Travelling-wave Tube Amplifiers

BY THEIR NATURE, conventional thermionic valves are unsuitable as amplifiers at centimetric wavelengths. Consequently in the radar receiver any form of RF amplification has of necessity been omitted.

With the development of the low-noise forward travelling-wave tube has come a ready answer to the RF amplification, and the Marconi range of travelling-wave tube amplifiers presents an impressive advance in the field of radar receiver design.

Features

Older types of radars can achieve noise factors comparable with most recent models when fitted with the amplifier.

Greatly extended receiver crystal life.

Substantial reduction in routine maintenance.

Protection of succeeding stages effected due to self-limiting properties of the travelling-wave tube.

EQUIPMENT

These units can be readily adapted for use with existing radar installations, and separate versions are available for 10 cm and 25 cm types.

When integrated with a radar receiver as an RF amplifier the signal-to-noise ratio obtained at the mixer stage is so increased as to make the electrical condition of the mixer and subsequent stages relatively unimportant. An overall receiver noise factor of less than 8 dB (10 cm) or 9 dB (25 cm) can thus be achieved. This can be maintained within 0·5 dB over the whole of the 10 and 25 cm band frequencies and for the entire life of the tube with only the minimum amount of adjustment and routine maintenance.

A further advantage is that during the transmission period the travelling wave-tube saturates and limits the output to 1 milliwatt. The sensitive succeeding stages are thus protected and crystal deterioration is virtually eliminated.

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The input to the travelling-wave tube is taken from the T/R cell *via* a suitable coaxial cable. The original mixer block is replaced by a new coaxial mixer unit incorporating an image channel rejection filter. This is coupled to the original head amplifier unit.

The amplifiers comprise (in addition to the coaxial mixer unit mentioned above), an amplifier unit and a power unit, each contained in a compact case. Full metering and switching facilities are included and are operated from the power unit.

Data Summary

COAXIAL MIXER UNIT

Input impedance:
50 Ω signal, 70 Ω local oscillator.*

Output impedance: 300 Ω.*

IF: 45 Mc/s.*

* *Dependent upon type of radar and installation.*

AMPLIFIER UNIT

Input impedance:
10 cm 50 Ω (coaxial). *25 cm* 70 Ω (coaxial).

Output impedance:
10 cm 50 Ω (coaxial). *25 cm* 70 Ω (coaxial).

Frequency range:
10 cm 2960–3040 Mc/s.
25 cm 1200–1400 Mc/s.

Gain:
10 cm Better than 20 dB.
25 cm Better than 20 dB.

Noise factor:
10 cm 7 dB (approx.) *25 cm* 8 dB (approx.) (*tube only*).

POWER UNIT

Input: 230 V 50 c/s single-phase AC.

Power consumption: 160 W (approx.).

Output: All travelling-wave tube power supplies including:
20 V DC 8–10 A (solenoid).
400 V DC 150 mA (gun and helix).

Dimensions (amplifier unit):
Height 10 in. (25·4 cm)
Width 11½ in. (29·5 cm)
Depth 32 in. (81·5 cm)
Weight 70 lb max (32 kg)

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