

PORTABLE OSCILLATOR PTS/12

Introduction

The PTS/12 is a high-grade resistance-capacitance oscillator designed for lines testing. It operates on 190/250-volt a.c. mains, but is otherwise an improved and portable version of the rack-mounted TS/9. The frequency is variable continuously from 20 c/s to 20 kc/s in four ranges, and the output level can be set to any value between +20 db and -50 db. To facilitate the testing of transmission circuits incorporating narrow-band filters, a series of small frequency increments and decrements can be introduced, graduated according to the frequency range. The instrument has a balanced output with a source impedance of 600 ohms.

The frequency of oscillation is controlled in each range by varying ganged capacitive elements of the Wien bridge, and the range is selected by switching resistive elements. (The lowest range is an exception to this, and is obtained by adding shunt capacitance and making any necessary alteration of padding resistance.) The four frequency ranges are:

- (1) 20 c/s to 40 c/s,
- (2) 40 c/s to 400 c/s,
- (3) 400 c/s to 4 kc/s,
- (4) 4 kc/s to 20 kc/s.

Range (4) extends nominally to 40 kc/s, but is satisfactory only up to about 20 kc/s. The small frequency increments and decrements, the values

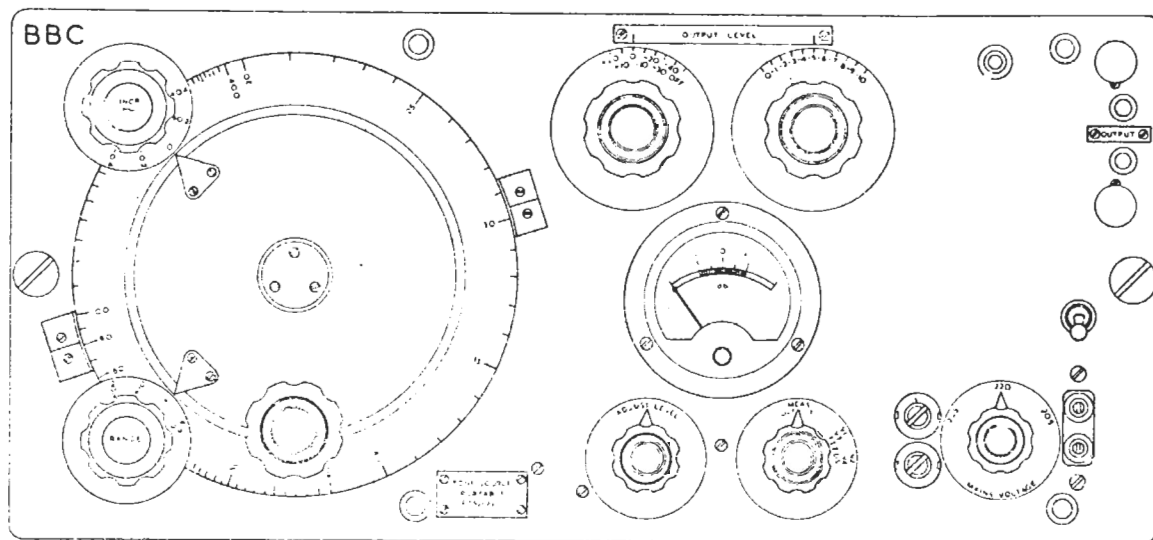


Fig. 9.5 Oscillator PTS/12 : Face-plate
Drawing No. EK 7245

The face-plate of the oscillator, with the various controls, is shown in Fig. 9.5. A simplified circuit diagram is given in Fig. 9.6. The essential features are (a) a two-stage oscillator section, embodying a resistance-capacitance network of the Wien-bridge type, which has zero phase-shift at the oscillatory frequency and incorporates resistance-lamp amplitude stabilisation, and (b) a two-stage amplifier with transformer output followed by balanced attenuators.

of which are constant within each range, are obtained by additive and subtractive switching of capacitors in series with the ganged capacitors. The frequency settings of the *Increment* switch are:

Range	Frequency Deviations (c/s)	
	(1) and (2)	± 0.2
(3)	± 2	± 4
(4)	± 20	± 40

Instruction S.4
Section 9

Of the two output-level attenuators, one has a range of 60 db in 10 db steps, and the other a range of 10 db in 1-db steps. Finer adjustments can be made using a continuously-variable *Adjust Level* control, placed between the oscillator section and the amplifier, in conjunction with a centre-zero output meter, calibrated in 0.1 db steps from -1 db to +1 db.

ever explanation is adopted, however, it will be clear that the actual behaviour of the circuit is the same. The mechanism of frequency control and amplitude stabilisation is examined in somewhat greater detail in Appendix A, page A.1.

The PTS/12, apart from its portable nature, differs from the TS/9 by possessing the following additional features:

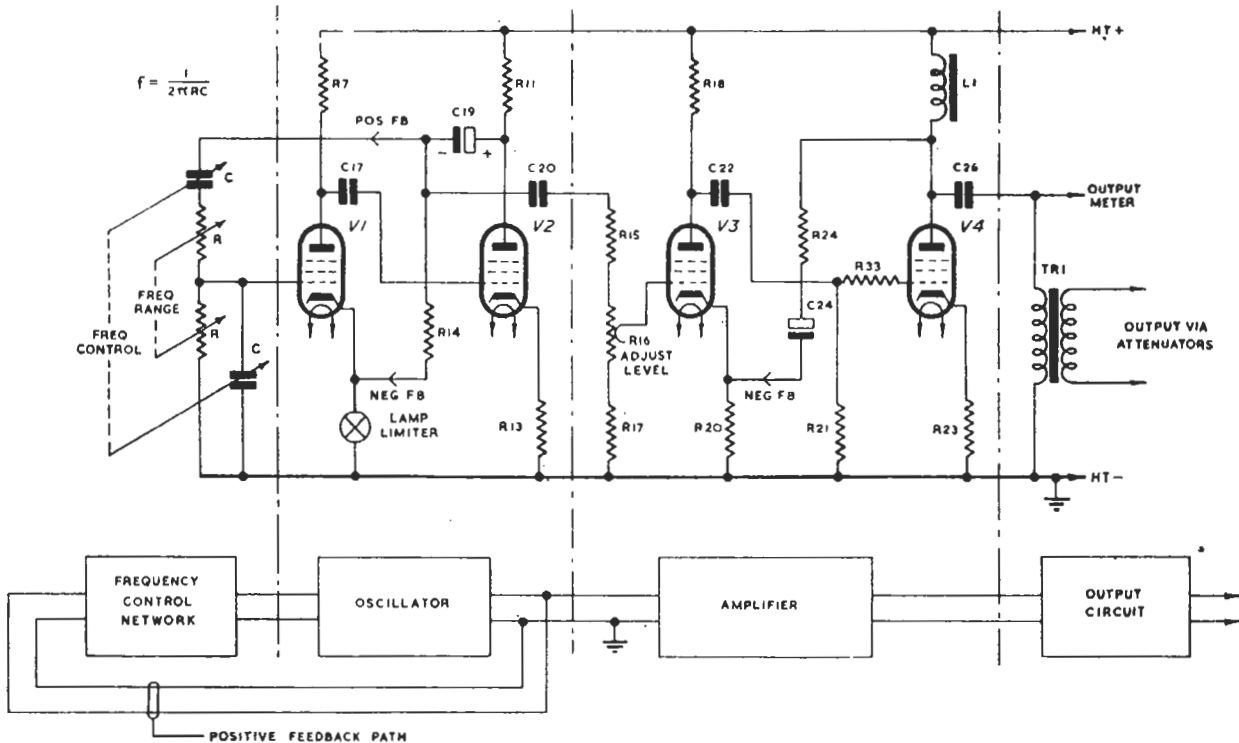


Fig. 9.6. Oscillator PTS/12 : Simplified Circuit

Electrical Design (Fig. 21)

General

The circuit of the oscillator is shown in Fig. 21. Electrically, the PTS/12 is virtually the same design as the rack-mounted TS/9; this latter instrument is fully described in Section 8 to which reference should be made. The frequency-determining and amplitude-stabilising networks are of a type now widely used, and their methods of functioning, considered as separate entities, are explained in Section 8. Together, the two networks constitute a Wien bridge, and their operation on this basis is explained on page 9.5, with reference to another similar oscillator, the PTS/10. Which-

- (i) Extended frequency coverage down to 20 c/s,
- (ii) Frequency-increment switching,
- (iii) A built-in mains unit.

Extended Frequency Coverage

The extension of the frequency coverage by the provision of a 20-c/s to 40-c/s range is accomplished by means of the 900-pF capacitors C37 and C38. These are switched in shunt across the main tuning capacitors C1A and C1B, thus nearly doubling the maximum available capacitance in each variable arm of the Wien bridge, and halving the minimum frequency of 40 c/s obtainable on the next lowest

range. The frequency-range switch also selects appropriate padding resistors R1C and R4C.

The frequency selected is read off on a dial attached to the ganged capacitors C1A and C1B (see *Note* on Fig. 21), a slow-motion drive being provided for accuracy in setting. The frequency dial is engraved with two separate scales, each occupying a little less than 180 degrees, and provided with separate gauge-marks situated on opposite sides of the dial. One scale is calibrated from 20 to 40 c/s and refers to range (1) while the other, calibrated from 40 to 400 c/s, is common to the remaining three ranges; this latter scale is direct-reading on range (2), but the appropriate multiplying factor of 10 or 100 must be introduced for range (3) or (4).

Frequency-increment Switching

The full details of the frequency-increment switching arrangement appear in Appendix A, and no explanation need therefore be given here.

Mains Unit

The built-in mains unit is of a conventional type. The primary of the mains transformer is tapped for an incoming supply of 205, 220 or 235 volts; the lowest tapping can be used with a supply as low as 190 volts, and the highest tapping with a supply as high as 250 volts, without affecting the normal functioning of the oscillator.

Mechanical Design

The instrument is contained in a standard duralumin box, measuring 19½ in. by 9 in. by 9½ in. All the controls, together with the output terminals and two output jacks, are mounted on the face-plate, which is protected by a detachable hinged cover. A canvas carrying case is provided. The weight of the oscillator is 31 lb.

Valve Data

<i>Valve</i>	<i>Heater Volts</i>	<i>Heater Amps</i>
Stage 1 EF50	6.3	0.3
Stage 2 EF55	6.3	0.95
Stage 3 EF50	6.3	0.3
Stage 4 EF55	6.3	0.3
Rectifier UU6	4.0	1.4

Power Supply

190 to 250 volts, 50 c/s a.c.

General Data

Frequency Ranges and Increment Settings

See page 9.11.

Output Level

−50 db to + 20 db.

Output Impedance

600 Ω, resistive.

Test Data

Output-level/Frequency Characteristic

With respect to level at 1 kc/s.

50 c/s to 15 kc/s, ±0.1 db.

20 c/s to 20 kc/s, ±0.2 db.

Accuracy of Frequency Setting

Accuracy 20 minutes after switching on.

Within ± 1 %.

Accuracy of Output-level Setting

From + 20 db to − 10 db, ± 0.1 db.

Below − 10 db, depends on precautions taken against longitudinal currents. (See note below.)

Longitudinal Output Voltage

At output-transformer secondary.

Of the order of 0.1 volt from 0.005 μF.

NOTE :—The transverse component of this voltage appearing across a reasonably well-balanced load is negligible at output levels down to − 10 db. At low output levels, particularly at higher frequencies, a further guard such as a screened repeating-coil must be used if good accuracy is required.

Separation of Total Harmonic Content from Signal Level

<i>Frequency</i>	<i>Separation</i>
100 c/s to 20 kc/s	better than 50 db
50 c/s to 20 kc/s	better than 40 db
1 kc/s	55 db
100 c/s	52 db
20 c/s	satisfactory on C.R.O.

Hum Level

More than 50 db below signal at all output levels.

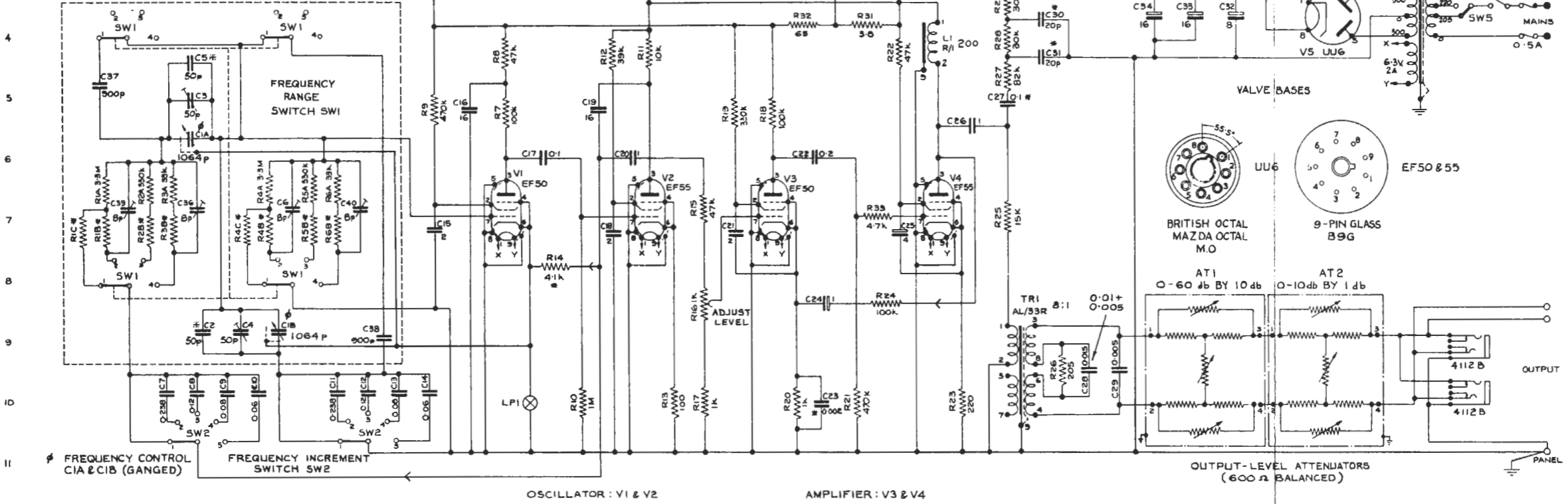
COMPONENT TABLE: FIG. 2I

Comp.	Loc.	Type	Tolerance per cent	Comp.	Loc.	Type	Tolerance per cent
AT1	U9	Painton 172019.1		MRI	Q2	Westinghouse 1 mA	
AT2	W9	Painton 172025					
C1A } C1B }	C6 E9	Wingrove Rogers 4-Gang C60.04/1	± 1	R1A	B7	Welwyn SA3635	± 2
C2	C9	T.C.C. Ceramic SCHI	± 10	R1B	B7	Erie 9	± 5
C3	C5	Eddystone 582		R1C	A7	" 8	"
C4	D9	" 582		R2A	B7	Welwyn SA3634	± 2
C5	C4	T.C.C. Ceramic SCHI	"	R2B	B7	Erie 9	± 5
C6	E7	Mullard E7850		R3A	C7	Welwyn SA3634	± 2
C7	C10	Muirhead 33AT	± 5	R3B	C7	Erie 9	± 5
C8	C10	" "	"	R4A	D7	Welwyn SA3635	± 2
C9	D10	" "	"	R4B	D7	Erie 9	± 5
C10	D10	" "	"	R4C	D7	" 8	"
C11	E10	" "	"	R5A	E7	Welwyn SA3634	± 2
C12	F10	" "	"	R5B	E7	Erie 9	± 5
C13	G10	" "	"	R6A	E7	Welwyn SA3634	± 2
C14	G10	" "	"	R6B	E7	Erie 9	± 5
C15	G7	" "	± 10	R7	H6	" "	± 10
C16	H5	B.E.C. CE15129		R8	H4	" "	"
C17	J6	T.C.C. SM1007	± 5	R9	G5	" "	"
C18	K7	Muirhead 33AT	± 10	R10	J10	" "	"
C19	K5	B.E.C. CE15129		R11	L5	Painton 7W P401	± 1
C20	K6	Muirhead 39AT	"	R12	K4	Erie 8	± 10
C21	M7	" 33AT	"	R13	L10	" 9	"
C22	N6	T.C.C. SM1007	± 5	R14	J8	Welwyn SA3623	± 1
C23	N10	" SM2N	± 10	R15	M7	" SA3622	± 5
C24	N9	" CE30N		R16	M8	Morganite MNAP 101250 26000	
C25	P7	" CE34P		R17	M10	Welwyn SA3622	± 5
C26	Q6	Muirhead 39AT	"	R18	N5	Erie 9	± 10
C27	R5	T.C.C. CP46S		R19	M5	" "	"
C28	S10	" SM3N	"	R20	N10	Welwyn SA3622	± 2
C29	S10	" "	"	R21	O10	Erie 9	± 10
C30	R4	" Ceramic SCD4	± 20	R22	P4	" 8	"
C31	R5	" " "	"	R23	O10	" "	"
C32	U4	" CE25P		R24	P8	Welwyn SA3634	± 2
C33	U4	B.E.C. CE15129		R25	Q7	" SA3622	"
C34	T4	" "		R26	R9	" "	± 1
C35	J3	T.C.C. CE32A		R27	Q5	" "	± 5
C36	C7	Mullard E7850		R28	Q4	" "	"
C37	B5	T.C.C. 701SMB	± 1	R29	Q3	" "	"
C38	F9	" "	"	R30	N1	Erie 9	± 10
C39	B7	Mullard E7850		R31	O4	Painton MVI	"
C40	F7	" "		R32	N4	" "	"
				R33	P7	Erie 9	"
L1	P5	R/I					
L2	T3	CH.1		TRI	Q10	AL/33R	
LPI	H10	Atlas EI		TR2	X4	M150	

A B C D E F G H J K L M N O P Q R S T U V W X Y Z

- 1 SW1 - POSN 1 - RANGE 1 20-40 C/S
 * 2 - RANGE 2. 40-400 C/S
 * 3 - RANGE 3. 400-4000 C/S
 * 4 - RANGE 4. 4000-20,000 C/S
- 2 SW2 - POSN 1 - INCR 1 - 4 SW3 - POSN 1 - MEAS. OUTPUT
 * 2 - INCR 2 - 2 * 2 -
 * 3 - INCR 3 0 * 3 - V1, V3 FEEDS
 * 4 - INCR 4 + 2 * 4 - V2, V4
 * 5 - INCR 5 + 4

* VALUES SUBJECT TO ADJUSTMENT ON TEST
 USING TRIMMING OR ALTERNATIVE COMPONENTS
 PROVIDED. SEE E.D. SPECIFICATION
 # C2 & C5 ONLY FITTED IF REQD.



NOTE: C1A & C1B EACH COMPRISE TWO
 532pF PARALLEL SECTIONS
 OF THE 4-GANG VARIABLE
 CAPACITOR C1

PORTABLE TONE SOURCE PTS/12

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