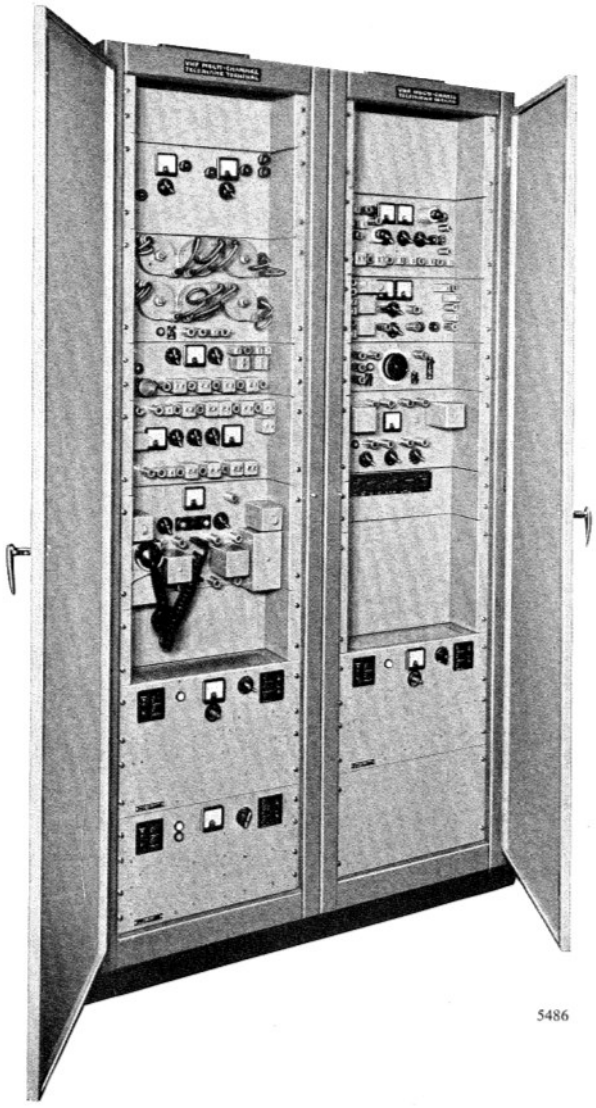
VHF Multi-Channel Terminal Units
HM 100 Series

THE DEMAND for increased communication facilities, especially over terrain inaccessible for constructing line or cable routes, has led to the development of a VHF multi-channel system designed to provide up to 48 telephone channels, any of which may be sub-divided by suitable VF telegraph channelling equipment to give either 18 or 24 telegraph channels.



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A frequency-modulated signal is transmitted and carrier-type channelling equipment based on frequency division is employed. This has the advantage of operating on the same principle as the standard equipment in common post and telegraph use. The changeover from line to radio and *vice versa* is therefore quite straightforward.

Complete equipment, including radio and carrier equipment and diesel generator sets can be supplied.

The terminal units, Type HM 100 series, are fitted with supervisory, monitoring, test and warning facilities, and used together with the Type HM 150 series repeaters (see page 235), form a comprehensive system. The mechanical design of the equipment has been largely influenced by the need for ample protection against dust and insects, and immediate accessibility to all components. To achieve these features the equipment has been built on units which are rack mounted with chassis vertical, the whole being contained in a twin cabinet having the few necessary openings protected by fine mesh metal gauze. The vertical disposition of the chassis allows the valves, meters, tuning controls and switches to be conveniently mounted on the front while at the back all wiring and components are accessibly laid out.

CIRCUITS

TRANSMITTER. The drive is derived from a crystal oscillator whose output is fed into two paths. Output A is phase modulated and is fed *via* a harmonic generator into a frequency changer. Output B passes *via* a harmonic generator stage to the frequency changer also, and the two signals are then mixed giving a resultant deviated frequency. This is then multiplied to the required

radiated carrier frequency and the final amplified signal is fed *via* a junction box to the aerial filters. The connecting lead to the aerial is unique in that it forms part of the RF hybrid circuit. Both transmit and receive feeder leads are cut to a critical length and thereby offer a theoretically infinite impedance at certain frequencies.

RECEIVER. The received signal passes *via* the feeder and aerial filter to an RF amplifier. It is next mixed with the output of a local crystal oscillator. There are six stages of IF amplification and two limiting stages before the discriminator. A cathode-follower stage and line amplifier complete the receiver circuit.

CONTROL FACILITIES

Engineers' order wire. Inter-station communication on a party line basis independent of the traffic is provided. The frequency band 300 c/s to 3 kc/s is used in this respect while the 3·4 kc/s to 204 kc/s spectrum is available for traffic.

Supervisory control. (*a*) Speech communication between all stations, terminals, repeaters, and exchanges. (*b*) Automatic fault alarm signalling from each unattended station. (*c*) An efficient fault-locating system.

Built-in test facilities. For normal maintenance and routine purposes the following measurements may be taken:

(*a*) LF levels; (*b*) Noise; (*c*) Non-linear distortion; (*d*) Frequency and deviation; (*e*) IF bandwidths.

The equipment will operate entirely unattended and changeover is automatic in duplicated systems.

DATA SUMMARY

Frequency ranges:

Type HM 101	60–73 Mc/s.
Type HM 102	73–88 Mc/s.
Type HM 103	132–150 Mc/s.
Type HM 104	150–185 Mc/s.
Type HM 105	185–230 Mc/s.

Frequency stability: ±0·005% within the temperature range 0–50°C.

TRANSMITTER

Power output: 10–20 W according to frequency range.

Output impedance: 70 Ω, unbalanced.

Input impedance: Traffic, 600, 300 or 150 Ω balanced, or 75 Ω unbalanced. Engineers' order wire, 600 Ω balanced.

Modulation: Frequency modulation with deviation of ±200 kc/s from 60 to 88 Mc/s and ±300 kc/s from 132 to 280 Mc/s.

Spurious radiation: 100 db below carrier level.

RECEIVER

Selectivity: Attenuation of a signal removed 2 Mc/s from the centre frequency, greater than 40 db.

Limiter performance: Variations of ±20 db in input produce output variations of not more than ±0·25 db. Input level between 10 μV and 10 mV.

Output impedance: Traffic, 600, 300 or 150 Ω balanced, or 75 Ω unbalanced. Engineers' order wire, 600 Ω balanced.

Noise factor (measured with aerial filters out of circuit):

Better than 6 db below 100 Mc/s.
Better than 9 db above 100 Mc/s.

Noise level: Not greater than −50 dbm for an output of 10 dbm.

AF response (overall):

±2 db from 3·4 to 12 kc/s
±0·5 db from 12 to 108 kc/s
Within +1 db and +2 db from 108 to 204 kc/s
} referred to mean level

Power supplies: 105–150 V or 200–250 V, 40–60 c/s single-phase AC mains. Voltage regulation ±6%, frequency variation ±2½%.

Power consumption: 0·8 kVA.

Dimensions:	Height	Width	Depth
	7 ft	3 ft 10 in.	2 ft
	(213 cm)	(117 cm)	(61 cm)

Marconi

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