on the front and all units removable from the front, access to the sides is not essential either. External connections are made to terminals as indicated on the diagram of connections. To obtain access to the terminal board, remove the plate with the small door at the bottom of the cabinet. Three 7/8" diam.holes are provided at each end of the bottom front member of the cabinet frame to permit entry of the connecting leads. Holes are also provided in each side of the cabinet (covered with a small removable plate). Thus, external connections can be run straight down through the bottom of the cabinet or out through either side. These holes will take standard 3/4" conduit fittings.Conduit should be used for the A.C.supply line wiring, which should be of No.12 gauge or larger. If the leads or conduits are run down through the bottom openings, holes must be drilled through the table for them before the cabinet is bolted in place. Ground studs are provided on the frame at each end of the lower front crossbar of the cabinet and a third stud at the bottom

at the bottom centre of the back of the cabinet. Any or all of these may be used as convenient. The aerial terminal is located at the top of the transmitter unit and is reached through a circular aperture in the top of the cabinet. The shielded aerial lead to the receiver should have not more than one inch of the shielding removed at the terminal and the sheath should extend within the receiver cabinet at the receiver end of the lead.

The earth connection should be made to a large stud through the nearest convenient point on the steel framework of the ship, the paint being carefully scraped off to bare the metal where the stud is mounted. In wooden ships it may be necessary to secure a copper sheet, 3 ft x 3 ft. or larger, to the hull below the water line to provide a good earth connection.

The aerial should be well insulated with one or two pyrex or porcelain insulators at each end. Its dimensions are not critical but in general it should be as high and as long as possible with the downlead kept as clear as possible of masts, funnels, stays and other grounded metal work. A single wire will be found adequate on all except very small vessels of less than 100 ft.or so in length, when it is sometimes desirable to use a two wire or four wire aerial.

B. Tuning Procedure
(a) Continuous Waves (C.W.)

After the transmitter has been assembled and completely set up and wired in position, it may be tuned to the three wavelengths desired. Leaving the main line and H.T.switches open, insert two RVC-836, one RVC-83V, two RVC-10, and two RVC-211 valves in their respective sockets. Pilot lamps should already be in their sockets.

Move the wavechange switch to Channel A (lever pointing towards red jewel). Connect the two flexible leads designated "A" (marked on white tape wrapped around spade lug end of lead) to terminals 1 and 2 on the M.O.coil. The shortest wavelength should be used on Channel A and this will usually be 600 metres. If a different wavelength is to be used, the appropriate tap positions may be estimated from the following approximate table:-

Taps	Waverange
1 and 2	580 - 650 metres
3 and 4	630 - 730 "
5 and 6	710 - 810 "
7 and 8	790 - 890 "
9 and 10	870 - 970 "
11 and 12	950 - 1050 "
13 and 14	1030-1130 "
15 and 16	1100-1200 "

The taps should always be used as pairs, as listed, to keep the circuit symmetrical. For example, tap 1 should always be used in conjunction with tap 2 and not with tap 4.

Disconnect the lead from terminal 19 on the P.A.tank coil and bend it clear of both the terminal and any surrounding metal parts. Start the rotary converter (if any) and close the main line switch, leaving the H.T.switch open. Pull the door toggle switch forward so as to permit applying H.T.with the door open. Approximately 40 seconds after closing the main line switch the H.T. time time delay relay should close. Turning the CW-MCW switch to M.C.W. should light the filament of the modulator valve (r.h.s.RVC-10) and switching to C.W.should leave it unlit. Place this switch in the C.W.position. Secure all of the flexible tap leads to some coil terminals so as to prevent them dropping across live parts of the circuit.

closed, and the wavechange interlock switch centred properly, H.T.will be applied to the M.O.valve. With the key open the M.O. will be biassed off, so that the current through Jack 1 will be about 15 m.a. This current is the load drawn by the resistor R18 and is not valve current. The actual M.O. cathode current with key open is practically zero.

Be careful to avoid touching any live parts of the circuit when H.T. is switched on whether the key is closed or open, as the high voltage is present in either case.

Now close the key. The meter should register about 75 m.a. in Jack 1. The M.O. circuit may now be tuned to the desired wavelength by means of the "A" range M.O.condenser, using the bakelite tunkey for adjustment. Release the locking device on the dial before attempting to rotate the condenser. A wavemeter loosely coupled to the M.O.coil will permit placing the circuit on the required wavelength.

Adjustment of the neutralizing condensers in the power amplifier stage is done while testing the transmitter before shipment. These are the two condensers mounted immediately behind the RVC-211 valve sockets. They are locked at the correct position during test, but if they have been altered or if it is desired to check the adjustment at any time, it can most conveniently be done by connecting first a 2 amp. thermocouple meter, and then a 120 m.a. theremocouple meter, in series with one end of the P.A.tank coil when tuned to about 600 metres, with tap 19 lifted to remove P.A. H.T.and the coupling coil set to zero coupling to remove any load. The P.A.tank circuit is then tuned by means of its condenser to give maximum circulating current in the 2 amp.meter,after which the neutralizing condensers are adjusted to balance to a minimum current. When this circulating current has been balanced to a low enough value, the 120 m.a.meter is used in place of the 2 amp.meter and the neutralization completed to give as low a reading as possible. The minimum value at 600 metres will be in the neighborhood of 50 m.a. and will probably occur at or close to maximum capacity of both balancing condensers. If no meters are available to make these adjustments, the two condensers may be set to maximum capacity, which will be found to be a satisfactory working value. When the final adjustment is made the dials should be locked in this position. The adjustment made on the neutralizing condensers at 600 metres, or thereabouts, will be satisfactory for all higher wavelengths and need not again be touched.

The P.A.and aerial circuits may now be tuned to the M.O. wavelength. Switch off the H.T.and reconnect the H.T.lead to terminal 19 on the P.A.tank coil. Set the P.A.coupling coil to a minimum coupling (zero on the scale). Set the "A" range taps to the same terminal numbers on the P.A.coil (one on top and one on bottom) as those on the M.O.coil. Now close the H.T.switch, press the key and resonate the P.A.range "A" tuning condenser for minimum P.A.cathode current (Jack 4). If the minimum reading is obtained at the minimum condenser capacity, set the coil taps to the next lower pair of terminals; if at maximum capacity set taps to next higher pair of terminals, until the minimum cathode current reading is obtained within the range of the condenser.

Now increase the coupling to about 30 degrees and adjust the link tap, aerial loading tap and aerial tuning variometer in range "A" until maximum current is registered in the R.F.ammeter.

The link tap is the flexible lead marked "A" at the r.f. end of the leading coil. It should be tapped not more than three or four turns from the end, to enable sufficiently tight coupling on longer wavelengths to be obtained without over-coupling on shorter waves. The leading tap should be moved up and down the coil until a position is found which gives a reading in the ammeter. The variometer must now be tuned to maximize this reading. If maximum current is obtained at minimum inductance of the variometer, the leading tap should be reduced to the next lower terminal (towards r.h.s.) and the variometer returned. If maximum aerial current is obtained at maximum inductance, then the leading must be increased (towards l.h.s.).

When the aerial circuit is in tune, the P.A.tank tuning condenser should be readjusted to give minimum P.A.cathode current (Jack 4). The aerial coupling must now be increased by rotating the coupling coil until the P.A.cathode current, when aerial and P.A.circuits are in resonance, has increased to about 320 m.a. Due to the effect of stray capacities it will be found that the coupling coil gives greater coupling when rotated in one direction from zero than the other. The tighter coupling direction should be used.

Check the wavelength now by coupling to the aerial circuit. It will have shifted somewhat, so shift the M.O.tuning to the desired wavelength and realign other circuits again, as before, until maximum aerial current is obtained on the required wavelength, combined with stability when keying and a P.A.cathode current of approximately 320 m.a. If the coupling is too tight the output may jump erratically from a high to a low value and vice versa when keyed.

If the aerial is small enough to permit tuning it to resonance with the series condenser C1 short circuited by the link, channel "A" should be used this way. If it is not found possible to tune the aerial circuit in Channel "A" this way, then the link must be opened and the condenser connected in circuit.

Channels "B" and "C" may now be tuned to the wavelengths desired by tuning first the M.O.and then the P.A.and aerial circuits, as outlined in the foregoing paragraphs. Approximate tap positions can be estimated from the table given on page 6. At wavelengths up to 900 metres the P.A.cathode current at resonance should be loaded to approximately 320 m.a.to give an output of 150 watts. At 1000 metres this must be increased to 350 m.a. while at 1150 metres a cathode current of 370 m.a. is required for an output of 150 watts. At wavelengths above 900 metres, it will be found that closing the door of the transmitter decreases the output of the transmitter slightly, due to increased losses in the shielding, and also partly due to the slight detuning caused by the reduction of inductance resulting from the proximity of the closed metal door to the coils. This effect can be partially compensated for by shifting the tuning slightly before closing the door until the desired meter readings are obtained with the door closed.

When all three channels, A,B and C, have been completely tuned for maximum output on the desired wavelengths, it will be necessary to go back and check them all again so as to obtain adjustments throughout which will permit switching from any one channel to any other with each channel remaining on the wavelength required and at full output. The coupling coil should be adjusted to the minimum position which will provide adequate coupling for the longest wavelength to be used. At shorter wavelengths the coupling can then be reduced by tapping down on the link circuit coupling taps, leaving the rotating coupling coil fixed at the above position.

Be sure that the aerial ammeter short circuiting switch (toggle switch immediately below meter) is open when taking readings, as the meter still gives an appreciable reading even when shorted by the switch. This switch is in the closed position, short circuiting the meter, when the toggle lever is upwards. Readings must be taken when the lever is pulled downwards, opening the switch contacts.

A typical set of readings for 150 watts output on C.W.at various wavelengths is given below:-

Freq. Kc/s	Wave-length	Channel	TAPS M.O.	TAPS P.A.	TURNS Link	TURNS Loading	CURRENT M.A. J1	J2	J3	J4
525	572	A	1-2	1-2	3	28	66	0	22	310
430	700	B	5-6	5-6	4	28	64	0	20	300
265	1130	C	15-16	13-14	8	67	58	0	27	360

With key up, the normal current in Jack 1 is 14 m.a. and 0 in Jacks 2,3 and 4, or any wavelength.

The P.A.plate input is greater(higher cathode current in J4) on Channel "A" than Channel "B" due to slightly lower efficiency in Channel "A" caused by the extra losses in the aerial circuit due to using the .002 mfd. series condenser, thereby requiring more series loading inductance than would otherwise be necessary. It will be noted that the same amount of leading was required for Channel "A" as for Channel "B" in spite of the difference in wavelength on account of this condenser.

When all adjustments have been completed the flexible tap leads to the various terminals on the aerial loading should each be secured in position well clear of each other and of surrounding metal parts to prevent any danger or arcing. A bakelite rod is provided across the front of the coil and these six leads should be tied to it by means of narrow white surgical tape. All other flex leads should be bent so as to be well clear of their surroundings and should be tightened in place so that they cannot drop across each other or any other parts of the circuit.

(b) Modulated Continuous Waves (M.C.W.)

When all of the adjustments on all channels are completed for the C.W.condition, operation on M.C.W. may be checked. To switch from C.W.to M.C.W. it is merely necessary to place the CW-MCW switch in the M.C.W. position. This will apply power to the modylator valve and shift the necessary connections. The desired modulating tone frequency may be selected by means of the 500,700 and 1000 c.p.s. tone switch. The power output and the P.A. cathode current on M.C.W. will both be approximately three quarters of their C.W. values. A typical set of readings for 115 watts output on M.C.W. is given below:-

Freq. Kc/s	Wave-length	Channel	Tone C.P.S.	TAPS M.O.	TAPS P.A.	TURNS Link	TURNS Loading	Current M.A. J1	J2	J3	J4
525	572	A	500	1-2	1-2	3	28	67	46	17	240
"	"	"	700	"	"	"	"	67	47	19	245
"	"	"	1000	"	"	"	"	67	46	17	238
430	700	B	500	5-6	5-6	4	28	67	46	17	225
"	"	"	700	"	"	"	"	67	47	19	230
"	"	"	1000	"	"	"	"	67	47	18	225
265	1130	C	500	15-16	13-14	8	67	60	47	19	250
"	"	C	700	"	"	"	"	60	48	21	253
"	"	C	1000	"	"	"	"	60	46	18	245

With key up the mormal current in Jack 1 is 15 m.a. and 0 in Jacks 2, 3 and 4, on any wavelength and with any tone frequency.

In switching from C.W. to M.C.W. always switch off the H.T.then turn the CW-MCW switch to the M.C.W. position, then turn on the H.T.switch again. This is to permit the modulator valve filament to heat up before H.T.voltage is applied to its plate. It is permissible to switch from M.C.W. to C.W.with the H.T.turned on, as the CW-MCW switch turns off both H.T.and filament simultaneously from the modulator valve.

V. OPERATING INSTRUCTIONS

All operating controls appear outside the cabinet,so that when the tuning is completed, the small plate with the fuse door may be replaced at the bottom of the cabinet front, and the door closed and locked to prevent unauthorized tampering.

To operate the transmitter, start the rotary converter (if one is used) and close the main line switch on the transmitter. The H.T. switch may be left permanently turned on as the time delay relay takes care of the required interval between heater and H.T. switching. Place the wavechange switch on the desired channel and the transmitter (after the 40 seconds time delay) is ready to be keyed. C.W. or M.C.W. may be obtained by switching appropriately always remembering that the H.T.switch should be opened before switching from C.W. to M.C.W. When M.C.W. is used the modulating frequency may be 500, 700 or 1000 c.p.s. as desired, by suitably placing the tone switch.

Because of the "break-in" relay, reception is possible every time the key is open. If the transmitted signals are heard too loudly in the headphones or loudspeaker, their level may be reduced by turning down the volume control on the receiver while transmitting and turning it back up to normal when it is desired to receive.

A special Marconi M.S.L. receiver type No.59225 is available particularly for use with this type of transmitter. In it is included a W.L.type 251-36 relay, the coil of which should be connected across a 100 ohm 25 watt resistor placed in series with the earth side of the key, i.e. in series with the lead connecting the key and terminal number 17. The contacts of this relay ground the grid of the first valve, thereby desensitizing the receiver each time the key is pressed.

The dropping resistor should preferably be placed close to the key and joined in the relay by means of a twisted pair of No.18 or No.20 wire.

A .1 mfd. 400 volt working condenser should be connected across the terminals of the manipulating key, as close to this instrument as possible, in order to prevent the slight sparking which takes place at the contacts from causing clicks in the receiver. Should this condenser fail to completely eliminate the clicks the key leads should be shielded using No.14 lead covered wire.

Wherever possible a separate earth connection should be employed for the receiver and the shield of the type 35897 cable used for the receiver aerial lead connected to this ground. Where such a separate earth connection is used the shield of the aerial lead should be insulated from the frame of the transmitter.

To shut down the transmitter merely open the line switch. If a rotary converter is used it must also be shut down. In the latter case, the converter input line switch may be used as the only power switch, the transmitter line switch being left permanently turned on.

If the overload relay trips it may be reset by pressing the nickelplated reset button. Since the tuning condenser frames are not earthed, arcovers due to mistuning do not short circuit the rectifier, but merely the R.F.circuits and hence do no damage. If the overload relay persists in tripping, the trouble should be investigated and corrected before attempting to operate.