



Five Band Privacy Equipment *Type HW11*

JOINT MARCONI-SIEMENS PRODUCT

THE FIVE-BAND split privacy equipment provides a very high degree of protection against unauthorised interception of speech on a radio telephone circuit.

Briefly the equipment performs the following functions:

- (a) Splits the speech band of 250–3000 c/s into five sub-bands each 550 c/s wide.
- (b) Changes the relative positions of individual sub-bands and recombines them in a new order in the 250–3000 c/s band.
- (c) Inverts the frequency range of any one or more of the sub-bands.
- (d) Rearranges the grouping of the sub-bands at regular intervals by synchronous switching at both ends of the radio circuit, in accordance with a pre-arranged sequence.

The resulting speech band, which modulates the radio transmitter, is unintelligible and a reversal of the process at the distant radio terminal restores the original speech. The frequent re-grouping of the sub-bands, with or without inversion, precludes any simple method of partial interception. The interval between successive groupings, or combinations, is controlled and may be from 4 to 20 seconds.

The process of band splitting, modulating, inverting and recombining is reversible, thus common channel equipment can be used for both transmission and reception. The separation between the two-wire privacy branch and the four-wire send and receive sides of the radio and line is secured by hybrid coil circuits working in conjunction with the suppressor circuits of the radio telephone terminal.



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Amplifiers are provided in the privacy path to compensate for the losses in the band splitting and recombining circuits.

A main feature of the equipment is the synchronous switching, carried out by relays under the control of a synchronous motor driven by a high-precision crystal oscillator. The use of a transmitter pilot tone is thereby avoided. Privacy working may be switched in or out of use at the radio terminal.

Power supplies are taken from 110–120 or 200–250 V 50–60 c/s single-phase AC, the consumption being 600 W approx.

CONSTRUCTION

The equipment is assembled on both sides of standard 8 ft 6 in. frameworks and comprises two bays. The first bay, which is known as the common equipment bay, accommodates such equipment as tone supplies, synchronising equipment, etc., which will serve more than one privacy system operating over the same radio path. On the second bay—the channel bay—is fitted those items which are peculiar to one speech channel or system. One common bay will serve up to four channel bays.

A test tablet on the channel bay, where the normal connections are made by U links, provides ready test facilities. This, combined with comprehensive monitoring, checking and metering arrangements, makes maintenance easy and straightforward. A service telephone is also included to provide direct communication with the distant radio station during adjustment and synchronising operations.

CIRCUITS

Both the input and output paths are taken through amplifiers whose gains are adjusted to give a suitable operating level and so provide any required compensation for system losses. A group of hybrid transformers is also employed on both line and radio sides serving to divide and combine the five sub-circuits and also couple the 'both-way' operation of the splitting and modulating paths to the four-wire (transmit and receive) amplifiers and external circuits.

The speech signals are fed to first group modulators which comprise four low-pass filters and four modulators, dealing with the four lower sub-bands between 250 and 2450 c/s, and these are followed by five band-pass filters covering 2450–3000 c/s. Each of the lower sub-bands is modulated by an appropriate frequency so producing frequencies in the band 2450–3000 c/s. A similar process reconverts this into the 250–2450 c/s band producing a band of unintelligible speech which is combined in a hybrid.

Provision is made for inverting any of the sub-bands while these lie in the 2450–3000 c/s band. The inverters are similar to the modulators and operate about a carrier frequency of 5450 c/s. An attenuator is connected in place of any inverter not in use.

The relative positions of the sub-bands may be rearranged by a relay switching system which may be arranged to insert an inverter also as required.

This switching is motor controlled, the motor speed being regulated within very close limits by a precision crystal oscillator.

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