Channel Shifting and Restoring Equipment

JOINT MARCONI-SIEMENS PRODUCT

IN SINGLE-SIDEBAND WORKING only one RF component is radiated for a given AF component in the input and it may be arranged that this component shall be either above or below the nominal radiated carrier frequency. Thus a speech input signal (such a signal is considered because it comprises a band of frequencies) applied to an SSB transmitter produces a side-band spectrum only on one side of the nominal carrier frequency instead of on both sides as with the double sideband system. By applying two separate speech signals to the input of an SSB transmitter it may be arranged that one of them produces RF components in the upper sideband while the other produces RF components in the lower sideband. Two speech signals are therefore transmitted in the RF bandwidth (approximately 12 kc/s) formerly required for one signal in the DSB system, and such a transmitter is known as a two-channel SSB transmitter. A low-level pilot carrier is also transmitted to control the AGC and AFC circuits of the distant receiver.

In a two-channel system of this nature it is very important that cross-talk between the two signals should be very small. Cross-talk is due to non-linearity in the transmitter circuits giving rise to inter-modulation products (I.P's). If the signal bandwidths are limited to about 3 kc/s and one of them is displaced, none of the third-order I.P's from one channel affects the other, and as the fifth-order I.P's are usually of a much lower level than the third-order I.P's, the displacement of one channel effects a marked decrease in inter-channel cross-talk.

The displacement of one channel is produced in the AF input to the transmitter by a channel-shifting equipment, and the restoration is effected in the AF output of the receiver by channel-restoring equipment.

In early SSB systems channel displacement was necessary to keep inter-channel cross-talk to a low-level, but improvement in the linearity of SSB transmitters now enables nearly the whole of the 12 kc/s spectrum to be used to transmit more than two signals in a two-channel SSB transmitter, and the primary function of displacement is in connection with channelling rather than in reduction of cross-talk between signals in the two sidebands.

The units are built on 19 in. panels which are rack mounted. The number of panels required will vary and individual layouts will be made to suit specific needs. In simple cases, where perhaps only one shifting or restoring equipment is needed, the separate panels may be supplied to be mounted on an existing rack.

In accordance with modern practice, the terminations are placed at the top of the rack to suit overhead cabling.

FEATURES

The conversion gain, measured between 600 Ω terminations, is nominally 0 db but provision is made for a gain adjustment of from −2 db to +4 db.

The gain/frequency characteristic is within ±1·0 db of the gain at the mid-band frequency between limits of 100 c/s from the edges of the bandwidth and within ±2·5 db over the whole band.

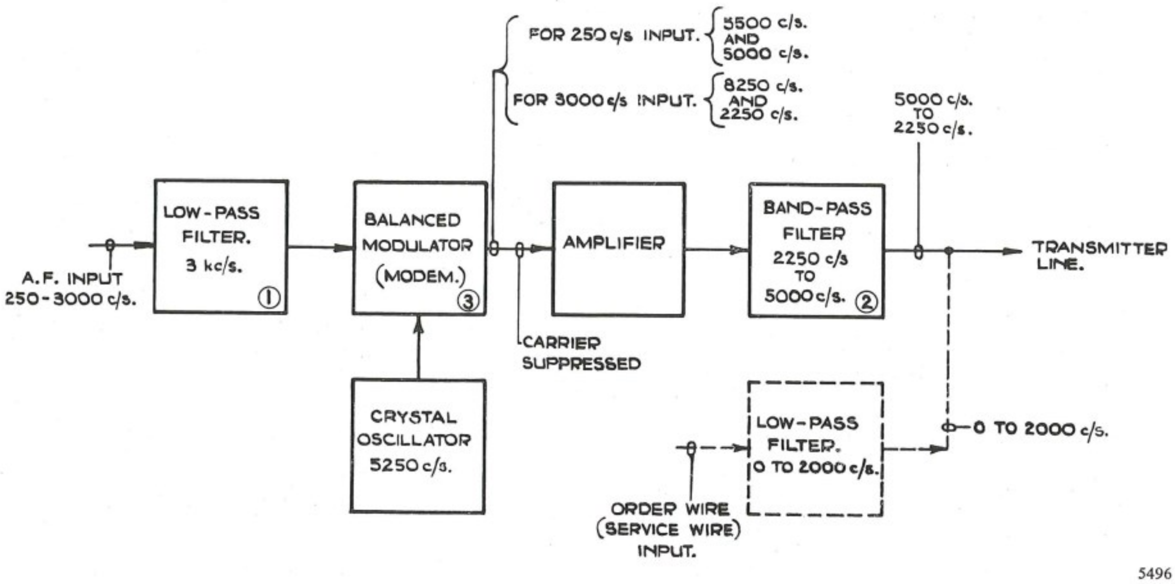
Overall performance linear up to an output level of +8 dbm.

Output level of unwanted modulation products not more than 30 db below the operating frequency.

The carrier and its harmonics are not more than 40 db below the output level.

Unwanted sidebands are more than 45 db down relative to the wanted sideband level.

Carrier variation not greater than ±1 c/s for normal mains supply variations and temperature changes from 0° to 45°C.



CHANNEL SHIFTING EQUIPMENT, SCHEMATIC DIAGRAM

1. *The channel restoring equipment is identical with the above except that the positions of the low-pass filter* (1) *and the band-pass filter* (2) *are interchanged.*

2. *The unit* (3) *may be used either as a modulator or a demodulator and is sometimes briefly referred to as a modem to cover either case.*