Ten-way Crystal Drive Unit
Type HD 11

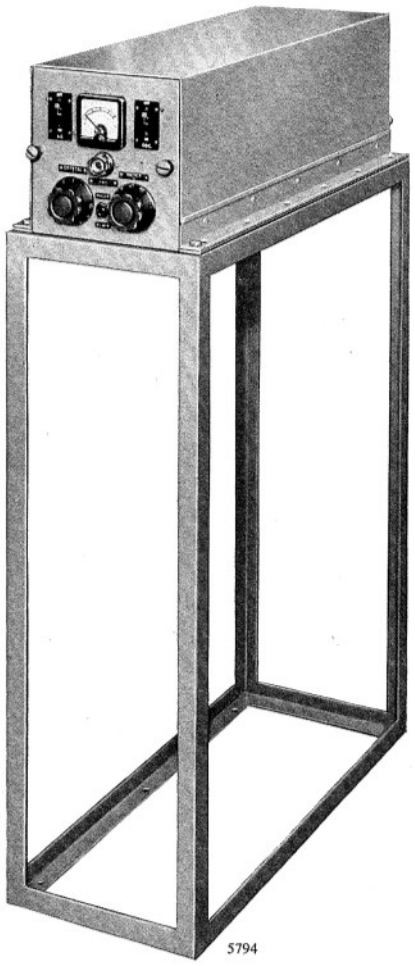
THE CLOSER FREQUENCY TOLERANCES now called for by International Regulations are not met by some existing transmitters. These transmitters, however, and in particular the famous SWB series, give otherwise a high performance and fully meet modern requirements. In order to overcome this difficulty, the ten way-crystal drive unit Type HD 11 has been developed and may be substituted for the drive in use, (the Franklin master oscillator in the case of the SWB transmitters), so that the transmitter performance attains to present day standards.

This unit will operate at any one of ten preselected frequencies in the range 1,000 to 1,500 kc/s, and embodies facilities for phase-modulation, for anti-fading or facsimile purposes.

The oscillator is built on a slide-out chassis and includes a thermostatically-controlled oven, which houses the ten crystals in their plug-in holders, a double triode maintaining circuit, a reactance modulator, a harmonic amplifier and output stage, and associated power supply circuits.

All connections including the RF output and modulation input leads are made by a flexible cable and multi-way plug so that partial withdrawal of the oscillator is possible without interfering with its operation. Protective covers are fitted to all high-voltage points, in order to prevent accidental contact when the oscillator is withdrawn.

A meter and selector switch mounted on the, front panel permit measurement of HT voltage, valve cathode currents, and RF output.



CRYSTALS AND OVEN

The crystals, which are of the cubic type with gold-sputtered electrodes, have an extremely low temperature coefficient, within their operating range, and are mounted in a thermostatically-controlled oven, giving an overall stability of one part in 10^5. They operate in the range 200–300 kc/s, and are mounted in plug-in type holders. A service frequency adjustment covering a range of approximately 50 parts in 10^6 is effected by means of a small slotted circular nut on top of the holder

having an arbitrary scale calibrated 0–10 and giving a resetting accuracy of better than 1 part in 100,000.

Control of the oven temperature is maintained by means of a bi-metallic spiral type of thermostat specially made and adjusted for this unit, the contacts of which are robustly constructed and are enclosed to avoid trouble due to dust. Access to the crystals for adjustment purposes is facilitated by holes cut in the inner cover of the oven; this cover may be lifted out when it is desired to change the crystals.

RF CIRCUITS

The oscillator maintaining circuit is of the Pierce type, employing a double-triode valve with the two halves connected in tandem. The system oscillates readily on any frequency within its range, and since it includes no tuned circuits, the fitting of a new crystal involves re-adjustment of only the appropriate buffer tuning condenser.

The oscillator is resistance-capacity coupled to the output stage, which also selects the fifth harmonic of the oscillator and amplifies it. An inductance in its anode circuit is tuned by a small pre-set capacitor for each crystal, and the appropriate condenser is selected at the same time as the crystal by a ten-position switch. Transformer coupling reduces the output impedance to a low value, so that a considerable length of coaxial feeder may be employed. This should be terminated by a low-loss circuit tuned to the buffer frequency, in order to discriminate further against unwanted oscillator harmonics. The output is of the order of 1 V RMS.

REACTIVE MODULATOR CIRCUIT

Phase modulation of the oscillator for anti-fading and facsimile working is achieved by applying appropriate modulating potentials to the grid of a triode reactance valve connected between the anode of the first maintaining valve and earth.

A Mod./CW switch on the front panel earths the grid of the reactance modulator when it is desired to use the unit for CW telegraphy or broadcasting purposes.

POWER SUPPLIES

The ten-way crystal oscillator has its own power-supply circuits built in. These employ an indirectly heated rectifier with inductance-capacity smoothing. No further stabilisation is necessary. A switch breaks the main HT line, permitting the oscillator to be turned off while oven and heater supplies remain on. Double pole fuses are installed at the rear of the chassis.

DATA SUMMARY

Frequency range: 1·0–1·5 Mc/s.

RF output: 1 V RMS approx. into 80 Ω.

Frequency stability: ±1 part in 100,000 for ambient temperature of 0–30°C, AC mains changes of ±10% and any conditions of modulation.

Phase modulation limits: Anti-fading– ±0·7 Radian/Mc/s max. at 400 c/s for an input of 20 V RMS ±15%.
Facsimile– ±0·3 Radian/Mc/s max. at 1250–3100 c/s for an input of 9 V RMS ±15%.

Phase modulation response: Level within 2 db for audio frequencies from 600–3,100 c/s; 3 db down at 400 c/s. (Relative to modulation at 1,000 c/s).

Change of frequency on operating 'Mod./CW' switch: Less than 1 part in 10^6.

Change of frequency on changing any valve: Less than 2 parts in 10^6.

Hum modulation:
Amplitude–Less than 0·1%.
Phase–Less than ±0·0001 Radian/Mc/s.

Power supply: 200–250 V, 50–60 c/s single-phase AC mains. Voltage regulation within ±6%: frequency tolerance ±2½%.

Dimensions:

	Height	Width	Depth	Weight
Overall Assembly	3 ft 1¼ in. (94·6 cm)	9½ in. (24 cm)	2 ft (61 cm)	196 lb. approx. (89 kg)
Type HD 11 Unit	7¼ in. (18·4 cm)	7¼ in. (18·4 cm)	22 in. (55·9 cm)	36 lb. approx. (16·3 kg)

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