SYLVANIA SUBMINIATURE STRAP FRAME GRID TUBES

SYLVANIA

7962

MECHANICAL DATA

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

RATINGS[1] (Absolute Maximum)

Bulb Temperature	180 °C
Altitude[2]	80,000 Ft.
Radiation[14]	
Total Dosage (neutrons/sq. cm)	10^{16} nvt
Dose Rate (neutrons/sq. cm/sec.)	10^{12} nv

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (¾ msec Duration)[5]	500 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5 G	Max.
On-Off Heater Cycles[7]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3 V
Heater Current	235 mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[8]	
Grid to Plate (Each Section)	2.2 pf	
Input	3.2 pf	
Output		
Section No. 1	1.2 pf	
Section No. 2	1.1 pf	
Grid to Grid	0.020 pf	Max.
Plate to Plate	1.2 pf	Max.

CONTROLLED DETRIMENTS

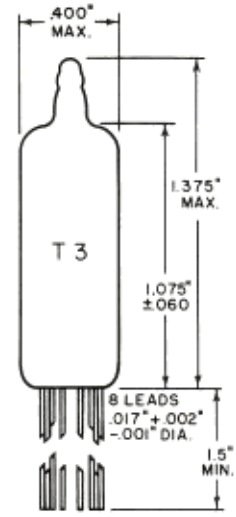
Interelectrode Insulation[9]	100 Meg.	Min.
Total Grid Current[10]	−0.3 μAdc	Max.
Grid Emission[11]	−0.5 μAdc	Max.
Vibration Output as Equivalent Grid Voltage[12]	5.5 mVax	Max
Heater-Cathode Leakage[13]	5 μAdc	Max.

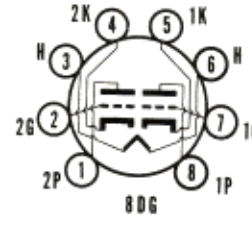
RATINGS[1] (Absolute Maximum)

Heater Voltage[3]	6.3 (±10 %) V
Plate Voltage	100 Vdc
Peak Plate Forward Voltage	200 v
Plate Dissipation (Each Section)	0.8 W
Plate Current (Each Section)	15 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Grid Current	1.0 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v
Grid Circuit Resistance	
Above 40 V	1.1 Meg.
Below 40 V	2.2 Meg.

QUICK REFERENCE DATA

The Sylvania Type 7962 is a frame grid subminiature medium mu double triode featuring high Gm, Gm/ma and comparatively low heater power. It is well suited to a variety of applications at frequencies up to 400 Mc: including IF preamp, RF amplifier, mixer/local oscillator and high speed multivibrator. The Type 7962 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.





The spacing between the grid and cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltage applied must not exceed 50 volts.

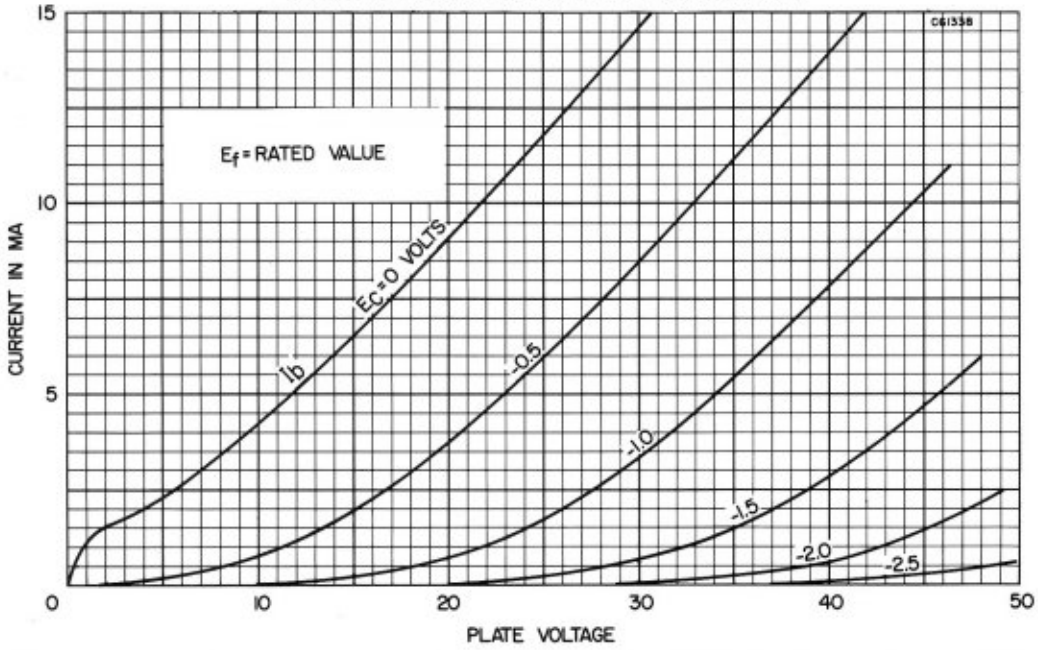
CHARACTERISTICS (Each Section)

Plate Voltage	26.5	60 Vdc
Cathode Resistor	—	220 Ohms
Grid Resistor	2.2	— Megs.
Plate Current	4.8	8.5 mAdc
Transconductance	9700	10,500 μmhos
Amplification Factor	22	22
Grid Voltage for Ib = 20 μAdc	−2.2	−5.5 Volts

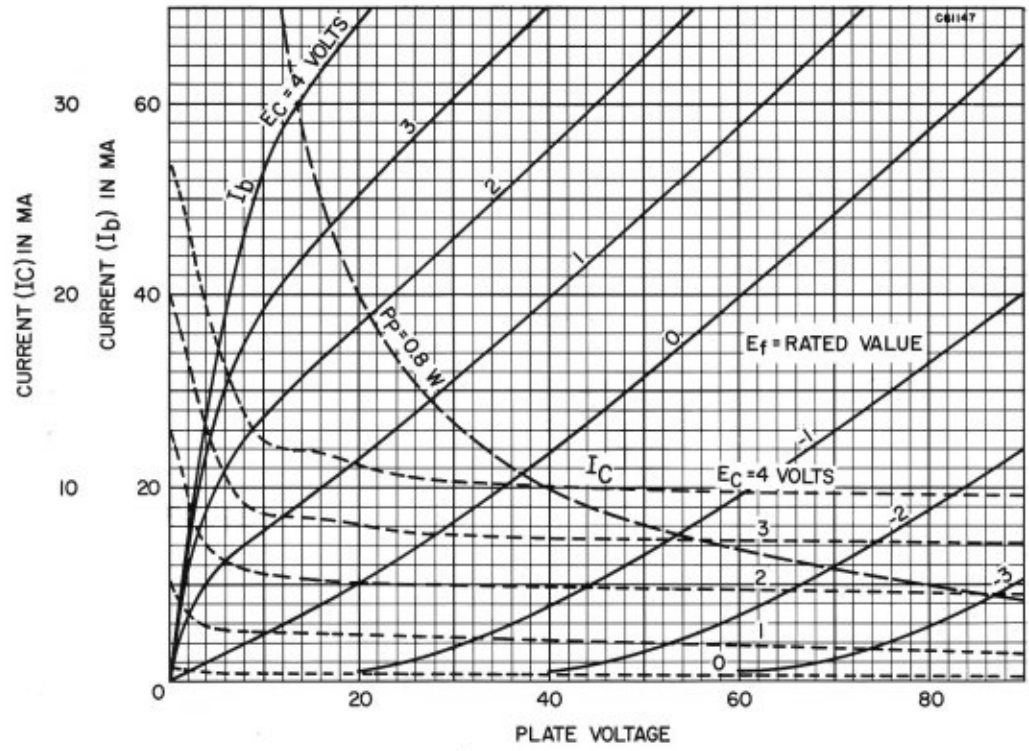
NOTES:

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.*
4. *Tests performed as a measure of the mechanical durability of the tube structure.*
5. *Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = ¾ milliseconds.*
6. *Vibrational forces applied in any direction for a period of 96 hours.*
7. *One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ebk = 140 Vac is applied continuously.*
8. *External shield No. 318 connected to cathode.*
9. *Measure each section separately with Ef = 6.3 V; Eg-all = −100 Vdc; Ep-all = −200 Vdc; Cathode is positive so that no cathode emission occurs.*
10. *Measure each section separately with Ef = 6.3 V; Eb = 60 Vdc; Rk = 220 ohms.*
11. *Preheat each section separately for five minutes with Ef = 7.5 V; Eb = 100 Vdc; Rk = 440 ohms; Rg = 1.0 Meg.; then test each section separately with Ef = 7.5 V; Eb = 60 Vdc; Ec1 = −5.5 Vdc; Rg = 1.0 Meg.*
12. *Test each section separately with Ef = 6.3 V; Eb = 60 Vdc; Rk = 220 ohms; Ck = 1000 μf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.*
13. *Measured with Ef = 6.3 V; Ebk = ±100 Vdc; each section separately.*
14. *The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90 % of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.*

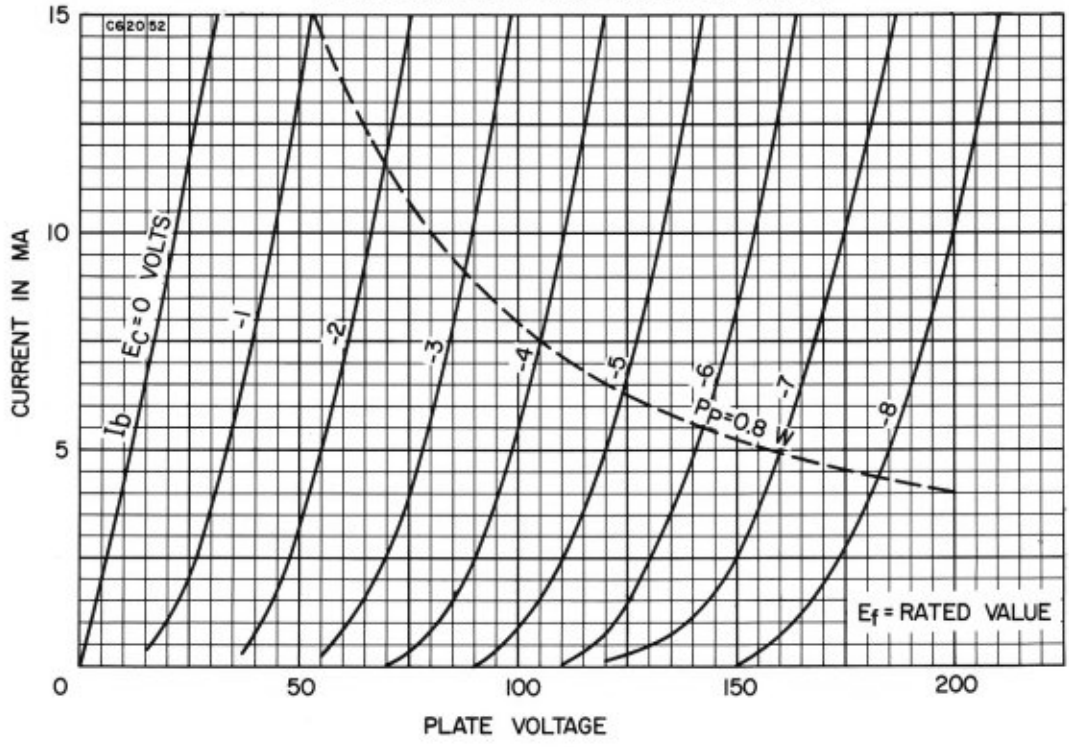
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS

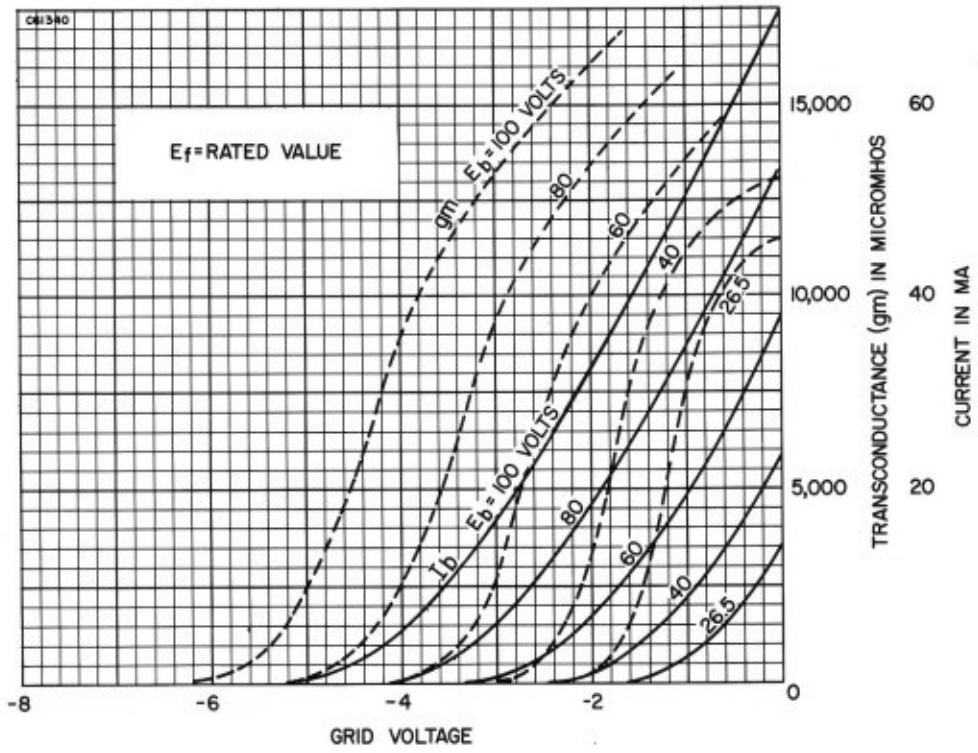


AVERAGE PLATE CHARACTERISTICS

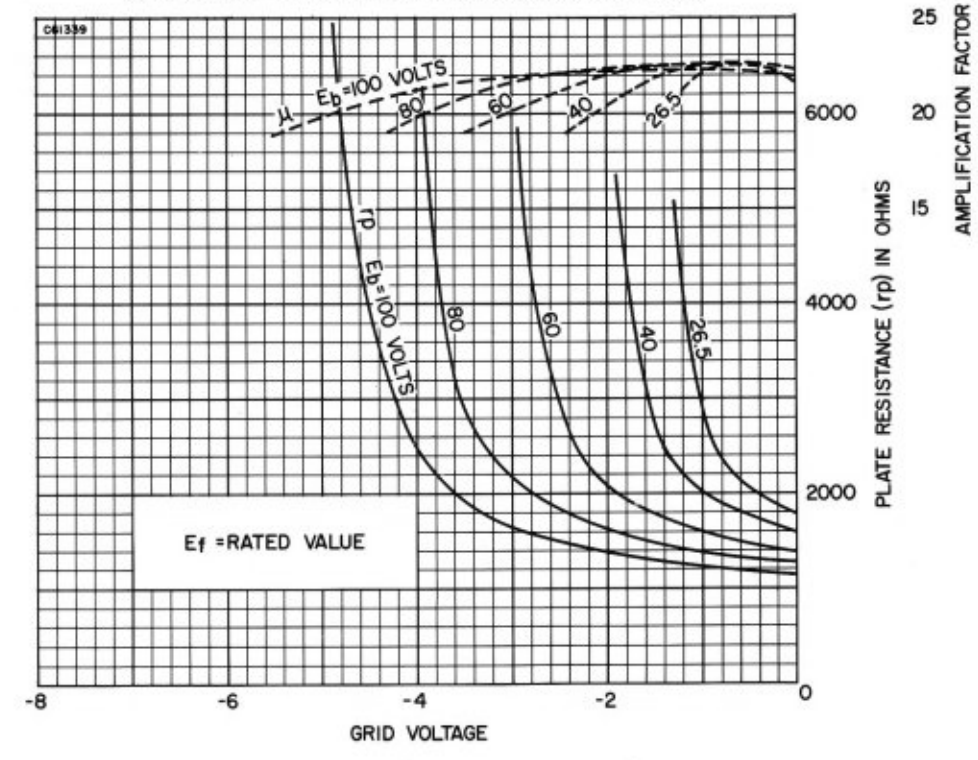


SYLVANIA
7962

AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA SUBMINIATURE STRAP FRAME GRID TUBES

SYLVANIA

7963

MECHANICAL DATA

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

RATINGS[1] (Absolute Maximum)

Bulb Temperature	180 °C
Altitude[2]	80,000 Ft.
Radiation[14]	
Total Dosage (neutrons/sq. cm)	10^{16} nvt
Dose Rate (neutrons/sq. cm/sec.)	10^{12} nv

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (¼ msec Duration)[5]	500 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5 G	Max.
On-Off Heater Cycles[7]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[3]	6.3 V
Heater Current	350 mA

DIRECT INTERELECTRODE CAPACITANCES

	Shielded[8]	
Grid to Plate (Each Section)	2.4 pf	
Input (Each Section)	4.0 pf	
Output		
Section No. 1	1.0 pf	
Section No. 2	1.2 pf	
Grid to Grid	0.030 pf	Max.
Plate to Plate	1.2 pf	Max.

CONTROLLED DETRIMENTS

Interelectrode Insulation[9]	100 Meg.	Min.
Total Grid Current[10]	−0.3 μAdc	Max.
Grid Emission[11]	−1.0 μAdc	Max.
Vibration Output as Equivalent Grid Voltage[12]	5 mVac	Max.
Heater-Cathode Leakage[13]	5 μAdc	Max.

RATINGS[1] (Absolute Maximum)

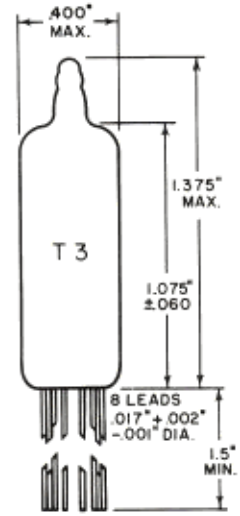
Heater Voltage[3]	6.3 (±10 %) V
Plate Voltage	165 Vdc
Peak Plate Forward Voltage	330 v
Plate Dissipation (Each Section)	1.1 W
Plate Current (Each Section)	22 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Grid Current	5.5 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	200 v
Heater Negative with Respect to Cathode	200 v
Grid Circuit Resistance	1.1 Meg.

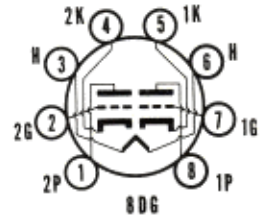
The spacing between grid No. 1 and cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltage applied must not exceed 50 volts

QUICK REFERENCE DATA

The Sylvania Type 7963 is a frame grid general purpose medium mu double triode of relatively high perveance design. It is suited to blocking oscillator, multivibrator, trigger applications, as well as IF, mixer and RF amplifier service at frequencies up to approximately 400 mc.

The Type 7963 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.





SYLVANIA

7963

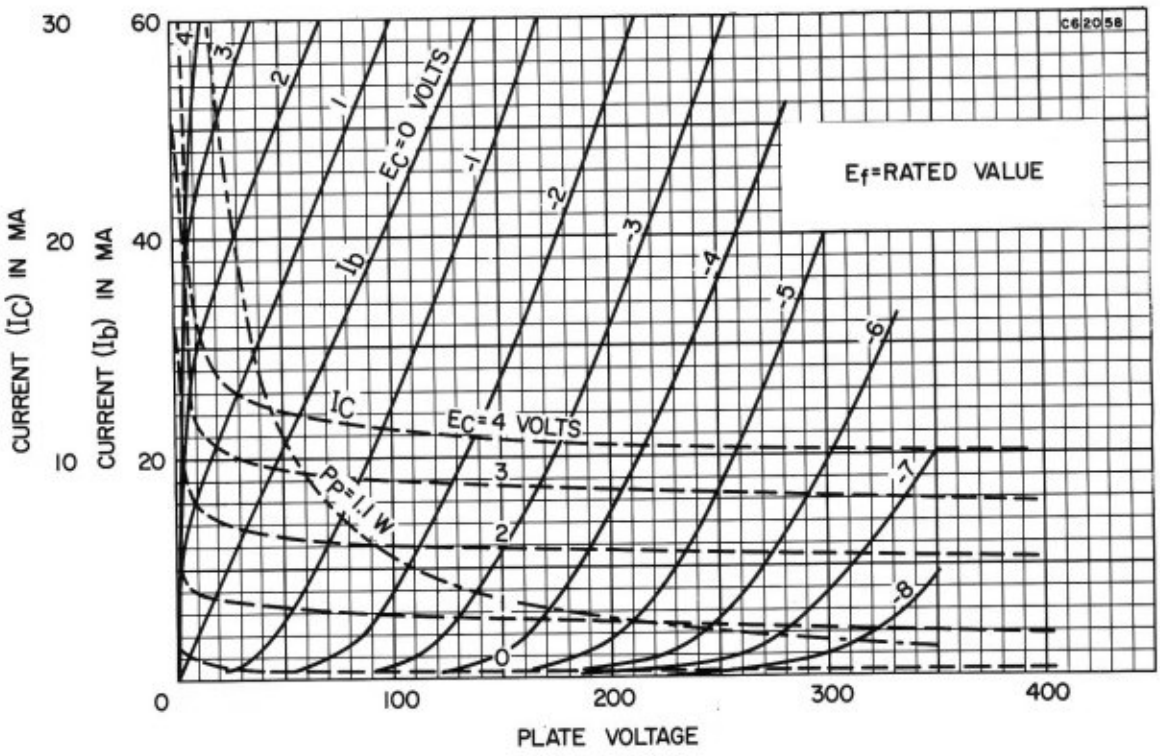
CHARACTERISTICS (Each Section)

Plate Voltage	100 Vdc
Cathode Resistor	270 Ohms
Plate Current	7.5 mAdc
Transconductance	13,000 μmhos
Amplification Factor	40
Grid Voltage for Ib = 20 μAdc Max.	−6.5 Volts

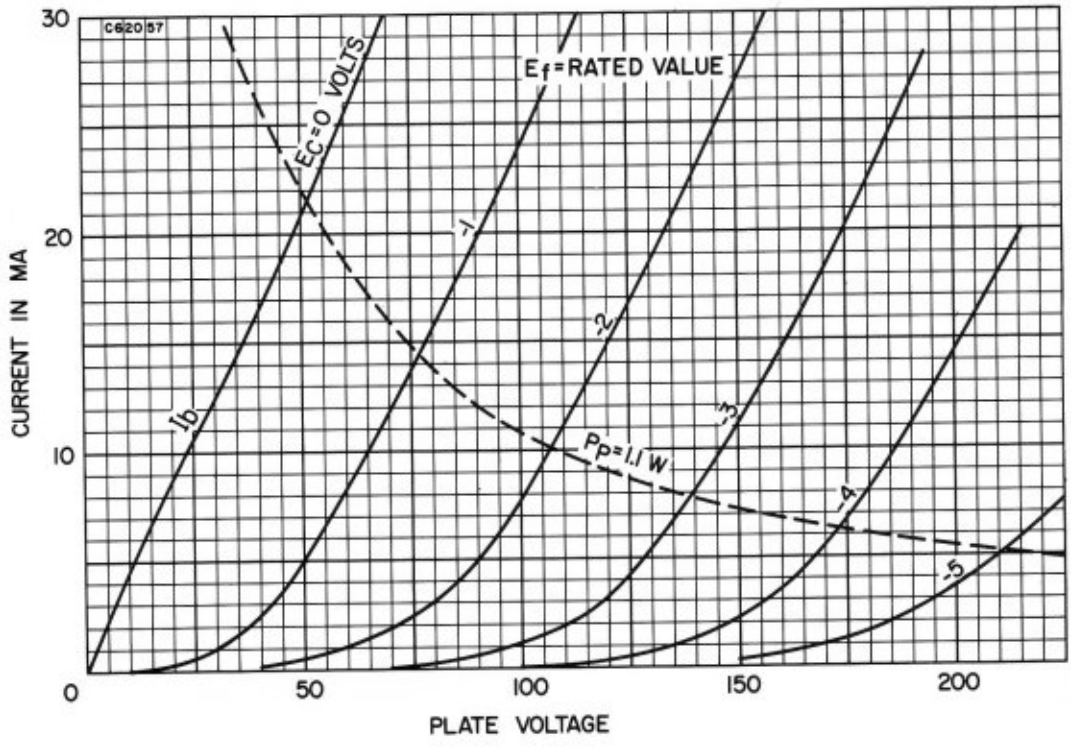
NOTES:

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.*
4. *Tests performed as a measure of the mechanical durability of the tube structure.*
5. *Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = ¾ milliseconds.*
6. *Vibrational forces applied in any direction for a period of 96 hours.*
7. *One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ebk = 140 Vac is applied continuously.*
8. *External shield No. 318 connected to cathode.*
9. *Measure each section separately with Ef = 6.3 V; Eg −all = −100 Vdc; Ep-all = −300 Vdc; Cathode is positive so that no cathode emission occurs.*
10. *Measure each section separately with Ef = 6.3 V; Eb = 100 Vdc; Rk = 270 ohms.*
11. *Preheat each section separately for five minutes with Ef = 7.5 V; Eb = 100 Vdc; Rk = 270 ohms; Rg = 1.0 Meg; then test each section separately with Ef = 7.5 V; Eb = 100 Vdc; Ec1 = −6.5 Vdc; Rg = 1.0 Meg.*
12. *Test each section separately with Ef = 6.3 V; Eb = 100 Vdc; Rk = 270 ohms; Ck = 1000 μf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.*
13. *Measured with Ef = 6.3 V; Ebk = ±100 Vdc; each section separately.*
14. *The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90 % of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.*

AVERAGE PLATE CHARACTERISTICS

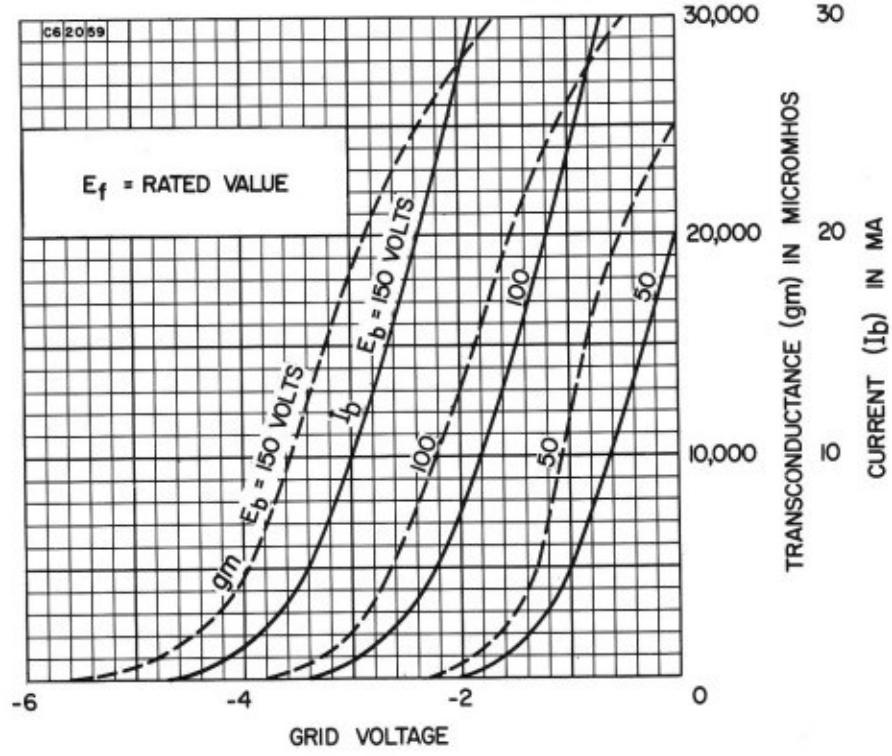


AVERAGE PLATE CHARACTERISTICS

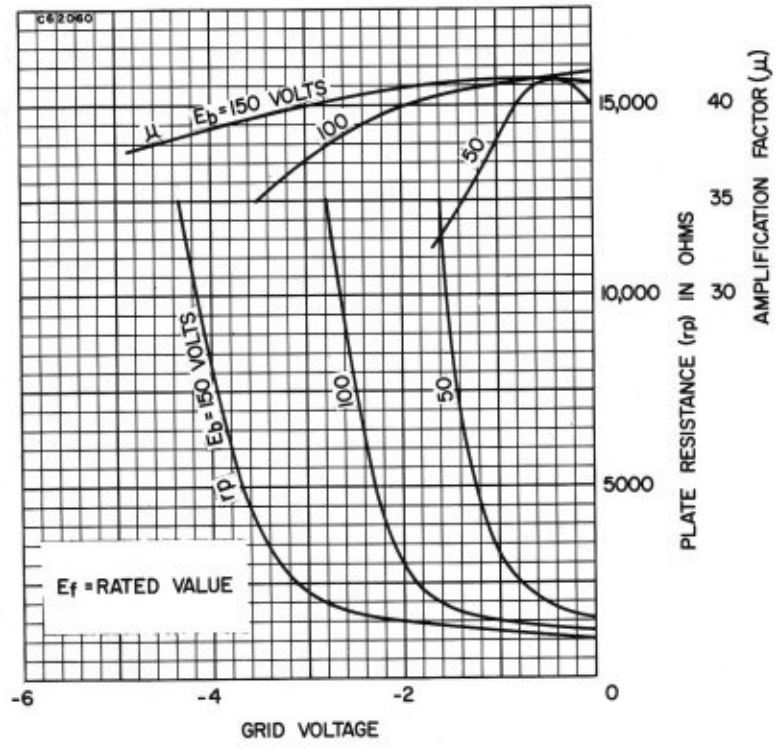


SYLVANIA
7963

AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA SUBMINIATURE STRAP FRAME GRID TUBES

SYLVANIA

8070

MECHANICAL DATA

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

RATINGS[1] (Absolute Maximum)

Bulb Temperature	180 °C
Altitude[2]	80,000 Ft.
Radiation[3]	
Total Dosage (neutrons/sq. cm)	10^{16} nvt
Dose Rate (neutrons/sq. cm/sec.)	10^{12} nv

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (¾ msec Duration)[5]	500 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	10 G	Max.
On-Off Heater Cycles[7]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[8]	6.3 V
Heater Current	125 mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[9]

Grid to Plate	1.7 pf
Input	3.3 pf
Output	2.1 pf
Heater to Cathode	2.3 pf

CONTROLLED DETRIMENTS

Interelectrode Insulation[10]	100 Meg.	Min.
Total Grid Current[11]	−0.4 μAdc	Max.
Grid Emission[12]	−0.5 μAdc	Max.
Vibration Output as Equivalent Ec[13]	2.7 mVac	Max.
Heater-Cathode Leakage[14]	5 μAdc	Max.

RATINGS[1] (Absolute Maximum)

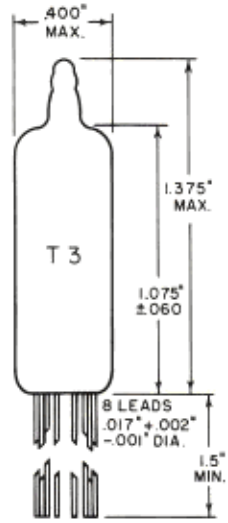
Heater Voltage[8]	6.3 (±10 %) V
Plate Voltage	165 Vdc
Peak Plate Forward Voltage	330 v
Plate Dissipation	1.0 W
Plate Current	20 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Grid Current	3.0 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v
Grid Circuit Resistance	1.1 Meg.

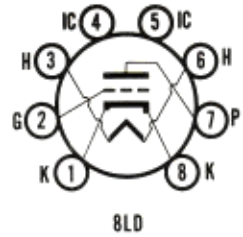
The spacing between grid No. 1 and cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltage applied must not exceed 50 volts

QUICK REFERENCE DATA

The Sylvania Type 8070 is a subminiature strap frame grid, high-mu triode featuring low heater power, high Gm and Gm/ma. It is intended for grounded cathode IF preamp, RF amplifier and mixer applications and is operable into UHF.

The Type 8070 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.





8LD

SYLVANIA

8070

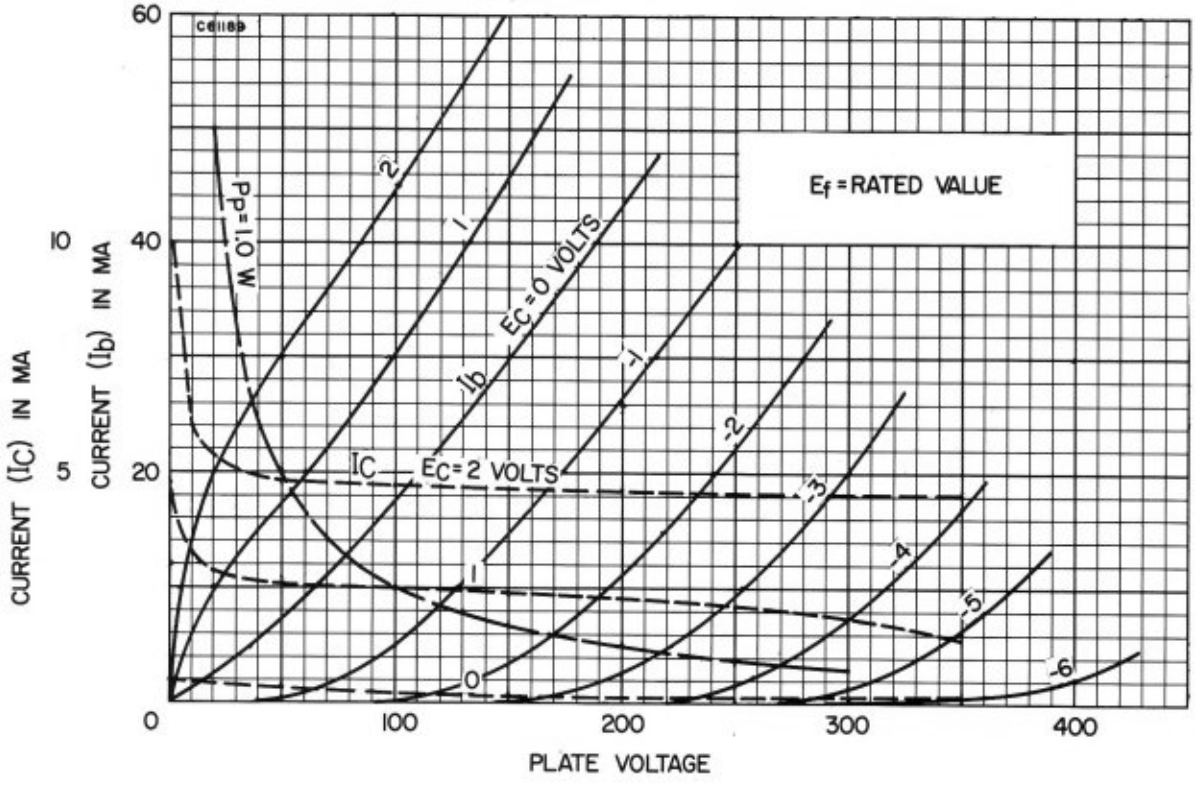
CHARACTERISTICS

Plate Voltage	110 Vdc
Cathode Resistor	130 Ohms
Plate Current	7.5 mAdc
Transconductance	11,000 μmhos
Amplification Factor	58
Grid Voltage for Ib = 20 μAdc	−3.0 Vdc

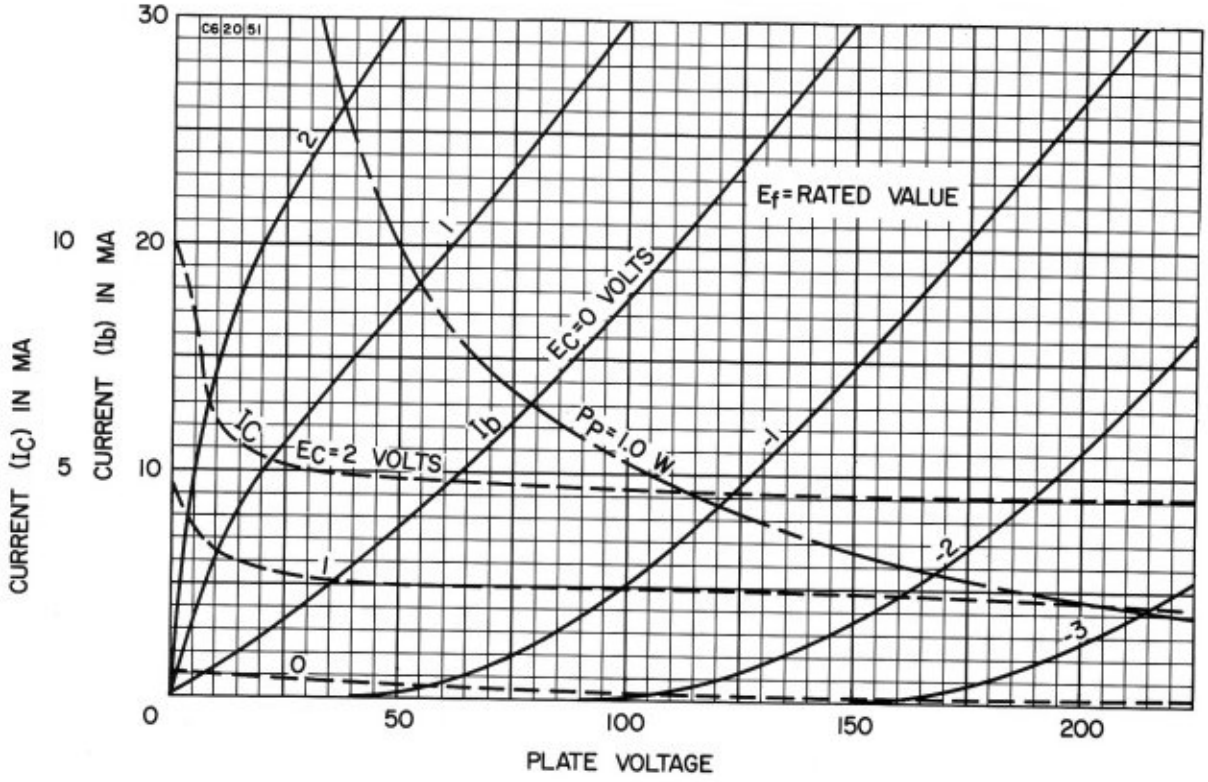
NOTES:

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. *The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90 % of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.*
4. *Tests performed as a measure of the mechanical durability of the tube structure.*
5. *Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = ¾ milliseconds.*
6. *Vibrational forces applied in any direction for a period of six hours, repeatedly sweeping the range from 30 cps to 3000 cps and back with the period of the sweep cycle being three minutes. Heater voltage only shall be applied.*
7. *One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.*
8. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value.*
9. *External shield No. 318 connected to cathode.*
10. *Measure with Ef = 6.3 V; Eg-all = −100 Vdc; Ep-all = −300 Vdc; Cathode is positive so that no cathode emission occurs.*
11. *Measure with Ef = 6.3 V; Eb = 150 Vdc; Ec = −1.7 Vdc.*
12. *Preheat for five minutes with Ef = 7.5 V; Eb = 150 Vdc; Rk = 270 Ohms; Rg = 1.0 Meg; then test with Ef = 7.5 V; Eb = 110 Vdc; Ec1 = −3.0 Vdc; Rg = 1.0 Meg.*
13. *Test with Ef = 6.3 V; Eb = 110 Vdc; Ec = 0; Rk = 130 Ohms; Rp = 10,000 Ohms; Ck = 1000 μf; F = 40 cps; Acc = 15 g.*
14. *Measured with Ef = 6.3 V; Ehk = ±100 Vdc.*

AVERAGE PLATE CHARACTERISTICS

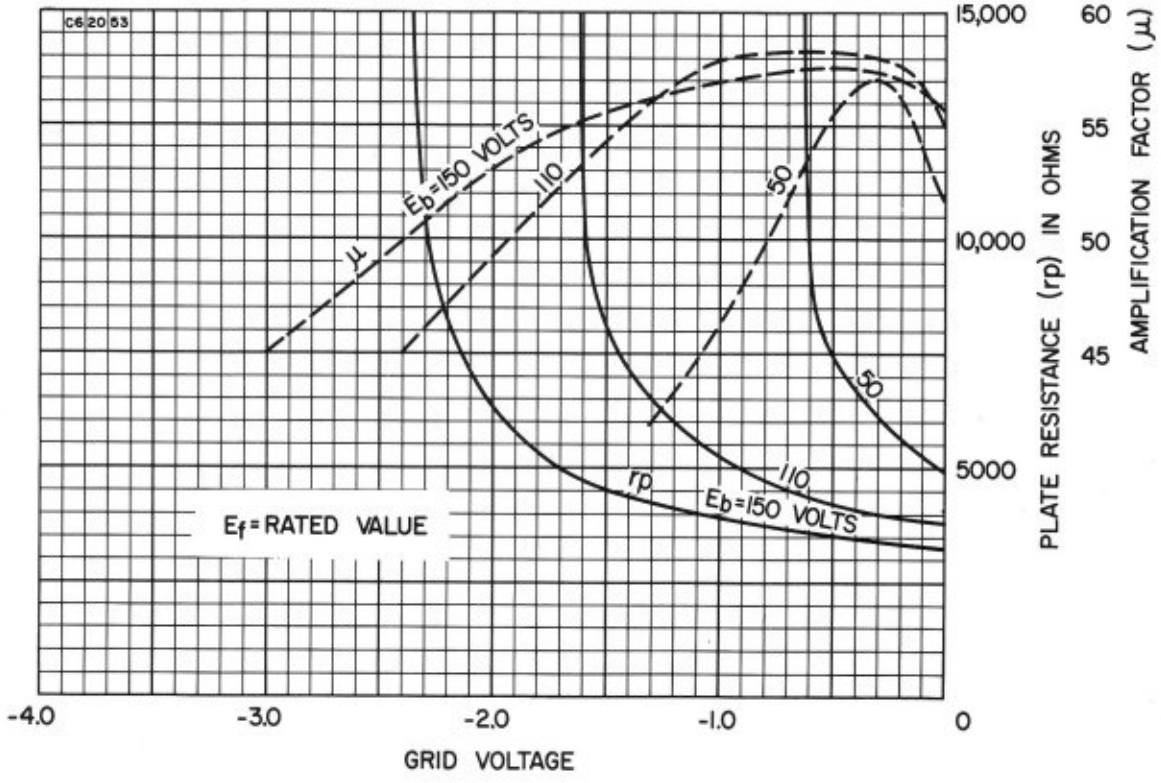


AVERAGE PLATE CHARACTERISTICS

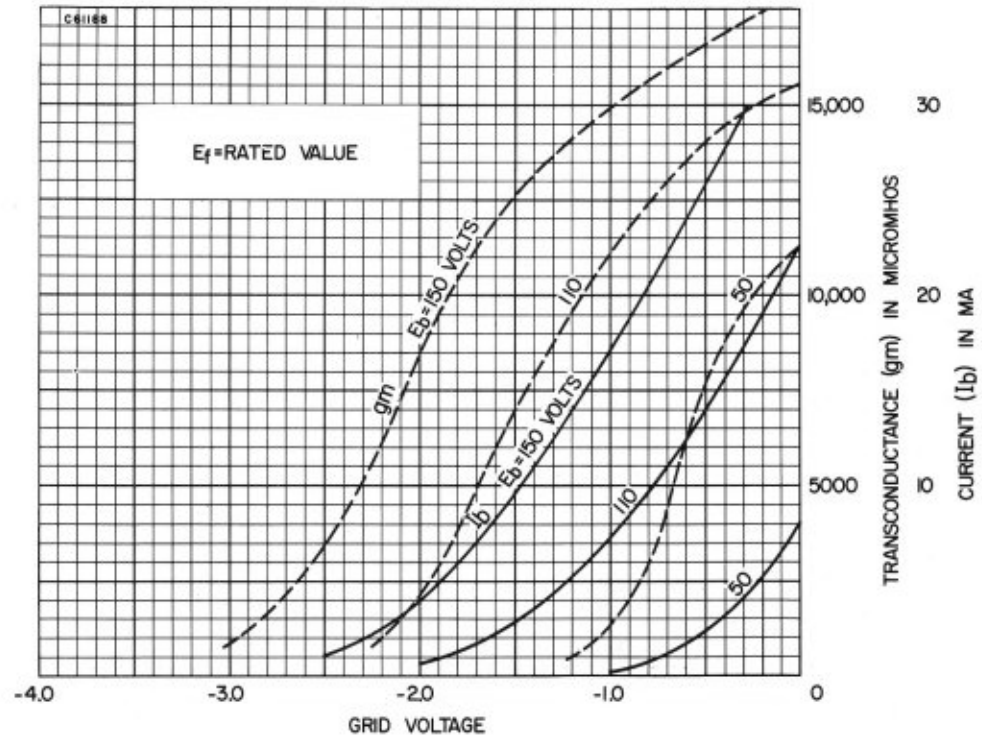


SYLVANIA
8070

AVERAGE TRANSFER CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA SUBMINIATURE STRAP FRAME GRID TUBES

SYLVANIA

8071

MECHANICAL DATA

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

RATINGS[1] (Absolute Maximum)

Bulb Temperature	180 °C	
Altitude[2]	80,000 Ft.	
Radiation[3]		
Total Dosage (Neutrons/sq. cm)	10^{16} nvt	
Dose Rate (Neutrons/sq. cm/sec.)	10^{12} nv	

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (¾ msec Duration)[5]	500 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5 G	Max.
On-Off Heater Cycles[7]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[8]	6.3 V
Heater Current	125 mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[9]

Grid to Plate	2.4 pf
Input	4.0 pf
Output	1.8 pf
Heater to Cathode	2.6 pf
Grounded Grid Operation	
Plate to Cathode	0.12 pf
Input	5.6 pf
Output	4.0 pf

CONTROLLED DETRIMENTS

Interelectrode Insulation[10]	100 Meg.	Min.
Total Grid Current[11]	−0.4 μAdc	Max.
Grid Emission[12]	−0.5 μAdc	Max.
Vibration Output as Equivalent Grid Voltage[13]	1.4 mVac	Max.
Heater-Cathode Leakage[14]	5 μAdc	Max.

RATINGS[1] (Absolute Maximum)

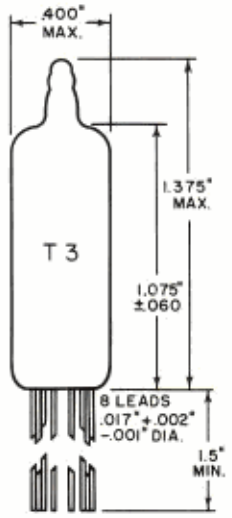
Heater Voltage[8]	6.3 (±10 %) V
Plate Voltage	165 Vdc
Peak Plate Forward Voltage	330 v
Plate Dissipation	2.0 W
Plate Current	20 mAdc
DC Grid Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Grid Current	3.0 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v
Grid Circuit Resistance	0.1 Meg.

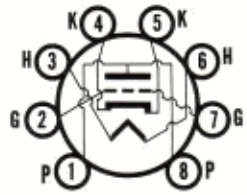
The spacing between the grid and cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltages applied must not exceed 50 volts.

QUICK REFERENCE DATA

The Sylvania Type 8071 is a subminiature strap frame grid, high-mu triode featuring low heater power, high Gm and Gm/Ma. It is designed for grounded grid RF amplifier service and is operable into UHF.

The Type 8071 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.





8LE

SYLVANIA

8071

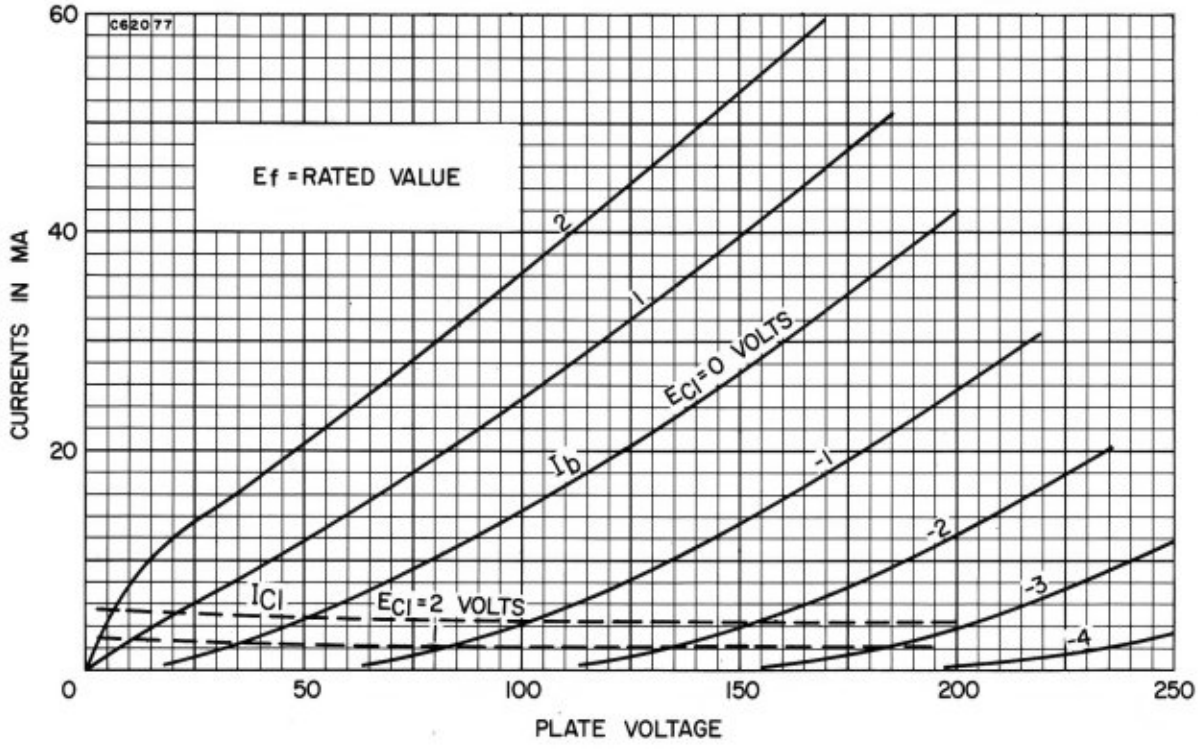
CHARACTERISTICS

Plate Voltage	150 Vdc
Cathode Resistor	100 Ohms
Plate Current	11.5 mAdc
Transconductance	12,000 μmhos
Amplification Factor	56
Grid Voltage for Ib = 20 μAdc	−4.0 Volts

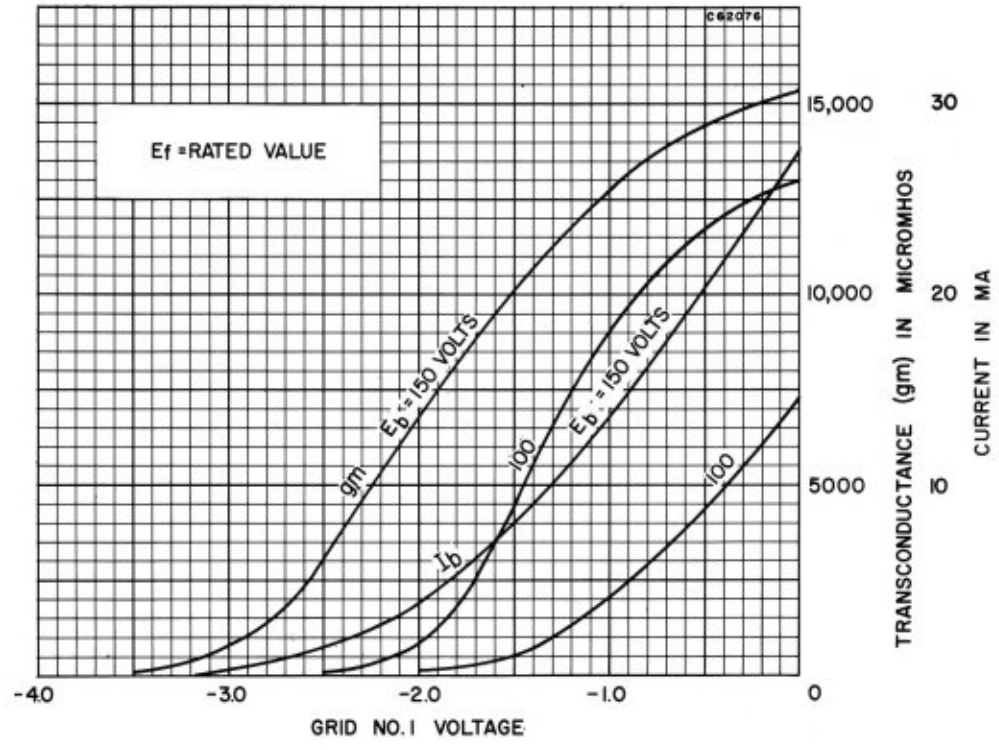
NOTES:

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. *The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90 % of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.*
4. *Tests performed as a measure of the mechanical durability of the tube structure.*
5. *Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = ¾ milliseconds.*
6. *Vibrational forces applied in any direction for a period of 96 hours.*
7. *One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.*
8. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value.*
9. *External shield No. 318 connected to cathode.*
10. *Measure with Ef = 6.3 V; Eg-all = −100 Vdc; Ep-all = −300 Vdc; cathode is positive so that no cathode emission occurs.*
11. *Measure with Ef = 6.3 V; Eb = 150 Vdc; Ec = −1.5 Vdc.*
12. *Preheat for five minutes with Ef = 7.5 V; Eb = 150 Vdc; Rk = 100 Ohms; Rg = 0.1 Meg; then test with Ef = 7.5 V; Eb = 150 Vdc; Ec1 = −6 Vdc; Rg = 0.1 Meg.*
13. *Test with Ef = 6.3 V; Eb = 150 Vdc; Ec = 0; Rk = 100 Ohms; Rp = .01 Meg; Ck = 1000 μf; F = 40 cps; Acc = 15 G.*
14. *Measured with Ef = 6.3 V; Ehk = ±100 Vdc.*

AVERAGE PLATE CHARACTERISTICS

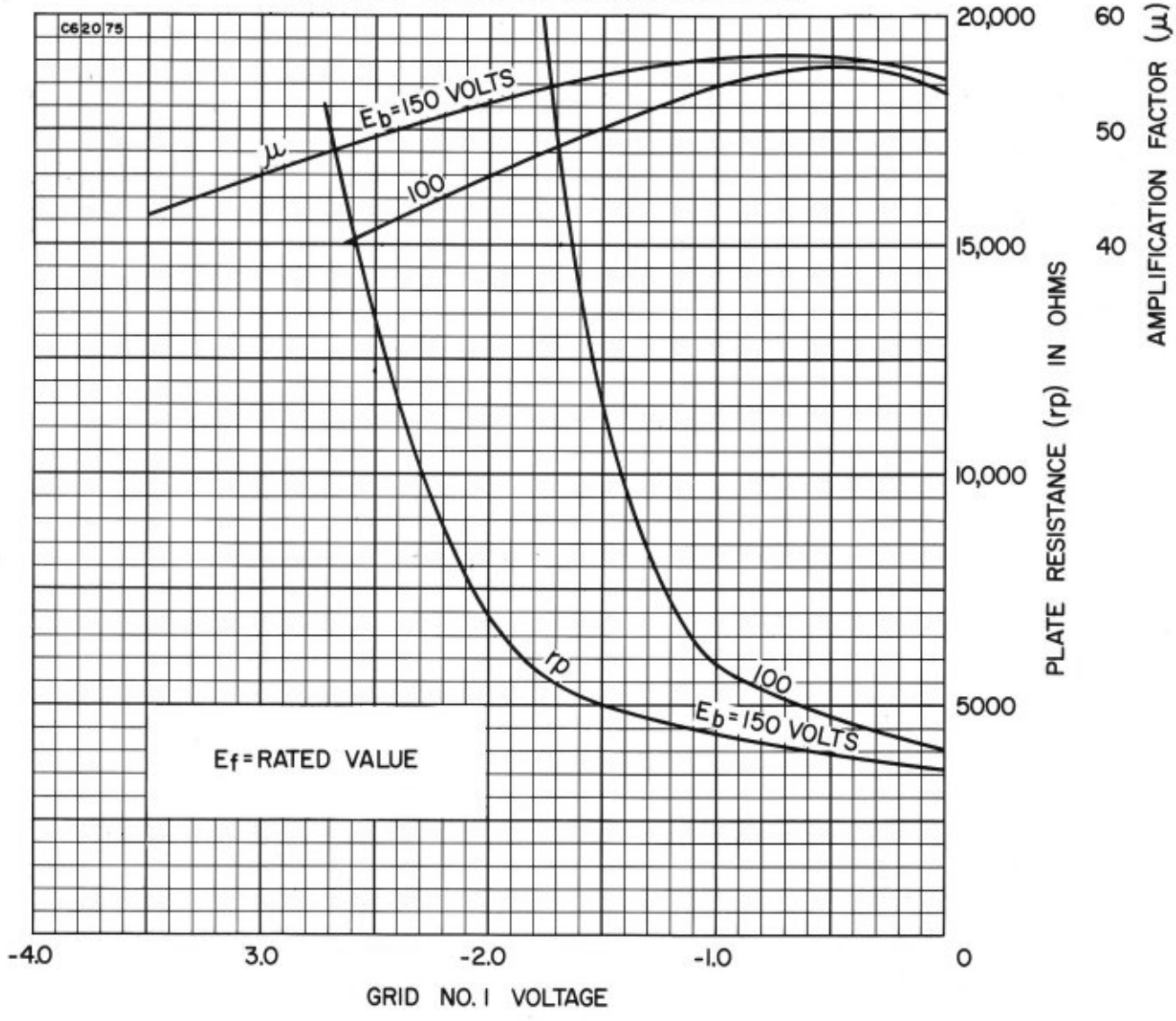


AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA
8071

AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA SUBMINIATURE STRAP FRAME GRID TUBES

SYLVANIA

8103

MECHANICAL DATA

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

RATINGS[1] (Absolute Maximum)

Bulb Temperature	180 °C	
Altitude	80,000 Ft.	
Radiation[2]		
Total Dosage (Neutrons/sq. cm)	10^{16} nvt	
Dose Rate (Neutrons/sq. cm/sec.)	10^{12} nv	

DURABILITY CHARACTERISTICS[3]

Impact Acceleration (¾ msec Duration)[4]	500 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[5]	10 G	Max.
On-Off Heater Cycles[6]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[7]	26.5 V
Heater Current	75 mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[8]

Grid to Plate (Each Section)	2.3 pf	
Input (Each Section)	3.9 pf	
Output		
Section No. 1	1.2 pf	
Section No. 2	1.25 pf	
Grid to Grid	0.02 pf	Max.
Plate to Plate	0.8 pf	Max.

CONTROLLED DETRIMENTS

Interelectrode Insulation[9]	100 Meg.	Min.
Total Grid Current[10]	−0.2 μAdc	Max.
Grid Emission[11]	−1.0 μAdc	Max.
Vibration Output as Equivalent Eg.[12]	1.8 mVac	Max.
Heater-Cathode Leakage[13]	10 μAdc	Max.

RATINGS[1] (Absolute Maximum)

Heater Voltage[7]	26.5 (±10 %) V
Plate Voltage	55 Vdc
Plate Current (Each Section)	22 mAdc
Grid Current (Each Section)	8.5 mAdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v

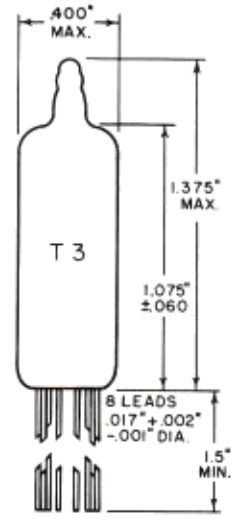
The spacing between grid No. 1 and cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltage applied must not exceed 50 volts.

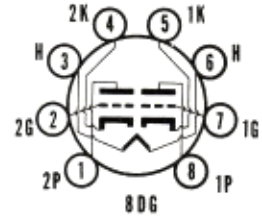
CHARACTERISTICS (Each Section)

Plate Voltage	26.5 Vdc
Grid Resistor	2.2 Megohms
Plate Current	5.5 mAdc
Transconductance	11,000 μmhos
Amplification Factor	20
Grid Voltage for Ib = 10 μAdc	−3.5 Vdc

QUICK REFERENCE DATA

The Premium Subminiature Type 8103 is a strap frame grid, medium mu, double triode featuring 26.5-volt all element operation. It is intended for use as an RF amplifier, oscillator and mixer, and is operable into UHF. The 8103 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.

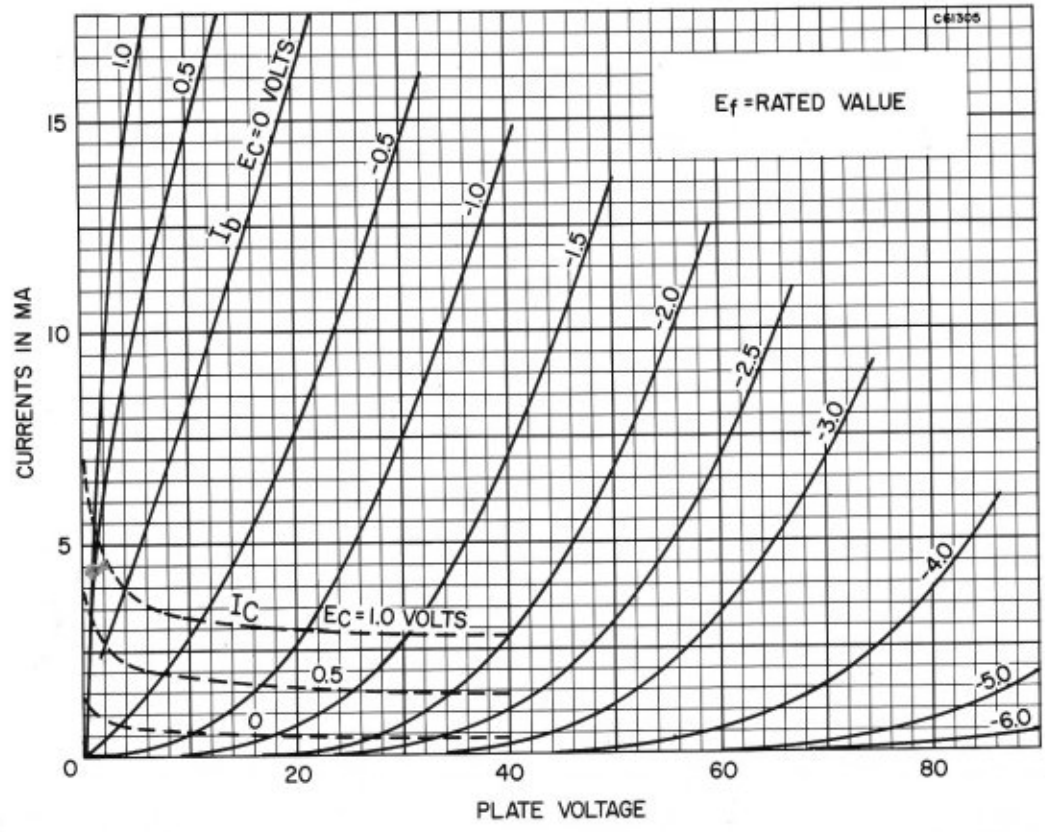




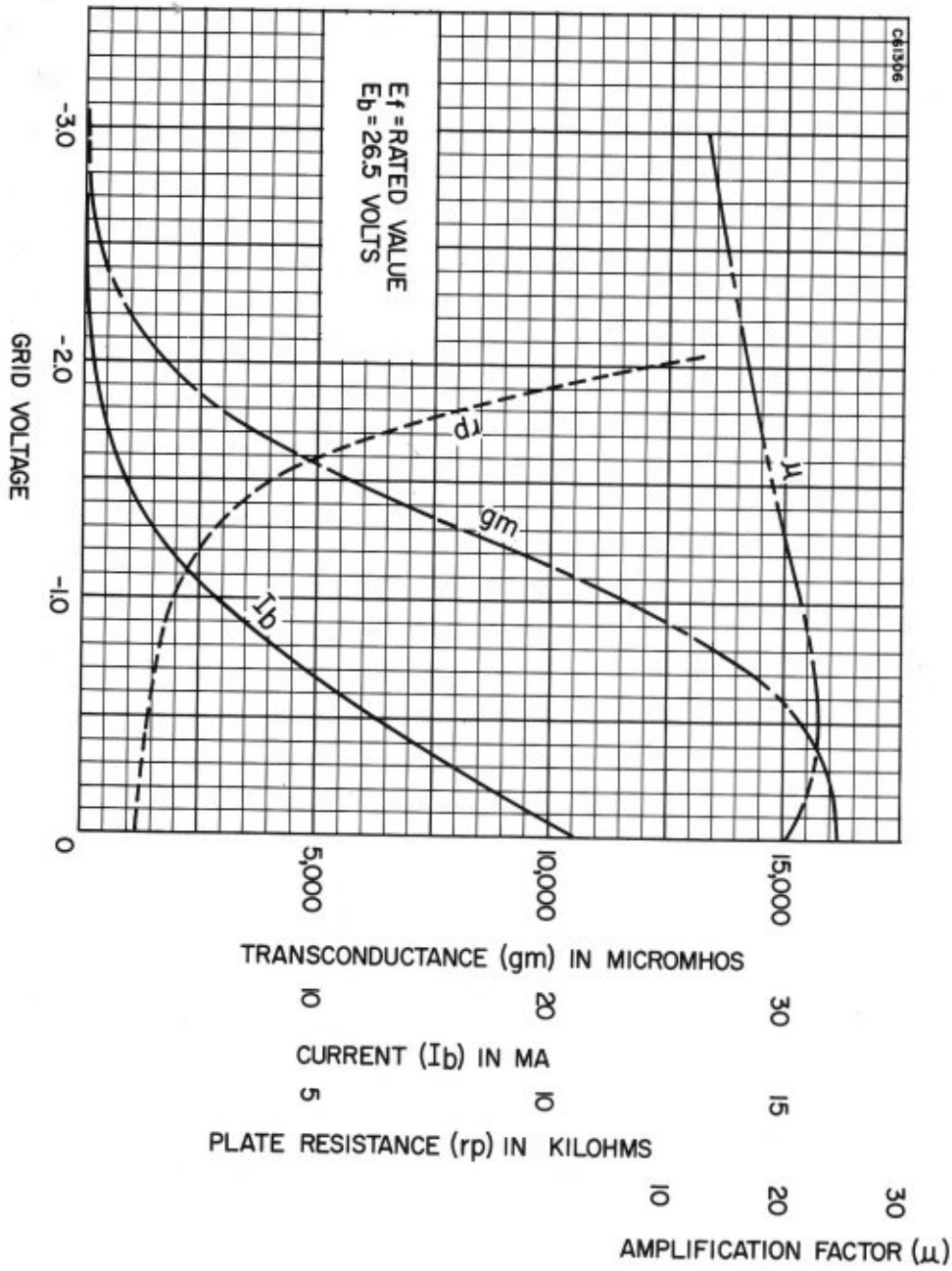
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90 % of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.*
3. *Tests performed as a measure of the mechanical durability of the tube structure.*
4. *Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = ¾ milliseconds.*
5. *Vibrational forces applied in any direction for a period of six hours, repeatedly sweeping the range from 30 cps to 3000 cps and back with the period of the sweep cycle being three minutes. Heater voltage only shall be applied.*
6. *One cycle consists of the application of Ef = 29.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.*
7. *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.*
8. *External shield No. 318 connected to cathode.*
9. *Measure each section separately with Ef = 26.5 V; Eg-all = −100 Vdc; Ep-all = −100 Vdc; Cathode is positive so that no cathode emission occurs.*
10. *Measure each section separately with Ef = 26.5 V; Eb = 50 Vdc; Ec = −1.5 Vdc.*
11. *Preheat each section separately for five minutes with Ef = 31.5 V; Eb = 26.5 Vdc; Rg = 2.2 Meg; then test each section separately with Ef = 31.5 V; Eb = 26.5 Vdc; Ec = −3.5 Vdc; Rg = 0.1 Meg.*
12. *Test each section separately with Ef = 26.5 V; Eb = 26.5 Vdc; Eg = 2.2 Megs; Cg1 = 1 μf; Rp = 10,000 Ohms; F = 40 cps; Acc = 15 g.*
13. *Measured with Ef = 26.5 V, Ehk = ±100 Vdc; each section separately.*

AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

8185
8186

SYLVANIA SUBMINIATURE STRAP FRAME GRID TUBES

MECHANICAL DATA

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

RATINGS[1] (Absolute Maximum)

Bulb Temperature	165 °C
Altitude[2]	80,000 Ft.
Radiation[3]	
Total Dosage (Neutrons/sq. cm)	10^{16} nvt
Dose Rate (Neutrons/sq. cm/sec.)	10^{12} nv

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (¾ msec Duration)[5]	500 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5 G	Max.
On-Off Heater Cycles[7]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

	8185	8186	
Heater Voltage[8]	6.3	26.5	V
Heater Current	300	75	mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[9]

	8185	8186		
Cathode to Plate	0.30	0.30	pf	Max.
Input (Grounded Grid)	8.5	10	pf	
Output (Grounded Grid)	5.0	5.0	pf	
Cathode to Grid	6.0	6.5	pf	
Heater to Cathode	2.5	4.0	pf	

CONTROLLED DETRIMENTS

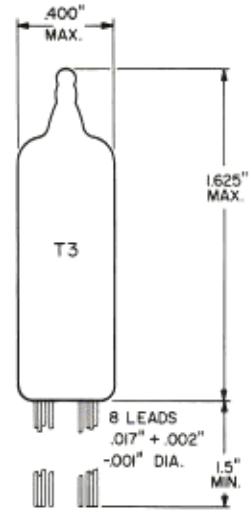
Interelectrode Insulation[10]	25 Meg.	Min.
Total Grid Current[11]	−1.0 μAdc	Max.
Grid Emission[12]	−1.0 μAdc	Max.
Vibration Output as Equivalent Eg.[13]	5.0 mVac	Max.
Heater-Cathode Leakage[14]	20 μAdc	Max.

RATINGS[1] (Absolute Maximum)

Heater Voltage[8]	
8185	6.3 (±10 %) V
8186	26.5 (±10 %) V
Plate Voltage	250 Vdc
DC Grid Voltage	−55 Vdc
Peak Positive RF Grid Voltage	25 v
Plate Dissipation	4.25 W
Grid Dissipation	0.2 W
Cathode Current	50 mAdc
Grid Current	10 mAdc
Peak Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v
Grid Circuit Resistance	
Class A	0.1 Megohm
Fixed Bias Class C	0.01 Megohm
Cathode Bias Class C	0.05 Megohm

QUICK REFERENCE DATA

The Sylvania Types 8185 and 8186 are subminiature strap frame grid medium-mu triodes featuring high Gm and Gm/Ma. They are designed for grounded grid RF power amplifier service. Type 8186 is identical to Type 8185 except for the 26.5 volt heater. These tubes are designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.



8KM

The spacing between the grid and cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited.

CHARACTERISTICS AND TYPICAL OPERATION

Class A Amplifier

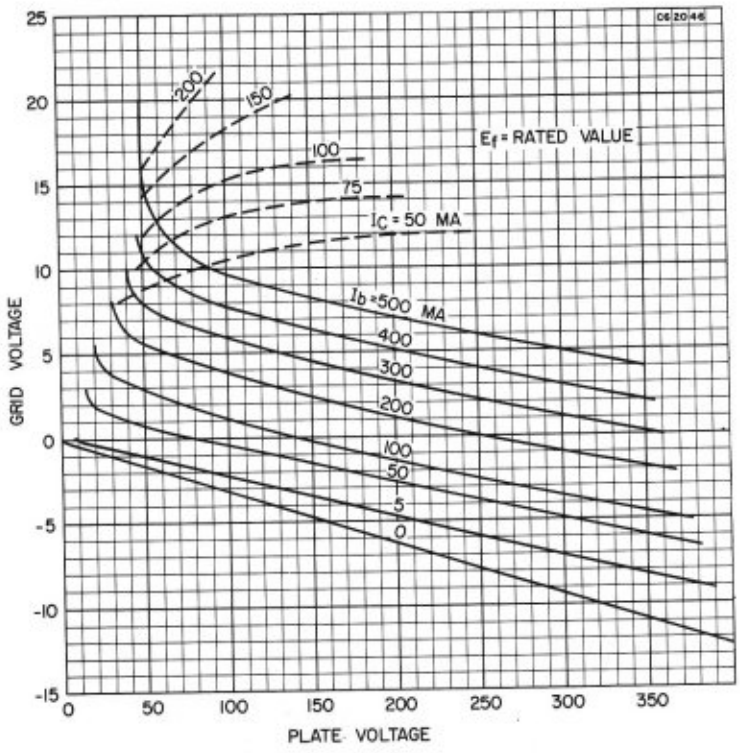
Plate Voltage	200 Vdc
Grid Voltage	0 Vdc
Cathode Resistor	220 Ohms
Plate Current	17 mAdc
Transconductance	19,000 μmhos
Amplification Factor	42
Ec for Ib = 100 μAdc (Approx.)	−7.0 Vdc

NOTES:

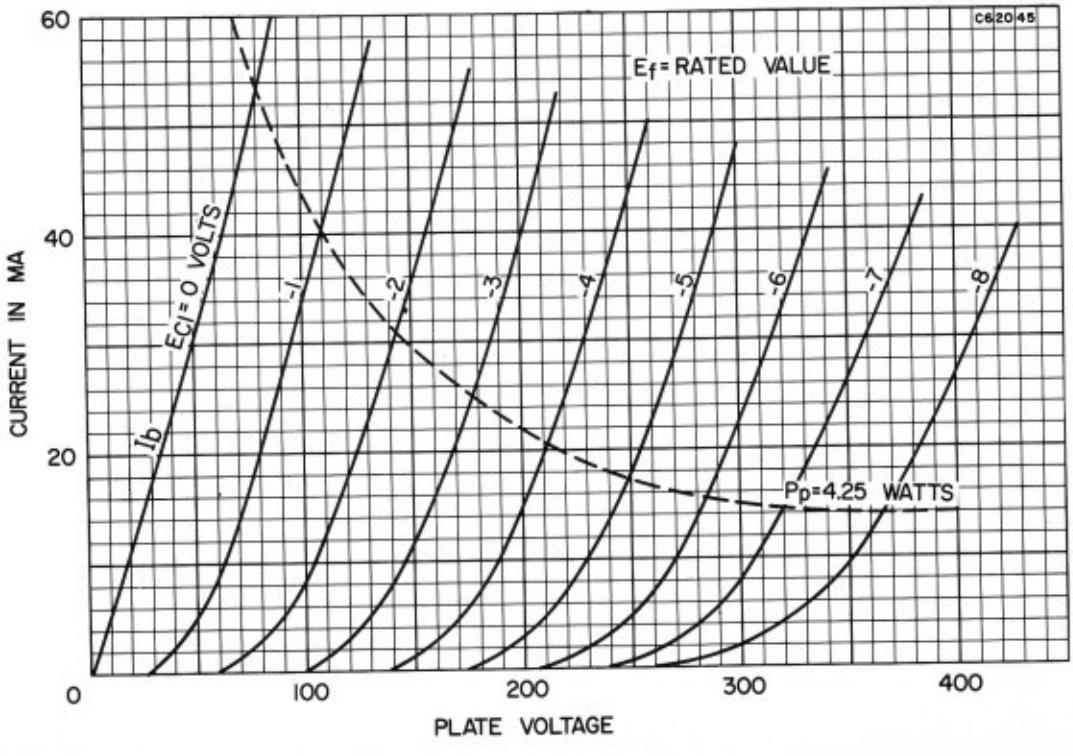
1. *Limiting values beyond which normal tube life and normal tube performance may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.*
3. *The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90 % of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.*
4. *Tests performed as a measure of the mechanical durability of the tube structure.*
5. *Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = ¼ milliseconds.*
6. *Vibrational forces applied in any direction for a period of 96 hours.*
7. *One cycle consists of the application of Ef = 7.0 V (8185), 29.0 V (8186) for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.*
8. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value.*
9. *Capacitances are measured with external Shield No. 318.*
10. *Measure with Ef = 6.3 V (8185), 26.5 V (8186); Eg-all = −100 Vdc; Ep-all = −300 Vdc; cathode is positive so that no cathode emission occurs.*
11. *Measure with Ef = 6.3 V (8185), 26.5 V (8186); Eb = 200 Vdc; Ec = 0 Vdc; Rk = 220 Ohms.*
12. *Preheat for five minutes with Ef = 7.5 V (8185), 31.5 V (8186); Eb = 200 Vdc; Ec = 0; Rk = 220 Ohms; Rg = 0.1 Meg. Then test with Ef = 7.5 V (8185), 31.5 V (8186); Eb = 200 Vdc; Ec = −9.0 Vdc.*
13. *Test with Ef = 6.3 V (8185), 26.5 V (8186); Eb = 200 Vdc; Ec = 0 Vdc; Rk = 220 Ohms; Rp = 10,000 Ohms; F = 40 cps; Acc = 15 g; Ck = 1000 μf.*
14. *Measure with Ef = 6.3 V (8185), 26.5 V (8186); Ehk = ±100 Vdc.*

SYLVANIA
8185
8186

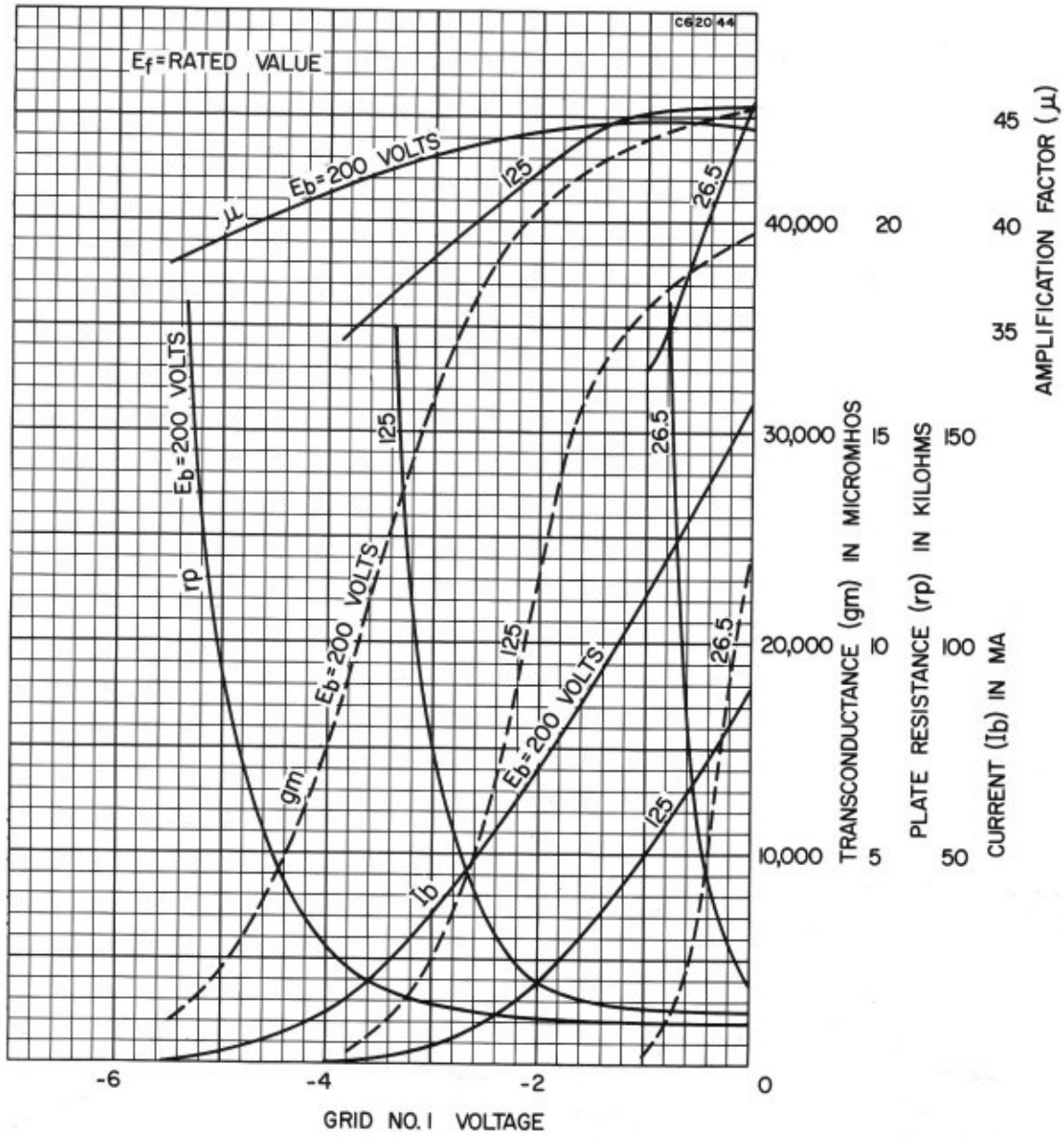
CONSTANT CURRENT CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

8210

SYLVANIA SUBMINIATURE STRAP FRAME GRID TUBES

MECHANICAL DATA

Bulb	T-3
Base	E8-10, Subminiature Button Flexible Leads
Outline	See Drawing
Basing	8LS
Cathode	Coated Unipotential
Mounting Position	Any

RATINGS[1] (Absolute Maximum)

Bulb Temperature	180 °C	
Altitude[2]	80,000 Ft.	
Radiation[3]		
Total Dosage (Neutrons/sq. cm)	10^{16} nvt	
Dose Rate (Neutrons/sq. cm/sec.)	10^{12} nv	

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (¾ msec Duration)[5]	500 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5 G	Max.
On-Off Heater Cycles[7]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[8]	6.3 V
Heater Current	125 mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[9]

Grid No. 1 to Plate (Max.)	0.012 pf
Input	4.8 pf
Output	3.8 pf

CONTROLLED DETRIMENTS

Interelectrode Insulation[10]	100 Meg.	Min.
Total Grid Current[11]	−0.3 μAdc	Max.
Grid Emission[12]	−0.5 μAdc	Max.
Vibration Output as Equivalent Eg[13]	1.2 mVac	Max.
Heater-Cathode Leakage[14]	5 μAdc	Max.

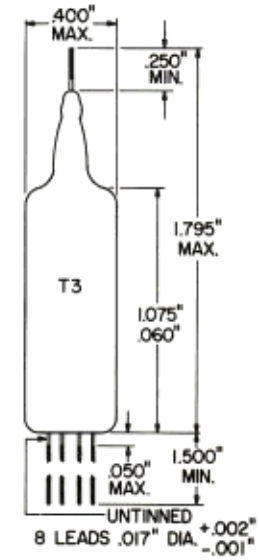
RATINGS[1] (Absolute Maximum)

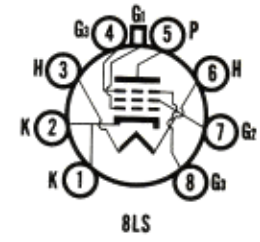
Heater Voltage[8]	6.3 (±10 %) V
Instantaneous Plate Voltage	330 V
Plate Voltage	165 Vdc
Grid No. 3 Voltage	22 Vdc
Grid No. 2 Voltage	155 Vdc
Plate Dissipation	1.1 W
Grid No. 2 Dissipation	0.55 W
Cathode Current	16.5 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v
Grid No. 1 Circuit Resistance	1.1Meg.

The spacing between grid No. 1 and cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltage applied must not exceed 50 volts.

QUICK REFERENCE DATA

The Sylvania Type 8210 is a subminiature strap frame grid sharp cutoff pentode featuring high transconductance and low grid to plate capacitance by virtue of a top grid No. 1 connection. The 8210 is well suited to VHF, RF and IF amplifier and mixer service. It is designed to provide dependable operation under conditions of severe shock, vibration, high temperature and high altitude.





8LS

CHARACTERISTICS

Plate Voltage	100 Vdc
Grid No. 3 Voltage	0 Vdc
Grid No. 2 Voltage	100 Vdc
Cathode Resistor (Bypassed)	100 Ohms
Plate Current	7.5 mAdc
Grid No. 2 Current	2.5 mAdc
Transconductance	8500 μmhos
Plate Resistance	260,000 Ohms
Grid No. 1 Voltage for Ib = 10 μAdc (Approx.)	−4.5 Vdc

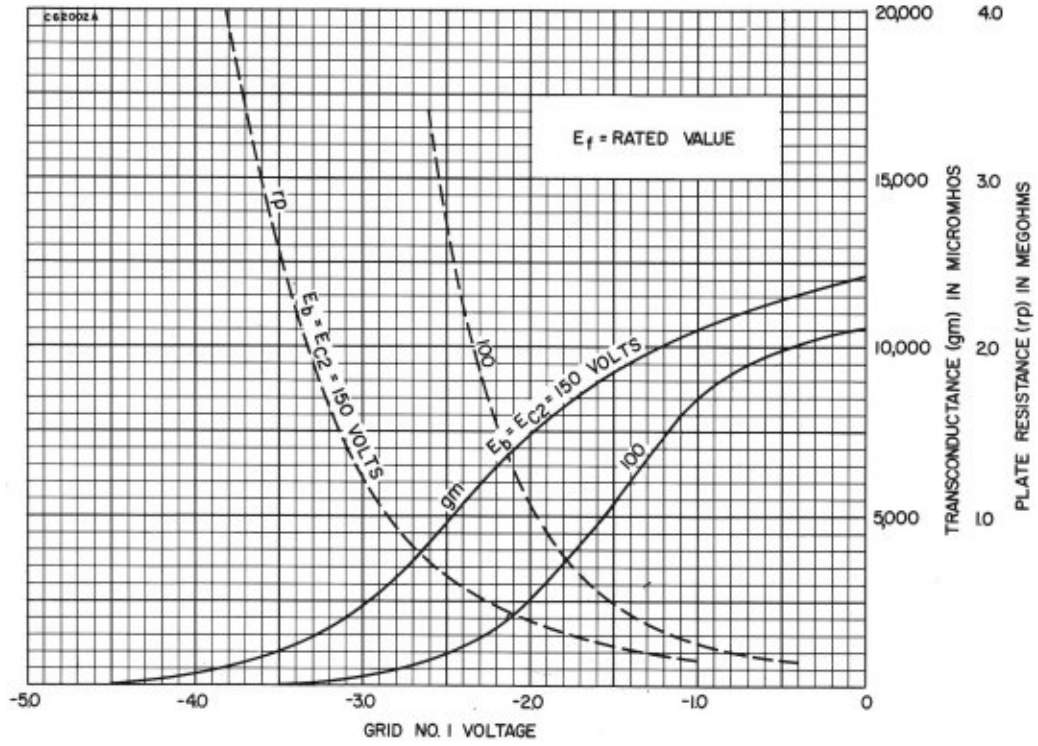
NOTES:

1. *Limitations beyond which normal tube performance and tube life may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltage (Ef excluded) may be required.*
3. *The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90 % of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.*
4. *Tests performed as a measure of the mechanical durability of the tube structure.*
5. *Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = ¾ milliseconds.*
6. *Vibrational forces applied in any direction for a period of 96 hours.*
7. *One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.*
8. *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.*
9. *External shield connected to cathode is similar to No. 318 except for provisions for top lead.*
10. *Measured with Ef = 6.3 V; Eg1-all = −100 Vdc; Ep-all = −300 Vdc; Cathode is positive so no cathode emission occurs.*
11. *Measured with Ef = 6.3 V; Eb = 125 Vdc; Ec2 = 125 Vdc; Rk = 160 ohms.*
12. *Preheated for five minutes with Ef = 7.5 V; Eb = 100 Vdc; Ec2 = 100 Vdc; Rk = 100 ohms; Rg1 = 1.0 Meg then tested with Ef = 7.5 V; Eb = 100 Vdc; Ec2 = 100 Vdc; Ec1 = −6.0 Vdc.*
13. *Test with Ef = 6.3 V; Eb = 100 Vdc; Ec2 = 100 Vdc; Rk = 100 ohms; Ck = 1000 μf; Rp = 10,000 ohms; F = 40 cps; Acc = 15 g.*
14. *Measure with Ef = 6.3 V; Ehk = ±100 Vdc.*

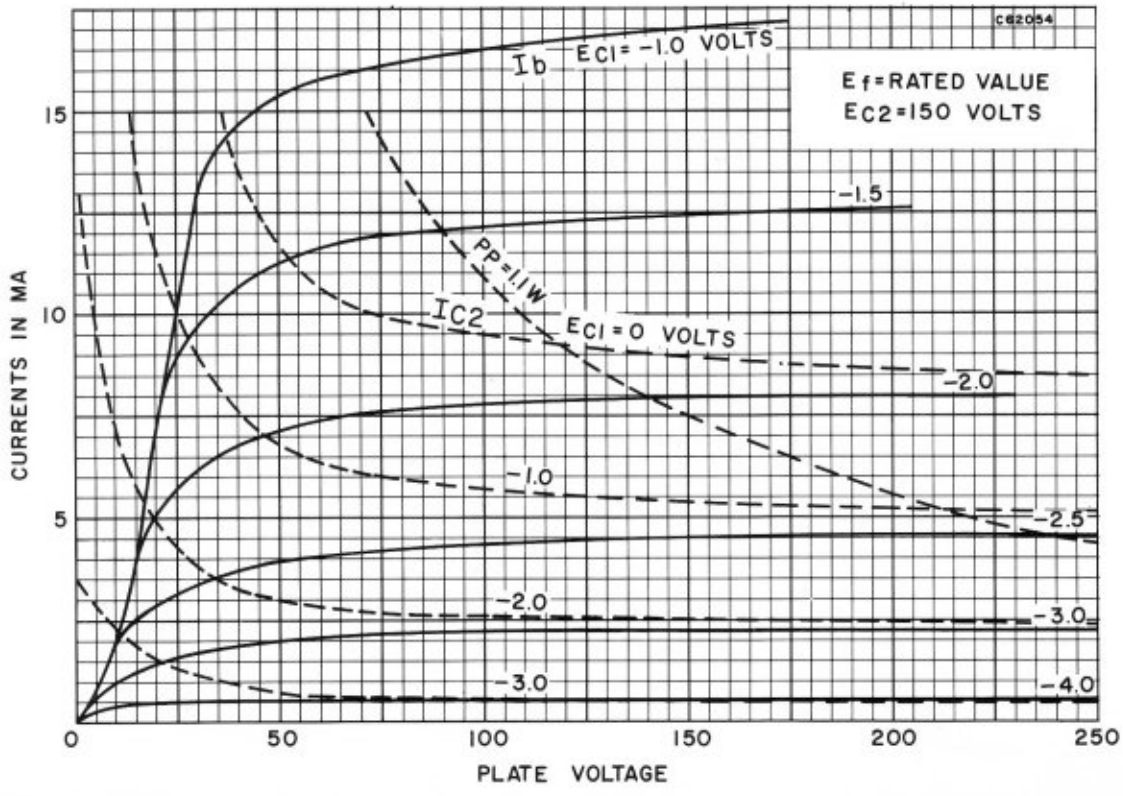
SYLVANIA

8210

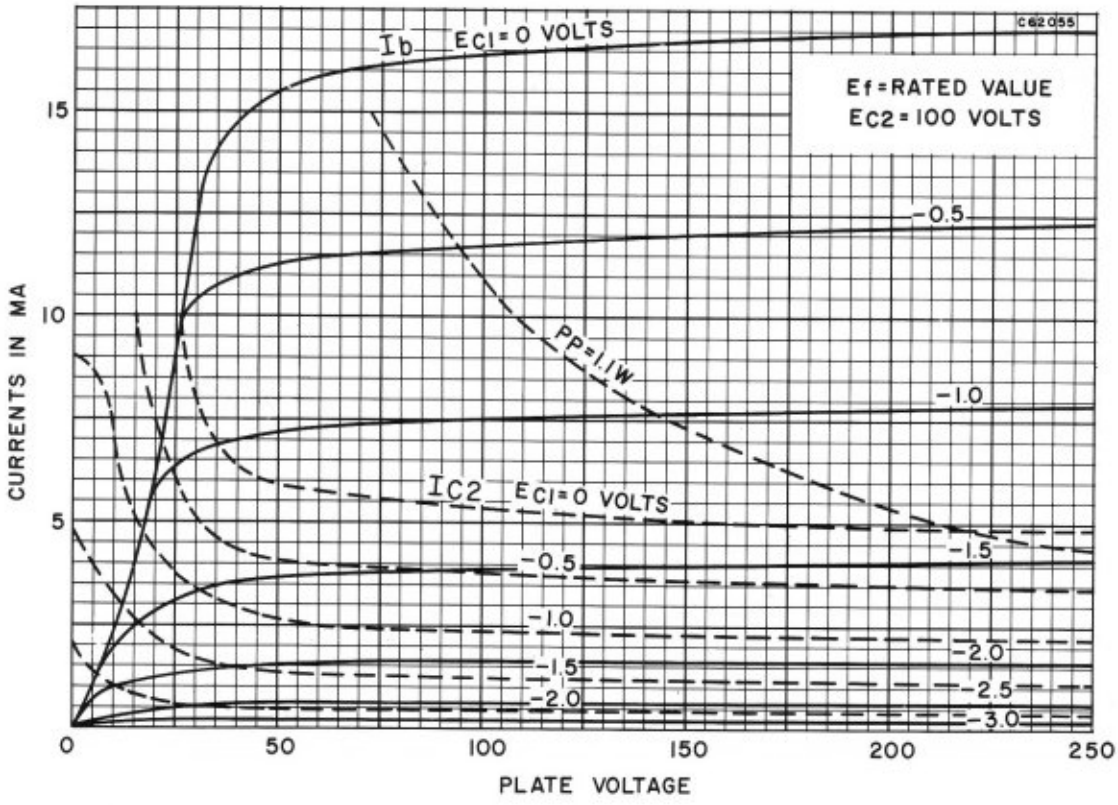
AVERAGE TRANSFER CHARACTERISTICS



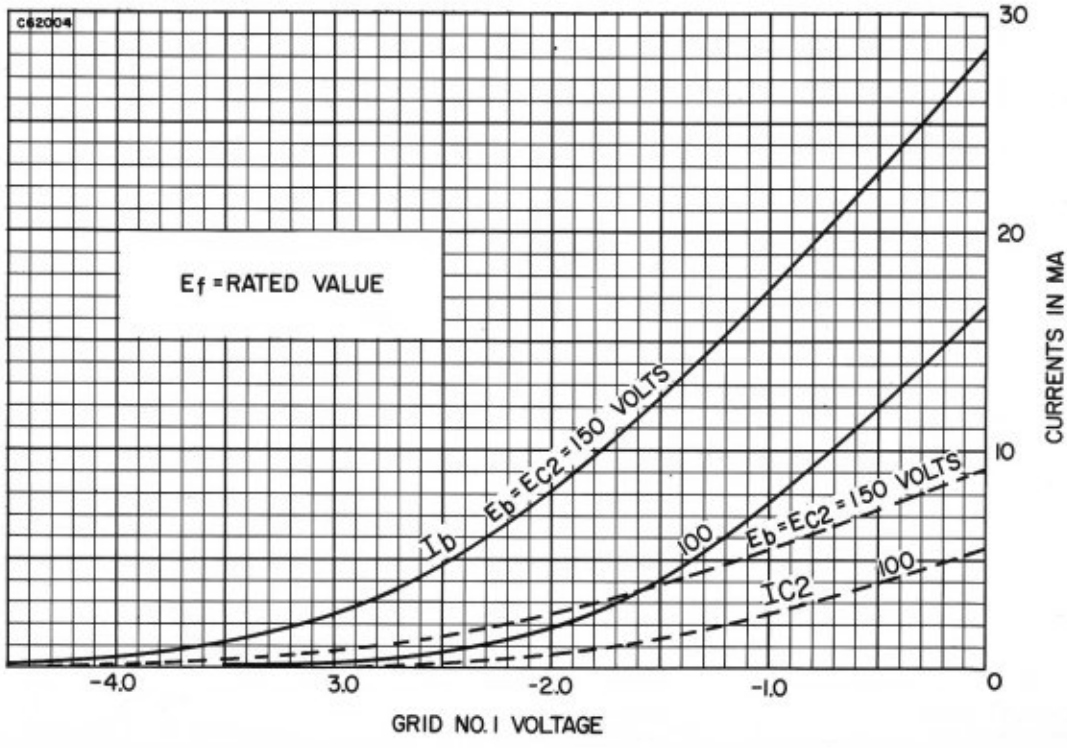
AVERAGE PLATE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS



SYLVANIA

8211

SYLVANIA SUBMINIATURE STRAP FRAME GRID TUBES

MECHANICAL DATA

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

RATINGS[1] (Absolute Maximum)

Bulb Temperature	180 °C
Altitude[2]	80,000 Ft.
Radiation[3]	
Total Dosage (Neutrons/sq. cm)	10^{16} nvt
Dose Rate (Neutrons/sq. cm/sec.)	10^{12} nv

DURABILITY CHARACTERISTICS[4]

Impact Acceleration (¾ msec Duration)[5]	500 G	Max.
Fatigue (Vibrational Acceleration for Extended Periods)[6]	2.5 G	Max.
On-Off Heater Cycles[7]	2000	Min.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Heater Voltage[8]	6.3 V
Heater Current	360 mA

DIRECT INTERELECTRODE CAPACITANCES (Shielded)[9]

Grid No. 1 to Plate	0.13 pf	Max.
Input	12.0 pf	
Output	8.0 pf	

CONTROLLED DETRIMENTS

Interelectrode Insulation[10]	50 Meg.	Min.
Total Grid Current[11]	−2.0 μAdc	Max.
Grid Emission[12]	−2.0 μAdc	Max.
Vibration Output as Equivalent Grid Voltage[13]	3.0 mVac	Max.
Heater-Cathode Leakage[14]	20 μAdc	Max.

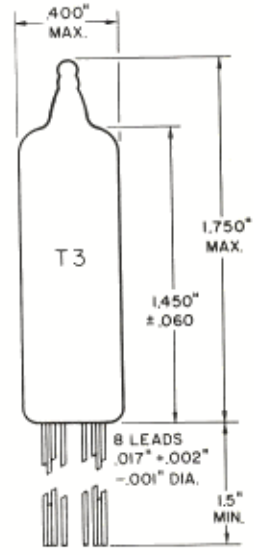
RATINGS[1] (Absolute Maximum)

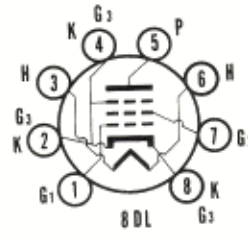
Heater Voltage[8]	6.3 (±10 %) V
Plate Voltage	165 Vdc
Peak Plate Forward Voltage	330 v
Grid No. 2 Voltage	155 Vdc
Plate Dissipation	4.0 W
Grid No. 2 Dissipation	1.0 W
Cathode Current	40 mAdc
Grid No. 1 Voltage	
Positive Value	0 Vdc
Negative Value	55 Vdc
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	100 v
Heater Negative with Respect to Cathode	100 v
Grid No. 1 Circuit Resistance	
Self Bias	0.5 Meg.
Fixed Bias	0.1 Meg.

The spacing between the grid and cathode is of such a low order of magnitude as to preclude the use of excessive voltages between these elements in commercial tube checkers and shorts indicating devices, particularly where the tube is mechanically excited. The DC or peak AC voltage applied must not exceed 50 volts.

QUICK REFERENCE DATA

The Sylvania Type 8211 is a subminiature strap frame grid pentode featuring low heater power. It is intended for use as a high gain video amplifier. The Type 8211 is designed to provide dependable operation under conditions of severe shock, vibration, high temperature, and high altitude.





CHARACTERISTICS

Plate Voltage	150 Vdc	
Grid No. 2 Voltage	100 Vdc	
Cathode Resistor	62 Ohms	
Plate Current	17 mAdc	
Grid No. 2 Current	4.2 mAdc	
Transconductance	15,500 μmhos	
Plate Resistance	65,000 Ohms	
Grid No. 1 Voltage for Ib = 75 μAdc	−8.5 Vdc	Max.

NOTES:

1. *Limiting values beyond which normal tube life and normal tube performance may be impaired.*
2. *If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.*
3. *The radiation ratings are confirmed by a qualification test. The test is conducted in a suitable reactor furnishing mixed pile radiation at no less than 90 % of the specified neutron dose rate. The tubes are measured for electrical parameters both before and after irradiation.*
4. *Tests performed as a measure of the mechanical durability of the tube structure.*
5. *Force as applied in any direction by the Navy Type High Impact (Flyweight) Shock Machine for Electronic Devices. Shock duration = ¼ milliseconds.*
6. *Vibrational forces applied in any direction for a period of 96 hours.*
7. *One cycle consists of the application of Ef = 7.0 V for one minute and interruption of the filament voltage for four minutes. A voltage of Ehk = 140 Vac is applied continuously.*
8. *Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value.*
9. *Capacitances are measured with an external Shield No. 318.*
10. *Measured with Ef = 6.3 V; Eg1-all = −100 Vdc; Ep-all = −300 Vdc; cathode is positive so no cathode emission occurs.*
11. *Measured with Ef = 6.3 V; Eb = 150 Vdc; Ec2 = 100 Vdc; Rk = 62 Ohms.*
12. *Preheated for five minutes with Ef = 7.5 V; Eb = 150 Vdc; Ec2 = 100 Vdc; Rk = 62 Ohms; Rg1 = 0.1 Meg; then tested with Ef = 7.5 V; Eb = 150 Vdc; Ec2 = 100 Vdc; Ec1 = −10 Vdc.*
13. *Test with Ef = 6.3 V; Eb = 150 Vdc; Ec2 = 100 Vdc; Rk = 62 Ohms; Ck = 1000 μf; Rp = 2000 Ohms; F = 40 cps; Acc = 15 g.*
14. *Measure with Ef = 6.3 V; Ehk = ±100 Vdc.*

SYLVANIA SUBMINIATURE STRAP FRAME GRID TUBES FOR MILITARY AND INDUSTRIAL APPLICATIONS VOL. 1

INTRODUCTION

The advantages of the strap frame grid are quite well known and are attested to by the steady increase in the number of new electron tubes employing this innovation. The area of growth in the past, however, had been restricted to miniature and larger designs. About two years ago, Sylvania launched a program to develop a subminiature frame grid tube design for the Military and Industrial markets. The results of this program to date are ten (10) new tube types. Each new type, when compared with its nearest conventional predecessor, shows a marked improvement in gain and operating efficiency of both the plate and heater. In addition, the new design offers the mechanical ruggedness, stability and reliability, characteristic of subminiature construction. Consistent with other Sylvania Premium Subminiature tubes, the new frame grid types are immune to nuclear radiation, as defined by specification.

This booklet is divided into two parts: The first section contains a brief description of each type, circuits for a number of basic building-block applications and performance data. The second section is comprised of data sheets which define each type in terms of mechanical and electrical ratings, average characteristics, basing connections and other pertinent details. Characteristic curves are also provided to facilitate circuit design and evaluation.

SYLVANIA FRAME GRID SUBMINIATURE TUBE TYPES

TYPE 8070

The Type 8070 is a high Mu triode featuring comparatively low heater power, high transconductance and high gm/Ib ratio. The tube is intended primarily for grounded cathode IF preamp, RF amplifier, mixer and local oscillator applications, and is operable into the UHF region.

Electrical characteristics include a heater current of 125 Ma at the rated heater voltage of 6.3 Volts; a gm of 11,000 at a plate voltage of 110 Volts and a plate current of 7.5 Ma; and a gm/Ib ratio of 1,470 μmhos per milliampere.

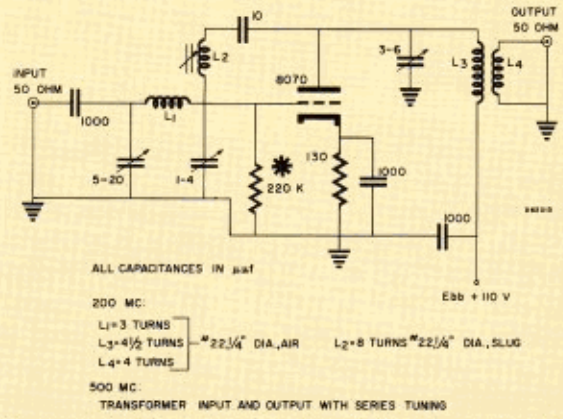
As a broadband 50 Mc amplifier, a single stage will provide a gain of 25 db (noise matched) and a noise figure of 1.6 db for a bandwidth of 6.5 Mc. Performance at 300 Mc shows a gain of 16.5 db, and a noise figure of 6.0 db for a bandwidth of 11 Mc. The basic circuit in which these data were obtained and a performance curve for the frequency range of 50 Mc to approximately 500 Mc are shown in the accompanying illustrations.

TYPE 8071

The Type 8071 is a high Mu (56) triode designed specifically for application as a small signal grounded grid amplifier at frequencies up to 900 Mc. Electrical features of the design include comparatively low heater power (6.3 Volts at 125 Ma) and a gm and gm/Ib ratio at a plate current of 11.5 Ma of 12,000 μmbos and 1,040 respectively. Structural features contributing to overall performance include multiple plate, grid, and cathode leads to minimize lead inductance and a basing arrangement that provides for isolation between input and output circuits.

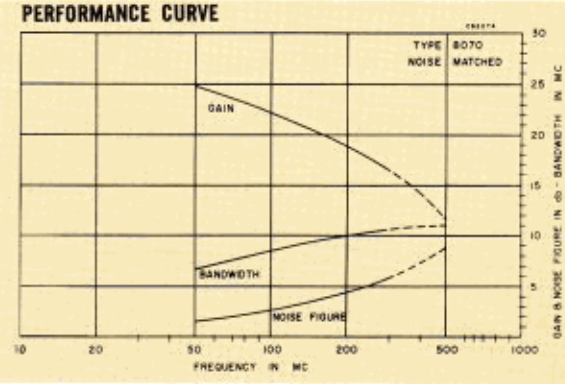
In its intended application at 480 Mc, a single stage amplifier will provide a gain of 14.5 db and a noise figure of 7.2 db for a bandwidth of 9.5 Mc. A basic grounded grid circuit and a performance curve for the frequency range of 200 to 900 Mc are presented in the accompanying illustrations.

VHF/UHF SINGLE TUBE AMPLIFIER

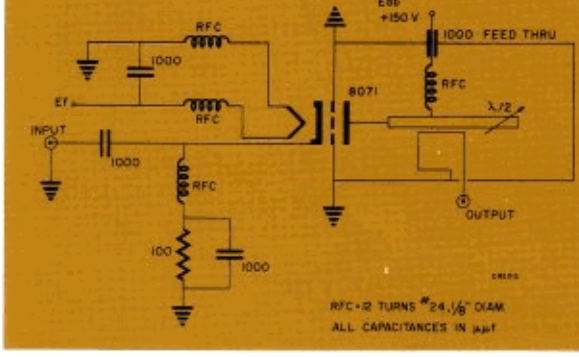


*A choke may be an advisable alternate in some applications.

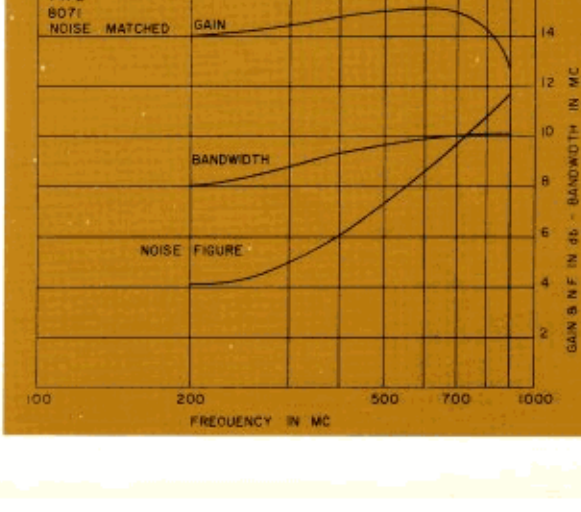
PERFORMANCE CURVE



480 MC GROUNDED GRID COAXIAL AMPLIFIER



PERFORMANCE CURVE (GROUNDED GRID)



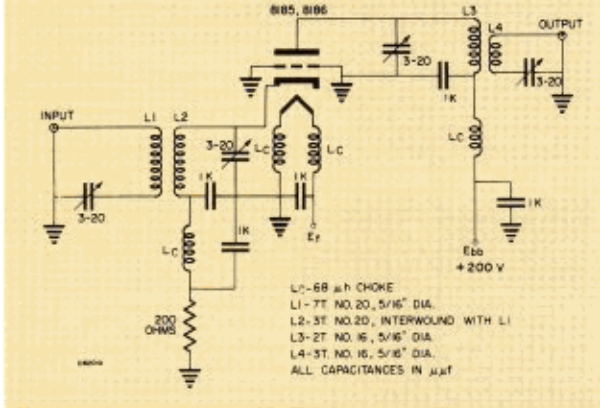
TYPE 8185, 8186 TYPE

The Type 8185 is a medium Mu (42) triode designed primarily for application as a grounded grid power amplifier and frequency multiplier at frequencies to approximately 475 Mc. Features of the design include a gm of 19,000, a gm/Ib ratio of 1,100 and high peak cathode current capability. Lead inductance is minimized and provision made for isolation of input and output circuitry by the use of multiple grid leads. A single tube will provide a useful power output at 235 Mc of approximately 4.0 Watts at a plate efficiency of 55 percent. A power output of 1.1 Watts is obtainable at 475 Mc.

In addition, the 8185 may be used as a continuous wave or plate pulsed oscillator at frequencies in excess of 700 Mc. Although not designed for the latter application, a peak power output of 250 Watts has been obtained in the laboratory. Circuitry and performance data for the aforementioned applications are presented in the accompanying illustrations.

The Types 8185 and 8186 are identical except for heater characteristics. Respective heater characteristics are 6.3 Volts at 300 Ma and 26.5 Volts at 75 Ma.

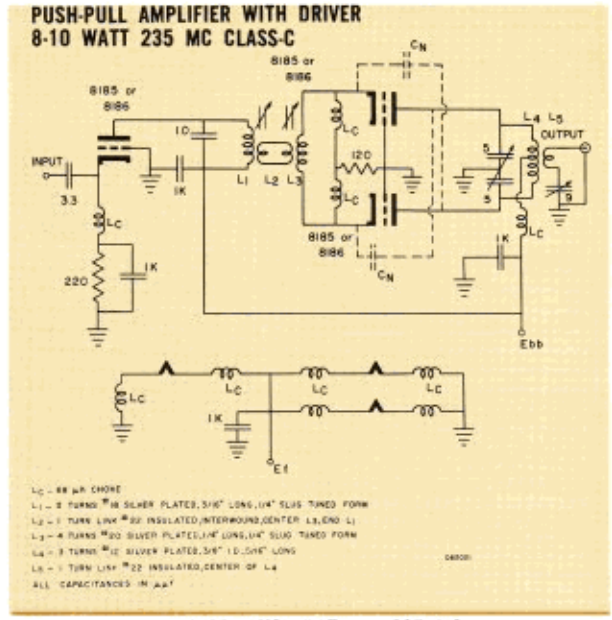
4-WATT 235 MC CLASS—C POWER AMPLIFIER



PERFORMANCE DATA — 235 MC

Heater Voltage	
8185	6.3 V
8186	26.5 V
B-Supply Voltage	200 Vdc
Plate Current	36 mAdc
Grid Current	7 mAdc
RF Driving Power (Approx.)	0.5 W
Power Output	3.9 W
Plate Efficiency	55 Percent

PUSH-PULL AMPLIFIER WITH DRIVER 8-10 WATT 235 MC CLASS-C

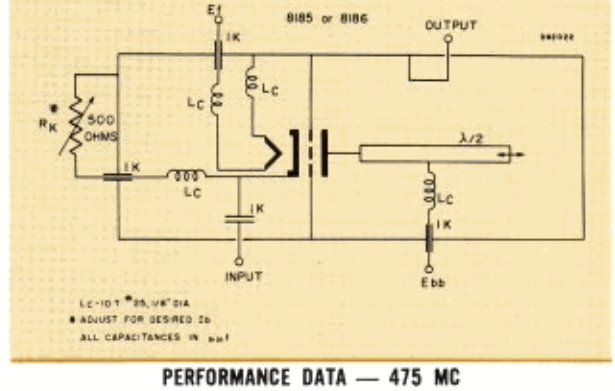


PERFORMANCE DATA — 235 MC

	Driver	Final	Driver	*Final	
Heater Voltage					
8185				6.3	V
8186				26.5	V
B-Supply Voltage	200	200	200	200	Vdc
Plate Current	25	82	27	100	Ma
Grid Current	1.5	16	2.0	16	Ma
Power Output		8		10	W
Plate Efficiency		50		50	Percent

*The absolute maximum plate dissipation of 4.25 Watts is exceeded under these conditions by 0.75 Watt. Although not generally recommended, such operation may be acceptable in those applications where a possible reduction in life would not be objectionable.

475 MC COAXIAL CLASS-C AMPLIFIER

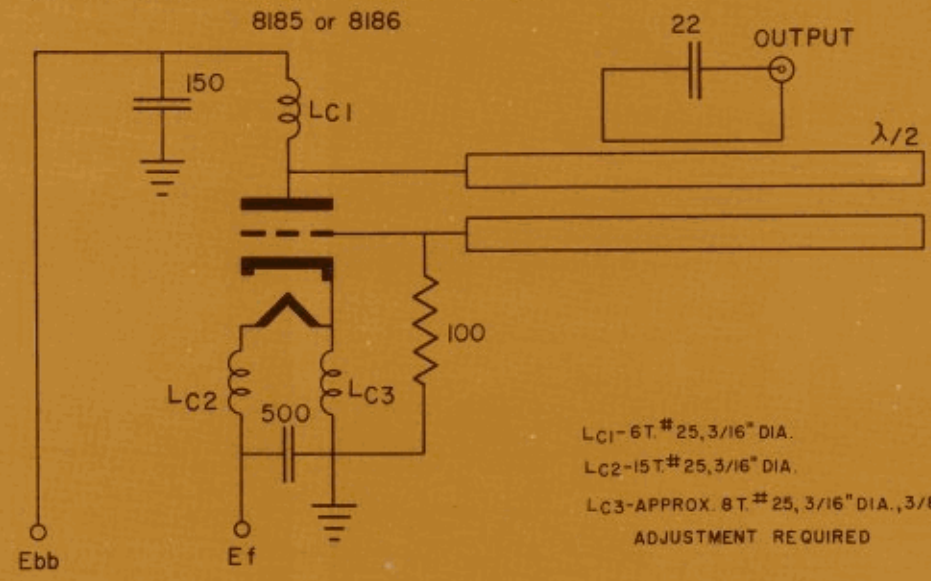


PERFORMANCE DATA — 475 MC

Heater Voltage	
8185	6.3 V
8186	26.5 V
B-Supply Voltage	100 V
Plate Current	45 Ma
Grid Current	5 Ma
RF Driving Power (Approx.)	0.1 W
Power Output	1.1 W
Plate Efficiency	24 Percent

Data obtained with tube wired directly into the circuit. The use of a socket may introduce excessive losses and prevent duplication of this performance data. Similarly, optimization of application design factors may result in a substantial increase in operating efficiency.

250-WATT EXPERIMENTAL 600 MC PLATE PULSED OSCILLATOR



PERFORMANCE DATA — 600 MC

Heater Voltage		
8185	6.3	V
8186	26.5	V
B-Supply Voltage		
20 μs Pulse Width, 200 pps	1,400	V Peak
Cathode Current	1.25	Amps Peak
Grid Current	.325	Amps Peak
Plate Current	.925	Amps Peak
Plate Input Power	1,300	W Peak
Power Output	250	W Peak
Plate Efficiency	19.3	Percent

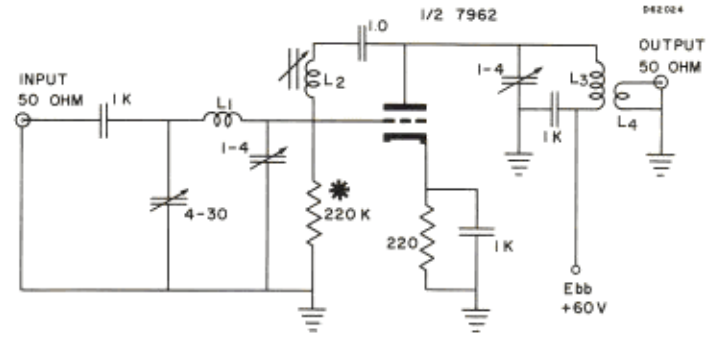
TYPE 7962 TYPE

The 7962 is a medium Mu (22) double triode featuring relatively low heater power (6.3V at 235 Ma) and B-supply (60V) operation; and a gm and gm/Ib ratio of 10,500 and 1,200 respectively.

It is well suited to a variety of small signal applications at frequencies up to 400 Mc. It is particularly useful as a cascode IF preamplifier. In this application at 60 Mc, a gain of 26 db and a noise figure of 2 db is obtainable for a bandwidth of 6.5 Mc. A single section operating at 150 Mc as a grounded cathode amplifier will provide, for a bandwidth of 10 Mc, a gain of 16 db and a noise figure of 4.5 db. As an oscillator, one section will perform efficiently to approximately 900 Mc.

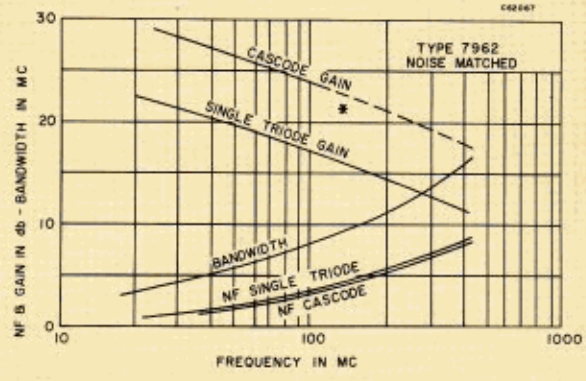
In addition, the 7962 may be used as a high speed multivibrator. Speed of operation is limited by switching speed, which is principally controlled by tube gm and input capacity. Assuming gm/Cin as a figure of merit, a numerical value of 328 is obtained for the 7962. This figure is more than twice that of many tubes currently serving this application.

VHF AMPLIFIER — single TRIODE



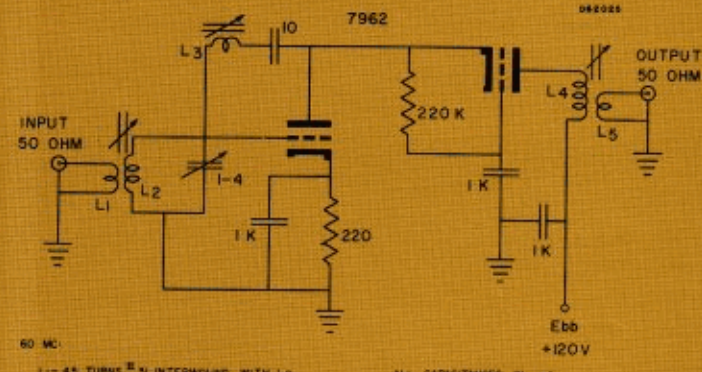
*A choke may be an advisable alternate in some applications.

PERFORMANCE CURVE



* STABILITY MAY BE DIFFICULT TO ACHIEVE AT FREQUENCIES ABOVE APPROXIMATELY 150 MC

CASCODE AMPLIFIER



TYPE 7963 TYPE

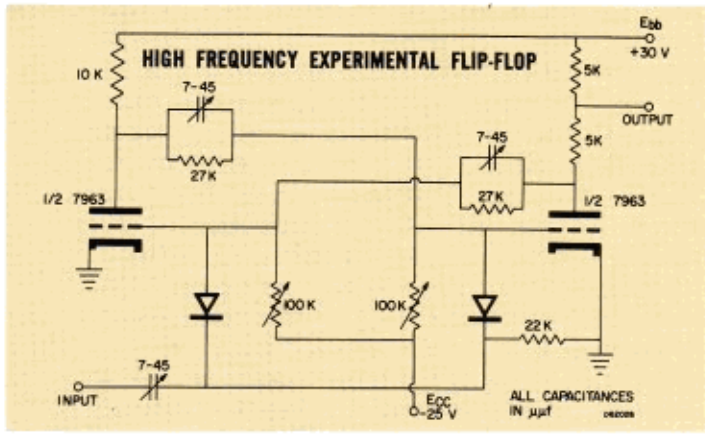
The 7963 is a general purpose medium Mu (40) double triode of relatively high perveance design. It is suited to a variety of applications including: blocking oscillator, multivibrator, trigger; as well as IF, mixer and RF amplifier service at frequencies up to approximately 400 Mc.

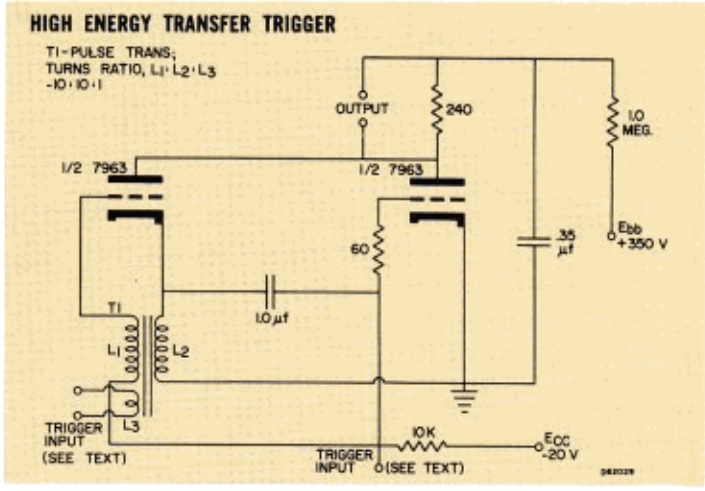
Electrical characteristics of each section at a plate voltage of 100 Volts include: a pulse plate current of approximately 1 Ampere at a pulse grid voltage of +40 Volts pk ; and, at a grid bias of —2 Volts, a gm of 13,000, a gm/Ib ratio 1,750 and an rp of 3,100 Ohms.

The speed of operation in multivibrator service is limited by switching speed, whch is principally controlled by tube gm and input capacity. Assuming gm/Cin as a figure of merit, the numerical value of 325 for the 7963 is more than twice that of many tubes currently serving this application. An experimental bistable flip-flop circuit is shown in the accompanying figure. Satisfactory operation and an output of 10 Volts Pk-to-Pk is easily achieved at 5 Mc with a B-supply voltage of 30 Volts and an input signal amplitude of approximately 3 Volts pk.

Circuits intended to develop and deliver a high energy trigger pulse to a low impedance load generally employ a thyratron. Weaknesses of this technique include instability and critical drive requirements. These characteristic problems with thyratrons can be avoided by using a suitable vacuum tube, such as the 7963. Referring to the accompanying circuit, the configuration is that of a monostable cathode coupled blocking oscillator driving a power amplifier. The output across the 240 Ohm load is initially, approximately 270 Volts and decays to 135 Volts in 65 Microseconds. Rise time is from ½ to 1 Microsecond. The trigger pulse can be applied in series or parallel with the grid circuit, requiring 7 and 15 Volts respectively, or to the tertiary winding of the blocking oscillator transformer for increased sensitivity. The latter arrangement requires a minimum trigger pulse amplitude of 1.4 Volts peak. The trigger pulse width in both cases is 2 Microseconds. Energy gain of the circuit is 70,000.

As a small signal RF amplifier at 200 Mc, a single section provides a gain of 14.8 db and a noise matched noise figure of 4.0 db for a bandwidth of 8.0 Mc.





TYPE 8103 TYPE

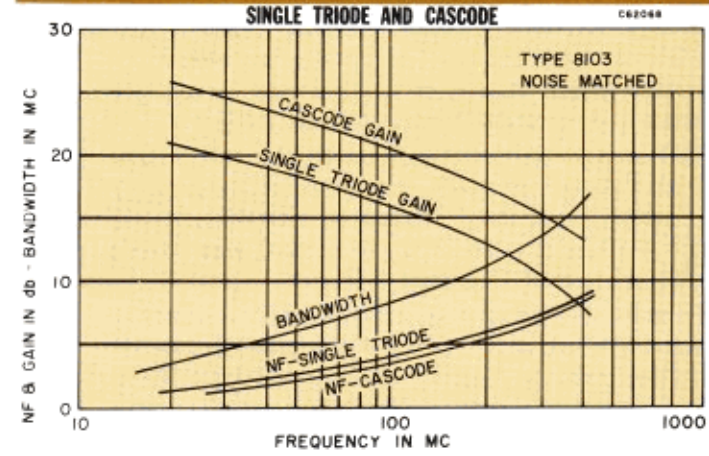
Direct operation of electronic equipments from the relatively low voltage power generating systems of commercial and military vehicles offers substantial reductions in space and weight in critical applications by eliminating those components associated with power conversion. In pursuit of this objective, two new frame grid tubes, Types 8103 and SR-2939A, have been developed for 26.5-Volt heater and B-supply operation. Both tubes are herein described and summarized in their intended applications. For additional information, reference should be made to the paper *"Elements of VHF Receivers for Direct Operation from 26-Volts" by Messrs. B. B. Scott and T. E. Gausman.

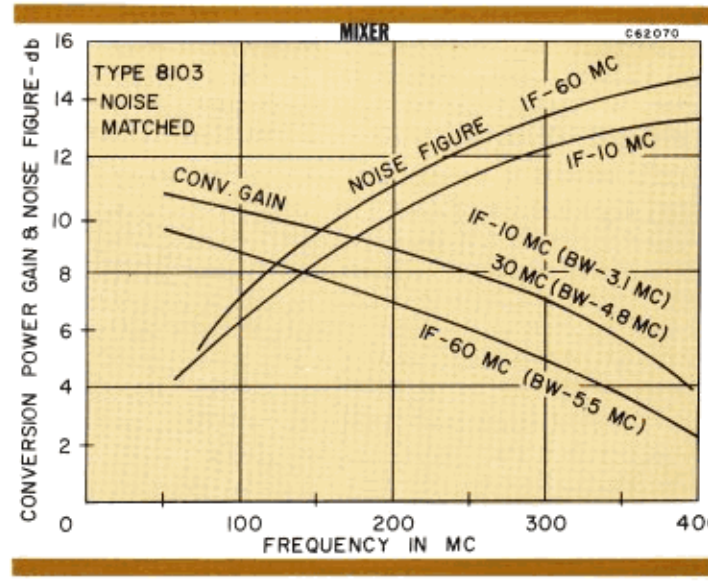
*Copies available from Sylvania Electric Products Inc., Central Advertising Distribution Department, 1100 Main Street, Buffalo 9, New York.

The Type 8103 is a medium-Mu (20) double triode featuring 26.5-Volt heater and B-supply operation. It is designed primarily to serve RF amplifier, mixer and local oscillator applications at frequencies up to approximately 300 Mc and IF pre-amplifier applications. Its transconductance of 11,000 is comparable to that obtained with other tube types at much higher plate voltages.

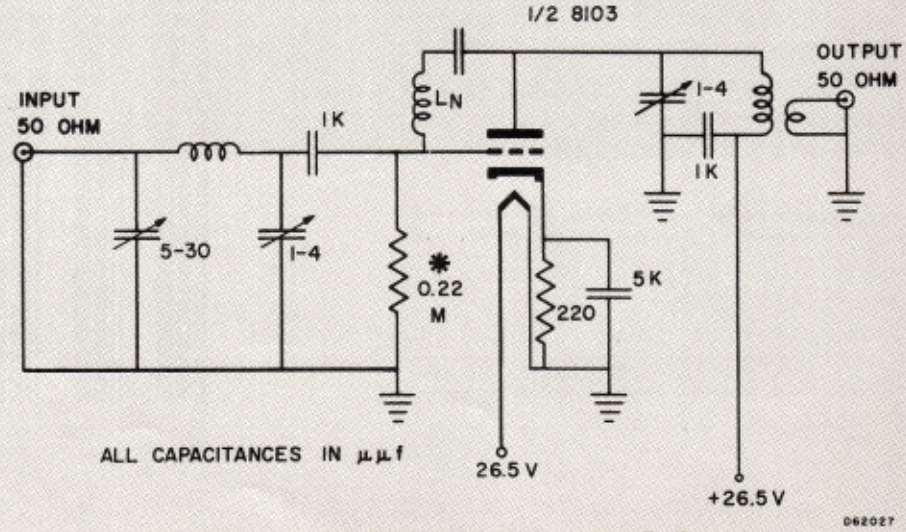
A single section operating as a grounded cathode amplifier at 150 Mc with a bandwidth of 8 Mc exhibits a gain of 15 db and a noise matched noise figure of 4.5 db. As a cascode amplifier under these same onditions, the Type 8103 provides a gain of approximately 18 db with a noise figure of 4.2 db. At 60 Mc, cascode operation offers a gain of 22 db with a noise figure of 2.5 db for a bandwidth of 6.5 Mc. As a mixer, a conversion gain of 9.5 db at 150 Mc, for a 30 Mc IF with a bandwidth of 5 Mc, is readily obtained. A single section will operate efficiently as an oscillator to approximately 460 Mc.

PERFORMANCE CURVE



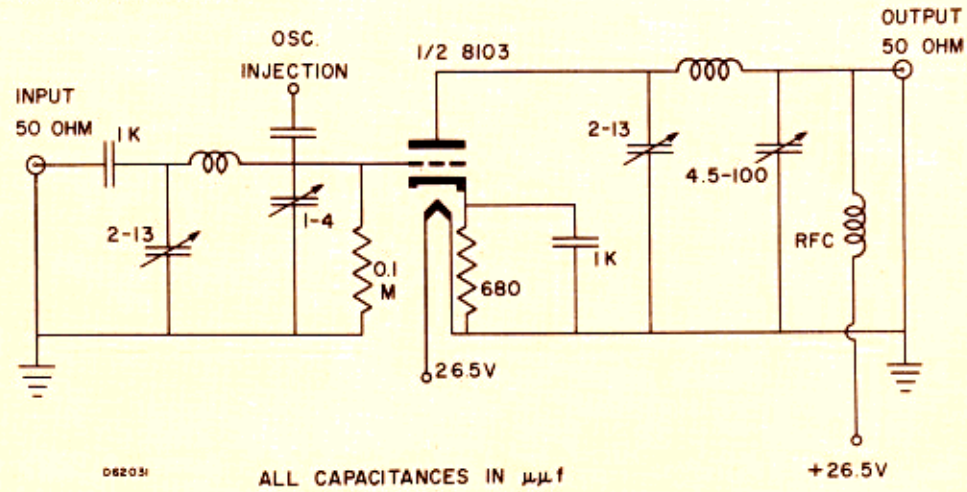


VHF SINGLE TRIODE AMPLIFIER

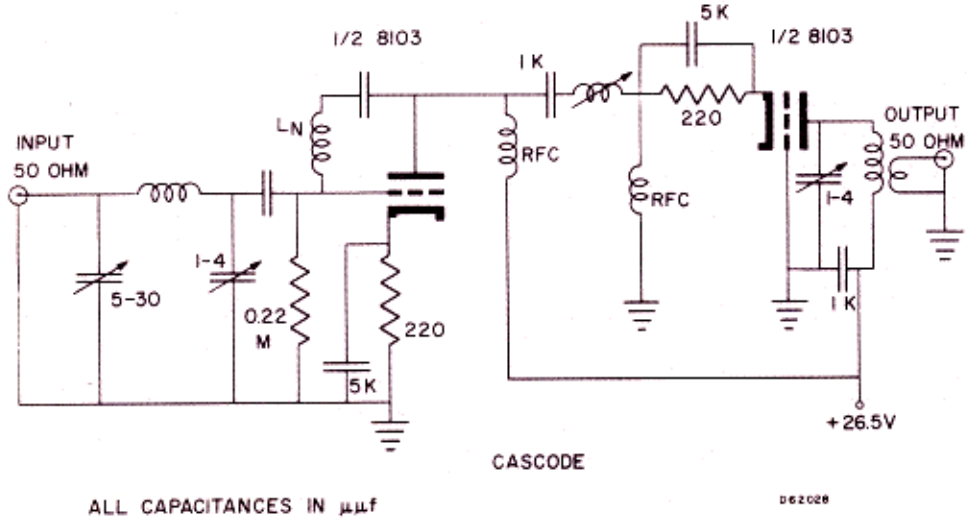


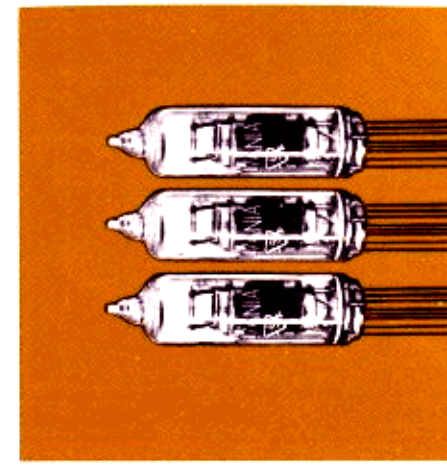
*A choke may be an advisable alternate in some applications.

VHF TRIODE MIXER TEST CIRCUIT



VHF CASCODE AMPLIFIER





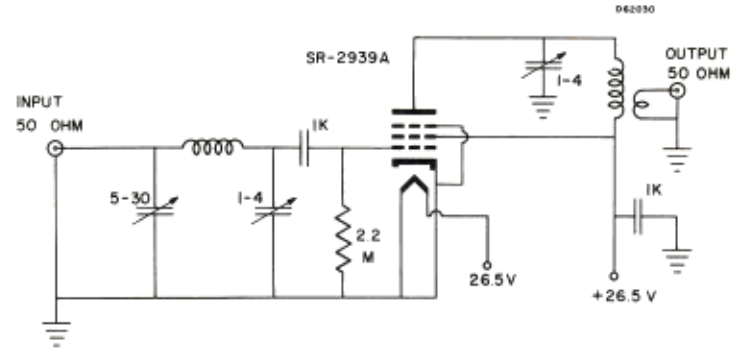
TYPE SR-2939A TYPE

The Type SR-2939A is a sharp cutoff frame grid pentode designed to operate directly from a 26.5 Volt heater and B-supply. Static characteristics include a transconductance of 5,000 μmhos and a plate resistance of 50K Ohms. The design features top connection to the Number 1 grid to minimize grid-to-plate capacitance and to provide for isolation between input and output circuits. It is well suited to RF amplifier, mixer and IF amplifier applications at frequencies up to approximately 300 Mc.

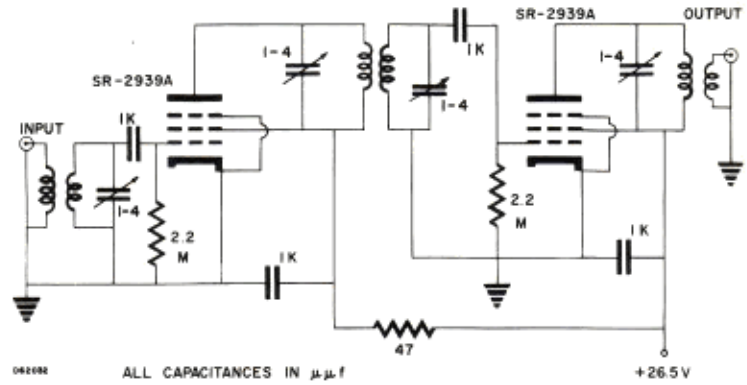
As an RF amplifier at 150 Mc with a bandwidth of 9 Mc, a single stage will provide a gain of 16 db with a noise figure of approximately 8 db. Two SR-2939A's in cascade as a 60 Mc IF amplifier will provide a gain of 38 db for a bandwidth of 5.5 Mc. In mixer service at 150 Mc, a conversion gain of 17 db for an IF frequency of 10 Mc with a bandwidth of 0.8 Mc, is obtainable. Performance data through 400 Mc is presented in the accompanying curves.

APPLICATION OF AGC AGC voltages are applied to 26.5V types in the same manner as higher voltage types. It is desirable to obtain bias with the grid leak method rather than from a cathode resistor in order to maintain as high a plate to cathode voltage as possible. In the case of an AGC controlled IF amplifier, however, cathode or self-bias is necessary since the grid leak method results in a significant variation of input capacitance with AGC voltage.

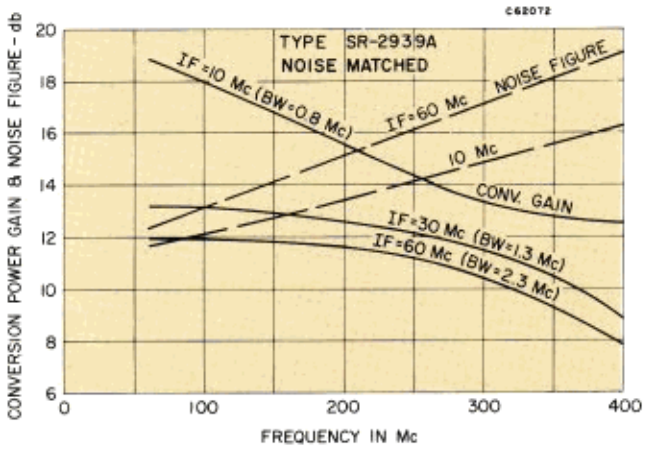
VHF AMPLIFIER — SINGLE PENTODE



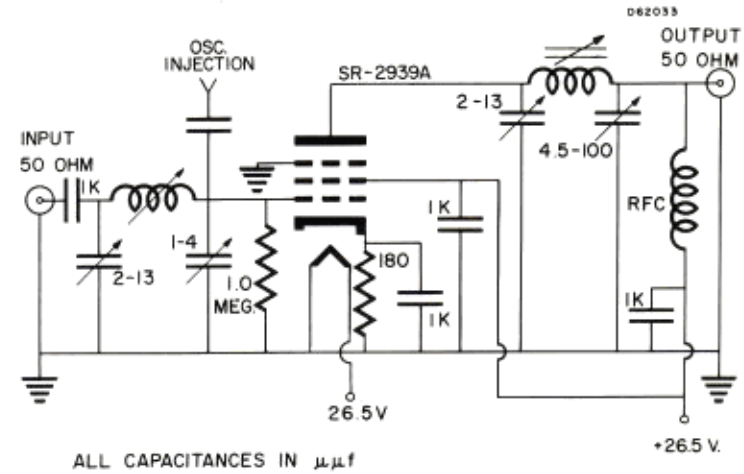
2-STAGE CASCADE IF AMPLIFIER



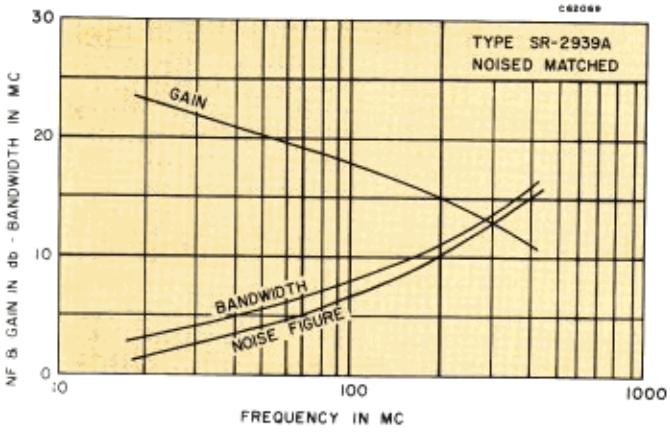
PERFORMANCE CURVE — MIXER



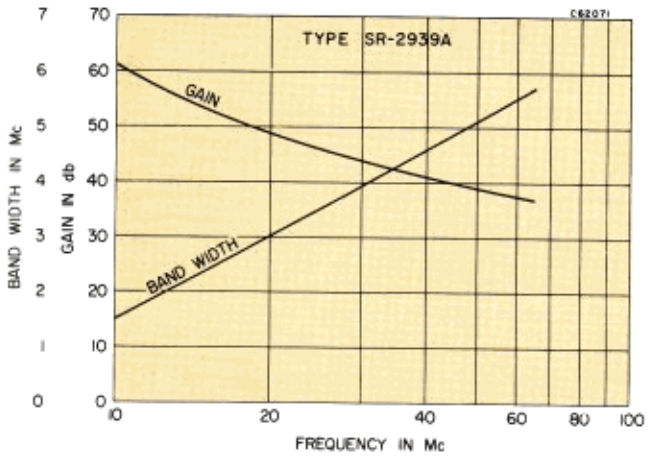
VHF PENTODE MIXER TEST CIRCUIT



PERFORMANCE CURVE — SINGLE PENTODE



PERFORMANCE CURVE — TWO STAGE CASCADE



TYPE 8211

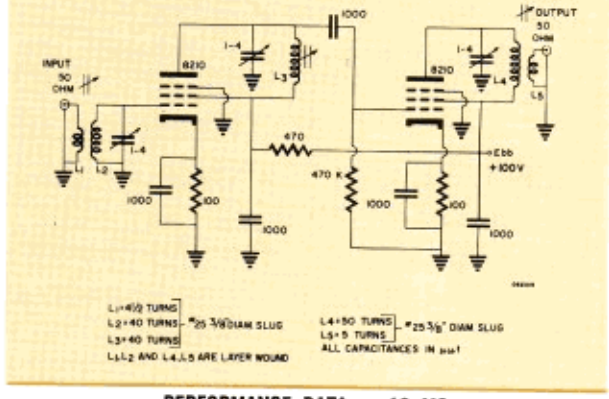
The Sylvania Type 8211 is a subminiature frame grid pentode intended primarily for application as a video amplifier. Electrical characteristics of the design include, at plate and Grid No. 2 voltages of 150 and 100 Volts respectively: a transconductance of 15,500 μmhos, a plate current of 17 Ma, and a plate resistance of 65,000 Ohms. Heater characteristics are 6.3 Volts and 360 Ma. Other pertinent data are contained in the data sheet found in latter pages of this booklet.

TYPE 8210

The Type 8210 is a sharp cutoff frame grid pentode. Features of the design include a transconductance of 8,500 μmhos and extremely low grid-to-plate capacity. The latter is achieved through double ended construction in which the grid is connected to a top lead. This arrangement provides for isolation of input and output circuitry to assure stability in high gain amplifier applications. The 8210 is well suited to IF, RF and mixer applications at frequencies up to approximately 400 Mc.

As a broadband IF amplifier, two 8210's in cascade at 60 Mc will provide a gain 51.5 db for a 6 db bandwidth of 3.5 Mc (3 db - 2.25 Mc). In a similar narrow band configuration at 10 Mc, a gain of 81 db is readily obtainable for a 6 db bandwidth of 300 Kc (3 db - 192 Kc).

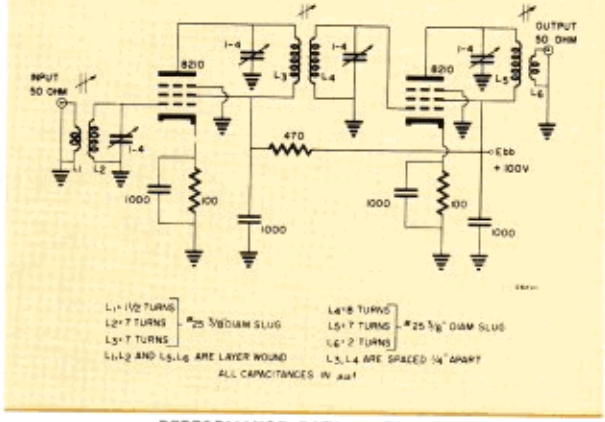
2 STAGE CASCADE — 10 MC IF AMPLIFIER



PERFORMANCE DATA — 10 MC

B-Supply Voltage	100 V
Gain	81.6 db
Bandwidth (6 db)	300 Kc

2-STAGE CASCADE — 60 MC IF AMPLIFIER



PERFORMANCE DATA — 60 MC

B-Supply Voltage	100 V
Gain	51.5 db
Bandwidth (6 db) down	3.5 Mc