



ELECTRONIC TUBE REFERENCE

0B2

Voltage Regulator electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

VOLTAGEREGULATOR

Cold-cathode gas voltage regulator providing approximately 108 V stabilization over roughly 5–30 mA for regulated supplies and reference circuits.

GENERAL CHARACTERISTICS

BASE DESIGNATION	B7G	BASE PINS	7
NOMINAL HEATER	0 V / 0 mA	PARALLEL HEATER	– / –
HEATING	Indirect; cold cathode	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Voltage Regulator	
REGULATOR VOLTAGE	108 V
MINIMUM REGULATOR CURRENT	5 mA
MAXIMUM REGULATOR CURRENT	30 mA
STARTING VOLTAGE	133 V
MAINTAINING VOLTAGE	108 V
DYNAMIC IMPEDANCE	100 Ω

Published electrical ratings and characteristics promoted from the approved source.

0B2 — Cold-Cathode Gas-Filled Voltage

Regulator

Overview

The **0B2** is a cold-cathode, two-electrode, inert-gas-filled miniature tube designed for use as a voltage regulator. It provides a sensibly constant voltage output of approximately 108 Volts over a wide operating current range of 5 to 30 mA. The device is highly suited for applications requiring stable voltage regulation, low noise, and long operating life.

Mechanical Specifications and Pinout

The 0B2 is constructed in a compact T-5 1/2 (or A 19-4) glass envelope with a small-button miniature 7-pin base (JETEC 5BO or B.S.448-B7G). It can be mounted in any physical position.

Physical Dimensions

- **Maximum Overall Length:** 2 5/8 inches (66.5 mm)
- **Maximum Seated Height:** 2 3/8 inches (60.1 mm)
- **Maximum Diameter:** 3/4 inch (19.0 mm)
- **Approximate Weight:** 0.3 ounces (approx. 8.5 grams)

Pin Connections

The 7-pin base configuration provides duplicate connections for both the anode and cathode, along with internal connections. This layout allows the tube to act as a safety switch; if the tube is removed from its socket, the connection between the supply and the load can be physically broken, preventing unregulated voltage from reaching the load.

Pin Number	Element
1	Anode
2	Cathode
3	Internal Connection (IC)
4	Cathode
5	Anode
6	Internal Connection (IC)
7	Cathode

Electrical Characteristics and Ratings

The electrical behavior of the 0B2 is characterized by its ionization (striking) voltage, its stable maintaining voltage, and its current limits.

Absolute Maximum and Minimum Ratings

- **Minimum DC Anode Supply Voltage:** 133 V (required to guarantee starting throughout tube life under normal illumination)
- **Maximum Average Starting Current:** 75 mA (for a starting period not exceeding 10 seconds; normal operation must continue for at least 20 minutes after passing this current to stabilize the tube)
- **Maximum DC Cathode Current:** 30 mA
- **Minimum DC Cathode Current:** 5 mA
- **Maximum Inverse Voltage:** 50 V (cathode must not become positive and anode negative)
- **Maximum Shunt Capacitor:** 0.1 μ F (to prevent parasitic oscillations)
- **Ambient Temperature Range:** -55 °C to +90 °C
- **Maximum Altitude (unpressurized):** 3,000 meters

Typical Operating Characteristics

- **Nominal Operating Voltage:** 108 V (measured at a typical operating current of 17.5 mA, with a range of 106 to 111 V)
- **Operating Voltage at 5.0 mA:** 105 V minimum
- **Operating Voltage at 30 mA:** 112 V maximum
- **Anode Breakdown (Striking) Voltage:**
 - Under normal illumination (50 to 500 lux / foot-candles): 127 V maximum (average 114 V)
 - In complete darkness: 210 V maximum (up to 225 V maximum under certain conditions)
- **Regulation (5 to 30 mA):** Typical 1.1 V, maximum 3.5 V to 4.0 V
- **Voltage Variation (during 500 hours of operation):** 4.0 V maximum
- **Noise (r.m.s., 50 to 5,000 Hz):** 5.0 mV maximum over the 5 to 30 mA current range

Circuit Design and Operating Principles

To operate the 0B2 safely and effectively, the circuit must include a series current-limiting resistor. Without sufficient series resistance, the current through the tube will exceed the maximum rating, leading to immediate damage or drastically reduced operating life.

Series Resistor Calculations

The value of the series limiting resistor (R1) is determined by the unregulated supply voltage (V1), the regulated output voltage (V2), and the load current (IL).

To ensure the tube current (IT) remains within the safe limits of 5 mA (IT_min) and 30 mA (IT_max), the series resistor must satisfy two boundary conditions:

1. **Lower Limit of R_1 (to prevent exceeding maximum tube current):** $R_1 > (V_{1_max} - V_{2_min}) / (I_{T_max} + I_{L_min})$
2. **Upper Limit of R_1 (to ensure minimum tube current is maintained):** $R_1 < (V_{1_min} - V_{2_max}) / (I_{T_min} + I_{L_max})$

Once a suitable resistor value within these limits is chosen, the designer must verify that there is sufficient voltage to strike (start) the tube under minimum supply voltage conditions: $V_{1_min} * [R_L / (R_1 + R_L)] > V_{starting}$

Where R_L is the load resistance. If this condition is not met, a lower load current must be selected, and the calculations must be repeated.

Parallel and Series Configurations

- **Parallel Operation:** Operating multiple 0B2 tubes in parallel to handle higher load currents is generally not recommended. If parallel operation is necessary, a small equalizing resistor of approximately 100 ohms must be placed in series with each individual tube to balance the current distribution. However, this configuration degrades the overall voltage regulation.
- **Series Operation:** Multiple tubes can be connected in series to achieve higher regulated voltages. For example, two 0B2 tubes in series provide a regulated output of approximately 216 V. Alternatively, a 0B2 can be placed in series with a 150 V regulator (such as the [0A2](#)) to provide a combined regulated output of 258 V. When using series configurations, the unregulated supply voltage must be high enough to strike all tubes in the string.

Premium and Service Designations

The 0B2 is registered under several military and industrial designations:

- **Service/Military Equivalents:** [CV1833](#) and [CV8162](#).
- **Premium Industrial Version:** The **6074** (also designated **6074/0B2**) is a ruggedized version of the 0B2. It shares the same electrical characteristics and 108 V nominal operating voltage but is specifically designed and tested to withstand severe shock and continuous vibration in critical military and industrial applications.

Technical Summary

The **0B2** is a cold-cathode, gas-filled voltage regulator featuring a 7-pin miniature base and a nominal operating voltage of 108 V over a current range of 5 to 30 mA. It provides excellent voltage stability with a typical regulation of 1.1 V and a maximum variation of 3.5 to 4.0 V. Safe operation requires a properly calculated series limiting resistor to prevent excessive current. The tube can be operated in series for higher voltage requirements, and its duplicate pin connections allow for safety-interlock wiring. For high-reliability applications subject to shock and vibration, the ruggedized **6074** premium version is available.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1953 Amperex

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

1953 AMPEREX

Section 1 · Voltage Regulator

CHARACTERISTICS

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Operating voltage nominal	108 V	—

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum anode supply voltage	133 V	—



SOURCE OPERATING CONDITIONS

1953 RFT Rundfunk Technik

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

1953 RFT RUNDFUNK TECHNIK

Section 1 · Voltage Regulator

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
RegulatorVoltage	108 V	—
RegulatorCurrentMinimum	5 mA	—
RegulatorCurrentMaximum	30 mA	—
RegulatorStartingVoltage	132 V	—
RegulatorMaintainingVoltage	108 V	—
RegulatorDynamicImpedance	100 ohm	—

SOURCE OPERATING CONDITIONS

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195X General Electric Essential Characteristics

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

195X GENERAL ELECTRIC ESSENTIAL CHARACTERISTICS

Section 1 · Voltage Regulator

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum anode supply voltage	133 V	VoltageRegulatorService
Maximum operating current	30 mA	VoltageRegulatorService

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum operating current	5 mA	VoltageRegulatorService
Operating voltage	105 V	VoltageRegulatorService
Ionization voltage	115 V	VoltageRegulatorService
Regulation	1 V	5 to 30 mA

SOURCE OPERATING CONDITIONS

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195X Raytheon Special Purpose Tubes

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

195X RAYTHEON SPECIAL PURPOSE TUBES

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Operating voltage	108 V	—
Maximum regulation	4 V	5to30mA

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum operating current	5 mA	—
Maximum operating current	30 mA	—
Minimum starting-voltage supply	133 V	—



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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1966 Tung Sol Electronic Tubes 3 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 3 OF 4

Section 1 · Voltage Regulator

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum DC anode supply voltage	133 V	RegulatorService
Maximum DC cathode current	30 mA	—
Minimum DC cathode current	5 mA	—
Maximum average starting current	45 mA	StartingPeriod
Maximum inverse voltage	-50 V	—
Maximum shunt capacitor	0.1 uF	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Average anode breakdown voltage	114 V	RegulatorService
Tube voltage drop minimum	101 V	RegulatorService
Tube voltage drop average	108 V	RegulatorService
Tube voltage drop maximum	114 V	RegulatorService



SOURCE DATA APPENDIX

1968 Mazda Belvu

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1968 MAZDA BELVU

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
StrikingVoltage	133 V	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MaintainingCurrentMinimum	5 mA	—
MaintainingCurrentMaximum	30 mA	—



SOURCE DATA APPENDIX

1971 English Electric Valve

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

1971 ENGLISH ELECTRIC VALVE

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Operating voltage	108 V	Approximate

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode current range	5 mA–30 mA	—
Striking voltage in normal lighting	127 V	—
Striking voltage in total darkness	210 V	—

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1999 Philips 0-D

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

1999 PHILIPS 0-D

Section 1 · Voltage Regulator

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
StartingCurrent	75 mA	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Regulation	3.5 V	I _a =5-30 mA