Marconi Eight Aerial Adcock H.F Direction Finder
Type S 480

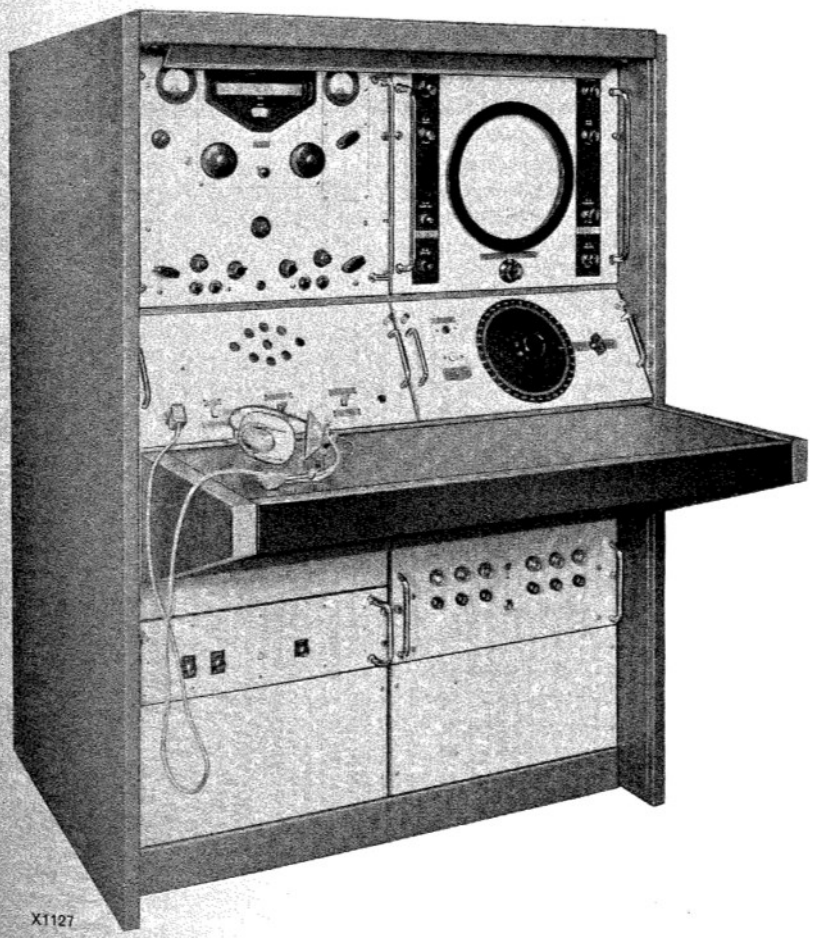
High frequency direction finding (h.f.d.f) has many applications, especially in the monitoring and intelligence services, where the location of unknown transmitting sources is of vital importance.

The Marconi S 480 direction finder uses a revolutionary radiogoniometer in a twin channel receiver system. In the past, twin channel systems have suffered from inaccuracies due to phase and amplitude variations between channels. However, this trouble has been eliminated by the use of the Marconi patented radiogoniometer which is connected between the aerial system and the receiver, thereby enabling the efficient transfer of energy from a four phase aerial system to a twin channel receiver. The overall result is an equipment which offers improved accuracy and sensitivity, with extended frequency coverage.

The use of an eight aerial system in combination with the new goniometer enables a frequency band from 1·5 to 30 MHz to be covered with a single system, thereby eliminating range switching and extra aerials. The aerial elements are fed at $\frac{1}{3}$ height via an insulated transformer, and the problem of earthing is overcome since the aerials are bonded to the earth mat. The elevated feed also improves the vertical polar diagram at the high frequency end of the band.

The twin channel receiver offers rapid, continuous tuning to within 500 Hz of any specified frequency. Alternative bandwidths of 8, 3, 1·2 kHz; 750, 300 or 100 Hz can be easily selected, and ganged controls ensure equality of gain, etc., in both channels.

A new type of electrostatic tube and a push-pull deflection amplifier are used in the c.r.t display.



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FEATURES

1·5–30 MHz range covered by a single aerial and goniometer system.

Improved vertical polar diagram of reception.

Patented goniometer accepts eight aerial inputs.

Twin channel receiver with rapid continuous tuning to within 500 Hz of any specified frequency.

Visual and aural indications.

Earth mat bonded to aerials.

Alignment oscillator aids calibration and checking.

Equipment

Aerial system

The S 480 employs an eight element Adcock Aerial system. The elements are triangular section, self-supporting towers, insulated at $\frac{1}{3}$ height where a transformer feeds from the aerial to the radiogoniometer. The elevated feed improves the vertical polar diagram for shallow-angle signals. The base of the tower is bonded to the earth mat, thereby eliminating insulation problems.

The earthing properties of a d.f site are important for screening horizontal feeders between aerials and for producing a homogeneous earth plane. Consequently a mat 120 ft in diameter is used to accommodate an aerial spacing of 36 ft.

Radiogoniometer

The Marconi patented radiogoniometer allows the advantages of an eight aerial system to be exploited since the problem of transferring energy from a four phase system to a twin channel receiver has been overcome.

The goniometer is wound on concentric ferrite cores. The outer (field) winding is wound in a toroidal manner and the four pairs of windings cross-connected to opposite pairs of aerials. The inner ferrite core is cylindrical and has two perpendicular search coils. Fringing effects of adjacent fields are reduced by a new method of winding which eliminates the solenoid type of coil. The design has a coupling factor near to 80% and errors of better than $\pm 1°$.

Receiver

The Racal twin channel Type RA 153 was chosen as it is specifically intended for d.f applications, and offers continuous tuning to within 500 Hz of any specified frequency. The bandwidth may be set to 8, 3, 1·2 kHz;

750, 300 or 100 Hz, and a 'peaking' control enables maximum sensitivity to be obtained at all frequency settings. Balance between channels is better than 15° in phase and 1 dB in amplitude and equality of gain is ensured by ganging attenuators.

C.R.T Display

The 100 kHz i.f of the Racal receiver is fed to two identical deflection amplifiers. A new design of electrostatic compass tube is used, having a flat face, with a compass scale engraved on it. A shift coil is used to correct any errors of alignment between the deflection plates and the compass scale.

The deflection amplifiers are mounted on printed boards on either side of the tube, and a push-pull circuit ensures good trace linearity. Normal shift and focus controls are on the front panel alongside the phase and gain controls of one amplifier. A central switch connects the two amplifiers in parallel so that phase and gain controls can be set.

Auxiliary equipment

The operator is provided with a microphone headset having separately connected headphones, thereby enabling instruction to be heard in one earpiece and the receiver in the other. A switch enables signals to be sent to line and the phones to be paralleled for weak signals. The line signal can then be heard on a monitor loudspeaker. If line conditions are poor a morse key and line oscillator may be used for sending instructions, etc.

Alignment oscillator

Two oscillators enable internal and external calibration of the equipment. They give c.w signals locked at 100 kHz intervals to crystals. The first is suitable for external calibration, being portable, it can be set up on predetermined position for performance checks. The second is mounted on the roof and excites a loop aerial which provides directional signals, thereby simplifying fault location, etc.

DATA SUMMARY

Frequency range: 1·5 to 30 MHz.

Receiver bandwidths: 8, 3, 1·2, 0·75, 0·3 or 0·1 kHz (selectable).

Phase balance: Better than 15° without external correction.

Amplitude balance: Within 1 dB at all settings of gain control.

Instrumental bearing accuracy: Frequency range maximum error:

1·5–2 MHz	±2°
2–25 MHz	±1·5°
25–30 MHz	±2° *

Sensitivity: Field strength for 10 dB S/N at maximum of polar diagram:

Frequency	Field Strength
1·5–2 MHz	2μ V/m
2–25 MHz	1μ V/m
25–30 MHz	2μ V/m

Power supplies: 190–250 V 50 Hz.

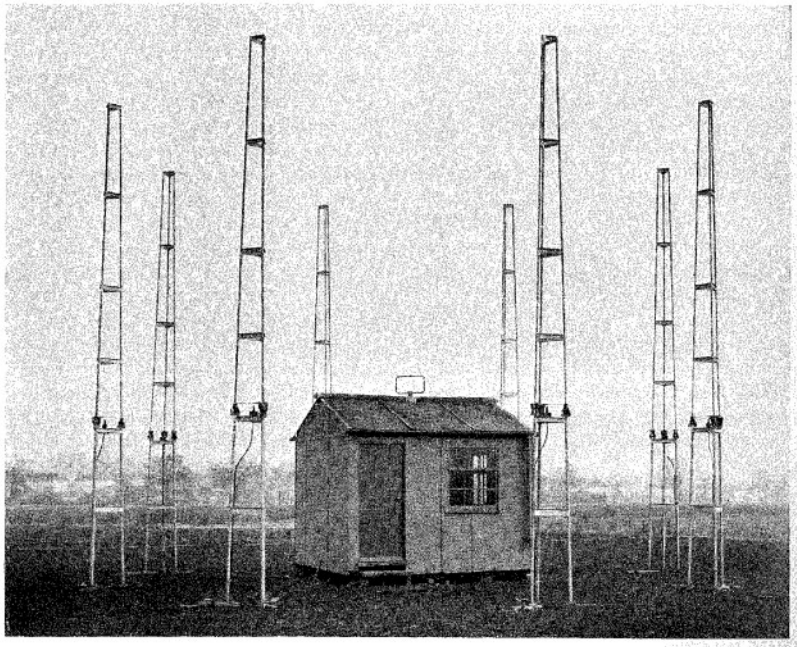
Power consumption: 360 VA.

Dimensions:

Height	4 ft 9 in.	(144 cm)
Width	3 ft 5 in.	(104 cm)
Depth	3 ft 5 in.	(104 cm) (including desk)
Weight	700 lb	(320 kg) (console and units)

Total weight, aerials, feeders, etc.: 5240 lb (2250 kg).

*This accuracy in the 25 to 30 MHz range is obtainable only with underground hut. Two to three times larger errors are obtained with a conventional hut.



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THE MARCONI COMPANY LIMITED
Radar Division

Marconi House, Chelmsford, Essex
Telephone: Chelmsford 53221. Telex: 99201
Telegrams: Expanse Chelmsford Telex