

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
MICROWAVETR SWITCH

1B44

Specialized - Switching Tube electronic tube

Fixed-tuned argon-filled ATR gas switching tube for microwave duplexer switching and receiver-protection service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	— / —	PARALLEL HEATER	— / —
HEATING	Indirect; cold cathode	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 MicrowaveTRSwitch
No fixed ratings recorded.
Special microwave/gas-discharge section; published electrical data retained as section parameters.

1B44 — Fixed-Tuned ATR Gas Switching Tube

Overview

The **1B44** is a fixed-tuned Anti-Transmit-Receive (ATR) gas switching tube designed for operation in the Sg band of microwave frequencies. Sponsored by the Sperry Gyroscope Company, Inc., and registered under RMA Release Number 444 on October 5, 1945, this specialized tube is engineered to handle high-power RF switching in radar and microwave systems.

Unlike typical thermionic vacuum tubes, the 1B44 does not contain a heated filament or cathode. Instead, it utilizes an ionizable gas medium to achieve rapid switching action under high-power radio frequency (RF) conditions, protecting sensitive receiver circuitry during transmitter pulses.

Electrical and RF Characteristics

The 1B44 is designed to operate at a specific resonant frequency with defined electrical loading characteristics. Its primary electrical parameters are tightly controlled to ensure proper impedance matching and switching efficiency within the Sg band waveguide or cavity assembly.

- **Resonant Frequency:** The tube is fixed-tuned to a nominal resonant frequency of **2750 Mc** (megacycles per second), with a permissible tolerance of **±0.5%**. This corresponds to a frequency range of approximately 2736.25 Mc to 2763.75 Mc.
- **Loaded Q (Q_L):** The maximum loaded quality factor (Q_L) is **4.5**. This relatively low Q-factor ensures a sufficiently broad bandwidth to accommodate the transmitter's spectrum within the Sg band.
- **Tuning Susceptance (B/Y_O):** The normalized tuning susceptance is specified at **±0.05**, indicating the degree of reactive loading the tube introduces to the transmission line.
- **Equivalent Conductance (G/Y_O):** The maximum normalized equivalent conductance is **0.1**, which limits the insertion loss and power dissipation of the tube when it is in the non-ionized state.
- **Transmitter Peak Power:** The 1B44 is rated to handle a minimum transmitter peak power of **20 kW**. This high peak power rating is essential for surviving the intense RF fields generated during radar transmission.

Mechanical, Environmental, and Mounting Specifications

The physical construction of the 1B44 is optimized for direct integration into waveguide systems or specialized resonant cavities. It features a robust mechanical design capable of withstanding extreme environmental conditions.

Ionizable Medium

The tube is filled with **Argon** gas, which serves as the ionizable medium. When high-power RF energy from the transmitter enters the waveguide, the Argon gas ionizes rapidly, creating a low-impedance path (an RF short circuit) that prevents the transmitter power from reaching and damaging the receiver. Once the transmitter pulse ends, the gas deionizes, restoring the tube to its non-conducting state and allowing weak received signals to pass to the receiver.

Environmental Limits and Mounting

The 1B44 is rated for operation across a wide ambient temperature range, making it suitable for military and aerospace applications where equipment is exposed to harsh climates.

- **Ambient Temperature Range:** **-50 to +100 °C**
- **Mounting Position:** The tube can be mounted in **any position**, providing flexibility in system layout and waveguide routing.

Physical Dimensions

The tube is designed with a flange mounting configuration to ensure a secure, RF-tight connection to the waveguide structure. The mounting flange is equipped with **10 holes**, each having a diameter of **7/32 inches**.

The maximum physical dimensions of the device are detailed in the table below:

Dimension Parameter	Maximum Value (inches)	Maximum Value (approx. mm)
Overall Length	4-5/32	105.6
Overall Width	3-5/16	84.1
Body Width	2-3/32	53.2
Top Cap Width	1-17/32	38.9

Technical Summary

The **1B44** is a specialized **Argon-filled, fixed-tuned ATR gas switching tube** designed by Sperry Gyroscope Company for Sg-band radar applications. Operating at a resonant frequency of **2750 Mc ± 0.5%**, the tube features a maximum loaded Q of **4.5**, a tuning susceptance of **±0.05**, and a maximum equivalent conductance of **0.1**. It is capable of handling a minimum transmitter peak power of **20 kW** and operates reliably across an environmental temperature range of **-50 to +100 °C**. Its physical design incorporates a 10-hole mounting flange for robust waveguide integration, allowing installation in any physical orientation.