ADAPTOR, FREQUENCY RANGE, No. 1

GENERAL DESCRIPTION

General

1. The Adaptor, frequency range, No. 1 is a high-grade two-valve frequency converter designed for the reception of signals within the frequency limits of 50 kc/s and 600 kc/s, and for the conversion of such signals to a constant frequency of 700 kc/s. The 700 kc s signals are then fed to a radio receiver for normal amplification and detection. The adaptor is designed primarily for use in conjunction with Reception set R 206, Mks. I and II, and its associated Power supply unit No. 15.

2. The frequency range is covered in three bands by means of a three-position switch located on the front panel. The individual range coverages are as follows:—

Range 7 600 kc/s to 260 kc/s.
„ 8 260 kc/s to 115 kc/s.
„ 9 115 kc/s to 50 kc/s.

These range numbers are continued from the six frequency ranges of the R 206 receiver.

Brief electrical description (Fig. 1001)

3. The circuit of the adaptor consists of a pentode R.F. amplifier followed by a triode-hexode frequency changer. The anode circuit of the frequency changer comprises a band-pass circuit tuned to 700 kc s, inductively coupled to an output socket.

4. The equipment requires an H.T. supply of 200 V D.C at 15 mA and an L.T. supply of 12 V A.C. or D.C. These may be obtained from the Power supply unit No. 15, which is used in conjunction with Reception set R 206.

Brief mechanical description (Fig. 1002)

5. The various components of the adaptor are mounted about a single metal chassis which incorporates a base plate and a front panel. The chassis is contained completely inside a metal case, from which it may be removed by slackening off two securing bolts at the back of the case and withdrawing the chassis by means of the handle on the front panel.

6. A protective metal cover fits over the front panel when the equipment is not in use. This cover may, for convenience, be fitted and secured at the back of the equipment when it is in use and access to the front panel is required.

7. Two rubber-covered connectors are supplied :—

(*a*) *Connector, coaxial, No. 2.* This is a short length of concentric cable with concentric plugs at both ends ; it is used to connect the output from the adaptor to the input socket of the Reception set R 206.

(*b*) *Connector, 4-pt., No. 9C.* This is a 4-cored cable having corresponding 4-point sockets at both ends ; it is used for connecting the Power supply unit No. 15 to the adaptor.

Controls

8. The controls are :—

(*a*) Main 3-gang tuning condenser (C 3A, C 3B, C 3C)	Selects frequency.
(*b*) RANGE selector switch S 1A...	Selects frequency range.
(*c*) AE TRIMMER condenser C 11A	Trimming condenser for aerial circuit.
(*d*) R.F. GAIN, adjustable resistance R 4A	Cathode bias control for both valves.
(*e*) ON/OFF switch S 2A	Breaks H.T. and L.T. supplies to valves.

TECHNICAL DESCRIPTION (Fig. 1001)

9. A wave-trap circuit L 12A, C 5E and C 8S is connected across the input circuit. It is tuned to 700 kc/s, the output frequency of the adaptor, and is included to eliminate break-through at this frequency.

10. The range switch S 1A is of the 10-pole 3-way type. It is operated by a lever (RANGE) on the front panel of the adaptor. The three positions of the switch are marked 7, 8 and 9, and they correspond respectively to the three calibrated scales on the tuning condenser dial. This switch performs the following functions :—

(*a*) Sections S 1A/1, /2, /4, /5, /7, /9 and /10 select the appropriate coils for the frequency band required.

(*b*) Sections S 1A/3, /6 and /8 short to earth the coils for the frequency bands lower than the one in use, to prevent unwanted resonance effects.

11. Overall tuning through the wavebands is accomplished by means of a 3-gang adjustable condenser C 3A, C 3B, C 3C, of which section C 3A tunes the input to V 1A, section C 3B tunes the signal input to V 2A and section C 3C tunes the local oscillator frequency. A trimming condenser C 11A (AE TRIMMER) is connected across the section C 3A of the gang condenser which tunes the grid circuit of V 1A. To the condenser spindle is attached a cursor which travels over three concentric semi-circular scales numbered 7, 8 and 9 to correspond with the three positions of the range switch. These scales are calibrated directly in kilocycles. A logging scale, reading 0 to 180 degrees in a clockwise direction, is printed round the inside of the main scale.

12. The R.F. tuned circuits are provided with both inductance (iron dust core) and capacity trimmers for alignment purposes. The oscillator circuits have, in addition, adjustable padding condensers consisting of small trimmers in parallel with fixed condensers.

13. The R.F. signal is fed from the coaxial input socket AE through the appropriate section of the aerial tuning system to the grid of the R.F. amplifying pentode valve V 1A. The cathode bias for this valve is obtained by means of the resistance R 5A in series with the adjustable resistance R 4A (R.F. GAIN). High-tension voltages are supplied to the anode and to the screen of V 1A through resistances R 3A and R 2A respectively.

14. The amplified R.F. output from the anode of V 1A is fed through the corresponding R.F. transformer to the signal grid of the hexode portion of the frequency changer valve V 2A. The cathode bias for this valve is obtained by means of the resistance R 6A, which is connected in series with the common adjustable resistance R 4A. Thus, the adjustment of this resistance (R.F. GAIN) controls the bias on both valves simultaneously. High-tension voltages are supplied to the hexode anode, the screens, and to the triode anode of this valve through resistances R 3B, R 2B and R 2C respectively. The triode section of the valve acts as a tuned grid reaction oscillator in conjunction with the appropriate coils.

15. The amplified signal-frequency oscillations and the locally generated oscillations are mixed within the valve V 2A, and the constant difference-frequency oscillations of 700 kc/s are taken from the anode of this valve and fed to the coupled pre-set tuned circuits L 10A, C 5A, C 8N and L 10B, C 5B and C 8P which are resonant at 700 kc/s. The output from these tuned circuits is passed through the resistance R 1A to another and similar pair of tuned circuits L 10C, C 5C, C 8Q and L 11A, C 5D, C 8R also resonant at 700 kc/s.

16. The final 700 kc/s output is taken from L 11A by means of a coupling coil L 11B which is connected to the coaxial output socket (OUTPUT). As previously mentioned, this output may be fed to any reception set which is tuneable to 700 kc/s (such as the type R 206) for normal amplification and detection.

Power input circuits

17. The adaptor requires an input power supply of 200 V H.T. (D.C.) and 12 V L.T. (A.C. or D.C.). When the adaptor is used in conjunction with the Reception set R 206, Mk. I or Mk. II, this power supply is taken from the Power supply unit No. 15. The power supply to the adaptor is fed in through a 4-point plug located at the rear of the equipment, and it is controlled by the ON/OFF switch at the bottom of the front panel. This switch breaks one lead in the H.T. supply (S 2A/1) and one lead in the L.T. supply (S 2A/2). The heaters of V 1A (6.3V, 0.2A) and V 2A (6.3V, 0.3A) are connected in series across the 12 V supply, and R 8A and R 9A in parallel are connected across V 1A to give the correct current distribution.

Circuit Ref.	*Value*	*Remarks*
	CONDENSERS	
C 1A-C 1G	0.1 μF	$\pm$ 20% 350V
C 2A, C 2B	0.01 μF	$\pm$ 20% 350V
C 3A/B/C	12-450 pF	3-gang tuning
C 4A	200 pF	$\pm$ 5% mica
C 5A-C 5B	150 pF	$\pm$ 10% mica
C 6A	100 pF	$\pm$ 5% mica
C 7A-C 7C	50 pF	$\pm$ 10% mica
C 8A-C 8S	3.8-50 pF	Trimmer
C 9A	30 pF	$\pm$ 10%
C 10A	20 pF	$\pm$ 10%
C 11A	4-15 pF	AE trimmer
	RESISTANCES	
R 1A	220,000 Ω	$\pm$20% $\frac{1}{4}$ watt
R 2A-R 2D	47,000 Ω	$\pm$20% $\frac{1}{2}$ watt
R 3A, R 3B	2,200 Ω	$\pm$20% $\frac{1}{2}$ watt
R 4A	5,000 Ω	Pot., linear law
R 5A	560 Ω	$\pm$10% $\frac{1}{2}$ watt
R 6A	390 Ω	$\pm$10% $\frac{1}{2}$ watt
R 7A	330 Ω	$\pm$20% $\frac{1}{4}$ watt
R 8A	150 Ω	$\pm$10% $\frac{1}{2}$ watt
R 9A	120 Ω	$\pm$10% $\frac{1}{2}$ watt
R 10A	10 Ω	$\pm$20% $\frac{1}{4}$ watt
	LAMPS	
P 1A	6 V .06 A	
P 1B	6 V .06 A	

Circuit Ref.	*Value*	*Remarks*
	INDUCTANCES	
L 1A	50-115 kc/s	Aerial coils
L 2A	115-260 kc/s	
L 3A	260-600 kc/s	
L 1B	50-115 kc/s	R.F. grid coils
L 2B	115-260 kc/s	
L 3B	260-600 kc/s	
L 4A	50-115 kc/s	Anode coils (V 1A)
L 5A	115-260 kc/s	
L 6A	260-600 kc/s	
L 4B	50-115 kc/s	Grid coils (V 2A)
L 5B	115-260 kc/s	
L 6B	260-600 kc/s	
L 7A	50-115 kc/s	Osc. grid coils (V 2A)
L 8A	115-260 kc/s	
L 9A	260-600 kc/s	
L 7B	50-115 kc/s	Osc. anode coils (V 2A)
L 8B	115-260 kc/s	
L 9B	260-600 kc/s	
L 10A-L 10C	700 kc/s	Output filter
L 11A	700 kc/s	Output filter
L 11B	700 kc/s	Output coil
L 12A	700 kc/s	Wave trap coil
	SWITCHES	
S 1A	10-pole 3-way	RANGE switch
S 2A	2-pole 1-way	ON/OFF switch
	VALVES	
V 1A	ARP 34	R.F. pentode
V 2A	ARTH 2	Triode-hexode

Table 1001—Details of components (Fig. 1001)

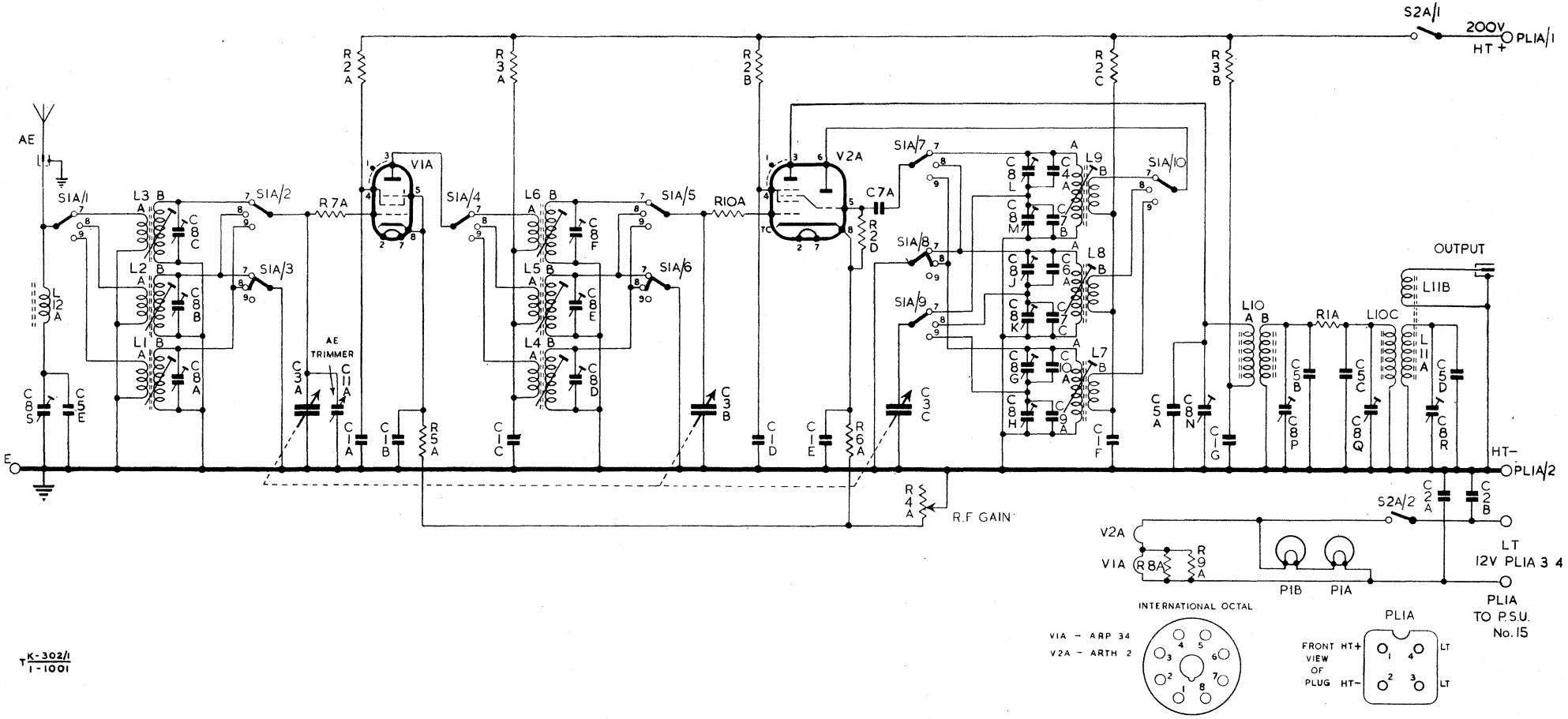

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Fig. 1001—Circuit diagram of Adaptor, frequency range, No. 1

S 1A/1-10—Frequency range switch
Range 7—260-600 kc/s
„ 8—115-260 kc/s
„ 9—50-115 kc/s
S 2A/1-2—Off/on switch
C 3A-C—Tuning control

DWG, No. ME 10/W—CL/1 Ed. 1

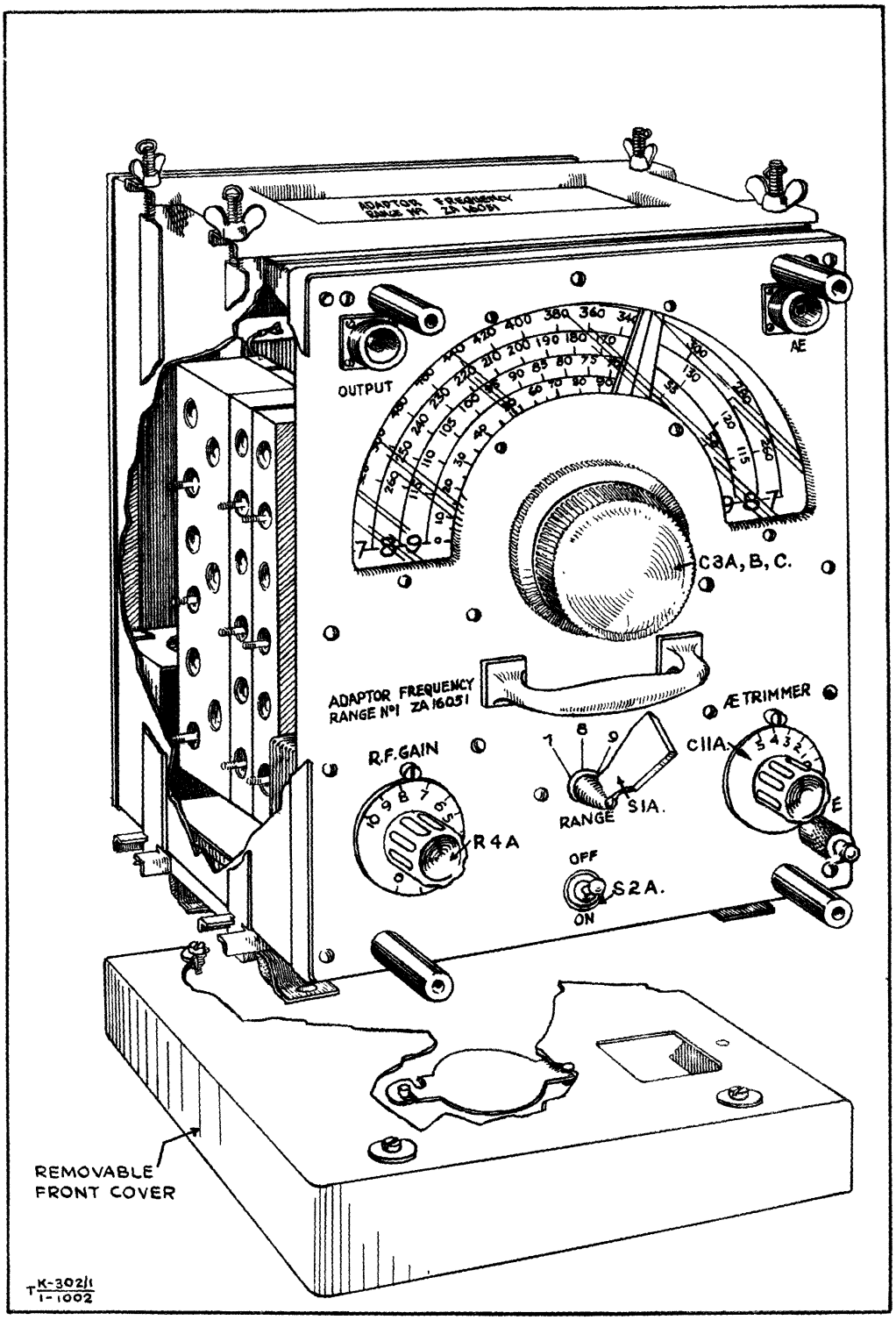

Fig. 1002—Front view of equipment

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