

Gas-filled microwave TR/ATR switching tube for pulsed transmitter/receiver duplexer 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 Microwave TR Switch

No fixed ratings recorded.

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

1863A Gas Switching TR Tube

The **1863A** (also designated as the **GL-1B63-A** or **GL-1863-A**) is an integral-cavity gas switching TR (Transmit-Receive) tube. It is designed to decouple the receiver from a common transmitting and receiving antenna during transmission in pulsed microwave circuits. This protects sensitive receiver components from high-power transmitter pulses while allowing received signals to pass with minimal attenuation during the non-transmitting period.

Electrical Characteristics and Operating Parameters

The 1863A operates within a specified microwave frequency band and relies on an igniter electrode to initiate and maintain a keep-alive gas discharge.

- **Operational Band:** The tube operates across a frequency range of 8490 to 9578 megacycles (Mc), defined at a maximum Voltage Standing Wave Ratio (VSWR) of 1.9.
- **Igniter Starting and Voltage Drop:** To initiate the keep-alive discharge, the igniter requires a maximum starting voltage of -650 V. Once active, the igniter voltage drop is between a minimum of 190 V and a maximum of 450 V when measured at an igniter current of 100 μ A.
- **Insertion Loss:** During reception (when the transmitter is inactive), the tube introduces very little signal attenuation. The maximum insertion loss is 0.9 dB at 9000 Mc with an igniter current of 100 μ A.
- **Recovery Time:** Following a high-power pulse, the tube recovers its receiving state rapidly, with a maximum recovery time of 4 μ s measured at 40 kW peak power and 3 dB down.

Leakage and Power Performance

When the transmitter fires, the TR tube must rapidly ionize to block the high-power RF energy from reaching the receiver. The leakage energy that passes through before and during full ionization is tightly controlled.

- **Spike Leakage Energy:** The transient energy that leaks through at the very beginning of the pulse is limited to a maximum of 0.1 watts per second per pulse. This is specified under test conditions of 40 kW peak power, a pulse repetition rate of 1000 pulses per second (pps), a pulse duration of 1 μ s, an igniter current of 100 μ A, and a frequency of 9000 Mc.
- **Flat Leakage Power:** Once the gas discharge is fully established, the steady-state leakage power passing through the tube is a maximum of 40 mW under the same operating conditions (40 kW peak power, 1000 pps, 1 μ s pulse width, 100 μ A igniter current, and 9000 Mc frequency).
- **High Level Loss:** The high-level loss is a maximum of 0.8 dB under conditions of 4 kW peak power, 1000 pps pulse repetition rate, 1 μ s pulse width, and 9000 Mc frequency.
- **Transmitter Power Limits:** The tube requires a minimum transmitter peak power of 4 kW to ensure reliable switching. Under maximum rating conditions, the tube can handle a transmitter peak power of up to 250 kW. The maximum igniter current is rated at 200 μ A.

Mechanical, Environmental, and Physical Specifications

The 1863A is a ruggedly constructed integral-cavity device designed for direct integration into microwave waveguide systems.

- **Mounting and Orientation:** The tube can be mounted in any position.
- **Igniter Configuration:** The tube features a single igniter, with a maximum igniter cap height of 1-3/8 inches.
- **Physical Dimensions:**
 - **Length:** 1.555 inches $\pm$ 0.010 inches.
 - **Flange Size:** 1.625 inches $\pm$ 0.010 inches square.
 - **Flange Thickness:** 0.093 inches $\pm$ 0.010 inches.
- **Mounting Interfaces:**
 - **High-Level End:** Features 4 mounting holes with a diameter of 0.1695 inches $\pm$ 0.004 inches.

- **Low-Level End:** Features 4 holes tapped for #8-32 screws.
- **Weight and Temperature:** The net weight of the device is approximately 0.75 lbs. It is rated for a non-operating ambient temperature range of -40 to +100 °C.

Frequency Response and VSWR Characteristics

The frequency response of the 1863A, characterized by the Voltage Standing Wave Ratio (VSWR) across its operating band, exhibits distinct behaviors depending on the tuning and limit conditions:

- **Typical Response:** The typical VSWR curve displays a double-minimum characteristic. The VSWR drops close to 1.0 near 8600 Mc and 9450 Mc, with a slight rise to approximately 1.2 VSWR at the center of the band near 9000 Mc.
- **Limit Response:** Under limit conditions, the VSWR remains relatively flat at approximately 1.4 across the majority of the band (from 8550 Mc to 9500 Mc). Near the band edges of 8490 Mc and 9578 Mc, the VSWR rises sharply to its maximum limit of 1.9.

Technical Summary

The **1863A** (GL-1B63-A / GL-1863-A) is an integral-cavity gas switching TR tube designed for pulsed microwave receiver protection in the 8490 to 9578 Mc frequency range. It features a single igniter requiring a maximum starting voltage of -650 V and operating with a keep-alive current up to a maximum rating of 200 μ A. The tube is capable of handling transmitter peak powers from a minimum of 4 kW up to a maximum of 250 kW, while restricting flat leakage to 40 mW and spike leakage energy to 0.1 watts per second per pulse. With a recovery time of 4 μ s and low insertion loss of 0.9 dB, the 1863A provides efficient antenna sharing and receiver isolation in a compact, 0.75 lb waveguide-mountable package.

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	9000 MHz	—

APPLICATION

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

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