

March 1, 1961

HIGH PRESSURE ION GAUGE TYPE 7903

The 7903 is a small, three-electrode ionization type vacuum gauge designed to measure gas pressures in the range of 1×10^{-5} to 5×10^{-1} mm Hg. The operating filament is a thorium coated iridium wire. Filament burnout will not occur if the tube is accidentally let down to air during operation. The ion collector is a flat plate parallel to the operating filament. The other electrode, which is used as an electron emitter during outgassing and as an electron collector during operation, is a tungsten ribbon parallel to the ion collector on the opposite side of the operating filament.

ELECTRICAL:

Outgassing:

Cathode.....	Tungsten Ribbon Filament
Filament:	
Voltage (ac or dc) Approx.	3.6 Volts
Current	13 Amperes

Operating:

Cathode.....	Thorium Coated Iridium Filament
Filament:	
Voltage	1.3 Volts
Current at 1×10^{-7} mm Hg	2.4 Amperes

MECHANICAL:

Type of Cooling.....	Air
Tubulation: (Note 1)	
Glass	Pyrex, Corning Code 7740
Size	$\frac{1}{2}$ " Diameter
Mounting Position	Any

MAXIMUM RATINGS:

Absolute Maximum Values

Outgassing: (DC Voltages are with Respect to Outgas-Filament-Electron-Collector Electrode).

Ion Collector Voltage	400 max.	Volts
Ion Collector DC Power Input.....	12 max.	Watts
Filament Voltage (ac or dc)	4 max.	Volts
Ambient Temperature	100 max.	°C

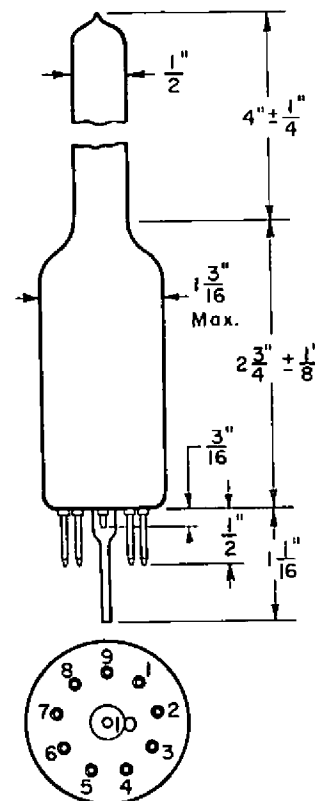
Operating: (DC Voltages are with Respect to Operate Filament)

Ion Collector Voltage	+65 max.	Volts
Outgas-Filament-Electron-Collector		
Electrode Voltage	-65 max.	Volts
Filament Voltage (ac or dc)	1.5 max.	Volts
Ambient Temperature	100 max.	°C
Gas Pressure	1 max.	mm Hg

INDEX OF TERMINALS

1. Electron Collector & Outgas Filament # 1
2. Operate Filament # 1
3. Electron Collector & Outgas Filament # 1
4. No Connection.
5. Electron Collector & Outgas Filament # 2
6. No Connection.
7. Operate Filament # 2
8. Electron Collector & Outgas Filament # 2
9. Short Index Pin
10. Ion Collector

Note: Both leads of each terminal of Outgas Filament should be used during outgassing to prevent damage to the tube.



Special Devices Section

WESTINGHOUSE ELECTRIC CORPORATION, ELECTRONIC TUBE DIVISION, ELMIRA, NEW YORK

OPERATING CONDITIONS

Ion Collector Voltage with Respect to Operate-Filament	-60	Volts
Outgas-Filament-Electron-Collector Electrode Voltage with Respect to Operate Filament	+60	Volts
Operate-Filament Conditions for 50 Microamperes Electron Current:		
Voltage (ac or dc)		
At 1×10^{-4} mm Hg	1.3	Volts
Electron Current:		
From 1×10^{-4} to 1×10^{-2} mm Hg	1	Ma.
From 1×10^{-3} to 1×10^{-1} mm Hg	50	μ A.
From 1×10^{-2} to Saturation	10	μ A.
Sensitivity with Nitrogen		
$S = (i_+ / i_-) \times (1/P)$	0.4 (mm Hg) -1	
Pressure Measuring Range with Nitrogen		
(See Figure 1)	1×10^{-4} to 6×10^{-1}	mm Hg

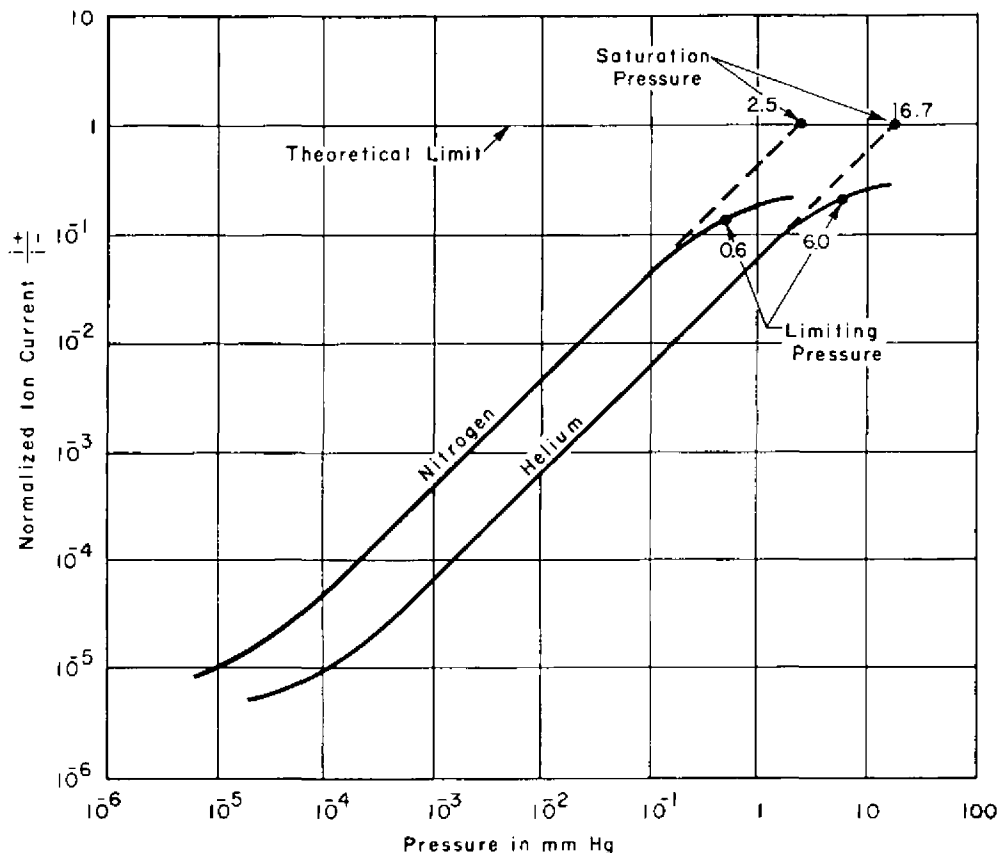
OUTGASSING CONDITIONS

Ion Collector Voltage with Respect to Outgas-Filament-Electron Collector Electrode			+300	Volts
Operate-Filament (Note 2)			Connected to Outgas-Filament- Electron-Collector-Electrode	
Outgas-Filament:				
Voltage (ac or dc)			3.6	Volts
Current			13	Amperes

NOTES

1. Other ion gauges, similar to type 7903 but having different sizes and materials of tubulation, are available under different numbers.
2. Voltage must not be applied across operate filament during outgassing.

AVERAGE ION CURRENT TRANSFER CHARACTERISTICS



CE-A1572

FIGURE 1

GAUGE CHARACTERISTICS FOR DIFFERENT GASSES

	N ₂	CO	He	H ₂
Sensitivity in (mmHg) ⁻¹	0.4	0.42	0.06	0.21
Saturation Pressure in mmHg	2.5	2.6	16.7	4.8
Limiting Pressure in mmHg	0.6	0.6	6.0	0.6

APPLICATION DATA

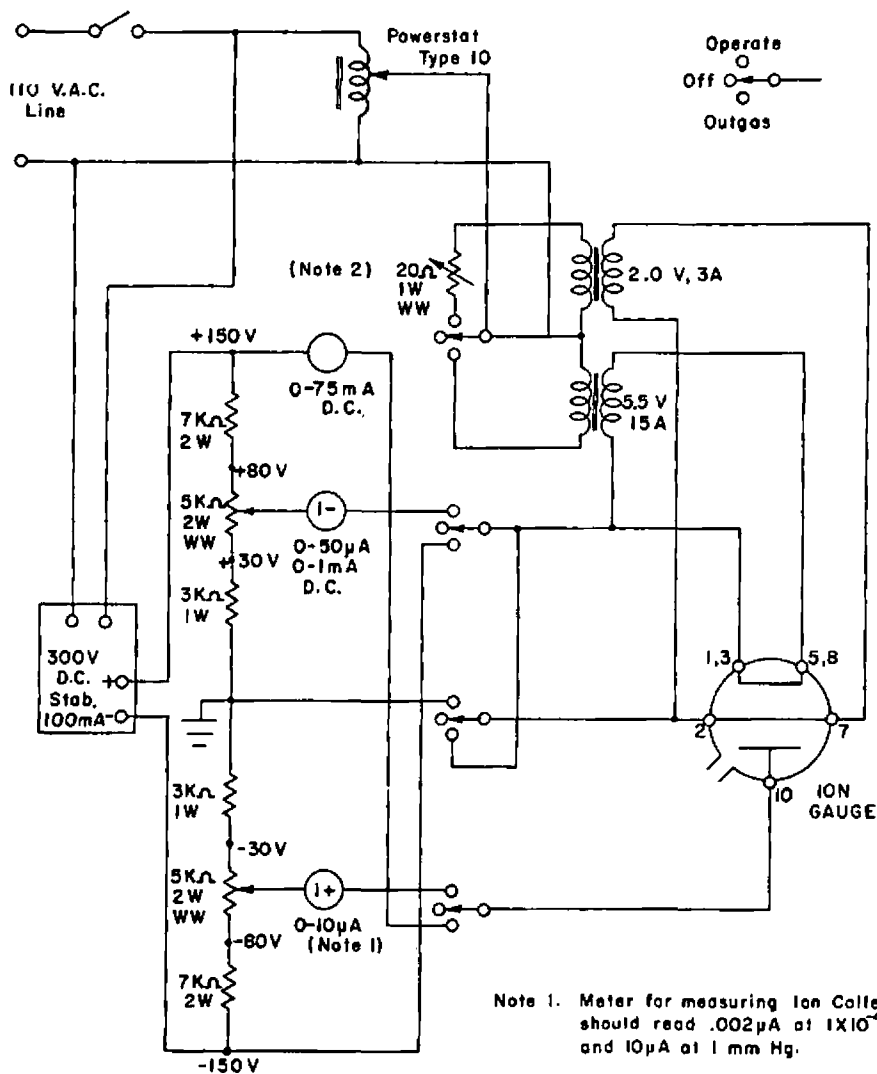
The circuitry for operation of the tube consists of suitable 60 V DC power supplies for each collecting electrode and a variable voltage filament supply. A meter with ranges from 10⁻⁵ to 10⁻³ ampere is required for measuring electron current and a sensitive microammeter with ranges from 10⁻⁸ to 10⁻⁵ amperes is required in the ion collector circuit. The filament power required is 2 volts at 2.5 amperes for operation and 5.5 volts at 13 amperes for outgassing. A circuit incorporating these features is shown in Figure 2. In this circuit, a 300 volt, 100 milliampere stabilized power supply is used.

For outgassing the full 300 V is used, the outgassing current being set by the outgassing filament temperature. The outgas filament voltage is adjusted by a variable auto-transformer.

During operation, the operating filament is connected to the center of a resistance chain across the power supply. The electron collector and ion collector are connected to potentiometers in the resistance chain, so that the ion collector is approximately 60 volts negative, and the electron collector approximately 60 volts positive with respect to the operate filament. The operate filament supply is controlled by a variable auto-transformer, with a series variable resistance which acts as a fine control.

Pressures over a wide range are covered. The cooling effect by the residual gas on the filament is considerable, resulting in changes in electron current. An operate circuit with an automatic filament control, in which a change in electron current is compensated by a change in filament voltage, is desirable as it permits continuous monitoring of pressure.

ION GAUGE POWER SUPPLY



Note 1. Meter for measuring Ion Collector should read .002 μ A at 1×10^{-4} mm Hg. and 10 μ A at 1 mm Hg.

Note 2. Fine control for filament voltage will give 2% variation.

CE-B1719

FIGURE 2