**DUOTRIODE PULSE AMPLIFIER**

7318

Reliable pulse tube with extremely fast cathode warm-up

**HEATER CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Series</th>
<th>Parallel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage, a-c</td>
<td>12.6±12% 6.3±12% volts</td>
</tr>
<tr>
<td>Current</td>
<td>175 350 ma</td>
</tr>
<tr>
<td>Peak heater-cathode voltage, max.</td>
<td>Heaters: 100 volts</td>
</tr>
<tr>
<td>Heaters: negative to cathode</td>
<td>Heaters: positive to cathode 100 volts</td>
</tr>
</tbody>
</table>

**ELECTRICAL DATA**

**DIRECT INTERELECTRODE CAPACITANCES, No Shield**

<table>
<thead>
<tr>
<th>Section 1</th>
<th>Section 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid to plate; g1 to p</td>
<td>1.4</td>
</tr>
<tr>
<td>Input; g1 to k + h</td>
<td>1.5</td>
</tr>
<tr>
<td>Output; p to k + h</td>
<td>0.5</td>
</tr>
<tr>
<td>Coupling; plate 1 to plate 2</td>
<td>0.8</td>
</tr>
</tbody>
</table>

**MAXIMUM RATINGS (Absolute Maximum Values)**

**Pulse Modulator**

- Plate supply voltage, d-c: 400 volts
- Grid 1 voltage, negative d-c: -50 volts
- Grid 1 voltage, positive d-c: 0 volts
- Peak positive grid voltage, d-c: 200 volts
- Peak grid current: 0.9 amp
- Peak plate current: 1.25 amp
- Peak cathode current: 2.2 amp
- Grid dissipation: 0.60 watts
- Plate dissipation: 1.35 watts
- Plate dissipation: 60,000 watts
- Plate dissipation: 60,000 feet

**CLASS A AMPLIFIER**

- Plate voltage: 330 volts
- Cathode current: 3.0 watts
- Control-grid circuit resistance: 22 ma
- Fixed bias: 0.5 megs
- Self bias: 1.0 megs
- Bulb temperature: 165 °C
- Altitude: 60,000 feet

**CHARACTERISTICS AND TYPICAL OPERATION**

**Pulse Modulator**

- Plate supply voltage, d-c: 300 volts
- Grid supply voltage, d-c: -25 volts
- Peak positive grid voltage: 150 volts
- Peak plate current: 0.9 amp
- Plate load resistance (noninductive): 75 ohms
- Grid resistance (noninductive): 2400 ohms
- Minimum cathode preheating: 10 sec

**NOTES:**

- Duty factor = .0035; pulse width = 1.5 microseconds; pulse repetition rate = 2000 pps.
- Each section.

**ENGINEERING DESIGN DATA**

7318

September 18, 1958

Pulse duotriode

**CHARACTERISTIC CURVES**

- Plate: 2004A
- Plate: 2004B
- Plate: 2004C
- Characteristics: Gm, μ: 2004D

**MECHANICAL DATA**

- Cathode, coated unipotential: 1-SV
- Outline: JETEC 6-2
- Maximum over-all height: 2.19 inches
- Minimum seated height: 1.94 inches
- Maximum diameter: 0.88 inch
- Base: (09-1)
- Basing: 9A
- Mounting position: Any

**PIN CONNECTIONS**

- Pin 1: Plate (Section 2)
- Pin 2: Grid (Section 2)
- Pin 3: Cathode (Section 2)
- Pin 4: Heater
- Pin 5: Plate (Section 1)
- Pin 6: Grid (Section 1)
- Pin 8: Cathode (Section 1)
- Pin 9: Heater (Center tap)

**CBS-HYTRON, Danvers, Massachusetts**
A Division of Columbia Broadcasting System, Inc.

from JETEC release #2319, Nov. 17, 1958
APPLICATION

The CBS-Hytron 7318 is a medium-mu duallode reliable pulse-tube cathode with an extremely fast cathode warm-up time capable of providing 80% emission in 10 seconds. It is designed for use in high voltage blocking oscillators, square-wave modulators, multivibrators, and other uses requiring a substantial plate current. Reliability and high cathode current, being of prime importance, are ensured by testing for vibration, fatigue, and pulse emission. Reliability under unfavorable environmental conditions is also enhanced by the 7318's ambient temperature operating range of -50°C to +100°C.

This tube contains a cathode heater assembly that is designed and processed to give the high emission required for pulse service. It will furnish rectangular pulses up to 55 microseconds width.

Life tests for the 7318 include environmental and pulse evaluation. They are on-off cycled for 12 minute periods with a 500 hour "on" time and pulse life tested for 500 hours for not more than 20% change in pulse emission.

Class A Amplifier

- Plate voltage: 100, 250 volts
- Control-grid voltage: 0, -8.5 volts
- Plate resistance (approx.): 5800, 7000 ohms
- Transconductance: 3500, 3500 µhos
- Amplification factor: 21.3, 16.5
- Plate current: 13.0, 11.5 ma
- Control-grid voltage (approx.) for Is = 10 µa: -22 volts

SPECIAL RATING AND PERFORMANCE DATA

Inter electrode Leakage Resistance Each section
- Er = 12.6/6.3 Vrms
- Grid to all other elements with 100 Vdc applied: 500 meg min
- Plate to all other elements with 300 Vdc applied: 500 meg min

Heater to Cathode Leakage Current, Sections tied together
- Er = 12.6/6.3 Vrms,
- Es = 100 Vdc
- Heater positive with respect to cathode: 10 µAdc max
- Heater negative with respect to cathode: 10 µAdc max

Transconductance at Low Heater Voltage Each section with other section grounded
- Er = 11/6.3 Vrms, Es = 100 Vdc, Ec = 0 Vdc ...
- 2500 µhos min

Cathode Warm-up Rating Each section with heater in parallel
- Es = 250 V, Ec = 8.5 V (instantaneous test)
- 80% of stabilized plate current ...
- 10 sec max

Pulse Emission Slump Each section
- Er = 12.6 V, Ec = 300 Vdc, Rl = 75 Ω, Is = 10 µsec, pr = 200 pps, Epr/k = 1.8 amp min, Ec = -25 Vdc, Rs = 1 Q, Limit of Epr = 200 v max
- Ratio of trailing edge to leading edge ...
- 80% min

ENVIRONMENTAL TESTS AND RATINGS

Ambient Temperature Range
- Operation within ratings ...
- -60°C to +100°C

Shock Rating
- (1) Impact acceleration for .001 sec duration (MIL-E-1D4.9.20.5) ...
- 450 g max
- (2) Impact acceleration for .01 sec duration (Drawing JAN S-44) ...
- 150 g max

Fatigue Rating (MIL-E-1D 4.9.20.6)
- Acceleration at 25 cps vibration: 2.5 g

Resonance Frequency Vibration Sections tied together
- Er = 12.6 Vdc, Es = 250 Vdc, Ec = -8.5 Vdc, acceleration ≈ 10 g
- Noise output at 60 cps (peak): 80 mVdc max
- Noise output at 370 cps (peak): 100 mVdc max
- High frequency fatigue sections tied together
- Constant acceleration at 10 to 500 cps (two hours in each of 3 mutually perpendicular positions)
- 10 g max

Test End Points (Post shock and fatigue)
- Pulse emission change ...
- 20% max
- Heater to cathode leakage current ...
- Heater positive with respect to cathode ...
- Heater negative with respect to cathode ...
- Grid I current ...
- Vibration Noise output voltage, (peak) ...
- (conditions of shock rating test (1) and (2), fatigue rating test (MIL-E-1D 4.9.20.6) and high frequency fatigue test, initially and until completion).
- Linear acceleration, 5 seconds in any plane ...
- 200 g

CBS ELECTRON TUBES
AVERAGE PLATE CHARACTERISTICS

$E_t = 12.6$ VOLTS
$E_g = 300$ VOLTS

AVERAGE PLATE CHARACTERISTICS

$E_t = 12.6$ VOLTS
$E_g = -25$ VOLTS D-C
PPR = 200 PPS
PULSE WIDTH = 10 usec.

Move decimal point one place to the left.
AVERAGE TRANSFER CHARACTERISTICS

E↑ = 12.6 VOLTS

PLATE MILLIAMPERES

CONTROL GRID VOLTS D-C

AVERAGE CHARACTERISTICS

E↑ = 12.6 VOLTS

AMPLIFICATION FACTOR (%) 25

TRANSCONDUCTANCE (g_m) MICROHMS

CONTROL GRID VOLTS D-C

CBS ELECTRON TUBES