

# SECTION 1

## INTRODUCTION

### 1.1 GENERAL DESCRIPTION

The Communications Receiver Type RA.17 has been designed for use as a general purpose receiver which will provide a high order of sensitivity, selectivity and stability. The receiver covers a frequency range from 1.0 to 30.0 Mc/s and extending, with slightly degraded performance, down to 500 kc/s.

A built-in crystal-controlled calibrator provides reference signals at each 100 kc/s division to permit exact alignment of the scale pointer. Two independent i.f. outputs, in parallel, at 100 kc/s are provided for external use if required. A number of audio outputs are available providing flexibility during operation; a small loudspeaker is fitted for monitoring purposes.

The receiver is designed to operate from 100–125 volts and 200–250 volts, 45–65 c/s mains supply. The power consumption is approximately 100 watts.

### 1.2 NORTH AMERICAN VERSION

North American versions of the RA.17 receiver are identical to the Standard model but include minor variations in detail to comply with North American practice. Certain tubes are changed to ensure that the set employs types commercially available in North America; this entails slight circuit changes to allow for differences in the tube operating voltages. The level meter circuits are modified to include a calibrated "S" meter range. The a.f. output stage is modified to give a maximum output of 1 watt. Coaxial connections are changed from British to North American standards and the supply connection comprises a lead directly connected to the set in place of the fixed plug and free socket fitted to the British version.

These instructions cover both types of receiver. Where applicable, attention is drawn to the differences between the two versions.

### 1.3 CONSTRUCTIONAL DETAILS

The receiver is designed for both bench (table) and rack mounting. The front panel is painted Light Battleship Grey (British Standard Specification 381C, colour 697) and has been carefully designed to minimise operator fatigue.

The dimensions of the  $\frac{1}{8}$ -in. thick front panel conform with the requirements for mounting in a standard 19-in. rack.

For bench mounting, the receiver is fitted in a robust steel cabinet which has a rear opening to enable the operator to gain easy access to the power input socket (Standard version only), the fuses and the termination strips.

A dust cover is provided with both models. This may be removed from cabinet-mounted receivers in conditions of high ambient temperature.

The chassis and major modules are of cast construction thus ensuring maximum rigidity and effective electrical screening.

Each receiver is supplied with three keys to facilitate removal of the control knobs, a plastic trimming tool and free coaxial terminations for aerial and i.f. connections. Extra sleeves are provided with the terminations for alternative coaxial cable sizes.

### 1.4 TECHNICAL SPECIFICATION

Frequency Range	1–30 Mc/s. Range extends to 0.5 Mc/s with slight degradation of performance.
Stability	The average receiver, after warm-up time of 1 to 2 hours, will remain tuned to within 50 c/s of the selected frequency under conditions of constant supply voltage and ambient temperature.
Input Impedance	75 $\Omega$ unbalanced.
Tuning	Effective scale length of approximately 145 feet, i.e. about 6 inches of scale length corresponds to 100 kc/s. Frequency increments remain substantially constant over the entire range.
Calibration	A 100 kc/s signal derived from a 1 Mc/s crystal oscillator having an accuracy of 5 parts in 10 <sup>6</sup> provides check points at 100 kc/s intervals.
Sensitivity	A1 reception, bandwidth 3 kc/s: 1 $\mu$ V for 18dB signal-to-noise ratio. A2 reception, 30% modulated, bandwidth 3 kc/s: 3 $\mu$ V for 18dB signal-to-noise ratio.
Intermodulation	More than 100dB down for interfering signals at least 10% removed from the wanted signal.

<b>Cross Modulation</b>	For wanted signal levels between $3\mu\text{V}$ and $1\text{mV}$ , an interfering signal $10\text{ kc/s}$ removed and modulated $30\%$ must have a level greater than $50\text{dB}$ above that of the wanted signal to produce a cross modulation of $3\%$ . The ratio of wanted to unwanted signal is improved, up to $10\%$ off tune, at the rate of $3\text{dB}$ per cent.		
<b>Blocking</b>	With similar conditions to those for cross modulation, an unwanted signal $f_2$ must be $60\text{dB}$ greater before the audio output of the wanted signal $f_1$ is reduced by $3\text{dB}$ due to blocking.		
<b>Selectivity</b>	Six alternative i.f. bandwidths are obtained by means of a selector switch. Filter details are:		
		-6dB	-66dB
	1.	13 kc/s	28 kc/s
	2.	6.5 kc/s	20 kc/s
	3.	3.0 kc/s	15 kc/s
	4.	1.2 kc/s	8 kc/s
	5.	0.3 kc/s	Less than 2 kc/s
	6.	0.10 kc/s	Less than 1.5 kc/s
	Bandwidths 5 and 6 are obtained with crystal-lattice filters; differences in centre frequencies of these bandwidth settings do not exceed $50\text{ c/s}$ .		
<b>I.F. Output</b>	$100\text{ kc/s}$ at $75\Omega$ impedance. Level $0.2\text{V}$ approx. with a.v.c. in operation. Two outlets in parallel are provided.		
<b>Image and Spurious Responses</b>	With wideband or tuned input, external image signals are at least $60\text{dB}$ down. Internally generated spurious responses are below noise level in all cases.		
<b>Noise Factor</b>	Better than $7\text{dB}$ throughout entire range.		
<b>B.F.O. Range</b>	$\pm 8\text{ kc/s}$ .		
<b>B.F.O. Stability</b>	With constant ambient temperature and supply voltage, drift after warm-up time of 1 to 2 hours does not exceed $50\text{ c/s}$ . For input level variations from $10\mu\text{V}$ to $1\text{mV}$ , b.f.o. drift is negligible.		
<b>Automatic Volume Control</b>	A.V.C. is applied to the r.f. and the final i.f. stages. An increase in signal level of $20\text{dB}$ above $1\mu\text{V}$ improves the signal-to-noise ratio by $18\text{dB}$ . An increase in signal level of $100\text{dB}$ above $1\mu\text{V}$ increases the a.f. output by less than $7\text{dB}$ .		
<b>A.V.C. Time Constants</b>	Short: Charge— $25$ milliseconds. Discharge— $200$ milliseconds. Long: Charge— $200$ milliseconds. Discharge— $1$ second.		
<b>A.F. Response</b>	With $13\text{ kc/s}$ bandwidth, response remains within $\pm 4\text{dB}$ from $250\text{ c/s}$ to $6000\text{ c/s}$ .		
<b>A.F. Output</b>	<ol style="list-style-type: none"> <li>1. <math>2\frac{1}{2}</math>-in. loudspeaker (<math>50\text{mW}</math>) (<math>1\text{W}</math>, North American version) on front panel (switched).</li> <li>2. Two headphone sockets in parallel on front panel. (See Note).</li> <li>3. Three independent outputs of <math>3\text{mW}</math> at <math>600\Omega</math> at rear of chassis.</li> <li>4. One output of <math>10\text{mW}</math> at <math>600\Omega</math>. Preset level is independent of A.F. GAIN control setting.</li> <li>5. One output of <math>50\text{mW}</math> (<math>1\text{W}</math>, North American version) at <math>3\Omega</math>.</li> </ol> <p>Note: The two headphone sockets are connected across the loudspeaker on the British version and across one of the <math>600\Omega</math>, <math>3\text{mW}</math> outlets on the North American version of the receiver.</p>		
<b>Distortion</b>	Not greater than $5\%$ at $50\text{mW}$ output. ( $1\text{W}$ , North American version)		
<b>Hum Level</b>	With A.F. GAIN control at maximum, the hum level is never worse than $40\text{dB}$ below rated output ( $50\text{mW}$ or $1\text{W}$ respectively).		
<b>Noise Limiter</b>	A series noise limiter circuit can be switched into operation to provide limiting at modulation levels exceeding $30\%$ .		
<b>Meter Indication</b>	Alternative switching for indication of signal carrier level or a.f. output level. An 'S' meter is incorporated in the North American version of the receiver.		
<b>Power Supply</b>	$100\text{--}125\text{V}$ and $200\text{--}250\text{V}$ , $45\text{--}65\text{ c/s}$ . Power consumption $100\text{W}$ approx.		
<b>Dimensions</b>	Height	Width	Depth
For rack mounting	$10\frac{1}{2}$	19	$20\frac{1}{8}$ in.
(fitted dust cover)	26.7	48.25	51 cm.
Fitted cabinet	12	$20\frac{1}{2}$	$21\frac{7}{8}$ in.
	30.5	52	55.6 cm.
<b>Weight</b>			
Rack mounted	67 lb. (30.5 kg).		
In cabinet	97 lb. (44 kg.)		