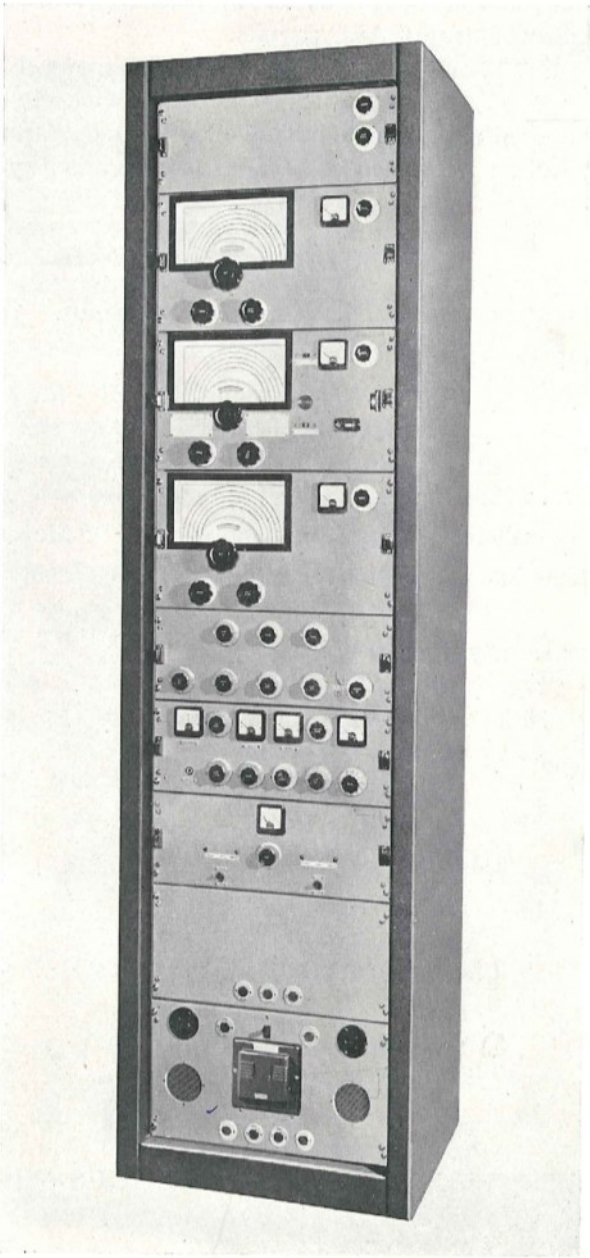
Double-Diversity HF Receiver
Type HR11

THIS EQUIPMENT is a diversity receiver designed for CW on/off and FSK working on important radio-telegraph circuits. A frequency change can be effected rapidly although the oscillator stability, discrimination and selectivity are of a high order. The discriminators and AFC circuits have been designed so that on FSK working values of shift down to 100 c/s can be handled.

The receiver is suitable for the modern practice of *direct* reception of an individual channel forming part of a 'frequency-shift tone' multi-channel transmission from an independent sideband transmitter. Furthermore, by the addition of a Type HU 14A unit the receiver may be adapted for the reception of two-channel frequency-shift ('FSK Diplex') signals.

The receiver is available in two editions: Ed. A with 1 and 2 kc/s filters, Ed. B with 0·5 and 1 kc/s filters. It is housed in a cabinet 7 ft high with a full-length door at the rear.



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FEATURES

Rapid selection of any one of six crystal-controlled spot frequencies.

High-stability LC oscillator calibrated directly in signal frequency gives complete range coverage.

Motor-driven automatic frequency correction follows drifts of up to ±3 kc/s with substantially zero error.

Simultaneous operation of a tone-sender together with two undulators or teleprinters is possible.

Units may be withdrawn on runners to give access to all components without cable disconnection.

Adequate metering facilities are provided and zero beat or 1 kc/s monitoring can be effected.

CIRCUIT

The circuit is that of a double superheterodyne

for CW on/off reception, employing intermediate frequencies of 2600 and 100 kc/s. For FSK reception a third oscillator giving an IF of 10 kc/s is also utilised.

Two stages of signal frequency amplification with ganged tuning are used in each path. The first frequency-changer may be fed from either a crystal oscillator giving a choice of six spot frequencies or a continuously variable LC oscillator. Two IF stages precede each second frequency-changer. The second oscillator works under control of AFC circuits.

On FSK reception the outputs of the second IF stages are converted to 10 kc/s at which frequency the signals are limited and detected. Path selection is effected at DC but is controlled by the signal levels at 100 kc/s. This arrangement eliminates switching transients encountered with 100 kc/s RF path selection.

On CW on/off reception the output of each second IF amplifier is taken from a power amplifier stage to a diode detector. The outputs of the two detectors are combined in a common load.

The DC output is limited, passed through a switchable low-pass filter, further limited and then used to key two pairs of output valves.

Output taken at the third IF is used to operate the AFC circuits. The tuning of these circuits can be switched to cater for various values of shift. In the automatic gain control circuits adjustment of intensity and time-constant is provided to cater for various types of keying and degrees of fading.

DATA SUMMARY

Frequency range: 3–27·5 Mc/s in four bands.

Input: 75 Ω coaxial.

Sensitivity: 0·25 μV input required at 27·5 Mc/s with a 1 kc/s passband for FSK 560 c/s shift giving 15% distortion (1 per 1000 characters) at 100 bauds.

Noise factor: 4 dB at 3 Mc/s and 7 dB at 27·5 Mc/s.

Image signal protection: 110 dB at 3 Mc/s and 60 dB at 27·5 Mc/s.

Selectivity (First IF):
11 kc/s wide at 3 dB attenuation.
34 kc/s wide at 20 dB attenuation.

Selectivity (Second IF):

0·5 kc/s filter:
0·4 kc/s wide at 6 dB attenuation.
1·4 kc/s wide at 70 dB attenuation.

1 kc/s filter:
0·9 kc/s wide at 6 dB attenuation.
3 kc/s wide at 70 dB attenuation.

2 kc/s filter:
2·2 kc/s wide at 6 dB attenuation.
7 kc/s wide at 70 dB attenuation.

Frequency stability:
Variable first oscillator 15 in 10^6 per °C.
Crystal first oscillator 1 in 10^6 per °C.
Second oscillator 15 in 10^6 per °C.

AFC: Frequency drifts up to ±3 kc/s are followed with a residual error of less than 4 c/s.

AGC: 20 dB change in output for 80 dB change in input.

Signalling speed: 300 bauds max. with 2 kc/s bandwidth at 850 c/s shift.

Frequency shift: 100–850 c/s.

DC output: Two outputs of 30–0–30 mA into earthed loads not exceeding 2000 Ω. 30–0–30 V output simultaneously available for keying a tone sender.

Power supply: 200–250 V 50 c/s single-phase AC. Permissible voltage variation, ±5%.

Power consumption: 500 W approx.

Dimensions:

Height	Width	Depth	Weight
7 ft 0¼ in. (214 cm)	1 ft 11½ in. (59 cm)	1 ft 10 in. (56 cm)	500 lb (227 kg)

Marconi

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