

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

1947

1 SECTION
CONSTRUCTION
GAUGE

Specialized - Gauge Tube electronic tube

Pirani vacuum-gauge tube using a heated platinum-iridium filament, individually calibrated under high vacuum for gas-pressure measurement.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	4
NOMINAL HEATER	10 V / 70 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Gauge
No fixed ratings recorded.
Published maximum ratings and device-specific characteristics are promoted where schema-compatible; remaining switching/gauge/regulator electrical data is retained in section parameters.

1947 — Pirani Vacuum-Gauge Tube

The **1947** is a specialized Pirani-type vacuum-gauge tube designed for the determination of gas pressures in vacuum systems and vacuum enclosures. Operating on the principle of thermal conductivity, the tube utilizes a heated filament whose resistance varies with the pressure of the surrounding gas.

Physical Construction and Dimensions

The 1947 is constructed with a T-9 glass bulb made of Corning Code 001 Lead soft glass. It features a tubulation at the top of the bulb for direct connection to the vacuum system under test. The tubulation diameter is specified as either 7/32 inch or 3/8 inch.

The physical dimensions and mounting specifications of the tube include:

- **Base:** Small-Shell Small 4-Pin or Small 4-pin base.
- **Mounting Position:** Any.
- **Maximum Overall Length:** 7-3/16 inches to 7-9/16 inches (including the tubulation).
- **Maximum Diameter:** 1-3/16 inches.
- **Pin-to-Bulb-Top Length:** Approximately 5-3/16 inches, measured from the end of the base pins to the bulb-top line as determined by a ring gauge of 1/2 inch inside diameter.

Filament and Calibration Characteristics

The sensing element of the 1947 is a filament made of **Platinum Iridium**. Under operating conditions, the filament characteristics are:

- **Nominal Voltage:** Approximately 10 V DC.
- **Filament Current:** 70 to 100 mA (0.07 to 0.1 A), which varies depending on the gas pressure inside the envelope.
- **Filament Resistance:** 135.8 ohms under a high vacuum better than 3×10^{-5} mm of mercury (Hg).

To ensure interchangeability and accuracy, each tube features a series filament-calibrating resistor (R) located directly within the base of the tube. Each individual tube is calibrated to establish a total resistance of exactly 135.8 ohms under a vacuum better than 3×10^{-5} mm of Hg.

Pinout Configurations

The 1947 uses a small 4-pin base. Depending on the specific production run or specification standard, two terminal connection configurations are documented (viewed from the bottom of the base):

Configuration A

- **Pin 1:** Filament
- **Pin 2:** Filament
- **Pin 3:** No Connection (NC)
- **Pin 4:** Internal Connection (IC) — Do Not Use

Configuration B

- **Pin 1:** Internal Connection (IC)
- **Pin 2:** Resistance element (R)
- **Pin 3:** No Connection (NC)
- **Pin 4:** Resistance element (R)

In both configurations, Pin 3 remains unused, and care must be taken not to connect external circuitry to the designated Internal Connection pin.

Absolute Maximum Ratings

To prevent damage to the Platinum Iridium filament and ensure stable calibration, the operating conditions must not exceed the following absolute limits:

- **Maximum Filament Voltage:** 16 V
- **Maximum Ambient Temperature:** 60 °C

Bridge Circuitry and Calibration

The 1947 is operated within a Pirani gauge bridge circuit. A typical bridge configuration utilizes the following components:

- **Power Supply:** 12 V
- **Resistors:**
 - **R1:** 50 Ohms (adjustable)
 - **R2:** 25 Ohms (adjustable)
 - **R3 + Meter:** 15 Ohms
 - **R4, R5:** 10 Ohms each
 - **R6:** 120.7 Ohms
 - **R7:** 135.8 Ohms
- **Switch (S):** A selector switch with positions 1 and 2.

Calibration Procedure

1. Set the selector switch S to position 2. Adjust the variable resistor R2 until the meter reads exactly 2.5 milliamperes.
2. Set the selector switch S to position 1. With dry air at atmospheric pressure inside the 1947 tube, adjust the variable resistor R1 until the meter reads exactly 5.0 milliamperes.
3. Without making any further adjustments, keep the switch S in position 1. The gauge is now calibrated and ready for vacuum measurement.

Pressure Sensitivity and Calibration Curve

The 1947 is capable of measuring gas pressures across a wide range, with its sensitivity characteristics defined as follows:

- **Useful Sensitivity Range:** 1.5 to less than 0.01 mm of Hg (equivalent to 1500 to less than 10 microns of Hg).
- **Greatest Sensitivity Range:** 0.5 to 0.01 mm of Hg (equivalent to 500 to 10 microns of Hg).

When calibrated with dry air using the standard bridge circuit, the relationship between the linear meter deflection (0 to 5 milliamperes) and the logarithmic gas pressure (0.01 to 3.0 mm of Hg) exhibits the following typical characteristics:

- At a high vacuum of **0.01 mm of Hg**, the meter deflection is approximately **0.25 mA**.

- At a pressure of **0.1 mm of Hg**, the meter deflection rises to approximately **1.8 mA**.
- At a pressure of **1.0 mm of Hg**, the meter deflection reaches approximately **4.5 mA**.
- As the pressure increases further, the curve rises extremely steeply as it approaches a meter deflection of approximately **4.7 mA**. This represents the upper limit of pressure sensitivity for this specific bridge configuration. For measurements in microns, the values in mm of Hg are multiplied by 1000.



SOURCE OPERATING CONDITIONS

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1960 RCA Industrial and Communications Types

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

1960 RCA INDUSTRIAL AND COMMUNICATIONS TYPES

Section 1 · Gauge

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Calibration resistance	135.8 0hm	Under vacuum better than 3e-5 mm Hg

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Filament voltage	10 V	—
Filament current maximum	100 mA	—
Maximum filament voltage	16 V	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 RCA HB3 Binder 2 of 7

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

1971 RCA HB3 BINDER 2 OF 7

Section 1 · Gauge

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Voltage (Approx)	10 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Gas Pressure) – published value 1	70 mA	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Gas Pressure) – published value 2	100 mA	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
meter reads 2.5 mlll iampe re 5 – published value 1	2.5 A	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
meter reads 2.5 mlll iampe re 5 – published value 2	5 A	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
at atmospheric pressure in the 39 Y7, adjust R1	39	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
so tnat meter reads 5.0 mill iamperes	5 A	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.
Heater or filament voltage nominal	10 V	Nominal value from supplied datasheet.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
FILAMENT VOLTAGE	16 V	Published datasheet value; multiple values on one row represent separate limits, service ratings, or operating conditions.

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