SYLVANIA

engineering data service

MECHANICAL DATA

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

RATINGS[1] (Absolute Maximum)

Impact Acceleration	450 G
Uniform Acceleration	1000 G
Fatigue (Vibrational Acceleration for Extended Periods)	2.5 G
Bulb Temperature	220° C
Altitude	80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	Min.	Bogey	Max.	
Heater Voltage[2]	25.2	26.5	27.8	V
Heater Current		45		mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[3]

Grid No. 1 to Plate	0.015 μμf	Max.
Input	4.0 μμf	
Output	3.4 μμf	

RATINGS[1 & 4] (Absolute Maximum)

Plate Voltage	55 Vdc
Grid No. 2 Voltage	55 Vdc
Cathode Current	10 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v

CHARACTERISTICS

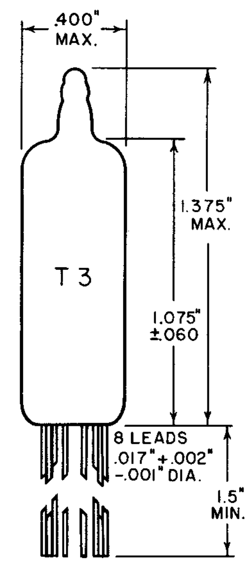
Plate Voltage	26.5 Vdc
Grid No. 2 Voltage	26.5 Vdc
Grid No. 1 Resistor	2.2 Meg
Plate Current	2.1 mAdc
Grid No. 2 Current	0.75 mAdc
Transconductance	2850 μmhos
Plate Resistance	150 K Ohms
Grid Bias for Ib = 10 μa	-3 Vdc

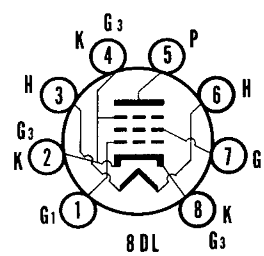
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 26.5 volts.*
3. *External shield of 0.405 inch internal diameter connected to cathode.*
4. *Values shown are as registered with RETMA.*

QUICK REFERENCE DATA

The Premium Subminiature Type 5905 is a sharp cutoff, UHF pentode designed for use as an amplifier with 26.5 volts on the heater, plate and grid No. 2. The Sylvania Type 5905 is intended for operation under conditions of severe shock, vibration, high temperature and high altitude. It is manufactured and inspected to meet the applicable specifications for reliable operation.





SYLVANIA ELECTRIC PRODUCTS INC.

RADIO TUBE DIVISION
EMPORIUM, PA.

Prepared and Released By The
TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
AUGUST, 1957

ACCEPTANCE CRITERIA

Test Conditions

Heater Voltage . . . . 26.5 V
Plate Voltage . . . . 26.5 Vdc
Grid No. 2 Voltage . . . . 26.5 Vdc
Grid No. 1 Resistor . . . . 2.2 Meg

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

MIL-E-1 Ref.	Tests	Limits Min.	Limits Bogey	Limits Max.	Units
Production Tests					
4.10.8	Heater Current:	40	45	50	mA
4.10.6.1	Grid No. 1 Current: Ec2 = Eb = 50 Vdc; Rg1 = 0.1 Meg; Ec1 = −1.5 Vdc	0	—	−0.3	μAdc
4.10.4.1	Plate Current (1):	1.4	2.1	2.8	mAdc
4.10.4.3	Grid No. 2 Current:	0	0.75	1.5	mAdc
4.10.9	Transconductance (1): Cg1 = 1 μf	2350	2850	3350	μmhos
Special Design Tests					
4.9.5.3	Subminiature Lead Fatigue:	4	—	—	arcs
4.9.19.2	Vibration: F = 40 cps; G = 15; Rp = 10,000 Ohms; Cg1 = 1 μf	—	—	30	mVac
4.10.15	Heater-Cathode Leakage: Ehk = +100 Vdc	0	—	10	μAdc
	Ehk = −100 Vdc	0	—	10	μAdc
4.8	Insulation of Electrodes: Eg1 — all = −100 Vdc; Ef = 26.5 V	100	—	—	Meg
4.10.3.2	AF Noise: Esig = 70 mVac; Rg2 = 1000 Ohms; Rp = 0.2 Meg; Ebb = 100 Vdc; Ecc2 = 19 Vdc	—	—	17	VU
Design Tests					
4.10.10	Plate Resistance: Cg1 = 1 μf	0.090	—	—	Meg
4.10.4.1	Plate Current (2): Ec1 = −3.0 Vdc; Rg1 = 0	0	—	100	μAdc
4.10.9	Transconductance (2): Ef = 24.0 V; Cg1 = 1 μf	2150	—	—	μmhos
4.10.14	Capacitance: Tests made with a 0.405 in. dia. shield tied to cathode				
	Cgp	—	—	0.015	μμf
	Cin	3.5	4.0	4.5	μμf
	Cout	2.9	3.4	3.9	μμf
Degradation Tests					
4.9.20.5	Shock: Note 1; Hammer Angle = 30°				
4.9.20.6	Fatigue: No. 1				
-----	Post Shock Test End Points: Vibration	—	—	100	mVac
-----	Post Fatigue Test End Points: Vibration	—	—	75	mVac
-----	Post Shock and Fatigue Test End Points: Heater-Cathode Leakage	0	—	20	μAdc
	Transconductance (1)	2100	—	—	μmhos

ACCEPTANCE CRITERIA (Continued)

MIL-E-1 Ref.	Tests	Limits Min.	Bogey	Max.	Units
Acceptance Life Tests					
4.11.7	Heater Cycling Life Test: Ef = 29.0 V; Eb = Ec2 = Ec1 = 0 V; Rg1 = 0 Ohms; Ehk = 140 Vac One min. On, four min. Off	2500	—	—	Cycles
4.11.5	Intermittent Life Test: Note 2 Rg1 = 2.2 Meg; Ehk = +200 Vdc; TA = 175°C	500	—	—	Hours
4.11.4	Intermittent Life Test End Points:				
	Transconductance	1700	—	—	μmhos
	Heater-Cathode Leakage	0	—	30	μAdc
	Grid No. 1 Current	—	—	-0.9	μAdc

ACCEPTANCE CRITERIA NOTES:

1: Acceptance sampling procedure shall be in accordance with the shock test sampling procedure of the Inspection Instructions for Electron Tubes.

2: At the conclusion of the five hundred hour life test, the average life of the life test group shall be not less than four hundred fifty hours. Life test sample size shall be ten tubes. Provision for release of tubes prior to completion of life test on a reduced basis as specified in Par. 4.3.1.3 of the Inspection Instructions for Electron Tubes shall not apply.

APPLICATION DATA

The Premium Subminiature Type 5905 is an ultra high frequency pentode designed for operation with 26.5 volts on heater, plate and No. 2 grid. For optimum performance this type should be used with grid-resistor bias to avoid the loss of plate voltage associated with cathode-biasing systems. The tube impedances are lower than those encountered in higher voltage tubes, but this is a natural result of the very low voltages employed. Input and output resistance are plotted as a function of frequency in Figure 1.

These input and output loading effects must be considered in uhf circuit design. As in any uhf pentode, the grid-plate feedback is not primarily dependent on grid-plate capacitance. At uhf the inductances of tube leads will go into resonance with the grid-plate capacitance, thereby effecting complete neutralization within the tube at some frequency. This self-neutralization point in the 5905 is approximately 200 megacycles. At higher frequencies the feedback is inductive, and takes place primarily through the tube leads.

The importance of short leads cannot be over-emphasized in the application of the Type 5905 to uhf. The careful reduction of coupling effects within the tube may be nullified if sufficient capacitance and mutual inductance exist in wiring external to the tube.

The three cathode leads provided in the 5905 allow isolation of the input and output circuit returns. Two of the three leads can be used to best advantage in the

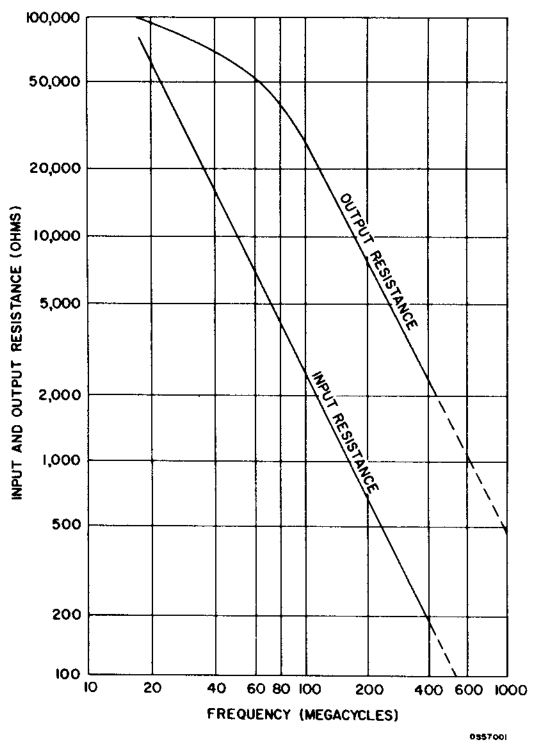


Figure 1—Input and output resistance vs frequency

APPLICATION DATA (Continued)

input circuit return, to provide the high input impedance shown in Figure 1.

A power gain of approximately 2 has been obtained from a Type 5905 at 400 megacycles using a single stage with matched input and output. At those frequencies where circuit impedances are relatively high in comparison with tube impedances and can be neglected, the power gain may be approximated as:

$$\text{Power Gain} = \left[\frac{gm\sqrt{\text{Rinput x Routput}}}{2}\right]^2$$

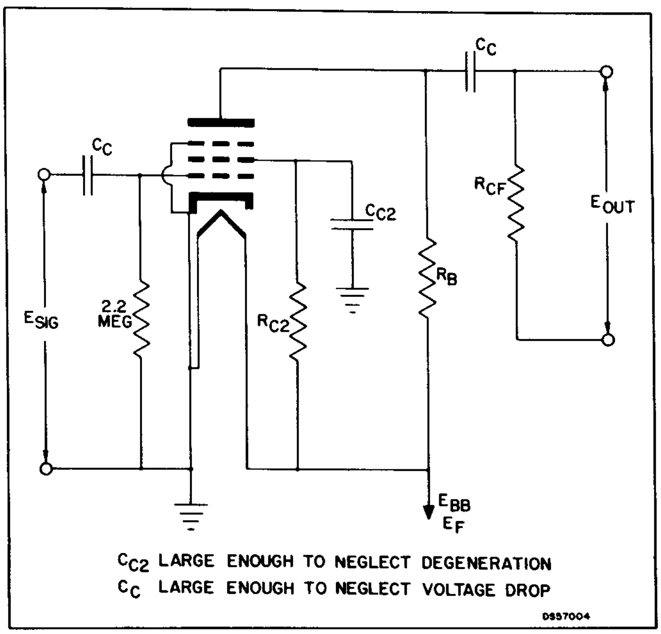
Life expectancy is described by the life tests, specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tube in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate 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.

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.

RESISTANCE COUPLED AMPLIFIER DATA
ZERO-BIAS OPERATION

Ef = Ebb (volts)	21.0		26.5		30.0	
Rb (megohms)	0.27	0.47	0.27	0.47	0.27	0.47
Rc_2 (megohms)	0.68	1.20	0.68	1.20	0.68	1.20
Rcf (megohms)	2.0	2.0	2.0	2.0	2.0	2.0
Esig (volts, rms)	0	0	0	0	0	0
Ib (ma)	0.050	0.031	0.068	0.082	0.082	0.050
Ic_2 (ma)	0.021	0.013	0.029	0.017	0.034	0.020
Eb (volts)	7.5	6.4	8.1	6.8	7.8	6.5
Ec_2 (volts)	6.7	5.4	6.8	6.1	6.9	6.0
Esig (volts, rms)	0.05	0.05	0.05	0.05	0.05	0.05
Eout (volts, rms)	3.0	3.1	3.4	3.8	3.8	4.1
Gain	60	62	68	76	76	82
% Distortion	4.2	4.4	3.1	3.8	2.4	4.3
Esig* (volts, rms)	0.07	0.06	0.07	0.06	0.07	0.06
Eout (volts, rms)	3.6	3.6	4.1	4.2	5.0	4.7
Gain	51	60	59	70	71	78
% Distortion	6.2	5.3	4.9	4.9	4.8	5.5

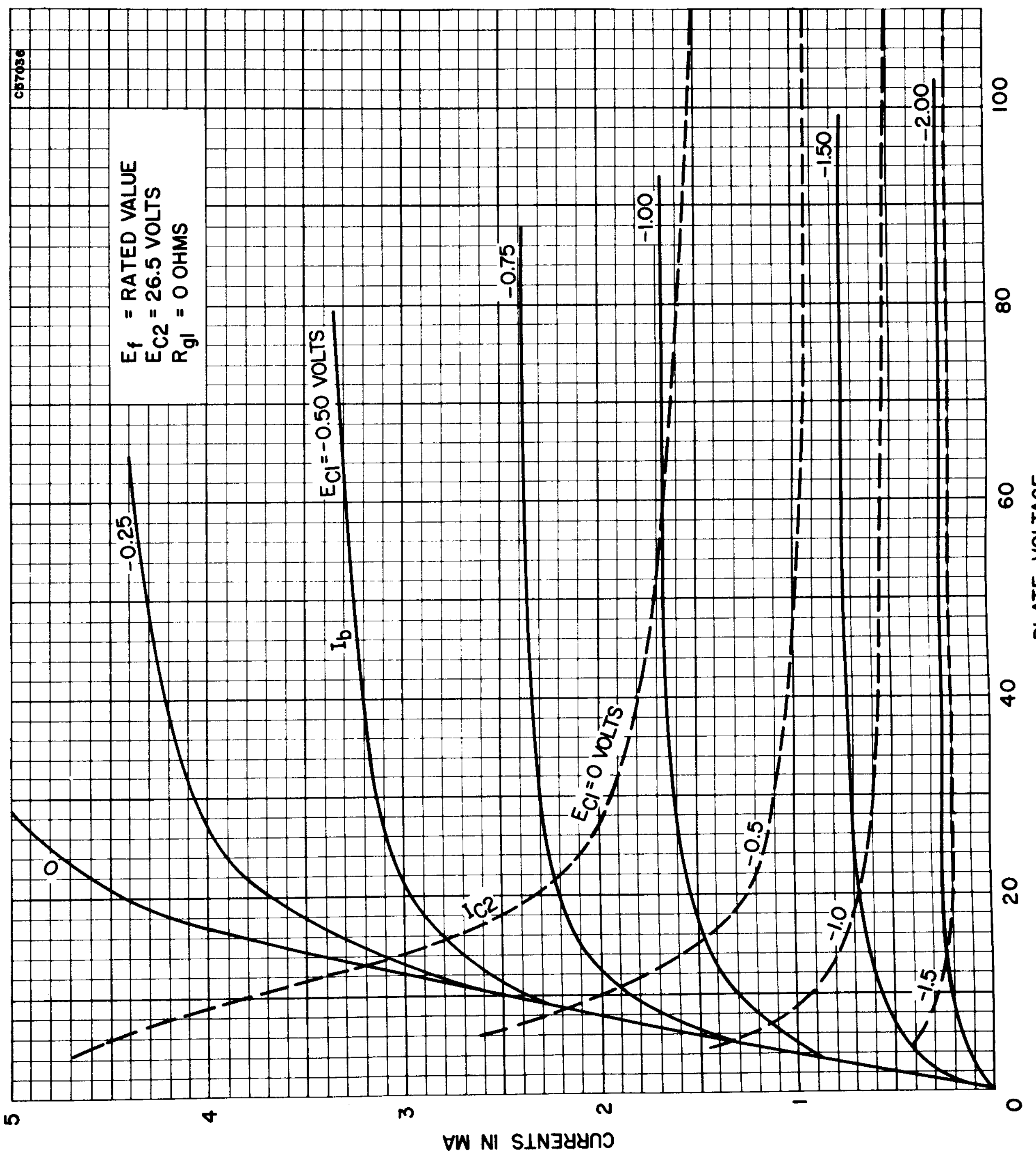
*Maximum Signal for 5% Distortion



Resistance coupled amplifier circuit

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

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS