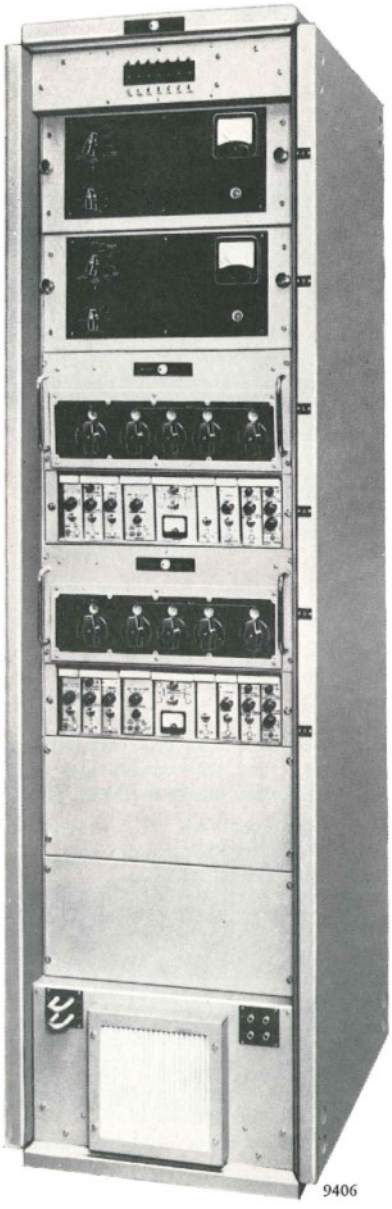
Comprehensive Synthesizer Drive Assemblies Types H 1601 and H 1602

THESE cabinet assemblies contain comprehensive drive equipment for one or two transmitter channels. They provide modulated outputs at the required radiated frequency, at a level of about 1·5 W, suitable for driving linear-amplifier transmitters.

The only difference between the two assemblies is in the arrangements for providing the 1 Mc/s master frequency signal from which the radiated frequency is derived.

The H 1601 assembly (see Fig. 1) accepts duplicated 1 Mc/s signals from a master frequency source Type H 1605, with a phase difference of 60° between them. This phase difference is increased to 120° in the hybrid transformer in which they are combined. As a result no interruption or change in level occurs if either 1 Mc/s signal should fail.

The H 1602 assembly is self-contained (see Fig. 2), incorporating its own master oscillator, Type H 1501, mounted in a distribution amplifier Type H 1504. If required, a second master oscillator can be fitted, and automatic change-over facilities to operate in the event of failure of the working oscillator, can be included in the distribution amplifier.



9406

Both assemblies use Comprehensive Modulator Units Type H 1503, Frequency Synthesizers Type H 1500C, and Wideband Amplifiers Type H 1001. The H 1503 generates modulated signals on a 100 kc/s subcarrier which is accepted by the synthesizer, the modulation being added to the synthesizer output at the required radiated frequency. The wide-band amplifier, which requires no tuning, raises the output level to about 1·5 W for feeding the linear amplifier transmitter.

Features

No tuning controls other than decade frequency selector switches on H 1500 synthesizer.

All types of modulation from built-in H 1503 modulator unit.

Comprehensive drive equipments for two transmitter channels in one cabinet assembly.

Front access only required.

Data Summary

TYPES H 1601 AND H 1602

1 Mc/s input level (H 1601 only): 200 mW in 75 Ω.

R.F output level: 1·5 watts p.e.p.

Frequency range: 2–27·5 Mc/s.

Services: See data summary for H 1503 (page 236).

Keying: 80–0–80 V to 6–0–6 V double current, −80 to −9 V single current.

Audio input level: +10 to −20 dBm.

Keying speeds (max.): f.s.k, offset 2 kc/s (t.s.k), 200 bauds; f.s.k, offset 4 kc/s (t.s.k), 3500 bauds; c.w. 400 bauds.

Intermodulation distortion: Two-tone test at p.e.p, better than −45 dB.

Power supply: 200–240 V, 45–65 c/s.

Power consumption:
H 1601, 2-channel, 350 W.
H 1602, 2-channel, 600 W.

Dimensions:

Height	Width	Depth
7 ft. (213 cm)	2 ft. (61 cm)	2 ft. 6 in. (76 cm)

Fig.1. One transmitter channel of a Type H 1601 assembly.

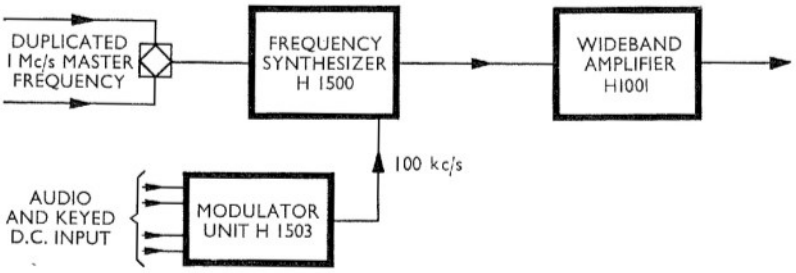
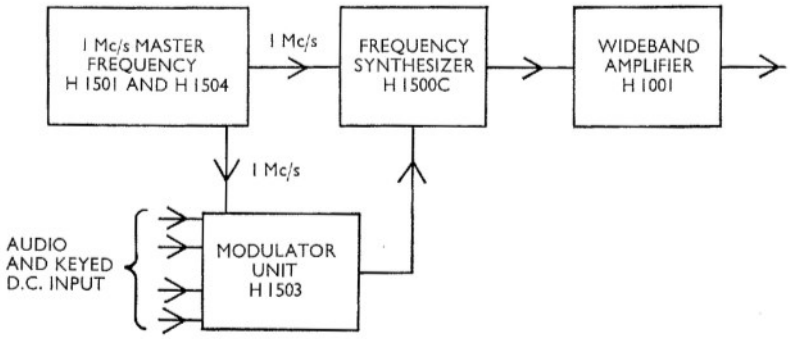


Fig.2. One transmitter channel of a Type H 1602 assembly.



Frequency Synthesizer
Type H 1500C

This fully transistorized synthesizer accepts a 100 kc/s modulation input and covers the band 100 kc/s to 27·9999 Mc/s.

The required frequency may be selected in a matter of seconds by adjusting a series of decade controls designated Mc/s, 100 kc/s, 10 kc/s, 1 kc/s and 100 c/s, the decade dials indicating the output frequency.

Features

Excellent frequency stability.

Instant frequency selection.

Inherently a 'fail-safe' system in which incorrect frequencies cannot be delivered.

Complete transistorization greatly improves reliability and serviceability and eliminates problems due to overheating.

Can be modulated with 100 kc/s sub-carrier thus eliminating external mixers.

EQUIPMENT

The unit is small and compact and may be mounted in a standard 19 in. (48 cm) rack or cabinet.

All frequencies are derived from a separate 1 Mc/s master oscillator, the stability of which is reflected in the output of the synthesizer at the exact 1 kc/s steps. The 100 c/s steps are derived from a free-running interpolating oscillator, for which a means of calibration at its upper and lower limits has been provided.

The basic 1 Mc/s input from the master oscillator is broken down in the standard-frequencies generator by means of a series of frequency dividers of the regenerative-modulator type, to provide standard frequencies of 100 kc/s, 10 kc/s and 1 kc/s. These are filtered and amplified before being applied to the appropriate 'adders', in which the process of synthesis takes place. An auxiliary output at 100 kc/s is also available via a co-axial socket for application to associated equipment.

The 'adders', which are identical except for frequency order, employ a triple-mixer process and are connected in cascade to produce the required frequency. A fourth mixer in the 10 kc/s adder accepts a modulated input on a sub-carrier of 100 kc/s and the output frequency is delivered with the impressed modulation.

Data Summary

Frequency stability: This is dependent upon the stability of the 1 Mc/s source employed (see H 1501, page 232).
Frequency range: 100 kc/s to 27·9999 Mc/s.
Auxiliary output frequencies: 100 kc/s from standard-frequencies generator.
Standard input frequency: 1 Mc/s at a level of 0·5 to 1V in 75 Ω.
Output levels: Main output, 5–20 mW. Auxiliary output not less than 10 mW.
Output impedance: 75 Ω unbalanced.
Spurious components: No spurious component (other than harmonics) exceeds −65 dB relative to the wanted output.
Harmonics: Relative to level of wanted output:
−25 dB at frequencies below 2·5 Mc/s.
−30 dB at frequencies between 2·5 and 3·5 Mc/s.
−36 dB at frequencies between 3·5 and 5·0 Mc/s.
−40 dB at frequencies above 5·0 Mc/s.
Noise: Noise and hum modulation of output not greater than −60 dB relative to carrier.
Intermodulation: Third-order products of the order of −50 dB ref. p.e.p, fifth-order products negligible when output level is limited to 5 mW p.e.p.
Power supplies: 100–125V or 200–240 V 50–60 c/s a.c mains.
Dimensions:

Height	Width	Depth (excluding handles)
Chassis		
7¾ in. (19·7 cm)	17½ in. (44·5 cm)	21 in. (53·3 cm)
Front panel		
19 in. (48·3 cm)	8¾ in. (22·3 cm)	

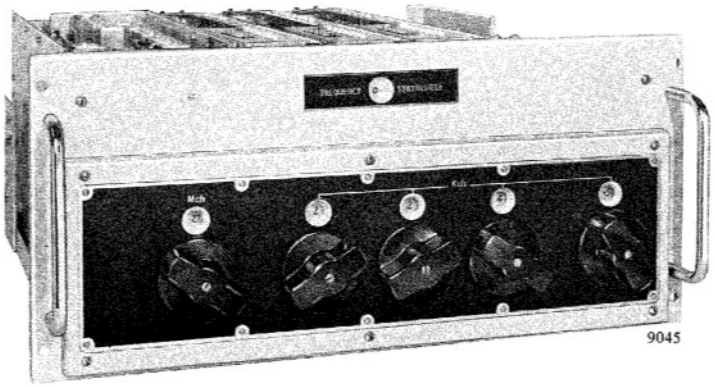
All normal forms of modulation are available with a standard set of modules, being switched merely by operation of switches; logic circuits prevent use of conflicting services.

Output is at 100 kc/s for combination with a frequency-determining source to produce the signal at radiated frequency in either a wide-band mixer or a modulated synthesizer H 1500.

F.S.K is generated by shifting the frequency of a tone with the transmitter operating on i.s.b with complete carrier suppression (t.s.k). Modules are available for 2 kc/s tone or 4 kc/s tone.

Features

Comprehensive modulation facilities provided by a compact unit.
Fully transistorized modules.
Logic circuits prevent operational errors.
Level meter and two-tone test facility incorporated.
Lights indicate service in use.
Servicing accessibility good, replacement modules may be rapidly substituted.
Combinations of modules available to suit individual requirements.



Frequency Synthesizer Type H 1500C.

Comprehensive Modulator Unit
Type H 1503

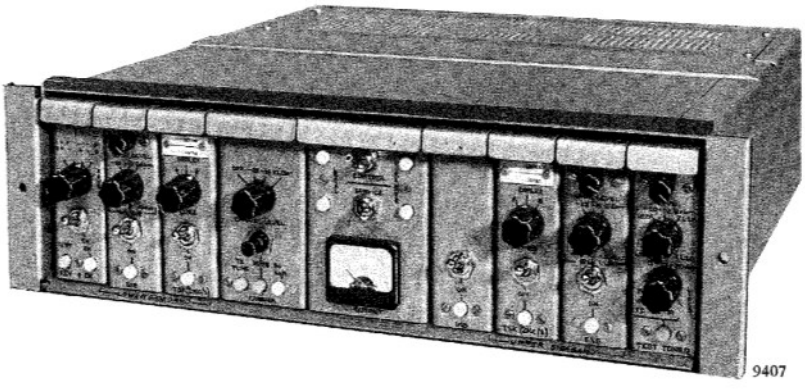
The H 1503, 100 kc/s modulator unit is designed as a fully comprehensive and flexible source of modulated signals for h.f communications transmitters.

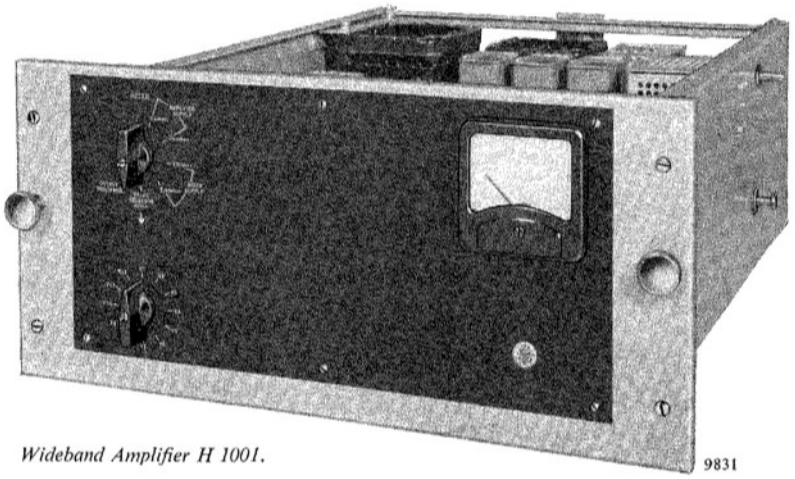
It normally forms part of the H 1600 series of drive assemblies which are especially suitable for the H 1100 and H 1200 series of transmitters.

The unit is constructed on a modular basis affording easy interchange of the modulation facilities provided, together with excellent accessibility for maintenance.

The modules are fully transistorized printed circuits with rear edge plugs, and slide into a 5¼ in. high 19 in. rack-mounting unit; a mains power pack is included.

Comprehensive Modulator Unit Type H 1503.





Wideband Amplifier H 1001. 9831

Data Summary

1 Mc/s input level: >14 dBm in 75 Ω.
100 kc/s output level: 250 μW in 75 Ω.
Output level stability: ±1 dB.
F.S.K input: 80–0–80 V to 6–0–6 V double current.
−80 V to −9 V single current short-circuit keying.
Keying speeds: C.W 400 bauds max. F.S.K (T.S.K 2 kc/s) 200 bauds max. F.S.K (T.S.K 4 kc/s) 3500 bauds max.
Space radiation: C.W 50 dB below 'mark' level.
Tone frequency stability: ±5 c/s (at max. shift), ±2 c/s (at min. shift).
Available shift range: (a) On 2 kc/s t.s.k modules, single channel, ±500 c/s to ±70 c/s on nominal centre frequency; (b) on 4 kc/s t.s.k module, choice of three pre-selected shifts of ±500 c/s to ±70 c/s on nominal centre frequency.
Diplex (on 2 kc/s t.s.k module only): ±600 c/s or ±300 c/s overall on nominal centre frequency.
NOTE: *For tone-shift keying (t.s.k), nominal centre frequencies are 2 kc/s and 4 kc/s, the nominal sub-carrier centre frequencies are 98, 102 and 96, 104 kc/s.*

I.S.B
Audio input level: +10 to −20 dBm in 600 Ω for 250 μW p.e.p carrier −6 dB.
Audio response: Bandwidth, ±250 c/s to ±6000 c/s, passband ripple, 1·5 dB total ±300 c/s to ±6000 c/s over range 15–60 °C.
Intermodulation products (standard two-tone test): 25 μW p.e.p, better than −55 dB to each test tone.
Clipping level stability: Better than ±1 dB.
A.G.C dynamic range: Greater than 20 dB, recovery time 2 seconds.
Pilot carrier levels: −26 dB, −16 dB, floating, and fully suppressed (less than −50 dB). Floating carrier level −6 dB with no modulation, −26 dB with full modulation; operating time 5 μs; recovery time 100 μs.

D.S.B
Audio input level: As I.S.B, but set to give p.e.p at 100% modulation for 250 μW with carrier −6 dB.
Distortion: Better than 1% at up to 85% modulation.
Sideband clipping level: Between 90% and 100% after carrier insertion.
Power supply: 200–250 V, 50/60 c/s a.c.
Consumption: 40 W.
Dimensions:

Height	Width	Depth
5¼ in.	19 in.	18 in.
(13·3 cm)	(48 cm)	(46 cm)

Wideband Amplifier
Type H 1001

The H 1001 raises the level of the modulated output from the synthesizer at the radiated frequency to a level suitable for feeding the transmitter. It is a wideband device, covering the whole h.f band without tuning, and introduces negligible intermodulation distortion.

Data Summary

Frequency range: 2–28 Mc/s.
Input impedance: 75 Ω.
Output: 3 W (max.) into 75 Ω.
Gain: 27 dB ±1 dB.
Intermodulation products: −45 dB at 3 W output.
Power supply: 200–250 V, 50–60 c/s a.c.
Dimensions:

Height	Width	Depth
8¾ in.	19 in.	24 in.
(22·3 cm)	(48·3 cm)	(61 cm)

The Marconi Company Limited
Marconi House, Chelmsford, Essex
Telephone: Chelmsford 3221 · Telex: 1953
Telegrams: Expanse Chelmsford Telex