

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
MICROWAVETR SWITCH

1858

Specialized - Switching Tube electronic tube

Gas-filled microwave TR/TR switching tube for pulsed transmitter/receiver duplex service, protecting or isolating receiver and transmitter paths during radar pulses.

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.
Gas-filled microwave switching tube; frequency, ignitor, leakage and insertion-loss data retained as parameters.

1858 — Gas Switching TR Tube

The **1858** (also designated as the GL-1B58 or GL-1858) is an integral-cavity, fixed, broadband gas switching transmit-receive (TR) tube. It is designed for use in pulsed microwave circuits to protect the receiver by decoupling it from a common transmitting and receiving antenna during the high-power transmission pulse.

Technical Overview and Application

The 1858 operates as an automatic switch in radar and other pulsed microwave systems sharing a single antenna. During transmission, the high-power RF pulse ionizes the gas within the tube's integral cavity, creating a short circuit that reflects the transmitter power away from the sensitive receiver input. When

the transmission pulse ends, the gas deionizes, allowing weak incoming echo signals to pass from the antenna to the receiver with minimal attenuation.

The tube is designed to operate over a fixed broadband frequency range of **2659 to 2969 Megacycles** (mc), defined at a maximum Voltage Standing Wave Ratio (VSWR) of 1.65.

Electrical Characteristics and Ignitor Operation

The 1858 features a single ignitor electrode designed to maintain a continuous, low-current auxiliary discharge (keep-alive) within the tube. This pre-ionization reduces the time required for the main RF discharge to form, thereby minimizing the leakage energy that reaches the receiver at the start of each pulse.

Ignitor Power Supply and Ratings

The ignitor circuit operates under the following electrical parameters:

- **Open-Circuit Ignitor Supply Voltage:** Minimum of **-500 Volts**, maximum of **-700 Volts**.
- **Ignitor Voltage Drop:** Between **250 Volts** and **400 Volts** when operating at an ignitor current of 200 μA .
- **Maximum Ignitor Current Rating:** **200 Microamperes** (μA).
- **Ignitor Time:** Maximum of **5 Seconds**.

Leakage and RF Performance

When the transmitter fires, a small amount of RF energy leaks through the TR tube before full ionization is established (the spike) and during the steady-state portion of the pulse (the flat). Under test conditions of 200 kW peak power, a pulse repetition rate of 1000 pps, a pulse duration of 1 μs , an ignitor current of 100 μA , and an operating frequency of 2802 mc, the leakage characteristics are:

- **Spike Leakage Energy:** Maximum of **0.3 Ergs**.
- **Flat Leakage Energy:** Maximum of **0.4 Ergs**.

Other critical RF performance metrics include:

- **Insertion Loss:** Maximum of **0.5 Decibels** (dB) at 2802 Megacycles with the ignitor current at zero. This represents the signal attenuation experienced by weak incoming signals during reception.
- **Ignitor Interaction:** Maximum of **0.3 Decibels** at an ignitor current of 200 μA , representing the insertion loss contribution caused by the keep-alive discharge itself.
- **Recovery Time:** Maximum of **15 Microseconds** (μs) measured at 750 Kilowatts peak power and 3 decibels down. This defines how quickly the tube deionizes and restores receiver sensitivity after a transmission pulse.

Frequency Response and Impedance Matching

The impedance matching of the integral-cavity structure is highly frequency-dependent. The voltage standing wave ratio (VSWR) varies across the operational band:

- **Band Edges:** At the operational limits of **2659 mc** and **2969 mc**, the maximum VSWR boundary is defined at **1.65**.
- **Mid-Band Performance:** The typical frequency-response curve shows a VSWR dipping below **1.2** between approximately 2700 mc and 2950 mc.
- **Optimum Match:** The VSWR reaches its minimum value of approximately **1.1** near **2820 mc**, indicating excellent impedance matching and minimal signal reflection in the center of the band.

Mechanical, Environmental, and Mounting Specifications

The physical construction of the 1858 is optimized for waveguide integration and rugged environmental conditions:

- **Physical Interface:** Features a **4-hole flange mounting** configuration for secure mechanical and electrical connection to the waveguide system.
- **Mounting Position:** The tube can be mounted in **any position** without affecting its electrical or gas-discharge characteristics.
- **Weight:** Approximately **2.75 Pounds** net weight.
- **Non-Operating Temperature Range:** Designed to withstand ambient storage and non-operating temperatures from **-40 to +100 °C**.

Technical Summary

The **1858** is a specialized, integral-cavity gas switching TR tube operating in the S-band from **2659 to 2969 mc**. Utilizing a single ignitor electrode with a maximum current rating of **200 μ A** and an open-circuit supply voltage of **-500 to -700 V**, the tube provides rapid ionization to protect sensitive receivers in pulsed microwave systems. It features a maximum recovery time of **15 μ s** at 750 kW peak power, a maximum insertion loss of **0.5 dB** at 2802 mc, and low leakage energy (maximum **0.3 Ergs** spike and **0.4 Ergs** flat). Its robust mechanical design includes a 4-hole flange mount, a net weight of approximately 2.75 pounds, and the ability to operate in any mounting orientation.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1950 General Electric Transmitting Types

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1950 GENERAL ELECTRIC TRANSMITTING TYPES

Section 1 · MicrowaveTRSwitch

CHARACTERISTICS

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Center/operating frequency	2802 MHz	—

APPLICATION

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Gas switching service	TR/ATR microwave switching	—

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