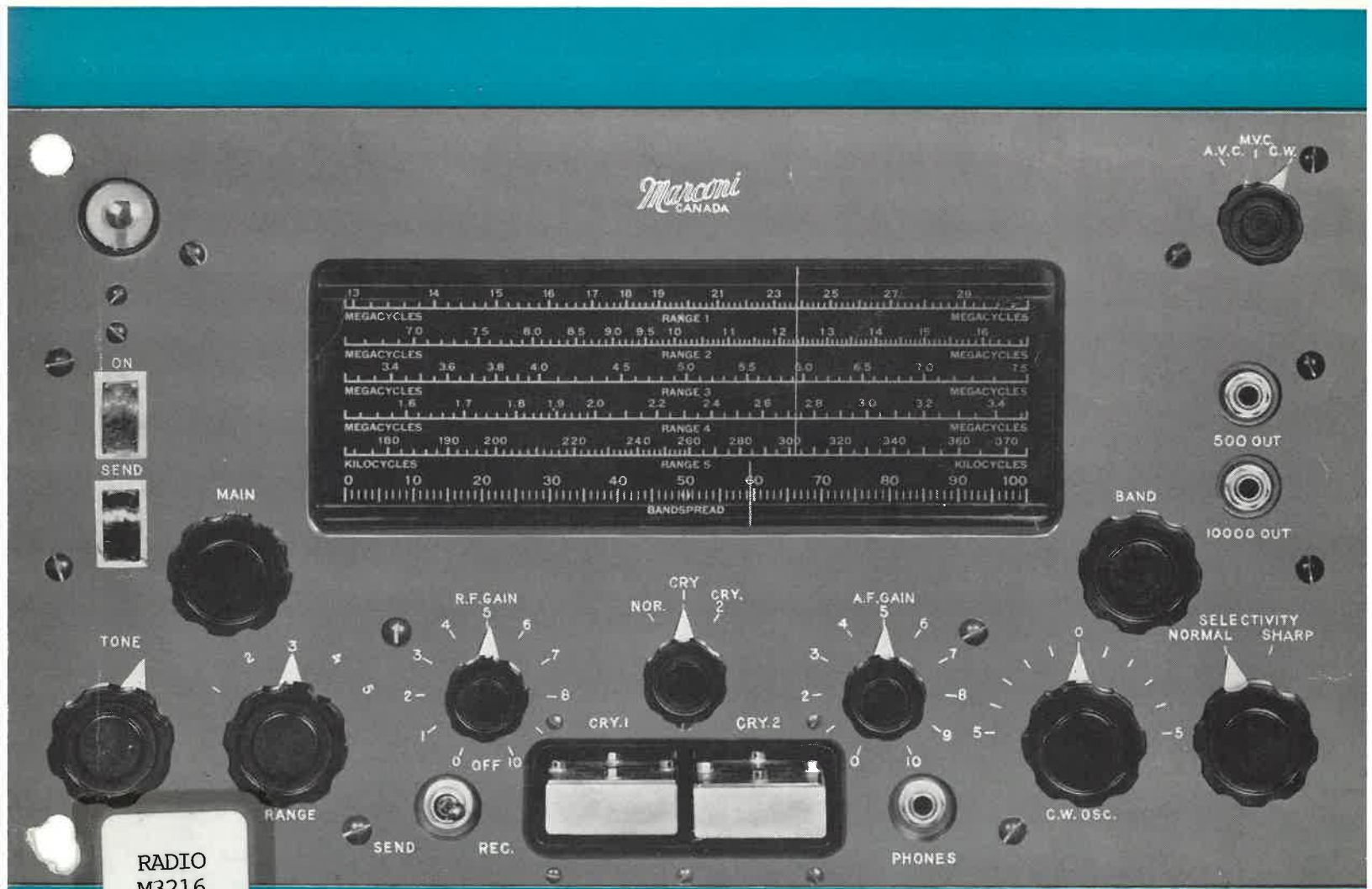


Marconi Presents an Outstanding

COMMUNICATIONS RECEIVER



RADIO
M3216
3083
D1940

CSR4

MARCONI

CSR4

COMMUNICATIONS RECEIVER

THIS Marconi CSR4 Communications Receiver was designed with only one object in view, to provide the highest grade of performance in continuous twenty-four-hour service for many years with a minimum of attention. Strictly a commercial receiver, it possesses exceptional sensitivity over all the bands, and in all parts of each band. No compromise has been made between selectivity, sensitivity and fidelity.

Each of these characteristics in the CSR4 is at the optimum obtainable by the use of the most up-to-date circuits, the latest proven tubes, and by the use of the highest obtainable quality of material.

CIRCUIT DESCRIPTION

The CSR4 Receiver is a fifteen-tube super-heterodyne arranged to cover from 175 to 385 kc and from 1.5 to 30 megacycles in five ranges. The tubes are all of the metal type except for the rectifier, output push-pull and tuning indicator tubes. The circuit used on all ranges consists of two stages of r-f amplification, frequency changing rectifier, high-frequency oscillator, three intermediate-frequency stages, diode second detector, audio driver and push-pull audio power tubes. In addition, circuits are employed for amplified and delayed a-v-c, beat-frequency oscillator using a positive μ circuit for stability, tuning indicator tube and quick changeover switch for emergency battery operation. The power supply is built in the receiver and is arranged for either 25 or 60 cycle operation.

Terminals are provided at the back of the receiver for emergency battery use and a switch is provided for a quick changeover. When the switch is moved to the battery position, both high tension and heater circuits are changed over so that they are connected to the battery terminals and at the same time the 115-volt a-c supply line is broken inside the receiver so that the rectifier circuits are protected should the power supply be again connected.

All r-f and i-f tuned circuits are provided with high-frequency iron cores for tuning and inductance setting purposes. The conversion oscillator circuits have fixed silvered mica tracking condensers which are of high quality and are specified within one per cent of rated capacity. All tuning adjustments are made from the top of the chassis and at no time should it be necessary to remove the bottom plate unless

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The Greatest Name In Radio

CIRCUIT (Cont'd.)

failure takes place in one of the components there assembled.

The use of two r-f stages on all bands gives adequate image suppression and completely eliminates i-f direct pick-up. Selectivity is well taken care of by the use of three intermediate-frequency stages using four iron core tuned transformers, three of which are provided with variable couplings in order to increase the width of the top of the selectivity curve. The selectivity of the receiver in the selective position is such that the sidebands of the modulated carrier are markedly attenuated and the output signals, in consequence, sound as if the audio high notes are missing. In the normal position, the i-f couplings are increased which has the effect of expanding the top of the selectivity curve so that more of these sidebands are allowed to pass giving good quality output signals.

TUNING DIAL

The CSR4 employs an indirectly lighted dial which enables the full calibration of all ranges to be observed at a glance. Each frequency band is individually calibrated in megacycles and, in addition, a further vernier tuning scale is supplied marked zero to one hundred divisions with an index mark at 50. The two tuning controls employ the "inertia" method of tuning such that a quick spin given to either knob will cause the respective indicator needle to move rapidly across the scale. The calibration of each band will be correct when the vernier pointer is set at 50 divisions.

RF GAIN CONTROL and ON-OFF SWITCH

The r-f gain control will be found to the right and a little above the Range Switch. When it is turned full anticlockwise the a-c line switch is turned off and the receiver is inoperative. The r-f gain control functions when using a-v-c, m-v-c and c-w and changes the gain of the r-f and i-f amplifying tubes by changing the grid bias voltage applied to the base of each grid isolating resistance.

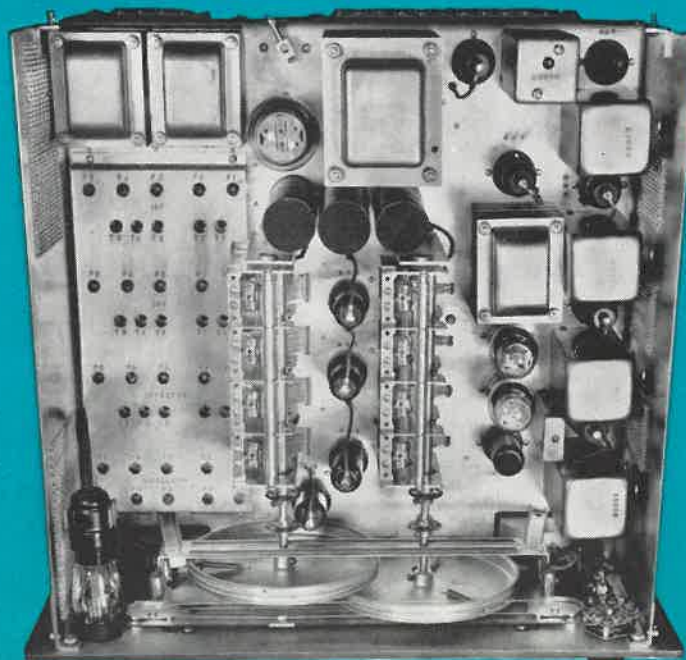
AVC-MVC-CW SWITCH

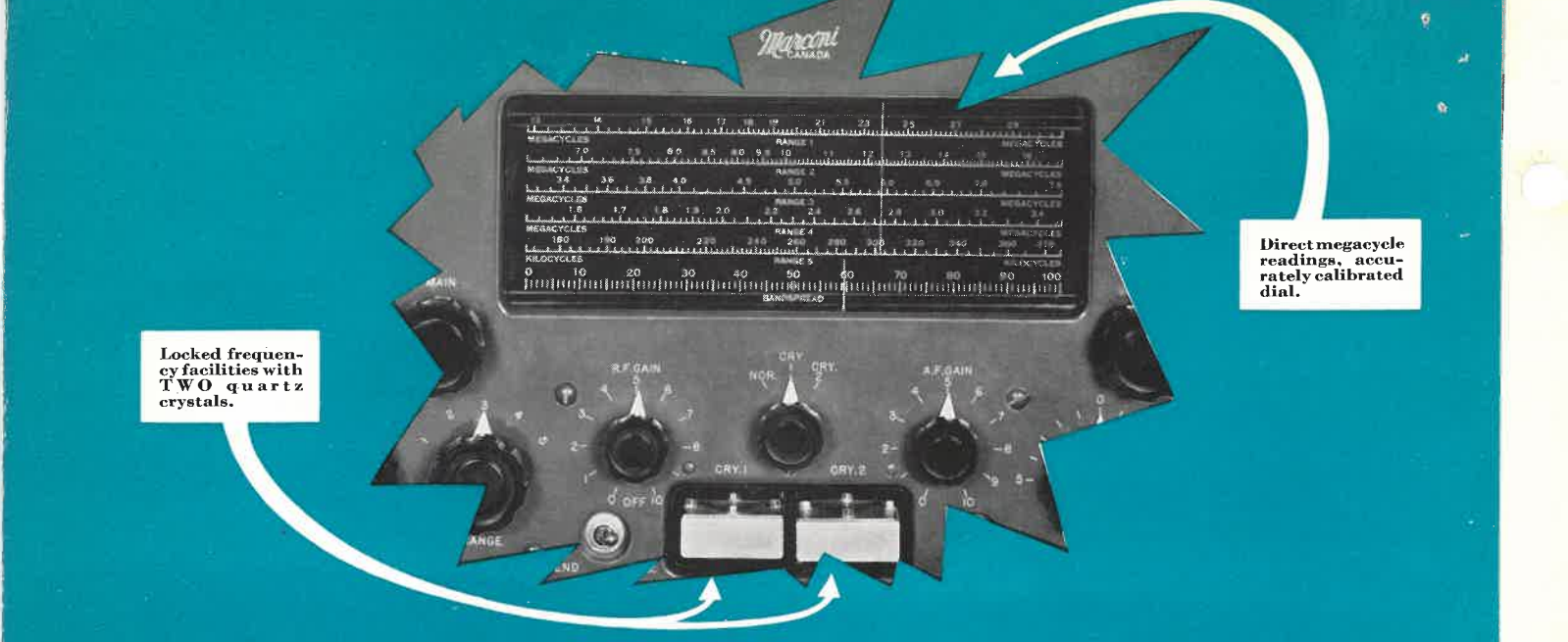
This switch is located at top right-hand side of panel and is for selecting Manual Volume Control, Automatic Volume Control and Continuous Wave (Beat Frequency Oscillator) reception.

The a-v-c circuit consists of a 6J7 tube arranged to produce amplified and delayed action. Signals above an average level of about 5 to 10 microvolts will be held at a nearly constant output level due to the action of the a-v-c. Delay is employed so that the a-v-c takes hold at a signal level which will provide nearly full output in the loudspeaker and as the signal increases from that point the output will remain substantially constant.

The middle position of the switch is marked MVC. Under this condition the a-v-c circuits are disconnected and the r-f gain control must be used for sensitivity adjustments.

Inside top view of chassis.





Locked frequency facilities with TWO quartz crystals.

Direct megacycle readings, accurately calibrated dial.

SELECTIVITY SWITCH

This switch is located at the extreme right-hand side of the receiver and is for the purpose of changing the overall selectivity of the receiver by varying the coupling in three of the i-f transformers. In the sharp position, the transformers are at optimum coupling and the full selectivity characteristics of the four sharply tuned transformers are utilized, producing steep sides to the selectivity curve and a narrow top. When switched to the normal side, the three transformers are provided with extra coupling between the primary and secondary coils of such a value that the narrow top of the selectivity curve is expanded giving less selectivity but better audio quality.

CRYSTAL SWITCH

This is located directly under the centre of the tuning dial and is used in conjunction with the two twin crystal sockets located below it. The switch is marked NOR-CRY1-CRY2 and for normal working is turned to the position marked NOR (normal). In this position the conversion oscillator is functioning as a variable tuned circuit with frequency depending upon the setting of the two tuning condensers. The oscillator employs a 6J7 tube, distinct from the first detector or conversion tube, which couples into the conversion tube by means of a fixed mica condenser.

When the crystal switch is moved to one of the crystal positions, the plate supply for the

6J7 oscillator is removed and the coupling is eliminated. At the same time the appropriate crystal is connected to the oscillator electrodes of the 6K8 conversion tube and oscillates at its own frequency independent of the setting of gang condensers. Under this condition signals may be received by tuning the r-f ganged circuit to resonance.

REC-SEND SWITCH

The switch is located at the bottom and near the middle of the panel. It is used for making the receiver "quiet" during transmission periods. When switched to the SEND side, the plate supply is removed from the r-f and i-f tubes leaving the audio and oscillator tubes, together with the voltage divider, connected so that the receiver will not change in temperature during long periods of transmission. A relay is located inside the receiver and may be used instead of the switch if automatic change over is required when transmitting. Two terminals are located on the back terminal board and are wired up to the relay energizing coil. Six volts d-c should be used for working the relay.

The green pilot light will indicate when the receiver is turned on by means of the switch on the r-f gain control. The red light will indicate when the receiver is in the SEND condition and serves as a warning that signals are not being received.

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CHARACTERISTICS

Typical sensitivity values of the different ranges is given in the following table which shows average sensitivities for one-half watt output using standard dummy aerials connected between the measuring device and the antenna input terminals.

Range 1.....	4 to 5 Microvolts
Range 2.....	1 to 2 Microvolts
Range 3.....	1 to 2 Microvolts
Range 4.....	1 to 2 Microvolts
Range 5.....	1 to 2 Microvolts

FREQUENCY RANGE

Band Dial at 50 divisions.	
Range 1.....	30 megacycles to 13 megacycles
Range 2.....	16.5 " " 6.6 "
Range 3.....	7.5 " " 3.15 "
Range 4.....	3.5 " " 1.55 "
Range 5.....	375 kilocycles to 175 kilocycles

POWER SUPPLY

The CSR4 receiver is a completely self-contained unit designed for operation on 115 volts a-c 25-60 cycle supply. The power required from the mains is 115 watts. The relay requires approximately 30 milliamperes at 6 volts d-c.

INPUT CIRCUITS

Characteristics to match 75 or 500-ohm transmission lines, either grounded or ungrounded. The 500-ohm input may also be used for open aerial operation.

OUTPUT CIRCUITS

Both output terminals and output jacks marked to designate high and low impedance loads.

High impedance...	10000 ohms
Low impedance...	500 ohms with centre tap.

Telephone Jack for use with high impedance telephones.

AUDIO OUTPUT POWER

Undistorted power output.....	3 watts
Maximum power output.....	5 watts

SELECTIVITY

Average values for each range using sharp or normal selectivity positions. Figures show the kilocycles off resonance to which a signal one thousand times as strong as the one being

received may approach to give the same output.

	Sharp	Normal
Range 1.....	9.0 kc	12.5 kc
Range 2.....	8.8 kc	12.0 kc
Range 3.....	7.0 kc	10.75 kc
Range 4.....	6.3 kc	10.0 kc
Range 5.....	6.25 kc	8.75 kc

CRYSTALS

Any two frequencies between 1.5 and 7.5 Mc. Using crystal harmonics the frequency range may be extended to 30 Mc.

IMAGE RATIO

Average values for each range.

Range 1.....	365 to 1
Range 2.....	5645 to 1
Range 3.....	25000 to 1
Range 4.....	50000 to 1
Range 5.....	Not measurable

NOISE RATIO

Average values for each range with controls at maximum sensitivity and input signal adjusted to give one-half watt output. Disconnecting antenna from receiver gives noise residue in ratio to one-half watt.

Range 1.....	375 to 1 down
Range 2.....	120 to 1 down
Range 3.....	33 to 1 down
Range 4.....	30 to 1 down
Range 5.....	130 to 1 down

AUTOMATIC VOLUME CONTROL

A change of input voltage between 10 and 10000 microvolts will cause a change in output level of less than 3 db. A change of input voltage between 10 and 100000 microvolts will cause a change in output level of less than 6 db.

FIDELITY

Frequency	Tone Clockwise		Tone Anticlockwise	
	Sharp db	Normal db	Sharp db	Normal db
100 cycles	Down .5	Down .5	Down .5	Down .5
200 "	0	0	0	0
300 "	0	0	0	0
400 "	0	0	0	0
1000 "	-2	-.5	-6.5	-3.6
2000 "	-7	-3	-15.5	-7.5
3000 "	-21	-6	-36	-19
4000 "	-	-9	-45	-30
5000 "	-	-15	-	-41

TUBES

Tubes are installed in the receiver at the Factory and the receiver is correctly adjusted with these tubes. The 15 tubes employed are as follows:—

- Marconi
R V C
- 6K7.....First r-f Preselector
 - 6K7.....Second r-f Preselector
 - 6K8.....First Detector
 - 6J7.....h-f Oscillator
 - 6K7.....First i-f
 - 6K7.....Second i-f
 - 6K7.....Third i-f
 - 6H6.....Second Detector
 - 6J7.....Amplified a-v-c
 - 6J7.....Beat Frequency Oscillator
 - 6J5.....First Audio
 - 6K6G.....Power Output
 - 6K6G.....Power Output
 - 6G5.....Tuning Indicator
 - 5X4G.....Rectifier

ANTENNA

The CSR4 receiver is designed for three general types of antenna inputs. Four terminals are located on the back of the receiver for antenna and earth connections marked 500, 75, E1 and E. The base of the antenna input coils are all connected to the terminal marked E1 so that if an underground antenna input is used this terminal, being ungrounded, should be connected to the appropriate antenna connection and the receiver grounded at the terminal marked E. If it is required to ground one side of the antenna, E1 and E are connected together and grounded.

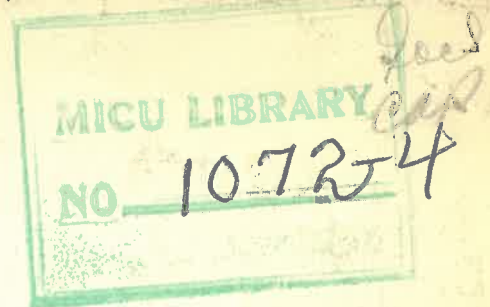
Terminals 75 and E1 are used for a 75-ohm line or input. Terminals marked 500 and E1 are used for a 500-ohm input. An open antenna of the Marconi type having an effective height of about four to five metres usually resolves itself, at frequencies above 1.5 megacycles, into an antenna impedance of about four to five hundred ohms, so that when using an antenna of this type it should be connected to the terminal marked 500 and E1 should be connected to E and earthed.

THE apparatus described in this catalogue is licensed for certain specific uses. Information concerning the license will be furnished upon request and receipt of particulars regarding the nature of the service required. 4-9

CANADIAN MARCONI COMPANY
MARCONI BUILDING, MONTREAL
VANCOUVER WINNIPEG TORONTO HALIFAX ST. JOHN'S, NFLD.

The Greatest Name In Radio

TECHNICAL DESCRIPTION
MARCONI CSR4-D RECEIVER.



GENERAL DESCRIPTION

The Marconi CSR4-D Receiver is a fourteen tube superheterodyne arranged to cover from 175 to 385 k.c. and from 1.5 to 30 megacycles in five ranges as follows:

Range 1	-	30 m.c.	to	13 m.c.
2	-	16.5 "	"	6.6 "
3	-	7.5 "	"	3.15 "
4	-	3.5 "	"	1.55 "
5	-	375 KC	"	175 KC

The receiver is designed for the reception of C.W. signals, as well as for voice.

The overall dimensions of the receiver are as follows:

18-1/2" in length
12" in height
17" in depth.

MECHANICAL DESCRIPTION

The receiver is built on a chassis 3-5/8" in depth which is mounted in a sheet steel cabinet provided with a hinged cover in the top. The steel panel carries the large oblong directly calibrated dial, as well as all the other controls. This dial employs the "inertia" method of tuning and has five main scales and a bandspread scale divided into 100 divisions. The control knobs of the tuning give a reduction ratio of 28 to 1. The controls on the panel from left to right are:

1. Tone control.
2. Main tuning control.
3. Wave change switch.
4. Send-receive switch.
5. R.F. gain control.
6. A.F. gain control.
7. Phone jack.
8. C.W. oscillator control.
9. Bandspread tuning control.
10. A.V.C., M.V.C. - C.W. switch.

The panel and cabinet are finished in Marconi battleship gray, the panel being engraved with the control designations.

On the rear of the chassis are mounted a panel containing the antenna and earth terminals and two sockets for the loudspeaker outlet.

CIRCUIT DESCRIPTION

The circuit used on all ranges consists of two stages of R.F. amplification, frequency changing rectifier, high frequency oscillator, three intermediate frequency stages, diode second detector, audio driver and an audio power output. In addition, circuits are employed for a beat frequency oscillator using a positive, MU circuit for stability, delayed and amplified automatic volume control, and a tuning indicator tube. The power supply is built in the receiver and is arranged for 60 cycle operation.

The R.F. input transformer is designed for operation with a standard open antenna, a 75 or 500 ohm transmission line, either grounded or ungrounded, a separate transformer being used for each of the five frequency ranges. These transformers are connected through a five position rotary switch to the grid of the 6K7 1st R.F. amplifier. From the plate of this valve is connected another stage of R.F. amplification to the 6K8 converter. A 6J7 valve is used for the high frequency oscillator circuits and the oscillations produced applied to the oscillator grid of the 6K8 converter. The converter output at 455 K.C. is then passed through the four intermediate frequency transformers which comprise the three I.F. stages to the diode detector where the I.F. signals are demodulated and converted to audio frequencies. These audio frequencies are amplified by the audio driver circuit and the power output stage.

All the R.F. and I.F. tuned circuits are provided with high frequency iron cores for tuning and inductance setting purposes. The conversion oscillator circuits have fixed tracking condensers of the silvered mica type, and, as these will remain constant, the receiver will remain on calibration and retain its sensitivity as long as the tubes operate correctly.

The manual R.F. gain control is effected by means of a variable resistance connected so as to vary the bias in the grid circuits of the R.F. and I.F. valves.

The A.V.C. circuit consists of a 6J7 valve arranged to produce amplified and delayed action. In the C.W. and manual positions the A.V.C. is disconnected.

A 6J7 valve is used for the positive MU beat frequency oscillator to provide an 0-2500 cycle beat note for reception of C.W. signals, this note being controlled by a knob on the panel.

The "Send-Receive" switch is used to remove the H.T. from the R.F. and I.F. valves when the transmitter is used, leaving the receiver filaments normal.

VALVE COMPLEMENT

6K7 - First R.F. Preselector
6K7 - Second R.F. Preselector
6K8 - Pentagrid Converter
6J7 - H.F. Oscillator
6K7 - First I.F. Amplifier
6K7 - Second I.F. Amplifier
6K7 - Third I.F. Amplifier
6H6 - Diode Second Detector
6J7 - Beat Frequency Oscillator
6J7 - Amplified A.V.C.
6J5 - Audio Driver
6K6G- Power Output
6G5 - Tuning Indicator
5Y4G- Rectifier

PERFORMANCE CHARACTERISTICS

The average sensitivity for one-tenth watt output using a standard dummy is under 2 microvolts on ranges 2 to 5 inclusive and under 5 microvolts on the High Frequency Range 1, the maximum undistorted output available being 1 watt with 1.5 watts maximum.

The average overall selectivity is such that an interfering signal 1000 times that of the signal being received would have to be within 4000 cycles to give the same power output.

The signal to image ratios will vary depending on the frequencies being received. The average values for each range are:

Range 1 - 365 to 1
2 - 5645 to 1
3 - 25,000 to 1
4 - 50,000 to 1
5 - not measurable

The signal inputs are controlled manually (M.V.C.) or automatically (A.V.C.) and the output manually controlled. With the output control (A.F. Gain) set for 100 milliwatts with an input of 2 to 5 microvolts, that is at maximum sensitivity, it is possible to maintain this output constant by means of the manual R.F. gain control up to inputs of 1. volt. The A.V.C. itself will hold the output level within 6 db with a change of input voltage of 80 db.

CONSTRUCTIONAL DESCRIPTION

The chassis, panel and cabinet are constructed of 1/16" cadmium plated sheet steel.

The R.F., Detector, Oscillator and Converter Valve sockets are isolantite construction, all other sockets are of moulded bakelite firmly riveted to the chassis.

Mica compression trimmer condensers are used on the R.F. circuits, and midget variable air condensers for the oscillator circuits.

The wave change switch is of eleven sections five position wafer type construction, high quality bakelite wafers and silver plated switch contacts are used throughout, rigidly assembled to prevent warping. The A.V.C., M.V.C., C.W. switch is a single wafer of the same type construction.

The three gang tuning condenser comprising both main and bandspread units is mounted upon the chassis on shockproof rubber supports.

Coil formers for the oscillator and R.F. circuits are high grade bakelite, grooving being provided for the windings on the high frequency range coils.

I.F. transformers are constructed of litz wire coils and fixed condensers moulded in low loss bakelite, adjustments for tuning being made by iron cores.

All controls operate smoothly and such controls as the R.F. and A.F. Gain and the Tone Controls are so designed to provide a practically linear output control. The beat oscillator control adjusts a small variable air condenser.

A printed location chart is provided with the receiver showing the location of all adjustments, as well as the major components and tube locations.

The receiver is tested and shipped with all tubes in place.

SUMMARY OF TECHNICAL DATA

Superheterodyne circuit.
Sensitivity under 5 microvolts on H.R. Range
Sensitivity under 2 microvolts on all other ranges.
Triple stage intermediate frequency amplifier.
Two stages of R.F. preselection.
Five frequency ranges.
Bandspreading on all frequency ranges.
Radio Frequency Gain control.
Audio Frequency Gain control.
Automatic volume control, amplified and delayed.
Beat Frequency Oscillator for C.W. reception.
Tone control.
Electron Tuning indicator.
Built-in 60 cycle power supply.
Large direct reading dial.
Air trimmer condensers on oscillator circuits.
Adjustable iron cores used on R.F. and I.F. circuits.

Maximum power output 1.5 watts.
Maximum undistorted power output - 1 watt.
Selectivity average - 60 db down for 4 kc off resonance.
Excellent frequency stability.
Better than 4:1 noise ratio on all bands.

CANADIAN MARCONI COMPANY,
February 21, 1940