

### MECHANICAL DATA

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

### RATINGS' (Absolute Maximum)

Impact Acceleration . . . . .	450 G
Uniform Acceleration . . . . .	1000 G
Fatigue (Vibrational Acceleration for Extended Periods) . . . . .	2.5 G
Bulb Temperature . . . . .	125° C Max. -55° C Min.
Altitude <sup>2</sup> . . . . .	80000 Ft.

### ELECTRICAL DATA

#### HEATER CHARACTERISTICS

	Min.	Bogey	Max.
Heater Voltage <sup>3</sup> . . . . .	6.0	6.3	6.6 V
Heater Current . . . . .		150	mA

#### DIRECT INTERELECTRODE CAPACITANCES

	Shielded <sup>4</sup>	Unshielded
Grid No. 1 to Anode . . . . .	0.08	0.11 $\mu\text{f}$
Grid No. 1 to All Other Electrodes . . . . .	1.70	1.60 $\mu\text{f}$
Anode to All Other Electrodes . . . . .	1.60	1.50 $\mu\text{f}$

### RATINGS<sup>1</sup> \* <sup>5</sup> (Absolute Maximum — Except as Noted)

Absolute Minimum Cathode Heating Time . . . . .	10 Seconds
Peak Forward Anode Voltage . . . . .	500 v
Peak Inverse Anode Voltage . . . . .	500 v
Negative Grid No. 1 Voltage	
Before Conduction . . . . .	200 Vdc
During Conduction . . . . .	10 Vdc
Negative Grid No. 2 Voltage	
Before Conduction . . . . .	100 Vdc
During Conduction . . . . .	10 Vdc
Cathode Current . . . . .	16 mA Dc
Peak Plate Current <sup>6</sup> . . . . .	100 ma
Peak Heater-Cathode Voltage	
Heater Positive with Respect to Cathode . . . . .	25 v
Heater Negative with Respect to Cathode . . . . .	100 v
Grid No. 1 Resistor . . . . .	10 Meg

#### CHARACTERISTICS

Tube Voltage Drop for $I_b = 20 \text{ mA Dc}$ . . . . .	10 Vdc
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#### TYPICAL OPERATING CONDITIONS

Anode Voltage . . . . .	150 Vac
Grid No. 2 Voltage <sup>7</sup> . . . . .	0 Vac
Grid No. 1 Voltage <sup>8</sup> . . . . .	5.0 Vac
Peak Grid No. 1 Signal Voltage . . . . .	5.0 v
Anode Resistor . . . . .	3750 Ohms
Grid No. 1 Resistor . . . . .	1.0 Meg

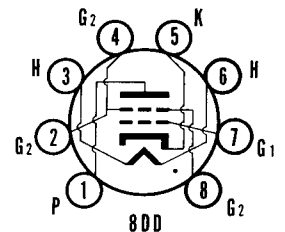
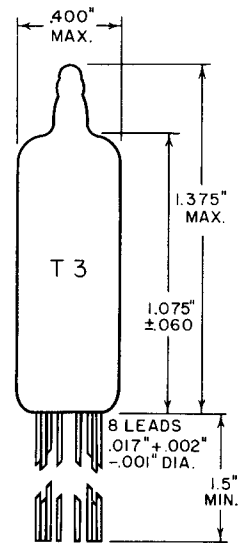
#### NOTES:

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 cathode.
5. Values shown are as registered with RETMA.
6. Averaged over three seconds maximum.
7. The No. 2 grid shall not be used for control purposes.
8. Bias voltage, 180° out of phase with anode voltage.

### QUICK REFERENCE DATA

The Premium Subminiature Type 5643 is a tetrode thyatron designed for use in counters, control circuits, as a grid-controlled rectifier and other light duty applications under conditions of severe shock, vibration, high temperature and high altitude.

The Sylvania Type 5643 is manufactured to meet the applicable specification for reliable operation.



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ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage . . . . . 6.3 V  
 Grid No. 2 Voltage . . . . . 0 V

Heater-Cathode Voltage . . . . . 0 V

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.	
<b>Measurements Acceptance Tests, Part 1, Note 1</b>								
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:.....	0.65	—	—	—	—	—	—
	Ehk = +25 Vdc.....	—	—	—	—	—	10	μAdc
	Ehk = -100 Vdc.....	—	—	—	—	—	10	μAdc
4.10.17.1	Grid Voltage (1): Epp = 350 Vac; Rg1 = 0.1 Meg; Rp = 10,000 Ohms.....	0.65	-2.0	—	—	—	-4.0	Vdc
4.10.17.1	Grid Voltage (2): Epp = 350 Vac; Rg1 = 10 Meg; Rp = 10,000 Ohms.....	0.65	—	—	—	—	-6.0	Vdc
4.10.17.2	Anode Voltage: Vary Ebb; Ec1 = 0 V; Rg1 = 0.1 Meg; Rp = 10,000 Ohms.....	0.65	—	—	—	—	26	Vdc
4.7.5.	Continuity and Shorts (Inoperatives):.....	0.4	—	—	—	—	—	—
4.9.1	Mechanical: Envelope (8-1).....	—	—	—	—	—	—	—
<b>Measurements Acceptance Tests, Part 2</b>								
4.10.24	Pulse Emission:..... epy = egy1 = egy2 = 180 ± 9 v; tp = 5 ± 0.25 μs; tr = 0.5 μs max.; tf = 1.0 μs max.; prr = 120 ± 5 pps; tk = 5 sec min.; Ra = 150 Ohms ± 5%, noninductive; Rp = 100 Ohms ± 5%, noninductive; Dummy = 50 Ohms ± 5%, noninductive	2.5	—	—	—	—	76	v
4.9.20.3	Vibration: No Voltages; Post Shock and Fatigue Test End Points Apply .....	10.0	—	—	—	—	—	—
<b>Degradation Rate Acceptance Tests, Note 3</b>								
4.9.5.3	Subminiature Lead Fatigue:.....	2.5	4	—	—	—	—	arcs
4.9.20.5	Shock: Hammer Angle = 30°.....	—	—	—	—	—	—	—
4.9.20.6	Fatigue: Fixed Frequency; F = 25 min., 60 max.....	6.5	—	—	—	—	—	—
— — — —	Post Shock and Fatigue Test End Points: Heater-Cathode Leakage	—	—	—	—	—	—	—
	Heater Positive.....	—	—	—	—	—	20	μAdc
	Heater Negative.....	—	—	—	—	—	20	μAdc
	Anode Voltage.....	—	—	—	—	—	26	Vdc
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.	
<b>Acceptance Life Tests, Note 3</b>							
4.11.7	Heater Cycling Life Test: E <sub>f</sub> = 7.0 V; 1 min. on, 4 min. off; E <sub>b</sub> = E <sub>c1</sub> = E <sub>c2</sub> = 0 V; E <sub>hk</sub> = 18 Vac.....	2.5	—	—	2500	—	Cycles
4.11.3.1	Survival Rate Life Test: (100 Hours) Notes 2 and 5 I <sub>b</sub> = 16 mA <sub>dc</sub> ; i <sub>b</sub> = 100 ma; R <sub>g1</sub> = 50,000 Ohms min.; E <sub>pp</sub> = 350 Vac; E <sub>hk</sub> = 100/25 V <sub>dc</sub> ; R <sub>p</sub> = 5000 Ohms approx.; TA = Room.....	—	—	—	—	—	
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives).....	0.65	—	—	—	—	
4.11.3.1	Intermittent Life Test: Notes 2, 4 and 5 Survival Rate Life Test, t <sub>k</sub> = 10 sec max.; T Envelope = +125°C min.....	—	—	—	—	—	
4.11.5							
4.11.3.1	Intermittent Life Test End Points: (500 Hours) Inoperatives..... Heater Current..... Grid Voltage (1)..... Anode Voltage..... Pulse Emission..... Heater-Cathode Leakage..... Heater Positive..... Heater Negative..... Total Defectives.....	—	1	3	—	—	
4.11.4		—	2	5	138	164	mA
		—	1	3	-0.8	-5.0	V <sub>dc</sub>
		—	1	3	—	70	V <sub>dc</sub>
		—	2	5	—	100	v
		—	2	5	—	—	
		—	—	—	—	20	μA <sub>dc</sub>
		—	—	—	—	20	μA <sub>dc</sub>
		—	4	8	—	—	

ACCEPTANCE CRITERIA NOTES:

- 1: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical, shall be one percent. A tube having one or more defects shall be counted as one defective.
- 2: Phase of grid voltage shall be adjusted to provide start of conduction at the peak of the applied anode voltage.
- 3: 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

- 4: 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 in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having bogey I<sub>b</sub> (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.
- 5: Cycling shall be 30 seconds positive voltage and 30 seconds negative voltage.

APPLICATION DATA

The 5643 is a Premium Subminiature tetrode thyratron designed for use in counters, grid-controlled rectifiers and other control circuits. This tube has a control characteristic which is virtually independent of ambient temperature over a comparatively wide range.

The No. 1 grid circuit resistance may be as high as 10 megohms, if required to obtain maximum signal from a high impedance source. When this high resistance is used, the tube base must be kept clean and dry to reduce leakage currents to a minimum. If a socket is used, precautions must also be taken to keep socket leakage to a minimum. When a high No. 1 grid resistance is used with a c anode voltage, the grid-anode circuit capacitance

should be reduced as much as possible to prevent erratic firing due to line voltage surges. For the usual application, it is recommended that lower values of grid resistance be employed. Values as low as 0.1 megohm are satisfactory for many applications.

As is customary for all gas tubes using oxide-coated cathodes, certain precautions must be observed. To prevent damage to the cathode, the heater voltage must not deviate more than ±5% from the rated value. Low voltage operation reduces cathode temperature and results in cathode sputtering, hot spots and eventual destruction of the cathode. Higher cathode temperatures, due to increased heater voltage, can cause erratic firing voltages.

**APPLICATION DATA (Continued)**

At least 10 seconds should be allowed to permit the cathode to reach normal operating temperature before anode voltage is applied.

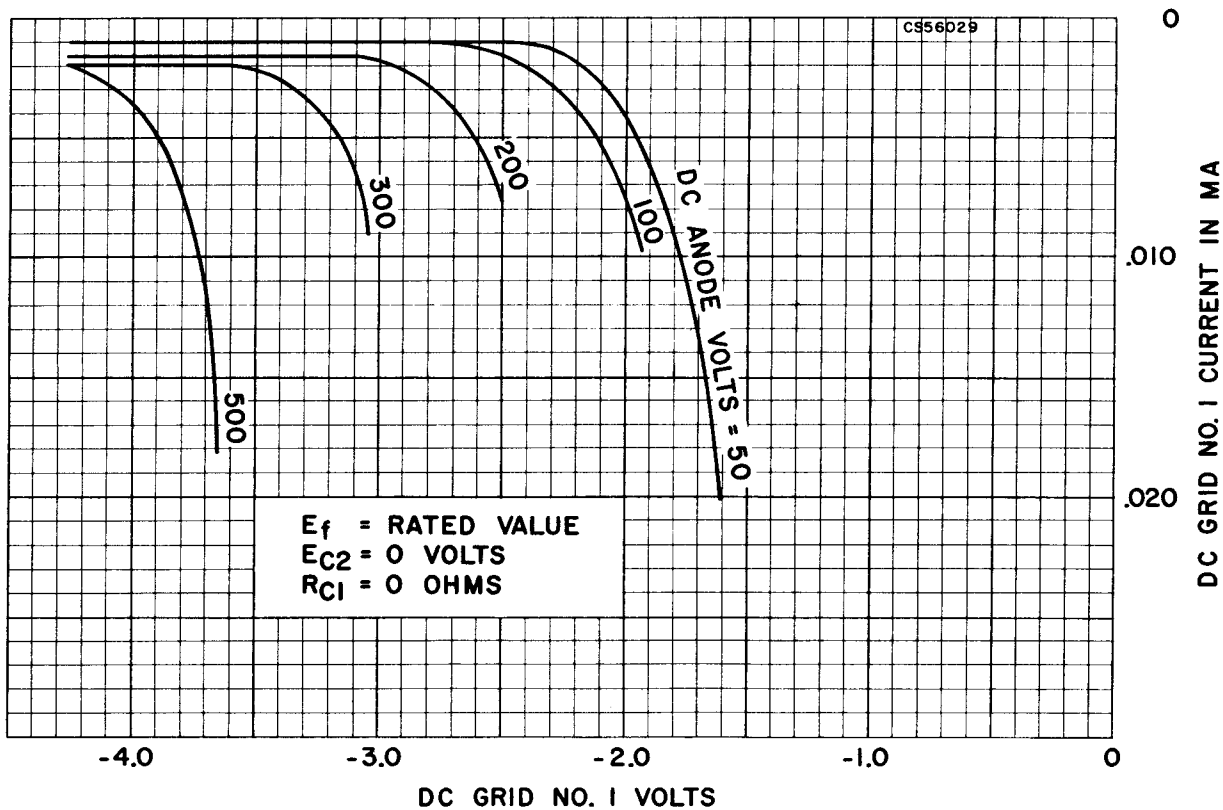
Whenever possible, it is recommended that no difference of potential exist between cathode and heater. In circuits where the cathode is not directly connected to the heater, the potential difference between them should not exceed recommended peak values shown in the tabulated data.

The 5643 is designed to provide long life and stable operation under conditions of severe shock, vibration, high altitude and high temperature. The 5643 is manu-

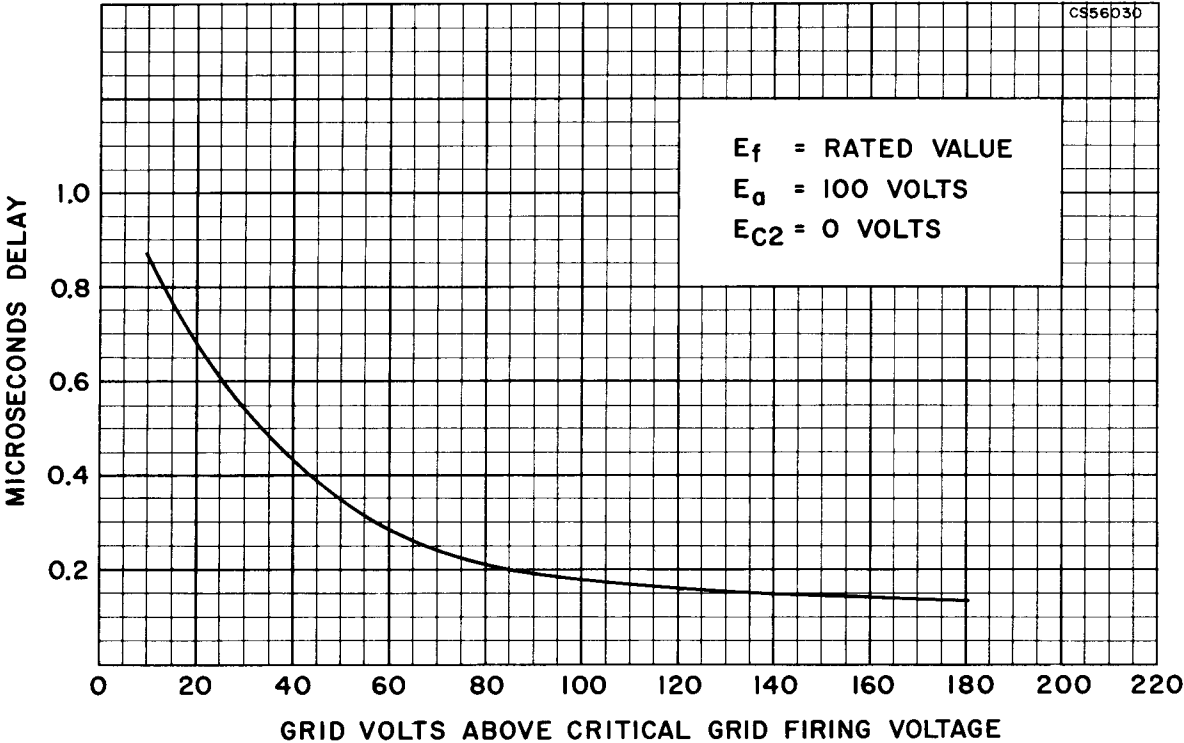
factured and inspected to meet the applicable MIL-E-1 specification for reliability. Life expectancy is described by the life tests specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating 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.

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

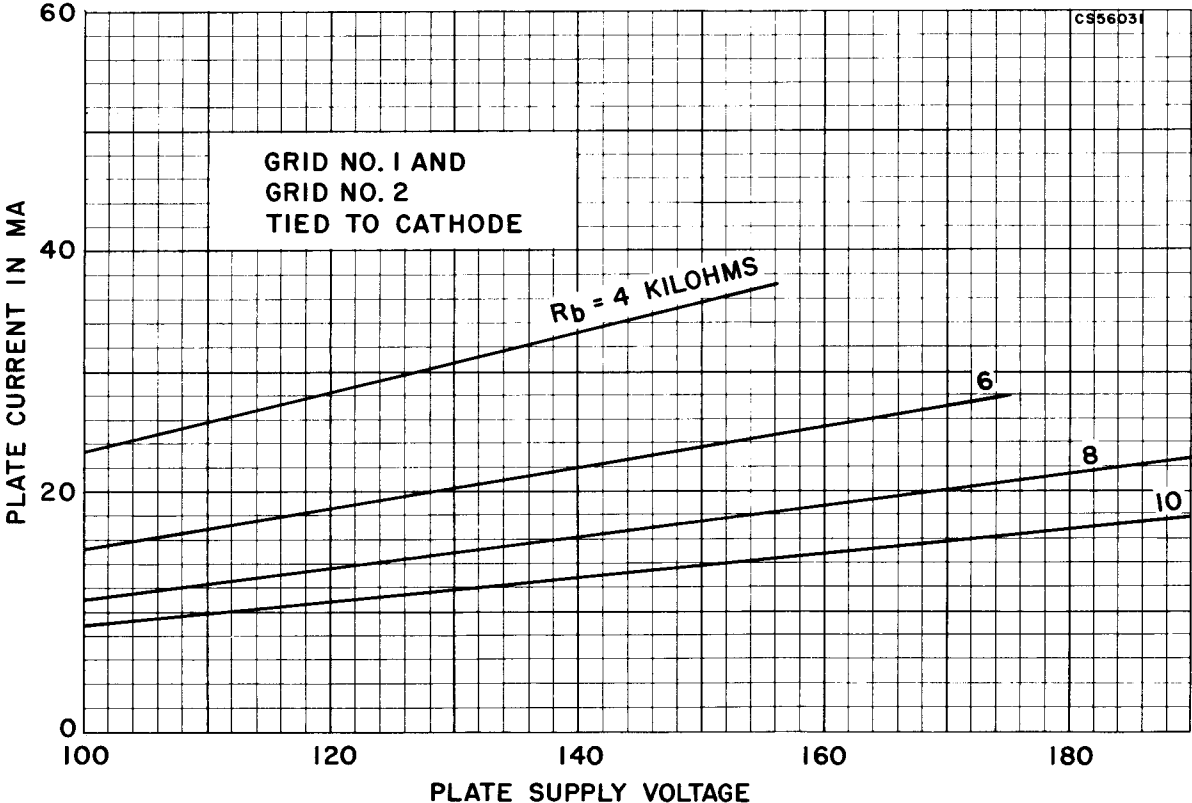
**AVERAGE GRID CHARACTERISTICS BEFORE ANODE CONDUCTION**



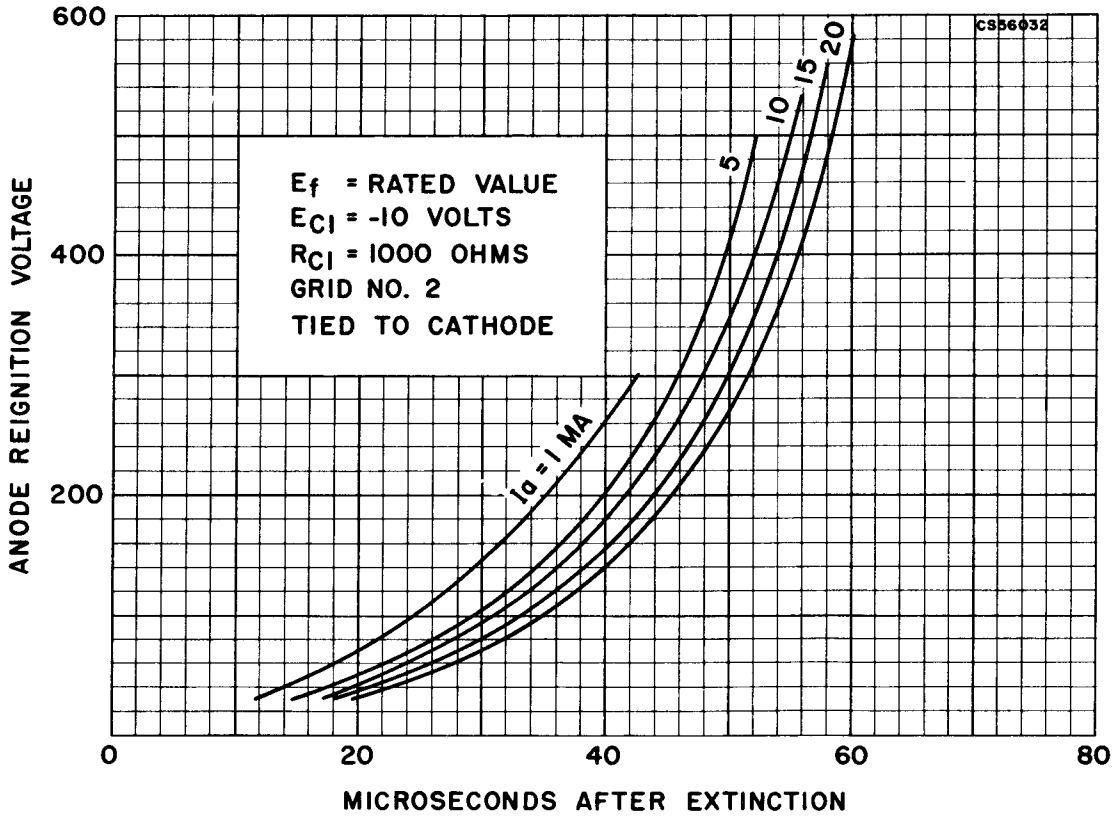
AVERAGE IONIZATION CHARACTERISTICS



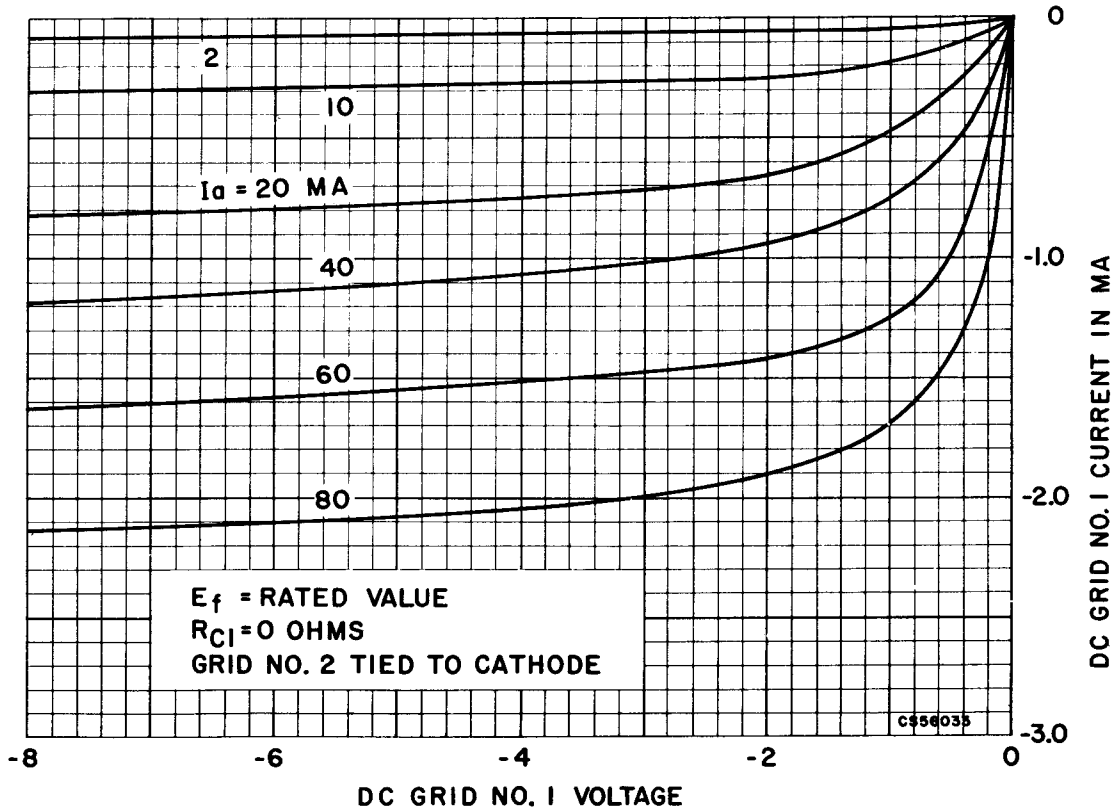
AVERAGE REGULATION CHARACTERISTICS



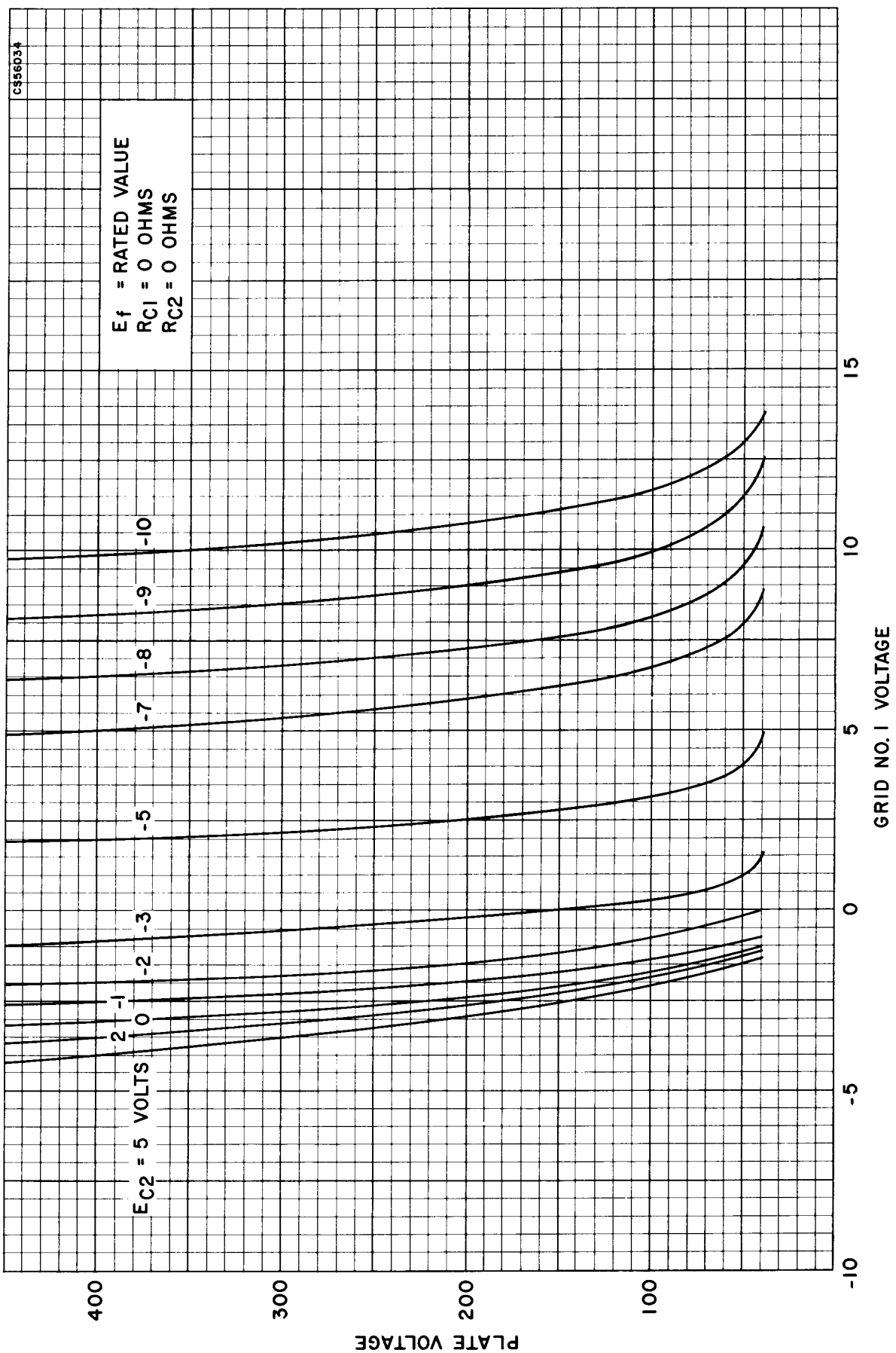
AVERAGE DEIONIZATION CHARACTERISTICS



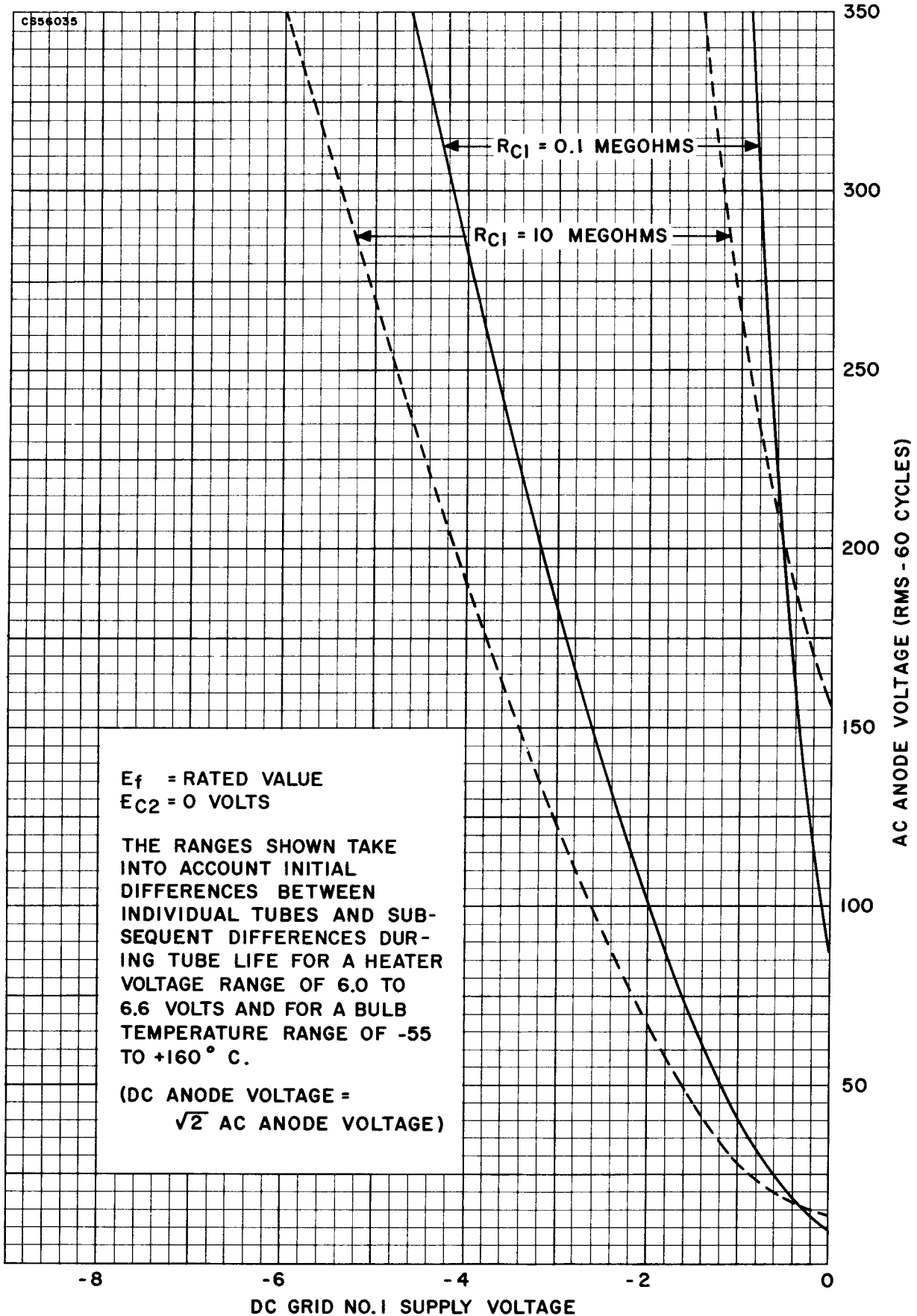
AVERAGE GRID CHARACTERISTICS BEFORE ANODE CONDUCTION



AVERAGE CONTROL CHARACTERISTICS



OPERATIONAL RANGE OF CRITICAL GRID VOLTAGE





INITIAL OPERATING RANGE OF CRITICAL GRID VOLTAGE

