

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	JETEC 3-1
Basing	8DJ
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS¹ (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude ²	60000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage ³	6.0	6.3	6.6 V
Heater Current		150	mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded ⁴	Unshielded
Plate to Plate	0.026	0.15 μ f Max.
Input (Each Section) ⁵	2.2	1.5 μ f
Cathode to All Other Electrodes (Each Section) ⁶	2.6	2.6 μ f

RATINGS^{1, 7} (Absolute Maximum)

Plate Supply Voltage (Each Plate)	156 Vac
Peak Inverse Plate Voltage ⁸	460 v
Steady State Peak Plate Current (Each Plate)	26.5 ma
Transient Peak Plate Current (Each Plate)	160 ma
Output Current (Each Plate)	4.4 mA _{dc}
Heater-Cathode Voltage ⁸	
Heater Positive with Respect to Cathode	360 v
Heater Negative with Respect to Cathode	360 v

CHARACTERISTICS

Tube Voltage Drop for $I_b = 15$ mA _{dc} (Each Plate)	10 V _{dc}
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TYPICAL OPERATION

Full-Wave Rectifier — Capacitor Input to Filter	
Plate Voltage (Each Plate)	150 Vac
Filter Input Capacitance	8 μ f
Effective Plate Supply Impedance	1500 Ohms
Output Current	8 mA _{dc}

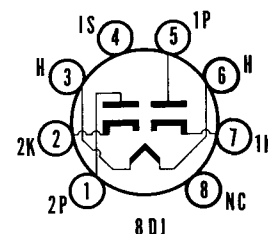
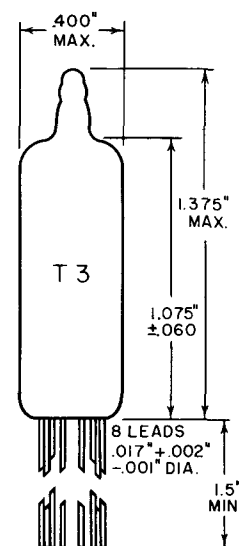
NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.
2. If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.
3. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.
4. External shield of 0.405 inch diameter connected to heater.
5. Plate to cathode, heater, internal shield and external shield.
6. Cathode to heater, plate, internal shield and external shield.
7. Values shown are as registered with RETMA.
8. The maximum voltage appearing between any pair of leads shall be no greater than the maximum peak inverse plate voltage.

QUICK REFERENCE DATA

The 6110 is a Premium Subminiature heater-cathode type double diode having separate cathode connections for each section. It is intended primarily for detector service at uhf as well as low frequencies.

The 6110 is designed to provide dependable service under conditions of severe shock, vibration, high temperature and high altitude, and is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability.



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RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
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ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage 6.3 V
Plate Supply Voltage Per Plate 165 Vac

Load Resistance 20000 Ohms
Load Capacitance 8 μ f

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

MIL-E-1 Ref.	Test	AQL (%)	Limits					Units
			Min.	LAL	Bogey	UAL	Max.	
Measurements Acceptance Tests, Part 1, Note 1								
4.1.1.7 4.10.8	(Method A) Heater Current: ALD = 12.....	—	—	144	150	156	—	mA
4.10.8	Heater Current:.....	0.65	140	—	—	—	160	mA
4.10.15	Heater-Cathode Leakage: Note 4.....	0.65	—	—	—	—	—	
	Ehk = +100 Vdc.....	—	—	—	—	—	20	μAdc
	Ehk = -100 Vdc.....	—	—	—	—	—	20	μAdc
4.10.13	Operation: Note 5 Io.....	0.65	7.8	—	—	—	—	mAdc
4.7.5	Continuity and Shorts (Inoperatives):.....	0.40	—	—	—	—	—	
4.9.1	Mechanical: Envelope (8-1).....	—	—	—	—	—	—	
Measurements Acceptance Tests, Part 2								
4.8	Insulation of Electrodes: Note 4 p-all.....	2.5	100	—	—	—	—	Meg
4.10.1.1	Emission: Note 4 Is Eb = 10 Vdc.....	2.5	7.5	—	—	—	—	mAdc
4.10.4.1	Plate Current: Note 4 Ebb = 0 V; Rp = 40,000 Ohms.....	2.5	2.0	—	—	—	22	μAdc
4.10.4.1	Plate Current Difference Between Sections:.....	2.5	—	—	—	—	5.0	μAdc
4.10.14	Capacitance: 0.405 In. Dia. Shield.....	6.5	—	—	—	—	—	
	C1p to 2p.....	—	—	—	—	—	0.026	μmf
	C1p to h+1k+sd.....	—	1.8	—	—	—	2.6	μmf
	C2p to h+2k+sd.....	—	1.8	—	—	—	2.6	μmf
	C1k to h+1p+sd.....	—	2.1	—	—	—	3.1	μmf
	C2k to h+2p+sd.....	—	2.1	—	—	—	3.1	μmf
4.9.12.1	Low Pressure Voltage Breakdown: Pressure = 55 ± 5 mm Hg.; Voltage = 330 Vac.....	6.5	—	—	—	—	—	
4.9.20.3	Vibration: No Voltages; Post Shock and Fatigue Test End Points Apply.....	10.0	—	—	—	—	—	
Degradation Rate Acceptance Tests, Note 2								
4.9.5.3	Subminiature Lead Fatigue:.....	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°; Ehk = +100 Vdc.....	20	—	—	—	—	—	
4.9.20.6	Fatigue: G = 2.5; Fixed Frequency; F = 25 min., 60 max.....	6.5	—	—	—	—	—	
— — —	Post Shock and Fatigue Test End Points: Heater-Cathode Leakage							
	Ehk = +100 Vdc.....	—	—	—	—	—	40	μAdc
	Ehk = -100 Vdc.....	—	—	—	—	—	40	μAdc
	Operation Io.....	—	7.0	—	—	—	—	mAdc
4.9.6.3	Glass Strain:.....	6.5	—	—	—	—	—	

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Test	AQL (%)	Allowable Defectives per Characteristic		Limits		Units
			1st Sample	Combined Samples	Min.	Max.	
Acceptance Life Tests, Note 2							
4.11.3.1	Stability Life Test: (1 Hour) Note 6 TA = Room.....	1.0	—	—	—	—	%
4.11.4	Stability Life Test End Points: Change in Operation of Individual Tubes ΔI_o	—	—	—	—	10.0	
4.11.3.1 4.11.3.1.1	Survival Rate Life Test: (100 Hours) Stability Life Test Conditions or Equivalent; TA = Room.....	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)..... Operation I_o	0.65 1.0	— —	— —	— 7	— —	mAdc
4.11.7	Heater Cycling Life Test: Ef = 7.0 V; 1 min. on, 4 min. off; Ehk = 140 Vac; E1b = E2b = 0 V.....	2.5	—	—	—	—	
4.11.5 4.11.3.1	Intermittent Life Test: Note 3 Stability Life Test Conditions; T Envelope = +220°C min.; 1000 Hour Requirements Do Not Apply.....	—	—	—	—	—	mA mAdc μ Adc μ Adc Meg
4.11.3.1 4.11.4	Intermittent Life Test End Points: (500 Hours)	—	—	—	—	—	
	Inoperatives.....	—	1	3	—	—	
	Heater Current.....	—	2	5	138	164	
	Operation I_o	—	1	3	6.8	—	
	Heater-Cathode Leakage.....	—	2	5	—	—	
	Ehk = +100 Vdc.....	—	—	—	—	40	
	Ehk = -100 Vdc.....	—	—	—	—	40	
	Insulation of Electrodes.....	—	2	5	—	—	
	p-all.....	—	—	—	25	—	
	Total Defectives.....	—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

- The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective.
- Tubes subjected to the following destructive tests are not to be accepted under this specification.
 - 4.9.5.3 Subminiature lead fatigue
 - 4.9.20.5 Shock
 - 4.9.20.6 Fatigue
 - 4.11.7 Heater cycling life test
 - 4.11.5 Intermittent life test
- Envelope temperature is defined as the highest temperature indicated when using a thermocouple of $\# 40$ BS or smaller diameter elements

welded to a ring of 0.025 inch diameter phosphor bronze placed in contact with the bulb. Envelope temperature requirement will be satisfied if a tube, having bogey Ib ($\pm 5\%$) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

- Test each section separately.
- In a full-wave circuit, adjust Zp/p so that a bogey tube gives $I_o = 8.8$ mAdc. A bogey tube has a tube drop of $E_{td} = 10$ Vdc at $I_s = 15$ mAdc per plate. $E_{hk} = E_o + 117$ Vac.
- In a full-wave life test circuit, the values specified for RL and CL shall be considered as approximate and shall be adjusted initially to give not less than $I_o = 8.8$ mAdc and $i_b = 24$ ma. $E_{hk} = E_o + 117$ Vac.

APPLICATION DATA

The 6110 is a Premium Subminiature heater-cathode type double diode manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. The 6110 is intended for operation under conditions of extreme shock, vibration, high altitude and high temperature.

In application, this type is intended primarily for detector service and may be used efficiently at uhf as well as low frequencies. Separate cathode connections permit

independent operation of each section. Its many uses include ratio and discriminator type detectors in communications equipment, frequency control, moderate power clamping or limiting and gating.

The 6110 exhibits a much lower perveance than the double diode Type 5896. The 6110, however, offers the advantage of lower heater power consumption, i.e., 150 ma against 300 ma for the 6021, at 6.3 volts.

APPLICATION DATA (Continued)

In critical detector applications, a reduction in hum output and contact potential voltage may be realized by lowering the operating heater voltage. Such a reduction will, however, result in a plate characteristic curve

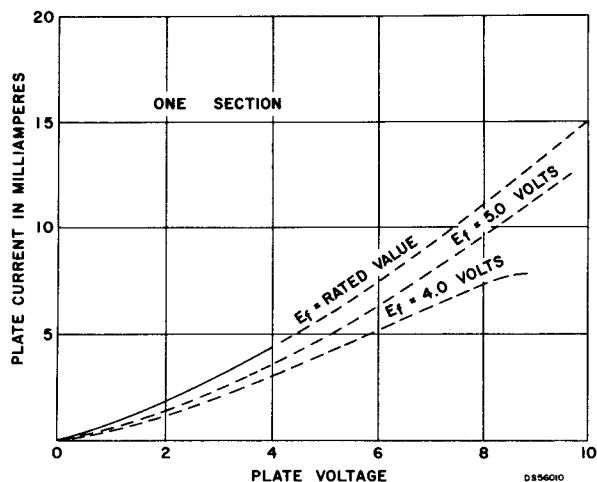


Figure 1—Approximate Plate Characteristics at reduced heater voltage

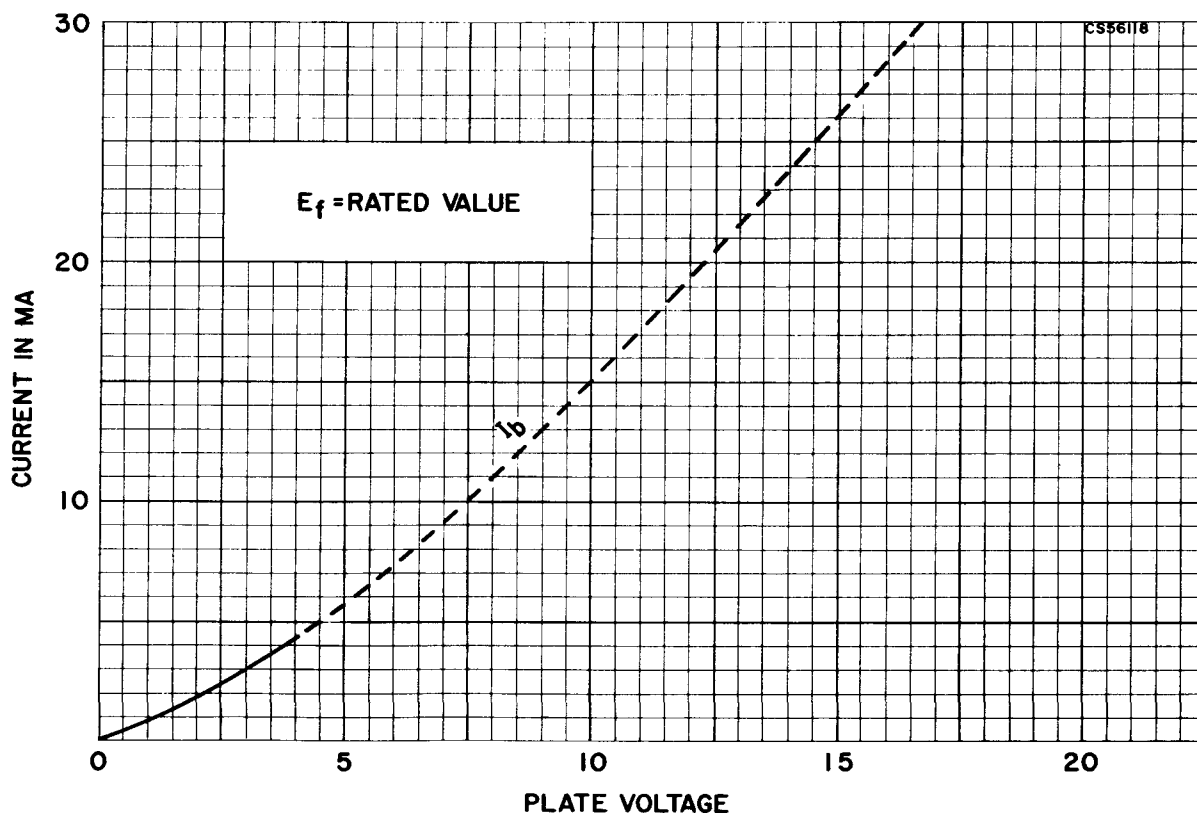
which departs from that obtained with rated heater voltage, Figure 1. With practical values of reduced heater voltage, hum output may be lowered by as much as 60% and contact potential by 20 to 30%. Operation under these conditions is satisfactory, providing the current requirements are consistent with values normally encountered in low level detection. An alternative method of lowering hum output and contact potential is to bias the heater with respect to the cathode.

Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

When operated under conditions common to on-off control applications the tube exhibits freedom from the development of interface resistance. The heater-cathode construction is designed to withstand intermittent operation.

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE OPERATION CHARACTERISTICS

