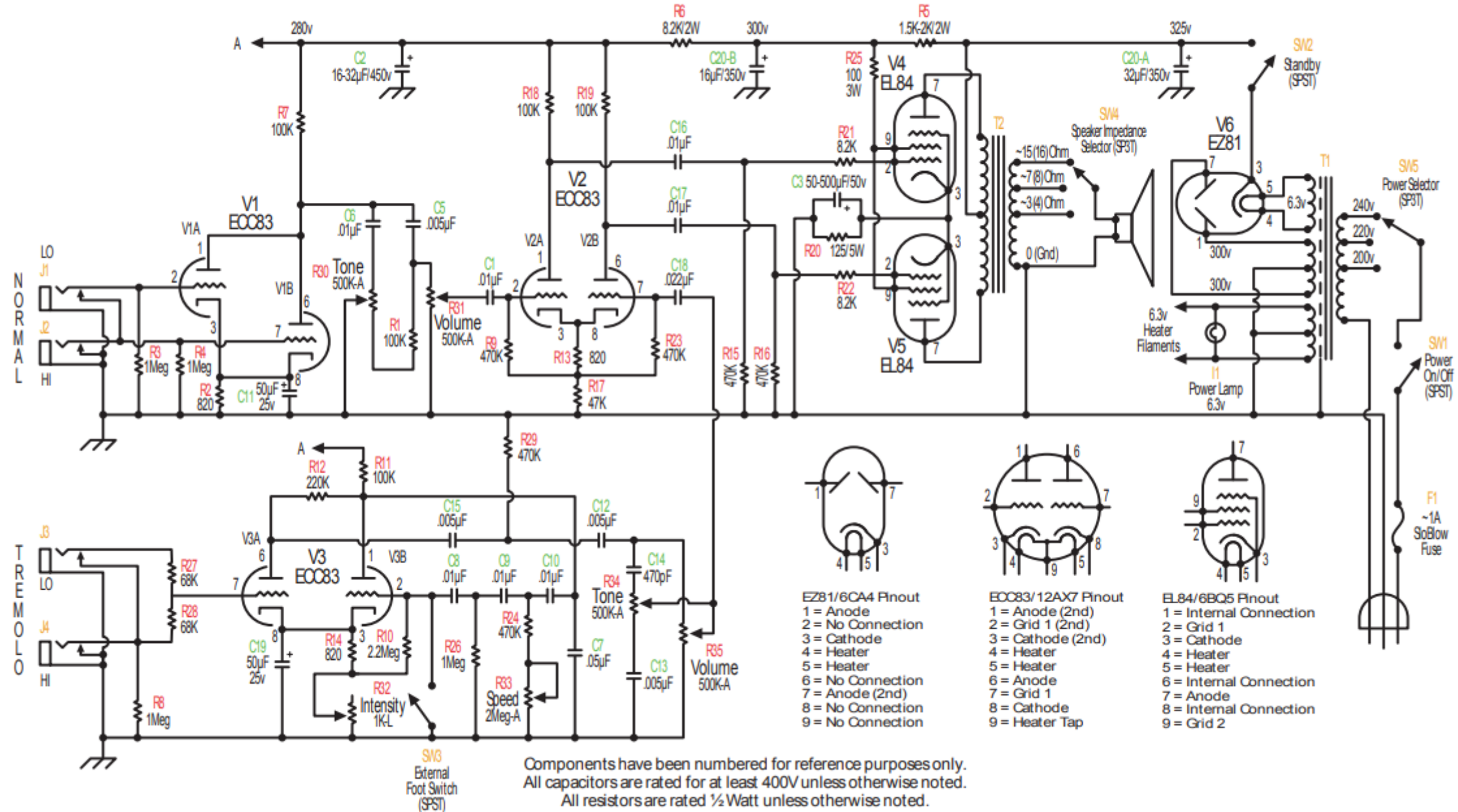


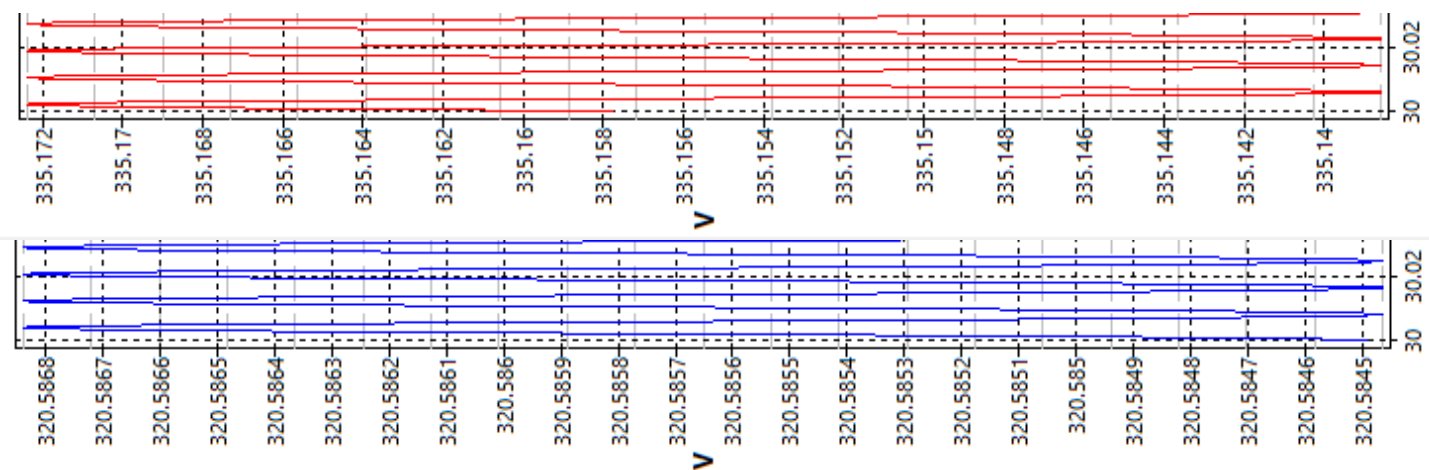
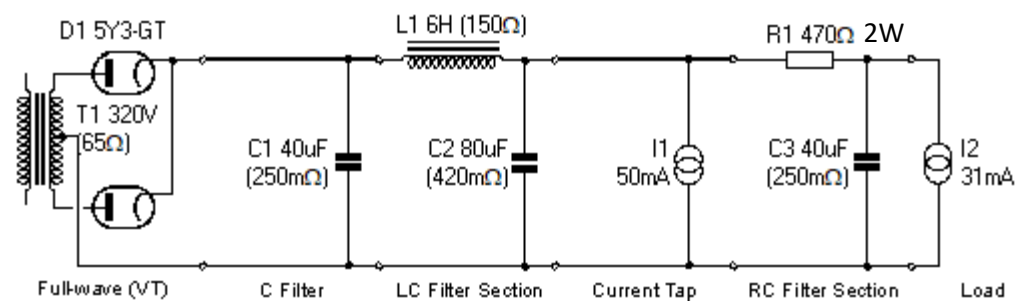
6HZ8/6KT8 Guitar Amplifier

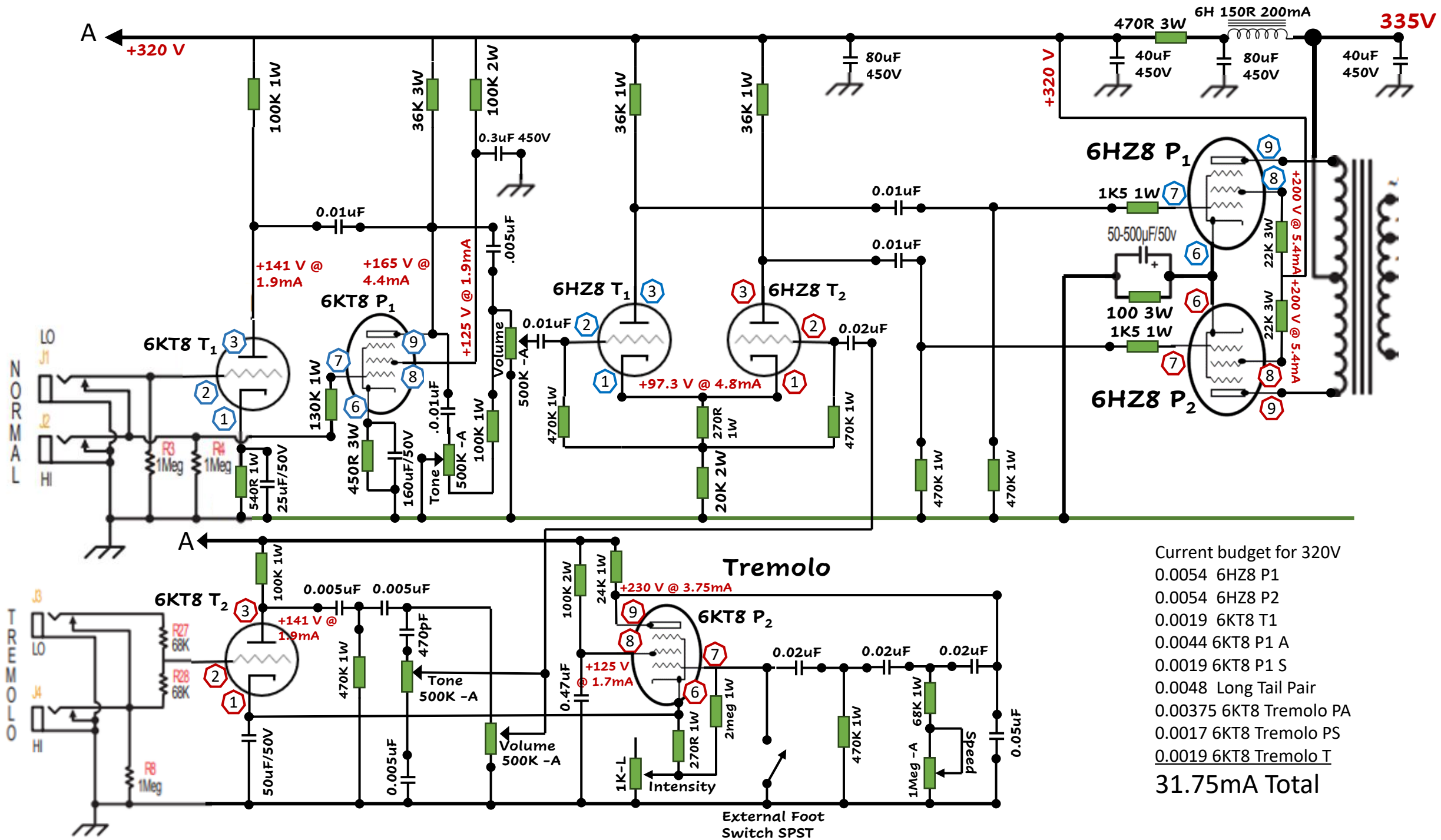
18-Watt Marshall Design

Marshall 18 Watt Combo Schematic

Revision 5







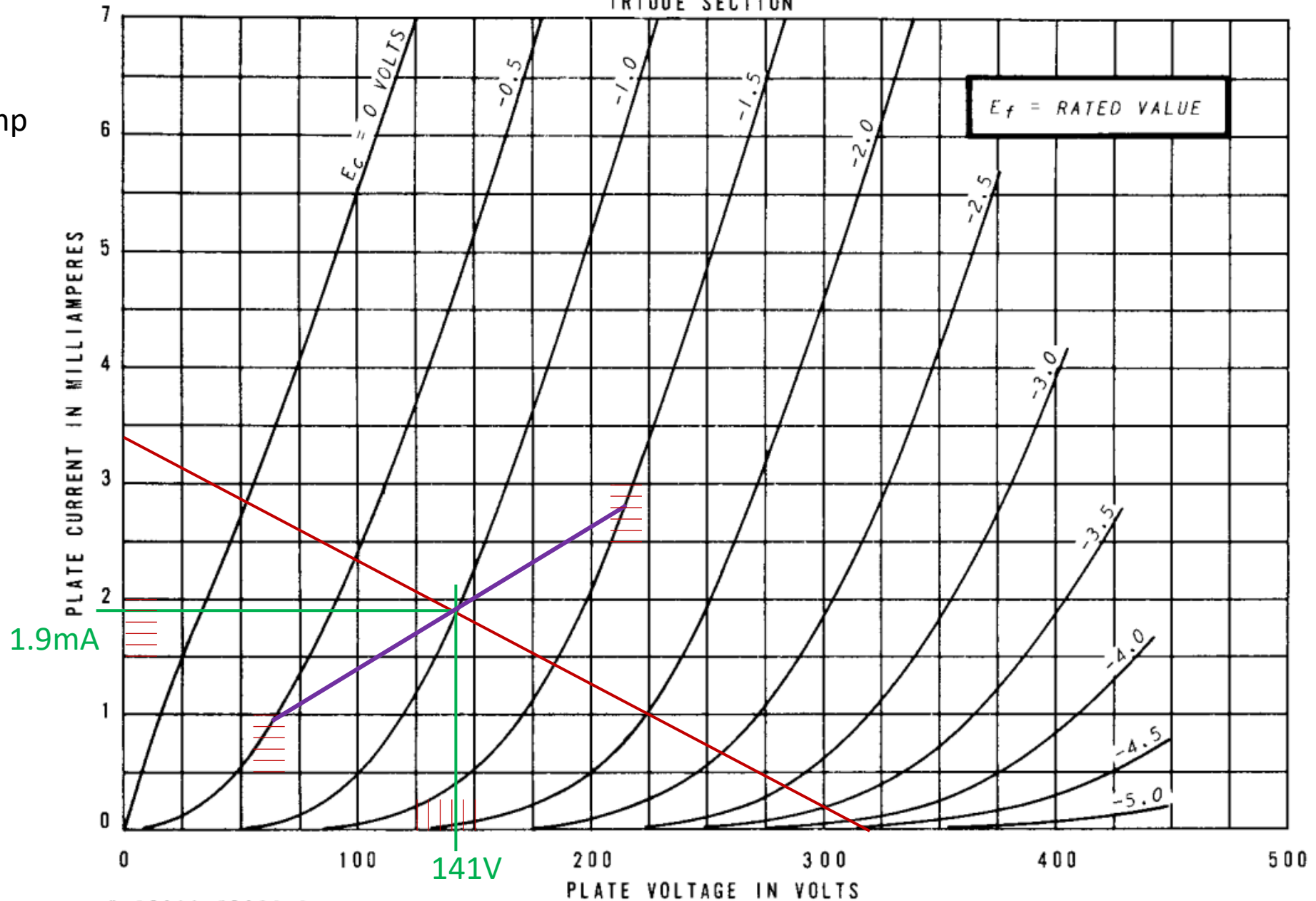
Current budget for 320V
0.0054 6HZ8 P1
0.0054 6HZ8 P2
0.0019 6KT8 T1
0.0044 6KT8 P1 A
0.0019 6KT8 P1 S
0.0048 Long Tail Pair
0.00375 6KT8 Tremolo PA
0.0017 6KT8 Tremolo PS
0.0019 6KT8 Tremolo T
31.75mA Total

AVERAGE PLATE CHARACTERISTICS

TRIODE SECTION

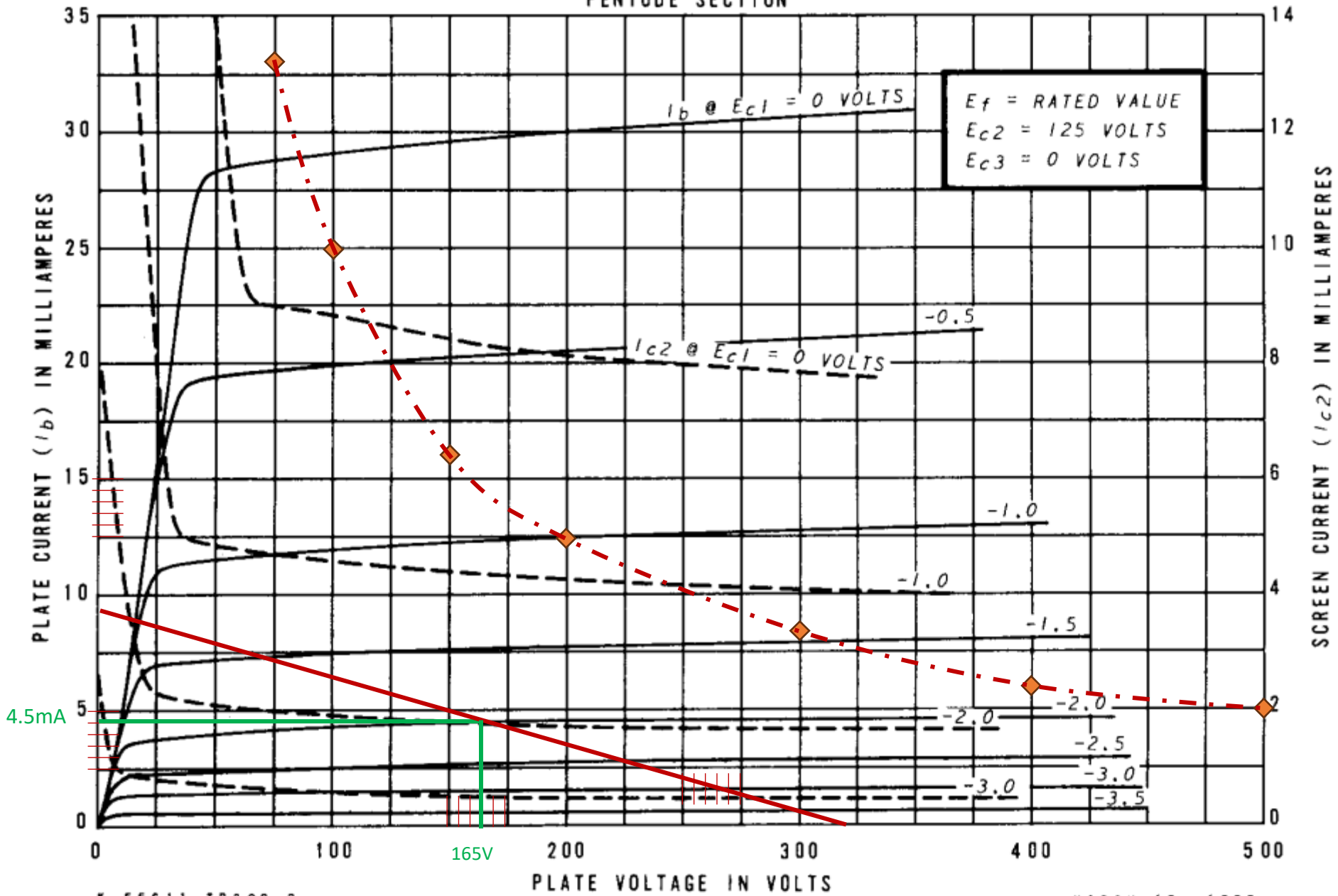
6KT8 Triode Preamp

100K R_L
540R R_K



AVERAGE PLATE CHARACTERISTICS

PENTODE SECTION



36K R_L
450 Ω 5W = R_K
 $R_S = 100K$ 2W

4.5mA

165V

Long Tail Pair Phase Inverter

AVERAGE PLATE CHARACTERISTICS

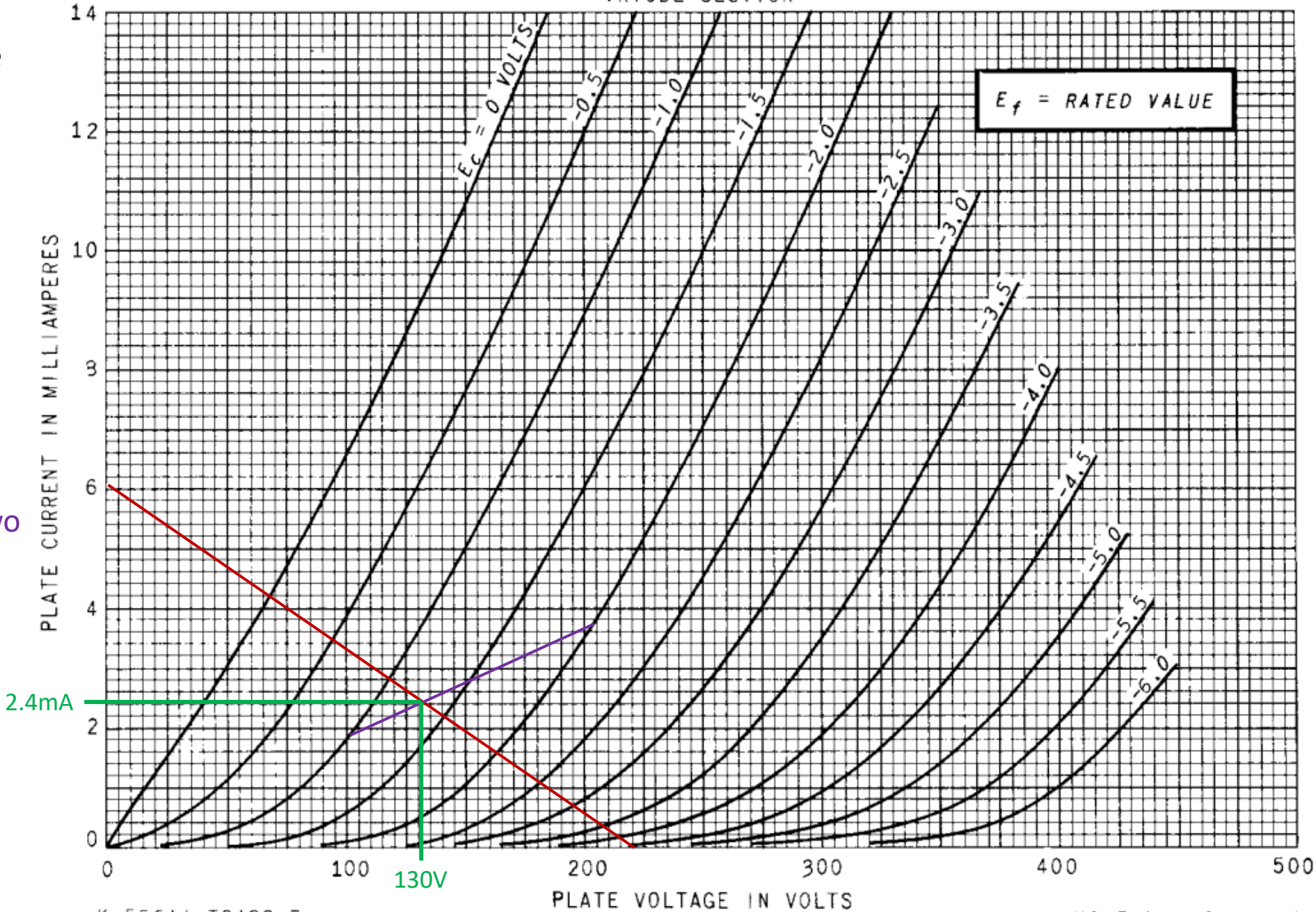
TRIODE SECTION

6HZ8 Triode

36K R_{Load}

540 R_k
270R for two

20K R_{Tail}



AVERAGE PLATE CHARACTERISTICS

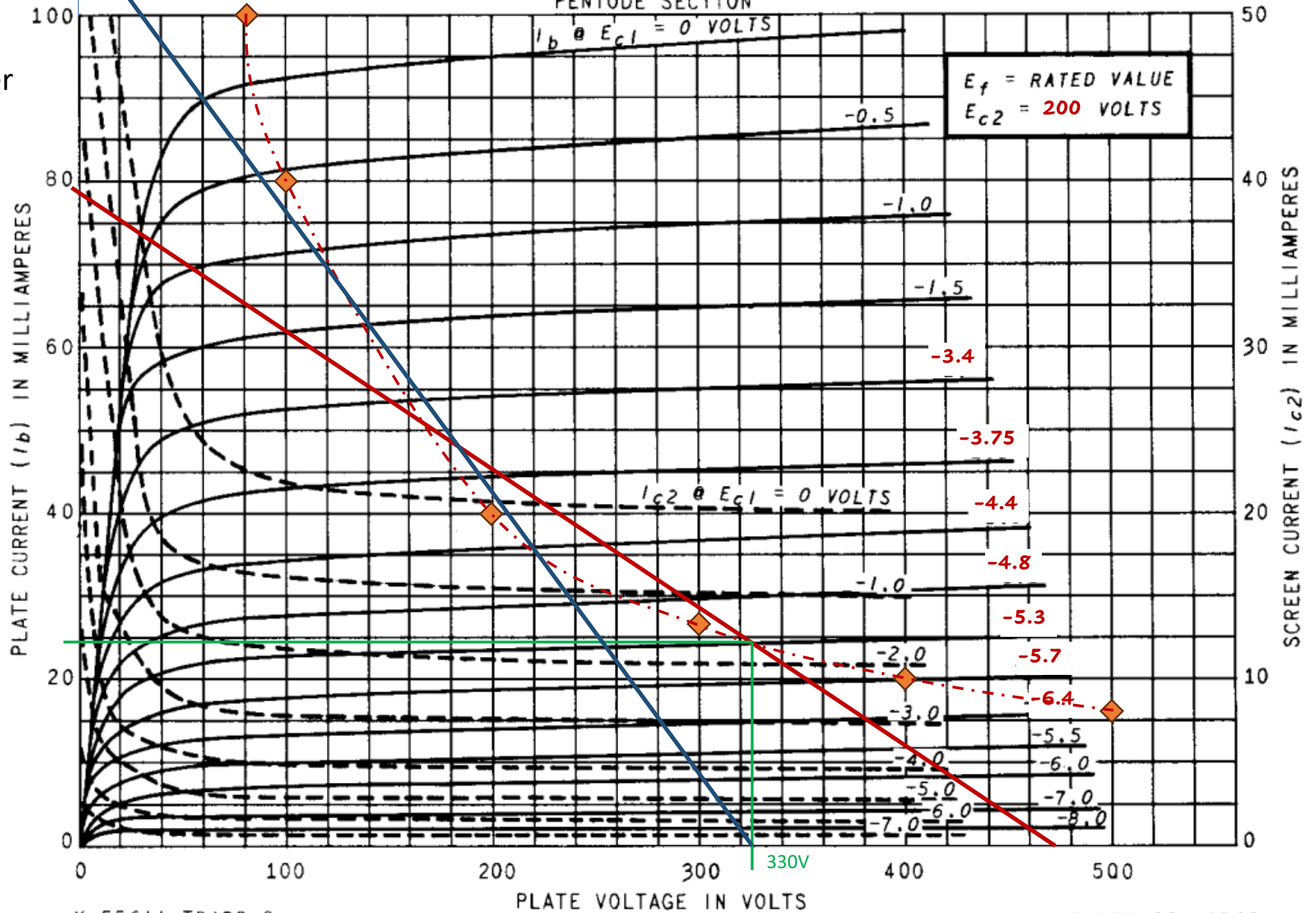
PENTODE SECTION

$I_b @ E_{c1} = 0$ VOLTS

$E_f = \text{RATED VALUE}$
 $E_{c2} = 200$ VOLTS

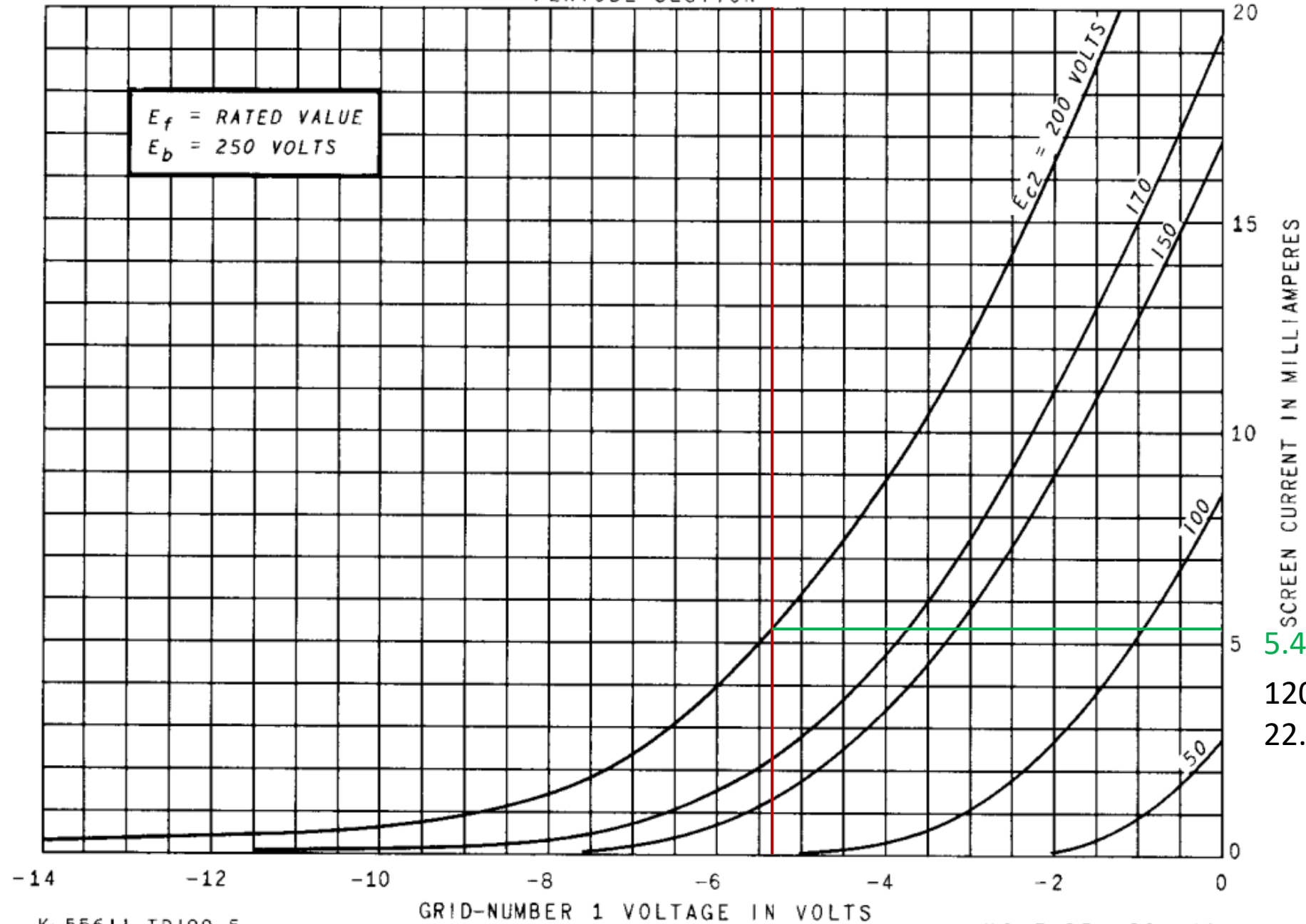
6HZ8 Pentode Power

12K Load Plate to Plate
 6000Ω Load A



AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION



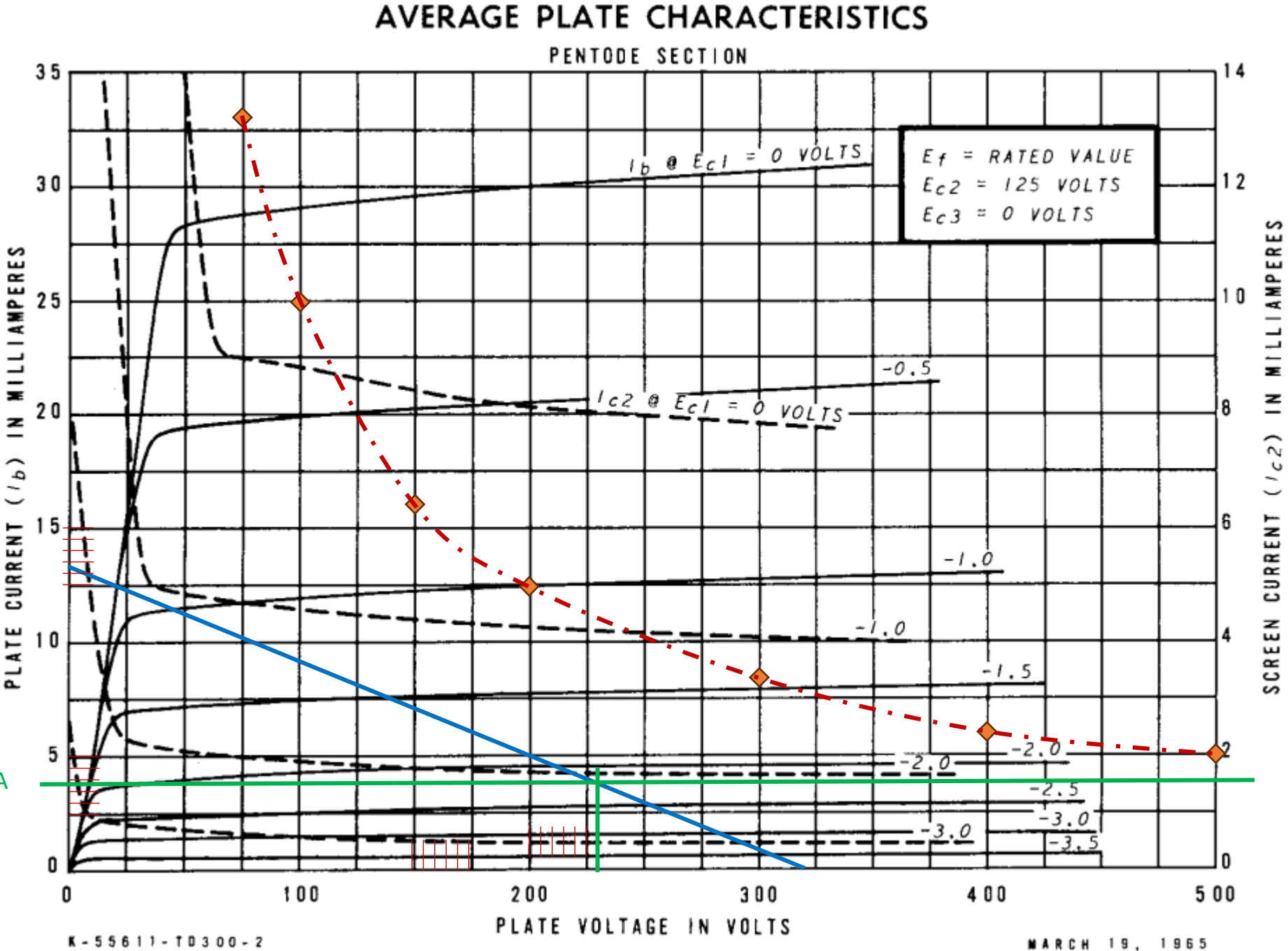
5.4mA

$$120\text{V} \div 0.0054\text{A} = 22.2\text{K}\Omega = \text{RGS}$$

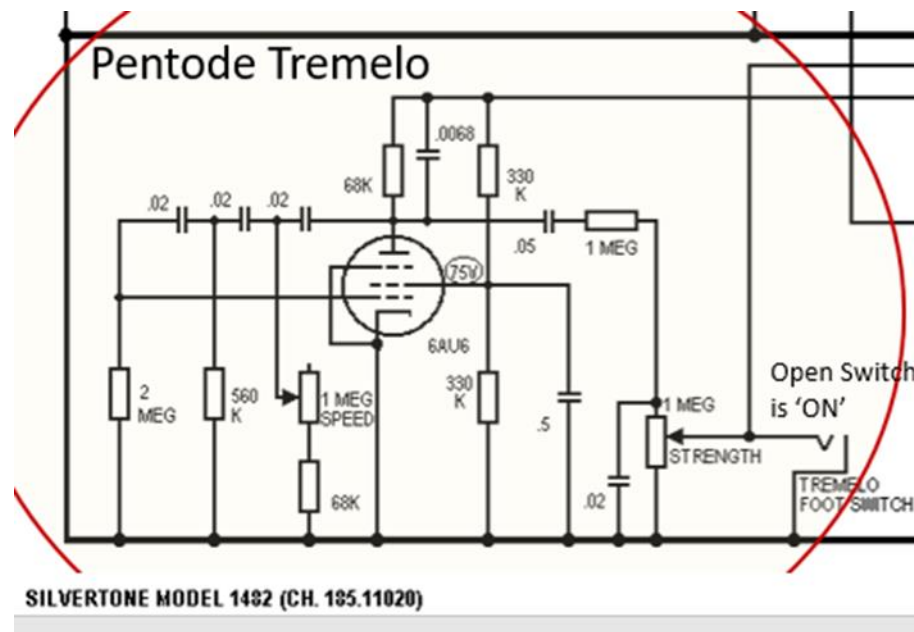
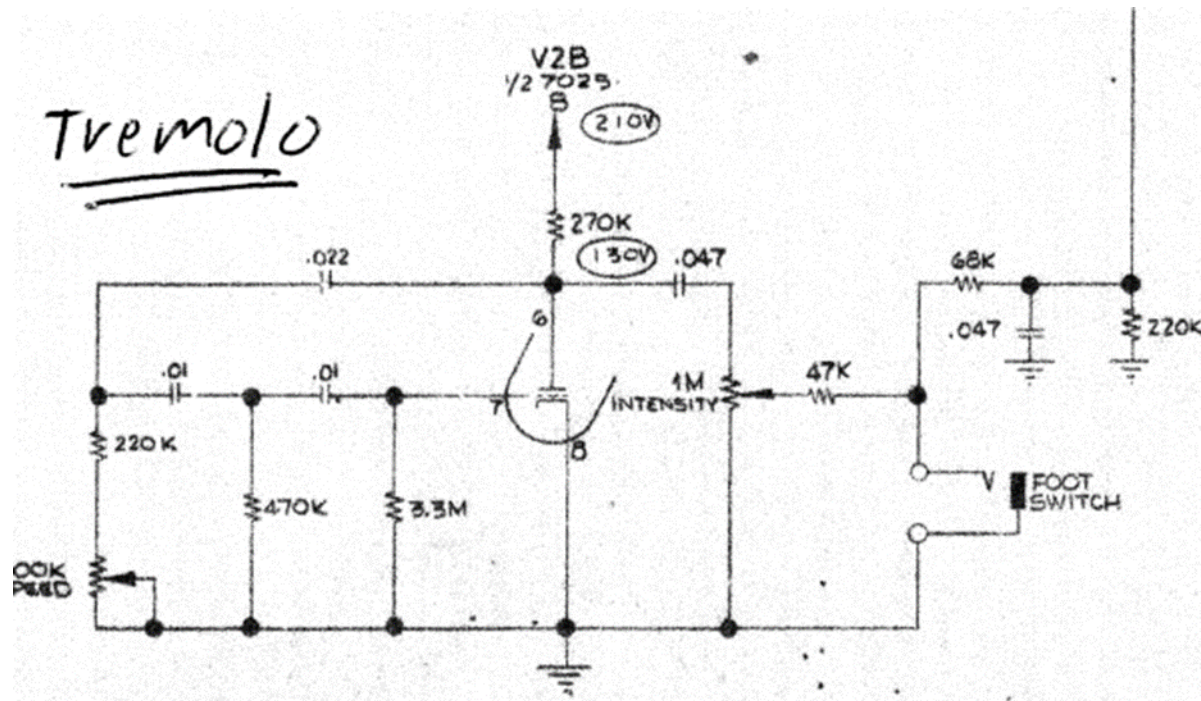
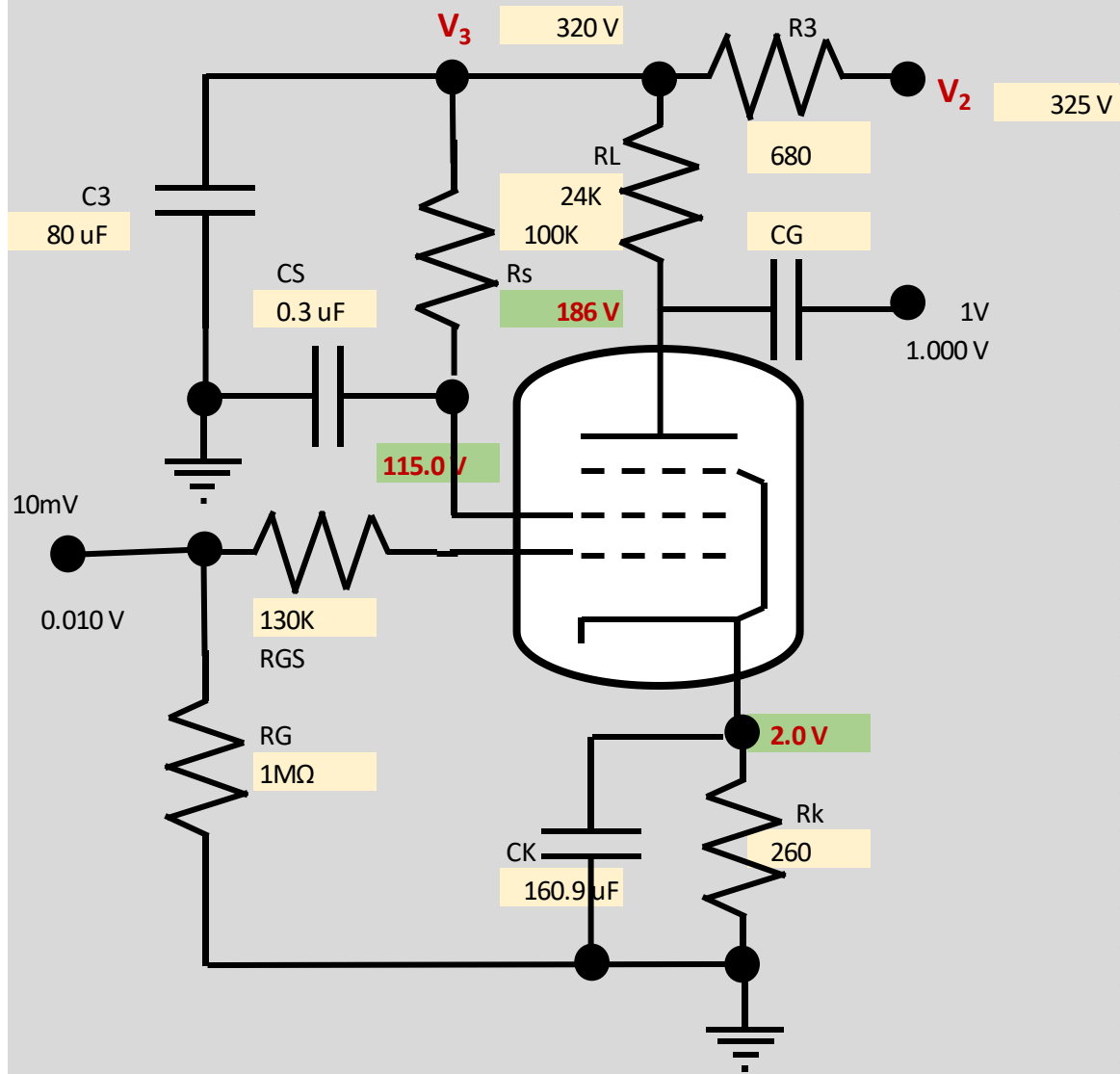
6KT8 Pentode Tremolo

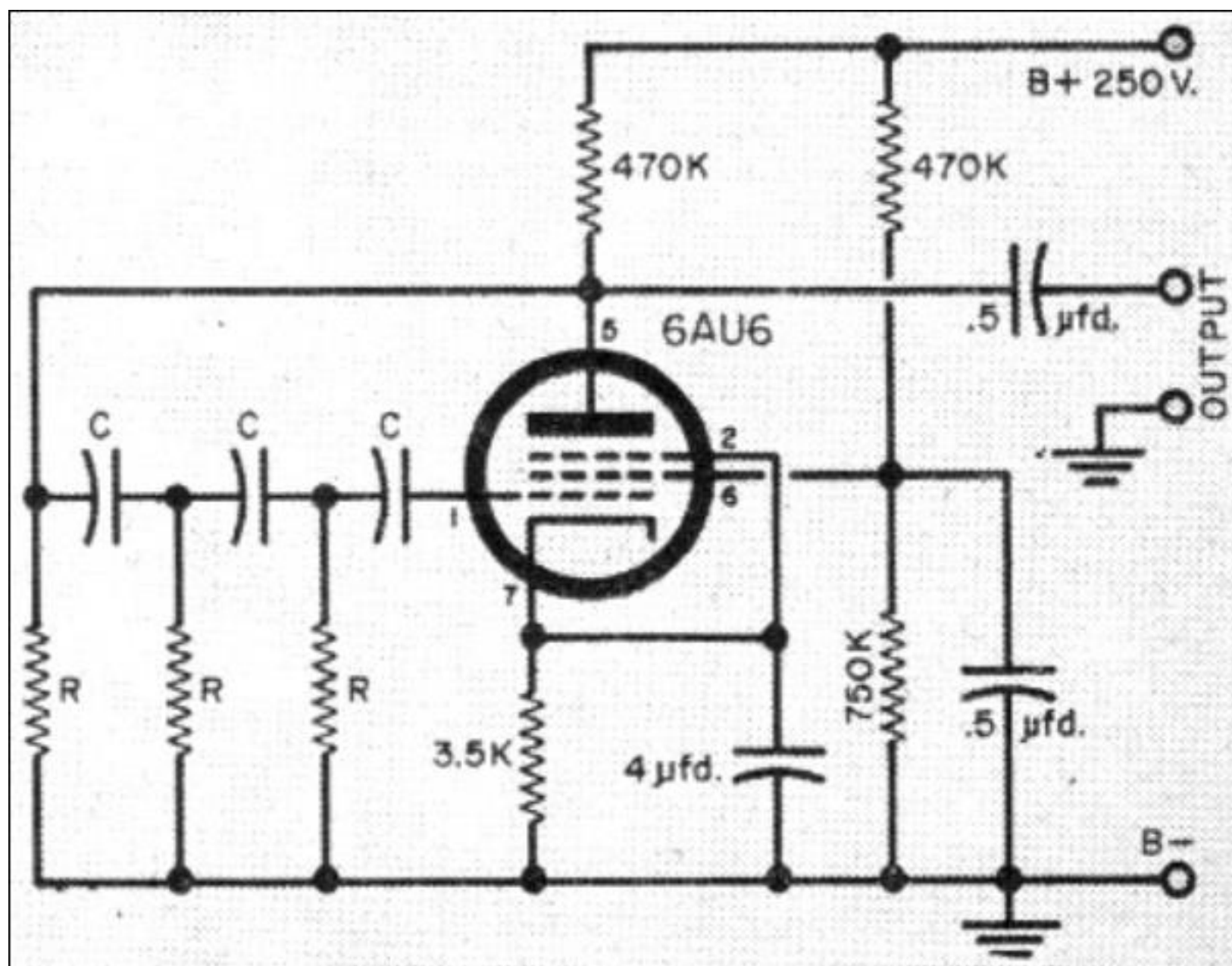
24K R_L

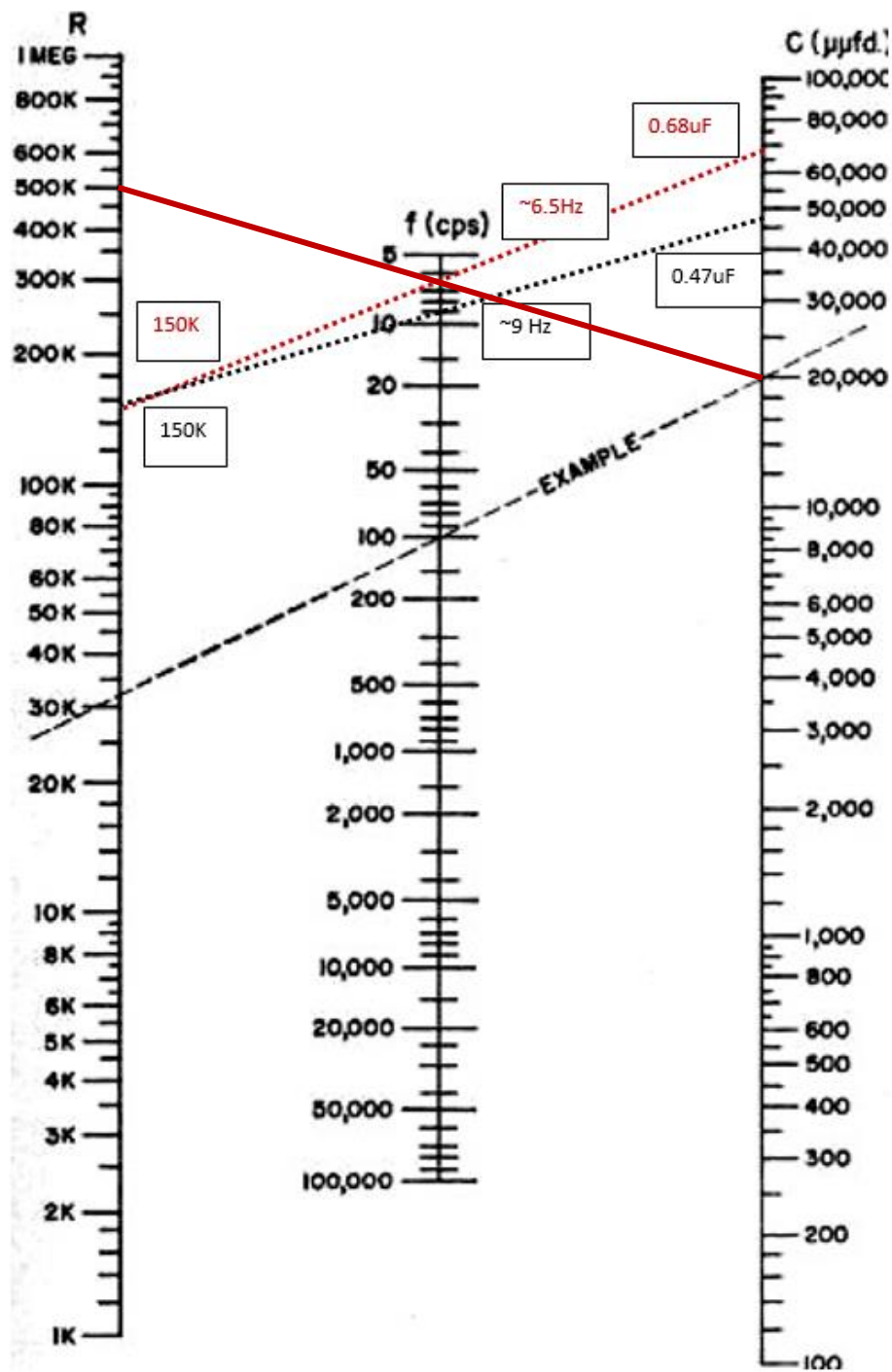
3.75mA



6KT8 Pentode Section







$\mu\text{F} / \text{MFD}$	nF	pF / MMFD
1uF / MFD	1000nF	1000000pF (MMFD)
0.82uF / MFD	820nF	820000pF (MMFD)
0.8uF / MFD	800nF	800000pF (MMFD)
0.7uF / MFD	700nF	700000pF (MMFD)
0.68uF / MFD	680nF	680000pF (MMFD)
0.6uF / MFD	600nF	600000pF (MMFD)
0.56uF / MFD	560nF	560000pF (MMFD)
0.5uF / MFD	500nF	500000pF (MMFD)
0.47uF / MFD	470nF	470000pF (MMFD)
0.4uF / MFD	400nF	400000pF (MMFD)
0.39uF / MFD	390nF	390000pF (MMFD)
0.33uF / MFD	330nF	330000pF (MMFD)
0.3uF / MFD	300nF	300000pF (MMFD)
0.27uF / MFD	270nF	270000pF (MMFD)
0.25uF / MFD	250nF	250000pF (MMFD)
0.22uF / MFD	220nF	220000pF (MMFD)
0.2uF / MFD	200nF	200000pF (MMFD)
0.18uF / MFD	180nF	180000pF (MMFD)
0.15uF / MFD	150nF	150000pF (MMFD)
0.12uF / MFD	120nF	120000pF (MMFD)
0.1uF / MFD	100nF	100000pF (MMFD)
0.082uF / MFD	82nF	82000pF (MMFD)
0.08uF / MFD	80nF	80000pF (MMFD)
0.07uF / MFD	70nF	70000pF (MMFD)
0.068uF / MFD	68nF	68000pF (MMFD)
0.06uF / MFD	60nF	60000pF (MMFD)
0.056uF / MFD	56nF	56000pF (MMFD)
0.05uF / MFD	50nF	50000pF (MMFD)
0.047uF / MFD	47nF	47000pF (MMFD)
0.04uF / MFD	40nF	40000pF (MMFD)

TRIODE-PENTODE

DESCRIPTION AND RATING

The 6HZ8 is a 9-pin, T-9 tube containing a high-mu triode and a sharp-cutoff pentode. The triode is intended for use as a voltage amplifier or sync separator, and the pentode is intended for video amplifier service.

GENERAL

ELECTRICAL

Cathode—Coated Unipotential
Heater Characteristics and Ratings
Heater Voltage, AC or DC*.....6.3 ± 0.6 Volts
Heater Current†.....1.125 Amperes
Direct Interelectrode Capacitances‡
Pentode Section
Grid-Number 1 to Plate: (Pg1 to Ep), Max. 0.1 pf
Input: Pg1 to (h+k+Pg2+Pg3+i.s.).....12 pf
Output: Pp to (h+k+Pg2+Pg3+i.s.).....5.0 pf
Triode Section
Grid to Plate: (Tg to Tp).....5.0 pf
Input: Tg to (h+Tk).....3.8 pf
Output: Tp to (h+Tk).....0.4 pf
Pentode Grid-Number 1 to Triode Plate:
(Pg1 to Tp), Max.0.005 pf
Triode Grid to Pentode Plate:
(Tg to Pp), Max.0.04 pf
Pentode Plate to Triode Plate:
(Pp to Tp), Max.0.2 pf

MECHANICAL

Operating Position—Any
Envelope—T-9, Glass
Base—E9-82, Small Button 9-Pin
Outline Drawing—EIA 9-77
Maximum Diameter.....1.188 Inches
Maximum Over-all Length.....2.990 Inches
Maximum Seated Height.....2.710 Inches

MAXIMUM RATINGS

DESIGN-MAXIMUM VALUES

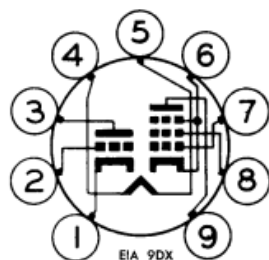
	Pentode Section	Triode Section
Plate Voltage.....	330	300 Volts
Screen Supply Voltage.....	330	Volts
Screen Voltage—See Screen Rating Chart		
Positive DC Grid-Number 1 Voltage...0	0	Volts
Plate Dissipation.....8.0	1.0	Watts
Screen Dissipation.....2.0	...	Watts

Heater—Cathode Voltage		
Heater Positive with Respect to Cathode		
DC Component.....	100	100 Volts
Total DC and Peak.....	200	200 Volts
Heater Negative with Respect to Cathode		
Total DC and Peak.....	200	200 Volts
Grid-Number 1 Circuit Resistance		
With Fixed Bias.....	0.25	0.5 Megohms
With Cathode Bias.....	1.0	1.0 Megohms

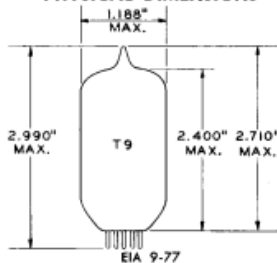
TERMINAL CONNECTIONS

- Pin 1—Triode Cathode
- Pin 2—Triode Grid
- Pin 3—Triode Plate
- Pin 4—Heater
- Pin 5—Heater
- Pin 6—Pentode Cathode, Grid Number 3, and Internal Shield
- Pin 7—Pentode Grid Number 1
- Pin 8—Pentode Grid Number 2 (Screen)
- Pin 9—Pentode Plate

BASING DIAGRAM



PHYSICAL DIMENSIONS



MAXIMUM RATINGS (CONT'D)

Design-Maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.

CHARACTERISTICS AND TYPICAL OPERATION

CLASS A₁ AMPLIFIER

	Pentode Section	Triode Section
Plate Voltage.....	60	250 Volts
Screen Voltage.....	170	170 Volts
Grid-Number 1 Voltage.....	0	−2.0 Volts
Cathode-Bias Resistor.....	100	Ohms
Amplification Factor.....	...	70
Plate Resistance, approximate.....	140000	Ohms
Transconductance.....	12600	4000 Micromhos
Plate Current.....	90	29 Milliampères
Screen Current.....	22.5	6.0 Milliampères
Grid-Number 1 Voltage, approximate		
Ib = 10 Microampères.....	−11.5	−5 Volts

NOTES

* The equipment designer should design the equipment so that heater voltage is centered at the specified bogey value, with heater supply variations restricted to maintain heater voltage within the specified tolerance.

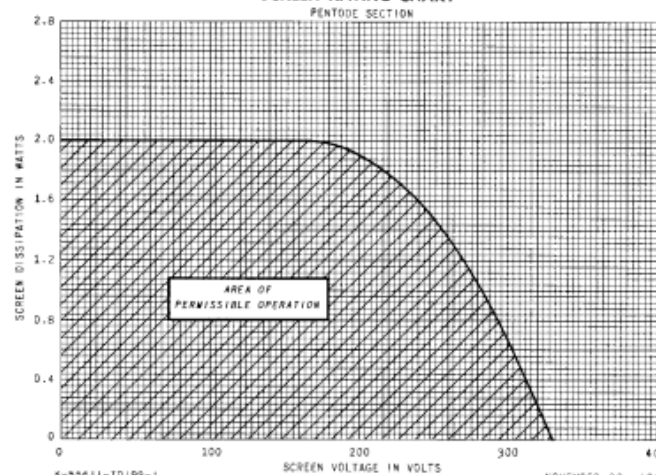
† Heater current of a bogey tube at Ef = 6.3 volts.

‡ Without external shield.

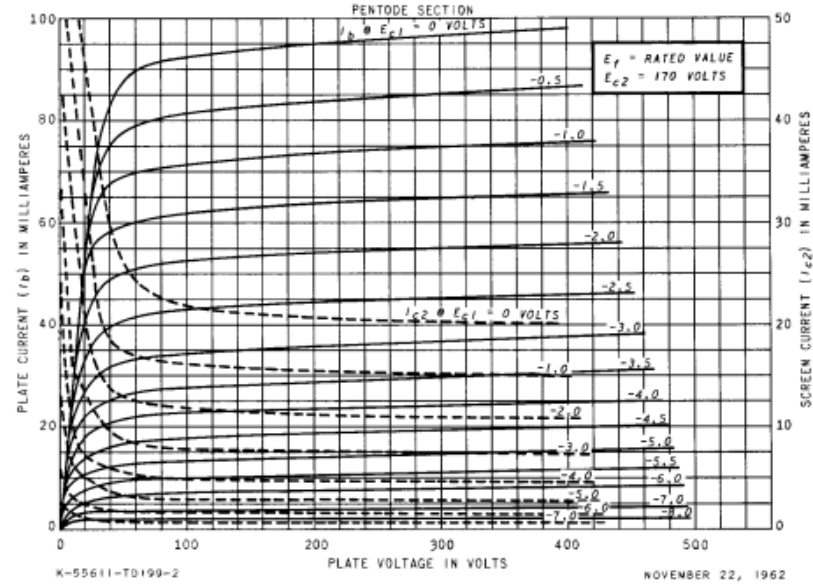
The tubes and arrangements disclosed herein may be covered by patents of General Electric Company or others. Neither the disclosure of any information herein nor the sale of tubes by General Electric Company conveys any license under patent claims covering combinations of tubes with other devices or elements.

In the absence of an express written agreement to the contrary, General Electric Company assumes no liability for patent infringement arising out of any use of the tubes with other devices or elements by any purchaser of tubes or others.

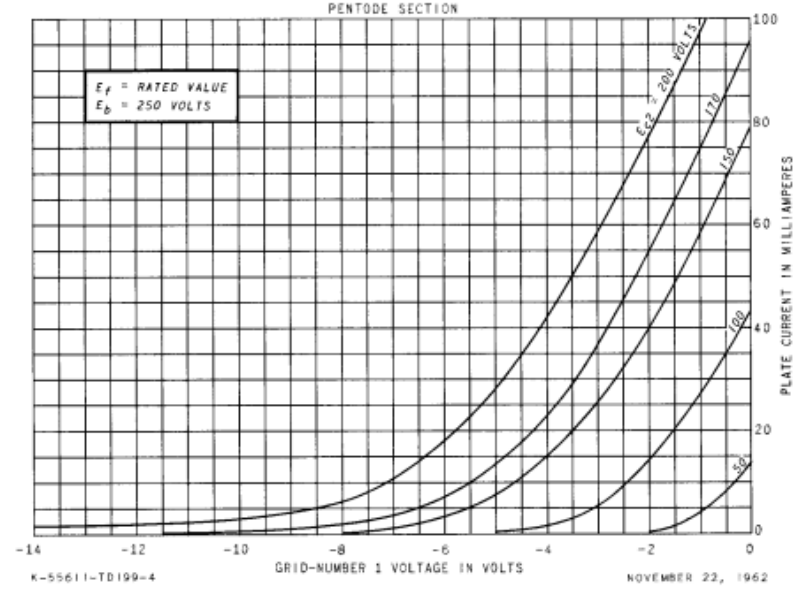
SCREEN RATING CHART



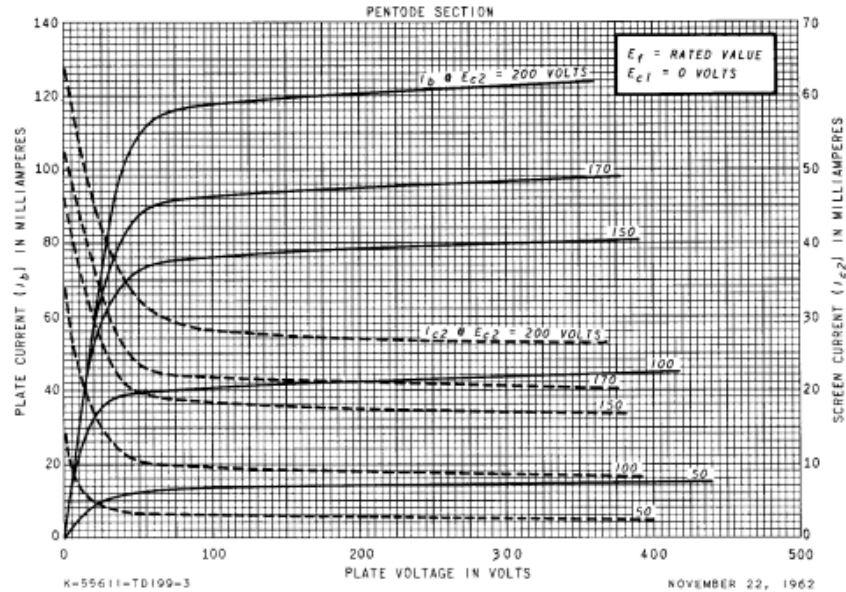
AVERAGE PLATE CHARACTERISTICS



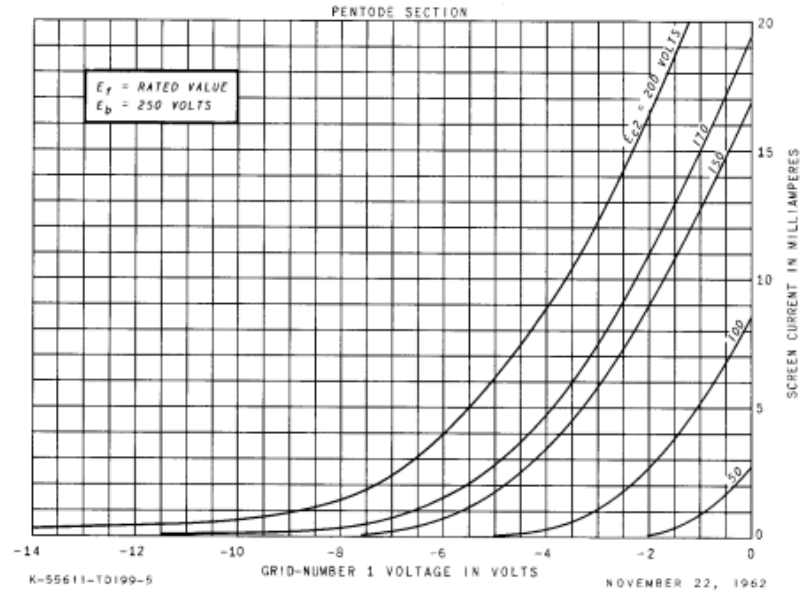
AVERAGE TRANSFER CHARACTERISTICS



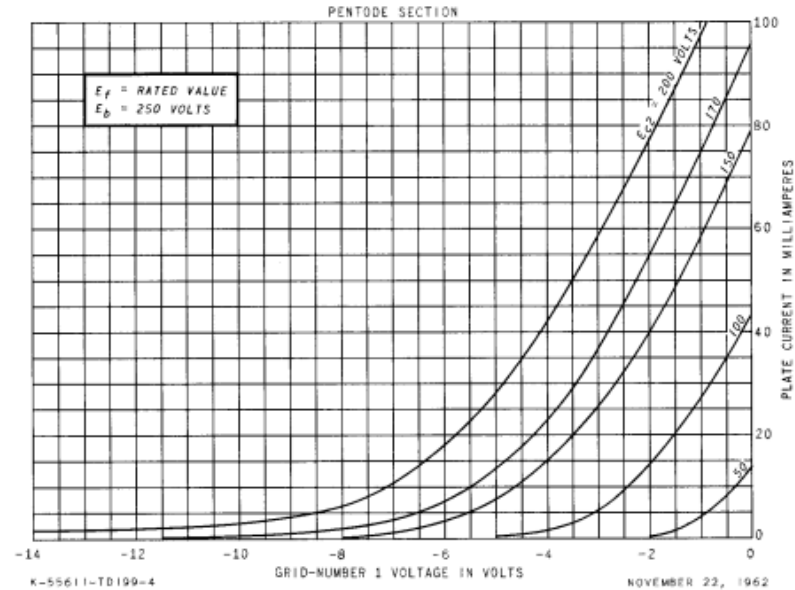
AVERAGE PLATE CHARACTERISTICS



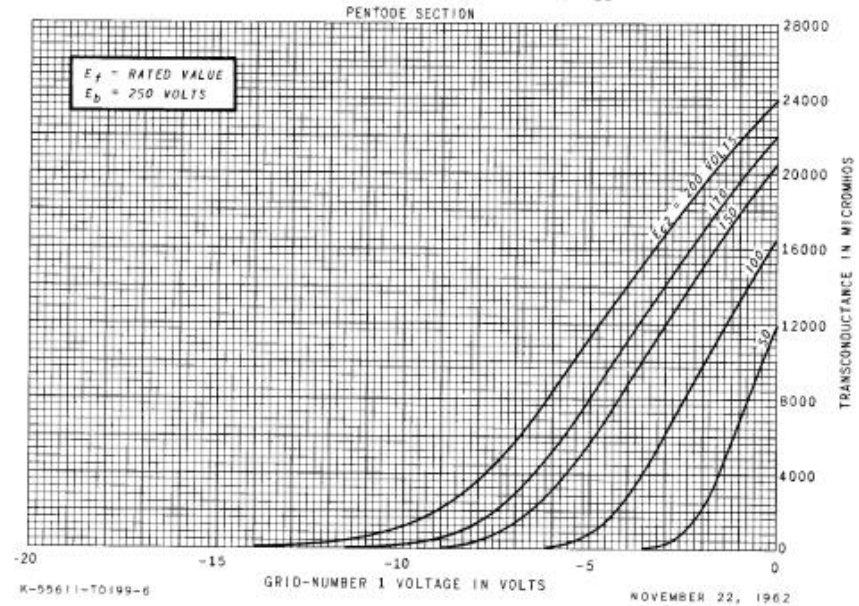
AVERAGE TRANSFER CHARACTERISTICS



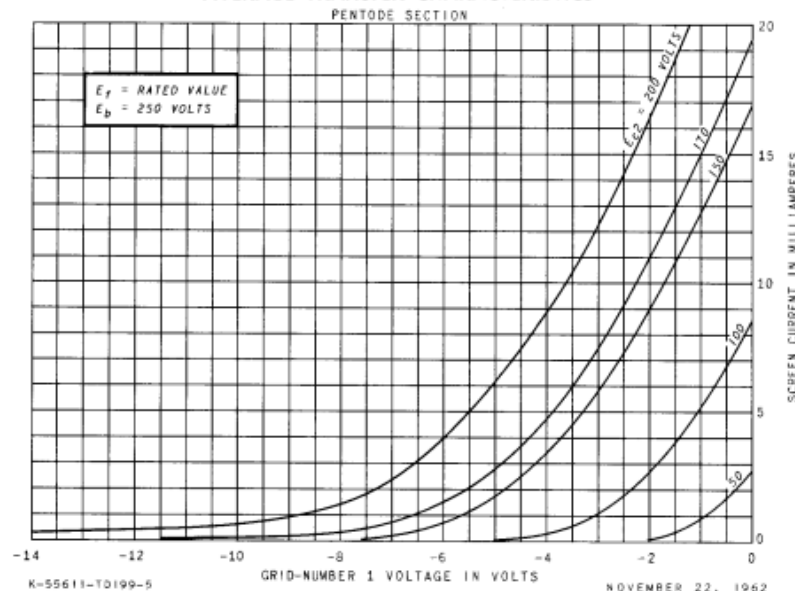
AVERAGE TRANSFER CHARACTERISTICS



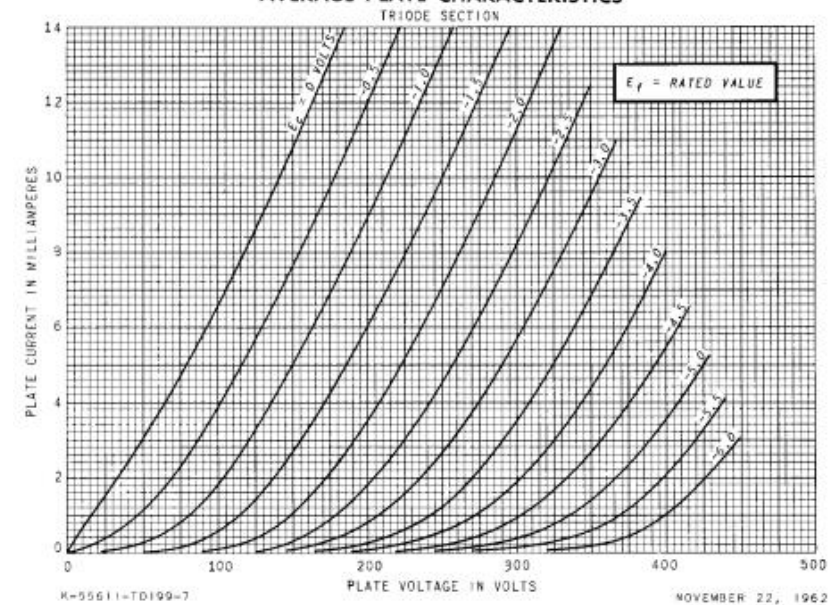
AVERAGE TRANSFER CHARACTERISTICS



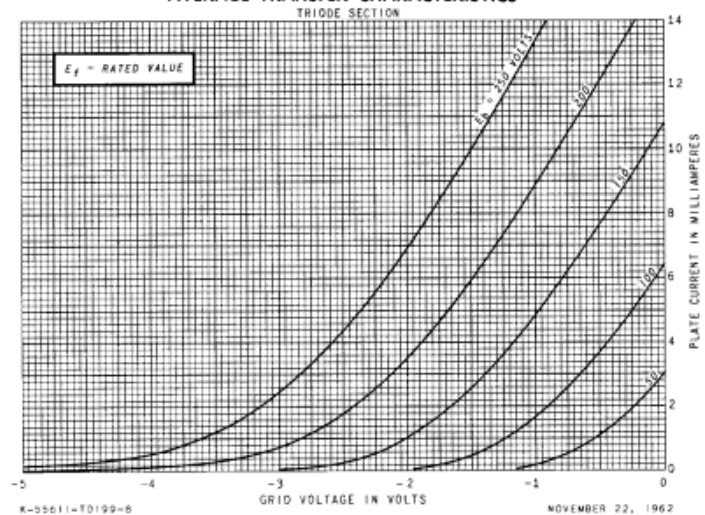
AVERAGE TRANSFER CHARACTERISTICS



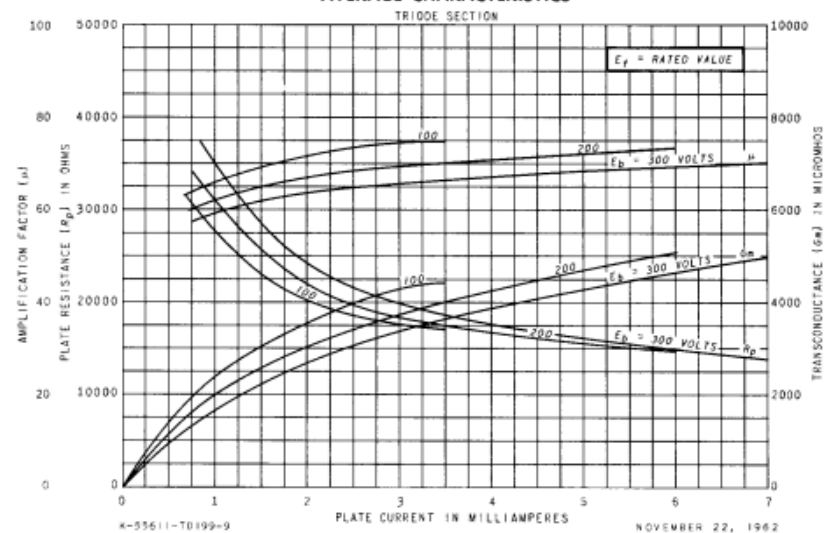
AVERAGE PLATE CHARACTERISTICS



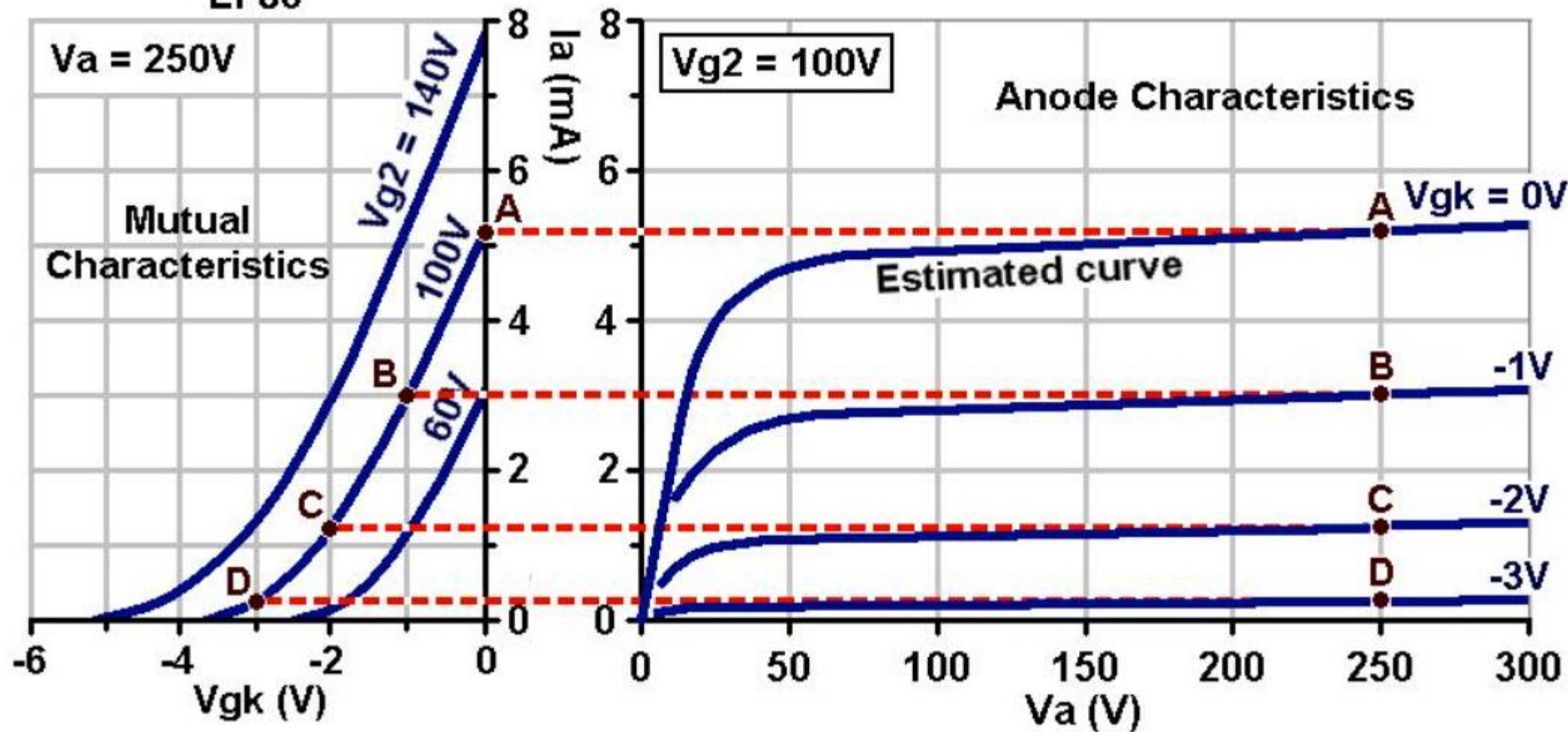
AVERAGE TRANSFER CHARACTERISTICS



AVERAGE CHARACTERISTICS

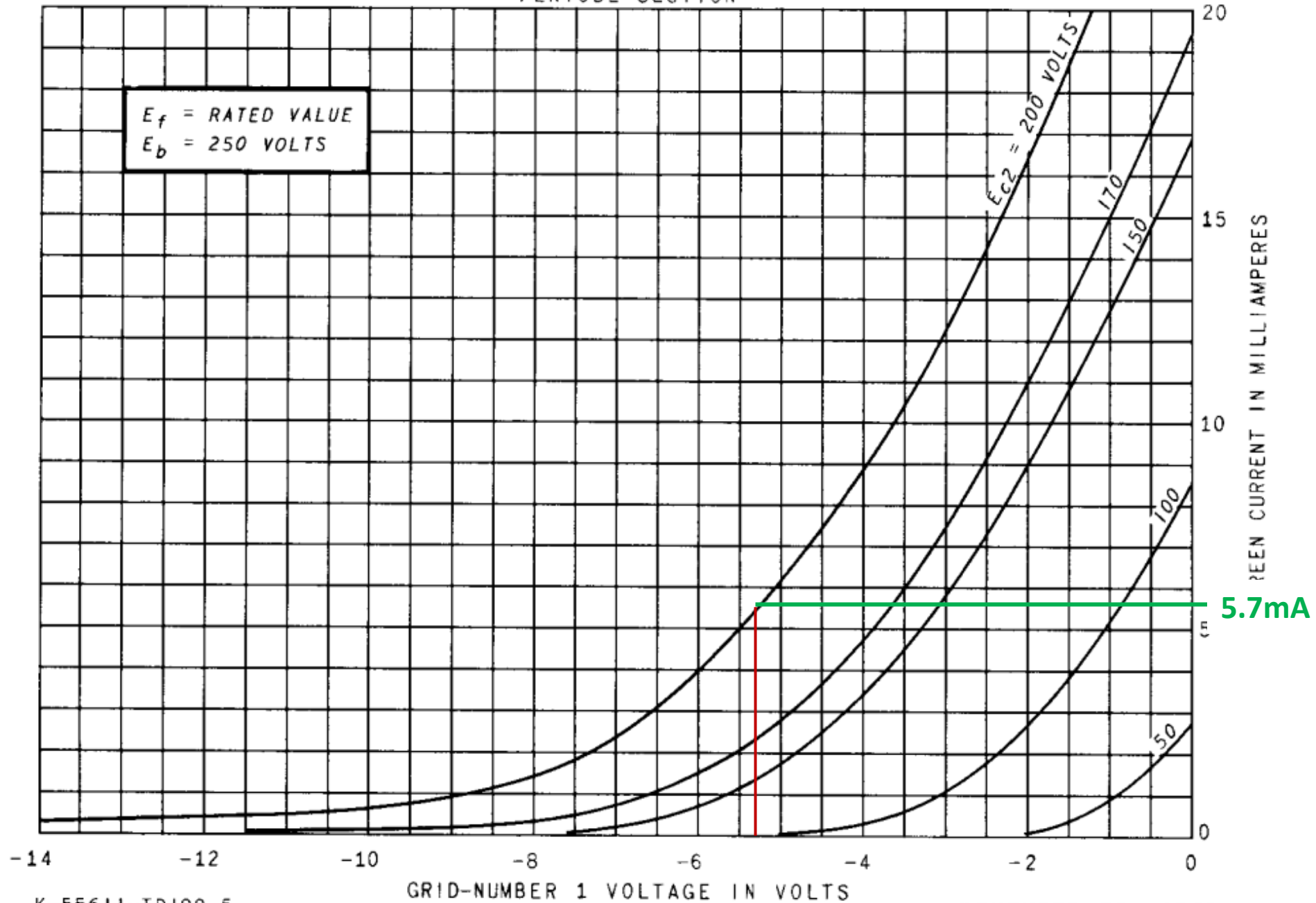


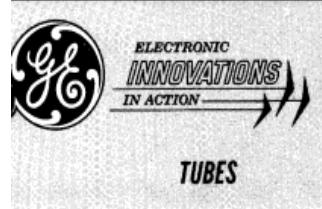
EF86



AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION





6KT8

Triode-Pentode

The 6KT8 is a general-purpose triode-pentode contained in a miniature envelope.

GENERAL

ELECTRICAL

Cathode - Coated Unipotential

Heater Characteristics and Ratings

Heater Voltage, AC or DC* . . . 6.3±0.6 Volts

Heater Current† 0.6 Amperes

Direct Interelectrode Capacitances

Pentode Section

Grid-Number 1 to Plate: **With Shield** **Without Shield**

(Pg1 to Pp), maximum . 0.03 0.046 pf

Input: Pg1 to (h + Pk +

Pg2 + Pg3 + i.s.) . . 7.5 7.5 pf

Output: Pp to (h + Pk +

Pg2 + Pg3 + i.s.) . . 2.8 2.2 pf

Triode Section

Grid to Plate: (Tg to Tp) 3.0 3.0 pf

Input: Tg to (h + Tk +

Pk + Pg3 + i.s.) . . 3.2 3.2 pf

Output: Tp to (h + Tk +

Pk + Pg3 + i.s.) . . 2.4 1.6 pf

Coupling

Triode Grid to Pentode

Plate: (Tg to Pp),

maximum 0.003 0.018 pf

Pentode Grid-Number 1 to

Triode Plate: (Pg1 to

Tp), maximum 0.002 0.006 pf

With Shield **Without Shield**

MECHANICAL

Operating Position - Any

Envelope - T-6 1/2, Glass

Base - E9-1, Small Button 9-Pin

Outline Drawing - EIA 6-2

Maximum Diameter. 0.875 Inches

Minimum Diameter. 0.750 Inches

Maximum Over-all Length . . . 2.188 Inches

Maximum Seated Height 1.938 Inches

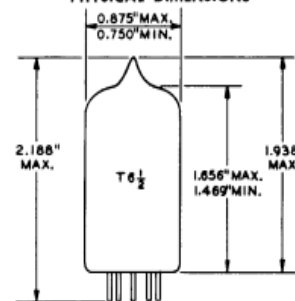
MAXIMUM RATINGS

Design-Maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.

PHYSICAL DIMENSIONS

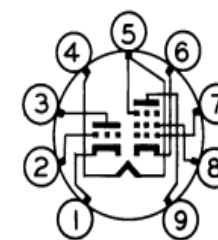


EIA 6-2

TERMINAL CONNECTIONS

- Pin 1 - Triode Cathode
- Pin 2 - Triode Grid
- Pin 3 - Triode Plate
- Pin 4 - Heater
- Pin 5 - Heater, Pentode Grid
- Number 3, and Internal Shield
- Pin 6 - Pentode Cathode
- Pin 7 - Pentode Grid Number 1
- Pin 8 - Pentode Grid Number 2 (Screen)
- Pin 9 - Pentode Plate

BASING DIAGRAM



EIA 9QP

MAXIMUM RATINGS (Cont'd)

DESIGN-MAXIMUM VALUES

	Pentode Section	Triode Section	
Plate Voltage	330	330	Volts
Screen Supply Voltage.	330	---	Volts
Screen Voltage - See Screen Rating Chart			
Positive DC Grid-Number 1 Voltage.	0	0	Volts
Plate Dissipation	2.5	1.0	Watts
Screen Dissipation.	0.55	---	Watts
Heater-Cathode Voltage			
Heater Positive with Respect to Cathode			
DC Component.	100	100	Volts
Total DC and Peak	200	200	Volts
Heater Negative with Respect to Cathode			
Total DC and Peak	200	200	Volts
Grid-Number 1 Circuit Resistance			
With Fixed Bias.	0.25	0.5	Megohms
With Cathode Bias	1.0	1.0	Megohms

CHARACTERISTICS AND TYPICAL OPERATION

AVERAGE CHARACTERISTICS

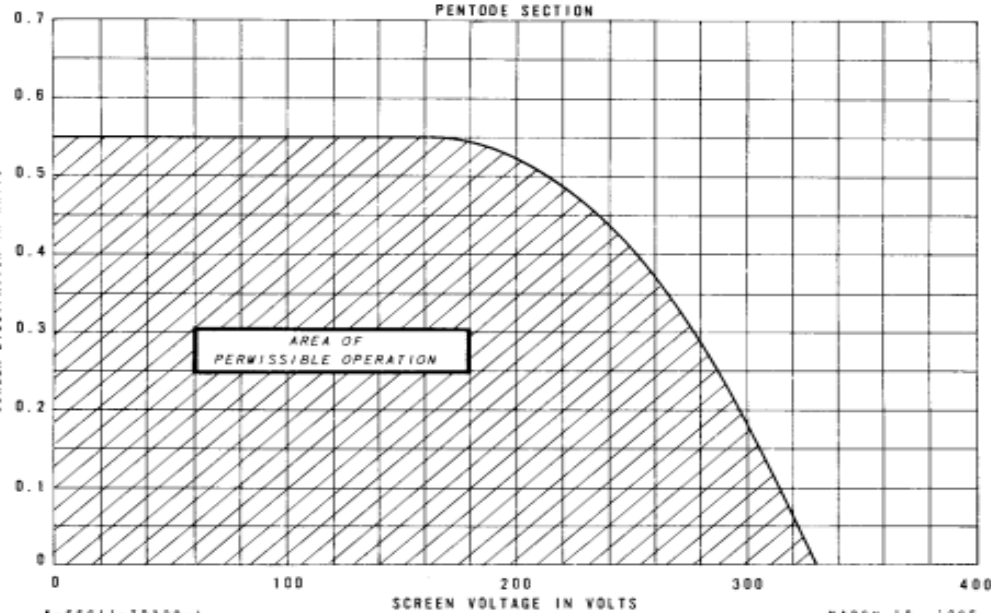
	Pentode Section	Triode Section	
Plate Voltage	125	250	Volts
Screen Voltage	125	---	Volts
Grid-Number 1 Voltage.	-1.0	-2.0	Volts
Amplification Factor	---	100	
Plate Resistance, approximate	150000	31500	Ohms
Transconductance	10000	3200	Micromhos
Plate Current	12	1.8	Milliamperes
Screen Current	4.5	---	Milliamperes
Grid-Number 1 Voltage, approximate			
Ib = 20 Microamperes	-7	-3.5	Volts

NOTES

- * The equipment designer should design the equipment so that heater voltage is centered at the specified bogey value, with heater supply variations restricted to maintain heater voltage within the specified tolerance.
- † Heater current of a bogey tube at Ef = 6.3 volts.
- § With external shield (EIA 315) connected to pins 4 and 5.

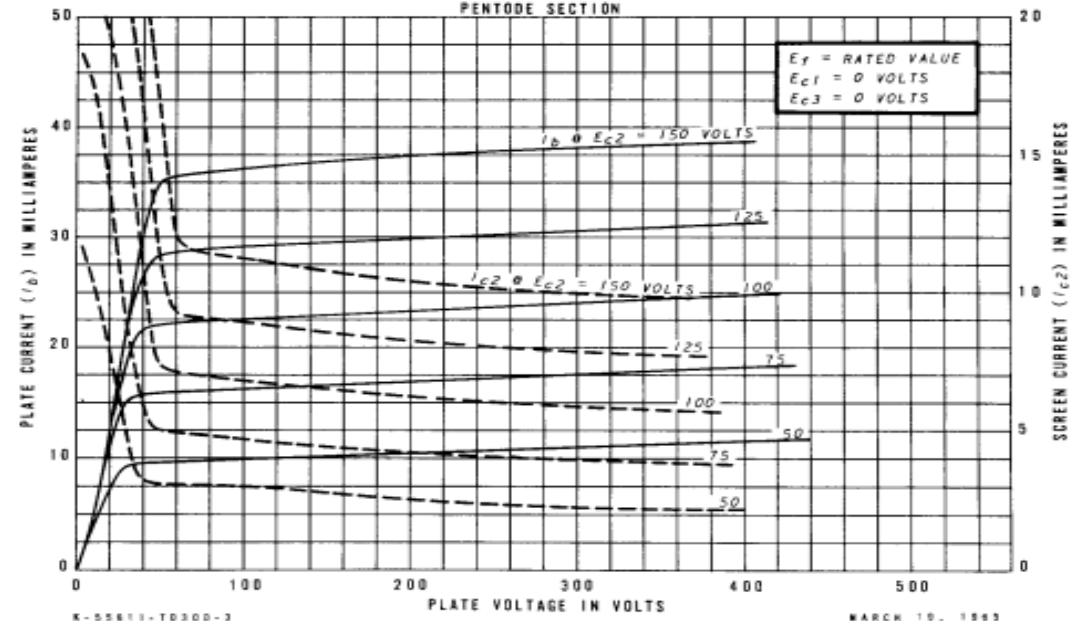
SCREEN RATING CHART

PENTODE SECTION



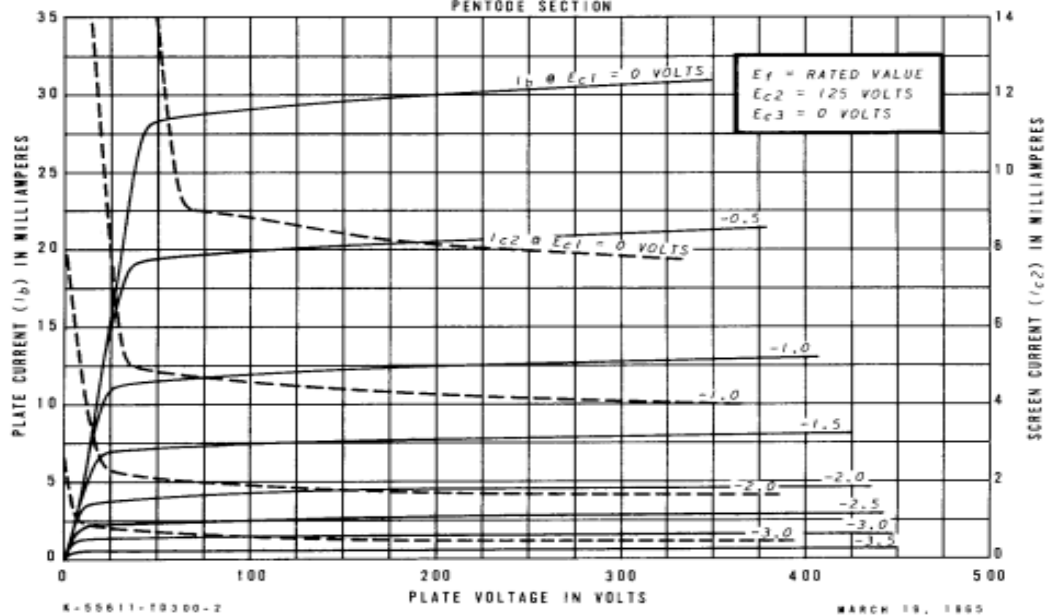
AVERAGE PLATE CHARACTERISTICS

PENTODE SECTION



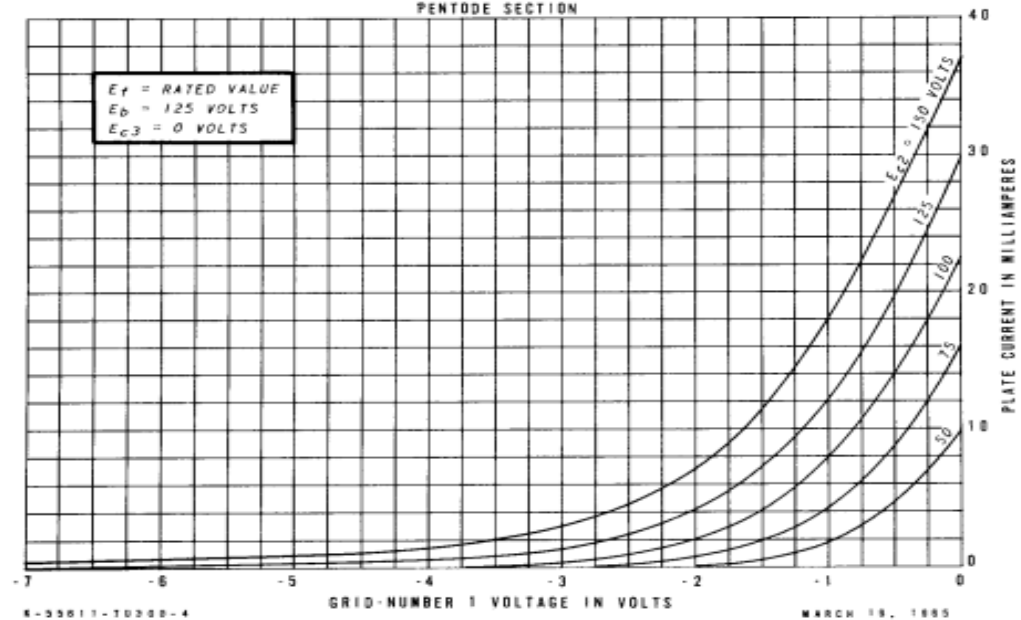
AVERAGE PLATE CHARACTERISTICS

PENTODE SECTION



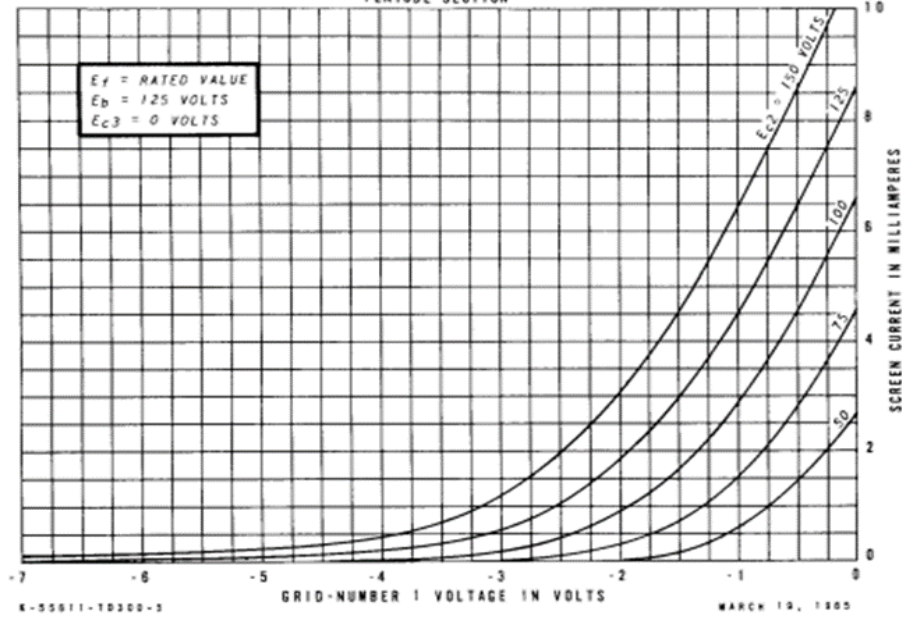
AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION



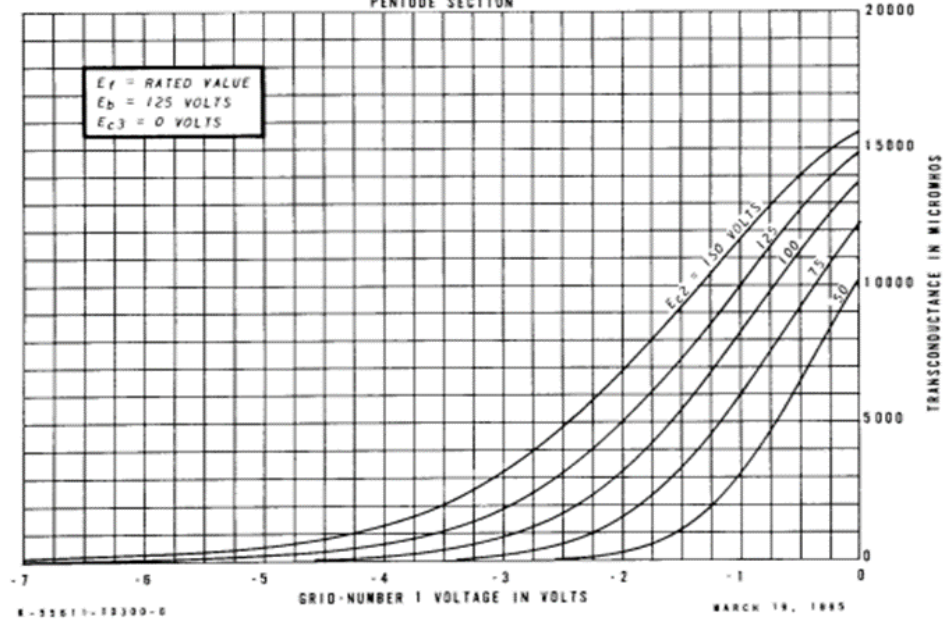
AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION



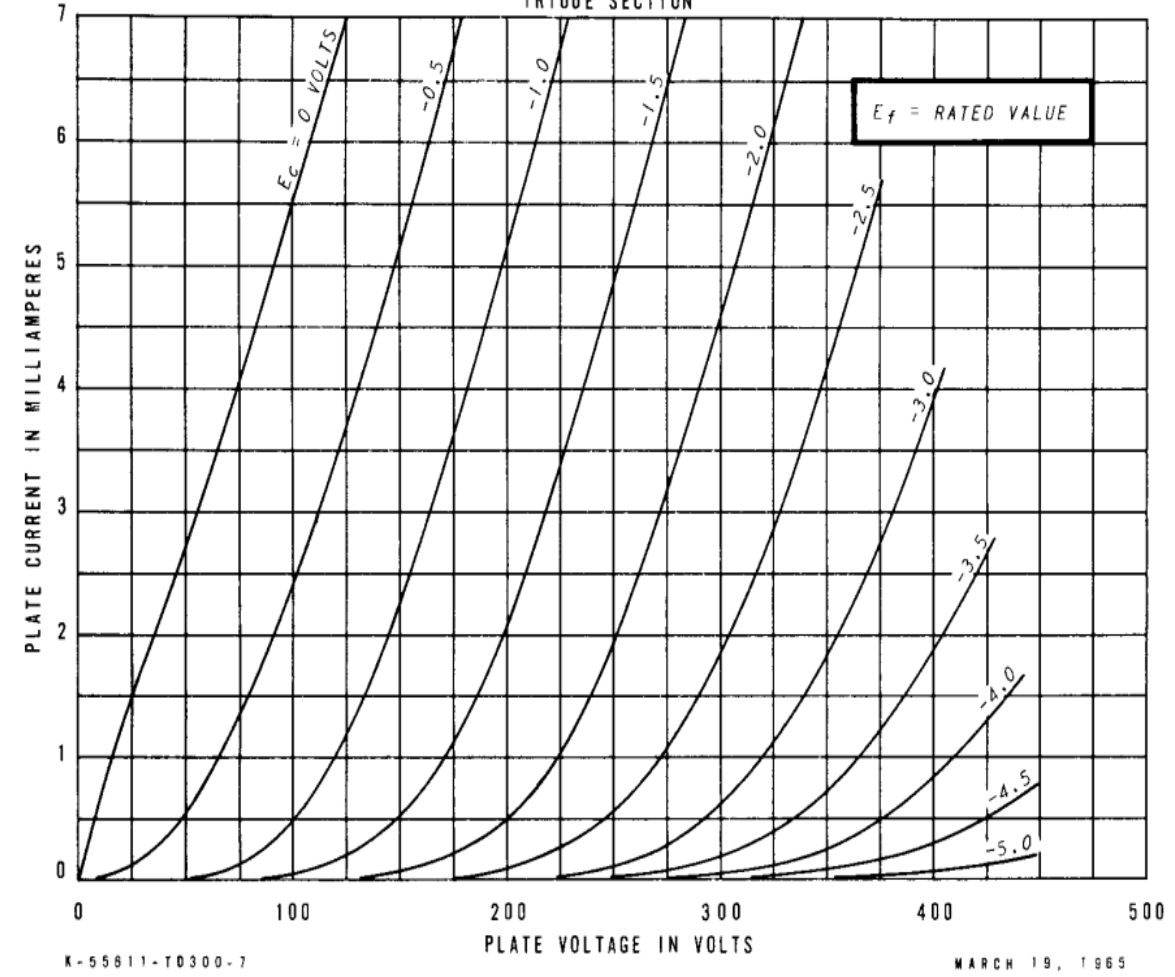
AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION



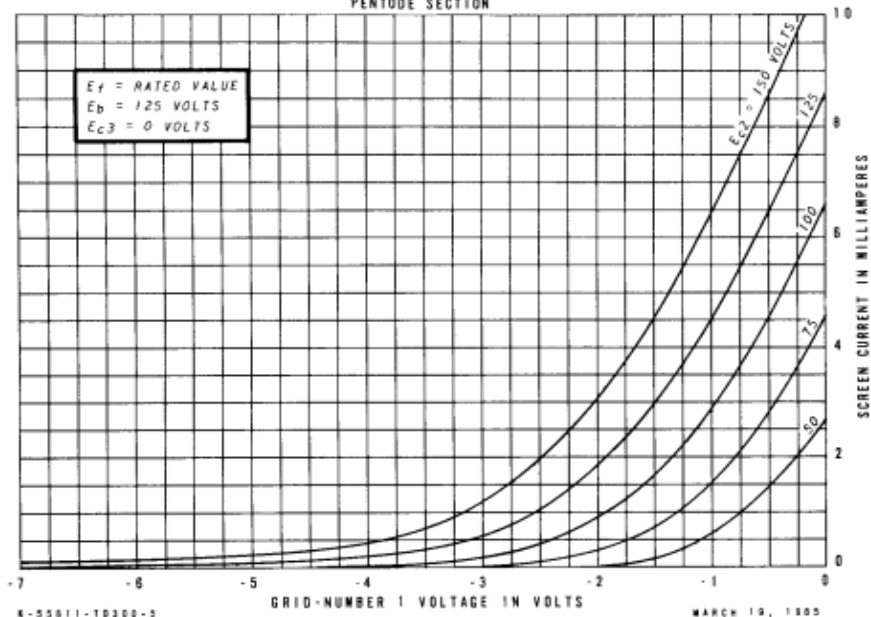
AVERAGE PLATE CHARACTERISTICS

TRIODE SECTION



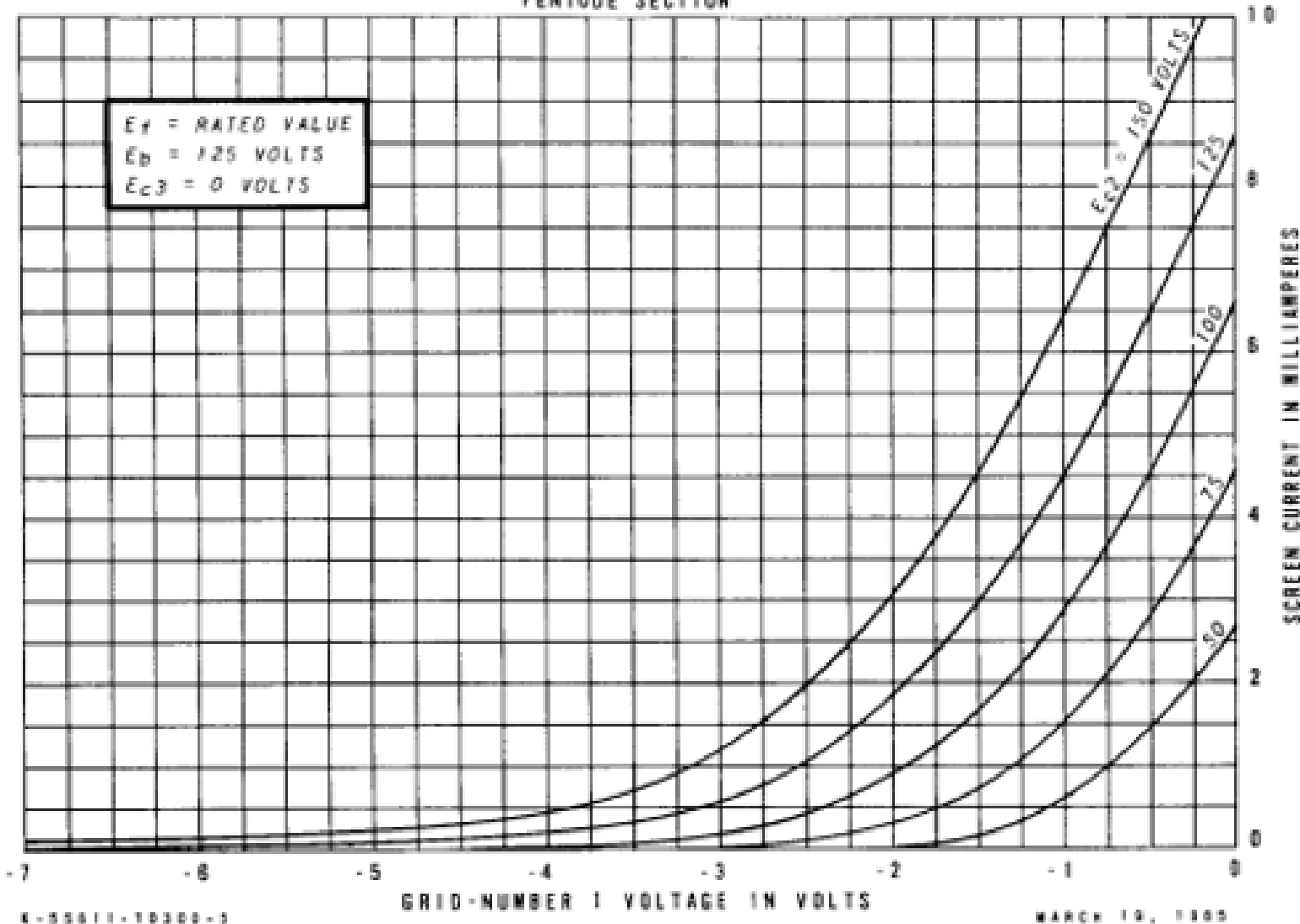
AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION



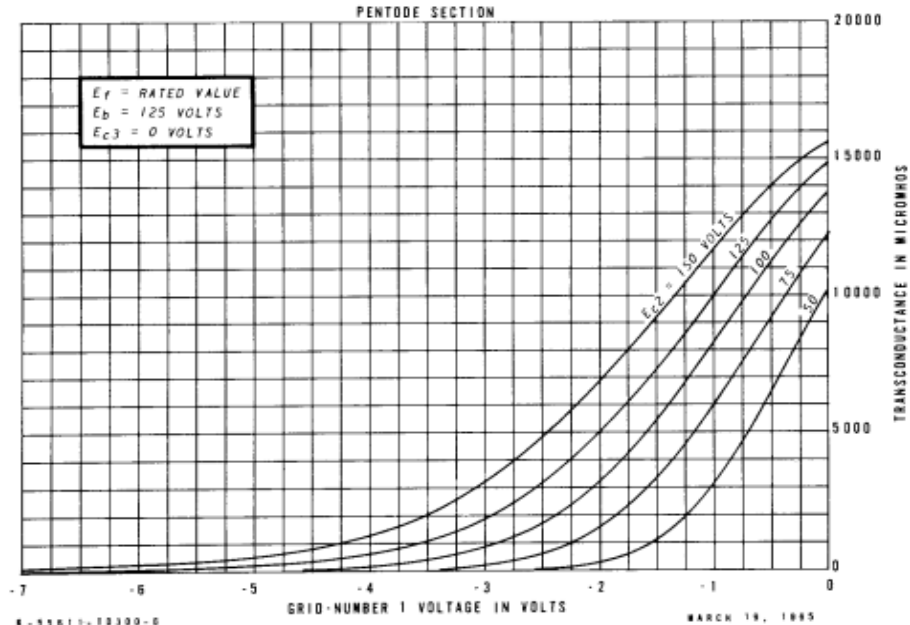
AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION

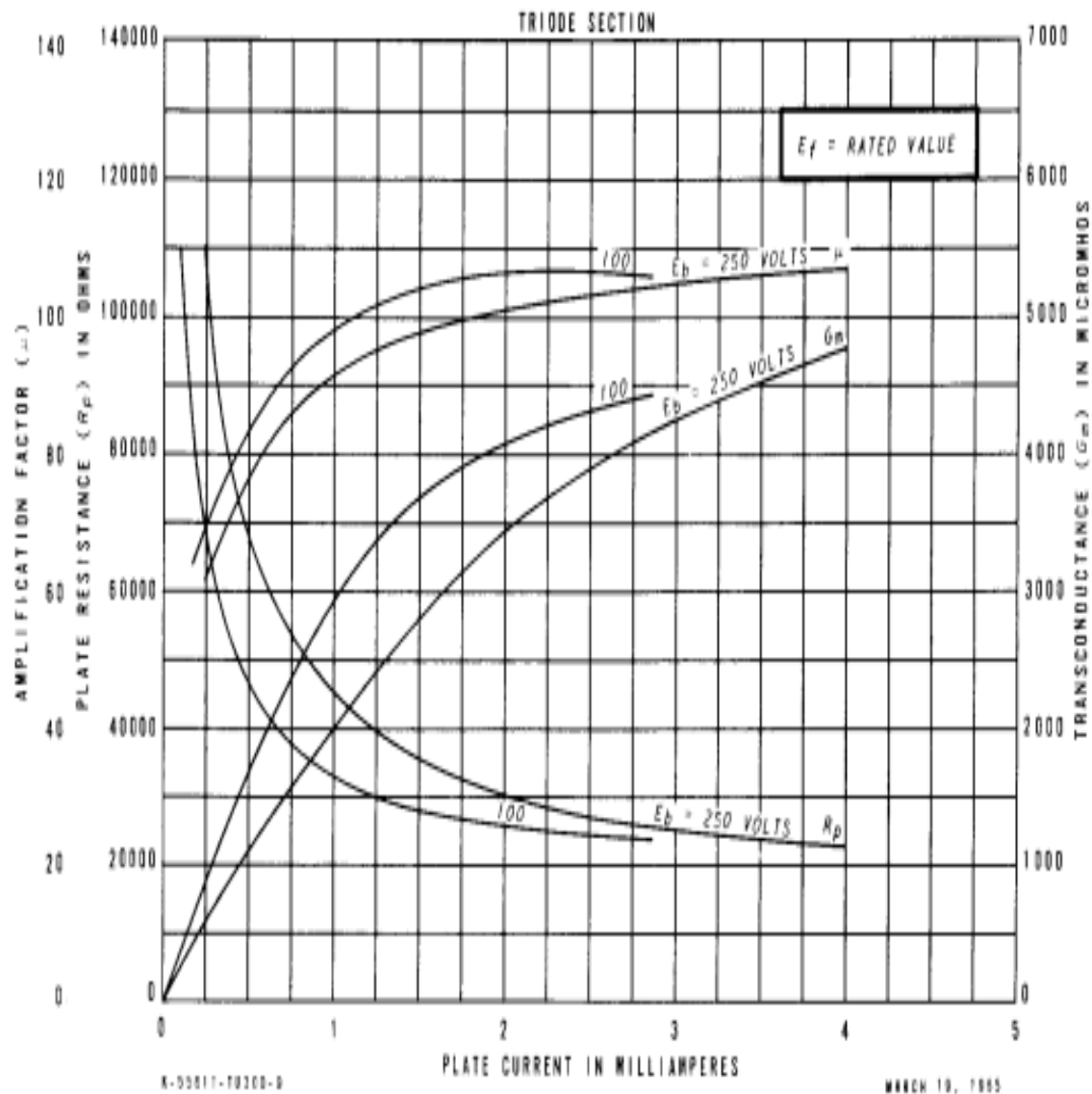


AVERAGE TRANSFER CHARACTERISTICS

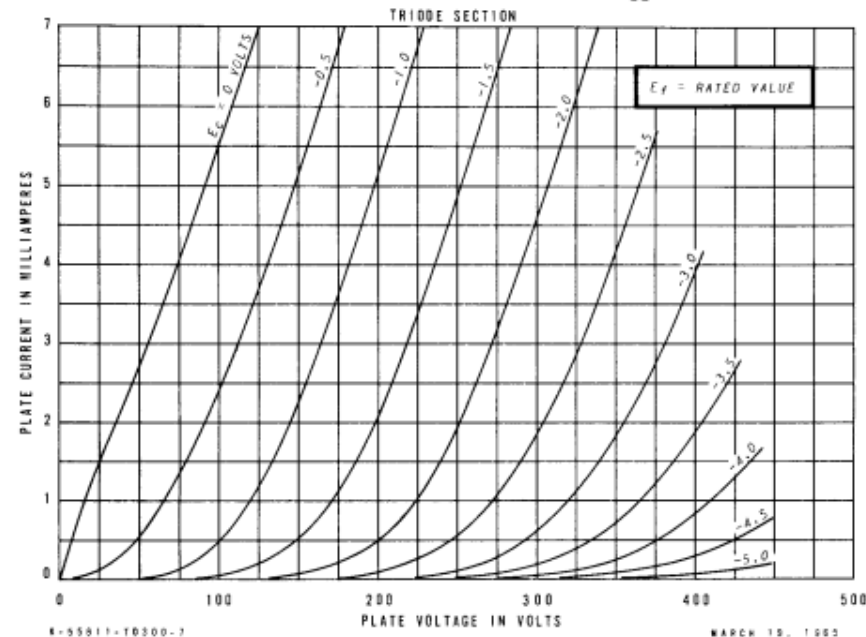
PENTODE SECTION



AVERAGE CHARACTERISTICS



AVERAGE PLATE CHARACTERISTICS



AVERAGE TRANSFER CHARACTERISTICS

