

## LINE-UP TONE OSCILLATOR OS2/17

### Introduction

The OS2/17 is a transistor oscillator which delivers a constant-amplitude sinusoidal output at about 850 c/s. It is intended as a supplementary unit of the Radio Microphone Receiver RC4/1 and is designed as a small sub-panel which fits into the receiver. The oscillator provides an output of tone from the receiver for operational line-up purposes.

The unit is mounted on a printed wiring board which measures 1.7 in. by 2.75 in.

### Circuit Description (Fig. 5)

The OS2/17 is a Wien-bridge phase-shift oscillator; its circuit diagram is shown in Fig. 5. The operation of Wien-bridge oscillators is analysed in Instruction S.4, Appendix 9.1.

In the OS2/17, the transistors are directly coupled to avoid the phase-shift which occurs with coupling capacitors. This also means that the circuit contains only four capacitors and is therefore very compact.

The oscillator uses three transistors. TR1 is a common-emitter amplifier and its output is fed to the base of TR2. TR2, which is an npn transistor, provides a second stage of amplification. The output from the collector of TR2 is fed to the base of TR3. TR3 is an emitter-follower output stage. Negative feedback, which minimises waveform distortion, is applied to the emitter of TR1 through the resistors R5 and R6. Both the emitter current of TR1 and the collector current of TR2 pass through these resistors and develop a negative-feedback voltage across them.

Oscillation is sustained in the circuit by means of a positive-feedback loop. The feedback is taken from the output of TR3, through the phase-shift network, to the base of TR1. The phase-shift network, which consists of R1, C1, R3 and C2, determines the frequency of oscillation. For sustained oscillation, a signal which is fed back to the base of TR1 must be in the same phase as the originating signal at this point. Since the output of TR3 is in phase with the input to TR1, the oscillation frequency is that for which the input and output of the phase-shift network are in phase. This

frequency is about 850 c/s, and is given by the expression

$$\frac{1}{2\pi\sqrt{(R1.R3.C1.C2)}}$$

The amplitude of the oscillator output is stabilised by a negative-feedback loop which includes a thermistor TH1. The thermistor is connected between the output of TR3 and the junction of R5 and R6. Negative feedback is applied to the emitter of TR1 through R6. The proportion of the output of TR3 which is fed back across R6 depends on the resistance of R6 compared with that of the thermistor. The resistance of a thermistor depends on its temperature and decreases as its temperature increases. If the amplitude of the output from TR3 increases, more current flows through the thermistor and its temperature rises. The resistance of the thermistor therefore decreases and a larger proportion of the output of TR3 is fed back across R6. This increase in negative feedback reduces the amplitude of the output and compensates for the original increase. Similarly a decrease in amplitude is compensated by a reduction in negative feedback.

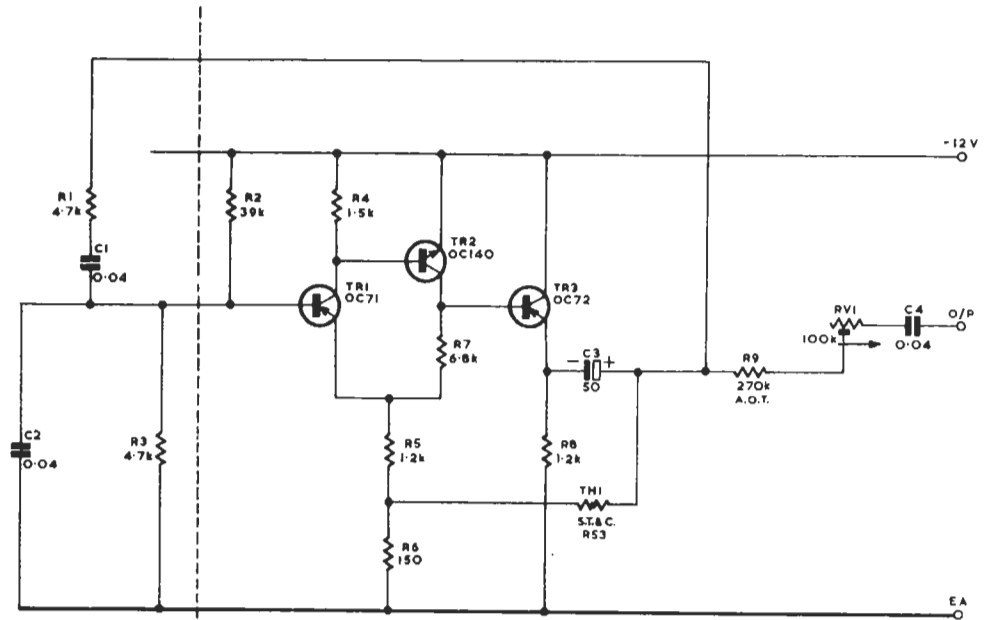
The amplitude of the output from the unit is controlled by the variable resistor RV1. When the oscillator is used with the Radio Microphone Receiver, the output of tone from the receiver is set to be the same amplitude as the output which is obtained from a Radio Microphone signal modulated to a deviation of  $\pm 19$  kc/s. This is a level of  $-47 \pm 3$  dB at the output of the receiver when feeding a 600-ohm load.

### Power Supplies

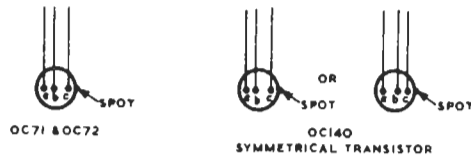
The nominal power requirement of the OS2/17 is a supply of 8 mA at 12 volts. The power-supply voltage is not critical and the unit functions normally with a supply at a considerably lower voltage. The supply for the oscillator, when it is used with the Radio Microphone Receiver RC4/1, is at just over 9 volts and is obtained from the 12-volt supply of the receiver. The voltage is reduced from 12 volts to 9.2 volts across the decoupling circuit between the receiver supply and the oscillator.

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WIEN BRIDGE  
 PHASE SHIFT  
 NETWORK



TRANSISTOR TERMINATIONS

Comp.	Type	Tolerance per cent	Comp.	Type	Tolerance per cent
C1	Hunt BM16KV	20	R4	Erie N6 0.125W.	2
C2	Hunt BM16KV	20	R5	Erie N6 0.125W.	2
C3	U.C.C. SM123S		R6	Erie N6 0.125W.	2
C4	Hunt BM16KV	20	R7	Erie N6 0.125W.	2
			R8	Erie N6 0.125W.	2
R1	Erie N6 0.125W.	2	R9	Erie N6A 0.125W.	2
R2	Erie N6 0.125W.	2			
R3	Erie N6 0.125W.	2	RV1	Plessey 404/1/02854/007	

LINE-UP TONE OSCILLATOR OS2/17 : CIRCUIT