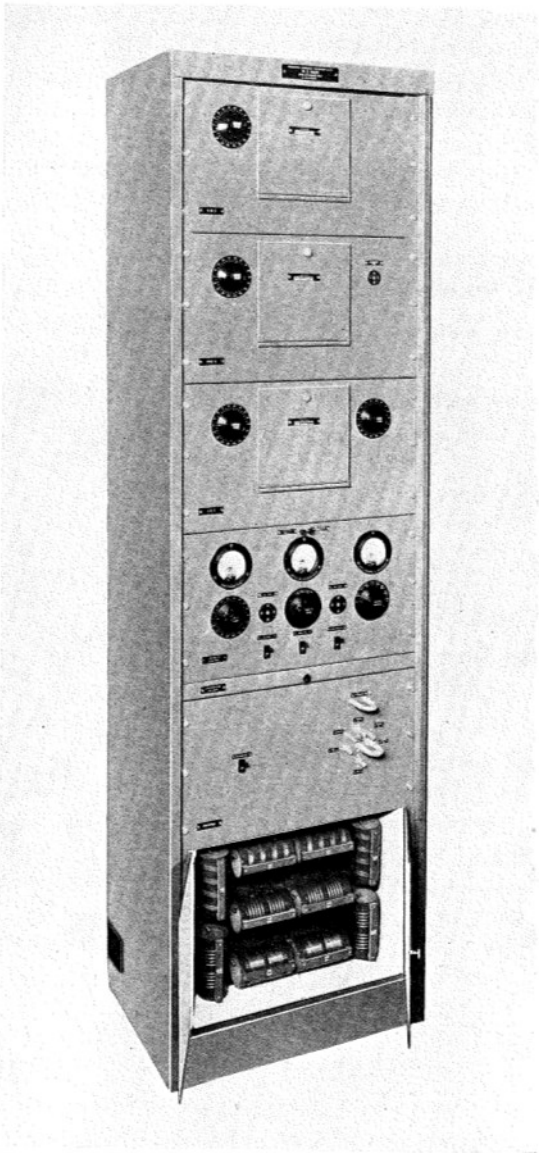
Single-Sideband Modulator

Type SSM 1

(THIRD MODULATOR RACK)



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WHEN AN HF TRANSMITTER normally used for CW or double-sideband telephony working is required to operate on the single-sideband system, an auxiliary unit, known as a 'third modulator', is needed. An SSB transmitter is driven by a single-sideband generating equipment which develops a pilot carrier of fixed frequency and the required sideband (or sidebands for two-channel working). The usual frequency of this pilot carrier is 3·1 Mc/s, and the function of the third modulator is to convert the 3·1 Mc/s pilot carrier to the required radiated frequency. The SSB generating equipment is not involved in the frequency-changing operation of the transmitter as this change is carried out in the third modulator equipment. The radiated pilot carrier frequency of an SSB transmitter is derived through three modulation processes. The first two form part of the generating equipment and the third occurs in the third modulator.

The Type SSM 1 rack is comprised of the following panels:

Output amplifier.
Third modulator unit.
Input amplifier.
Meter and control panel.
Drawer for calibration sheets.
Rectifier and U-link selector.
Coil cupboard.

CIRCUIT

In the SSB condition the pilot carrier is generated in the Type SSD 2 SSB Generating Equipment (see page 221) and is a fixed frequency of 3·1 Mc/s. This pilot carrier is converted to the required radiated frequency (f_{cr}) by means of a third

modulator unit which forms part of the SSM 1 rack. The output from the transmitter harmonic generator stage is fed to the third modulator at a specific frequency (f_{c3}) together with the fixed frequency pilot carrier (3·1 Mc/s) from the SSD 2 equipment. The output circuit of the third modulator is tuned to the final radiated frequency fcr.

The third modulator unit is preceded by an amplifier called the input amplifier which serves two functions: (i) to enable the f_{c3} frequency to be fed to the monitor equipment free from other frequencies, and (ii) to give control of the level of f_{c3} voltage fed to the third modulator. In order to keep non-linear distortion to a minimum, it is found desirable to be able to control the f_{c3} voltage level at the third modulator grid so that it is about four times the level of the 3·1 Mc/s voltage. In addition, variable damping is provided across the third modulator LC circuit which gives both level control and control of distortion.

As the output of the third modulator is not tuned to either of the driving frequencies on its grid, the efficiency is low and the output amplifier is provided in order to obtain adequate driving voltage to the transmitter.

Grid bias voltage supply is obtained from the main transmitter GB potentiometer. A rectifier panel is included in the SSM 1 rack which provides HT and filament supply for the three main units and this panel is also used to mount the U-link selector for the RF monitor points in the transmitter.

RF pick-ups are included in the third modulator and output amplifier units, to enable distortion to be checked by the monitor equipment.

The rack is provided with a safety switch which is interlocked with the main transmitter trip circuits.

DATA SUMMARY

Input circuits:

Impedance: (i) 3·1 Mc/s input to third modulator should connect to a 75 Ω source.

(ii) f_{c3} input to the input amplifier should connect to a 75 Ω source.

Levels: (i) Normal 3·1 Mc/s voltage on the third modulator grid is 10 V approx.

(ii) Normal f_{c3} voltage on the third modulator grid is 40 V approx.

Note: The 3·1 Mc/s input passes through a 10 db attenuator and the level figures given above apply for a peak envelope power of 1 W from the SSB generating unit. Lower input levels can be accepted if the attenuation is reduced in value.

Output circuit:

Impedance: 75 Ω.

Level: Maximum 4·5 W. Normal working 0·5–1 W. (Depending on damping in third modulator and on operating point of third modulator valve.)

Non-linear distortion: When measured by the standard test using two modulating tones f_1 and f_2 of equal level, the value of the third-order intermodulation product $2f_1-f_2$ is practically constant at about −40 db relative to the level of one of the testing tones, for damping conditions which produce outputs between 0·5 W and 1 W.

Frequency range:

Output: 4–27 Mc/s

Input: (i) The input frequency of 3·1 Mc/s is constant.

(ii) The input frequency f_{c3} varies over the range 7·1 Mc/s to 23·9 Mc/s.

Dimensions:

Height	Width	Depth
72 in.	21 in.	15 in.
(183 cm)	(53 cm)	(38 cm)

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