from JETEC release #1862, March 4, 1957
sponsor: Rogers Majestic Electronics, Ltd.

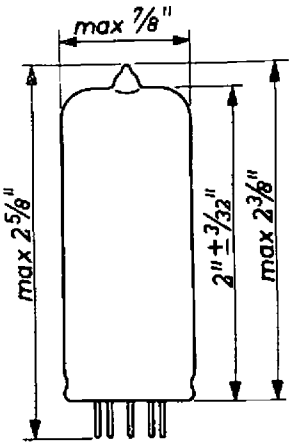
12AD5

REMOTE CUT-OFF R.F. PENTODE

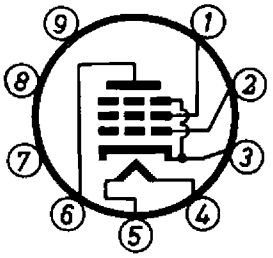
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
RETMA basing designation	~~9CA~~ 9AZ
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Grid No.2
2	Grid No.1
3	Cathode, grid No.3, internal shield
4	Heater
5	Heater
6	Plate
7	Internal connection
8	Internal connection
9	No connection

HEATER DATA

Heater voltage	12.6 volts
Heater current	0.1 amp

DIRECT INTERELECTRODE CAPACITANCES

Output capacitance	8.1 μμF
Input capacitance	5.1 μμF
Grid No.1 to plate	max. 0.002 μμF
Grid No.1 to heater	max. 0.05 μμF

MAXIMUM RATINGS (Design Center Values)

Plate voltage (without current)	550 volts
Plate voltage	250 volts
Plate dissipation	2.0 watts
Grid No.2 voltage (without current)	550 volts
Grid No.2 voltage (plate current less than 4 mA)	250 volts
Grid No.2 voltage (plate current = 7.2 mA)	150 volts

MAXIMUM RATINGS (Design Center Values) continued

Grid No.2 dissipation	0.3 watts
Cathode current	10 mamps
External resistance between grid No.1 and cathode	3 megohms
External resistance between heater and cathode	20,000 ohms
Voltage between heater and cathode	150 volts

OPERATING CHARACTERISTICS AS R.F. OR I.F. AMPLIFIER

A. with sliding grid No.2 voltage

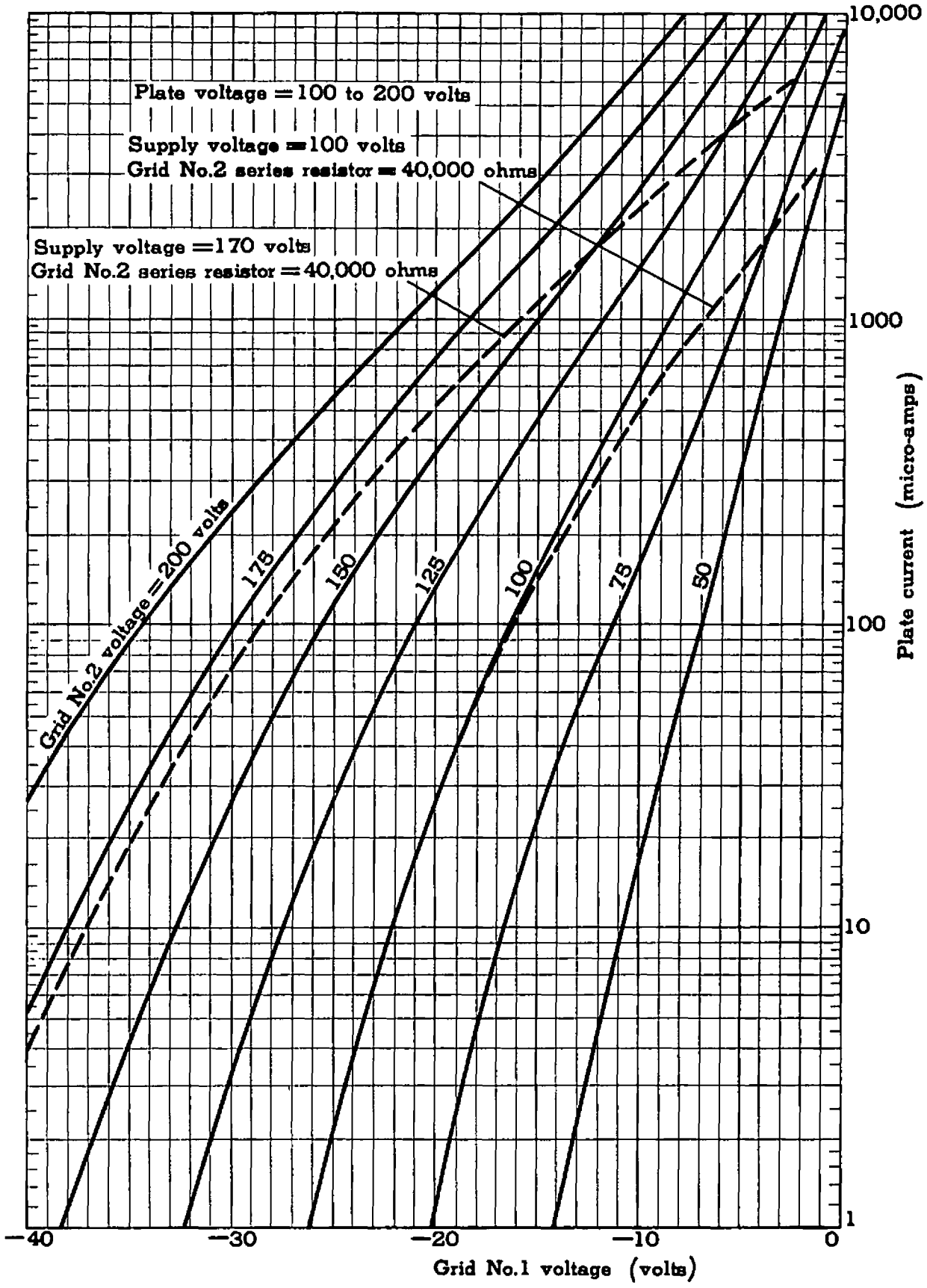
Plate and supply voltage	100		170		volts
Grid No.2 series resistor	40,000		40,000		ohms
Cathode resistor	325		325		ohms
Grid No.1 voltage	-1.4	-17	-2.5	-28	volts
Plate current	3.3	-	6.0	-	mamps
Grid No.2 current	1.0	-	1.75	-	mamps
Transconductance	1900	19	2200	22	µmhos
Plate resistance	0.8	>10	1.0	>10	megohms
Amplification factor of grid No.2 with respect to grid No.1	18	-	18	-	
Equivalent noise resistance	5500	-	6500	-	ohms

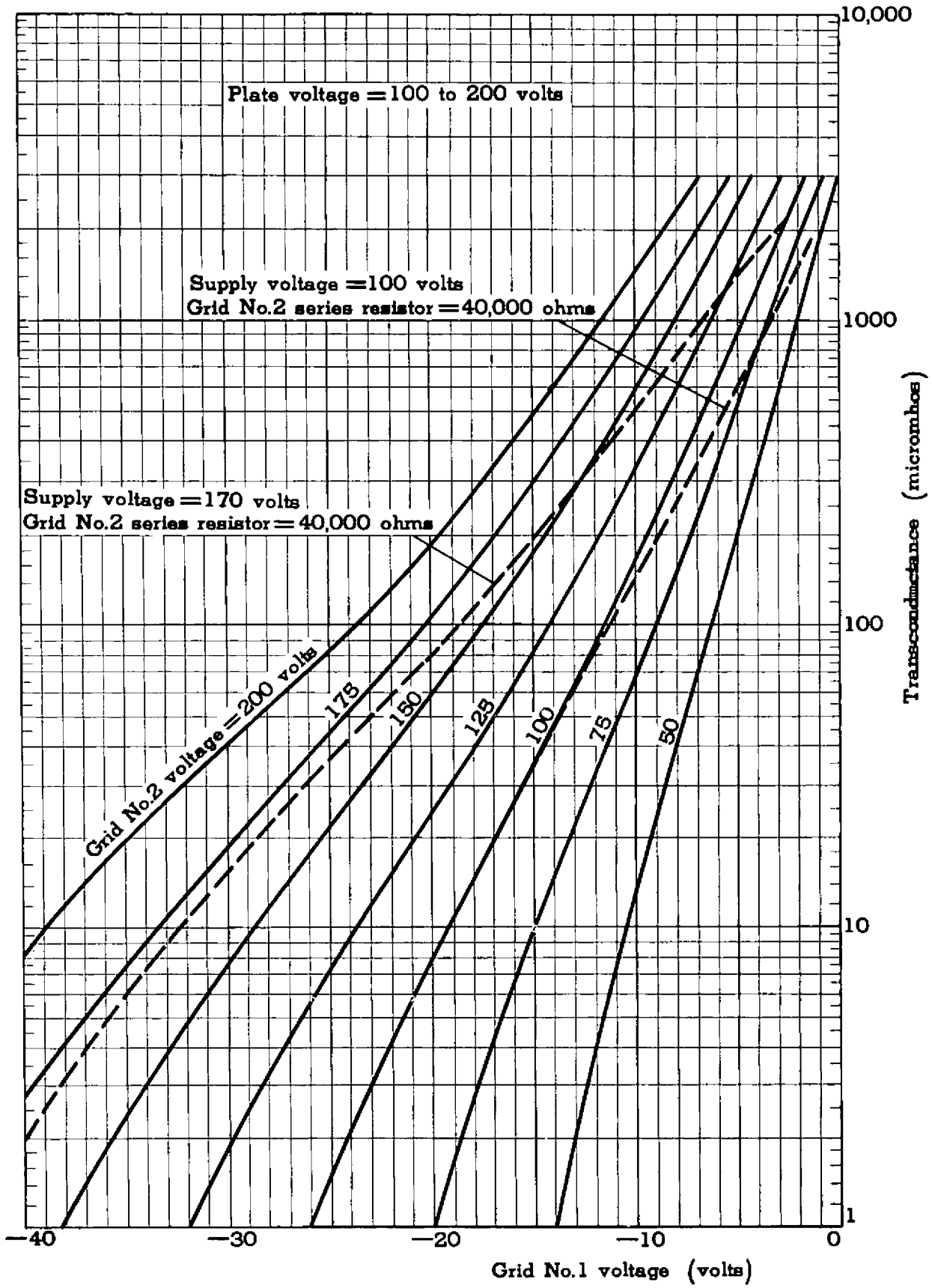
Plate and supply voltage	200		volts
Grid No.2 series resistor	40,000		ohms
Cathode resistor	325		ohms
Grid No.1 voltage	-3	-34	volts
Plate current	7.2	-	mamps
Grid No.2 current	2.1	-	mamps
Transconductance	2300	23	µmhos
Plate resistance	1.0	>10	megohms
Amplification factor of grid No.2 with respect to grid No.1	18	-	
Equivalent noise resistance	7000	-	ohms

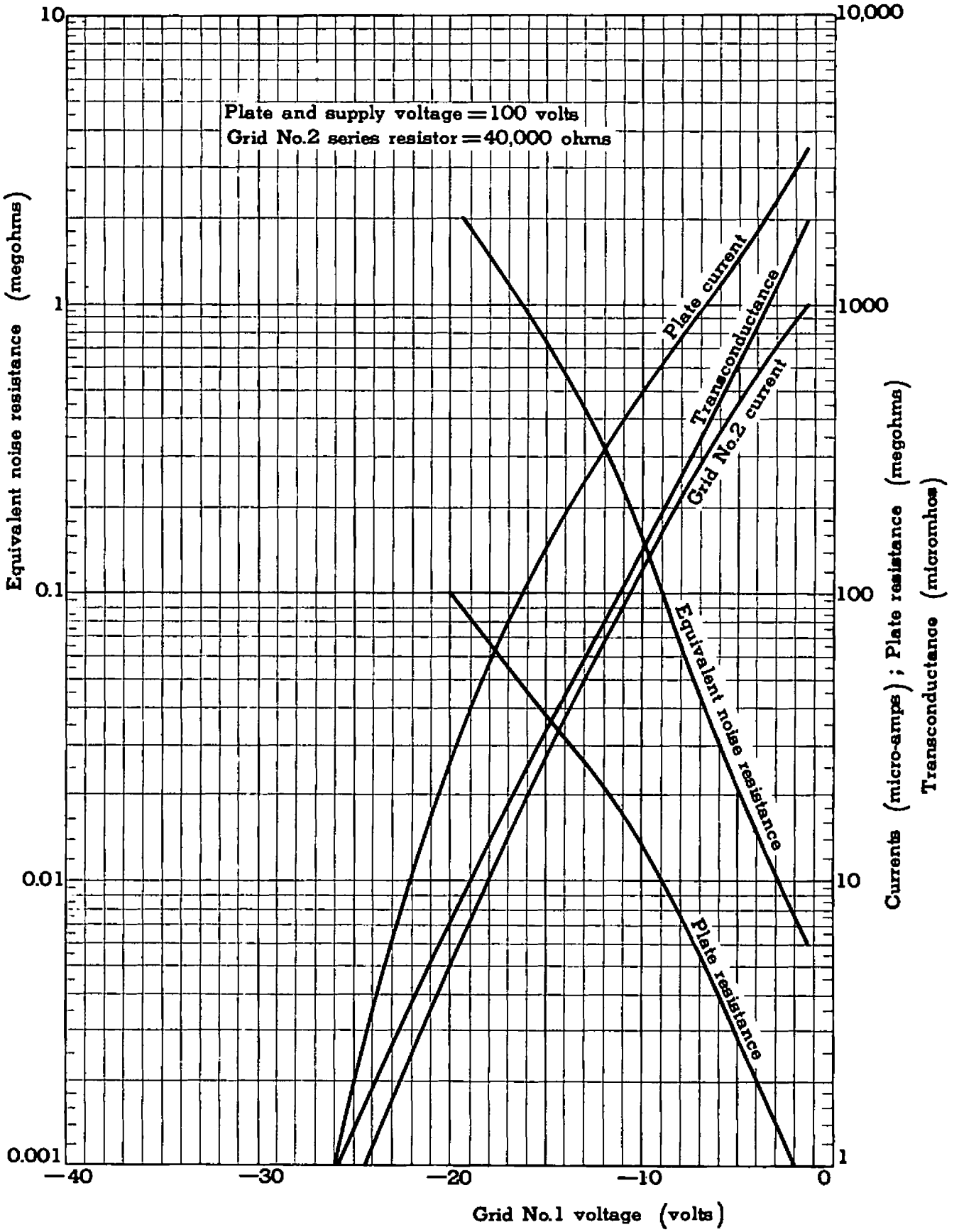
OPERATING CHARACTERISTICS AS R.F. OR I.F. AMPLIFIER

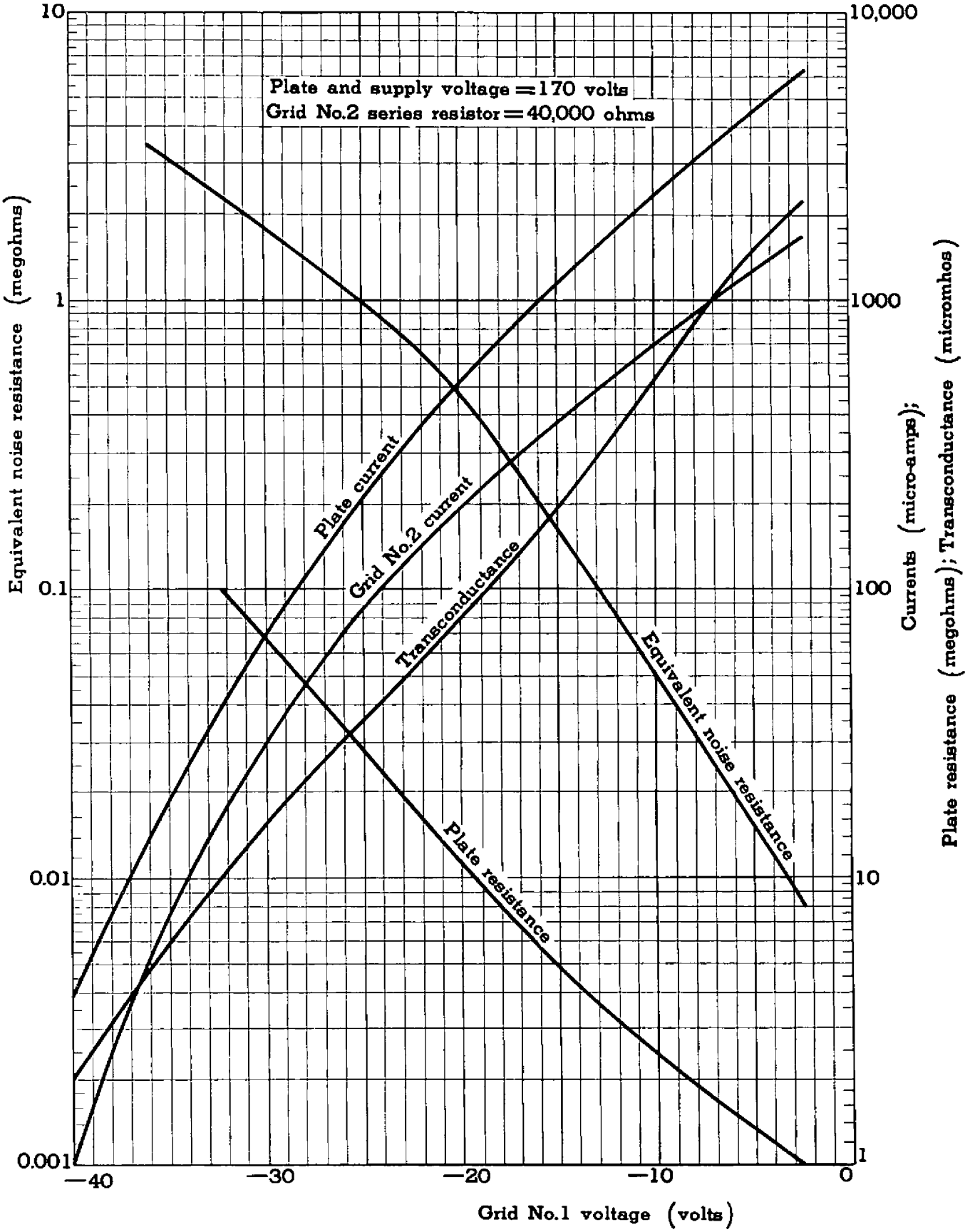
B. with fixed grid No.2 voltage

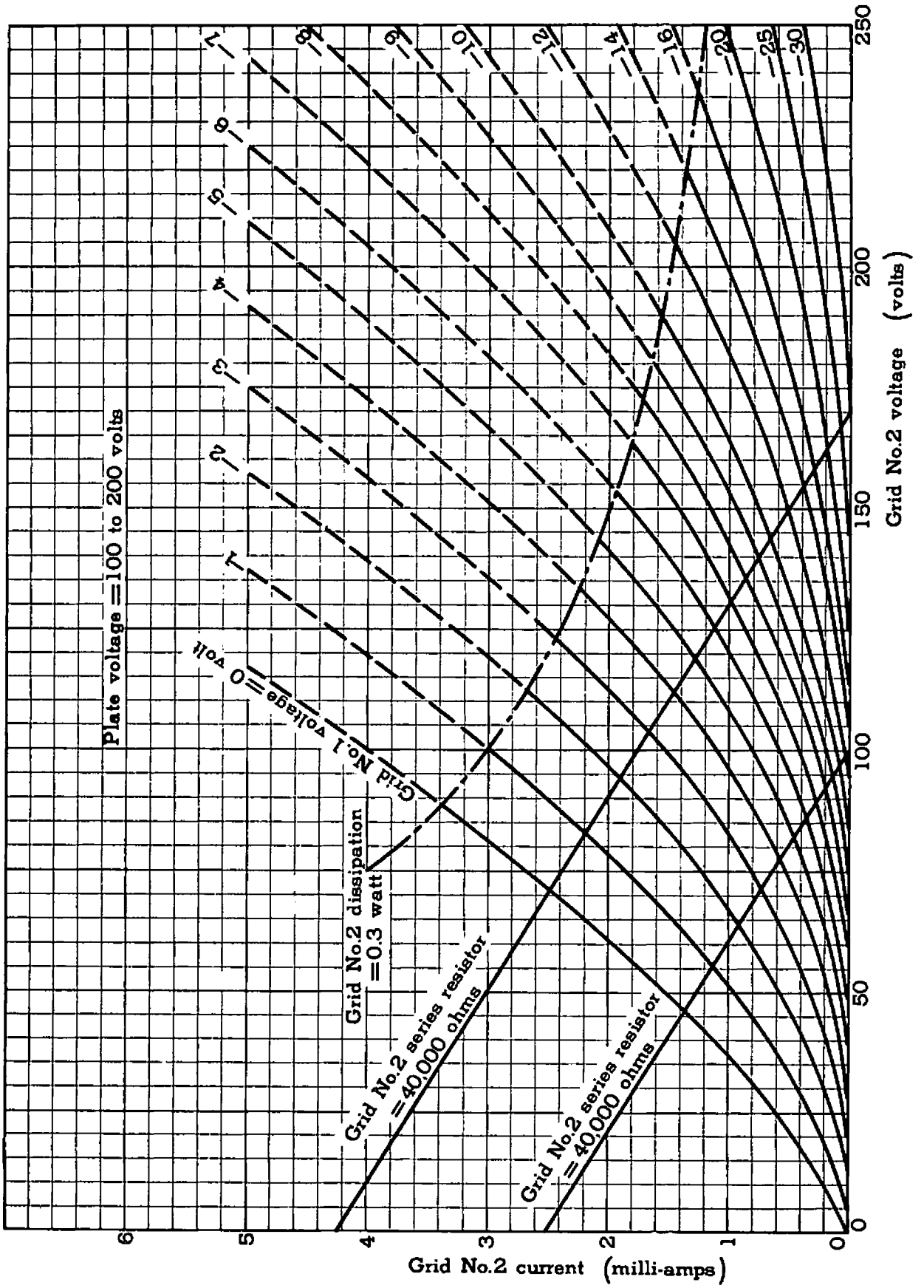
Plate voltage	100		volts
Grid No.2 voltage	100		volts
Cathode resistor	325		ohms
Grid No.1 voltage	-2.5	-16.5	volts
Plate current	6.0	-	mamps
Grid No.2 current	1.75	-	mamps
Transconductance	2200	22	μmhos
Plate resistance	0.6	>10	megohms
Amplification factor of grid No.2 with respect to grid No.1	18	-	
Equivalent noise resistance	6500	-	ohms


Plate voltage = 100 to 200 volts
Supply voltage = 100 volts
Grid No.2 series resistor = 40,000 ohms
Supply voltage = 170 volts
Grid No.2 series resistor = 40,000 ohms
Grid No.2 voltage = 200 volts
175
150
125
100
75
50
10,000
1000
100
10
1
−40
−30
−20
−10
0
Plate current (micro-amps)
Grid No.1 voltage (volts)


Plate voltage = 100 to 200 volts
Supply voltage = 100 volts
Grid No.2 series resistor = 40,000 ohms
Supply voltage = 170 volts
Grid No.2 series resistor = 40,000 ohms
Grid No.2 voltage = 200 volts
175
150
125
100
75
50
10,000
1000
100
10
1
Transconductance (micromhos)
−40
−30
−20
−10
0
Grid No.1 voltage (volts)


Plate and supply voltage = 100 volts
Grid No.2 series resistor = 40,000 ohms
Plate current
Transconductance
Grid No.2 current
Equivalent noise resistance
Plate resistance
Equivalent noise resistance (megohms)
Currents (micro-amps); Plate resistance (megohms)
Transconductance (micromhos)
Grid No.1 voltage (volts)
10
1
0.1
0.01
0.001
10,000
1000
100
10
1
−40
−30
−20
−10
0


Plate and supply voltage = 170 volts
Grid No.2 series resistor = 40,000 ohms
Plate current
Grid No.2 current
Transconductance
Equivalent noise resistance
Plate resistance
Equivalent noise resistance (megohms)
Currents (micro-amps); Plate resistance (megohms); Transconductance (micromhos)
Grid No.1 voltage (volts)
10
1
0.1
0.01
0.001
10,000
1000
100
10
1
−40
−30
−20
−10
0


Plate voltage = 100 to 200 volts
Grid No.1 voltage = 0 volt
Grid No.2 dissipation = 0.3 watt
Grid No.2 series resistor = 40,000 ohms
Grid No.2 series resistor = 40,000 ohms
Grid No.2 voltage (volts)
Grid No.2 current (milli-amps)
250
200
150
100
50
0
0
1
2
3
4
5
6
7
8
9
10
12
14
16
20
25
30

RMA Release # 249

July 1, 1940

RECEIVING TUBE TYPE 12B6 (GM)

Reservation No: 343 Date: 2/19/40 Registration No: 249 Date: July 1, 1940.

Sponsor: ROGERS RADIO TUBES LIMITED

Type Classification: Diode High Mu Triode

Physical Specifications:

Type of Cathode: Unipotential

Pin Connections:

Pin 1	Metal Spray Shield	Pin 5	Diode plate	
2	Heater	6	No connection	Basing Designation: 6Y
3	Plate (triode)	7	Heater	
4	No connection	8	Cathode	
		Cap	Control grid (triode)	

Type of Base:	Small Octal Shell
Type of Cap:	Miniature Metal
Type of Bulb:	T9 - Metal Spray
Maximum Diameter	1-3/16"
Maximum Overall Length	4-1/4"
Maximum Seated Height (Including top cap)	3-11/16"

Mounting Position for Operation: Any

Direct Interelectrode Capacitances, Triode Unit (approx.):

Grid-Plate	1.7 µµf
Input	2.5 µµf
Output	7.0 µµf

VOLTAGE AMPLIFIER

Class A

Ratings:

Heater Voltage (ac or dc)	12.6	volts
Heater Current	0.150	amps
Maximum Plate Voltage	250	volts
Minimum Grid Bias Voltage	-1	volts

Typical Operation and Characteristics:

Plate Voltage	250	volts
Grid Voltage	-2	volts
Amplification Factor	100	
Plate Resistance	91000	ohms
Transconductance	1100	µmhos
Plate Current	0.9	ma.

Printed in U.S.A.

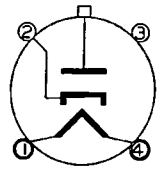
RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

Registration No. 361
January 31, 1944

TYPE 12X3

HIGH VACUUM HALF WAVE RECTIFIER

4A0



Physical Specifications:

Type of Cathode: Unipotential

Pin Connections:

Pin 1.	Heater	Pin 3.	N.C.
2.	Cathode	4.	Heater
	Top Cap Plate		

Basing Designation 4A0

Type of Base	Small 4 pin
Type of Cap	Small metal
Type of Bulb	T9
Maximum Overall Length	4-1/4"
Maximum Diameter	1-3/16"
Maximum Seated Height (Including top cap)	3-3/4"

Mounting position of Operation: Any

Ratings

Heater Voltage (ac or dc)	12.6	volts
Heater Current	0.65	amps
Maximum DC Heater-to-Cathode Potential	50	volts
Maximum Peak Inverse Voltage	7000	volts
Maximum Peak Plate Current (At E_B = 270 volts)	200	ma

Typical Operation:

Half-Wave Rectifier (Condenser Input to Filter)

AC Plate Voltage per Plate (RMS)	2500	Volts max.
DC Output Current	10	ma max.

sponsor: Rogers Radio Tubes, Ltd.
Toronto, Ontario, Canada

DATA FOR E.I.A. REGISTRATION

November 5, 1958

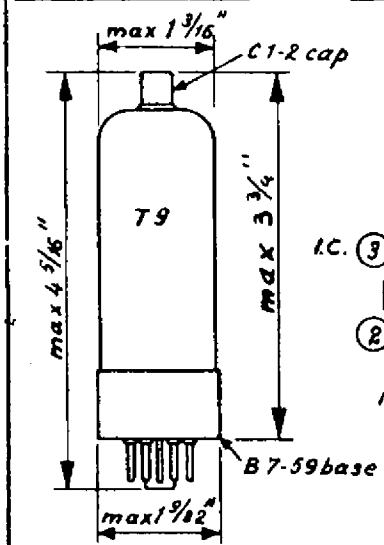
TUBE TYPE
13CM5

brought by

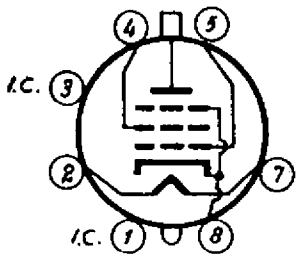
Rogers Electronic Tubes and Components,
116 Vanderhoof Avenue,
Leaside (Toronto 17) Ontario

DESCRIPTION: Output pentode for use as horizontal output tube in television receivers; heater type; T9 bulb; body length $3^3/_4$" max.; B7-59 octal base; C1-2 miniature cap.

TUBE OUTLINE



BOTTOM VIEW OF BASE



8GT

BASE PIN No.	ELEMENT
1	Internal connection
2	Heater
3	Internal connection
4	Grid No.2
5	Grid No.1
7	Heater
8	Cathode, grid No.3

HEATER DATA

Heater voltage	12.8	volts
Heater current	600	mamp

MAXIMUM RATINGS (Design center values)

Plate voltage	250 volts
Plate voltage without plate current	550 volts
Peak plate voltage	7000 volts[1]
Peak inverse plate voltage	1500 volts[1]
Plate dissipation	see curve
Grid No.2 dissipation	see curve [2]

1) Maximum pulse duration 22% of one cycle with a maximum of 18 micro seconds.

2) During the heating up time of the booster diode the maximum permissible value of the grid No.2 dissipation is 7 watts.

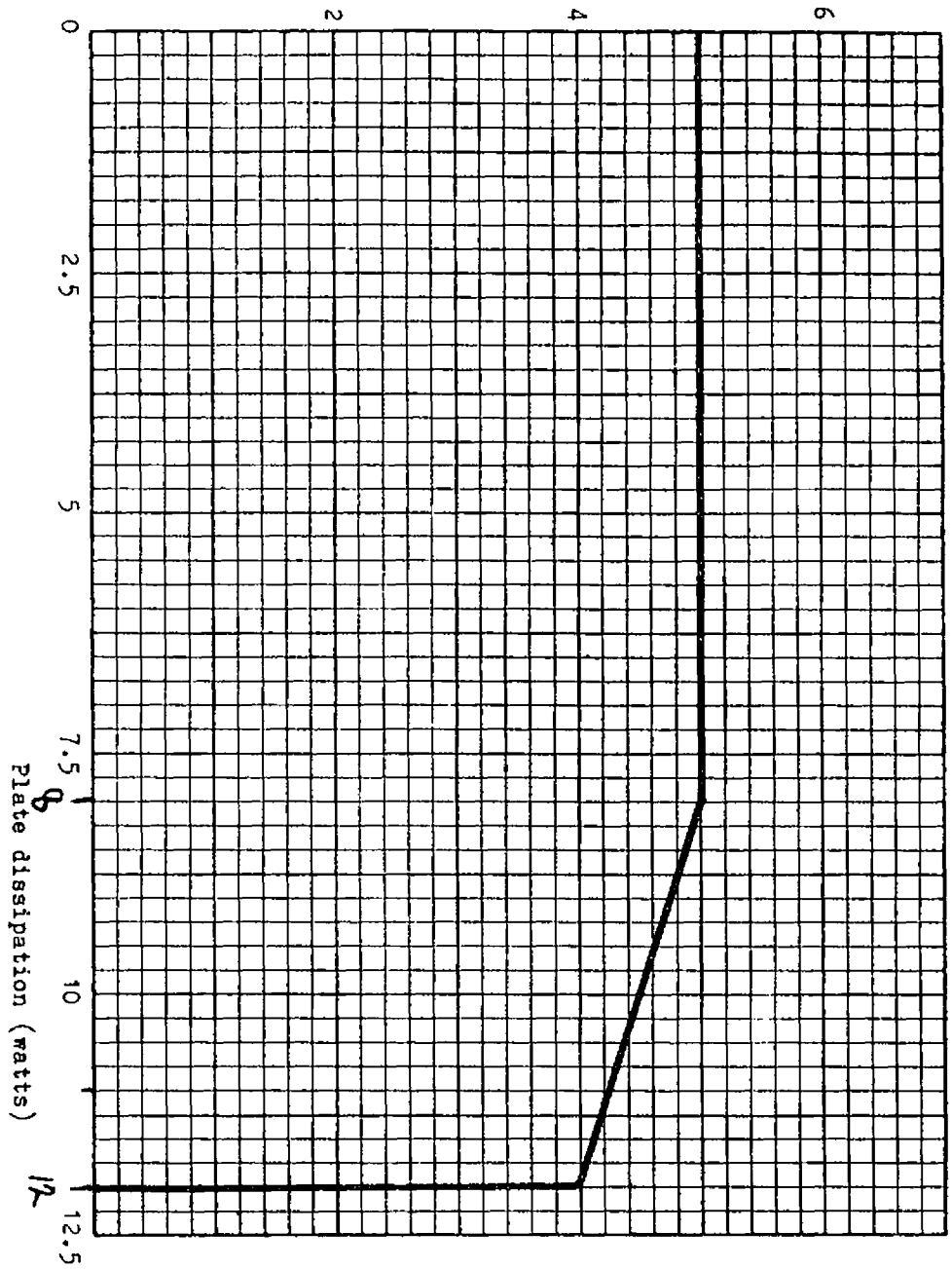
MAXIMUM RATINGS (Design Center Values; continued)

Grid No.2 voltage	250 volts
Grid No.2 voltage without current	550 volts
Peak negative grid No.1 voltage	1000 volts
Grid No.1 circuit resistance	[3] 0.5 megohm
Cathode current	200 mamps
Voltage between cathode and heater	
cathode positive with respect to heater	250 volts
Cathode negative with respect to heater	200 volts
Circuit resistance between cathode and heater	20 000 ohms

TYPICAL CHARACTERISTICS

Plate voltage	100 volts
Grid No.2 voltage	100 volts
Grid No.1 bias	-8.2 volts
Plate current	100 mamps
Grid No.2 current	7 mamps
Transconductance	14 000 micromhos
Amplification factor of grid No.2 with respect to grid No.1	5.6
Plate resistance	5000 ohms

[3] If the total dissipation of anode and grid No.2 is less than 10 Watts, the max. value of grid No.1 circuit resistance may amount up to 2.2 megohms.



Type 13CM5

Area of permissible operation

from JETEC release #1909, April 22, 1957
sponsor: Rogers Majestic Electronics, Ltd.

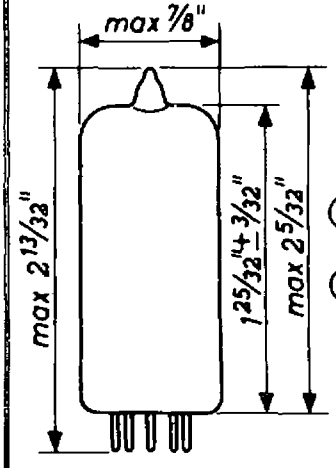
14G6

DOUBLE DIODE HIGH MU TRIODE

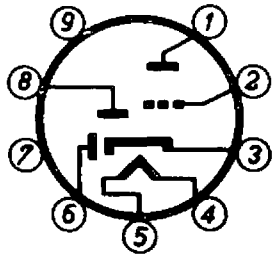
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
RETMA basing designation	9Z

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No	ELEMENT
1	Triode plate
2	Grid
3	Cathode
4	Heater
5	Heater
6	Diode No.1 plate
7	Internal shield
8	Diode No.2 plate
9	Internal connection

HEATER DATA

Heater voltage	14 volts
Heater current	0.1 amp

DIRECT INTERELECTRODE CAPACITANCES

Triode plate to cathode		1.3 μμF
Triode grid to cathode		2.4 μμF
Triode grid to triode plate		1.3 μμF
Triode grid to heater	max.	0.05 μμF
Diode No.1 plate to cathode		0.8 μμF
Diode No.2 plate to cathode		0.75 μμF
Diode No.1 plate to heater	max.	0.3 μμF
Diode No.2 plate to heater	max.	0.05 μμF
Diode No.1 plate to triode grid	max.	0.01 μμF
Diode No.2 plate to triode grid	max.	0.01 μμF
Diode No.1 plate to diode No.2 plate	max.	0.05 μμF
Diode No.1 plate to triode plate	max.	0.005 μμF
Diode No.2 plate to triode plate	max.	0.015 μμF

MAXIMUM RATINGS OF THE TRIODE SECTION (Design Center Values)	
Plate voltage (without current)	550 volts
Plate voltage	250 volts
Plate dissipation	0.5 watts
Cathode current	5 mamps
External resistance between grid and cathode (see note 1)	3 megohms
External resistance between cathode and heater	20,000 ohms
Voltage between cathode and heater	150 volts

MAXIMUM RATINGS OF THE DIODE SECTION (each diode; Design Center Values)	
Peak inverse plate current	350 volts
Plate current	0.8 mamp
Peak plate current	5 mamps
Voltage between heater and cathode	150 volts
External resistance between heater and cathode	20,000 ohms

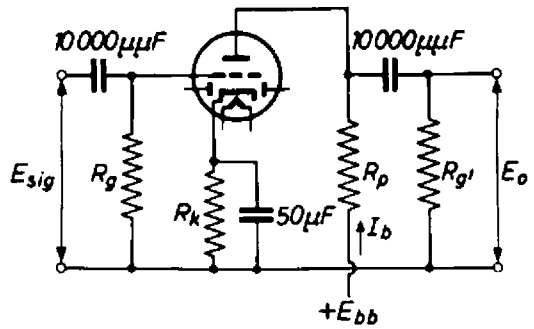
TYPICAL CHARACTERISTICS OF THE TRIODE SECTION

Plate voltage	100	170	volts
Grid voltage	-1.0	-1.55	volts
Plate current	0.8	1.5	mamps
Transconductance	1400	1650	µmhos
Amplification factor	70	70	
Plate resistance	50,000	42,000	ohms

NOTE 1

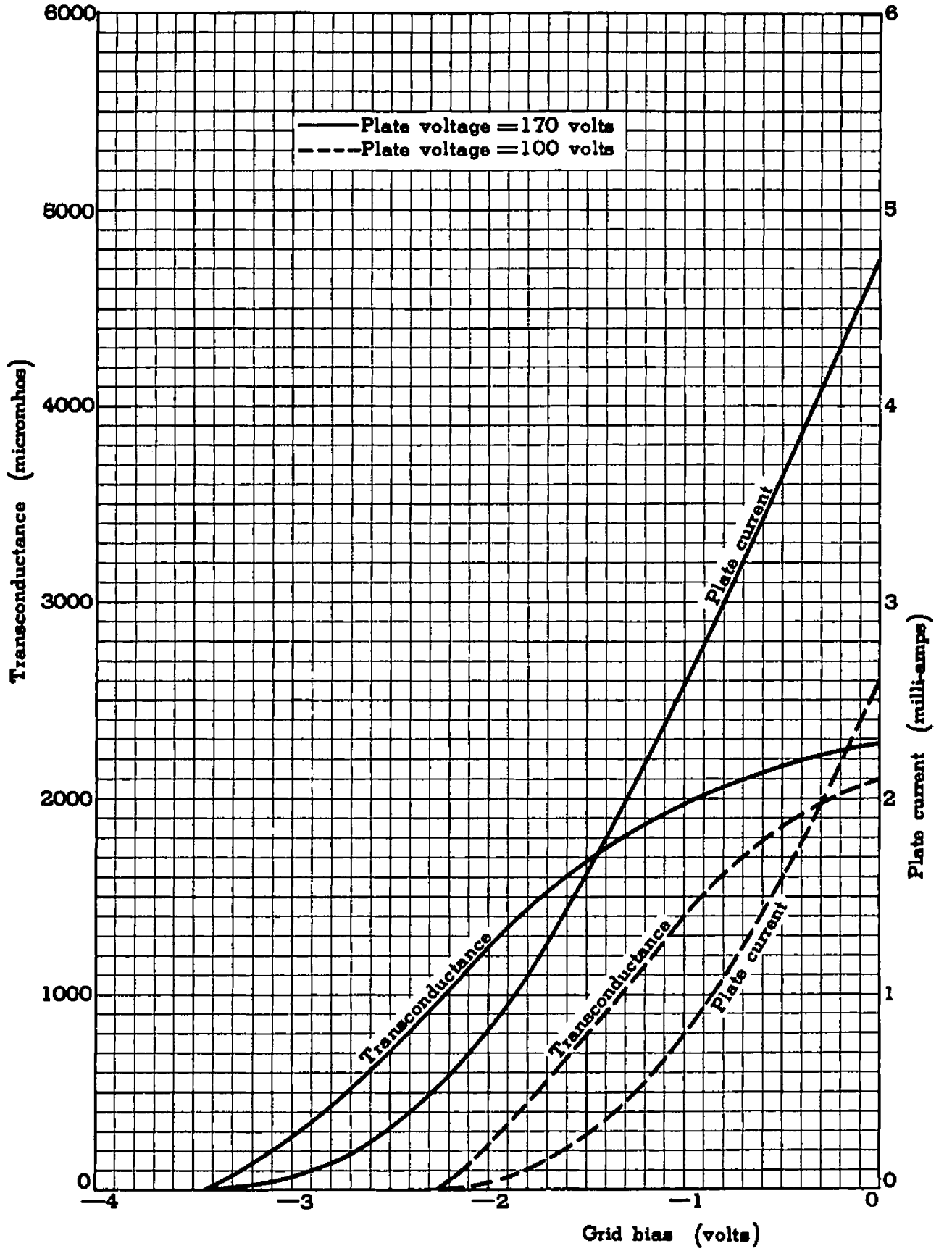
The maximum value of this resistor is 22 megohms if the grid bias is only obtained by grid current biasing.

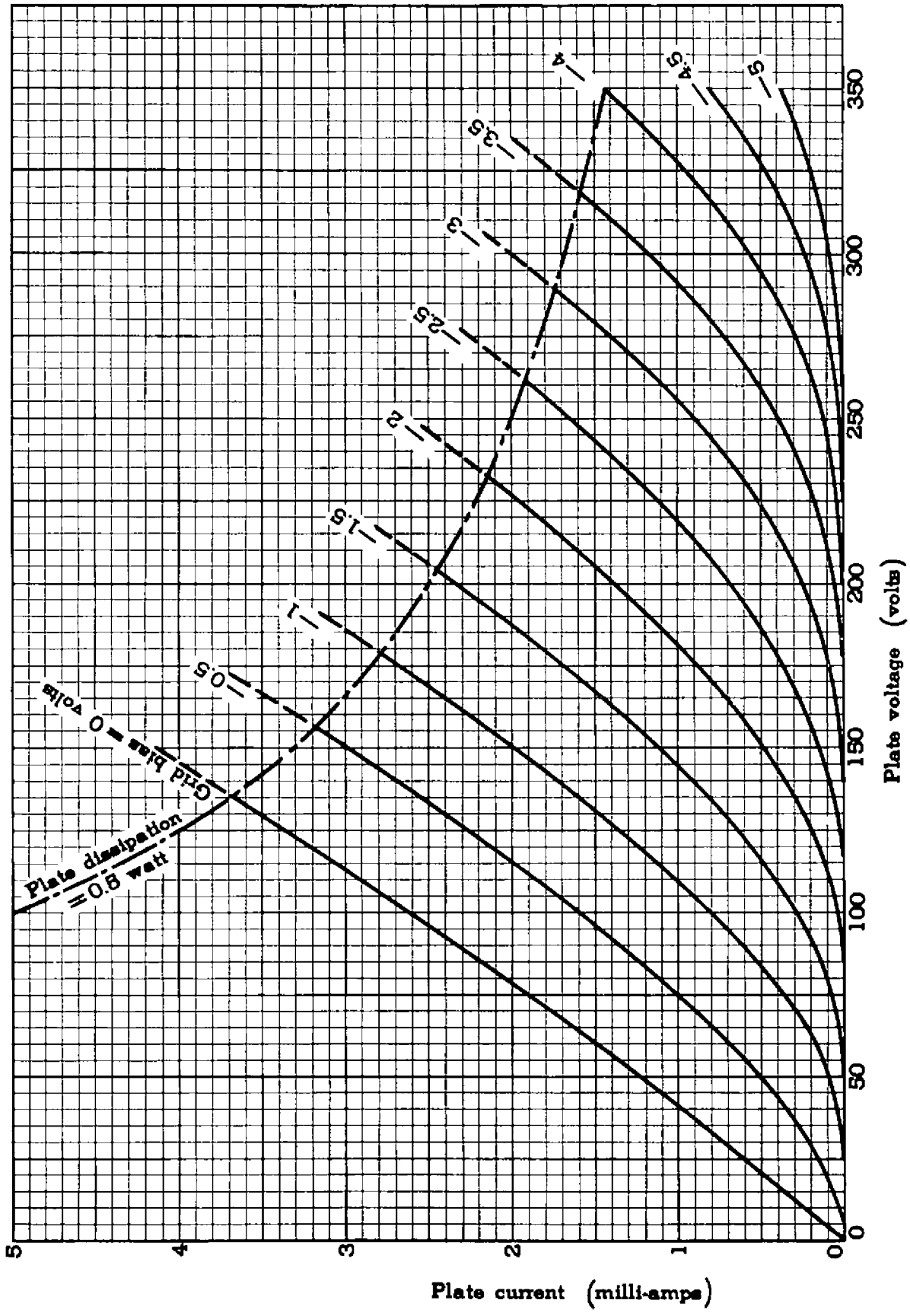
OPERATING CHARACTERISTICS OF THE TRIODE SECTION AS A.F. AMPLIFIER



Ebb volt	Rg megohm	Rp megohm	Rg' megohm	Rk ohm	Ib mA	$\frac{E_o}{E_{sig}}$	Total harmonics (%) E_o=3V	E_o=5V	E_o=8V
170	1	0.22	0.68	5600	0.28	44	1.1	1.3	1.9
170	1	0.1	0.33	3900	0.45	37	1.1	1.7	2.6
170	22	0.22	0.68	0	0.46	48	1.0	1.1	1.3
170	22	0.1	0.33	0	0.82	42	0.8	1.0	1.2
100	1	0.22	0.68	5600	0.18	41	1.4	1.9	-
100	1	0.1	0.33	3900	0.28	34	2.0	3.5	-
100	22	0.22	0.68	0	0.21	41	1.5	2.0	-
100	22	0.1	0.33	0	0.35	35	1.6	2.8	-

In circuits using a loudspeaker with an acoustical efficiency of 5% this tube can be used without special precautions against microphonic effects if the input voltage for an output of 50 milliwatts of the output tube is more than 10 millivolts


Plate voltage =170 volts
Plate voltage =100 volts
Transconductance (micromhos)
Plate current (milli-amps)
Grid bias (volts)
Transconductance
Plate current
Transconductance
Plate current
6000
5000
4000
3000
2000
1000
0
6
5
4
3
2
1
0
−4
−3
−2
−1
0


Plate voltage (volts)
Plate current (milli-amps)
0
50
100
150
200
250
300
350
0
1
2
3
4
5
4
3.5
3
2.5
2
1.5
1
0.5
Grid bias = 0 volts
Plate dissipation
= 0.8 watt

from JETEC release #1860, March 4, 1957
sponsor: Rogers Majestic Electronics, Ltd.

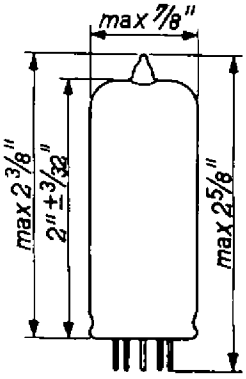
14Y7

TRIODE-HEXODE for use as frequency converter

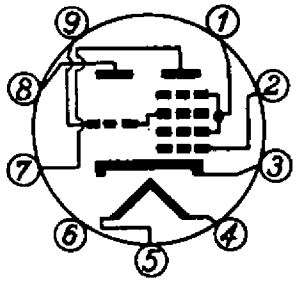
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
RETMA basing designation	9Q
Mounting position	Any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN NO.	ELEMENT
1	Hexode grids No.2 and 4
2	Hexode grid No.1
3	Cathode, internal shield
4	Heater
5	Heater
6	Internal connection
7	Hexode plate
8	Triode plate
9	Triode grid and hexode grid No.3

ELECTRICAL DATA

HEATER DATA

Heater voltage	14 volts
Heater current	0.1 amp

DIRECT INTERELECTRODE CAPACITANCES

Grid No.1 to all other electrodes	3.8 μμF
Hexode plate to all other electrodes	9.2 μμF
Between hexode grid No.1 and hexode plate	max. 0.1 μμF
Between hexode grid No.1 and heater	max. 0.15 μμF
Between cathode and triode grid + hexode grid No.3	5.6 μμF
Between cathode and triode plate	2.4 μμF
Between triode plate and triode grid + hexode grid No.3	1.4 μμF
Between hexode grid No.1 and triode grid + hexode grid No.3	max. 0.35 μμF
Between hexode plate and triode grid + hexode grid No.3	max. 0.2 μμF

MAXIMUM RATINGS OF THE HEXODE SECTION (Design Center Values)	
Plate voltage (without current)	550 volts
Plate voltage	250 volts
Plate dissipation	1.5 watts
Grid No.2 and 4 voltage (without current)	550 volts
Grid No.2 and 4 voltage (anode current less than 1 mA)	250 volts
Grid No.2 and 4 voltage (anode current = 3 mA)	125 volts
Grid No.2 and 4 dissipation	0.3 watt
Cathode current	10 mamps
External resistance between grid No.3 and cathode	3 megohms
External resistance between grid No.1 and cathode	3 megohms
External resistance between heater and cathode	20,000 ohms
Voltage between heater and cathode	150 volts

MAXIMUM RATINGS OF THE TRIODE SECTION (Design Center Values)	
Plate voltage (without current)	550 volts
Plate voltage	175 volts
Plate dissipation	0.8 watt
Cathode current	6 mamps
External resistance between grid and cathode	3 megohms
External resistance between heater and cathode	20,000 ohms
Voltage between heater and cathode	150 volts

TYPICAL CHARACTERISTICS OF THE TRIODE SECTION	
Plate voltage	100 volts
Grid voltage	0 volt
Plate current	10 mamps
Transconductance	2800 μmhos
Amplification factor	22

OPERATING CHARACTERISTICS OF THE TRIODE SECTION AS OSCILLATOR

Supply voltage	100		170		200		volts
Plate resistor	10 000		10 000		22 000		ohms
Oscillator voltage	4		8		8		volts, rms
Grid resistor	22,000	47,000	22,000	47,000	22,000	47,000	ohms
Grid current	175	100	350	200	350	200	μamps
Plate current	3.4	3.1	6.5	5.7	5.5	5.2	mamps
Effective transconductance	700	600	750	650	650	550	μmhos

OPERATING CHARACTERISTICS OF THE HEXODE SECTION AS frequency converter

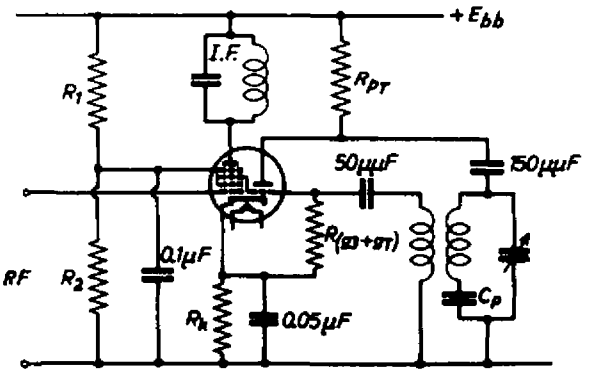


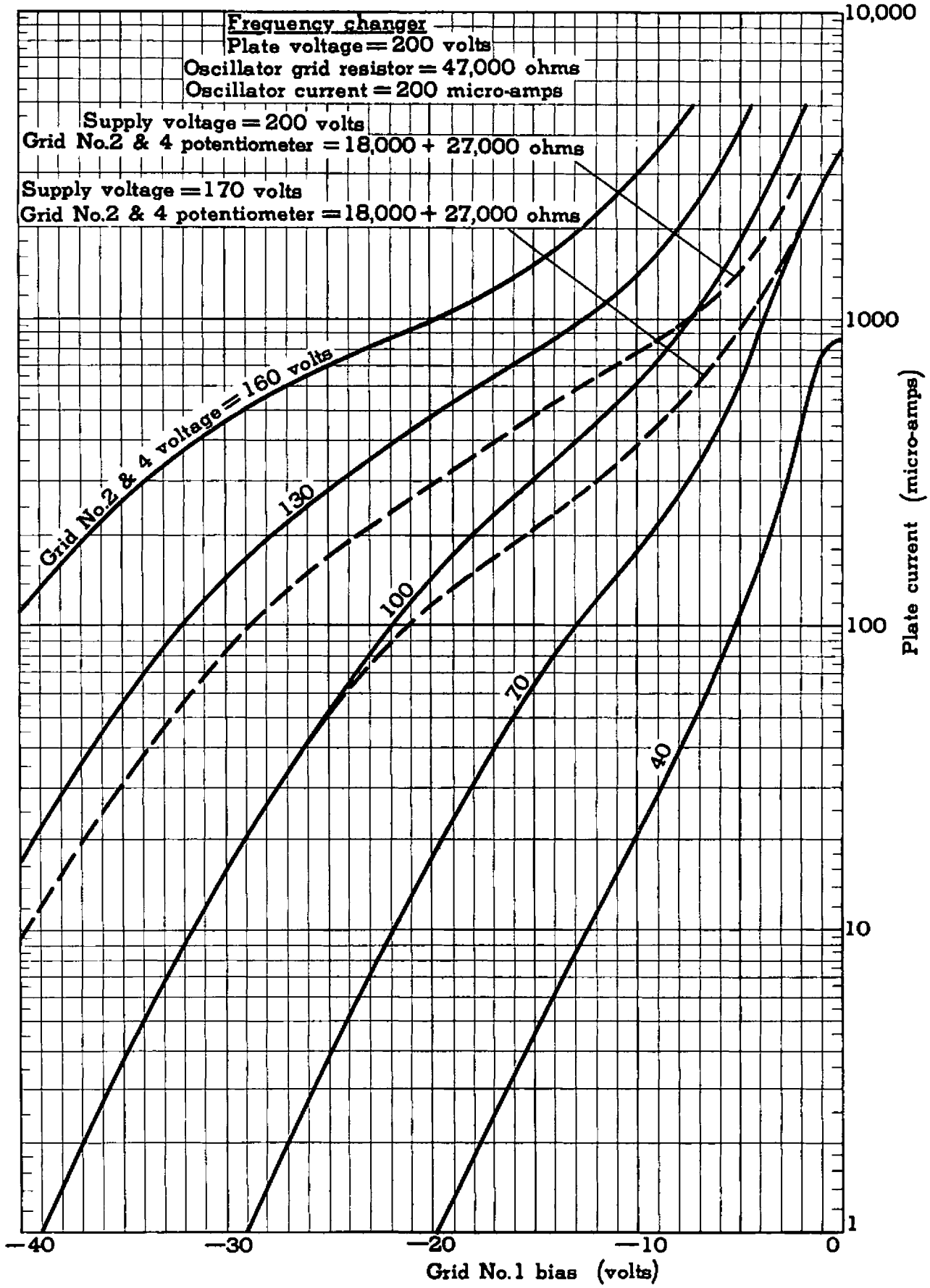
Plate and supply voltage	100		170		volts
R_1 (see circuit diagram)	18,000		18,000		ohms
R_2 (see circuit diagram)	27,000		27,000		ohms
Cathode resistor	180		180		ohms
Grid No.3 and triode grid resistor	22,000		22,000		ohms
Grid No.3 and triode grid current (see note 1 page 4)	175		350		μamps
Grid No.1 voltage	-1.0	-13.5	-1.85	-25	volts
Grid No.2 and 4 voltage	43	57	70	100	volts
Plate current	1.2	-	2.1	-	mamps
Grid No.2 and 4 current	1.46	-	2.6	-	mamps
Conversion conductance	530	5.3	670	6.7	μ mhos
Plate resistance	>1.0	>5	>1.0	>5	megohms
Equivalent noise resistance	60,000	-	65,000	-	ohms

OPERATING CHARACTERISTICS OF THE HEXODE SECTION (CONTINUED)

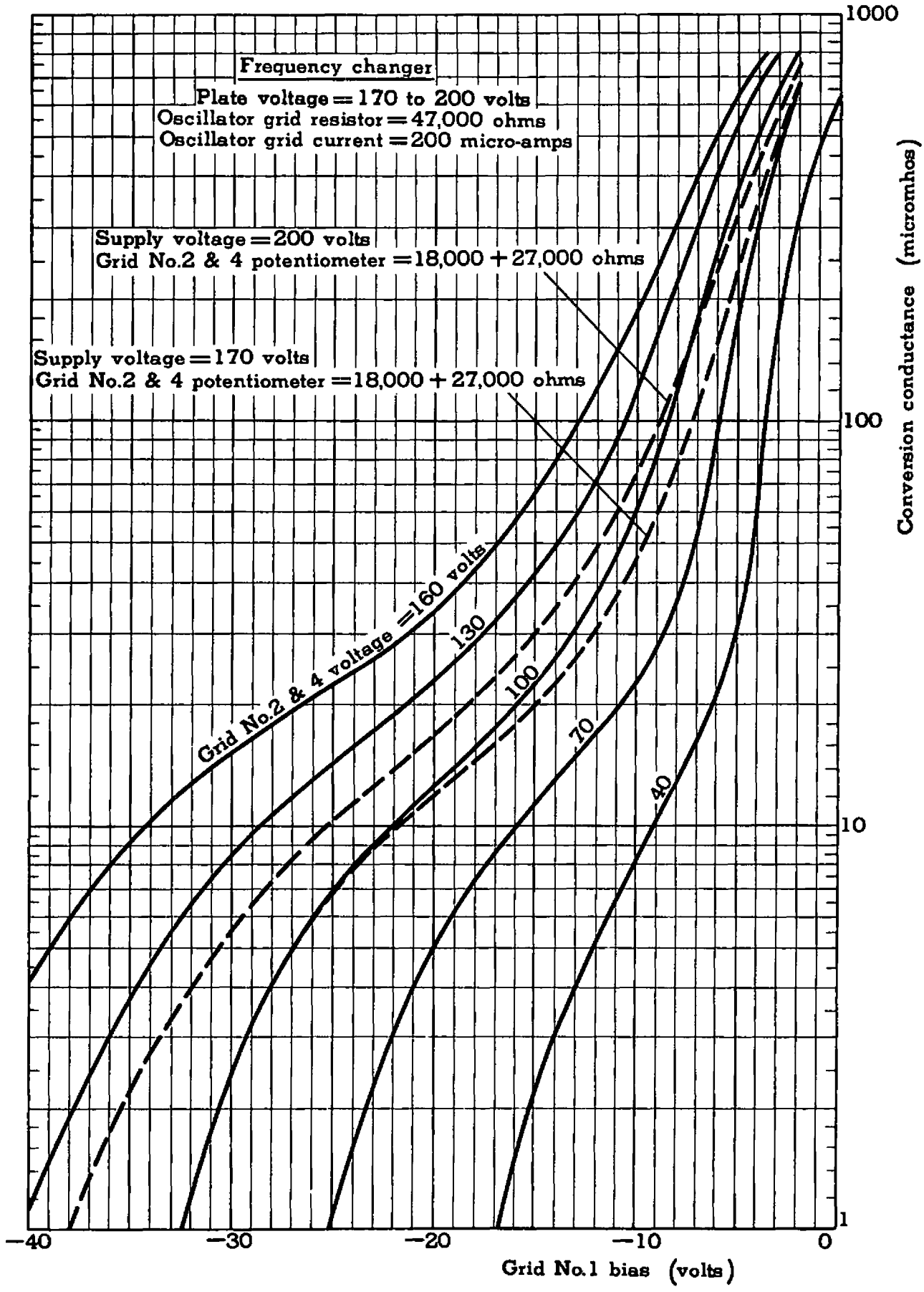
Plate and supply voltage	200		volts
R_1 (see circuit diagram)	18,000		ohms
R_2 (see circuit diagram)	27,000		ohms
Cathode resistor	180		ohms
Grid No.3 and triode grid resistor	22,000		ohms
Grid No.3 and triode grid current (see note 1)	350		µamps
Grid No.1 voltage	-2	-27.5	volts
Grid No.2 and 4 voltage	85	119	volts
Plate current	3.0	-	mamps
Grid No.2 and 4 current	3.0	-	mamps
Conversion conductance	750	7.5	µmhos
Plate resistance	>1.0	>5	megohms
Equivalent noise resistance	75,000	-	ohms

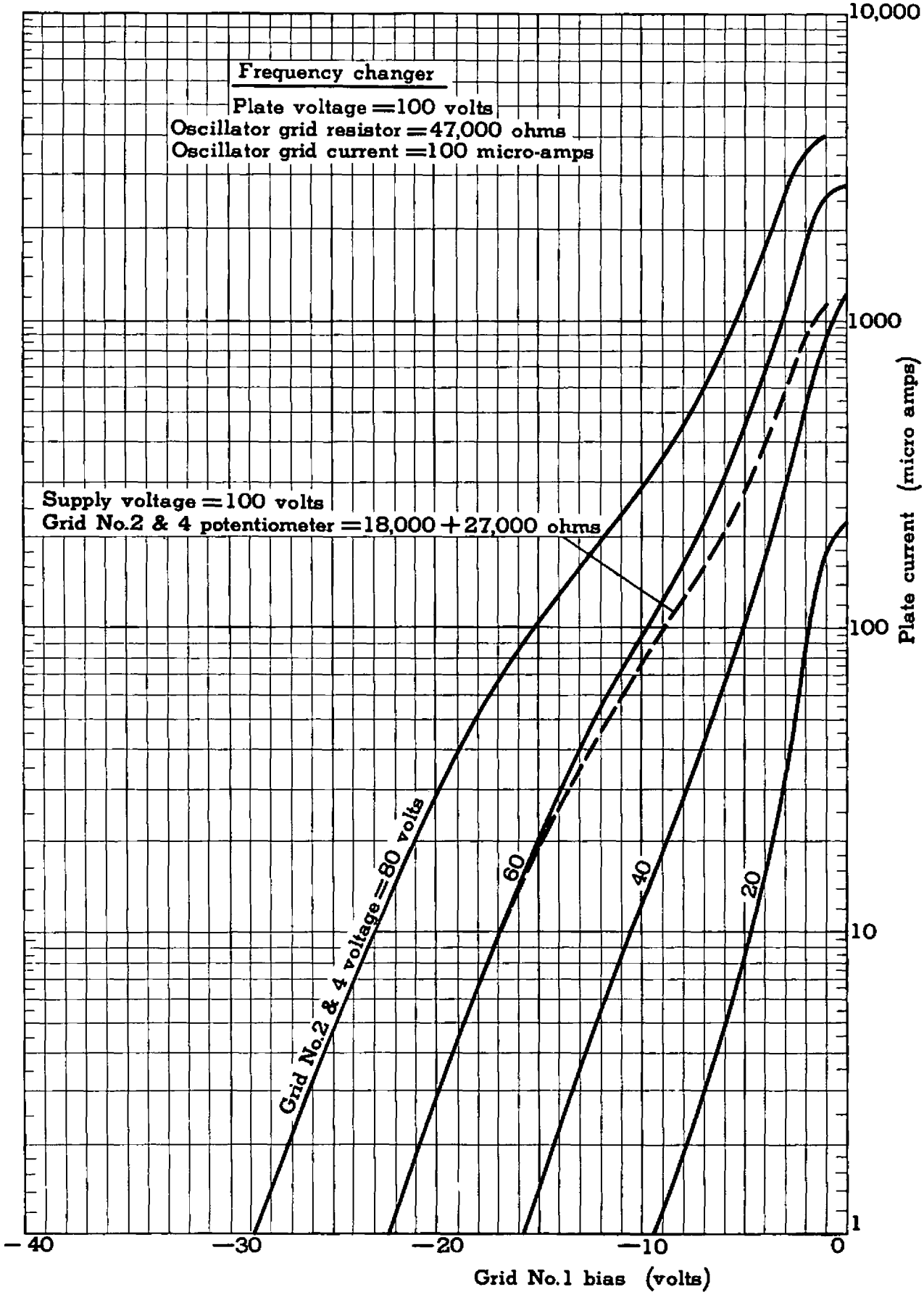
Note 1

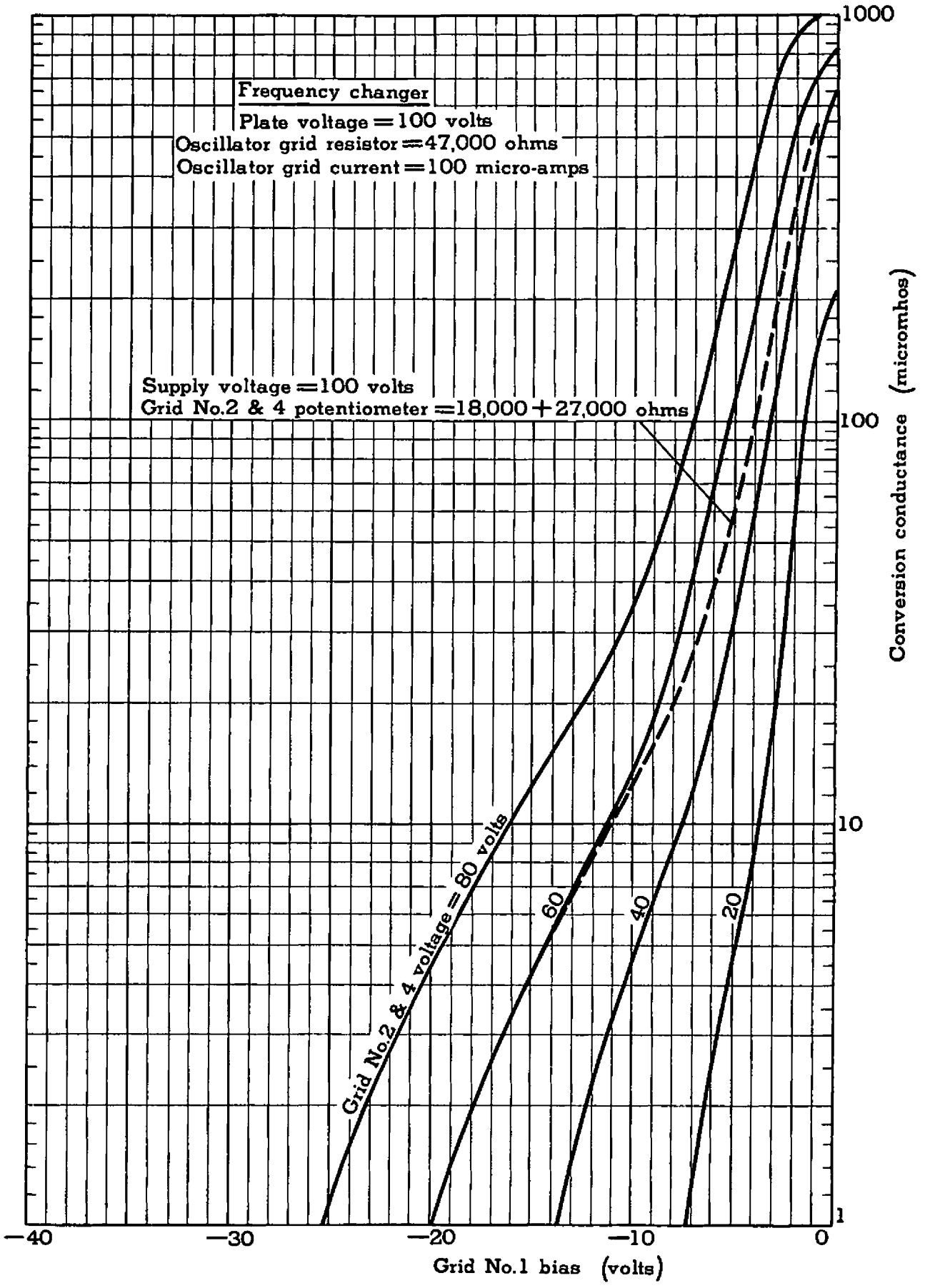
For the alternative of grid No.3 resistor, viz 47,000 ohms, the grid current should be adjusted to 100 µamps at a supply voltage of 100 volts and to 200 µamps at a supply voltage of 170 volts or 200 volts

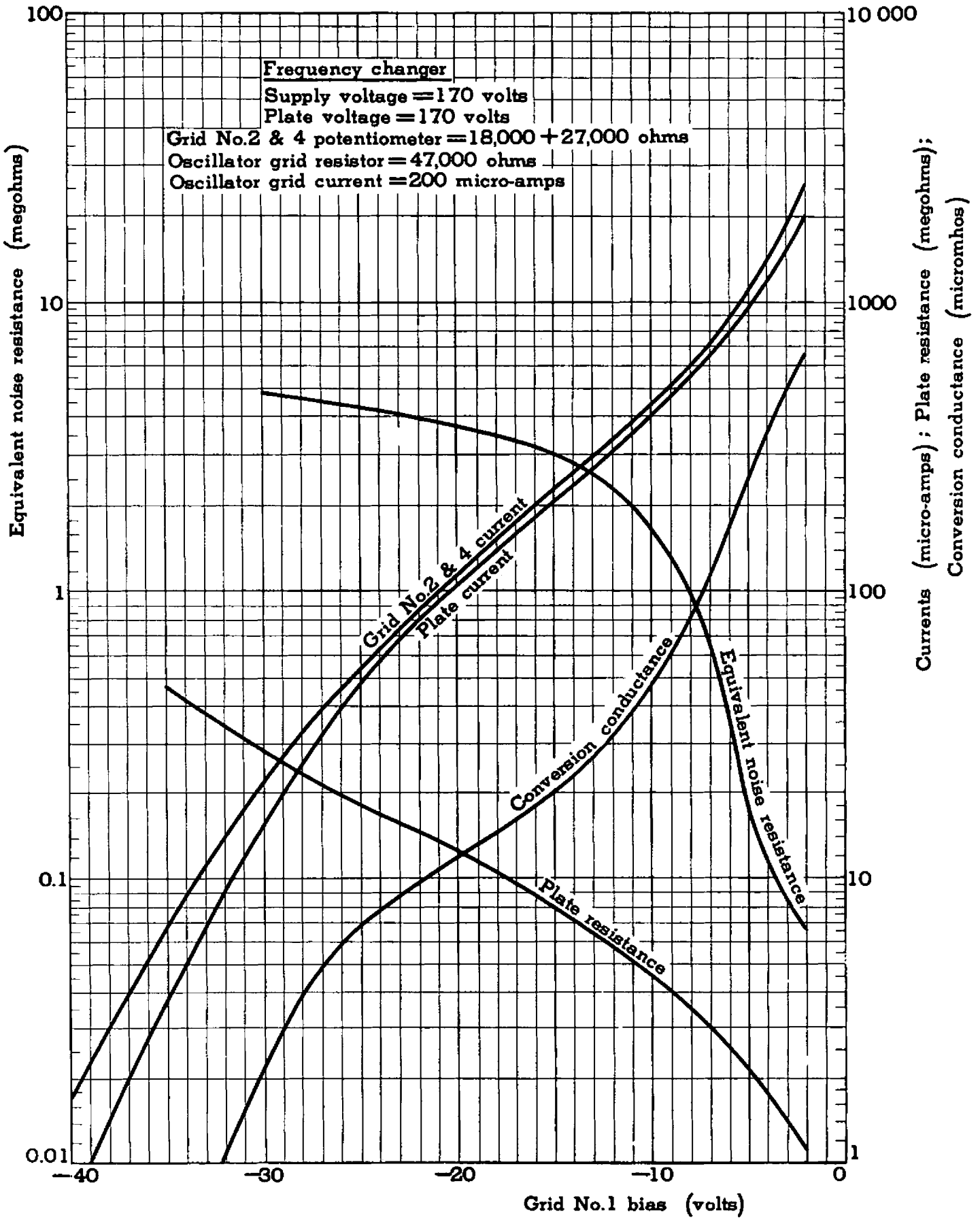

Frequency changer
Plate voltage = 200 volts
Oscillator grid resistor = 47,000 ohms
Oscillator current = 200 micro-amps
Supply voltage = 200 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Supply voltage = 170 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Grid No.2 & 4 voltage = 160 volts
130
100
70
40
10,000
1000
100
10
1
Plate current (micro-amps)
−40
−30
−20
−10
0
Grid No.1 bias (volts)

14Y7

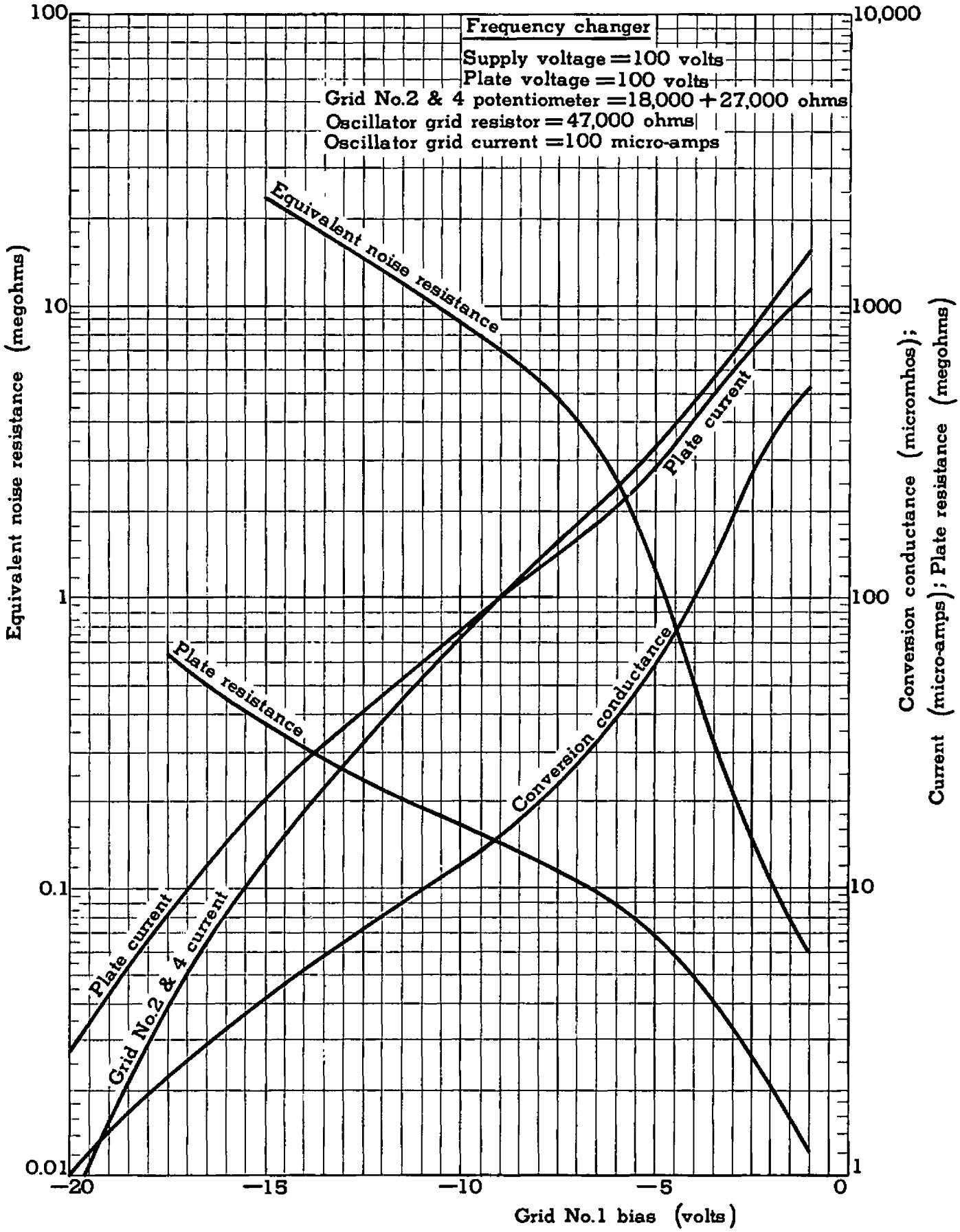

Frequency changer
Plate voltage = 170 to 200 volts
Oscillator grid resistor = 47,000 ohms
Oscillator grid current = 200 micro-amps
Supply voltage = 200 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Supply voltage = 170 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Grid No.2 & 4 voltage = 160 volts
130
100
70
40
1000
100
10
1
−40
−30
−20
−10
0
Grid No.1 bias (volts)
Conversion conductance (micromhos)

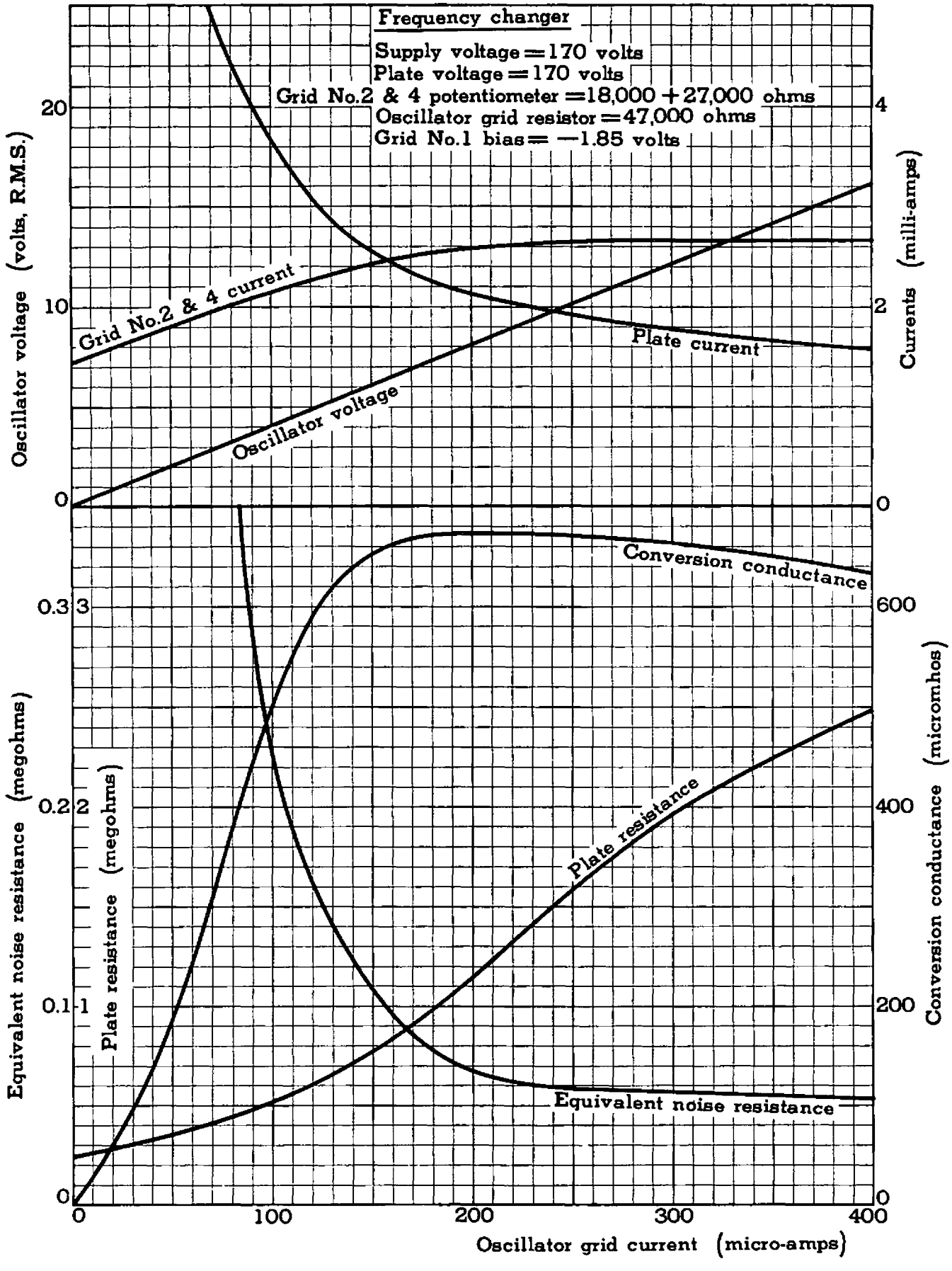

Frequency changer
Plate voltage = 100 volts
Oscillator grid resistor = 47,000 ohms
Oscillator grid current = 100 micro-amps
Supply voltage = 100 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Grid No.2 & 4 voltage = 80 volts
60
40
20
10,000
1000
100
10
1
Plate current (micro amps)
−40
−30
−20
−10
0
Grid No.1 bias (volts)

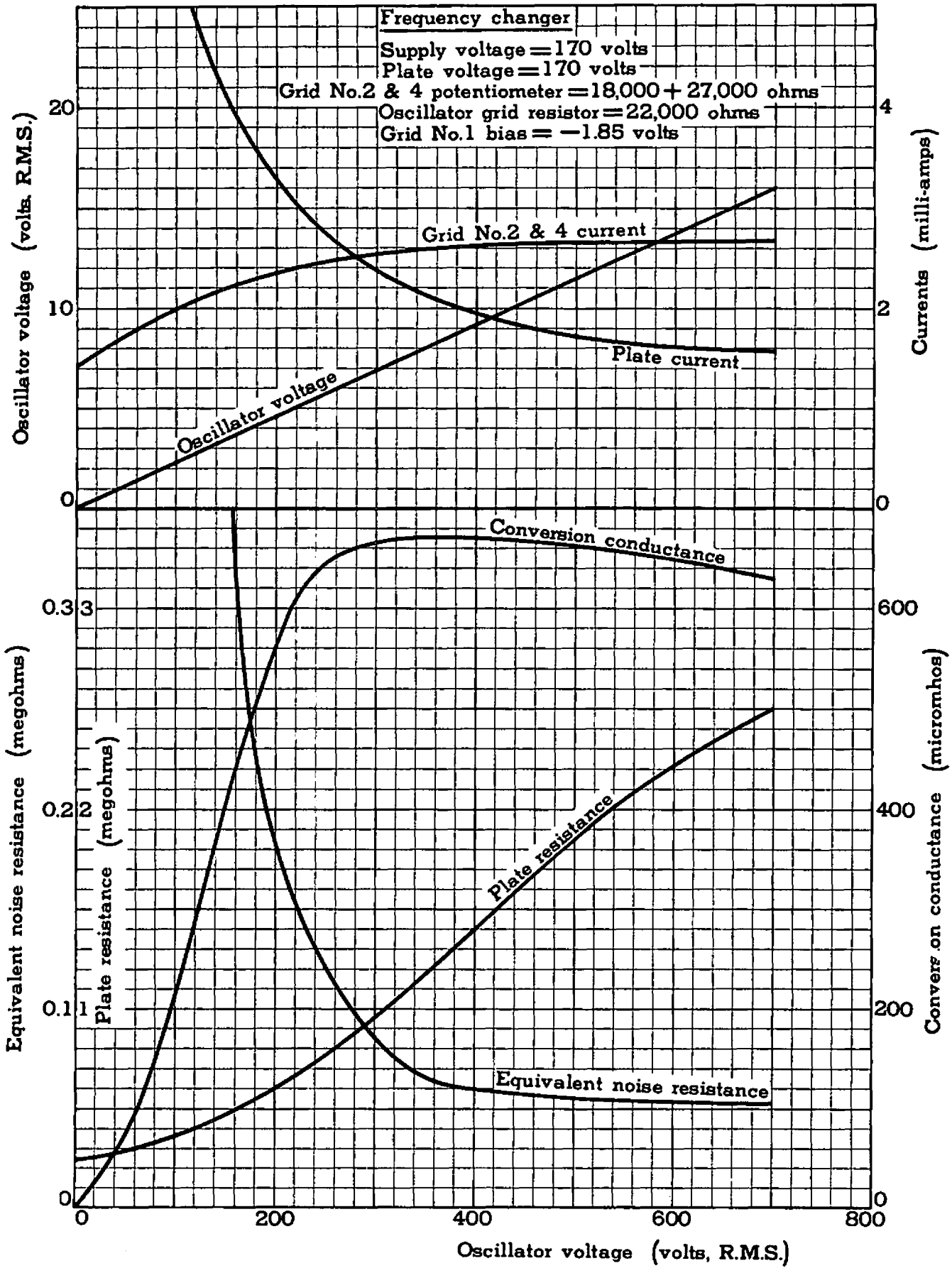

Frequency changer
Plate voltage = 100 volts
Oscillator grid resistor = 47,000 ohms
Oscillator grid current = 100 micro-amps
Supply voltage = 100 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Grid No.2 & 4 voltage = 80 volts
60
40
20
1000
100
10
1
Conversion conductance (micromhos)
−40
−30
−20
−10
0
Grid No.1 bias (volts)

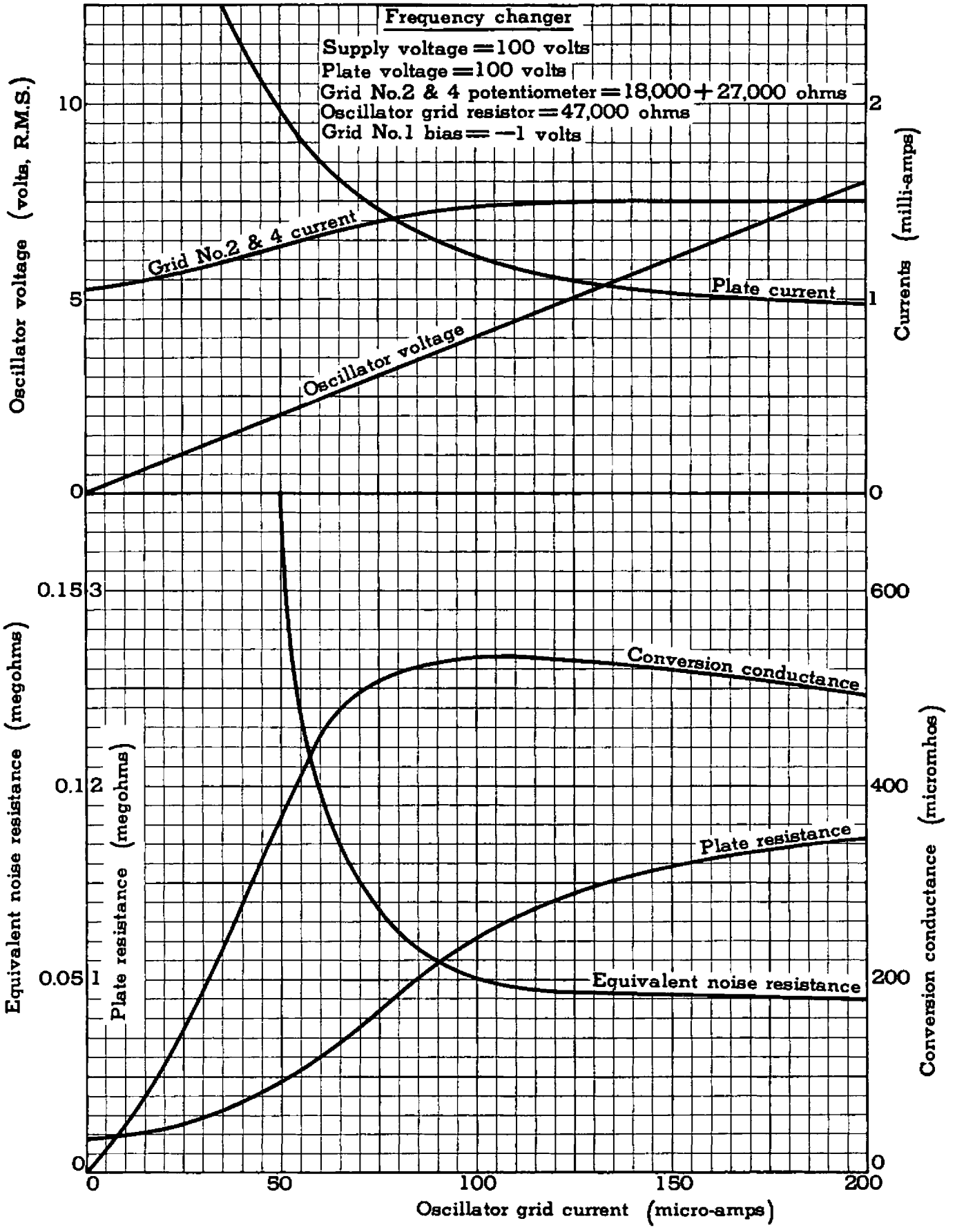

Frequency changer
Supply voltage = 170 volts
Plate voltage = 170 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Oscillator grid resistor = 47,000 ohms
Oscillator grid current = 200 micro-amps
Equivalent noise resistance (megohms)
Currents (micro-amps); Plate resistance (megohms); Conversion conductance (micromhos)
Grid No.2 & 4 current
Plate current
Conversion conductance
Equivalent noise resistance
Plate resistance
100
10
1
0.1
0.01
10 000
1000
100
10
1
−40
−30
−20
−10
0
Grid No.1 bias (volts)

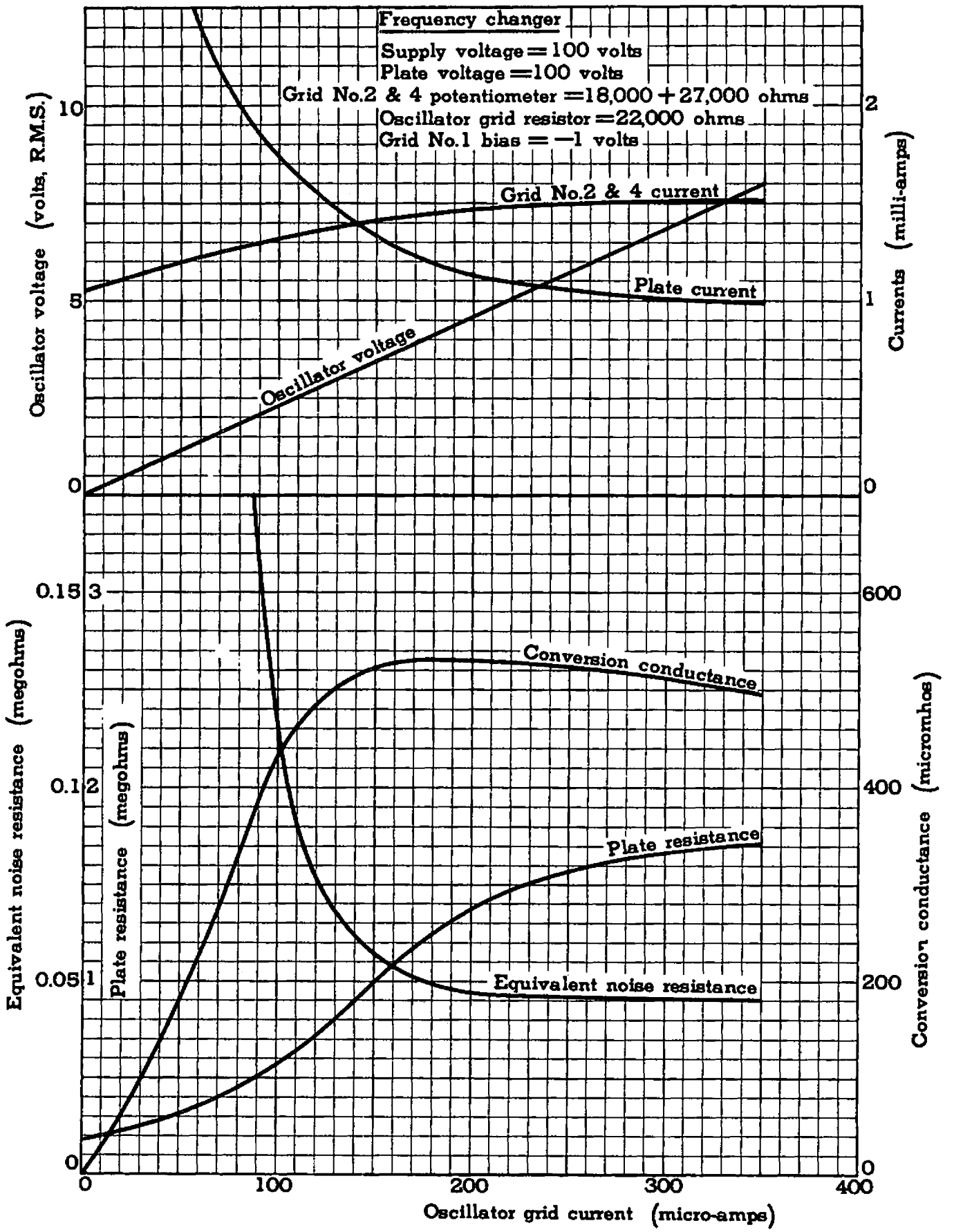
14Y7

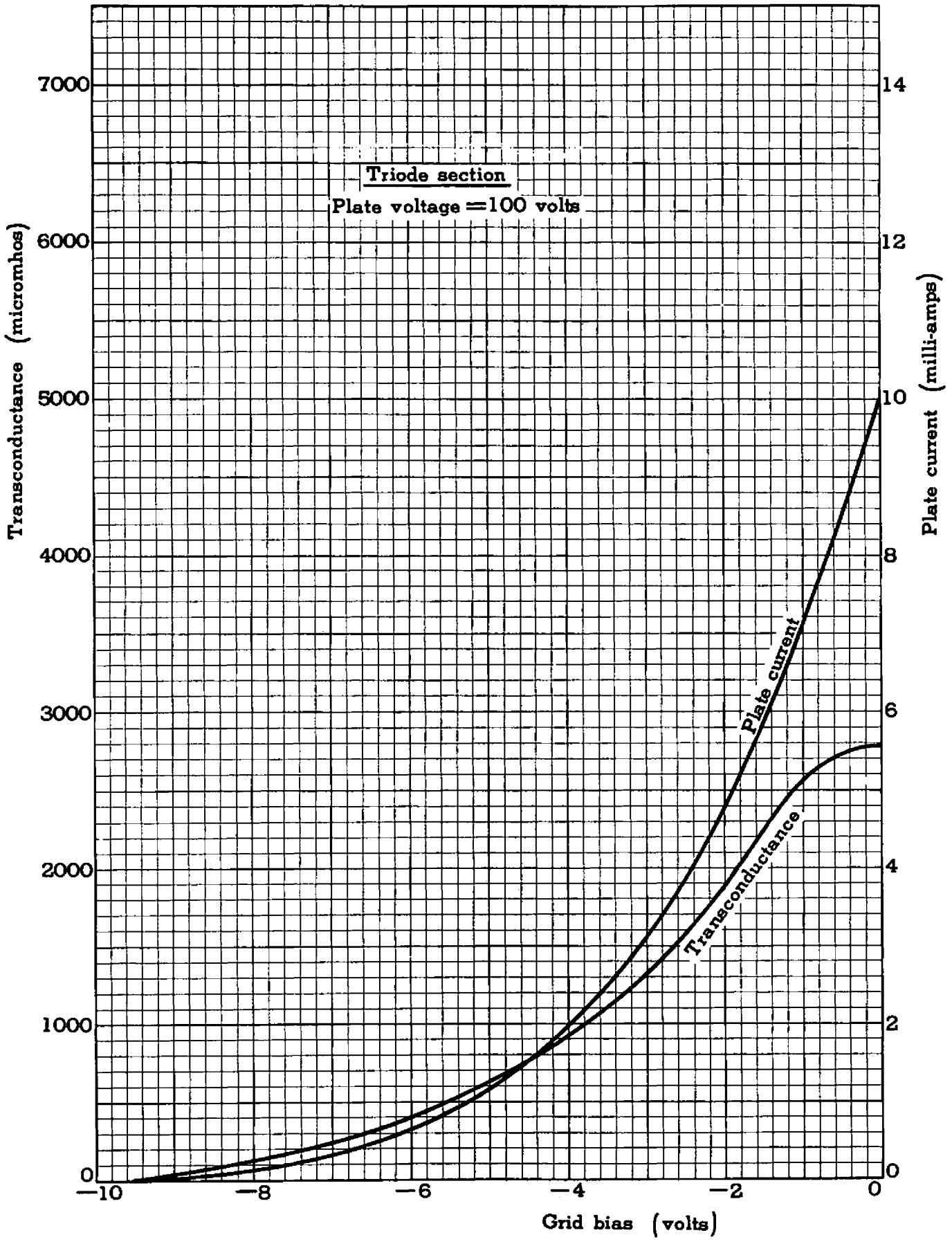

Frequency changer
Supply voltage = 100 volts
Plate voltage = 100 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Oscillator grid resistor = 47,000 ohms
Oscillator grid current = 100 micro-amps
Equivalent noise resistance
Plate current
Plate resistance
Conversion conductance
Plate current
Grid No.2 & 4 current
100
10
1
0.1
0.01
10,000
1000
100
10
1
−20
−15
−10
−5
0
Equivalent noise resistance (megohms)
Conversion conductance (micromhos); Current (micro-amps); Plate resistance (megohms)
Grid No.1 bias (volts)

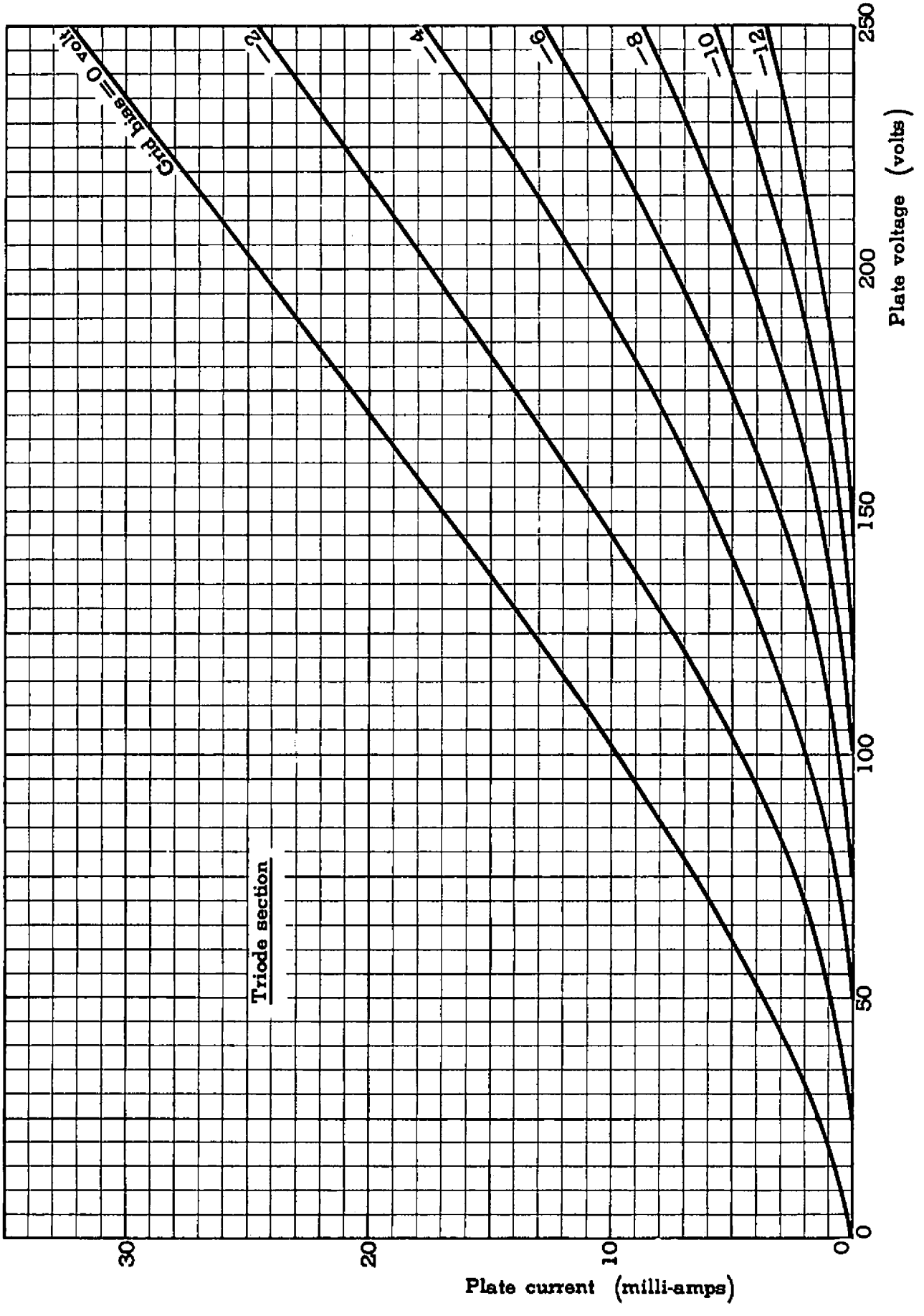

Frequency changer
Supply voltage = 170 volts
Plate voltage = 170 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Oscillator grid resistor = 47,000 ohms
Grid No.1 bias = −1.85 volts
Grid No.2 & 4 current
Plate current
Oscillator voltage
Conversion conductance
Plate resistance
Equivalent noise resistance
Oscillator voltage (volts, R.M.S.)
Currents (milli-amps)
Equivalent noise resistance (megohms)
Plate resistance (megohms)
Conversion conductance (micromhos)
Oscillator grid current (micro-amps)
0
100
200
300
400
0
10
20
0
2
4
0
0.1
0.2
0.3
0
1
2
3
0
200
400
600

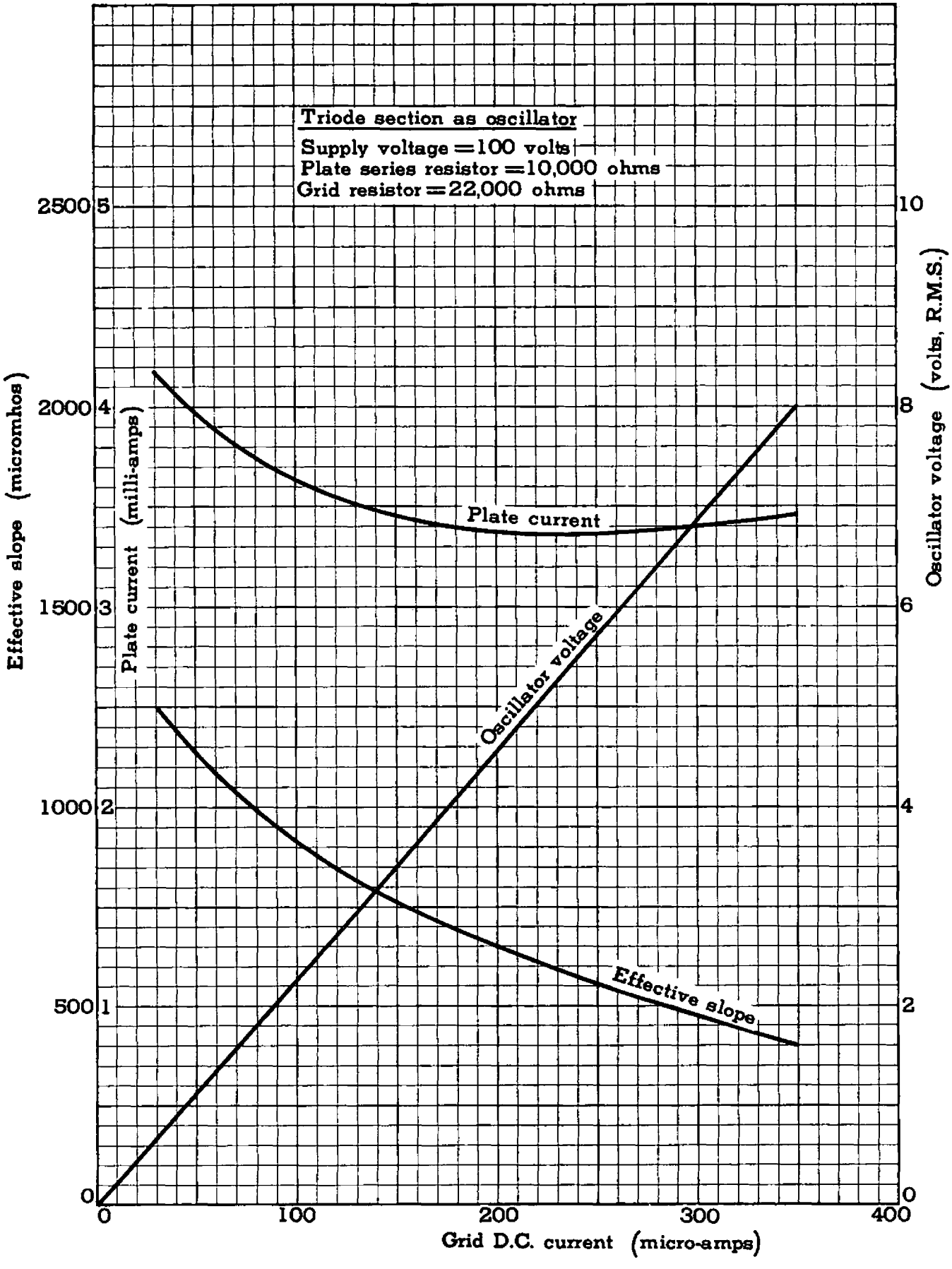

Frequency changer
Supply voltage = 170 volts
Plate voltage = 170 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Oscillator grid resistor = 22,000 ohms
Grid No.1 bias = −1.85 volts
Grid No.2 & 4 current
Plate current
Oscillator voltage
Conversion conductance
Plate resistance
Equivalent noise resistance
Oscillator voltage (volts, R.M.S.)
Currents (milli-amps)
Conversion conductance (micromhos)
Plate resistance (megohms)
Equivalent noise resistance (megohms)
0
200
400
600
800
2
4
200
400
600
1
2
3
0.1
0.2
0.3

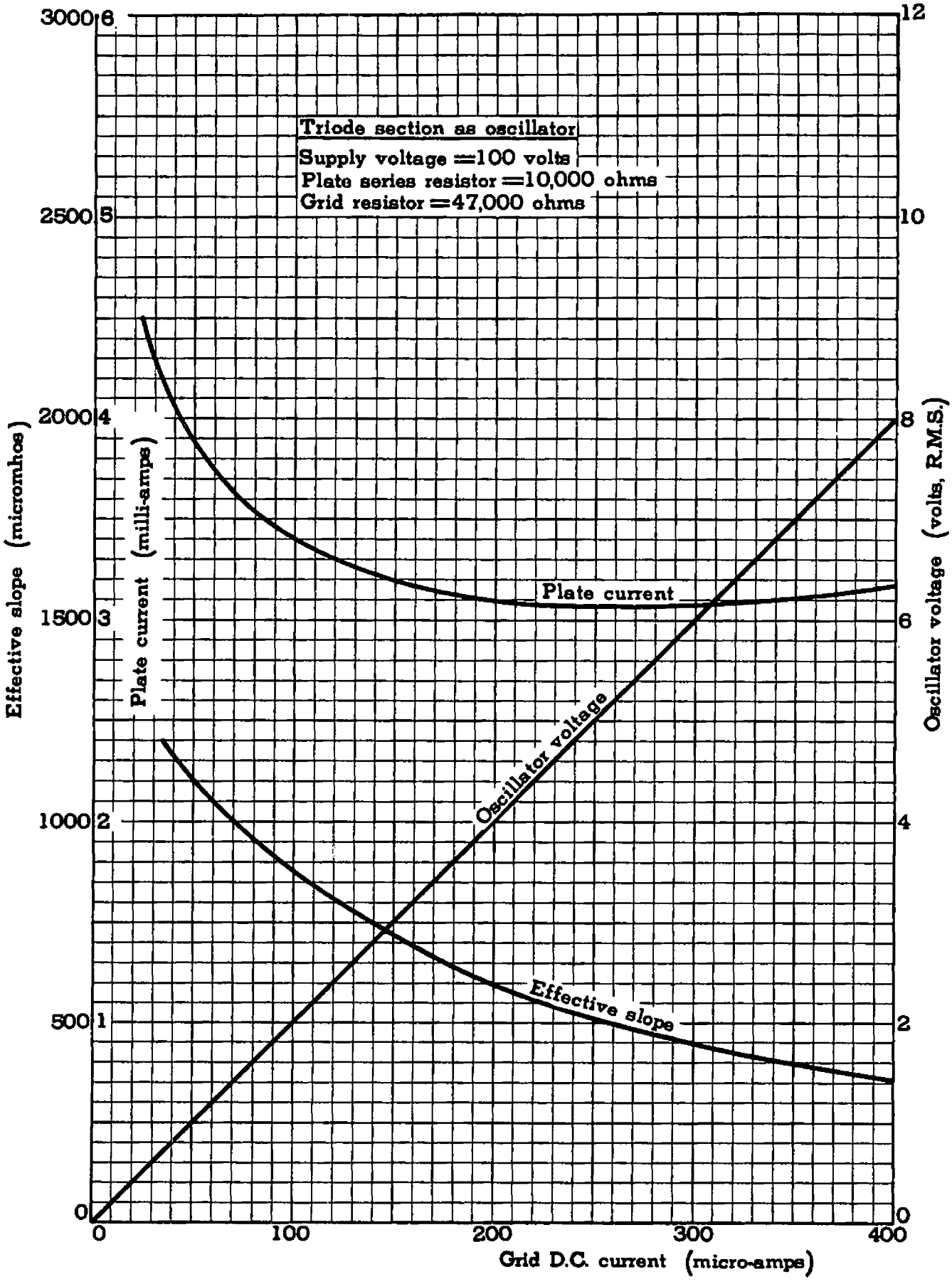

Frequency changer
Supply voltage = 100 volts
Plate voltage = 100 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Oscillator grid resistor = 47,000 ohms
Grid No.1 bias = −1 volts
Grid No.2 & 4 current
Plate current
Oscillator voltage
Conversion conductance
Plate resistance
Equivalent noise resistance
Oscillator voltage (volts, R.M.S.)
Currents (milli-amps)
Equivalent noise resistance (megohms)
Plate resistance (megohms)
Conversion conductance (micromhos)
Oscillator grid current (micro-amps)
0
5
10
1
2
0.05
0.1
0.15
200
400
600
50
100
150

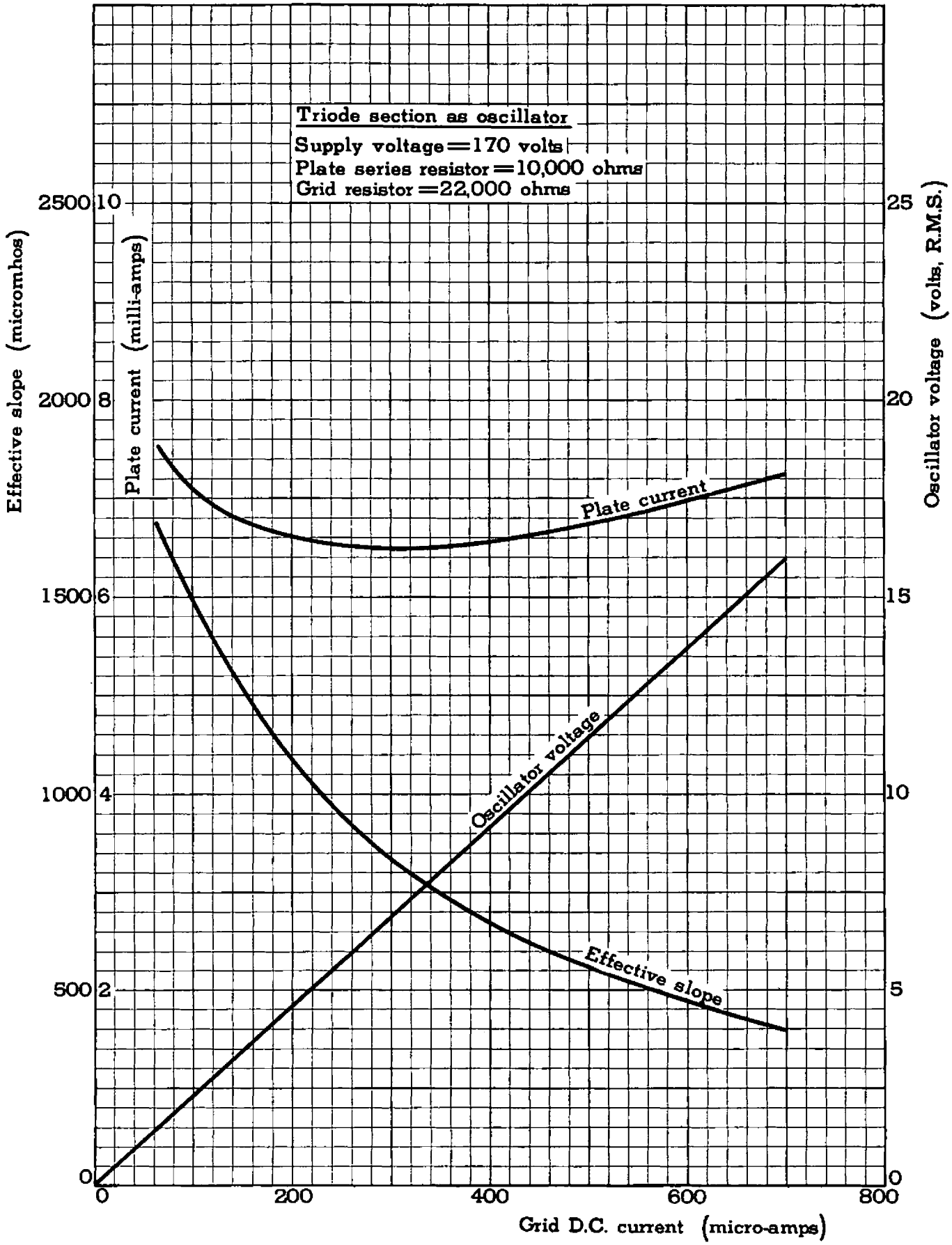

Frequency changer
Supply voltage = 100 volts
Plate voltage = 100 volts
Grid No.2 & 4 potentiometer = 18,000 + 27,000 ohms
Oscillator grid resistor = 22,000 ohms
Grid No.1 bias = −1 volts
Grid No.2 & 4 current
Plate current
Oscillator voltage
Conversion conductance
Plate resistance
Equivalent noise resistance
Oscillator voltage (volts, R.M.S.)
Currents (milli-amps)
Equivalent noise resistance (megohms)
Plate resistance (megohms)
Conversion conductance (micromhos)
Oscillator grid current (micro-amps)
0
5
10
1
2
0.05
0.1
0.15
200
300
400
600

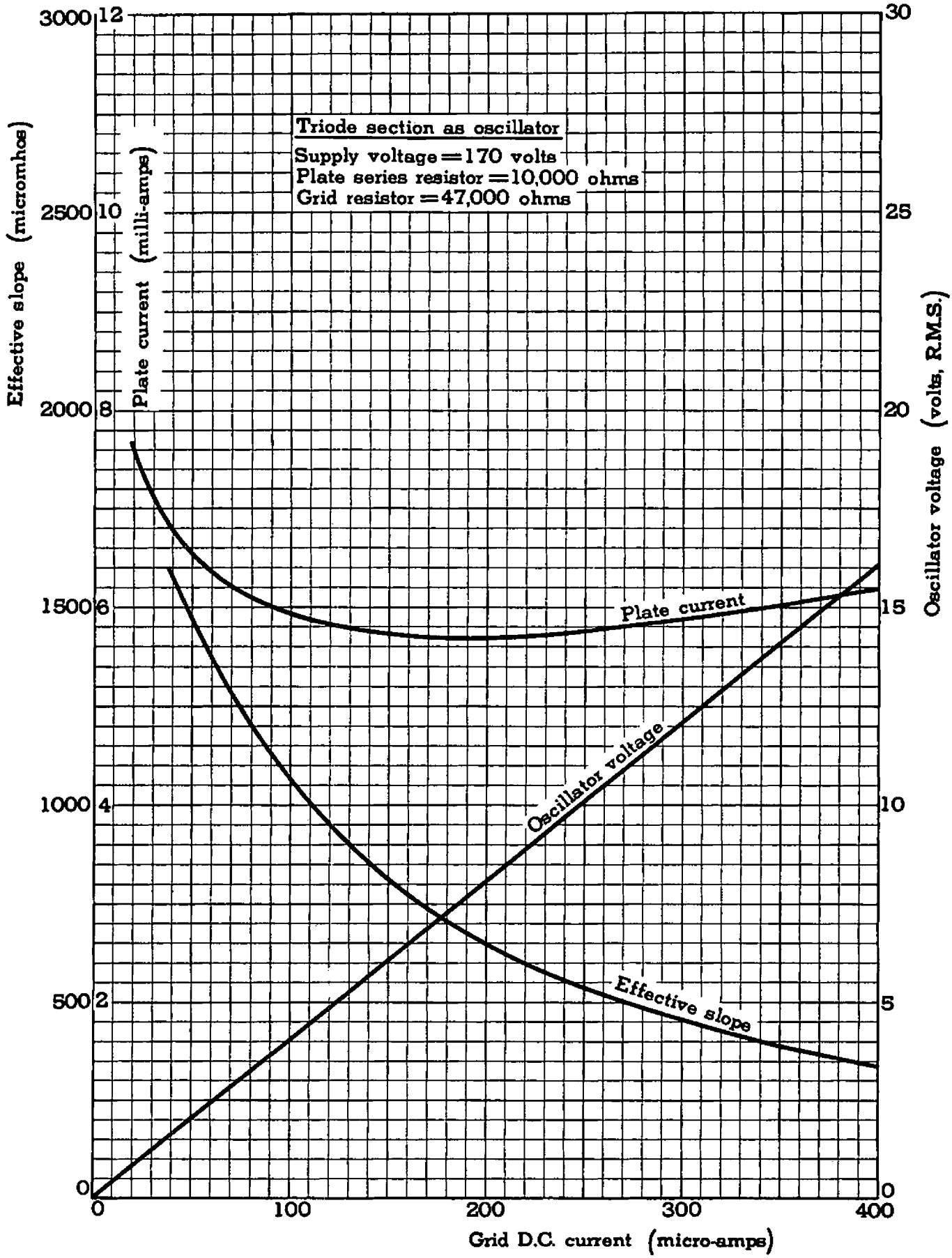

Triode section
Plate voltage = 100 volts
Transconductance (micromhos)
Plate current (milli-amps)
Grid bias (volts)
Plate current
Transconductance
7000
6000
5000
4000
3000
2000
1000
0
14
12
10
8
6
4
2
0
−10
−8
−6
−4
−2
0


Grid bias = 0 volt
-2
-4
-6
-8
-10
-12
Triode section
Plate voltage (volts)
0
50
100
150
200
250
Plate current (milli-amps)
0
10
20
30


Triode section as oscillator
Supply voltage = 100 volts
Plate series resistor = 10,000 ohms
Grid resistor = 22,000 ohms
Plate current
Oscillator voltage
Effective slope
Effective slope (micromhos)
Plate current (milli-amps)
Oscillator voltage (volts, R.M.S.)
Grid D.C. current (micro-amps)
2500
2000
1500
1000
500
0
5
4
3
2
1
0
10
8
6
4
2
0
0
100
200
300
400


Triode section as oscillator
Supply voltage =100 volts
Plate series resistor =10,000 ohms
Grid resistor =47,000 ohms
Plate current
Oscillator voltage
Effective slope
Effective slope (micromhos)
Plate current (milli-amps)
Oscillator voltage (volts, R.M.S.)
Grid D.C. current (micro-amps)
3000
2500
2000
1500
1000
500
0
6
5
4
3
2
1
0
12
10
8
6
4
2
0
0
100
200
300
400


Triode section as oscillator
Supply voltage = 170 volts
Plate series resistor = 10,000 ohms
Grid resistor = 22,000 ohms
Effective slope (micromhos)
Plate current (milli-amps)
Oscillator voltage (volts, R.M.S.)
Grid D.C. current (micro-amps)
Plate current
Oscillator voltage
Effective slope
2500
2000
1500
1000
500
0
10
8
6
4
2
0
25
20
15
10
5
0
200
400
600
800


Triode section as oscillator
Supply voltage = 170 volts
Plate series resistor = 10,000 ohms
Grid resistor = 47,000 ohms
Effective slope (micromhos)
Plate current (milli-amps)
Oscillator voltage (volts, R.M.S.)
Grid D.C. current (micro-amps)
Plate current
Oscillator voltage
Effective slope
3000
2500
2000
1500
1000
500
0
12
10
8
6
4
2
0
30
25
20
15
10
5
0
0
100
200
300
400

Rogers Electronic Tubes & Components

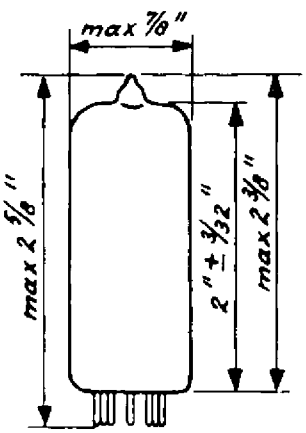
15 DQ 8

Description: Triode-pentode with separate cathodes. Triode for use in circuits for keyed A.G.C., sync-separation, sync-amplification and noise suppression. Pentode for use as video output tube

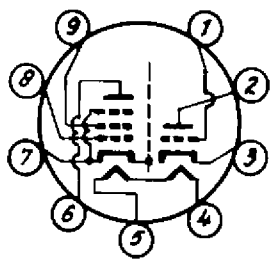
Mechanical data

Cathode	coated, unipotential
Base	E9-1
Bulb	T6 1/2
Outline	6-3
Basing	9HX
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Triode grid
2	Triode plate
3	Triode cathode
4	Heater
5	Heater
6	Pentode plate
7	Pentode cathode, grid No.3, internal shield
8	Grid No. 1
9	Grid No. 2

Heater data

Heater voltage	15 volts
Heater current	300 mamps

from JEDEC release #2556, Aug. 3, 1959

Direct interelectrode capacitances

Pentode section

Grid No. 1 to all other elements except plate	9.0 µµF
Plate to all other elements except grid No. 1	4.5 µµF
Plate to grid No. 1	max. 0.1 µµF
Grid No. 1 to heater	max. 0.1 µµF

Triode section

Grid to all other elements except plate	4.0 µµF
Plate to all other elements except grid	2.3 µµF
Plate to grid	2.7 µµF
Grid to heater	max. 0.1 µµF

Between triode and pentode section

Triode plate to pentode grid No. 1	max.0,01 µµF
Triode grid to pentode grid No. 1	max.0.01 µµF

Maximum ratings (desigr center values)

Pentode section

Plate voltage without current	550 volts max.
Plate voltage	250 volts max.
Plate dissipation	4 watts max.
Grid No. 2 voltage without current	550 volts max.
Grid No. 2 voltage	250 volts max.
Grid No. 2 dissipation	1.7 watts max.
Cathode current	40 mamps max.
Grid No.1 circuit resistance with fixed bias	1 megohm max.
Grid No. 1 circuit resistance with automatic bias	2 megohms max.
Voltage between heater and cathode	200 volts max.
Circuit resistance between heater and cathode	20,000 ohms max.

Triode section

Plate voltage without current (positive and negative)	550 volts max.
Plate voltage (positive and negative)	250 volts max.
Peak plate voltage at plate current maximum 0,1 mamp (note 1)	600 volts max.
Plate dissipation	1 watt max.

Maximum ratings (continued)

Cathode current	12 mamps max.
Grid circuit resistance with fixed bias	1 megohm max.
Grid circuit resistance with automatic bias	3 megohms max.
Voltage between heater and cathode (cathode negative with respect to heater)	150 volts max.
(cathode positive with respect to heater)	200 volts (dc) max. +150 volts (rms) max.
Circuit resistance between heater and cathode	20,000 ohms

Typical characteristics

Pentode section

Plate voltage	170	200	220	volts
Grid No. 2 voltage	170	200	220	volts
Grid No. 1 bias	-2.1	-2.9	-3.4	volts
Plate current	18	18	18	mamps
Grid No. 2 current	3	3	3	mamps
Transconductance	11000	10400	10000	micromhos
Plate resistance	0.1	0.13	0.15	megohm
Amplification factor of Grid No.2 with respect to Grid No. 1	36	36	36	

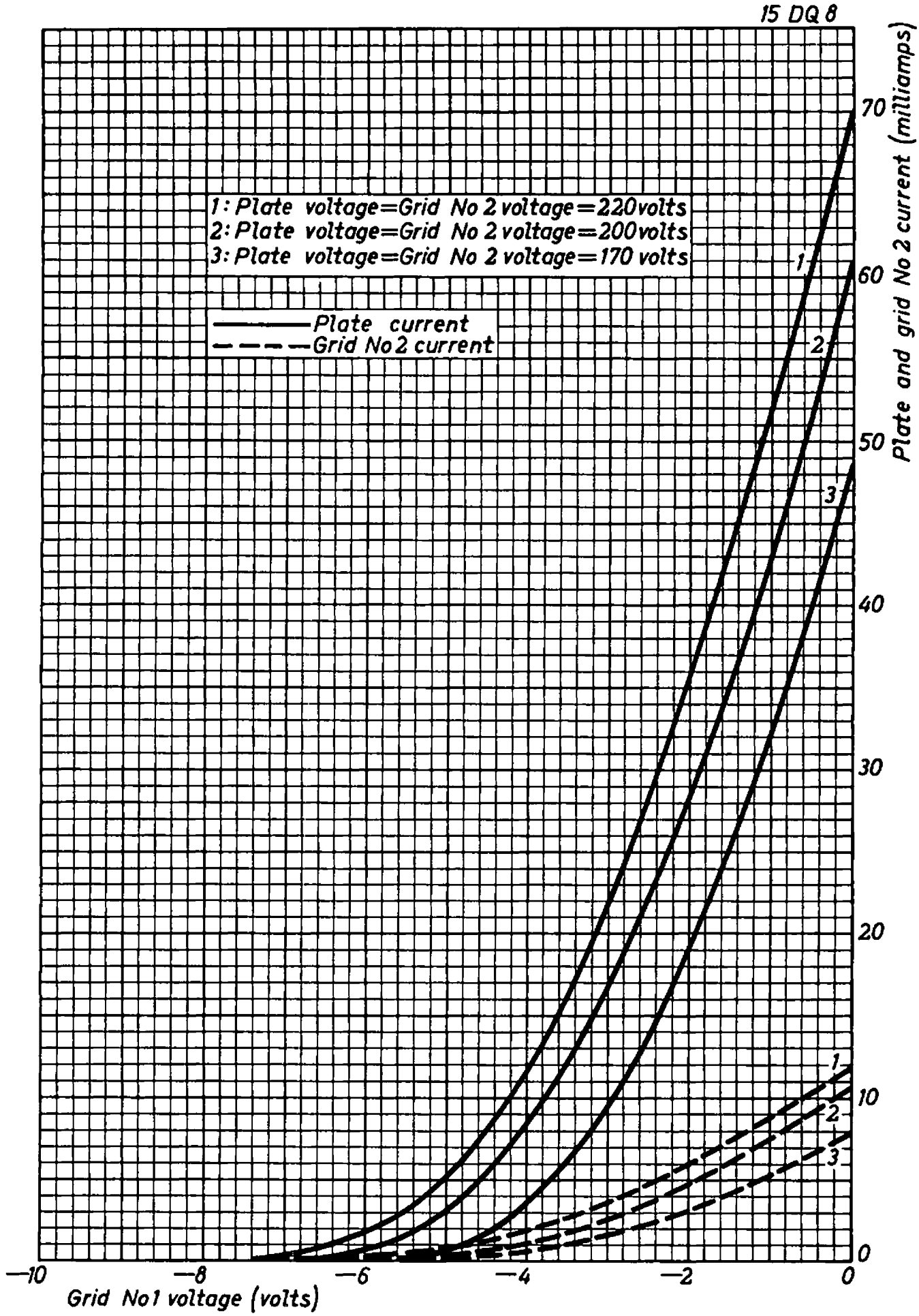
Triode section

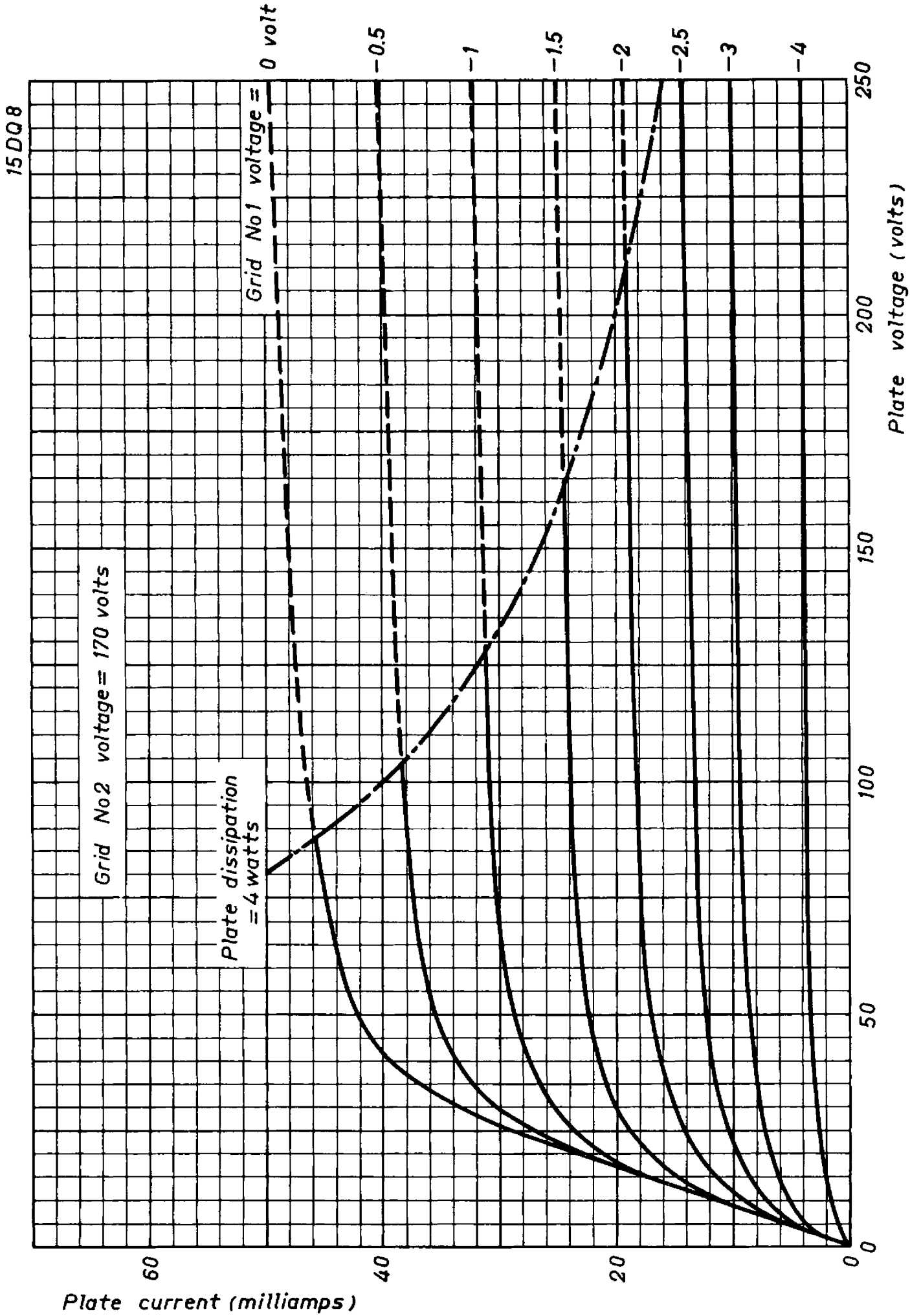
Plate voltage	200	volts
Grid bias	-1.7	volts
Plate current	3	mamps
Transconductance	4000	micromhos
Amplification factor	65	

Operating characteristics of the pentode section as video output tube

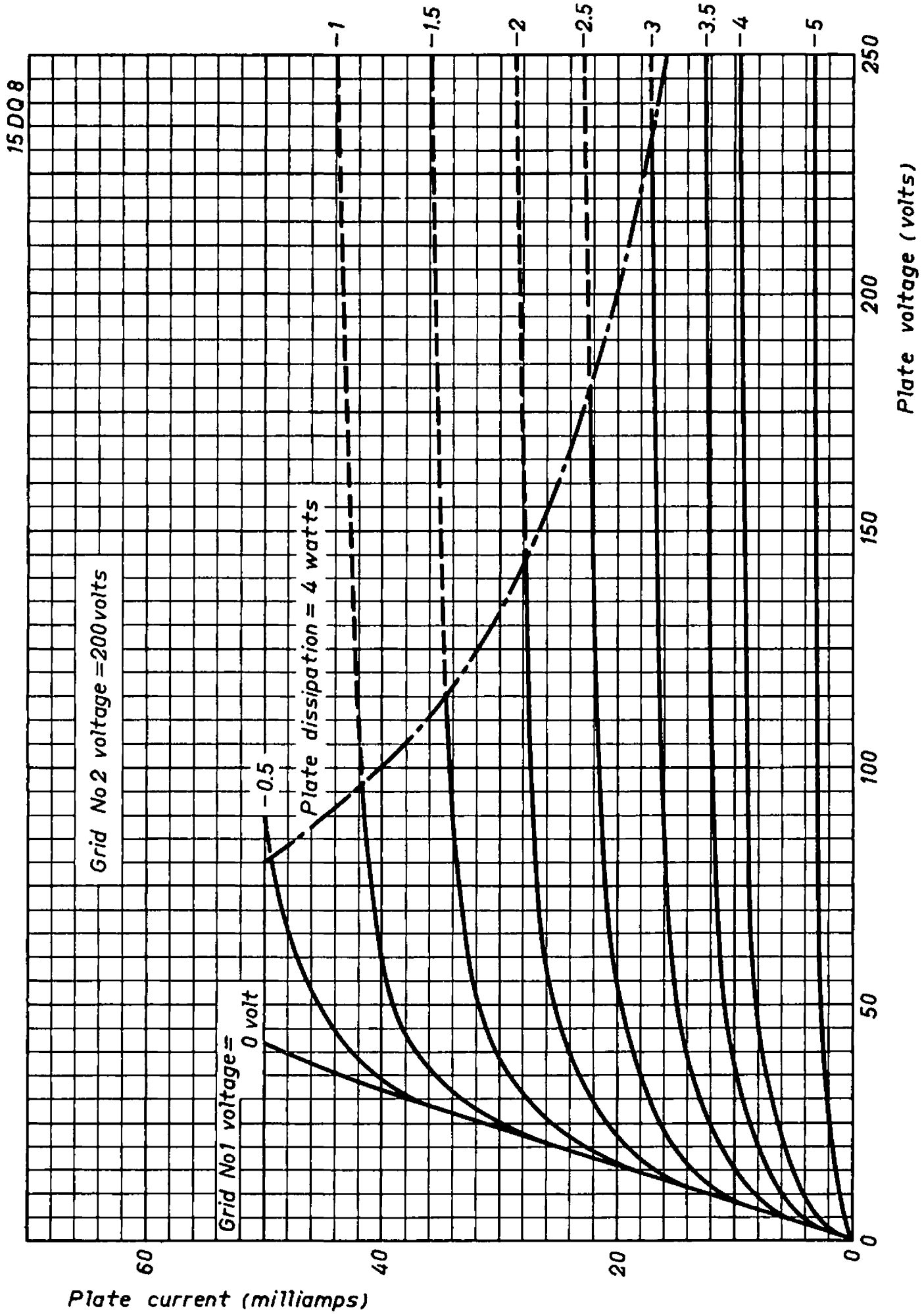
Supply voltage	170	200	220	volts
Plate series resistance	3000	3000	3000	ohms
Grid No. 2 voltage	170	200	220	volts
Grid No. 1 bias	-2	-2.8	-3.3	volts
Plate current	18	18	18	mamps
Grid No. 2 current	3.2	3.1	3.1	mamps
Transconductance	10400	10000	9700	micromhos

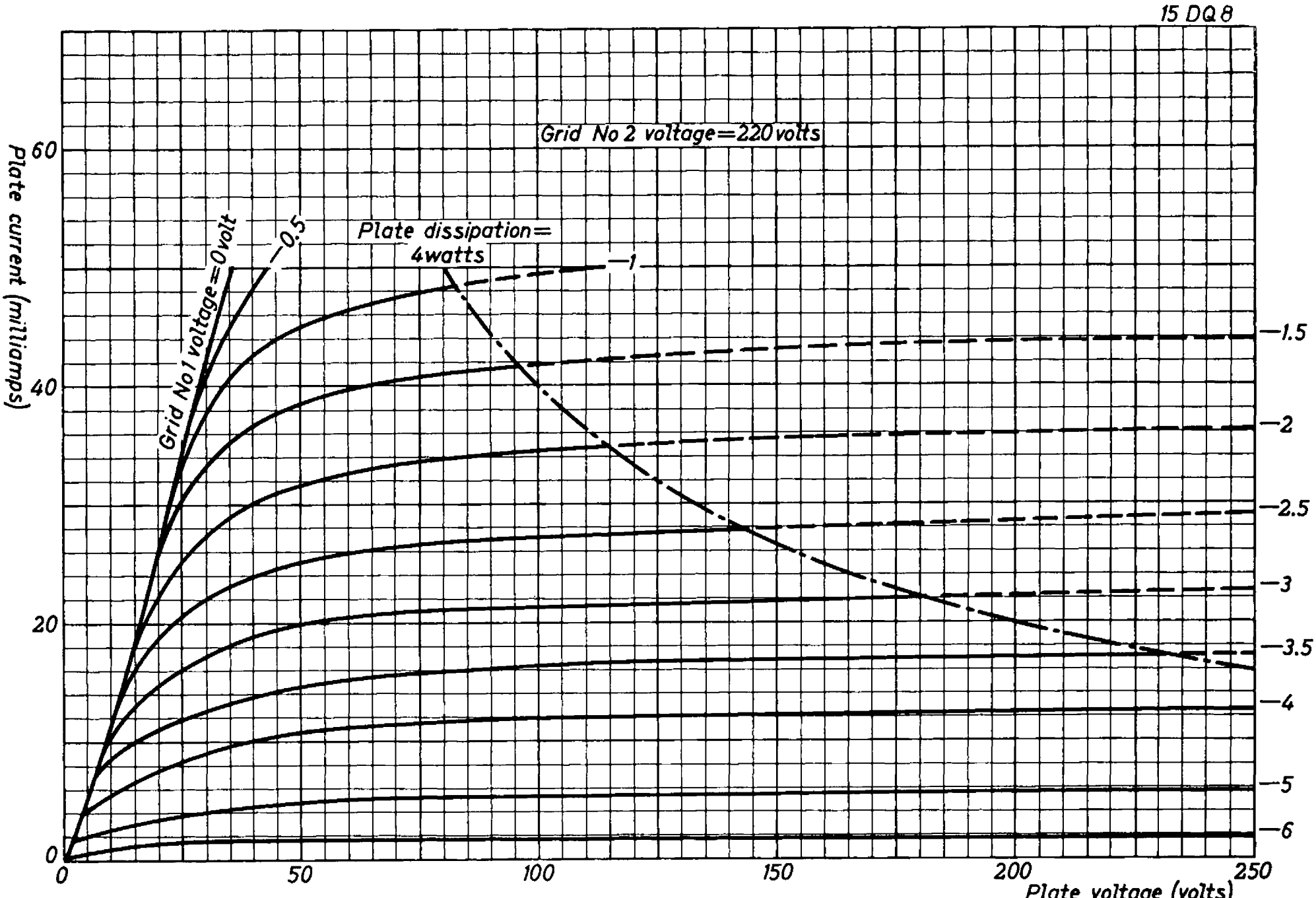
Note 1. Max.pulse duration 18% of a cycle with a maximum of 18 micro-seconds


15 DQ 8
1: Plate voltage=Grid No 2 voltage=220volts
2: Plate voltage=Grid No 2 voltage=200volts
3: Plate voltage=Grid No 2 voltage=170 volts
Plate current
Grid No2 current
Plate and grid No 2 current (milliamps)
Grid No1 voltage (volts)
70
60
50
40
30
20
10
0
−10
−8
−6
−4
−2
0
1
2
3

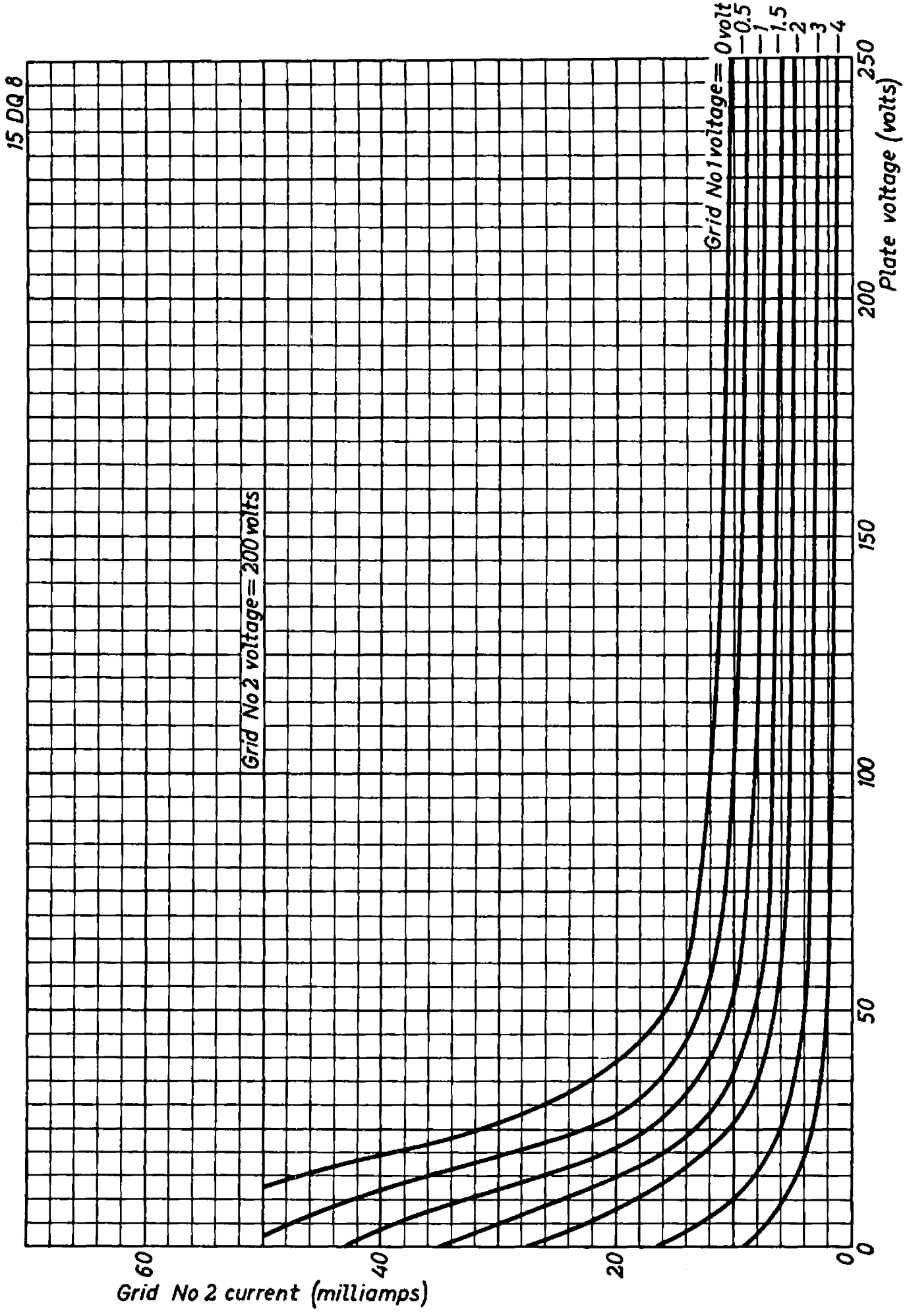

15DQ8
Grid No1 voltage =
0 volt
-0.5
-1
-1.5
-2
-2.5
-3
-4
Grid No2 voltage = 170 volts
Plate dissipation
= 4 watts
Plate voltage (volts)
0
50
100
150
200
250
Plate current (milliamps)
0
20
40
60

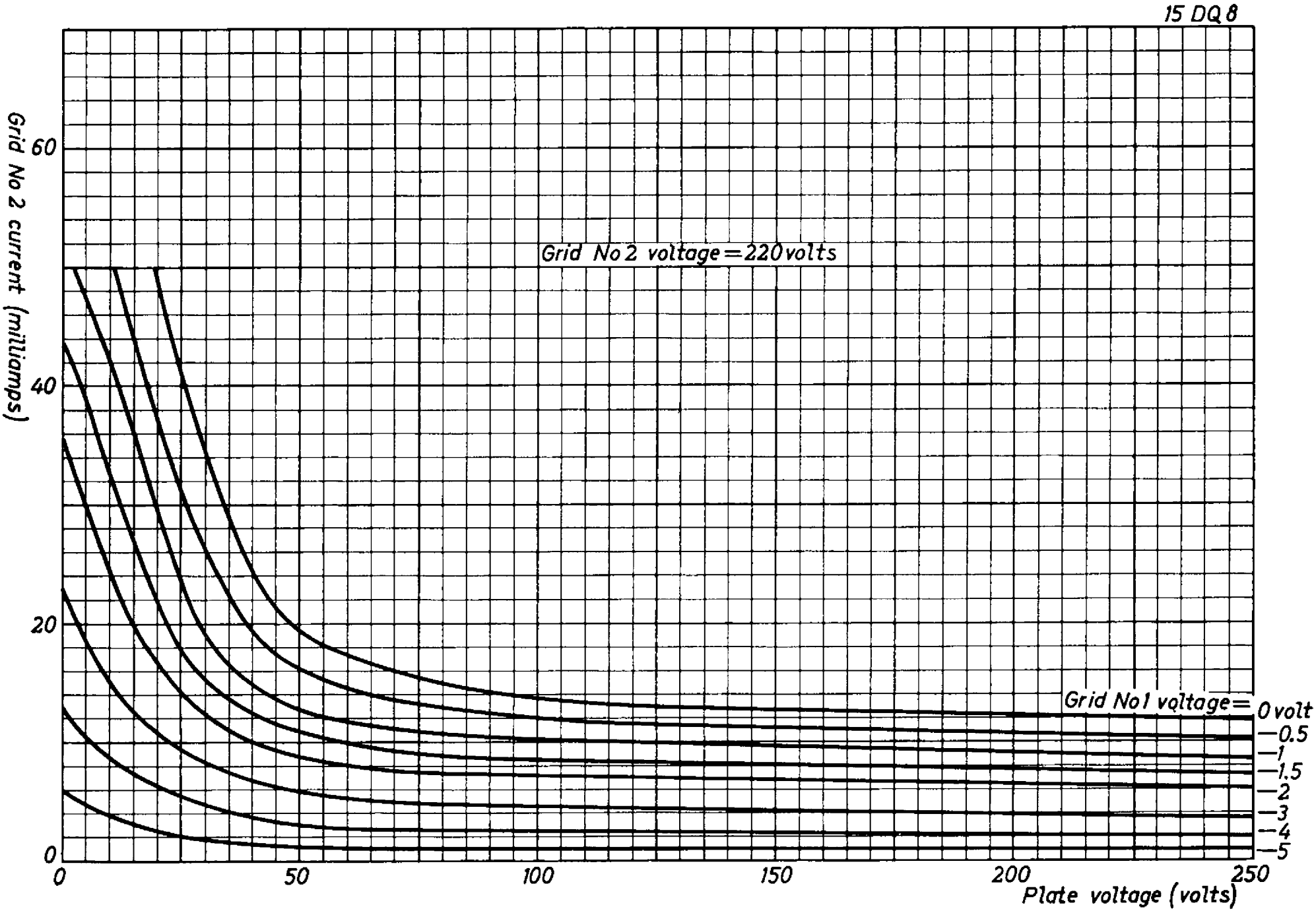
B


15 DQ 8
Grid No 2 voltage = 200 volts
Plate dissipation = 4 watts
Grid No1 voltage =
0 volt
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
-5
0
50
100
150
200
250
Plate voltage (volts)
0
20
40
60
Plate current (milliamps)

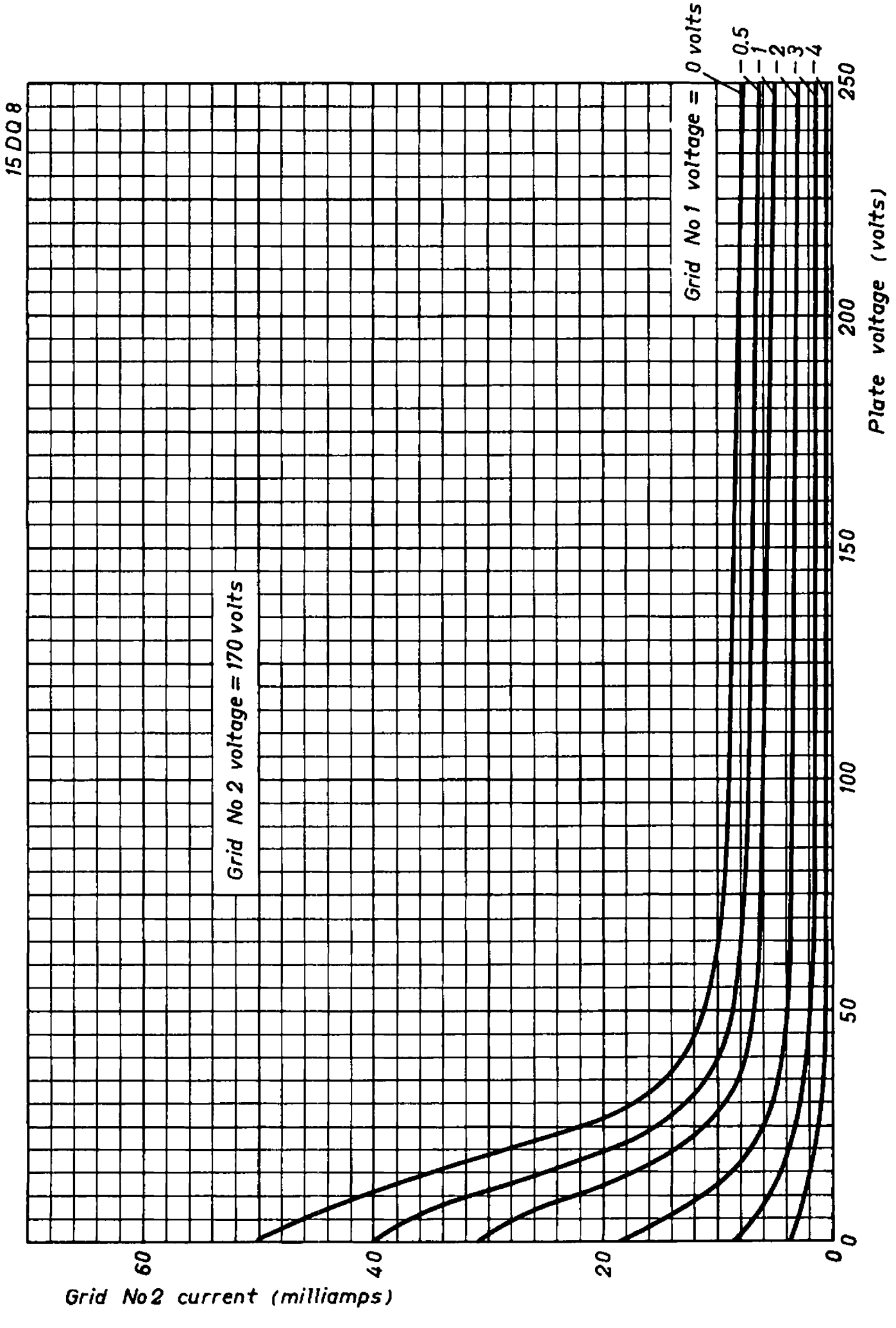

15 DQ 8
Grid No 2 voltage=220 volts
Plate dissipation=
4 watts
Grid No 1 voltage=0 volt
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
-5
-6
Plate current (milliamps)
0
20
40
60
0
50
100
150
200
250
Plate voltage (volts)

D


15 DQ 8
Grid No 1 voltage = 0 volt
−0.5
−1
−1.5
−2
−3
−4
Plate voltage (volts)
250
200
150
100
50
0
Grid No 2 voltage = 200 volts
60
40
20
0
Grid No 2 current (milliamps)

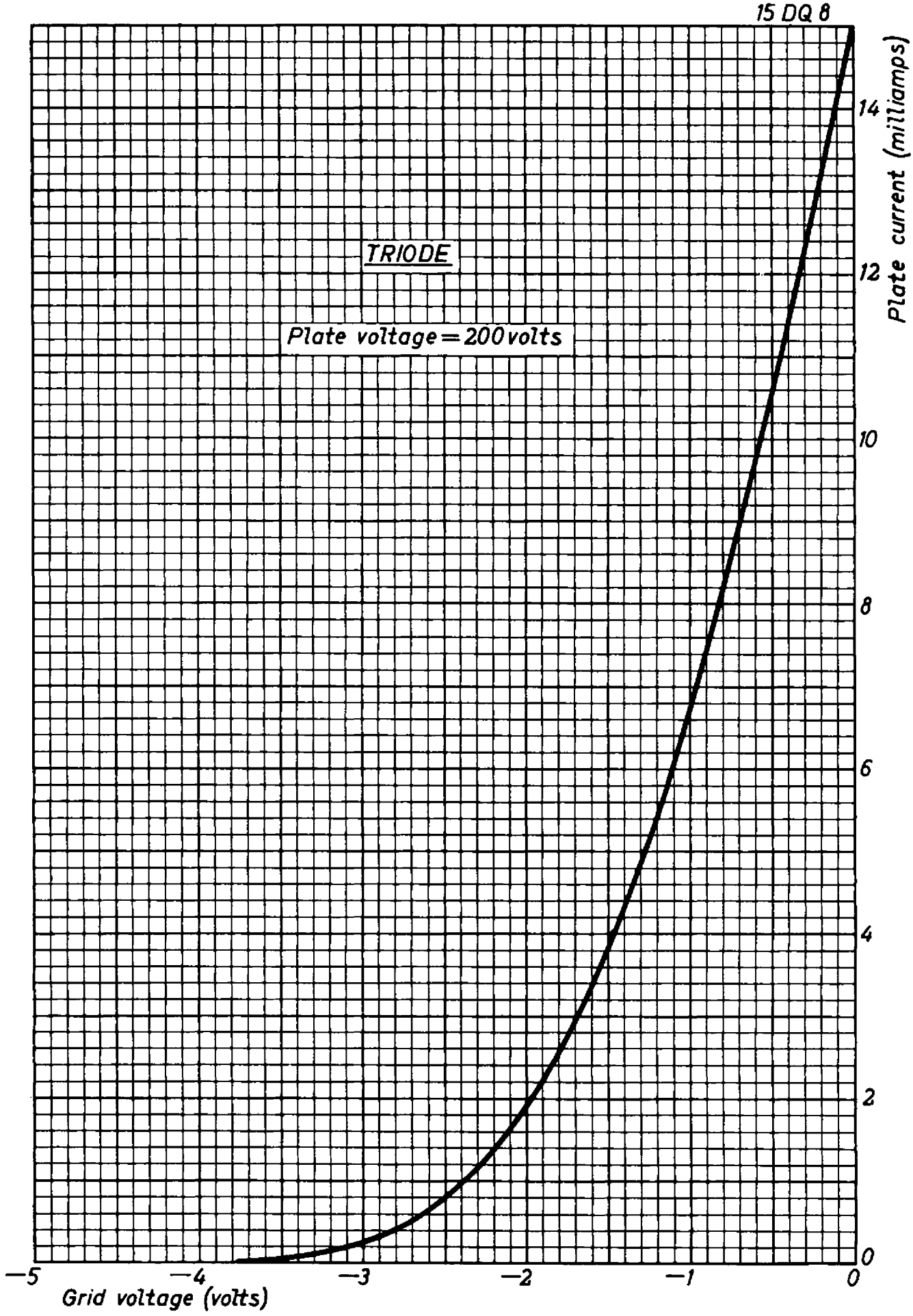

15 DQ 8
Grid No 2 current (milliamps)
60
40
20
0
Grid No 2 voltage = 220 volts
Grid No 1 voltage = 0 volt
−0.5
−1
−1.5
−2
−3
−4
−5
0
50
100
150
200
250
Plate voltage (volts)

F


15 DQ 8
Grid No 1 voltage =
0 volts
-0.5
-1
-2
-3
-4
Grid No 2 voltage = 170 volts
Plate voltage (volts)
250
200
150
100
50
0
60
40
20
0
Grid No 2 current (milliamps)

10.10.1958

G


15 DQ 8
TRIODE
Plate voltage = 200 volts
Plate current (milliamps)
0
2
4
6
8
10
12
14
−5
−4
−3
−2
−1
0
Grid voltage (volts)

10.10.1958

H

ROGERS 16AQ3

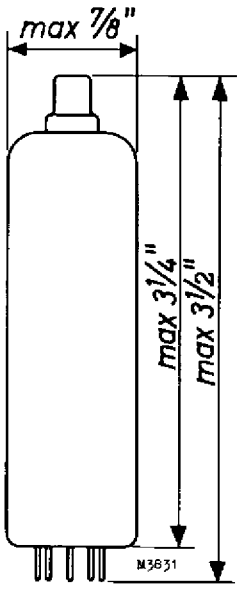
BOOSTER DIODE

Booster diode for use in line-timebase circuits of transformerless television receivers.

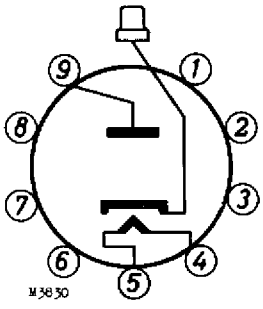
MECHANICAL DATA

Cathode	coated, unipotential
Base	E9-1
Bulb	T6 1/2
Outline	see drawing
Basing	9CB
Top cap	C1-2
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	internally
2	connected;do
3	not use
4	heater
5	heater
6	internally
7	connected;do
8	not use
9	anode
Top cap	cathode

from JEDEC release #2684, Jan. 4, 1960

HEATER DATA	
Heater voltage	16.4 volts
Heater current	600 mamps
DIRECT INTERELECTRODE CAPACITANCES	
Plate to all other elements	8.6 μμF
Cathode to heater	2.0 μμF
MAXIMUM RATINGS (Design Center Values)	
Supply voltage without current	550 volts max.
Supply voltage	250 volts max.
Plate current	220 mamps max.
Peak plate current	550 mamps max.
Plate dissipation	5 watts max.
Peak negative plate voltage	6000 volts max.[1)][2)]
Peak voltage between heater and cathode	6600 volts max.[1)]
Voltage between heater and earth	220 volts r.m.s. max.

[1)] Max. pulse duration 22% of a cycle with a max. of 18 μsec.

[2)] Absolute maximum ratings 7500 volts.

Rogers Electronic Tubes & Components

17BTP4

Description: Rectangular television picture tube with filter glass, metal-backed screen, ion trap, electrostatic focusing and 90° magnetic deflection

Heater data

Heater voltage	6.3 volts
Heater current	0.3 amp

Note: (applies to series operation only) The surge heater voltage must not exceed 9,5 volts rms when the supply is switched on. When used in a series chain a current limiting device may be necessary in the circuit to ensure that this voltage is not exceeded.

Direct interelectrode capacitances

Grid No.1 to all other electrodes	7 µµF
Cathode to all other electrodes	4 µµF
External conductice coating to grid No.4 and 6	max. 1400 µµF min. 900 µµF

Screen

Phosphor number (JETEC designation)	P4
Fluorescent color	white
Persistance	short
Light transmission	75 %
Useful diagonal	min. 15 3/8 "
Useful width	min. 14 1/4 "
Useful height	min. 10 3/4 "

Focusing method	electrostatic
Deflection method	double magnetic
Deflection angle, diagonal	90°
Deflection angle, horizontal	85°
Deflection angle, vertical	65°

Mounting position

The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The outer circumference of the base will fall within a circle which is concentric with the perpendicular from the centre of the face and which has a diameter of 2 3/16"

Ion trapmagnet

Single magnet, field strength approx. 50 Gausses.

from JEDEC release #2383, Aug. 17, 1959

Picture centering magnet

Field intensity perpendicular to the tube axis for centering of the picture: 0-10 gausses.
Maximum distance between centre of field of this magnet and reference line is 70 mm

Ratings (Design Center Values)

Grid No.4 and 6 voltage	18000 max. volts x)
	12000 min. volts
Grid No.3 and 5 voltage	
positive	500 max. volts
negative	500 max. volts
Grid No.2 voltage	500 max. volts
	200 min. volts
Grid No.1 voltage	
negative	150 max. volts
positive	0 max. volt
positive peak	2 max. volts
Heater to cathode voltage +)	
Heater positive with respect to cathode	125 max. volts
Heater negative with respect to cathode	200 max. volts.
Peak value during a warm-up period not exceeding 45 sec.; heater negative	410 max. volts

Maximum circuit values

Grid No.1 circuit resistance	1,5 max. megohms
Grid No.1 circuit impedance at 50 cps	0,5 max. megohms
Circuit resistance between cathode and heater	see o)

Circuit design values

Negative grid No.3 and 5 current	10 max. microamps
Positive grid No.3 and 5 current	10 max. microamps

x) At zero current

+) In order to avoid excessive hum, the A.C. component of the heater to cathode voltage should be as low as possible and must not exceed 20 volts, rms.

o) When the heater is supplied from a separate transformer, the maximum value of the circuit resistance between cathode and heater = 1 megohm. When the heater is in a series chain or earthed the maximum circuit impedance at 50 cps = 0,1 MΩ

Typical operating conditions

Grids No.4 and 6 voltage	14000	16000	volts
Grids No.3 and 5 voltage at final accelerating electrodes current of 100 microamps	-103 to +203	-75 to +235	volts[xx])
Grid No.2 voltage	300	300	volts
Grid No.1 voltage for visual extinction of undeflected focused spot	-40 to -80	-40 to -80	volts

Mechanical data

Overall length	15 5/8"
Greatest dimensions of bulb	
diagonal	16 5/8" ± 1/8"
width	15 3/8" ± 1/8"
height	12 1/4" ± 1/8"
Neck length	6 1/2"
Bulb number (ASA designation)	J 133
Bulb contact (JETEC designation)	J1-21
Base (JETEC designation)	B7-51

[xx]) At the specified value of grids No.3 and 5 voltage the focusing of the tube is optimum in the centre of the screen. If a uniform focusing over the entire screen is preferred this voltage has to be raised with 100 to 200 volts.

Notes from page 5 and 6

1)Reference line, determined by the plane of the upper edge of the flange of the reference gauge JETEC No. 116 when the gauge is resting on the cone.

2)Allowable contact area

3)Space for deflection coils and centering magnet

4)Space for the ion trap magnet

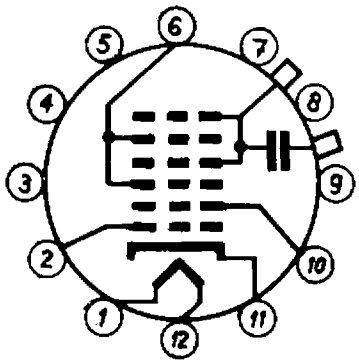
5)Distance from reference line to top centre of grid

6)Recessed cavity contact

7)Ion trap magnet

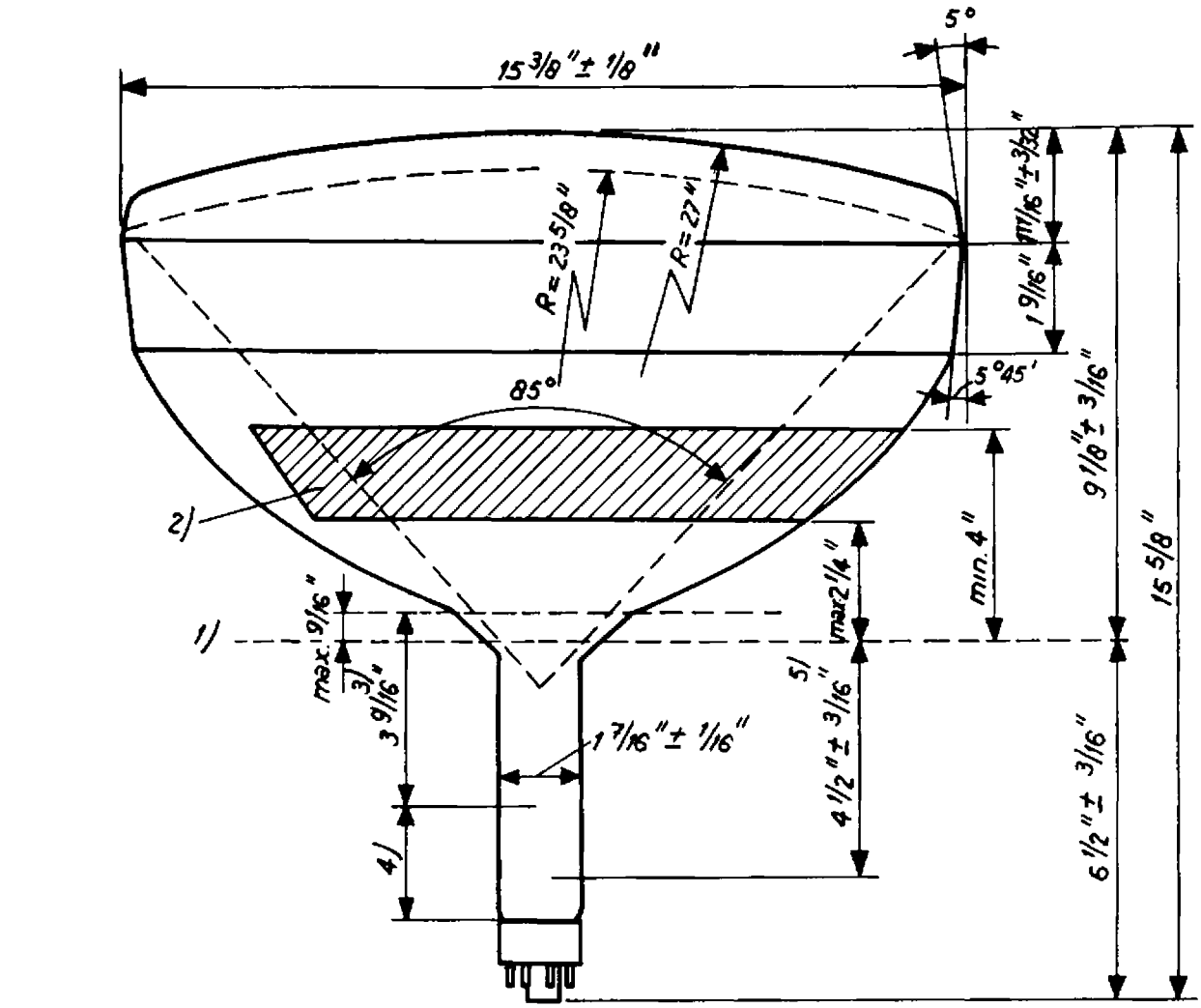
8)This area must be kept clean

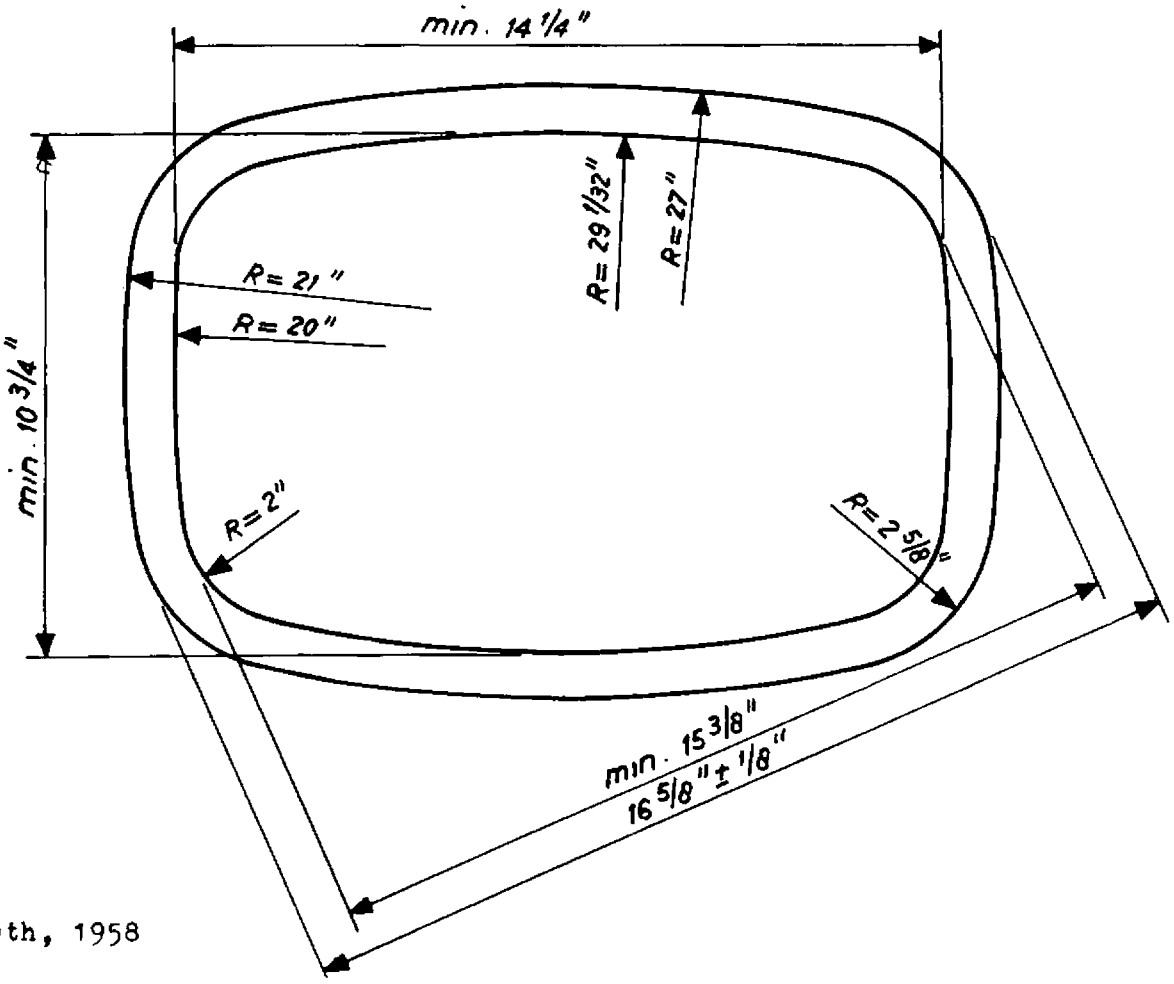
BOTTOM VIEW OF BASE

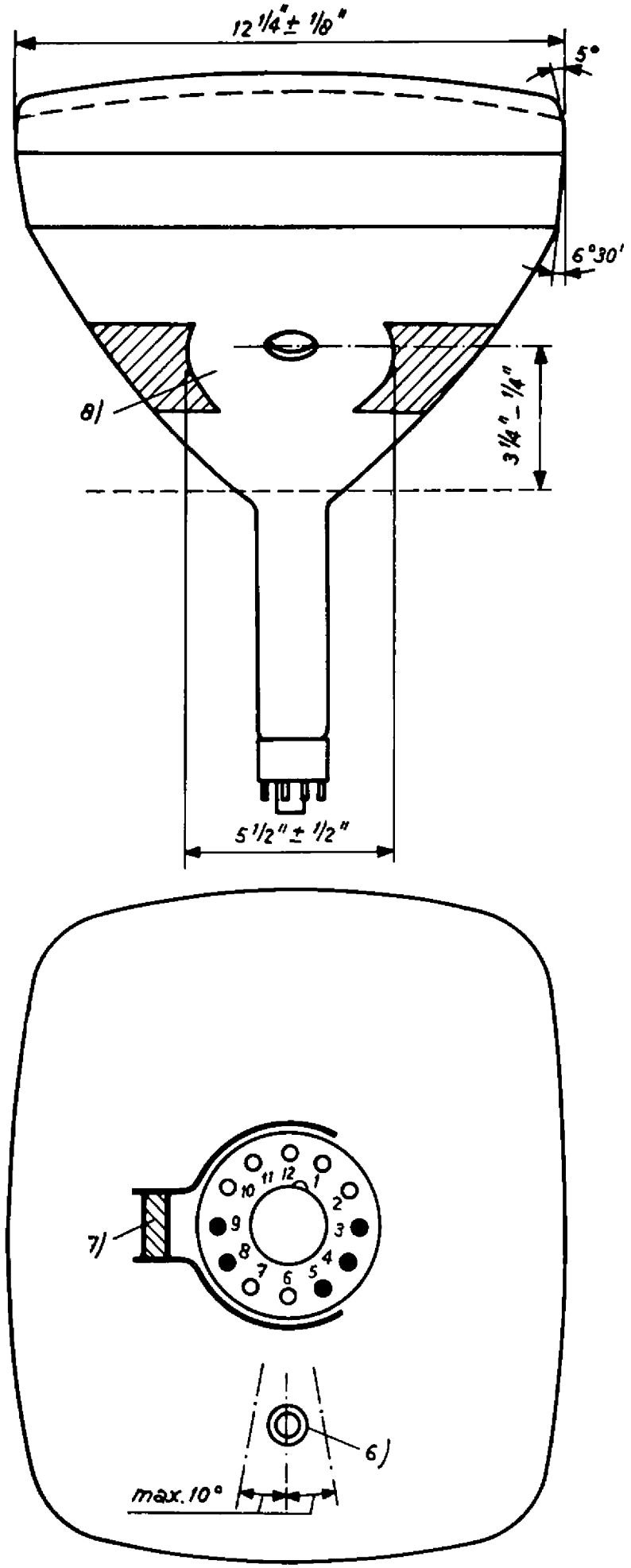


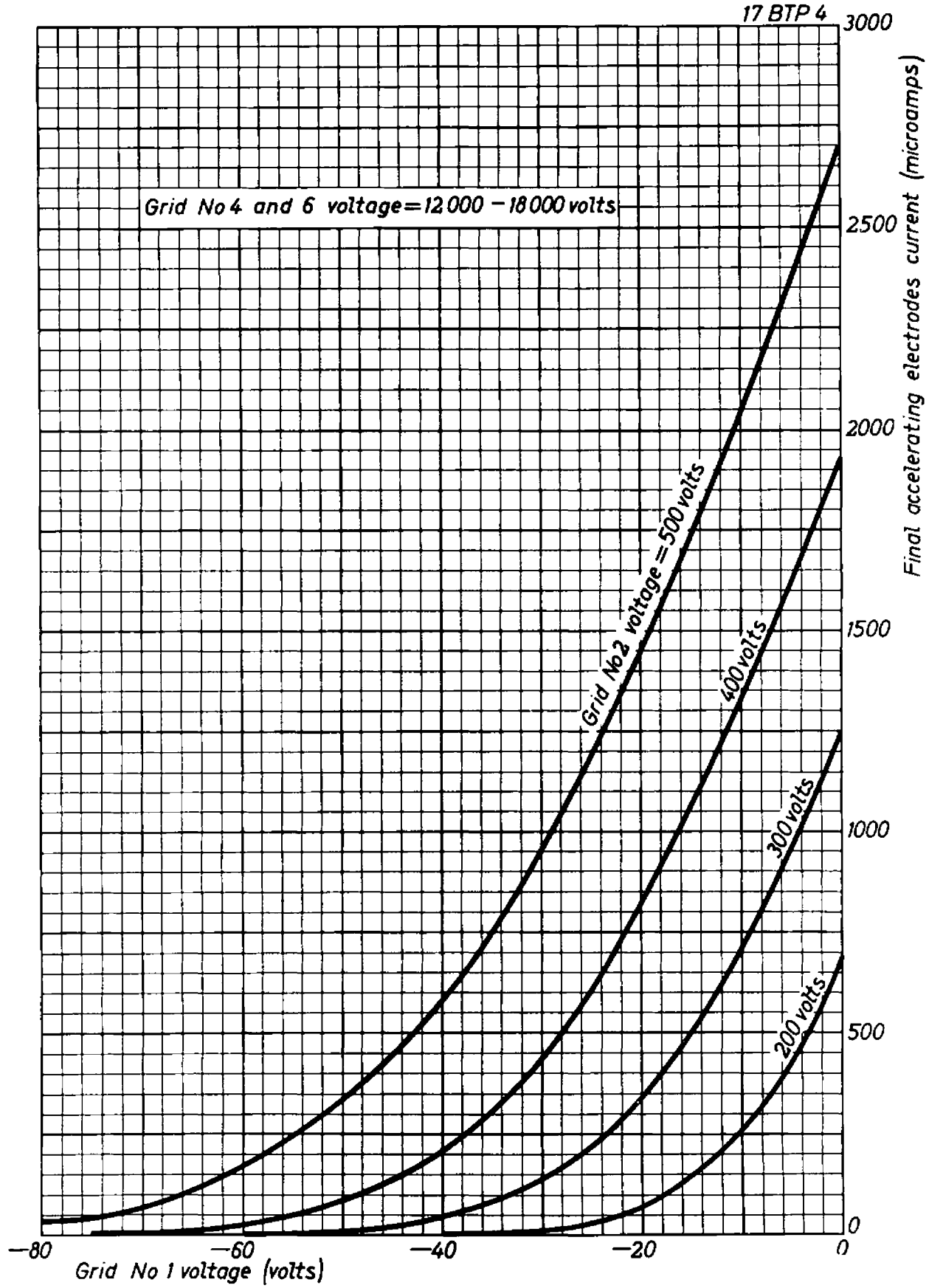
12 AJ

BASE PIN No.	ELEMENT
1	heater
2	grid No.1
6	grid No.3 and 5
10	grid No.2
11	cathode
12	heater
bulb contact	grid no.4 and 6, collector


5°
15 3/8" ± 1/8"
R= 23 5/8"
R= 27"
1 9/16" ± 1/32"
85°
5°45'
9 1/8" ± 3/16"
15 5/8"
2/
min. 4"
max 2 1/4"
1/
max. 9/16"
3/
3 9/16"
1 7/16" ± 1/16"
5/
4 1/2" ± 3/16"
6 1/2" ± 3/16"
4/

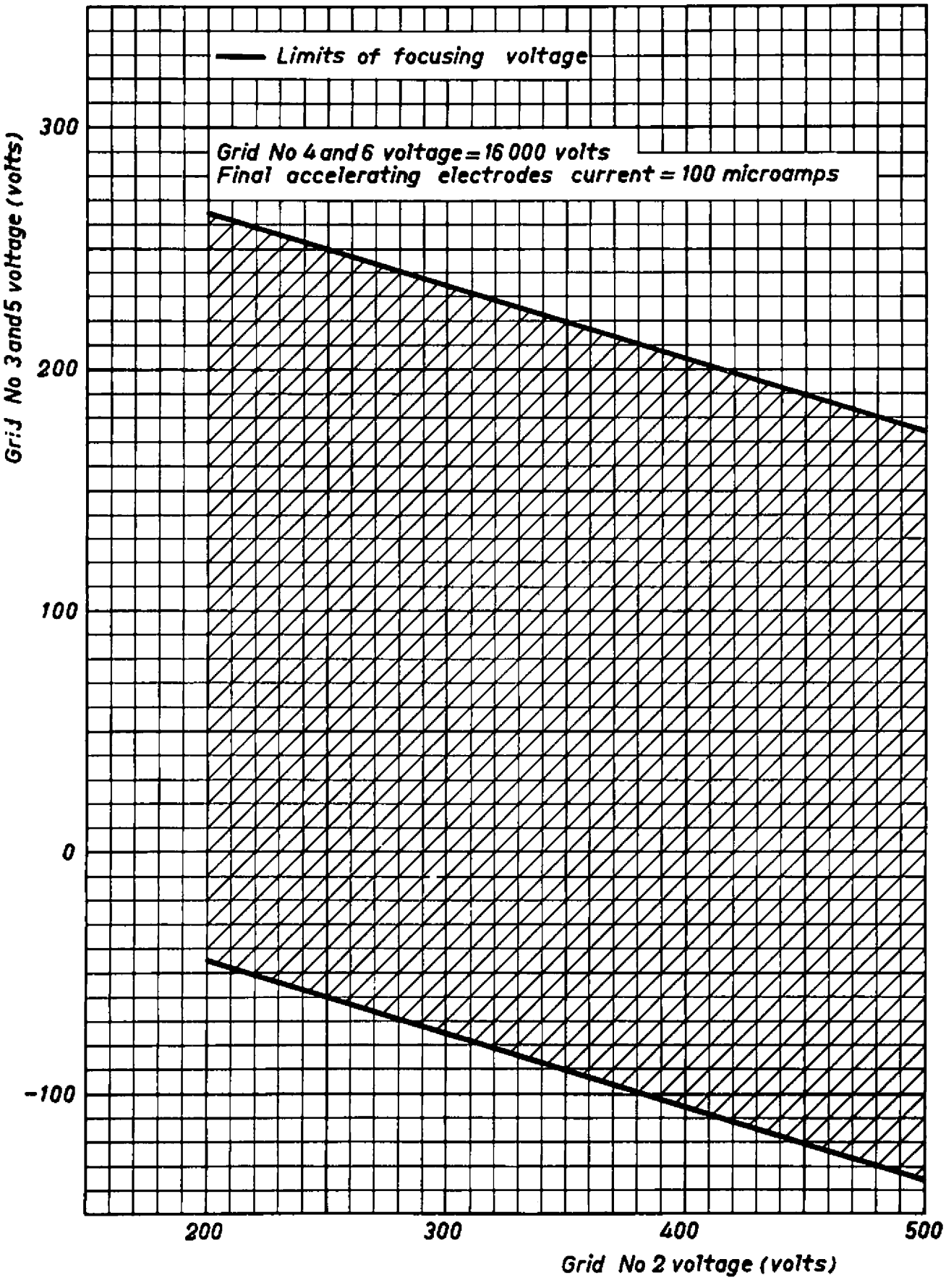

min. 14 1/4"
R= 29 1/32"
R= 27"
R= 21"
R= 20"
min. 10 3/4"
R= 2"
R= 2 5/8"
min. 15 3/8"
16 5/8" ± 1/8"


12 1/4" ± 1/8"
5°
6°30'
8)
3 1/4" - 1/4"
5 1/2" ± 1/2"
7)
10
11
12
1
2
9
3
8
4
7
6
5
6)
max. 10°

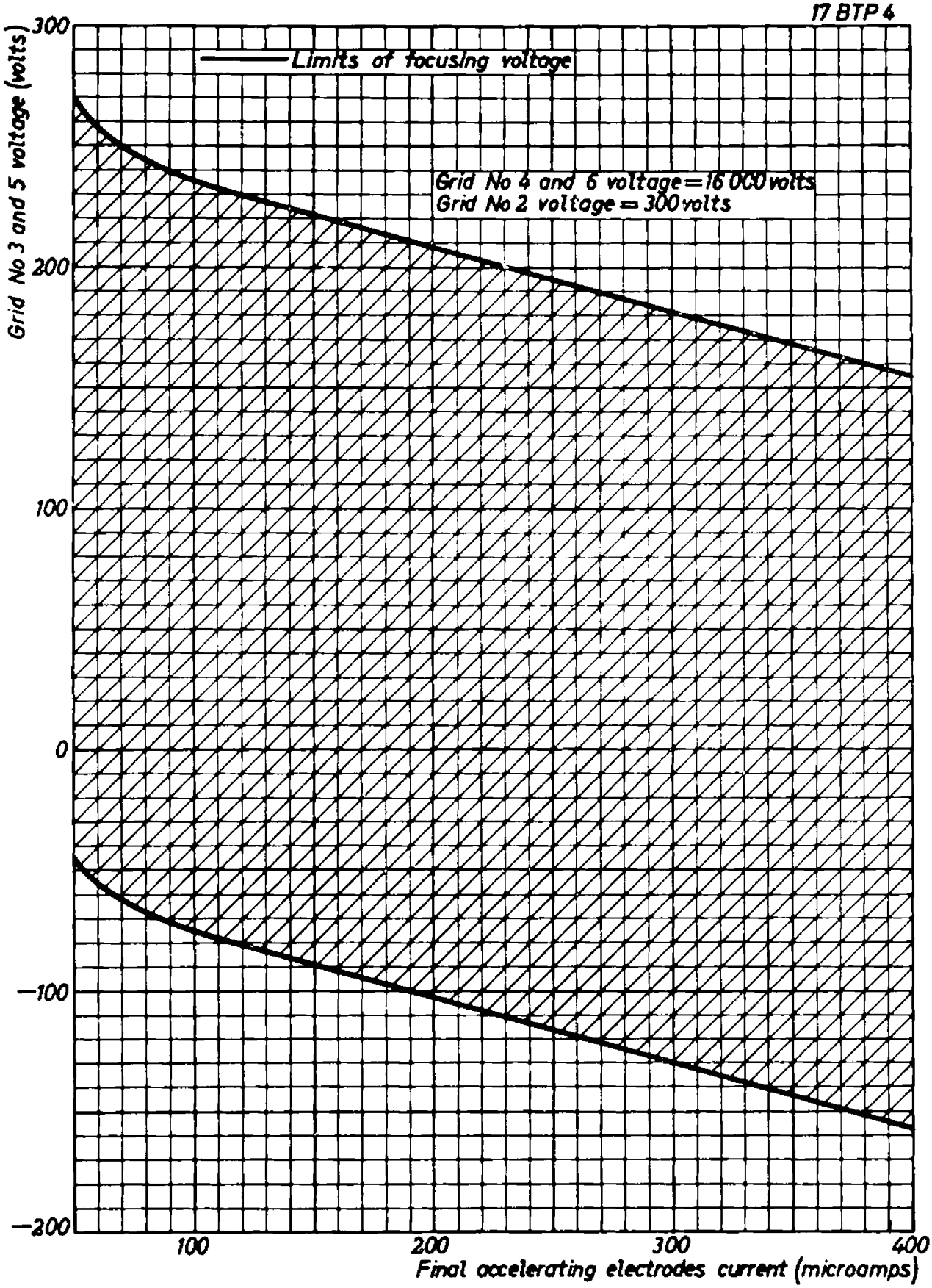

17 BTP 4
Grid No 4 and 6 voltage = 12 000 – 18 000 volts
Grid No 2 voltage = 500 volts
400 volts
300 volts
200 volts
3000
2500
2000
1500
1000
500
0
Final accelerating electrodes current (microamps)
–80
–60
–40
–20
0
Grid No 1 voltage (volts)

A

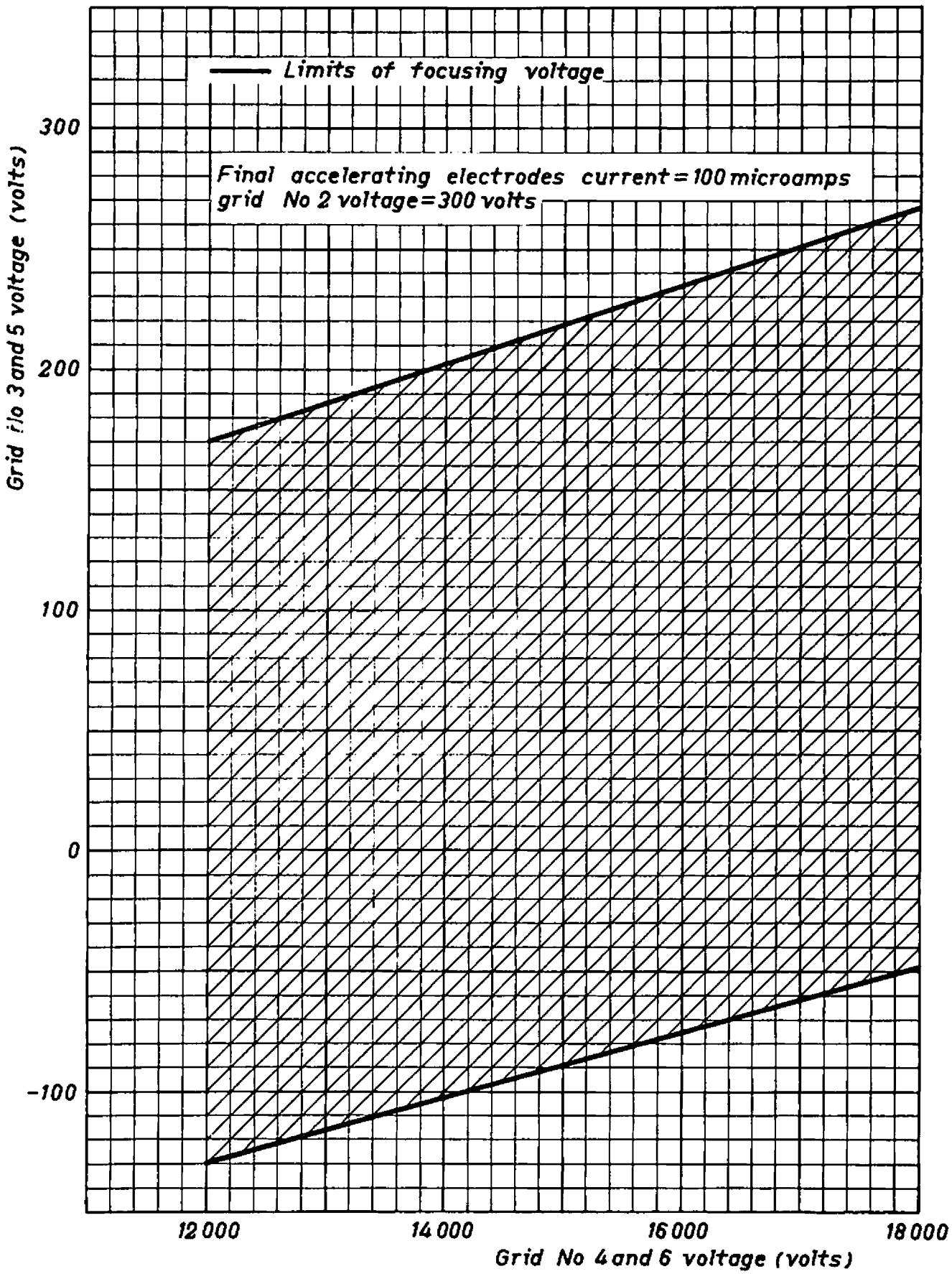
17BTP4


Limits of focusing voltage
Grid No 4 and 6 voltage = 16 000 volts
Final accelerating electrodes current = 100 microamps
Grid No 3 and 5 voltage (volts)
300
200
100
0
-100
200
300
400
500
Grid No 2 voltage (volts)

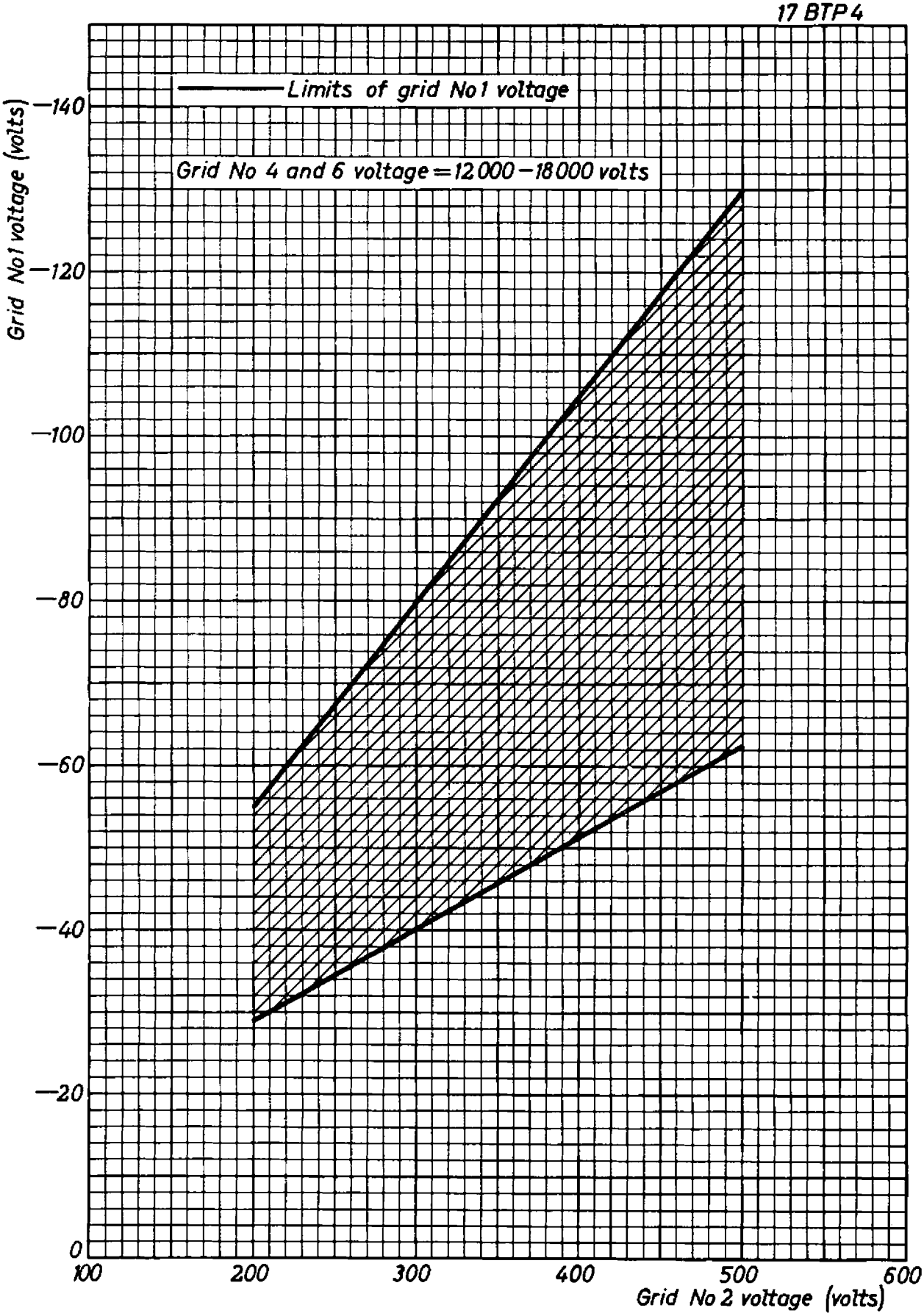
B


Limits of focusing voltage
Grid No 4 and 6 voltage = 16 000 volts
Grid No 2 voltage = 300 volts
Grid No 3 and 5 voltage (volts)
300
200
100
0
−100
−200
100
200
300
400
Final accelerating electrodes current (microamps)

C


Limits of focusing voltage
Final accelerating electrodes current = 100 microamps
grid No 2 voltage = 300 volts
300
200
100
0
-100
Grid No 3 and 5 voltage (volts)
12 000
14 000
16 000
18 000
Grid No 4 and 6 voltage (volts)

D


Limits of grid No 1 voltage
Grid No 4 and 6 voltage = 12 000 – 18 000 volts
Grid No1 voltage (volts)
–140
–120
–100
–80
–60
–40
–20
0
100
200
300
400
500
600
Grid No 2 voltage (volts)

from JETEC release #1865, March 11, 1957
sponsor: Rogers Majestic Electronics, Ltd.

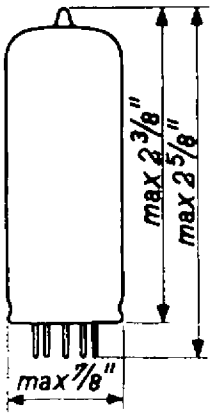
17C8

DOUBLE DIODE-REMOTE CUTOFF PENTODE for use as RF, IF or AF amplifier

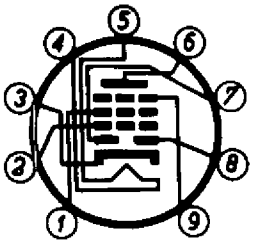
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
RETMA basing designation	9T

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN NO.	ELEMENT
1	Grid No.2
2	Grid No.1
3	Cathode, internal shield
4	Heater
5	Heater
6	Pentode plate
7	Diode No.1 plate
8	Diode No.2 plate
9	Grid No.3

ELECTRICAL DATA

HEATER DATA

Heater voltage	17 volts
Heater current	100 mamps

DIRECT INTERELECTRODE CAPACITANCES

Pentode grid No.1 to all other elements		4.2 μμF
Pentode plate to all other elements		4.9 μμF
Between pentode plate and grid No.1	max.	0.0025 μμF
Between pentode grid No.1 and heater	max.	0.07 μμF
Between diode No.1 plate and cathode		2.2 μμF
Between diode No.2 plate and cathode		2.35 μμF
Between diode plates	max.	0.35 μμF
Between diode No.1 plate and heater	max.	0.02 μμF
Between diode No.2 plate and heater	max.	0.005 μμF
Between diode No.1 plate and grid No.1	max.	0.0008 μμF
Between diode No.2 plate and grid No.1	max.	0.001 μμF
Between diode No.1 plate and pentode plate	max.	0.2 μμF
Between diode No.2 plate and pentode plate	max.	0.05 μμF

MAXIMUM RATINGS

Pentode section

Plate voltage (without current)	550 volts
Plate voltage	250 volts
Plate dissipation	1.5 watts
Screen grid voltage (without current)	550 volts
Screen grid voltage (plate current less than 2 mamps)	250 volts
Screen grid voltage (plate current = 5 mamps)	125 volts
Screen grid dissipation	0.3 watts
Cathode current	10 mamps
External resistance between grid No.1 and cathode with cathode bias	3 megohms[1])
External resistance between heater and cathode	20,000 ohms
Voltage between heater and cathode	150 volts

Diode sections (each diode)

Peak plate inverse voltage	350 volts
Plate current	0.8 mamp
Peak plate current	5 mamps
External resistance between heater and cathode	20,000 ohms
Voltage between heater and cathode	150 volts

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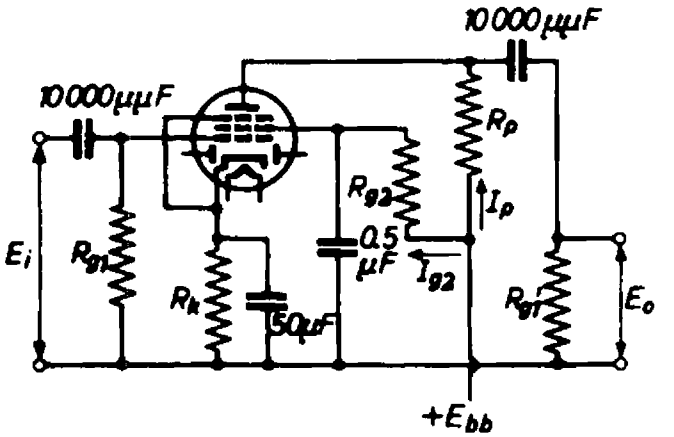
[1])The maximum value of this resistance is 22 megohms when the grid bias is obtained by means of grid current biasing only

OPERATING CHARACTERISTICS OF THE PENTODE SECTION AS R.F. OR I.F. AMPLIFIER

Plate and supply voltage	200		volts
Grid No.3 voltage	0		volt
Grid No.2 series resistor	68,000		ohms
Cathode resistor	295		ohms
Grid No.1 voltage	-2	-31.5	volts
Plate current	5	-	milli-amps
Grid No.2 current	1.75	-	milli-amps
Transconductance	2200	22	micromhos
Plate resistance	1.0	>10	megohms
Amplification factor of grid No.2 with respect to grid No.1	18	-	
Equivalent noise resistance	6,200	-	ohms

Plate and supply voltage	170		100		volts
Grid No.3 voltage	0		0		volts
Grid No.2 series resistor	47,000		47,000		ohms
Cathode resistor	295		295		ohms
Grid No.1 voltage	-2	-26.5	-1.15	-15.5	volts
Plate current	5.0	-	2.8	-	mamps
Grid No.2 current	1.75	-	1.0	-	mamps
Transconductance	2200	22	1900	19	micromhos
Plate resistance	0.9	>10	0.9	>10	megohm
Amplification factor of grid No.2 with respect to grid No.1	18	-	18	-	
Equivalent noise resistance	6200	-	4600	-	ohms

OPERATING CHARACTERISTICS OF THE PENTODE SECTION AS RESISTANCE COUPLED A.F. AMPLIFIER



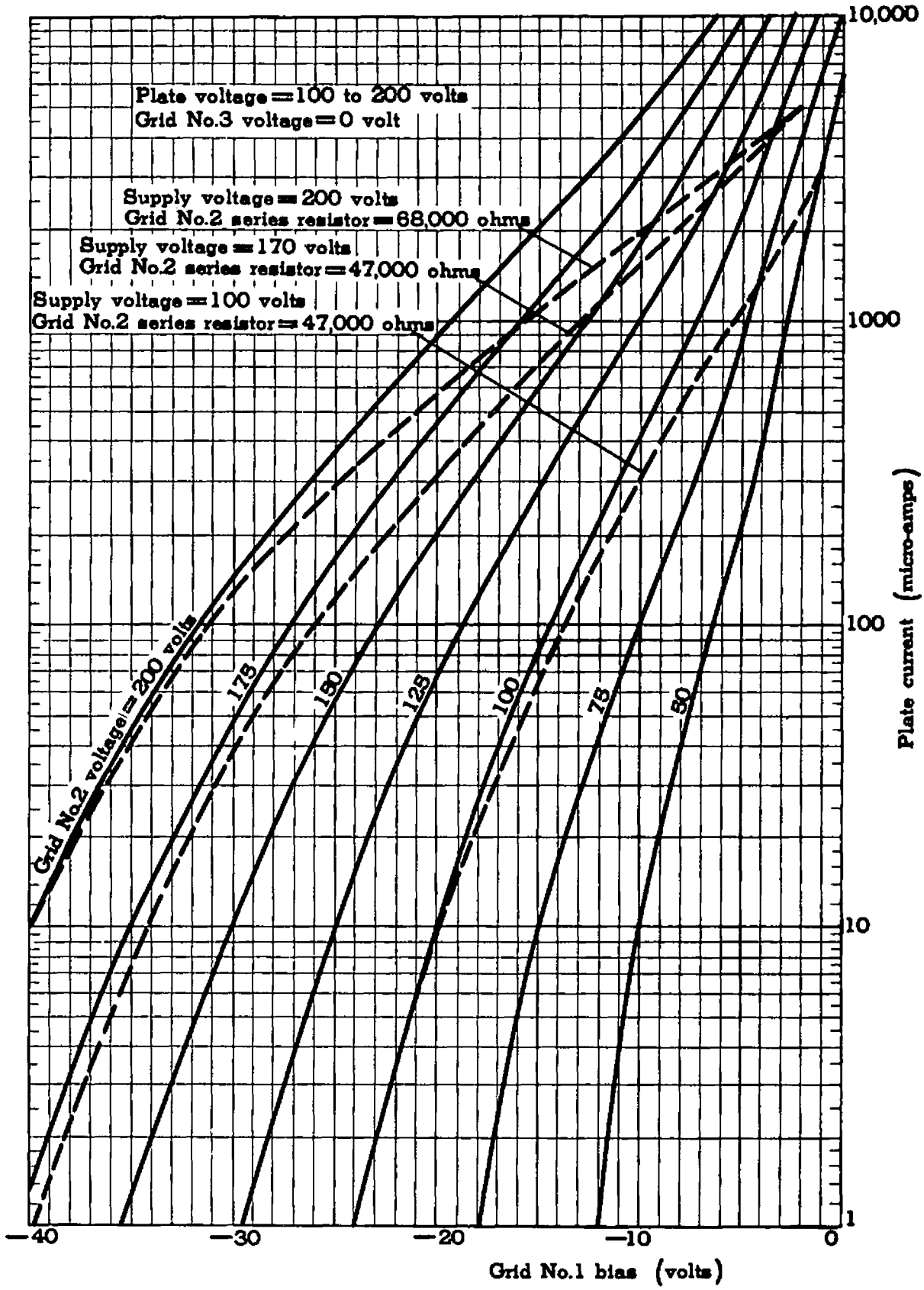
In circuits with a loudspeaker with an acoustical efficiency of 5% this valve can be used without special precaution against microphonic effects if the input voltage for an output of 50 milli-watts of the output tube is more than 25 milli-volts

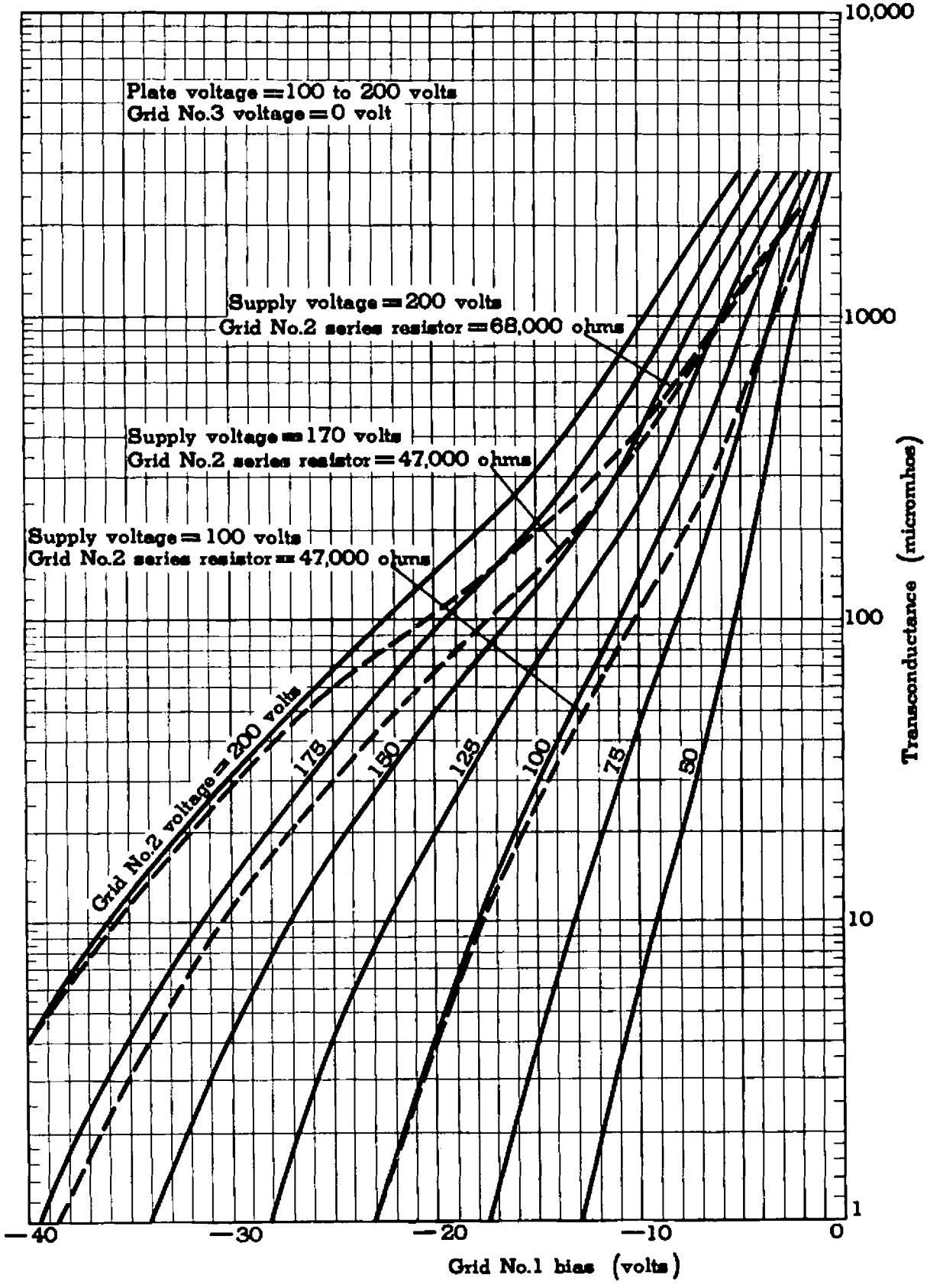
E_{bb}	R_p	R_{g2}	R_{g1}	R_k	R'_{g1}	I_p	I_{g2}	$\frac{E_o}{E_i}$	Distortion (%) at E_o (r.m.s.)=		
(volts)	(MΩ)	(MΩ)	(MΩ)	(Ω)	(MΩ)	(mA)	(mA)		3 volts	5 volts	8 volts
170	0.22	0.68	1	2700	0.68	0.56	0.20	85	1.2	1.5	1.8
170	0.10	0.27	1	1000	0.33	1.25	0.50	70	1.2	1.6	2.0
170	0.22	0.82	10	0	0.68	0.56	0.19	140	0.8	1.0	1.4
170	0.10	0.33	10	0	0.33	1.16	0.46	100	0.8	1.4	2.0
100	0.22	0.68	1	2700	0.68	0.32	0.12	82	1.4	1.9	
100	0.10	0.27	1	1000	0.33	0.73	0.29	67	1.4	1.8	
100	0.22	0.82	10	0	0.68	0.32	0.11	100	2.8	3.0	
100	0.10	0.33	10	0	0.33	0.66	0.25	70	1.7	3.2	

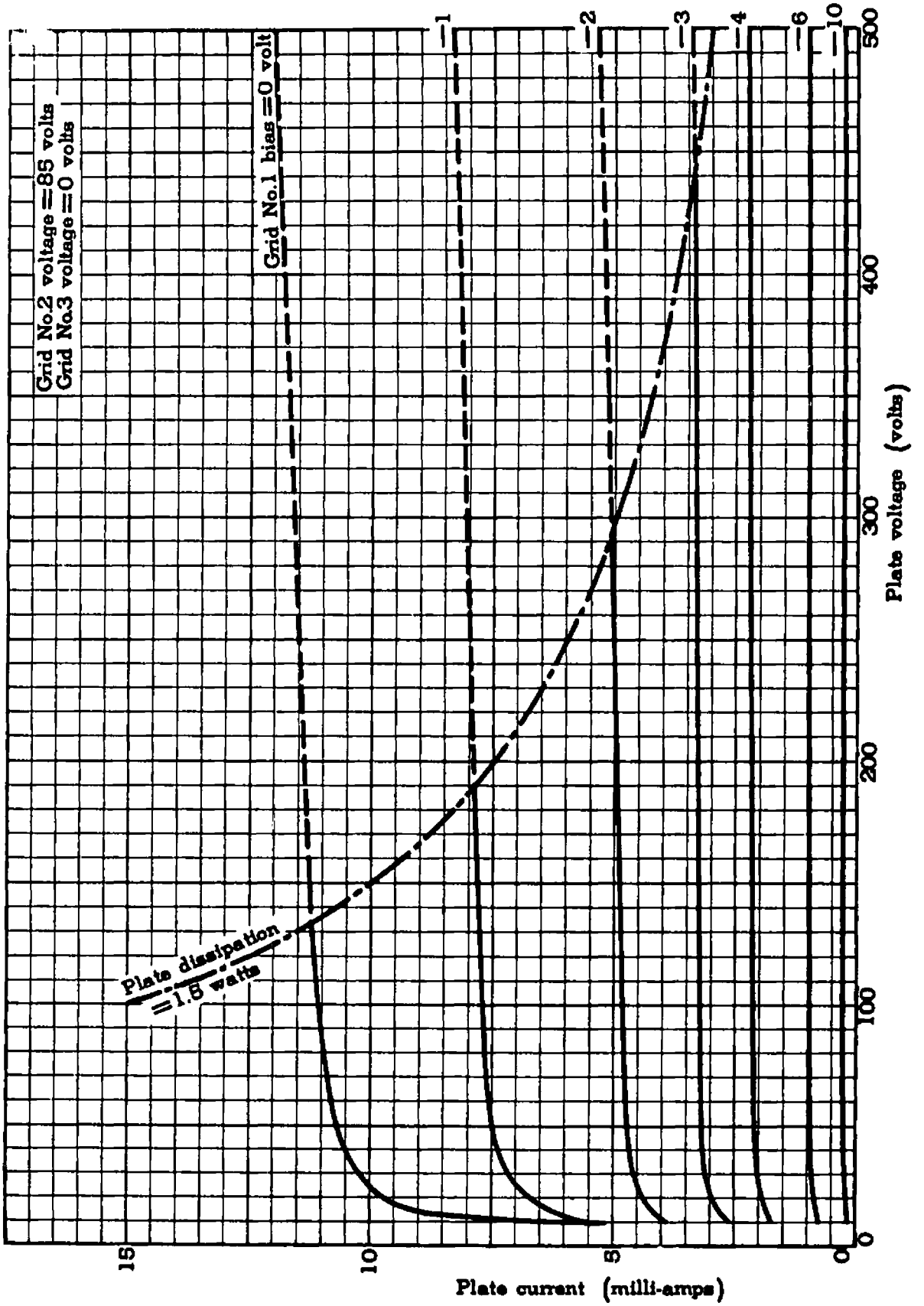
OPERATING CHARACTERISTICS OF THE PENTODE SECTION AS RESISTANCE COUPLED A.F. AMPLIFIER IN TRIODE CONNECTION

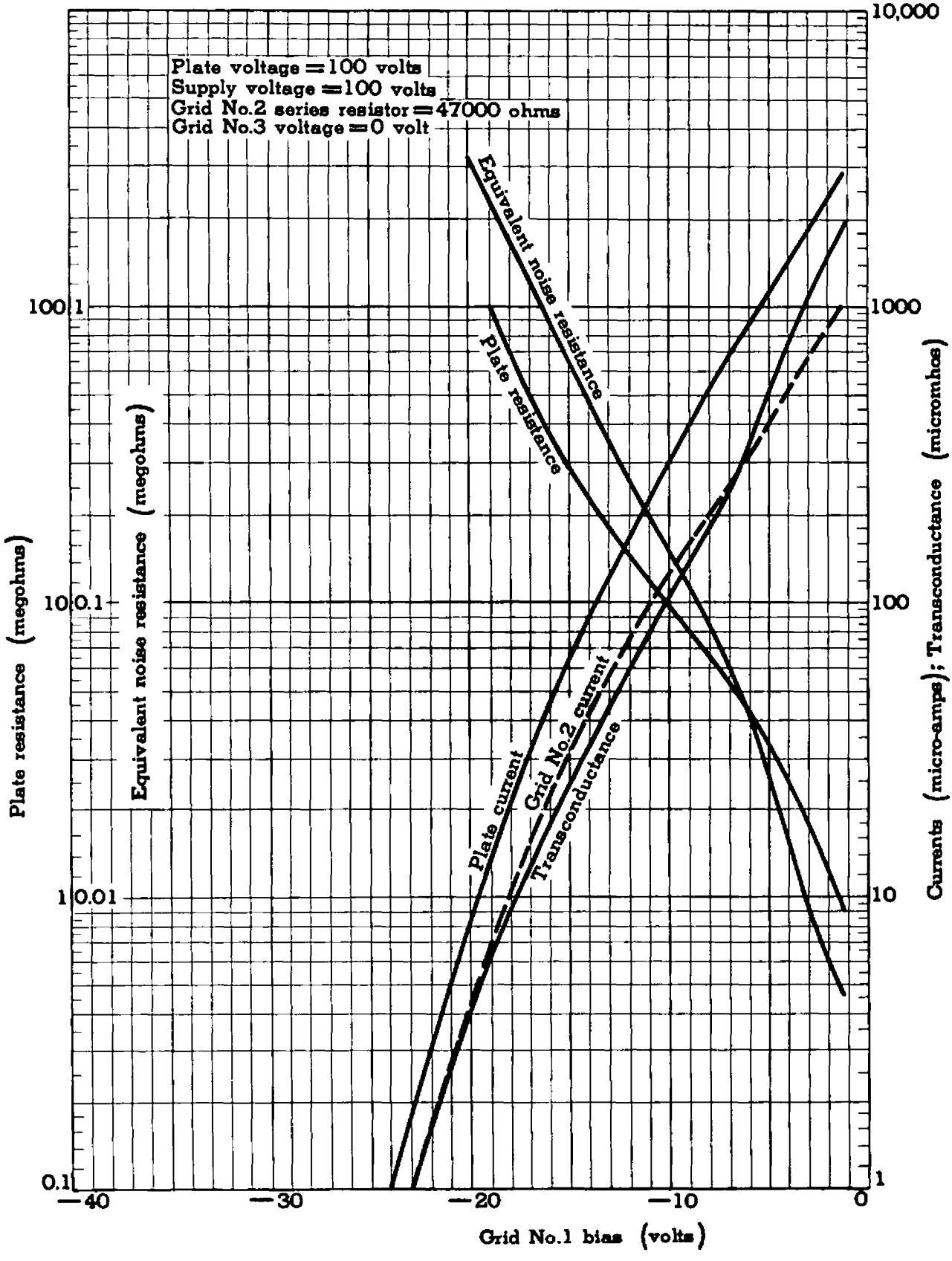
(grid No.2 connected to plate)

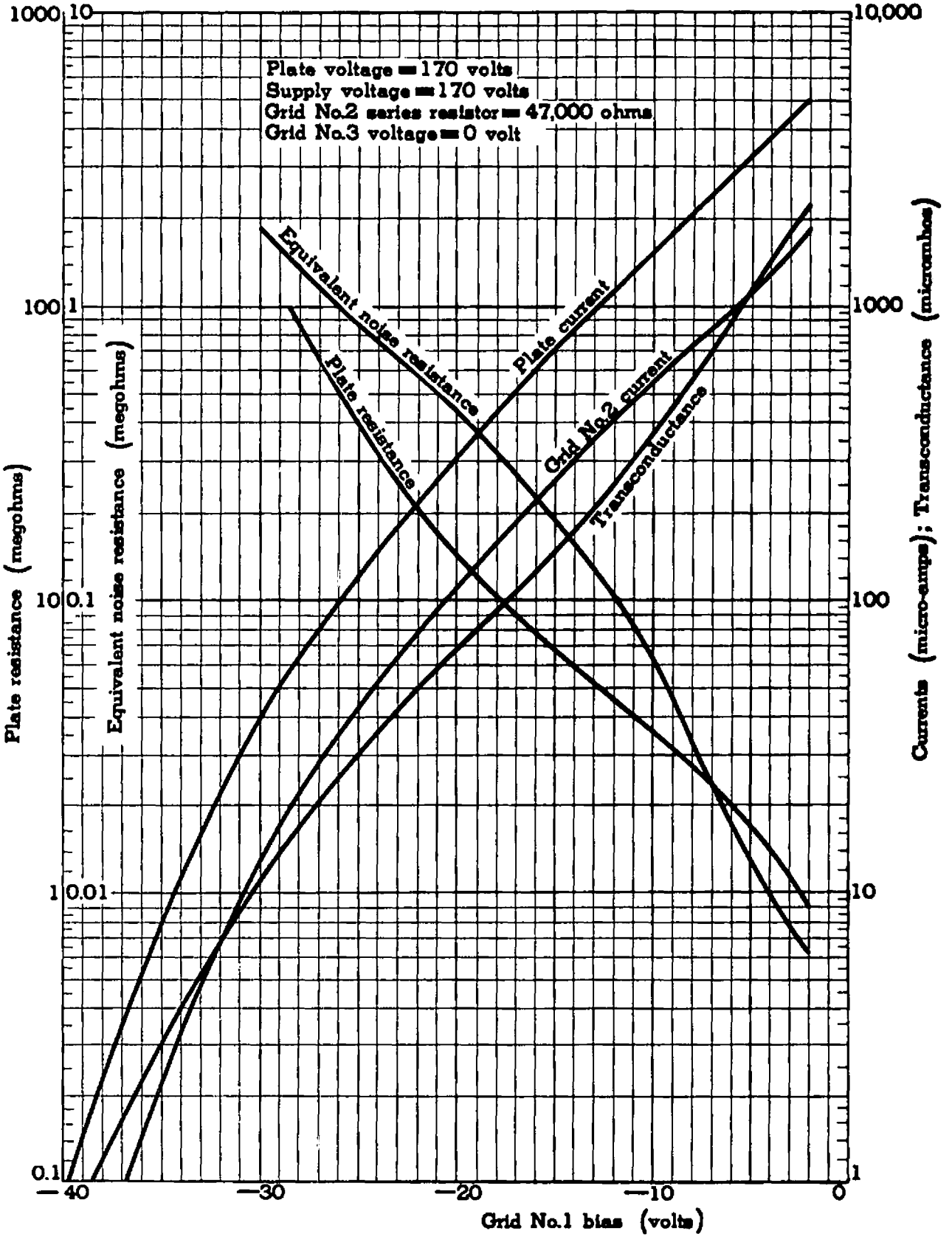
E_{bb} (volts)	R_p (MΩ)	R_{g1} (MΩ)	R_k (Ω)	R'_{g1} (MΩ)	I_p (mA)	$\frac{E_o}{E_i}$	Distortion (%) at E_o (r.m.s.) =		
							3volts	5volts	8volts
170	0.1	1	1800	0.33	1.25	11	2.1	3.5	4.8
170	0.047	1	1800	0.15	2.4	11	1.8	3.1	4.6
170	0.1	10	0	0.33	1.4	14	2.5	3.8	5.0
170	0.047	10	0	0.15	2.8	14	2.1	3.4	4.7
100	0.1	1	1800	0.33	0.74	11	3.2	4.9	
100	0.047	1	1000	0.15	1.4	11	3.0	4.8	
100	0.1	10	0	0.33	0.8	12	3.0	4.7	
100	0.047	10	0	0.15	1.5	12	3.0	4.8	

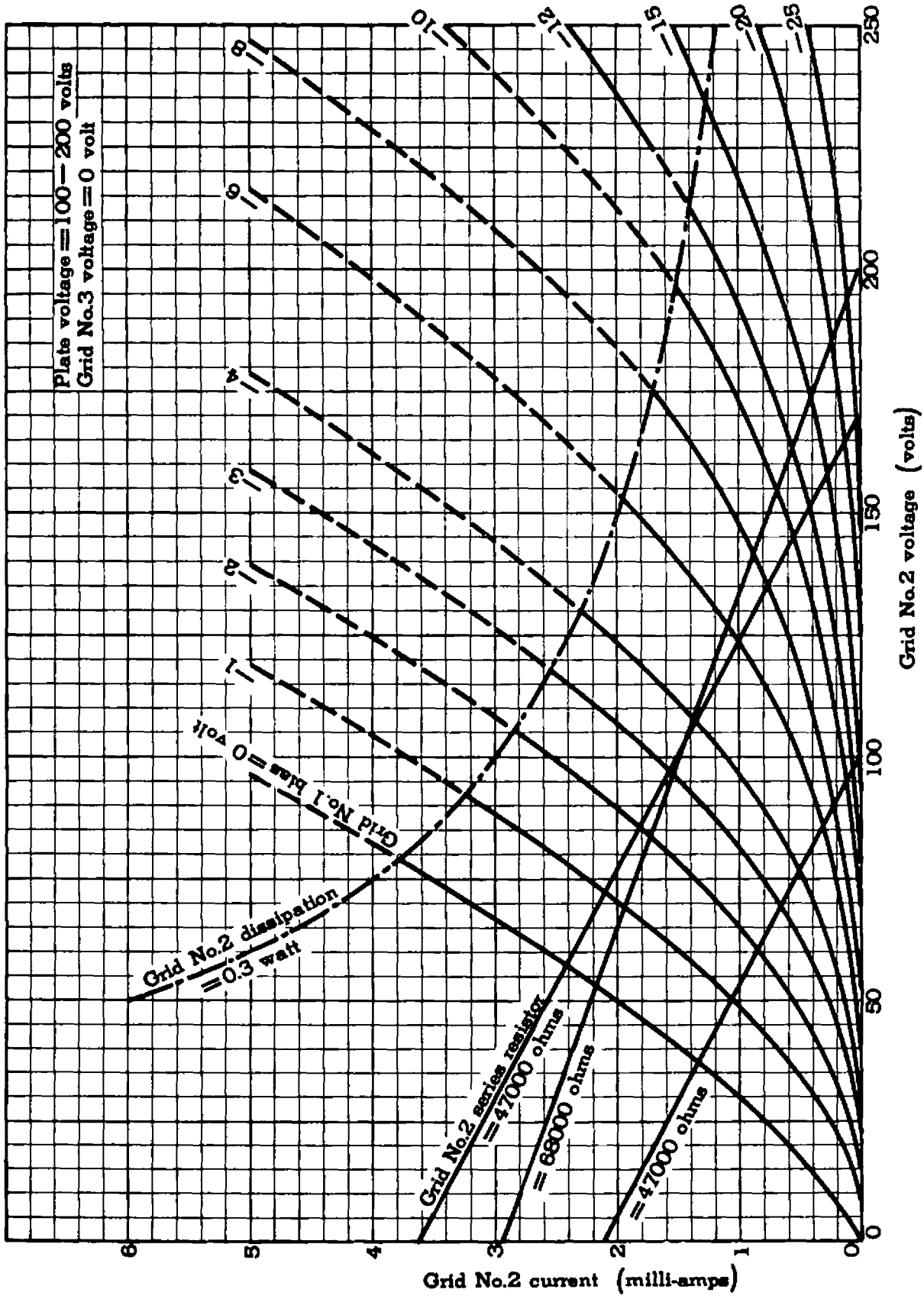

Plate voltage = 100 to 200 volts
Grid No.3 voltage = 0 volt
Supply voltage = 200 volts
Grid No.2 series resistor = 68,000 ohms
Supply voltage = 170 volts
Grid No.2 series resistor = 47,000 ohms
Supply voltage = 100 volts
Grid No.2 series resistor = 47,000 ohms
Grid No.2 voltage = 200 volts
175
150
125
100
75
50
10,000
1000
100
10
1
Plate current (micro-amps)
−40
−30
−20
−10
0
Grid No.1 bias (volts)


Plate voltage = 100 to 200 volts
Grid No.3 voltage = 0 volt
Supply voltage = 200 volts
Grid No.2 series resistor = 68,000 ohms
Supply voltage = 170 volts
Grid No.2 series resistor = 47,000 ohms
Supply voltage = 100 volts
Grid No.2 series resistor = 47,000 ohms
Grid No.2 voltage = 200 volts
175
150
125
100
75
50
10,000
1000
100
10
1
Transconductance (micromhos)
—40
—30
—20
—10
0
Grid No.1 bias (volts)


Grid No.2 voltage =85 volts
Grid No.3 voltage =0 volts
Grid No.1 bias =0 volt
−1
−2
−3
−4
−6
−10
Plate dissipation =1.5 watts
Plate voltage (volts)
500
400
300
200
100
0
15
10
5
0
Plate current (milli-amps)


Plate voltage = 100 volts
Supply voltage = 100 volts
Grid No.2 series resistor = 47000 ohms
Grid No.3 voltage = 0 volt
Equivalent noise resistance
Plate resistance
Plate current
Grid No.2 current
Transconductance
Plate resistance (megohms)
Equivalent noise resistance (megohms)
Currents (micro-amps); Transconductance (micromhos)
Grid No.1 bias (volts)
100
10
1
0.1
0.01
10,000
1000
100
10
1
0.1
−40
−30
−20
−10
0


Plate voltage = 170 volts
Supply voltage = 170 volts
Grid No.2 series resistor = 47,000 ohms
Grid No.3 voltage = 0 volt
Equivalent noise resistance
Plate current
Plate resistance
Grid No.2 current
Transconductance
Plate resistance (megohms)
Equivalent noise resistance (megohms)
Currents (micro-amps); Transconductance (micromhos)
Grid No.1 bias (volts)
1000
100
10
1
0.1
10
1
0.1
0.01
10,000
1000
100
10
1
−40
−30
−20
−10
0


Plate voltage = 100—200 volts
Grid No.3 voltage = 0 volt
10
12
15
20
25
8
6
4
3
2
1
Grid No.1 bias = 0 volt
Grid No.2 dissipation = 0.3 watt
Grid No.2 series resistor = 47000 ohms
= 68000 ohms
= 47000 ohms
Grid No.2 voltage (volts)
Grid No.2 current (milli-amps)
250
200
150
100
50
0
6
5
4
3
2
1
0

Rogers Electronic Tubes & Components

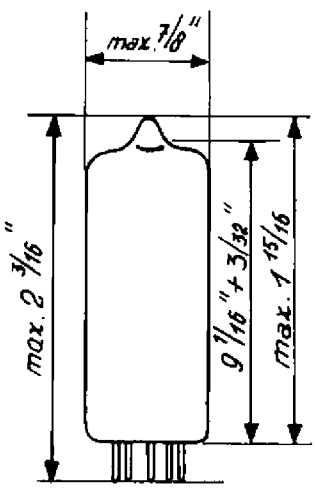
17EW8

Description: Double triode for use as R.F. amplifier and self-oscillating mixer

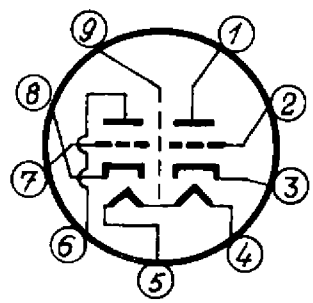
Mechanical Data

Cathode	coated, unipotential
Base	E 9-1
Bulb	T 6 1/2
Outline	6-2
Basing	9AJ
Mounting position	any

Tube outline



Bottom view of base



Base pin No.		Element
1	Plate	Triode no. 2
2	Grid	
3	Cathode	
4	Heater	
5	Heater	
6	Plate	Triode no. 1
7	Grid	
8	Cathode	
9	Internal shield	

Heater Data

Heater voltage	17.5 volts
Heater current	150 mamps

Direct interelectrode capacitances (each system)

Plate to grid	1.5 μμF
Plate to cathode	0.18 μμF
Plate to cathode, heater and shield	1.2 μμF
Plate to cathode, heater and shield ≠	1.9 μμF
Grid to cathode, heater and shield	3 μμF

≠ With external shield with internal diameter of 0.886"

from JEDEC release #2556, Aug. 3, 1959

Direct interelectrode capacitances (continued)

Between the triode systems

Plate to plate	max. 0.04 µµF
Plate to plate ≠	max. 0.008 µµF
Grid to grid	max. 0.003 µµF
Plate triode No.1 to grid triode No.2	max. 0.008 µµF
Plate triode No.2 to grid triode No.1	max. 0.008 µµF
Plate triode No.1 to cathode triode No.2	max. 0.008 µµF
Plate triode No.2 to cathode triode No.1	max. 0.008 µµF
Grid triode No.1 to cathode triode No. 2	max. 0.003 µµF
Grid triode No.2 to cathode triode No. 1	max..0.003 µµF

Maximum ratings (each section; Design Center Values)

Plate voltage without current	550 volts max.
Plate voltage	250 volts max.
Plate dissipation	2.5 watts max.
Plate dissipation of two systems together	4.5 watts max.
Cathode current	15 mamps max.
Negative grid bias	100 volts max.
Grid circuit resistance	1 megohm max.
Voltage between cathode and heater	90 volts max.
Circuit resistance between heater and cathode	20000 ohms max.

Typical characteristics (each section)

Plate voltage	100	170	200	volts
Grid bias	-1.1°)	-1.5	-2.1	volts
Plate current	4.5	10	10	mamps
Transconductance	4600	6200	5800	micromhos
Amplification factor	50	50	48	

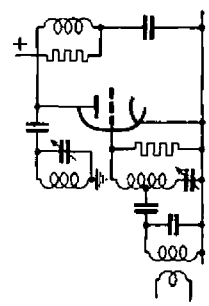
≠ With external shield with internal diameter of 0.886"

°)In this case grid current may occur. If this is not permissible a condition with a bias of -1.5 volts should be chosen.

Operating characteristics as R.F. amplifier in FM/AM receivers (triode system No.1)

Supply voltage	170	170	100	volts
Plate series resistor	1300	1500	1500	ohms
Plate voltage	160	155	92	volts
Cathode resistor	330	160	160	ohms
Negative grid bias	-2	-1.4	-0.85	volts
Plate current	6	8.7	5.2	mamps
Transconductance	4700	6000	5200	micromhos
Internal resistance	10500	8400	10000	ohms
Input resistance at 100 Mc	8000	6000	7000	ohms
Equivalent noise resistance	650	500	580	ohms

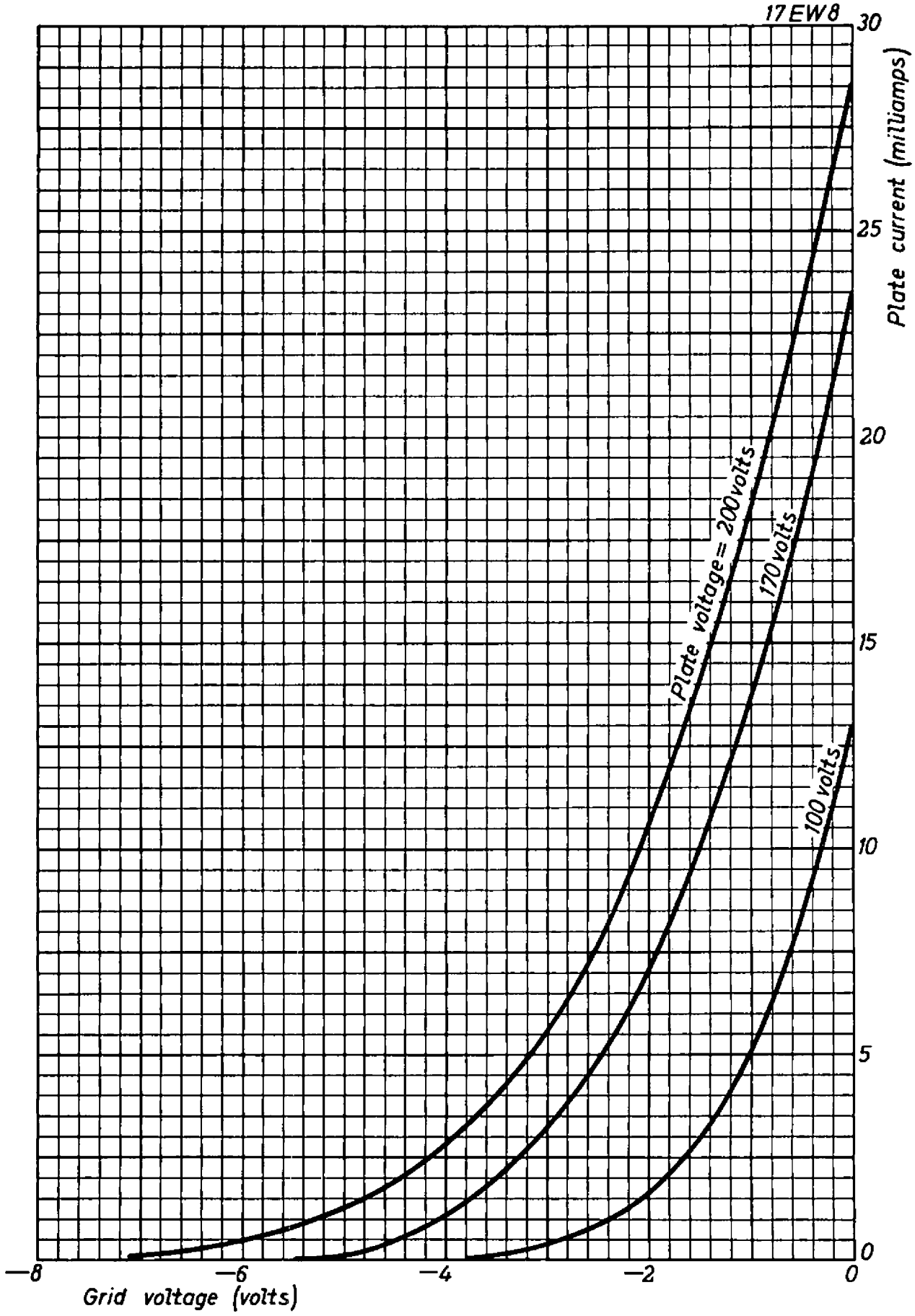
Operating characteristics as self-oscillating mixer in FM/AM receivers (triode system No.2)

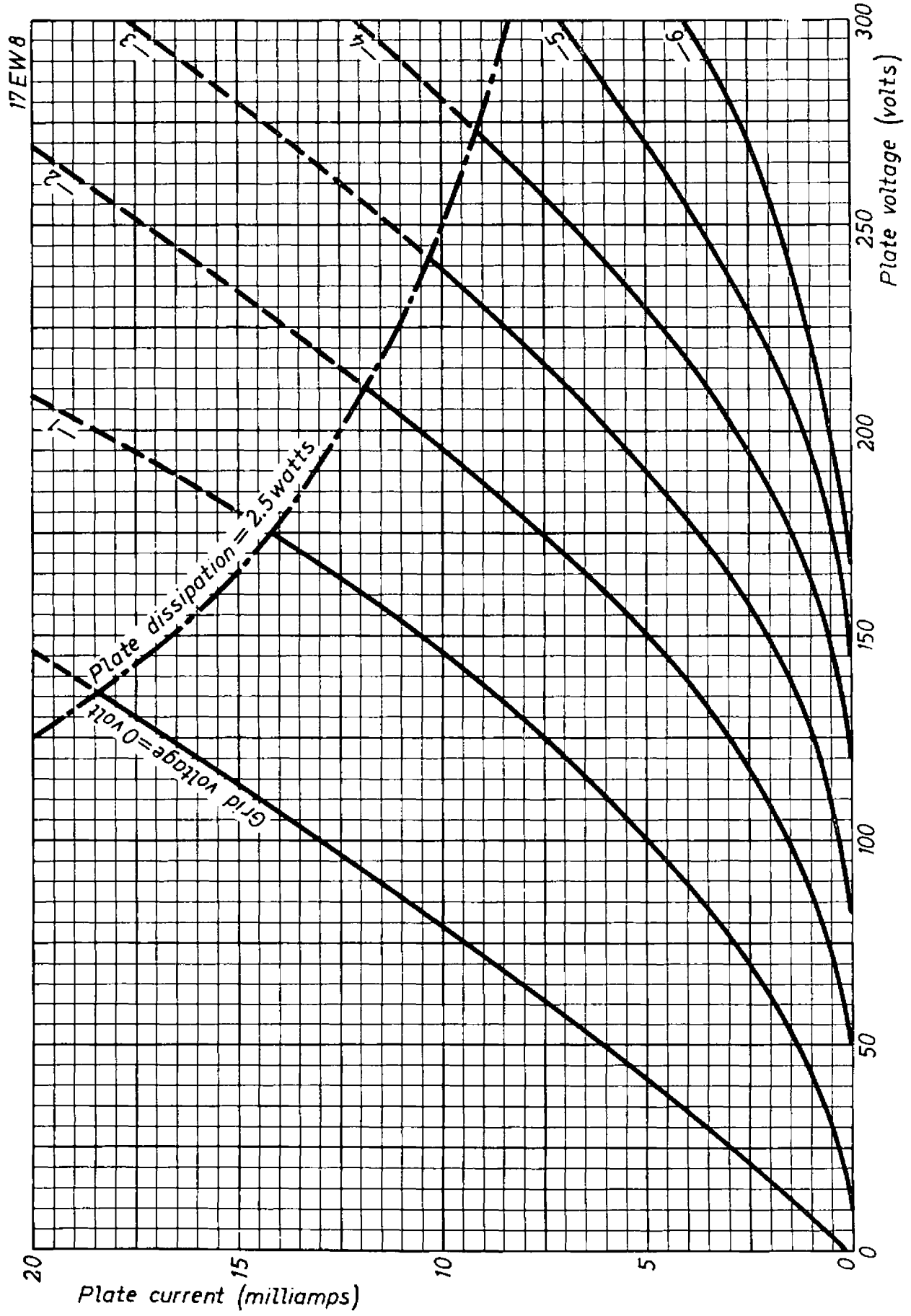


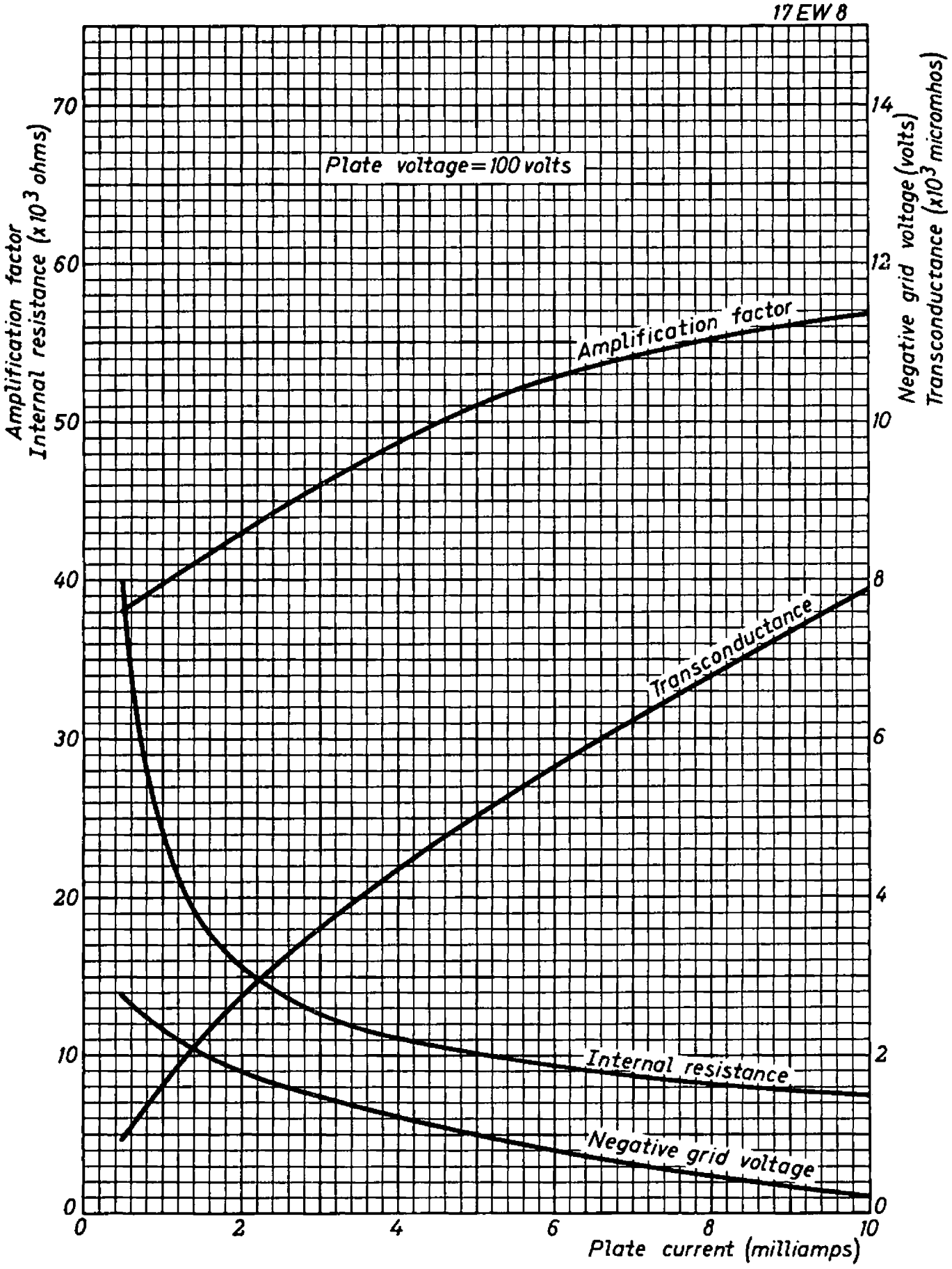
Supply voltage	100	170	200	volts
Plate series resistor	4700	4700	8200	ohms
Grid leak	1	1	1	megohm +)
Oscillator voltage	1.8	2.8	2.8	volts (rms)
Plate current	2.2	4.8	5.2	mamps
Conversion conductance	1700	2200	2300	micromhos
Internal resistance	20000	16000	15000	ohms
Input resistance at 100 Mc	-	15000	-	ohms

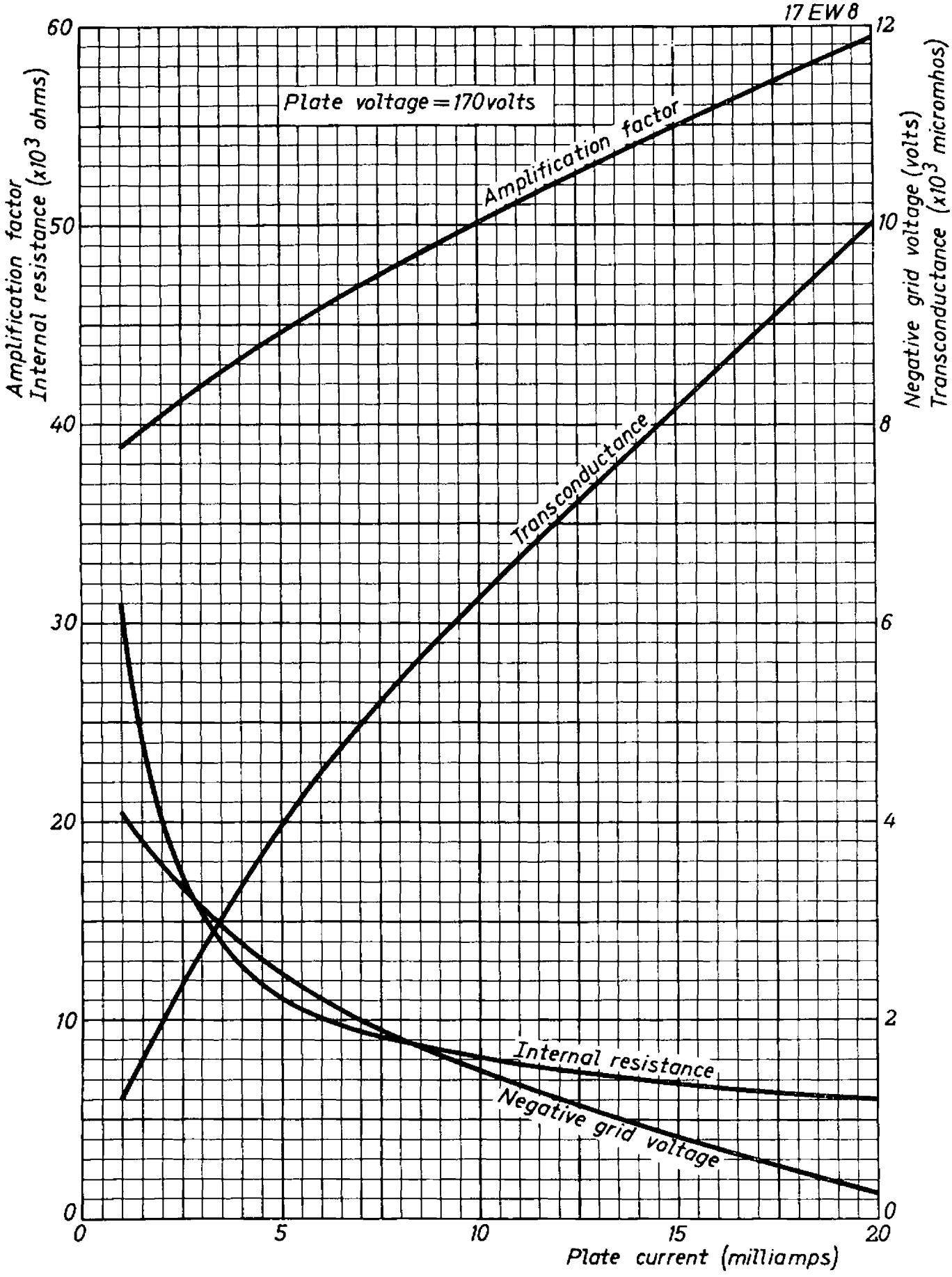
+) At this value of grid leak squegging is prevented by feed-back, which normally is applied in order to compensate for the internal resistance

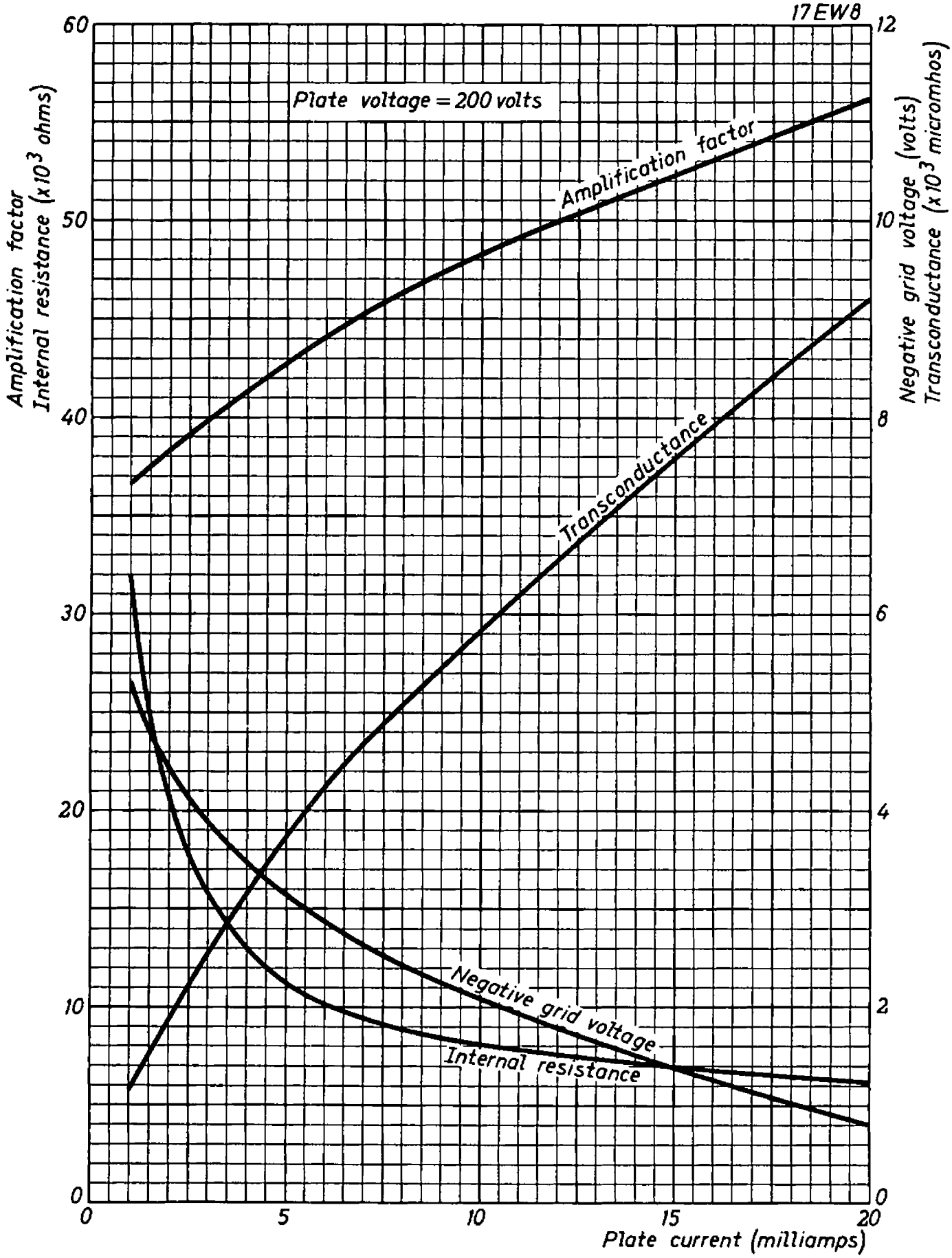
°) See page 2

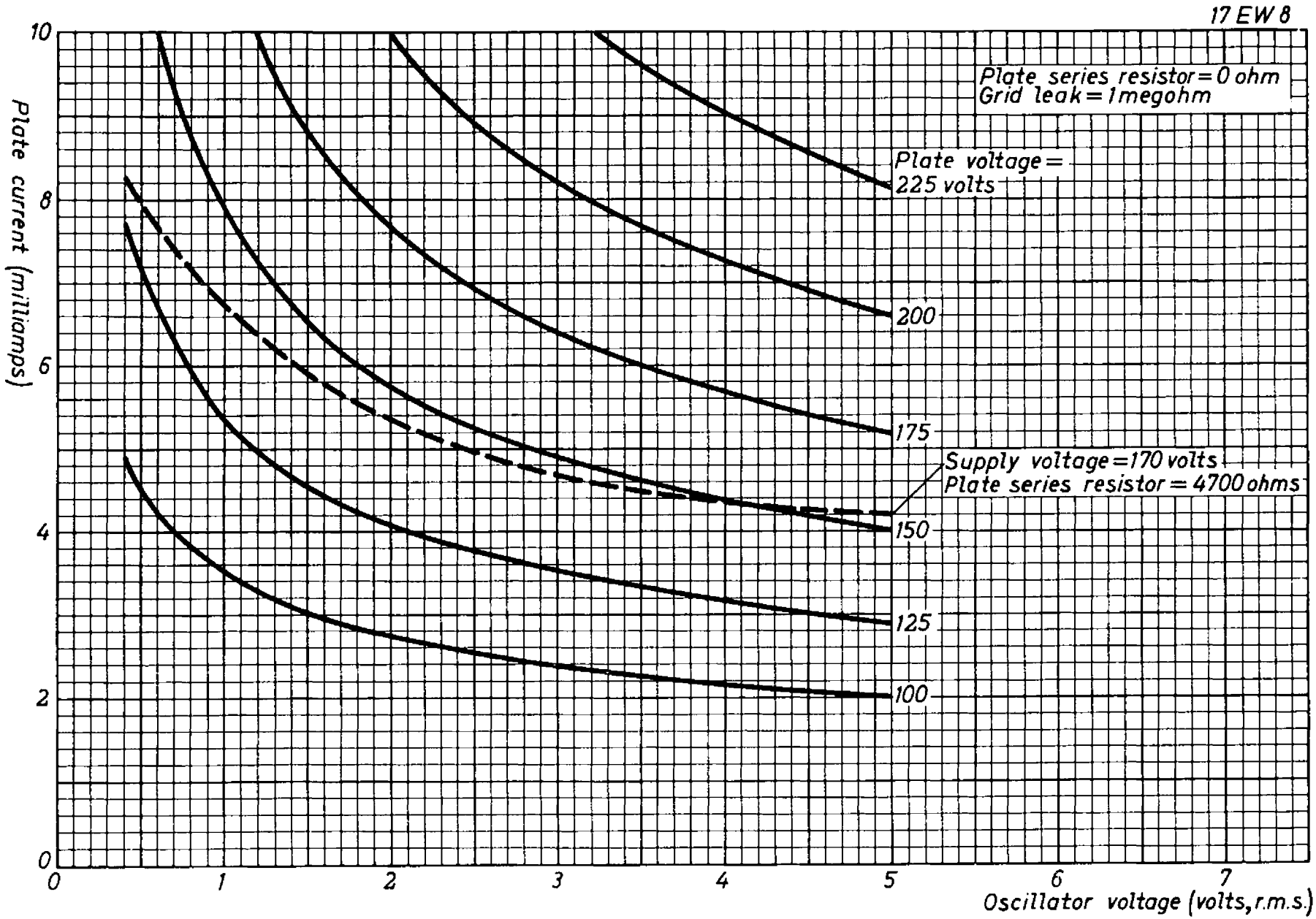

17EW8
30
25
20
15
10
5
0
Plate current (milliamps)
Plate voltage = 200 volts
170 volts
100 volts
−8
−6
−4
−2
0
Grid voltage (volts)

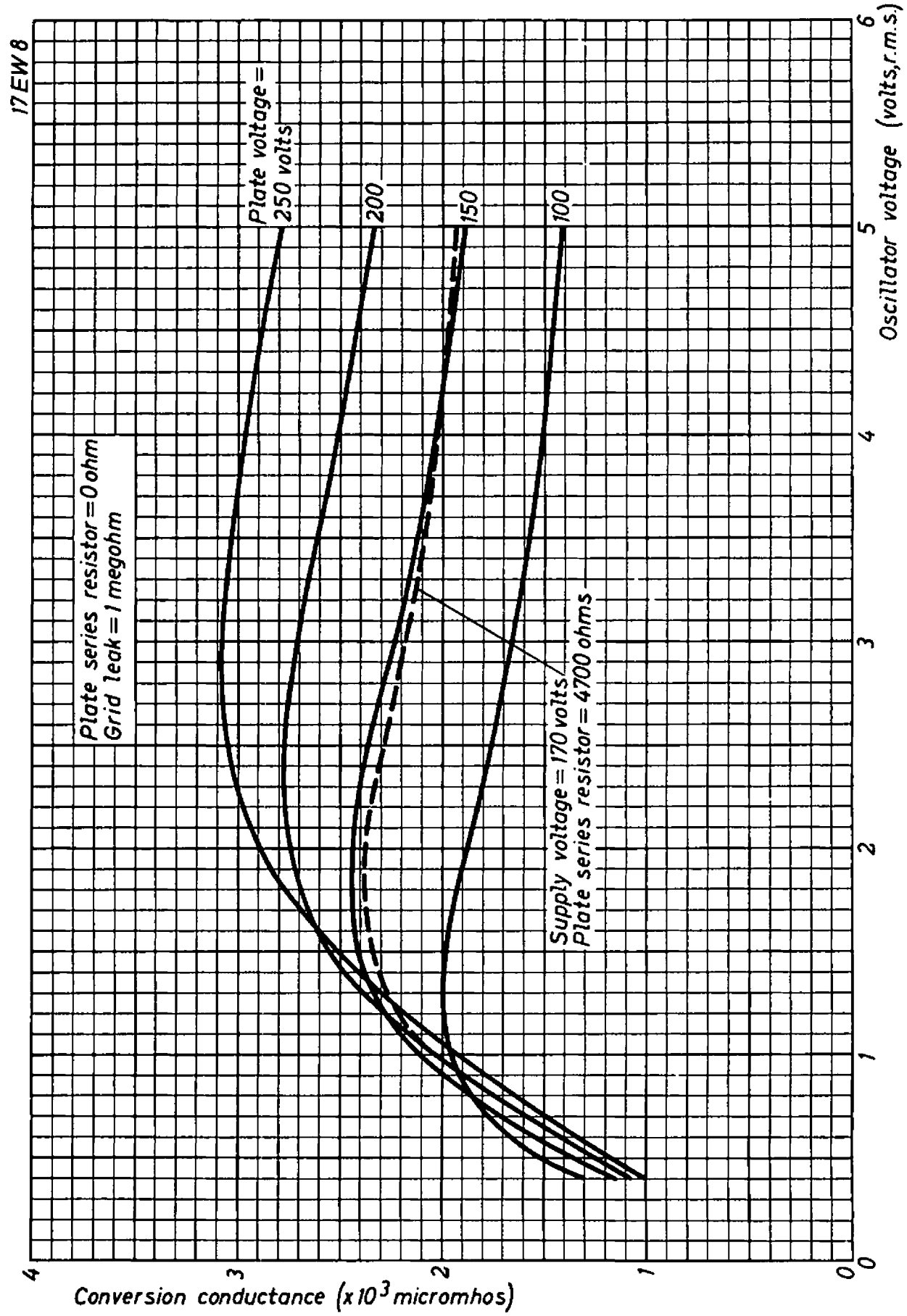

17EW8
Plate voltage (volts)
300
250
200
150
100
50
0
Plate current (milliamps)
20
15
10
5
0
Plate dissipation = 2.5 watts
Grid voltage = 0 volt
1
2
3
4
5
6

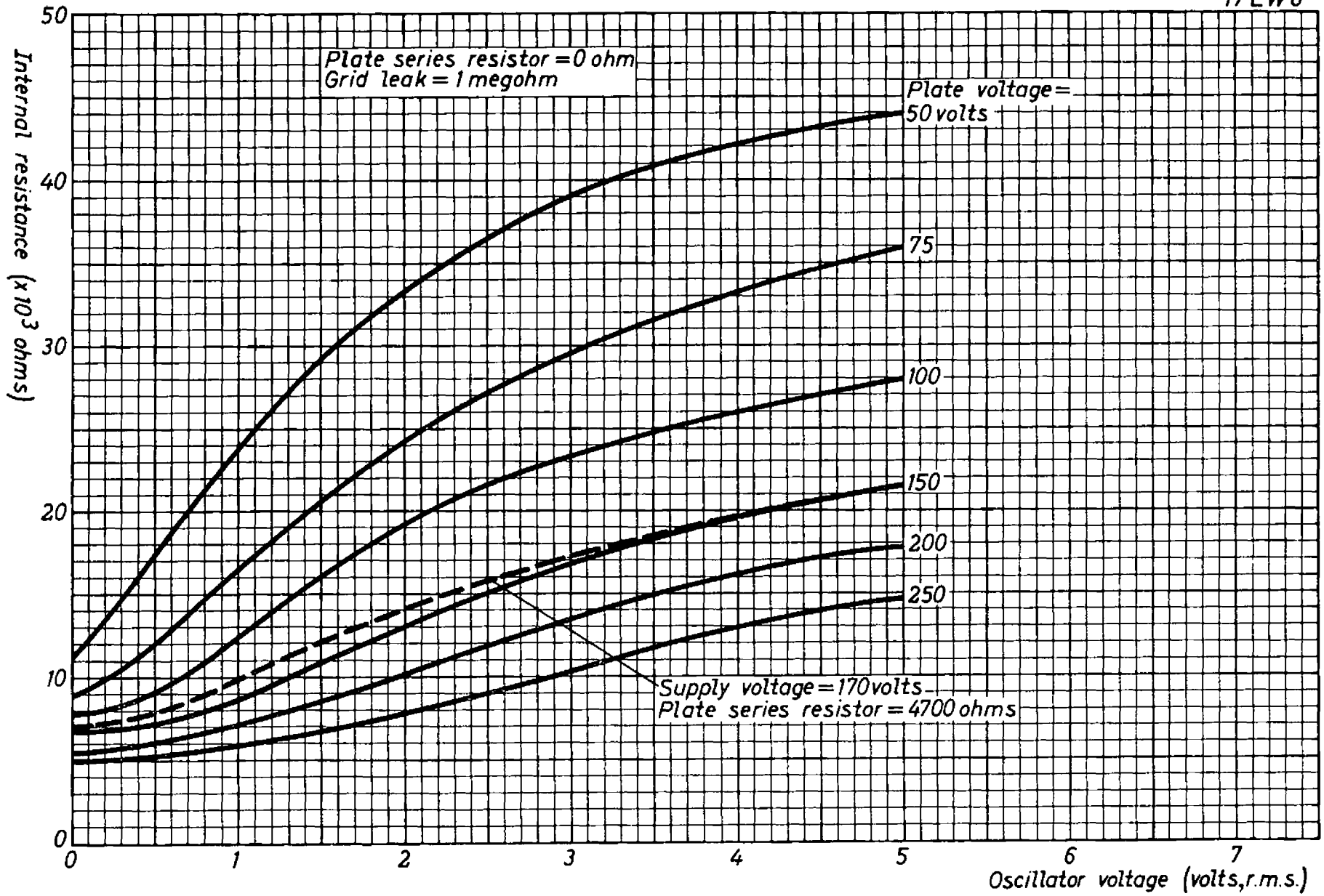

17EW8
Plate voltage=100 volts
Amplification factor
Transconductance
Internal resistance
Negative grid voltage
Amplification factor
Internal resistance (x10³ ohms)
Negative grid voltage (volts)
Transconductance (x10³ micromhos)
Plate current (milliamps)
0
10
20
30
40
50
60
70
2
4
6
8
12
14


17 EW 8
Plate voltage = 170 volts
Amplification factor
Transconductance
Internal resistance
Negative grid voltage
Amplification factor
Internal resistance (x10³ ohms)
Negative grid voltage (volts)
Transconductance (x10³ micromhos)
Plate current (milliamps)
0
5
10
15
20
0
10
20
30
40
50
60
0
2
4
6
8
10
12

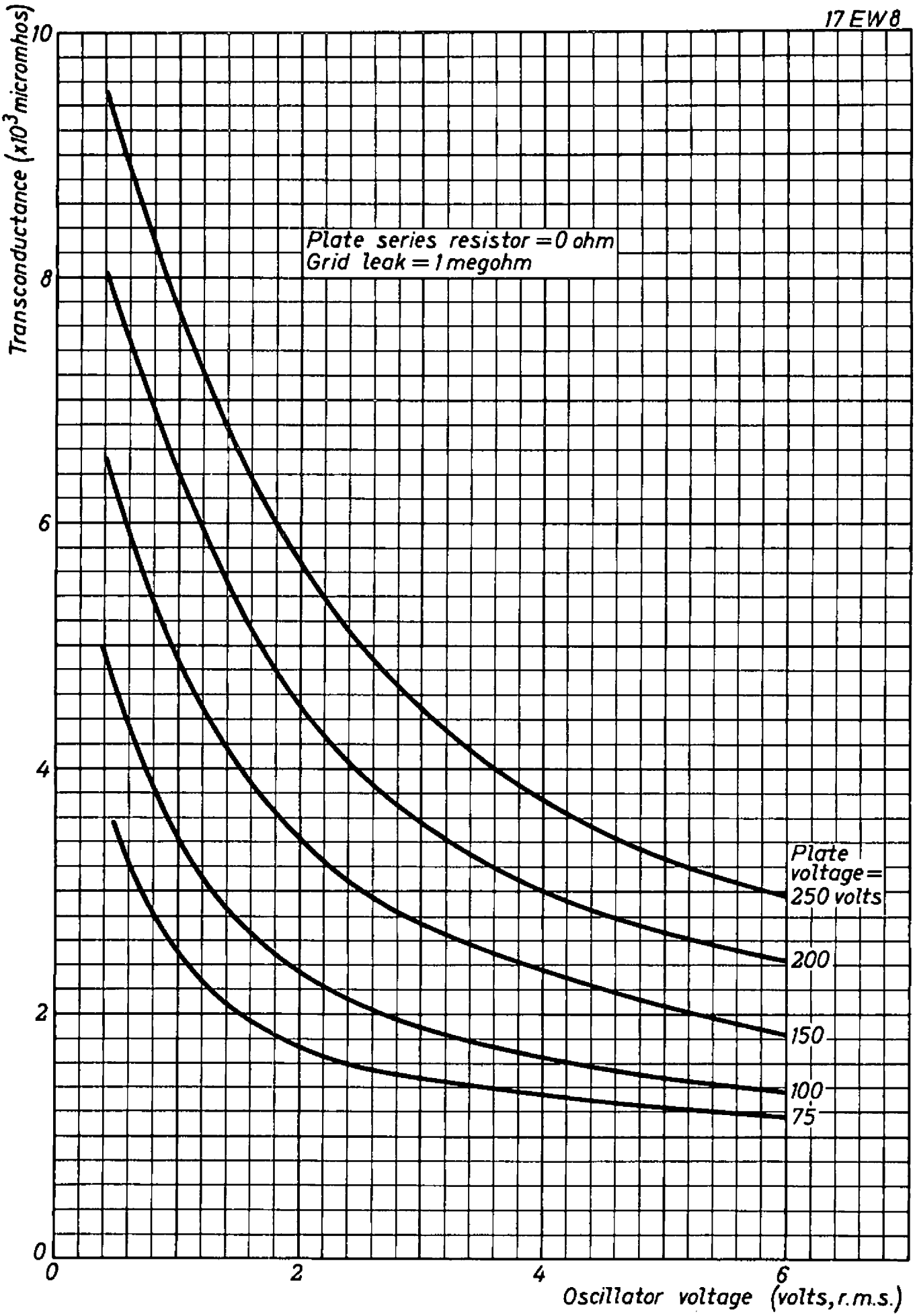

17EW8
Plate voltage = 200 volts
Amplification factor
Transconductance
Negative grid voltage
Internal resistance
Amplification factor
Internal resistance (x10³ ohms)
Negative grid voltage (volts)
Transconductance (x10³ micromhos)
Plate current (milliamps)
0
5
10
15
20
0
10
20
30
40
50
60
0
2
4
6
8
10
12


17 EW 8
Plate series resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage = 225 volts
200
175
Supply voltage = 170 volts
Plate series resistor = 4700 ohms
150
125
100
Plate current (milliamps)
Oscillator voltage (volts, r.m.s.)
0
2
4
6
8
10
0
1
2
3
4
5
6
7


17EW8
Plate voltage = 250 volts
200
150
100
Plate series resistor = 0 ohm
Grid leak = 1 megohm
Supply voltage = 170 volts
Plate series resistor = 4700 ohms
Conversion conductance (x10³ micromhos)
Oscillator voltage (volts,r.m.s.)
0
1
2
3
4
5
6


Plate series resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage =
50 volts
75
100
150
200
250
Supply voltage = 170 volts
Plate series resistor = 4700 ohms
Internal resistance (x 10³ ohms)
Oscillator voltage (volts, r.m.s.)
0
10
20
30
40
50
0
1
2
3
4
5
6
7

H


Transconductance (x10³ micromhos)
10
8
6
4
2
0
Plate series resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage = 250 volts
200
150
100
75
0
2
4
6
Oscillator voltage (volts, r.m.s.)

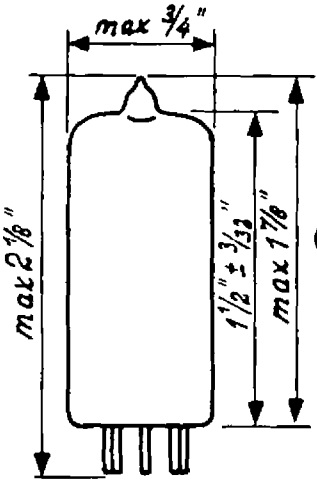
Rogers Electronic Tubes & Components

Description: Variable-mu pentode for use as I.F. amplifier and multiplicative or additive mixer in FM/AM battery-receivers

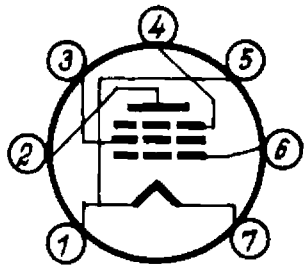
Mechanical data

Cathode	coated, filament
Base	E7-1
Bulb	T 5 1/2
Outline	5-2
Basing	7 ES
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	(-) filament, internal shield
2	Plate
3	Grid No.2
4	Grid No.3
5	(-) filament, internal shield
6	Grid No.1
7	(+) filament

General Electrical data

Filament voltage (parallel supply of the filaments)	1.4 volts
Filament current	25 mamps
Filament current (series supply of the filaments)	25 mamps
Filament voltage	1.3 volts

Direct interelectrode capacitances

Output capacitance	7.5 μμF
Input capacitance	3.7 μμF
Grid No.3 to all other elements	5.2 μμF
Plate to grid No.1	max. 0.01 μμF
Grid No.1 to grid No.3	max. 0.1 μμF
Grid No.1 to grid No.2	2.5 μμF

from JEDEC release #2382, Feb. 9, 1959

Direct interelectrode capacitances (continued)

In triode connection (grids No.2 and 3 connected to plate)

Output capacitance	8.1 μμF
Input capacitance	1.1 μμF
Plate to grid	2.6 μμF

Maximum ratings (design center values)

Supply voltage	120 volts +)
Plate voltage	120 volts
Plate dissipation	0.25 watts
Grid No.2 voltage	90 volts
Grid No.2 dissipation	0.15 watt
Cathode current	2.5 mamps
Grid No.1 circuit resistance	3 megohms
Grid No.3 circuit resistance	1.5 megohms

Operating characteristics as I.F. amplifier

Plate and supply voltage	85 x)		85 x)		
Grid No.3 voltage	0		0		
Grid No.2 series resistor	33,000		47,000		
Grid No.1 bias	0	-5	0	-5	volts
Grid No.2 voltage	62	-	57	-	volts
Plate current	1.7	-	1.5	-	mamps
Grid No.2 current	700	-	595	-	μamps
Transconductance	940	10	900	10	micromhos
Plate resistance	0.45	>10	0.525	>10	megohms
Amplification factor of grid No. 2 with respect to grid No. 1	20	-	20	-	

x) Based on a battery voltage of 90 volts, minus the bias of the output tube
Voltage with respect to (-) filament.

+) Absolute maximum 150 volts

Operating characteristics as I.F. amplifier (continued)

Plate and supply voltage	64 x)		64 x)		volts
Grid No.3 voltage	0		0		volt
Grid No.2 series resistor	1500		4700		ohms
Grid No.1 bias	0	-3.8	0	-3.8	volts
Grid No.2 voltage	63	-	61	-	volts
Plate current	1.7	-	1.6	-	mamps
Grid No.2 current	780	-	725	-	µamps
Transconductance	880	10	870	10	micromhos
Plate resistance	0.25	>10	0.27	>10	megohm
Amplification factor of grid No. 2 with respect to grid No. 1	20	-	20	-	
Plate and supply voltage			45		volts
Grid No.3 voltage			0		volt
Grid No.2 series resistor			0		ohm
Grid No.1 bias			0	-2.7	volts
Grid No.2 voltage			45	-	volts
Plate current			0.9	-	mamps
Grid No.2 current			445	-	µamps
Transconductance			700	10	micromhos
Plate resistance			0.28	>10	megohm
Amplification factor of grid No.2 with respect to grid No.1			20	-	

Operating characteristics as multiplicative mixer with oscillator voltage on g3 o).

Plate and supply voltage	85 x)		64 x)		volts
Grid No.2 series resistor	47,000		4700		ohms
Oscillator voltage	12		12		volts(rms)
Grid No.3 resistor	0.3		0.3		megohm
Grid No.1 bias	0	-4.6	0	-3.5	volts
Grid No.2 voltage	47	-	58	-	volts
Plate current	540	-	670	-	µamps
Grid No.2 current	800	-	1250	-	µamps
Conversion conductance	265	10	280	10	micromhos
Plate resistance	0.50	>5	0.30	>5	megohms

x),+),o) See page 4

Operating characteristics as multiplicative mixer with oscillator voltage on g3 °) continued.

Plate and supply voltage	45		volts
Grid No.2 series resistor	0		ohm
Oscillator voltage	12		volts(rms)
Grid No.3 resistor	0.3		megohm
Grid No.1 bias	0	-2.4	volts
Grid No.2 voltage	45	-	volts
Plate current	420	-	µamps
Grid No. 2 current	795	-	µamps
Conversion conductance	250	10	micromhos
Plate resistance	0.49	>5	megohms

Operating characteristics as additive mixer (triode connection grid No.2 and 3 connected to plate)

Supply voltage	85[X]	85[X]	64[+]	64[+]	45	45	volts
Plate series resistor ⫽	0	4700	0	3300	0	1500	ohms
Grid resistor	1	1	1	1	1	1	megohm
Grid current	4.4	3.8	3.1	2.5	2.0	2.0	µamps
Plate current	1.9	1.7	1.3	1.2	0.73	0.7	mamp
Oscillator voltage	4.0	3.5	3.0	2.5	2.0	2.0	volts (rms)
Conversion conductance	500	490	465	460	405	400	micro-mhos
Plate resistance	26,000	26,500	29,000	28,500	34,000	35,000	ohms

---

[X]) Based on a battery voltage of 90 volts, minus the bias of the output tube. Voltage with respect to (-)filament

[+]) Based on a battery voltage of 67.5 volts, minus the bias of the output tube. Voltage with respect to (-)filament

⫽) By-passed.

°) If in the short wave range A.G.C. is applied to the mixer, the current flowing to g1 due to transit time effect should be taken into account.

1S2A

High vacuum single-anode RECTIFYING TUBE for E.H.T. supply from the line time base in television receivers

This tube is directly interchangeable with tube type 1S2, the characteristics and dimensions being entirely identical. The new tube differs from the 1S2 in that it has a chemically treated envelope, which avoids flash-over under conditions of high humidity and low atmospheric pressure

from JETEC release #1663, June 11, 1956
sponsor: Rogers Majestic Electronics

RMA Release # 215

Reservation No. 292 Date: 7/24/39 Registration No. 215 Date: 9/18/39

Type No. 20J8 (GM)

Sponsor:- Rogers Radio Tubes Limited, Toronto, Ontario

Type Classification:- Triode Heptode Converter

Physical Specification:-

Type of Cathode:- Unipotential

Pin Connections:-

Pin 1	S	Pin 5	G_0, G_3
2	H	6	P_0
3	P	7	H
4	G_2, G_4	8	K, G_5

Top Cap G_1

Basing Designation: 8H

Type of Base	Small octal shell
Type of Cap	Miniature
Type of Bulb	ST12 - Metal spray
Maximum Diameter	1 9/16"
Maximum Overall Length	4 11/32"
Maximum Seated Height (Including top cap)	3 25/32"

Mounting Position for Operation:- any

Direct Interelectrode Capacitances:-

Signal Grid to Mixer Plate	0.012	uuf (max.)
Signal Input to all other electrodes	5	uuf
Osc. Output to all other electrodes	5.5	uuf

CONVERTER

Ratings:-

Heater or Filament Voltage (ac or dc)	20	volts
Heater or Filament Current	0.15	amps
Maximum Plate Voltage	250	volts
Maximum Screen Voltage	100	volts
Maximum Plate Dissipation	2.5	watts
Maximum Screen Dissipation	0.6	watts
Maximum Osc. Anode Voltage	100	volts
Maximum Osc. Anode Dissipation	0.75	watts
Maximum Total Cathode Current	18	ma
Minimum Signal Grid Bias Voltage	-1	volts

Typical Operation:-

Converter Service:-

Plate Voltage	100	250	volts
Screen Voltage (Grid #G2,G4)	100	100	volts
Signal Grid Voltage (Grid #G1)	-3	-3	volts
Osc. Anode Voltage (P_O)	100	* 250	volts
Osc. Grid (Grid #G_O,G_3) Resistor	50,000	50,000	ohms
Peak Osc. Grid Voltage (min.)	25	25	volts
Plate Resistance	1	2	megohms
Conversion Transconductance			
Ec_1 = -1 volt	320	350	umhos
Ec_1 = -3 volts (rated bias)	240	270	umhos
Ec_1 = -5 volts	110	130	umhos
Ec_1 = -15 volts (cut-off bias)	10	10	umhos
Plate current	1.4	1.5	ma
Screen current	3.5	3.4	ma
Osc. Anode current	5	6.5	ma
Osc. Grid current	0.4	0.4	ma

Oscillator Section Characteristics:-

Osc. Anode Voltage	100	* 250	volts
Osc. Grid Voltage	0	0	volts
Transconductance	2500	2300	umhos
Amplification Factor	15	15	
Osc. Anode Current	12.5	8.5	ma
Osc. Grid Current at Zgk = 7000 ohms	400	500	uamps
Zgk = 5500 ohms	300	400	uamps
Zgk = 300 ohms	50	60	uamps

* Plate voltage applied thru 20,000 ohms series resistor.

Rogers Electronic Tubes & Components

21CLP4

Description: Rectangular television picture tube with filter glass, metal-backed screen, ion trap, electrostatic focusing and 90° magnetic deflection

Heater data

Heater voltage	6.3 volts
Heater current	0.3 amp

Note: (applies to series operation only) The surge heater voltage must not exceed 9,5 volts rms when the supply is switched on. When used in a series chain a current limiting device may be necessary in the circuit to ensure that this voltage is not exceeded

Direct interelectrode capacitances

Grid No. 1 to all other electrodes	7 μμF
Cathode to all other electrodes	4 μμF
External conductive coating to grids No. 4 and 6	max.1750 μμF min.1250 μμF

Screen

Phosphor number (JETEC designation)	P4
Fluorescent color	white
Persistance	short
Light transmission	70 %
Useful diagonal	min. 20 1/8"
Useful width	min. 19 "
Useful height	min. 14 7/8"

Focusing method	electrostatic
Deflection method	double magnetic
Deflection angle, diagonal	90 °
Deflection angle, horizontal	85 °
Deflection angle, vertical	65 °
Mounting position	any

The socket for the base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The outer circumference of the base will fall within a circle which is concentric with the perpendicular from the centre of the face and which has a diameter of 2 3/16"

Ion trapmagnet

Single magnet, field strength approx. 50 Gausses

from JEDEC release #2383, Aug. 17, 1959

Picture centring magnet

Field intensity perpendicular to the tube axis for centering of the picture: 0-10 gausses.
Maximum distance between centre of field of this magnet and reference line is 2 3/4"

Ratings (Design center values)

Grid No. 4 and 6 voltage	18000 max. volts[x])
	12000 min. volts
Grid No. 3 and 5 voltage	
positive	500 max. volts
negative	500 max. volts
Grid No. 2 voltage	500 max. volts
	200 min. volts
Grid No. 1 voltage	
negative	150 max. volts
positive	0 max. volt
positive peak	2 max. volts
Heaterto cathode voltage [+])	
Heater positive with respect to cathode	125 max. volts
Heater negative with respect to cathode	200 max. volts
Peak value during a warm-up period not exceeding 45 sec; heaternegative	410 max. volts

Maximum circuit values

Grid No. 1 circuit resistance	1,5 max. megohms
Grid No. 1 circuit impedance at 50 cps	0,5 max. megohms
Circuit resistance between cathode and heater	see [o])

Circuit design values

Negative grid No. 3 and 5 current	10 max. microamps
Positive grid No. 3 and 5 current	10 max. microamps

[x]) At zero current

[+]) In order to avoid excessive hum, the A.C. component of the heater to cathode voltage should be as low as possible and must not exceed 20 volts, rms.

[o]) When the heater is supplied from a separate transformer, the maximum value of the circuit resistance between cathode and heater = 1 megohm. When the heater is in a series chain or earthed the maximum circuit impedance at 50 cps = 0,1 MΩ

Typical operating conditions

Grids No. 4 and 6 voltage	14000	16000 volts
Grids No. 3 and 5 voltage at final accelerating electrodes current of 100 microamps	-103 to +203	-75 to +235 volts [XX])
Grid No. 2 voltage	300	300 volts
Grid No. 1 voltage for visual extinction of undeflected focused spot	-40 to -80	-40 to -80 volts

Mechanical data

Overall length	19" ± 3/8"
Greatest dimensions of bulb	
diagonal	21 3/8" ± 1/8"
width	20 1/4" ± 1/8"
height	16 3/8" ± 1/8"
Neck length	6 1/2"
Bulb number (ASA designation)	J171
Bulb contact (JETEC designation)	J1-21
Base (JETEC designation)	B7-51

[XX]) At the specified value of grids No. 3 and 5 voltage the focusing of the tube is optimum in the centre of the screen. If a uniform focusing over the entire screen is preferred this voltage has to be raised with 100 to 200 volts

Notes from page 5 and 6

1)Reference line, determined by the plane of the upper edge of the flange of the reference gauge JETEC No. 116 when the gauge is resting on the cone.

2)Allowable contact area

3)Space for deflection coils and centering magnet

4)Space for the ion trap magnet

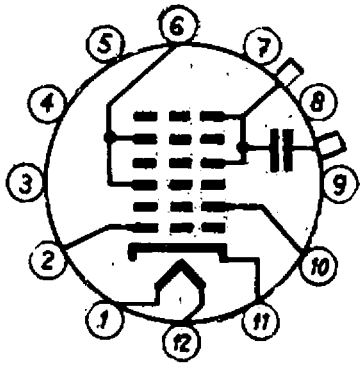
5)Distance from reference line to top centre of grid

6)Recessed cavity contact

7)Ion trap magnet

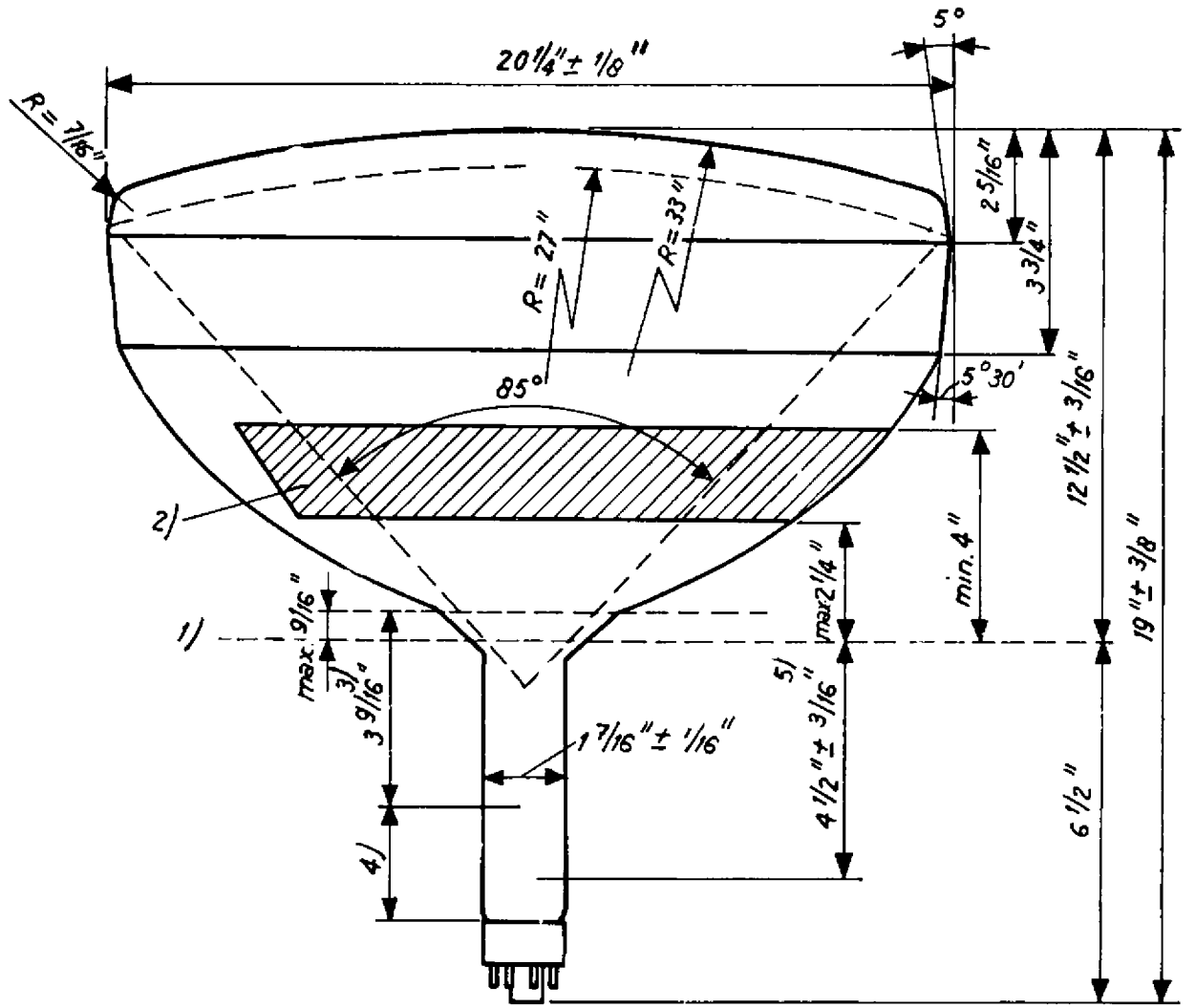
8)This area must be kept clean

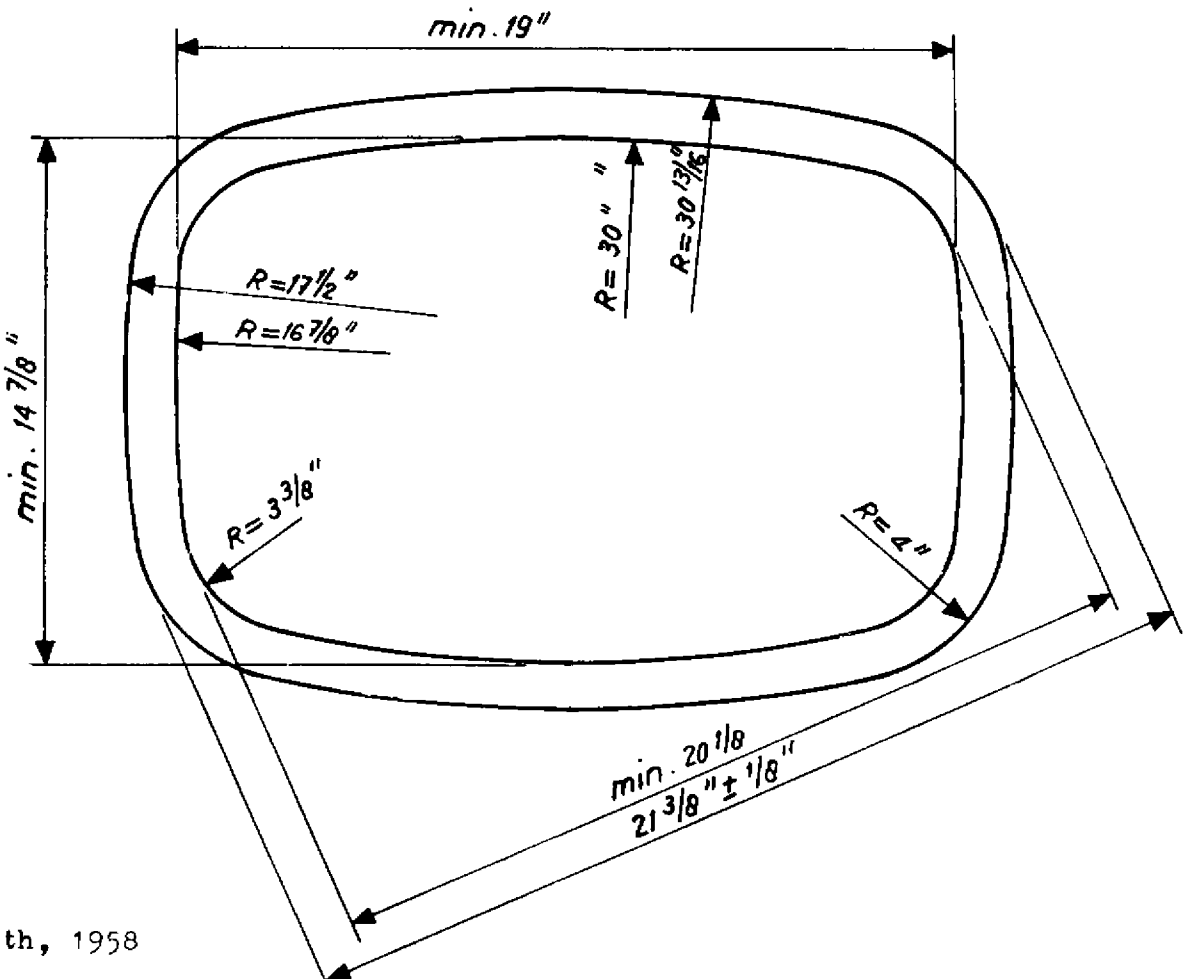
BOTTOM VIEW OF BASE

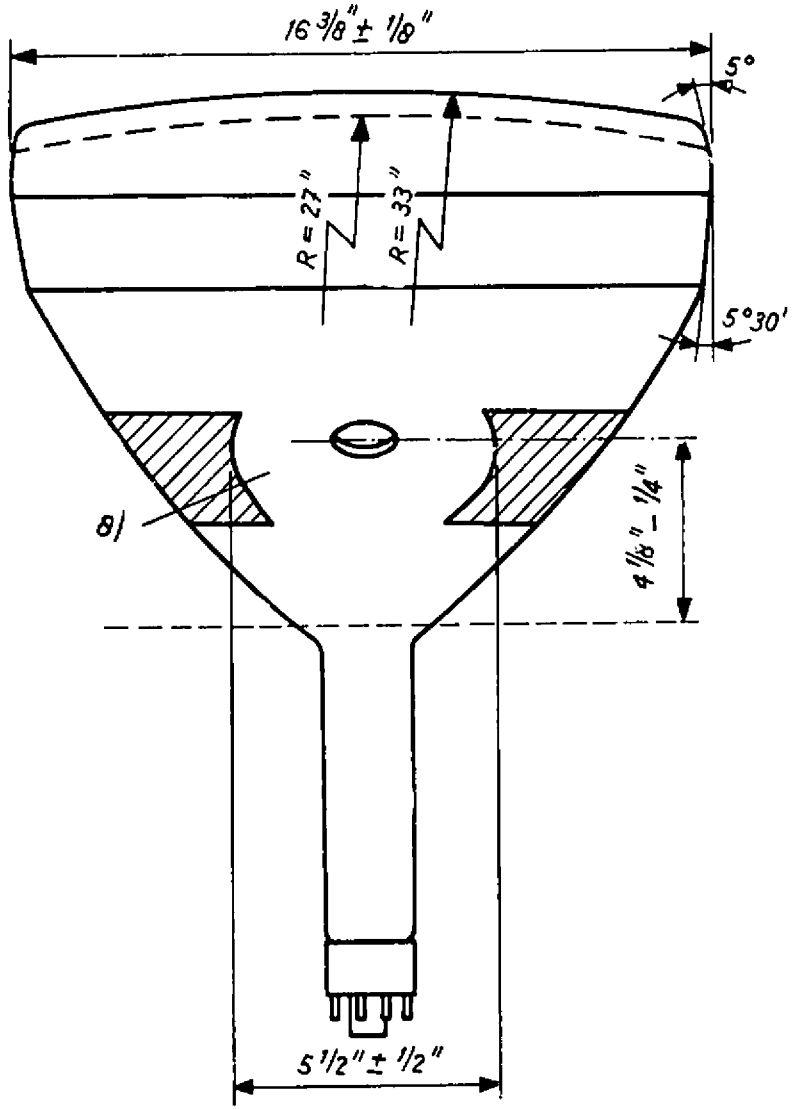


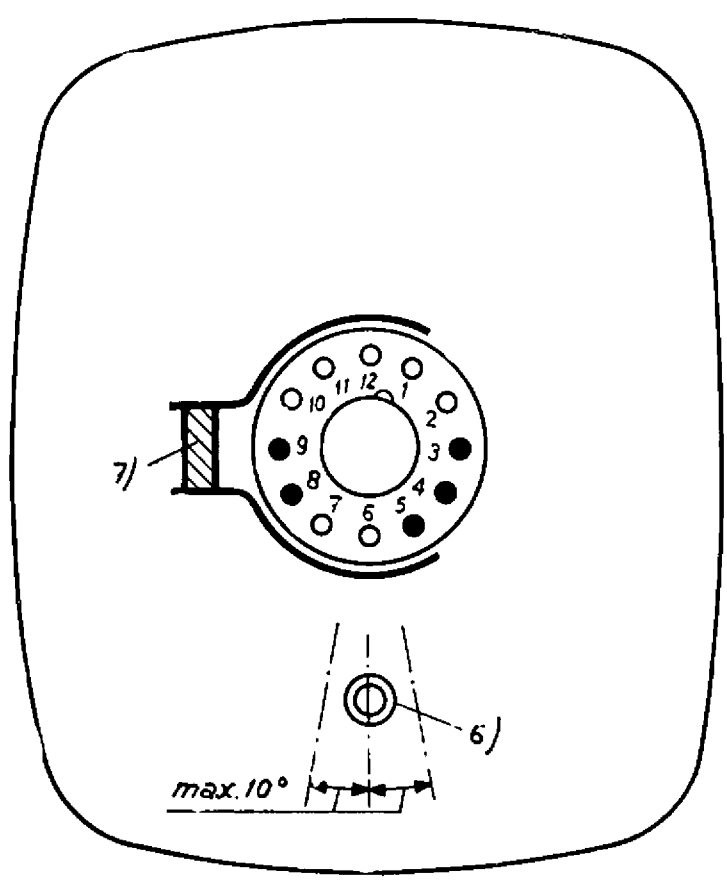
12AJ

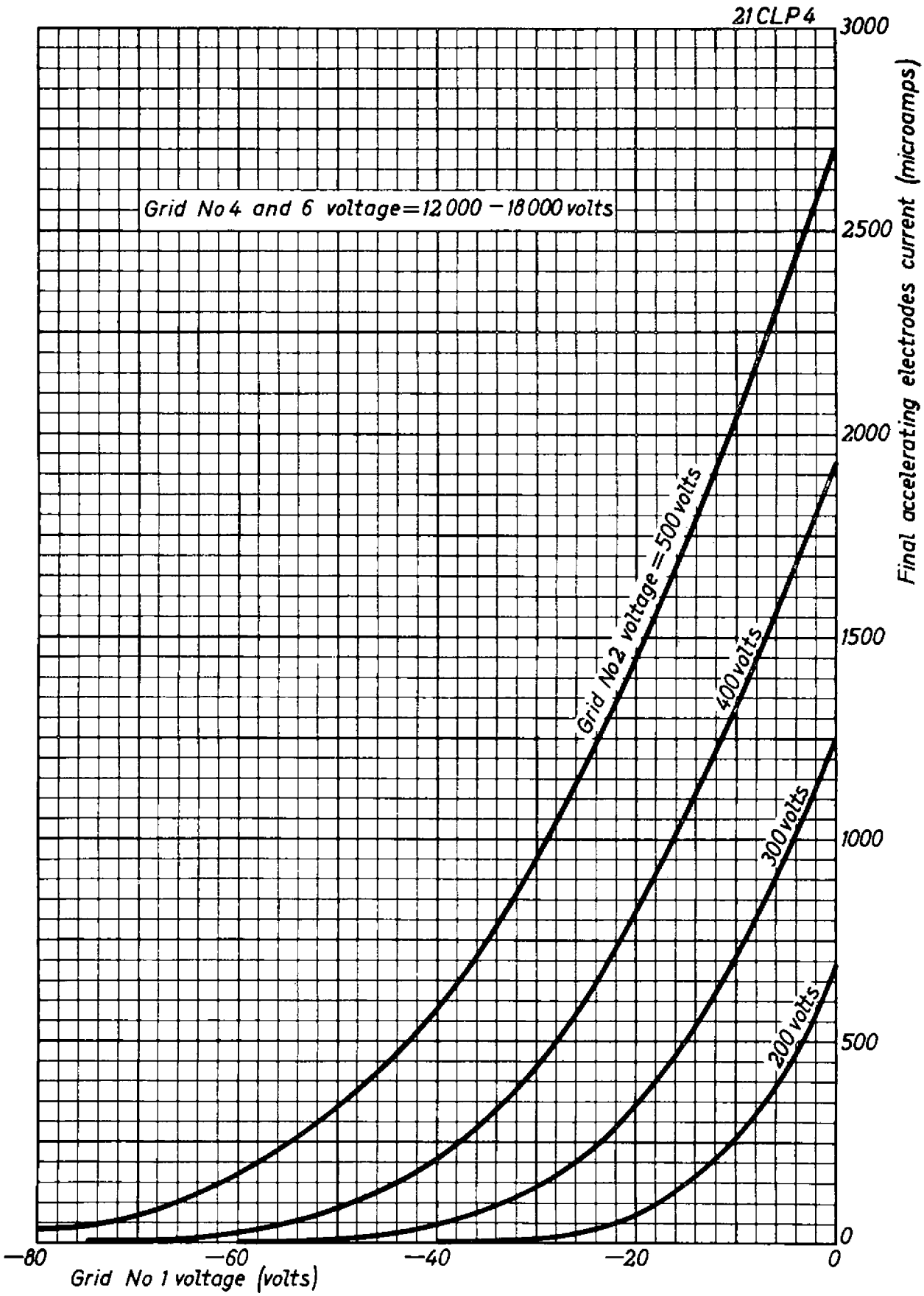
BASE PIN No.	ELEMENT
1	heater
2	grid No.1
6	grid No.3 and 5
10	grid No.2
11	cathode
12	heater
bulb contact	grid no.4 and 6, collector


5°
20 1/4" ± 1/8"
R = 7/16"
2 5/16"
3 3/4"
R = 27"
R = 33"
85°
5°30'
12 1/2" ± 3/16"
19" ± 3/8"
min. 4"
2)
max 2 1/4"
1)
max 9/16"
3"
3 9/16"
1 7/16" ± 1/16"
5)
4 1/2" ± 3/16"
6 1/2"
4)


min. 19"
R = 30"
R = 30 13/16"
R = 17 1/2"
R = 16 7/8"
min. 14 7/8"
R = 3 3/8"
R = 4"
min. 20 1/8
21 3/8" ± 1/8"


16 3/8" ± 1/8"
5°
R = 27"
R = 33"
5°30'
8)
4 1/8" - 1/4"
5 1/2" ± 1/2"

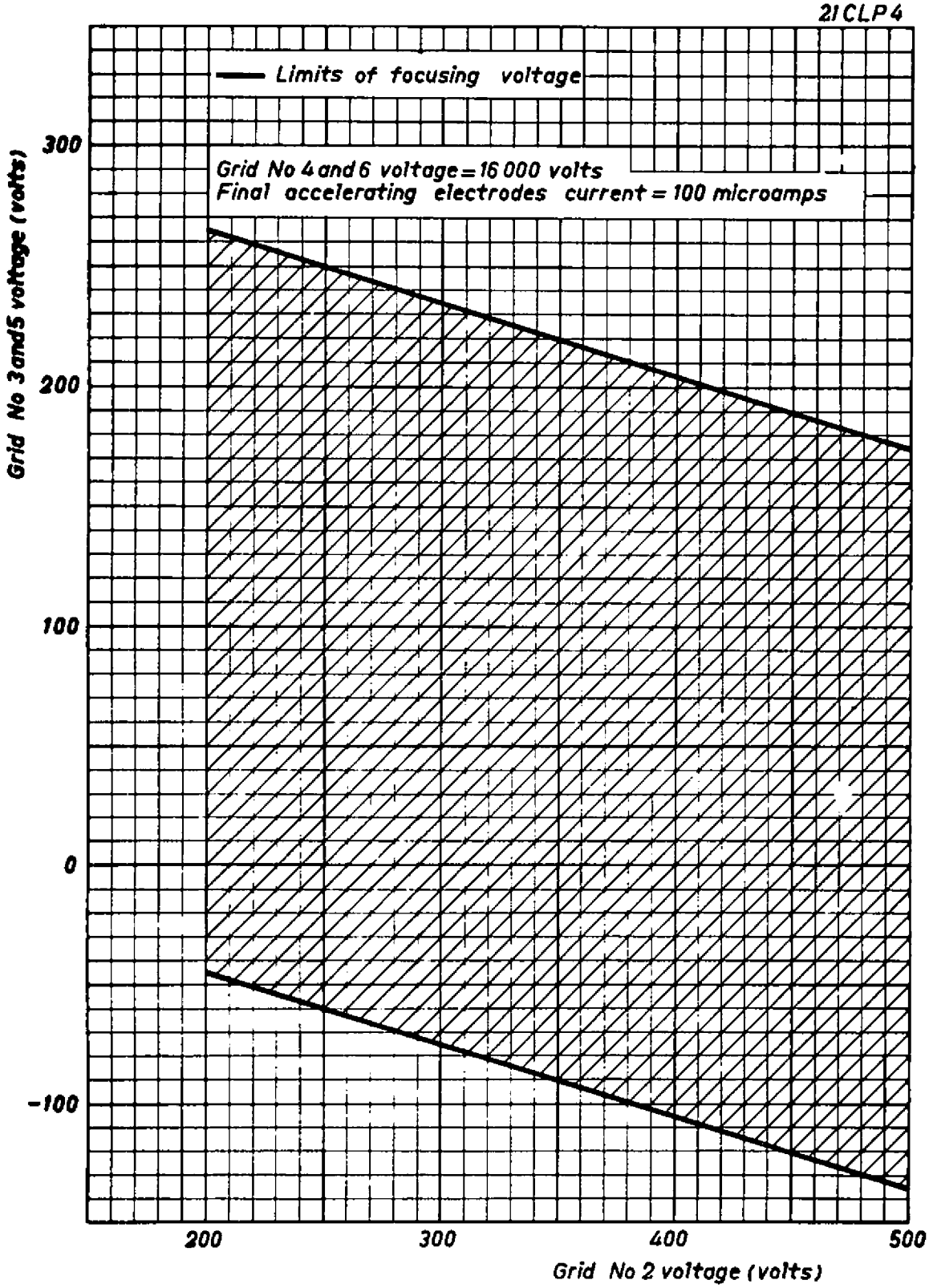

12
1
2
3
4
5
6
7
8
9
10
11
7)
6)
max. 10°


21 CLP 4
Grid No 4 and 6 voltage = 12 000 – 18 000 volts
Grid No 2 voltage = 500 volts
400 volts
300 volts
200 volts
Final accelerating electrodes current (microamps)
3000
2500
2000
1500
1000
500
0
–80
–60
–40
–20
0
Grid No 1 voltage (volts)

10.10.1958

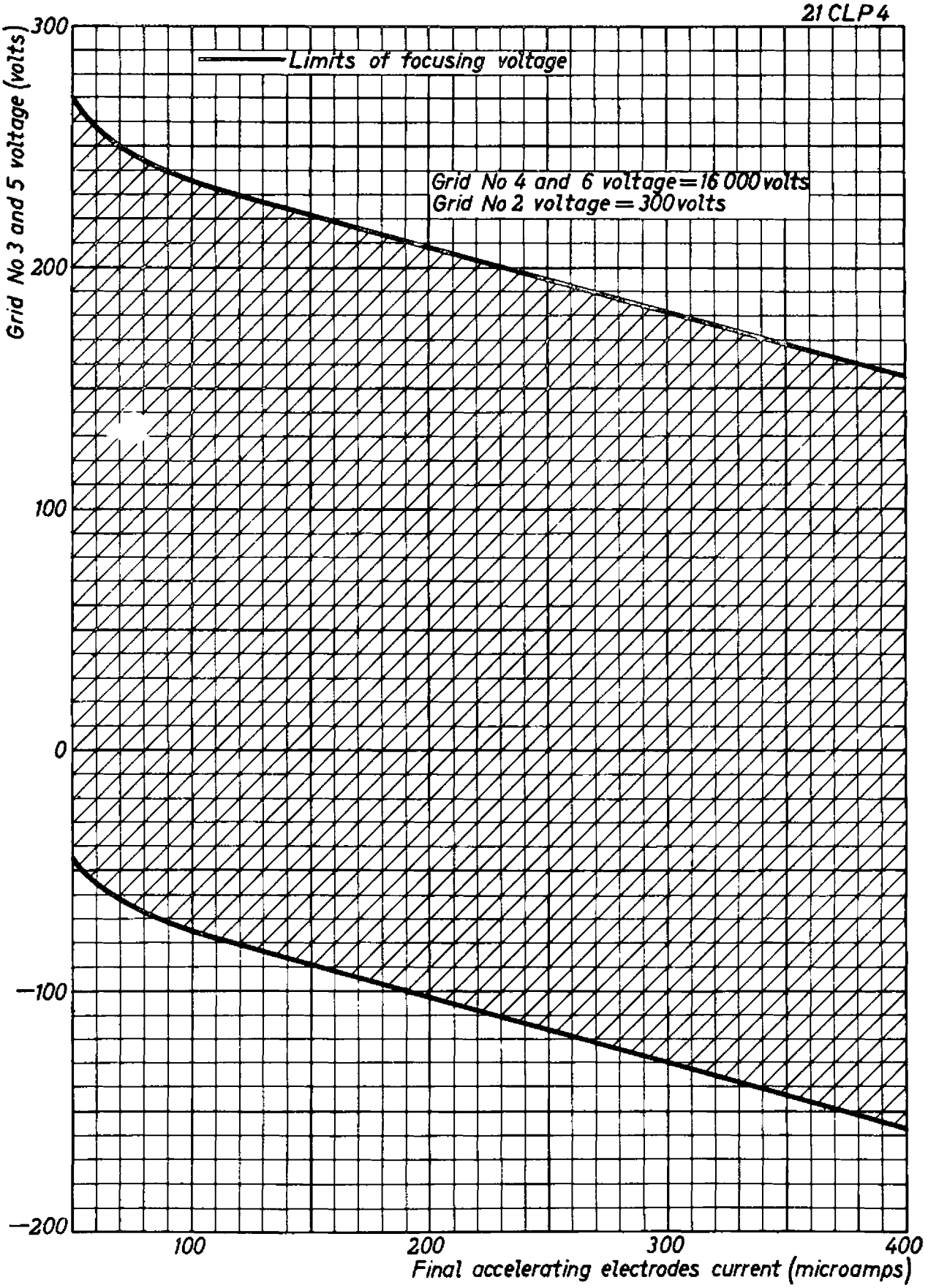
A

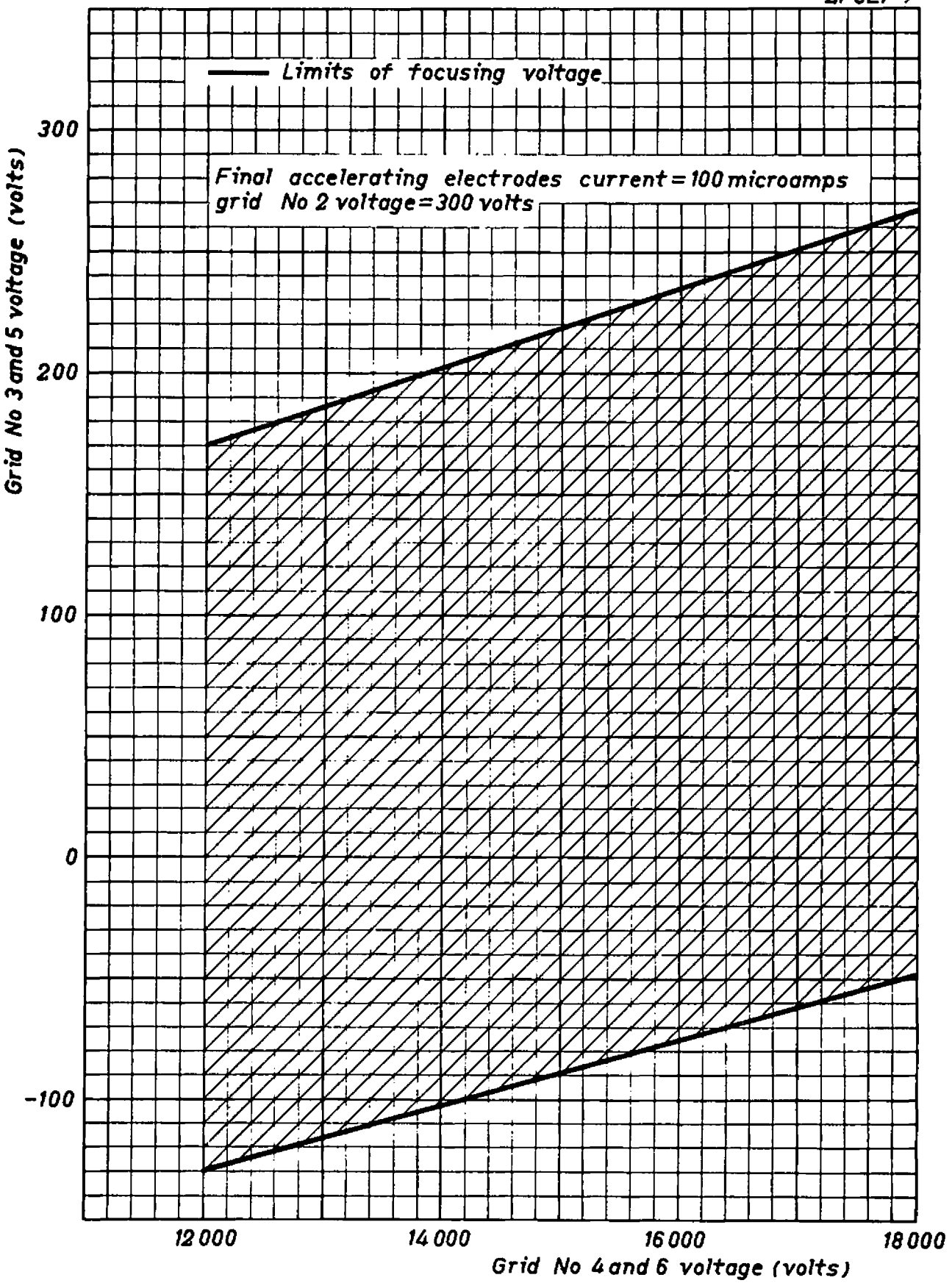
21CLP4



10.10.1958

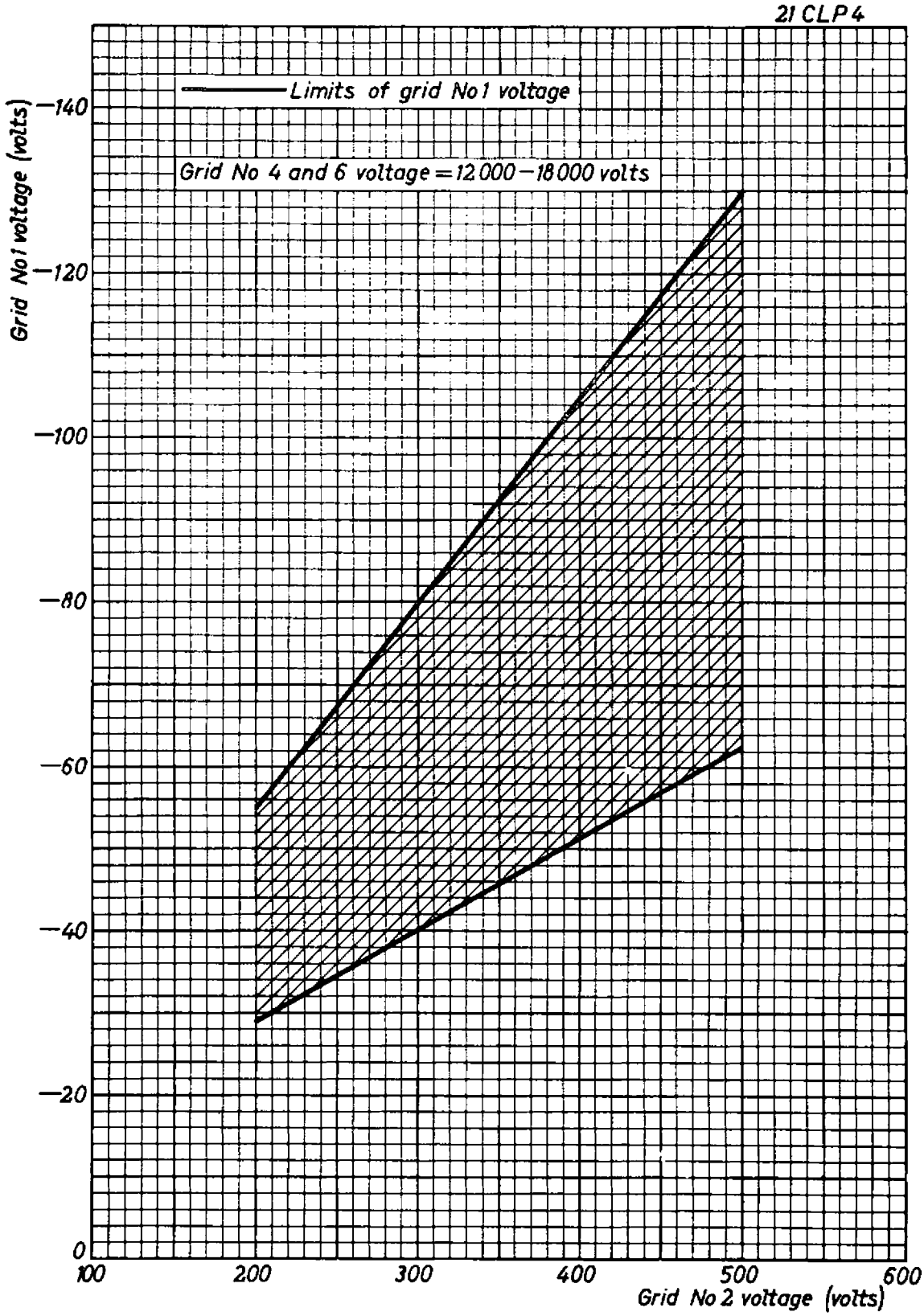
B


Limits of focusing voltage
Grid No 4 and 6 voltage = 16 000 volts
Grid No 2 voltage = 300 volts
Grid No 3 and 5 voltage (volts)
300
200
100
0
−100
−200
100
200
300
400
Final accelerating electrodes current (microamps)


Limits of focusing voltage
Final accelerating electrodes current = 100 microamps
grid No 2 voltage = 300 volts
300
200
100
0
-100
Grid No 3 and 5 voltage (volts)
12 000
14 000
16 000
18 000
Grid No 4 and 6 voltage (volts)

10.10.1958

D


Limits of grid No 1 voltage
Grid No 4 and 6 voltage = 12 000 – 18 000 volts
Grid No 1 voltage (volts)
–140
–120
–100
–80
–60
–40
–20
0
100
200
300
400
500
600
Grid No 2 voltage (volts)

TUBE TYPE 2X3G

HALF WAVE HIGH VACUUM RECTIFIER

Filament		Coated	
	Voltage	2.5	A.C. Volts
	Current	2.0	Ampere

Maximum Overall Length	4"
Maximum Diameter	1-9/16"
Bulb	ST12
Base	Small Octal Shell 4 pin

Pin 1 Shell

Pin 2 Filament

Pin 4 Plate

Pin 8 Filament

A pair of these tubes, operated with the filaments in series, have identical electrical characteristics as a Type 80 full wave rectifier.

from RMA release #111, April 1, 1937
sponsored by Rogers Radio Tubes Ltd., Toronto, Canada

from JETEC release #1699, July 30, 1956
sponsor: Rogers Electronic Tubes, Toronto, Canada

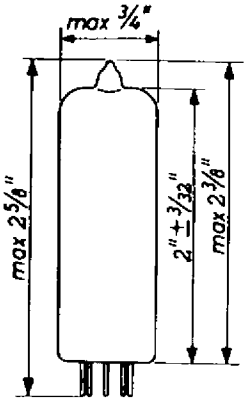
30A5

OUTPUT PENTODE for use in receivers for low mains voltages

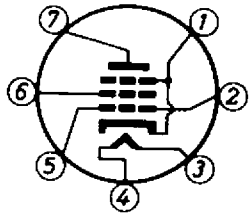
MECHANICAL DATA

Cathode	Coated unipotential
Base	E7-1
Bulb	T5½
RETMA basing designation	7 CV
Mounting position	Any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Cathode, grid No.3
2	Grid No.1
3	Heater
4	Heater
5	Grid No.1
6	Grid No.2
7	Plate

ELECTRICAL DATA

Heater data

Heater voltage	30 volts
Heater current	150 mamps

DIRECT INTERELECTRODE CAPACITANCES

Plate to all other elements	5.8 μμF
Grid No.1 to all other elements	12 μμF
Plate to grid No.1	0.3 μμF
Grid No.1 to heater	0.4 μμF

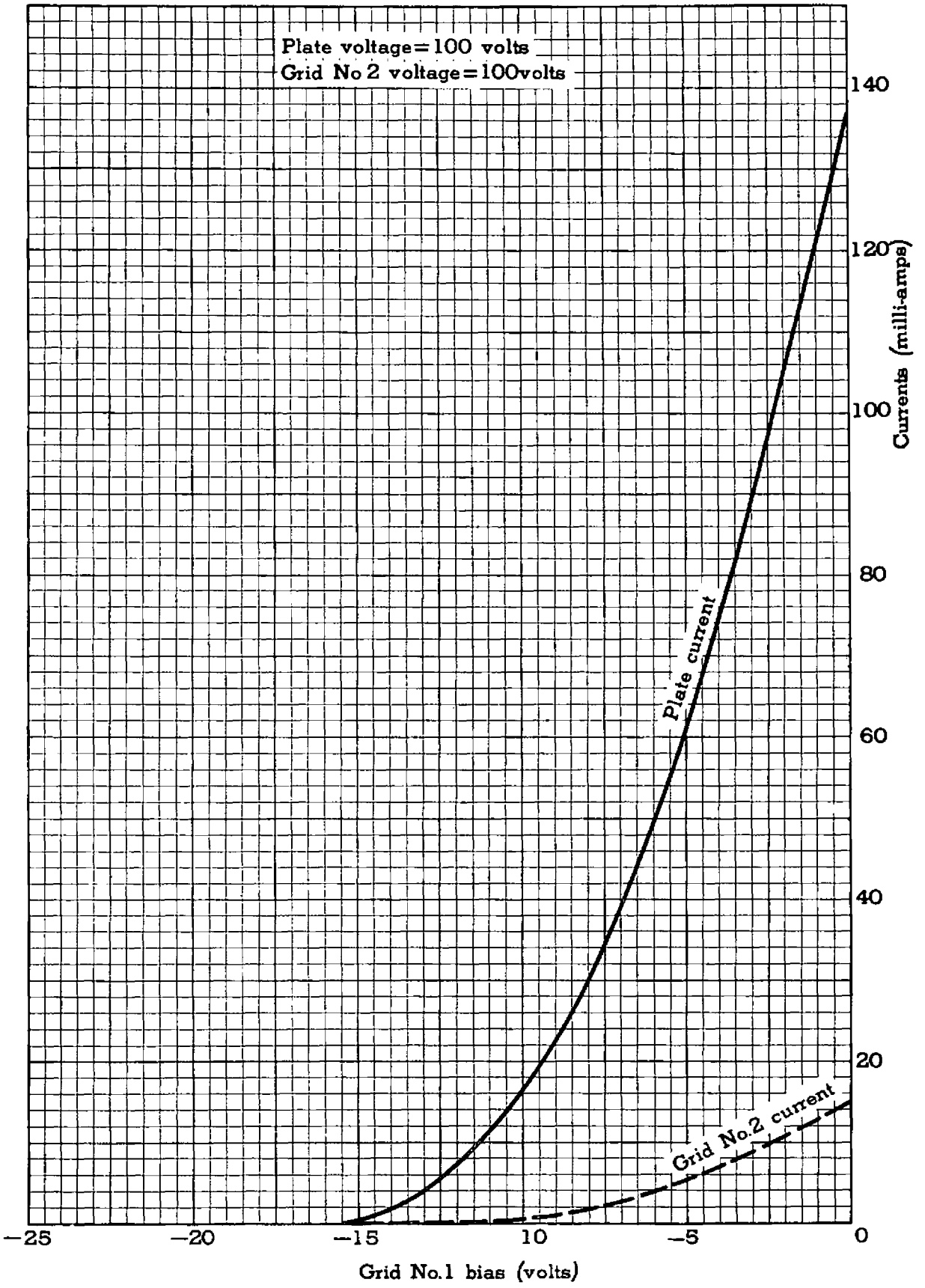
MAXIMUM RATINGS (Design Center Values)

Plate voltage	150 volts
Plate voltage (without current)	550 volts
Plate dissipation	7.5 watts
Grid No.2 voltage	150 volts
Grid No.2 voltage (without current)	550 volts
Grid No.2 dissipation	1.5 watts
Peak grid No.2 dissipation during drive	2.5 watts
Cathode current	100 mamps
Grid No.1 circuit resistance with automatic bias	1 megohm
Voltage between heater and cathode	150 volts

OPERATING CHARACTERISTICS

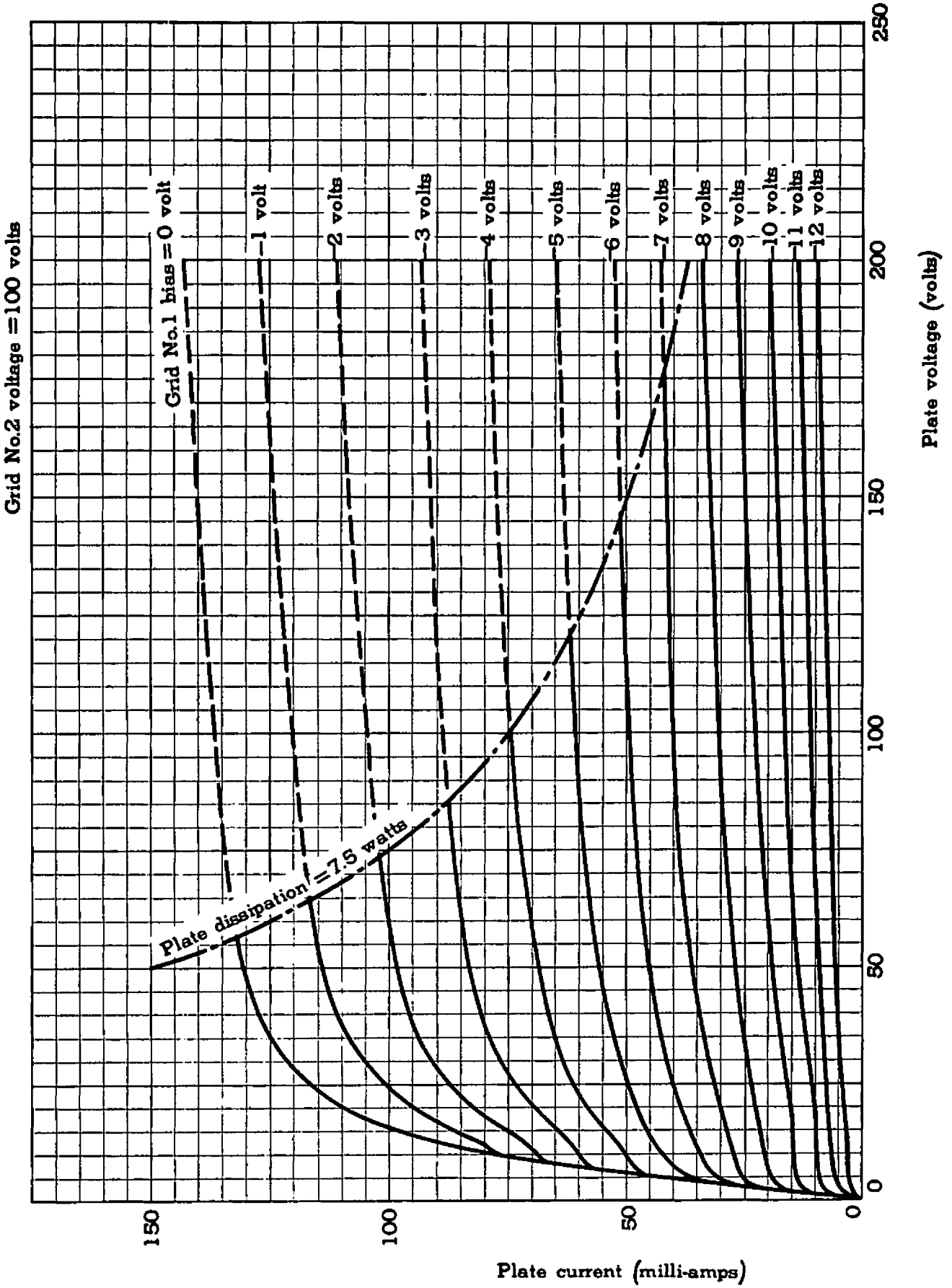
Plate voltage	100 volts
Grid No.2 voltage	100 volts
Grid No.1 voltage	-6.7 volts
Zero signal plate current	43.0 mamps
Max. signal plate current	43.0 mamps
Zero signal grid No.2 current	3.0 mamps
Max. signal grid No.2 current	11 mamps
Transconductance	9200 micromhos
Plate resistance	22 000 ohms
Amplification factor of grid No.2 with respect to grid No.1	7.8
Plate load resistance	2400 ohms
Output power at 10% distortion	1.9 watts
Required input A.F. voltage	4.3 volts rms
Required input A.F. voltage at an output power of 50 mwatts	0.55 volts rms

30A5



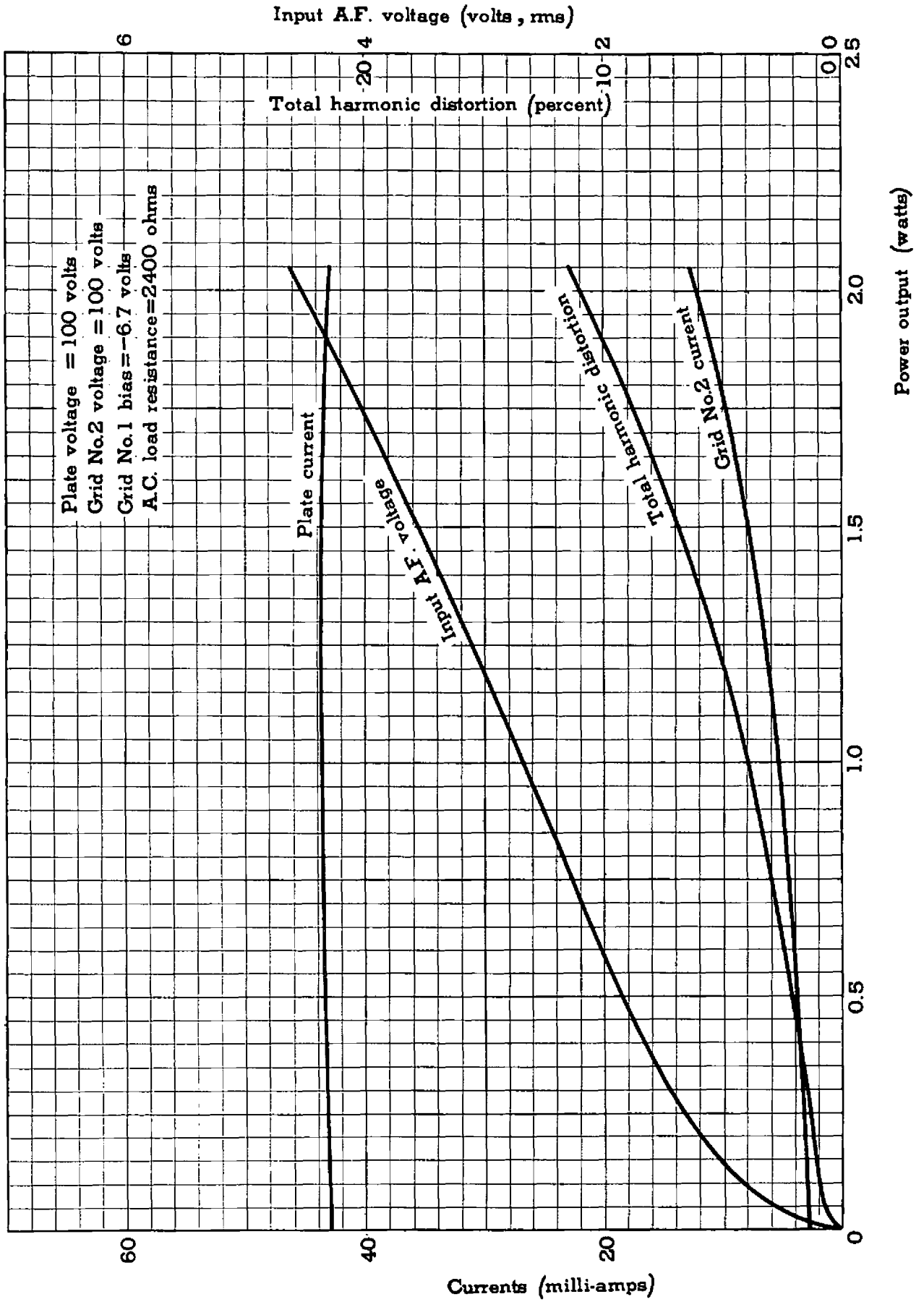
April 28, 1956

30A5



April 28, 1956

30A5



April 28, 1956

ROGERS 30AE3

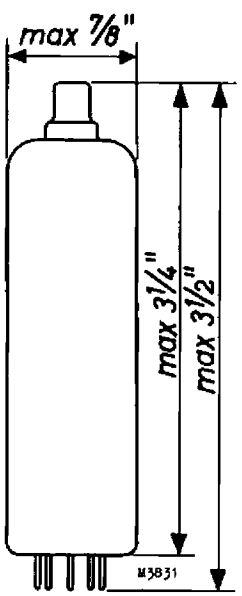
BOOSTER DIODE

Booster diode in line-timebase circuits for transformerless television receivers.

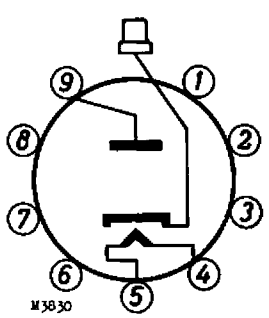
MECHANICAL DATA

Cathode	coated, unipotential
Base	E9-1
Bulb	T6 1/2
Outline	see drawing
Basing	9CB
Top cap	C1-2
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1 }	internally
2 }	connected;do
3 }	not use
4	heater
5	heater
6 }	internally
7 }	connected;do
8 }	not use
9	anode
Top	cathode

JULY 1959

from JEDEC release #2684, Jan. 4, 1960

HEATER DATA	
Heater voltage	30 volts
Heater current	300 mamps
DIRECT INTERELECTRODE CAPACITANCES	
Plate to all other elements	8.6 μμF
Cathode to heater	2.0 μμF
MAXIMUM RATINGS (Design Center Values)	
Supply voltage without current	550 volts max.
Supply voltage	250 volts max.
Plate current	220 mamps max.
Peak plate current	550 mamps max.
Plate dissipation	5 watts max.
Peak negative plate voltage	6000 volts max.[1)][2)]
Peak voltage between heater and cathode	6600 volts max.[1)]
Voltage between heater and earth	220 volts r.m.s. max.

[1)] Max. pulse duration 22% of a cycle with a max. of 18 μsec.

[2)] Absolute maximum ratings 7500 volts.

Rogers Electronic Tubes & Components

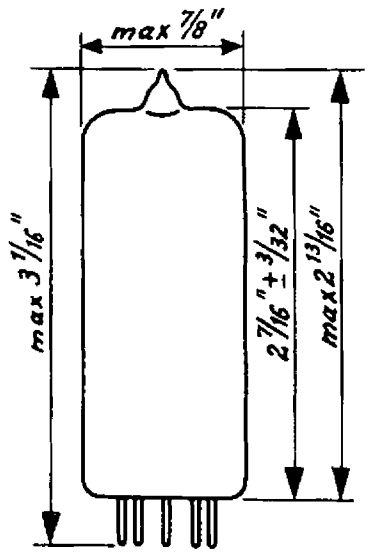
32A8

Description : Triode pentode; triode section for use as A.F. amplifier; pentode section for use as A.F. output tube.

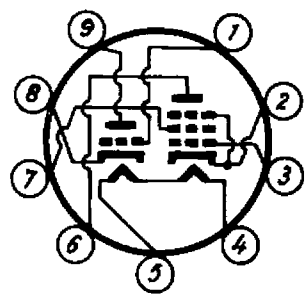
MECHANICAL DATA

Cathode	coated, unipotential
Base	E9-1
Bulb	T6 1/2
Outline	6-4
Basing	9EX
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Triode grid
2	Pentode cathode and grid No. 3, internal shield
3	Pentode grid No.1
4	Heater
5	Heater
6	Pentode plate
7	Grid No. 2
8	Triode cathode
9	Triode plate

HEATER DATA

Heater voltage	32 volts
Heater current	150 mamps

DIRECT INTERELECTRODE CAPACITANCES

Triode section

Grid to all other elements except plate		2.7 uuF
Plate to all other elements except grid		4.3 uuF
Plate to grid		4.2 uuF
Grid to heater	max.	0.02 uuF

Pentode section

Grid No.1 to all other elements except plate		9.3 uuF
Plate to all other elements except grid No.1		8.0 uuF
Plate to grid No. 1	max.	0.3 uuF
Grid No.1 to heater	max.	0.3 uuF

from JEDEC release #2556, Aug. 3, 1959

DIRECT INTERELECTRODE CAPACITANCES (continued)

Between triode and pentode section

Triode plate to pentode grid No. 1	max.	0.02 uuF
Triode grid to pentode plate	max.	0.02 uuF
Triode grid to pentode grid No. 1	max.	0.025 uuF
Triode plate to pentode plate	max.	0.25 uuF

MAXIMUM RATINGS (design center values)

Pentode section

Plate voltage without plate current	550 volts max.
Plate voltage	250 volts max.
Plate dissipation	7 watts max.
Grid No.2 voltage without current	550 volts max.
Grid No. 2 voltage	250 volts max.
Grid No. 2 dissipation	1.8 watts max.
Peak grid No. 2 dissipation	3.2 watts max.
Cathode current	50 mamps max.
Grid No.1 circuit resistance with automatic bias	2 megohms max.
Grid No.1 circuit resistance with fixed bias	1 megohm max.
Voltage between heater and cathode	200 volts max.
Circuit resistance between heater and cathode	20000 ohms max.

Triode section

Plate voltage without plate current	550 volts max.
Plate voltage	250 volts max.
Plate dissipation	1 watt max.
Cathode current	15 mamps max.
Grid circuit resistance with automatic bias	3 megohms max.
Grid circuit resistance with fixed bias	1 megohm max.
Voltage between heater and cathode	200 volts max.
Circuit resistance between heater and cathode	20000 ohms max.
Grid circuit impedance (freq. = 50 c/s)	0.5 megohm max.

TYPICAL CHARACTERISTICS

Pentode section

Plate voltage	100	170	200	200 volts
Grid No. 2 voltage	100	170	200	200 volts
Grid No. 1 bias	-6.0	-11.5	-12.5	-16 volts
Plate current	26	41	35	35 mamps

Grid No. 2 current	5.0	8.0	6.5	7.0	mamps
Transconductance	6800	7500	6800	6400	micromhos
Plate resistance	15000	16000	20500	20000	ohms
Amplification factor of grid No.2 with respect to grid No. 1	10	9.5	9.5	9.5	

Triode section

Plate voltage	100	volts
Grid voltage	0	volts
Plate current	3.5	mamps
Transconductance	2500	micromhos
Amplification factor	70	

OPERATING CHARACTERISTICS of the pentode section as audio output tube, class A

Plate voltage	100	170	200	200	volts
Grid No. 2 voltage	100	170	200	200	volts
Grid No. 1 bias	-6.0	-11.5	-12.5	-16	volts
Plate current	26	41	35	35	mamps
Grid No. 2 current	5.0	8.0	6.5	7.0	mamps
Load resistance	3900	3900	5600	5600	ohms
Power output at a harmonic distortion of 10%	1.05	3.3	3.4	3.5	watts
Required input A.F.voltage	3.8	6.0	5.8	6.6	volts (rms)
Required input A.F.voltage at a power output of 50 milliwatts	0.65	0.59	0.56	0.60	volts (rms)

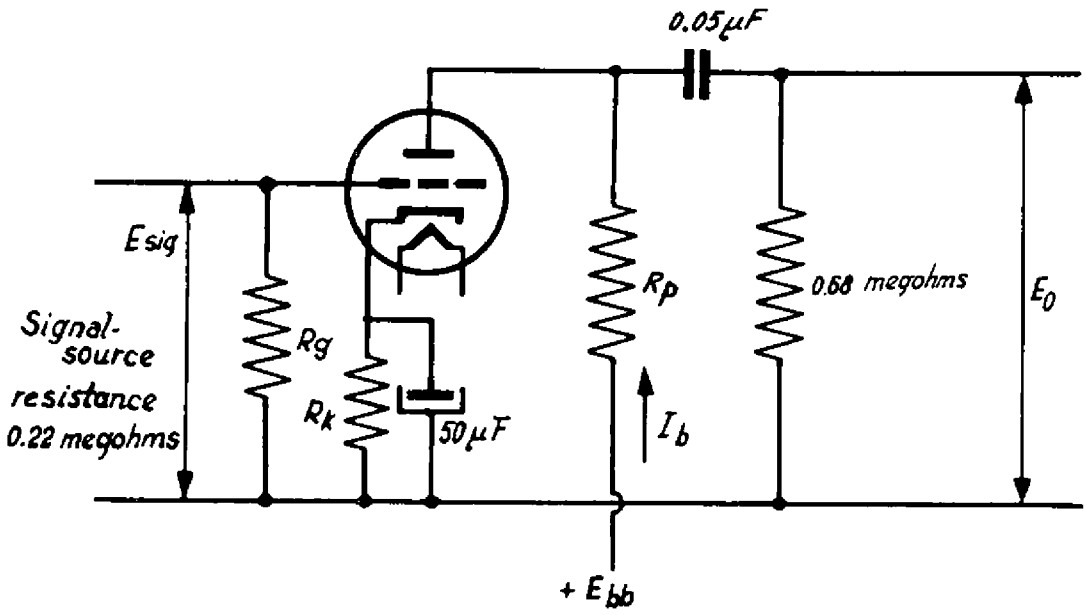
MICROPHONY

The triode section can be used without special precautions against microphonic effect in circuits in which an input voltage of at least 10 millivolts gives an output power of 50 milliwatts.

HUM

In order to statisfy the hum requirement for the triode section of -60 db at an output power of 50 milliwatts, the input voltage for 50 milliwatts output must be higher than 10 millivolts when the grid circuit impedance at 50 cycles/second $\leq$ 0.5 megohm. In this case the A.C.voltage between pin 5 and cathode must be zero. When the A.C.voltage between pin 5 and cathode is 12.6 volts, the input voltage for 50 milliwatts output must be at least 20 millivolts.

OPERATING CHARACTERISTICS OF THE TRIODE SECTION AS A.F. AMPLIFIER

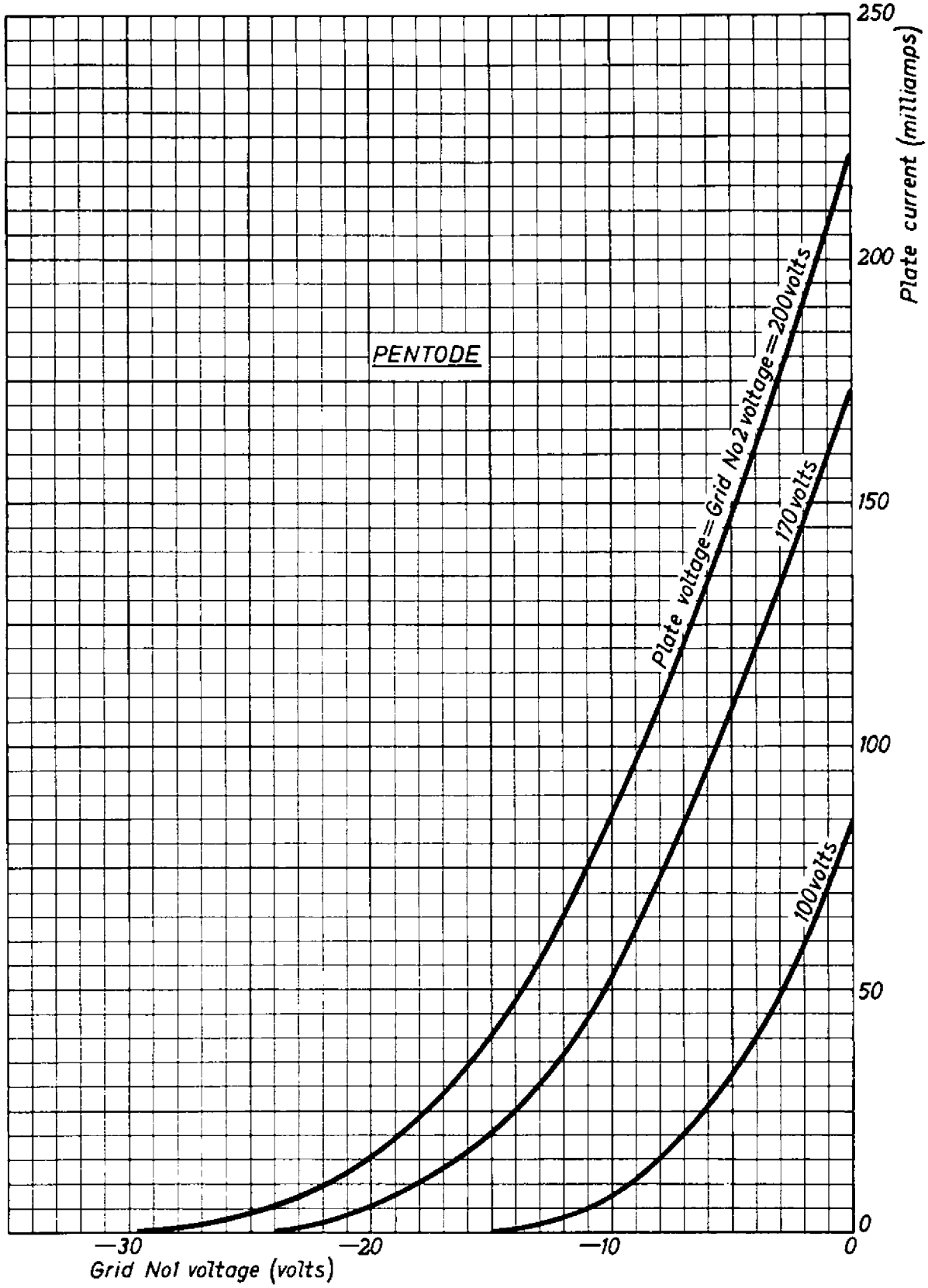


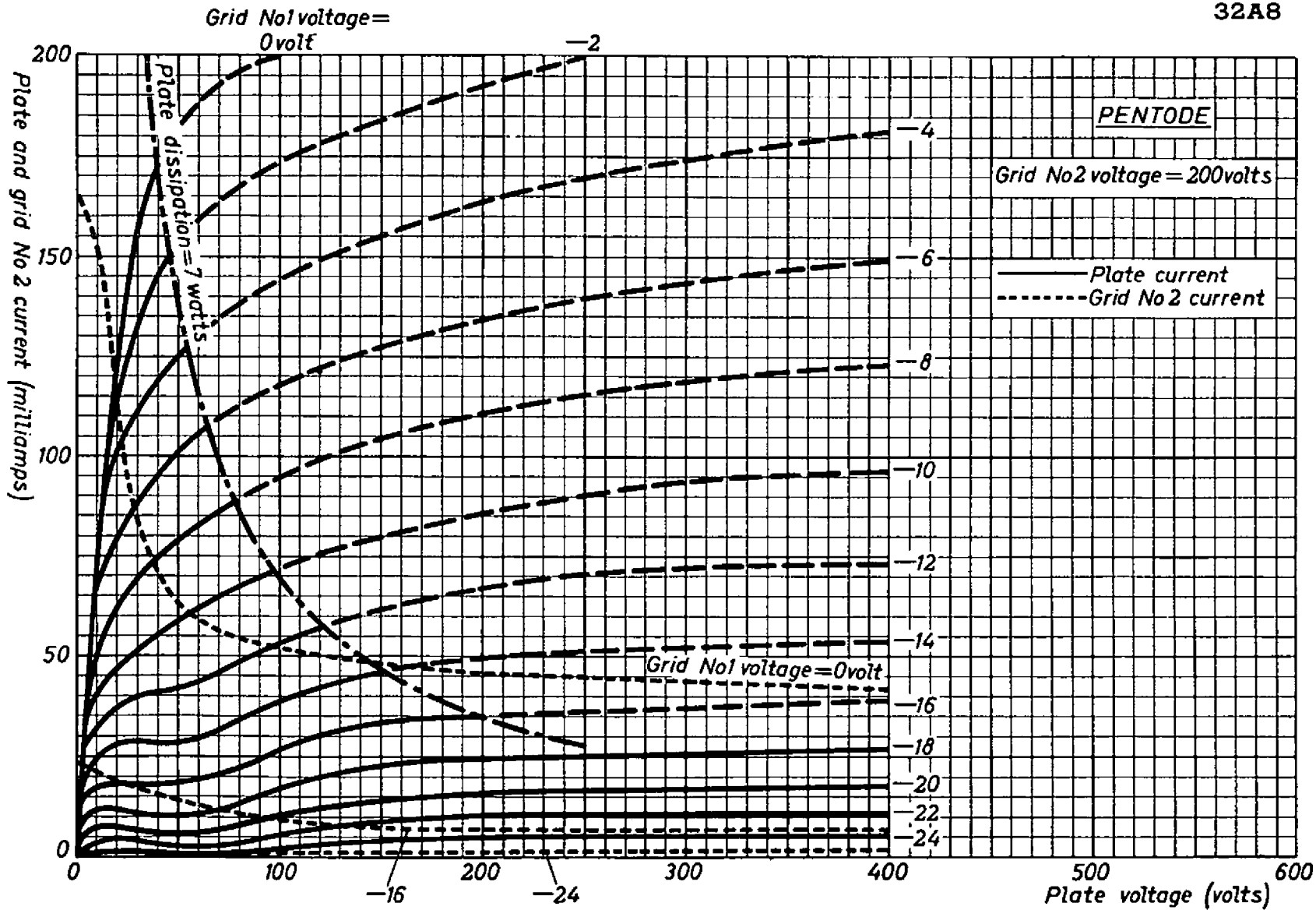
E_{bb} volts	R_g megohms	R_k ohms	R_p megohms	I_b mamps	E_o volts(rms)	$\frac{E_o}{E_{sig}}$ (1	total harmonics
200	3	2200	0.22	0.52	26	52	1.6 (2
170	3	2700	0.22	0.43	25	51	2.3 (2
100	3	2700	0.22	0.23	15	47	4.0 (2
200	22	0	0.1	1.05	24	50	1.5 (3
170	22	0	0.1	0.86	19	49	1.4 (3
100	22	0	0.1	0.37	8	42	1.3 (2
200	22	0	0.22	0.61	25	55	1.4 (3
170	22	0	0.22	0.50	20	53	1.4 (3
100	22	0	0.22	0.22	9	46	1.5 (2

1) Measured at small input voltage

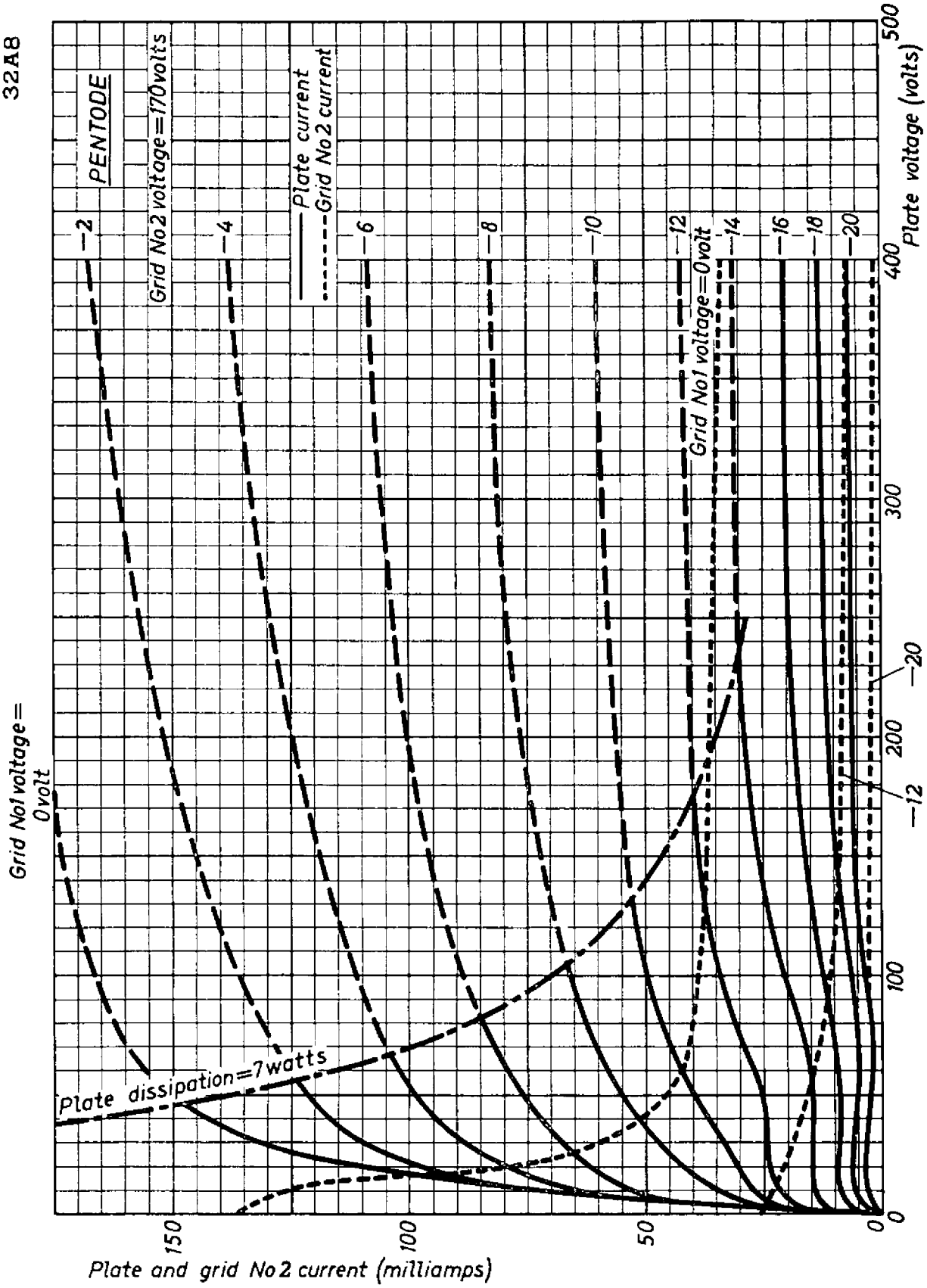
2) At lower output voltages the distortion is proportionally lower

3) At lower output voltages the distortion remains approx. constant up to V_o = 5 V_{eff}. At values < 5 V_{eff} the distortion is proportionally lower.


PENTODE
Plate voltage = Grid No2 voltage = 200volts
170volts
100volts
Plate current (milliamps)
250
200
150
100
50
0
—30
—20
—10
0
Grid No1 voltage (volts)

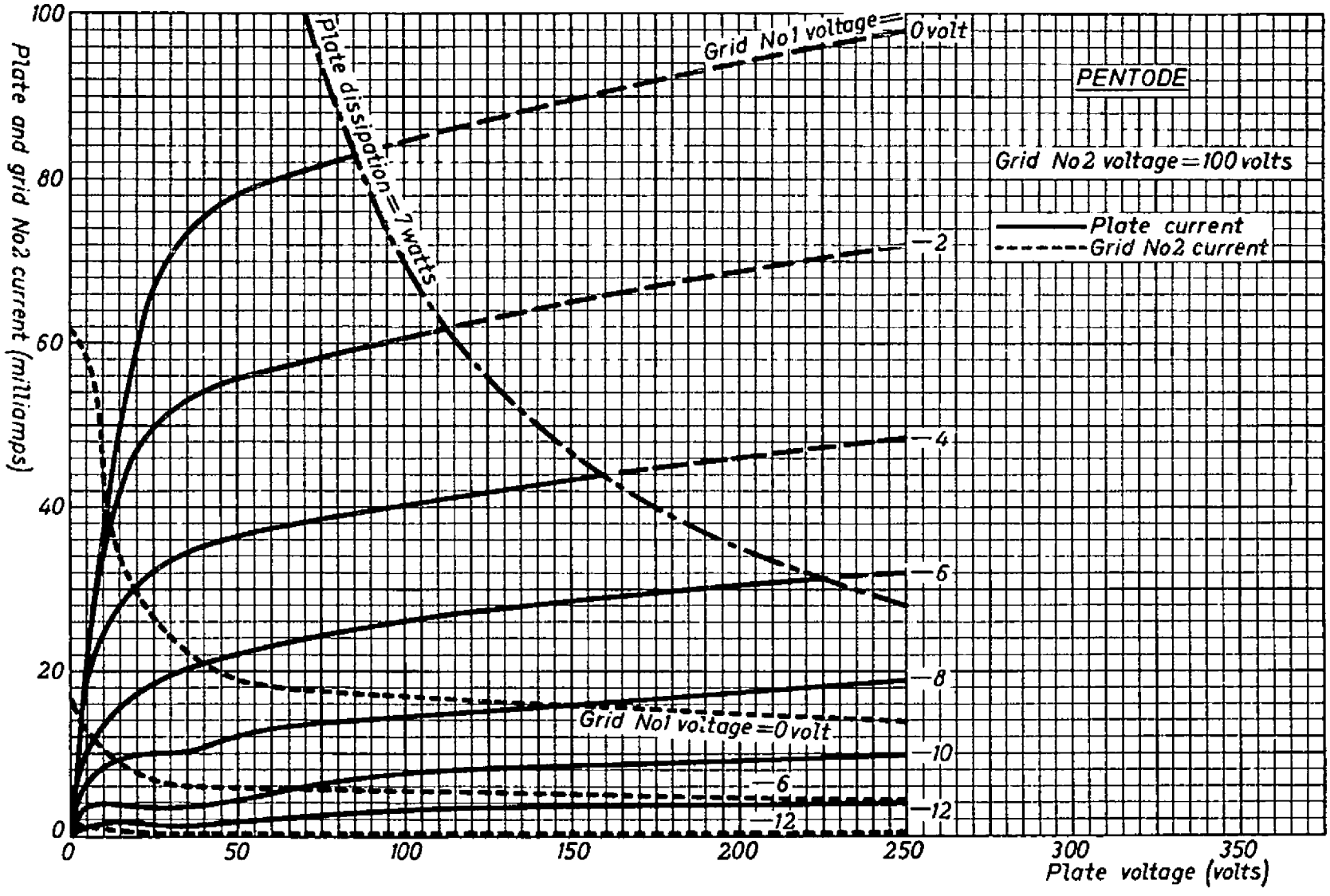

Grid No1 voltage = 0 volt
−2
−4
−6
−8
−10
−12
−14
−16
−18
−20
−22
−24
PENTODE
Grid No2 voltage = 200volts
Plate current
Grid No 2 current
Plate dissipation = 7 watts
Grid No1 voltage = 0volt
Plate and grid No 2 current (milliamps)
Plate voltage (volts)
0
50
100
150
200
300
400
500
600

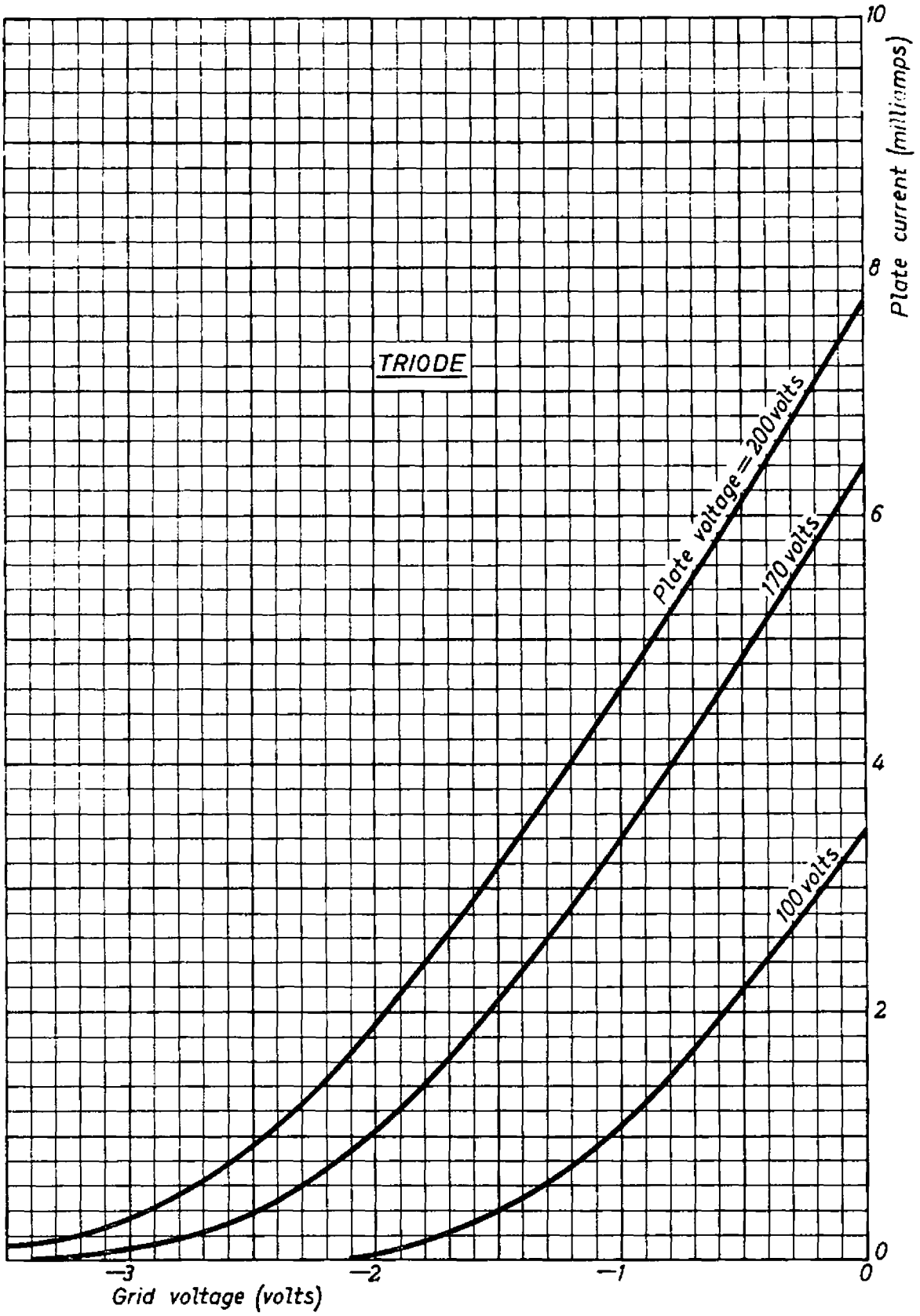
32A8

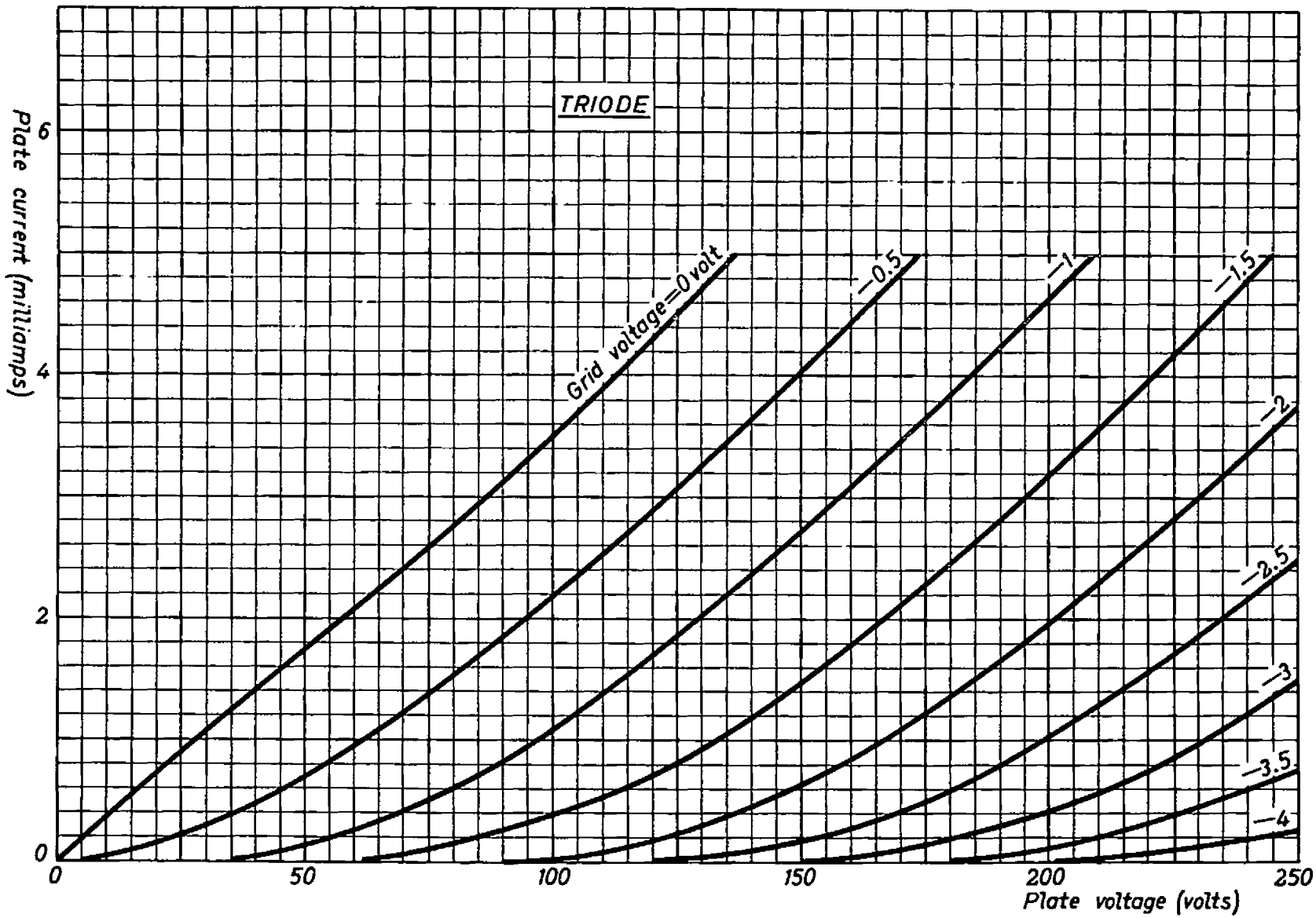


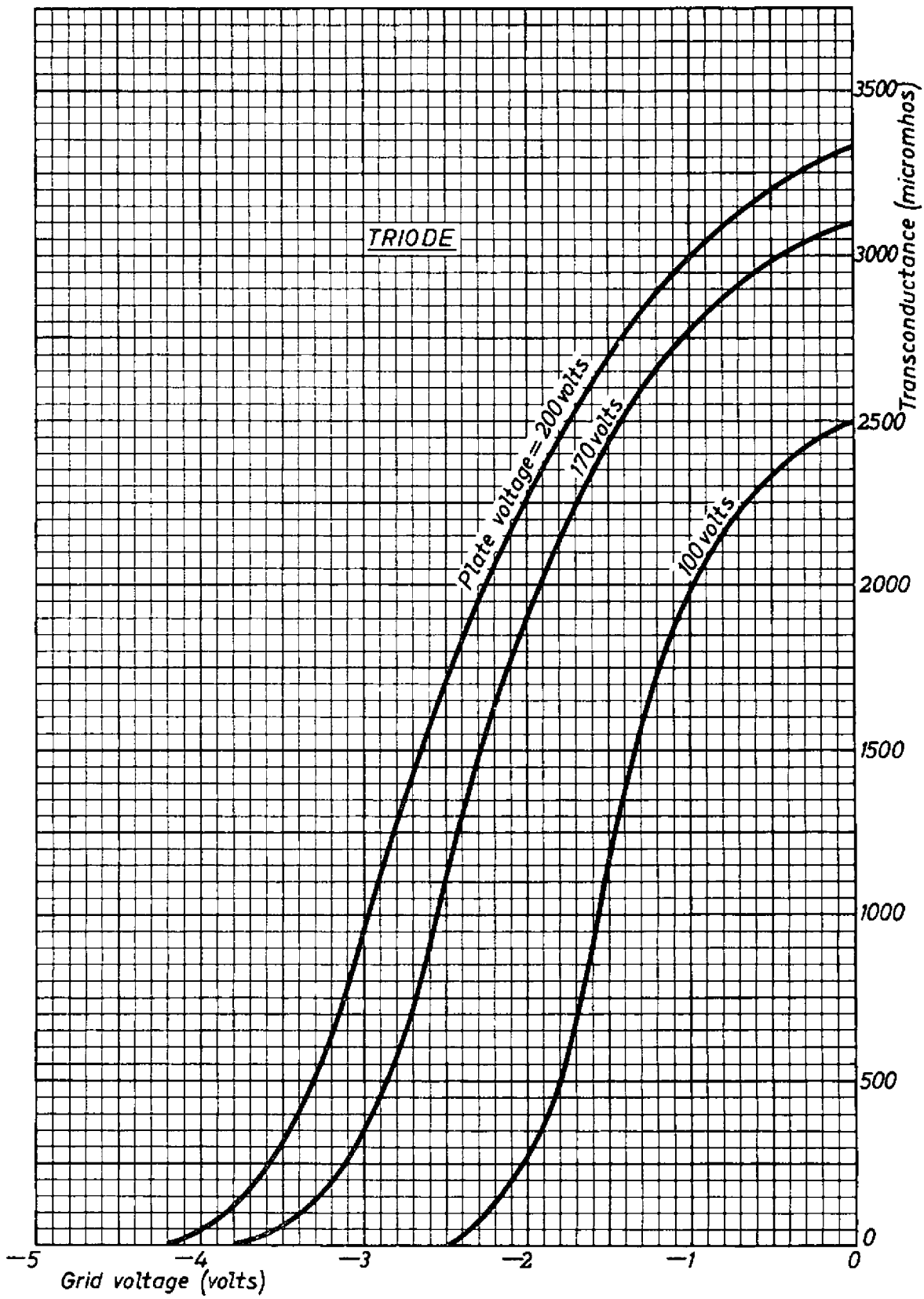
5.5.1959

C


PENTODE
Grid No2 voltage=100 volts
Plate current
Grid No2 current
Plate dissipation=7 watts
Grid No1 voltage=0 volt
-2
-4
-6
-8
-10
-12
-6
-12
Grid No1 voltage=0 volt
Plate and grid No2 current (milliamps)
Plate voltage (volts)
0
20
40
60
80
100
0
50
100
150
200
250
300
350


TRIODE
Plate voltage = 200 volts
170 volts
100 volts
Plate current (milliamps)
10
8
6
4
2
0
−3
−2
−1
0
Grid voltage (volts)


TRIODE
Plate current (milliamps)
0
2
4
6
0
50
100
150
200
250
Plate voltage (volts)
Grid voltage=0 volt
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
−4


TRIODE
Plate voltage = 200 volts
170 volts
100 volts
Transconductance (micromhos)
3500
3000
2500
2000
1500
1000
500
0
−5
−4
−3
−2
−1
0
Grid voltage (volts)

from JETEC release #1865, March 11, 1957
sponsor: Rogers Majestic Electronics, Ltd.

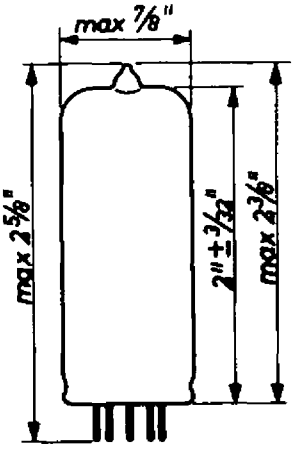
38A3

SINGLE ANODE MAINS RECTIFYING TUBE

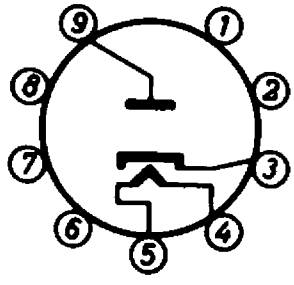
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
RETMA basing designation	9BM
Mounting position	Any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No	ELEMENT
1	Internally connected
2	Internally connected
3	Cathode
4	Heater
5	Heater
6	Internally connected
7	Internally connected
8	Internally connected
9	Plate

HEATER DATA

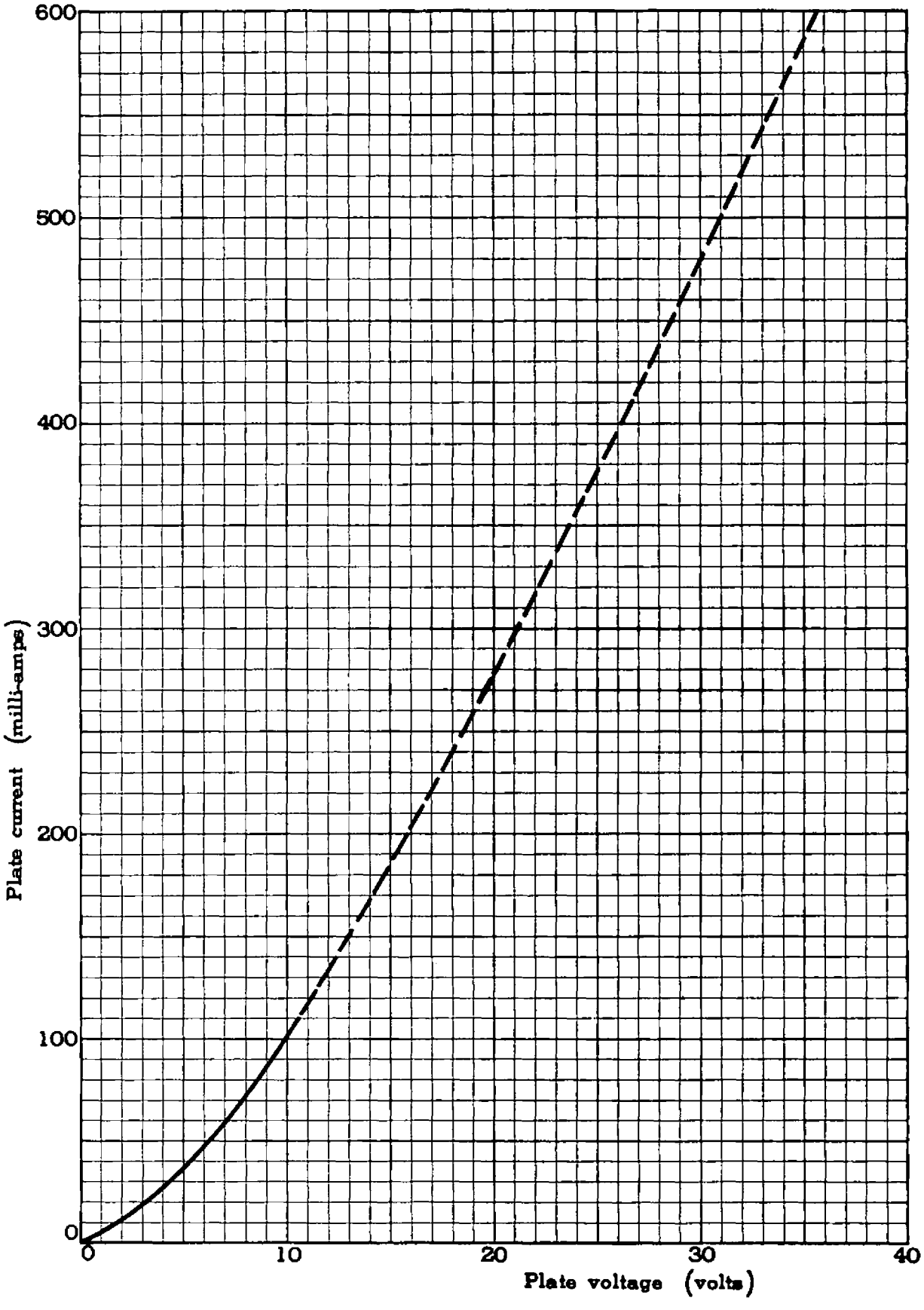
Heater voltage	38 volts
Heater current	0.1 amp

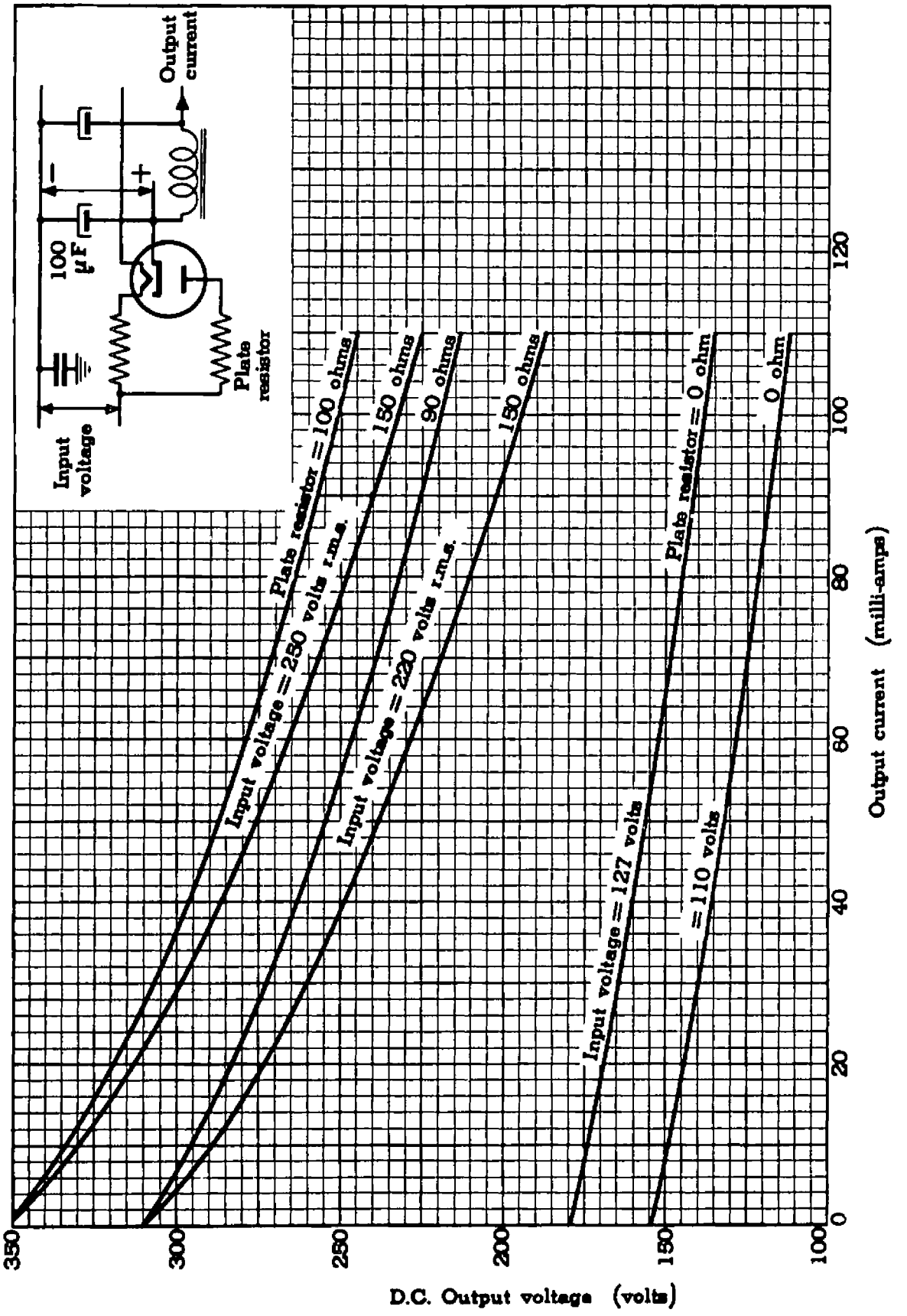
RATINGS

Peak inverse plate voltage				700 volts max.
D.C. output current				110 mamps max.
Peak cathode current				660 mamps max.
Peak heater-cathode voltage (cathode positif with respect to heater)				550 volts max.
Mains voltage	110	127	220	250 volts(r.m.s.)
Total effective plate supply resistance	0	0	90	100 ohms

OPERATING CONDITIONS

Mains voltage	110	127	220	250	volts(rms)
D.C. output current	110	110	110	110	mamps
Filter input capacitor	100	100	100	100	µF
Total effective plate supply resistance	0	0	90	100	ohms
D.C. output voltage	112	135	215	245	volts


600
500
400
300
200
100
0
Plate current (milli-amps)
0
10
20
30
40
Plate voltage (volts)


Output current
100 μF
Input voltage
Plate resistor
Plate resistor = 100 ohms
150 ohms
90 ohms
150 ohms
Input voltage = 250 volts r.m.s.
Input voltage = 220 volts r.m.s.
Plate resistor = 0 ohm
0 ohm
Input voltage = 127 volts
= 110 volts
350
300
250
200
150
100
0
20
40
60
80
100
120
D.C. Output voltage (volts)
Output current (milli-amps)

Rogers Electronic Tubes & Components

3BY7

Limiting values (design centre values)

Plate voltage at zero current	550 volts max.
Plate voltage	250 volts max.
Plate dissipation	2.5 watts max.
Grid No.2 voltage at zero current	550 volts max.
Grid No.2 voltage	250 volts max.
Grid No.2 dissipation	0.65 watts max.
Cathode current	15 mamps max.
Grid No.1 circuit resistance	3 megohms max.[1]
Voltage between heater and cathode	150 volts max.
Circuit resistance between heater and cathode	20 000 ohms max.

Operating characteristics

Supply voltage	100	170	200	250 volts
Plate voltage	100	170	200	250 volts
Grid No.3 voltage	0	0	0	0 volts
Grid No.2 series resistance	27000	27000	27000	60000 ohms
Grid No.1 voltage	-1.1	-2	-2.3	-2 volts
Grid No.2 voltage	57	100	116	100 volts
Plate current	5.5	9.7	11.4	10 mamps
Grid No.2 current	1.6	2.6	3.1	2.5 mamps
Transconductance	5000	5900	6100	6000 micromhos
Transconductance reduced to 1/100 at grid No.1 voltage of	-14	-24	-28	-35 volts
Plate resistance	0.25	0.3	0.35	0.6 megohm
Equivalent noise resistance	1100	1400	1500	1400 ohms
Input damping at 50 Mc/s	5600	7600	8000	9000 ohms

[1] When the tube is used at or near maximum ratings it is advisable to take the value of the grid No.1 circuit resistance as low as possible.

from JEDEC release #2739, Feb. 29, 1960

Rogers Electronic Tubes & Components

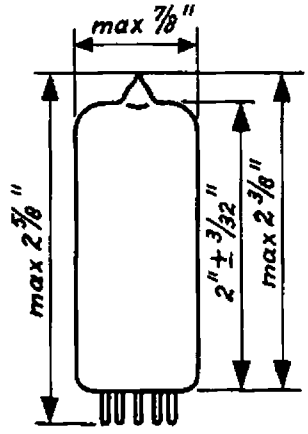
3BY7

DESCRIPTION: R.F. pentode with variable transconductance for use as wide-band amplifier.

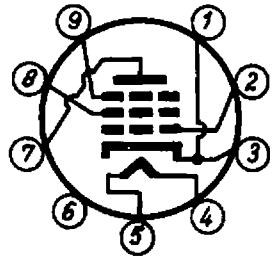
MECHANICAL DATA

Cathode	coated, unipotential
Outline	6-3
Bulb	T6 1/2
Base	E9-1
Basing	9AQ
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	cathode
2	grid No.1
3	cathode
4	heater
5	heater
6	internal screen
7	plate
8	grid No.2
9	grid No.3

ELECTRICAL DATA

Heating

Heater voltage	3.4 volts
Heater current	0.6 amp

Direct interelectrode capacitances

Grid No.1 to all other elements except plate	6.9 µµF
Plate to all other elements except grid No.1	3.2 µµF
Plate to grid No.1	max. 0.007 µµF
Grid No.1 to heater	max. 0.15 µµF

from JETEC release #1829, Jan. 21, 1957
sponsor: Rogers Majestic Electronics, Ltd.

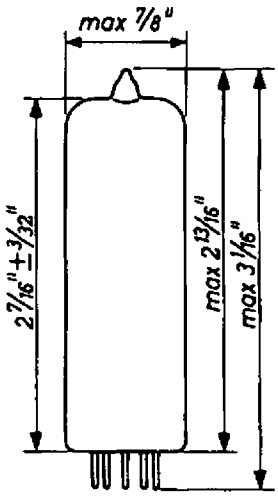
45B5

POWER PENTODE

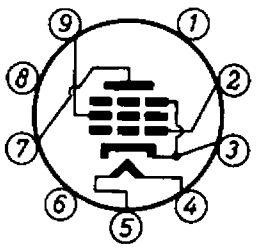
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
Mounting position	Any
RETMA basing designation	9CV

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Internally connected
2	Grid No.1
3	Cathode, grid No.3
4	Heater
5	Heater
6	Internally connected
7	Plate
8	Internally connected
9	Grid No.2

ELECTRICAL DATA

HEATER DATA

Heater voltage	45 volts
Heater current	100 mamps

DIRECT INTERELECTRODE CAPACITANCES

Grid No.1 to all other elements except plate	12 μμF
Plate to all other elements except grid No.1	6 μμF
Plate to grid No.1	max. 0.6 μμF
Grid No.1 to heater	max. 0.25 μμF

MAXIMUM RATINGS (Design Center Values)

Plate voltage	250 volts
Plate voltage without plate current	550 volts
Plate dissipation	12 watts
Grid No.2 voltage	200 volts
Grid No.2 voltage without current	550 volts
Grid No.2 dissipation	1.75 watts
Grid No.2 peak dissipation	6 watts

MAXIMUM RATINGS (Design Center Values) continued

Cathode current	100 mamps
Grid No.1 circuit resistance with automatic bias	1 megohm
Voltage between heater and cathode	200 volts

TYPICAL CHARACTERISTICS

Plate voltage	100	170	200	volts
Grid No.2 voltage	100	170	-	volts
Grid No.2 supply voltage	-	-	200	volts
Grid No.2 series resistor	-	-	470	ohms [1]
Grid No.1 bias	-6.7	-12.5	-17.3	volts
Plate current	43	70	60	mamps
Grid No.2 current	3.0	5.0	4.1	mamps
Transconductance	9 000	10 000	8800	micromhos
Plate resistance	23 000	23 000	28 000	ohms
Amplification factor of grid No.2 with respect to grid No.1	8	8	8	

OPERATING CHARACTERISTICS class A, one tube

Plate voltage	100	170	200	volts
Grid No.2 voltage	100	170	-	volts
Grid No.2 supply voltage	-	-	200	volts
Grid No.2 series resistor	-	-	470	ohms [1]
Grid No.1 bias	-6.7	-12.5	-17.3	volts
Plate load resistance	2400	2400	2400	ohms
Input A.F. grid No.1 voltage	4.3	7.0	7.8	volts(rms)
Zero-signal plate current	43	70	60	mamps
Max. signal plate current	43	70	62.5	mamps
Zero-signal grid No.2 current	3.0	5.0	4.1	mamps
Max.signal grid No.2 current	11	22	12.5	mamps
Total harmonic distortion	10	10	10	percents
Power output	1.9	5.6	5.2	watts

[1])Not bypassed

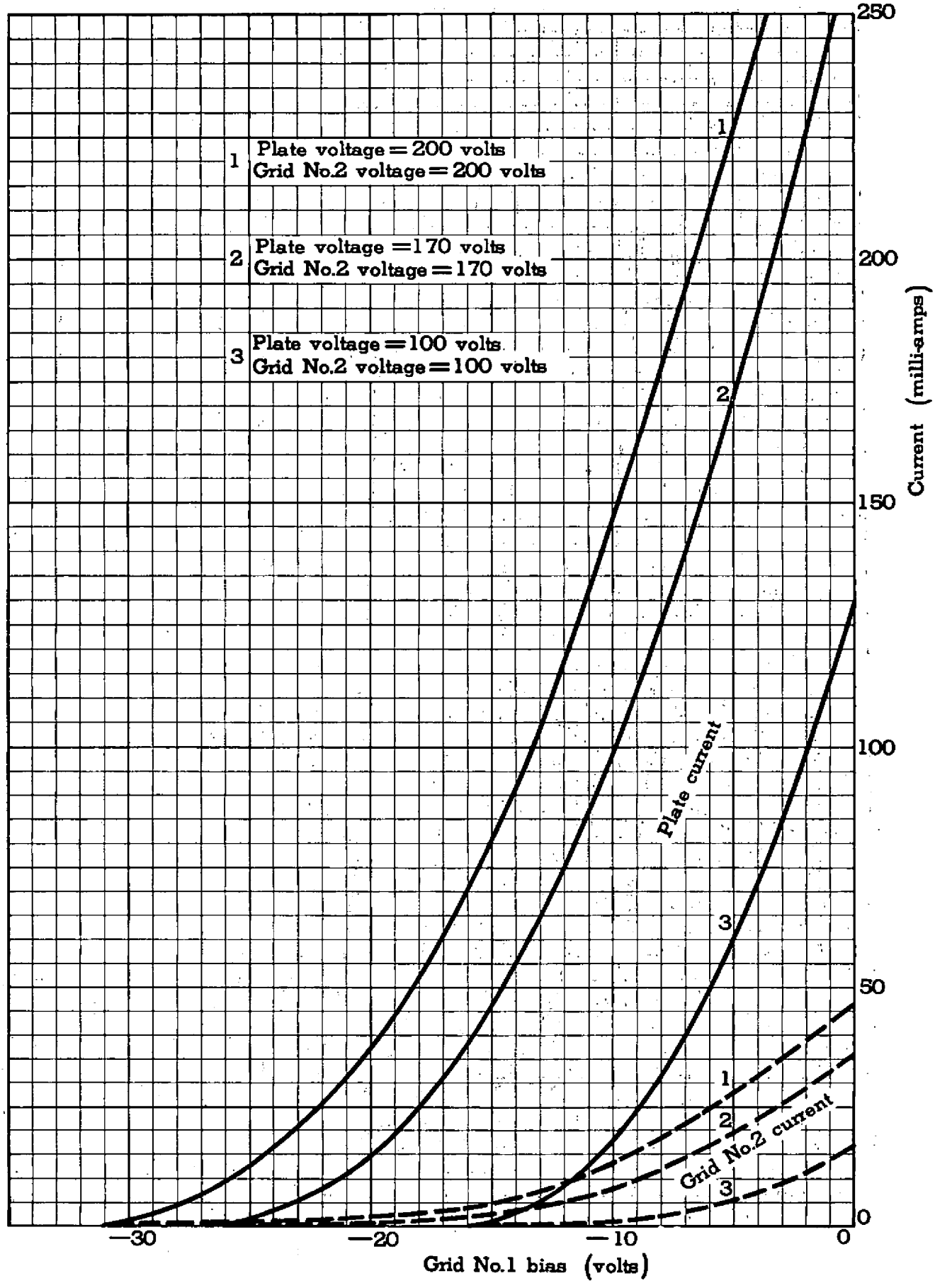
OPERATING CHARACTERISTICS class B push-pull, two tubes		
Plate voltage	100	170 volts
Grid No.2 voltage	100	170 volts
Grid No.1 bias	-11.4	-20.5 volts
Load resistance, plate to plate	3500	3500 ohms
Input A.F. grid No.1 voltage	7.9	14.6 volts(rms)
Zero-signal plate current	2x10	2x15 mamps
Max.-signal plate current	2x30.5	2x57.5 mamps
Zero-signal grid No.2 current	2x0.55	2x0.7 mamp
Max.-signal grid No.2 current	2x7.1	2x20.5 mamps
Total harmonic distortion	2.8	4.8 percents
Power output	3.7	13.5 watts

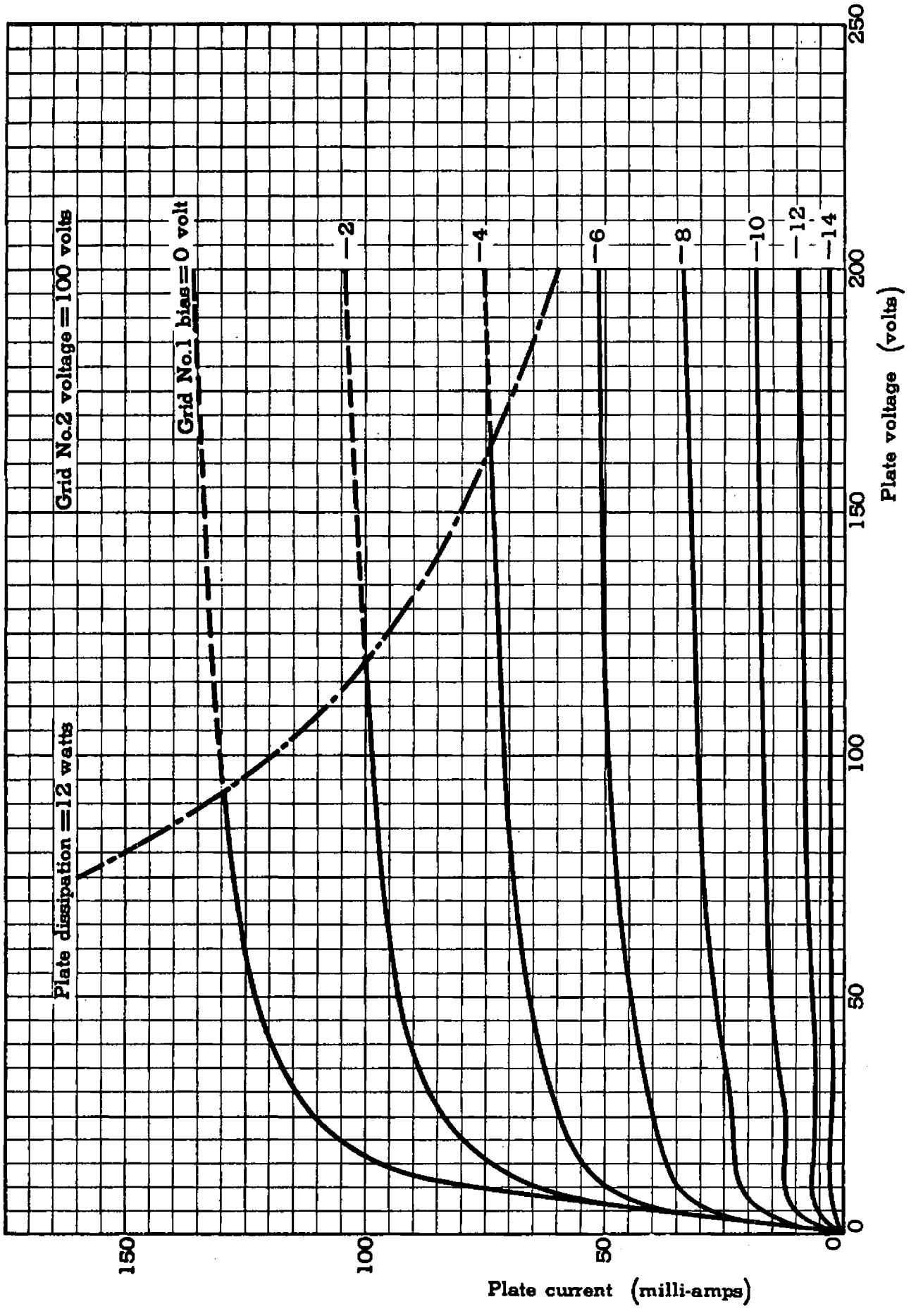
OPERATING CHARACTERISTICS class AB push-pull; two tubes		
Plate voltage	100	170 volts
Grid No.2 voltage	100	170 volts
Common cathode resistor	135	120 ohms
Load resistance, plate to plate	3500	3500 ohms
Input A.F. grid No.1 voltage	7.0	13.1 volts(rms)
Zero-signal plate current	2x29	2x56.5 mamps
Max.-signal plate current	2x31	2x57.5 mamps
Zero-signal grid No.2 current	2x1.6	2x3.0 mamps
Max.-signal grid No.2 current	2x7.0	2x20.5 mamps
Total harmonic distortion	3.0	4.5 percents
Output power	3.6	13.0 watts

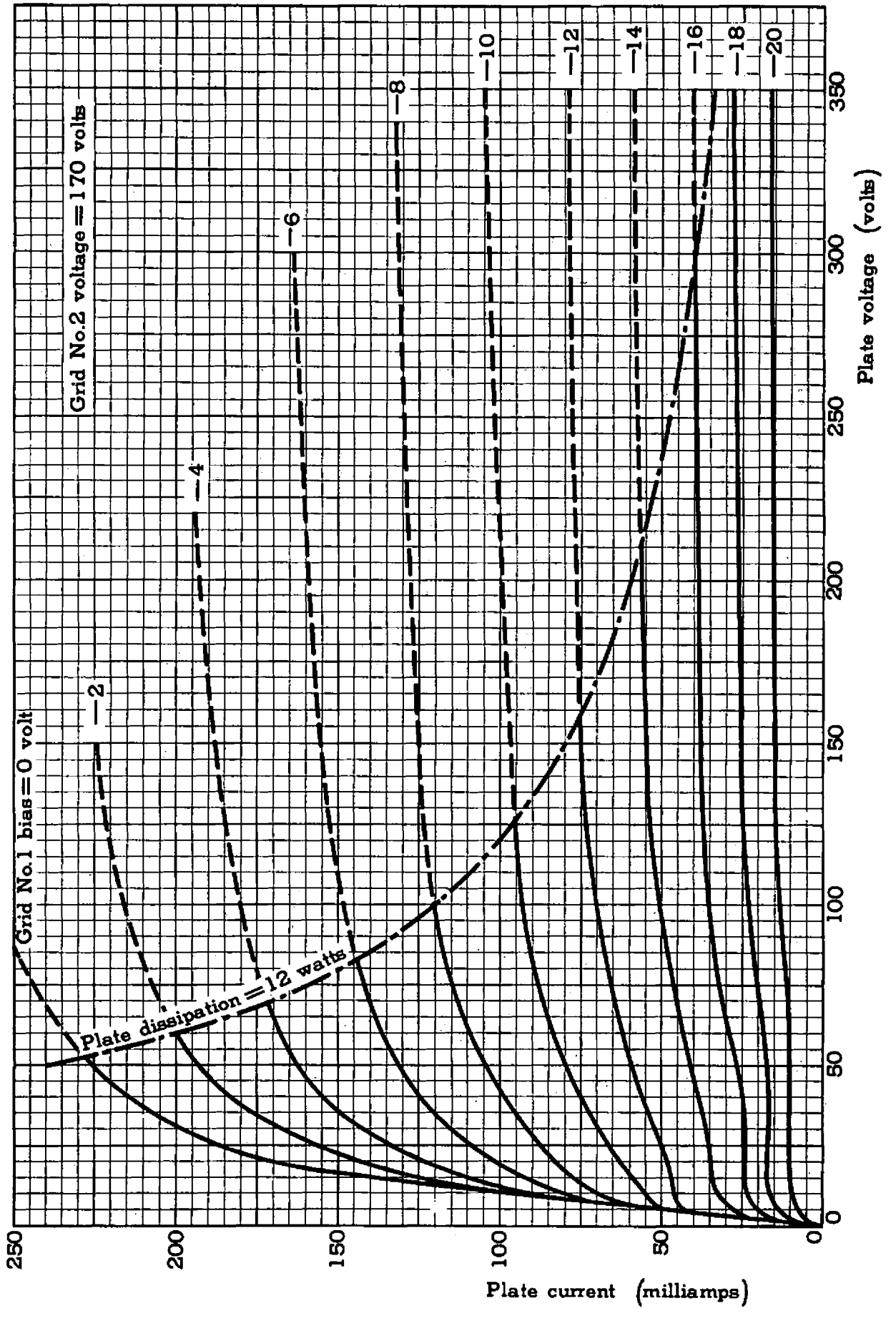
OPERATING CHARACTERISTICS IN TRIODE CONNECTION class A, one tube (Grid No.2 connected to plate)		
Plate voltage	100	170 volts
Grid bias	-8.0	-15.1 volts
Plate load resistance	1200	1200 ohms
Input A.F. grid voltage	5.7	10.8 volts(rms)
Zero-signal plate current	30	50 mamps
Max.-signal plate current	36.1	62 mamps
Total harmonic distortion	10	10 percents
Output power	0.52	2.1 watts

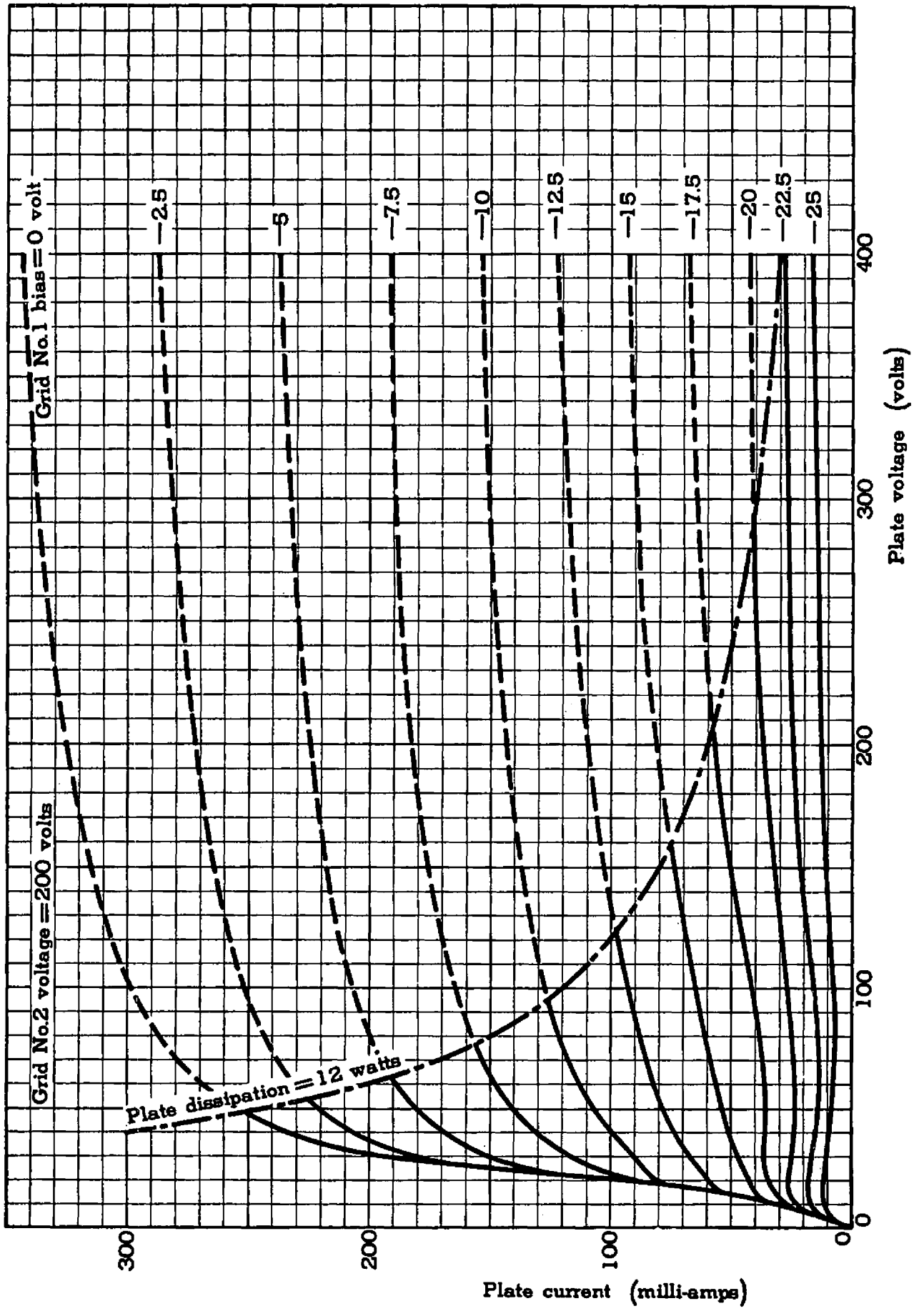
OPERATING CHARACTERISTICS IN TRIODE CONNECTION class AB push-pull, two tubes (Grid No.2 connected to plate)

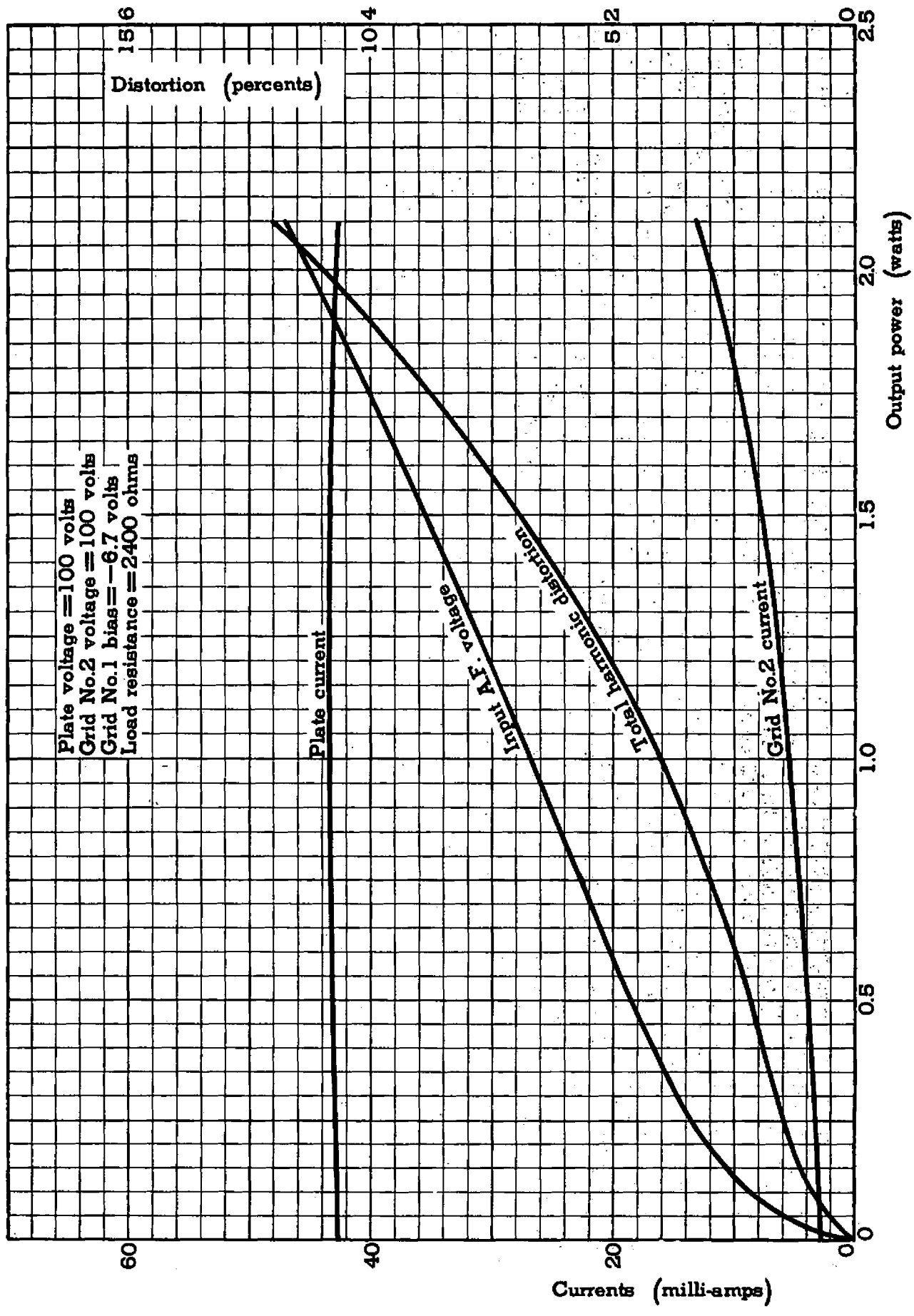
Plate voltage	100	170	volts
Cathode resistor	270	270	ohms
Load resistance, plate to plate	3500	3500	ohms
Input A.F. grid voltage	7.3	13.4	volts(rms)
Zero-signal plate current	2x18	2x32.5	mamps
Max.-signal plate current	2x20	2x36	mamps
Total harmonic distortion	3.2	3.8	per cents
Output power	1.0	3.9	watts

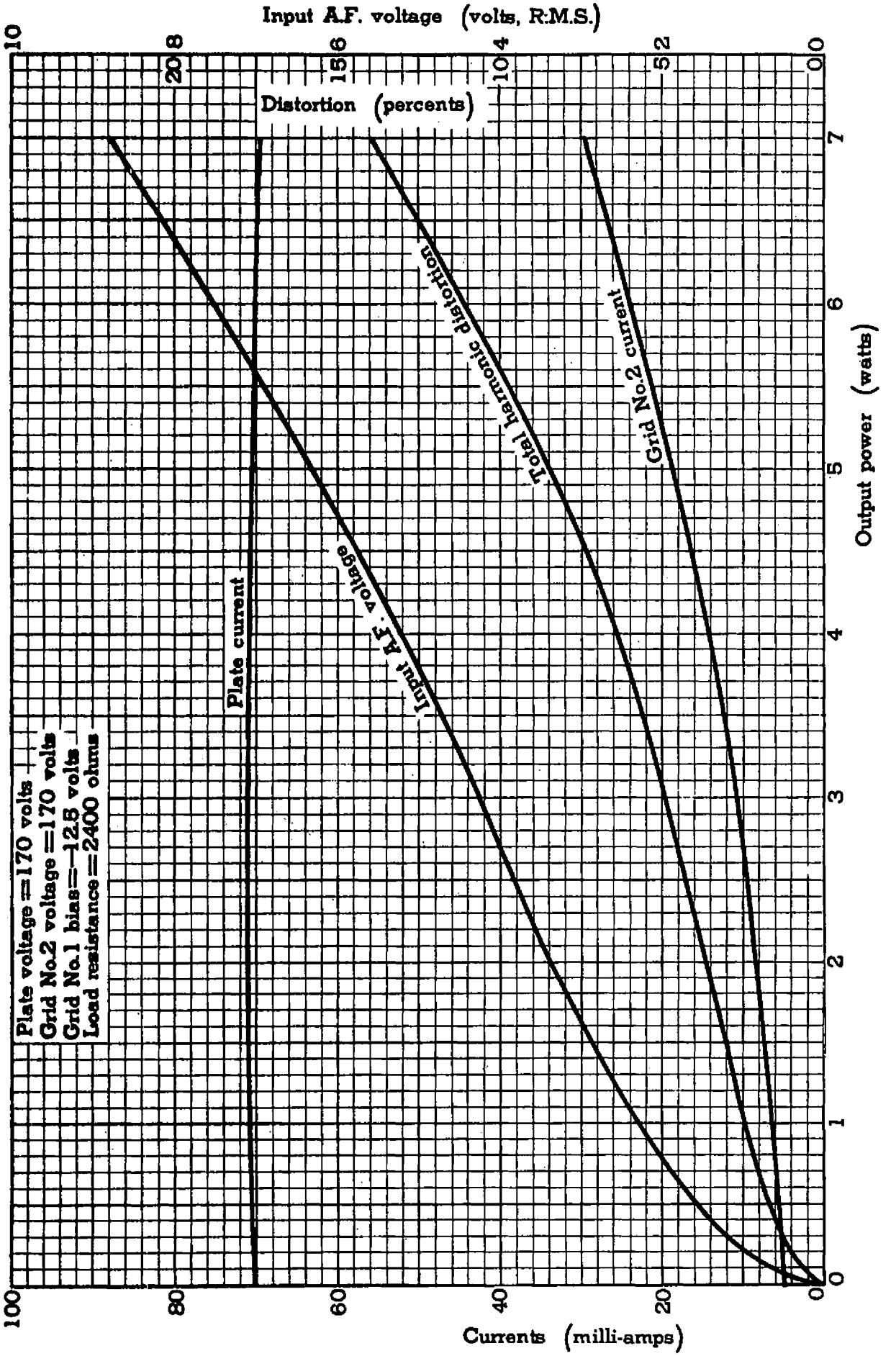

1 Plate voltage = 200 volts
Grid No.2 voltage = 200 volts
2 Plate voltage = 170 volts
Grid No.2 voltage = 170 volts
3 Plate voltage = 100 volts
Grid No.2 voltage = 100 volts
Plate current
Grid No.2 current
Current (milli-amps)
250
200
150
100
50
0
−30
−20
−10
0
Grid No.1 bias (volts)

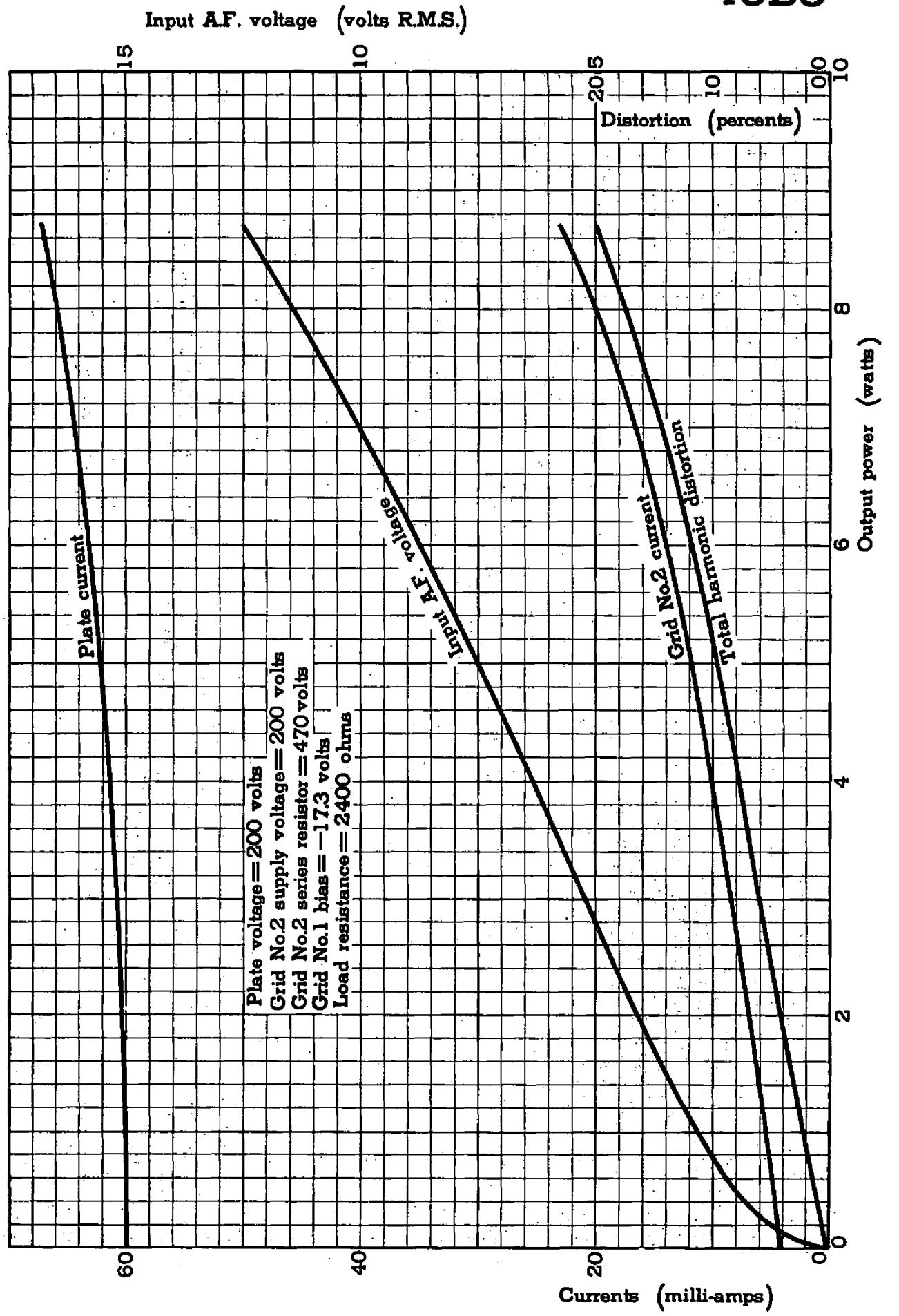

Grid No.2 voltage = 100 volts
Grid No.1 bias = 0 volt
Plate dissipation = 12 watts
-2
-4
-6
-8
-10
-12
-14
0
50
100
150
200
250
Plate voltage (volts)
0
50
100
150
Plate current (milli-amps)

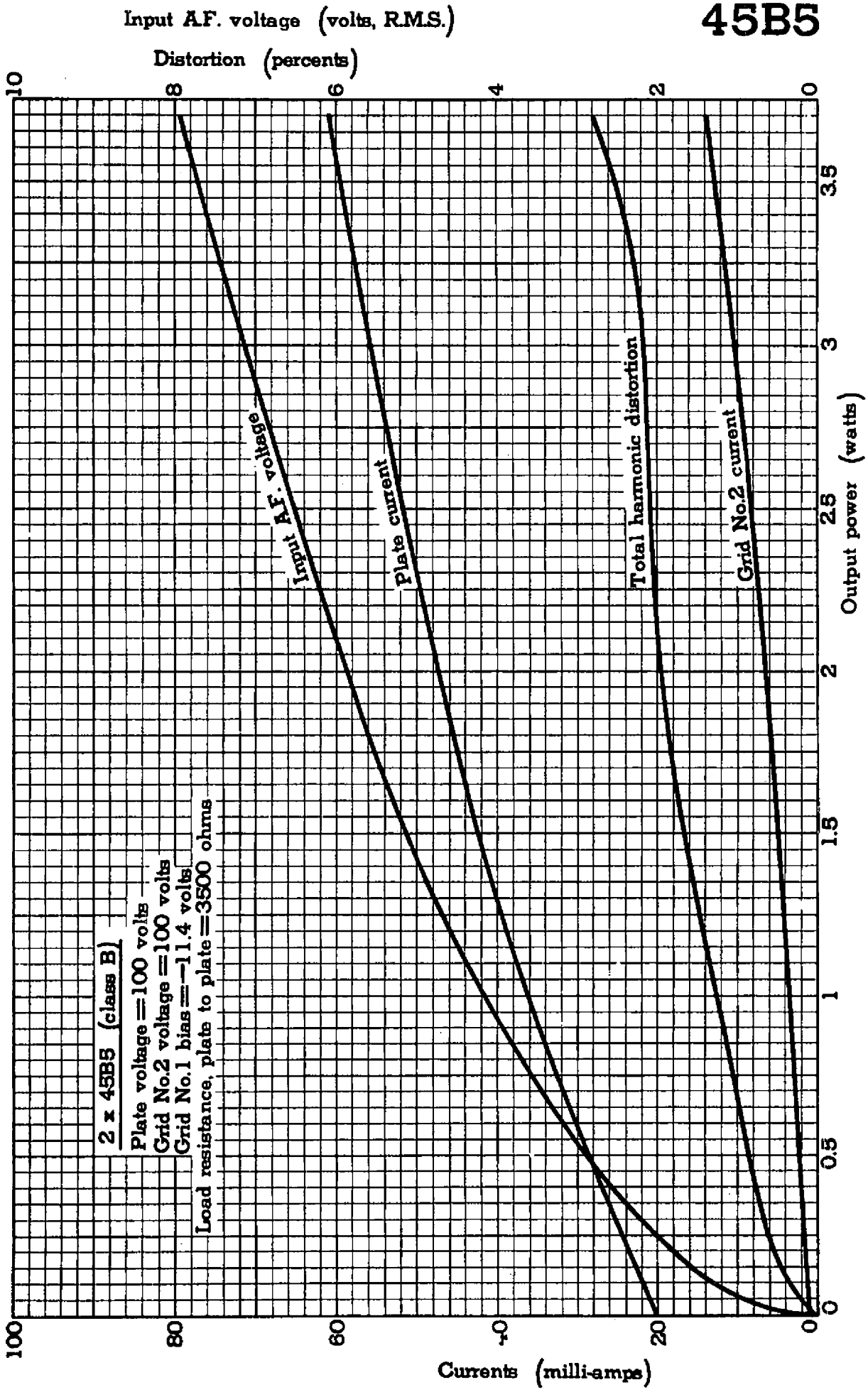

Grid No.2 voltage = 170 volts
Grid No.1 bias = 0 volt
—2
—4
—6
—8
—10
—12
—14
—16
—18
—20
Plate dissipation = 12 watts
Plate voltage (volts)
Plate current (milliamps)
0
50
100
150
200
250
300
350

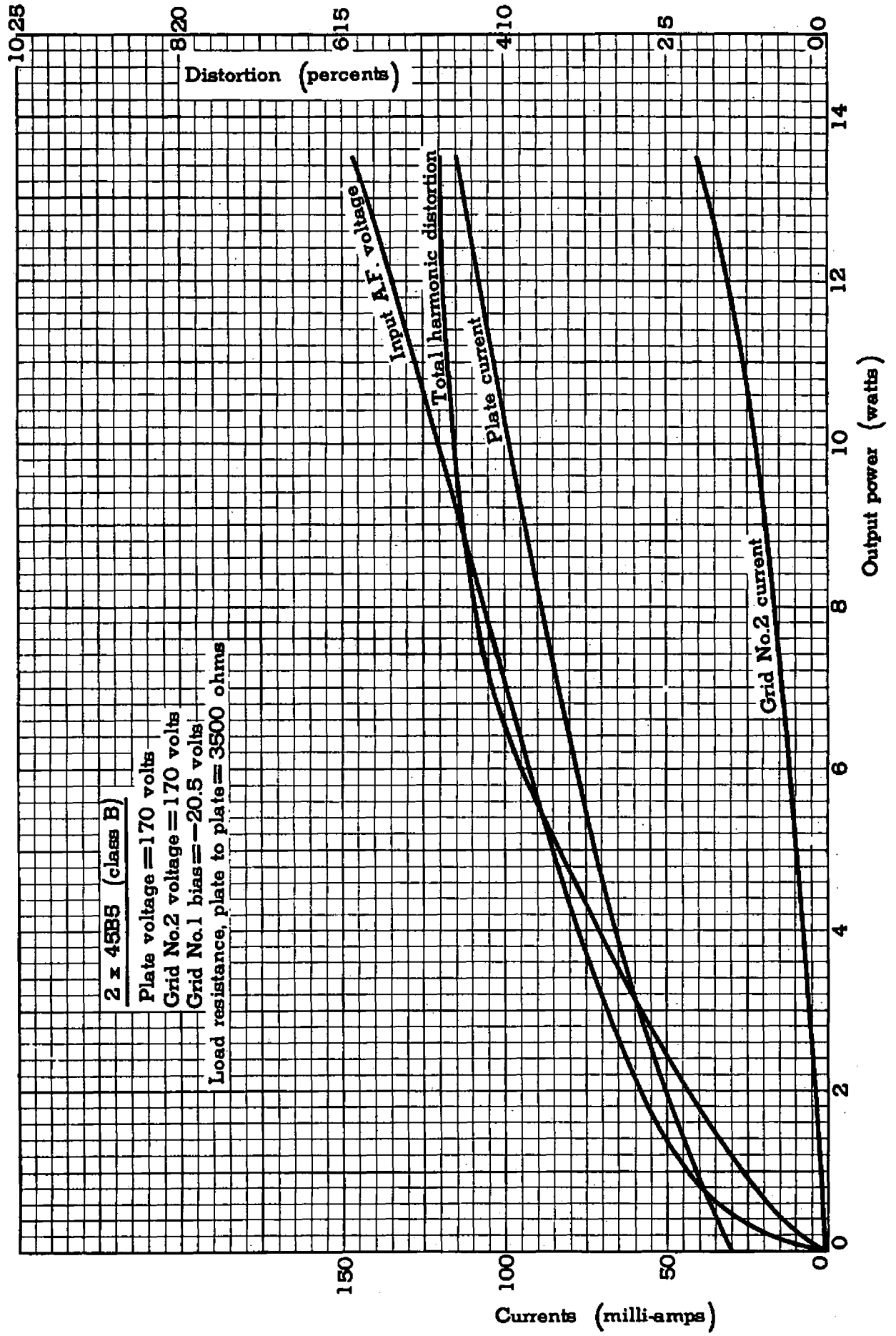

Grid No.1 bias = 0 volt
−2.5
−5
−7.5
−10
−12.5
−15
−17.5
−20
−22.5
−25
Grid No.2 voltage = 200 volts
Plate dissipation = 12 watts
Plate current (milli-amps)
300
200
100
0
Plate voltage (volts)
0
100
200
300
400


Input A.F. voltage (volts, R.M.S.)
15 6
10 4
5 2
0
Distortion (percents)
Plate voltage = 100 volts
Grid No.2 voltage = 100 volts
Grid No.1 bias = −6.7 volts
Load resistance = 2400 ohms
Plate current
Input A.F. voltage
Total harmonic distortion
Grid No.2 current
2.5
2.0
1.5
1.0
0.5
0
Output power (watts)
60
40
20
0
Currents (milli-amps)

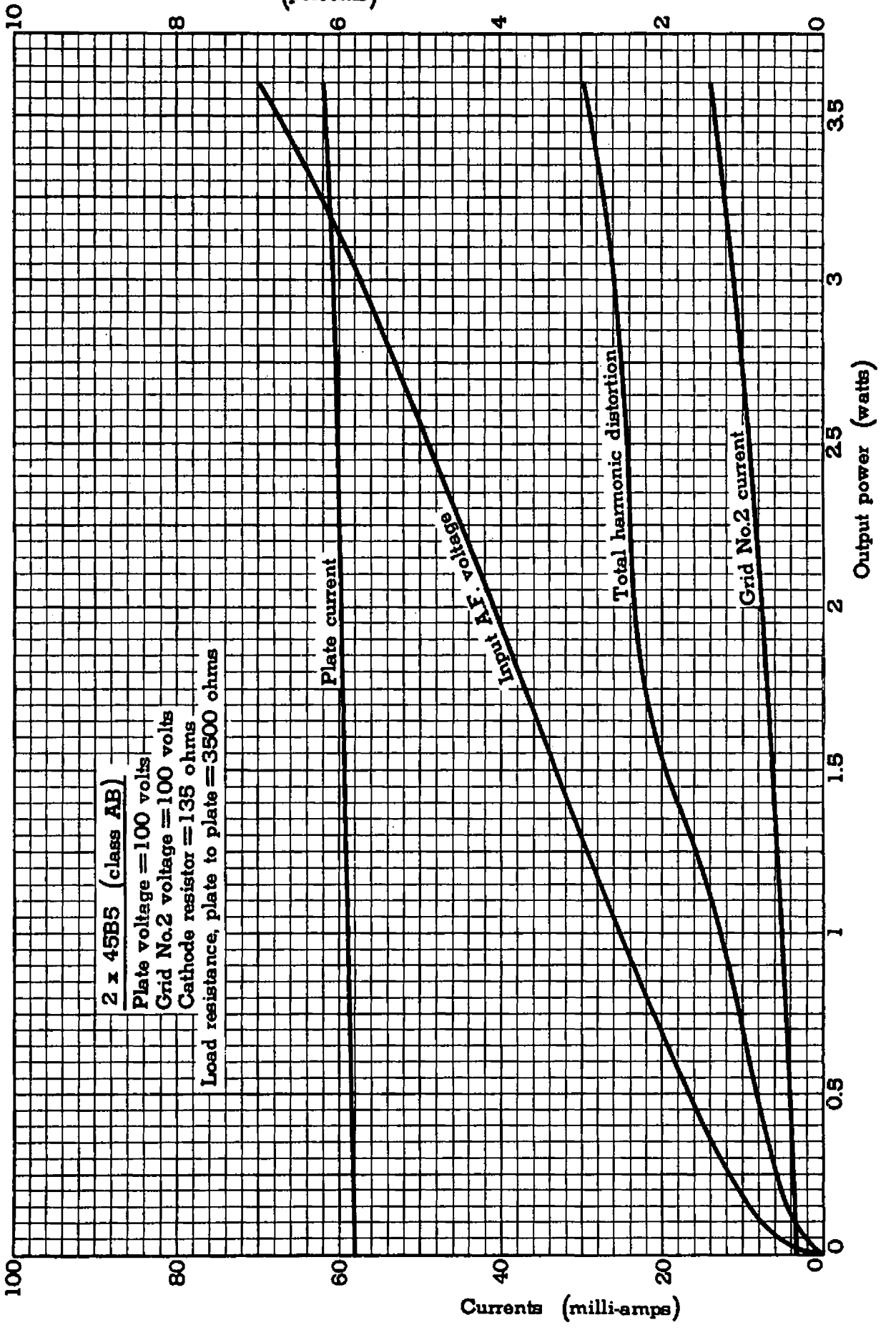

Input A.F. voltage (volts, R.M.S.)
Distortion (percents)
Total harmonic distortion
Grid No.2 current
Input A.F. voltage
Plate current
Plate voltage = 170 volts
Grid No.2 voltage = 170 volts
Grid No.1 bias = −12.5 volts
Load resistance = 2400 ohms
Output power (watts)
Currents (milli-amps)

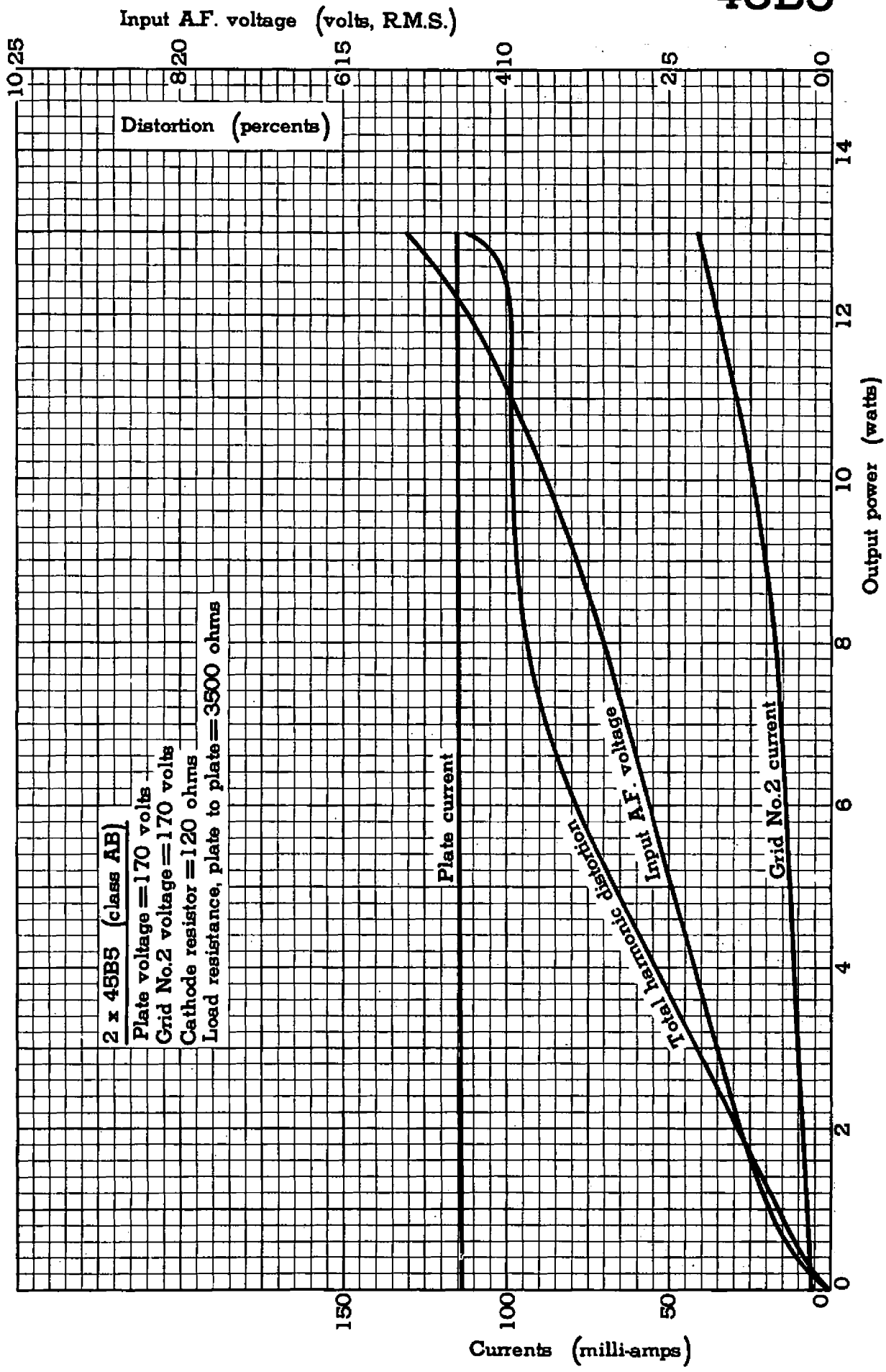

Input A.F. voltage (volts R.M.S.)
15
10
5
0
Distortion (percents)
20
10
0
Output power (watts)
0
2
4
6
8
10
Plate current
Input A.F. voltage
Grid No.2 current
Total harmonic distortion
Plate voltage = 200 volts
Grid No.2 supply voltage = 200 volts
Grid No.2 series resistor = 470 volts
Grid No.1 bias = −17.3 volts
Load resistance = 2400 ohms
60
40
20
0
Currents (milli-amps)

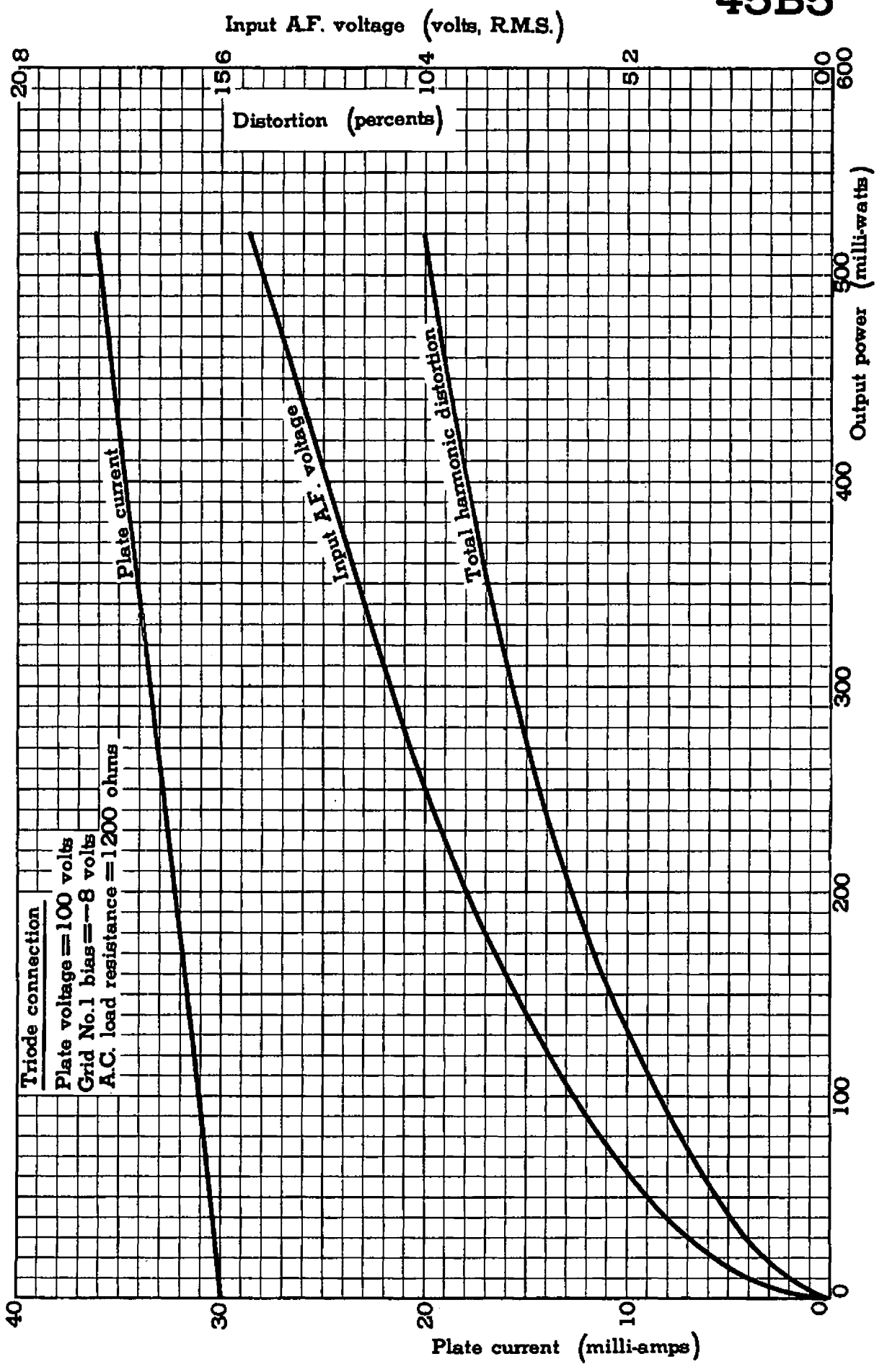

Input A.F. voltage (volts, R.M.S.)
Distortion (percents)
10
8
6
4
2
0
3.5
3
2.5
2
1.5
1
0.5
0
Output power (watts)
Input A.F. voltage
Plate current
Total harmonic distortion
Grid No.2 current
100
80
60
40
20
0
Currents (milli-amps)
2 x 45B5 (class B)
Plate voltage = 100 volts
Grid No.2 voltage = 100 volts
Grid No.1 bias = −11.4 volts
Load resistance, plate to plate = 3500 ohms


Input A.F. voltage (volts, R.M.S.)
0
2.5
4
6.15
8.20
10.25
Distortion (percents)
Input A.F. voltage
Total harmonic distortion
Plate current
Grid No.2 current
2 x 45B5 (class B)
Plate voltage = 170 volts
Grid No.2 voltage = 170 volts
Grid No.1 bias = −20.5 volts
Load resistance, plate to plate = 3500 ohms
0
50
100
150
Currents (milli-amps)
0
2
4
6
8
10
12
14
Output power (watts)

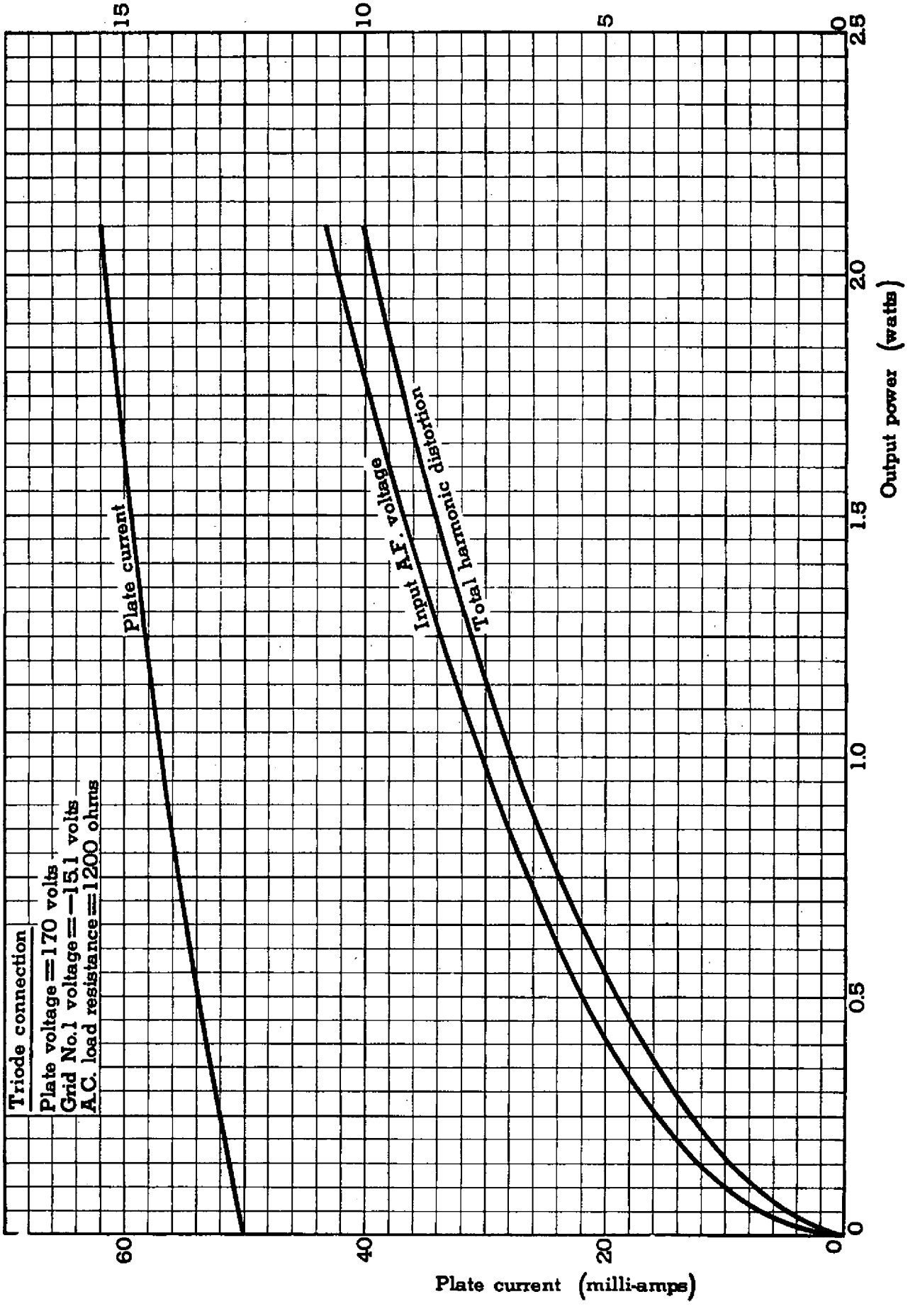
45B5

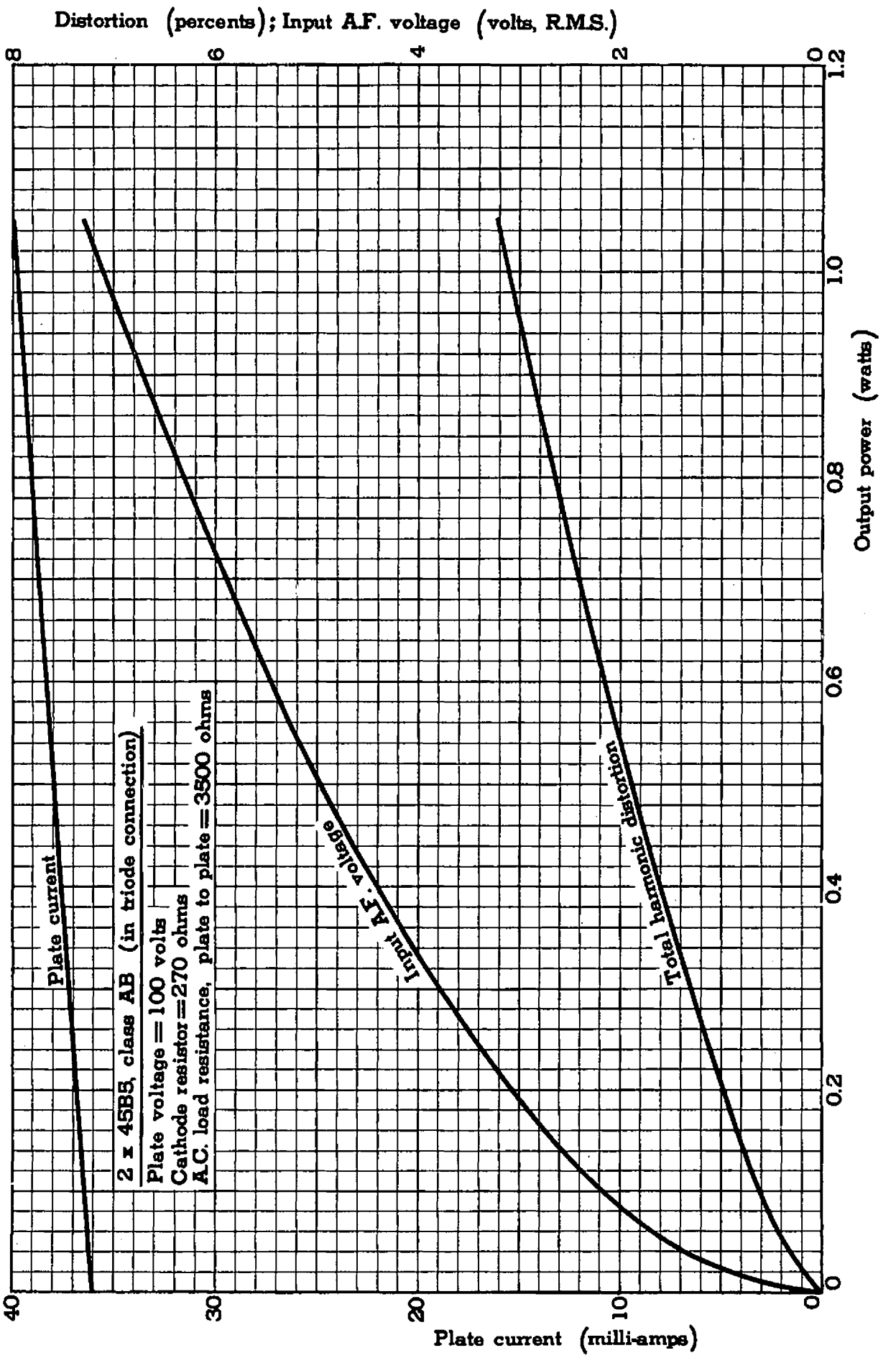

Input A.F. voltage (volts R.M.S.)
Distortion (percents)
10
8
6
4
2
0
3.5
3
2.5
2
1.5
1
0.5
0
Output power (watts)
100
80
60
40
20
0
Currents (milli-amps)
Plate current
Input A.F. voltage
Total harmonic distortion
Grid No.2 current
2 x 45B5 (class AB)
Plate voltage = 100 volts
Grid No.2 voltage = 100 volts
Cathode resistor = 135 ohms
Load resistance, plate to plate = 3500 ohms

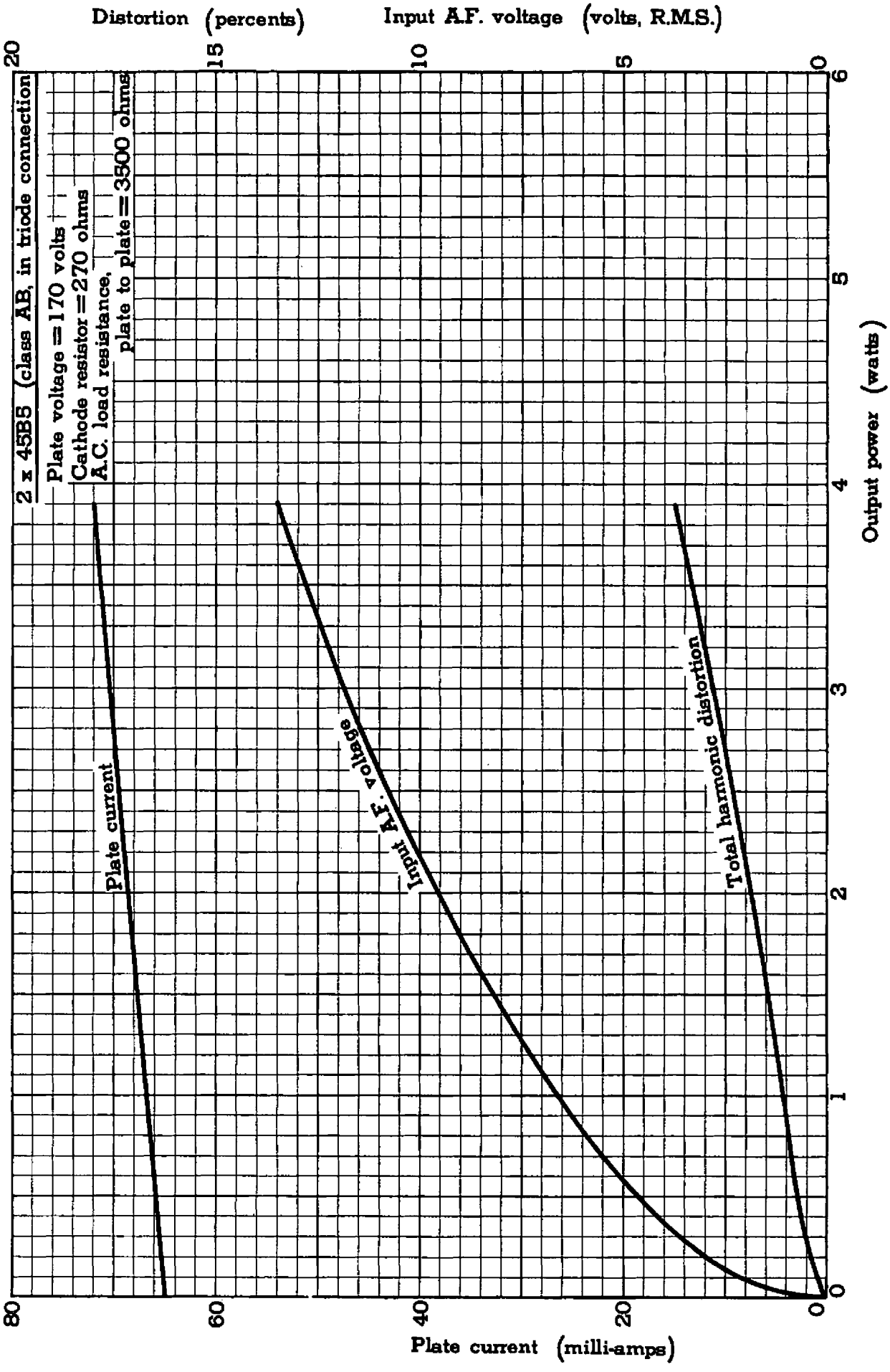

Input A.F. voltage (volts, R.M.S.)
0
2.5
5
7.5
10
12.5
15
17.5
20
22.5
25
Distortion (percents)
0
2
4
6
8
10
12
14
Output power (watts)
2 x 45B5 (class AB)
Plate voltage = 170 volts
Grid No.2 voltage = 170 volts
Cathode resistor = 120 ohms
Load resistance, plate to plate = 3500 ohms
Plate current
Total harmonic distortion
Input A.F. voltage
Grid No.2 current
0
50
100
150
Currents (milli-amps)


Input A.F. voltage (volts, R.M.S.)
Distortion (percents)
Output power (milli-watts)
Plate current (milli-amps)
Plate current
Input A.F. voltage
Total harmonic distortion
Triode connection
Plate voltage = 100 volts
Grid No.1 bias = −8 volts
A.C. load resistance = 1200 ohms
0
100
200
300
400
500
600
10
20
30
40
52
104
156
208

45B5


Distortion (percents)
Input A.F. voltage (volts, R.M.S.)
15
10
5
0
2.5
2.0
1.5
1.0
0.5
0
Output power (watts)
Plate current
Input A.F. voltage
Total harmonic distortion
Triode connection
Plate voltage = 170 volts
Grid No.1 voltage = −15.1 volts
A.C. load resistance = 1200 ohms
60
40
20
0
Plate current (milli-amps)


Distortion (percents); Input A.F. voltage (volts, R.M.S.)
8
6
4
2
0
1.2
1.0
0.8
0.6
0.4
0.2
0
Output power (watts)
40
30
20
10
0
Plate current (milli-amps)
2 x 45B5, class AB (in triode connection)
Plate voltage = 100 volts
Cathode resistor = 270 ohms
A.C. load resistance, plate to plate = 3500 ohms
Plate current
Input A.F. voltage
Total harmonic distortion


Distortion (percents)
Input A.F. voltage (volts, R.M.S.)
20
15
10
5
0
6
5
4
3
2
1
0
Output power (watts)
2 x 45B5 (class AB, in triode connection
Plate voltage = 170 volts
Cathode resistor = 270 ohms
A.C. load resistance, plate to plate = 3500 ohms
Plate current
Input A.F. voltage
Total harmonic distortion
80
60
40
20
0
Plate current (milli-amps)

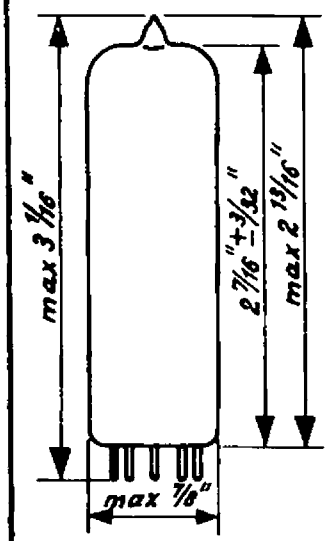
DATA FOR R.E.T.M.A. REGISTRATION

August 29, 1957

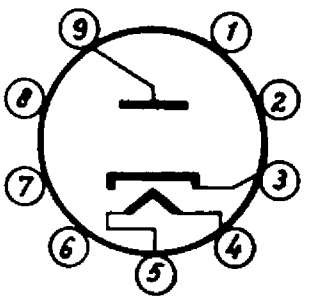
TUBE TYPE 55N3 brought by ROGERS MAJESTIC ELECTRONICS Ltd.
11-19 Brentcliffe Road
Leaside (Toronto 17) Ontario.

DESCRIPTION: Half-wave high-vacuum rectifying tube; heater type (A.C. or D.C.); T6½ bulb; body length 2 13/16" max; E9-1 base

TUBE OUTLINE



BOTTOM VIEW OF BASE



9BM

BASE PIN No.	ELEMENT
1	Internally connected
2	Internally connected
3	Cathode
4	Heater
5	Heater
6	Internally connected
7	Internally connected
8	Internally connected
9	Plate

HEATER DATA

Heater voltage	55 volts
Heater current	100 mamps

RATINGS (Design center values)

Peak inverse plate voltage					700 volts max.
Peak plate current					1100 ma max.
D.C. output current					180 ma max.
Filter input capacitor					60 µF [1]) max.
Heater-cathode voltage (peak value, cathode positive with respect to heater)					550 volts max.
D.C. component of heater-cathode voltage					250 volts max.
A.C. component of heater-cathode voltage					220 volts (RMS) max.
A.C. input voltage	250	240	220	200	127 volts (RMS)
Total effective plate supply resistance	100	80	40	30	0 ohms min.

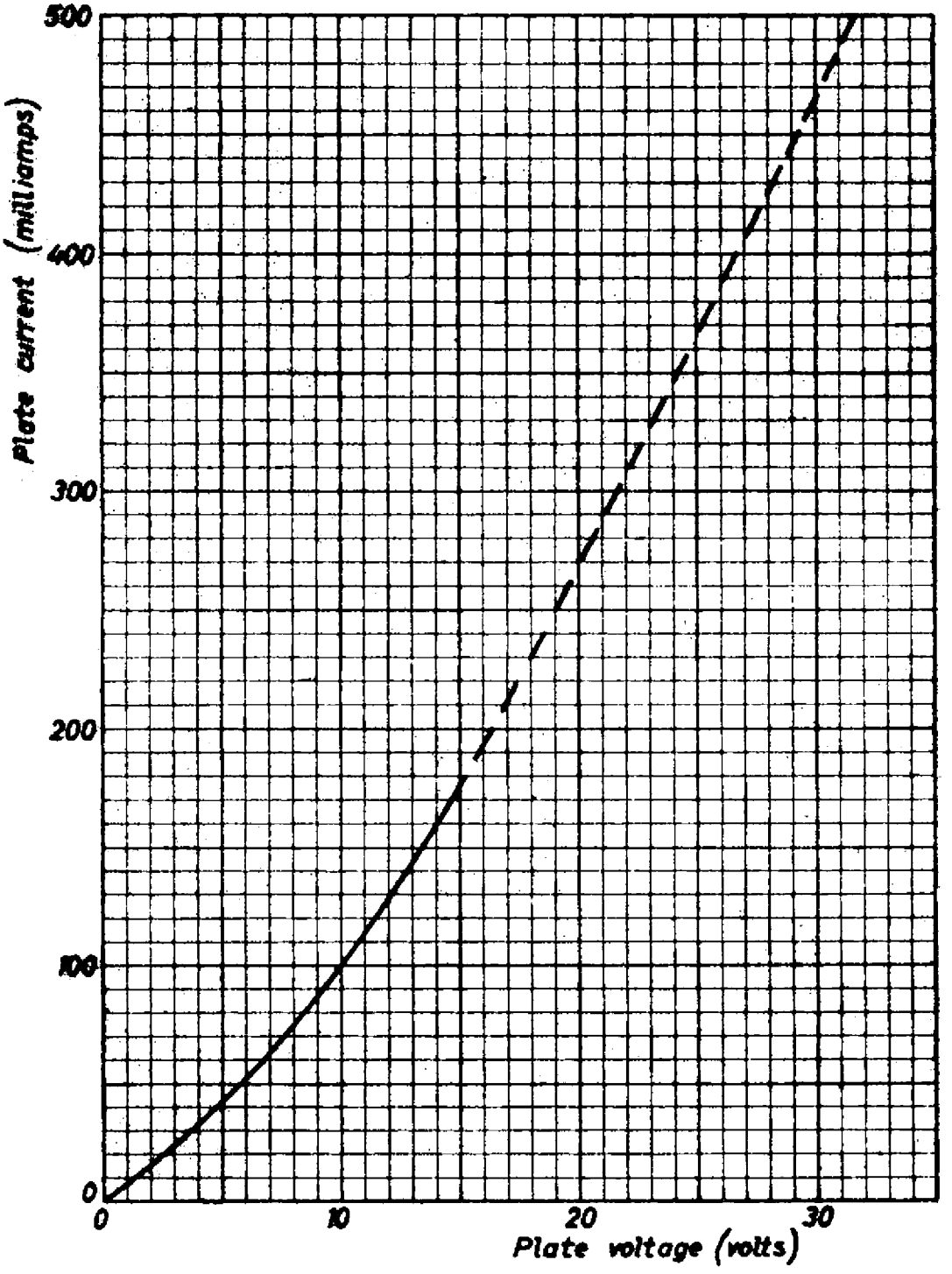
[1]) See page 2

OPERATING CONDITIONS

A.C. input voltage	250	240	220	200	127 volts (RMS)
Filter input capacitor	60	60	60	60	60 μF
Total effective plate supply resistance	125	105	65	30	0 ohm
D.C. output current	180	180	180	180	180 ma
D.C. output voltage	195	195	195	195	127 volts

---

[1]) When two tubes are connected in parallel, the maximum value of the capacitor may be increased to 100 μF. In this case each plate must have the minimum total effective supply resistance specified above


500
400
300
200
100
0
Plate current (milliamps)
0
10
20
30
Plate voltage (volts)

ROGERS MAJESTIC ELECTRONICS LTD.
Electronic Tube Division
11-19 Brentcliffe Road
LEASIDE (Toronto 17) ONTARIO

TECHNICAL DATA SHEET FOR TYPE 6047

PHYSICAL CHARACTERISTICS

Bulb:	T6½
Base:	Small button 9-pin
Overall Length:	2.50" maximum
Seated Height:	2.25" maximum
Diameter:	0.88" maximum

DIRECT INTER-ELECTRODE CAPACITIES

(No external shield)

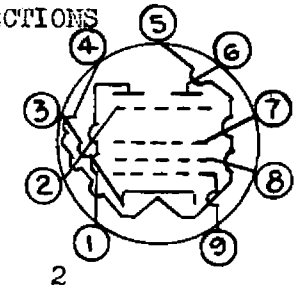
Input Capacity	5.0 uuf
Output Capacity	10.0 uuf
Capacity a1 to a2	1.0 uuf
Capacity g1,1 or g1,2 or g1,3 to a1 or a2	0.5 uuf

ELECTRICAL RATINGS

Heater Voltage	6.3V ± 10%
Sum Collector Voltage	330 maximum
Carry Collector Voltage	330 maximum

BASE CONNECTIONS

Pin	1	a2	Pin	6	a1
"	2	g2	"	7	g1,1
"	3	k	"	8	g1,2
"	4	h	"	9	g1,3
"	5	h			



DESIGN DATA

	1 Without Interstage Cathode Follower	2 With Interstage Cathode Follower
Ef	6.3V	6.3V
If	150 mA	150 mA
Ebb	250 Vdc	250 Vdc
Ec2	125 Vdc	125 Vdc
Ek	27.5 Vdc	14 Vdc
Eccl	75 Vdc	75 Vdc
*Ra1	63,000 ohms	47,000 ohms
*Ra2	63,000 ohms	47,000 ohms
*Rg1,1, Rg1,2, Rg1,3	63,000 ohms	0
*Rk	0	6,300 ohms
Ib1	1.3 mA min.	1.6 mA min.
Ib2	1.2 mA min.	1.6 mA min.
CR1	2.5 min.	3.5 min.
CR2	15 min.	30 min.

* These are equivalent resistance values.

from RTMA release #954, March 20, 1951
sponsor: Canadian Radio Manufacturing Corp. Ltd.

ROGERS MAJESTIC ELECTRONICS LTD.
Electronic Tube Division
11-19 Brentcliffe Road
LEASIDE (Toronto 17) ONTARIO

TYPE 6047*

The Rogers' Additron 6047 is an electrostatically focussed radial double beam tube, designed primarily for use as a binary adder tube in high speed digital computing devices.

The internal construction of the tube is shown diagrammatically in Figures 1-3. Twelve control elements, placed symmetrically on a circle around the cathode are connected internally to form the three control electrodes (G1,1, g1,2 and g1,3, collectively referred to as g1**). Twelve collector elements, alternate ones connected internally to form two collector electrodes (a1 and a2, collectively referred to as a), are placed on a circle and opposite the gaps between the control elements. The collector elements are shielded from each other by the screen (g2).

If one of the eight possible combinations of a zero voltage and a positive voltage is applied to the three control electrodes of the Additron, the electrostatic field set up in conjunction with the self-bias of the tube directs the electron beams to either a sum (a1) or a carry (a2) collector element, to neither or to both according to Table I. This corresponds to the function table for binary addition where $E_{c1,1}$*** is the augend input, $E_{c1,2}$ the addend input, $E_{c1,3}$ the carry input (from the preceding stage). I_{b1} is the sum output and I_{b2} the carry output (to the following stage), whether the positive voltage represents a 1-digit and the zero voltage a 0-digit, or vice-versa.

TABLE I

$E_{c1,1}$	$E_{c1,2}$	$E_{c1,3}$	I_{b1}	I_{b2}
0	0	0	0	0
+	0	0	+	0
0	+	0	+	0
0	0	+	+	0
+	+	0	0	+
+	0	+	0	+
0	+	+	0	+
+	+	+	+	+

* R.M.A. Type Designation
** All symbols according to JAN specifications unless otherwise noted.
*** All voltages referred to ground, not to the cathode.

Design Notes

Figures of merit for an additron are:-

(a) Time factor

This is the ratio $\frac{E_{c1} \times (C_{in} + C_{out})}{I_b}$ (sec.)

For directly coupled tubes, $C_{in} + C_{out}$ is 15 uuf* and either collector current for E_{c1} = 100V. is 1.6 milliamperes (Table II), giving for the time factor a value of about 1 microsecond.

For cathode follower coupling, neglecting the effect of the cathode follower input capacity, C_{in} is zero, and C_{out} is 10 uuf. The current is 2.3 milliamperes (Table IV). The time factor is thus about 0.5 microsecond.

These values determine the ultimate speed with which the tubes can be satisfactorily operated.

(b) Control ratios CR_1 and CR_2

For each collector, the control ratio is defined as the ratio of the lowest desirable current to highest undesirable current and is a measure of the effectiveness with which that collector distinguishes between a 1- and a 0-digit.

The control electrodes, when positive, draw currents which are functions of the input voltage combinations and for which allowance must be made in the design of a circuit. These currents can be used to equalize the input potentials approximately, when two or three grids are positive, by placing resistance in the input circuits. The way in which equalization occurs can be deduced from the curves in Figure 4, which shows that when the potential of one positive grid changes slightly, the grid currents change so as to drive the potentials of the other positive grids in the same direction. This tendency toward equalization is more evident in Figure 5.

Figure 4 also shows that the tube will tolerate inequalities of 10% in nominally equal input potentials.

When the output of one additron directly drives the input of another additron, the equivalent input resistance of the second tube is equal to the equivalent output resistance of the first one, provided the coupling is effected by a low impedance device such as a neon light or a condenser (Figure 6).

Where direct coupling is used, it is recommended that the cathode resistor be zero and that the cathode potential be between 35% and 42% of the input potential. The equivalent load resistance should be 63,000 ohms or greater. The equivalent circuit and typical operating conditions for direct coupling are shown in Figure 7 and Table II respectively.

* For capacitances etc., see Technical Data Sheet, which is attached.

TABLE II

E_{bb} (volts)	E_{c2} (volts)	E_{cc1} (volts)	E_k (volts)	R_a (ohms)	R_{g1} (ohms)	R_k (ohms)	I_{b1} (mA)	I_{b2} (mA)	CR_1	CR_2
300	125	100	35	63,000	63,000	0	1.6	1.6	3.0	15
250	125	75	27.5	68,000	68,000	0	1.2	1.2	2.5	15
250	125	50	20	72,000	72,000	0	0.7	0.7	2.5	30

If the additrons are coupled by cathode followers (Figure 8), the currents to positive control electrodes are of less importance in designing the circuit, but it may still be advisable to retain some resistance in the input circuits for equalization of the control electrode voltages as explained above. The equivalent circuit for cathode follower coupling is shown in Figure 7, where R_{g1} in this case will have a small value. In Table III are shown typical operating conditions for the case where the input resistance to the additron is zero and Table IV shows an intermediate case where the values of R_k and R_{g1} are between the values for the cases shown in Table II and Table III.

TABLE III

E_{bb} (volts)	E_{c2} (volts)	E_{cc1} (volts)	E_k (volts)	R_a (ohms)	R_{g1} (ohms)	R_k (ohms)	I_{b1} (mA)	I_{b2} (mA)	CR_1	CR_2
300	125	100	18	42,000	0	5,600	2.5	2.5	4.0	30
250	125	75	14	47,000	0	6,300	1.7	1.7	3.5	30
250	125	50	10	56,000	0	6,800	1.1	1.1	3.0	35

TABLE IV

E_{bb} (volts)	E_{c2} (volts)	E_{cc1} (volts)	E_k (volts)	R_a (ohms)	R_{g1} (ohms)	R_k (ohms)	I_{b1} (mA)	I_{b2} (mA)	CR_1	CR_2
300	125	100	27	47,000	7,500	4,200	2.3	2.3	3.5	30
250	125	75	20	56,000	10,000	4,700	1.4	1.4	3.0	30
250	125	50	14	63,000	12,000	5,600	0.9	0.9	2.5	40

The values of the control ratios depend on the values of E_{cc1}, R_{g1}, E_k and R_k. In Figure 9 the variation of $I_{c1,1}$ with $E_{c1,1}$ is shown for the case where $E_{c1,1} = E_{c1,2}$ and $E_{c1,3} = 0$. The slope of this curve increases rapidly as the grid potential approaches the screen potential. For this reason, the screen voltage should be held at the maximum of the grid swing or above. The difference between collector and screen supply voltages must be at least equal to the desired signal output.

The bleeder circuit (see Figure 6 and Figure 8) may be so designed that the coupling neon lights extinguish when the carry collector receives current. However, this method of equalization of negative inputs is not absolutely necessary, since the carry collector voltage swings between two levels, one determined by the screen potential, the other by the collector supply voltage. If the circuit is designed such that the neon lights are always conducting, a condenser should be placed in parallel with the neon lights.

The measurements of Table V were made on one additron under the conditions indicated and in the equivalent circuit (see Figure 7) to illustrate the manner in which the currents to the various electrodes depend on the combination of input potentials.

TABLE V

(a) Test Conditions:-

E_{bb} = +250V; E_{c2} = +125V; E_k = +27.5V.

R_a = 63,000 ohms; R_{g1} = 63,000 ohms; R_k = 0.

$E_{cc1,1}$	$E_{cc1,2}$ (volts)	$E_{cc1,3}$	I_{b1} (mA)	I_{b2} (mA)	$I_{c1,1}$ (uA)	$I_{c1,2}$ (uA)	$I_{c1,3}$ (uA)	I_{c2} (uA)
0	0	0	0	0	0	0	0	0
75	0	0	1.5	0.03	60	0	0	400
0	75	0	1.7	0.05	0	50	0	500
0	0	75	1.5	0.04	0	0	100	460
75	75	0	0.3	1.2	490	500	0	80
75	0	75	0.3	1.2	480	0	500	90
0	75	75	0.2	1.2	0	520	510	100
75	75	75	1.6	1.4	630	640	630	210

$$CR_1 = \frac{1.5}{0.3} = 5.0$$

$$CR_2 = \frac{1.2}{0.05} = 24$$

(b) Test Conditions:-

E_{bb} = +250V; E_{c2} = +125V; E_k = +14V.

R_a = 47,000 ohms; R_{g1} = 0; R_k = 6,300 ohms.

$E_{cc1,1}$	$E_{cc1,2}$ (volts)	$E_{cc1,3}$	I_{b1} (mA)	I_{b2} (mA)	$I_{c1,1}$ (uA)	$I_{c1,2}$ (uA)	$I_{c1,3}$ (uA)	I_{c2} (uA)
0	0	0	0	0	0	0	0	0
75	0	0	2.3	0.05	130	0	0	80
0	75	0	2.2	0.04	0	170	0	170
0	0	75	2.2	0.06	0	0	100	90
75	75	0	0.4	2.2	1050	1200	0	370
75	0	75	0.4	2.2	990	0	1200	500
0	75	75	0.3	2.2	0	1150	1100	520
75	75	75	2.2	2.0	1010	1090	1050	680

$$CR_1 = \frac{2.2}{0.4} = 5.5$$

$$CR_2 = \frac{2.0}{0.06} = 33$$

TABLE V (Cont'd.)

(c) Test Conditions:-

E_{bb} = +250V; E_{c2} = +125V; E_k = +20V.

R_a = 56,000 ohms; R_{g1} = 10,000 ohms; R_k = 4,700 ohms.

$E_{cc1,1}$	$E_{cc1,2}$ (volts)	$E_{cc1,3}$	I_{b1} (mA)	I_{b2} (mA)	$I_{c1,1}$ (uA)	$I_{c1,2}$ (uA)	$I_{c1,3}$ (uA)	I_{c2} (uA)
0	0	0	0	0	0	0	0	0
75	0	0	1.8	0.04	70	0	0	110
0	75	0	1.8	0.04	0	50	0	150
0	0	75	1.8	0.05	0	0	120	180
75	75	0	0.4	1.9	900	930	0	310
75	0	75	0.3	1.9	820	0	1000	430
0	75	75	0.3	1.9	0	960	980	420
75	75	75	1.9	1.8	970	1000	1000	710

$$CR_1 = \frac{1.8}{0.4} = 4.5$$

$$CR_2 = \frac{1.8}{0.05} = 36$$

The process of addition usually involves two discrete steps. First, the numbers to be added are applied to the control electrodes of the tube. Second, the addition is carried out. Usually it is desirable to have the tube operative only during the second step. If the cathode is the gating element, its potential is normally above the highest of the input potentials and a negative pulse to the cathode permits the addition to take place.

The screen may also be used for gating. Currents to the output elements are effectively cut off when the screen is at cathode potential. In this case the positive control electrodes will draw current. The use of the screen as a gating element is also facilitated by the small screen currents (approximately half the output currents).

Function tables other than that for binary addition may also be obtained. If the cathode is returned to a voltage approximately 55% of the input voltage, the outputs of Table VI (a) are obtained, while if a large cathode resistor is returned to a voltage negative with respect to the lower grid swing, the outputs of Table VI (b) are obtained.

TABLE VI

$E_{c1,1}$	$E_{c1,2}$	$E_{c1,3}$	(a) I_{b1}	(a) I_{b2}	(b) I_{b1}	(b) I_{b2}
0	0	0	0	0	+	+
+	0	0	0	0	+	0
0	+	0	0	0	+	0
0	0	+	0	0	+	0
+	+	0	0	+	0	+
+	0	+	0	+	0	+
0	+	+	0	+	0	+
+	+	+	+	+	+	+

Queries and comments regarding type 6047, the operating conditions and circuitry, are invited.

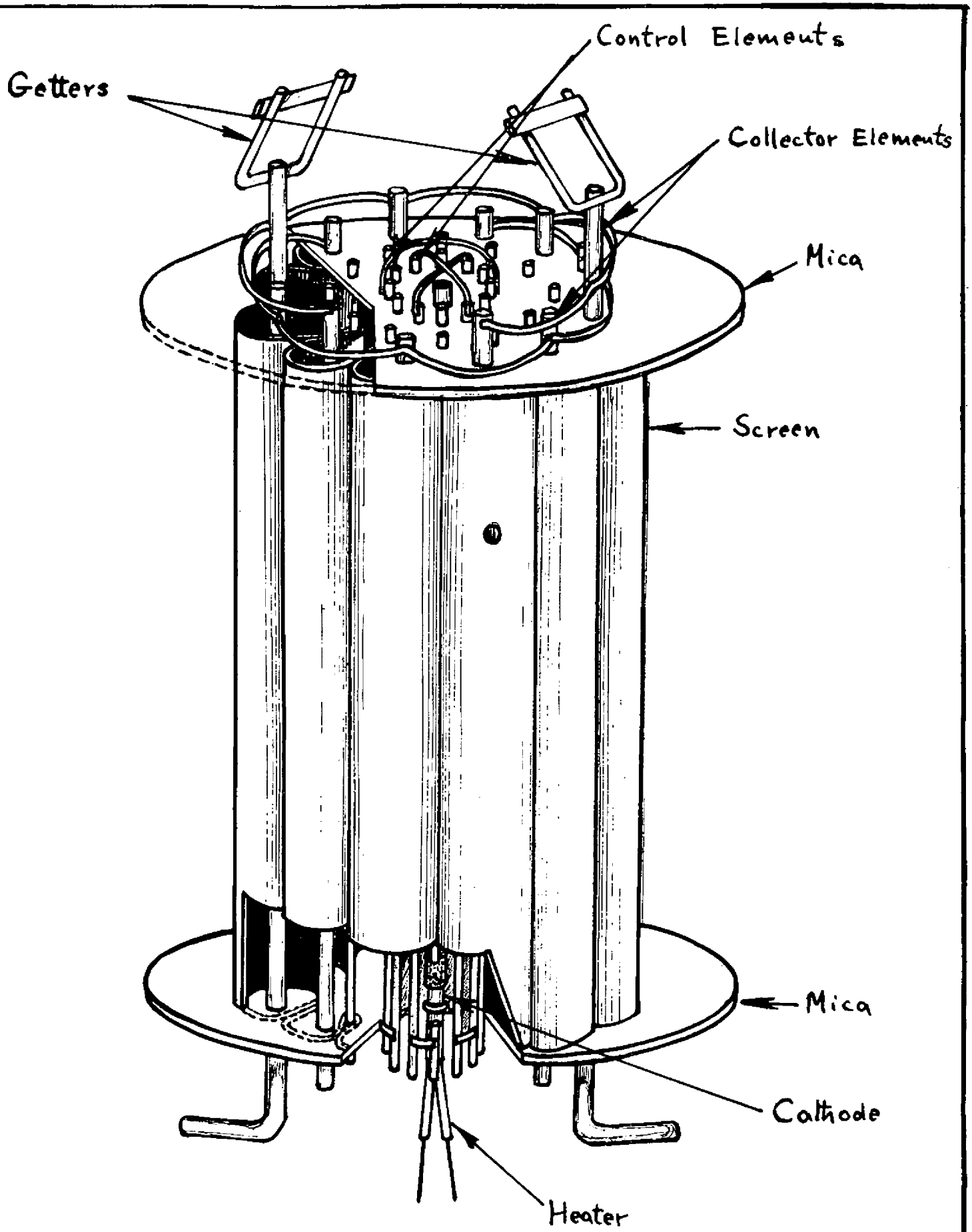

Control Elements
Getters
Collector Elements
Mica
Screen
Mica
Cathode
Heater

FIG. 1.

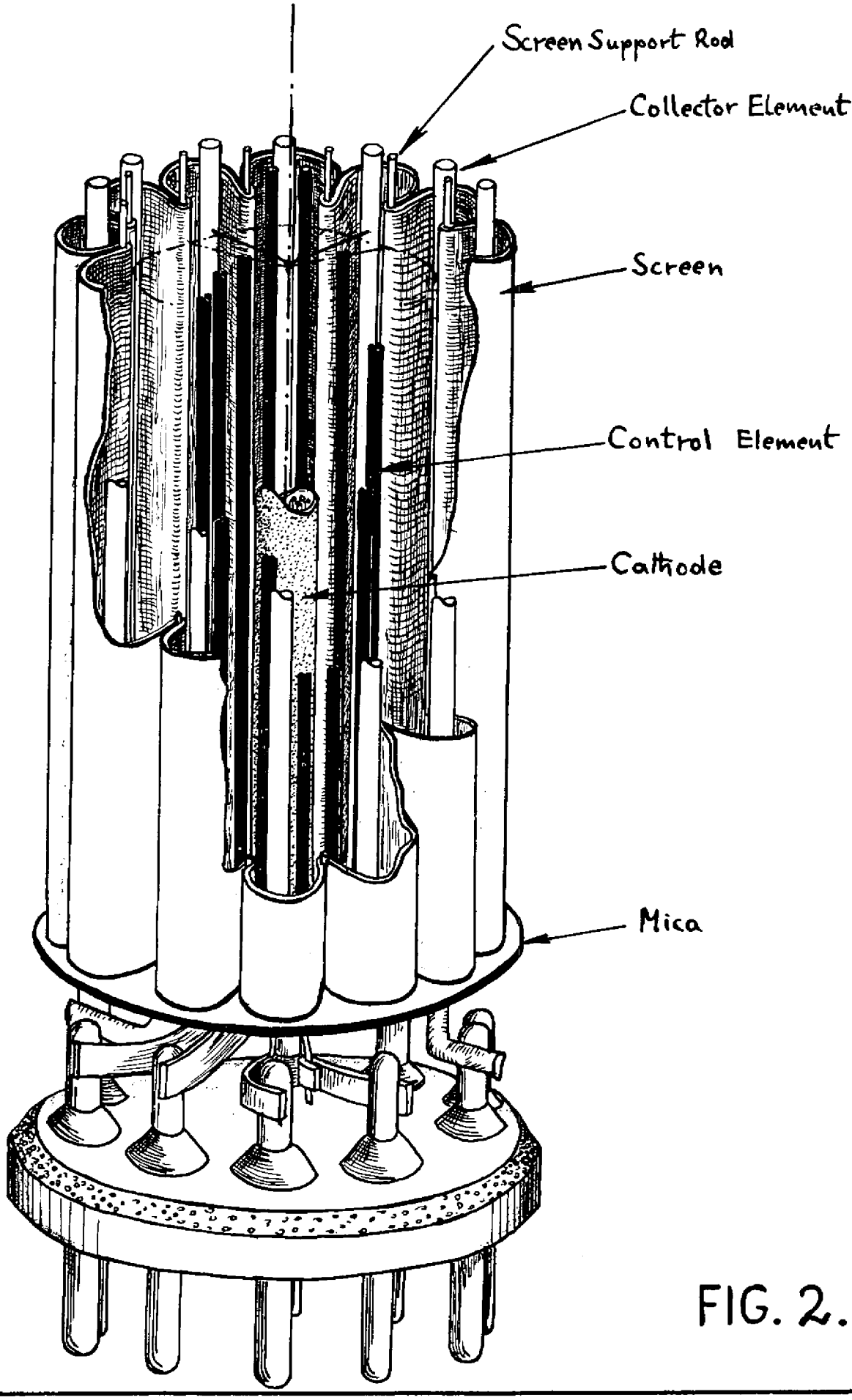

Screen Support Rod
Collector Element
Screen
Control Element
Cathode
Mica

FIG. 2.

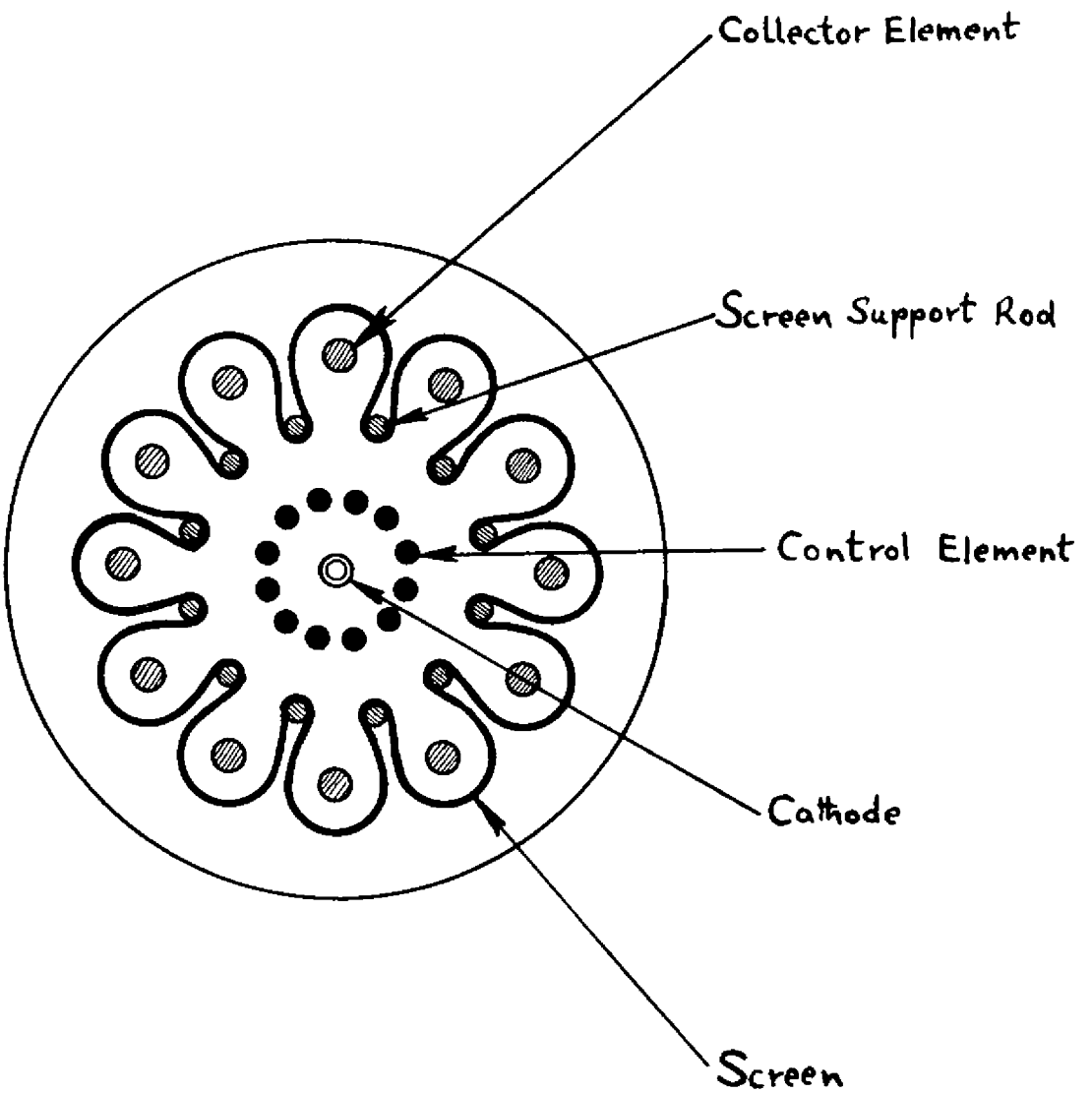

Collector Element
Screen Support Rod
Control Element
Cathode
Screen

FIG. 3.

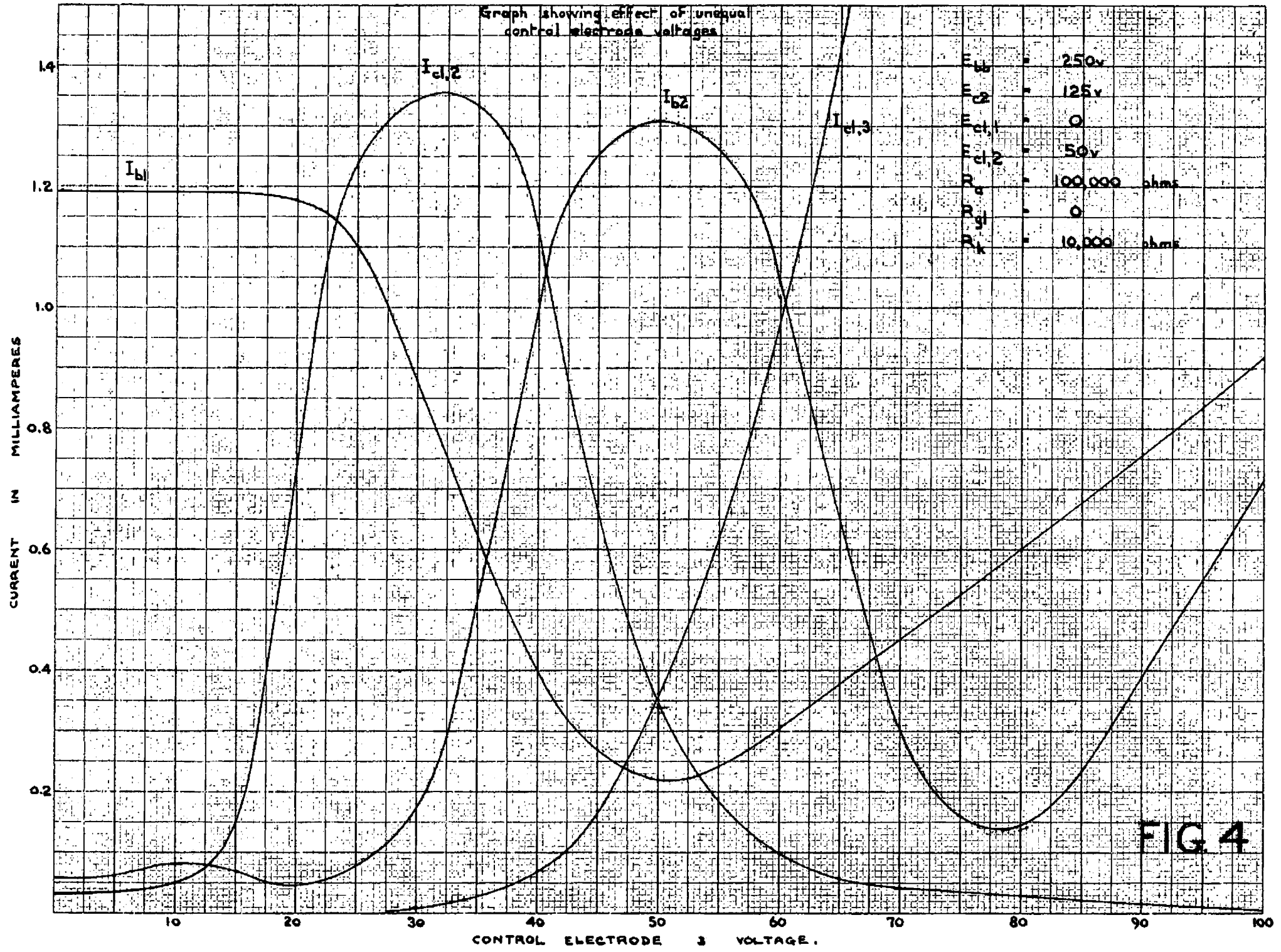

Graph showing effect of unequal control electrode voltages
E_{bb} = 250v
E_{c2} = 125v
$E_{c1,1}$ = 0
$E_{c1,2}$ = 50v
R_a = 100,000 ohms
R_{g1} = 0
R_k = 10,000 ohms
$I_{c1,2}$
I_{b2}
$I_{c1,3}$
I_{b1}
CURRENT IN MILLIAMPERES
1.4
1.2
1.0
0.8
0.6
0.4
0.2
10
20
30
40
50
60
70
80
90
100
CONTROL ELECTRODE 3 VOLTAGE.

FIG. 4

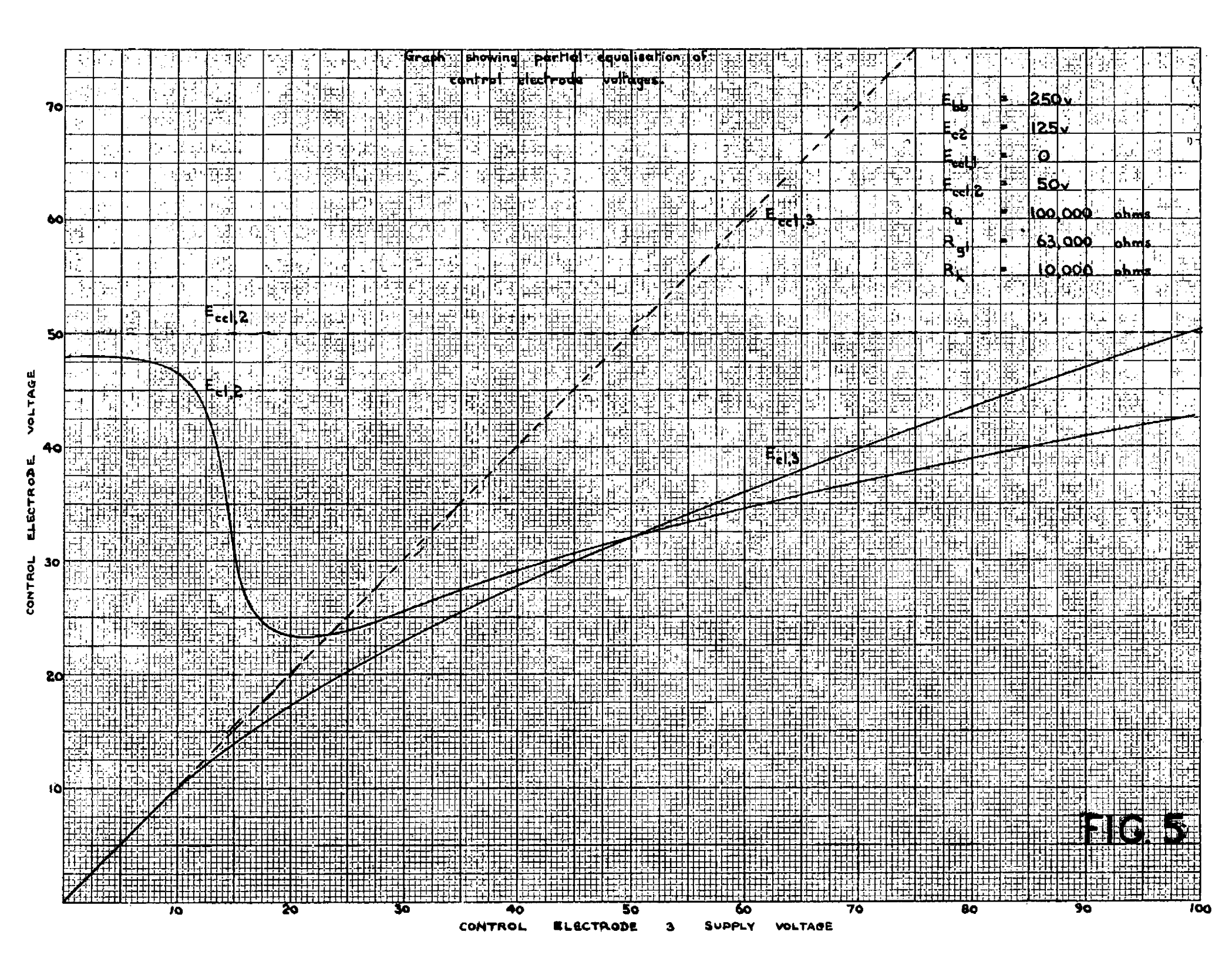
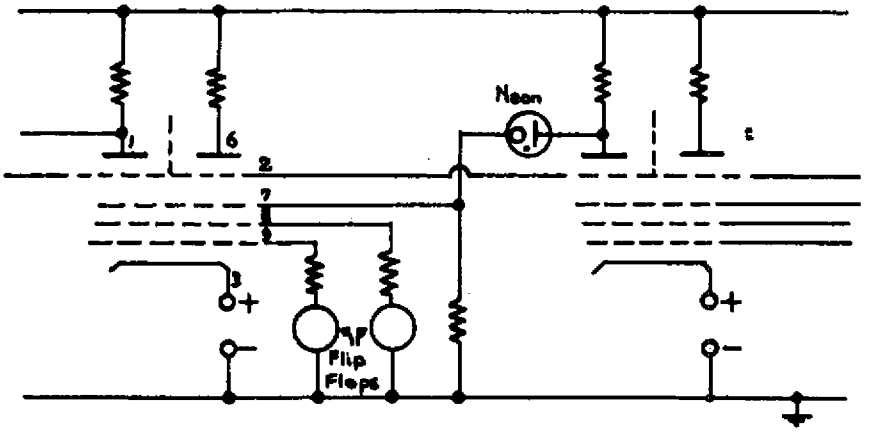
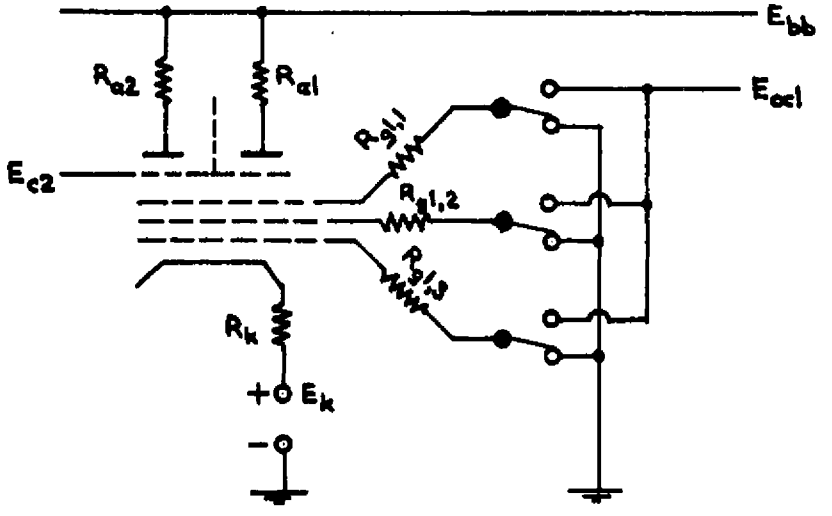

Graph showing partial equalisation of control electrode voltages.
E_{bb} = 250v
E_{c2} = 125v
$E_{cc1,3}$ = 0
$E_{cc1,2}$ = 50v
R_a = 100,000 ohms
R_{g^1} = 63,000 ohms
R_k = 10,000 ohms
$E_{cc1,2}$
$E_{c1,2}$
$E_{cc1,3}$
$E_{c1,3}$
CONTROL ELECTRODE VOLTAGE
CONTROL ELECTRODE 3 SUPPLY VOLTAGE
10
20
30
40
50
60
70
80
90
100

FIG. 5



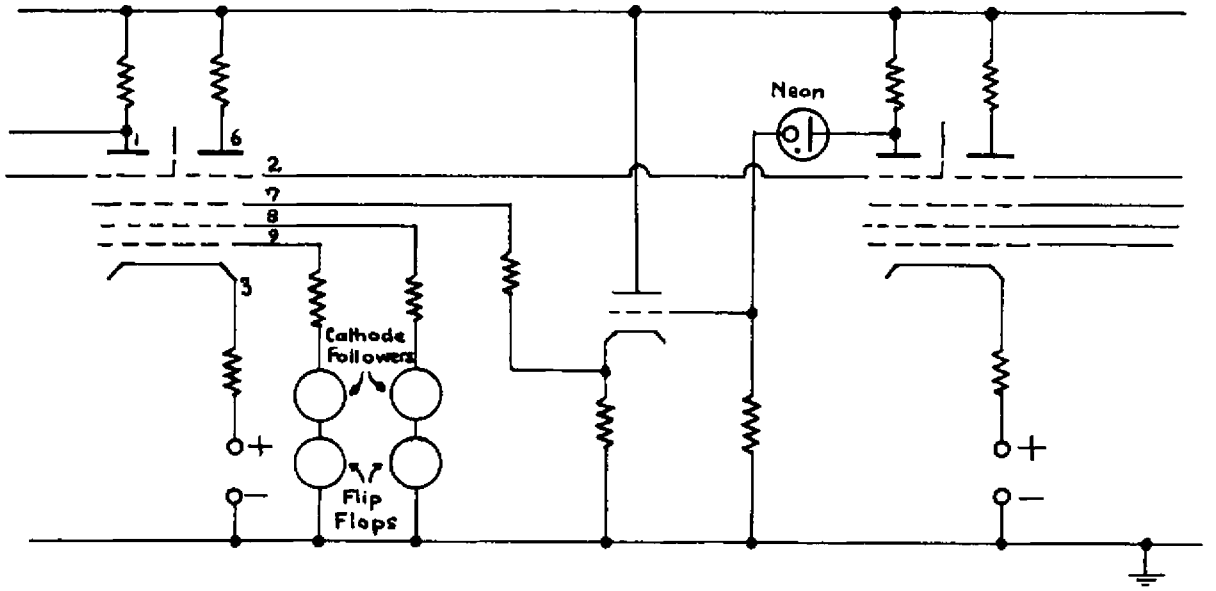
Circuit for direct coupling

FIG. 6



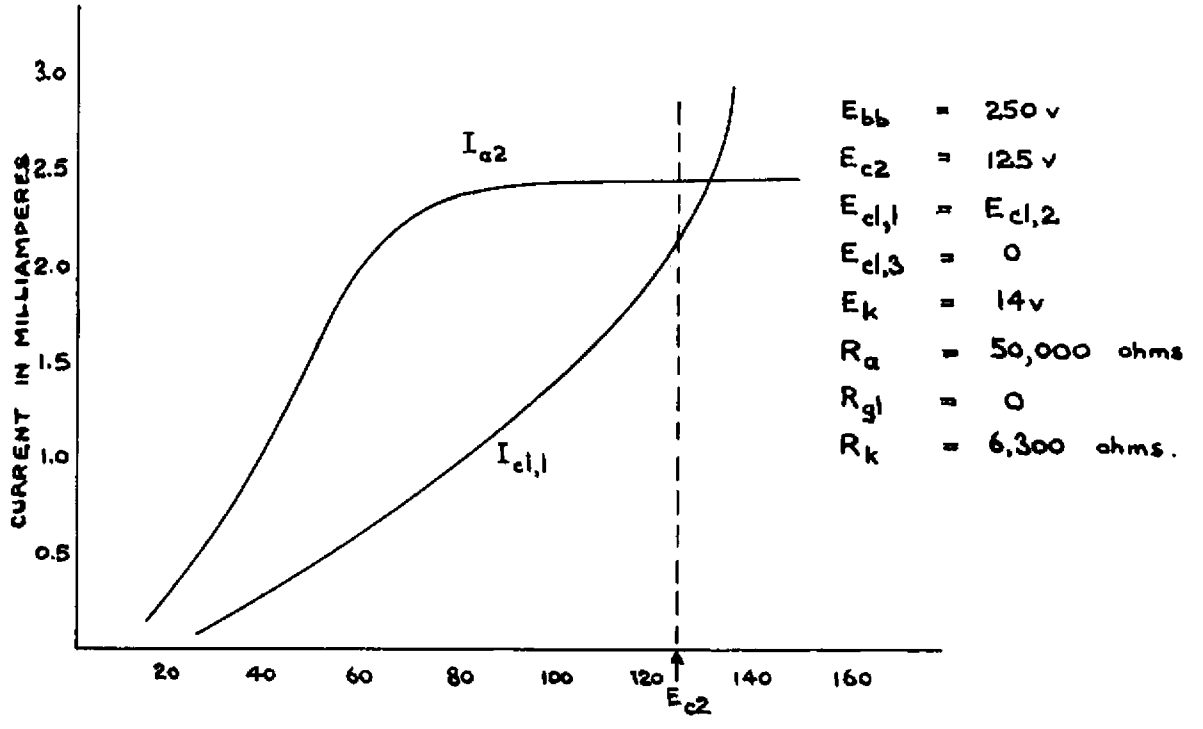
Equivalent circuit for an additron.

FIG. 7



Circuit for cathode follower coupling

FIG. 8



Graph of $I_{c1,1}$ against $E_{c1,1}$

FIG. 9

ROGERS MAJESTIC ELECTRONICS LIMITED
Electronic Tube Division
11-19 Brentcliffe Road
Leaside (Toronto 17) Ontario

Rel # 1115

TECHNICAL DATA FOR RTMA TYPE 6218.

1. Description

The 6218 is a reliable miniature tube in glass construction designed to withstand severe shock. It is a special modulated beam deflection tube for pulse generation up to a frequency of 375 Mc. Although the 6218 was designed primarily for military purpose, it may also be used in a number of other applications where pulse generation is required.

2. Mechanical Data

Envelope	T6½ max. length 2.75" max. diameter 0.88"
Base	9 pin, E9-1
Top Cap	skirted miniature C1-2
Base Connections	9CG (see diagram)
Shock Rating	500 G
Mounting Position	any, but must not be subjected to magnetic fields.

3. Electrical Ratings

Cathode Coating unipotential

Operating Conditions

heater voltage	E_h	6.3 volts
heater current	I_h	150 mA
plate voltage	E_b	100 volts
grid 1 voltage	E_{c1}	-6 volts
grid 2 voltage	E_{c2}	70 volts
grid 3 voltage	E_{c3}	250 volts
deflection plate voltage	E_D	120 volts

Interelectrode Capacities (no external shield)

C1 - all	3.0 uuf
D1 - all	3.0 uuf
D2 - all	3.5 uuf
D1 - G1	.075 uuf
D2 - G1	.075 uuf
G1 - G2	0.60 uuf
D1;D2;G2 - P	.025 uuf

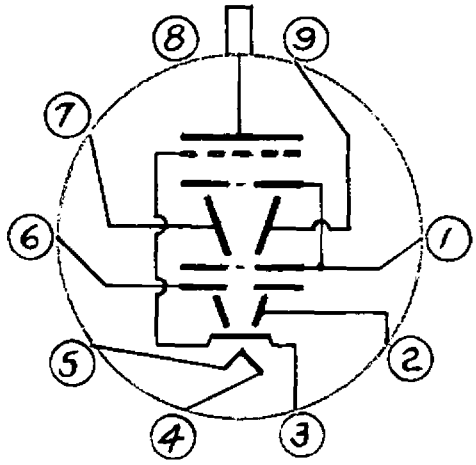
from RTMA release #1115, Aug. 25, 1952

Absolute Maximum Ratings

cathode current	5.5 mA
deflection plate one	170 volts
deflection plate two	170 volts
peak voltage, deflection plate one	800 volts
peak voltage, deflection plate two	500 volts
plate voltage	330 volts
heater to cathode voltage	50 volts

4. Base Connections

Basing designation for bottom view 9CG



Pin No.	1	2	3	4	5	6	7	8	9	top cap
Connection.	G3	G1	K G4	H	H	G2	D2	-	D1	P

P	collector plate
D1, D2	deflection plates
G1	beam plates, internally connected
G2	first split anode, internally connected
G3	second and third split anode, internally connected
G4	suppressor grid, internally connected to cathode
K	cathode
H	heater

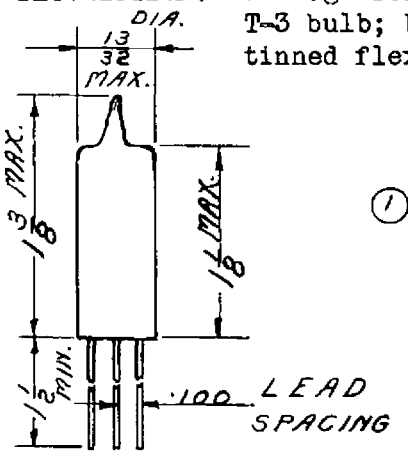
VH/MP

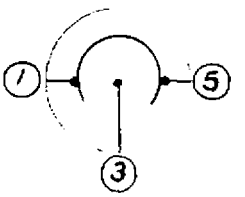
ROGERS MAJESTIC ELECTRONICS LIMITED
LEASIDE, (Toronto 17), ONTARIO, CANADA.

October 23, 1952

R.T.M.A. No. 6259

DESCRIPTION: Voltage reference tube of the cold cathode discharge type; T-3 bulb; body length 1-3/8" max; button base, 0.016" tinned flexible leads.





LEAD NO.	ELEMENT
1	cathode
3	anode
5	cathode

Numbers refer to pin holes in standard sub-miniature tube socket.

MAXIMUM RATINGS (absolute value)

DC Operating current	max. 8 mA
DC Operating current	min. 1 mA

OPERATING CHARACTERISTICS

Preferred DC operating current	4.5 mA
AC resistance	max. 450 ohms
DC starting voltage	max. 97 volts) very
DC starting voltage	min. 92 volts)
DC operating voltage at 4.5 mA; variation from tube to tube	83-87 volts
Temperature coefficient of operating voltage	-3 mV/°C
Leakage E_b = 90V R_p = 10 megohms	max. 2 μA
Max. percentage variation of operating voltage during life	0.5 percent
Max. percentage variation of operating voltage after first 300 hours of life	0.2 percent
Max. short term (100 hours max.) variation of operating voltage after first 300 hours of life	0.1 percent
Max. percent variation of striking voltage on life	1.0 percent

NOTES

1. Equilibrium conditions are normally reached after 3 minutes operation.

2. An additional feature of this tube is the stability of the striking voltage at low frequency rates.

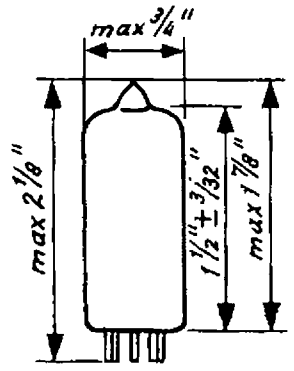
6354

Description Voltage stabiliser

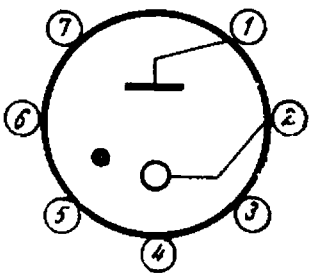
Mechanical data

Cathode	cold cathode
Base	E 7 - 1
Bulb	T 5½
Outline	5 - 2
Basing	see drawing
Mounting position	any

Tube outline



Bottom view of base



Base pin No.	Element
1	anode
2	cathode
3	int.conn.
4	int.conn.
5	int.conn.
6	int.conn.
7	int.conn.

Ratings (absolute values)

Supply voltage necessary to insure starting throughout life	min.	180	volts
D.C. cathode current	max.	15	mamps
	min.	5	mamps
Starting current(av.time max.40 sec.)	max.	40	mamps
Ambient temperature	max.	90	°C
	min.	-55	°C

from JEDEC release #3133, Feb. 6, 1961

Typical characteristics

Anode voltage drop(at 10 mamps)	bogey	150 volts
	min.	146 volts
	max.	154 volts
Anode breakdown voltage	max.	180 volts
Variation of anode voltage drop at 10 mamps during 1000 hours	max.	1 %
Temperature coefficient of the voltage drop		10 m.volts/^{o}C
Regulation(from 5 to 15 mamps)	max.	5 volts

Remarks

1) The tube should be operated only with the cathode negative and the anode positive
2) Equilibrium conditions are reached within three minutes
3) The tube should not be subjected to severe shock or continuous vibration

from JETEC release #1696, July 23, 1956
Sponsor: Rogers Electronic Tubes, Toronto, Canada

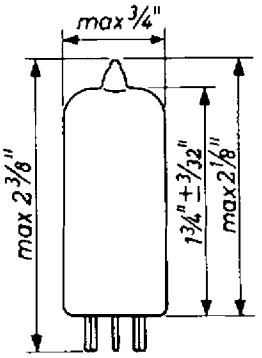
6687

DUAL CONTROL HEPTODE for use as gated amplifier in computer and on-off control circuits

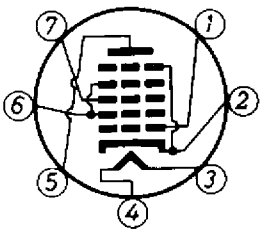
MECHANICAL DATA

Cathode	Coated unipotential
Base	E7-1
Bulb	T5½
RETMA basing designation	7 CH
Mounting position	Any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No	ELEMENT
1	Grid No.1
2	Cathode and grid No.5
3	Heater
4	Heater
5	Plate
6	Grids No.2 and 4
7	Grid No.3

ELECTRICAL DATA

Heater data

Heater voltage [1]	6.3 volts
Heater current at 6.3 volts	270(±5%) mamps

DIRECT INTERELECTRODE CAPACITANCES (without external shield)

Plate to all other elements		7.6 μμF
Grid No.1 to all other elements		5.4 μμF
Grid No.3 to all other elements		7.1 μμF
Plate to grid No.1	max.	0.08 μμF
Plate to grid No.3	max.	0.35 μμF
Grid No.1 to grid No.3	max.	0.2 μμF

[1]) In order to obtain a prolonged tube life the maximum variations of the heater voltage should be less than ± 5% (absolute limits)

MAXIMUM RATINGS (Absolute Values)

Plate voltage	250 volts max.
Plate voltage (without current)	500 volts max.
Plate dissipation	1.0 watt max.
Grid No.2 and 4 voltage	100 volts max.
Grid No.2 and 4 voltage (without current)	500 volts max.
Grid No.2 and 4 dissipation	1.0 watt max.
Negative grid No.3 voltage	100 volts max.
Positive grid No.3 voltage	0 volt max.
Negative grid No.3 peak voltage	200 volts max.
Positive grid No.3 peak voltage	90 volts max.
Grid No.3 dissipation	0.5 watt max.
Grid No.3 circuit resistance (with fixed bias)	0.5 megohm max.
Grid No.3 circuit resistance (with automatic bias)	1 megohm max.
Negative grid No.1 voltage	100 volts max.
Positive grid No.1 voltage	0 volt max.
Negative grid No.1 peak voltage	200 volts max.
Grid No.1 dissipation	0.5 watt max.
Grid No.1 circuit resistance (with fixed bias)	0.5 megohm max.
Grid No.1 circuit resistance (with automatic bias)	1 megohm max.
Cathode current	20 mamps max.
Peak cathode current	70 mamps max.
Voltage between heater and cathode	120 volts max.

TYPICAL CHARACTERISTICS

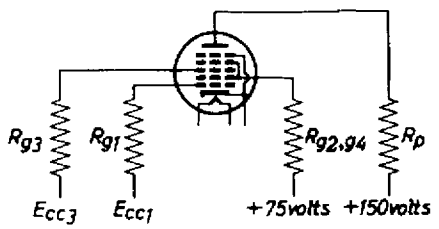
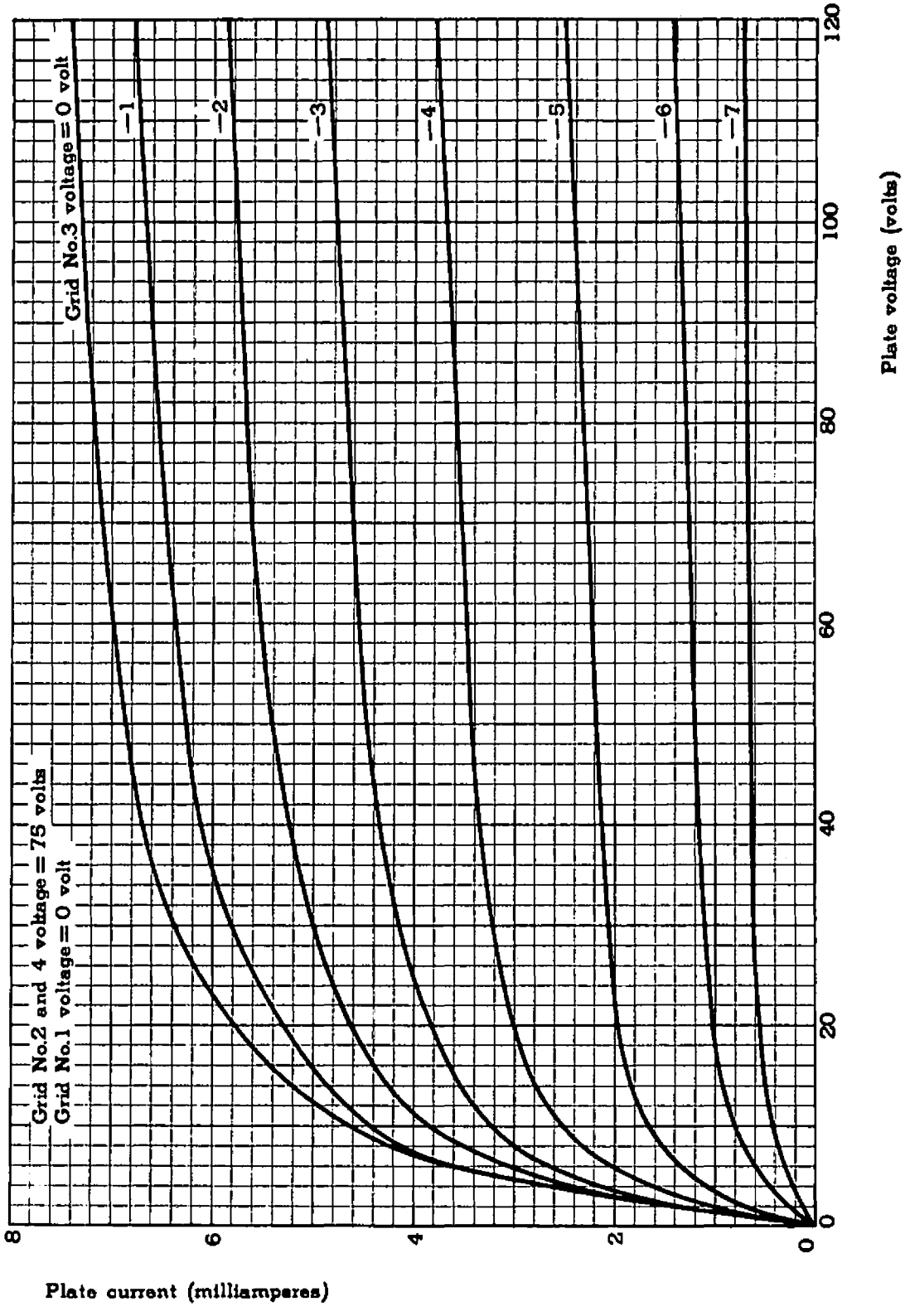


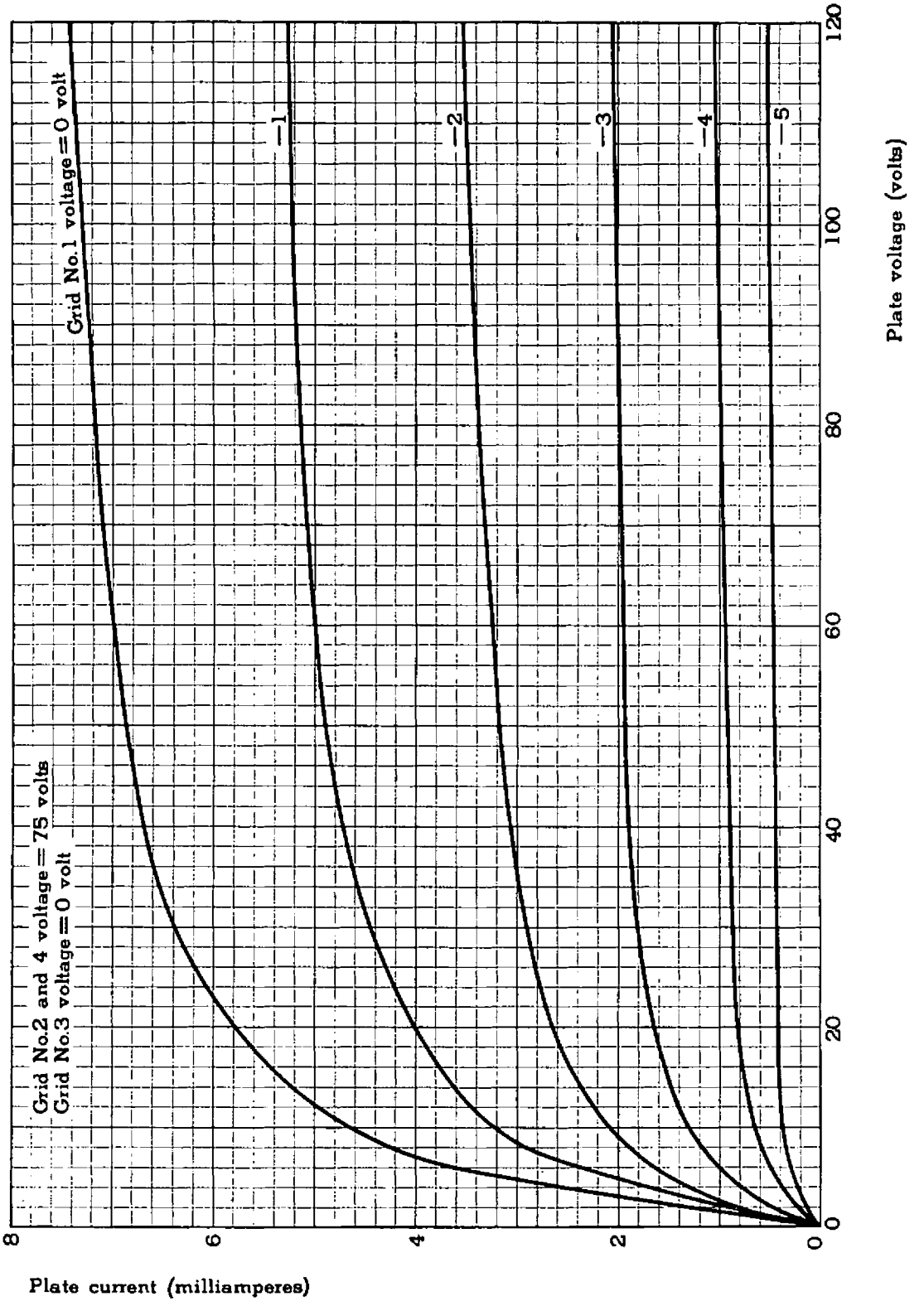
Plate supply voltage	150	150	150	150	volts
Grids No.2 and 4 supply voltage	75	75	75	75	volts
Grid No.1 supply voltage	0	0	-10	0	volt
Grid No.3 supply voltage	0	-10	0	+55	volts
Plate series resistor	20 000	20 000	20 000	0	ohms
Grids No.2 and 4 series resistor	470	470	470	0	ohms
Grid No.1 series resistor	47 000	47 000	47 000	0	ohms
Grid No.3 series resistor	47 000	47 000	47 000	0	ohms
Plate current	max.6.5 min.5.0	max.0.2	max.0.2	-	mamps
Grid No.3 current	-	-	min. 0		mamp

Inverse grid No.1 and grid No.3 current (measured in the above circuit diagram)

Plate supply voltage	150	volts
Grid No.2 and 4 supply voltage	75	volts
Grid No.1 supply voltage	-1.5	volts
Grid No.3 supply voltage	-1.5	volts
Plate series resistor	20 000	ohms
Grids No.2 and 4 series resistor	470	ohms
Grid No.1 series resistor	47 000	ohms
Grid No.3 series resistor	47 000	ohms
Grid No.1 inverse current	max. 0.2	µamp
Grid No.3 inverse current	max. 0.2	µamp

Insulation between cathode and heater
(voltage between heater and cathode 120 volts) min.8 megohm


Grid No.2 and 4 voltage = 75 volts
Grid No.1 voltage = 0 volt
Grid No.3 voltage = 0 volt
-1
-2
-3
-4
-5
-6
-7
0
2
4
6
8
0
20
40
60
80
100
120
Plate current (milliamperes)
Plate voltage (volts)


Grid No.2 and 4 voltage = 75 volts
Grid No.3 voltage = 0 volt
Grid No.1 voltage = 0 volt
—1
—2
—3
—4
—5
0
2
4
6
8
0
20
40
60
80
100
120
Plate current (milliamperes)
Plate voltage (volts)

from JETEC release #1699, July 30, 1956
sponsor: Rogers Electronic Tubes, Toronto, Canada

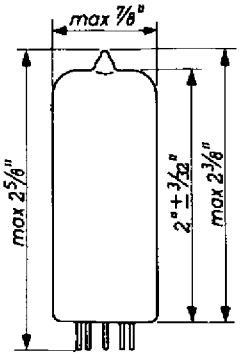
6689

PENTODE for use in telephone equipment with a life longer than 10 000 hours

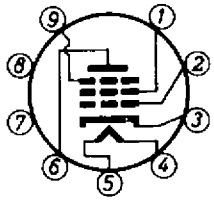
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
Mounting position	Any
RETMA basing designation	9BK

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Grid No.2
2	Grid No.1
3	Cathode
4	Heater
5	Heater
6	Plate
7	Internally connected
8	Internally connected
9	Grid No.3; internal shield

ELECTRICAL DATA

HEATER DATA

	min.	bogey	max.	
Heater voltage [1]		6.3		volts
Heater current at 6.3 volts [2]	0.285	0.300	0.315	amp

[1] In order to obtain a tube life of 10 000 hours in case of parallel supply of the heaters, the maximum variations of the heater voltage should be less than ± 5% (absolute limits)

[2] In order to obtain a tube life of 10 000 hours in case of series supply of the heaters, the maximum variation of the heater current due to voltage fluctuations and tolerances in the parts should be less than ± 1.5% (absolute limits)

DIRECT INTERELECTRODE CAPACITANCES

	bogey	max.	
Plate to all other elements	3.6	4.2	µµF
Grid No.1 to all other elements	8.5	9.2	µµF
Plate to grid No.1		0.015	µµF
Grid No.1 to heater		0.15	µµF
Cathode to heater	4.0		µµF
Grid No.1 to all other elements at a cathode current of 12.1 mamps	11.3		µµF
Radiation capacitance of plate [3]		0.025	µµF
Radiation capacitance of grid No.1 [3]		0.025	µµF

RATINGS (design center values)

Plate voltage	210	volts
Plate voltage (without current)	550	volts
Plate dissipation	2.1	watts
Grid No.2 voltage	210	volts
Grid No.2 voltage (without current)	550	volts
Grid No.2 dissipation	0.35	watt
Cathode current	16	mamps
Grid No.1 circuit resistance (with automatic bias)	1	megohm
Voltage between heater and cathode	100	volts
External resistance between cathode and heater [4]	20 000	ohms
Bulb temperature	170	°C

---

[3] Radiation capacitance is the capacitance of the concerning electrode to a surrounding box with an inner diameter of 2 1/16" and a length of 3 7/8", the other electrodes being earthed

[4] For stable operation it is advisable to restrict the external resistance between heater and cathode to values smaller than 20 000 ohms

TYPICAL CHARACTERISTICS	min.	bogey	max.	
Plate voltage		210		volts
Grid No.3 voltage		0		volt
Grid No.2 voltage		120		volts
Cathode resistor		165		ohms
Plate current [5]	8.7	10	11.3	mamps
Grid No.2 current [5]	1.7	2.1	2.5	mamps
Transconductance [5]	7800	9000	10200	micromhos
Amplification factor of grid No.2 with respect to grid No.1		34		
Plate resistance	0.3	0.5		megohm
Equivalent noise resistance (R.F.)		750	1000	ohms
Equivalent noise resistance (30-10 000 c/s)			36000	ohms
Negative grid No.1 bias at plate current of 0.5 mamp	3.0		5.25	volts
Grid current starting point Grid No.1 bias at grid No.1 current = +0.3 μA			-1.1	volts
Negative grid current (grid series resistor 0.1 megohm) [5]			0.5	μamp
Grid No.1 hum voltage (grid leak = 0.5 megohm) [6]		0.06	0.5	mvolt
Insulation between two electrodes	20			megohms
Insulation between cathode and heater (voltage between heater and cathode 100 volts)	5			megohms
Heating time of the cathode (till half the ultimate plate current)	8	13	20	sec
Cooling time of the cathode (till half the original plate current)	7	12		sec

[5] See page 4

[6] This value has been measured at a mains frequency of 50 c/s with the electric center of the heater connected to earth. The voltage has been measured in the anode lead with the aid of a band-pass filter linear from 30-200 c/s and translated into a hum voltage on the grid.

OPERATING CHARACTERISTICS for use as class A amplifier (Measured with a resistor of 0.33 megohm in series with grid No.1 as internal resistance of the driver tube.)

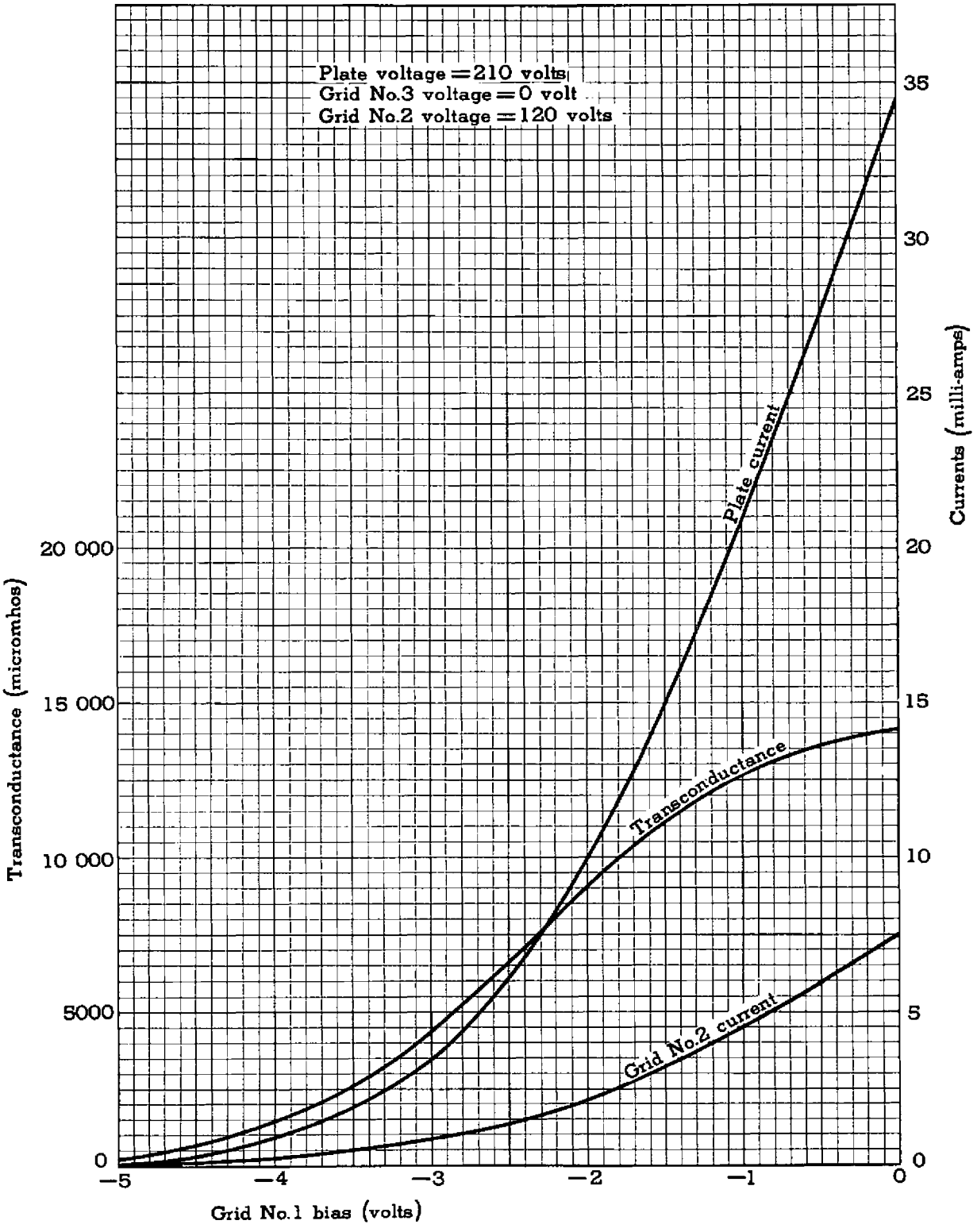
Plate voltage	120	210 volts
Grid No.3 voltage	0	0 volt
Grid No.2 supply voltage	120	120 volts
Grid No.2 series resistor	5600	5600 ohms
Cathode resistor	180	180 ohms
Plate current	8.3	8.3 mamps
Grid No.2 current	1.7	1.7 mamps
Transconductance	8200	8200 micromhos
Plate resistance	0.42	0.44 megohm
Load A.C. resistance	10 000	20 000 ohms
Output power at a distortion of 10 percent	340	660 mwatts
Input A.C. voltage at a distortion of 10 percent	1.1	1.1 volts(rms)
Output power at grid No.1 current = +0.3 μamp	400	870 mwatts
Input A.C. voltage at an output power of 50 mwatts	0.35	0.25 volt (rms)

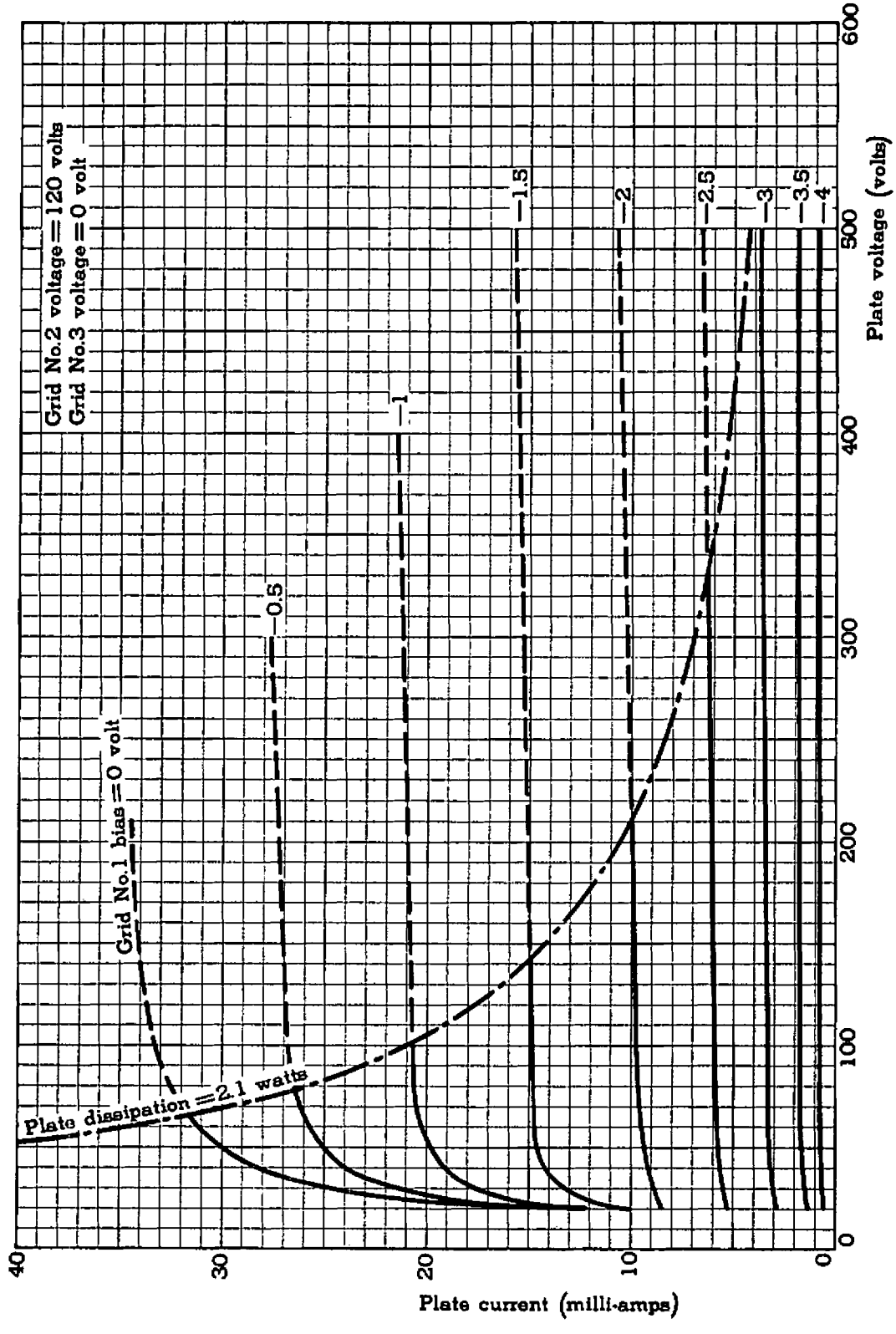
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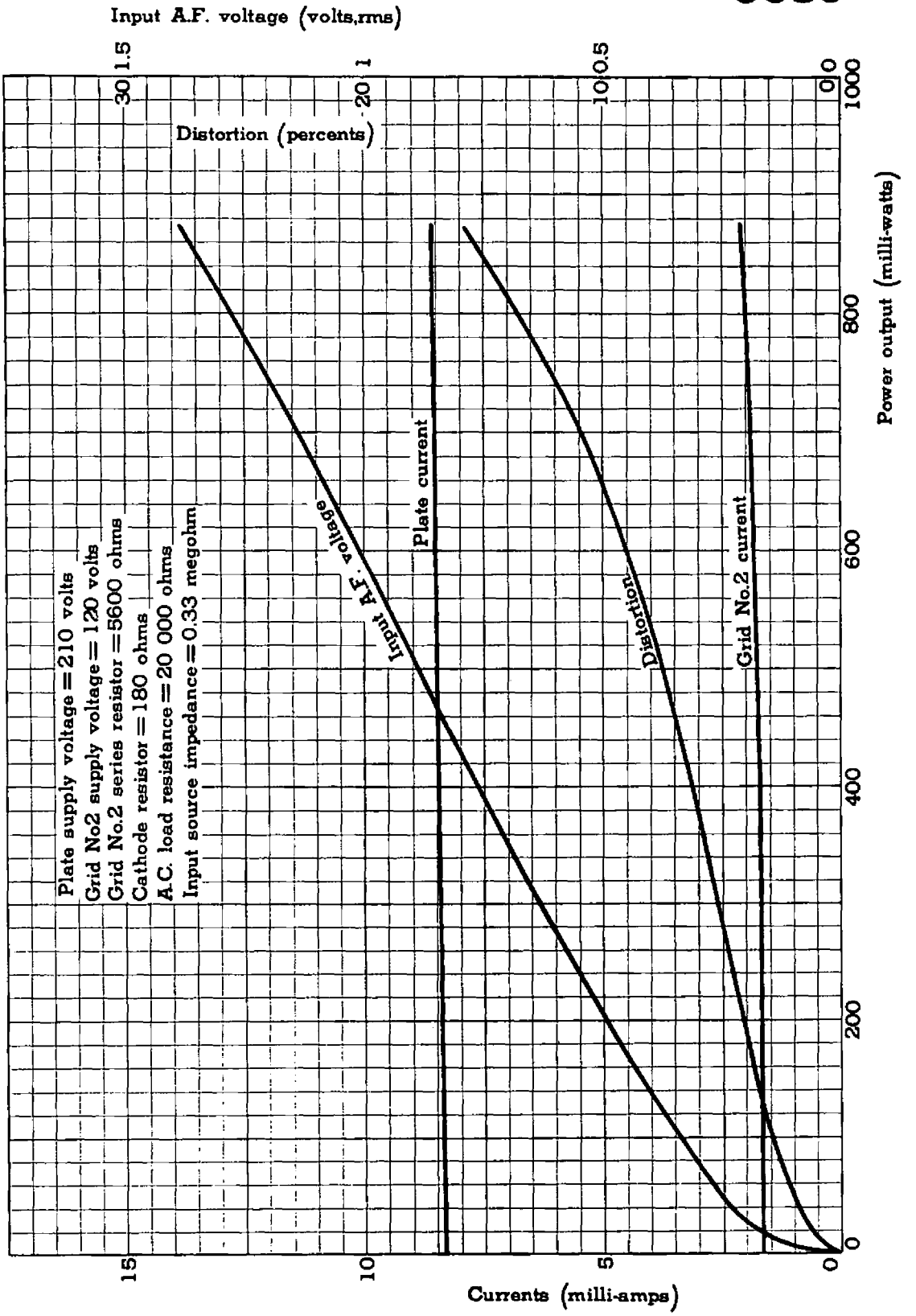
5) END POINT OF LIFE

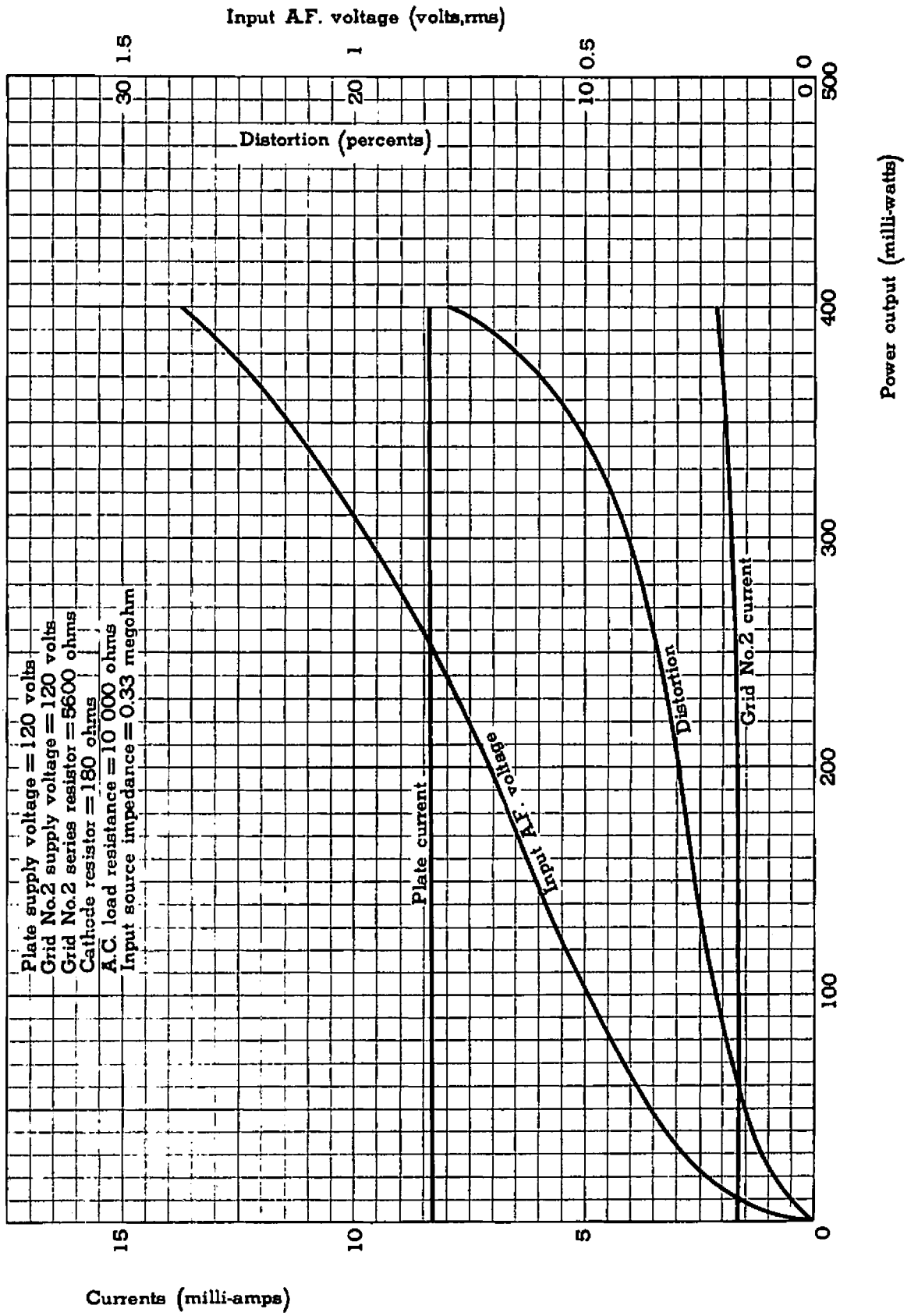
The end point of life of the tube is reached when one or more of the characteristics have changed to the following values:

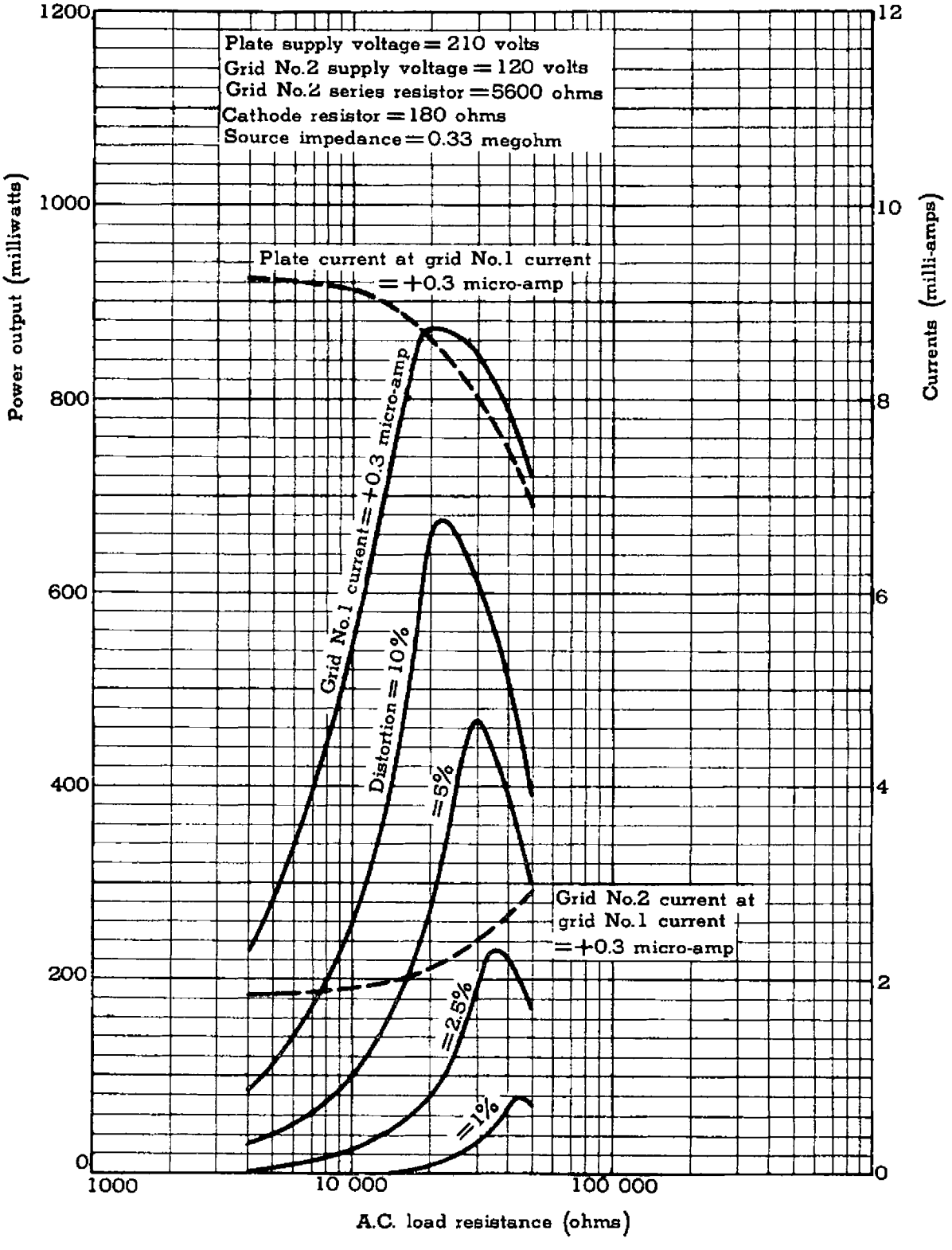
Plate current	≦	7.0 mamps
Grid No.2 current	≦	1.25 mamp
Transconductance	≦	6400 micromhos
Negative grid current (grid series resistor = 0.1 megohm)	≧	1.0 μamp

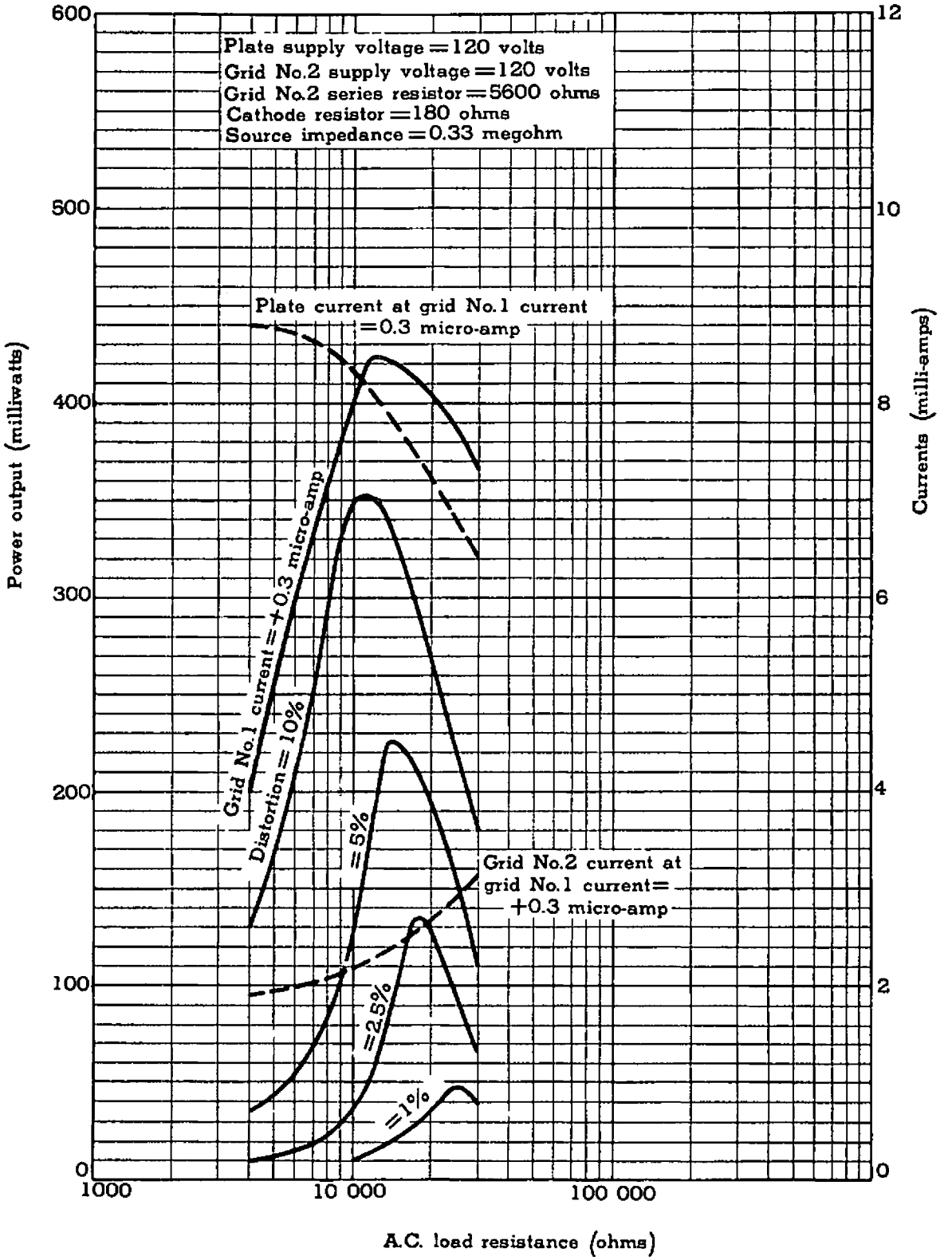

Plate voltage = 210 volts
Grid No.3 voltage = 0 volt
Grid No.2 voltage = 120 volts
Plate current
Transconductance
Grid No.2 current
Transconductance (micromhos)
20 000
15 000
10 000
5000
0
Currents (milli-amps)
35
30
25
20
15
10
5
0
−5
−4
−3
−2
−1
0
Grid No.1 bias (volts)

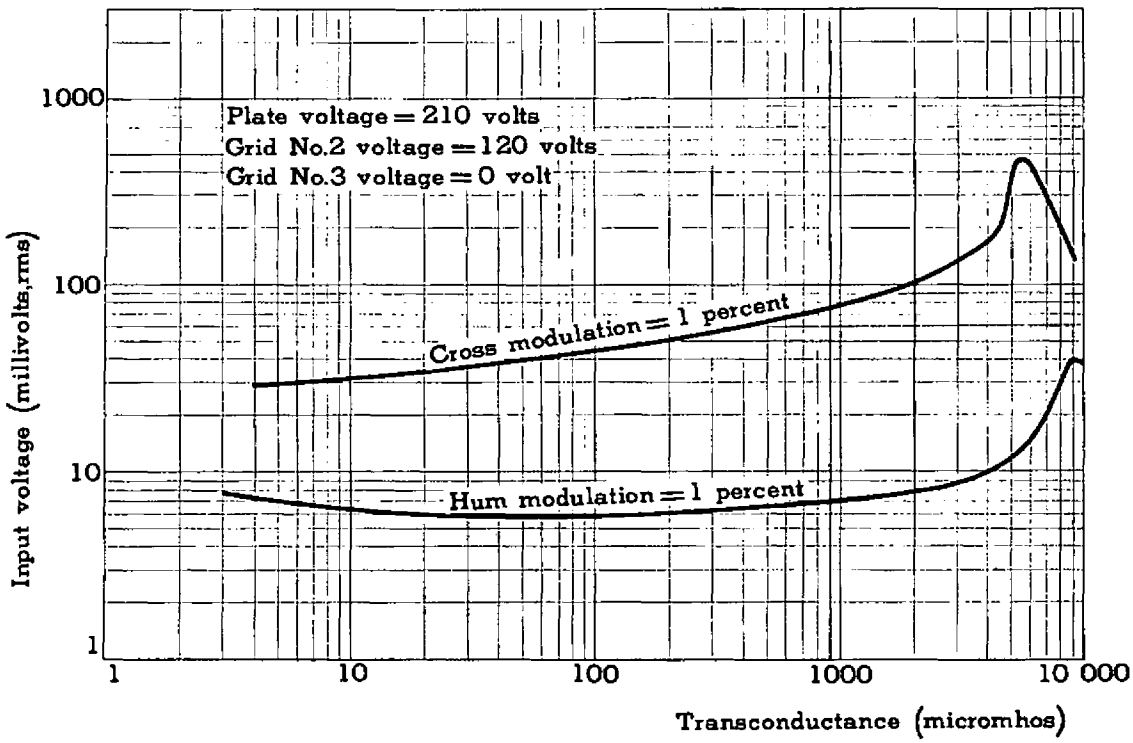

Grid No.2 voltage = 120 volts
Grid No.3 voltage = 0 volt
Grid No.1 bias = 0 volt
Plate dissipation = 2.1 watts
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
Plate voltage (volts)
0
100
200
300
400
500
600
Plate current (milli-amps)
40
30
20
10
0

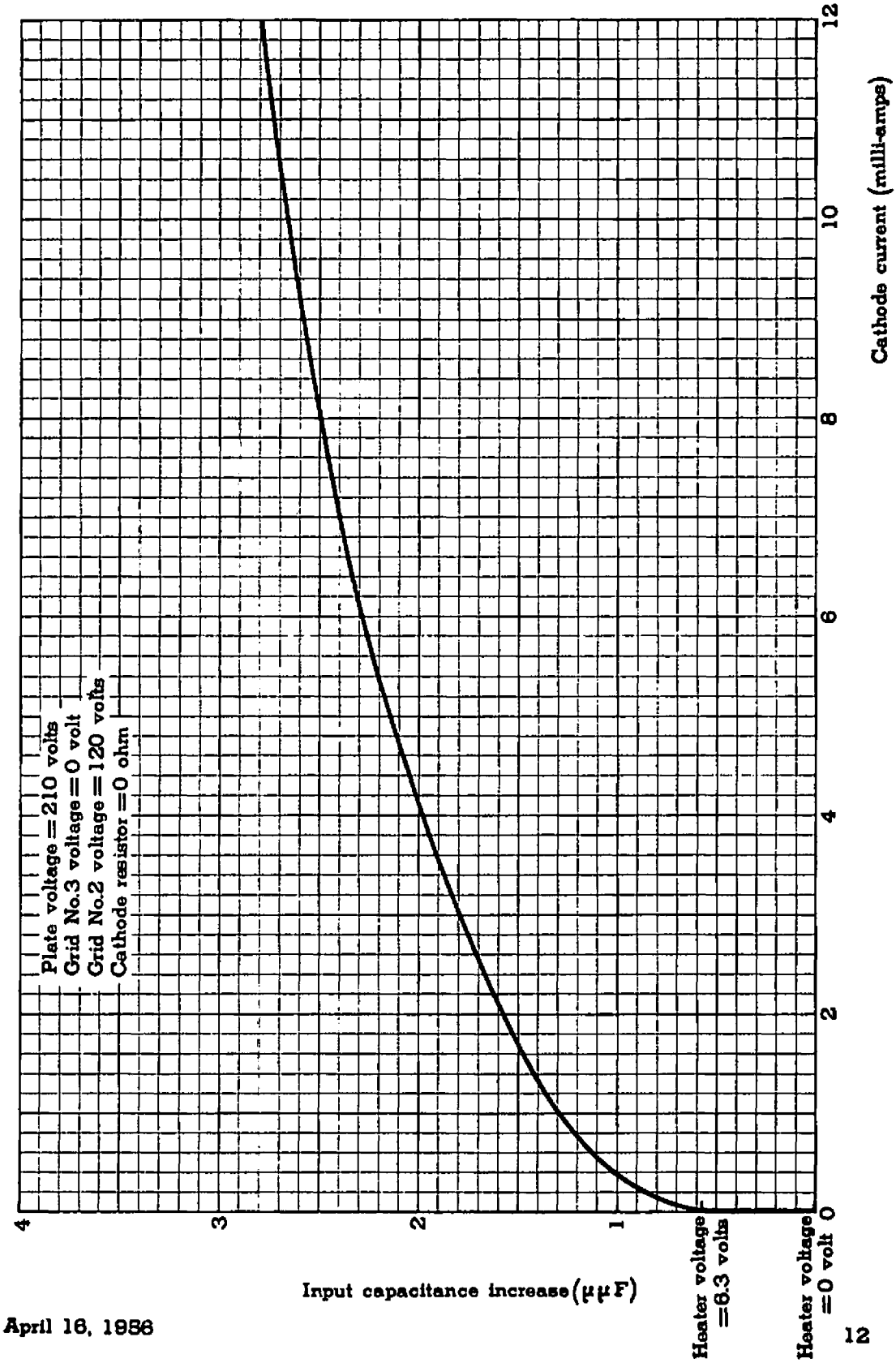

Input A.F. voltage (volts,rms)
1.5
1
0.5
0
30
20
10
0
Distortion (percents)
1000
800
600
400
200
0
Power output (milli-watts)
Plate supply voltage = 210 volts
Grid No2 supply voltage = 120 volts
Grid No.2 series resistor = 5600 ohms
Cathode resistor = 180 ohms
A.C. load resistance = 20 000 ohms
Input source impedance = 0.33 megohm
Input A.F. voltage
Plate current
Distortion
Grid No.2 current
15
10
5
0
Currents (milli-amps)


Input A.F. voltage (volts,rms)
1.5
1
0.5
0
30
20
10
0
Distortion (percents)
500
400
300
200
100
0
Power output (milli-watts)
Plate supply voltage = 120 volts
Grid No.2 supply voltage = 120 volts
Grid No.2 series resistor = 5600 ohms
Cathode resistor = 180 ohms
A.C. load resistance = 10 000 ohms
Input source impedance = 0.33 megohm
Plate current
Input A.F. voltage
Distortion
Grid No.2 current
15
10
5
0
Currents (milli-amps)

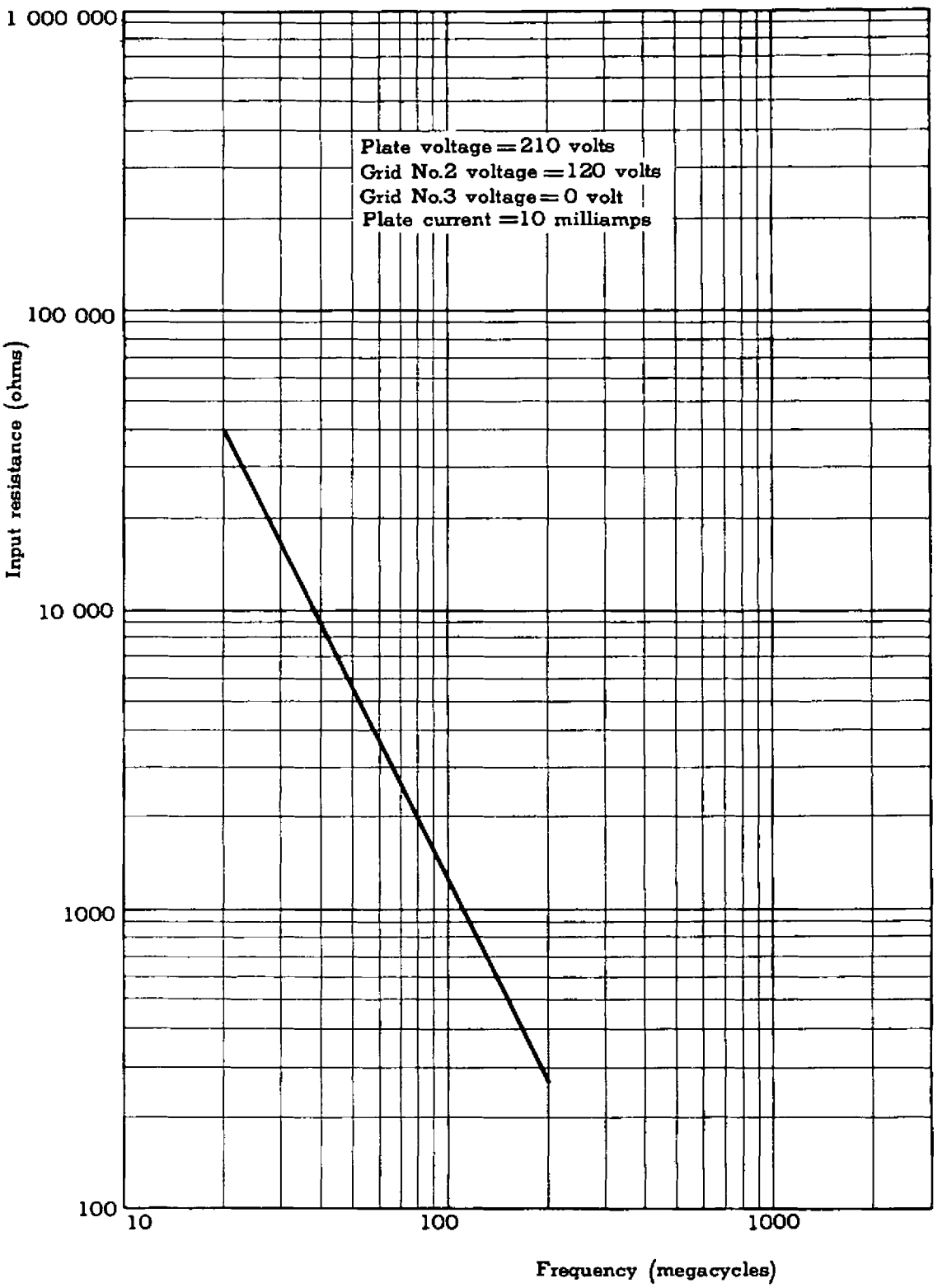

Plate supply voltage = 210 volts
Grid No.2 supply voltage = 120 volts
Grid No.2 series resistor = 5600 ohms
Cathode resistor = 180 ohms
Source impedance = 0.33 megohm
Plate current at grid No.1 current = +0.3 micro-amp
Grid No.1 current = +0.3 micro-amp
Distortion = 10%
= 5%
= 2.5%
= 1%
Grid No.2 current at grid No.1 current = +0.3 micro-amp
Power output (milliwatts)
Currents (milli-amps)
A.C. load resistance (ohms)
1200
1000
800
600
400
200
0
12
10
8
6
4
2
0
1000
10 000
100 000

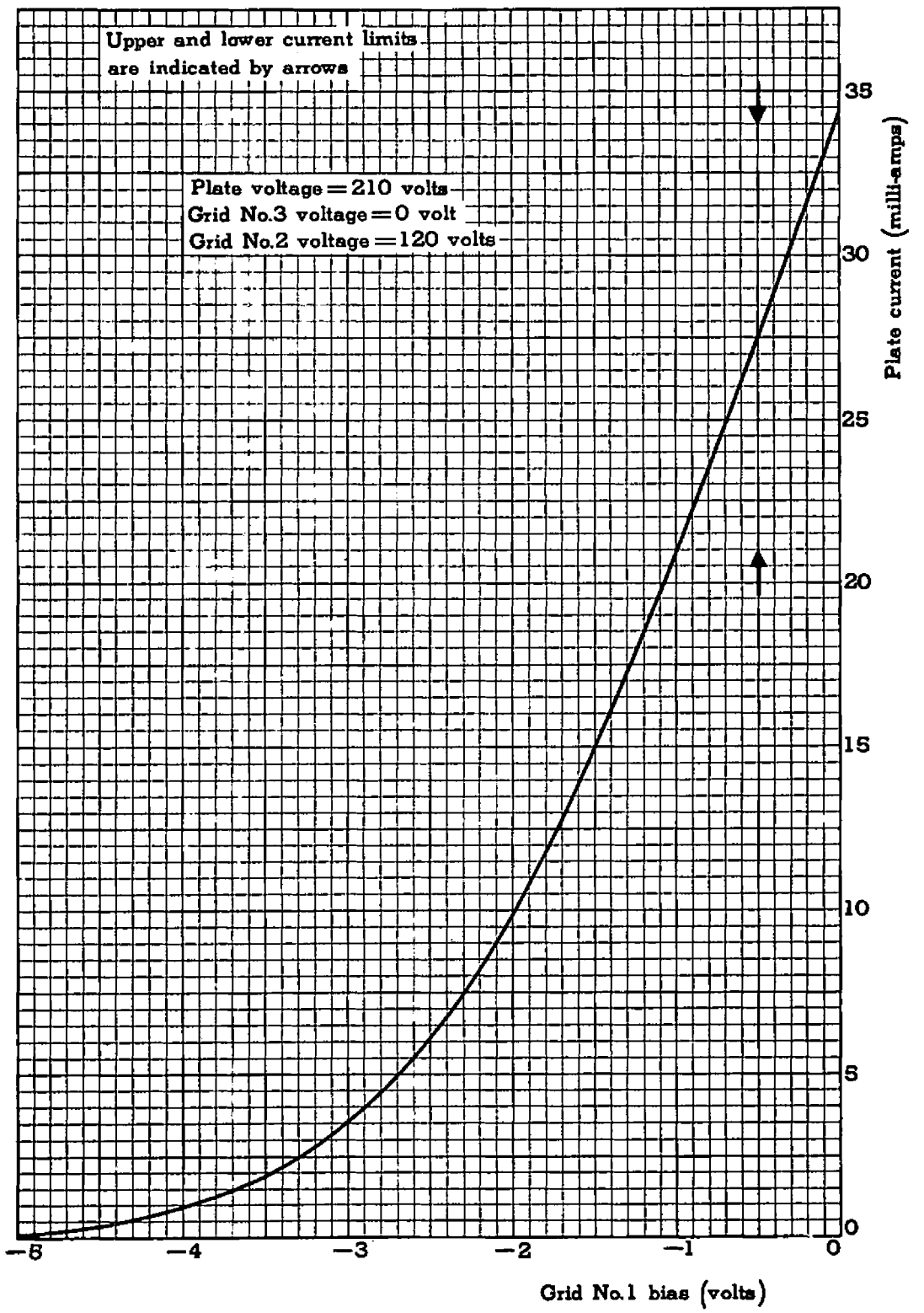

Plate supply voltage = 120 volts
Grid No.2 supply voltage = 120 volts
Grid No.2 series resistor = 5600 ohms
Cathode resistor = 180 ohms
Source impedance = 0.33 megohm
Plate current at grid No.1 current = 0.3 micro-amp
Grid No.1 current = +0.3 micro-amp
Distortion = 10%
= 5%
= 2.5%
= 1%
Grid No.2 current at grid No.1 current = +0.3 micro-amp
Power output (milliwatts)
Currents (milli-amps)
A.C. load resistance (ohms)
600
500
400
300
200
100
0
12
10
8
6
4
2
0
1000
10 000
100 000


Plate voltage = 210 volts
Grid No.2 voltage = 120 volts
Grid No.3 voltage = 0 volt
Cross modulation = 1 percent
Hum modulation = 1 percent
Input voltage (millivolts,rms)
1000
100
10
1
1
10
100
1000
10 000
Transconductance (micromhos)



April 16, 1936


1 000 000
100 000
10 000
1000
100
Input resistance (ohms)
Plate voltage = 210 volts
Grid No.2 voltage = 120 volts
Grid No.3 voltage = 0 volt
Plate current = 10 milliamps
10
100
1000
Frequency (megacycles)


Upper and lower current limits are indicated by arrows
Plate voltage = 210 volts
Grid No.3 voltage = 0 volt
Grid No.2 voltage = 120 volts
35
30
25
20
15
10
5
0
Plate current (milli-amps)
−5
−4
−3
−2
−1
0
Grid No.1 bias (volts)

Rogers Electronic Tubes & Components

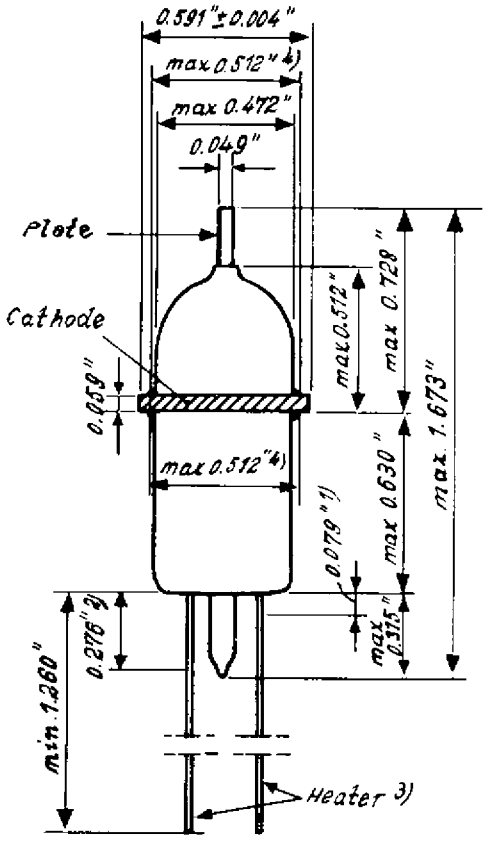
6923

Description: Measuring diode for frequencies up to 1000 Mc

Mechanical data

Cathode	coated, unipotential
Mounting position	any

Eccentricity of the plate pin with respect to the cathode connection 0.01" max. In order to avoid strain the connections to the cathode should be made elastically



---

1) This part of the leads should not be bent

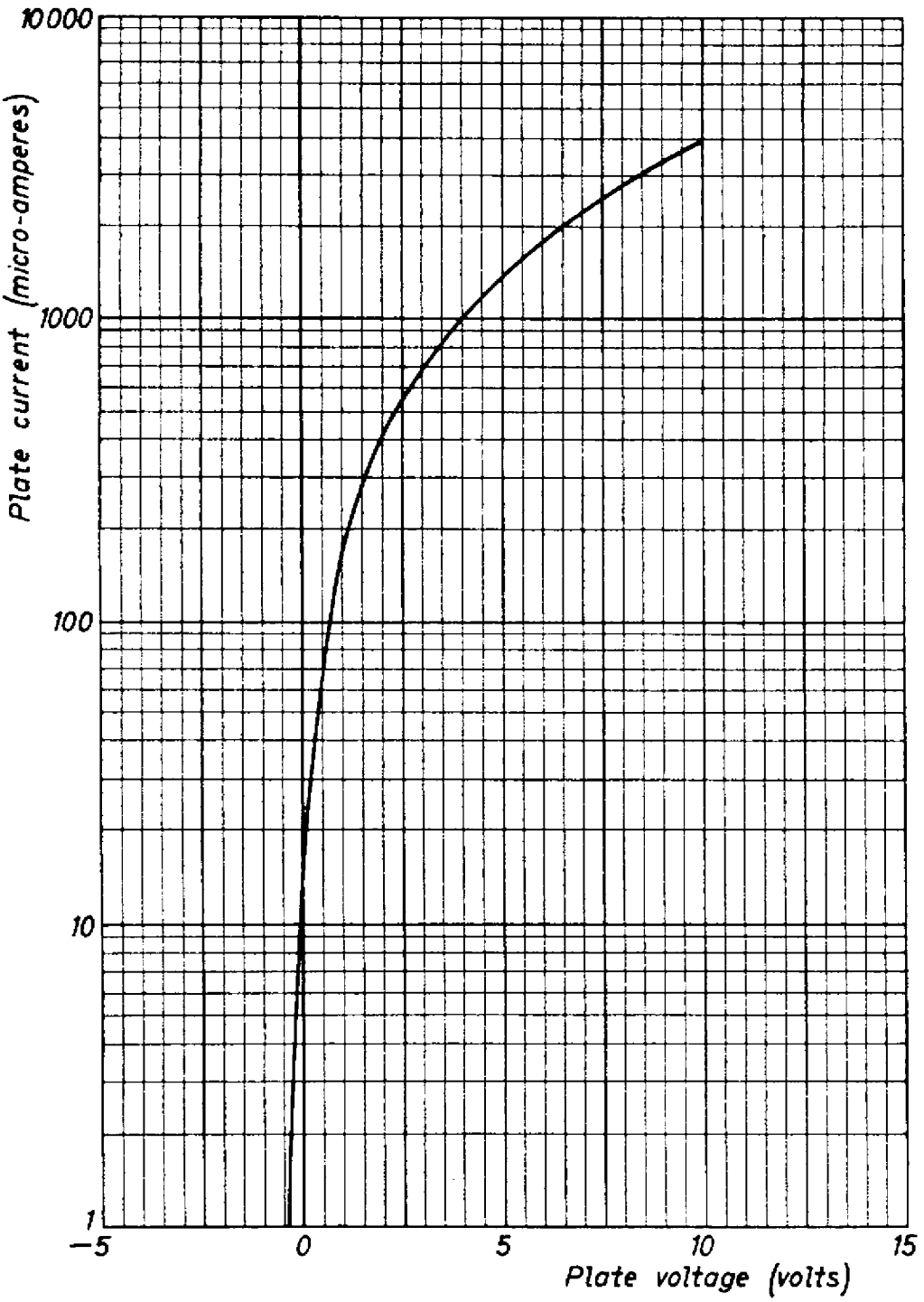
2) This part of the leads should not be soldered

3) Cadmiated lead; diameter 0.0158"

4) Maximum diameter of the glass seal

Heater data		
Heater voltage	6.3	volts
Heater current	300	mamps
Capacitance		
Between plate and cathode	max. 0.5	µµF
Ratings (Absolute limits)		
Peak inverse plate voltage at frequencies below 100 Mc	1000	volts max.
Peak inverse plate voltage at frequencies higher than 100 Mc	$\frac{100}{f}$ x 1000	volts max.[5]
Cathode current	300	µamps max.
Peak cathode current	5	mamps max.
Voltage between heater and cathode	50	volts max.
Circuit resistance between heater and cathode	20 000	ohms max.
Heater voltage	7.0	volts max.
Heater voltage	5.6	volts min.
Typical characteristics		
Plate voltage at plate current = 0.5 mamps	3	volts max.
Insulation resistance between plate and cathode	10 000	megohms min.

[5]) f = frequency in Mc


10000
1000
100
10
1
Plate current (micro-amperes)
−5
0
5
10
15
Plate voltage (volts)

ROGERS 6AL3

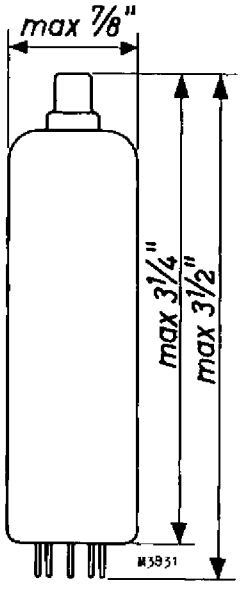
BOOSTER DIODE

Booster diode for use in line-timebase circuits for television receivers.

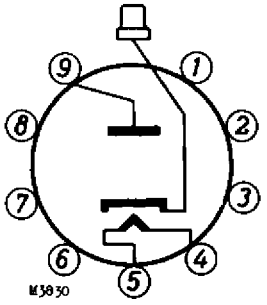
MECHANICAL DATA

Cathode	coated, unipotential
Base	E9-1
Bulb	T6 1/2
Outline	see drawing
Basing	9CB
Top cap	C1-2
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	internally
2	connected; do
3	not use
4	heater
5	heater
6	internally
7	connected; do
8	not use
9	anode
Top cap	cathode

from JEDEC release #2684, Jan. 4, 1960

HEATER DATA	
Heater voltage	6.3 volts
Heater current	1.55 amps
DIRECT INTERELECTRODE CAPACITANCES	
Plate to all other elements	8.6 µµF
Cathode to heater	2.0 µµF
MAXIMUM RATINGS (Design Center Values)	
Supply voltage without current	550 volts max.
Supply voltage	250 volts max.
Plate current	220 mamps max.
Peak plate current	550 mamps max.
Plate dissipation	5 watts max.
Peak negative plate voltage	6000 volts max.[1)][2)]
Peak voltage between heater and cathode	6600 volts max.[1)]

[1)] Max. pulse duration 22% of a cycle with a max. of 18 µsec.

[2)] Absolute maximum ratings 7500 volts.

from JETEC release #1504, Aug. 15, 1955
sponsor: Rogers Majestic Electronics Ltd.

6 AQ8

DOUBLE TRIODE for use as R.F. amplifier and self-oscillating mixer

PHYSICAL SPECIFICATIONS

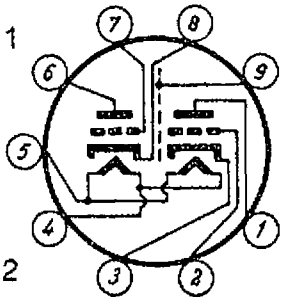
Cathode	Coated unipotential
Base	Small button noval 9-pin
Maximum overall length	2 3/16 inches
Maximum seated height	1 15/16 inches
Bulb length excluding tip	1 9/16±3/32 inches
Maximum diameter	7/8 inch
Mounting position	any
Basing connections- JETEC basing designation	9 DE

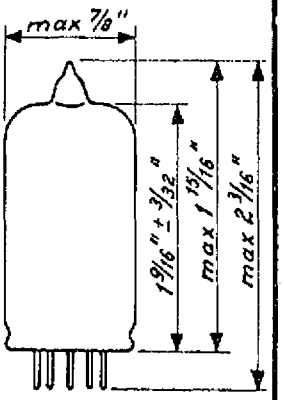
Pin 1 - Plate
Pin 2 - Grid
Pin 3 - Cathode
} Triode section 1

Pin 4 - Heater
Pin 5 - Heater

Pin 6 - Plate
Pin 7 - Grid
Pin 8 - Cathode
} Triode section 2

Pin 9 - Internal shield





GENERAL ELECTRICAL DATA

Heater voltage	6.3 volts
Heater current	0.435 ampere

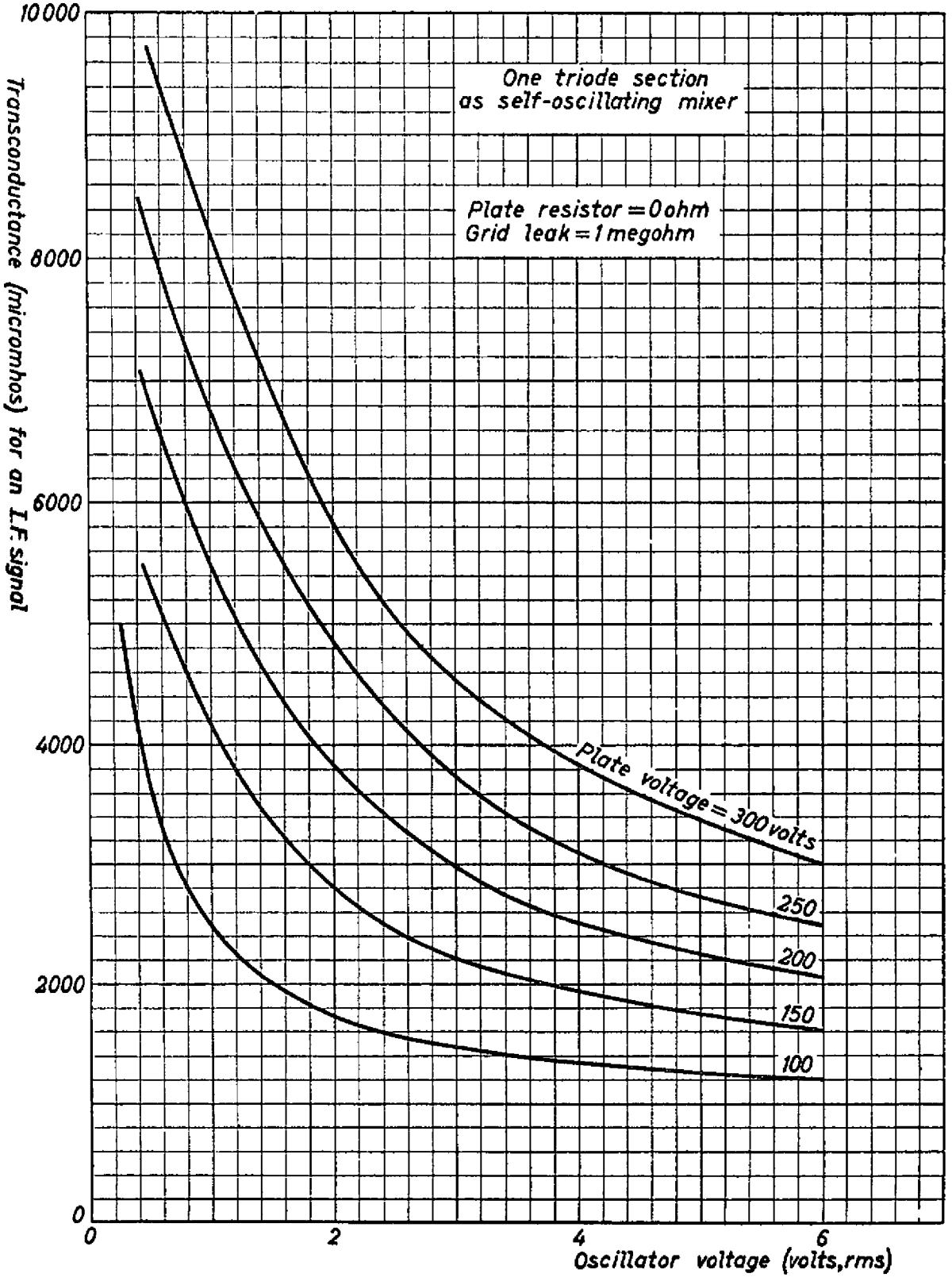
Direct Interelectrode Capacitances

Triode section 1

Plate to grid	1.5 µµF
Plate to cathode	0.18 µµF
Grid to cathode + heater + shield	3.0 µµF
Plate to cathode+ heater + shield	1.2 µµF
Plate to cathode+ heater + shield*)	1.9 µµF

*) With external shielding can with diameter of 0.886"

6AQ8


One triode section
as self-oscillating mixer
Plate resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage = 300 volts
250
200
150
100
Transconductance (micromhos) for an I.F. signal
10000
8000
6000
4000
2000
0
0
2
4
6
Oscillator voltage (volts, rms)

6 AQ8

Triode section 2

Plate to grid	1.5	µµF
Plate to cathode	0.18	µµF
Grid to cathode + heater + shield	3.0	µµF
Plate to cathode + heater + shield	1.2	µµF
Plate to cathode + heater+shield*)	1.9	µµF

Between triode section 1 and triode section 2

Plate to plate	max. 0.04	µµF
Plate to plate*)	max.0.008	µµF
Grid to grid	max.0.003	µµF
Plate section 1 to grid section 2	max.0.008	µµF
Plate section 2 to grid section 1	max.0.008	µµF
Plate section 1 to cathode section 2	max.0.008	µµF
Plate section 2 to cathode section 1	max.0.008	µµF
Grid section 1 to cathode section 2	max.0.003	µµF
Grid section 2 to cathode section 1	max.0.003	µµF

Maximum ratings (design center values; each section)

Plate voltage	max.	300	volts
Plate voltage without current	max.	550	volts
Plate dissipation	max.	2.5	watts
Plate dissipation of both sections together	max.	4.5	watts
Cathode current	max.	15	mamps
Negative grid bias	max.	100	volts
External resistance between grid and cathode	max.	1	megohm
External resistance between cathode and heater	max.	20 000	ohms
Voltage between cathode and heater	max.	90	volts

Typical characteristics (each section)

Plate voltage	250	volts
Negative grid bias	-2.3	volts
Plate current	10	mamps
Transconductance	5900	micromhos
Amplification factor	57	

*) With external shielding can with diameter of 0.886"

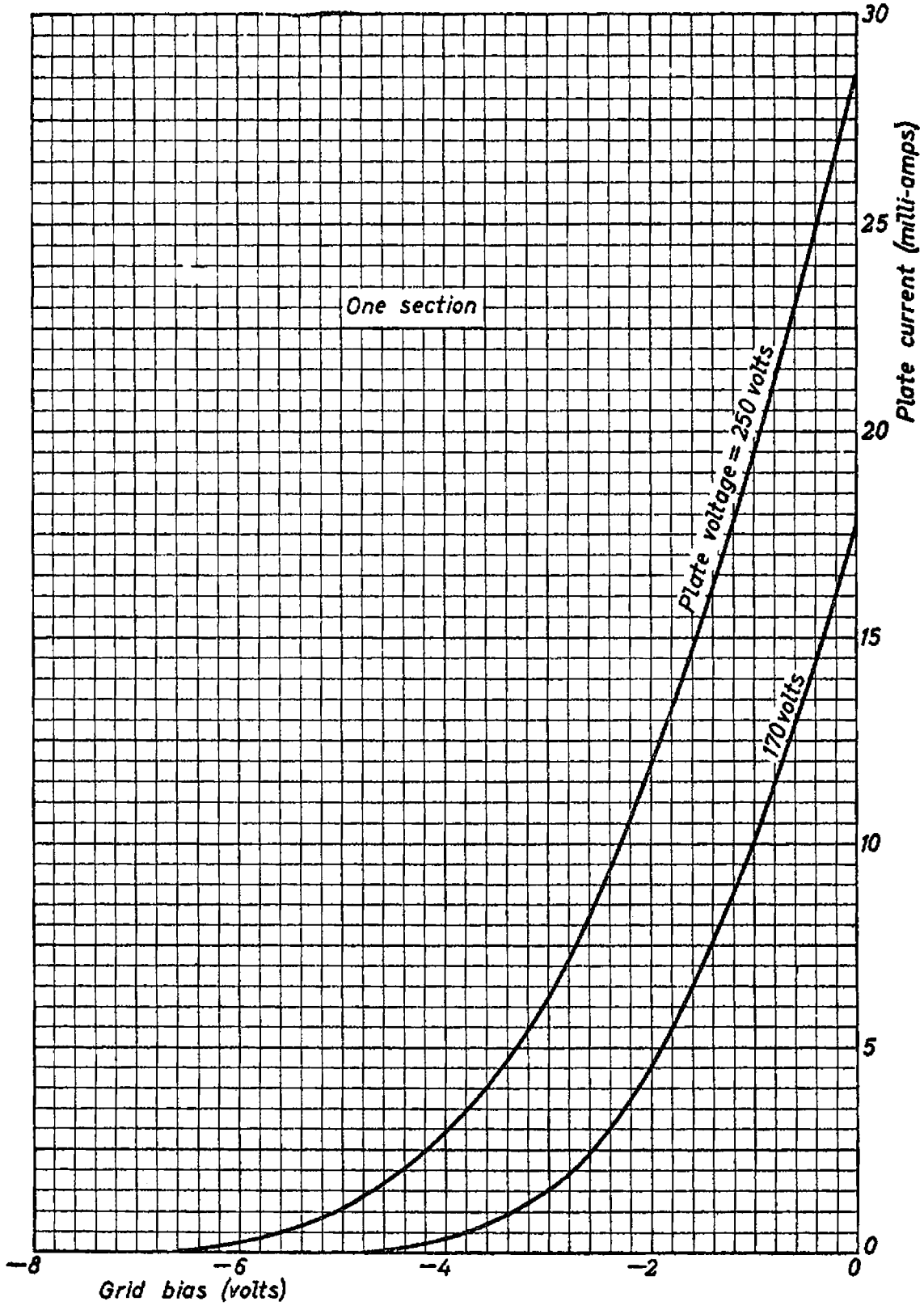
Operating characteristics as R.F. amplifier in FM/AM receivers

Supply voltage	250 volts
Plate series resistor	1800 ohms
Plate voltage	230 volts
Cathode resistor	200 ohms
Plate current	10 m amps
Negative grid bias	-2 volts
Transconductance	6000 micromhos
Internal resistance	9700 ohms
Input resistance at 100 Mc	6000 ohms
Equivalent noise resistance	500 ohms

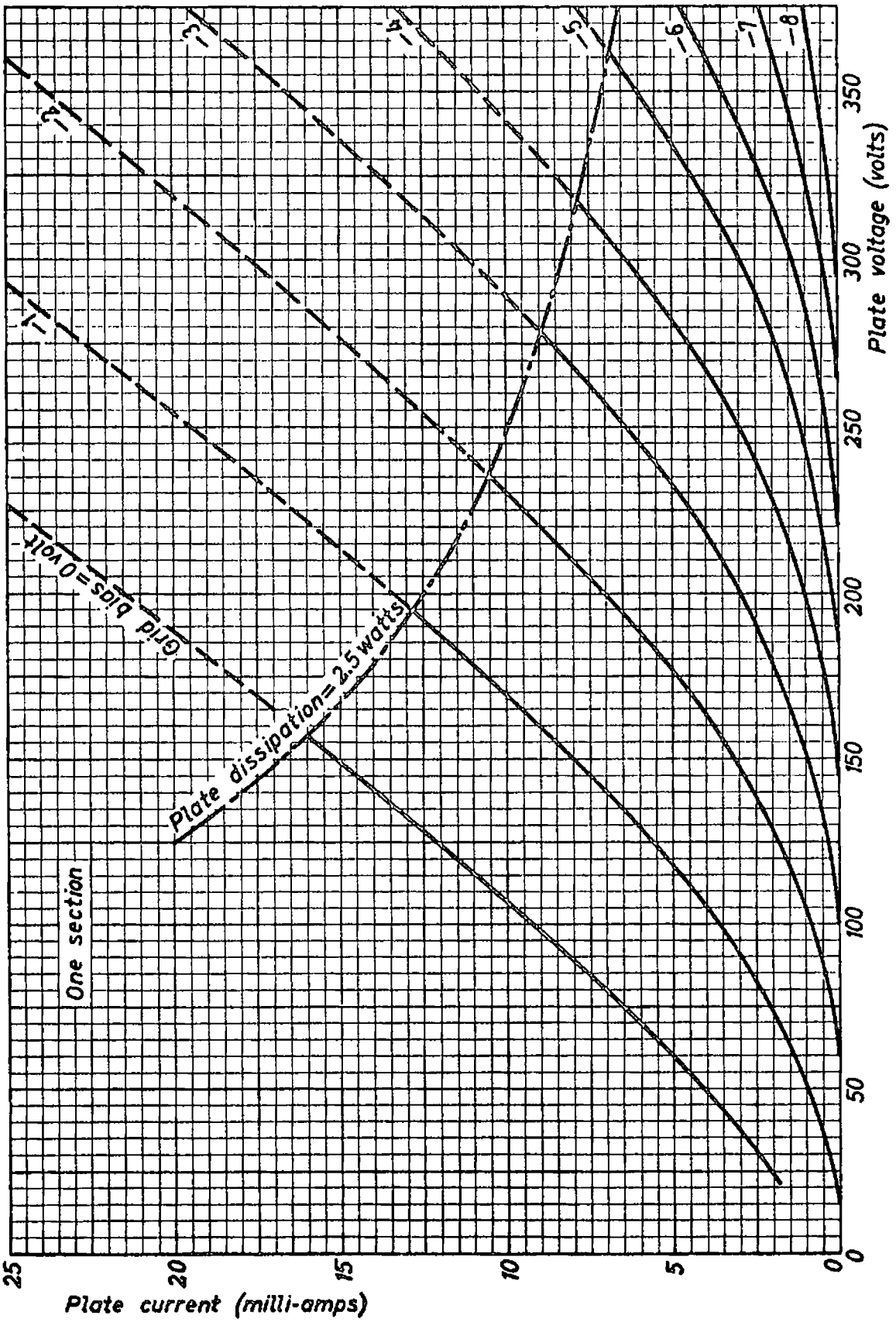
Operating characteristics as self-oscillating mixer in FM/AM receivers

Supply voltage	250 volts
Plate resistor	12000 ohms
Grid leak	1 megohm
Oscillator voltage	3 volts,rms
Plate current	5.2 m amps
Conversion conductance	2300 micromhos
Internal resistance	22 000 ohms
Input resistance at 100 Mc	15 000 ohms

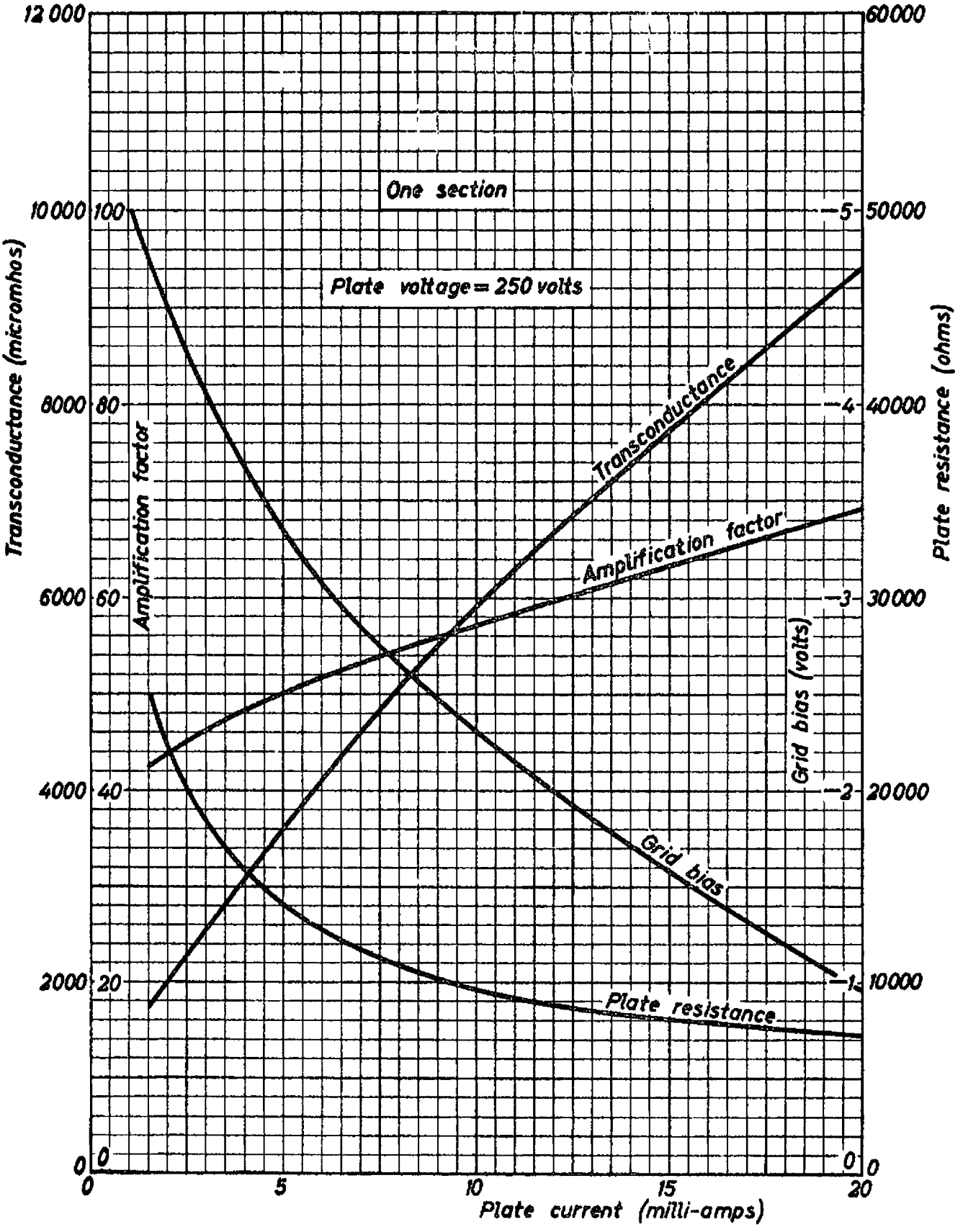
6AQ8


One section
Plate voltage = 250 volts
170 volts
Plate current (milli-amps)
30
25
20
15
10
5
0
−8
−6
−4
−2
0
Grid bias (volts)

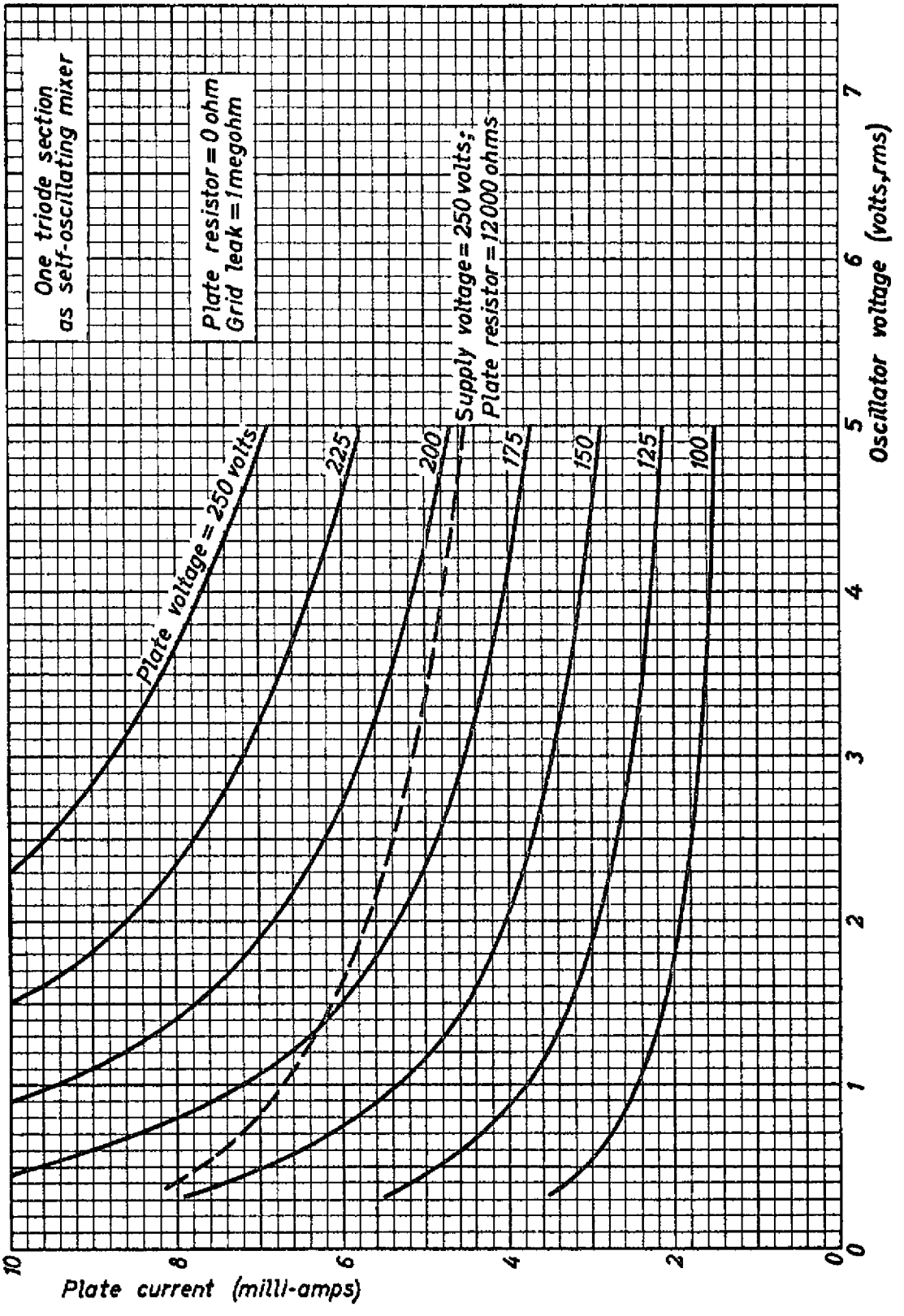
6AQ8


Plate voltage (volts)
350
300
250
200
150
100
50
0
Plate current (milli-amps)
25
20
15
10
5
0
-3
-4
-5
-6
-7
-8
-2
-1
Grid bias=0 volts
Plate dissipation=2.5 watts
One section

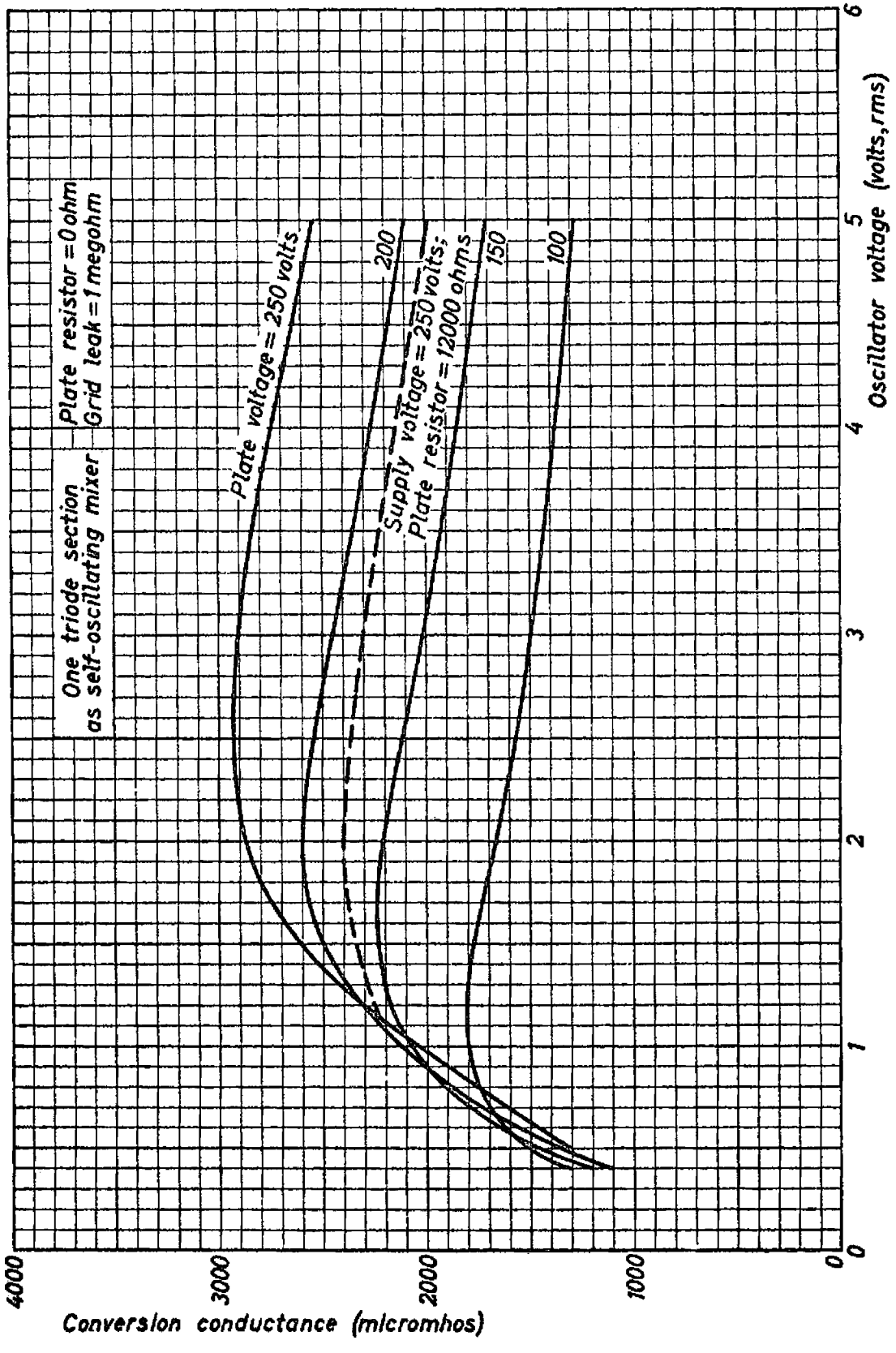
6AQ8


One section
Plate voltage = 250 volts
Transconductance (micromhos)
Amplification factor
Plate resistance (ohms)
Grid bias (volts)
Transconductance
Amplification factor
Grid bias
Plate resistance
Plate current (milli-amps)
12 000
10 000
8000
6000
4000
2000
0
100
80
60
40
20
0
60000
50000
40000
30000
20000
10000
0
-5
-4
-3
-2
-1
0
5
10
15
20

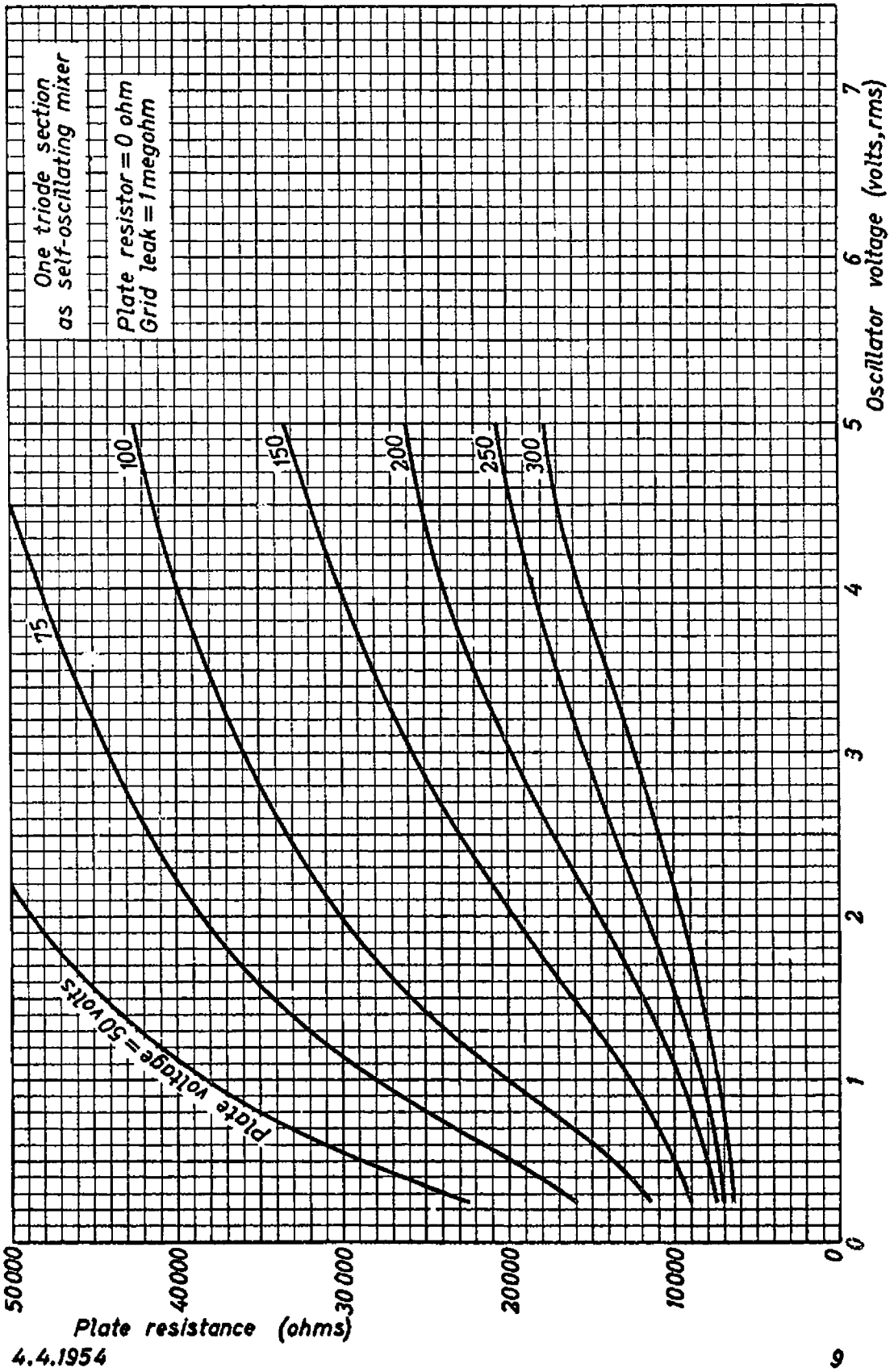
6AQ8


One triode section
as self-oscillating mixer
Plate resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage = 250 volts
225
200
Supply voltage = 250 volts;
Plate resistor = 12000 ohms
175
150
125
100
Plate current (milli-amps)
Oscillator voltage (volts, rms)
0
2
4
6
8
10
0
1
2
3
4
5
6
7

6AQ8


One triode section
as self-oscillating mixer
Plate resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage = 250 volts
200
Supply voltage = 250 volts;
Plate resistor = 12000 ohms
150
100
Conversion conductance (micromhos)
4000
3000
2000
1000
0
0
1
2
3
4
5
6
Oscillator voltage (volts, rms)

6AQ8


One triode section
as self-oscillating mixer
Plate resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage = 50 volts
75
100
150
200
250
300
0
10000
20000
30000
40000
50000
Plate resistance (ohms)
0
1
2
3
4
5
6
7
Oscillator voltage (volts, rms)

from JETEC release #1746, Sept. 24, 1956
sponsor: Rogers Majestic Electronics, Ltd.

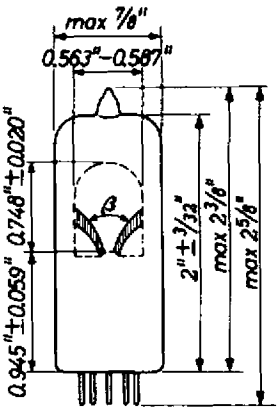
6BR5

ELECTRON-RAY TUNING INDICATOR

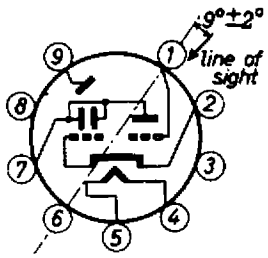
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
Mounting position	Any
RETMA basing designation	9DB

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No	ELEMENT
1	Grid
2	Cathode
3	Internal connection
4	Heater
5	Heater
6	Internal connection
7	Plate, Ray control electrode
8	Internal connection
9	Target

ELECTRICAL DATA

HEATER DATA

Heater voltage	6.3 volts
Heater current	0.3 amp

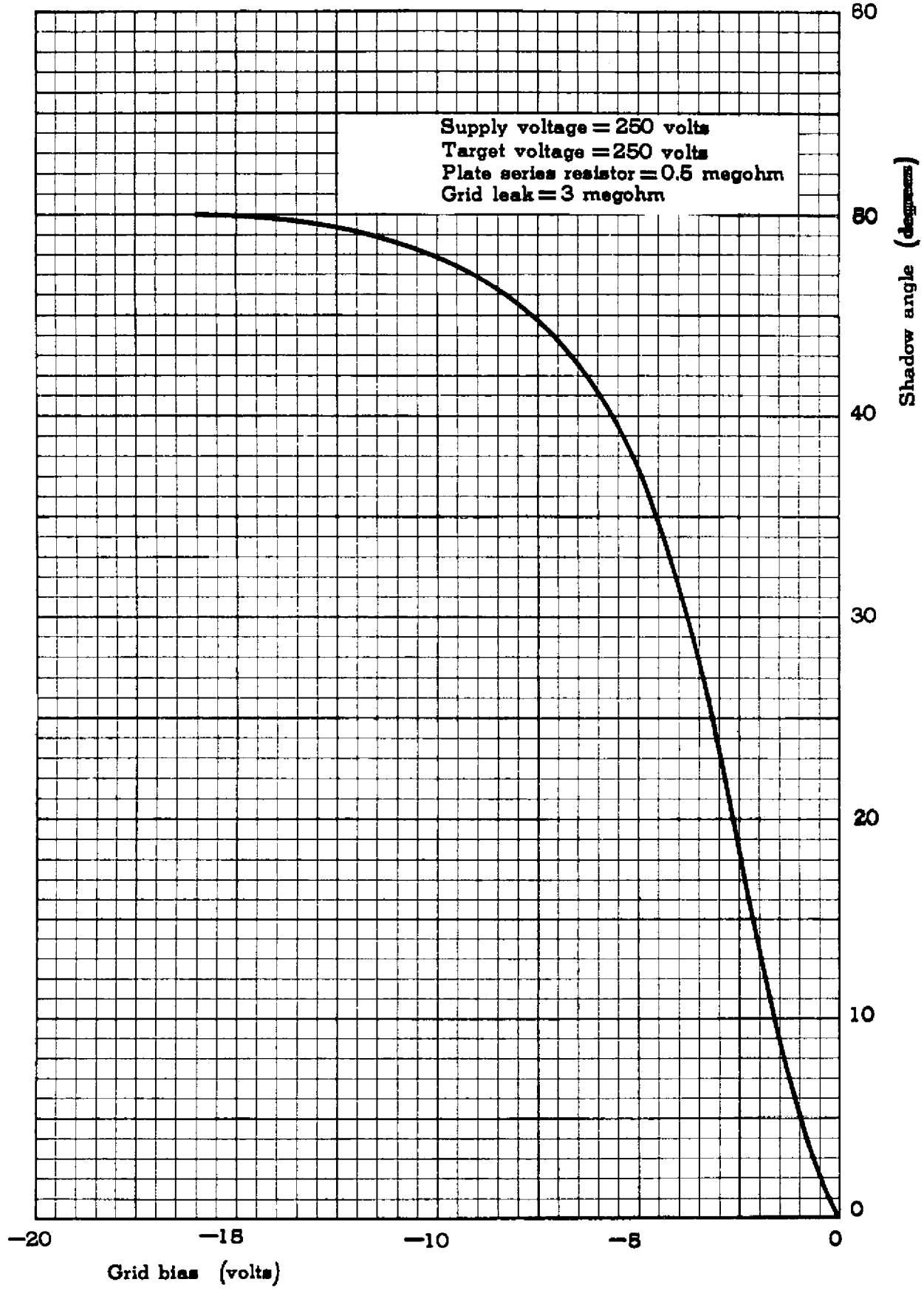
RATINGS (Design Center Values)

Plate voltage	300 volts max.
Plate voltage without current	550 volts max.
Plate dissipation	0.2 watt max.
Target voltage	300 volts max.
Target voltage	165 volts min.
Target voltage without current	550 volts max.
Cathode current	3 mamps max.
Grid circuit resistance	3 megohms max.
Voltage between cathode and heater	100 volts max.
Circuit resistance between cathode and heater	20 000 ohms max.

OPERATING CONDITIONS

Supply voltage	250		volts
Target voltage	250		volts
Plate series resistor	0.5		megohm
Grid series resistor	3		megohms
Negative grid bias	-1	-14	volts
Light sector on target	5	50	degrees
Plate current	0.37	0.01	mamp
Target current	2	2.3	mamps

6BR5


Supply voltage = 250 volts
Target voltage = 250 volts
Plate series resistor = 0.5 megohm
Grid leak = 3 megohm
60
50
40
30
20
10
0
Shadow angle (degrees)
−20
−15
−10
−5
0
Grid bias (volts)

Information Release

Tube & Component Division

ROGERS MAJESTIC ELECTRONICS LIMITED

TECHNICAL INFORMATION CENTRE

LEASIDE (TORONTO 17) ONTARIO

File

Release 1254

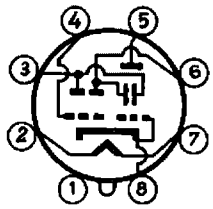
ROGERS 6CD7

ELECTRON-RAY TUNING INDICATOR with triode unit and two indicating sectors of different sensitivity

PHYSICAL SPECIFICATIONS

Cathode	Coated unipotential
Base	Octal 8 pin
Bulb	Tubular bulb; diameter 1 3/32" max.
Maximum overall length	3 19/32"
Maximum seated height	3 1/32"
Maximum diameter	1 3/32"
Basing connections-JETEC basing designation	8 EV

Pin 1 - not connected
Pin 2 - heater
Pin 3 - plate No.1
deflection rod No.1
Pin 4 - control grid
Pin 5 - target
Pin 6 - plate No.2
deflection rod No.2
Pin 7 - heater
Pin 8 - cathode



Bottom view

GENERAL ELECTRICAL DATA

Heater voltage	6.3 volts
Heater current	0.2 amp

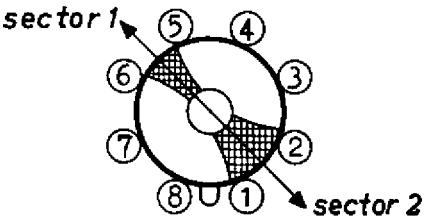
MAXIMUM RATINGS (Design Center Values)

Plate No.1 voltage (cold condition)	550 volts
Plate No.1 voltage	300 volts
Plate No.2 voltage (cold condition)	550 volts
Plate No.2 voltage	300 volts
Target voltage (cold condition)	550 volts
Target voltage	300 volts
Grid current starting point. Grid voltage when grid current is 0.3 μamp.	-1.3 volts
Grid circuit resistance	3 megohms
Heater-cathode voltage	100 volts
External resistance between heater and cathode	20,000 ohms

from RETMA release #1254, Nov. 6, 1953

6CD 7 ROGERS

OPERATING CHARACTERISTICS



Position of the shadow sectors (top view)

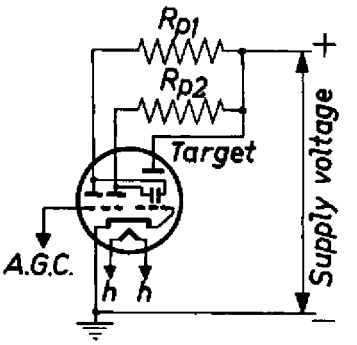
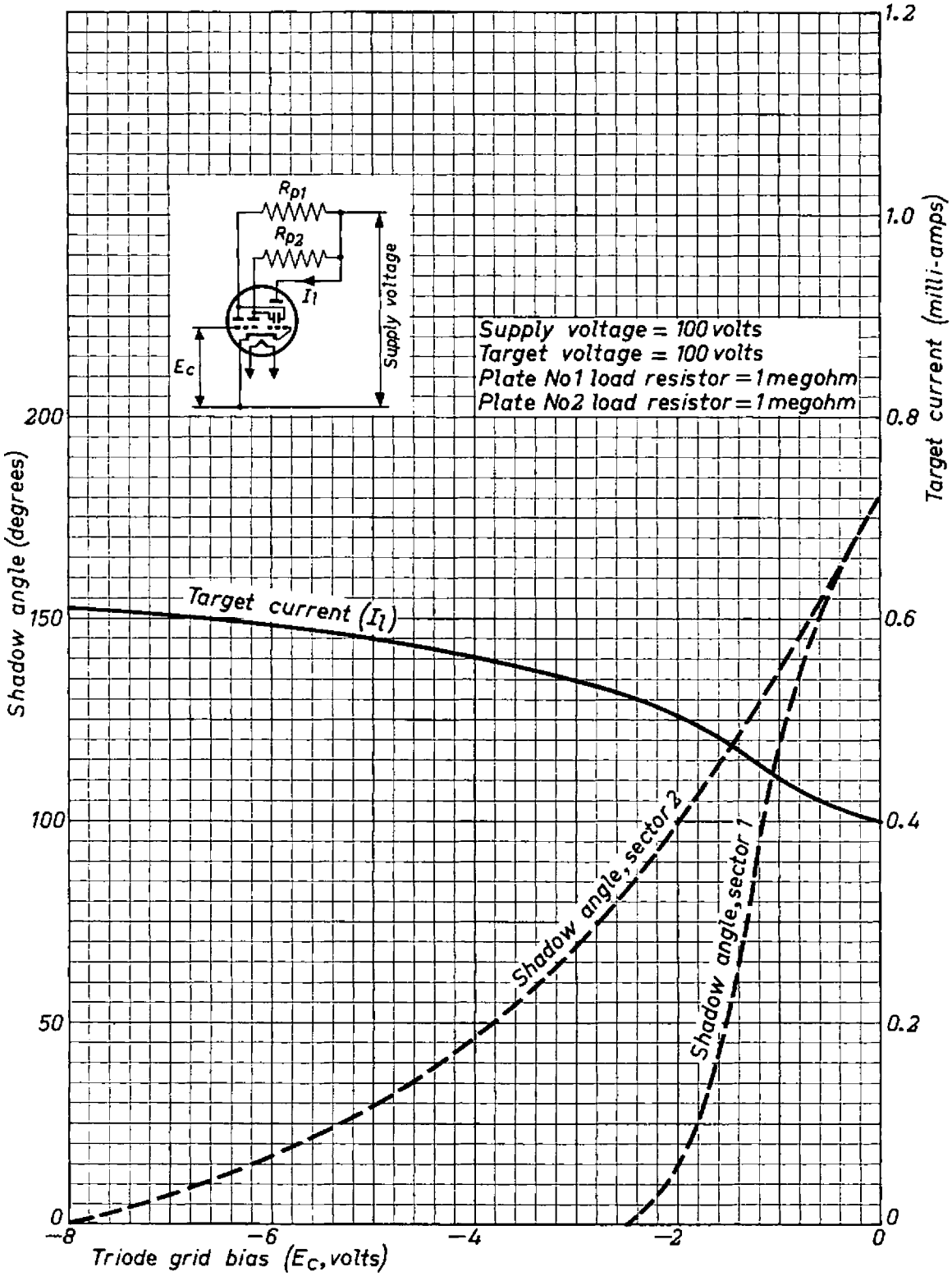


Plate and target supply voltage	100	200	250	volts
Series resistor of plate No.1	1.0	1.0	1.0	megohm
Series resistor of plate No.2	1.0	1.0	1.0	megohm
Target current approx.	0.4	1.4	2.0	mamps
Triode grid voltage (for section No.1)				
for minimum shadow angle	−2.5	−4.2	−5	volts
for shadow angle of 180°	0	0	0	volt
(for section No.2)				
for minimum shadow angle	−8	−12.5	−16	volts
for shadow angle of 180°	0	0	0	volt

ROGERS

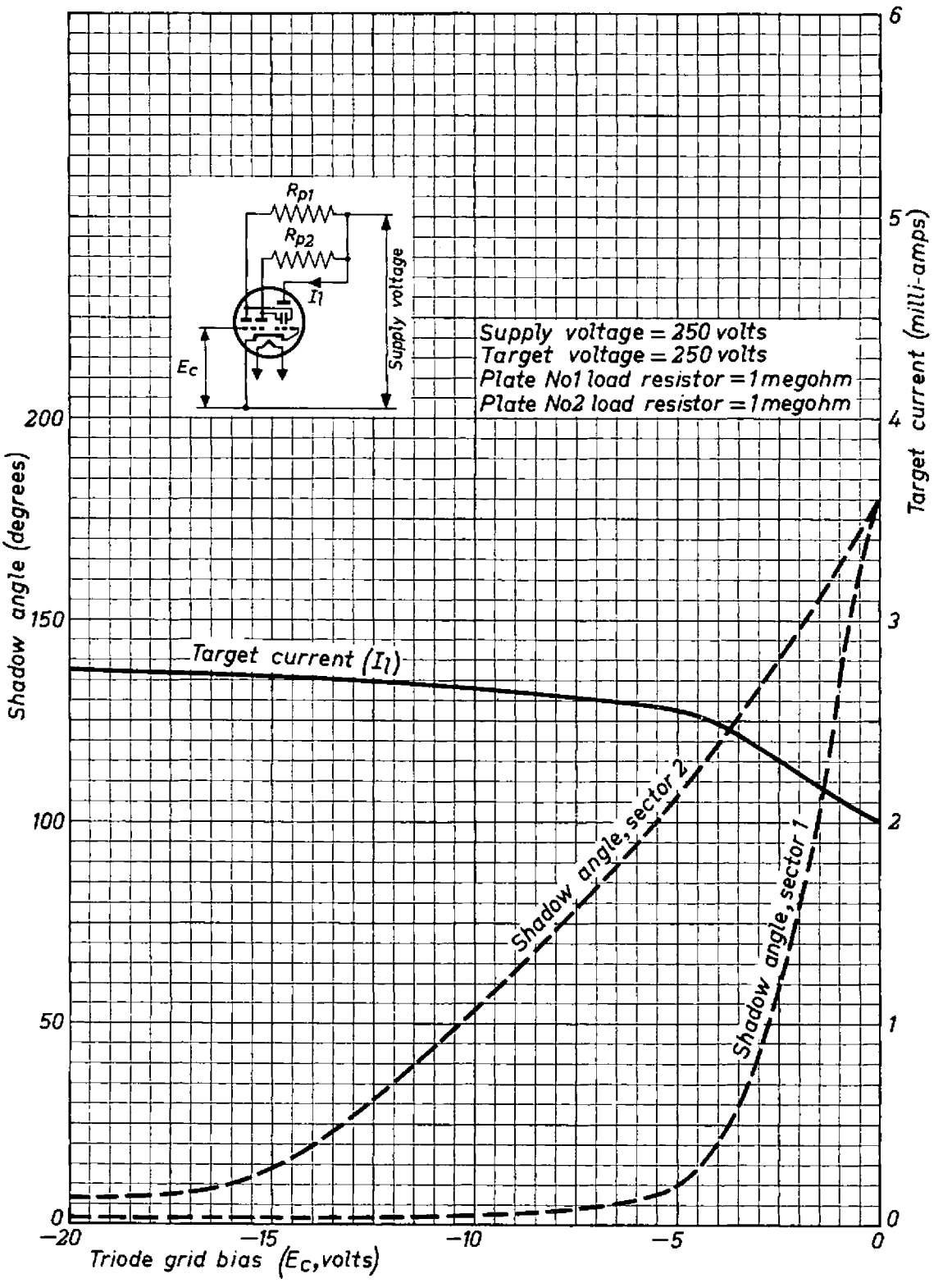
6CD7



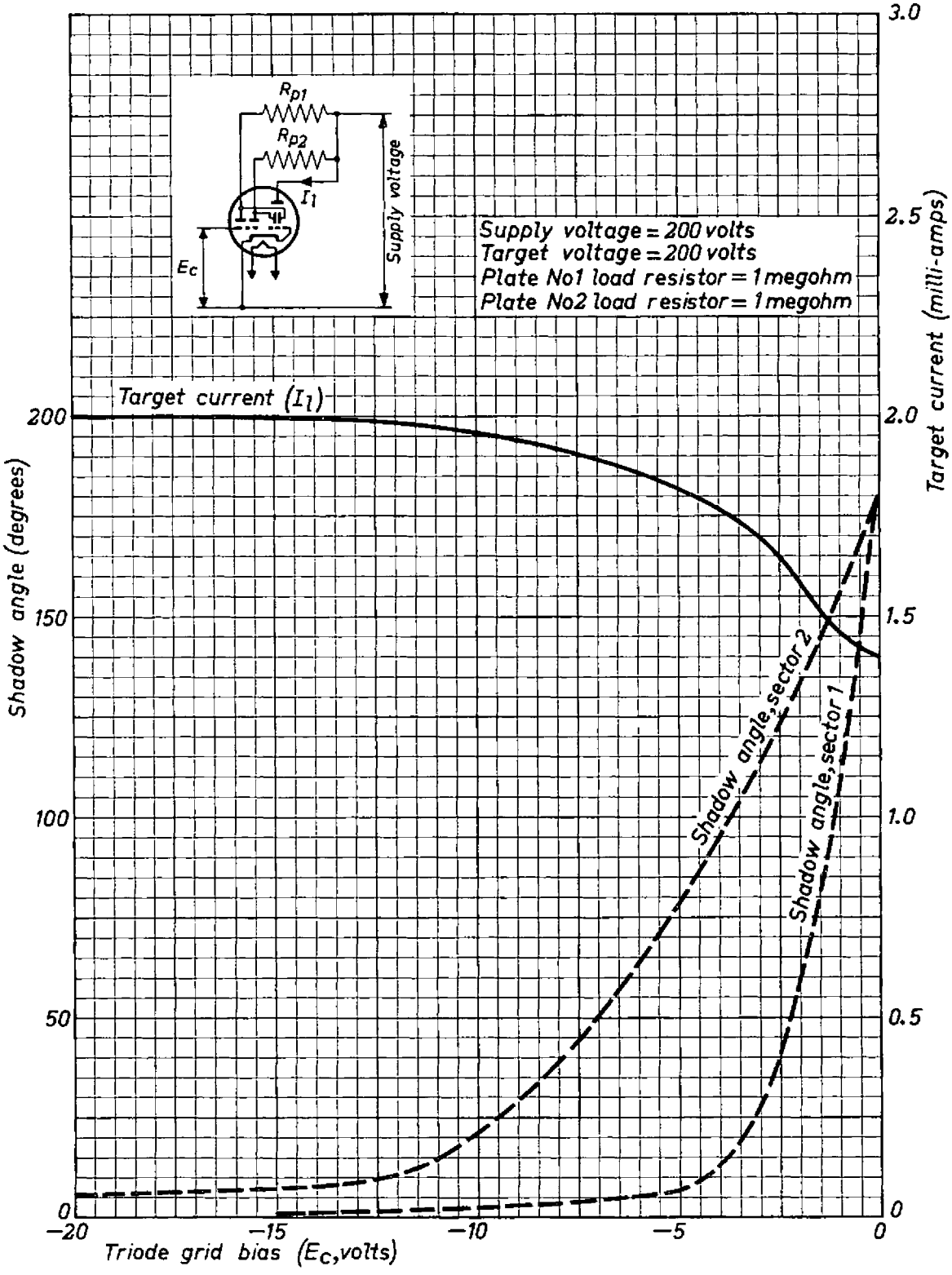
2.2.1953

ROGERS

6CD7


Rp1
Rp2
I1
Ec
Supply voltage
Supply voltage = 250 volts
Target voltage = 250 volts
Plate No1 load resistor = 1 megohm
Plate No2 load resistor = 1 megohm
Target current (I1)
Shadow angle, sector 2
Shadow angle, sector 1
Shadow angle (degrees)
Target current (milli-amps)
Triode grid bias (Ec, volts)
200
150
100
50
0
6
5
4
3
2
1
0
−20
−15
−10
−5
0

6CD7 ROGERS


R_{p1}
R_{p2}
I_1
E_c
Supply voltage
Supply voltage = 200 volts
Target voltage = 200 volts
Plate No1 load resistor = 1 megohm
Plate No2 load resistor = 1 megohm
Target current (I_1)
Shadow angle, sector 2
Shadow angle, sector 1
Shadow angle (degrees)
Target current (milli-amps)
Triode grid bias (E_c, volts)
200
150
100
50
0
3.0
2.5
2.0
1.5
1.0
0.5
0
−20
−15
−10
−5
0

from JETEC release #1737, Sept. 17, 1956
sponsor: Rogers Majestic Electronics, Ltd.

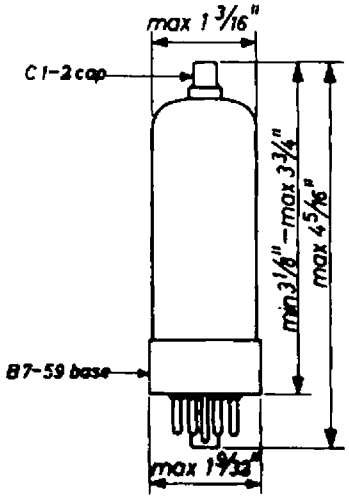
6CM5

OUTPUT PENTODE for use as line output tube in television re-receivers.

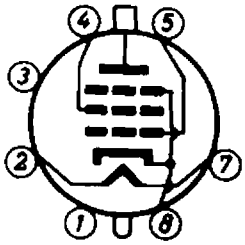
MECHANICAL DATA

Cathode	Coated unipotential
Base	B7-59
Bulb	T9
Mounting position	Any
RETMA basing designation	8GT
Top cap	C1-2

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Internal connection
2	Heater
3	Internal connection
4	Grid No.2
5	Grid No.1
7	Heater
8	Cathode, grid No.3
Top	Plate

ELECTRICAL DATA

HEATER DATA

Heater voltage		6.3 volts
Heater current		1.25 amp

DIRECT INTERELECTRODE CAPACITANCES

Grid No.1 to all other elements		17.5 μμF
Plate to all other elements		7.7 μμF
Plate to grid No.1	max.	1.1 μμF

MAXIMUM RATINGS (Design Center Values)

Plate voltage	250 volts[1]
Plate voltage without plate current	550 volts
Peak plate voltage	7000 volts[2]
Peak inverse plate voltage	1500 volts[2]
Plate dissipation	10 watts
Grid No.2 dissipation	5 watts[3]
Plate and grid No.2 dissipation together	13 watts

1) For A.F. class B operation the maximum permissible value of the plate voltage is 300 volts

2)3) See page 2

MAXIMUM RATINGS (continued)

Grid No.2 voltage	250 volts
Grid No.2 voltage without current	550 volts
Peak negative grid No.1 voltage	1000 volts
Cathode current	200 mamps
Grid No.1 circuit resistance	0.5 megohm
Grid No.1 circuit resistance when plate and grid No.2 dissipation together are less than 10 watts	2.2 megohms
Voltage between cathode and heater	100 volts

TYPICAL CHARACTERISTICS

Plate voltage	100 volts
Grid No.2 voltage	100 volts
Grid No.1 voltage	-7.7 volts
Plate current	100 mamps
Grid No.2 current	7.0 mamps
Transconductance	14000 micromhos
Plate resistance	5300 ohms
Amplification factor of grid No.2 with respect to grid No.1	6

OPERATING CONDITIONS AS CLASS B AMPLIFIER. Two tubes

Plate voltage	300 volts
Grid No.2 voltage	150 volts
Grid No.1 voltage	-29 volts
Load resistance, plate to plate	3500 ohms
Input A.F. voltage	20 volts,rms
Zero signal plate current	2x18 mamps
Max. signal plate current	2x100 mamps
Zero signal grid No.2 current	2x0,5 mamp
Max. signal grid No.2 current	2x19 mamps
Max. signal power output	44.5 watts
Total harmonic distortion	7.2 percents

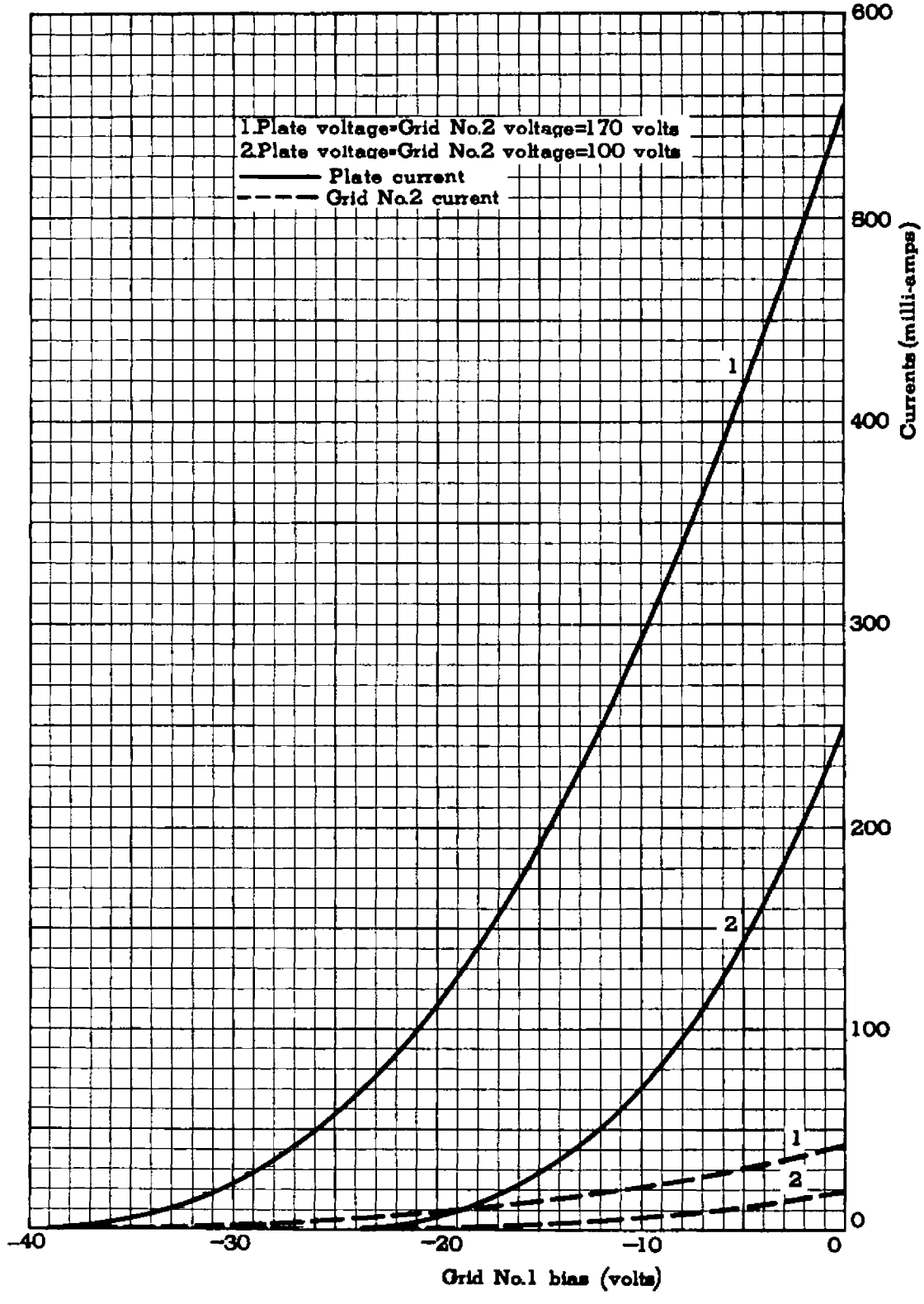
REMARK: On pages 6,7,8 and 9 plate characteristics for nominal new tubes are given. To allow for tube spread and deterioration during life the line output circuit should be designed around a current 25% lower than the values shown on pages 6 and 7 and 20% lower than the values shown on pages 8 and 9

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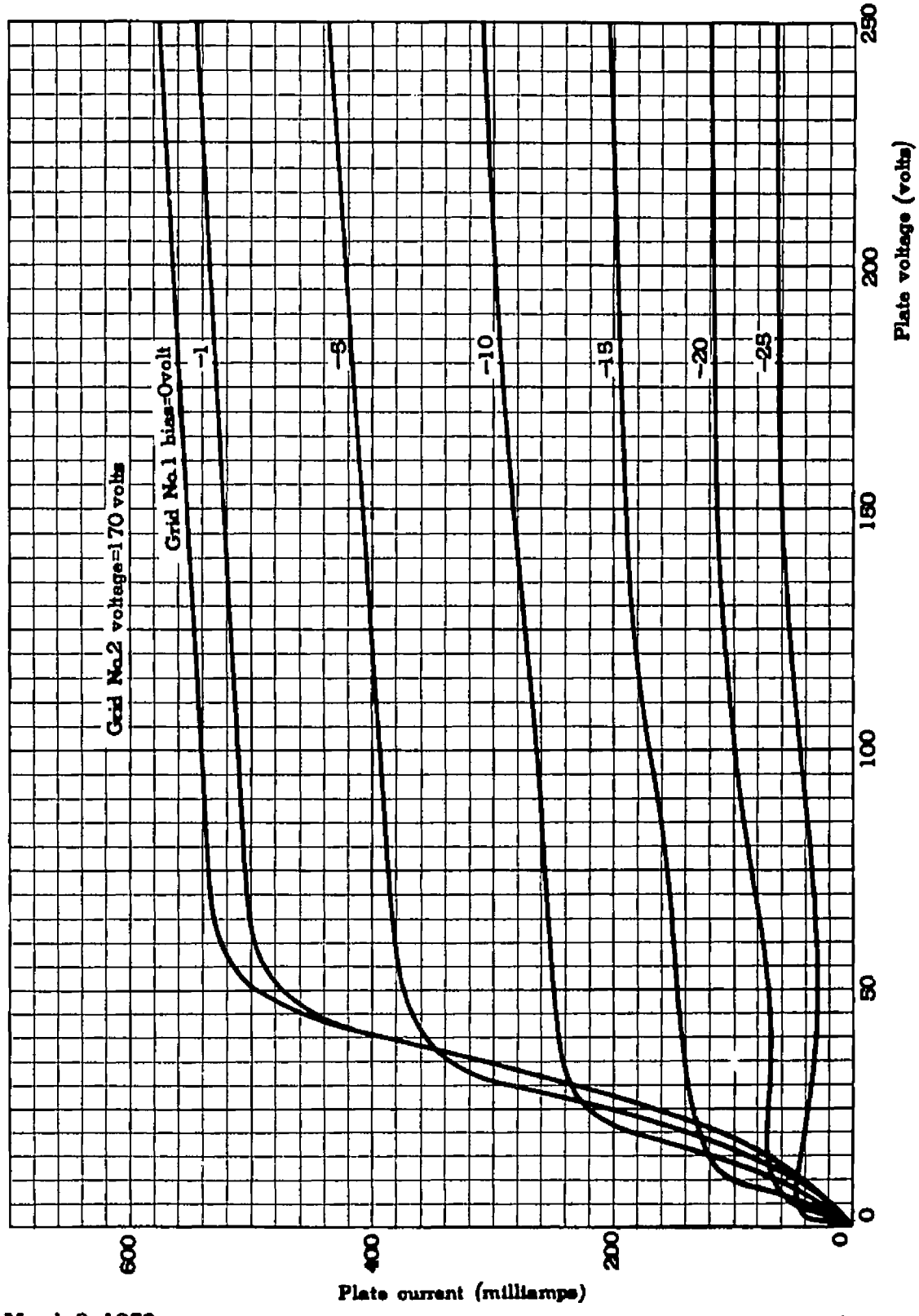
[2])Valid for line time base circuits where the pulse duration is max. 18% of a cycle with a max. of 18 µsec.

[3])During the heating time of the booster this value is max. 7 watts

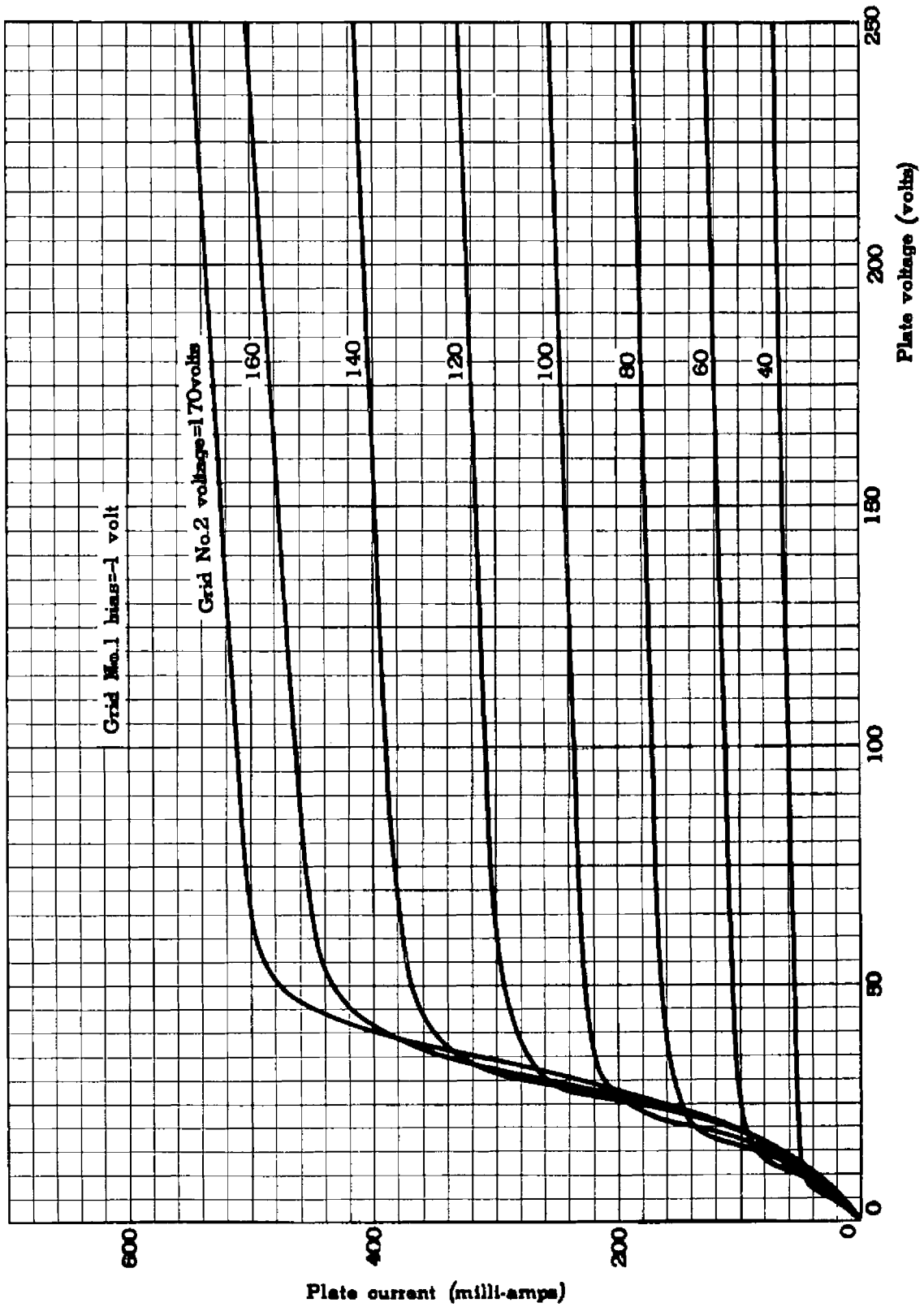
6CM5


1.Plate voltage=Grid No.2 voltage=170 volts
2.Plate voltage=Grid No.2 voltage=100 volts
Plate current
Grid No.2 current
600
500
400
300
200
100
0
Currents (milli-amps)
1
2
1
2
-40
-30
-20
-10
0
Grid No.1 bias (volts)

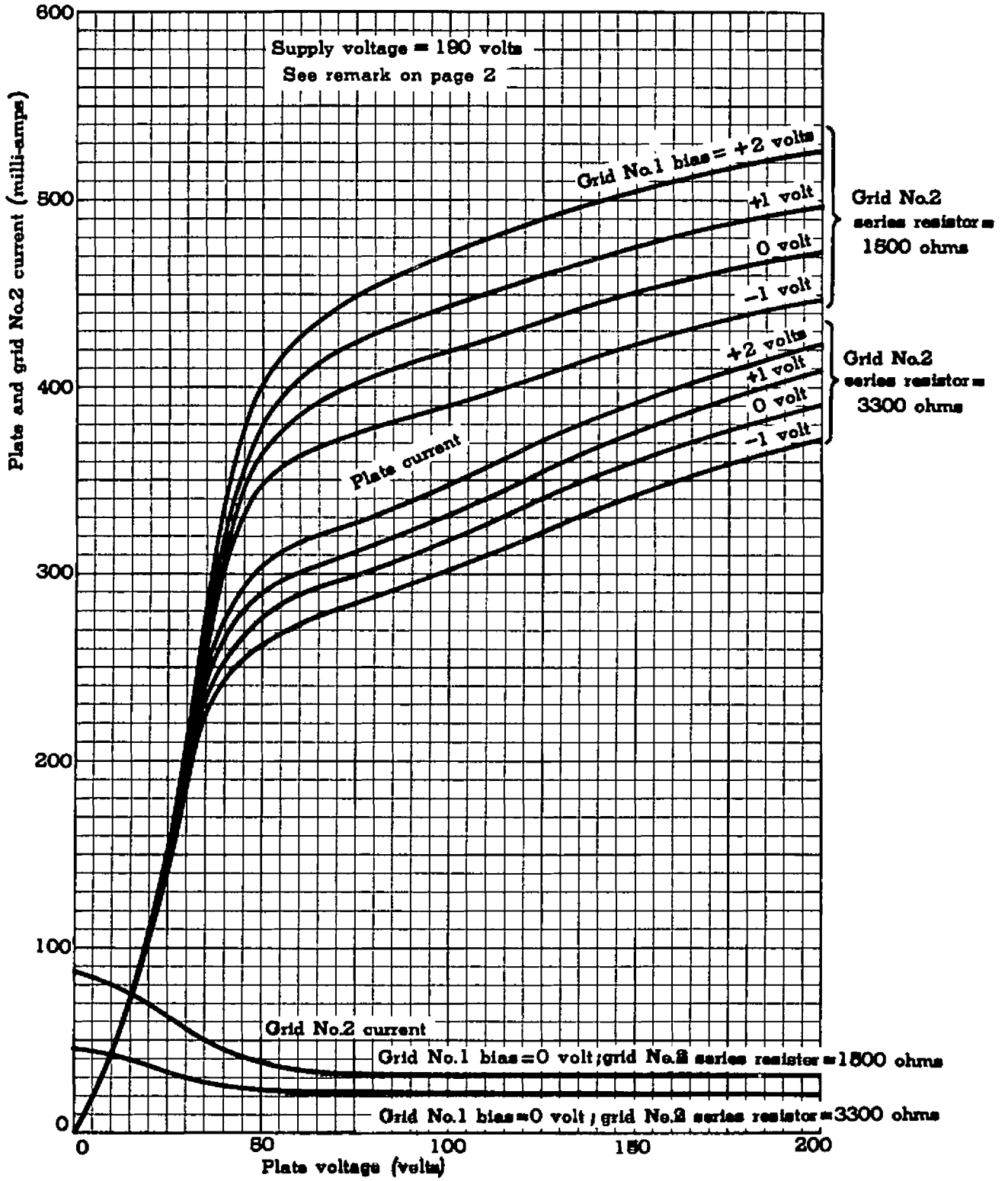
6CM5


Grid No.2 voltage=170 volts
Grid No.1 bias=0volt
-1
-5
-10
-15
-20
-25
Plate voltage (volts)
250
200
150
100
50
0
600
400
200
0
Plate current (milliamps)

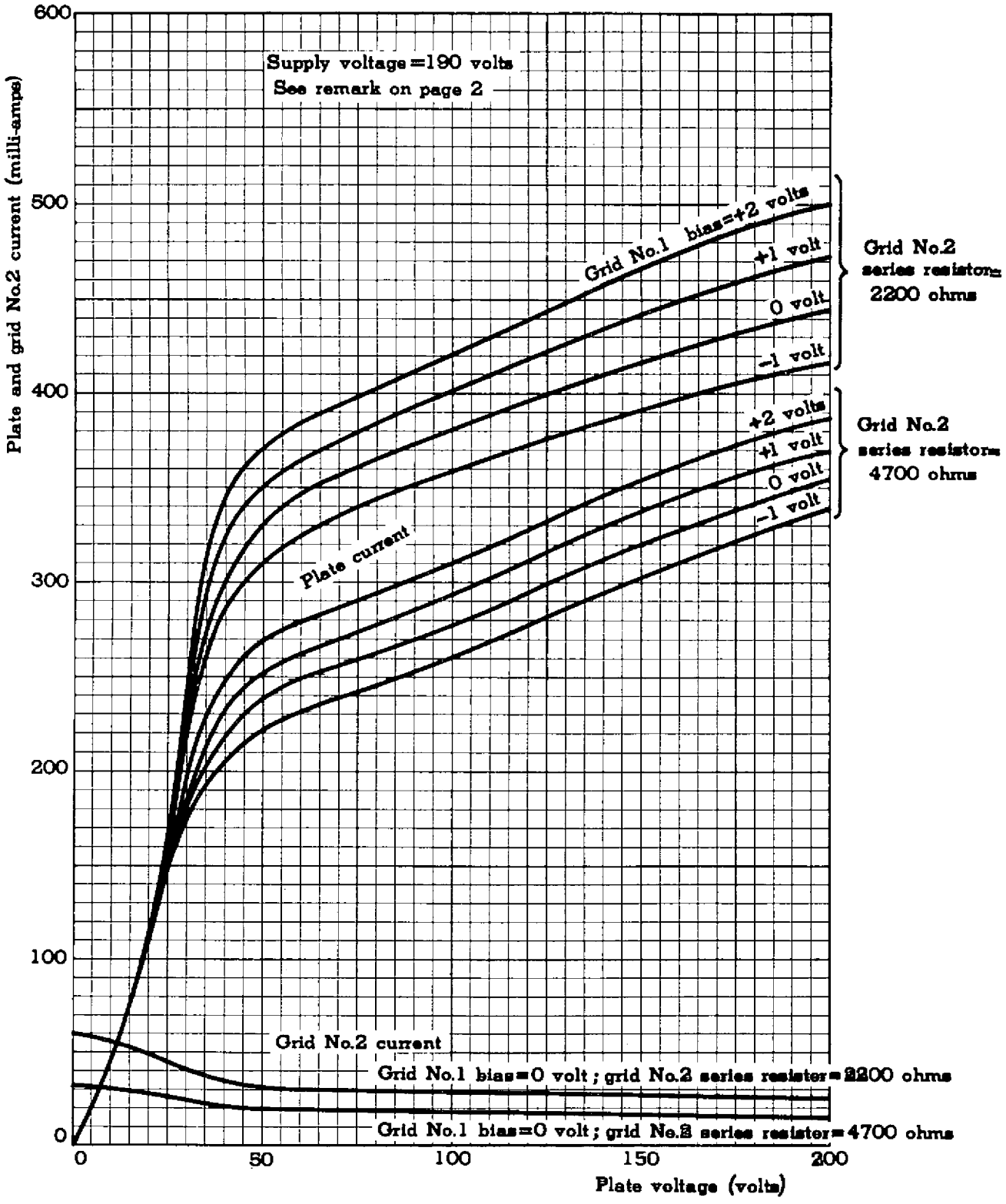
6CM5


Grid No.1 bias=-1 volt
Grid No.2 voltage=170volts
160
140
120
100
80
60
40
0
50
100
150
200
250
Plate voltage (volts)
0
200
400
600
Plate current (milli-amps)

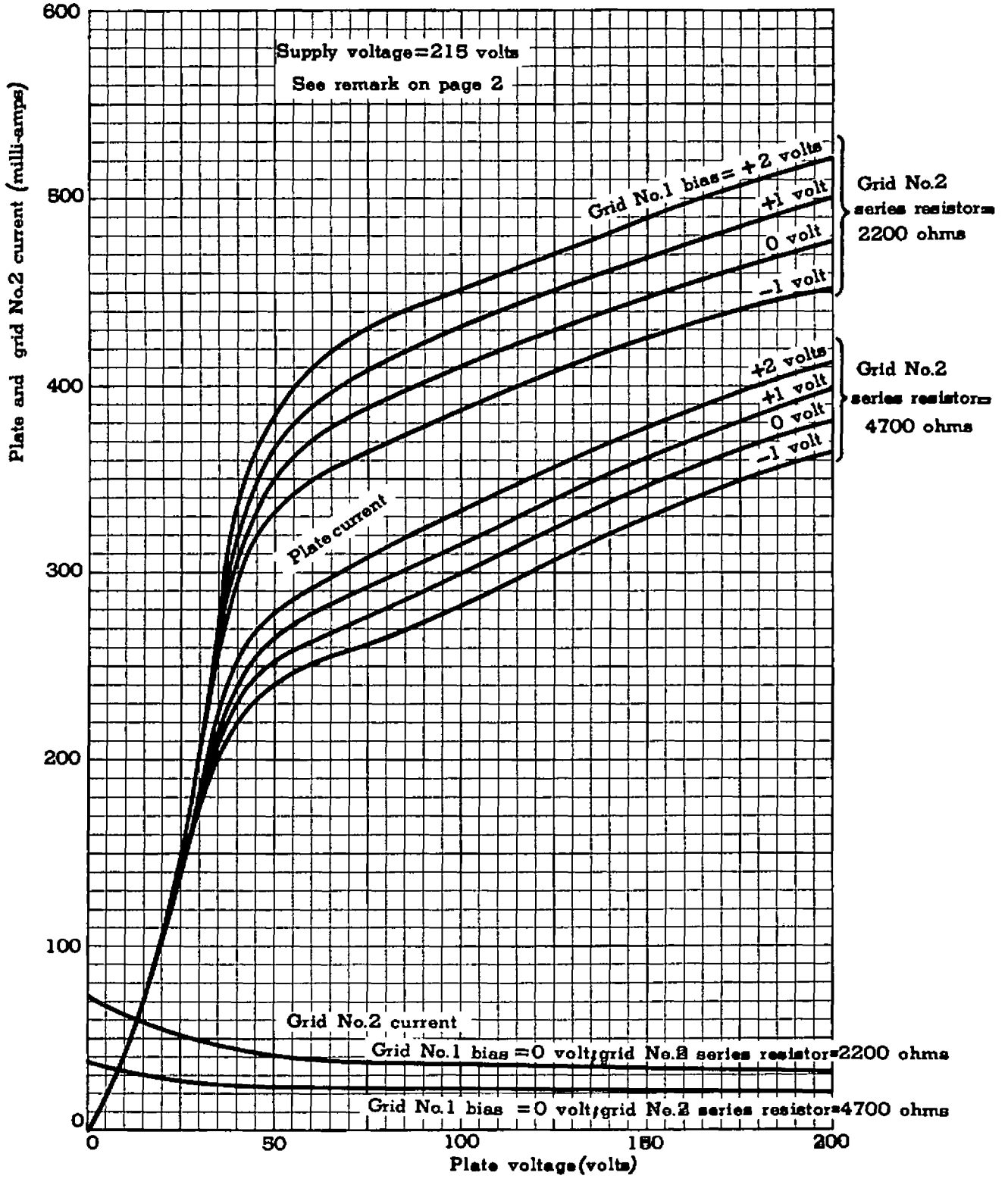
6CM5


Supply voltage = 190 volts
See remark on page 2
Grid No.1 bias = +2 volts
+1 volt
0 volt
−1 volt
Grid No.2 series resistor = 1500 ohms
+2 volts
+1 volt
0 volt
−1 volt
Grid No.2 series resistor = 3300 ohms
Plate current
Grid No.2 current
Grid No.1 bias = 0 volt; grid No.2 series resistor = 1500 ohms
Grid No.1 bias = 0 volt; grid No.2 series resistor = 3300 ohms
Plate and grid No.2 current (milli-amps)
600
500
400
300
200
100
0
0
50
100
150
200
Plate voltage (volts)

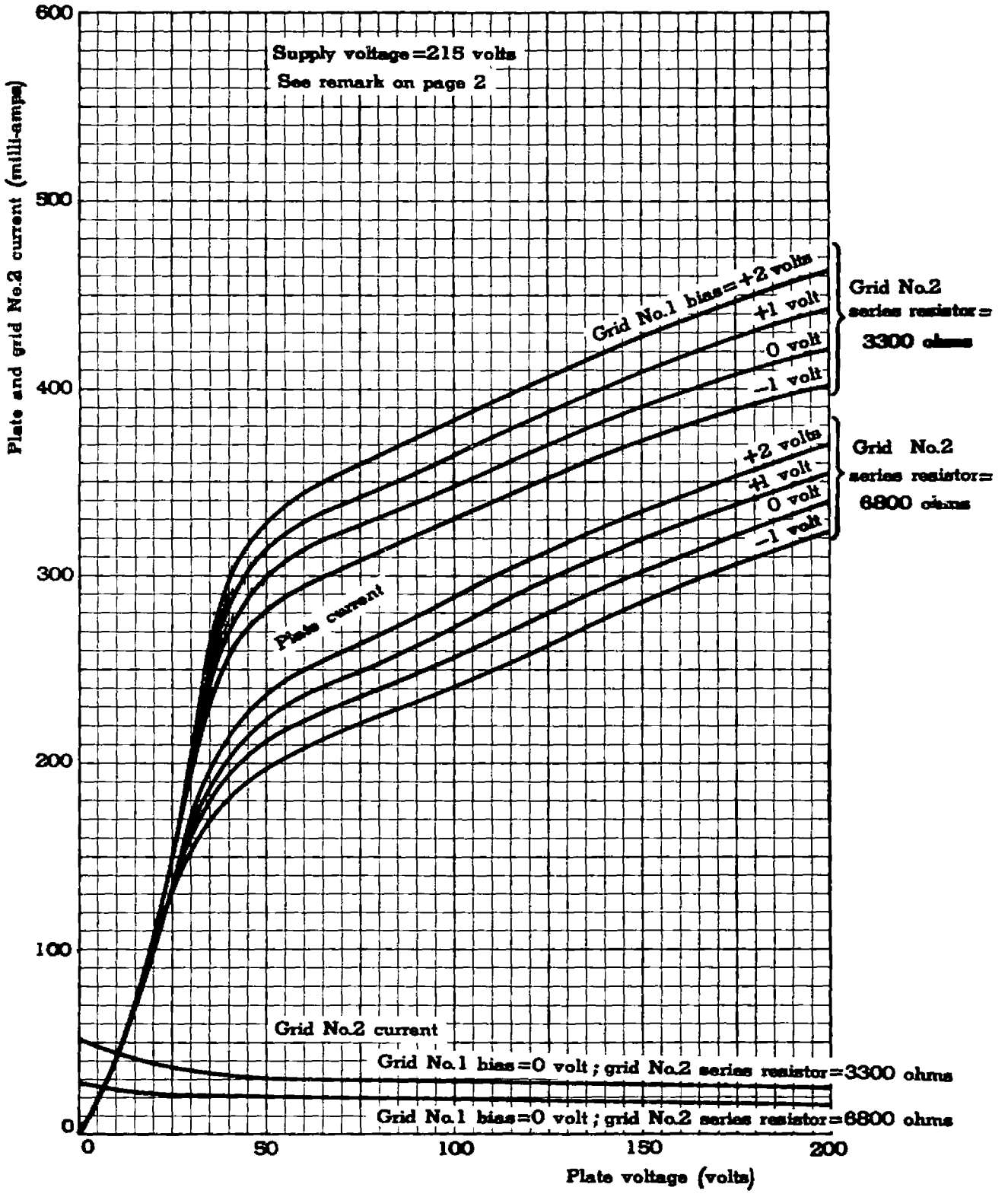
6CM5


Supply voltage=190 volts
See remark on page 2
Plate and grid No.2 current (milli-amps)
600
500
400
300
200
100
0
Grid No.1 bias=+2 volts
+1 volt
0 volt
−1 volt
Grid No.2 series resistor= 2200 ohms
+2 volts
+1 volt
0 volt
−1 volt
Grid No.2 series resistor= 4700 ohms
Plate current
Grid No.2 current
Grid No.1 bias=0 volt; grid No.2 series resistor=2200 ohms
Grid No.1 bias=0 volt; grid No.2 series resistor=4700 ohms
0
50
100
150
200
Plate voltage (volts)

6CM5


Supply voltage=215 volts
See remark on page 2
Plate and grid No.2 current (milli-amps)
600
500
400
300
200
100
0
Grid No.1 bias = +2 volts
+1 volt
0 volt
−1 volt
Grid No.2 series resistor= 2200 ohms
+2 volts
+1 volt
0 volt
−1 volt
Grid No.2 series resistor= 4700 ohms
Plate current
Grid No.2 current
Grid No.1 bias =0 volt; grid No.2 series resistor=2200 ohms
Grid No.1 bias =0 volt; grid No.2 series resistor=4700 ohms
0
50
100
150
200
Plate voltage (volts)

6CM5


Supply voltage=215 volts
See remark on page 2
Plate and grid No.2 current (milli-amps)
600
500
400
300
200
100
0
Grid No.1 bias=+2 volts
+1 volt
0 volt
−1 volt
Grid No.2 series resistor=3300 ohms
+2 volts
+1 volt
0 volt
−1 volt
Grid No.2 series resistor=6800 ohms
Plate current
Grid No.2 current
Grid No.1 bias=0 volt; grid No.2 series resistor=3300 ohms
Grid No.1 bias=0 volt; grid No.2 series resistor=6800 ohms
0
50
100
150
200
Plate voltage (volts)

from JETEC release #1746, Sept. 24, 1956
sponsor: Rogers Majestic Electronics, Ltd.

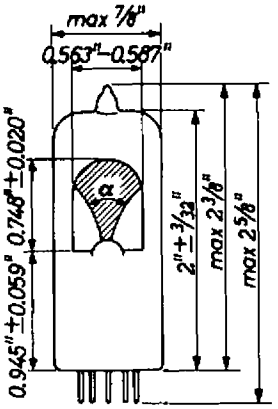
6DA5

ELECTRON-RAY TUNING INDICATOR

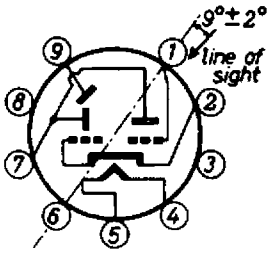
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
Mounting position	Any
RETMA basing designation	9DB

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No	ELEMENT
1	Grid
2	Cathode
3	Internal connection
4	Heater
5	Heater
6	Internal connection
7	Plate, Ray control electrode
8	Internal connection
9	Target

ELECTRICAL DATA

Heater data

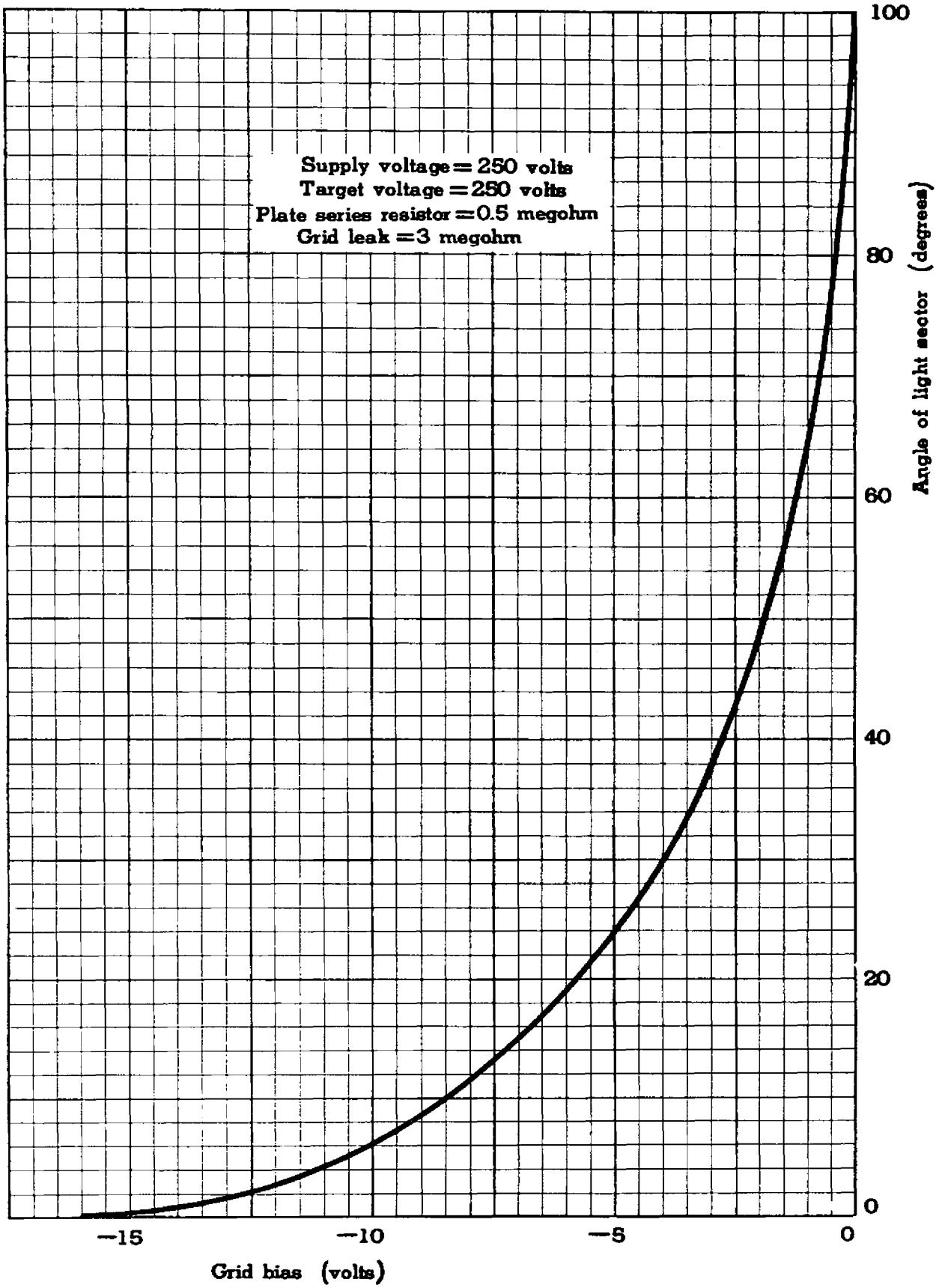
Heater voltage	6.3 volts
Heater current	0.3 amp

RATINGS (Design Center Values)

Plate voltage	300 volts max.
Plate voltage without current	550 volts max.
Plate dissipation	0.2 watt max.
Target voltage	300 volts max.
	165 volts min.
Target voltage without current	550 volts max.
Cathode current	3 mamps max.
Grid circuit resistance	3 megohms max.
Voltage between cathode and heater	100 volts max.
Circuit resistance between cathode and heater	20 000 ohms max.

OPERATING CONDITIONS

Supply voltage	250		volts
Target voltage	250		volts
Plate series resistor	0.5		megohm
Grid series resistor	3		megohms
Negative grid bias	-1	-14	volts
Shadow sector on target	65	5	degrees
Plate current	0.37	0.02	mamp
Target current	2	2.3	mamps


Supply voltage = 250 volts
Target voltage = 250 volts
Plate series resistor = 0.5 megohm
Grid leak = 3 megohm
100
80
60
40
20
0
Angle of light sector (degrees)
−15
−10
−5
0
Grid bias (volts)

from JETEC release #1865, March 11, 1957
sponsor: Rogers Majestic Electronics, Ltd.

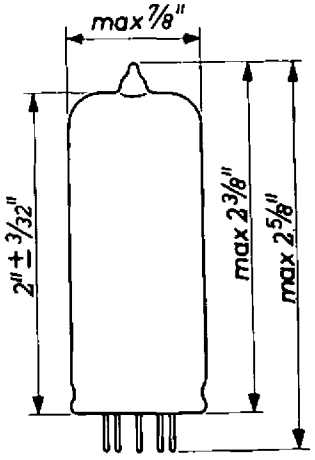
6DC8

DOUBLE DIODE REMOTE CUT-OFF PENTODE FOR USE AS R.F. or I.F. AMPLIFIER

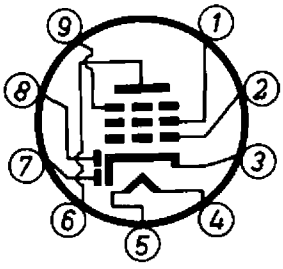
MECHANICAL DATA

Cathode	coated unipotential
Base	E9-1
Bulb	T6½
RETMA basing designation	9HE
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Grid No.2
2	Grid No.1
3	Cathode, internal shield
4	Heater
5	Heater
6	Plate
7	Diode No.1 plate
8	Diode No.2 plate
9	Grid No.3

HEATER DATA

Heater voltage	6.3 volts
Heater current	300 mamps

DIRECT INTERELECTRODE CAPACITANCES

Pentode section

Plate to all other elements except grid No.1		5.2 μμF
Grid No.1 to all other elements except plate		5.0 μμF
Plate to grid No.1	max.	0.0025 μμF
Grid No.1 to heater	max.	0.05 μμF

Diode section

Diode No.1 plate to all other elements		2.5 μμF
Diode No.2 plate to all other elements		2.5 μμF
Diode No.1 plate to diode No.2 plate	max.	0.25 μμF
Diode No.1 plate to heater	max.	0.015 μμF
Diode No.2 plate to heater	max.	0.003 μμF

DIRECT INTERELECTRODE CAPACITANCES (continued)

Between pentode and diode sections

Diode No.1 plate to grid No.1	max.	0.0008 µµF
Diode No.2 plate to grid No.1	max.	0.001 µµF
Diode No.1 plate to pentode plate	max.	0.15 µµF
Diode No.2 plate to pentode plate	max.	0.025 µµF

MAXIMUM RATINGS (Design Center Values)

Pentode section

Plate voltage	300 volts max.*)
Plate voltage without current	550 volts max.
Plate dissipation	2.25 watts max.
Grid No.2 voltage at a plate current higher than 8 mamps	125 volts max.
Grid No.2 voltage at a plate current less than 4 mamps	300 volts max.*)
Grid No.2 dissipation	0.45 watt max.
Cathode current	16.5 mamps max.
Grid No.3 circuit resistance	10 000 ohms max.
Grid No.1 circuit resistance	3 megohms max.
Grid No.1 circuit resistance with grid current biasing	22 megohms max.
Voltage between cathode and heater	100 volts max.
Circuit resistance between cathode and heater	20 000 ohms max.

Diode section (each diode)

Peak inverse plate voltage	200 volts max.
Plate current	0.8 mamps max.
Peak plate current	5 mamps max.

*) When the tube is fed from a storage battery and vibrator the max. permissible value of the positive voltages is 250 volts

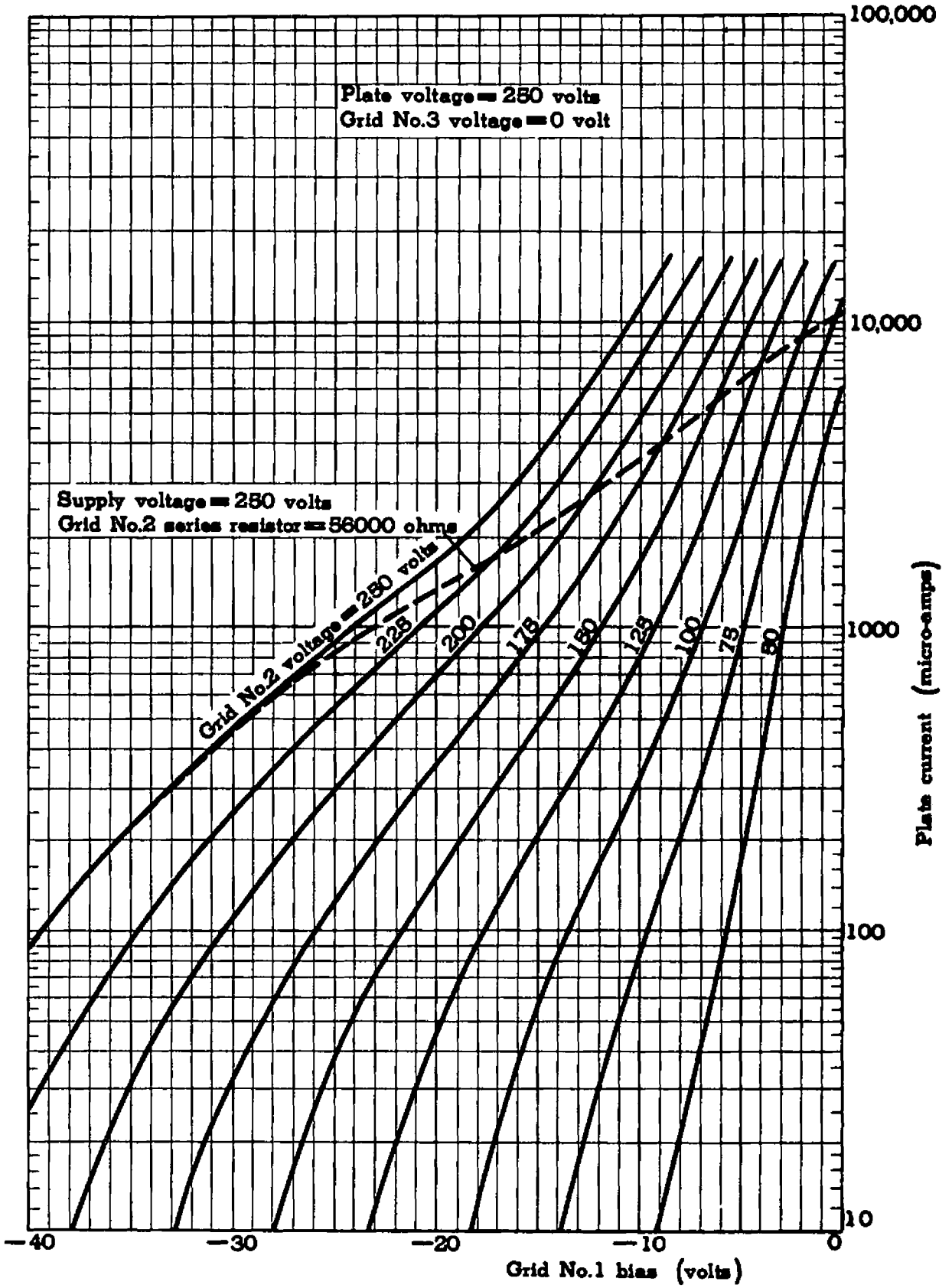
TYPICAL CHARACTERISTICS

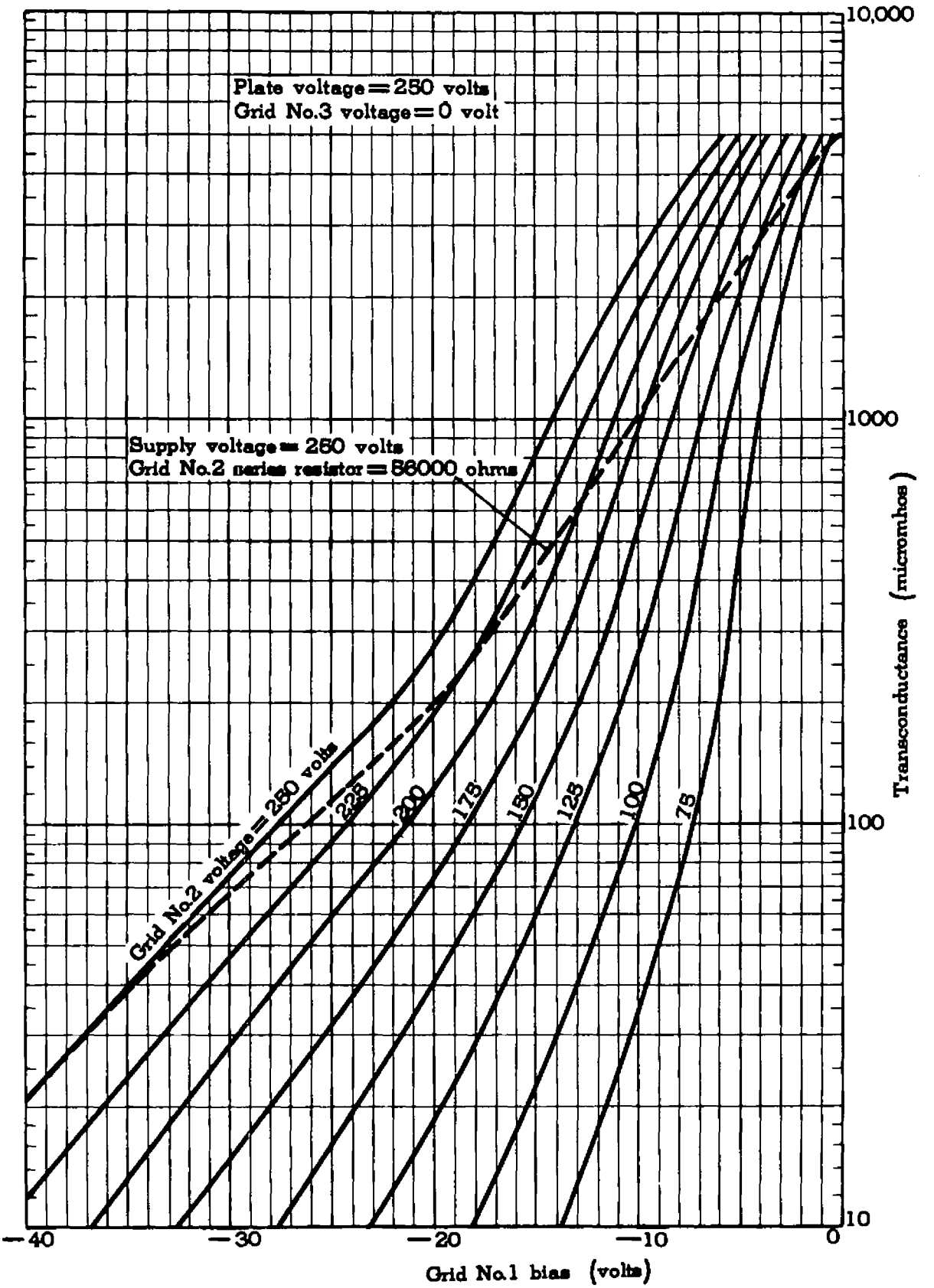
Plate voltage	250	250	200	170	volts
Grid No.2 voltage	100	80	100	100	volts
Grid No.3 voltage	0	0	0	0	volt
Grid No.1 voltage	-2	-1*)	-1.5	-1*)	volt
Plate current	9	9	11	12	mamps
Grid No.2 current	2.7	2.7	3.3	4.0	mamps
Transconductance	3800	4500	4500	5000	μ mhos
Plate resistance	1.0	0.9	0.6	0.4	megohm
Amplification factor of grid No.2 with respect to grid No.1	20	20	20	20	

OPERATING CONDITIONS as R.F. or I.F. amplifier

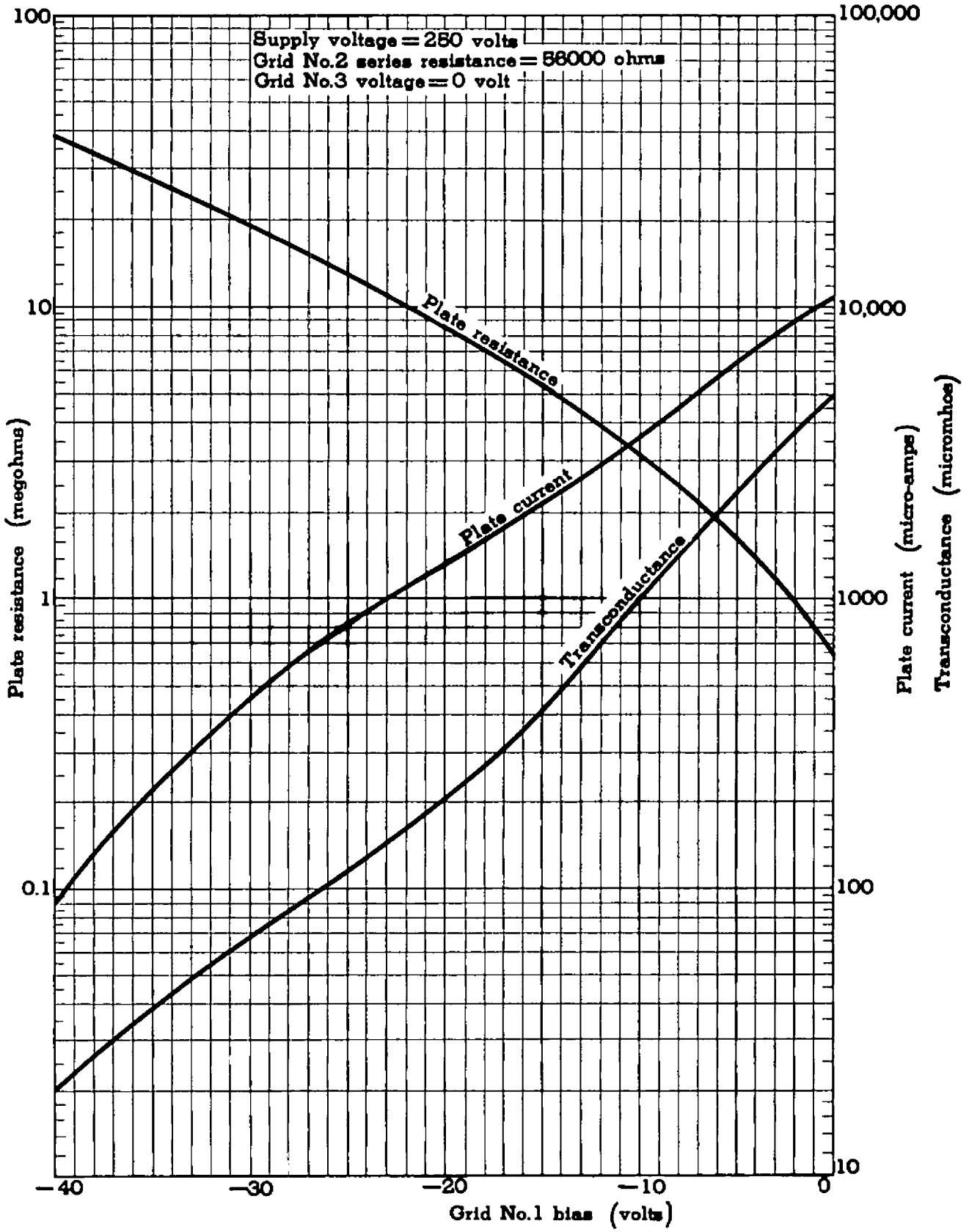
Plate and supply voltage	250	200	250	volts
Grid No.3 voltage	0	0	0	volt
Grid No.2 series resistor	56 000	30 000	62 000	ohms
Grid No.1 voltage	-2.0	-1.5	-1.0*)	volt
Plate current	9	11	9	mamps
Grid No.2 current	2.7	3.3	2.7	mamps
Plate resistance	1.0	0.6	0.9	megohm
Transconductance	3800	4500	4500	μ mhos
Transconductance at grid No.1 voltage = -20 volts	200	120	200	μ mhos

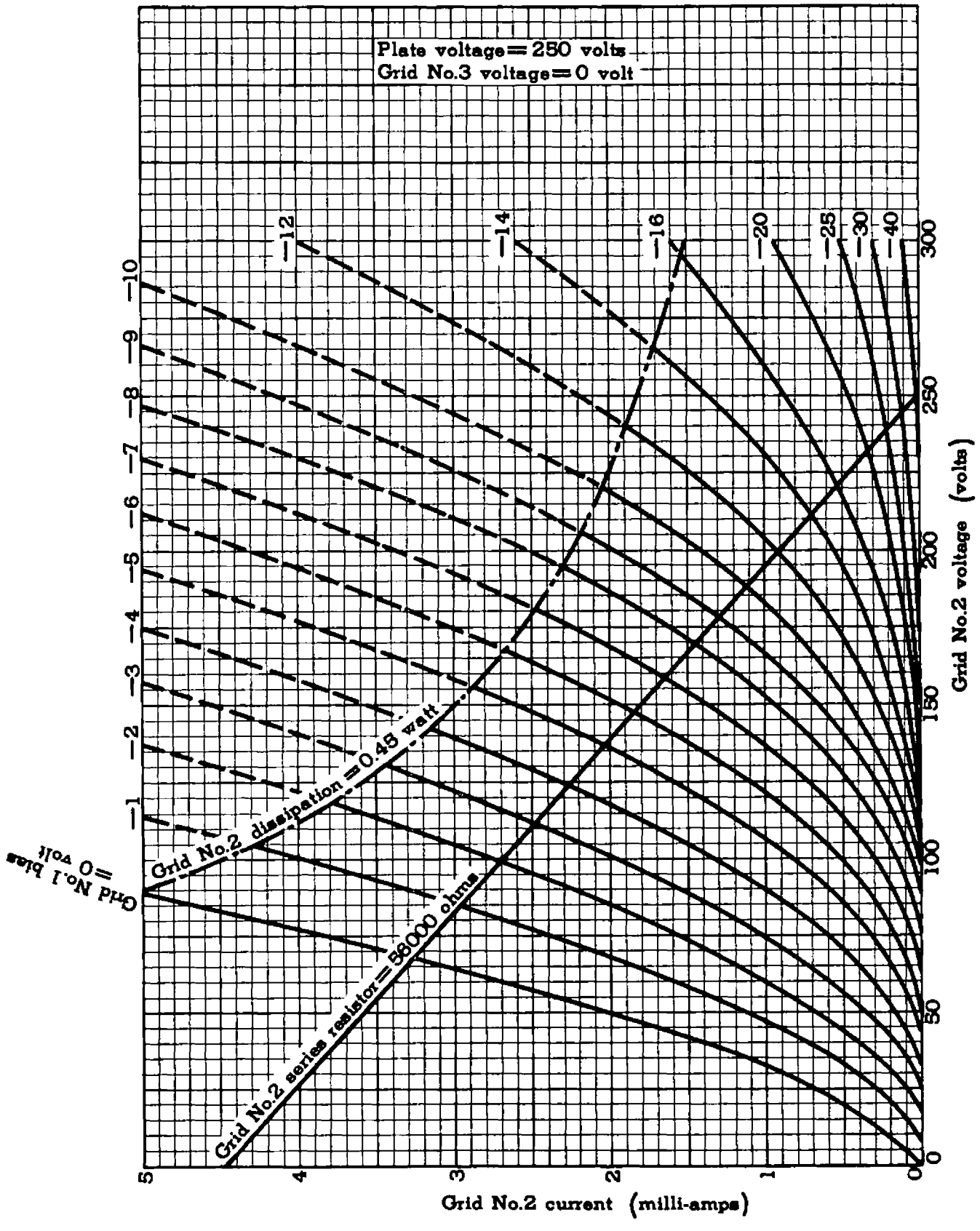
*) In this cas grid current may occur. If this is not permissible, the negative grid bias should be increased to a value of 1.5 volts at least


Plate voltage = 250 volts
Grid No.3 voltage = 0 volt
Supply voltage = 250 volts
Grid No.2 series resistor = 56000 ohms
Grid No.2 voltage = 250 volts
225
200
175
150
125
100
75
50
100,000
10,000
1000
100
10
Plate current (micro-amps)
−40
−30
−20
−10
0
Grid No.1 bias (volts)


Plate voltage = 250 volts
Grid No.3 voltage = 0 volt
Supply voltage = 250 volts
Grid No.2 series resistor = 86000 ohms
Grid No.2 voltage = 250 volts
225
200
175
150
125
100
75
10,000
1000
100
10
Transconductance (micromhos)
−40
−30
−20
−10
0
Grid No.1 bias (volts)

6DC8


Supply voltage = 250 volts
Grid No.2 series resistance = 56000 ohms
Grid No.3 voltage = 0 volt
Plate resistance
Plate current
Transconductance
Plate resistance (megohms)
Plate current (micro-amps)
Transconductance (micromhos)
100
10
1
0.1
100,000
10,000
1000
100
10
−40
−30
−20
−10
0
Grid No.1 bias (volts)


Plate voltage = 250 volts
Grid No.3 voltage = 0 volt
Grid No.2 dissipation = 0.45 watt
Grid No.2 series resistor = 56000 ohms
Grid No.1 bias = 0 volt
Grid No.2 voltage (volts)
Grid No.2 current (milli-amps)

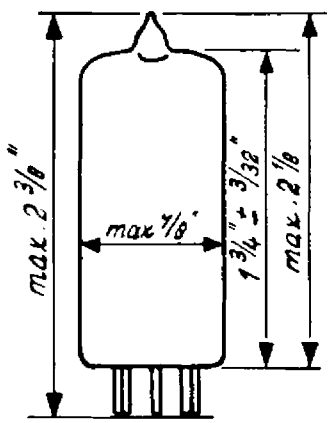
Rogers Electronic Tubes & Components

Description: Output pentode for use in carradio sets

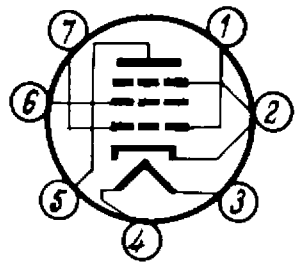
Mechanical data

Cathode	coated, unipotential
Base	E7-1
Bulb	T5 1/2
Outline	See drawing
Basing	7DQ
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Grid No. 1
2	Cathode, grid No. 3
3	Heater
4	Heater
5	Plate
6	Grid No. 2
7	Grid No. 1

Heater data

Heater voltage	6.3 volts
Heater current	0.2 amp

Direct interelectrode capacitances

Grid No. 1 to all other elements except plate	5.3 µµF
Plate to all other elements except grid No. 1	3.5 µµF
Plate to grid No. 1	max. 0.4 µµF
Grid No. 1 to heater	max. 0.2 µµF

from JEDEC release #2556, Aug. 3, 1959

Maximum ratings (design center values)

Plate voltage (without current)	550 volts max.
Plate voltage	+)300 volts max.
Plate dissipation	6 watts max.
Grid No.2 voltage(without current)	550 volts
Grid No.2 voltage	+)300 volts max.
Grid No.2 dissipation (Input A.F. voltage = 0 volt)	1.25 watts max.
Peak grid No. 2 dissipation	2.5 watts max.
Cathode current	35 mamps max.
Grid No. 1 circuit resistance with cathode bias	2 megohms max.
Voltage between heater and cathode	100 volts max.
Circuit resistance between cathode and heater	20.000 ohms max.

Operating conditions as class A sound output tube

Plate voltage	200	250	volts
Grid No. 2 voltage	200	250	volts
Cathode resistor	230	320	ohms
Plate current	23	24	mamps
Grid No. 2 current	4.2	4.5	mamps
Load resistance	8000	10000	ohms
Input A.F. voltage	4.5	5	volts (rms)
Power output	2.3	3.0	watts
Total harmonic distortion	12	12	%
Input A.F. voltage for 50 milliwatts power output	0.55	0.50	volts (rms)

Operating conditions as sound output tube, class A push-pull (two tubes)

Plate voltage	200			250			volts
Grid No. 2 voltage	200			250			volts
Cathode resistor	180			180			ohms
Load resistance (plate to plate)	10000			10000			ohms
Input A.F. voltage	0	0.5	7	0	0.5	9	volts(rms)
Plate current	2x17.5		2x20	2x22		2x26	mamps
Grid No.2 current	2x3.2		2x5.2	2x4.0		2x7.5	mamps

+) See page 3

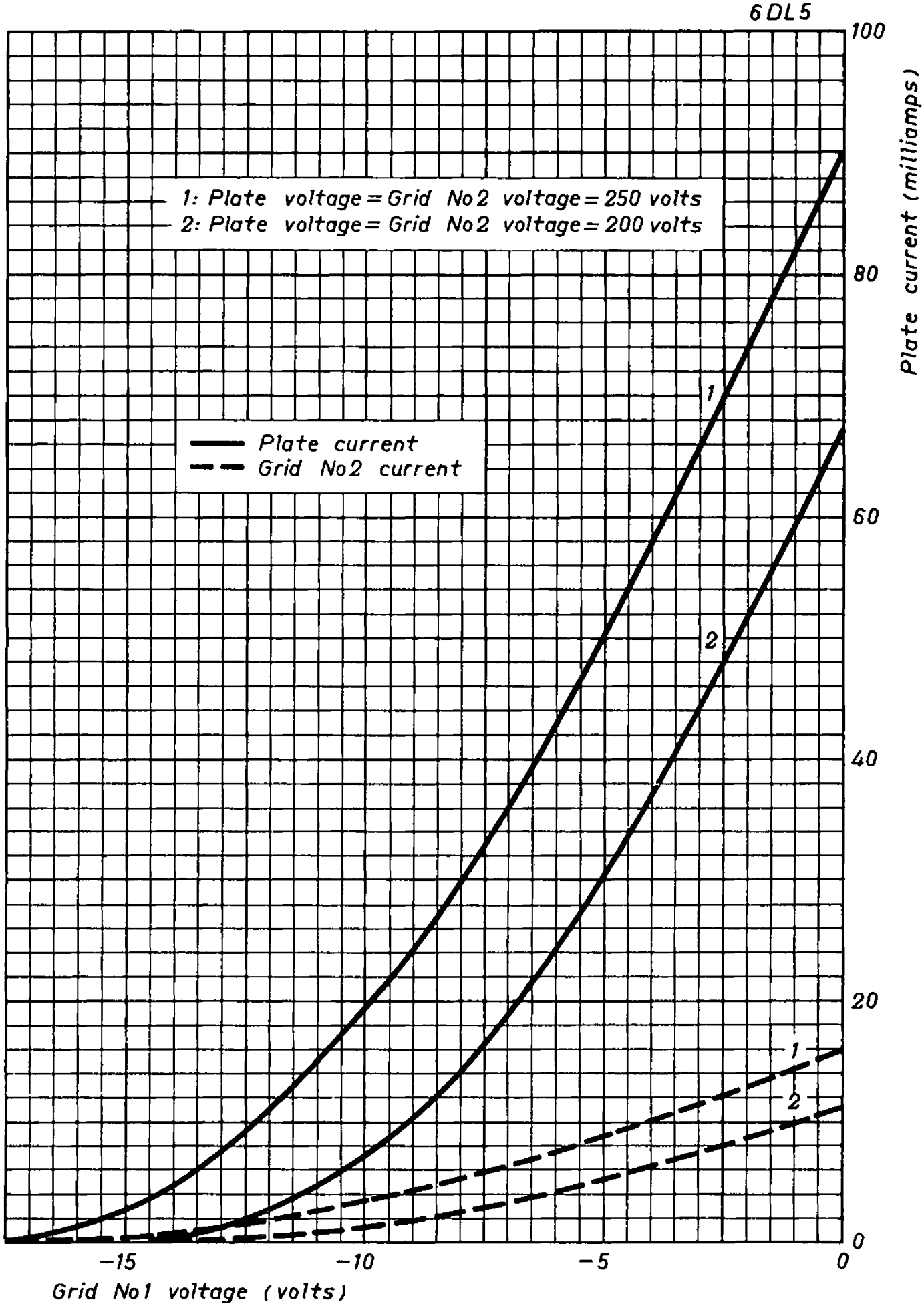
Operating conditions as sound output tube, class A push-pull (two tubes), continued

Power output	0	0.05	4.1	0	0.05	7	watts
Total harmonic distortion			4.5			5	%

Operating conditions as sound output tube, class B push-pull (two tubes)

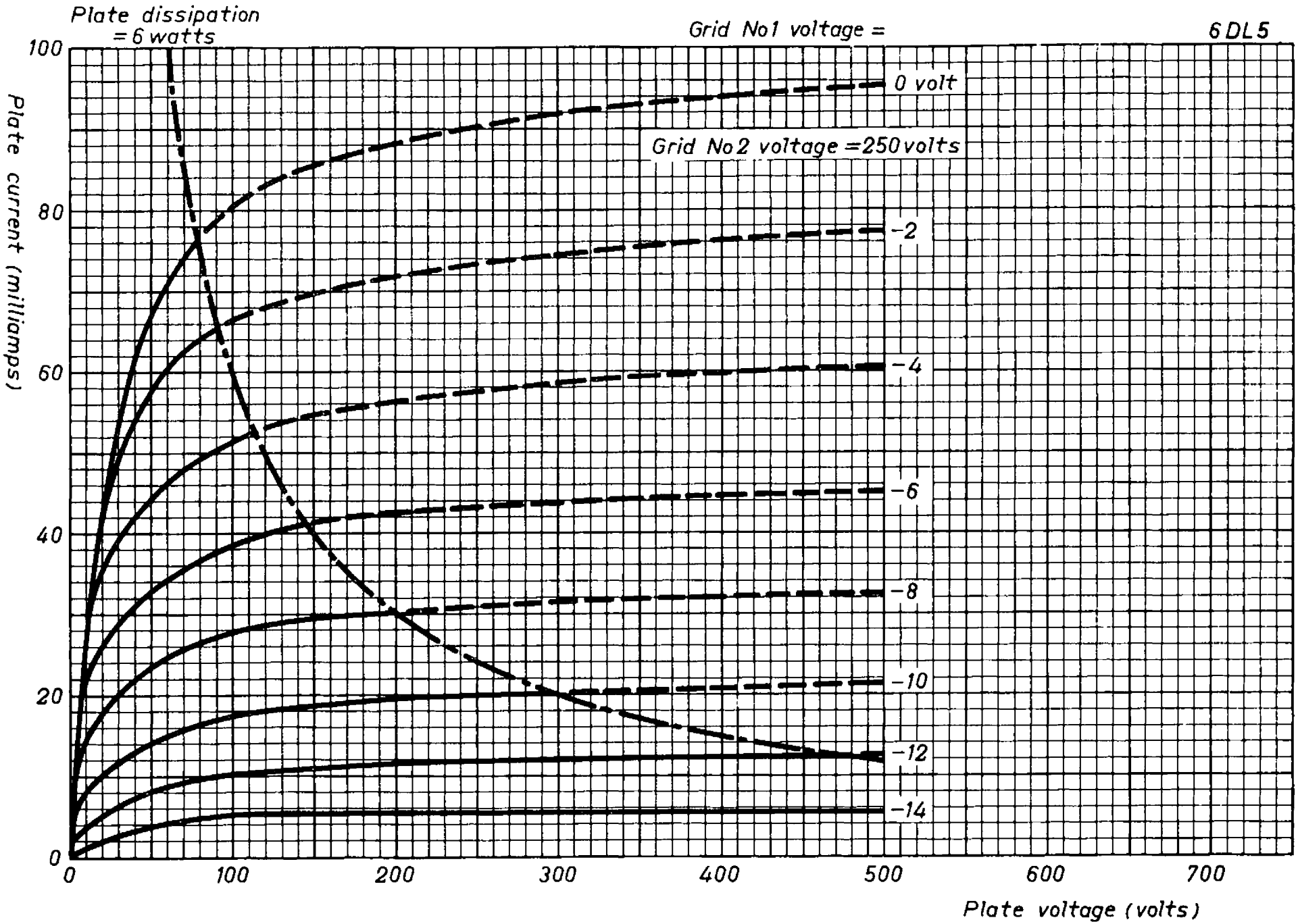
Plate voltage			200			250	volts
Grid No.2 voltage			200			250	volts
Grid No.1 bias			-10			-13	volts
Load resistance (plate to plate)			10000			10000	ohms
Input A.F. voltage	0	0.7	7	0	0.7	9	volts(rms)
Plate current	2x7		2x19	2x8		2x24	mamps
Grid No.2 current	2x1.2		2x5	2x1.2		2x7.2	mamps
Power output	0	0.05	4.0	0	0.05	6.5	watts
Total harmonic distortion			3.5			3.5	%

+) When the heater and positive voltages are obtained from a storage battery (positive voltages by means of a vibrator) the max. values of plate and grid No.2 voltages are 250 volts.

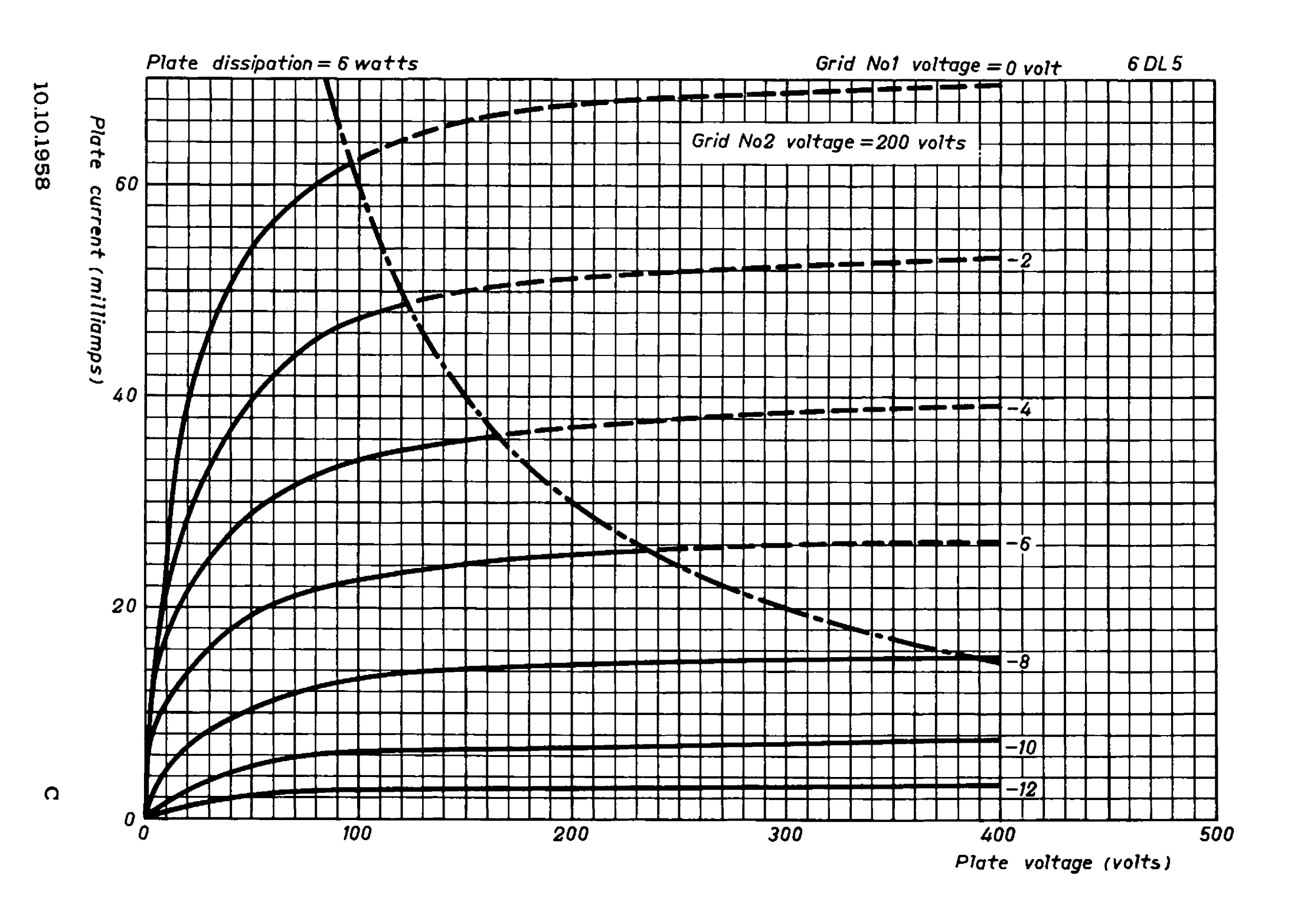

6DL5
1: Plate voltage = Grid No2 voltage = 250 volts
2: Plate voltage = Grid No2 voltage = 200 volts
Plate current
Grid No2 current
1
2
1
2
100
80
60
40
20
0
Plate current (milliamps)
−15
−10
−5
0
Grid No1 voltage (volts)

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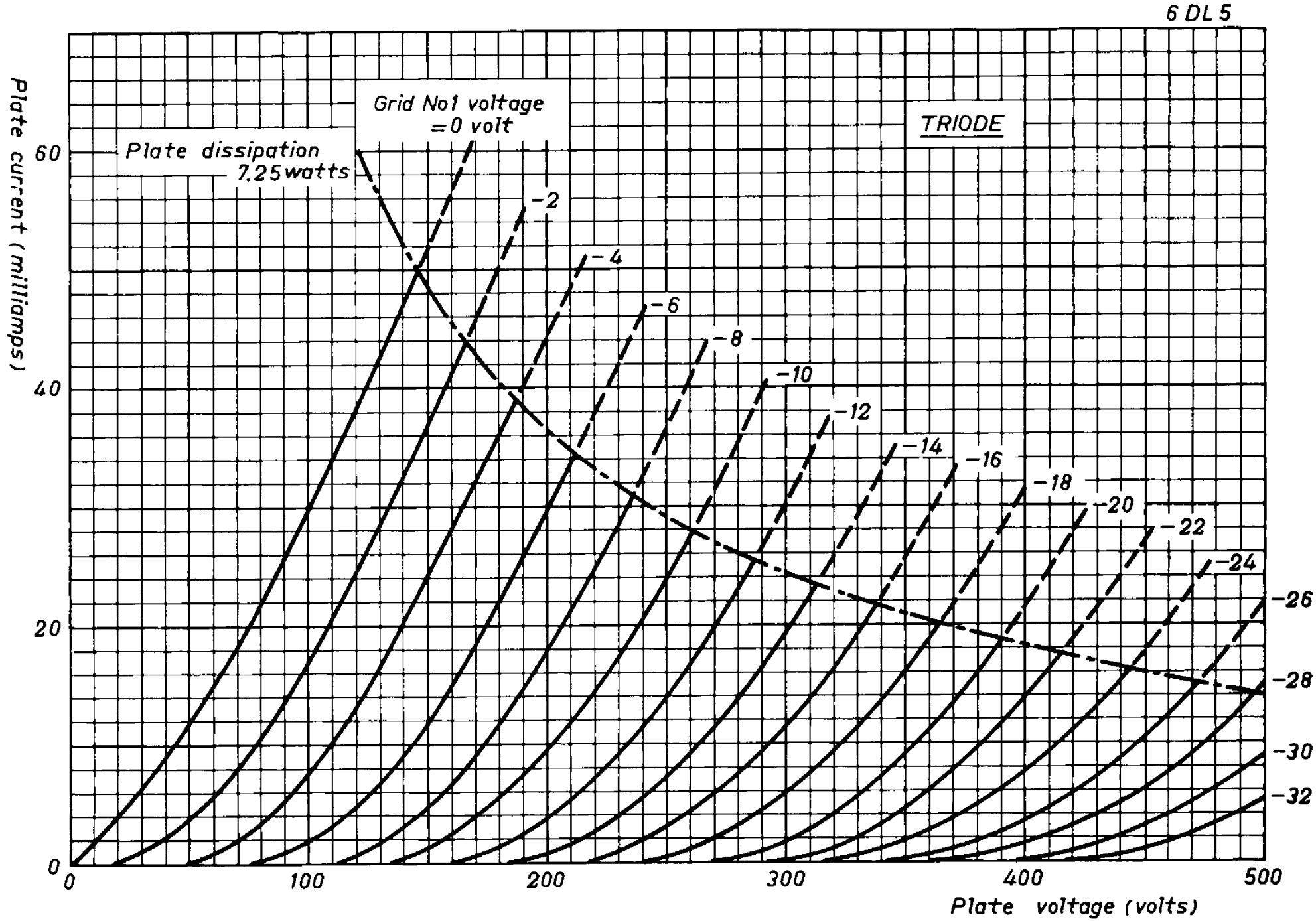
A


Plate dissipation
=6 watts
Grid No1 voltage =
6DL5
0 volt
Grid No2 voltage =250volts
-2
-4
-6
-8
-10
-12
-14
Plate current (milliamps)
100
80
60
40
20
0
0
100
200
300
400
500
600
700
Plate voltage (volts)

B


Plate dissipation = 6 watts
Grid No1 voltage = 0 volt
6 DL 5
Grid No2 voltage = 200 volts
-2
-4
-6
-8
-10
-12
Plate current (milliamps)
0
20
40
60
0
100
200
300
400
500
Plate voltage (volts)

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C


6 DL 5
TRIODE
Grid No1 voltage
=0 volt
Plate dissipation
7.25 watts
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
Plate current (milliamps)
0
20
40
60
0
100
200
300
400
500
Plate voltage (volts)

Rogers Electronic Tubes & Components

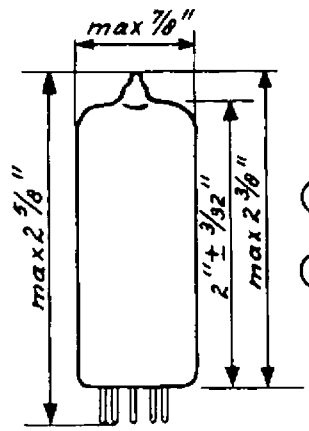
6 DR 8

Description: Double-diode-pentode for use as I.F. amplifier, detector and for automatic gain control in car-radio sets to be operated directly from a storage battery.

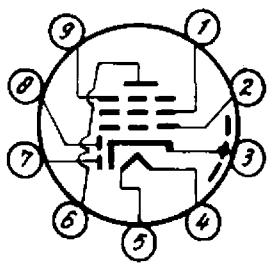
Mechanical data

Cathode	coated, unipotential
Base	E 9-1
Bulb	T 6 1/2
Outline	6-3
Basing designation	9 HE
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Grid No. 2
2	Grid No. 1
3	Cathode, internal shield
4	Heater
5	Heater
6	Plate
7	Diode plate No. 1
8	Diode plate No. 2
9	Grid No. 3

Heater data

Heater voltage	6.3 volts
Heater current	300 mamps

Direct interelectrode capacitances

Pentode section	
Grid No. 1 to all other elements except plate	5.0 μμF
Plate to all other elements except grid No. 1	5.2 μμF
Plate to grid No. 1	max. 0.0025 μμF
Diode section	
Diode plate No. 1 to cathode	2.5 μμF
Diode plate No. 2 to cathode	2.5 μμF
Diode plate No. 1 to diode plate No. 2	max. 0.25 μμF

from JEDEC release #2556, Aug. 3, 1959

Direct interelectrode capacitances (continued)

Between pentode and diode sections

Diode plate No. 1 to grid No. 1	max.	0.0008 µµF
Diode plate No. 2 to grid No. 1	max.	0.001 µµF
Diode plate No.1 to pentode plate	max.	0.15 µµF
Diode plate No.2 to pentode plate	max.	0.025 µµF

Maximum ratings (design center values)

Pentode section

Plate voltage	50 volts max.
Grid No. 2 voltage	50 volts max.
Cathode current	5 mamps max.
Grid No. 1 circuit resistance	5 megohms max.
Voltage between cathode and heater	50 volts max.

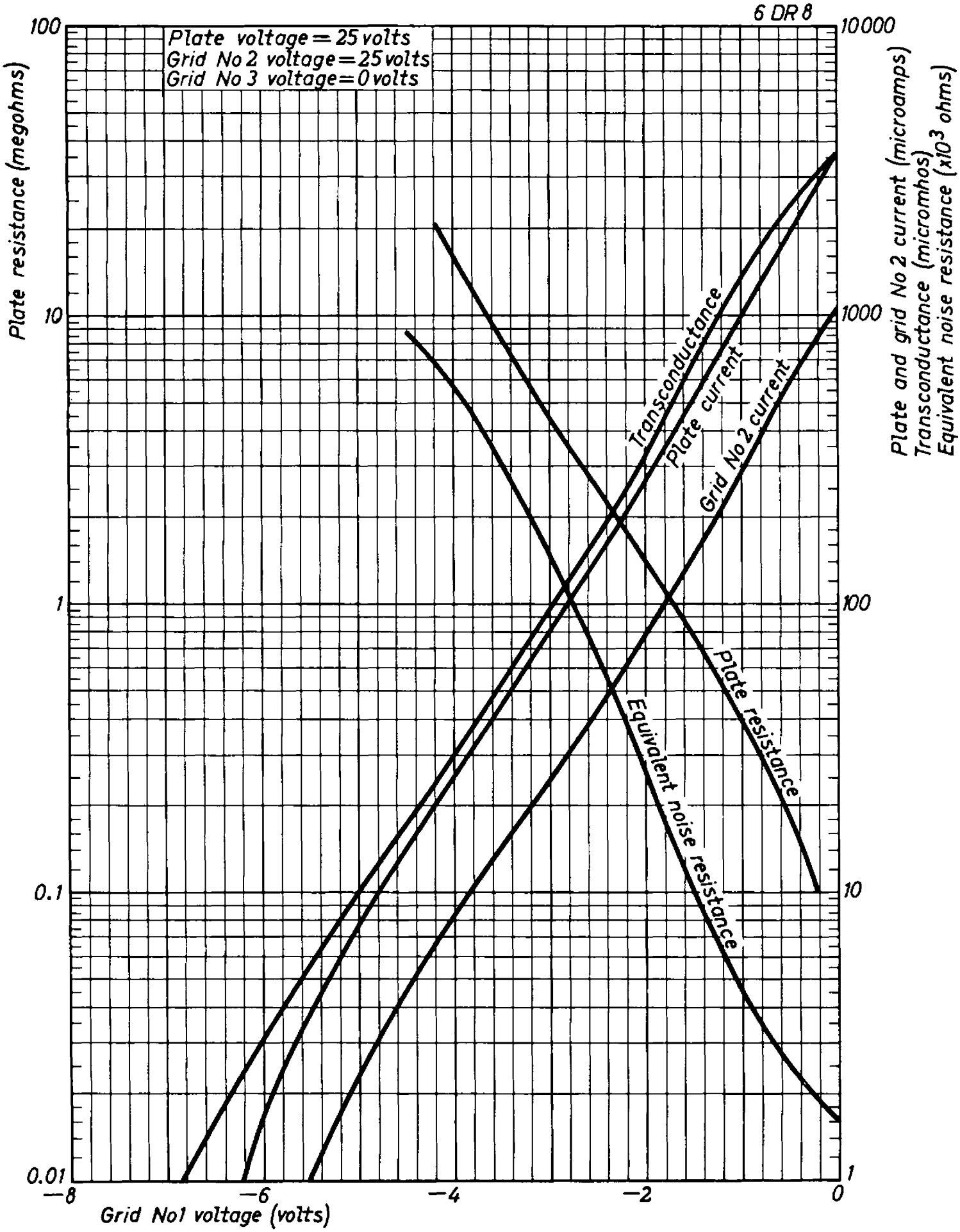
Diode section (each section)

Plate current	0.8 mamp max.
Peak plate current	5 mamps max.

Operating characteristics as I.F. amplifier

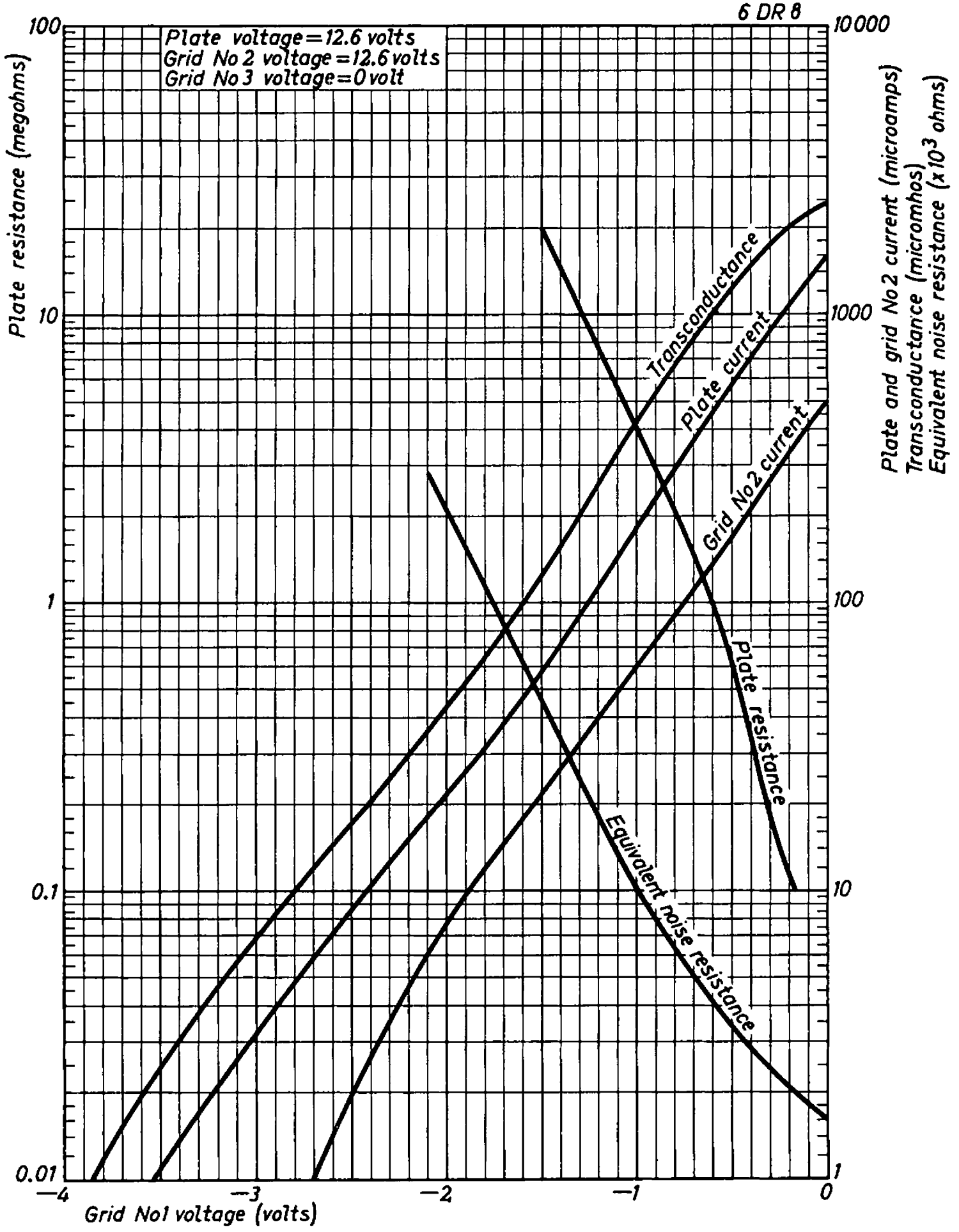
Plate voltage	25	12.6	6.3 volts
Grid No. 3 voltage	0	0	0 volt
Grid No. 2 voltage	25	12.6	6.3 volts
Grid No. 1 bias	[1])	[1])	[1])
Plate current	1.7	0.45	0.12 mamp
Grid No. 2 current	0.5	0.14	0.04 mamp
Transconductance	2100	1000	450 micromhos
Plate resistance	0.2	1.0	0.65 megohm

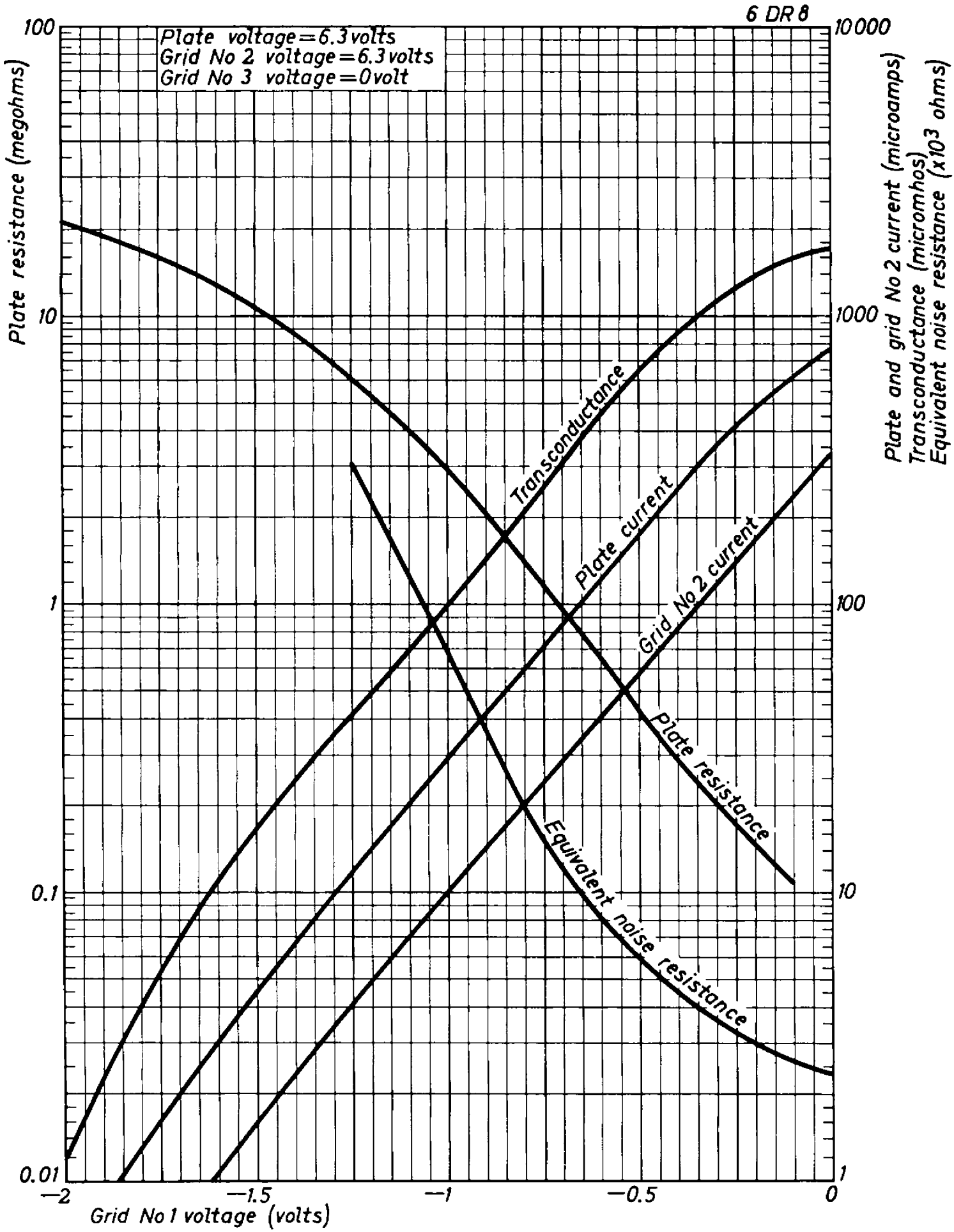
[1]) Grid No. 1 bias obtained by grid current biasing with a grid No. 1 resistor of 2.2. megohms.


6 DR 8
Plate voltage = 25 volts
Grid No 2 voltage = 25 volts
Grid No 3 voltage = 0 volts
Plate resistance (megohms)
Plate and grid No 2 current (microamps)
Transconductance (micromhos)
Equivalent noise resistance (x10³ ohms)
100
10
1
0.1
0.01
10000
1000
100
10
1
−8
−6
−4
−2
0
Grid No1 voltage (volts)
Transconductance
Plate current
Grid No 2 current
Plate resistance
Equivalent noise resistance

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A


6 DR 8
Plate voltage = 12.6 volts
Grid No 2 voltage = 12.6 volts
Grid No 3 voltage = 0 volt
Plate resistance (megohms)
Plate and grid No 2 current (microamps)
Transconductance (micromhos)
Equivalent noise resistance (x10³ ohms)
100
10
1
0.1
0.01
10000
1000
100
10
1
−4
−3
−2
−1
0
Grid No 1 voltage (volts)
Transconductance
Plate current
Grid No 2 current
Plate resistance
Equivalent noise resistance


6 DR 8
Plate voltage = 6.3 volts
Grid No 2 voltage = 6.3 volts
Grid No 3 voltage = 0 volt
Plate resistance (megohms)
Plate and grid No 2 current (microamps)
Transconductance (micromhos)
Equivalent noise resistance (x10³ ohms)
100
10
1
0.1
0.01
10000
1000
100
10
1
Transconductance
Plate current
Grid No 2 current
Plate resistance
Equivalent noise resistance
−2
−1.5
−1
−0.5
0
Grid No 1 voltage (volts)

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C

Rogers Electronic Tubes & Components

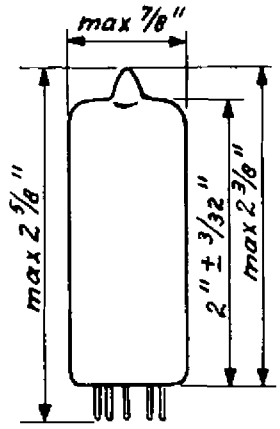
6 DS 8

Description: Triode-heptode for use as frequency converter in carradio sets, to be operated directly from a storage battery

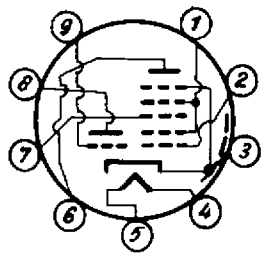
Mechanical data

Cathode	coated, unipotential
Base	E 9-1
Bulb	T 6 1/2
Outline	6 - 3
Basing designation	9 CA
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Grids No. 2 and 4
2	Grid No. 1
3	Cathode, grid No. 5, internal shield
4	Heater
5	Heater
6	Heptode plate
7	Grid No. 3
8	Triode plate
9	Triode grid

Heater data

Heater voltage	6.3 volts
Heater current	300 mamps

Direct interelectrode capacitances

Heptode section

Grid No.1 to all other elements except plate	4.8 µµF
Plate to all other elements except grid No.1	7.9 µµF
Plate to grid No. 1	max. 0.012 µµF
Grid No. 3 to all other elements	6.0 µµF
Grid No. 3 to grid No. 1	max. 0.3 µµF

from JEDEC release #2556, Aug. 3, 1959

Direct interelectrode capacitances (continued)

Triode section

Grid to all other elements except plate	2.6 µµF
Plate to all other elements except grid	2.1 µµF
Plate to grid	1.0 µµF

Between heptode and triode section

Heptode plate to triode plate	0.20 µµF
Heptode plate to triode grid	max. 0.09 µµF
Heptode plate to triode grid + heptode grid No. 3	max. 0.35 µµF
Heptode grid No. 1 to triode plate	max. 0.06 µµF
Heptode grid No. 1 to triode grid	max. 0.17 µµF
Heptode grid No. 1 to triode grid + heptode grid No. 3	max. 0.45 µµF

Maximum ratings (design center values)

Heptode section

Plate voltage without current	550 volts max.
Plate voltage	50 volts max.
Grids No. 2 and 4 voltage with cold cathode	550 volts max.
Grids No. 2 and 4 voltage	50 volts max.
Cathode current	5 mamps max.
Grid No. 1 circuit resistance	3 megohms max.
Grid No. 3 circuit resistance	0.05 megohms max.
Voltage between cathode and heater	150 volts max.
D.C. component of cathode to heater voltage	100 volts max.

Triode section

Plate voltage without current	550 volts max.
Plate voltage	250 volts max.
Plate dissipation	0.8 watt max.
Cathode current	6.5 mamps max.
Grid No. 1 circuit resistance	3 megohms
Circuit resistance between cathode and heater	20000 ohms
Voltage between cathode and heater	150 volts max.
D.C. component of cathode to heater voltage	100 volts max.

Operating characteristics of the heptode section as frequency converter

Plate voltage	25	12.6	6.3	volts
Grids No. 2 and 4 voltage	25	12.6	6.3	volts
Grid No. 1 bias	[1]	[1]	[1]	
Grid No. 3 (oscillator) voltage [2]	3.5	1.7	1.1	volts (rms)
Grid No. 3 (oscillator) current	40	18	7	µamps
Grid No. 3 resistance	47000	47000	47000	volts (rms)
Plate current	550	170	50	µamps
Grids No. 2 and 4 current	1000	300	80	µamps
Conversion conductance	450	220	90	micromhos
Plate resistance	0.5	1.5	1.3	megohms

Operating characteristics of the heptode section as R.F. or I.F. amplifier

Plate voltage	25	12.6	6.3	volts
Grids No. 2, 3 and 4 voltage	25	12.6	6.3	volts
Grid No. 1 bias	[1]	[1]	[1]	
Plate current	1.25	0.4	0.11	mamps
Grids No.2,3 and 4 current	0.85	0.25	0.08	mamps
Transconductance	1500	750	350	micromhos
Plate resistance	0.2	0.85	0.6	megohm
Equivalent noise resistance	5000	6500	8500	ohms

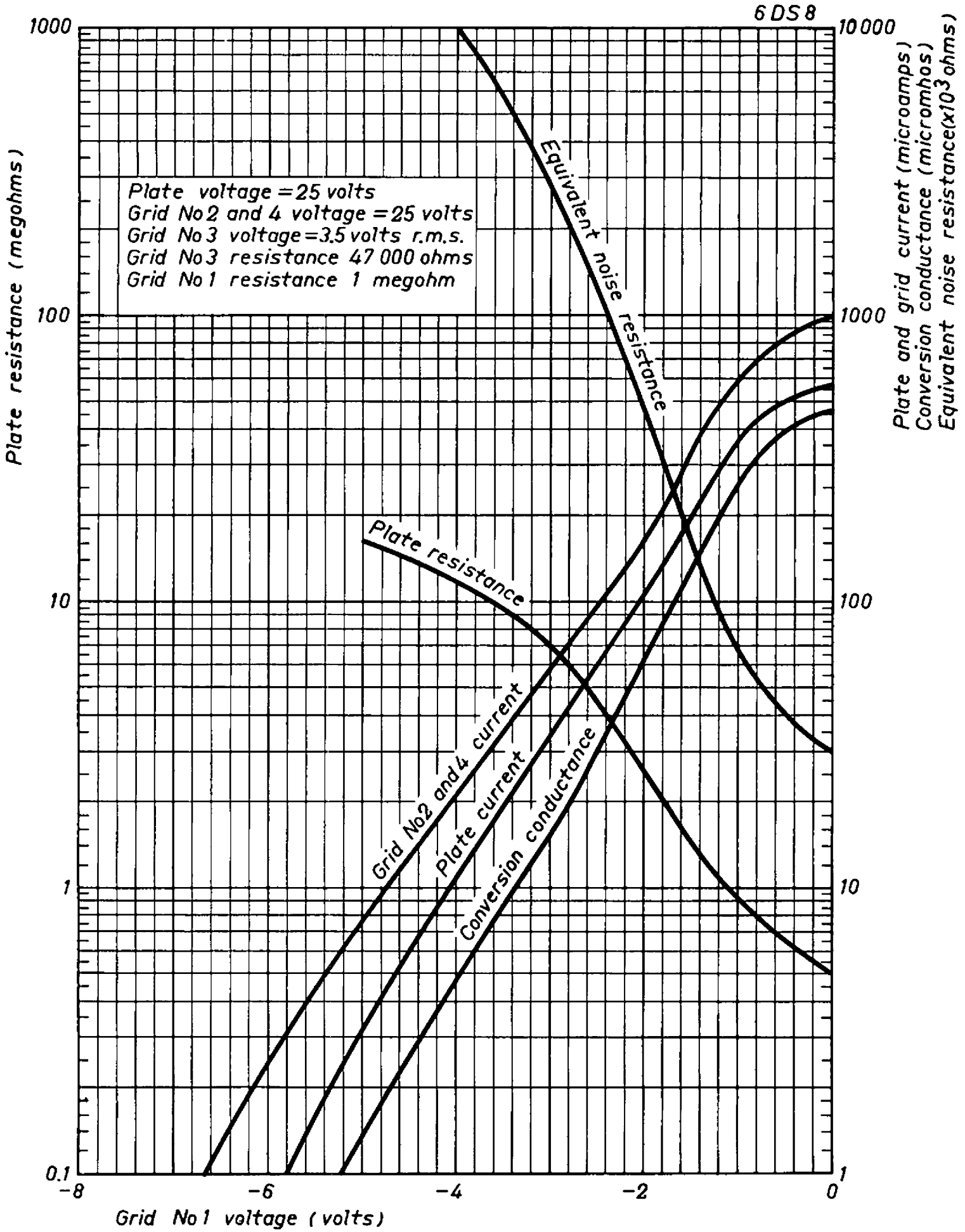
Typical characteristics of the triode section

Plate voltage	25	12.6	6.3	volts
Grid bias	[3]	[3]	[3]	
Plate current	2	0.75	0.3	mamps
Transconductance	2200	1400	800	micromhos
Amplification factor	20	18.3	14.6	

[1] Grid No.1 bias obtained by grid current biasing with a grid No.1 resistor of 1 megohm

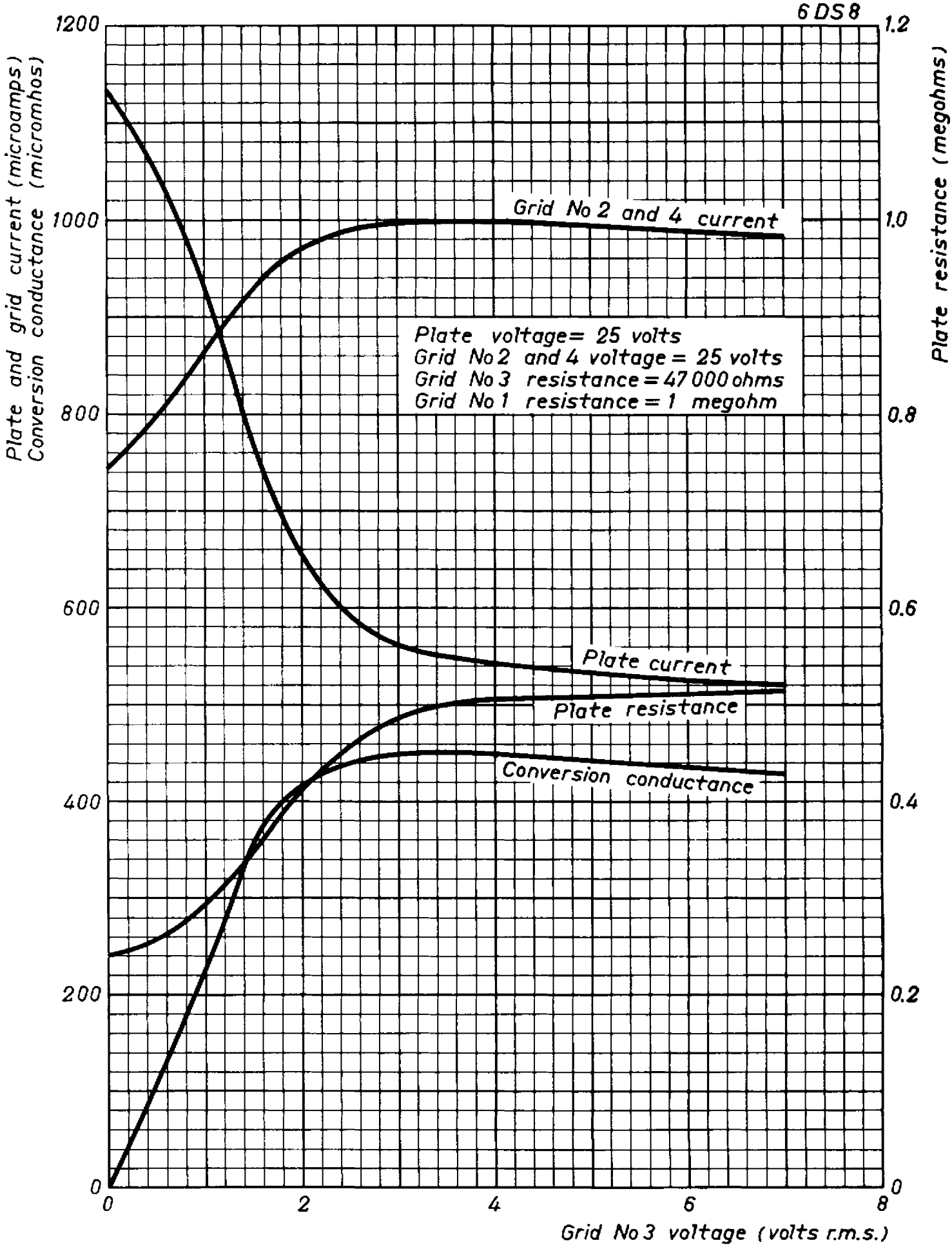
[2] Grid No.3 capacitively coupled to the oscillator

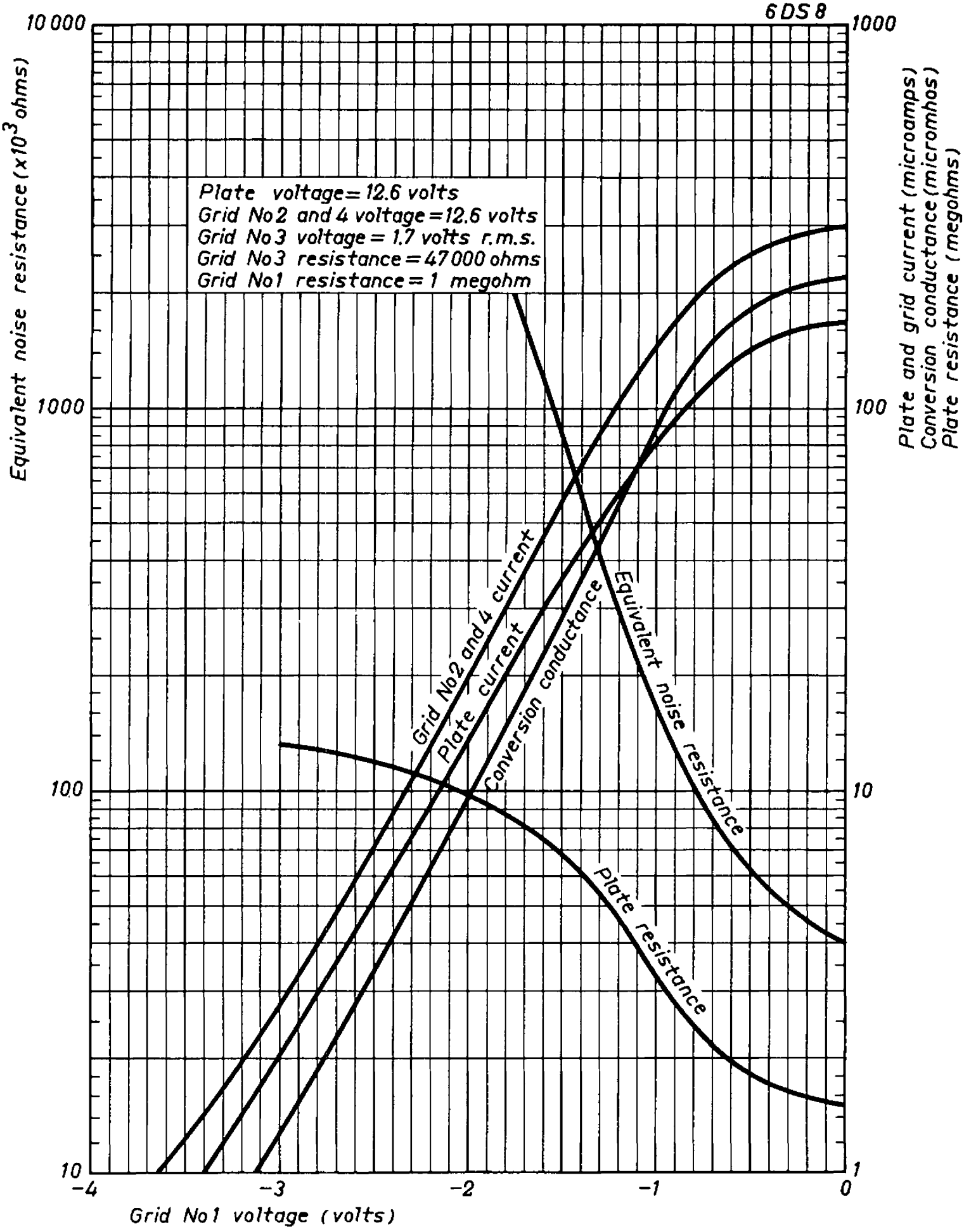
[3] Grid bias obtained by grid current biasing with a grid resistor of 47000 ohms


6 DS 8
Plate voltage = 25 volts
Grid No 2 and 4 voltage = 25 volts
Grid No 3 voltage = 3.5 volts r.m.s.
Grid No 3 resistance 47 000 ohms
Grid No 1 resistance 1 megohm
Equivalent noise resistance
Plate resistance
Grid No2 and 4 current
Plate current
Conversion conductance
Plate resistance (megohms)
Plate and grid current (microamps)
Conversion conductance (micromhos)
Equivalent noise resistance(x10³ ohms)
Grid No 1 voltage (volts)
1000
100
10
1
0.1
10 000
1000
100
10
1
-8
-6
-4
-2
0

10.10.1958

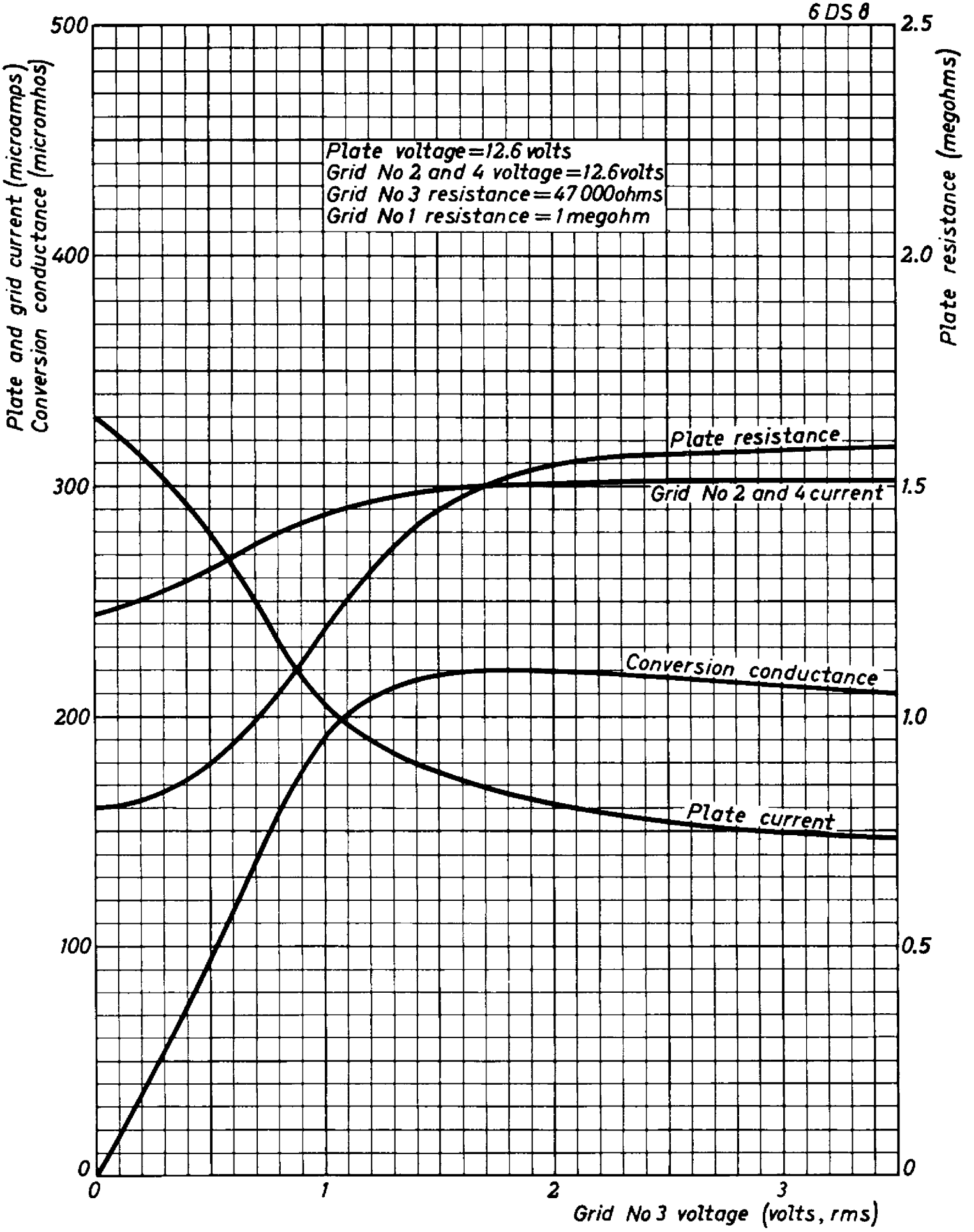
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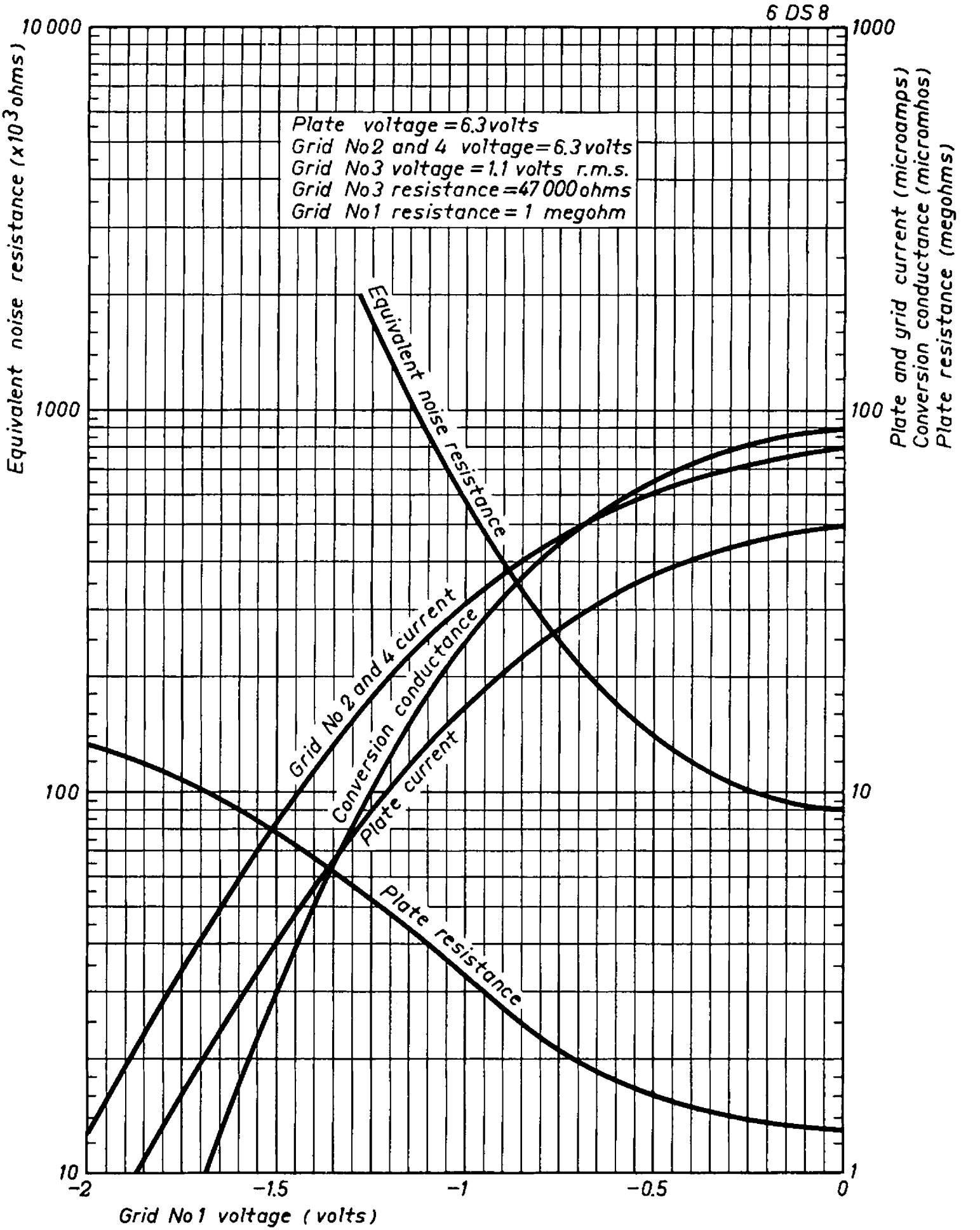

6 DS 8
Plate and grid current (microamps)
Conversion conductance (micromhos)
Plate resistance (megohms)
1200
1000
800
600
400
200
0
1.2
1.0
0.8
0.6
0.4
0.2
0
Grid No 2 and 4 current
Plate voltage= 25 volts
Grid No 2 and 4 voltage = 25 volts
Grid No 3 resistance = 47 000 ohms
Grid No 1 resistance = 1 megohm
Plate current
Plate resistance
Conversion conductance
0
2
4
6
8
Grid No 3 voltage (volts r.m.s.)


6DS8
Plate voltage = 12.6 volts
Grid No2 and 4 voltage = 12.6 volts
Grid No3 voltage = 1.7 volts r.m.s.
Grid No3 resistance = 47000 ohms
Grid No1 resistance = 1 megohm
Equivalent noise resistance (x10³ ohms)
Plate and grid current (microamps)
Conversion conductance (micromhos)
Plate resistance (megohms)
10000
1000
100
10
1000
100
10
1
Grid No2 and 4 current
Plate current
Conversion conductance
Equivalent noise resistance
Plate resistance
−4
−3
−2
−1
0
Grid No1 voltage (volts)

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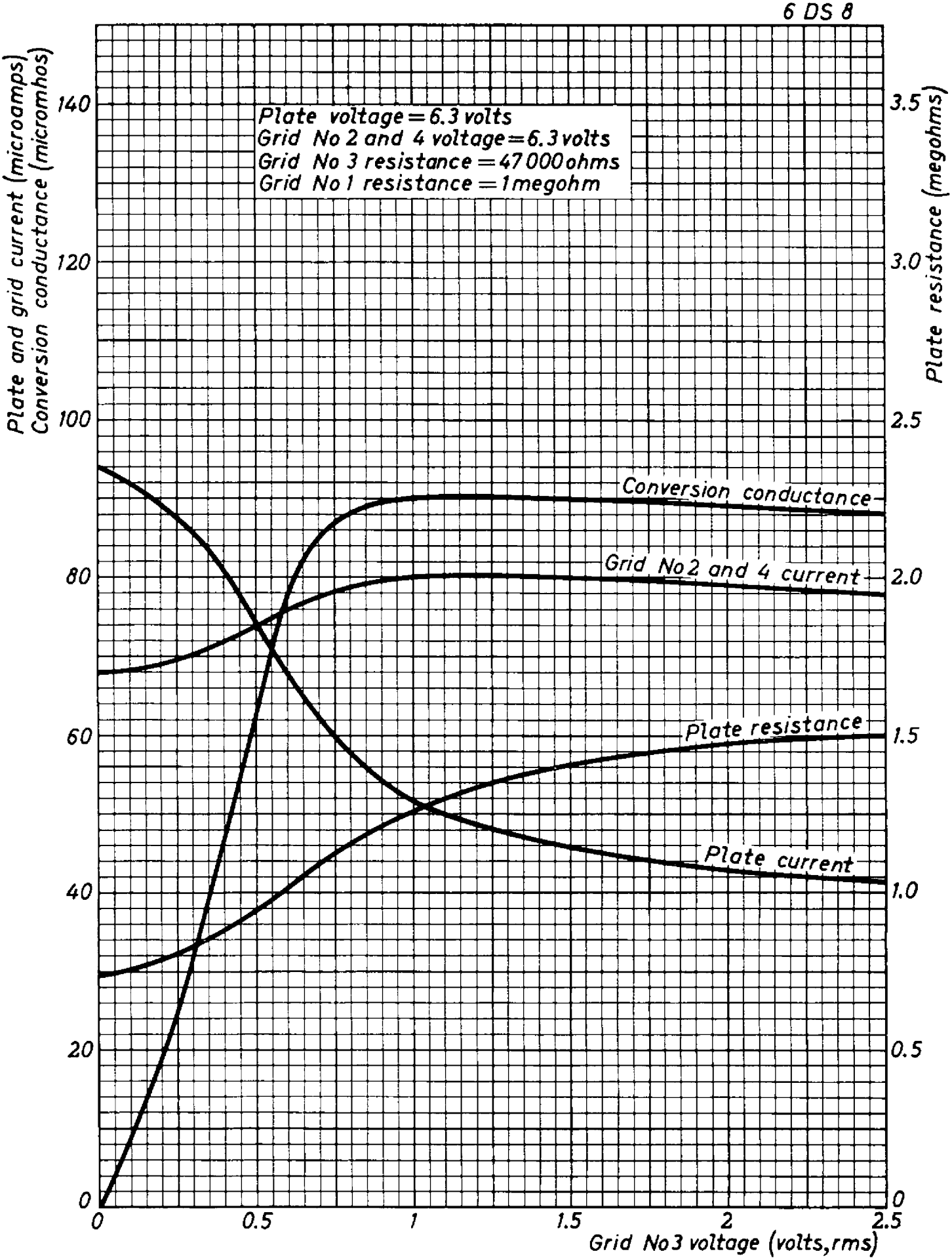
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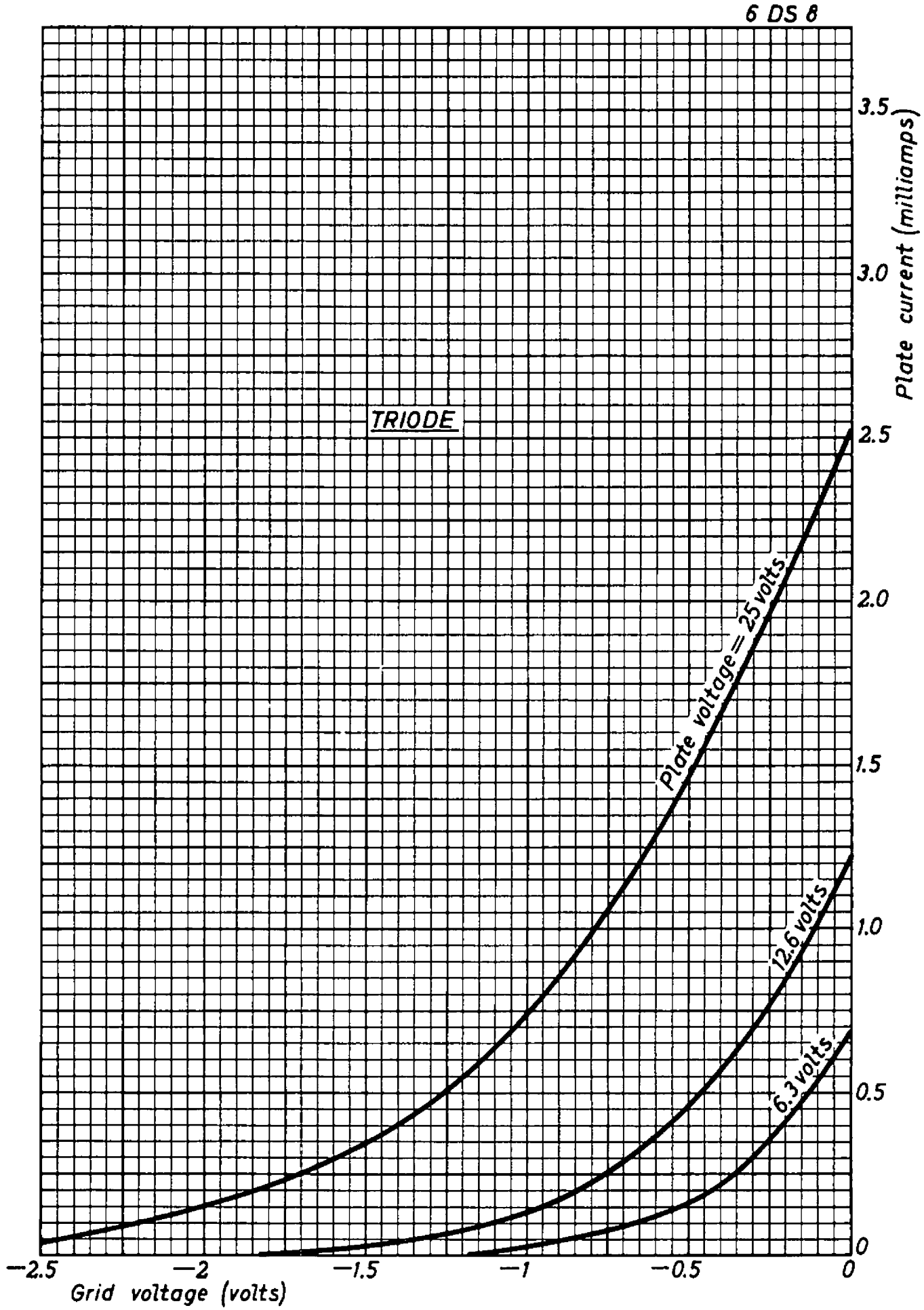

6 DS 8
Plate voltage=12.6 volts
Grid No 2 and 4 voltage=12.6volts
Grid No 3 resistance=47 000ohms
Grid No 1 resistance = 1 megohm
Plate resistance
Grid No 2 and 4 current
Conversion conductance
Plate current
Plate and grid current (microamps)
Conversion conductance (micromhos)
Plate resistance (megohms)
Grid No 3 voltage (volts, rms)
500
400
300
200
100
0
2.5
2.0
1.5
1.0
0.5
0
0
1
2
3


6 DS 8
Plate voltage = 6.3 volts
Grid No 2 and 4 voltage = 6.3 volts
Grid No 3 voltage = 1.1 volts r.m.s.
Grid No 3 resistance = 47 000 ohms
Grid No 1 resistance = 1 megohm
Equivalent noise resistance
Grid No 2 and 4 current
Conversion conductance
Plate current
Plate resistance
Equivalent noise resistance (x10³ ohms)
Plate and grid current (microamps)
Conversion conductance (micromhos)
Plate resistance (megohms)
10 000
1000
100
10
1000
100
10
1
−2
−1.5
−1
−0.5
0
Grid No 1 voltage (volts)

10.10.1958

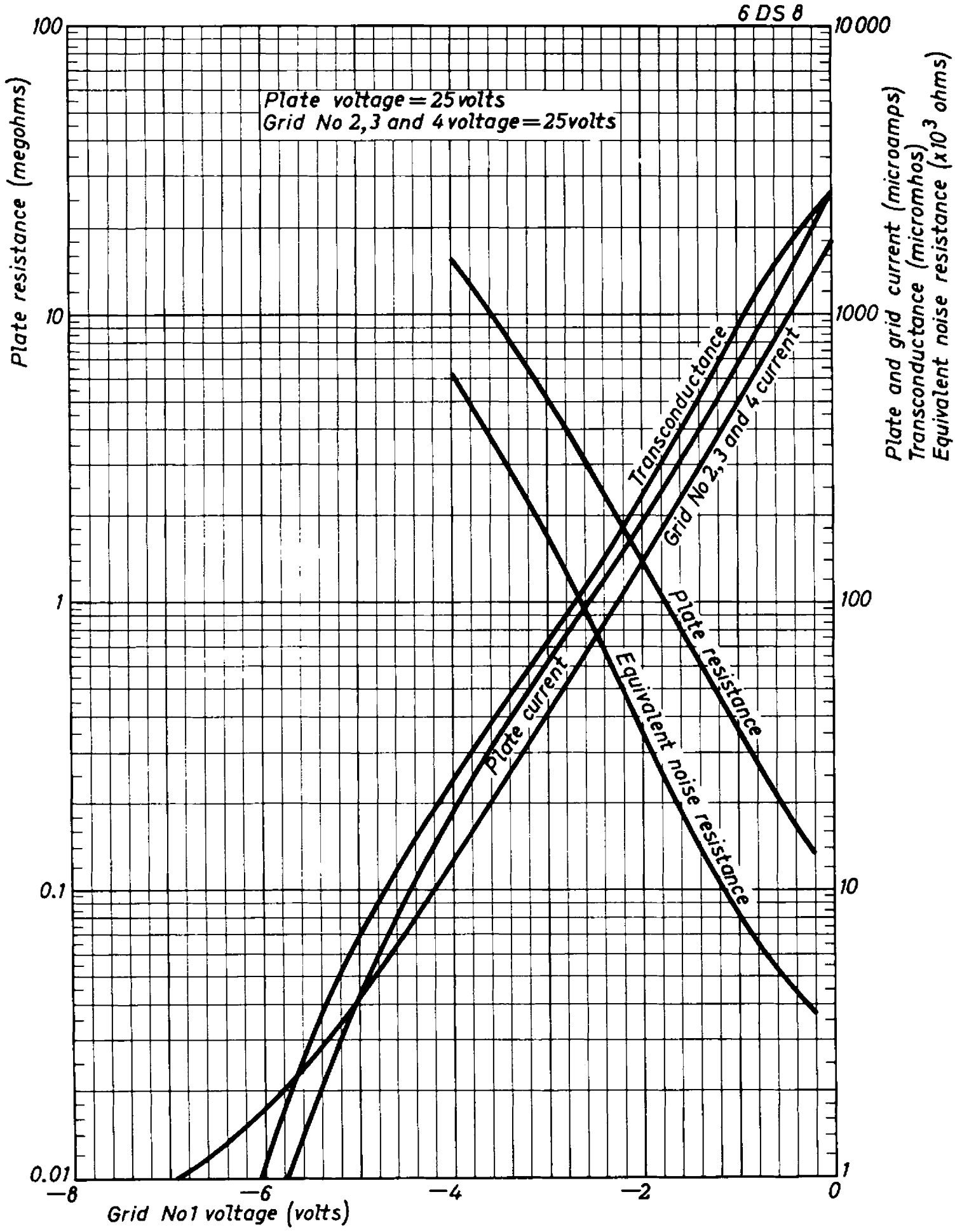
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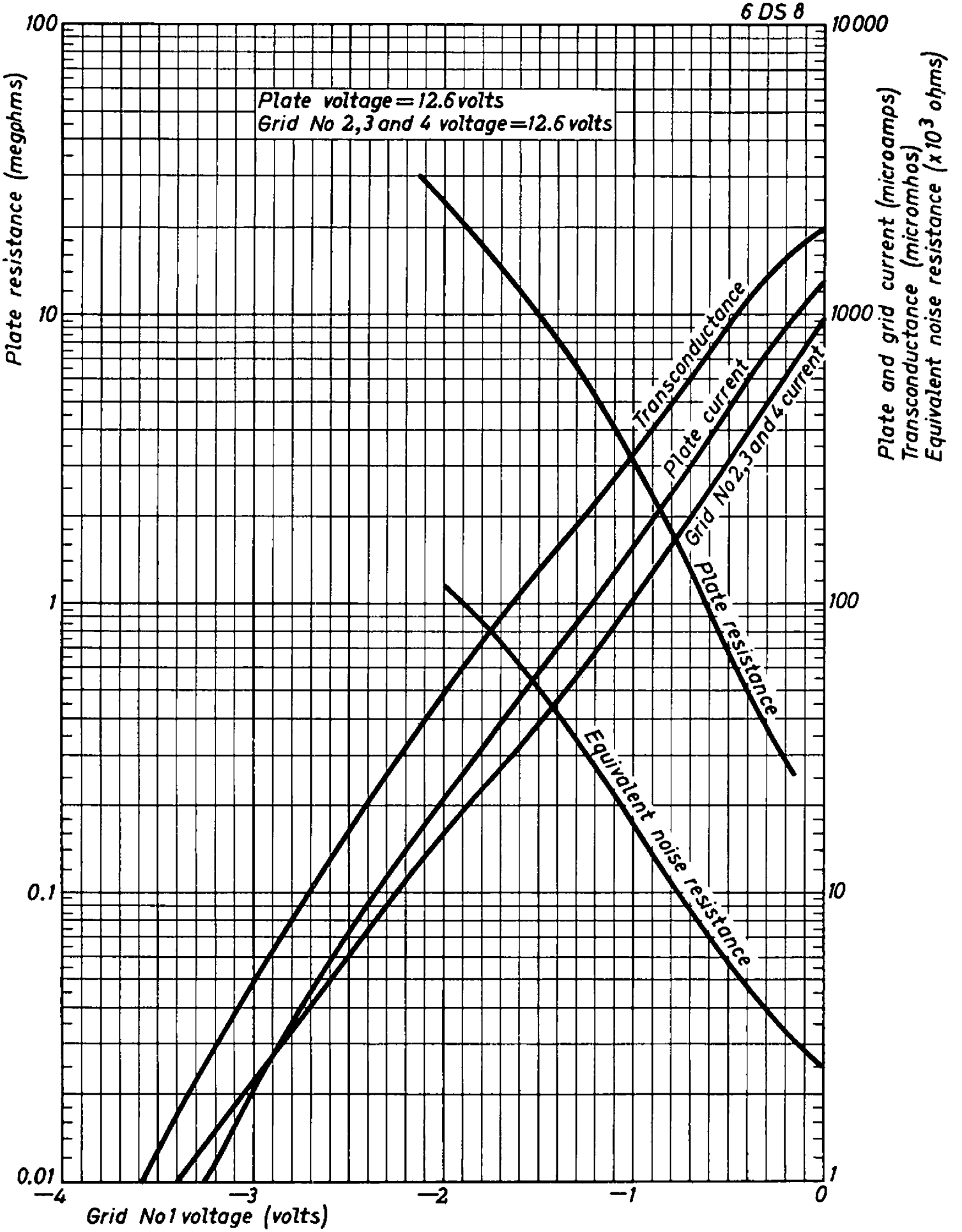

6 DS 8
Plate voltage = 6.3 volts
Grid No 2 and 4 voltage = 6.3 volts
Grid No 3 resistance = 47 000 ohms
Grid No 1 resistance = 1 megohm
Plate and grid current (microamps)
Conversion conductance (micromhos)
Plate resistance (megohms)
Conversion conductance
Grid No 2 and 4 current
Plate resistance
Plate current
Grid No 3 voltage (volts, rms)
0
20
40
60
80
100
120
140
0.5
1
1.5
2
2.5
3.5
3.0
2.5
2.0
1.5
1.0
0.5

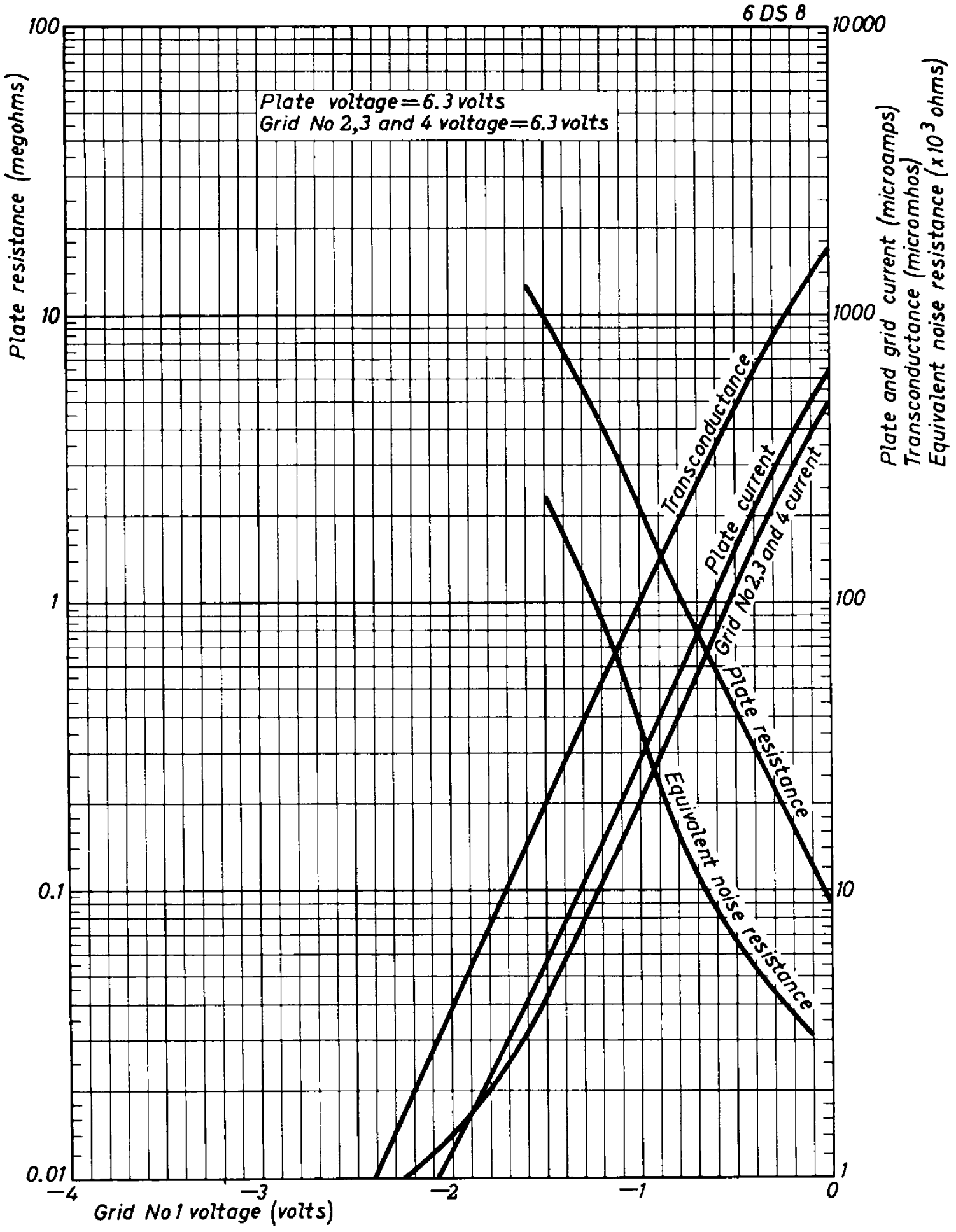

6 DS 8
TRIODE
Plate voltage = 25 volts
12.6 volts
6.3 volts
Plate current (milliamps)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
−2.5
−2
−1.5
−1
−0.5
0
Grid voltage (volts)

10.10.1958

G


6 DS 8
Plate voltage = 25 volts
Grid No 2, 3 and 4 voltage = 25 volts
Plate resistance (megohms)
Plate and grid current (microamps)
Transconductance (micromhos)
Equivalent noise resistance (x10³ ohms)
100
10
1
0.1
0.01
10000
1000
100
10
1
−8
−6
−4
−2
0
Grid No 1 voltage (volts)
Transconductance
Grid No 2, 3 and 4 current
Plate resistance
Plate current
Equivalent noise resistance


6 DS 8
Plate voltage = 12.6 volts
Grid No 2,3 and 4 voltage = 12.6 volts
Transconductance
Plate current
Grid No 2,3 and 4 current
Plate resistance
Equivalent noise resistance
Plate resistance (megohms)
Plate and grid current (microamps)
Transconductance (micromhos)
Equivalent noise resistance (x10³ ohms)
Grid No 1 voltage (volts)
100
10
1
0.1
0.01
10000
1000
100
10
1
−4
−3
−2
−1
0


6 DS 8
Plate voltage = 6.3 volts
Grid No 2,3 and 4 voltage = 6.3 volts
Plate resistance (megohms)
Plate and grid current (microamps)
Transconductance (micromhos)
Equivalent noise resistance (x 10³ ohms)
100
10
1
0.1
0.01
10000
1000
100
10
1
−4
−3
−2
−1
0
Grid No 1 voltage (volts)
Transconductance
Plate current
Grid No 2,3 and 4 current
Plate resistance
Equivalent noise resistance

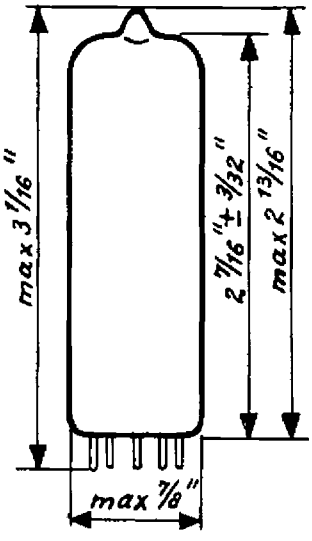
6 DY 5

Description: Pentode for use as frame time base and sound output tube

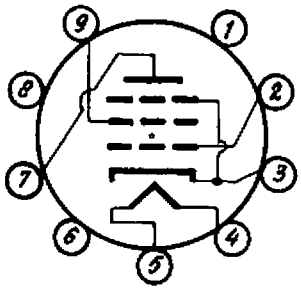
Mechanical data

Cathode	coated, unipotential
Base	E 9-1
Bulb	T 6 1/2
Outline	6 - 4
Basing	9 CV
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Internally connected
2	Grid No. 1
3	Cathode grid No. 3
4	Heater
5	Heater
6	Internally connected
7	Plate
8	Internally connected
9	Grid No. 2

Heater data

Heater voltage	6.3 volts
Heater current	0.8 amp

Direct interelectrode capacitances

Grid No.1 to all other elements except plate		11 μμF
Plate to all other elements except grid No.1		5.9 μμF
Plate to grid No. 1	max.	1 μμF
Grid No. 1 to heater	max.	0.15 μμF

from JEDEC release #2737, Feb. 22, 1960

Maximum ratings (design center values)

Plate voltage(without current)	550 volts max.
Plate voltage [1])	250 volts max.
Peak positive plate voltage [2])	2500 volts max.
Peak negative plate voltage	500 volts max.
Plate dissipation	9 watts max.
Grid No.2 voltage(without current)	550 volts max.
Grid No.2 voltage	250 volts max.
Grid No.2 dissipation	2.5 watts max.
Peak grid No.2 dissipation	4 watts max.
Cathode current	75 mamps max.
Grid No.1 circuit resistance with cathode bias	1 megohm max.
Grid No.1 circuit resistance with fixed bias	0.4 megohm max.
Voltage between heater and cathode	100 volts max.
Circuit resistance between cathode and heater	20000 ohms max.

Operating conditions as class A sound output tube

Plate and supply voltage	170	200	volts
Grid No. 2 series resistor	0	680	ohms
Grid No. 1 bias	-10.4	-13.9	volts
Plate current	53	45	mamps
Grid No. 2 current	10	8.5	mamps
Transconductance	9000	7600	micromhos
Plate resistance	20000	24000	ohms
Amplification factor of grid No.2 with respect to grid No. 1	10	10	
Load resistance	3000	4000	ohms
Power output at 10 % total harmonic distortion	4.0	4.2	watts
Input A.F. voltage for 10 % total harmonic distortion	6.0	7.0	volts (rms)
Input A.F. voltage for 50 milliwatts power output	0.5	0.55	volts (rms)

Operating characteristics as sound output tube, class A push-pull (two tubes)

Plate voltage	170		200		volts
Grid No.2 voltage	170		200		volts
Cathode resistor	100		135		ohms
Load resistance (plate to plate)	4000		4000		ohms
Input A.F. voltage	0	2x9.3	0	2x13.5	volts (rms)
Plate current	2x46	2x50	2x45	2x52	mamps
Grid No.2 current	2x8.7	2x17	2x8.5	2x19	mamps
Power output	0	9	0	12	watts
Total harmonic distortion	-	5	-	5	%

Optimum peak plate current in frame output operation

To allow for tube spread and for deterioration during life in frame output application the circuit should be designed around a peak plate current not exceeding 90 mamps at a plate voltage of 50 volts and a grid No. 2 voltage of 170 volts and 120 mamps at a plate voltage of 60 volts and a grid No. 2 voltage of 200 volts

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[1]) When used as frame output tube with a plate dissipation of less than 4.5 watts the maximum permissible plate voltage is 450 volts

[2]) Maximum permissible pulse duration 10 % of a cycle with a maximum of 2 milli-seconds

Rogers Electronic Tubes & Components

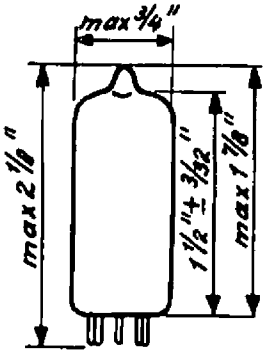
6 ES 6

Description: Pentode with variable transconductance for use as R.F. amplifier, I.F. amplifier or mixer in carradio sets, to be operated directly from a storage battery

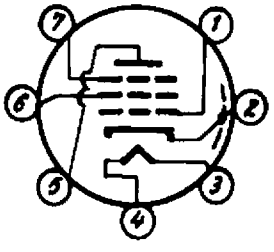
Mechanical data

Cathode	coated unipotential
Base	E 7-1
Bulb	T 5 1/2
Outline	5 - 2
Basing designation	7 EN
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Grid No. 1
2	Cathode, internal shield
3	Heater
4	Heater
5	Plate
6	Grid No. 2
7	Grid No. 3

Heater data

Heater voltage	6.3 volts
Heater current	300 mamps

Direct interelectrode capacitances

Grid No. 1 to all other elements except plate	6.5 μμF
Plate to all other elements except grid No. 1	4.0 μμF
Plate to grid No. 1	0.015 μμF
Grid No. 1 to grid No. 2	3.0 μμF

from JEDEC release #2382, Feb. 9, 1959

Maximum ratings (design center values)

Plate voltage	50 volts max.
Plate dissipation	0.5 watt max.
Grid No. 2 voltage	50 volts max.
Grid No. 2 dissipation	0.5 watt max.
Grid No. 3 voltage	50 volts max.
Cathode current	15 mamps max.
Grid No. 1 circuit resistance	22 megohm max
Grid No. 3 circuit resistance	5 megohm max
Voltage between cathode and heater	50 volts max.

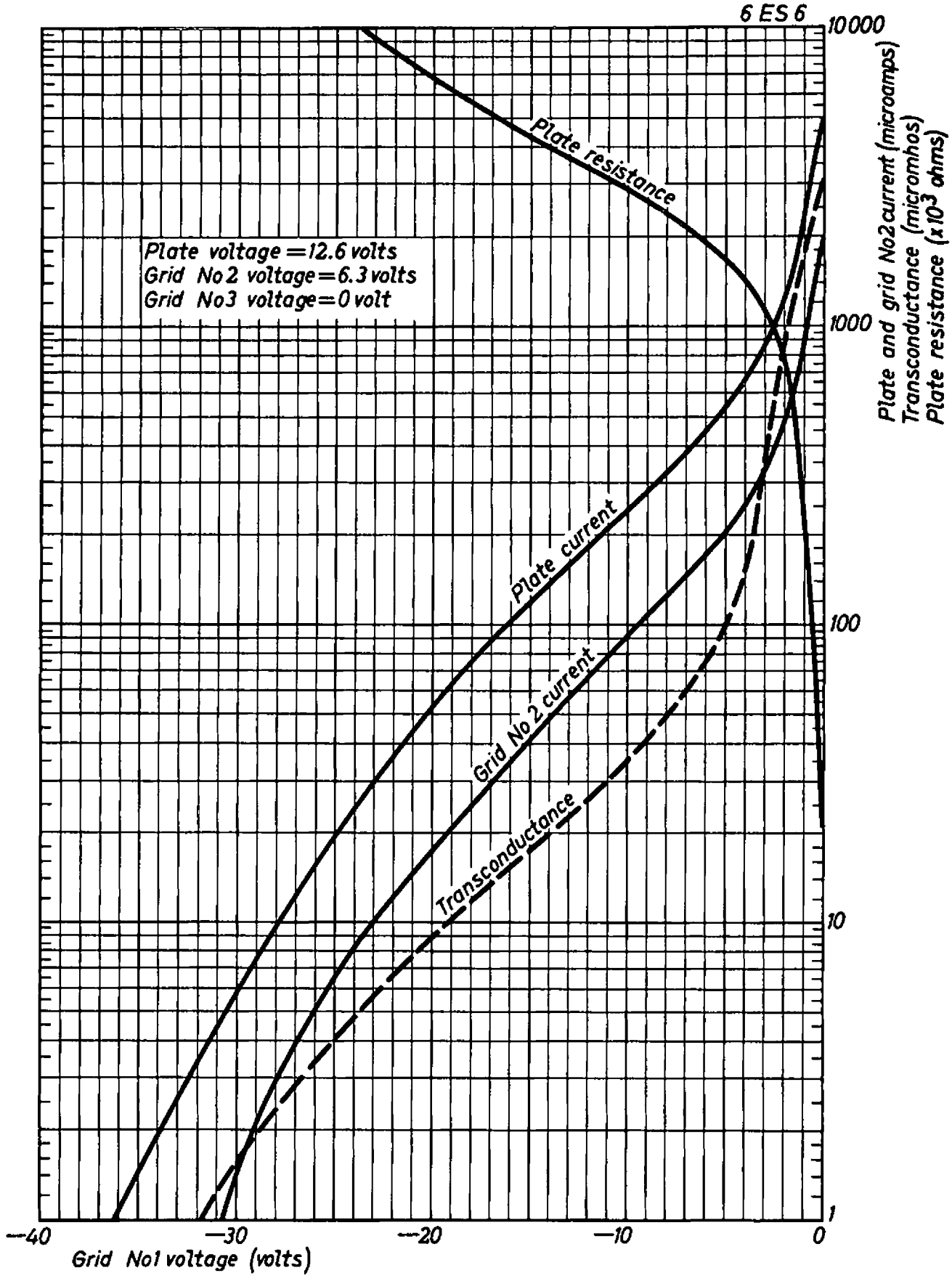
Operating characteristics as R.F. or I.F. amplifier

Plate voltage	25	12.6	6.3	12.6	6.3	volts
Grid No. 2 voltage	6.3	6.3	3.2	3.2	1.6	volts
Grid No. 3 voltage	0	0	0	0	0	volt
Grid No. 1 bias [1])	-0.7	-0.7	-0.7	-0.7	-0.7	volt
Plate current	3.3	3	1	1	0.4	mamps
Grid No. 2 current	0.95	1.1	0.4	0.35	0.15	mamps
Transconductance	2100	1900	1000	1100	500	micromhos
Transconductance reduced to 1/10 at grid No.1 bias of	-3.5	-3.5	-2.5	-2.5	-2.5	volts
Transconductance reduced to 1/20 at grid No.1 bias of	-5	-5	-4	-4	-3.5	volts
Plate resistance	0.05	0.15	0.07	0.2	0.2	megohm
Equivalent noise resistance	5000	5500	8000	7000	15000	ohms

Operating characteristics as mixer (R.F. voltage applied to grid No. 1, oscillator voltage applied to grid No. 3)

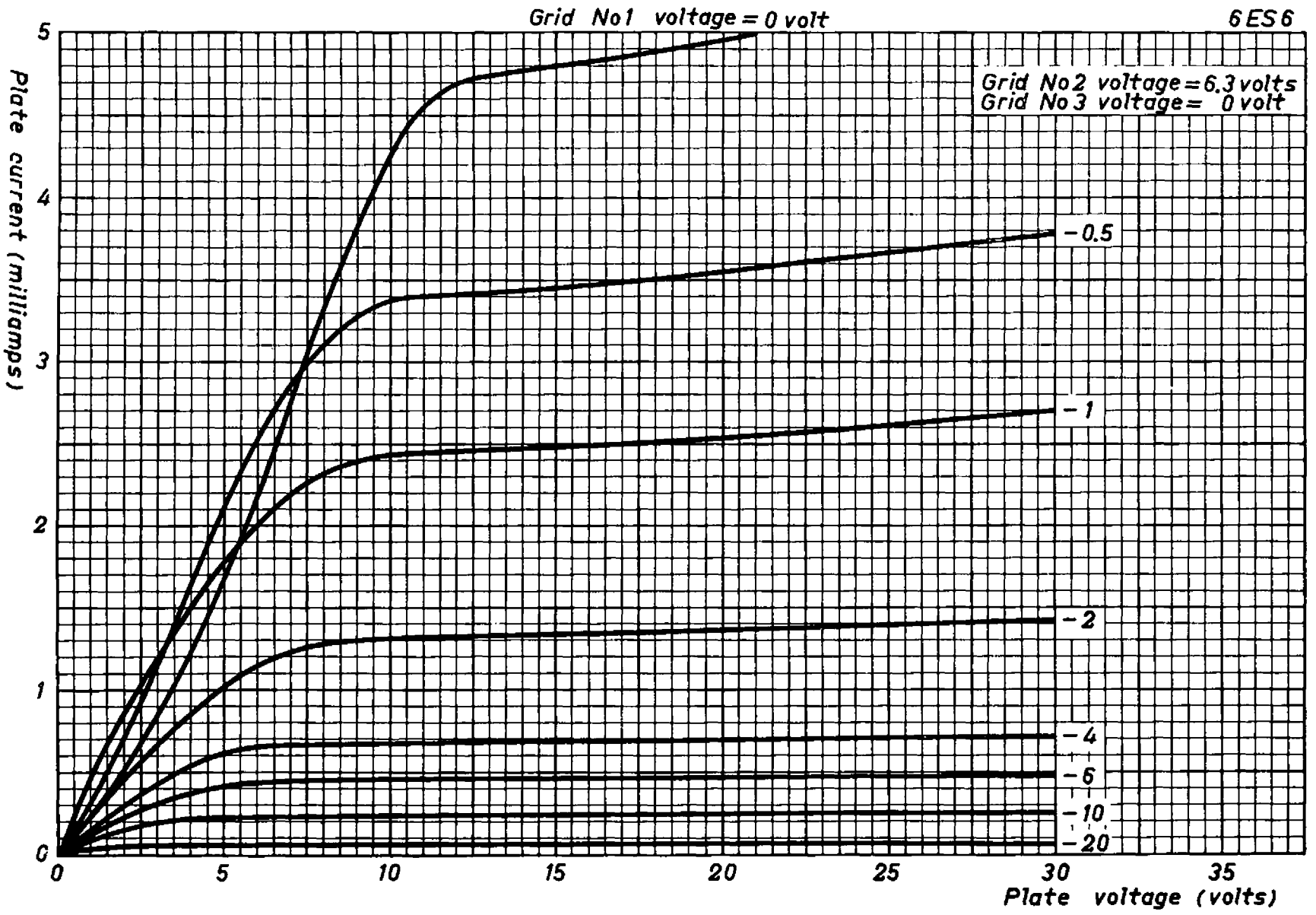
Plate voltage	25	12.6	6.3	volts
Grid No. 2 voltage	6.3	6.3	3.2	volts
Grid No. 3 resistance	0.1	0.1	0.1	megohm
Oscillator voltage	10	10	5	volts (rms)
Grid No. 1 bias [1])				
Plate current	1.8	1.3	0.45	mamps
Grid No. 2 current	1.5	1.7	0.6	mamps
Conversion conductance	600	550	300	micromhos
Conversion conductance reduced to 1/10 at grid No. 1 bias of	-3	-3.5	-2.5	volts
Conversion conductance reduced to 1/20 at grid No. 1 bias of	-4	-5	-3.5	volts
Plate resistance	50000	25000	30000	ohms
Equivalent noise resistance	40000	40000	55000	ohms

[1]) Grid No. 1 bias obtained by grid current biasing with grid No. 1 resistor of 10 megohms

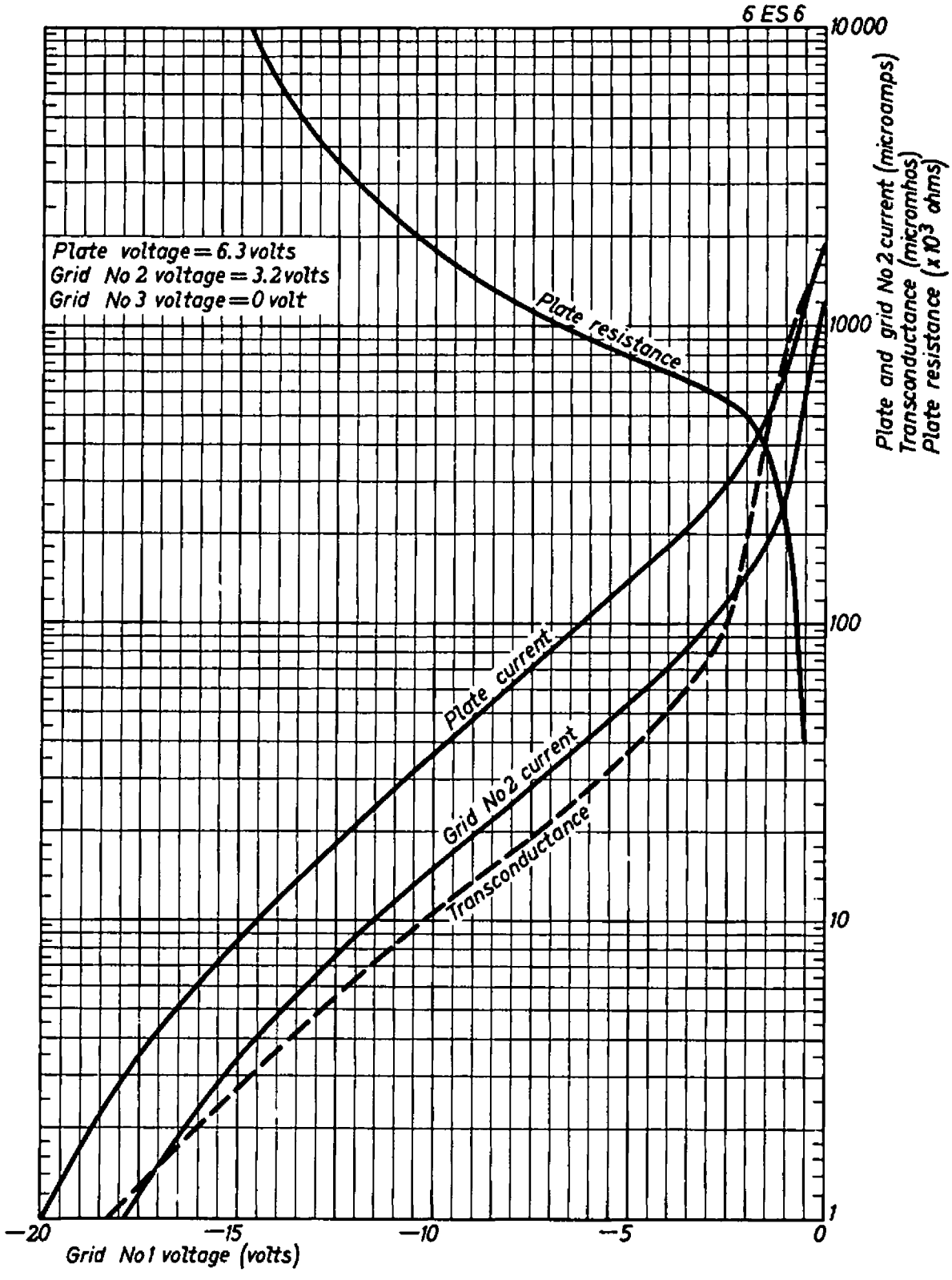

6 ES 6
Plate voltage = 12.6 volts
Grid No 2 voltage = 6.3 volts
Grid No 3 voltage = 0 volt
Plate resistance
Plate current
Grid No 2 current
Transconductance
10000
1000
100
10
1
−40
−30
−20
−10
0
Grid No 1 voltage (volts)
Plate and grid No 2 current (microamps)
Transconductance (micromhos)
Plate resistance (x10³ ohms)

10.10.1958

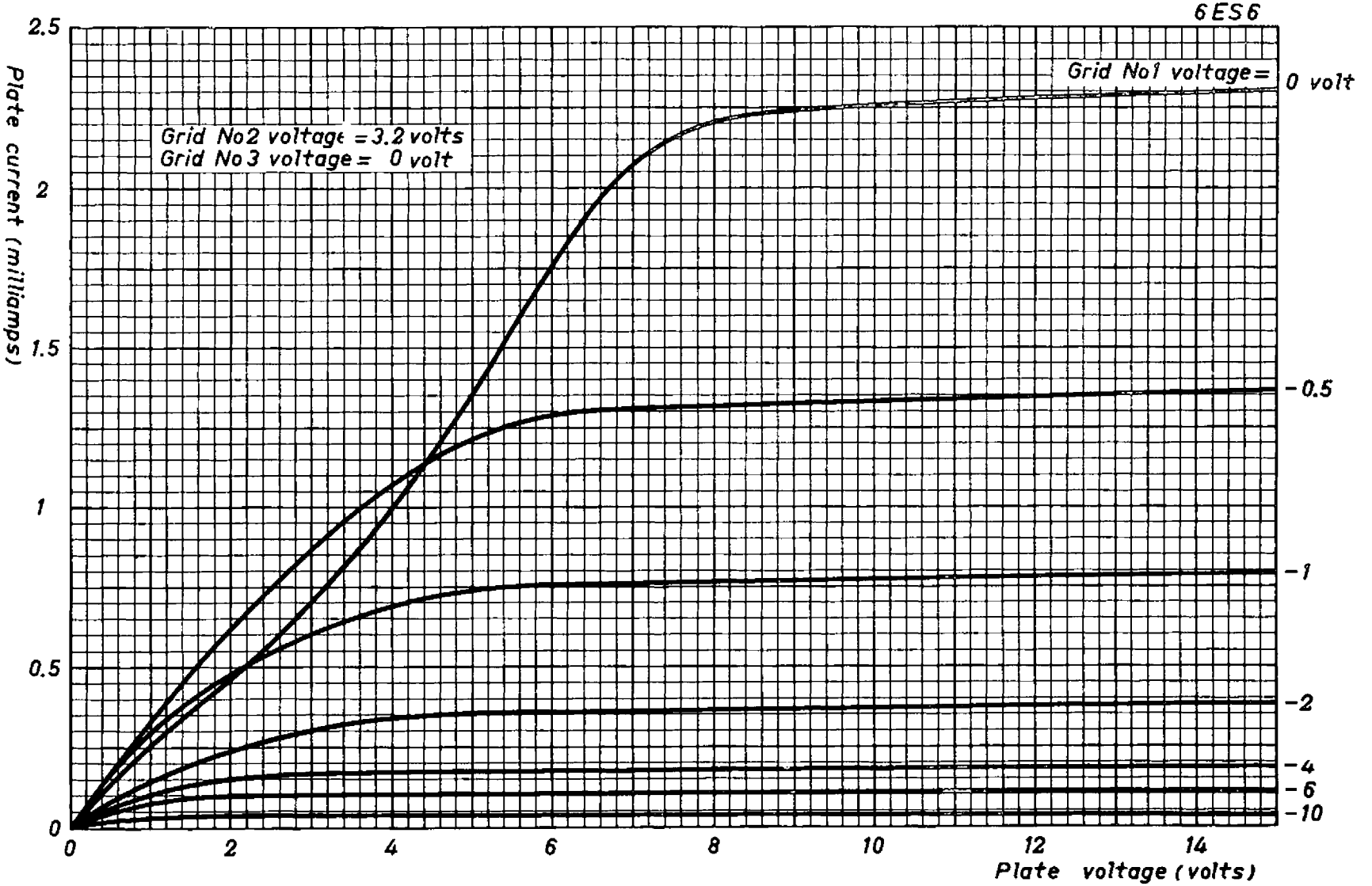
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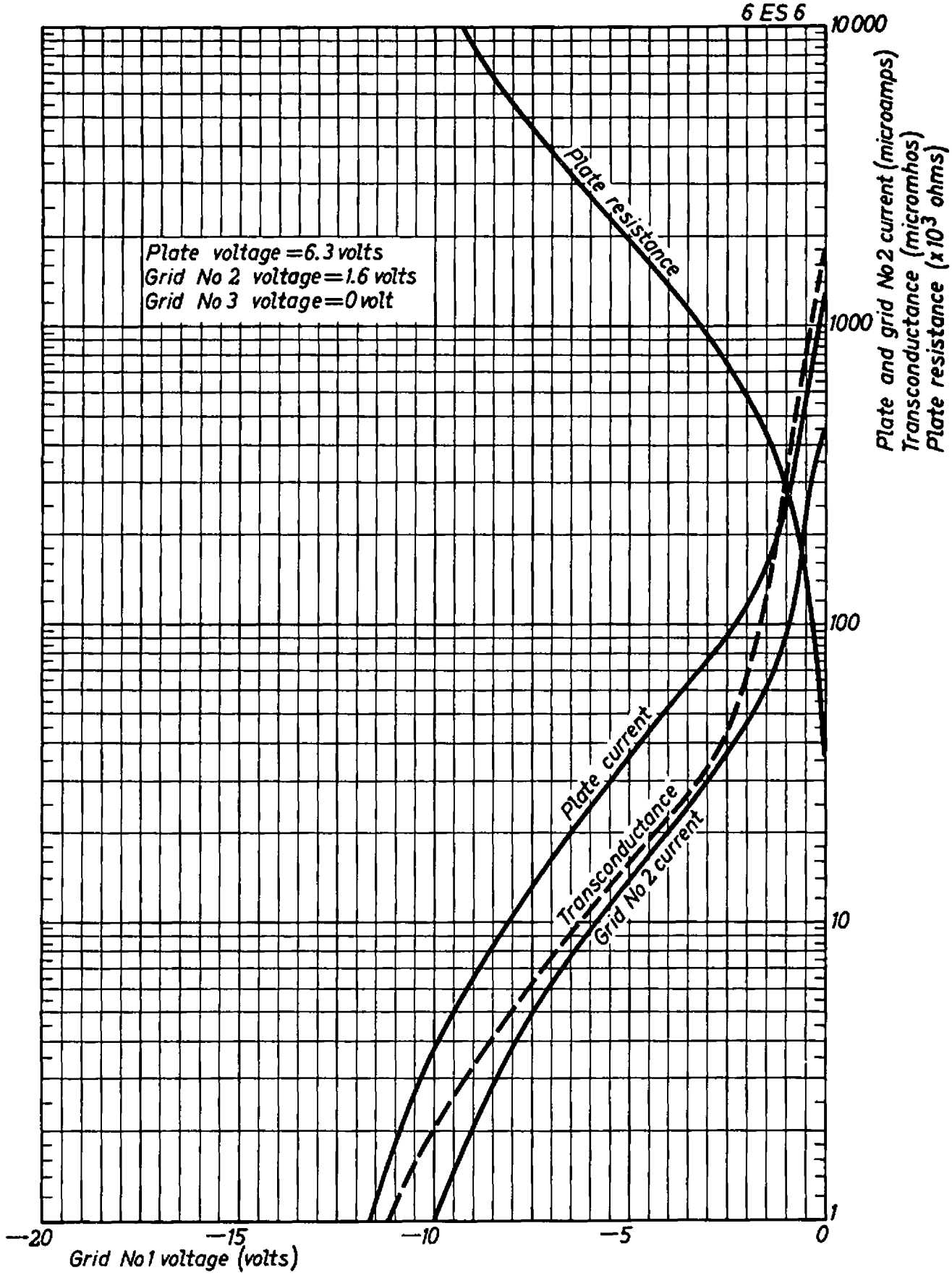

6ES6
Grid No1 voltage = 0 volt
Grid No2 voltage = 6.3 volts
Grid No3 voltage = 0 volt
-0.5
-1
-2
-4
-6
-10
-20
Plate current (milliamps)
Plate voltage (volts)
0
1
2
3
4
5
0
5
10
15
20
25
30
35

B


6 ES 6
Plate voltage = 6.3 volts
Grid No 2 voltage = 3.2 volts
Grid No 3 voltage = 0 volt
Plate resistance
Plate current
Grid No 2 current
Transconductance
10000
1000
100
10
1
−20
−15
−10
−5
0
Grid No 1 voltage (volts)
Plate and grid No 2 current (microamps)
Transconductance (micromhos)
Plate resistance (x 10³ ohms)

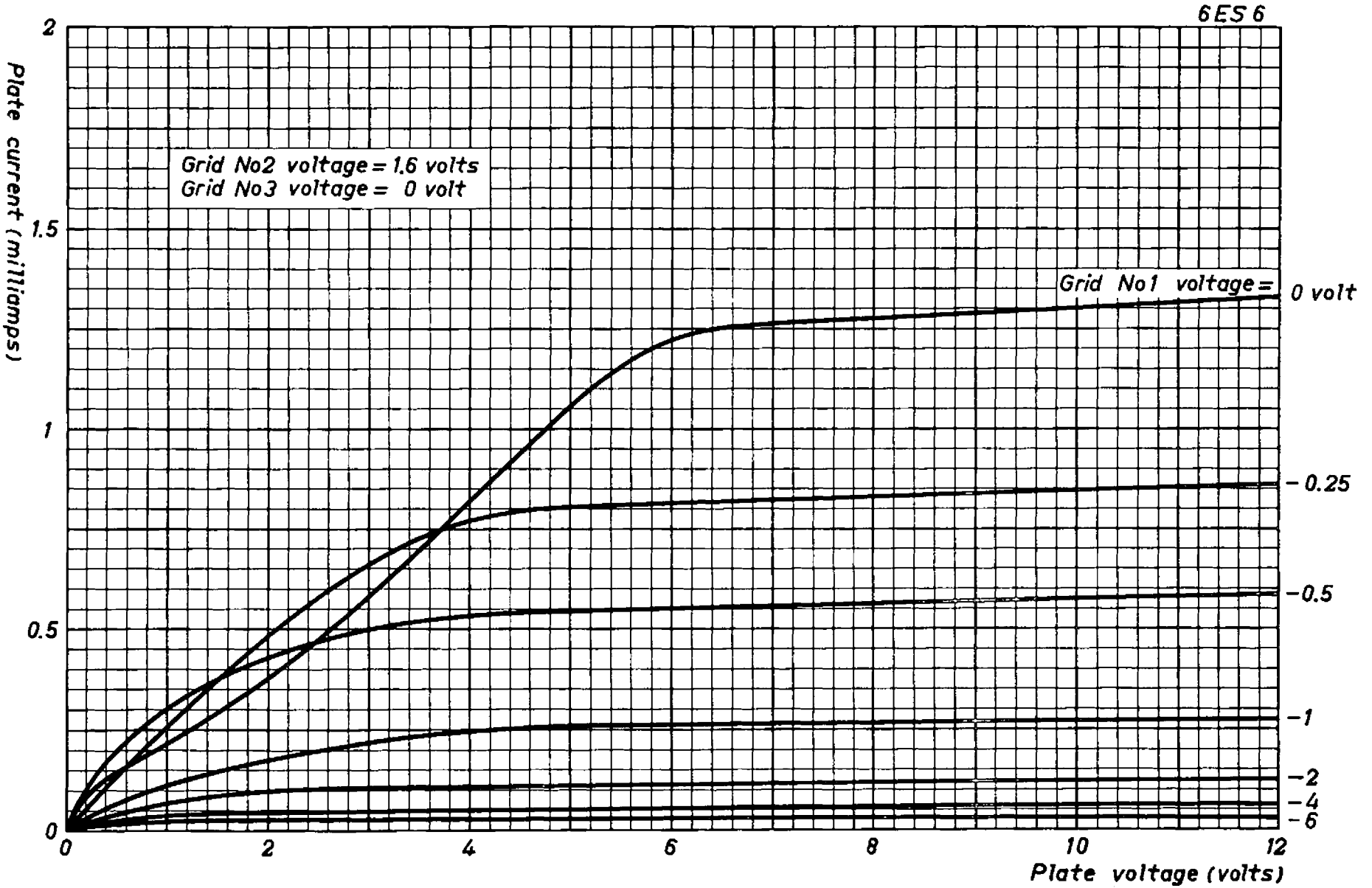
10.10.1958 C

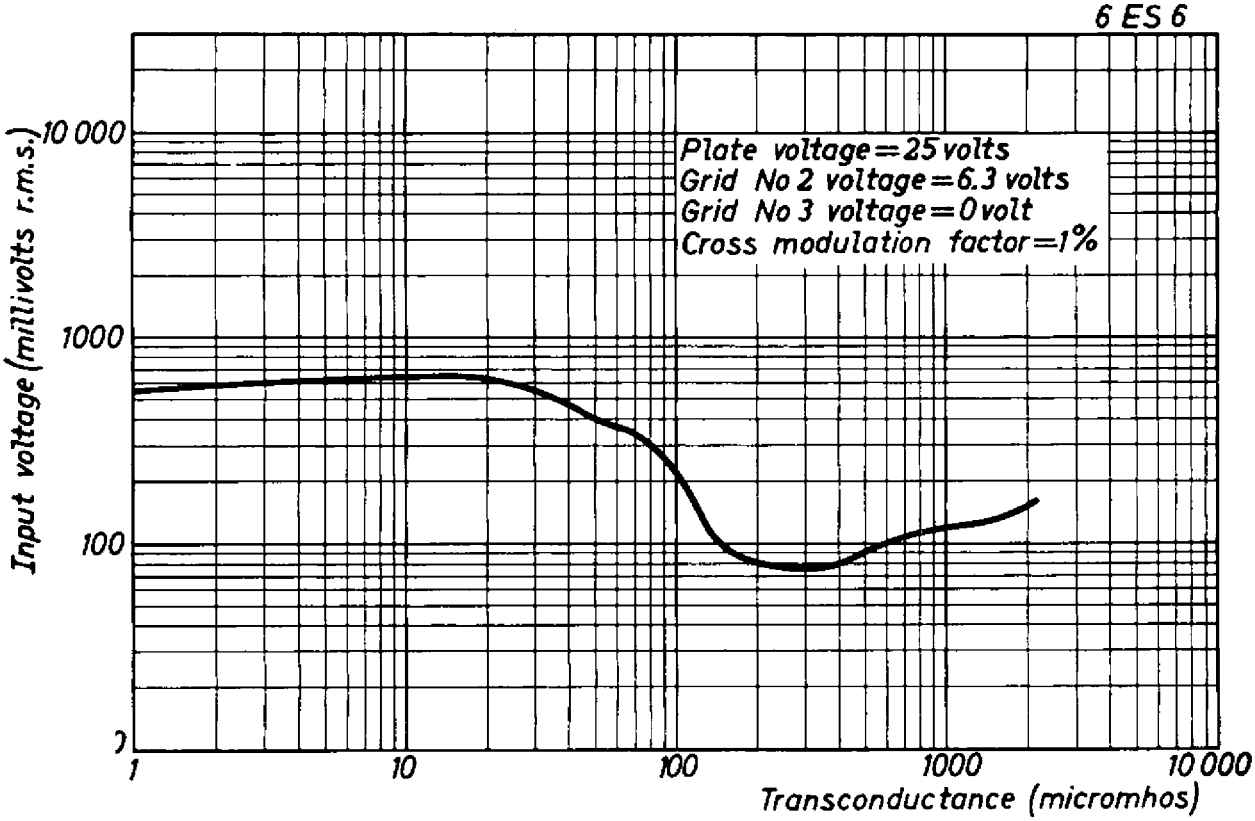

6ES6
Grid No1 voltage =
0 volt
Grid No2 voltage = 3.2 volts
Grid No3 voltage = 0 volt
-0.5
-1
-2
-4
-6
-10
Plate current (milliamps)
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
12
14
Plate voltage (volts)

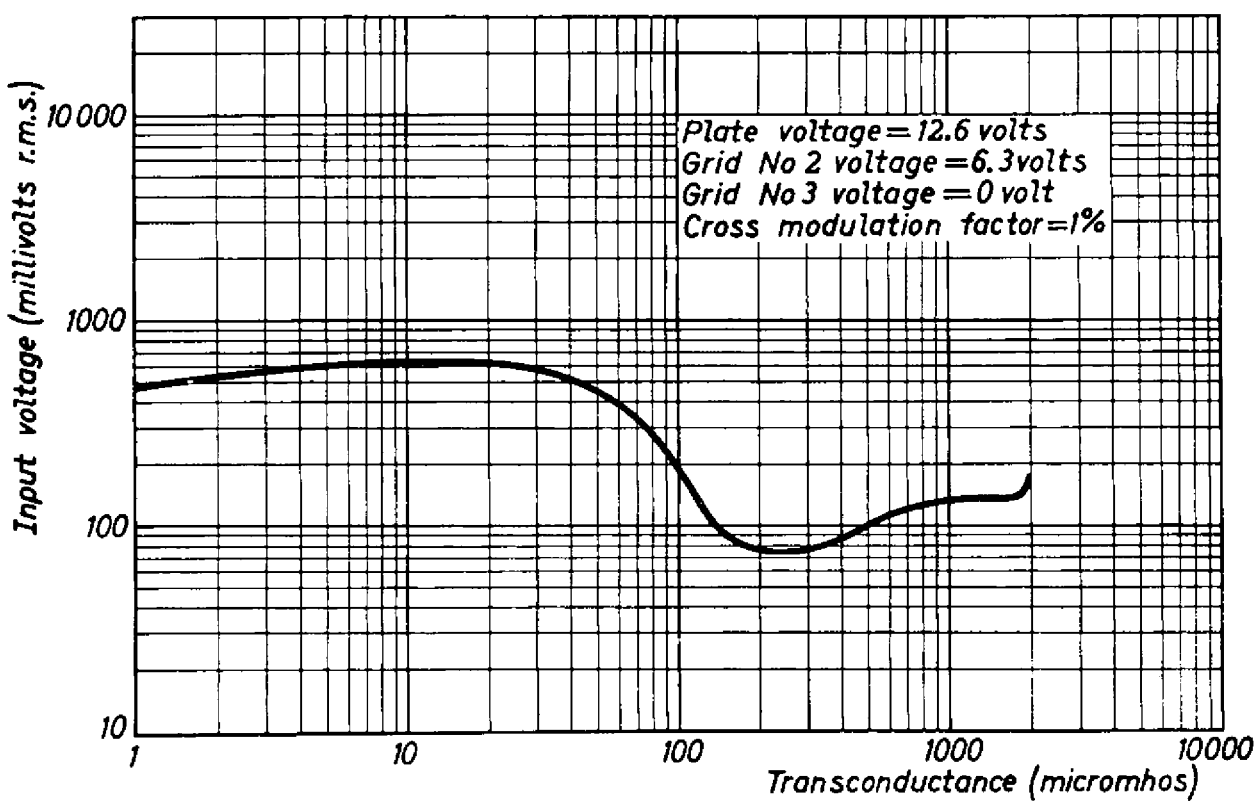

6 ES 6
Plate voltage = 6.3 volts
Grid No 2 voltage = 1.6 volts
Grid No 3 voltage = 0 volt
Plate resistance
Plate current
Transconductance
Grid No 2 current
10000
1000
100
10
1
−20
−15
−10
−5
0
Grid No 1 voltage (volts)
Plate and grid No 2 current (microamps)
Transconductance (micromhos)
Plate resistance (x10³ ohms)

10.10.1958

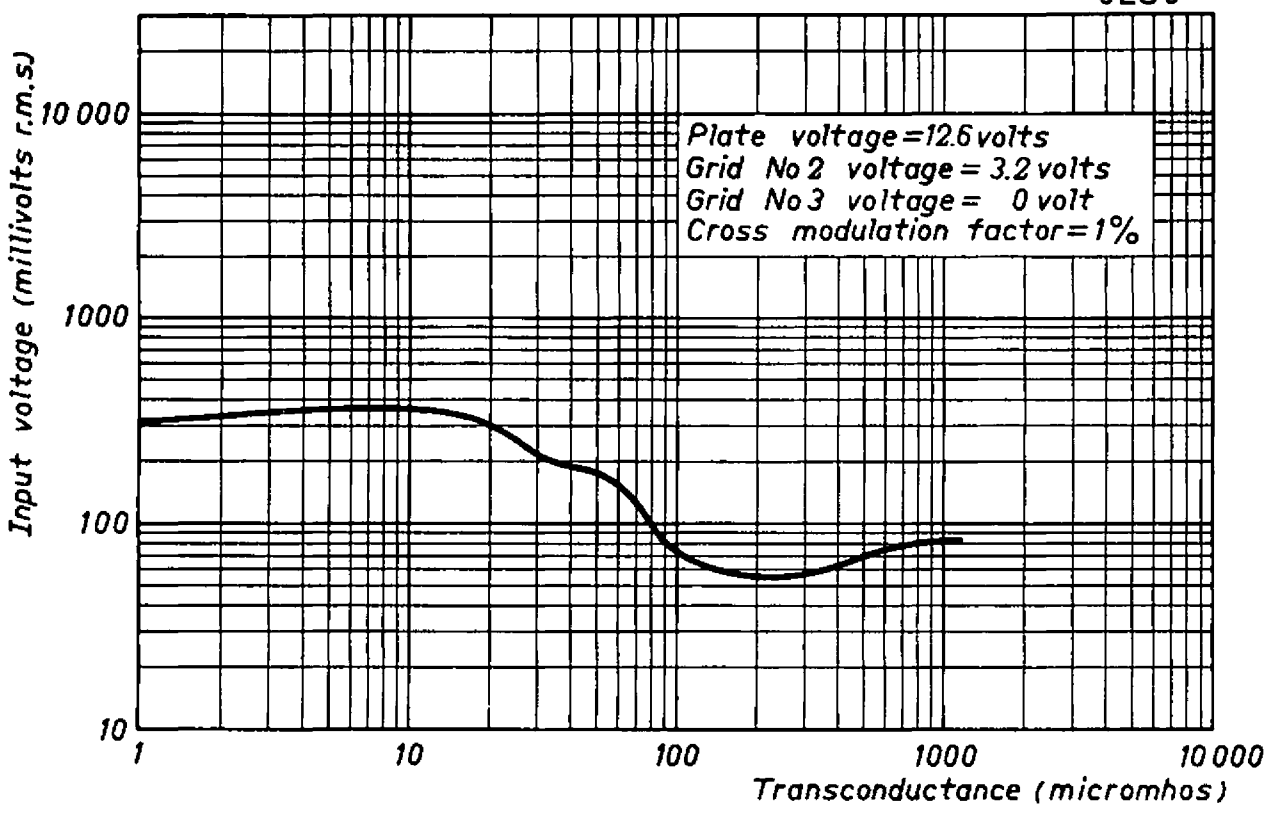
E

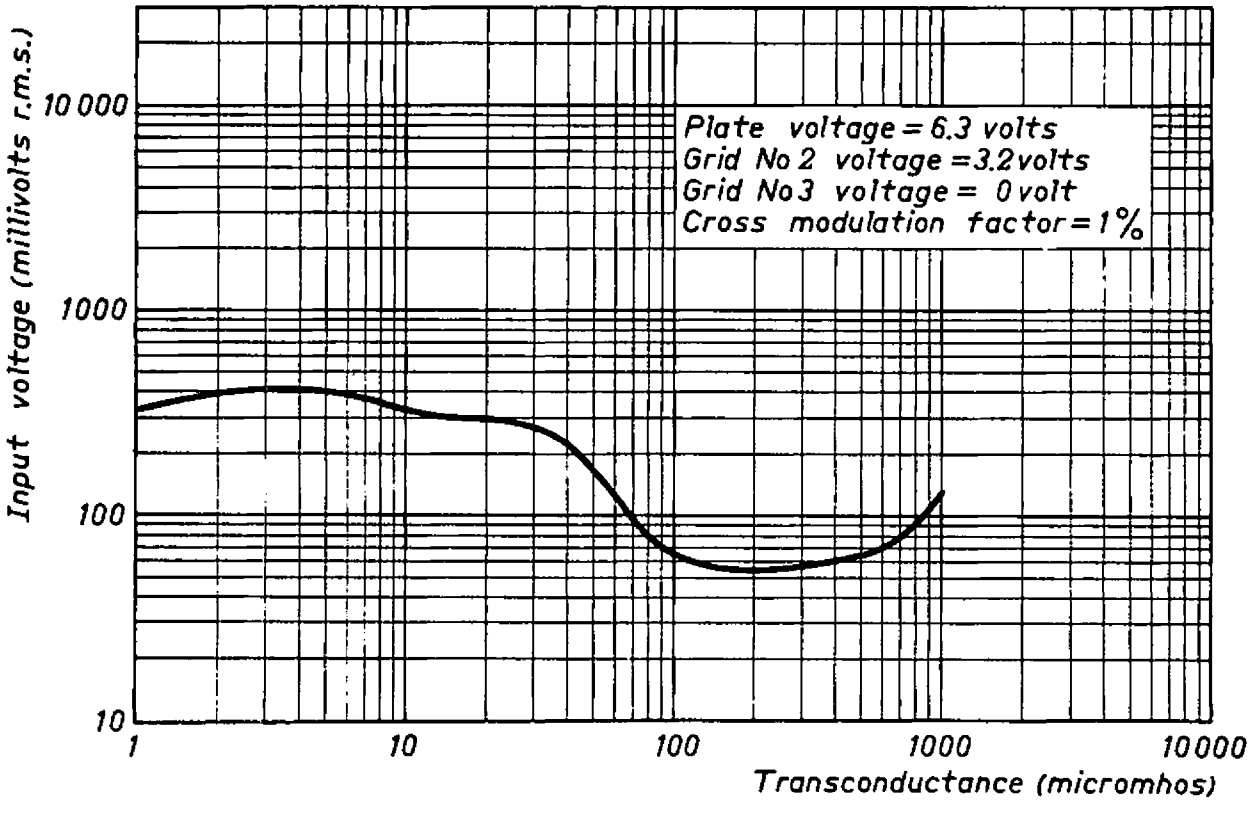

6ES6
Plate current (milliamps)
2
1.5
1
0.5
0
Grid No2 voltage = 1.6 volts
Grid No3 voltage = 0 volt
Grid No1 voltage =
0 volt
-0.25
-0.5
-1
-2
-4
-6
0
2
4
6
8
10
12
Plate voltage (volts)


Plate voltage = 25 volts
Grid No 2 voltage = 6.3 volts
Grid No 3 voltage = 0 volt
Cross modulation factor = 1%
Input voltage (millivolts r.m.s.)
10 000
1000
100
1
10
100
1000
10 000
Transconductance (micromhos)

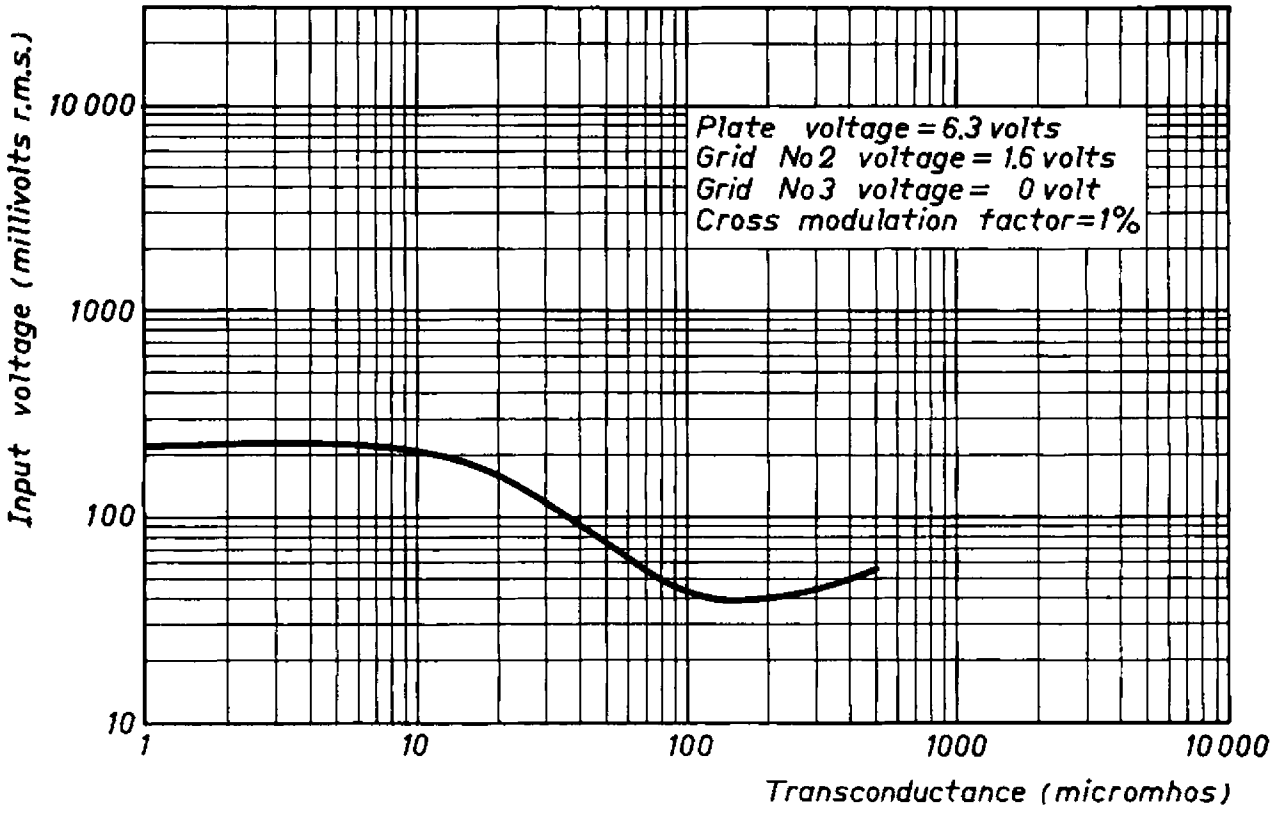

Plate voltage = 12.6 volts
Grid No 2 voltage = 6.3 volts
Grid No 3 voltage = 0 volt
Cross modulation factor = 1%
Input voltage (millivolts r.m.s.)
10 000
1000
100
10
1
10
100
1000
10000
Transconductance (micromhos)

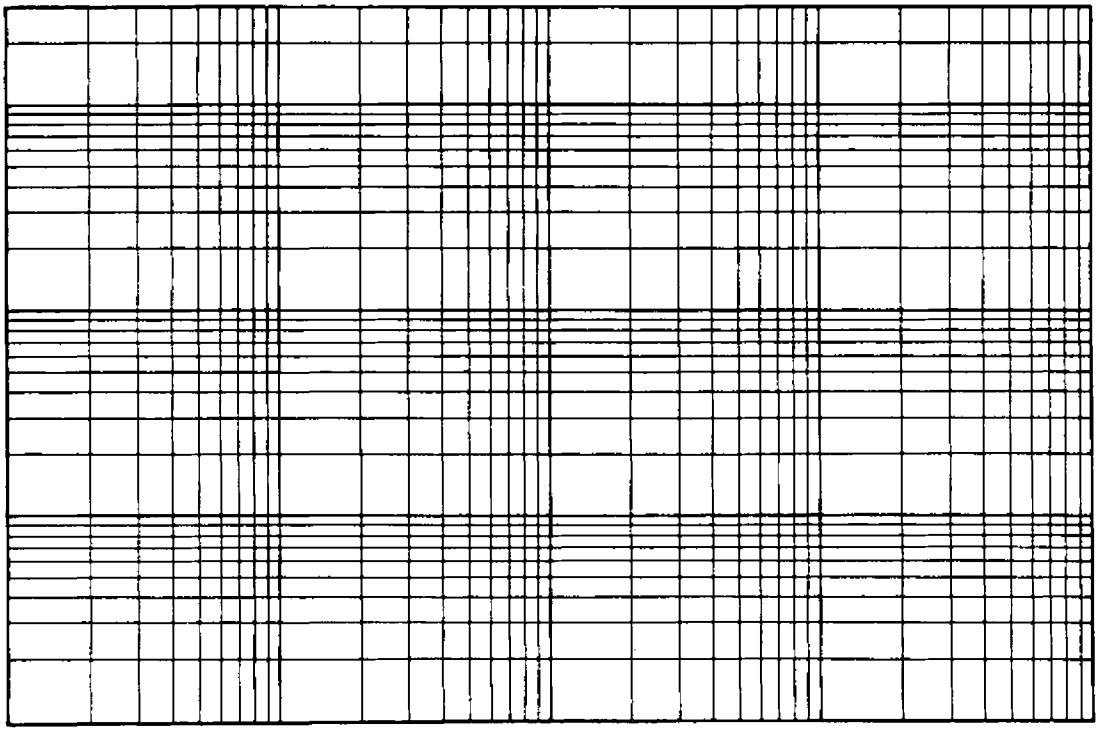
6ES6


Plate voltage=12.6 volts
Grid No 2 voltage = 3.2 volts
Grid No 3 voltage = 0 volt
Cross modulation factor=1%
Input voltage (millivolts r.m.s)
10 000
1000
100
10
1
10
100
1000
10 000
Transconductance (micromhos)


Plate voltage = 6.3 volts
Grid No 2 voltage =3.2 volts
Grid No 3 voltage = 0 volt
Cross modulation factor=1%
Input voltage (millivolts r.m.s.)
10 000
1000
100
10
1
10
100
1000
10000
Transconductance (micromhos)

6ES6


Input voltage (millivolts r.m.s.)
10 000
1000
100
10
1
10
100
1000
10 000
Transconductance (micromhos)
Plate voltage = 6.3 volts
Grid No 2 voltage = 1.6 volts
Grid No 3 voltage = 0 volt
Cross modulation factor=1%



Rogers Electronic Tubes & Components

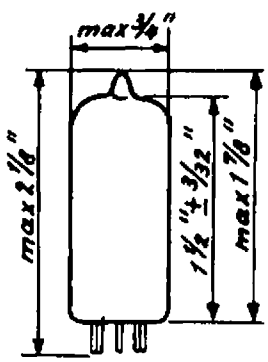
6 ET 6

Description: Pentode for use as I.F. amplifier, oscillator or A.F. amplifier in carradio sets, to be operated directly from a storage battery

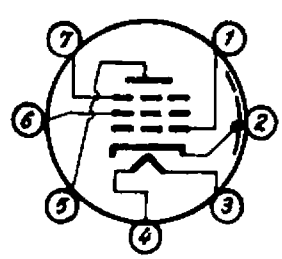
Mechanical data

Cathode	coated, unipotential
Base	E 7-1
Bulb	T 5 1/2
Outline	5 - 2
Basing designation	7 EN
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Grid No. 1
2	Cathode, internal shield
3	Heater
4	Heater
5	Plate
6	Grid No. 2
7	Grid No. 3

Heater data

Heater voltage	6.3 volts
Heater current	300 mamps

Direct interelectrode capacitances

Grid No. 1 to all other elements except plate	6.7 μμF
Plate to all other elements except grid No. 1	4.0 μμF
Plate to grid No. 1	0.015 μμF
Grid No. 1 to grid No. 2	3.0 μμF

from JEDEC release #2382, Feb. 9, 1959

Maximum ratings (design center values)

Plate voltage	50 volts max.
Plate dissipation	0.5 watt max.
Grid No. 2 voltage	50 volts max.
Grid No.2 dissipation	0.5 watt max.
Grid No. 3 voltage	50 volts max.
Cathode current	15 mamps max.
Grid No. 1 circuit resistance	22 megohm max
Grid No. 3 circuit resistance	0.1 megohm max
Voltage between cathode and heater	50 volts max.

Operating characteristics as I.F. amplifier

Plate voltage	25	12.6	6.3	volts
Grid No.2 voltage	6.3	6.3	3.2	volts
Grid No.3 voltage	0	0	0	volts
Grid No.1 bias [1])	-0.75	-0.75	-0.8	volt
Plate current	2.2	2	0.6	mamps
Grid No.2 current	0.6	0.7	0.2	mamp
Transconductance	2100	2000	1000	micromhos
Plate resistance	0.09	0.2	0.1	megohm
Amplification factor of grid No. 2 with respect to grid No. 1	4.1	4.1	3.2	

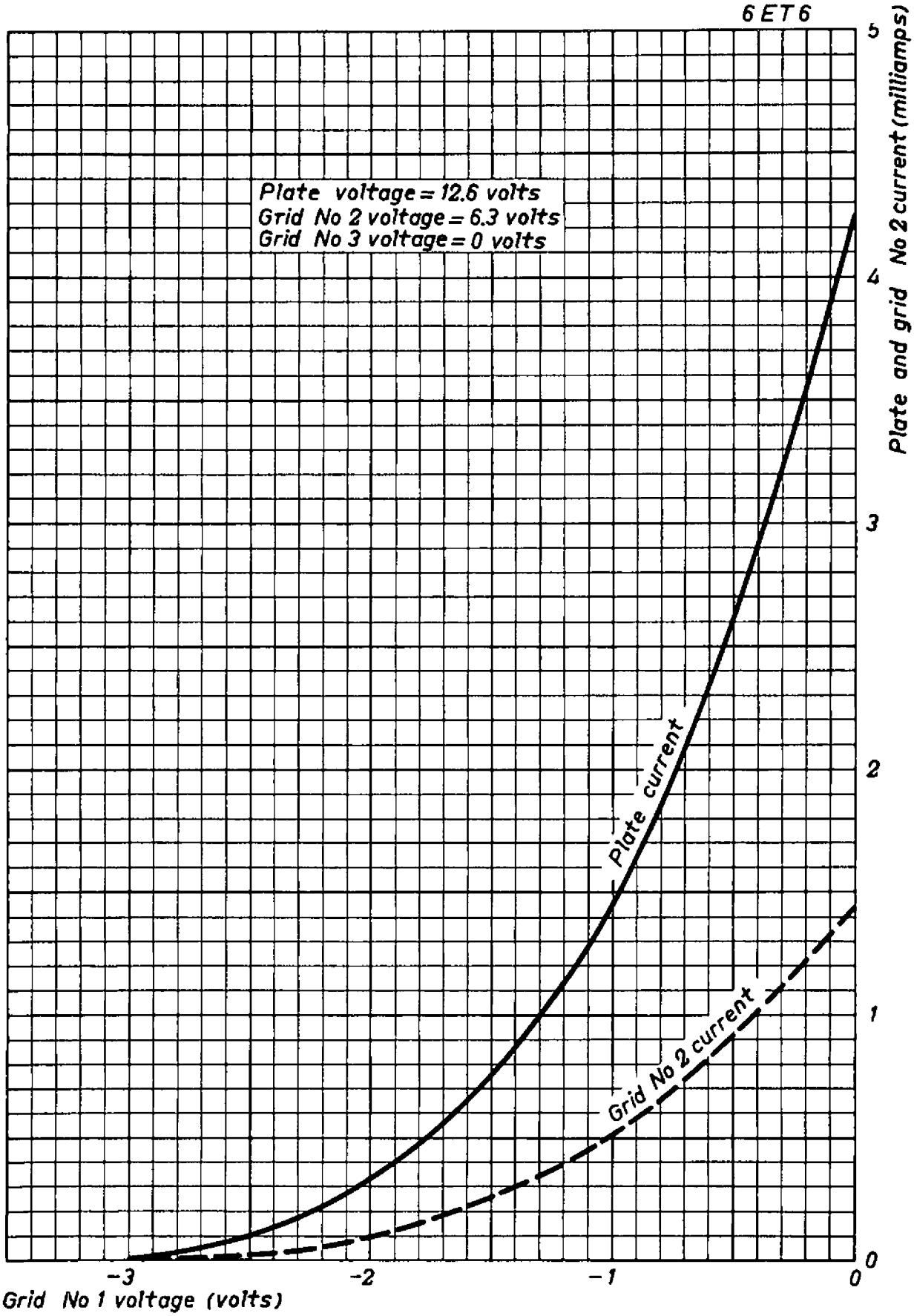
Operating characteristics as A.F. driver [3])

Plate voltage	25	12.6	14	6.3	7	volts
Grid No.2 voltage	12.6	12.6	14	6.3	7	volts
Grid No.3 voltage [2])	25	12.6	14	6.3	7	volts
Grid No.1 voltage [1])	-2	-2.3	-2.4	-1.2	-1.3	volts
Plate + grid No. 3 current	3	2.1	2.5	1.1	1.2	mamps
A.C. load resistance	8000	6000	6000	5800	5800	ohms
Input A.F. voltage	1.2	1	1	0.4	0.4	volts(rms)
Power output	30	11	14	1.2	1.6	mwatts
Total harmonic distortion	10	10	10	10	10	%

[1]) Nearly the same results can be obtained, when the grid No. 1 bias is obtained by grid current biasing with grid No. 1 resistor of 10 megohms

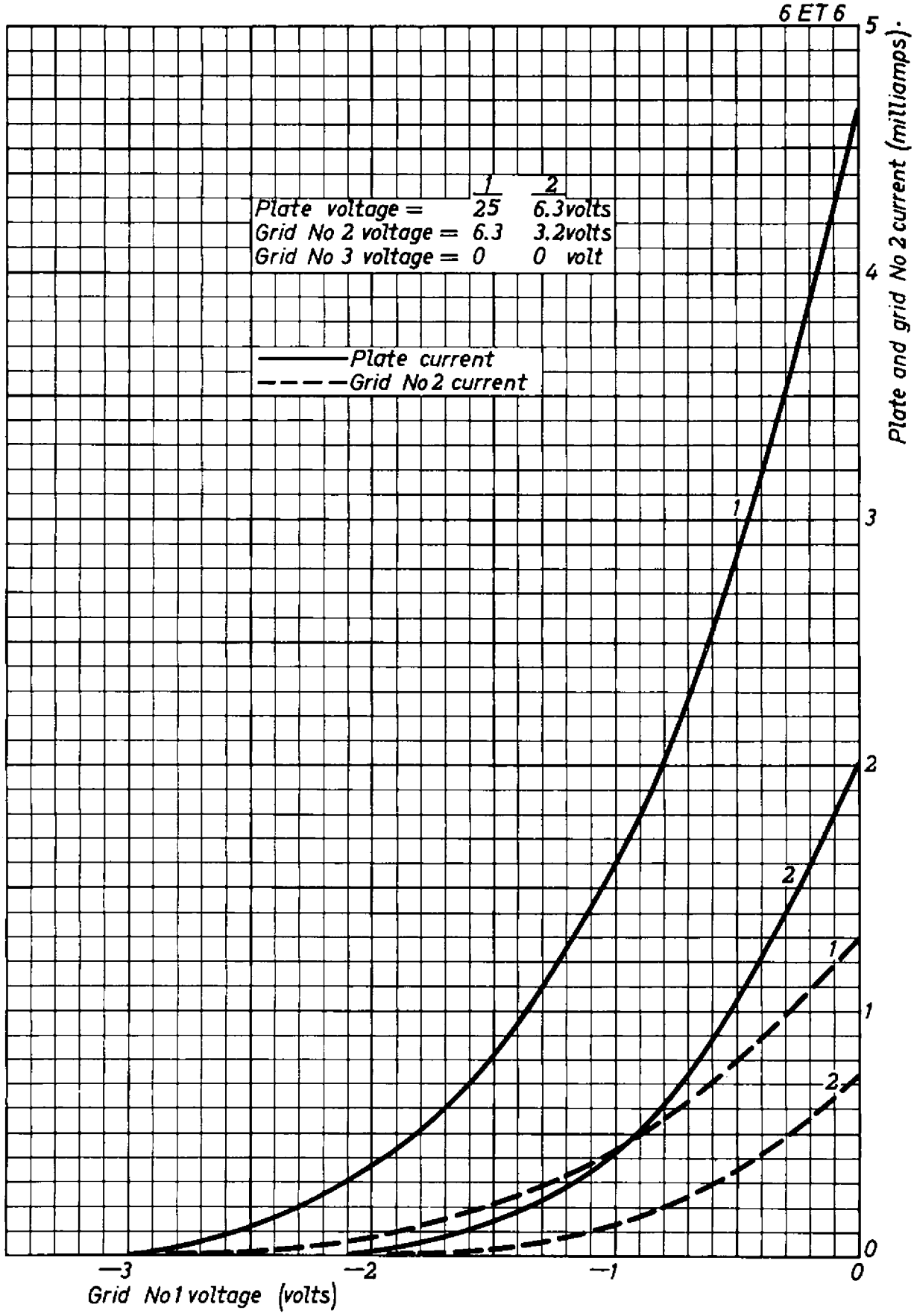
[2]) Connection of grid No. 3 to anode is preferred

[3]) Data at supply voltages of 7 volts and 14 volts have been added, because these values are normal praxis when the car is running

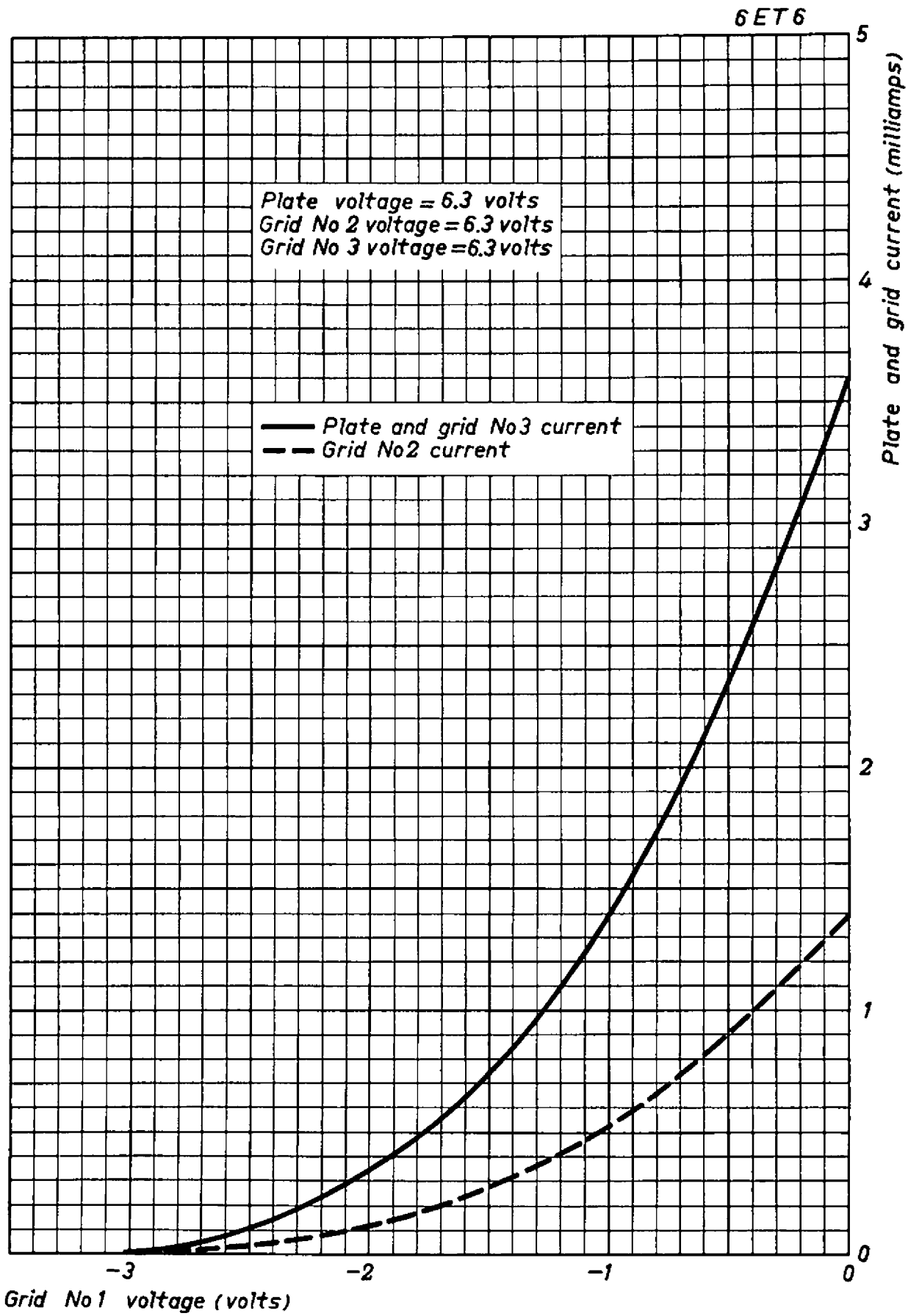

6ET6
Plate voltage = 12.6 volts
Grid No 2 voltage = 6.3 volts
Grid No 3 voltage = 0 volts
Plate current
Grid No 2 current
Plate and grid No 2 current (milliamps)
5
4
3
2
1
0
−3
−2
−1
0
Grid No 1 voltage (volts)

10.10.1958

A

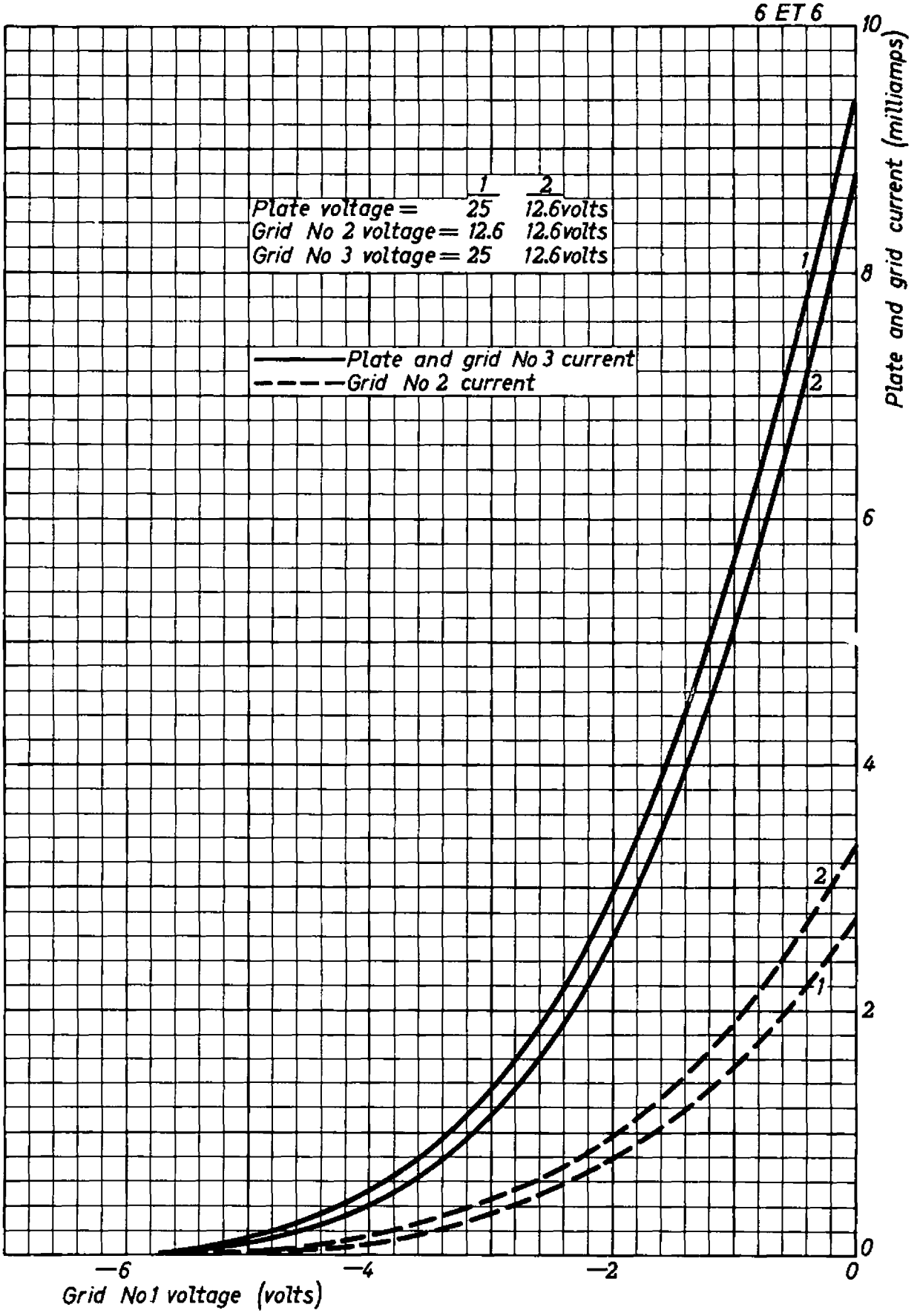

6 ET 6
Plate voltage = 1: 25 2: 6.3volts
Grid No 2 voltage = 6.3 3.2volts
Grid No 3 voltage = 0 0 volt
Plate current
Grid No 2 current
Plate and grid No 2 current (milliamps)
Grid No 1 voltage (volts)
5
4
3
2
1
0
−3
−2
−1
0

B

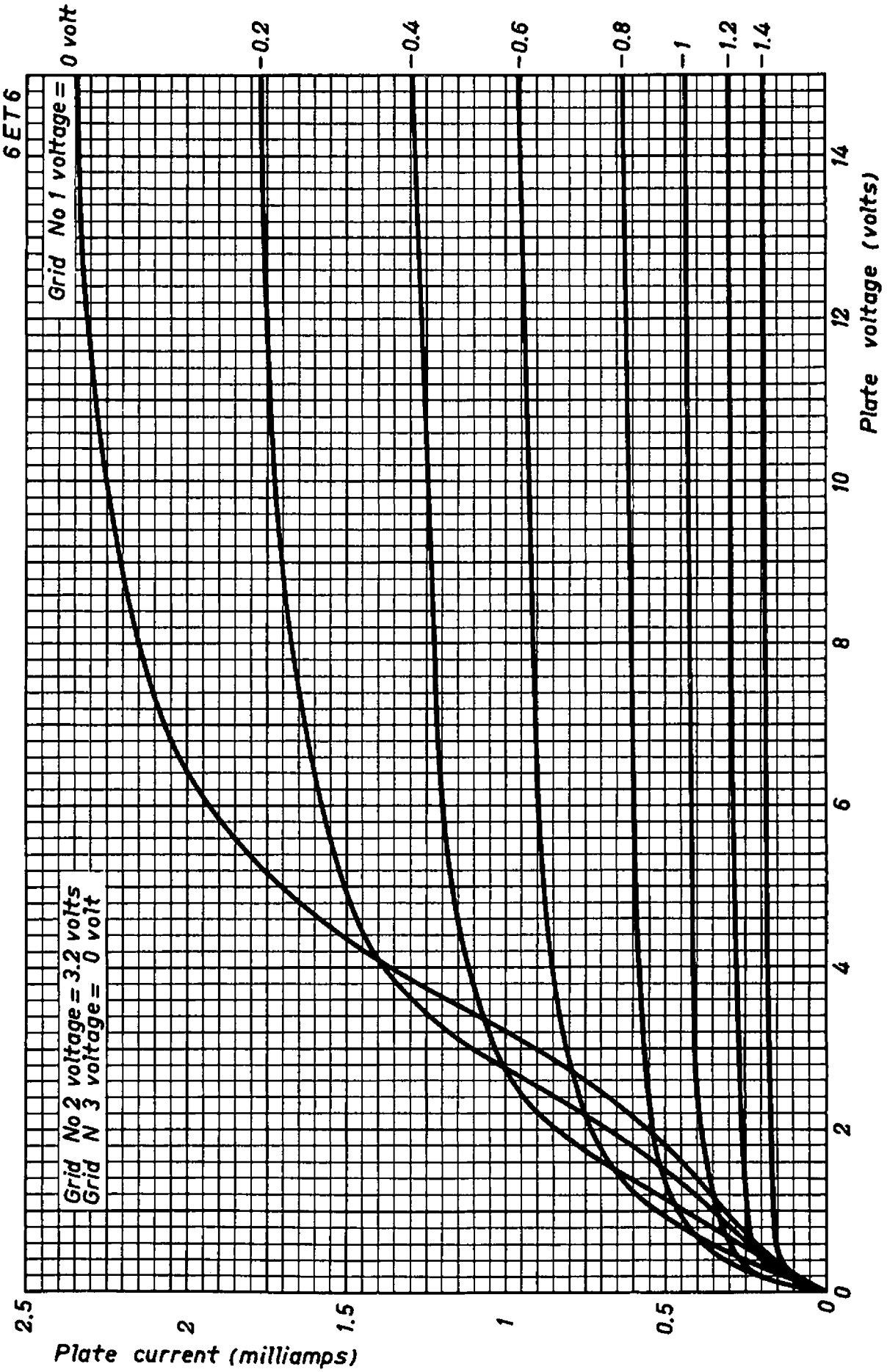

6ET6
Plate voltage = 6.3 volts
Grid No 2 voltage = 6.3 volts
Grid No 3 voltage = 6.3 volts
Plate and grid No3 current
Grid No2 current
Plate and grid current (milliamps)
5
4
3
2
1
0
−3
−2
−1
0
Grid No 1 voltage (volts)

10.10.1958

C

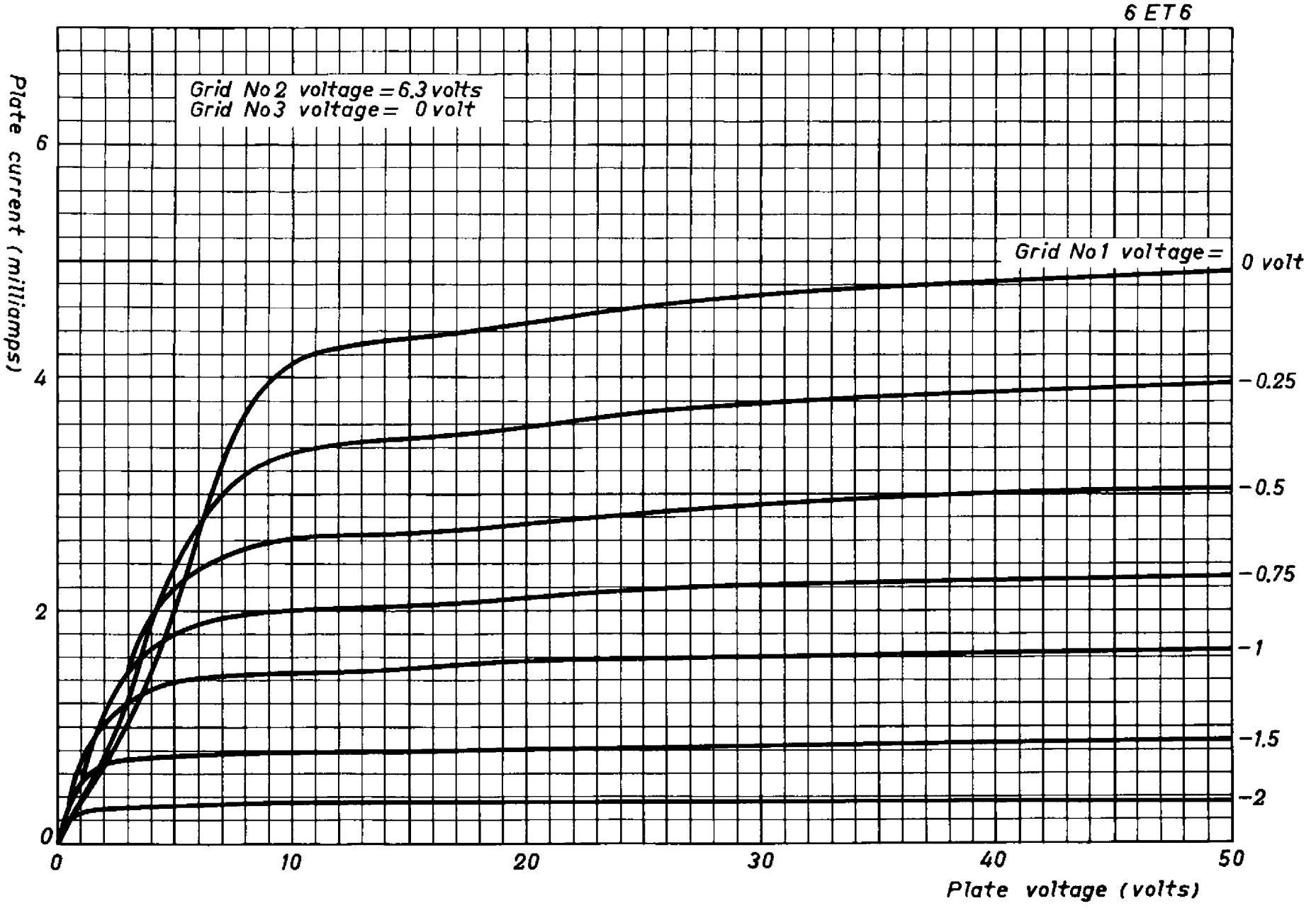

6 ET 6
Plate voltage = 1 25 2 12.6volts
Grid No 2 voltage = 12.6 12.6volts
Grid No 3 voltage = 25 12.6volts
Plate and grid No 3 current
Grid No 2 current
1
2
2
1
10
8
6
4
2
0
−6
−4
−2
0
Plate and grid current (milliamps)
Grid No 1 voltage (volts)

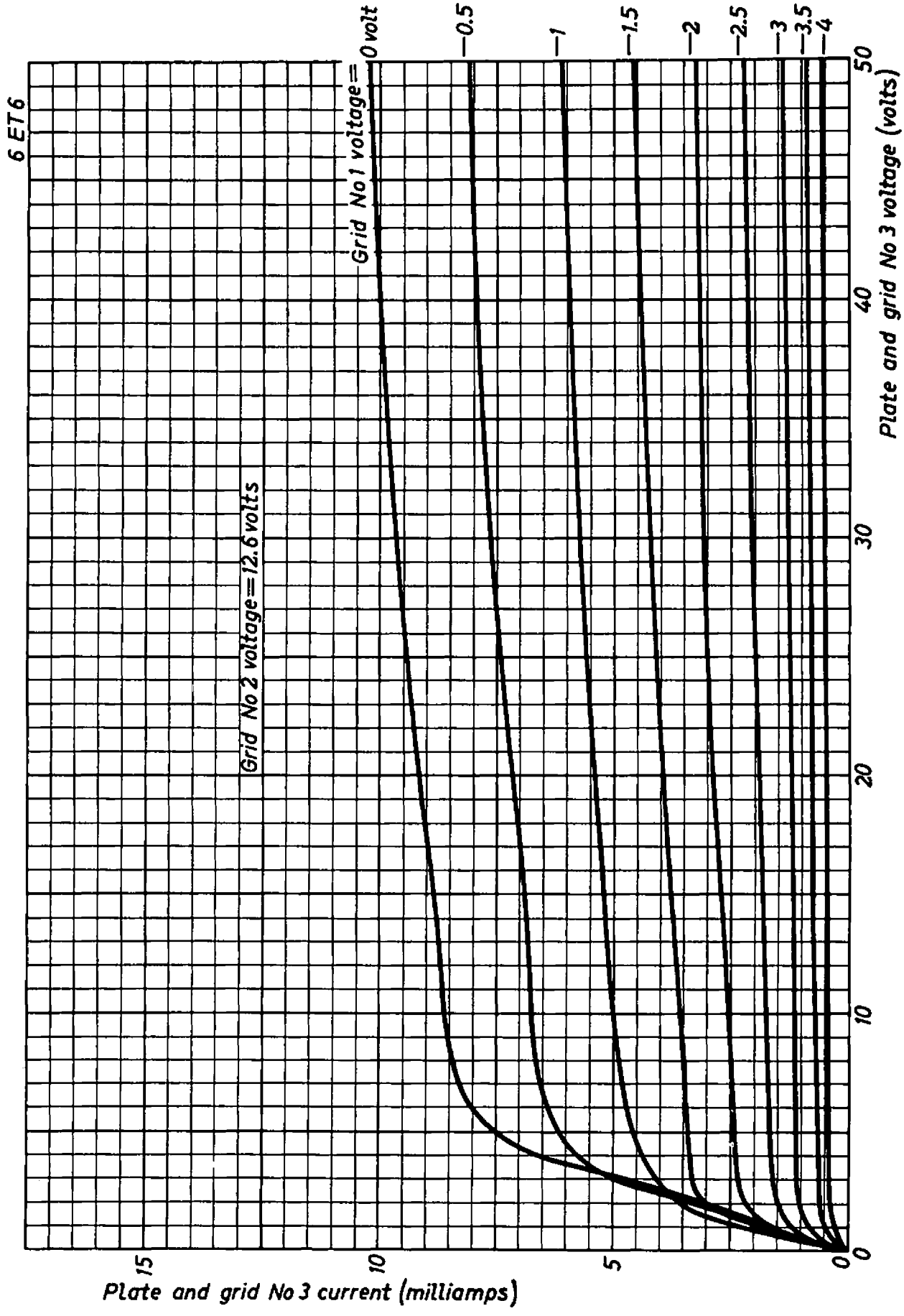
D


6 ET 6
Grid No 1 voltage = 0 volt
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
Grid No 2 voltage = 3.2 volts
Grid N 3 voltage = 0 volt
Plate current (milliamps)
Plate voltage (volts)
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
12
14

10.10.1958

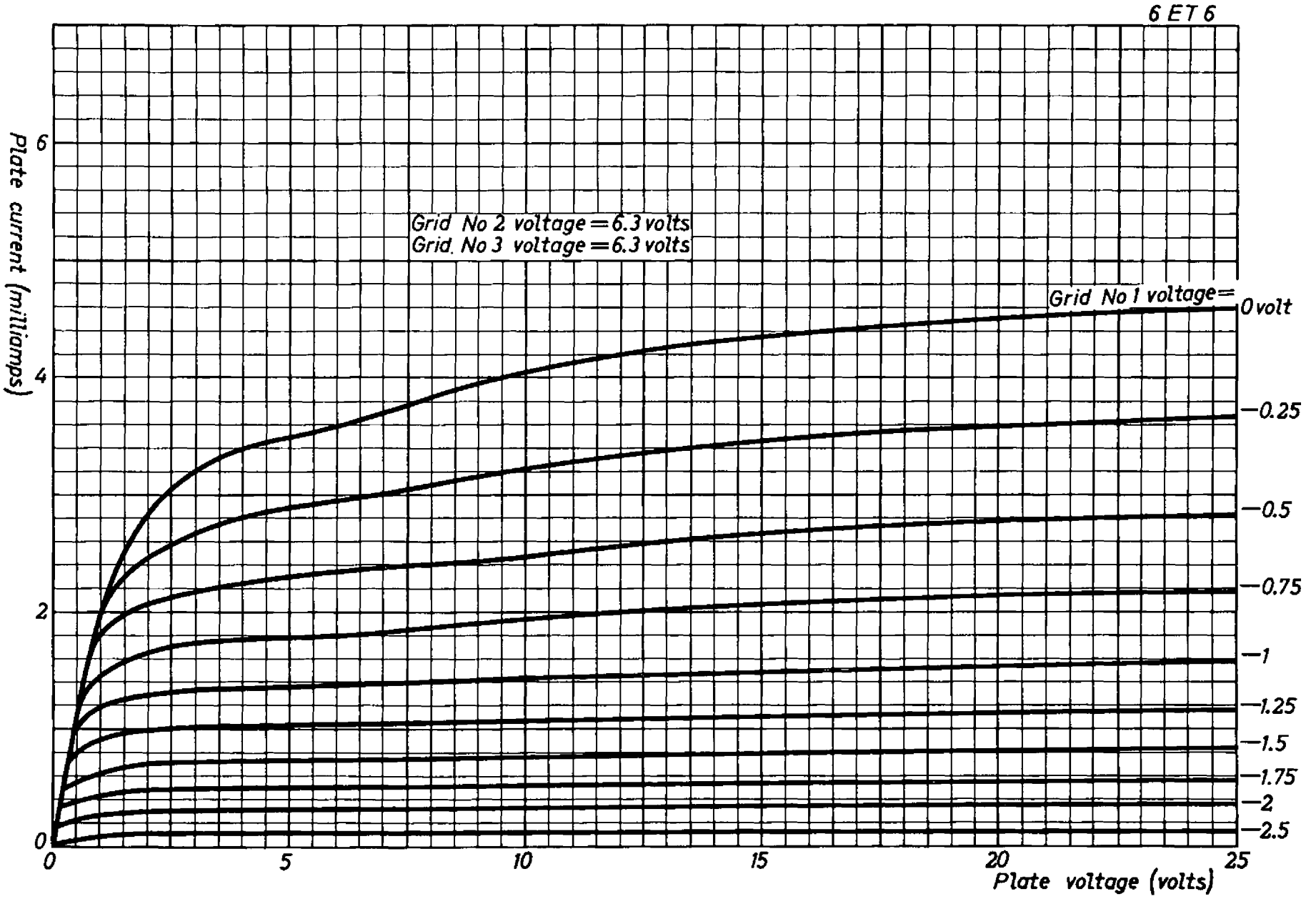
E


6 ET 6
Grid No 2 voltage = 6.3 volts
Grid No 3 voltage = 0 volt
Grid No 1 voltage =
0 volt
-0.25
-0.5
-0.75
-1
-1.5
-2
Plate current (milliamps)
0
2
4
6
0
10
20
30
40
50
Plate voltage (volts)


6 ET6
Grid No 1 voltage = 0 volt
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
−4
Grid No 2 voltage = 12.6 volts
Plate and grid No 3 voltage (volts)
0
10
20
30
40
50
Plate and grid No 3 current (milliamps)
0
5
10
15

10.10.1958

G


6 ET 6
Plate current (milliamps)
Grid No 2 voltage = 6.3 volts
Grid No 3 voltage = 6.3 volts
Grid No 1 voltage =
0 volt
−0.25
−0.5
−0.75
−1
−1.25
−1.5
−1.75
−2
−2.5
0
2
4
6
0
5
10
15
20
25
Plate voltage (volts)

H

Rogers Electronic Tubes & Components

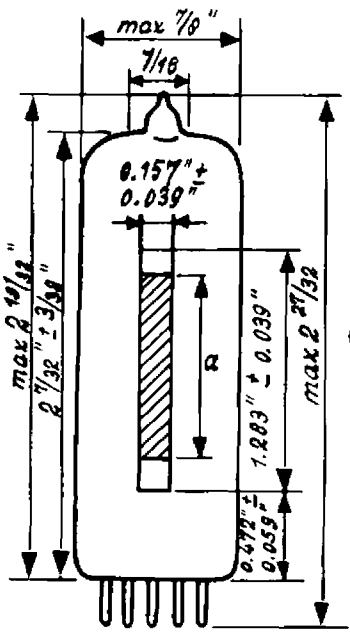
6 FG 6

Description: Indicator tube with amplifying triode for use as tuning indicator or for modulation control

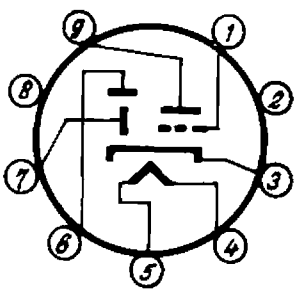
Mechanical data

Cathode	coated, unipotential
Base	E9-1
Bulb	T6 1/2
Outline	see drawing
Basing	see drawing
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Triode grid
2	Internally connected
3	Cathode
4	Heater
5	Heater
6	Target
7	Deflection electrode
8	Internally connected
9	Triode plate

Heater data

Heater voltage	6.3 volts
Heater current	270 mamps

Ratings (Design center values)

Deflection electrode voltage without current	550 volts max.
Deflection electrode voltage	300 volts max.
Target voltage without current	550 volts max.
Target voltage	300 volts max. 150 volts min.
Triode plate dissipation	0.5 watt max.

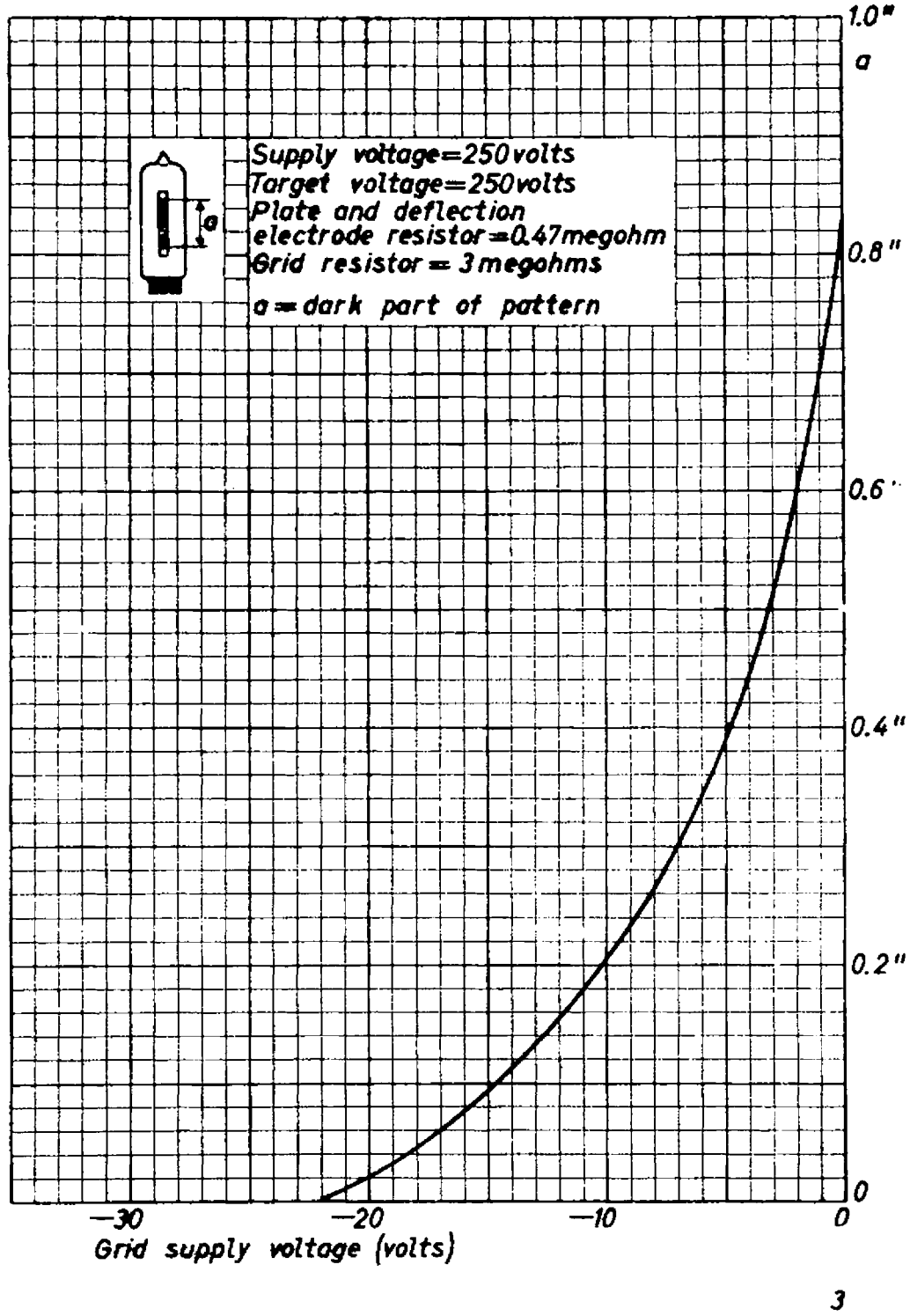
from JEDEC release #2382, Feb. 9, 1959

Ratings (Design center values)

Cathode current	3 mamps max.
Triode grid circuit resistance	3 megohms max.
Voltage between heater and cathode	100 volts max.
Bulb temperature	120 °C max.

Operating characteristics (Deflection electrode connected to triode plate)

Supply voltage	250		volts
Target voltage	250		volts
Plate and deflection electrode resistor	0.47		megohm
Grid resistor	3		megohms
Grid supply voltage	0	-22	volts
Plate and deflection electrode current	0.45	0.06	mamp
Target current	1.1	1.6	mamps
Length (a) of dark part of pattern (see Tube outline)	0.83" ± 0.20"	0"	
Length (a) of dark part of pattern when grid resistor=0Ω	0.94" ± 0.20"		



October 16, 1958

Tube type 6H7S
A Power Pentode and High-Mu Triode

Heater volts A.C. or D.C.	6.3 volts
Heater Current	0.5 ampere

POWER PENTODE SECTION

Plate voltage (P_2)	250 volts
Screen voltage (G_{22})	250 volts
Suppressor voltage (G_{32})	Internal connection to cathode
Control Grid voltage (G_{12})	-18.0 volts
Plate current	32 milliamperes
Screen current	6 milliamperes
Plate resistance	70000 ohms
Amplification Factor	150 approximately
Transconductance	2.2 milliamperes per volt
Load Resistance	7600 ohms
Power Output (10% harmonic distortion)	3.4 watts

TRIODE AMPLIFIER SECTION

Plate Voltage (P_1)	250 volts
Control Grid voltage (G_{11})	-1.5 volts
Amplification Factor	100
Plate resistance	0.33 megohms
Transconductance	0.3 milliamperes per volt

Overall Length	4-1/2 to 4-3/4"
Maximum Diameter	1-9/16"
Bulb	ST-12
Cap	Small Metal
Base	Small 7-pin

Pin Arrangement:

Pin 1 - Heater	Pin 5 - Triode Plate (P_1)
Pin 2 - Pentode Plate (P_2)	Pin 6 - Cathode and Suppressor (G_{32})
Pin 3 - Screen Grid (G_{22})	Pin 7 - Heater
Pin 4 - Control Grid (G_{12})	Cap - Control Grid (G_{11})

Note 1: The full spray shield is grounded to the chassis by means of a clip.

Note 2: Triode plate voltage is applied through a 0.5 megohm resistor.

From RMA release #8, August 21, 1934
Tube type: 6H7S
registered by Rogers Radio Tubes, Ltd., Toronto, Canada

from JETEC release #1699, July 30, 1956
sponsor: Rogers Electronic Tubes, Toronto, Canada

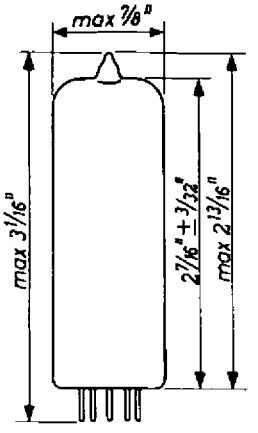
6N3

High-vacuum single-anode RECTIFYING TUBE

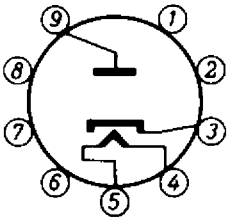
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
RETMA basing designation	9 BM
Mounting position	Any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Not to be connected
2	Not to be connected
3	Cathode
4	Heater
5	Heater
6	Not to be connected
7	Not to be connected
8	Not to be connected
9	Plate

HEATER DATA

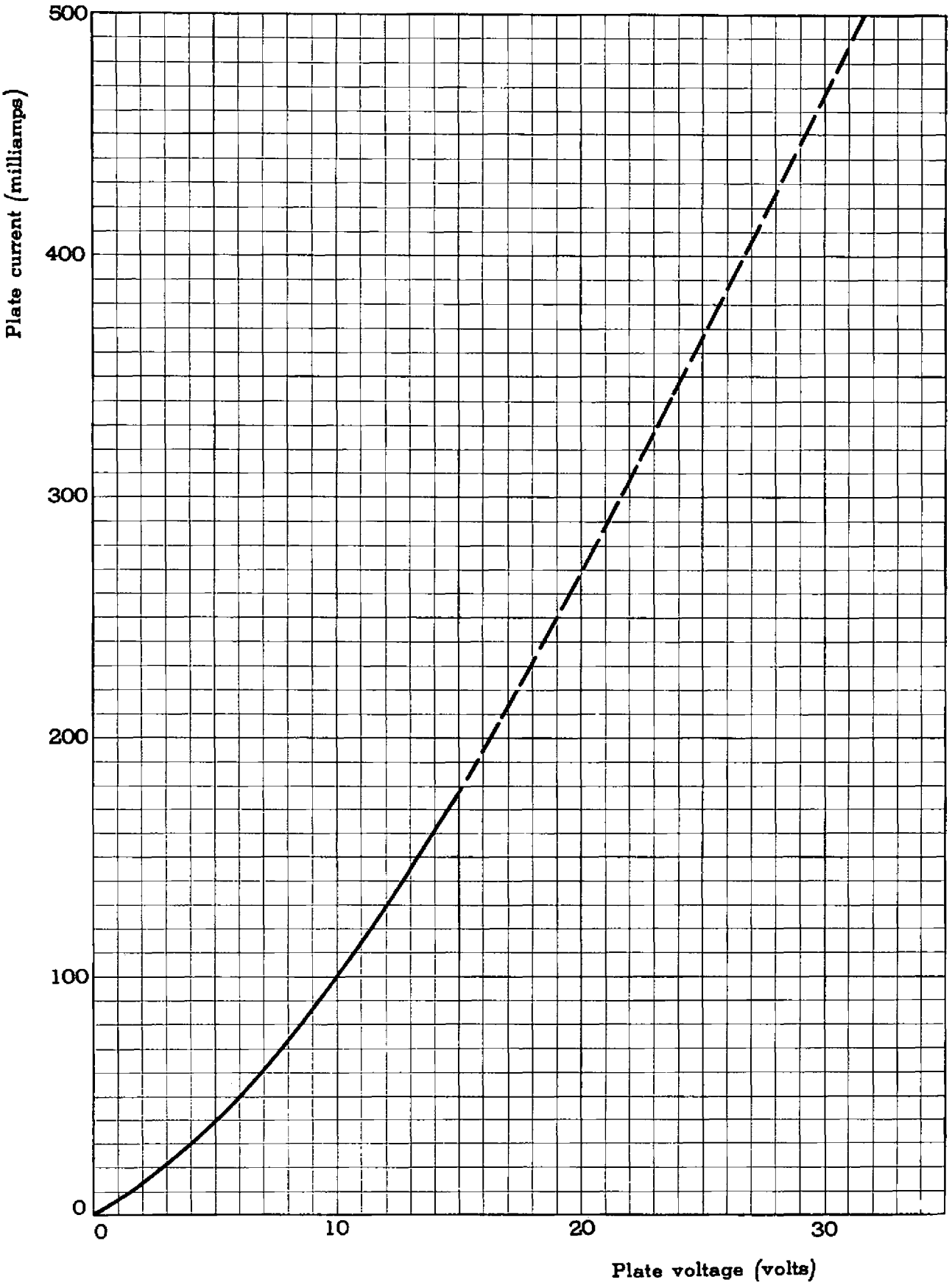
Heater voltage	6.3 volts
Heater current	0.9 amp

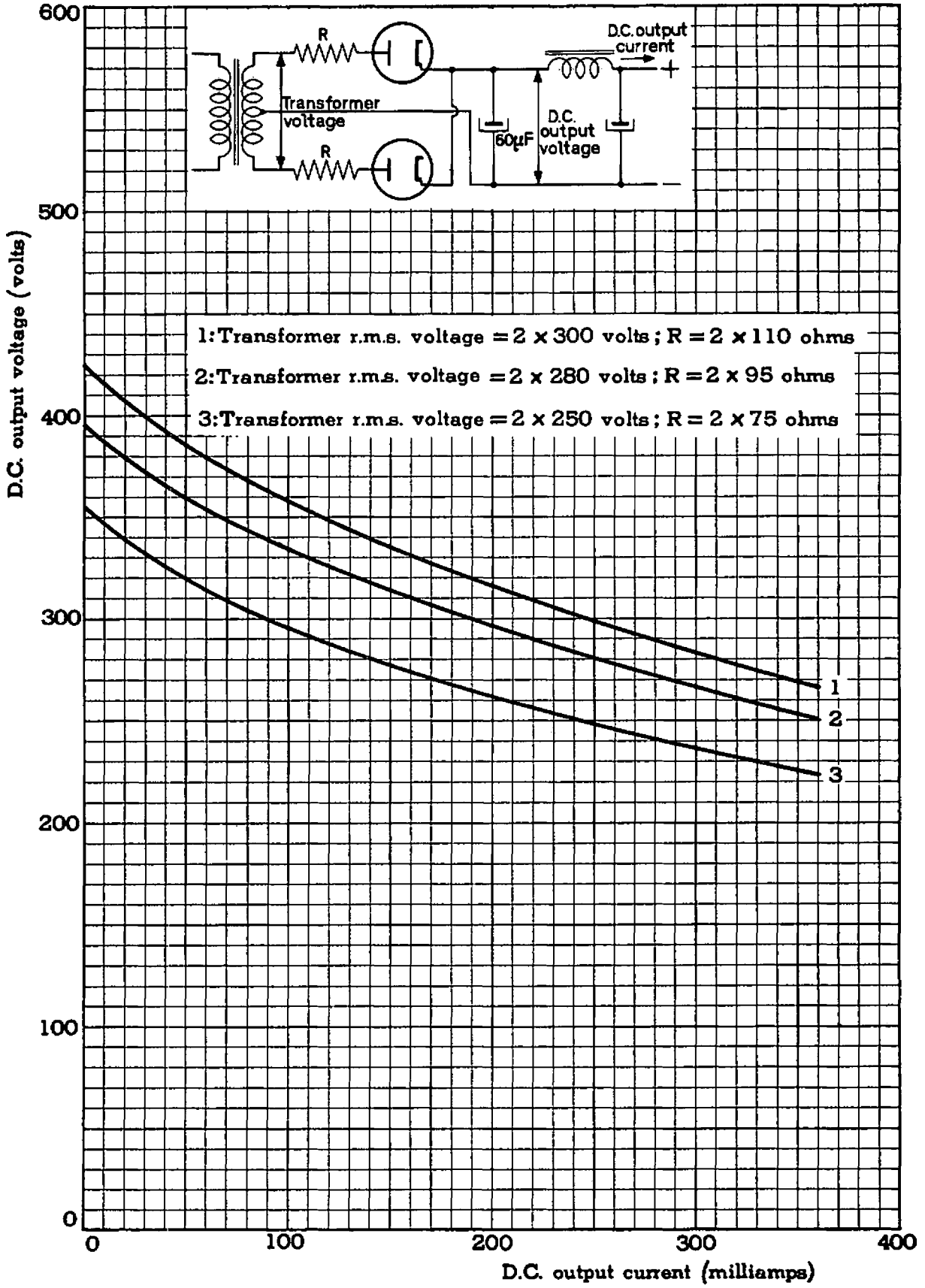
RATINGS for two tubes in full wave rectifying circuit (design center values)

Peak inverse plate voltage			850 volts max.
D.C. output current			360 mamps max.
Peak plate current (each tube)			1100 mamps max.
Heater-cathode voltage			450 volts max.
Filter input capacitor			60 μF max.
Transformer voltage	2x300	2x280	2x250 volts, rms
Total effective plate supply resistance	2x110	2x95	2x75 ohms min.

OPERATING CONDITIONS (two tubes in full-wave rectifying circuit)

Transformer voltage	2x300	2x280	2x250	volts, rms
Filter input capacitor	60	60	60	μF
Total effective plate resistance	2x110	2x95	2x75	ohms
D.C. output current	360	360	360	mamps
D.C. output voltage	268	250	225	volts


Plate current (milliamps)
500
400
300
200
100
0
0
10
20
30
Plate voltage (volts)


R
D.C. output current
+
Transformer voltage
R
60μF
D.C. output voltage
1: Transformer r.m.s. voltage = 2 x 300 volts; R = 2 x 110 ohms
2: Transformer r.m.s. voltage = 2 x 280 volts; R = 2 x 95 ohms
3: Transformer r.m.s. voltage = 2 x 250 volts; R = 2 x 75 ohms
1
2
3
D.C. output voltage (volts)
600
500
400
300
200
100
0
0
100
200
300
400
D.C. output current (milliamps)

from JETEC release #1699, July 30, 1956
sponsor: Rogers Electronic Tubes, Toronto, Canada

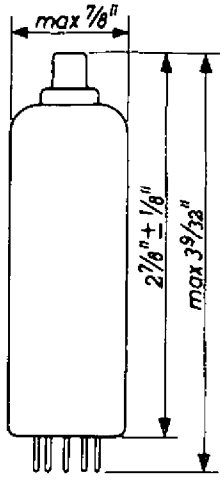
6R3

BOOSTER DIODE for time base circuits in television receivers

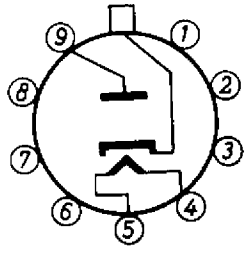
MECHANICAL DATA

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
Top cap	C1-2
RETMA basing designation	9 CB
Mounting position	Any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No	ELEMENT
1	Not to be connected
2	Not to be connected
3	Not to be connected
4	Heater
5	Heater
6	Not to be connected
7	Not to be connected
8	Not to be connected
9	Plate
Top cap	Cathode

ELECTRICAL DATA

Heater data

Heater voltage	6.3 volts
Heater current	0.81 amp

DIRECT INTERELECTRODE CAPACITANCES

Plate to all other elements	6.4 μμF
Heater to cathode	2.5 μμF

MAXIMUM RATINGS (Design center values)

Plate current	150 mamps
Peak plate current	450 mamps
Booster condenser	4 μF
Voltage between heater and cathode	600 volts[1])
During flyback	
Peak voltage between cathode and heater (cathode positive)	4500 volts[2])[4])
Peak voltage between cathode and plate (cathode positive)	4500 volts[2])[4])
Peak voltage between heater and plate (heater positive)	3000 volts[3])[4])

Remark: With regard to the long heating time of the 6R3 it is advisable to take measures that the screen grid dissipation of the tubes that derive their plate voltage from the booster is not exceeded during this heating time.

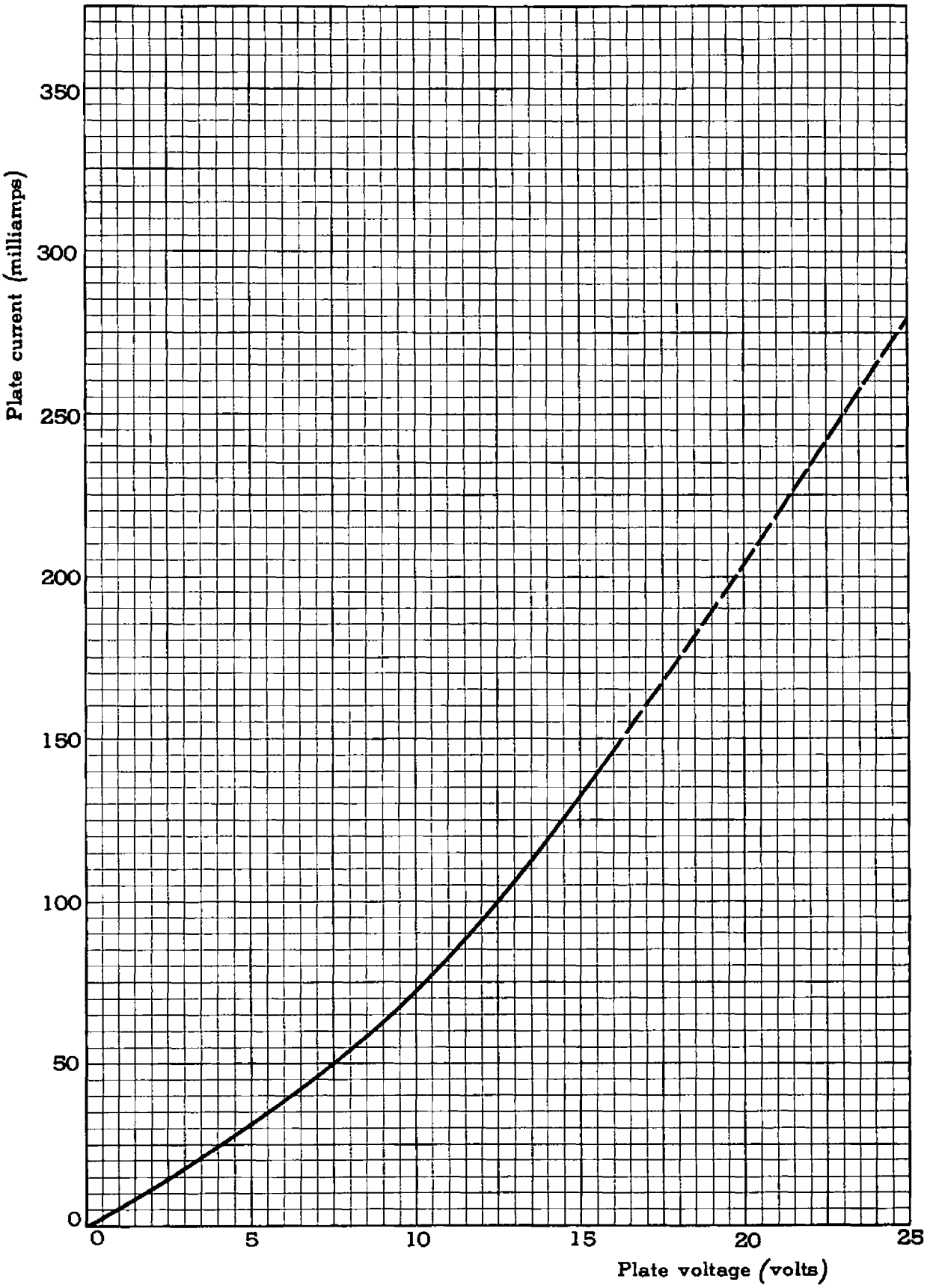
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[1])Cathode positive with respect to heater. Averaging time max. 1 cycle of the line time base

[2])Absolute maximum value 5600 volts

[3])Absolute maximum value 3800 volts

[4])Max. pulse duration 18% of one cycle of the line time base with a max. of 18 microseconds

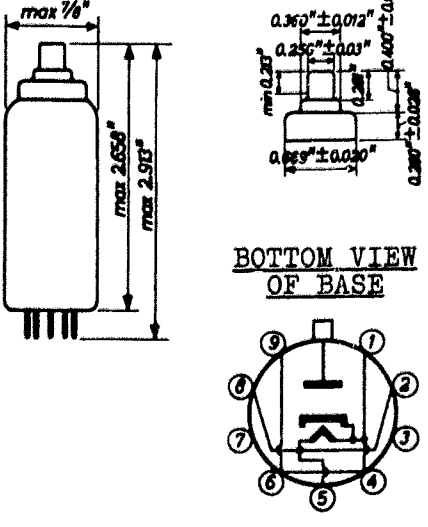

Plate current (milliamps)
350
300
250
200
150
100
50
0
0
5
10
15
20
25
Plate voltage (volts)

High vacuum single-anode RECTIFYING TUBE for E.H.T. supply from the line time base in television receivers

PHYSICAL SPECIFICATIONS

Cathode	Coated unipotential
Base	E9-1
Bulb	T6½
Mounting position	Any
RETMA basing designation	9DT

TUBE OUTLINE



BOTTOM VIEW OF BASE

BASE PIN No.	ELEMENT
1	Heater, cathode and internal shield [1]
2	Heater
3	Not connected [2]
4	Heater, cathode and internal shield [1]
5	Heater
6	Heater, cathode and internal shield [1]
7	Not connected [2]
8	Heater
9	Heater, cathode and internal shield [1]
Top	Plate

from JETEC release #1663, June 11, 1956
sponsor: Rogers Majestic Electronics

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[1] To prevent corona it is recommended to use an anti-corona ring around the tubeholder, which should be connected to the cathode (pins 1, 4, 6 and 9)

[2] Circuit elements having the same potential as the heater (e.g. a series resistor) may be supported by the tube-holder contacts 3 or 7. These contacts should, however, never be earthed.

ELECTRICAL DATA

HEATER DATA

Heater voltage	6.3 volts[3]
Heater current	90 mamps

DIRECT INTERELECTRODE CAPACITANCE (without external shield)

Plate to cathode and heater	1.8 μμF

RATINGS (Design Center Values)

Peak inverse plate voltage	22 000 volts max.[4][5]
Peak inverse plate voltage at zero plate current	24 000 volts max.[4][5]
Peak inverse plate voltage (absolute limit)	27 000 volts max.[4][5]
D.C. output current	0.8 mamp max.
Peak plate current	40 mamps max.[6]
Filter input capacitor	2000 μμF max.
Heater voltage at a D.C. output current lower than 200 μamps (absolute limits)	6.3 volts ± 15%
Heater voltage at a D.C. output current higher than 200 μamps (absolute limits)	6.3 volts ± 7%

OPERATING CONDITIONS

DC output current	0.15 mamp
DC output voltage	18 000 volts

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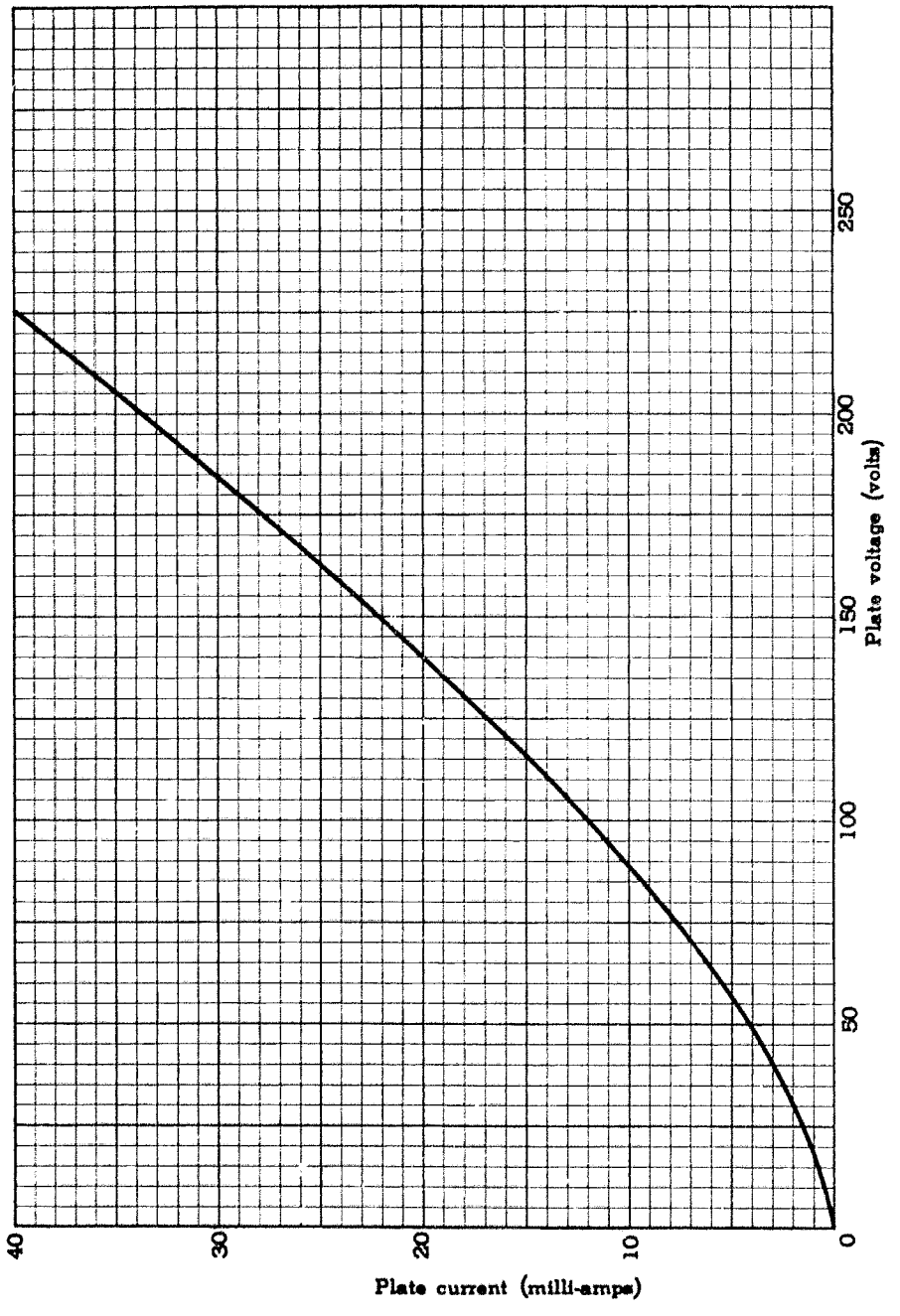
[3] When the heater is to be operated on R.F. voltage or fly back pulses, the heater voltage can be adjusted to 6.3 volts by comparison of the color of the cathode with that of a cathode heated by 6.3 volts DC or low-frequency AC

[4] Due to ringing caused by the line output transformer, an additional negative plate voltage may occur, the peak value of which must be taken into account. The increase of the peak inverse plate voltage due to this effect may amount up to 23% of the D.C. output voltage of the tube.

[5] Maximum pulse duration 18% of a cycle, with a maximum of 18 μsec.

[6] Maximum pulse duration 10% of a cycle, with a maximum of 10 μsec.

6S2


Plate voltage (volts)
250
200
150
100
50
0
40
30
20
10
0
Plate current (milli-amps)

6S2A

High vacuum single-anode RECTIFYING TUBE for E.H.T. supply from the line time base in television receivers

This tube is directly interchangeable with tube type 6S2, the characteristics and dimensions being entirely identical. The new tube differs from the 6S2 in that it has a chemically treated envelope, which avoids flash-over under conditions of high humidity and low atmospheric pressure

from JETEC release #1663, June 11, 1956
sponsor: Rogers Majestic Electronics

TUBE TYPE 6S5

ELECTRON-RAY TUBE

INDICATOR TYPE

Heater		Coated Unipotential Cathode
Voltage	6.3	A.C. or D.C. volts
Current	0.3	Ampere
Maximum Overall Length		4-1/4"
Maximum Diameter		1-9/16"
Bulb		ST12
Base		Small 6 pin

Pin 1	Heater	Pin 4	Target
Pin 2	Vane Grid	Pin 5	Triode Cathode
Pin 3	Control Grid	Pin 6	Heater

Bottom View

Typical Operating Condition

Heater	6.3 volts	6.3 volts
Target	250 volts	250 volts
Vane Grid	135 volts	135 volts
Control Grid	0 volts	-8 volts
Target Current	2 ma.	0 ma.
Illuminated Angle	300 degrees	0 degrees

The Type 6S5 is a high-vacuum voltage indicating Electron discharge tube designed to indicate visually the effect of change in the controlling voltage. For different controlling voltages, the shaded pattern produced on the fluorescent target varies through an angle from 60 degrees to 360 degrees.

Tentative Data

from RMA release #111, April 1, 1937
sponsored by Rogers Radio Tubes Ltd., Toronto, Canada

September 29, 1939

RMA Release # 218

AMPLIFIER

Reservation No. 298 Date: 9/16/39 Registration No. 218 Date: 9/29/39

Type No. 6T6 (GM)

Sponsor: Rogers Radio Tubes Limited, Toronto, Ontario.

Type Classification: High Transconductance R. F. Pentode

Physical Specifications:

Type of Cathode: Unipotential

Pin Connections:

Pin 1	Metal Spray Shield	(S)	Pin 5			
2	Heater	(H)	6			
3	Plate	(P)	7	Heater		(H)
4	Screen Grid	(G_2)	8	Cathode and Suppressor		(KG_3)

Top Cap - Control Grid (G_1)

Basing Designation: 6Z

Type of Base:	Small octal shell
Type of Cap:	Miniature Metal
Type of Bulb:	T9 - Metal Spray
Maximum Diameter	1 9/16"
Maximum Overall Length	4 1/4"
Maximum Seated Height (Including top cap)	3 11/16"

Mounting Position for Operation: Vertical

Direct Interelectrode Capacitances:

Grid to Plate	(CGP)	0.02	uuf. (max.)
Input	(G1 to all other electrodes)	8.	uuf.
Output	(P to all other electrodes)	12.	uuf.

VOLTAGE AMPLIFIER

Class A

Ratings:

Heater or Filament Voltage (ac or dc)	6.3	volts
Heater or Filament Current	0.45	amps
Maximum Plate Voltage	300	volts
Maximum Screen Voltage	200	volts
Maximum Plate Dissipation	4	watts
Maximum Screen Dissipation	0.4	watts
Minimum Grid Bias Voltage	-1	volts

Typical Operation and Characteristics:

Plate Voltage	250	volts
Screen Voltage	100	volts
Grid Voltage	-1	volts
Suppressor Voltage *	0	volts
Plate Resistance	1	megohm
Transconductance	5500	umhos
Grid Bias **	-7.5	volts
Plate Current	10	ma
Screen Current	2	ma

* Suppressor grid (G_3) is internally connected to cathode (K)

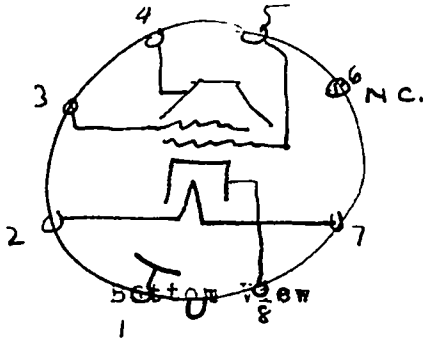
** For G_m = 5 umhos.

TUBE TYPE 6X6G

ELECTRON-RAY TUBE

INDICATOR TYPE

Heater		Coated Unipotential Cathode
Voltage	6.3	A.C. or D.C. volts
Current	0.3	Ampere
Maximum Overall Length		4"
Maximum Diameter		1-9/16"
Bulb		ST12
Base		Small Octal Shell 7 pin



Pin 1 Shell

Pin 2 Heater

Pin 3 Vane Grid

Pin 4 Target

Pin 5 Control Grid

Pin 7 Heater

Pin 8 Triode Cathode

Typical Operating Condition

Heater	6.3 volts	6.3 volts
Target	250 volts	250 volts
Vane Grid	135 volts	135 volts
Control Grid	0 volts	-8 volts
Target Current	2 ma.	0 ma.
Illuminated Angle	300 degrees	0 degrees

The type 6X6G is the same as Type 6S5 except that an Octal Shell Base is used instead of a small six pin base.

The type 6S5 is a high-vacuum voltage indicating Electron discharge tube designed to indicate visually the effect of change in the controlling voltage. For different controlling voltages, the shaded pattern produced on the fluorescent target varies through an angle from 60 degrees to 360 degrees.

Tentative Data

from RMA release #111, April 1, 1937
sponsored by Rogers Radio Tubes Ltd., Toronto, Canada

RADIO MANUFACTURERS ASSOCIATION
Suite 701-4 American Building
1317 F Street, N. W.
Washington, D. C.

SUB-COMMITTEE ON TUBE NUMBERING

E. W. Wilby, Chairman
711 Fifth Avenue
New York, N. Y.

June 14th, 1937

Re: Release #111 Revision of tube type 6X6G

To Tube Engineer:

Through production studies it has been found necessary to revise the tube type 6X6G in order to have a target cathode. The data as listed below will provide you with information as supplied by the Rogers Radio Tubes Limited of Canada.

Heater	Coated Unipotential Cathode
Voltage	6.3 AC or DC Volts
Current	0.3 Amperes
Maximum Overall Length	4"
Maximum Diameter	1-9/16"
Bulb	ST-12
Base	Small Octal Shell 8 Pin

Pin No. 1:	Shell	Pin No. 5:	Control Grid
Pin No. 2:	Heater	Pin No. 6:	Target Cathode
Pin No. 3:	Vane & Triode Plate	Pin No. 7:	Heater
Pin No. 4:	Target	Pin No. 8:	Triode Cathode

Typical Operating Conditions

Heater	6.3	6.3	volts
Target Cathode	50	50	volts
Target	250	250	volts
Vane & Triode Plate (through 1 meg. resistor	250	250	volts
Control Grid	0	-12	volts
Target Current	4	4	ma.
Illuminated Angle	120	360	degrees

The type 6X6G is a High-Vacuum Voltage Indicating Electron Discharge Tube designed to indicate visually the effect of change in the controlling voltage. For different controlling voltages, the shaded pattern produced on the fluorescent target varies through an angle from 240 degrees to 0 degrees.

Very truly yours,

EDWARD W. WILBY
Chairman
Tube Numbering

eww:lg

Rogers Electronic Tubes & Components

SPECIAL QUALITY DOUBLE TRIODE

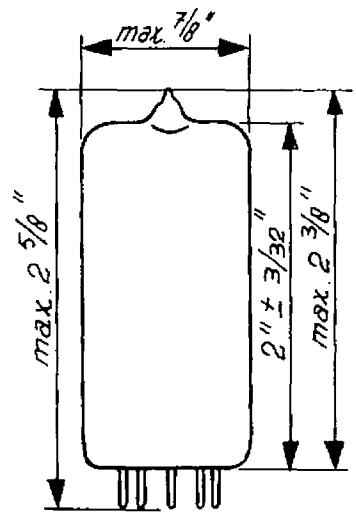
The 7062 is a special quality double triode with separate cathode connections especially designed for application in electronic computer circuits. The tube will maintain its emission capabilities after long periods of operation under cut-off conditions.

The 7062 is not intended to be used in circuits critical as to hum, microphony and noise.

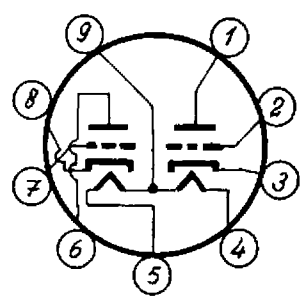
MECHANICAL DATA

Cathode	Coated, unipotential
Base	E9-1
Bulb	T6 1/2
Outline	6-3
Basing	9A
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT	
1	plate	triode No.2
2	grid	
3	cathode	
4	heater	
5	heater	
6	plate	triode No.1
7	grid	
8	cathode	
9	heater mid-tap	

HEATER DATA

Heater arrangement	series	parallel	
Heater voltage	12.6	6.3	volts
Heater current	200	400	mamps

from JEDEC release #2556, Aug. 3, 1959

DIRECT INTERELECTRODE CAPACITANCES

	triode No.1	triode No.2	
Plate to cathode and heater	0.5	0.45	µµF
Grid to cathode and heater	3.5	3.5	µµF
Plate to grid	2.2	2.3	µµF
Cathode to heater	3.5	3.5	µµF
	between the triode sections		
Plate to plate	max. 1.3		µµF
Grid to grid	max. 0.06		µµF

MAXIMUM RATINGS (absolute limits; each section)

Plate voltage	max.	275 volts
Plate voltage without current	max.	600 volts
Plate dissipation	max.	2 watts
Negative grid voltage	max.	100 volts
Peak negative grid voltage (pulse time max. 10 µsec at a duty cycle of 1%)	max.	200 volts
Positive grid voltage	max.	1 volt
Grid current	max.	2 mamps
Peak grid current (pulse time max. 10 µsec at a duty cycle of 1%)	max.	50 mamps
Cathode current	max.	20 mamps
Peak cathode current (pulse time max.10 µsec at a duty cycle of 1%)	max.	200 mamps
Grid circuit resistance with automatic bias	max.	1 megohm
Grid circuit resistance with fixed bias	max.	0.5 megohm
Heater to cathode voltage		
cathode pos. with respect tc heater	max.	200 volts
cathode neg. with respect to heater	max.	100 volts
Heater voltage x)	6.3 ± 5% or 12.6 ± 5%	
Bult temperature //	max. 170 centigrades	

// Tube life and reliability of performance will be enhanced by operation at lower temperature.

x) In order to obtain a prolonged tube life the maximum variation should be less than ± 5%.

TYPICAL CHARACTERISTICS

Plate voltage	100	100	150	150	volts
Grid voltage	-0.8		-1.85	-7.5	volts
Grid supply voltage	-	100	-	-	volts
Grid circuit resistance	-	0.5	-	-	megohm
Plate current	8.5	17.8	8.5	max.0.15	mamps
Transconductance	7800	-	6400	-	micromhos
Amplification factor	50	-	46	-	
Internal resistance	6400	-	7200	-	ohms

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

Heater voltage for all items = 6.3 volts

	Initial		End of life °)		
	min.	max.	min.	max.	
Heater current	380	420	380	480	mamps
Plate current at					
plate supply volt. = 150 volts					
cathode resistor = 220 ohms	6.3	10.7	5.0	-	mamps
Transconductance					
plate supply volt. = 150 volts					
cathode resistor = 220 ohms	5300	8100	4000	-	micromhos
Plate current at					
plate voltage = 150 volts					
grid voltage = -7.5 volts	-	150	-	150	micromamps
Plate current at					
plate voltage = 100 volts					
Grid supply volt. = 100 volts					
Grid circuit resistance = 0.5 megohm	13.6	22.0	9.5	-	mamps
Difference in grid voltage of both section at					
plate voltage = 150 volts					
Plate current = 0.15 mamps	-	2	-	2	volts

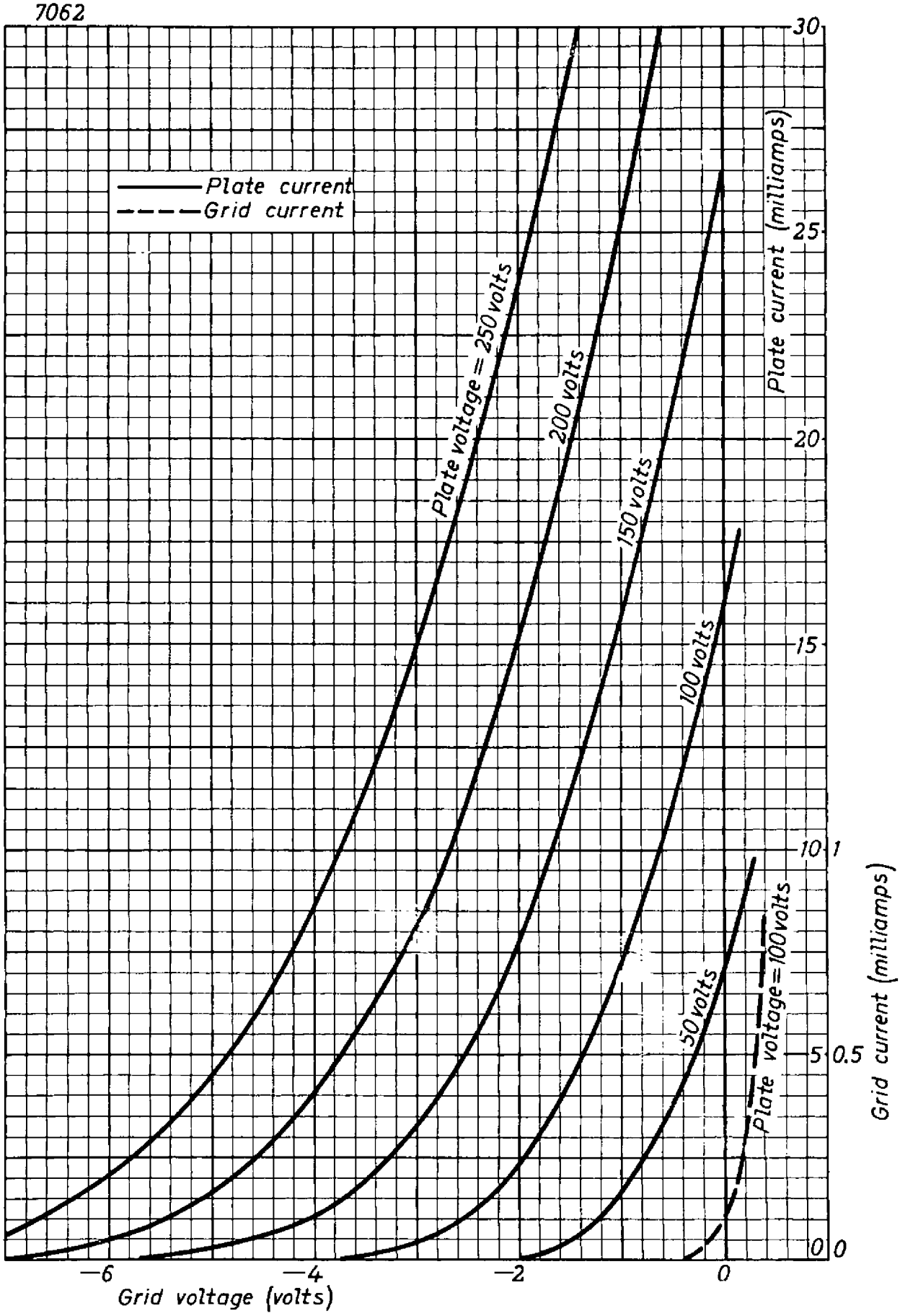
°)life test conditions are :

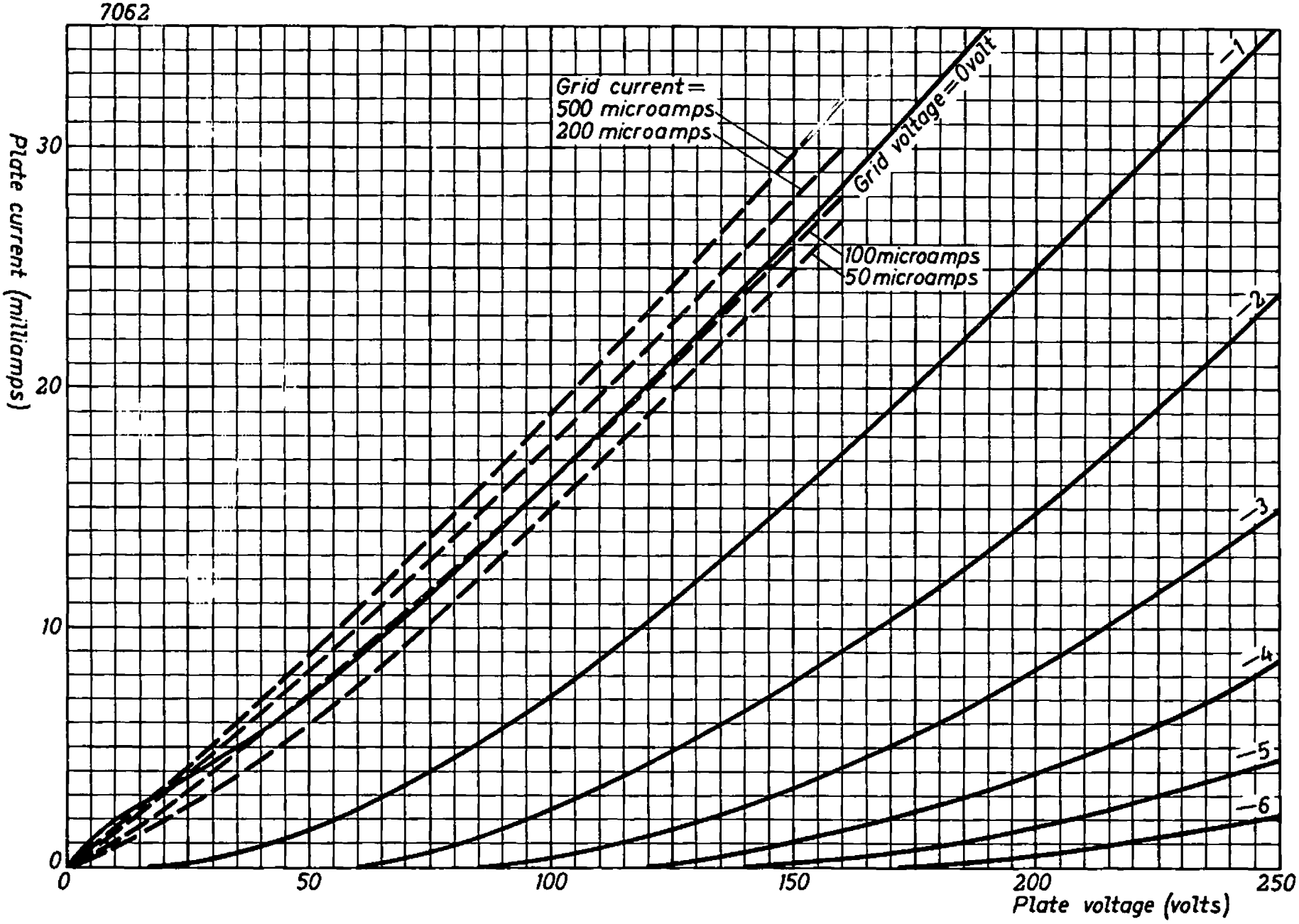
Heater voltage	6.3 volts
Plate supply voltage	150 volts
Grid supply voltage	150 volts
Plate series resistance	2600 ohms
Grid circuit resistance	1.5 megohms
Cathode to heater voltage(cathode pos.)	200 volts

CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN (continued)

Heater voltage for all items = 6.3 volts

	Inital min.	Inital max.	End of life min.	End of life max.	
Negative grid current					
plate supply volt. = 150 volts					
cathode resistor = 220 ohms					
grid leak = 0.1 megohm	-	0.2	-	1	microamp
Cathode to heater leakage current at					
cathode to heater voltage					
(cathode pos.) = 200 volts					
series resistor = 1 megohm	-	15	-	30	microamps
Insulation resistance between two electrodes at 275 volts	100	-	20	-	megohms
Direct interelectrode capacitances of triode No.1					
plate to cathode and heater	0.30	0.70	-	-	µµF
grid to cathode and heater	3.0	4.0	-	-	µµF
plate to grid	1.8	2.6	-	-	µµF
Direct interelectrode capacitances of triode No.2					
plate to cathode and heater	0.25	0.65	-	-	µµF
grid to cathode and heater	3.0	4.0	-	-	µµF
plate to grid	1.9	2.7	-	-	µµF


7062
Plate current
Grid current
Plate voltage = 250 volts
200 volts
150 volts
100 volts
50 volts
Plate voltage = 100 volts
Plate current (milliamps)
Grid current (milliamps)
Grid voltage (volts)
30
25
20
15
10
5
0
1
0.5
0
−6
−4
−2
0


7062
Grid current =
500 microamps
200 microamps
100 microamps
50 microamps
Grid voltage = 0 volt
−1
−2
−3
−4
−5
−6
Plate current (milliamps)
0
10
20
30
0
50
100
150
200
250
Plate voltage (volts)

Rogers Electronic Tubes & Components

7119

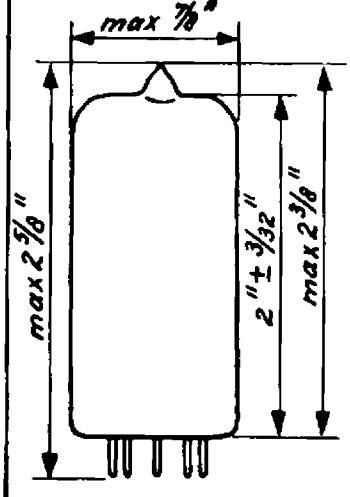
SPECIAL QUALITY DOUBLE TRIODE

The 7119 is a special quality double triode with separate cathode connections expecially designed for application in electronic computer circuits. The tube will maintain its emission capabilities after long periods of operation under cut-off conditions.
The 7119 is not intended to be used in circuits critical as to hum, microphony and noise.

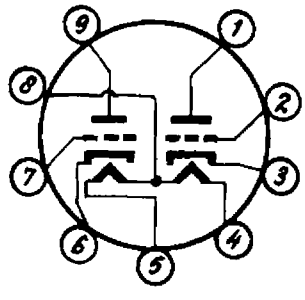
Mechanical data

Cathode	coated, unipotential
Base	E 9-1
Bulb	T6 1/2
Outline	6 - 3
Mounting position	any
Basing designation	9H

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT	
1	Plate	Triode no.2
2	Grid	
3	Cathode	
4	Heater	
5	Heater	
6	Cathode triode no.1	
7	Grid triode no. 1	
8	Heater mid tap	
9	Plate triode no.1	

Heater data

Heater arrangement	Series	Parallel	
Heater voltage	12.6	6.3	volts
Heater current	320	640±35	mamps

from JEDEC release #2382, Feb. 9, 1959

Direct interelectrode capacitances

	Triode no.1	Triode no.2
Plate to cathode and heater	1.1	1.0 μμF
Grid to cathode and heater	5.8	5.8 μμF
Plate to grid	3.9	4.0 μμF
Cathode to heater	3.7	3.7 μμF
	Between the triode sections	
Plate to plate		0.6 μμF
Grid to grid		max. 0.15 μμF

Maximum ratings (absolute limits; each section)

Plate voltage	300 volts max.
Plate voltage without current	600 volts max.
Plate dissipation	4.5 watts max.
Total plate dissipation of both sections	8 watts max.
Negative grid voltage	100 volts max.
Peak negative grid voltage (pulse time max. 10 μsec at a duty cycle of 1 %)	200 volts max.
Positive grid voltage	1 volt max.
Peak positive grid voltage (pulse time max. 10 μsec at a duty cycle of 1 %)	30 volts max.
Grid current	8 mamps max.
Peak grid current (pulse time max. 10 μsec at a duty cycle of 1 %)	200 mamps max.
Peak cathode current (pulse time max. 10 μsec at a duty cycle of 1 %)	400 mamps max.
Cathode current	60 mamps max.
Grid circuit resistance with automatic bias	1 megohm max.
Grid circuit resistance with fixed bias	0.5 megohm max.
Peak heater-to-cathode voltage (pulse time max. 10 μsec at a duty cycle of 1 %)	200 volts max.
D.C. component of heater-to-cathode voltage	120 volts max.
Bulb temperature //	160 centigrades max.

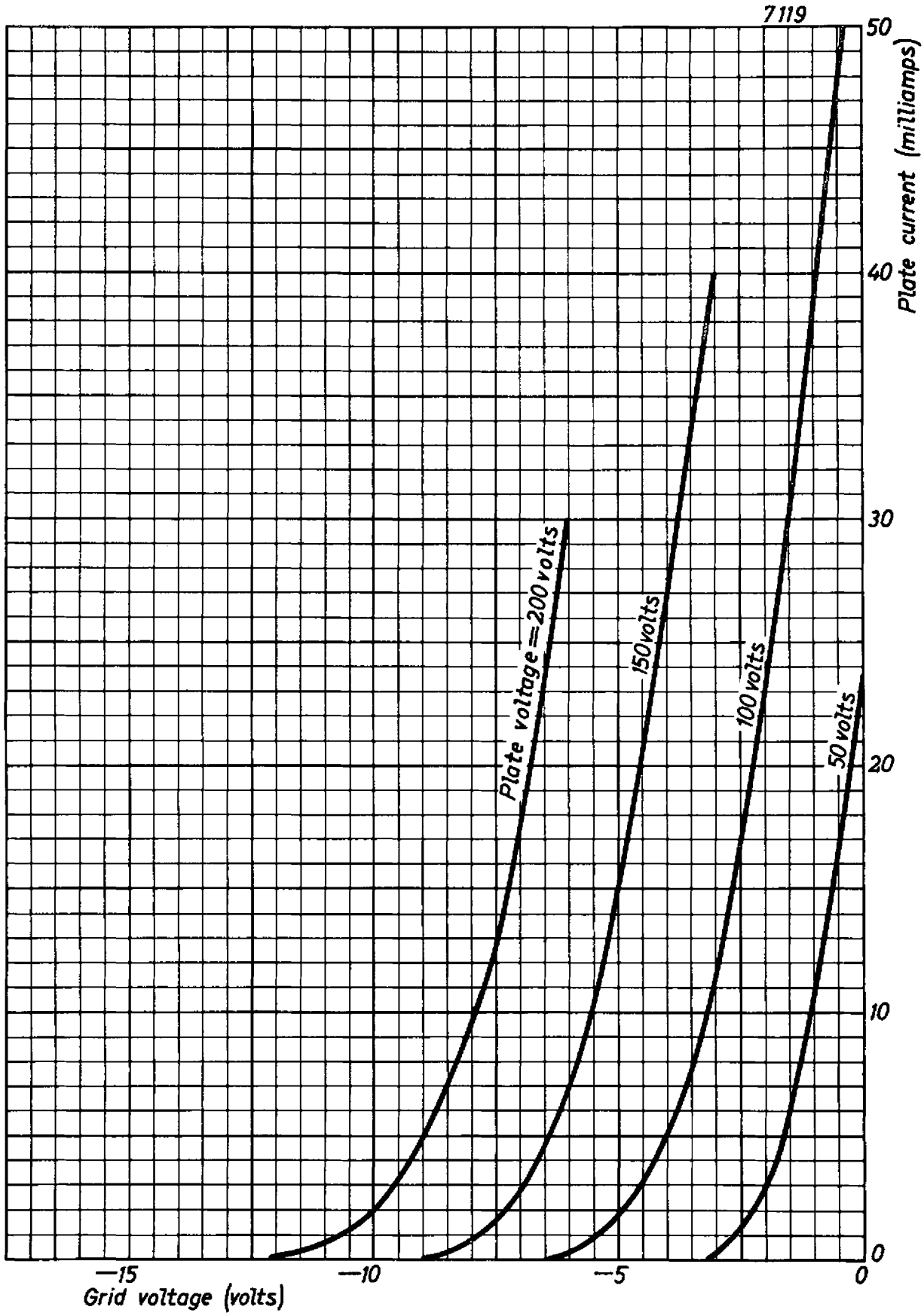
Typical characteristics

Plate voltage	120	150	volts
Grid voltage	-2	-14	volts
Plate current	36	max. 0.2	mamp
Transconductance	15000		micromhos
Amplification factor	24		

Characteristic range values for equipment design

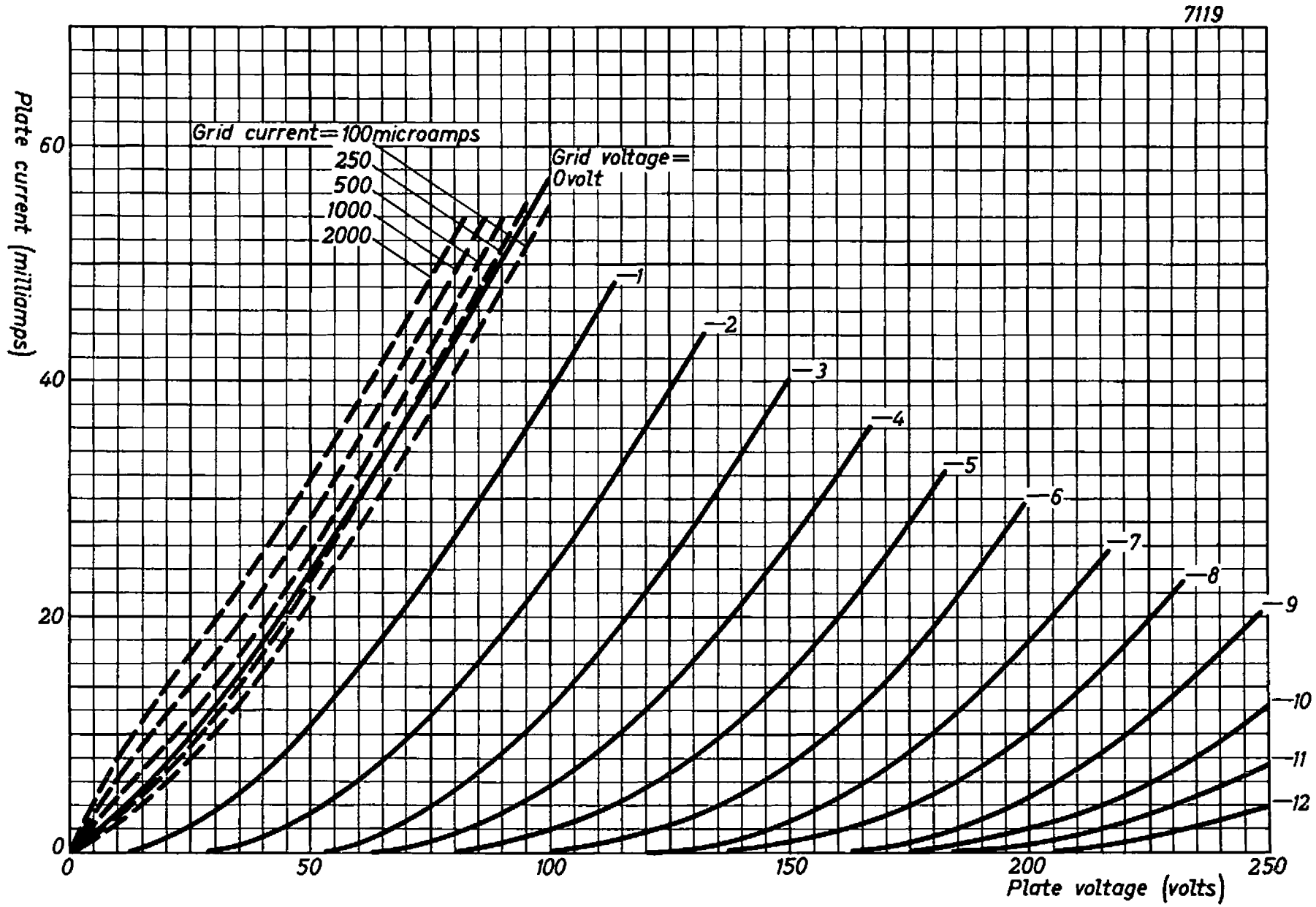
	Initial min.	Initial max.	End of life min.	End of life max.	
Plate current at					
Plate voltage 90 volts Grid current 250 µamps	41	62	24		mamps
Plate current at					
Plate voltage 120 volts Neg.grid voltage -2 volts	26	45			mamps
Plate current at					
Plate voltage 150 volts Neg.grid voltage -14 volts		0.2			mamps
Transconductance at					
Plate voltage 120 volts Cathode resistor 55 Ω	11200	18800	5600		micromhos
Negative grid current at					
Plate voltage 120 volts Neg.grid voltage -2 volts Grid series resistor 0.1 megohm		0.2		1	µamps
Cathode to heater leakage current at					
Cathode to heater voltage (cathode pos) 200 volts series resistor 1 megohm		15		30	µamps
Insulation resistance between two electrodes	100		20		megohm

// Tube life and reliability of performance will be enhanced by operation at lower temperatures


7119
50
40
30
20
10
0
Plate current (milliamps)
Plate voltage = 200 volts
150 volts
100 volts
50 volts
−15
−10
−5
0
Grid voltage (volts)

10.10.1958

A


7119
Plate current (milliamps)
60
40
20
0
Grid current=100microamps
250
500
1000
2000
Grid voltage=
0volt
—1
—2
—3
—4
—5
—6
—7
—8
—9
—10
—11
—12
0
50
100
150
200
250
Plate voltage (volts)

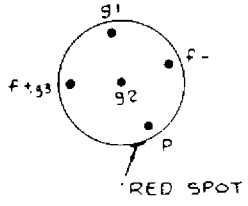
B

ROGERS

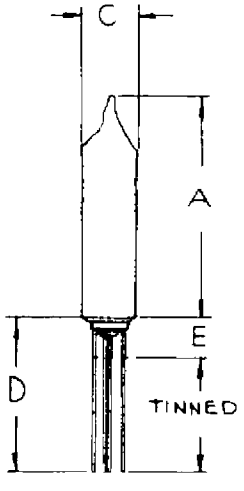
electron tube reference data

7727

Subminiature
Electrometer Pentode
(Triode Connected)
for
Logarithmic
Applications



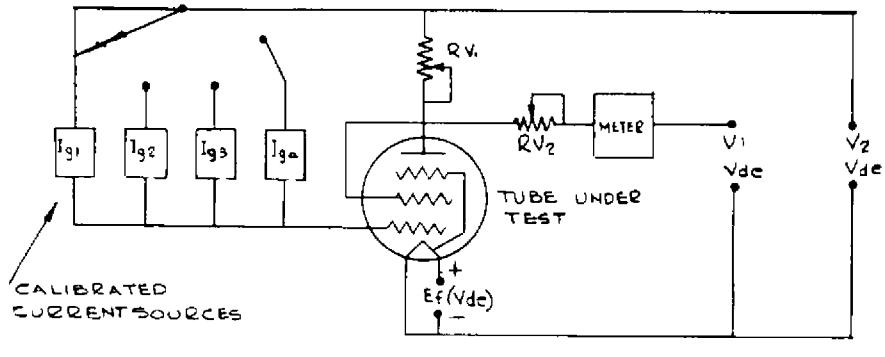
Dimensions			
Dim.	Min.	Max.	Units
A		1.750	Inches
C	.366	.400	"
D	1.25		"
E		.25	"



ELECTRICAL DATA

Test	Conditions	Symbol	Limits Min.	Limits Max.	Units
Filament Current	Ef = 1.25 Vdc	If	7.2	9.2	mA
Circuit Test (1)	EF = 1.25 Vdc V_1 = 6.25 Vdc V_2 = 12.5 Vdc Notes 1, 2, 3	-	-	-	-
Test (2)	Ef = 1.35 Vdc V_1 = 6.75 Vdc V_2 = 13.5 Vdc Notes 1, 2, 4	-	-	-	-
Test (3)	Ef = 1.15 Vdc V_1 = 5.75 Vdc V_2 = 11.5 Vdc Notes 1, 2, 5	-	-	-	-

FIG. 1



ROGERS *electronic tubes & components*

A DIVISION OF PHILIPS ELECTRONICS INDUSTRIES LTD.

116 VANDERHOOF AVE. TORONTO 17, ONTARIO

from JEDEC release #2869, July 4, 1960

ROGERS

7727

NOTES

1. This test to be carried out in the test circuit in Fig. 1

   RV_1 = Variable from 15,750 ohms to 90,000 ohms.
   RV_2 = Variable from 0 - 13,500 ohms.

   Meter full scale = 100 μA maximum meter resistance = 3,000 ohms ≠ 2%.

   $I_{g1} = 10^{-12}$ amps. $I_{g3} = 10^{-9}$ amps.
   $I_{g2} = 3.3 \times 10^{-11}$ amps. $I_{g4} = 5 \times 10^{-9}$ amps.

2. The test circuit is to be enclosed in an electrostatically shielded light tight box.

3. The following sequence of measurements shall be made:-

   a. With current source IGI in circuit adjust RV_1 for meter reading = 0.
   b. With current source IG3 in circuit adjust RV_2 for meter reading = 40 μA.
   c. With current source IG2 in circuit read value of meter current. Value shall be within the limits 18.50 to 21.25 μA.
   d. With current source IG4 in circuit read value of meter current. Value shall be within the limits 49.00 to 52.00 μA.

   Any tube which cannot meet the requirements of (a), (b), (c) and (d) above shall be considered defective.

4. The following sequence of measurements shall be made:

   a. With current source IG1 in circuit adjust RV1 for meter reading = 0.

   b. With current source IG3 in circuit adjust RV2 for meter reading = 39 μA.

   Any tube which cannot meet the requirements of (a) and (b) above shall be considered defective.

5. The following sequence of measurements shall be made:

   a. With current source IG1 in circuit adjust RV1 for meter reading = 0.

   b. With current source IG3 in circuit adjust RV2 for meter reading = 41 μA.

   Any tube which cannot meet the requirements of (a) and (b) above shall be considered defective.

from JETEC release #1504, Aug. 15, 1955
sponsor: Rogers Majestic Electronics Ltd.

7 AN 7

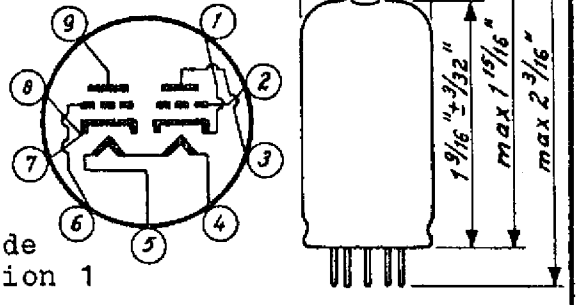
DOUBLE TRIODE particularly designed for use as R.F. cascode amplifier in tuners for television receivers up to 220 Mc

PHYSICAL SPECIFICATIONS

Cathode	Coated unipotential
Base	Small button Noval 9-pin
Bulb	T6½
Maximum diameter	7/8"
Maximum overall length	2 3/16"
Maximum seated height	1 15/16"
Bulb length excluding tip	1 9/16" ± 3/32"
Mounting position	Any

BASING CONNECTIONS- JETEC basing designation 9DD

Pin 1 - Cathode
Pin 2 - Grid and internal shield
} Triode section 2
Pin 3 - Plate
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Grid
Pin 7 - Cathode input lead
Pin 8 - Cathode output lead
} Triode section 1
Pin 9 - Plate



In a cascode amplifier the triode section No.1 should be used as the grounded cathode amplifier and triode section No.2 as the grounded grid amplifier.

GENERAL ELECTRICAL DATA

Heater voltage	7 volts
Heater current	0.3 amp

7 AN 7

DIRECT INTERELECTRODE CAPACITANCES (without external shield)

TRIODE SECTION 1 (grounded cathode section)

Input capacitance		2.3 µµF
Output capacitance		0.45 µµF
Between plate and grid		1.2 µµF
Between grid and filament	max.	0.25 µµF

TRIODE SECTION 2 (grounded grid section)

Cathode to grid + heater	4.7 µµF
Plate to grid + heater	2.5 µµF
Plate to cathode	0.16 µµF
Cathode to heater	2.7 µµF
Plate to grid	2.3 µµF

BETWEEN TRIODE SECTIONS 1 and 2

Plate section 1 to cathode section 1 + heater + grid section 2		1.2 µµF
Plate section 1 to plate section 2	max.	0.035 µµF
Grid section 1 to plate section 2	max.	0.006 µµF

MAXIMUM RATINGS (Design Center Values)

Plate voltage (each section)	180 volts
Supply voltage without current	550 volts
Plate dissipation (each section)	2 watts
Cathode current (each section)	18 mamps
Negative grid bias (each section)	50 volts
Grid circuit resistance section 1	0.5 megohm°)
Grid circuit resistance section 2	+)
Voltage between cathode and heater, section 1	90 volts
Peak voltage between cathode and heater section 2 (heater negative with respect to cathode)	250 volts*)
Voltage between cathode and heater, section 2 (heater positive with respect to cathode)	90 volts
Circuit resistance between cathode and heater	20 000 ohms

°)In the case of parallel supply of the heater the maximum value is 1.5 megohm

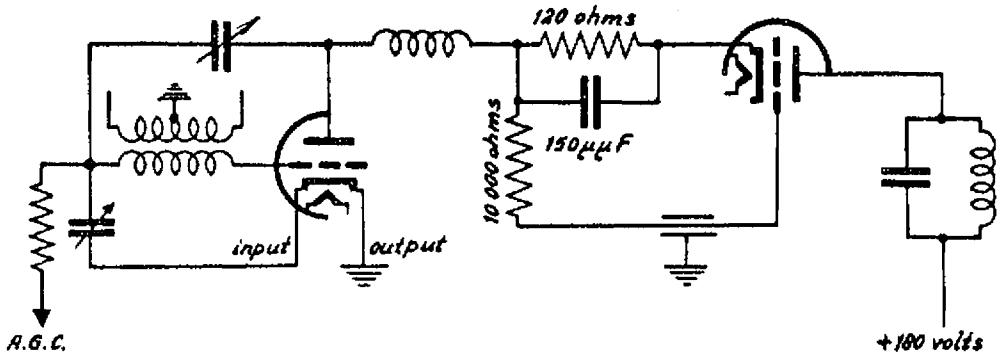
+)See note page 3

*)D.C. component max. 180 volts

TYPICAL CHARACTERISTICS (each section)

Plate voltage	90 volts
Grid bias	-1.5 volts
Plate current	12 mamps
Transconductance	6000 micromhos
Amplification factor	24

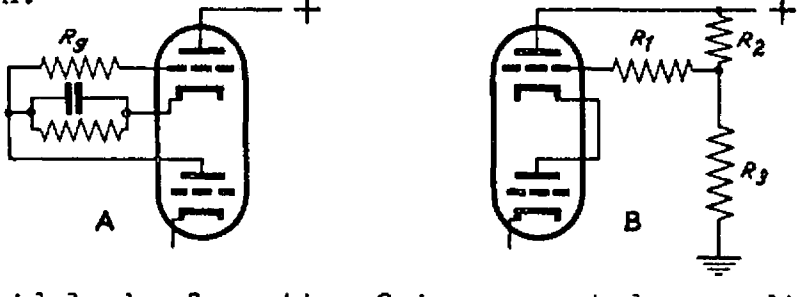
OPERATING CONDITIONS



Noise figure (bandwidth of input circuit 7-8 Mc)	6.5
Input conductance at 200 Mc	250 micromhos

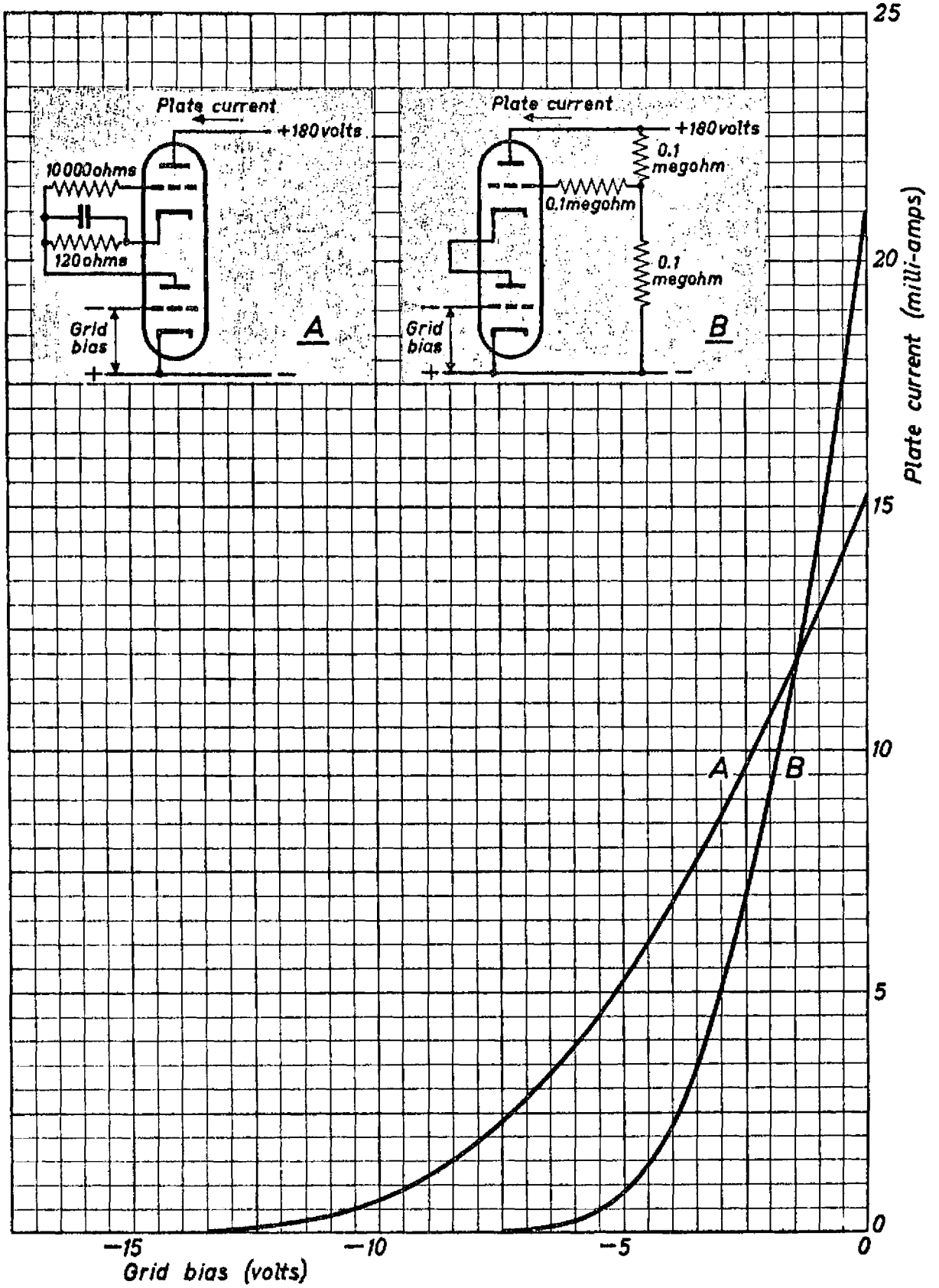
These values of the noise figure and the input conductance are valid in the case that the cathode input lead is connected to the input circuit and the cathode output lead to the chassis. A noise figure of about 5 can be obtained in the case that the two cathode leads are connected in parallel. The value of the input conductance at 200 Mc, however, will than increase to about 700 micromhos

The grid bias of the grounded grid section can be achieved by means of a decoupled cathode resistor, a typical value of which is 120 ohms (fig.A), or by means of a potentiometer (fig.B). Typical values of R2 and R3 are 0.1 MΩ each.

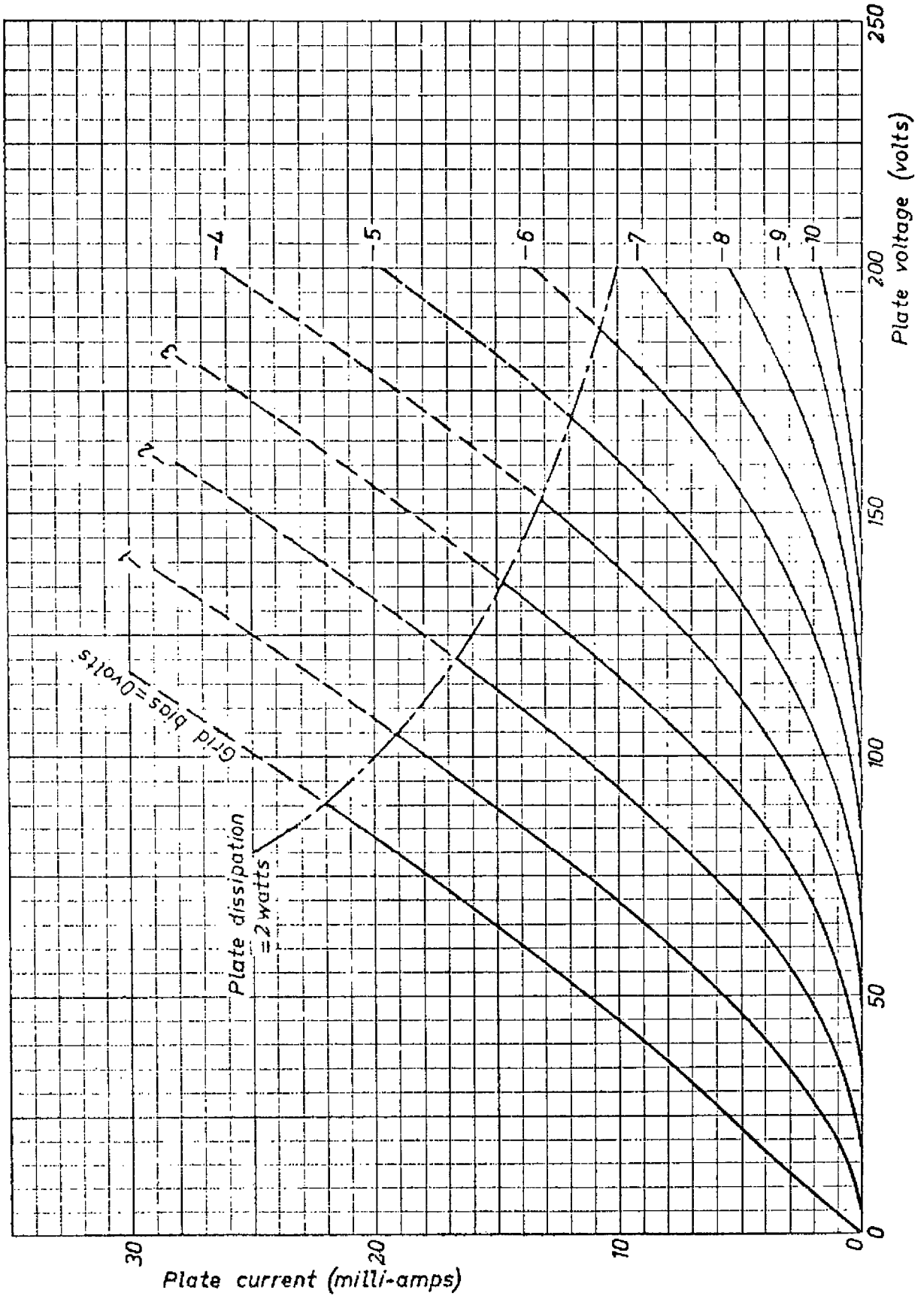


*) If the grid leak of section 2 is connected according to fig.A, the maximum value of the grid leak is 20 000 ohms. In the case of circuit B the maximum value of $R_1 + \frac{R_2 \times R_3}{R_2 + R_3}$ = 0.5 megohm.

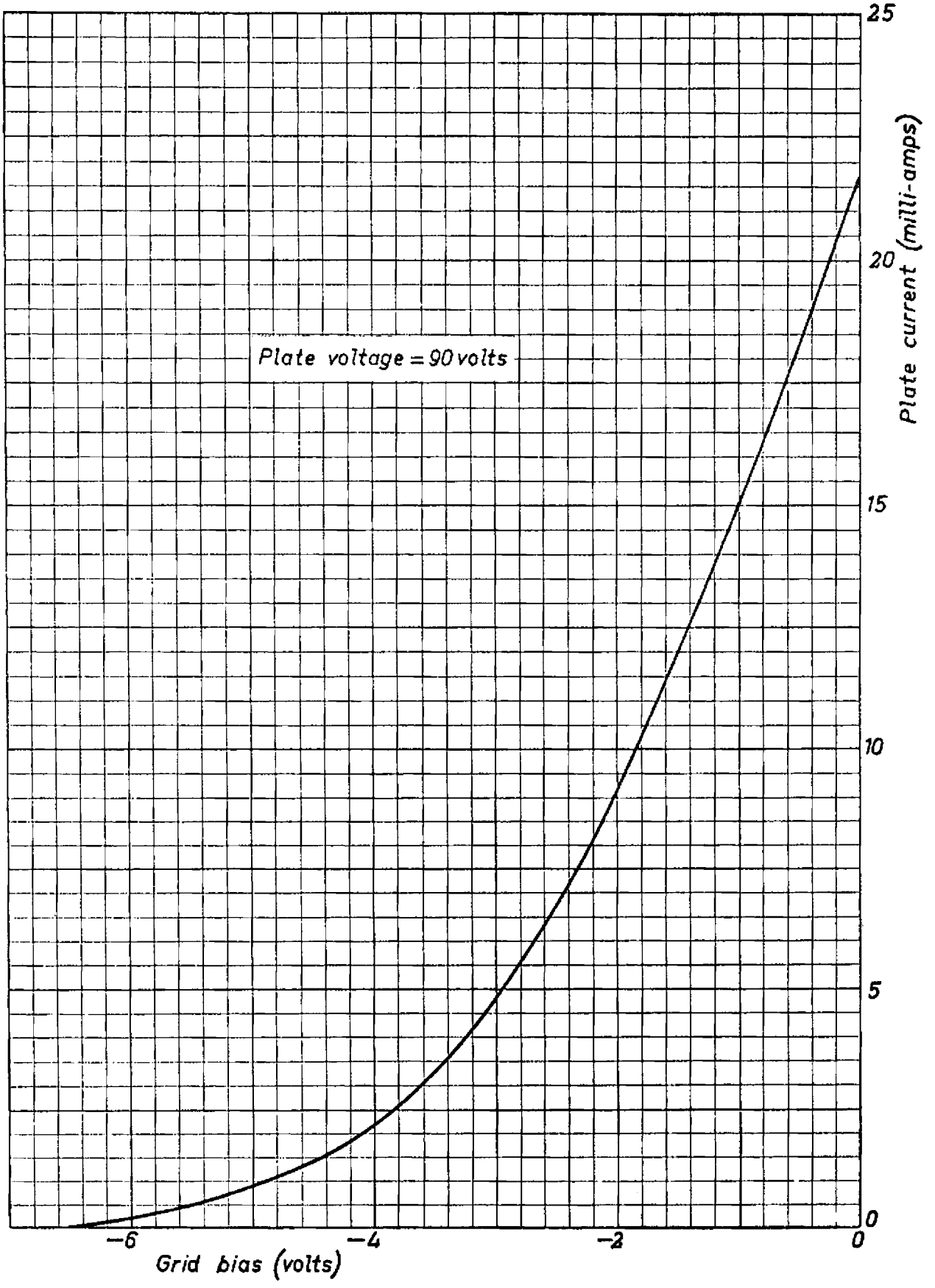
7AN7


Plate current
+180volts
10000ohms
120ohms
Grid bias
A
Plate current
+180volts
0.1 megohm
0.1megohm
0.1 megohm
Grid bias
B
25
20
15
10
5
0
Plate current (milli-amps)
A
B
−15
−10
−5
0
Grid bias (volts)

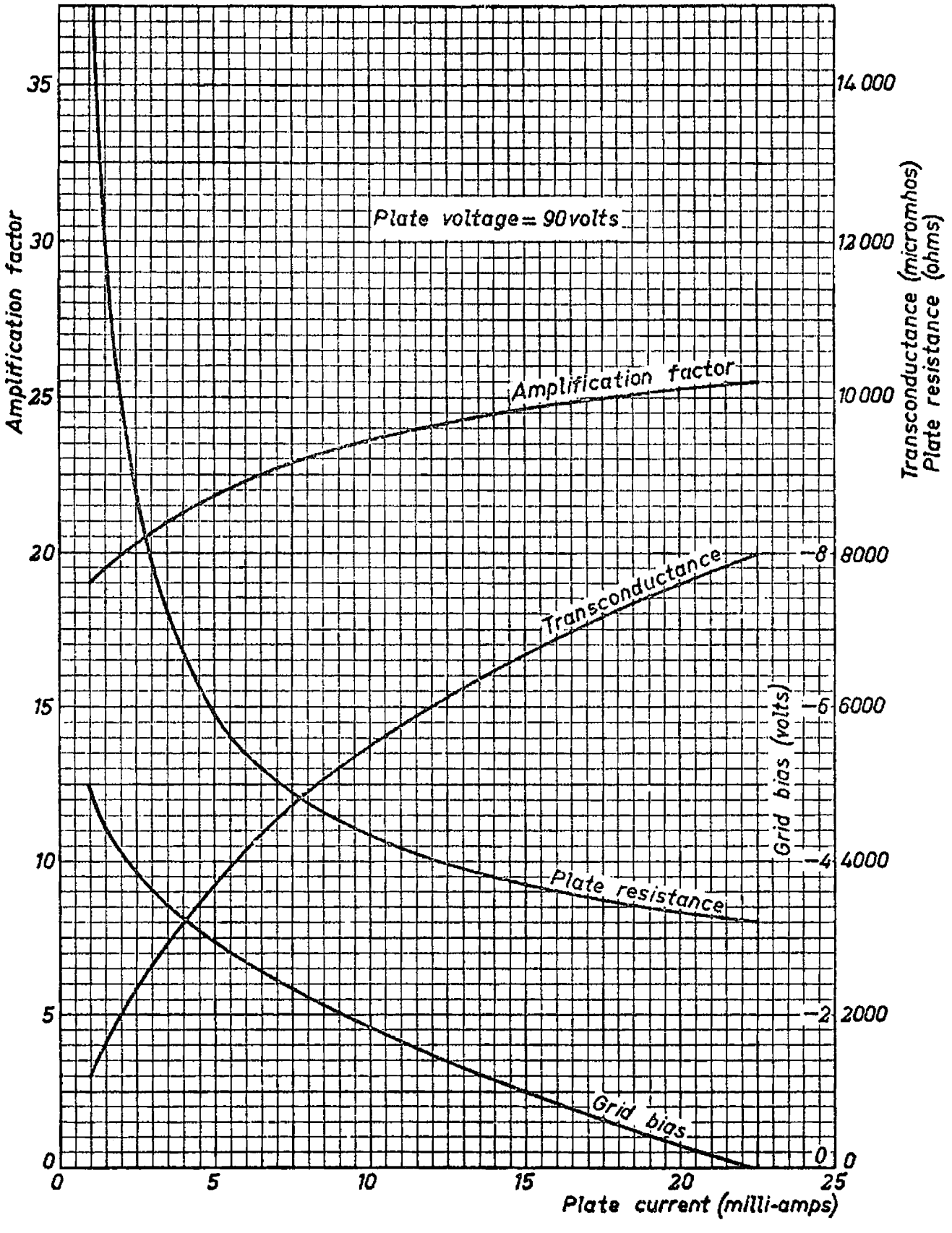
7AN7


Plate voltage (volts)
250
200
150
100
50
0
Plate current (milli-amps)
30
20
10
0
Grid bias = 0 volts
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
Plate dissipation
= 2 watts

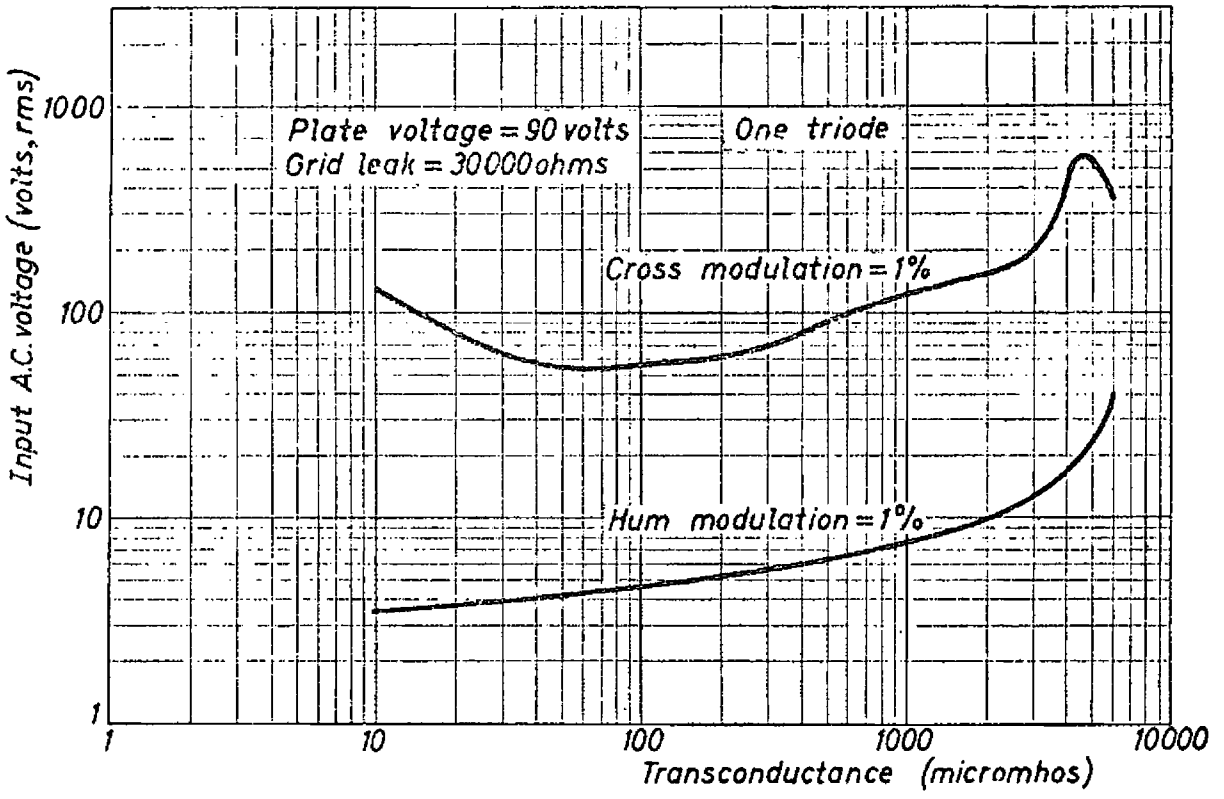
7AN7

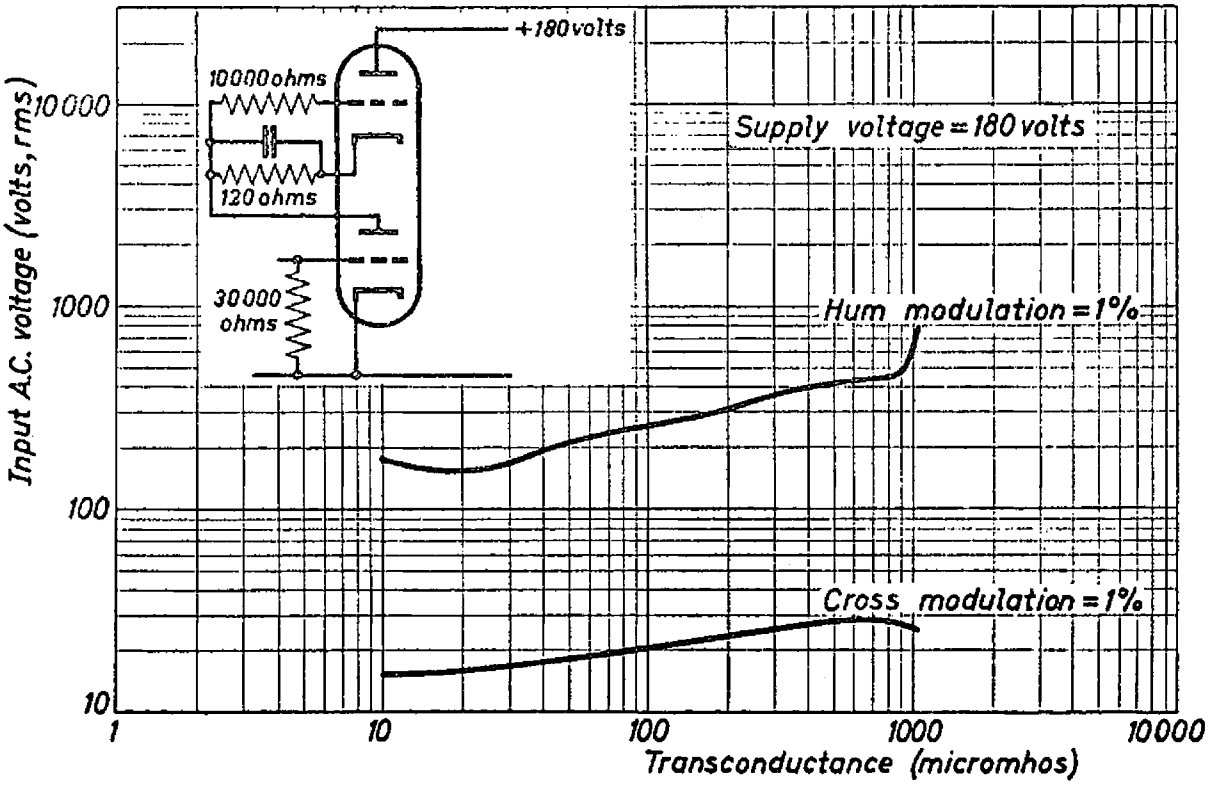

Plate voltage = 90 volts
25
20
15
10
5
0
Plate current (milli-amps)
−6
−4
−2
0
Grid bias (volts)

7AN7


Plate voltage = 90 volts
Amplification factor
Transconductance
Plate resistance
Grid bias
Amplification factor
Transconductance (micromhos)
Plate resistance (ohms)
Grid bias (volts)
Plate current (milli-amps)
0
5
10
15
20
25
30
35
2000
4000
6000
8000
10000
12000
14000
−2
−4
−6
−8

7AN7


Plate voltage = 90 volts
Grid leak = 30000 ohms
One triode
Cross modulation = 1%
Hum modulation = 1%
Input A.C. voltage (volts, rms)
1000
100
10
1
1
10
100
1000
10000
Transconductance (micromhos)


+180 volts
10000 ohms
120 ohms
30000 ohms
Supply voltage = 180 volts
Hum modulation = 1%
Cross modulation = 1%
Input A.C. voltage (volts, rms)
10000
1000
100
10
1
10
100
1000
10000
Transconductance (micromhos)

Rogers Electronic Tubes & Components

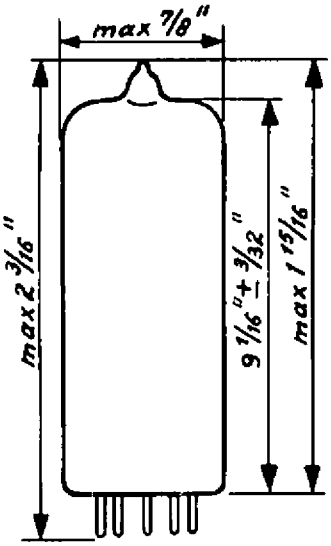
7 DJ 8

Description: Double triode with high transconductance and low noise for use as cascode amplifier in tuners for television receivers

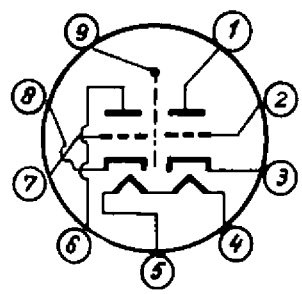
Mechanical data

Cathode	coated, unipotential
Base	E 9-1
Bulb	T 6 1/2
Outline	6-2
Basing	9 DE
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.		ELEMENT
1	Plate	Grounded-grid output section
2	Grid	
3	Cathode	
4	Heater	
5	Heater	
6	Plate	Grounded-cathode input section
7	Grid	
8	Cathode	
9	Internal shield	

Heater data

Heater voltage	7 volts
Heater current	300 mamps

Direct interelectrode capacitances

	without external shield	with external shield
Grounded-cathode section		
Grid to all other elements except plate	3.3	3.3 μμF
Plate to all other elements except grid	1.8	2.5 μμF
Plate to grid	1.4	1.4 μμF
Grid to heater	0.13	0.13 μμF

10.10.1958

from JEDEC release #2382, Feb. 9, 1959

Direct interelectrode capacitances (continued)

	without external shield	with external shield	
Grounded-grid section			
Cathode to all other elements except plate	6,0	6,0	µµF
Plate to all other elements except cathode	2,8	3,7	µµF
Plate to grid	1,4	1,4	µµF
Cathode to heater	2,7	2,7	µµF
Plate to cathode	0,18	0,16	µµF
Between grounded-cathode and grounded-grid section			
Plate to plate	max. 0,045	0,015	µµF
Grid (grounded-cathode-section) to plate (grounded-grid-section)	max. 0,005	0,005	µµF

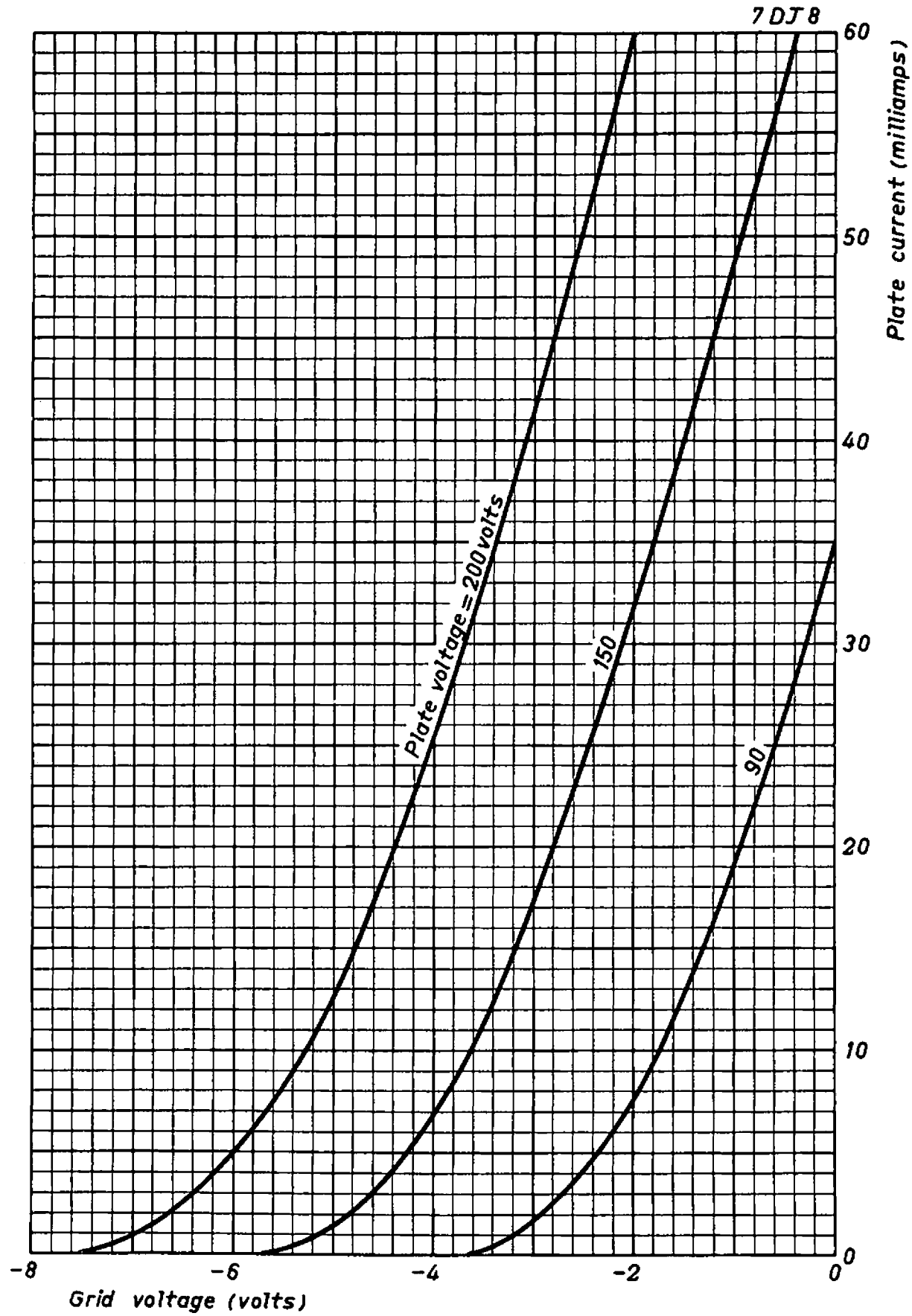
Maximum ratings (each section) (design center values)

Plate voltage (with cold cathode)	550	volts max.
Plate voltage	130	volts max.
Plate dissipation	1,8	watts max.
Cathode current	25	mamps max.
Negative grid voltage	50	volts, max
Grid circuit resistance	1	megohm max
Voltage between cathode and heater (grounded cathode section)	80	volts rms max.
Peakvoltage between cathode and heater (grounded grid section; cathode positive with respect to heater)	180	volts max.
D.C. component of cathode to heater voltage (grounded grid section)	130	volts max.
Circuit resistance between heater and cathode	20.000	ohms max.

Typical characteristics (each section)

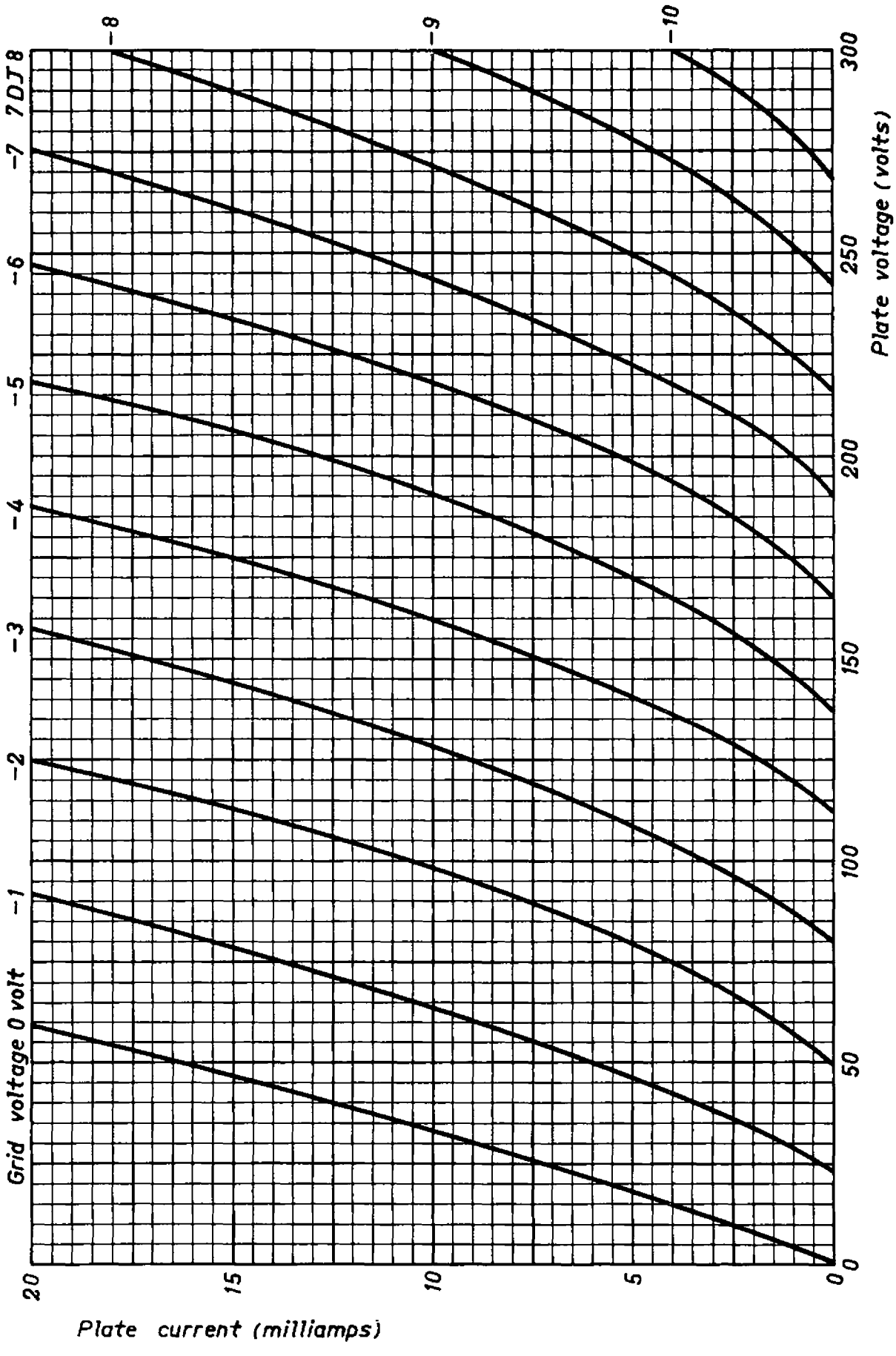
Plate voltage	90	volts
Grid bias	-1.3	volts
Plate current	15	mamps
Transconductance	12500	micromhos
Amplification factor	33	
Equivalent noise resistance	300	ohms

Remark: In order not to exceed the maximum permissible plate voltage when the cascode amplifier is controlled, it is necessary to use a voltage divider for the grid of the grounded-grid section.
With grid current biasing for the grounded-cathode section the plate voltage across this section should not exceed 75 volts in the not-controlled condition.


7 DJ 8
Plate current (milliamps)
60
50
40
30
20
10
0
Plate voltage = 200 volts
150
90
-8
-6
-4
-2
0
Grid voltage (volts)

10.10.1958

A


7DJ8
Grid voltage 0 volt
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
Plate voltage (volts)
300
250
200
150
100
50
0
Plate current (milliamps)
20
15
10
5
0

B

Rogers Electronic Tubes & Components

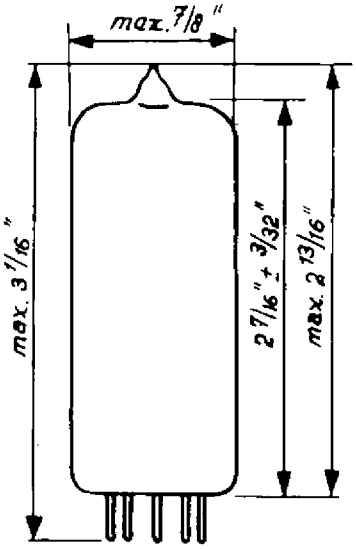
8B8
16A8

Description: Triode pentode; triode section for use as frame time base oscillator and A.F. amplifier; pentode section for use as frame output tube and A.F. output tube.

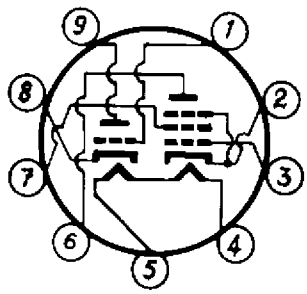
Mechanical data

Cathode	coated, unipotential
Base	E9-1
Bulb	T6 1/2
Outline	6-4
Basing	9EX
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Triode grid
2	Pentode cathode and grid No.3, internal shield
3	Pentode grid No.1
4	Heater
5	Heater
6	Pentode plate
7	Grid No.2
8	Triode cathode
9	Triode plate

HEATER DATA	8B8	16A8	
Heater voltage	8	16	volts
Heater current	600	300	mamps

DIRECT INTERELECTRODE CAPACITANCES

Triode section		
Grid to all other elements except plate		2.7 μμF
Plate to all other elements except grid		4.3 μμF
Plate to grid		4.2 μμF
Grid to heater	max.	0.02 μμF
Pentode section		
Grid No.1 to all other elements except plate		9.3 μμF
Plate to all other elements except grid No.1		8.0 μμF
Plate to grid No.1	max.	0.3 μμF
Grid No.1 to heater	max.	0.3 μμF

from JEDEC release #2556, Aug. 3, 1959

DIRECT INTERELECTRODE CAPACITANCES (continued)

Between triode and pentode section

Triode plate to pentode grid No.1	max.	0.02 µµF
Triode grid to pentode plate	max.	0.02 µµF
Triode grid to pentode grid No.1	max.	0.025 µµF
Triode plate to pentode plate	max.	0.25 µµF

MAXIMUM RATINGS (design center values)

Pentode section

Plate voltage without plate current	550 volts max.
Plate voltage	250 volts max.
Peak plate voltage	2500 volts max. 1)
Peak inverse plate voltage	500 volts max.
Plate dissipation	5 watts max. 2)
Plate dissipation	7 watts max. 3)
Grid No.2 voltage without current	550 volts max.
Grid No.2 voltage	250 volts max.
Grid No.2 dissipation	1.8 watts max.
Peak grid No.2 dissipation	3.2 watts max.
Cathode current	50 mamps max.
Grid No.1 circuit resistance with automatic bias	2 megohms max.
Grid No.1 circuit resistance with fixed bias	1 megohm max.
Voltage between heater and cathode	200 volts max.
Circuit resistance between heater and cathode	20000 ohms max.

Triode section

Plate voltage without plate current	550 volts max.
Plate voltage	250 volts max.
Peak plate voltage	600 volts max. 1)
Plate dissipation	1 watt max.
Cathode current	15 mamps max.
Grid circuit resistance with automatic bias	3 megohms max.
Grid circuit resistance with fixed bias	1 megohm max.
Voltage between heater and cathode	200 volts max.
Circuit resistance between heater and cathode	20000 ohms max.
Grid circuit impedance (freq. = 50 c/s)	0.5 megohm max.

1)Maximum pulse duration 4% of one cycle with a maximum of 0.8 milli second.

2)For frame output application

3)For audio output application

TYPICAL CHARACTERISTICS

Pentode section

Plate voltage	100	170	200	200	volts
Grid No.2 voltage	100	170	200	200	volts
Grid No.1 bias	-6.0	-11.5	-12.5	-16	volts
Plate current	26	41	35	35	mamps
Grid No.2 current	5.0	8.0	6.5	7.0	mamps
Transconductance	6800	7500	6800	6400	micromhos
Plate resistance	15000	16000	20500	20000	ohms
Amplification factor of grid No.2 with respect to grid No.1	10	9.5	9.5	9.5	

Triode section

Plate voltage	100	volts
Grid voltage	0	volt
Plate current	3.5	mamps
Transconductance	2500	micromhos
Amplification factor	70	

OPERATING CHARACTERISTICS of the pentode section as audio output tube, class A

Plate voltage	100	170	200	200	volts
Grid No.2 voltage	100	170	200	200	volts
Grid No.1 bias	-6.0	-11.5	-12.5	-16	volts
Plate current	26	41	35	35	mamps
Grid No.2 current	5.0	8.0	6.5	7.0	mamps
Load resistance	3900	3900	5600	5600	ohms
Power output at a harmonic distortion of 10%	1.05	3.3	3.4	3.5	watts
Required input A.F. voltage	3.8	6.0	5.8	6.6	volts(rms)
Required input A.F. voltage at a power output of 50 milliwatts	0.65	0.59	0.56	0.60	volt (rms)

OPTIMUM PEAK PLATE CURRENT OF THE PENTODE SECTION IN FRAME OUTPUT APPLICATION

To allow for tube spread and for deterioration during life the circuit should be designed around a peak plate current not exceeding 85 mA at 50 volts plate voltage and 170 volts grid No.2 voltage.
At underheating (nominal heater current -7%) the following values of peak plate current must be considered:

70 mA at 50 volts plate voltage and
170 volts grid No.2 voltage

80 mA at 50 volts plate voltage and
190 volts grid No.2 voltage

The peak plate current of an average new tube is:

135 mA at 50 volts plate voltage and
170 volts grid No.2 voltage
and 0.3 µA positive grid No.1 current

OPTIMUM PEAK CATHODE CURRENT OF THE TRIODE SECTION AS FRAME TIME BASE OSCILLATOR

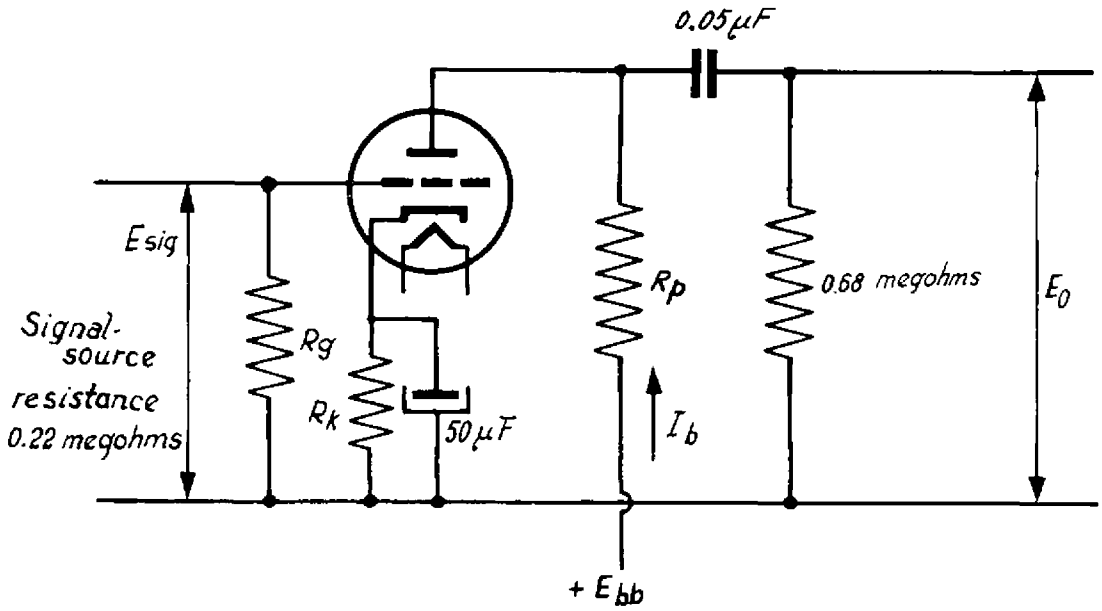
To allow for tube spread, for deterioration during life and for emission drop at underheating the equipment should be so designed that it still operates satisfactorily with a peak cathode current of 200 mA (max. pulse duration 4% of a cycle, with a maximum of 0.8 msec)
The amplitude of the peak current occuring with new tubes should be limited automatically to this max. value of 200 mA. (e.g. by non-bypassed resistances in the grid lead)
If no automatic limitation is present the equipment should be designed around a peak cathode current of 100 mA

OBSERVATIONS

If the tube is fed from a mains that is not synchronised with the video frequency, image interference may be caused. A curve is given showing the relation between the permissible grid No.1 circuit impedance of the pentode section and the A.C. voltage between pin 4 and cathode. For this curve it has been assumed that capacitances between grid No.1 and the heater (inclusive of wiring and tube socket) is 0.8 µµF and that the negative feedback-coupling for 50 to 400 cycles/second is at least a factor 2

The triode section can be used without special precautions against microphonic effect and hum in circuits in which an input voltage of at least 10 millivolts gives an output power of 50 milliwatts.
The A.C. voltage between pin 4 and cathode should not exceed 6.3 volts

OPERATING CHARACTERISTICS OF THE TRIODE SECTION AS A.F. AMPLIFIER

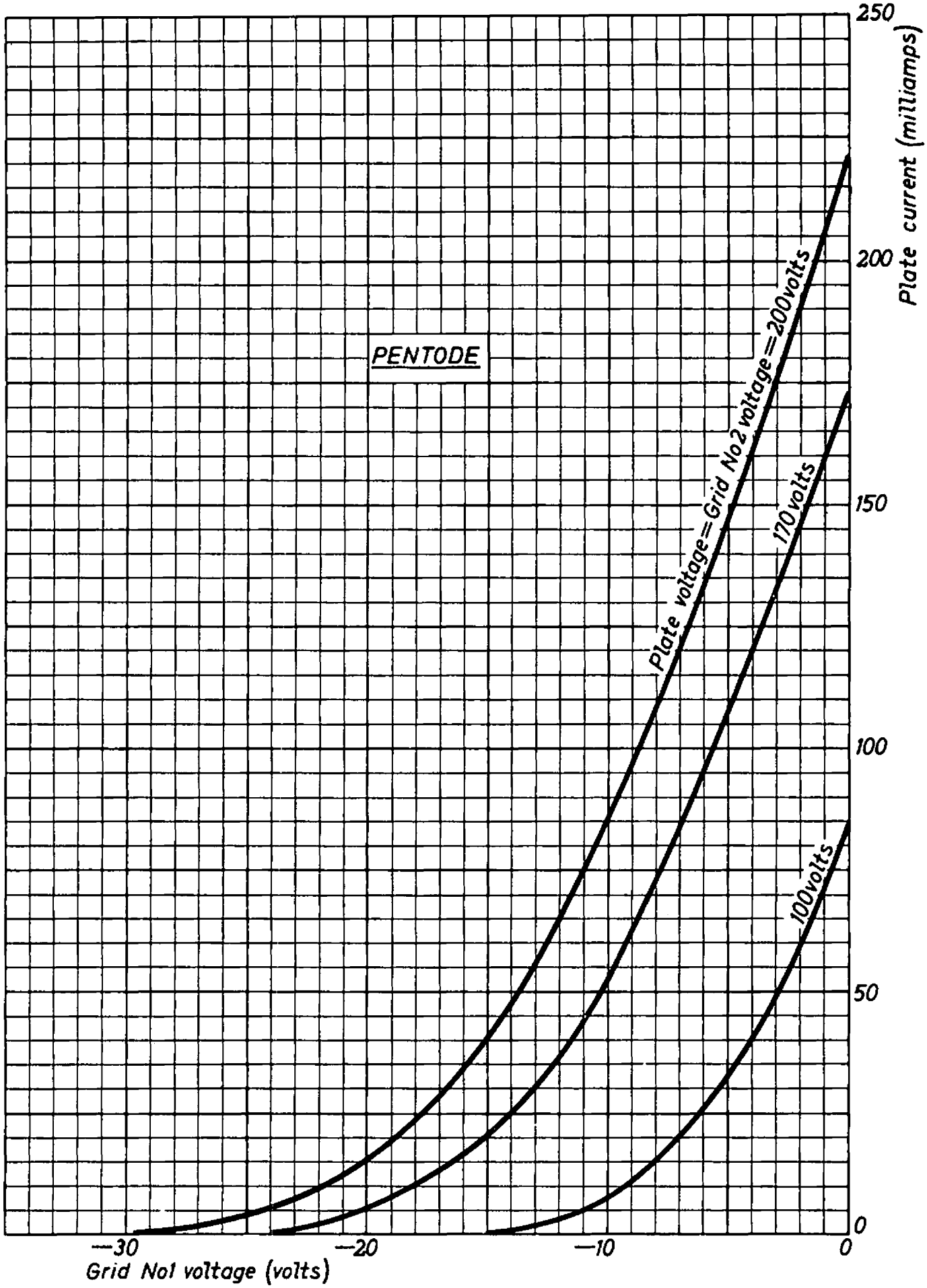


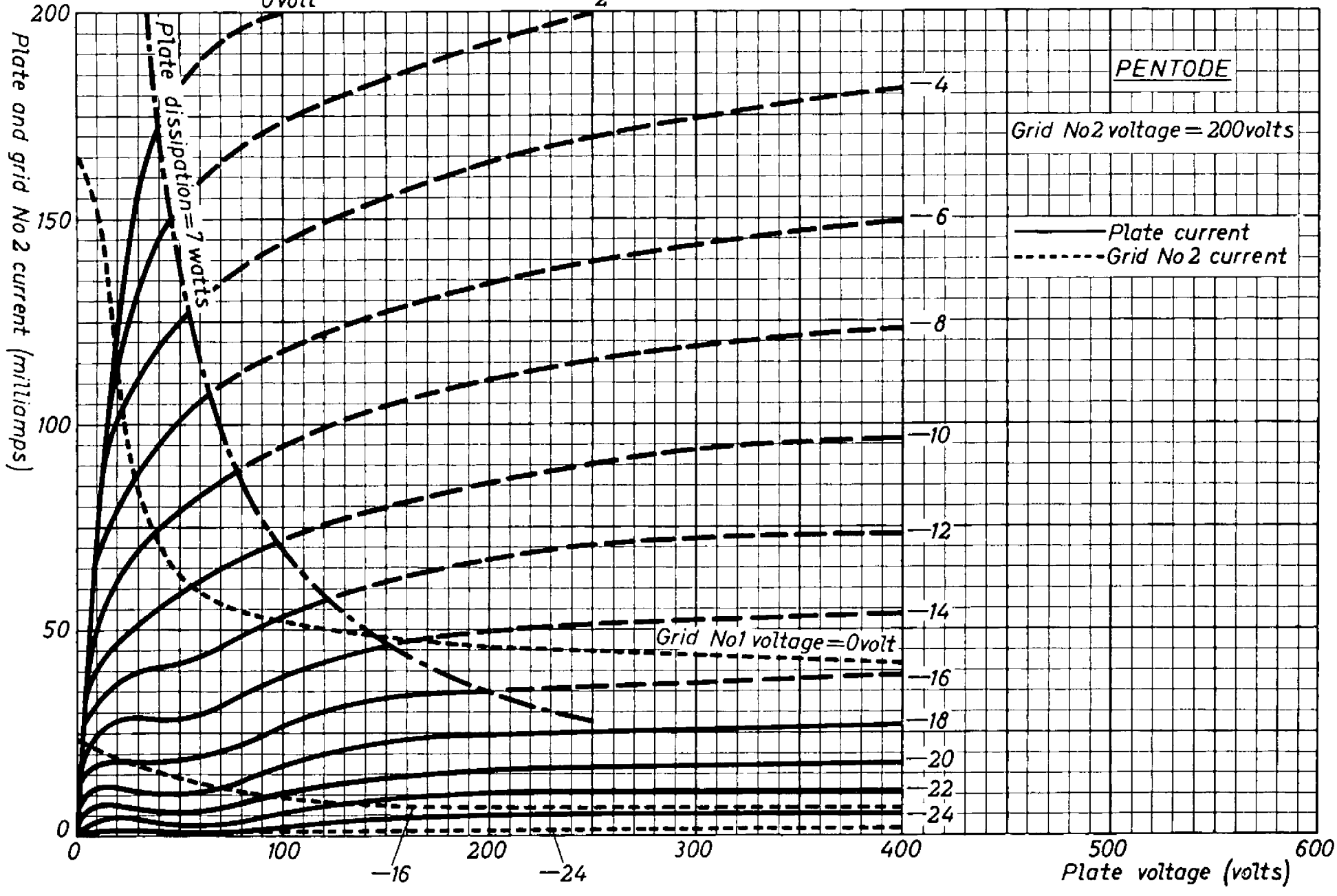
Ebb volts	Rg megohms	Rk ohms	Rp megohms	Ib mamps	Eo volts(rms)	$\frac{E_o}{E_{sig}}$ (1	total harmonics %	
200	3	2200	0.22	0.52	26	52	1.6	(2
170	3	2700	0.22	0.43	25	51	2.3	(2
100	3	2700	0.22	0.23	15	47	4.0	(2
200	22	0	0.1	1.05	24	50	1.5	(3
170	22	0	0.1	0.86	19	49	1.4	(3
100	22	0	0.1	0.37	8	42	1.3	(2
200	22	0	0.22	0.61	25	55	1.4	(3
170	22	0	0.22	0.50	20	53	1.4	(3
100	22	0	0.22	0.22	9	46	1.5	(2

1)Measured at small input voltage

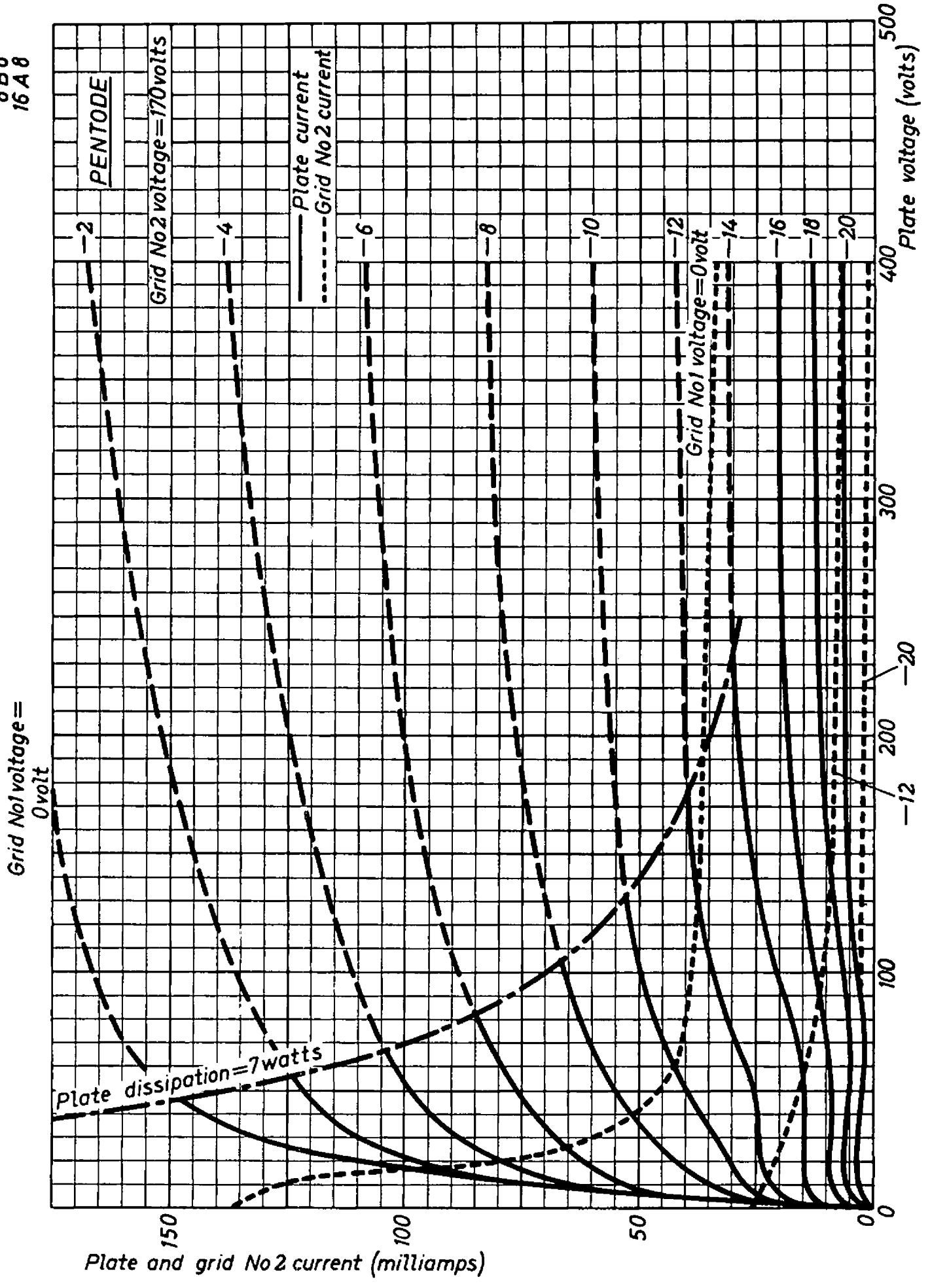
2)At lower output voltages the distortion is proportionally lower

3)At lower output voltages the distortion remains approx. constant up to V_o = 5 Veff. At values < 5 Veff the distortion is proportionally lower.


PENTODE
Plate voltage = Grid No2 voltage = 200volts
170volts
100volts
250
200
150
100
50
0
Plate current (milliamps)
—30
—20
—10
0
Grid No1 voltage (volts)

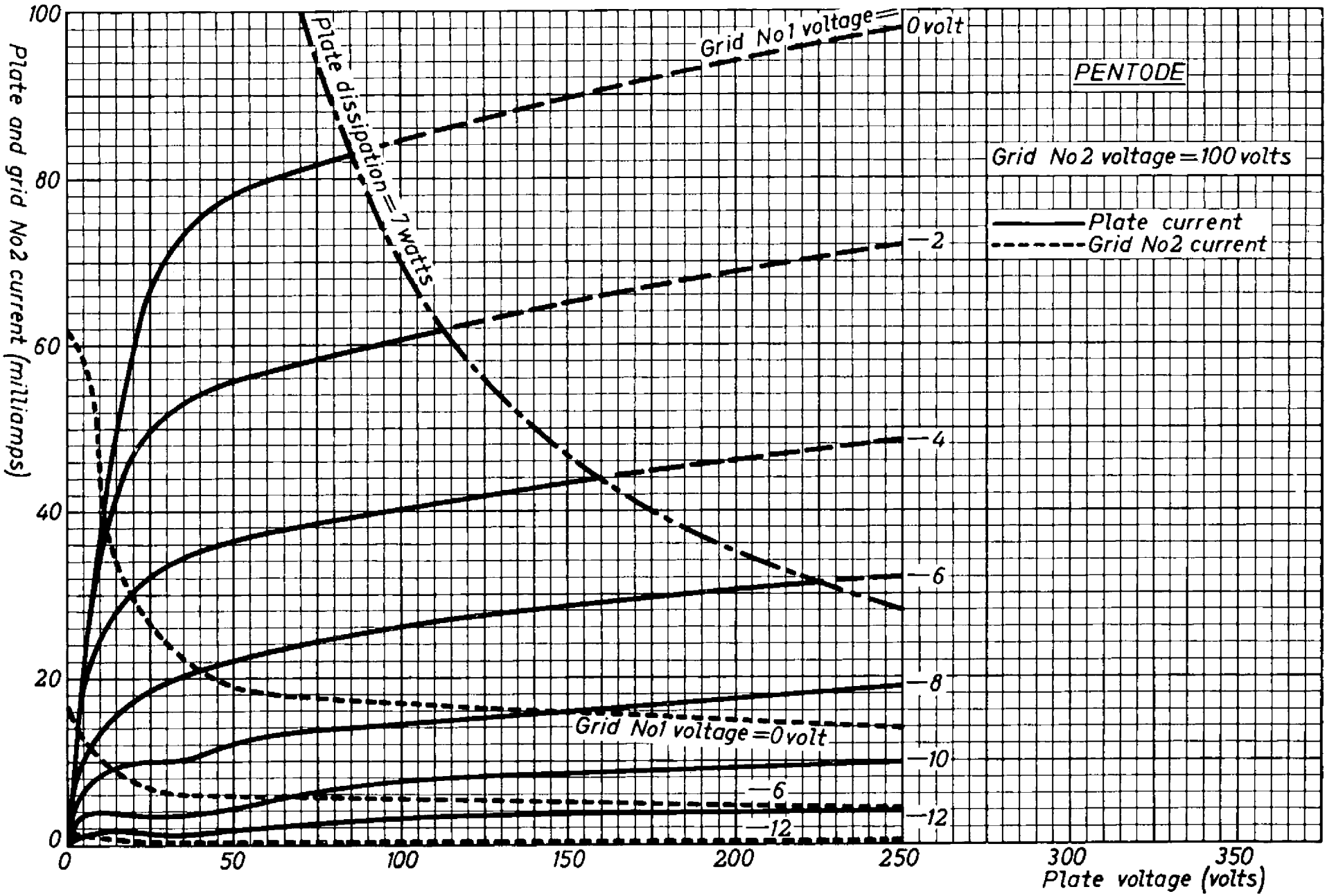

PENTODE
Grid No2 voltage = 200volts
Plate current
Grid No2 current
Grid No1 voltage = 0volt
−2
−4
−6
−8
−10
−12
−14
−16
−18
−20
−22
−24
Plate dissipation = 7 watts
Grid No1 voltage = 0volt
Plate and grid No 2 current (milliamps)
Plate voltage (volts)
0
50
100
150
200
300
400
500
600

B

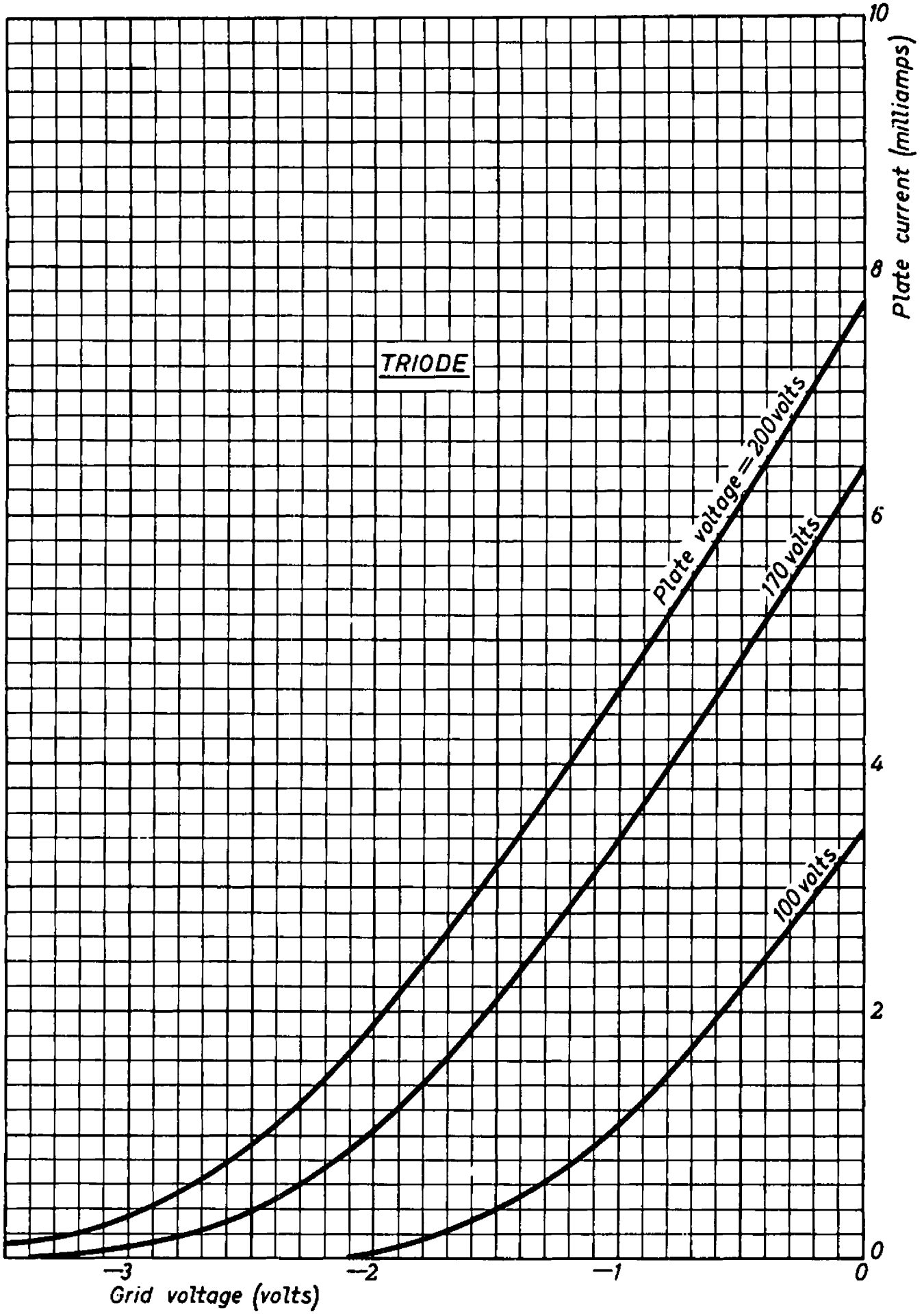

8B8
16A8
PENTODE
Grid No2 voltage=170volts
Plate current
Grid No2 current
—2
—4
—6
—8
—10
—12
—14
—16
—18
—20
Grid No1 voltage=0volt
Plate voltage (volts)
500
400
300
200
100
0
—20
—12
Grid No1 voltage=
0volt
Plate dissipation=7watts
150
100
50
0
Plate and grid No2 current (milliamps)

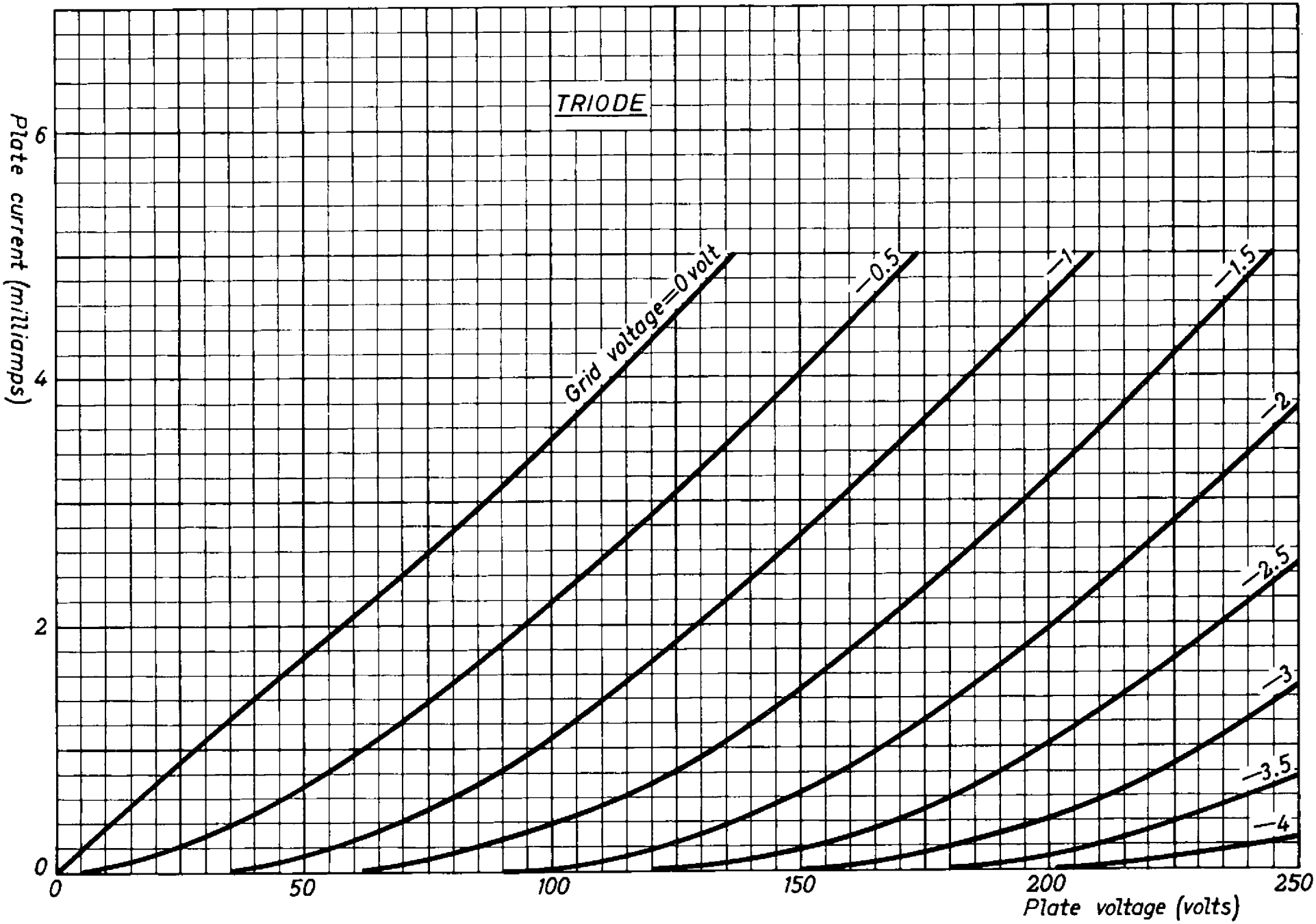
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C

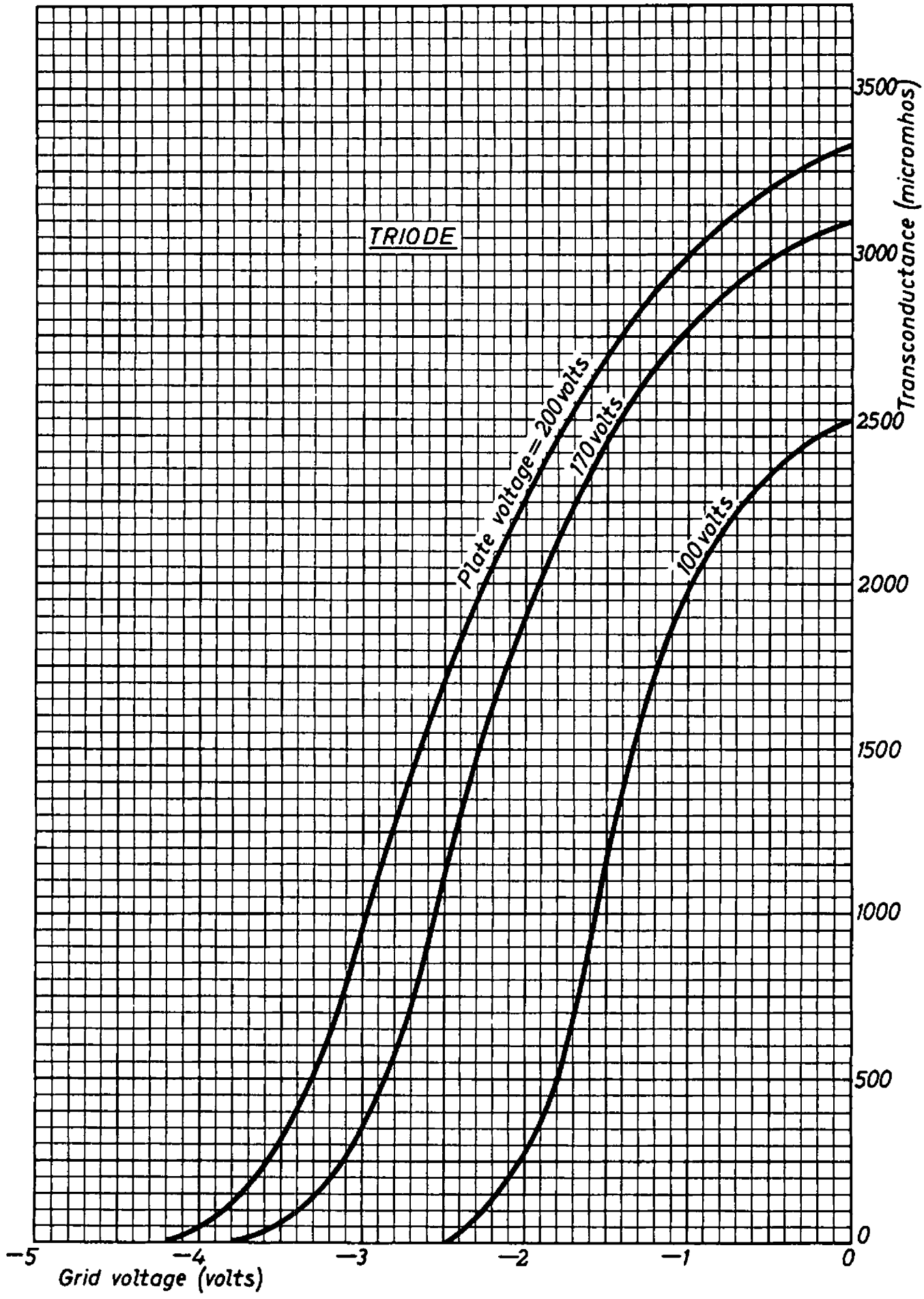

PENTODE
Grid No 2 voltage = 100 volts
Plate current
Grid No 2 current
Plate dissipation = 7 watts
Grid No 1 voltage = 0 volt
−2
−4
−6
−8
−10
−12
Grid No 1 voltage = 0 volt
−6
−12
Plate and grid No 2 current (milliamps)
Plate voltage (volts)
0
20
40
60
80
100
0
50
100
150
200
250
300
350

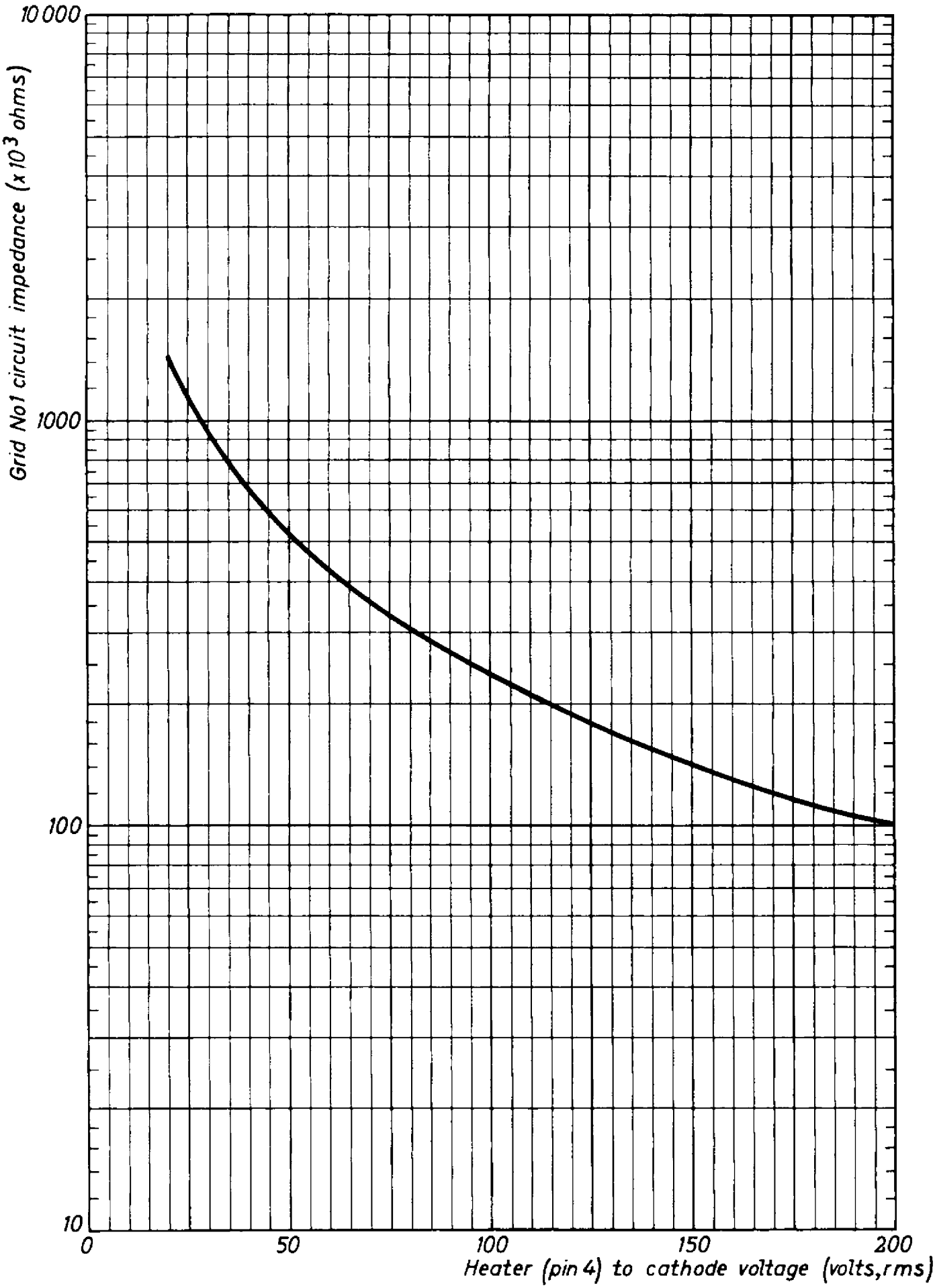
D


TRIODE
Plate voltage = 200 volts
170 volts
100 volts
Plate current (milliamps)
10
8
6
4
2
0
−3
−2
−1
0
Grid voltage (volts)


TRIODE
Plate current (milliamps)
0
2
4
6
0
50
100
150
200
250
Plate voltage (volts)
Grid voltage=0 volt
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
−4

F


TRIODE
Plate voltage = 200 volts
170 volts
100 volts
Transconductance (micromhos)
3500
3000
2500
2000
1500
1000
500
0
−5
−4
−3
−2
−1
0
Grid voltage (volts)


10 000
1000
100
10
Grid No1 circuit impedance (x 10³ ohms)
0
50
100
150
200
Heater (pin 4) to cathode voltage (volts, rms)

Rogers Electronic Tubes & Components

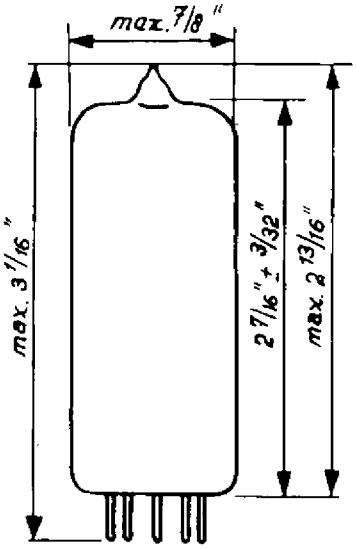
8B8
16A8

Description: Triode pentode; triode section for use as frame time base oscillator and A.F. amplifier; pentode section for use as frame output tube and A.F. output tube.

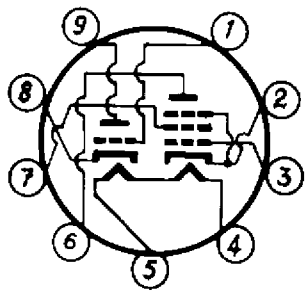
Mechanical data

Cathode	coated, unipotential
Base	E9-1
Bulb	T6 1/2
Outline	6-4
Basing	9EX
Mounting position	any

TUBE OUTLINE



BOTTOM VIEW OF BASE



BASE PIN No.	ELEMENT
1	Triode grid
2	Pentode cathode and grid No.3, internal shield
3	Pentode grid No.1
4	Heater
5	Heater
6	Pentode plate
7	Grid No.2
8	Triode cathode
9	Triode plate

HEATER DATA	8B8	16A8	
Heater voltage	8	16	volts
Heater current	600	300	mamps

DIRECT INTERELECTRODE CAPACITANCES

Triode section		
Grid to all other elements except plate		2.7 μμF
Plate to all other elements except grid		4.3 μμF
Plate to grid		4.2 μμF
Grid to heater	max.	0.02 μμF
Pentode section		
Grid No.1 to all other elements except plate		9.3 μμF
Plate to all other elements except grid No.1		8.0 μμF
Plate to grid No.1	max.	0.3 μμF
Grid No.1 to heater	max.	0.3 μμF

from JEDEC release #2556, Aug. 3, 1959

DIRECT INTERELECTRODE CAPACITANCES (continued)

Between triode and pentode section

Triode plate to pentode grid No.1	max.	0.02 µµF
Triode grid to pentode plate	max.	0.02 µµF
Triode grid to pentode grid No.1	max.	0.025 µµF
Triode plate to pentode plate	max.	0.25 µµF

MAXIMUM RATINGS (design center values)

Pentode section

Plate voltage without plate current	550 volts max.
Plate voltage	250 volts max.
Peak plate voltage	2500 volts max. 1)
Peak inverse plate voltage	500 volts max.
Plate dissipation	5 watts max. 2)
Plate dissipation	7 watts max. 3)
Grid No.2 voltage without current	550 volts max.
Grid No.2 voltage	250 volts max.
Grid No.2 dissipation	1.8 watts max.
Peak grid No.2 dissipation	3.2 watts max.
Cathode current	50 mamps max.
Grid No.1 circuit resistance with automatic bias	2 megohms max.
Grid No.1 circuit resistance with fixed bias	1 megohm max.
Voltage between heater and cathode	200 volts max.
Circuit resistance between heater and cathode	20000 ohms max.

Triode section

Plate voltage without plate current	550 volts max.
Plate voltage	250 volts max.
Peak plate voltage	600 volts max. 1)
Plate dissipation	1 watt max.
Cathode current	15 mamps max.
Grid circuit resistance with automatic bias	3 megohms max.
Grid circuit resistance with fixed bias	1 megohm max.
Voltage between heater and cathode	200 volts max.
Circuit resistance between heater and cathode	20000 ohms max.
Grid circuit impedance (freq. = 50 c/s)	0.5 megohm max.

1)Maximum pulse duration 4% of one cycle with a maximum of 0.8 milli second.

2)For frame output application

3)For audio output application

TYPICAL CHARACTERISTICS

Pentode section

Plate voltage	100	170	200	200	volts
Grid No.2 voltage	100	170	200	200	volts
Grid No.1 bias	-6.0	-11.5	-12.5	-16	volts
Plate current	26	41	35	35	mamps
Grid No.2 current	5.0	8.0	6.5	7.0	mamps
Transconductance	6800	7500	6800	6400	micromhos
Plate resistance	15000	16000	20500	20000	ohms
Amplification factor of grid No.2 with respect to grid No.1	10	9.5	9.5	9.5	

Triode section

Plate voltage	100	volts
Grid voltage	0	volt
Plate current	3.5	mamps
Transconductance	2500	micromhos
Amplification factor	70	

OPERATING CHARACTERISTICS of the pentode section as audio output tube, class A

Plate voltage	100	170	200	200	volts
Grid No.2 voltage	100	170	200	200	volts
Grid No.1 bias	-6.0	-11.5	-12.5	-16	volts
Plate current	26	41	35	35	mamps
Grid No.2 current	5.0	8.0	6.5	7.0	mamps
Load resistance	3900	3900	5600	5600	ohms
Power output at a harmonic distortion of 10%	1.05	3.3	3.4	3.5	watts
Required input A.F. voltage	3.8	6.0	5.8	6.6	volts(rms)
Required input A.F. voltage at a power output of 50 milliwatts	0.65	0.59	0.56	0.60	volt (rms)

OPTIMUM PEAK PLATE CURRENT OF THE PENTODE SECTION IN FRAME OUTPUT APPLICATION

To allow for tube spread and for deterioration during life the circuit should be designed around a peak plate current not exceeding 85 mA at 50 volts plate voltage and 170 volts grid No.2 voltage.
At underheating (nominal heater current -7%) the following values of peak plate current must be considered:

70 mA at 50 volts plate voltage and
170 volts grid No.2 voltage

80 mA at 50 volts plate voltage and
190 volts grid No.2 voltage

The peak plate current of an average new tube is:

135 mA at 50 volts plate voltage and
170 volts grid No.2 voltage
and 0.3 µA positive grid No.1 current

OPTIMUM PEAK CATHODE CURRENT OF THE TRIODE SECTION AS FRAME TIME BASE OSCILLATOR

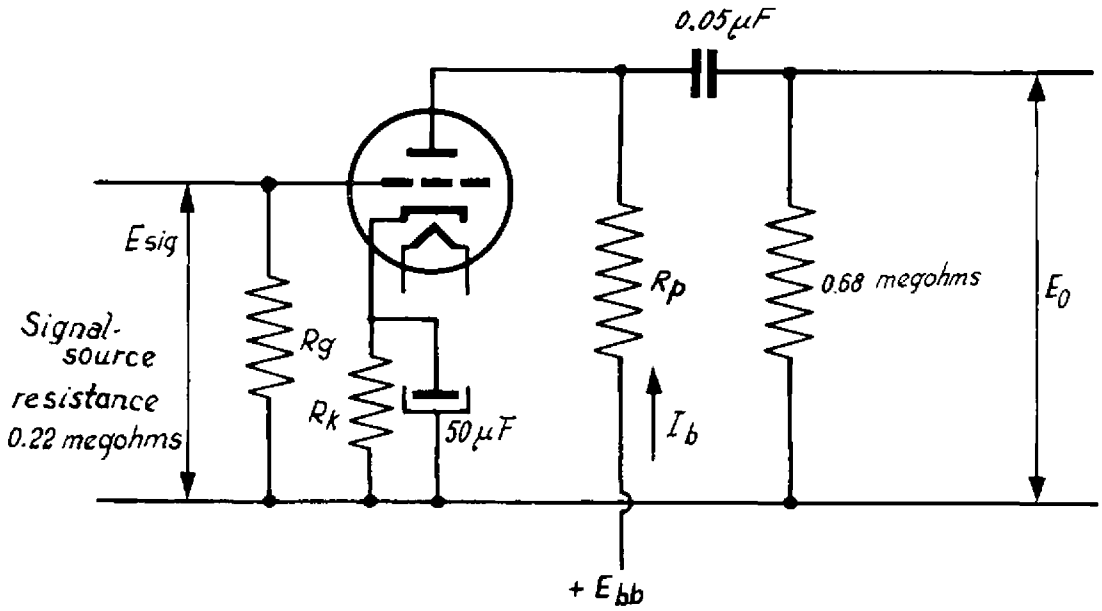
To allow for tube spread, for deterioration during life and for emission drop at underheating the equipment should be so designed that it still operates satisfactorily with a peak cathode current of 200 mA (max. pulse duration 4% of a cycle, with a maximum of 0.8 msec)
The amplitude of the peak current occuring with new tubes should be limited automatically to this max. value of 200 mA. (e.g. by non-bypassed resistances in the grid lead)
If no automatic limitation is present the equipment should be designed around a peak cathode current of 100 mA

OBSERVATIONS

If the tube is fed from a mains that is not synchronised with the video frequency, image interference may be caused. A curve is given showing the relation between the permissible grid No.1 circuit impedance of the pentode section and the A.C. voltage between pin 4 and cathode. For this curve it has been assumed that capacitances between grid No.1 and the heater (inclusive of wiring and tube socket) is 0.8 µµF and that the negative feedback-coupling for 50 to 400 cycles/second is at least a factor 2

The triode section can be used without special precautions against microphonic effect and hum in circuits in which an input voltage of at least 10 millivolts gives an output power of 50 milliwatts.
The A.C. voltage between pin 4 and cathode should not exceed 6.3 volts

OPERATING CHARACTERISTICS OF THE TRIODE SECTION AS A.F. AMPLIFIER

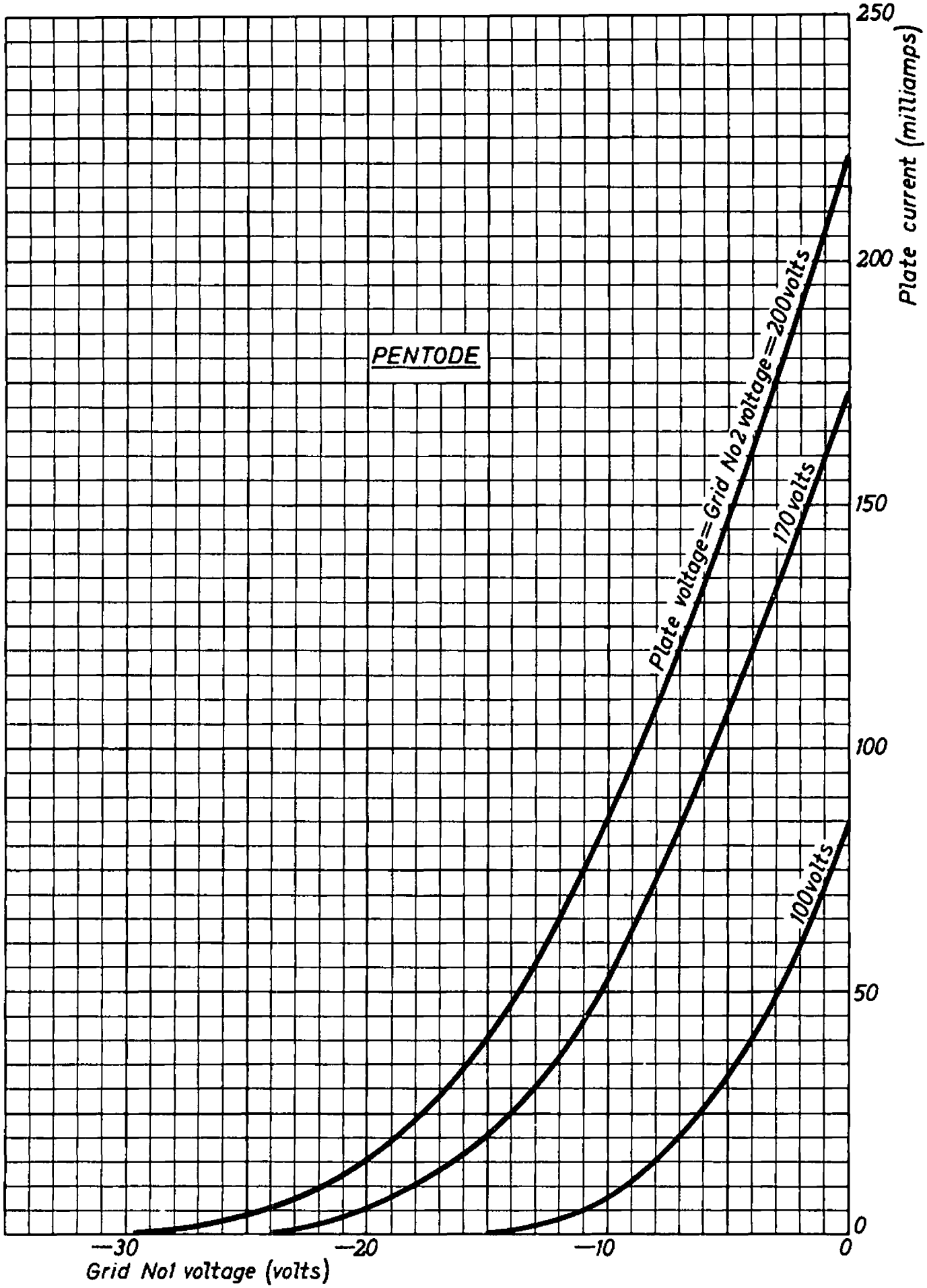


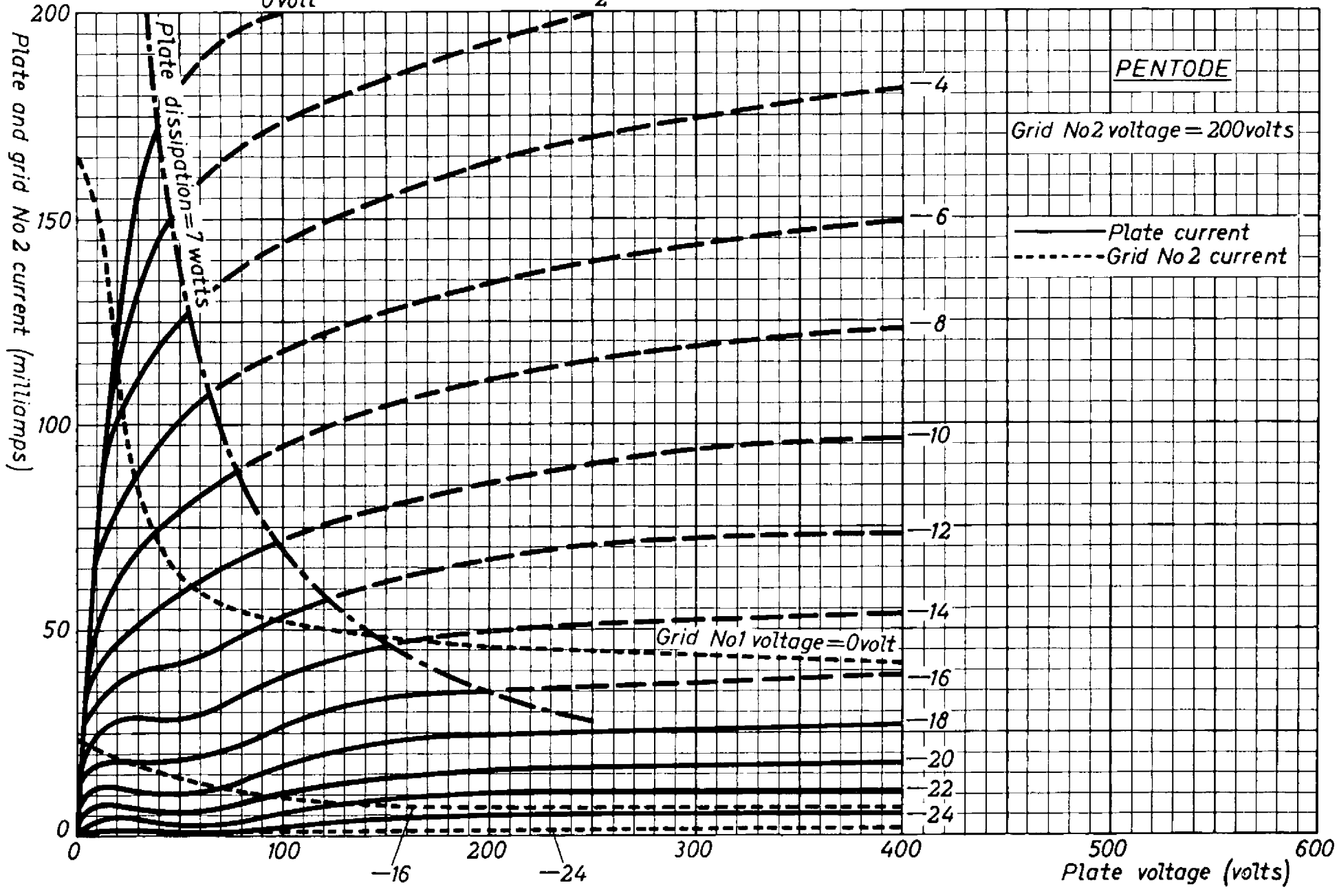
Ebb volts	Rg megohms	Rk ohms	Rp megohms	Ib mamps	Eo volts(rms)	$\frac{E_o}{E_{sig}}$ (1	total harmonics %	
200	3	2200	0.22	0.52	26	52	1.6	(2
170	3	2700	0.22	0.43	25	51	2.3	(2
100	3	2700	0.22	0.23	15	47	4.0	(2
200	22	0	0.1	1.05	24	50	1.5	(3
170	22	0	0.1	0.86	19	49	1.4	(3
100	22	0	0.1	0.37	8	42	1.3	(2
200	22	0	0.22	0.61	25	55	1.4	(3
170	22	0	0.22	0.50	20	53	1.4	(3
100	22	0	0.22	0.22	9	46	1.5	(2

1)Measured at small input voltage

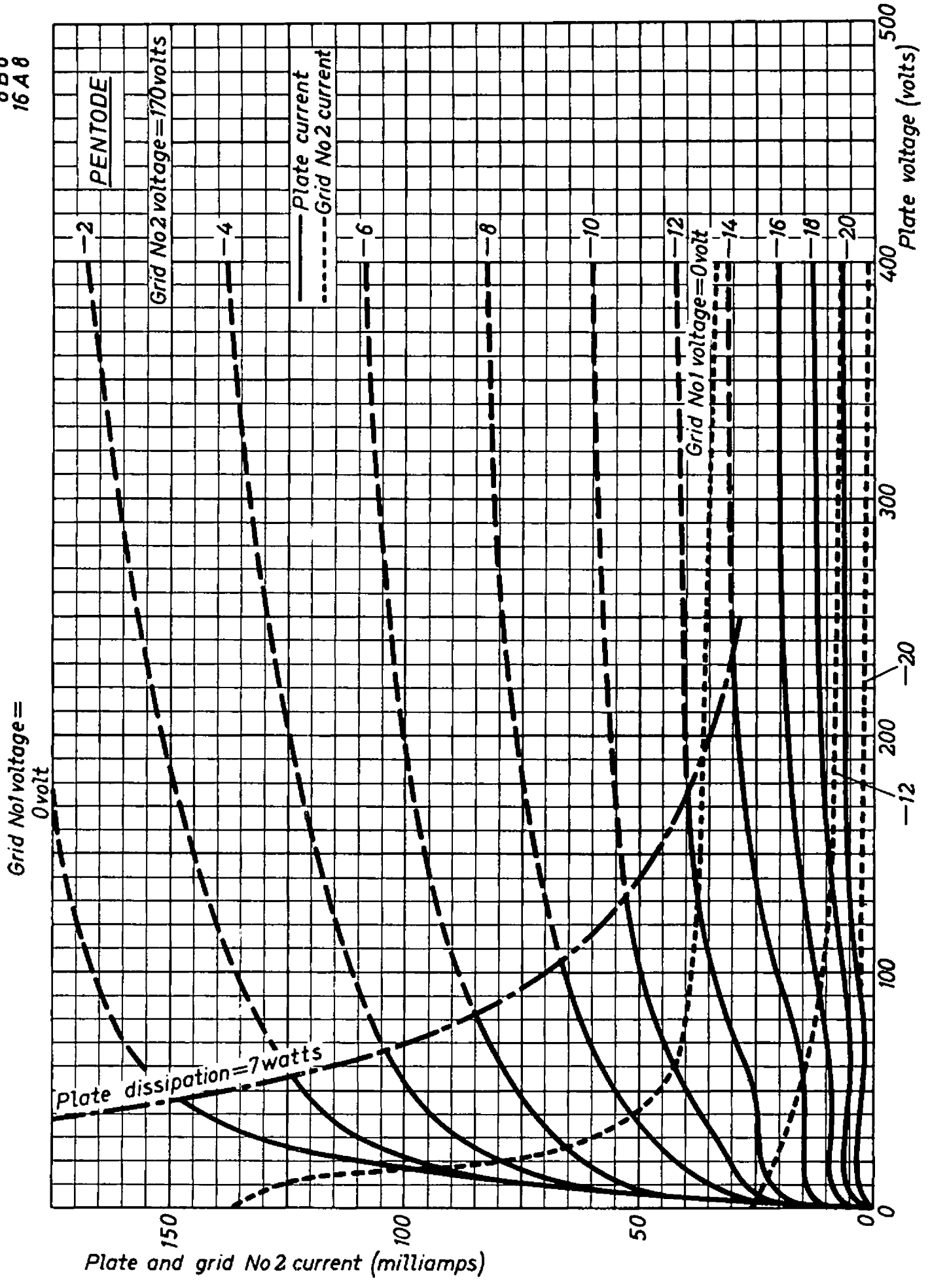
2)At lower output voltages the distortion is proportionally lower

3)At lower output voltages the distortion remains approx. constant up to V_o = 5 Veff. At values < 5 Veff the distortion is proportionally lower.


PENTODE
Plate voltage = Grid No2 voltage = 200volts
170volts
100volts
250
200
150
100
50
0
Plate current (milliamps)
—30
—20
—10
0
Grid No1 voltage (volts)

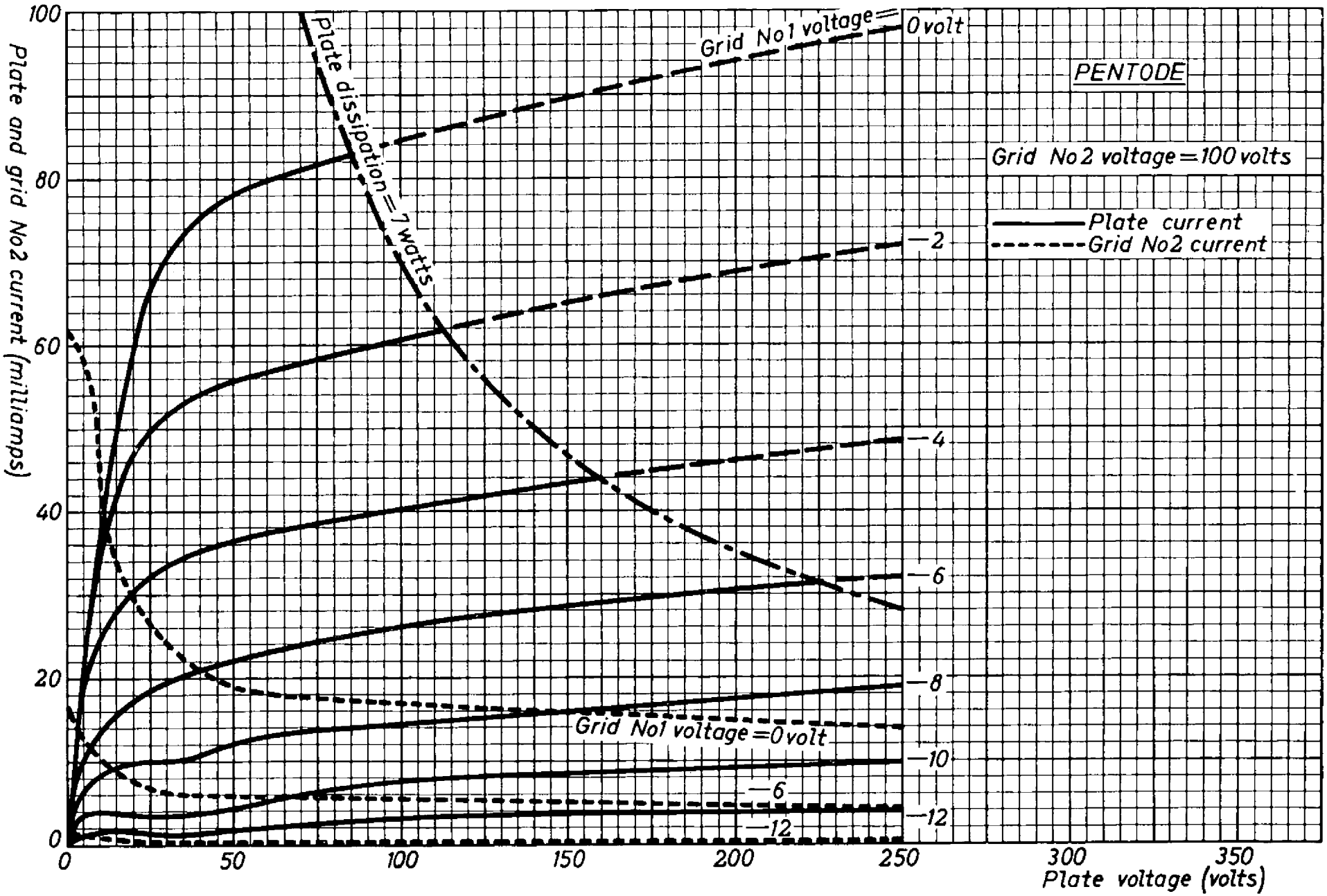

PENTODE
Grid No2 voltage = 200volts
Plate current
Grid No2 current
Grid No1 voltage = 0volt
−2
−4
−6
−8
−10
−12
−14
−16
−18
−20
−22
−24
Plate dissipation = 7 watts
Grid No1 voltage = 0volt
Plate and grid No 2 current (milliamps)
Plate voltage (volts)
0
50
100
150
200
300
400
500
600

B

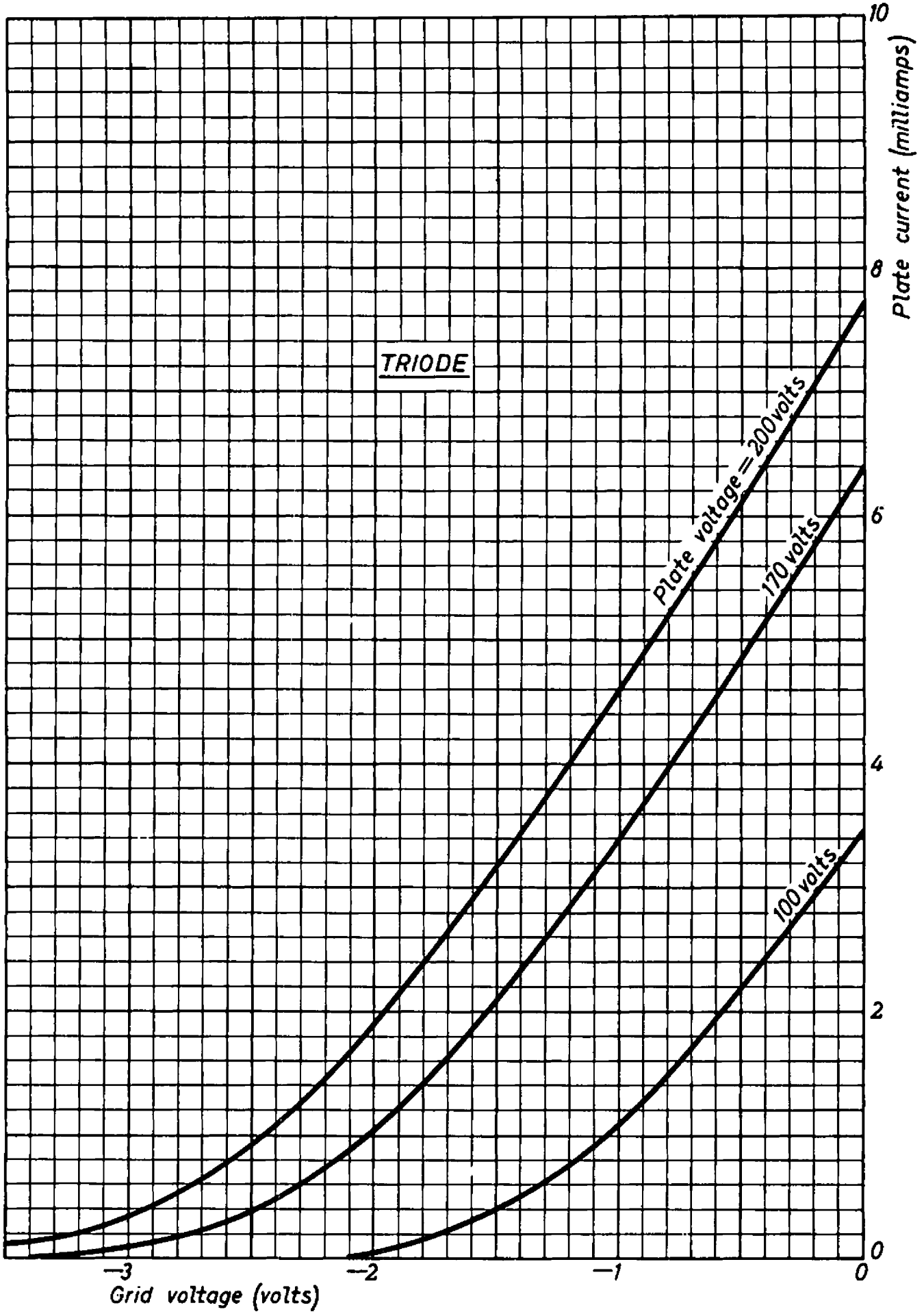

8B8
16A8
PENTODE
Grid No2 voltage=170volts
Plate current
Grid No2 current
—2
—4
—6
—8
—10
—12
—14
—16
—18
—20
Grid No1 voltage=0volt
Plate voltage (volts)
500
400
300
200
100
0
—20
—12
Grid No1 voltage=
0volt
Plate dissipation=7watts
150
100
50
0
Plate and grid No2 current (milliamps)

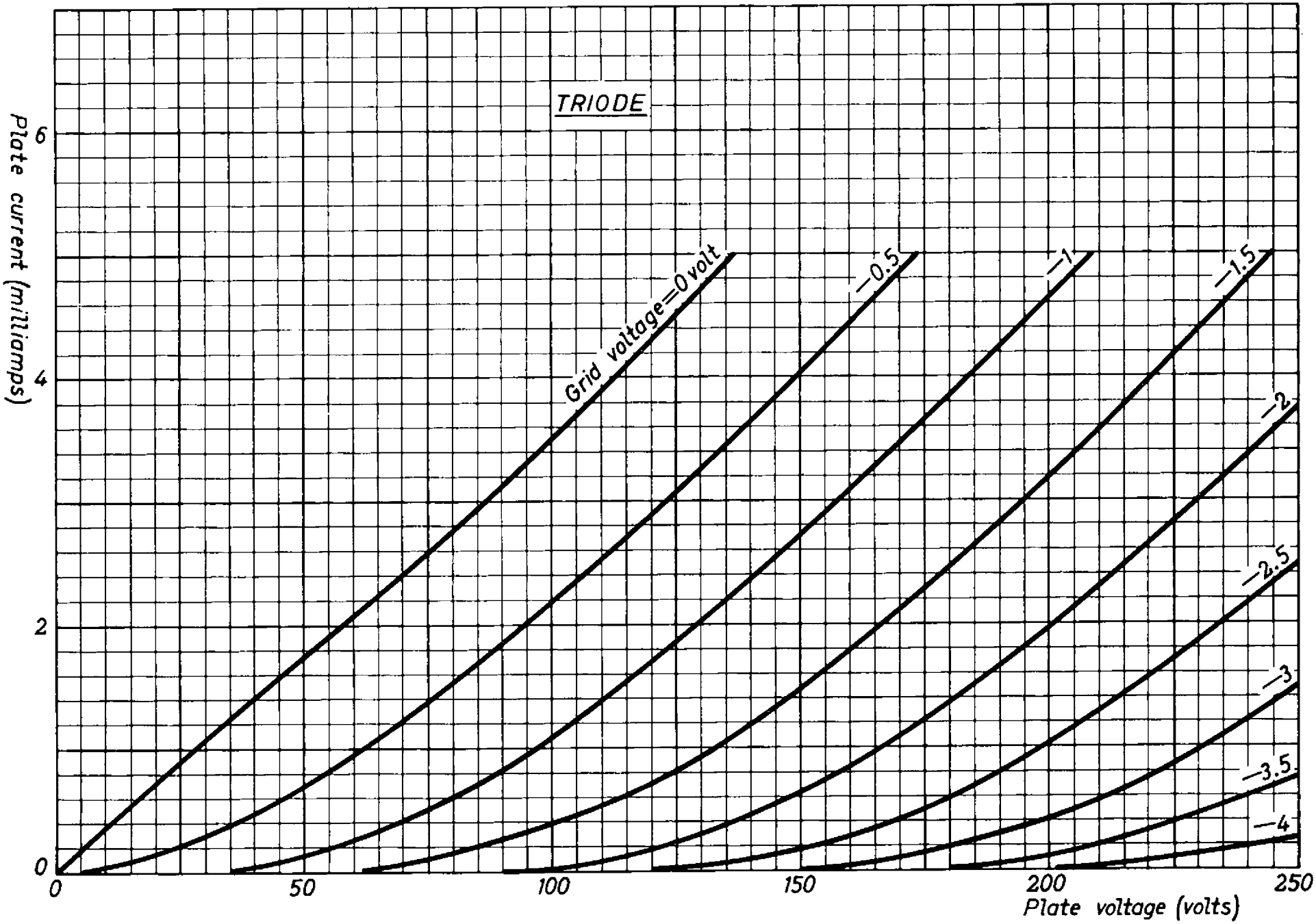
10.10.1958

C

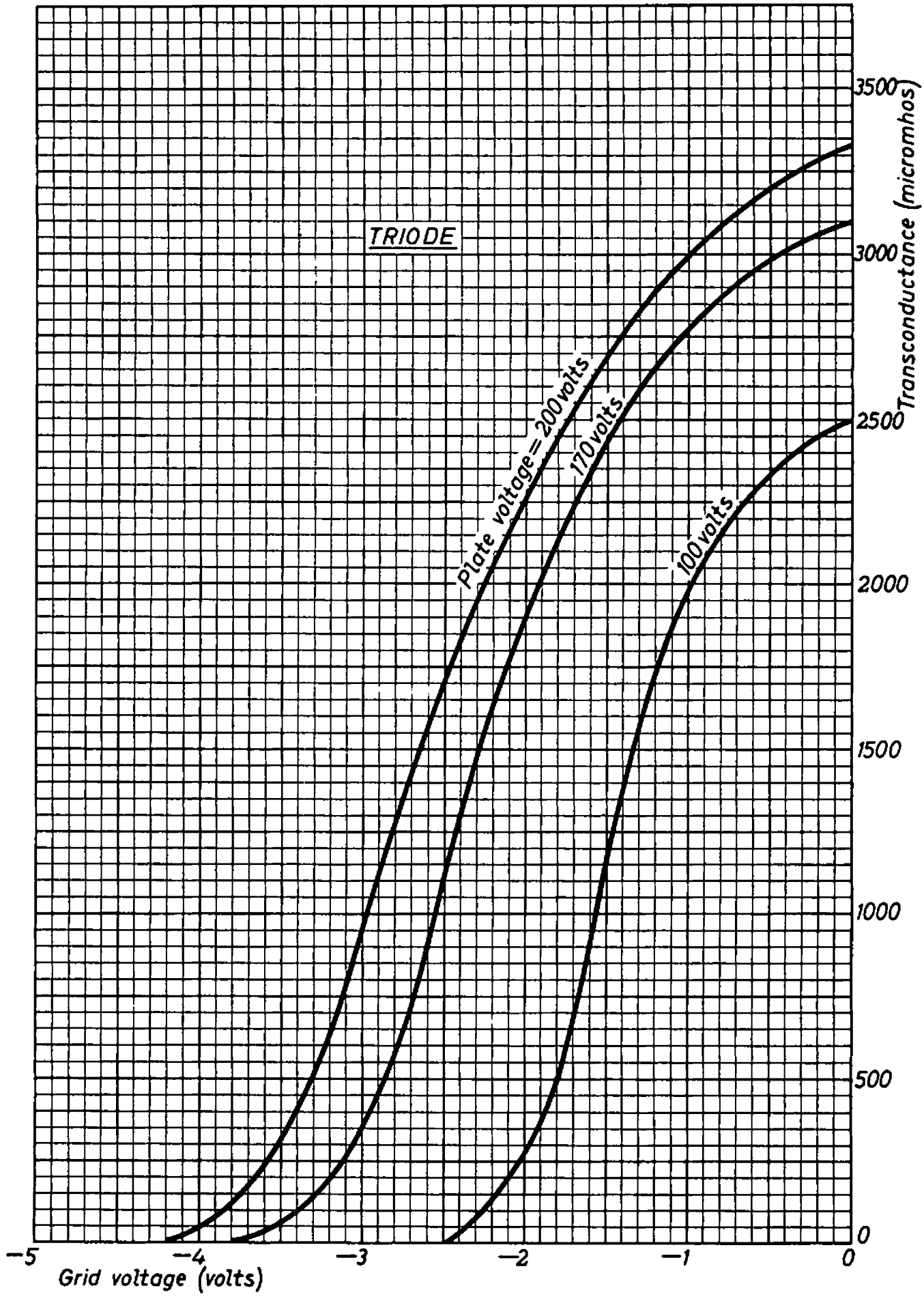

PENTODE
Grid No 2 voltage = 100 volts
Plate current
Grid No 2 current
Plate dissipation = 7 watts
Grid No 1 voltage = 0 volt
−2
−4
−6
−8
−10
−12
Grid No 1 voltage = 0 volt
−6
−12
Plate and grid No 2 current (milliamps)
Plate voltage (volts)
0
20
40
60
80
100
0
50
100
150
200
250
300
350

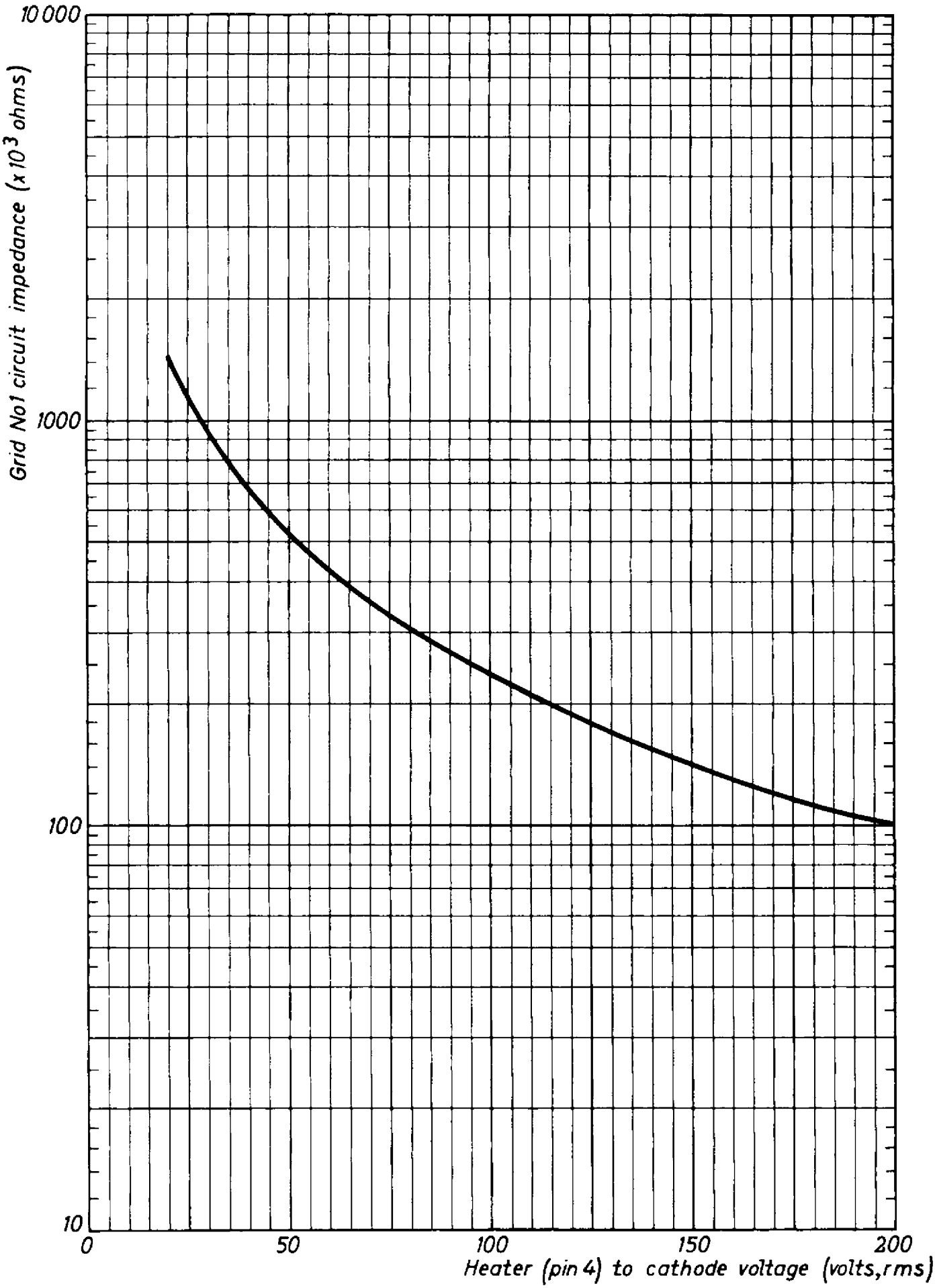
D


TRIODE
Plate voltage = 200 volts
170 volts
100 volts
Plate current (milliamps)
10
8
6
4
2
0
−3
−2
−1
0
Grid voltage (volts)


TRIODE
Plate current (milliamps)
0
2
4
6
0
50
100
150
200
250
Plate voltage (volts)
Grid voltage=0 volt
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
−4

F


TRIODE
Plate voltage = 200 volts
170 volts
100 volts
Transconductance (micromhos)
3500
3000
2500
2000
1500
1000
500
0
−5
−4
−3
−2
−1
0
Grid voltage (volts)


10 000
1000
100
10
Grid No1 circuit impedance (x 10³ ohms)
0
50
100
150
200
Heater (pin 4) to cathode voltage (volts, rms)

from JETEC release #1504, Aug. 15, 1955
sponsor: Rogers Majestic Electronics Ltd.

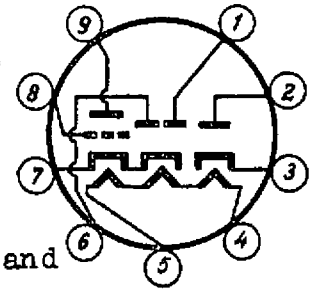
9AK 8

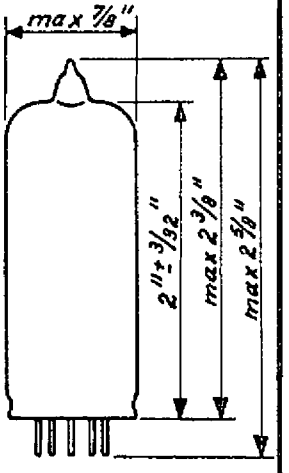
TRIPLE DIODE TRIODE for video and audio signal detection in television receivers

PHYSICAL SPECIFICATIONS

Cathode	Coated unipotential
Base	Small button noval 9-pin
Maximum overall length	2 5/8 inches
Maximum seated height	2 3/8 inches
Bulb length excluding tip	2±3/32 inches
Maximum diameter	7/8 inch
Mounting position	any
Basing connections- JETEC basing designation	9 E

Pin 1 - Diode plate No. 3
Pin 2 - Diode plate No. 2
Pin 3 - Diode cathode No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Diode plate No. 1
Pin 7 - Cathode of triode and diodes No.1 and 3, internal shield
Pin 8 - Triode grid
Pin 9 - Triode plate





GENERAL ELECTRICAL DATA

Heater voltage	9.5 volts
Heater current	0.3 ampere

DIRECT INTERELECTRODE CAPACITANCES

Diode sections

Diode plate No.1 to all other elements		0.9 μμF
Diode plate No.2 to all other elements		4.5 μμF
Diode plate No.3 to all other elements		4.5 μμF
Diode cathode No.2 to all other elements except diode plate No.2		4.5 μμF
Diode plate No.1 to heater	max.	0.25 μμF
Diode plate No.3 to heater	max.	0.2 μμF
Diode cathode No.2 to heater		2.7 μμF

9 AK8

Direct Interelectrode Capacitances (continued)

Triode Section	
Grid to all other elements	1.9 μμF
Plate to all other elements	1.2 μμF
Plate to grid	2.1 μμF
Grid to heater	max. 0.04 μμF
Between diode and triode sections	
Grid to diode plate No.1	max. 0.07 μμF
Grid to diode cathode No.2	max.0.005 μμF
Grid to diode plateNo.3	max. 0.02 μμF
Triode plate to diode plate No.1	max. 0.1 μμF
Triode plate to diode cathodeNo.2	max. 0.01 μμF
Triode plate to diode plate No.3	max. 0.1 μμF

Maximum ratings (design center values)

Diode sections	
Peak inverse voltage at diode No.1	350 volts
Average current of diode No.1	1 mamp
Peak current of diode No.1	6 mamps
Peak inverse voltage of diode No.2	350 volts
Average current of diode No.2	10 mamps
Peak current of diode No.2	75 mamps
Peak inverse voltage of diode No.3	350 volts
Average current of diode No.3	10 mamps
Peak current of diode No.3	75 mamps
Voltage between diode cathodeNo.2 and heater	150 volts
Triode section	
Plate voltage	250 volts
Plate voltage without current	550 volts
Plate dissipation	1 watt
Cathode current	5 mamps
Grid circuit resistance	⁄ 3 megohms
Grid current starting point (Grid voltage at grid current =+0.3 μ amp)	-1.3 volts
External resistance between heater and cathode	20,000 ohms
Voltage between heater and cathode	150 volts

⁄ With grid current biasing max. 22 megohms

Typical characteristics of the diode sections

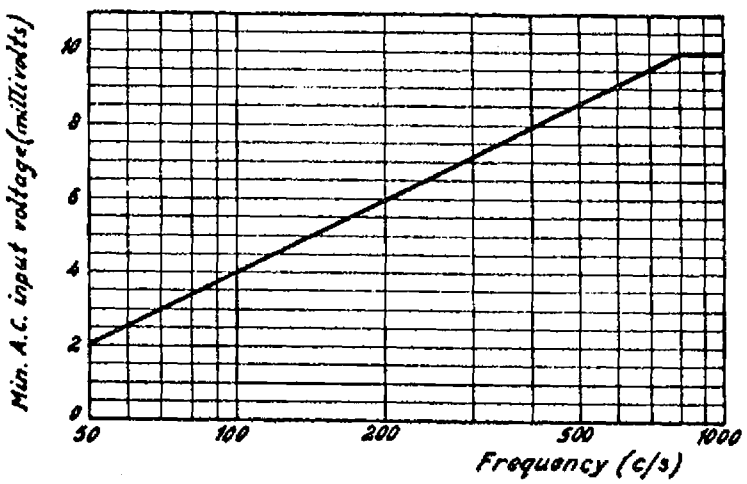
Plate resistance of diode No.1 at plate voltage = +10 volts	5000 ohms
Plate resistance of diode No.2 at plate voltage = + 5 volts	200 ohms
Plate resistance of diode No.3 at plate voltage = + 5 volts	200 ohms
Ratio of plate resistances of diodes No.2 to diode No.3 or vice versa	max. 1.5

Typical characteristics of the triode section

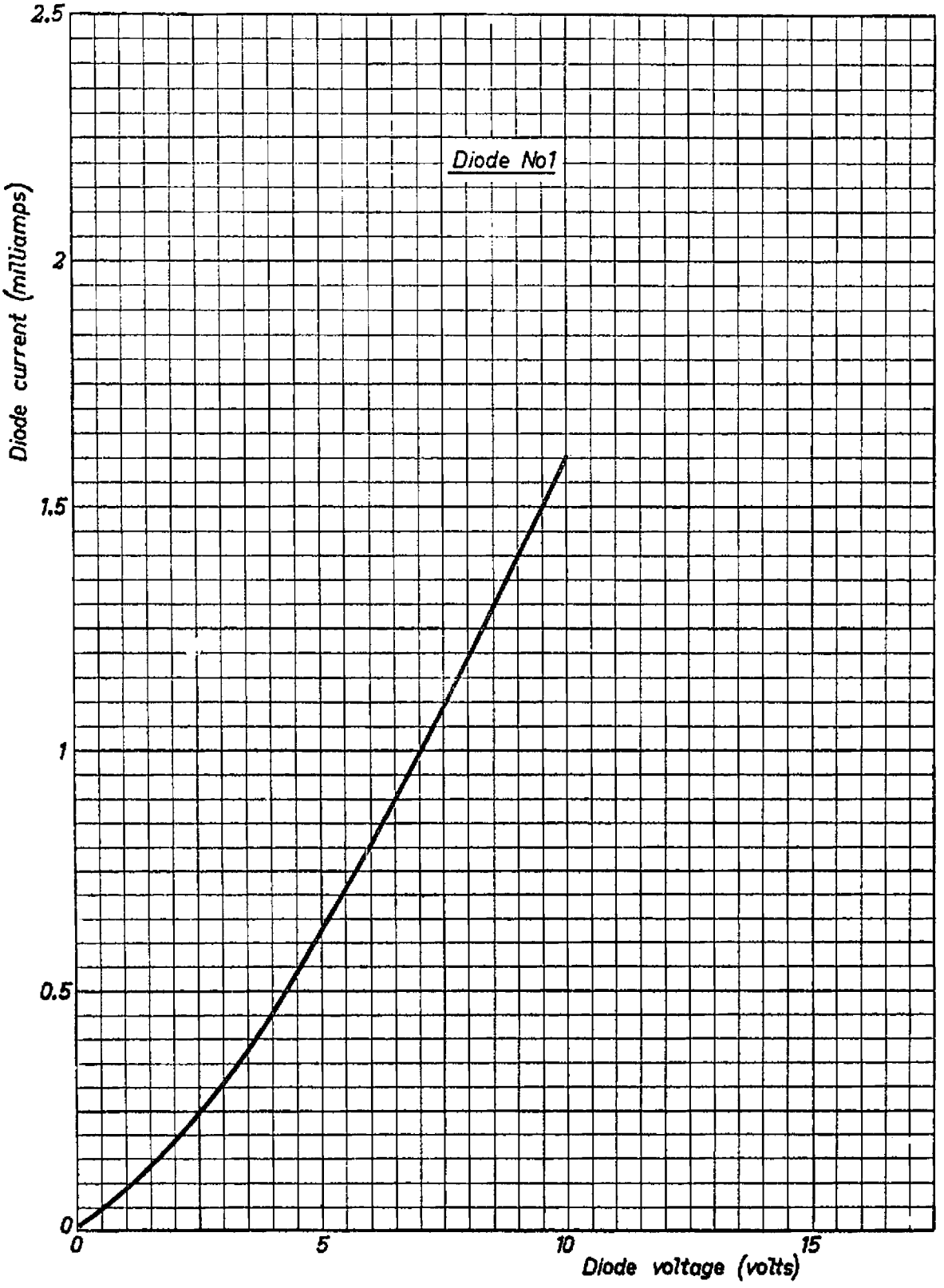
Plate voltage	100	170	200	250	volts
Grid bias	-1	-1.85	-2.3	-3	volts
Plate current	0.8	1.0	1.0	1.0	mamp
Transconductance	1300	1300	1250	1200	micromhos
Amplification factor	70	70	70	70	
Plate resistance	54,000	54,000	56,000	58,000	ohms

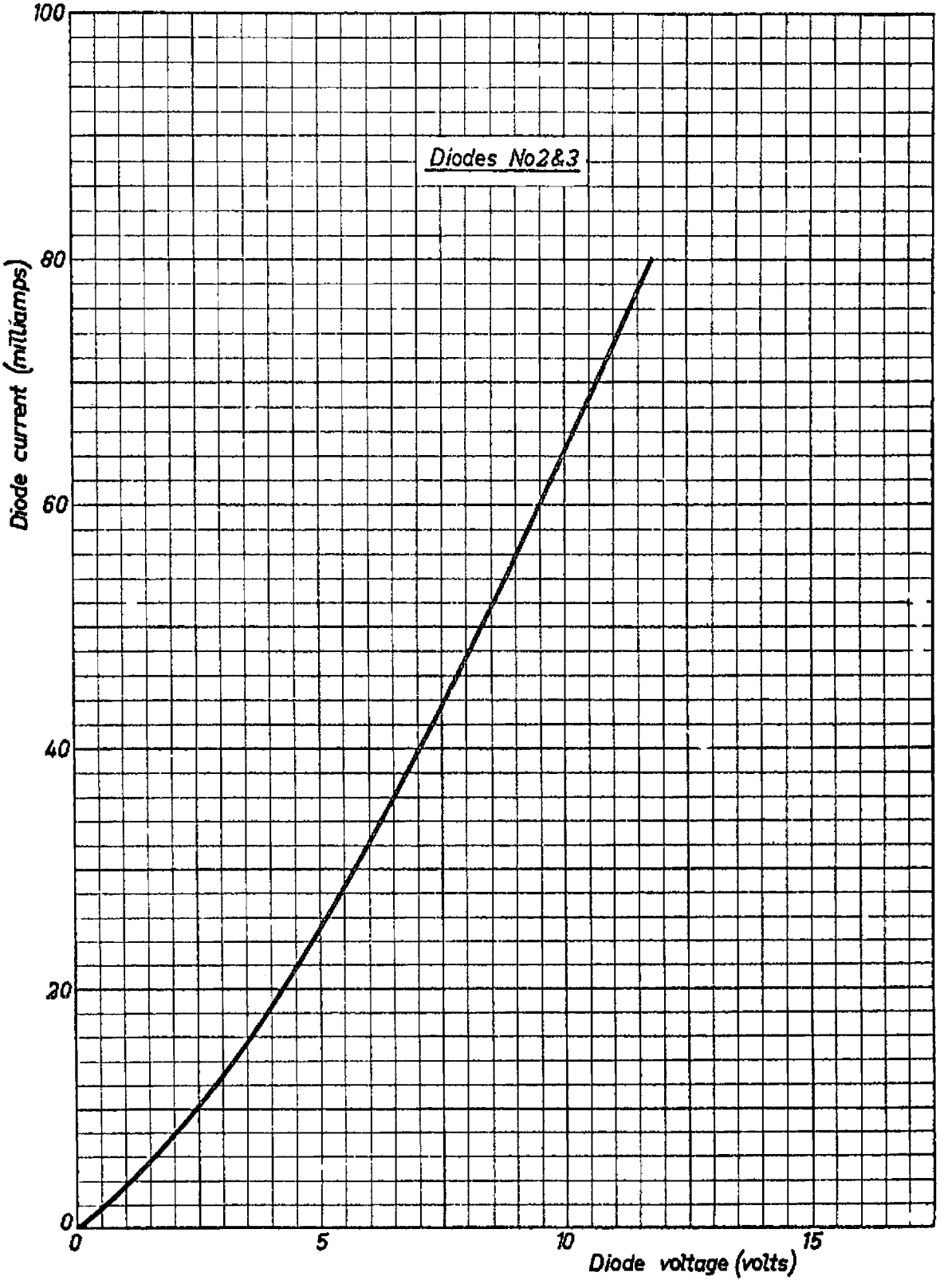
A.F. Amplifier

The triode section of this tube can be used without special precautions against microphonic effect in circuits in which the A.C. input voltage is higher than 10 millivolts for an output of 50 milliwatts of the output tube at frequencies of 800 c/s and higher. At lower frequencies the sensitivity may be increased according to the figure below.

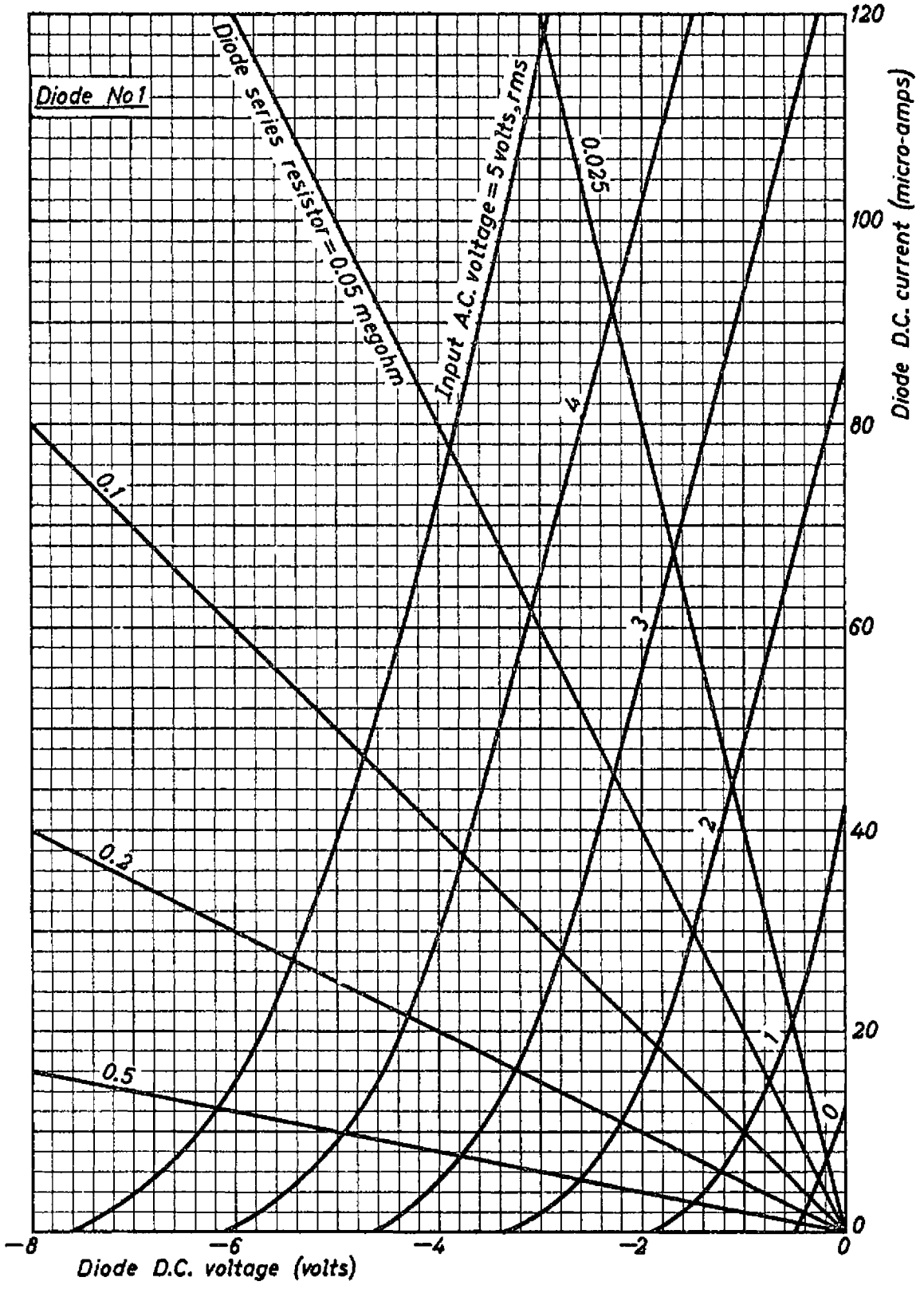


9AK8

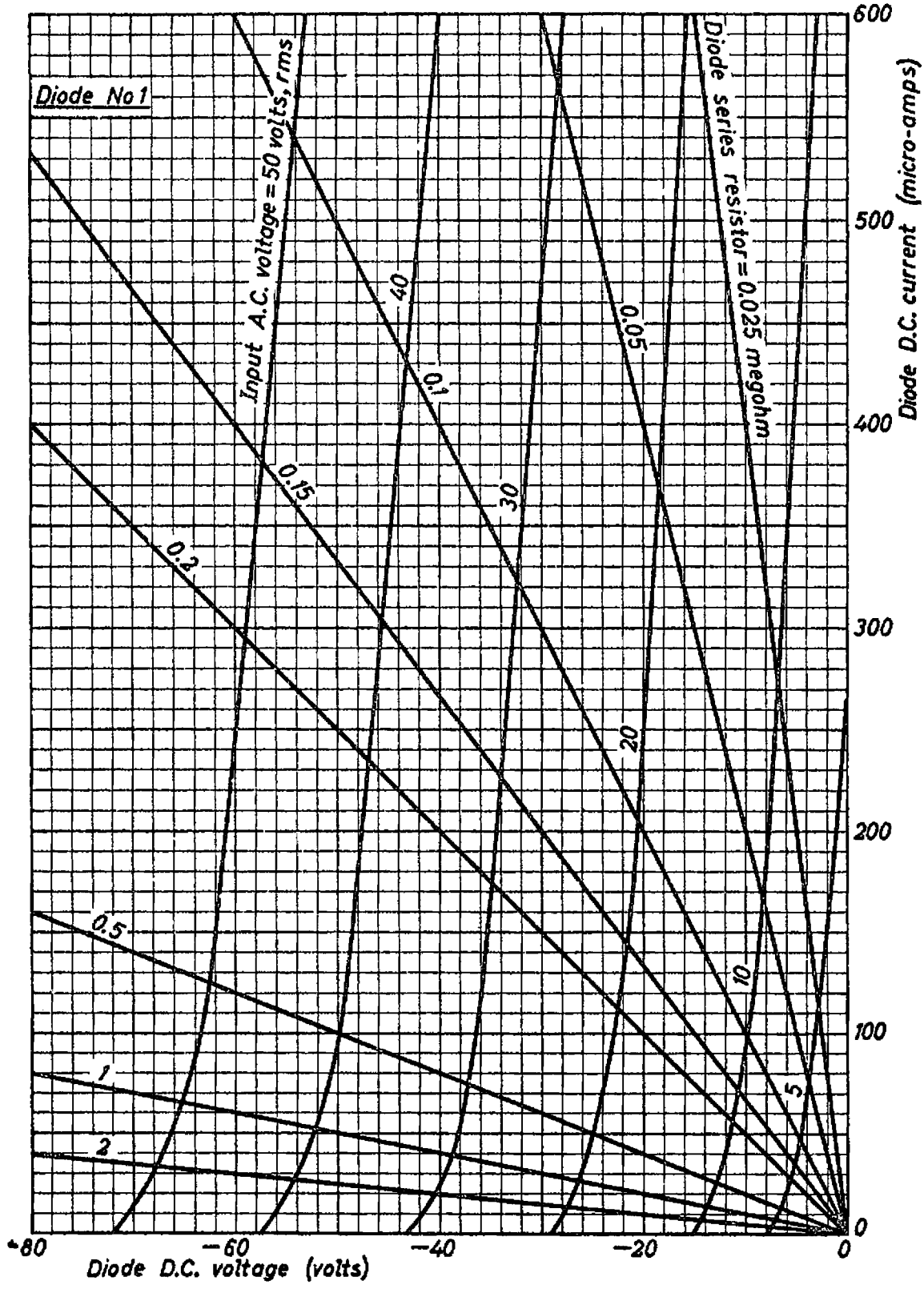

Diode No1
Diode current (milliamps)
2.5
2
1.5
1
0.5
0
0
5
10
15
Diode voltage (volts)


Diodes No2&3
Diode current (milliamps)
100
80
60
40
20
0
0
5
10
15
Diode voltage (volts)

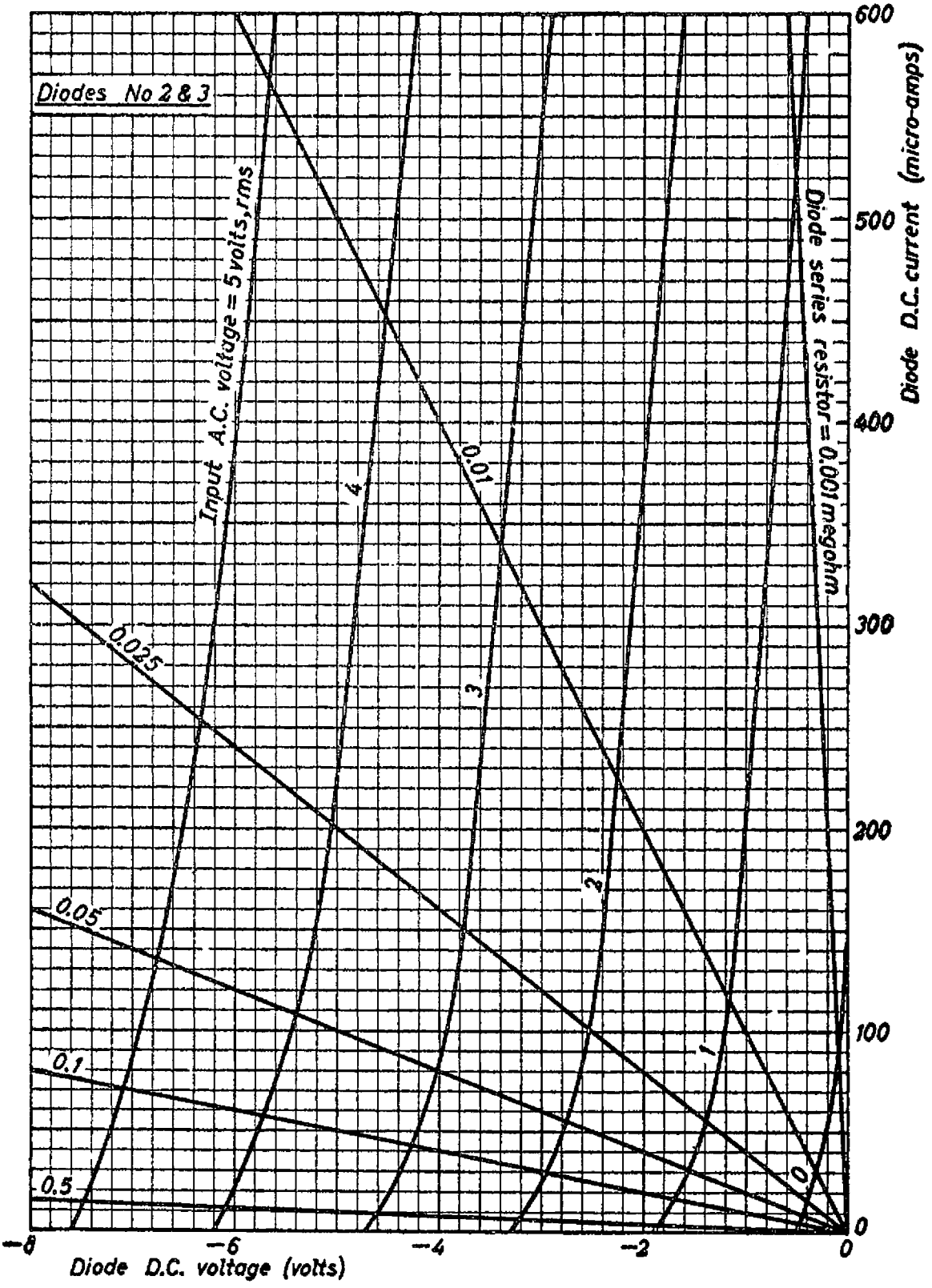
9AK8


Diode No 1
Diode series resistor = 0.05 megohm
Input A.C. voltage = 5 volts, rms
0.025
0.1
0.2
0.5
4
3
2
1
0
120
100
80
60
40
20
0
−8
−6
−4
−2
0
Diode D.C. current (micro-amps)
Diode D.C. voltage (volts)

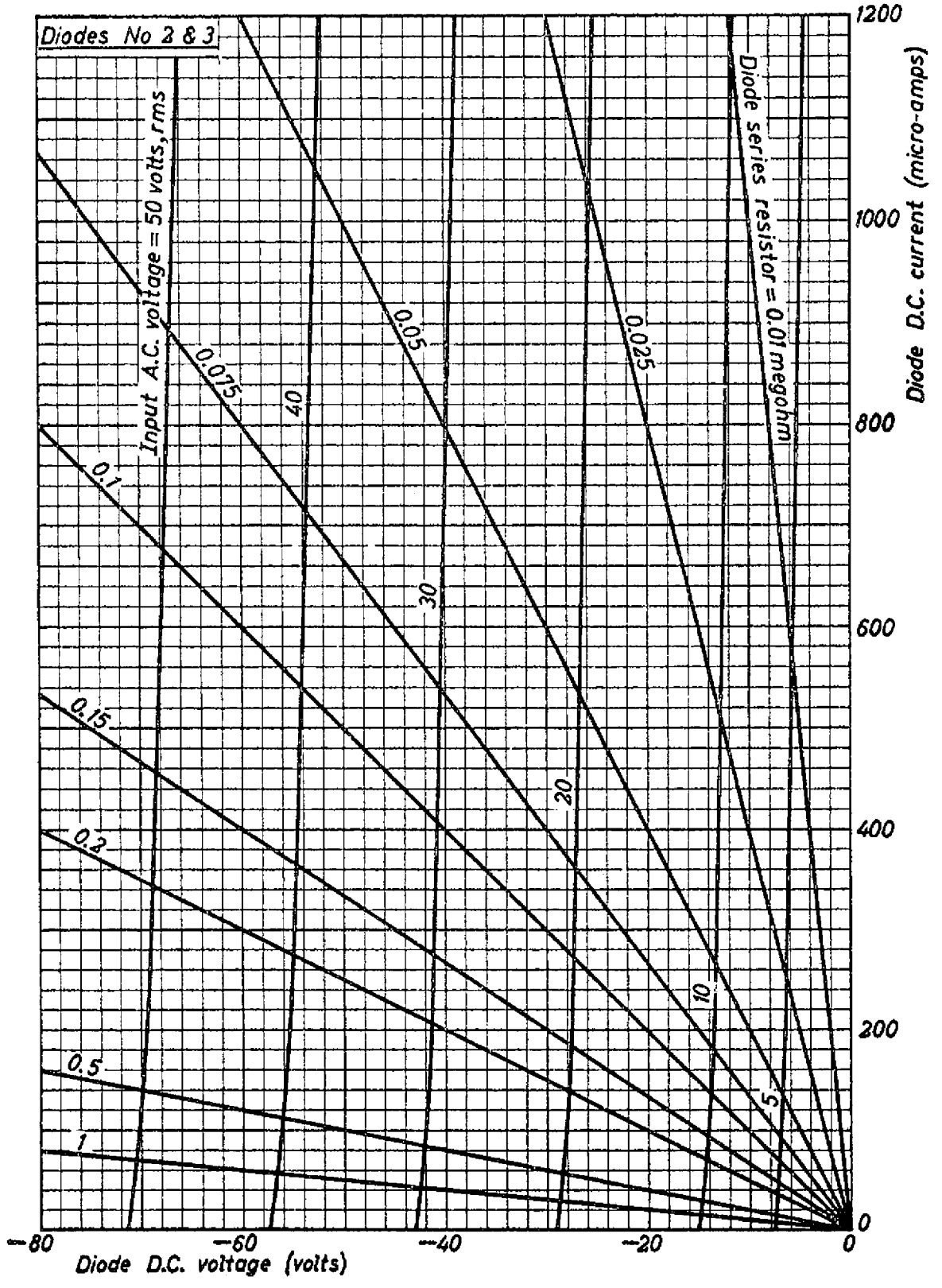
9AK8


Diode No 1
Input A.C. voltage = 50 volts, rms
Diode series resistor = 0.025 megohm
40
0.1
0.05
30
0.15
0.2
20
0.5
10
1
5
2
600
500
400
300
200
100
0
−80
−60
−40
−20
0
Diode D.C. current (micro-amps)
Diode D.C. voltage (volts)

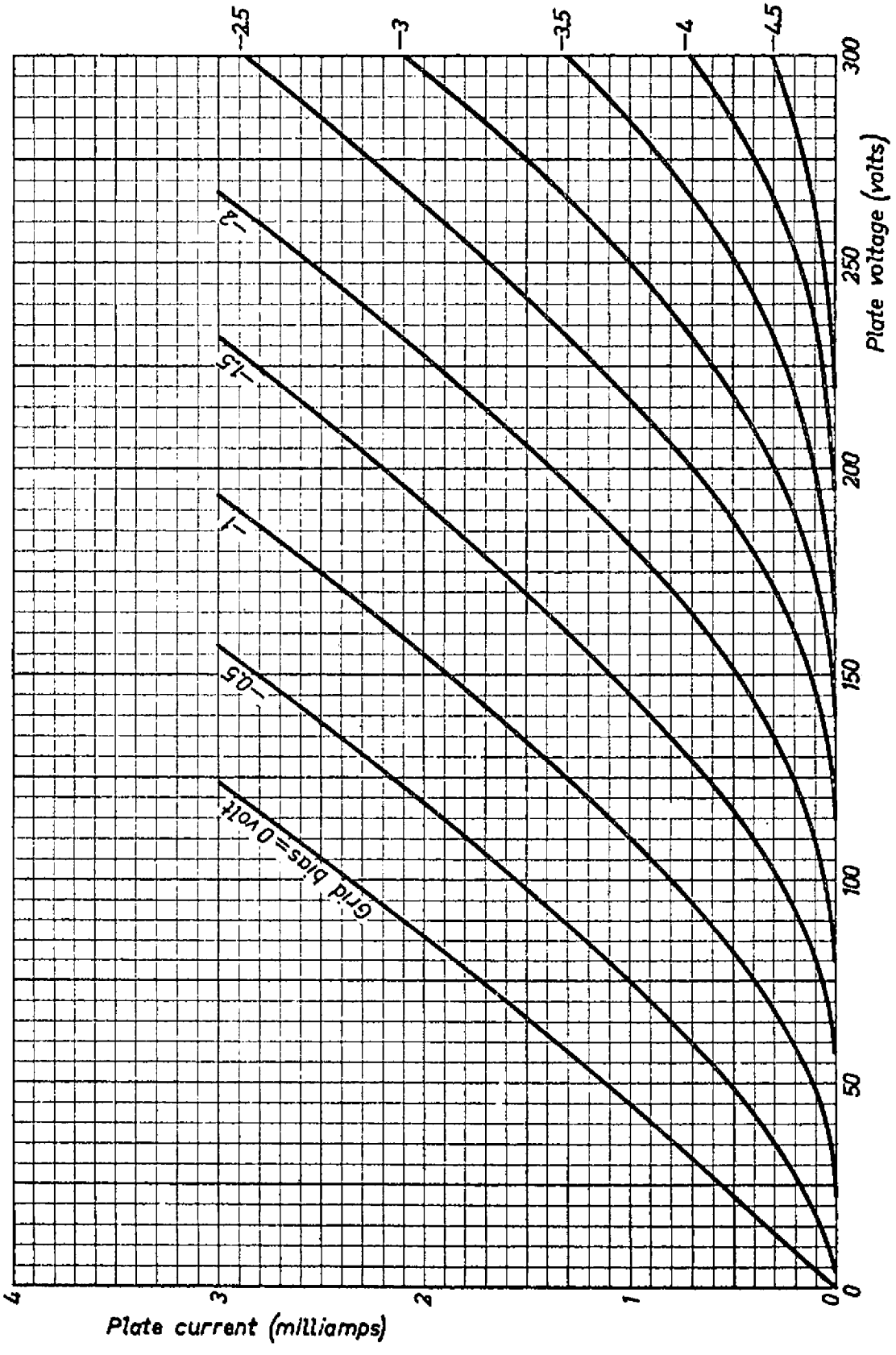
9AK8


Diodes No 2 & 3
Input A.C. voltage = 5 volts, rms
Diode series resistor = 0.001 megohm
Diode D.C. current (micro-amps)
Diode D.C. voltage (volts)
600
500
400
300
200
100
0
−8
−6
−4
−2
0
0.01
0.025
0.05
0.1
0.5
4
3
2
1
0

9AK8


Diodes No 2 & 3
Input A.C. voltage = 50 volts, rms
Diode series resistor = 0.01 megohm
0.05
0.025
0.075
40
0.1
30
0.15
20
0.2
10
0.5
5
1
1200
1000
800
600
400
200
0
−80
−60
−40
−20
0
Diode D.C. current (micro-amps)
Diode D.C. voltage (volts)

9 AK 8


-2.5
-3
-3.5
-4
-4.5
-2
-1.5
-1
-0.5
Grid bias = 0 Volt
300
250
200
150
100
50
0
4
3
2
1
0
Plate voltage (volts)
Plate current (milliamps)

from JETEC release #1504, Aug. 15, 1955
sponsor: Rogers Majestic Electronics Ltd.

9AQ 8

DOUBLE TRIODE for use as R.F. amplifier and self-oscillating mixer in television receivers

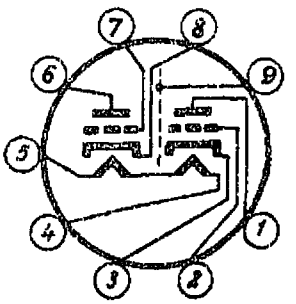
PHYSICAL SPECIFICATIONS

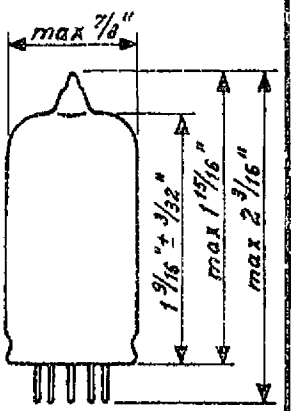
Cathode	Coated unipotential
Base	Small button noval 9-pin
Maximum overall length	2 3/16"
Maximum seated height	1 15/16"
Bulb length excluding tip	1 9/16" ± 3/32"
Maximum diameter	7/8"
Mounting position	any
Basing connections- JETEC basing designation	9DE

Pin 1 - Plate
Pin 2 - Grid
Pin 3 - Cathode
} Triode section 1

Pin 4 - Heater
Pin 5 - Heater

Pin 6 - Plate
Pin 7 - Grid
Pin 8 - Cathode
} Triode section 2





GENERAL ELECTRICAL DATA

Heater voltage	9.0 volts
Heater current	0.3 ampere

DIRECT INTERELECTRODE CAPACITANCES

Triode section 1

Plate to grid	1.5 μμF
Plate to cathode	0.18 μμF
Grid to cathode + heater + shield	3.0 μμF
Plate to cathode + heater + shield	1.2 μμF
Plate to cathode + heater + shield*)	1.9 μμF

*)With external shielding can with diameter of 0.886"

9AQ 8

Triode section 2			
Plate to grid		1.5	µµF
Plate to cathode		0.18	µµF
Grid to cathode + heater + shield		3.0	µµF
Plate to cathode + heater + shield		1.2	µµF
Plate to cathode + heater + shield*)		1.9	µµF
Between triode section 1 and triode section 2			
Plate to plate	max.	0.04	µµF
Plate to plate*)	max.	0.008	µµF
Grid to grid	max.	0.003	µµF
Plate section 1 to grid section 2	max.	0.008	µµF
Plate section 2 to grid section 1	max.	0.008	µµF
Plate section 1 to cathode section 2	max.	0.008	µµF
Plate section 2 to cathode section 1	max.	0.008	µµF
Grid section 1 to cathode section 2	max.	0.003	µµF
Grid section 2 to cathode section 1	max.	0.003	µµF
MAXIMUM RATINGS (design center values; each section)			
Plate voltage	max.	250	volts
Plate voltage without current	max.	550	volts
Plate dissipation	max.	2.5	watts
Plate dissipation of both sections together	max.	4.5	watts
Cathode current	max.	15	mamps
Negative grid bias	max.	100	volts
External resistance between grid and cathode	max.	1	megohm
External resistance between cathode and heater	max.	20 000	ohms
Voltage between cathode and heater	max.	90	volts

TYPICAL CHARACTERISTICS (each section)				
Plate voltage	100	170	200	volts
Negative grid bias	-1.1	-1.5	-2.1	volts
Plate current	4.5	10	10	mamps
Transconductance	4600	6200	5800	micromhos
Amplification factor	50	50	48	

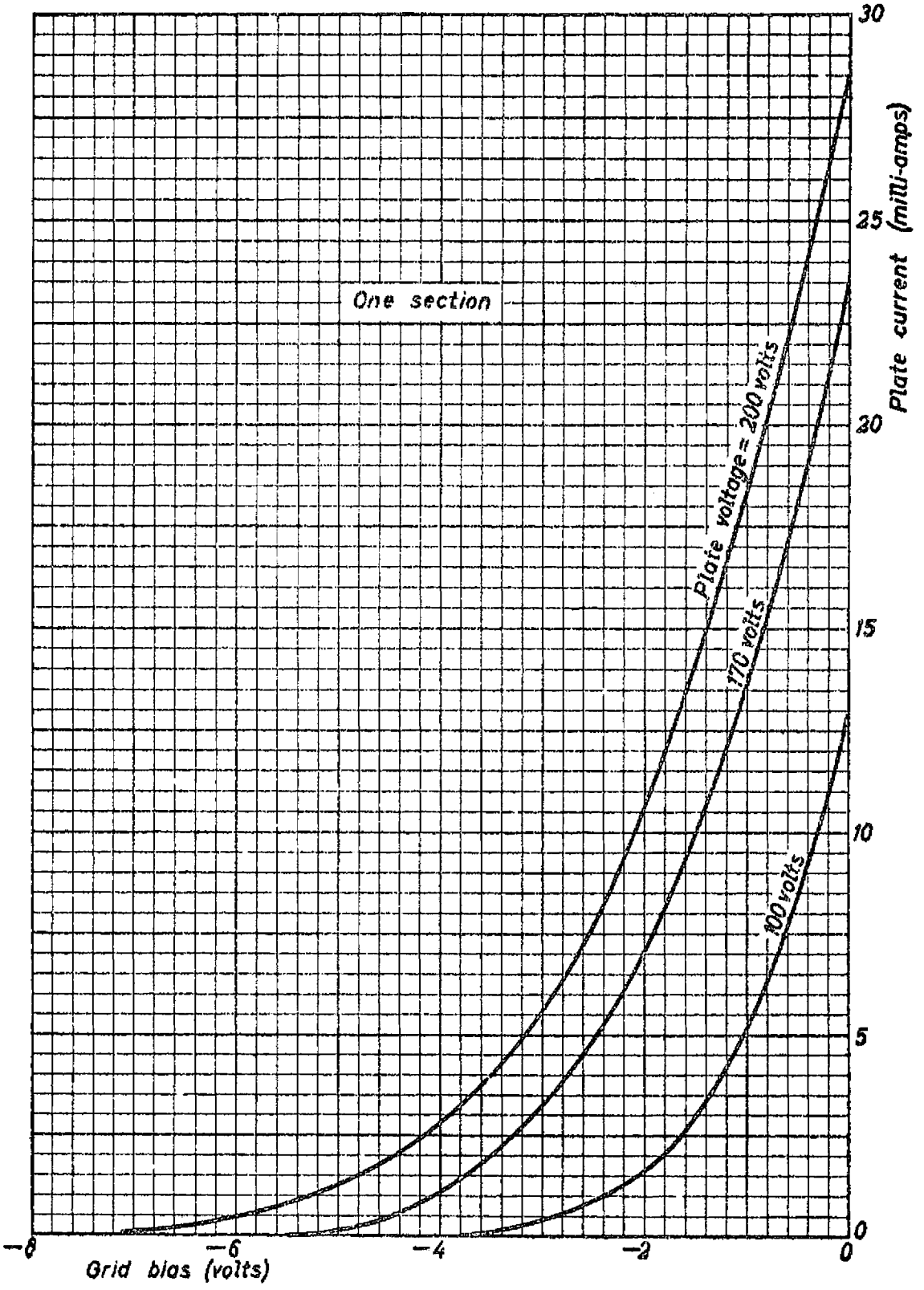
*)With external shielding can with diameter of 0.886"

9AQ 8

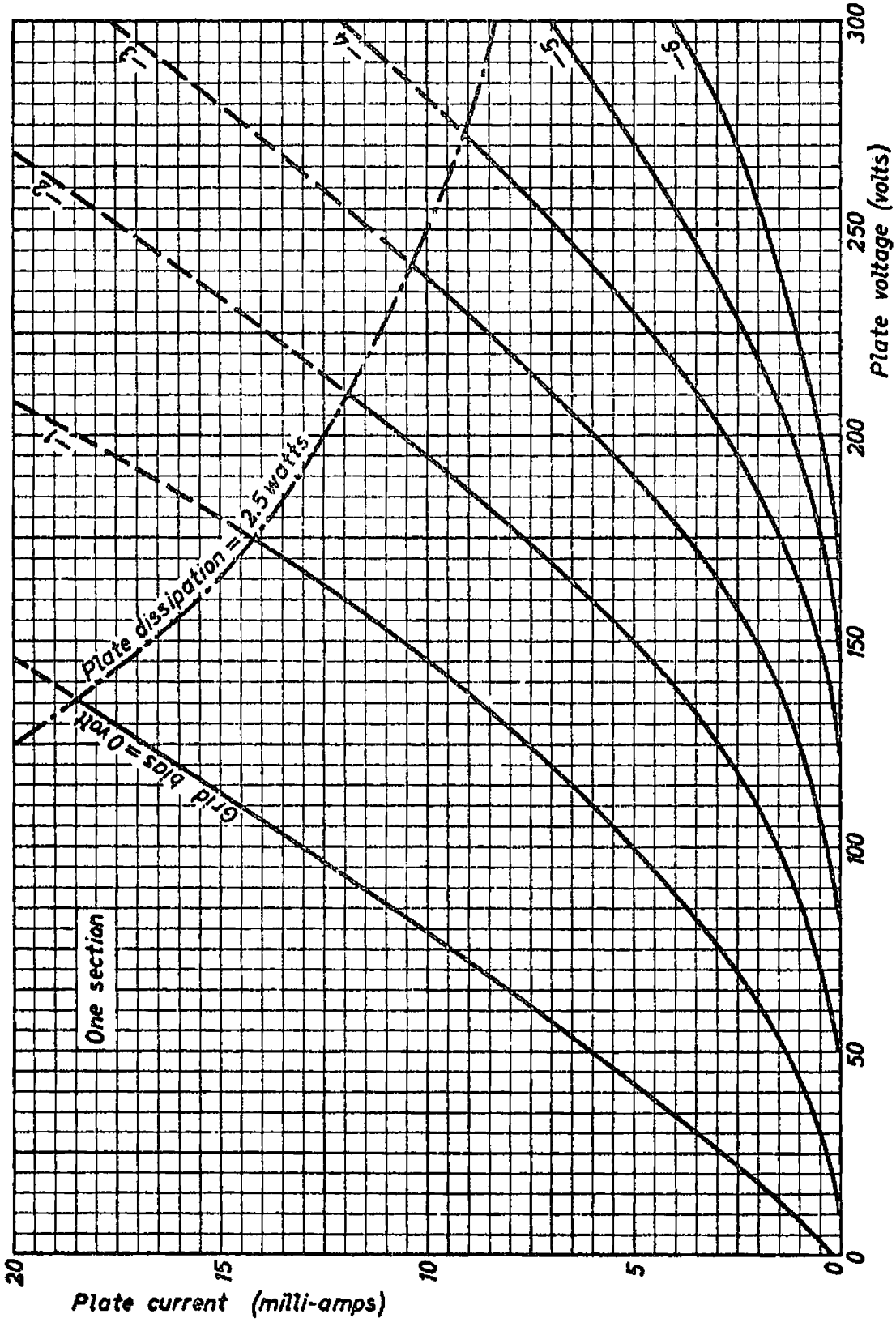
OPERATING CHARACTERISTICS AS ADDITIVE MIXER				
Supply voltage	100	170	200	volts
Plate resistor	4700	4700	8200	ohms
Grid resistor	1	1	1	megohm
Oscillator voltage	1.8	2.8	2.8	volts,rms
Plate current	2.2	4.8	5.2	mamps
Conversion conductance	1700	2200	2300	micromhos
Plate resistance	20000	16000	15000	ohms
Input resistance at 100 Mc		15000	-	ohms

OPERATING CHARACTERISTICS AS OSCILLATOR in television receivers		
Supply voltage	180	volts
Plate resistor	4400	ohms
Grid resistor	22000	ohms
Oscillator voltage	9	volts,rms
Plate current	8	mamps
Plate dissipation	1.2	watts

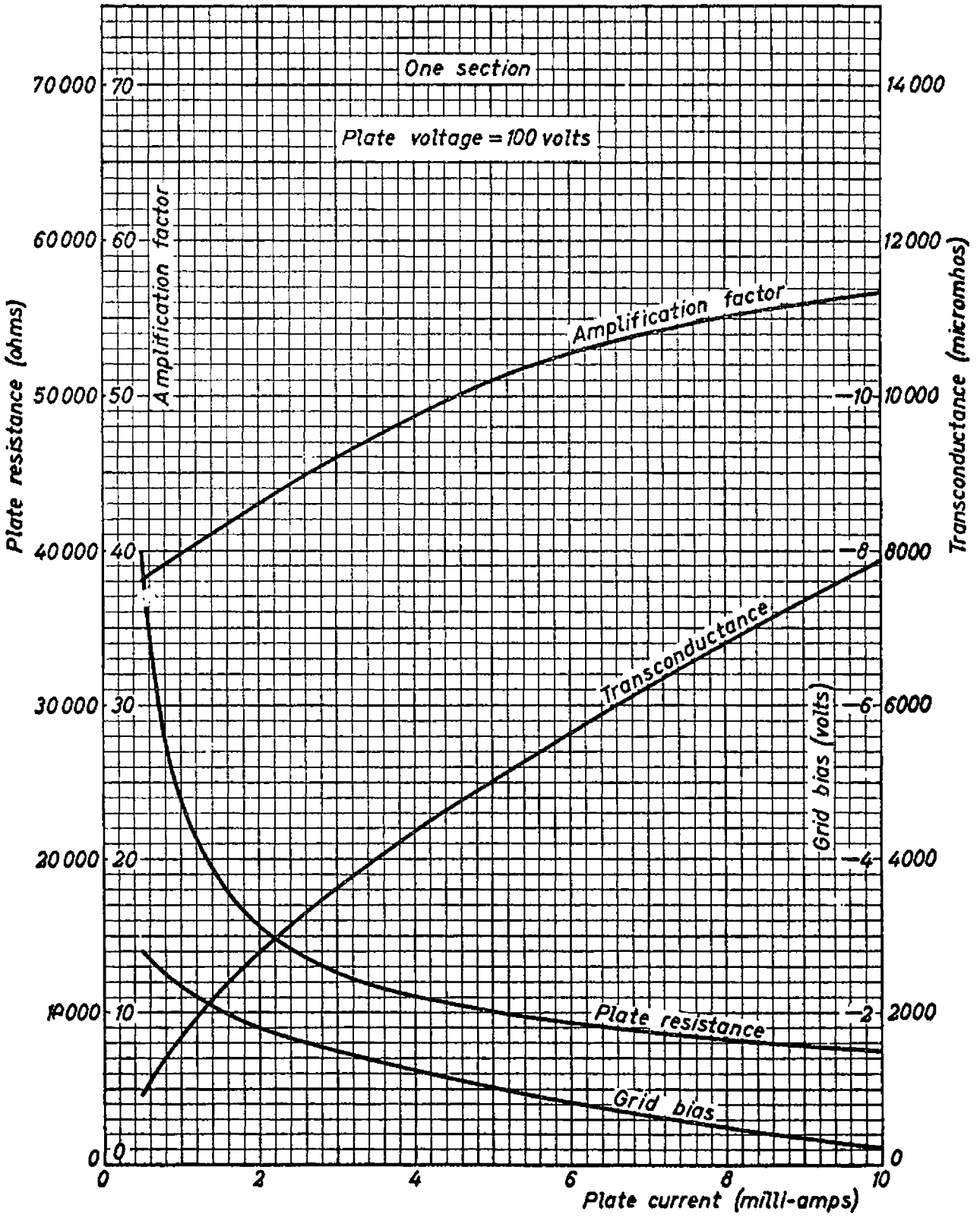
9AQ8


One section
Plate voltage = 200 volts
170 volts
100 volts
Plate current (milli-amps)
30
25
20
15
10
5
0
−8
−6
−4
−2
0
Grid bias (volts)

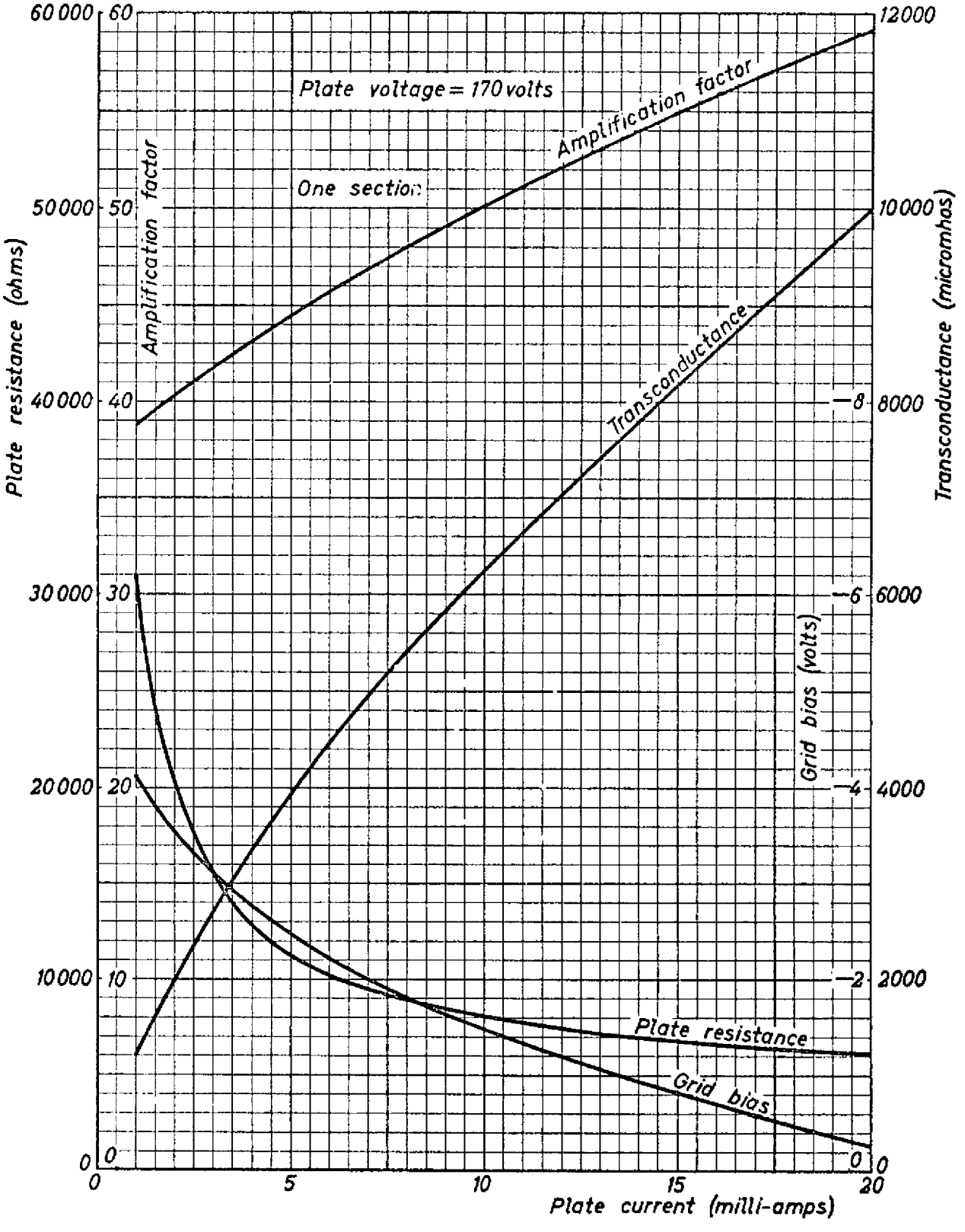
9AQ8


Plate voltage (volts)
300
250
200
150
100
50
0
Plate current (milli-amps)
20
15
10
5
0
-1
-2
-3
-4
-5
-6
Plate dissipation = 2.5 watts
Grid bias = 0 volt
One section

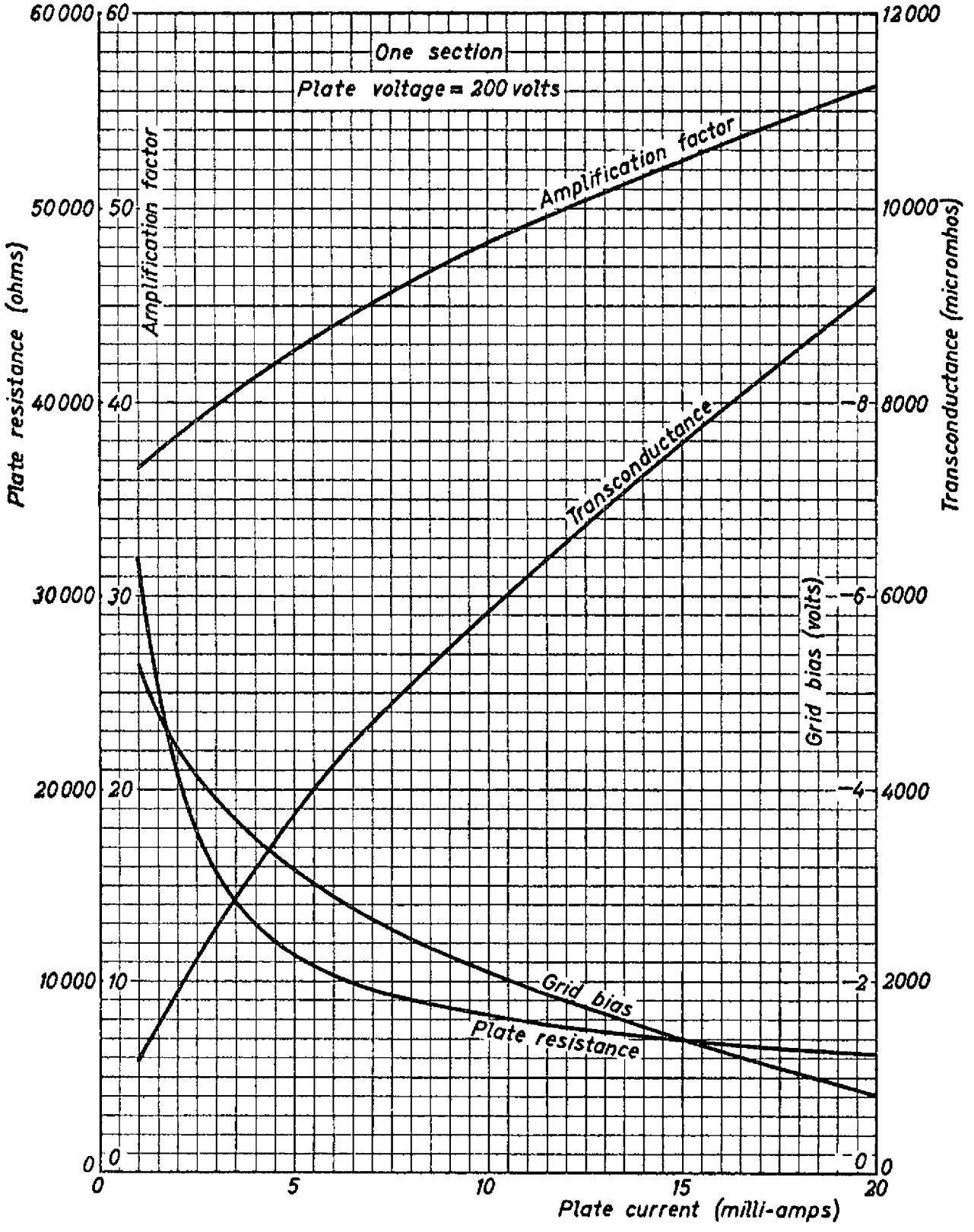
9AQ8

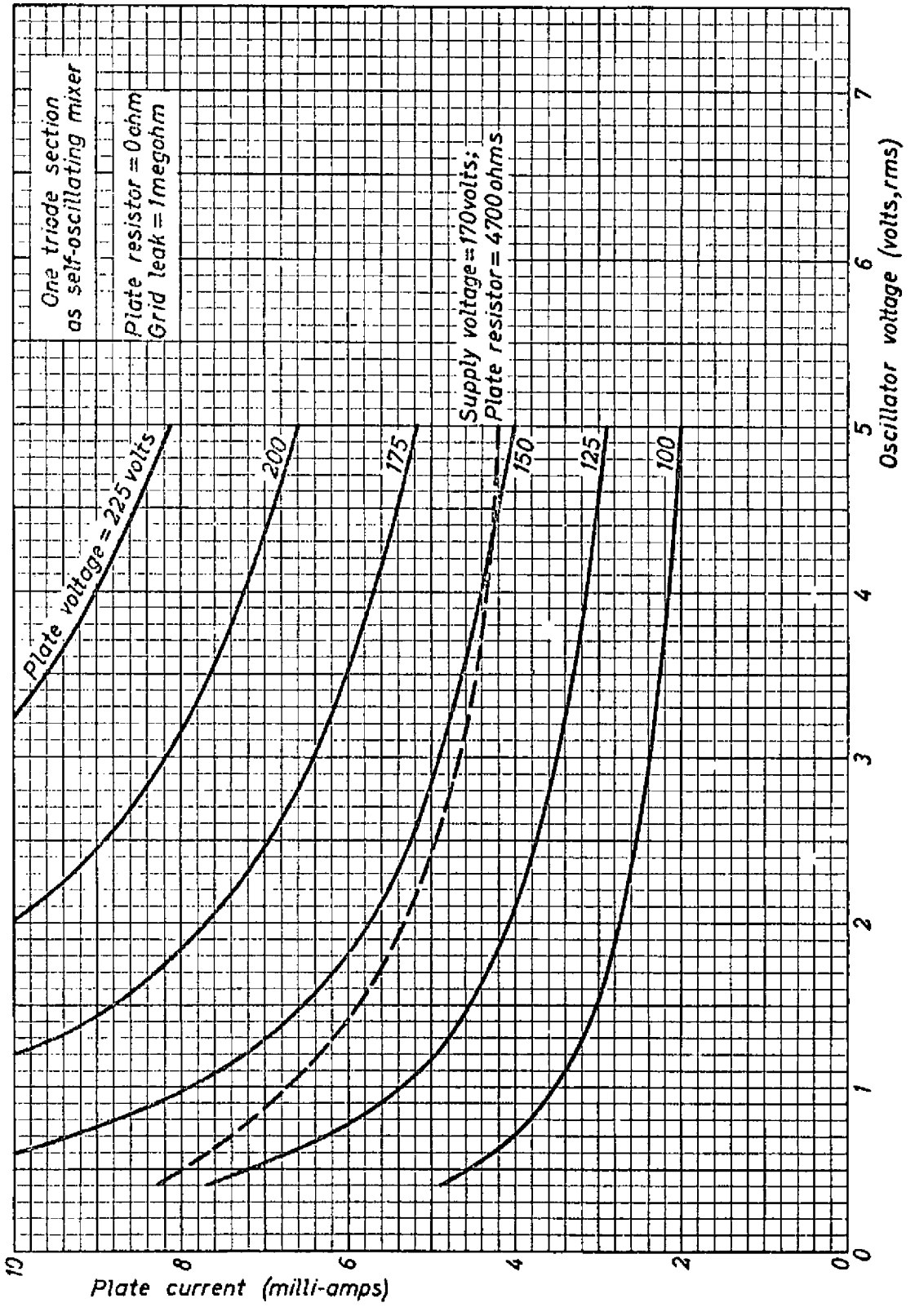

One section
Plate voltage = 100 volts
Plate resistance (ohms)
Amplification factor
Transconductance (micromhos)
Grid bias (volts)
Plate current (milli-amps)
70000
60000
50000
40000
30000
20000
10000
0
70
60
50
40
30
20
10
0
14000
12000
10000
8000
6000
4000
2000
0
−10
−8
−6
−4
−2
0
2
4
6
8
10
Amplification factor
Transconductance
Plate resistance
Grid bias

9AQ8

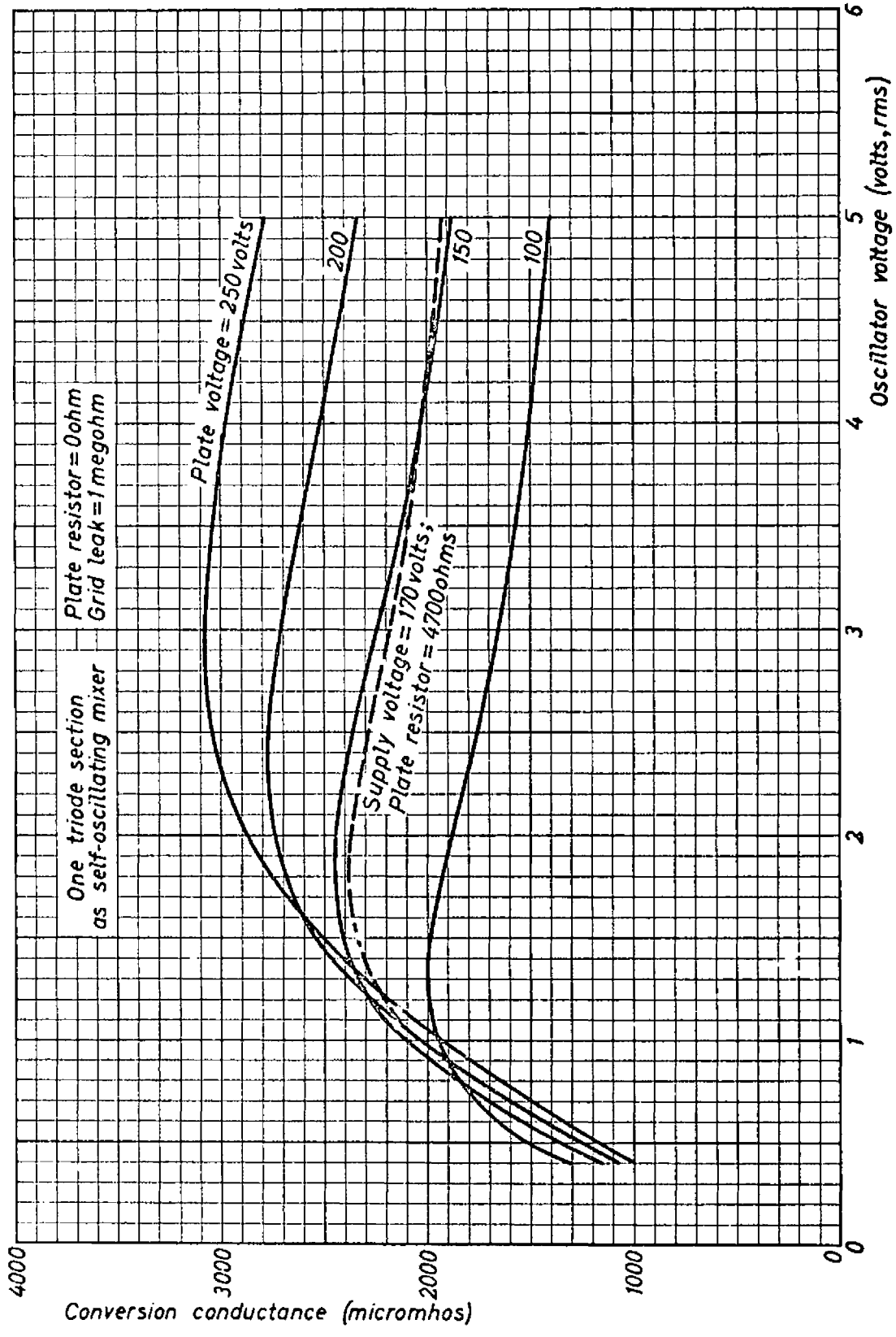

Plate voltage = 170 volts
One section
Amplification factor
Transconductance
Plate resistance
Grid bias
Plate resistance (ohms)
Amplification factor
Transconductance (micromhos)
Grid bias (volts)
Plate current (milli-amps)
60 000
50 000
40 000
30 000
20 000
10 000
0
60
50
40
30
20
10
0
12000
10000
8000
6000
4000
2000
0
−8
−6
−4
−2
0
5
10
15
20

9AQ8

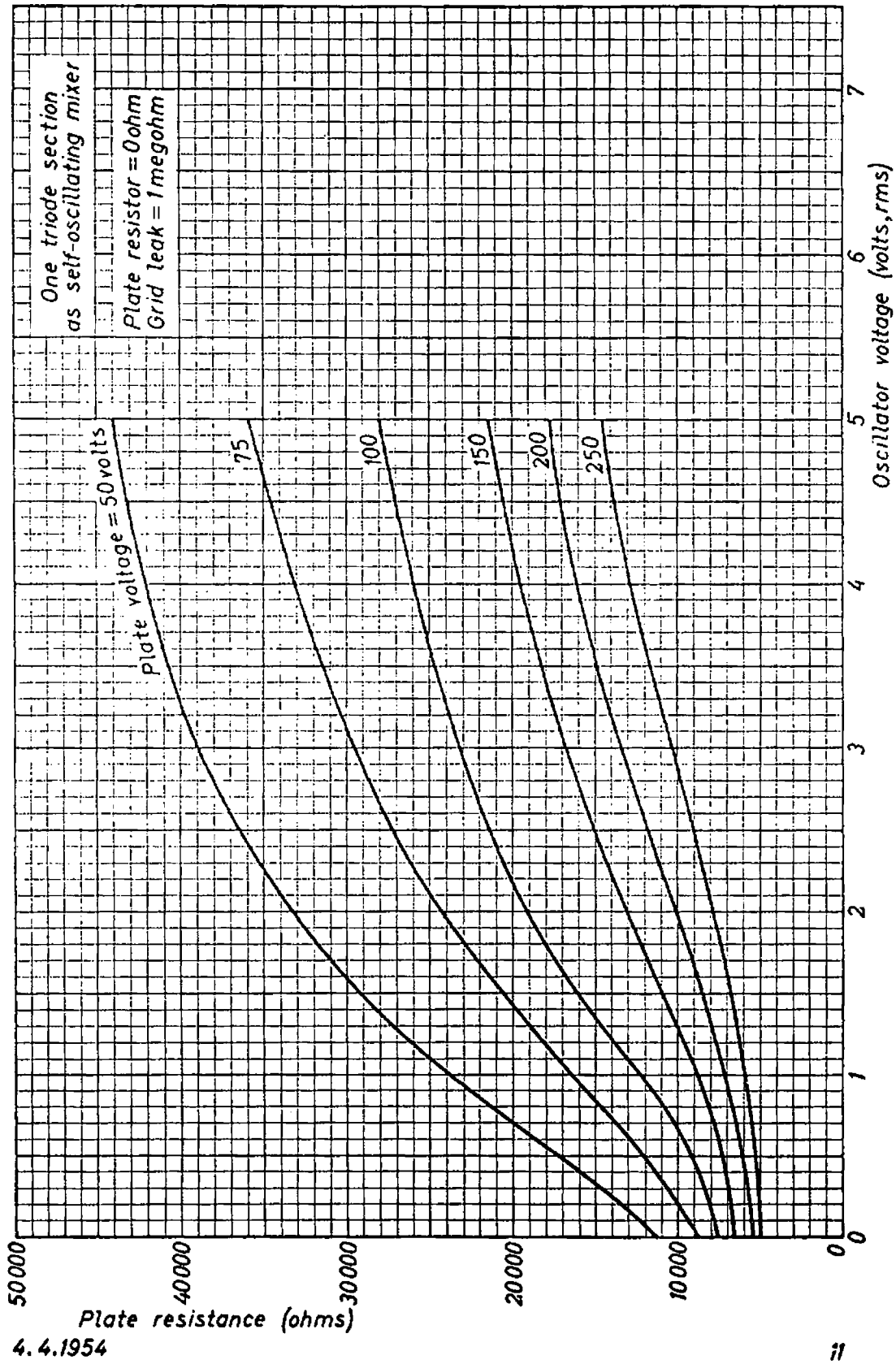

One section
Plate voltage = 200 volts
Plate resistance (ohms)
Amplification factor
Transconductance (micromhos)
Grid bias (volts)
Amplification factor
Transconductance
Grid bias
Plate resistance
Plate current (milli-amps)
60 000
50 000
40 000
30 000
20 000
10 000
0
60
50
40
30
20
10
0
12 000
10000
8000
6000
4000
2000
0
-8
-6
-4
-2
-0
0
5
10
15
20


One triode section
as self-oscillating mixer
Plate resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage = 225 volts
200
175
Supply voltage = 170 volts;
Plate resistor = 4700 ohms
150
125
100
10
8
6
4
2
0
Plate current (milli-amps)
0
1
2
3
4
5
6
7
Oscillator voltage (volts, rms)

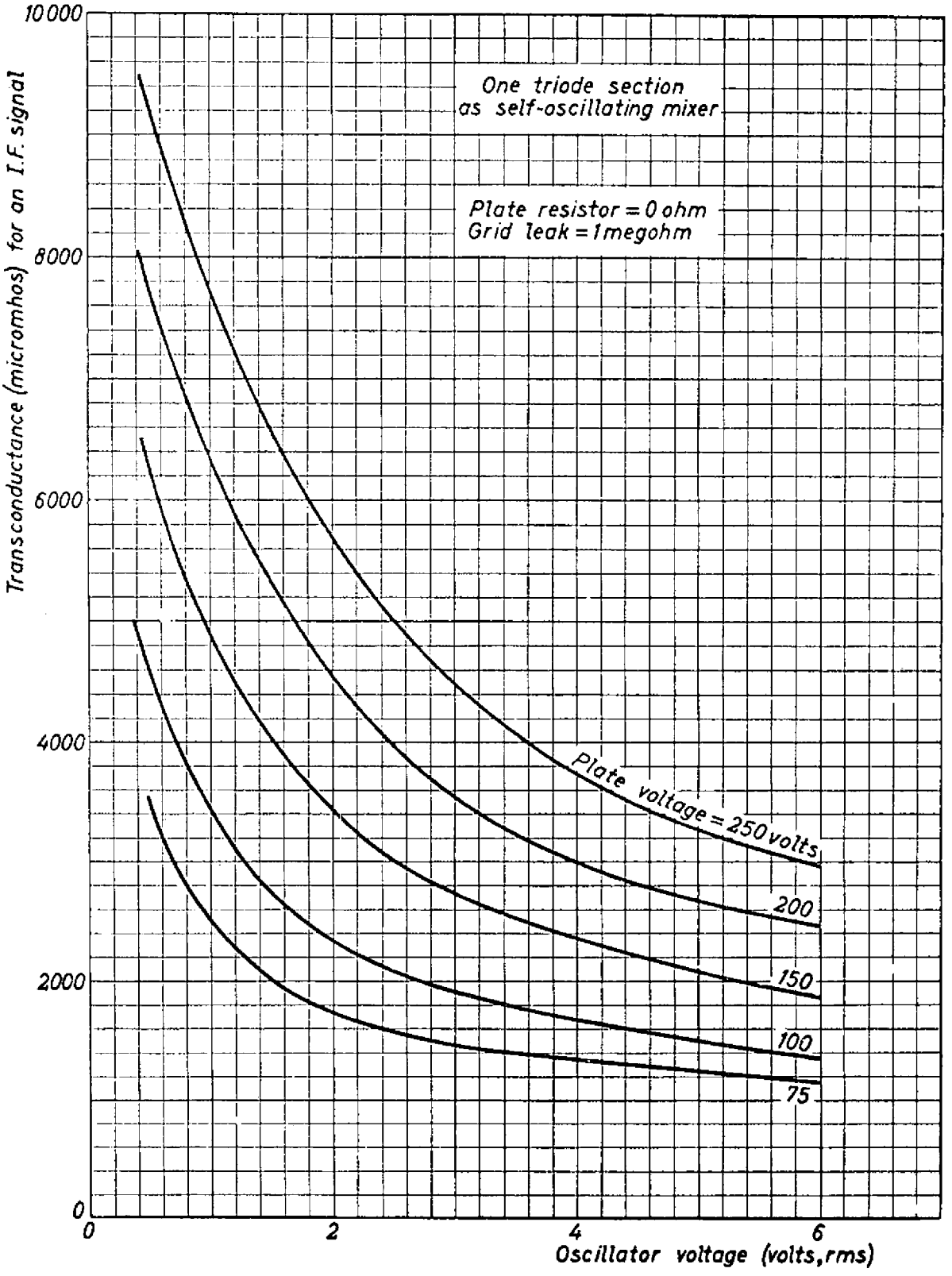
9AQ8


One triode section
as self-oscillating mixer
Plate resistor = 0ohm
Grid leak = 1 megohm
Plate voltage = 250 volts
200
150
100
Supply voltage = 170 volts;
Plate resistor = 4700ohms
Conversion conductance (micromhos)
4000
3000
2000
1000
0
0
1
2
3
4
5
6
Oscillator voltage (volts, rms)

9AQ8


One triode section
as self-oscillating mixer
Plate resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage = 50 volts
75
100
150
200
250
50000
40000
30000
20000
10000
0
0
1
2
3
4
5
6
7
Plate resistance (ohms)
Oscillator voltage (volts, rms)

9AQ8


10000
8000
6000
4000
2000
0
Transconductance (micromhos) for an I.F. signal
One triode section
as self-oscillating mixer
Plate resistor = 0 ohm
Grid leak = 1 megohm
Plate voltage = 250 volts
200
150
100
75
0
2
4
6
Oscillator voltage (volts, rms)