# Marconi 15 kW Klystron Transmitters

The design of this equipment is based on many years of experience in the high-power transmitter field and in particular the klystron equipments for tropospheric scatter and television applications. High-power satellite communication transmitters have been designed and manufactured for military and civil systems and are now in operational use.

## FEATURES

Tunable range of 500 MHz from 5,925–6,425 MHz with a 1 dB bandwidth of 30 MHz.

Uses established 5-cavity klystron with a guaranteed life of 5,000 hours.

Equipment can be built into shelters with the r.f container suitable for mounting on to the back structure of the tracking aerial.

Comprehensive metering and monitoring is presented on the equipment.

Designed for full remote control operation, with local over-ride facilities for maintenance.

Air conditioning can be provided.

Proved equipment—transmitters of this type are operational at the Ascension Island Apollo satellite communication station.

## Equipment

The transmitter comprises three equipments- r.f, power supply, and cooling units.

**R.F Equipment**

This consists of:

(a) Klystron amplifier and output waveguide components.

(b) Exciter rack containing up-convertor, t.w.t amplifier and power supplies.

(c) Control and auxiliaries rack for the klystron amplifier.

The equipment uses a well-established 5-cavity klystron—the VA 884C—which has a mechanical tuning range of 500 MHz from 5,925–6,425 MHz with a bandwidth of 30 MHz at the 1 dB points. The klystron generates 15 kW of c.w measured at the output waveguide of the transmitter. The klystron and the waveguide is water-cooled from equipment housed in the same container. An arc detector is included in the waveguide for klystron protection, and when initiated will remove the r.f drive to the klystron in some 10 $\mu$s. A special 'leaky wall' filter is provided for insertion between the klystron output and the aerial for suppression of harmonic frequencies.

Waveguide changeover switches for dual transmitter installations, can be provided with an operating time of approximately 150 ms.

An air conditioning unit can be provided to remove the heat generated in the shelter.

**Power Supply Equipment**

This generates high voltage supplies for the klystron. Comprehensive fault protection and interlock circuits are provided. A control panel on the equipment displays the operating state of the control circuits and these indications may also be remoted to the operations equipment room. An air conditioning unit can be provided to remove the heat generated in the equipment.

**Cooling Equipment**

This comprises the liquid to air heat exchanger, the pump and the reservoir tank providing a cooling system for the klystron and waveguide runs. A total coolant flow of around 16 gallons per minute at 100 p.s.i. is provided. Pressure and temperature monitors are fitted. Each cooling circuit has temperature monitoring, flow monitoring and flow meters which provide alarm facilities and interlocks with the appropriate power supplies. A temperature-controlled by-pass valve maintains the coolant temperature to the klystron constant to within $\pm 3^{\circ}$C.

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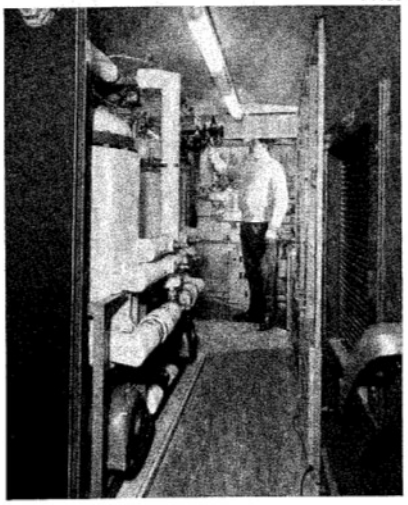
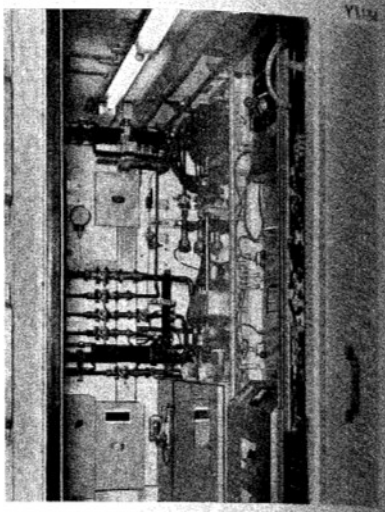


*High-power transmitter for an air transportable military satellite communications station*

Y1134



*15 kW Transmitter for the Apollo satellite communications station on Ascension Island*

## DATA SUMMARY

**Frequency range:**
Amplifier: 5,925–6,425 MHz.
Exciter: Capable of operation over the above band.

**Output power:** 14–15 kW to waveguide system.

**Output tube:** 5 cavity klystron with 500 MHz mechanical tuning range.

**Output waveguide:** Water-cooled WG 14.

**R.F Bandwidth:** 30 MHz between 1 dB points.

**Harmonic radiation:**
2nd harmonic —60 dB.
3rd harmonic —75 dB.

**Spurious radiation:** —60 dB relative to c.w carrier.

**Input level to wideband i.f. amplifier:** 0·5 V r.m.s into 75 Ω at 70 MHz.

**Power supply:** 400 V $\pm 6\%$ 3-phase, 50 Hz $\pm 2\%$.

**Operating ambient:** —15°C to +50°C, humidity up to 98% max. altitude 6,000 ft.

**Weights and sizes:**

*R.F equipment in container*
Approx. 6 × 5 × 7 ft long, weight approx. 1,400 lb.

*Cooling Unit*
Approx. 6 × 5 × 4 ft, weight approx. 1,500 lb.

*Power Supply Equipment in container*
12 × 7 × 7 ft, weight approx. 5,000 lb.

The foregoing data summary gives typical figures, and these may vary between specific types of equipment.

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