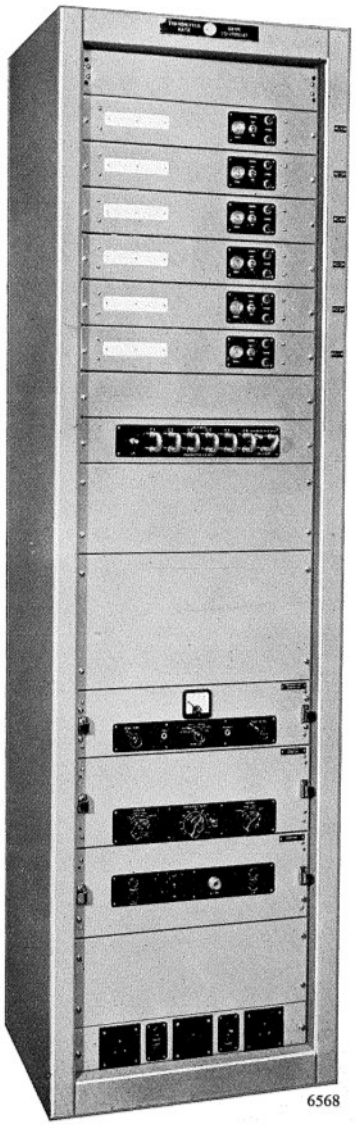
Crystal Drive and Auxiliary Units

TO exploit fully the capabilities of communication transmitters such as the Types HS 31, HS 51 and HS 71, particularly where a number of these are operated on one station and centralized drive equipment is desirable, a flexible drive arrangement is necessary. A series of crystal and LC drives with auxiliary units has therefore been developed to provide RF drive of high stability on several frequencies (normally up to six) with on-off keying or frequency-shift (FS) keying. On-off CW keying with anti-fading frequency modulation is also available.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A typical assembly of crystal drive and auxiliary units.

A typical drive equipment is made up from a selection of the units described below, the quantities depending on requirements. Each item in the series consists of one or two units of 19 in. (48 cm) width suitable for mounting in a standard cabinet. The metering of cabinet-mounted equipment is effected by a general-purpose meter in the cabinet which can be connected to any of the units by a test cord and plug.

Overall cabinet dimensions:

Height 7 ft 0¼ in. (214 cm)
Width 1 ft 11½ in. (60 cm)
Depth 1 ft 7⅛ in. (48 cm)

Single-frequency Crystal Drive Unit Type HD 21

This unit consists of an oscillator and compact crystal oven, with an amplifier and power supply components. These are mounted on a strip-type panel 3½ in. (9 cm) high and 19 in. (48 cm) wide. The temperature of the crystal is maintained constant at 70°C by the thermostatically controlled oven.

The crystal operates in the parallel resonant condition in a tritet circuit. Crystals between 2 and 8 Mc/s are employed with provision for fine frequency adjustment in service. No tuned circuits are used in the oscillator.

The oscillator is capacity-coupled to a single-stage output amplifier. This is connected *via* a tuned transformer to a 75 Ω coaxial cable termination.

Auto RF switching unit

By means of this panel any one of up to six inputs from external oscillators (*e.g.* Type HD 21 drives) can be selected for feeding to a transmitter. The switch may be manually operated or remotely controlled by a Ledex switch unit incorporated as an extra.

Keying Unit Type HD 22

This unit provides a keyed FS or CW on/off output at 3·1 Mc/s (or, with a Multiplier Type HG 23, 6·2 Mc/s). A second unit houses its power supply.

For FS service the input keying signal is applied *via* DC amplifiers to the grid of a reactance valve which is coupled to the tuned circuit of a 3·1 Mc/s crystal oscillator. The 3·1 Mc/s signal is passed *via* a buffer amplifier to the output stage where termination for a coaxial cable is provided.

For CW on/off working the buffer amplifier is keyed. A 3·1 Mc/s on/off keyed and shaped signal is thence passed to the output stage. A 400 c/s oscillator provides for frequency modulation of the output CW or FS signal.

Monitor Unit Type HD 24

This unit monitors FS and CW on/off telegraph signals. It will monitor input signals at 3·1 Mc/s and, as it incorporates an RF mixer stage, it can also deal with input signals in the band 4 to 27·5 Mc/s, provided that the appropriate conversion frequency is also available to convert the signal back to 3·1 Mc/s. It is therefore possible to monitor the keying signals at all stages of a transmitter, except where frequency multiplication is effected after the mixer stage in the transmitter.

The monitor unit incorporates a compact 2¾ in. (7 cm) oscilloscope upon which the frequency shifts and keying waveforms can be checked.

Type HD 21 Crystal Drive Unit.

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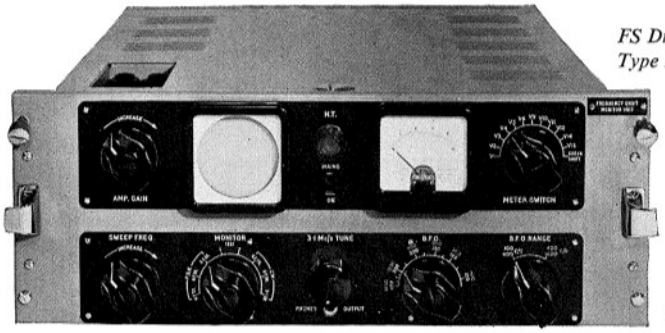

FS Drive Unit Type HD 63.

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Crystal Drive Unit Type HD 26

This unit provides an output on any one of six crystal-controlled frequencies in the range 1·4 to 8 Mc/s. Provision is also made for connecting a signal from an external LC oscillator which may be switched through to the output of the unit when required. There is a built-in power supply.

Variable LC Drive Type HD 28

This equipment comprises a high-stability variable-frequency oscillator with frequency multipliers and a power supply unit. The tuning mechanism of the oscillator incorporates precision gearing to enable a high order of setting accuracy to be attained. The equipment is suitable for use as a transmitter drive or as a frequency standard. The master oscillator has a range of 2 to 4 Mc/s. The temperature-sensitive elements are mounted in a simple thermally-controlled oven. The master oscillator is coupled to a harmonic amplifier which extends the frequency range to 32 Mc/s.

Crystal Calibrator Type HD 29

Designed for use as a reference frequency source to check up to 3 variable-frequency oscillators, e.g. Type HD 28, this unit provides crystal-controlled calibration signals at 10 kc/s intervals in the range 2 to 4 Mc/s. A mixer stage is incorporated into which the crystal-controlled signal and a signal from the variable oscillator may be fed. The resulting beat note may be aurally monitored. The unit has a built-in power supply.

Double Sideband Modulator Type HD 56

This unit is suitable for use with transmitters such as the Types HS 31, HS 51 and HS 71 for emergency DSB service. It produces a low-level modulated output at either 3·1 Mc/s or 6·2 Mc/s. The depth of modulation is shown on a front-panel meter. Over-modulation is prevented by a compressor circuit.

Four-way Frequency-shift Drive and Keying Unit Type HD 63

Type HD 63 unit is a compact general-purpose drive for FS and CW on/off services. It may be used with almost any type of Class C or linear transmitter.

Any one of four crystal-controlled spot frequencies may be switch-selected.

The drive consists basically of a crystal-oscillator covering the range 2–8 Mc/s, with switched crystals and coils, followed by an amplifier. The frequency shift is produced by a keyed diode, and is variable by pre-set controls.

A monitor heterodyne oscillator with four switched crystals provides reference frequencies for setting-up purposes. The output of the drive on a selected channel can be heterodyned with the appropriate monitor frequency. The resultant audio tone can be checked on headphones. An input jack is provided into which a signal of known frequency can be fed from an external AF oscillator for comparison with the heterodyne shift tone to permit accurate setting-up of the frequency shifts.

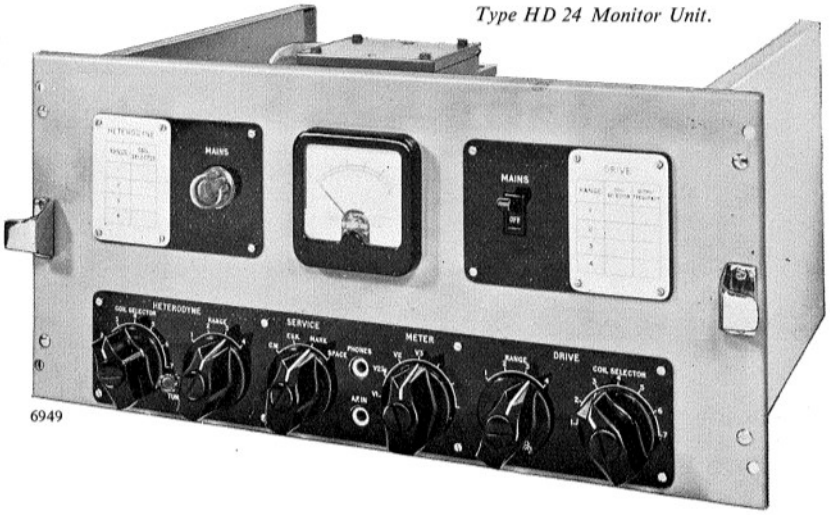
Frequency-shift Diplex Keying Unit Type HK 12

This unit is primarily for keying transmitters by the two-channel frequency-shift diplex system. It also provides single-channel FS, CW on/off, MCW on/off, or facsimile operation. All outputs are at 3·1 Mc/s. Anti-fading frequency modulation may be applied on single-channel FS or CW.

The drive unit makes use of four frequencies with a separation of 400 c/s between each, giving a total shift of 1200 c/s in the radiated frequency. A 3·1 Mc/s crystal oscillator is controlled by a reactance valve.

High-speed Electronic Keying Unit Type HK 11

Type HK 11 converts the amplitude-modulated output of a facsimile picture transmitter into a form suitable for keying certain types of frequency-shift drive units. It is essentially a black or white system only, corresponding to a 'mark' or 'space' frequency in the drive unit. It may be used in conjunction with keying units Types HD 22 and HK 12. The method of operation is with either a mechanical relay, which applies one or two keying voltages to the grid of a reactance modulator, or an electronic relay which itself provides the keying voltages. Signal curbing components in the FS drive units should be removed so that keying up to a maximum speed of 3500 bauds may be achieved.



Type HD 24 Monitor Unit.

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Data Summary

HF DRIVE UNITS

Unit Type:	*HD 29*	*HD 21*	*HD 26*	*HD 63*	*HS 28*	*HD 22*	*HK 12*
Frequency:	2–4 Mc/s at 10 kc/s intervals	2–8 Mc/s 1 spot freq.	2–8 Mc/s 6 spot freq.	2–8 Mc/s 4 spot freq.	2–32 Mc/s variable	3·1 Mc/s	3·1 Mc/s
Overall stability (temp. range 10–40°C, ambient):	40 parts in 10^6	5 parts in 10^6	10 parts in 10^6	30 parts in 10^6	40 parts in 10^6	15 parts in 10^6	15 parts in 10^6
Output impedance:	75 Ω	75 Ω	75 Ω	75 Ω	75 Ω	75 Ω	75 Ω
Output power:	+12 dBm	100 mW	100 mW	250 mW	100 mW	250 mW	250 mW
Frequency shift:	—	—	—	200–1000 c/s (200–500 c/s below 2·5 Mc/s)	—	0–1200 c/s	2-channel 50–1200 c/s; single-channel 50–1000 c/s
Keying speed:	—	—	—	150 bauds	—	200 bauds	2-channel 100 bauds; single-channel 400 bauds
Power supply (50 to 60 c/s AC):	110, 120 and 200–250 V	200–250 V	210–250 V	200–250 V	110, 120 and 200–250 V	200–250 V	200–250 V
Power consumption:	45 W	20 W	22 W	55 W	300 W	80 W	—
Dimensions:					Oscillator panel / Supply panel	Keying panel / Supply panel	
Height	7 in. (18 cm)	3½ in. (9 cm)	7 in. (18 cm)	8¾ in. (22 cm)	10½ in. (27 cm) / 7 in. (18 cm)	7 in. (18 cm) / 7 in. (18 cm)	8¾ in. (22 cm)
Width	19 in. (48 cm)	19 in. (48 cm)	19 in. (48 cm)	19 in. (48 cm)	19 in. (48 cm) / 19 in. (48 cm)	19 in. (48 cm) / 19 in. (48 cm)	19 in. (48 cm)
Depth	16 in. (41 cm)	6½ in. (17 cm)	10 in. (25 cm)	13 in. (33 cm)	19½ in. (49·5 cm) / 16 in. (41 cm)	12 in. (31 cm) / 12 in. (31 cm)	15 in. (38 cm)
Weight	27 lb (12·3 kg)	5¾ lb (6·8 kg)	19 lb (8·6 kg)	31 lb (14 kg)	80 lb (36·3 kg) / 35 lb (15·9 kg)	16¾ lb (7·6 kg) / 27½ lb (12·5 kg)	36 lb (16·3 kg)

Auto RF Switching Unit

Inputs: Up to six, 75 Ω coaxial.
Output: One, 75 Ω coaxial.
Motor power requirements: 50 V DC, 2 A intermittent.
Dimensions:
Height 3½ in. (9 cm)
Width 19 in. (48 cm)
Depth 6½ in. (17 cm)
Weight 5¾ lb (2·6 kg)

Monitor Unit Type HD 24

Services:
(a) Single- and two-channel FS. (b) Single-channel FS with anti-fading FM.
(c) Facsimile.
(d) CW on/off keying with or without anti-fading FM.
Input signal: Approx. 1 V into 75 Ω at 3·1 Mc/s *or* approx. 0·5 V into 75 Ω in the band 4–27·5 Mc/s together with 4 V of conversion frequency from transmitter HG or from an external oscillator.
Telegraph keying speed: 400 bauds max.
AF oscillator stability: ±2%.
Power supply: Details as Type HD 21 unit. Consumption 120 W approx.
Dimensions:
Height 7 in. (18 cm)
Width 19 in. (48 cm)
Depth 15 in. (38 cm)
Weight 35 lb (15·9 kg)

Double Sideband Modulator Type HD 56

Input level: −20 dB min.
Output frequency: 3·1 Mc/s or 6·2 Mc/s.
Output power: 0·25 W carrier into 75 Ω.
Distortion: Not greater than 2% at 80% modulation (with compressor circuit inoperative).
Noise: 50 dB below 100% mod. level.
Frequency response: ±2 dB from 200–3500 c/s.
Frequency stability: Less than ±10 parts in 10^6 per month, for changes in temperature of 20°C to 50°C.
Input impedance: 600 Ω balanced or unbalanced.
Output impedance: 75 Ω unbalanced.
Power consumption: 40 W.
Power supply: 110 or 200–250 V, 50–60 c/s AC.
Dimensions: Height 8¾ in. (22 cm)
Width 19 in. (48 cm)
Depth 10 in. (25 cm)
Weight 26 lb (11·8 kg)

High-speed Keying Unit Type HK 11

Services:
(a) Single-current high-speed keying.
(b) Double-current high-speed keying.
(c) Amplitude-modulated facsimile signals or tone keying.
Test facilities: Permanent 'mark' or 'space'. Keying at mains frequency.
Inputs:
(1) From facsimile transmitter.
(2) Tone keying from line.
(3) High-speed DC keying line.
(Plug-in filters to suit standard audio frequencies, amplitude-modulated.)
Input impedance: Keying line 2·2 kΩ unbalanced. Facsimile 600 Ω balanced.
Line potentials:
Keying line: (a) ±10 V double-current.
(b) ±10 V single-current.
Facsimile −20 dBm minimum.
Keying speed: 3500 bauds max.
Output voltages:
(1) ±10 V approx., into 2·2 kΩ.
(2) Gates one of two voltages between 0–16 V and 16–32 V supplied by a keying unit.
Power supply: 200–250 V, 50–60 c/s, single-phase AC.
Power consumption: 55 W.
Dimensions:
Height 7 in. (18 cm)
Width 19 in. (48·3 cm)
Depth 10¾ in. (27·3 cm)
Weight 25 lb (11·4 kg)

Marconi

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