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1. Select "File – Print" or click on the printer icon. This will bring up the print dialog box.
2. Select the correct printer if necessary.
3. Select the pages you want to print – even if you want to print all of the document, you will probably not want to print this notice and help page, so start the printing at page 3.
4. In the "Page Handling" area, next to "Page Scaling", select "Fit to paper". The press "OK"

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Please get in touch with me at archivist@vmarsmanuals.co.uk.

Richard Hankins, VMARS Archivist, Summer 2004

RECEPTION SET CANADIAN R 103 Mk. I

TECHNICAL DESCRIPTION

GENERAL

1. Reception Set Cdn. R 103 Mk. I is a superheterodyne receiver, designed for use in staff cars for the reception of radio telephone and continuous wave signals. The set covers the frequency range from 1.0 tc 16.0 Mc/s. in three bands. The 6 V. car battery is used to supply the necessary power required to operate the receiver.

BRIEF MECHANICAL DESCRIPTION

2. The entire set is housed in a steel case, shock-mounted on a steel base. The set may be mounted on a flat surface by means of the small mounting brackets, or it may be mounted on a vertical or slanting surface by means of the large angle brackets.

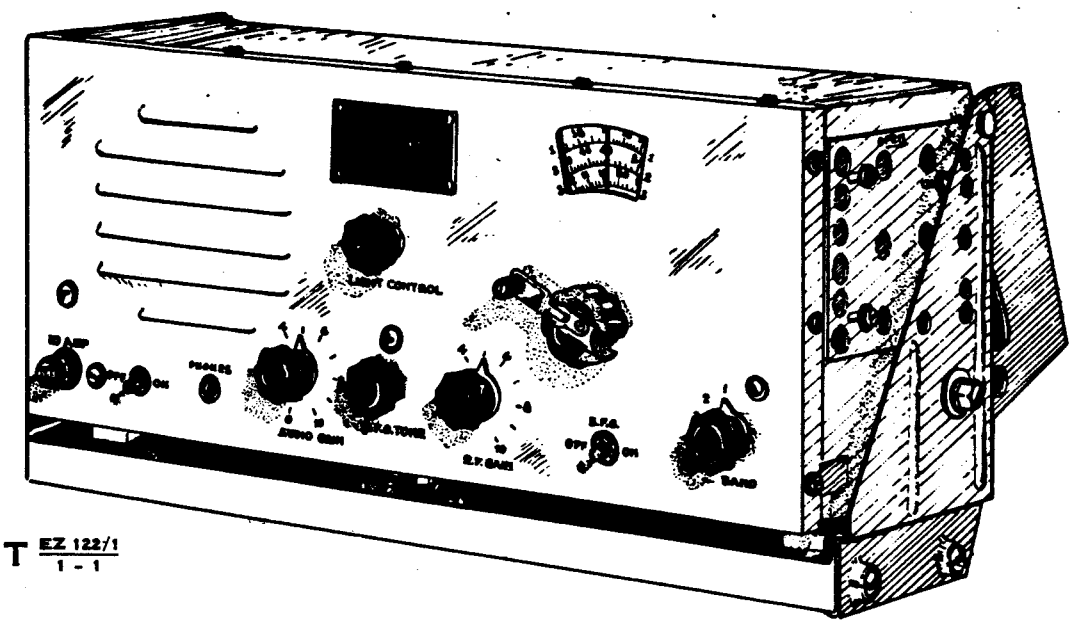

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FIG. 1—RECEPTION SET CDN. R 103 MK. I (FRONT VIEW)

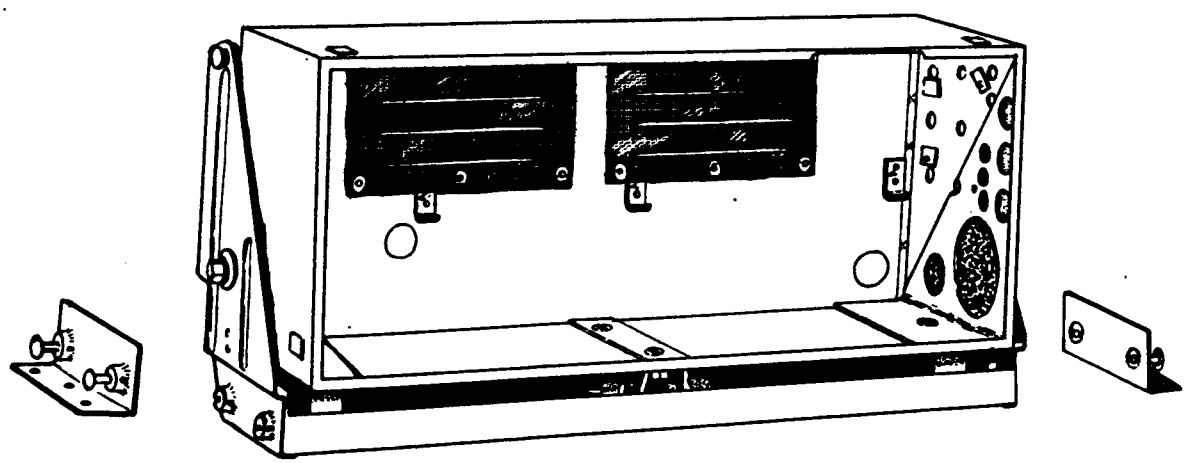

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FIG. 2—STEEL CASE FOR RECEPTION SET CDN. R 103 MK. I

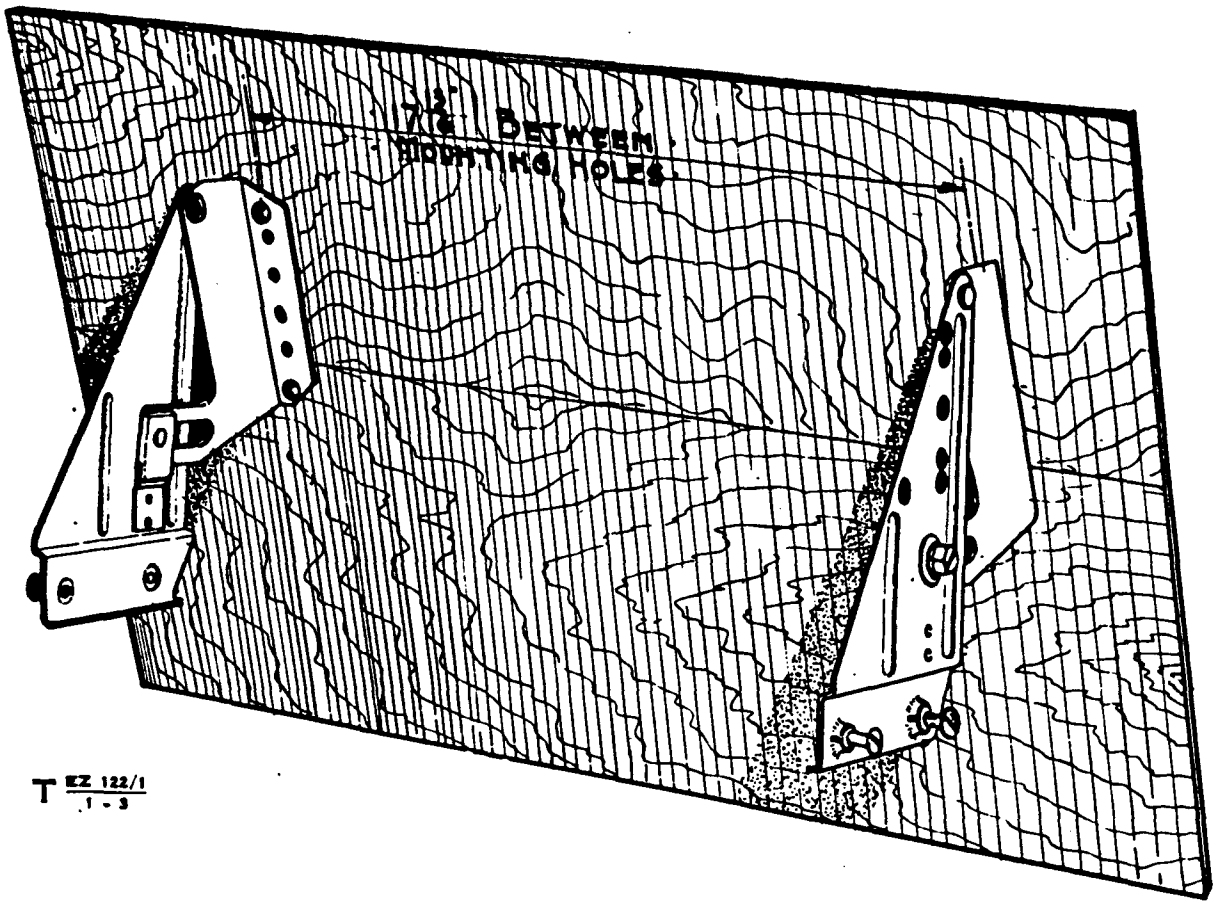

FIG. 3—ANGLE MOUNTING BRACKETS

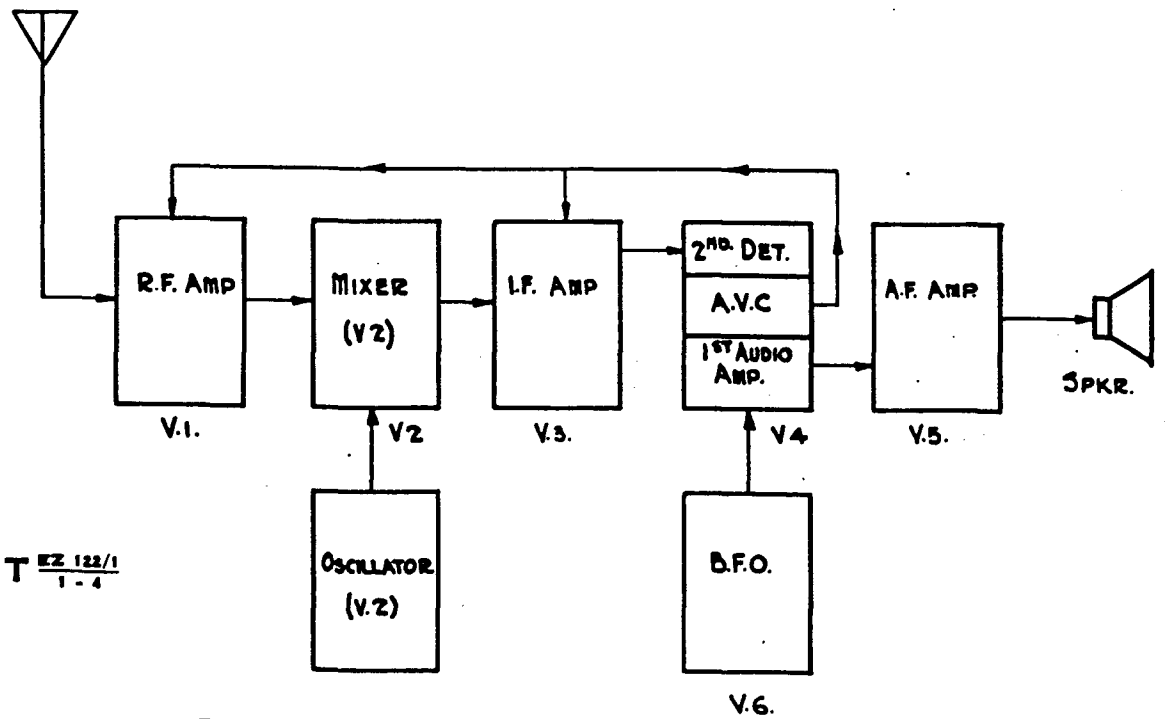

FIG. 4—BLOCK DIAGRAM OF RECEPTION SET CDN. R 103 MK. I

BRIEF ELECTRICAL DESCRIPTION

3. The receiver employs a seven valve superheterodyne circuit, designed to operate from the 6 V. car battery. The circuit consists of one stage of R.F. amplification, a mixer and H. F. oscillator, one stage of I.F. amplification, and a second detector and A.F. amplifier, coupled to a beam power output valve. A specially designed A.V.C. is provided, the bias voltage being series fed to the I.F. stage and shunt fed to the R.F. stage. A beat frequency oscillator is provided for C.W. reception. The permanent magnet dynamic speaker is matched to the output stage by the output transformer.

4. A vibrator, transformer, and full-wave rectifier valve with associated circuit are employed to supply the necessary H.T. voltages.

TABLE 1—CONTROLS AND THEIR FUNCTIONS

Panel Designation	Circuit Reference	Function
OFF-ON	SW2	Opens and closes the 6 V. input circuit.
AUDIO GAIN	R16	Controls the amount of audio fed from the diode rectifier (detector) to the 1st. audio amplifier.
B.F.O. TONE	C32	Varies the frequency of the B.F.O.
R.F. GAIN	R4	Varies the cathode bias on the R.F. and I.F. amplifier valves.
B.F.O. ON-OFF	SW3	Opens or closes the H.T. line to the plate of the B.F.O.
BAND	SW1	Selects the set of coils to be used for the frequency being received.
LIGHT CONTROL	R23	Varies the voltage to the pilot lights, thus varying the intensity.
	C1A C1B C1C	3-gang tuning condenser.

DETAILED ELECTRICAL DESCRIPTION

Aerial Circuit

5. C16 (500 uufd.) and R1 (100,000 ohms) together form an impedance network to match the telescopic rod aerial. R1 also completes the aerial circuit to ground as the coils are floating. The junction of C16 and R1 is connected to SW1, a two-section, three-position, three-bank switch. In the first position, L1 (aerial coil) trimmed by C4 (4 - 40 uufd.) are in the circuit and L2 and L3 (aerial coils for the other two bands) with their respective trimmers, C3 (2 - 20 uufd.) and C2 (4 - 40 uufd.) are shorted out. C17 (1200 uufd.) completes the R.F. circuit to ground for all these coils. The main tuning is accomplished by C1A (440 uufd.) which is the section of the three-gang tuning condenser farthest away from the front panel. From this point the R.F. is coupled to the control grid of V1 by C18 (100 uufd.).

R. F. Amplifier

6. The R.F. amplifier valve, V1 (7H7), is a shielded pentode, the cathode of which is by-passed to ground by C19 (.006 ufd.). Fixed minimum bias is supplied by R3 (150 ohms) while additional variable bias is controlled by R4 (15,000 ohm potentiometer), the R.F. Gain Control. The screen receives its voltage through R5 (50,000 ohms) and is by-passed by C20 (.006 ufd.). The suppressor and shield of V1 are directly grounded. The plate receives its voltage from the H.T. line through R6 (10,000 ohms).

7. The amplified R.F. from the plate of V1 is coupled through C22 (500 uufd.) to the primary winding of L4 when SW1 is in the first position. The secondary of L4 is trimmed by C5 (4 - 40 uufd.) and the whole coil circuit is completed to ground by C23 (1200 uufd.). The second section of SW1 shorts out the other two coils, L5 and L6 and their respective trimmers,

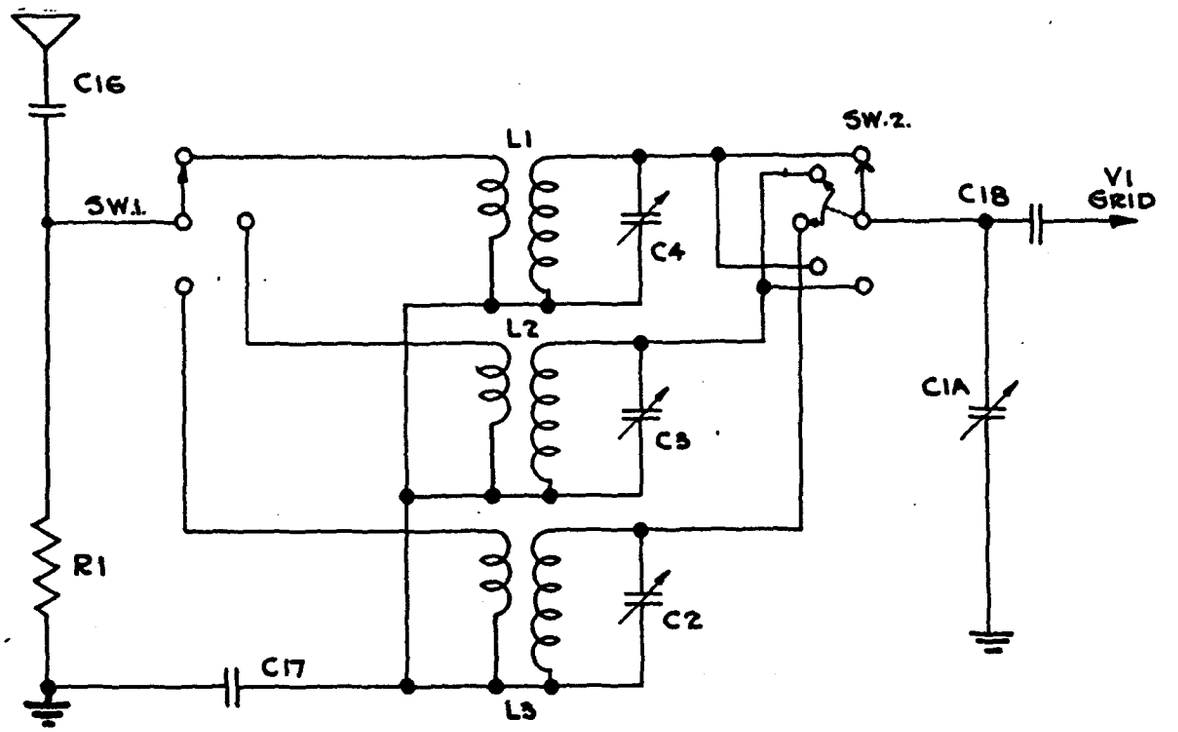

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FIG. 5—BAND SWITCHING ARRANGEMENT

C6 (2 - 20 uufd.) and C7 (4 - 40 uufd.) while L4 is in use. The whole circuit is tuned by C1B (440 uufd.), the second section of the three-gang tuning condenser. The amplified R.F. is coupled to the signal grid of V2, the mixing valve,

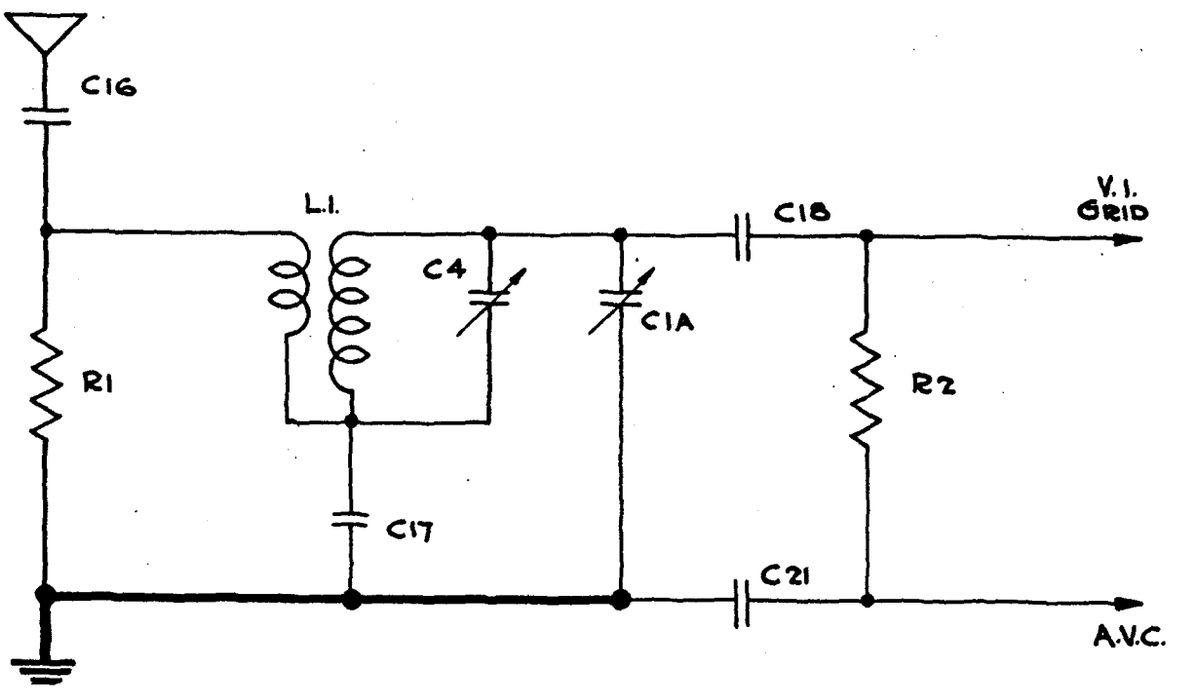

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FIG. 6—SIMPLIFIED R.F. CIRCUIT

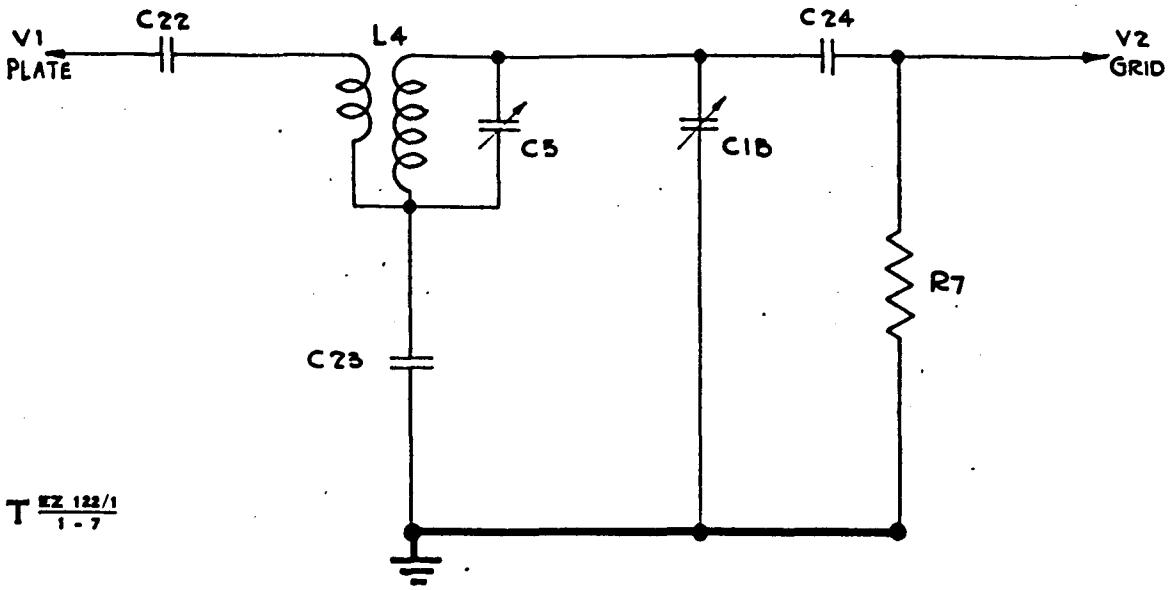

FIG. 7—SIMPLIFIED DIAGRAM OF R.F. OUTPUT CIRCUIT

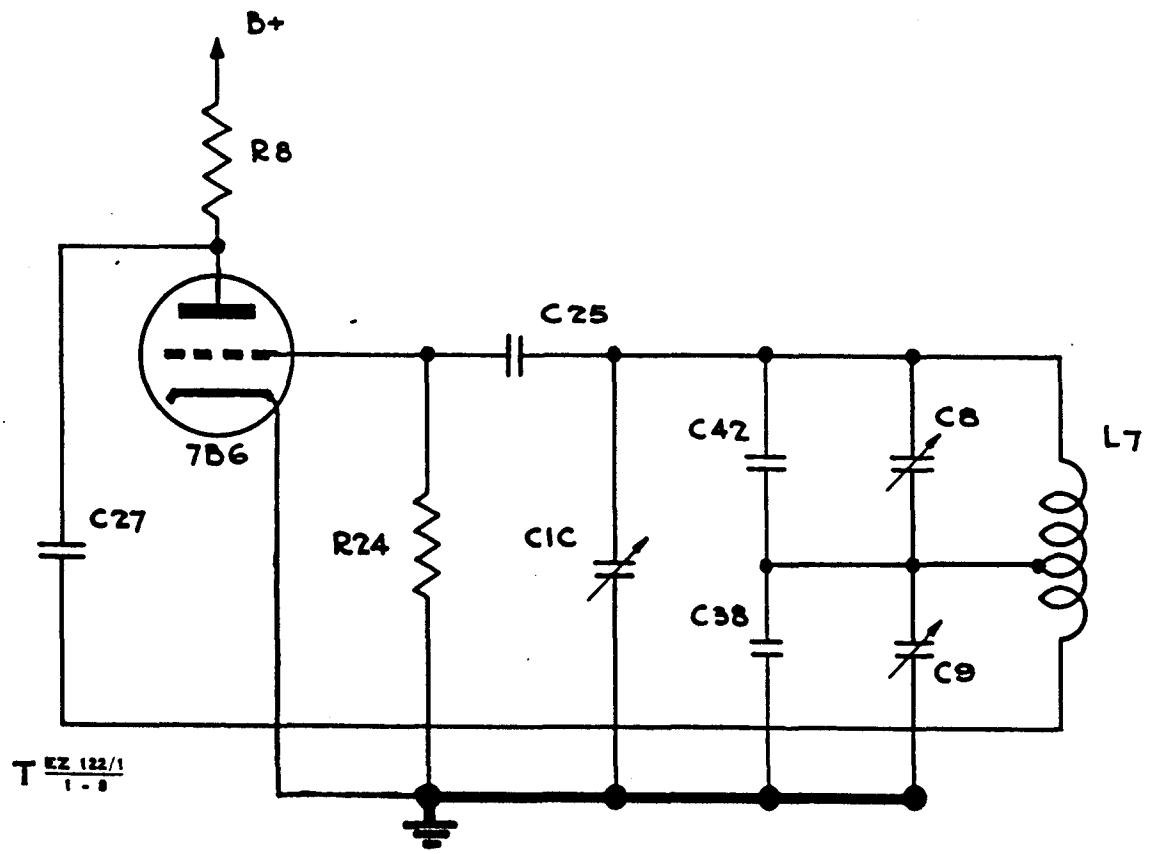

FIG. 8—SIMPLIFIED OSCILLATOR CIRCUIT

by C24 (100 uufd.). The signal grid circuit is completed to ground by R7 (500,000 ohms).

Local Oscillator

8. The local oscillator circuit is a type of Hartley Oscillator. The tuned grid section

is composed of part of L7 trimmed by C8 (2 - 20 uufd.) which is parallelled by C42 (15 uufd.), a temperature compensator. This circuit is coupled to the oscillator grid of V2 through D.C. blocking condenser, C25 (100 uufd.). The grid circuit is completed to ground by R24 (25,000 ohms), the grid leak resistor. The other part of L7 is the plate section and is coupled to the plate of V2 through C27 (500 uufd.). C9 (335 - 550 uufd.) is a padder, and C38 (50 uufd.) is a temperature compensator. The oscillator circuit is tuned by C1C (440 uufd.), the section of the three-gang tuning condenser nearest the front panel.

9. There are three of these oscillator circuits, one for each band. The circuit for band No. 2 is composed of L8; C10 (2 - 20 uufd.), the trimmer condenser; padder, C13 (335 - 550 uufd.); fixed padder, C15 250 uufd.); and temperature compensator, C43 (300 uufd.). Across all these aforementioned trimmers and padders, except the high end of Band No. 2, it was found necessary to put a compensating capacity. These trimmers and padders have more than two plates and therefore temperature change has a very definite effect on their capacity.

10. The mixer-oscillator valve, V2, is a type 7S7. The oscillator plate receives its voltage through R8 (25,000 ohms) and R12 (150 ohms). The screen is by-passed to ground by C26 (.006 ufd.) and is connected to the screen of V3. The cathode is directly grounded. The plate of the mixer section receives its voltage through the primary of T1 and R12. There are four main frequencies present in V2; the incoming signal frequency, the oscillator frequency and the sum and difference of these two frequencies. The I.F. stage being tuned to the difference frequency, it is this frequency that is taken from the plate of the mixer and directly fed to the primary winding of T1, the input I.F. transformer. The primary is fixed-tuned by C35 (85 uufd.) and is adjusted by a variable slug. The output of T1 is taken from the secondary winding, which is also permeability-tuned and fixed-tuned by C37 (85 uufd.), and fed to the control grid of V3.

I.F. Amplifier

11. V3 (7A7) is the I.F. amplifier. The cathode is by-passed to ground by C39 (.006 ufd.) and fixed minimum bias is maintained by R9 (150 ohms) while extra variable bias is controlled by R4, the R.F. gain control. In the cathode circuit is connected a very small winding which is coupled to the secondary of T1. This produces degeneration which compensates for differences in gain between 7A7 valves. The screen of V3 is by-passed to ground by C40 (.1 ufd.) and voltage is supplied to the screens of V3 and V2 through R10 (10,000 ohms) and R12. C28 (.006 ufd.) at this point is an H.T. line by-pass condenser. The suppressor and shield of the valve are grounded. The amplified I.F. is taken from the plate and fed to the primary winding of T2. This winding is fixed-tuned by C41 (85 uufd.), and permeability-tuned by a slug adjustment. The bottom end of the winding is connected to the H.T. line to supply voltage to the plate of V3. The I.F. induced in the secondary winding of T2 is fed to the diode plates of V4. The secondary winding of T2 is also permeability-tuned and fixed-tuned by C44 (85 uufd.).

2nd Detector

12. V4 (7B6) is the 2nd detector, A.V.C. and 1st audio amplifier valve. The cathode is directly grounded. The two diode plates are connected together and rectification takes place from diode plates to cathode. The audio signal is taken from the bottom of the secondary of T2. This audio voltage is filtered by C45 (250 uufd.) which filters the R.F. out of the audio line and R15 (25,000 ohms). The audio gain control, R16 (500,000 ohms) is connected between R15 and ground, and the amount of audio voltage required is taken from R16 and coupled to the grid of V4 by C48 (.006 ufd.).

A.V.C.

13. A.V.C. voltage is taken from the secondary of T2 and fed to the control grid of V3 through the secondary of T1, and to the control grid of V1 through R2 (1 meg.). R11 (1 meg.) and C21 (.006 ufd.) provide the necessary time constant.

1st Audio Amplifier

14. The filtered audio voltage is fed to the control grid of V4. Completing the grid circuit to ground is R17 (15 meg.). Amplification takes place from grid to plate and the audio signal is taken from the plate to the 2nd audio amplifier. C46 (100 uufd.) acts as an R.F. filter. The plate receives its voltage through the plate load resistor, R18 (500,000 ohms.)

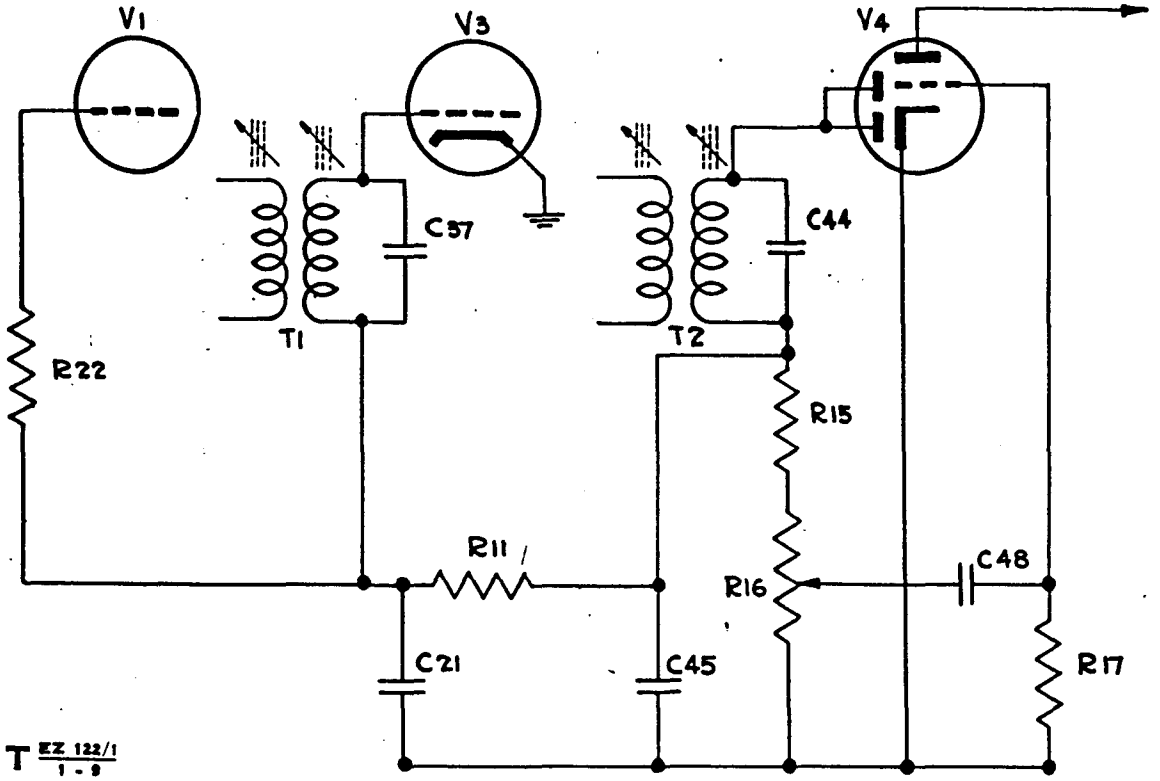

FIG. 9—SIMPLIFIED DIAGRAM OF A.V.C. AND AUDIO CIRCUITS

A.F. Output Stage

15. The audio signal voltage from the plate load of V4 is coupled to the control grid of V5 through C47 (.006 ufd.). Cathode bias is maintained by R20 (300 ohms). The grid circuit is completed to ground by R19 (500,000 ohms). C47 is of a low value (.006 ufd.) and R20 (300 ohms) is not by-passed in order to give the circuit broader frequency response. V5 (7C5) is a beam power amplifier. The screen is connected directly to the H.T. line, and the H.T. line is by-passed to ground at this point by C49 (4 .ufd.). The beam plates are connected internally to the cathode. The amplified audio signal is now taken from the plate and fed through a shielded lead, directly to the primary of T3, the audio output and speaker transformer. The plate of V5 receives its voltage through the primary of T3 from the rectifier valve.

16. The impedance of the output stage is 5500 ohms and the transformer is designed to match the speaker to this impedance. The primary winding is composed of 2926 turns and the secondary, 77 turns. One side of the secondary is grounded. The phone jack is connected between the high potential end of the secondary and ground. Low resistance headphones are used and when connected in the circuit, the mis-match caused by this extra resistance is just enough to give comfortable volume level. It is for this reason that the speaker is not switched out of the circuit when the headphones are used.

Beat Frequency Oscillator

17. The B.F.O., V6, employs a 7B6 type valve in a Colpitts circuit. One of the diode plates is connected to the cathode which is directly grounded. The filament is heated continuously with the receiver. The oscillator coil, L10, is connected to the grid, the other end being grounded through R14 (50,000 ohms), the grid leak. C34 (4 - 40 uufd.) is the zero beat adjustment which tunes the B.F.O. circuit in conjunction with C33 (50 uufd.). Feedback coupling from the plate is accomplished by C31 (250 uufd.). A pitch control is provided by C32 (5 -15 uufd.) and C30 (20 uufd.) is a temperature compensating condenser. Plate voltage is supplied through R13 (1. meg.), the plate load resistor. Plate voltage is turned on and off by means of the B.F.O. OFF-ON switch, SW3. C29 (.1 ufd.) is an R.F. by-pass.

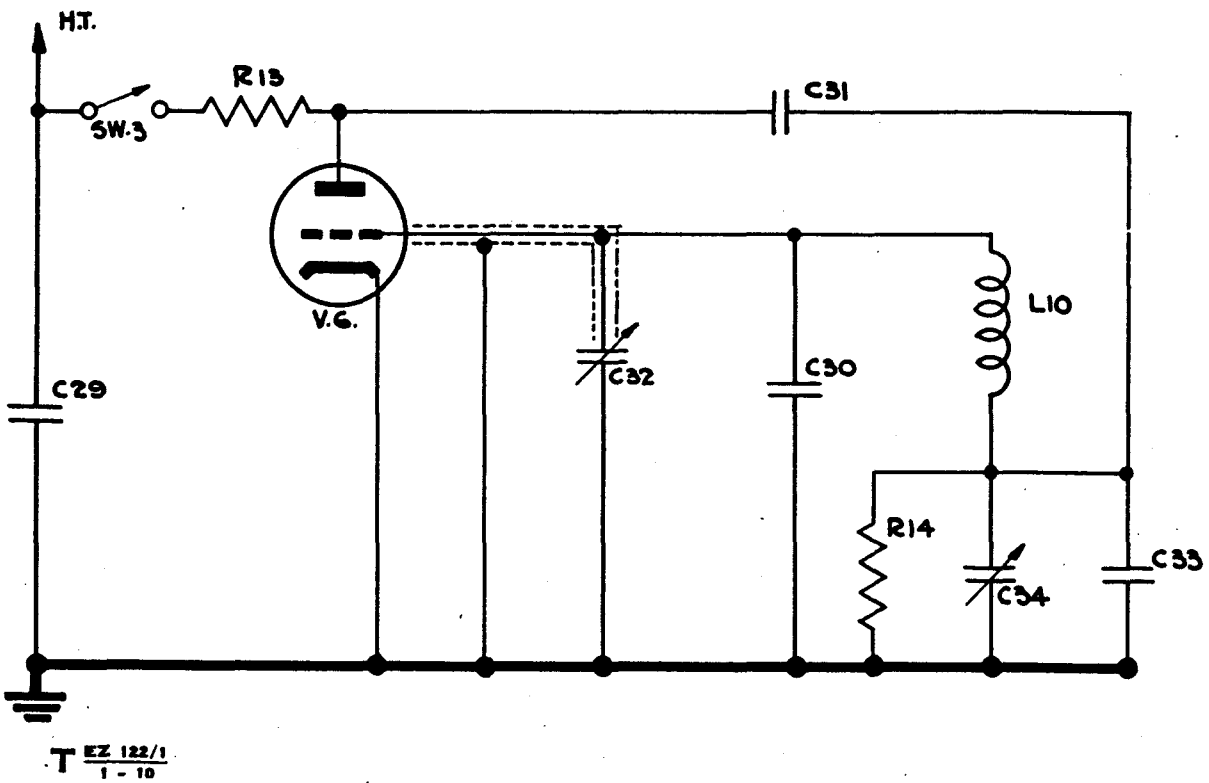

FIG. 10—SIMPLIFIED DIAGRAM OF B.F.O.

Filament Circuit

18. The filaments are connected in parallel with the one side of all filaments being grounded. They receive their voltage from the 6 V., D.C. source through chokes, CH3 and CH4, and the 10 amp. fuse, F1.

Pilot Light Circuit

19. The two pilot lights, V8 and V9 (6.3 V.) are connected in parallel with one side grounded. The voltage is supplied, as in the case of the filament circuit, from CH4 through R23 (25 ohms), an intensity control. The dial is coloured to minimize the effect of glare on the operator's eyes in night manoeuvres.

Power Supply

20. When the ON-OFF switch, SW2, is switched to ON, 6 V., D.C. from the battery is fed through F1 and CH3, and through a filter network composed of CH2, C52 (.5 ufd.) and C53 (.5 ufd.) to the centre tap of the primary of transformer, T4. The two ends of the primary winding are connected to the vibrator through suppressor resistors, R21 and R22 (150 ohms each). The vibrator action produces an A.C. voltage in the secondary of T4, and since T4 is a step-up transformer, this induced voltage is approximately 225 V. C51 (.006 ufd.) across the secondary of T4 acts as a timing capacity. The A.C. in the secondary is fed to the two plates of V7 (7Y4), a full-wave rectifier. Rectifying action takes place from plates to cathode and the rectified H.T. is taken from the cathode and filtered by C50 (4. ufd.) and the filter choke, CH1. The H.T. measured at the output side of CH1 is approximately 210 V.

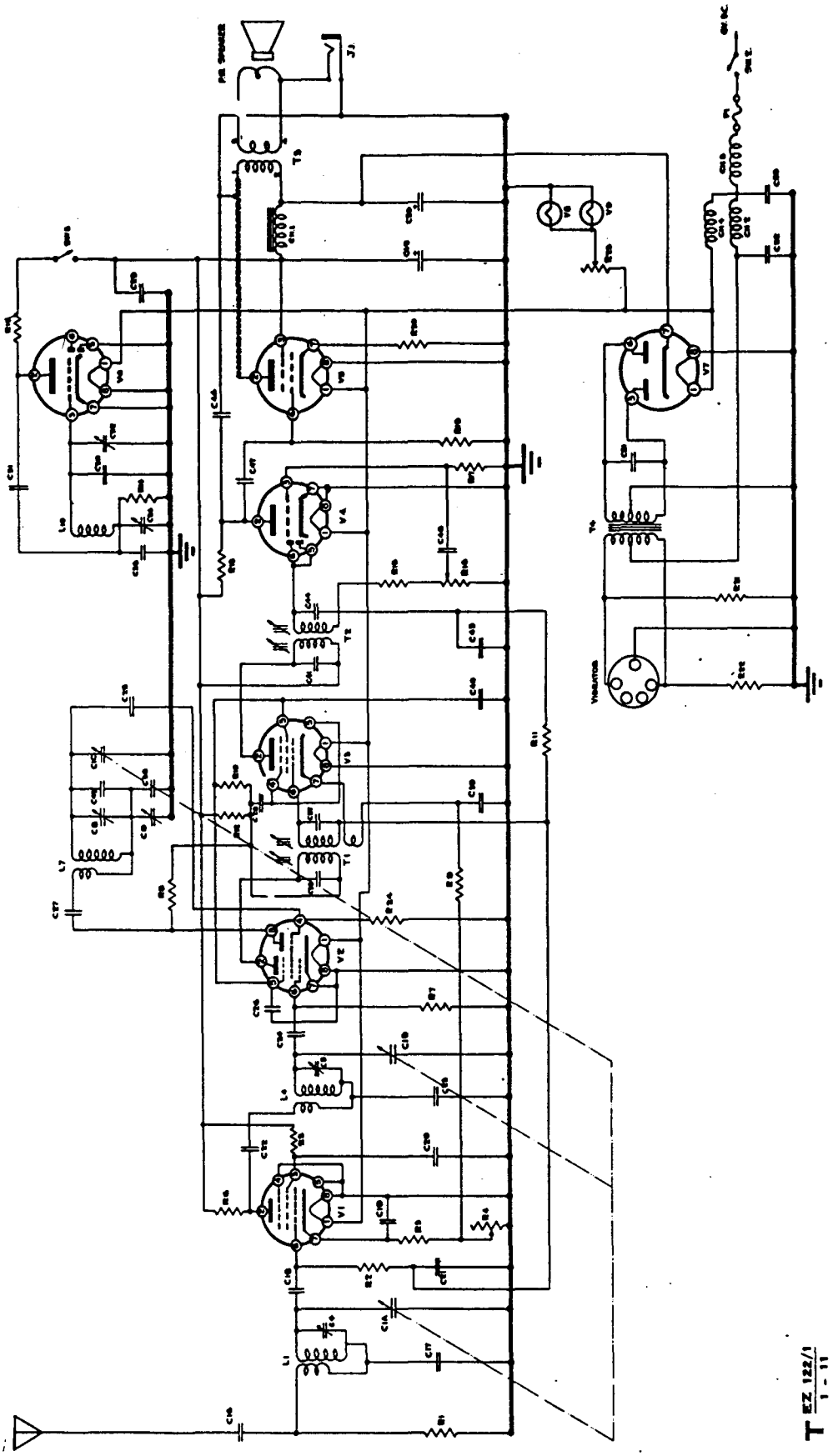

FIG. 11—SIMPLIFIED DIAGRAM OF RECEPTION SET CDN. R 103 MK. I