AMPEREX TUBE TYPE ECC82 / 12AU7

The ECC82[1] is a miniature, low-gain, medium-mu twin triode, each section of which has an individual cathode connection. The construction of the ECC82 is such that noise and microphony are reduced to a minimum. Hum is reduced by winding the heater as a bifilar twisted pair of wires. A center-tapped heater permits operation of the tube from either a 6.3 volt or a 12.6 volt supply.

GENERAL CHARACTERISTICS

ELECTRICAL

Cathode	Coated, unipotential	
	Series	Parallel
Heater Voltage, AC or DC	12.6	6.3 volts
Heater Current[2]	0.15	0.3 amps

Direct Interelectrode Capacitances	With Shield[3]	Without Shield
Grid to Plate (each section)	1.6	1.6 uuf
Input (each section)	2.0	1.8 uuf
Output (Section 1)	2.1	00.5 uuf
Output (section 2)	2.1	0.37 uuf

MECHANICAL

Maximum Overall Dimensions	
Length	2 3/16 inches
Seated Height	1 15/16 inches
Diameter	7/8 inch
Mounting Position	any
Base	Small Button, 9 pin RETMA #9A

The ECC82 is a direct, high-quality replacement for the type 12AU7.

[2] When used in equipment which employs series-connected heaters, a current-limiting device must be inserted to limit the current when switching on.

[3] With external shield (RETMA #315) connected to cathode of section under test.

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MAXIMUM RATINGS (Each Section)

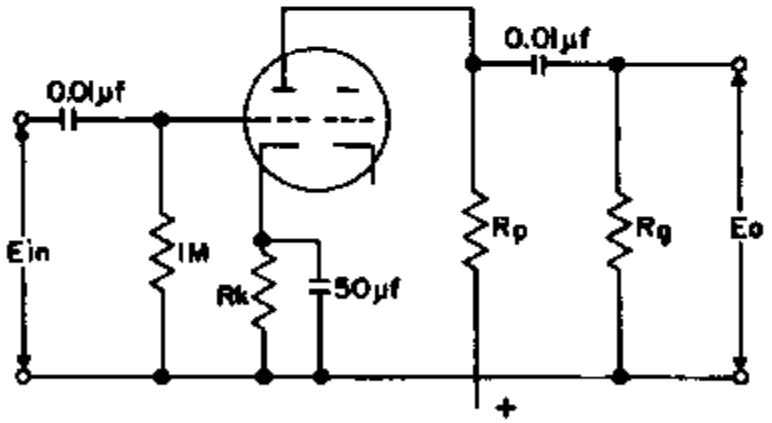
Design Center Values

Zero Signal Plate Voltage	550	volts
Plate Voltage	300	volts
Plate Dissipation	2.75	watts
Cathode Current	20	mA
Grid Voltage	−100	volts
Grid to Plate Voltage	−250	volts
Grid Voltage (Grid current = + 0.3 uA)	−1.3	volts
Grid Resistance [4]	1	megohm
Heater to Cathode Voltage	180	volts
Heater to Cathode Resistance	20,000	ohms
Heater to Cathode Resistance [5]	150,000	ohms

Typical Operating Conditions

Class A Amplifier (Each Section)

Plate Voltage	100	250	volts
Grid Voltage	0	−8.5	volts
Amplification Factor	19.5	17	
Plate Resistance (approx.)	6250	7700	ohms
Transconductance	3100	2200	micromhos
Plate Current	11.8	10.5	mA



Rp = 0.047 MΩ
Rg = 0.15 MΩ

CLASS A RESISTANCE-COUPLED AMPLIFIER, EACH SECTION

[4] With self bias.

[5] In phase inverting circuits.

R_p = 0.047 MΩ R_g = 0.15 MΩ R_k = 1.2 KΩ

E_{bb} (V)	I_p (mA)	E_o (V_{eff})[6]	Gain	% Distortion [7]
100	1.20	11	13.5	5.6
150	1.82	18	1.35	6.1
200	2.41	26	13.5	6.3
250	3.02	34	13.5	6.4
300	3.65	43	13.5	6.5
350	4.30	51	13.5	6.6
400	5.00	59	13.5	6.7

R_p = 0.1 MΩ R_g = 0.33 MΩ R_k = 2.2 KΩ

E_{bb} (V)	I_p (mA)	E_o (V_{eff})[6]	Gain	% Distortion [7]
100	0.66	10	14	4.8
150	0.98	17	14	5.6
200	1.30	25	14	5.8
250	1.63	32	14	5.9
300	1.97	41	14	6.0
350	2.30	49	14	6.1
400	2.62	57	14	6.2

R_p = 0.22 MΩ R_g = 0.68 MΩ R_k = 3.9 KΩ

E_{bb} (V)	I_p (mA)	E_o (V_{eff})[6]	Gain	% Distortion [7]
100	0.33	8	14.5	4.0
150	0.50	15	14.5	4.4
200	0.66	22	14.5	4.7
250	0.82	28	14.5	4.8
300	0.98	36	14.5	4.9
350	1.16	43	14.5	5.0
400	1.31	50	14.5	5.1

[6] Grid current = + 0.3 μA.

[7] Approximately proportional to output voltage

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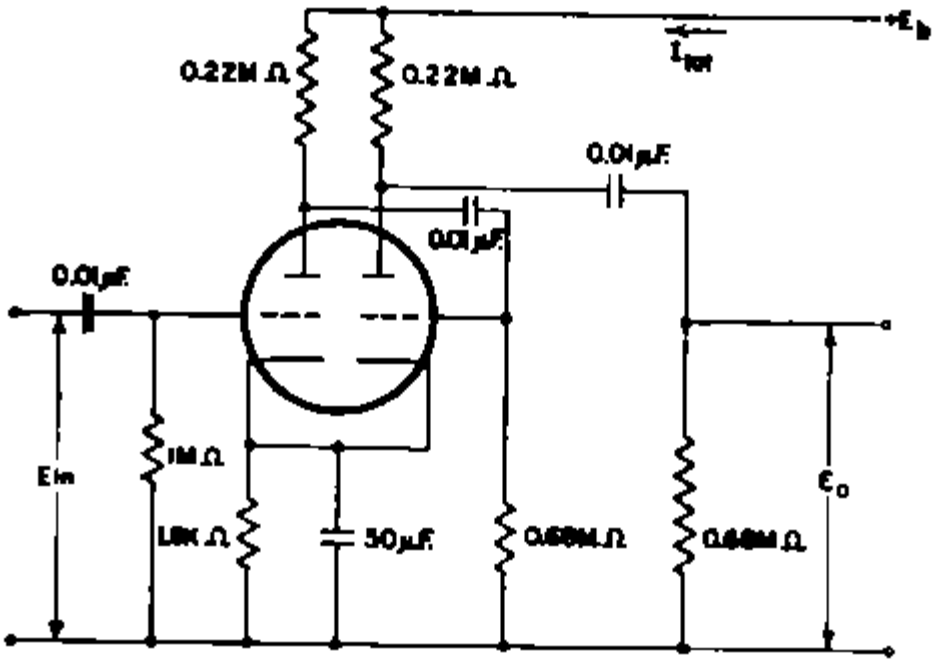
Class A Resistance - Coupled Amplifier

Two Sections in Cascade

Supply Voltage	250	350	volts
Total Current	1.66	2.33	mA
Output Voltage [6]	15	25	volts (RMS)
Gain	178	178	
Total Distortion [7]	2	2	%



APPLICATION NOTES

MICROPHONICS

The tube can be used without special precautions against microphonic effect in amplifiers in which the input voltage is higher than 50 millivolts when the tube is mounted in the near viciniry of a 5 watt loud speaker with an acoustical efficiency of 5%.

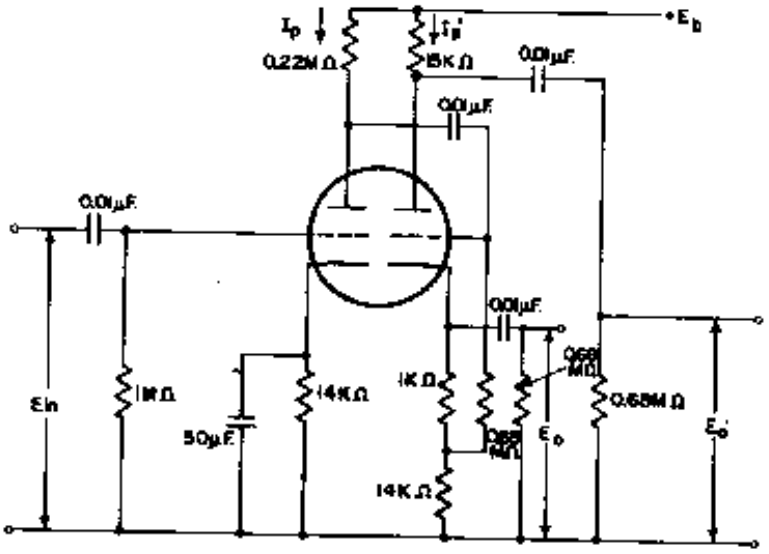
HUM

The hum and noise level will be better than −60 db when the grid circuit impedance is less than 0.3 megohms (at 60 cps), the center tap of the heater is grounded and the cathode resistor is decoupled by a capacitor of at least 100 uuf.

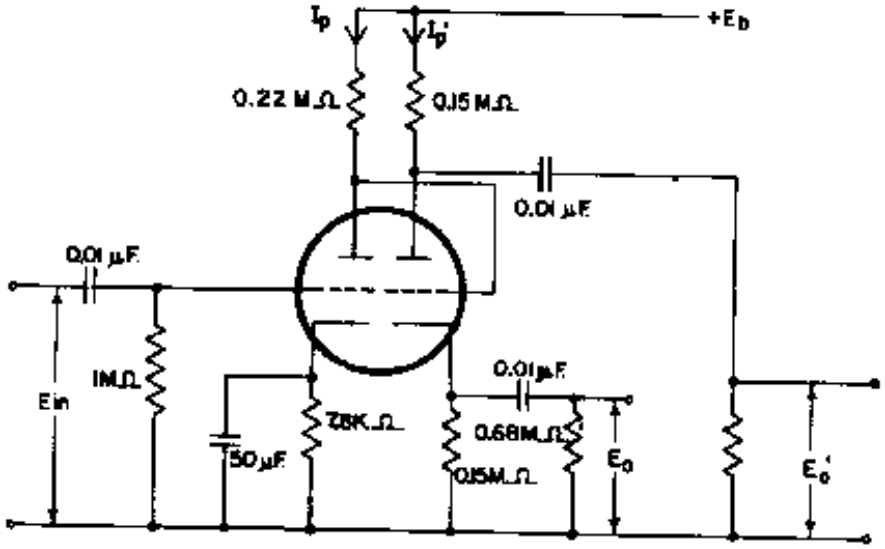
[6] Grid current = + 0.3 μA.

[7] Approximately proportional to output voltage

Operating Characteristics as a Phase Inverter



Supply Voltage	250	350	volts
Plate Current (I_p)	0.82	1.16	mA
Plate Current (I_p')	4.5	6.3	mA
Output Voltage[6]	13	20	volts (RMS)
Voltage Gain	11	11	
Percent Distortion [7]	1.5	1.5	%



Supply Voltage	250	350	volts
Plate Current (I_p)	0.70	1.00	mA
Plate Current (I_p')	0.68	0.93	mA
Output Voltage[6]	15	24	volts (RMS)
Voltage Gain	11	11	
Percent Distortion [7]	1.0	1.0	%

[6] Grid Current = + 0.3 μA.

[7] Approximately proportional to output voltage.

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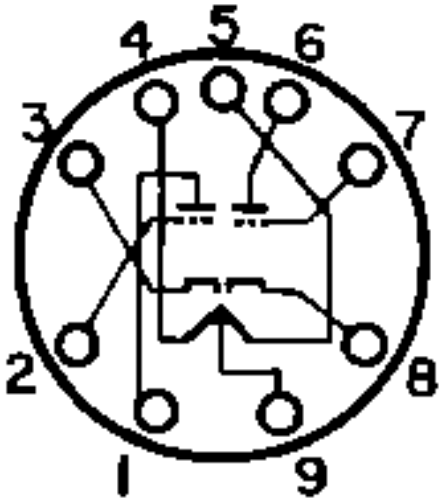
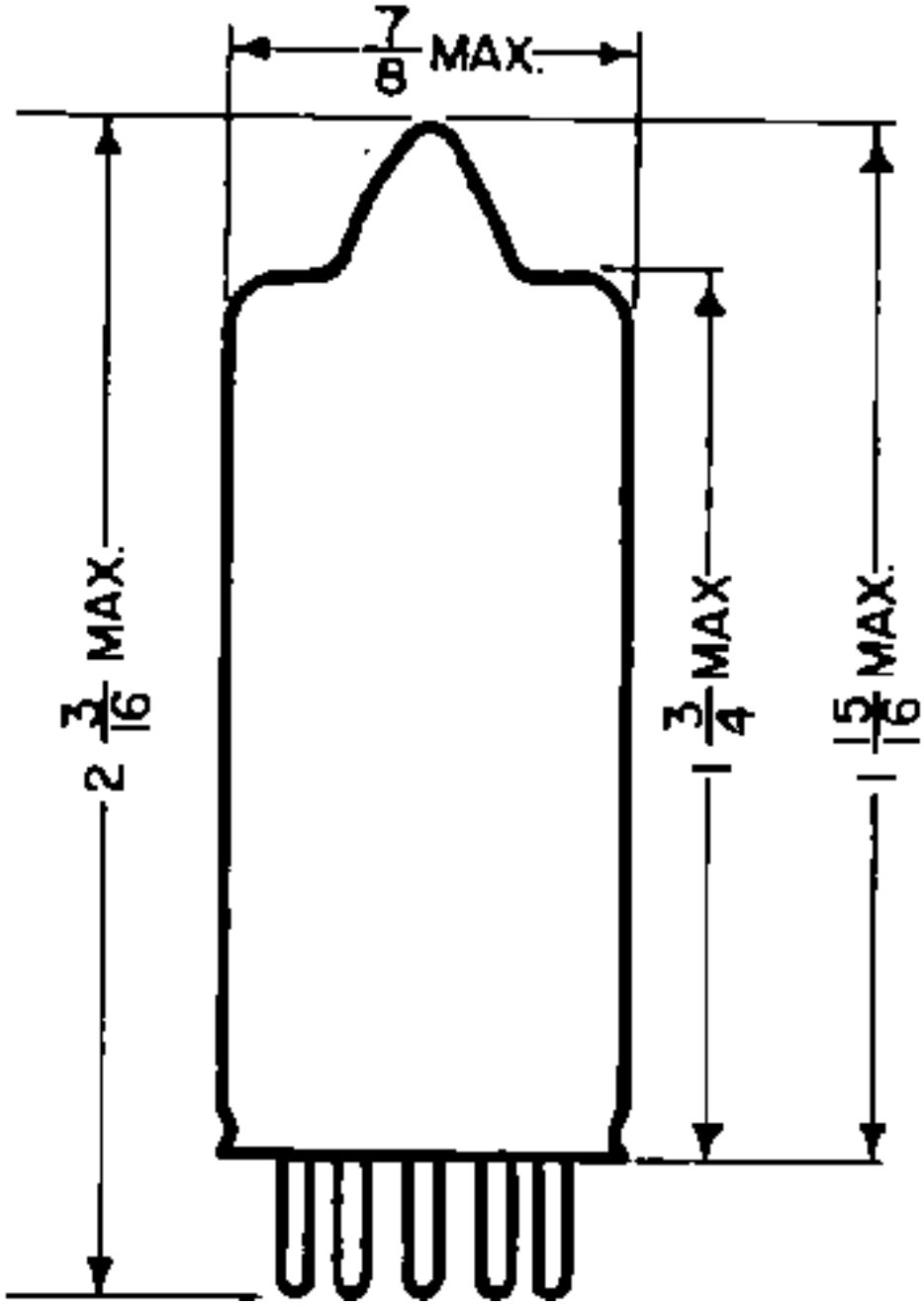


PIN CONNECTIONS

PIN NO. 1 = PLATE NO. 1
PIN NO. 2 = GRID NO. 1
PIN NO. 3 = CATHODE
PIN NO. 4 = HEATER
PIN NO. 5 = HEATER
PIN NO. 6 = PLATE NO. 2
PIN NO. 7 = GRID NO. 2
PIN NO. 8 = CATHODE
PIN NO. 9 = HEATER CENTER TAP



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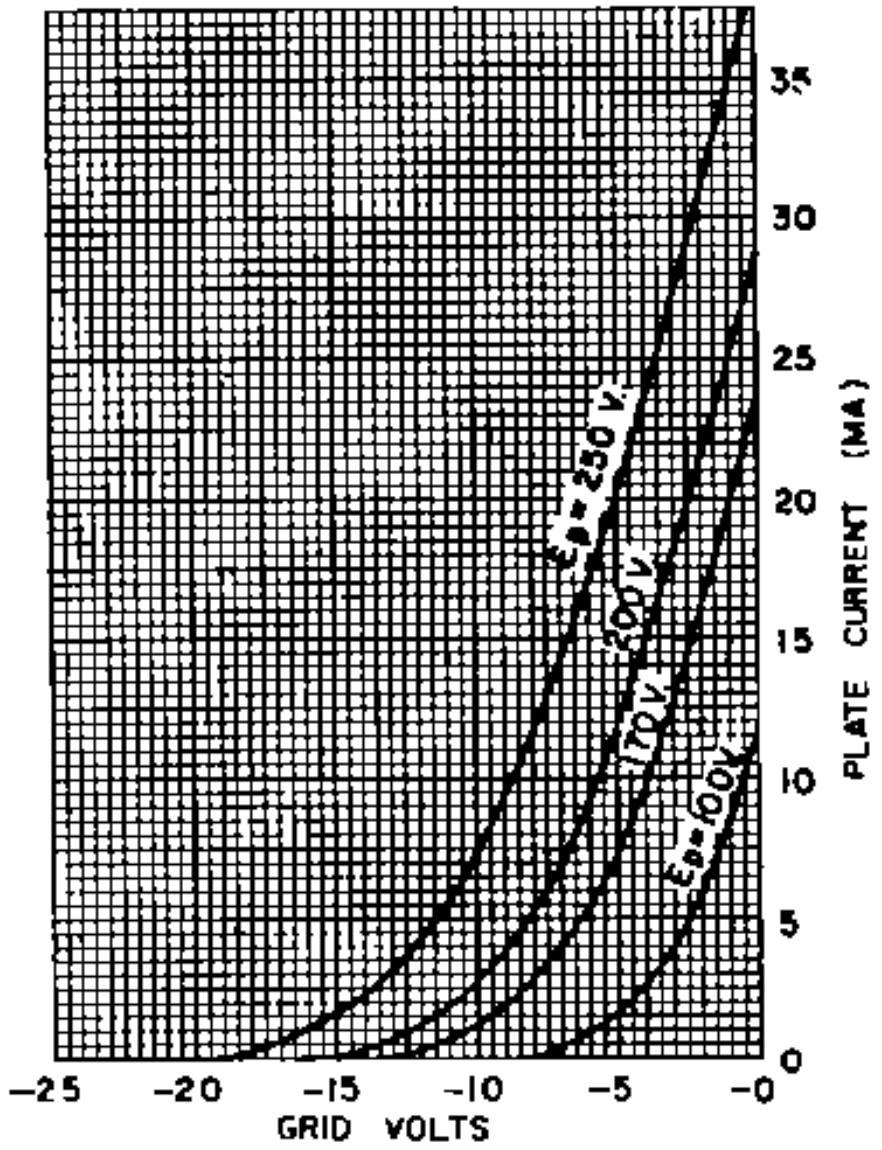
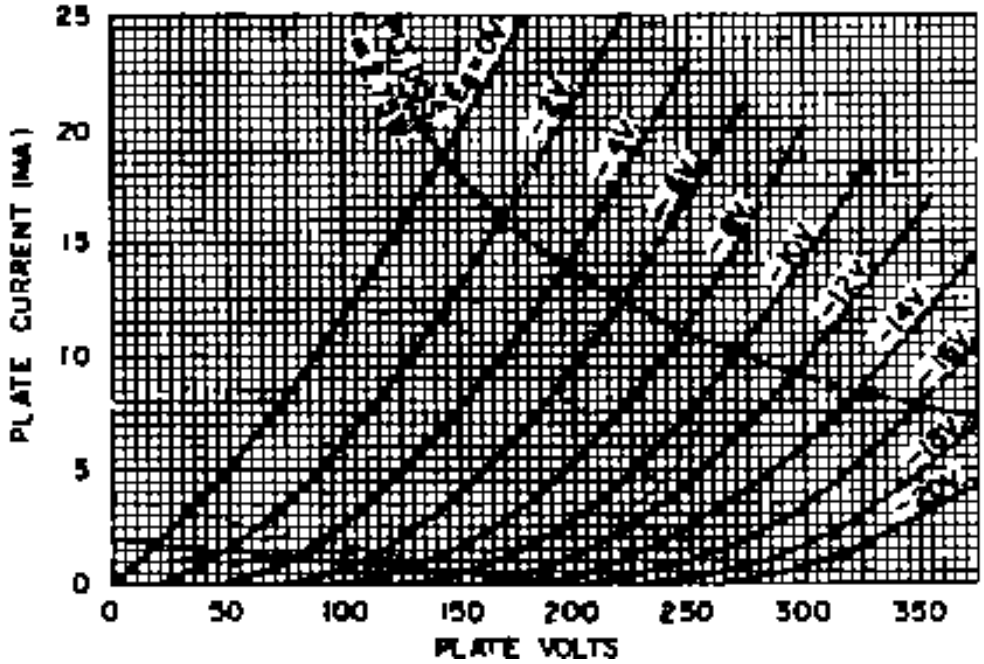

35
30
25
20
15
10
5
0
PLATE CURRENT (MA)
Eb = 250 V
200 V
150 V
100 V
−25
−20
−15
−10
−5
−0
GRID VOLTS


25
20
15
10
5
0
PLATE CURRENT (MA)
0
50
100
150
200
250
300
350
PLATE VOLTS

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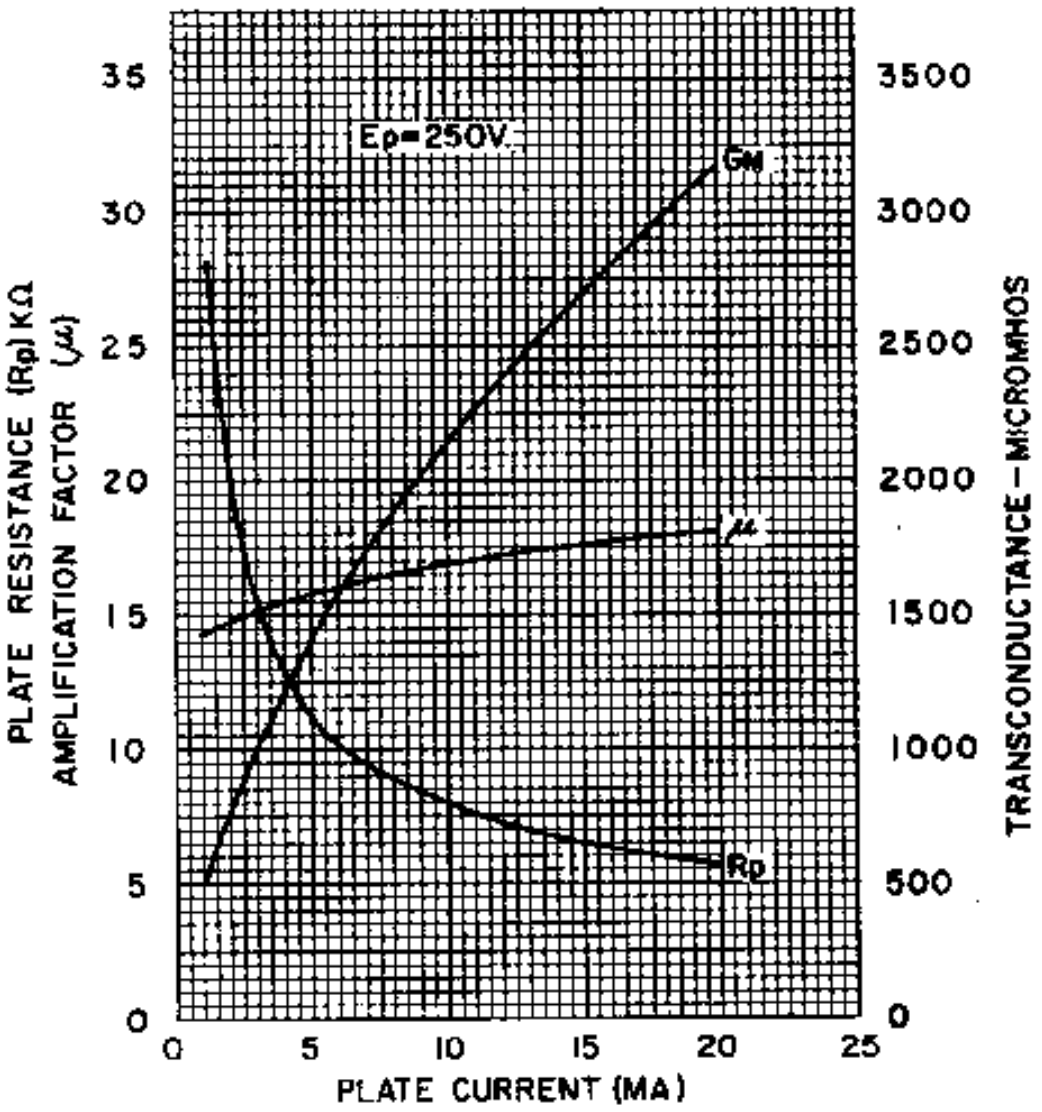
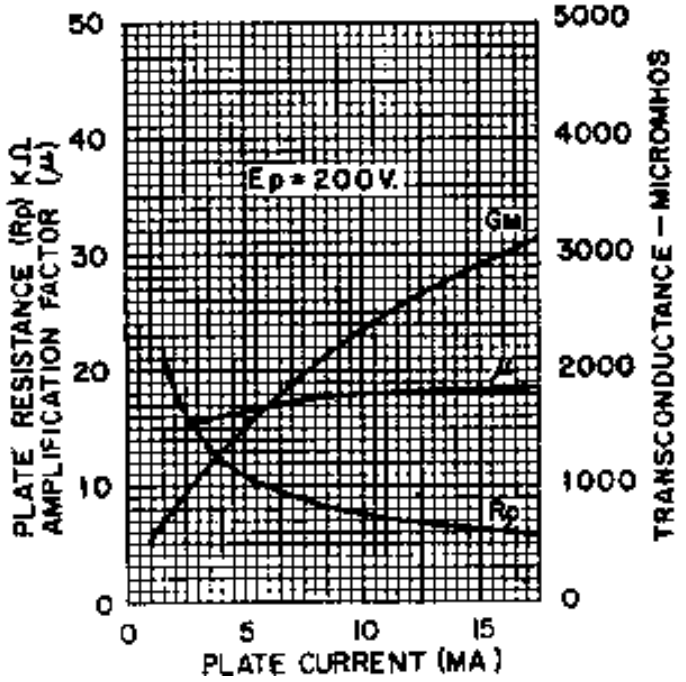

Ep=250V.
Gm
μ
Rp
PLATE RESISTANCE (Rp) KΩ
AMPLIFICATION FACTOR (μ)
TRANSCONDUCTANCE – MICROMHOS
PLATE CURRENT (MA)
0
5
10
15
20
25
30
35
500
1000
1500
2000
2500
3000
3500


Ep=200V.
Gm
μ
Rp
PLATE RESISTANCE (Rp) KΩ
AMPLIFICATION FACTOR (μ)
TRANSCONDUCTANCE – MICROMHOS
PLATE CURRENT (MA)
0
5
10
15
20
30
40
50
1000
2000
3000
4000
5000

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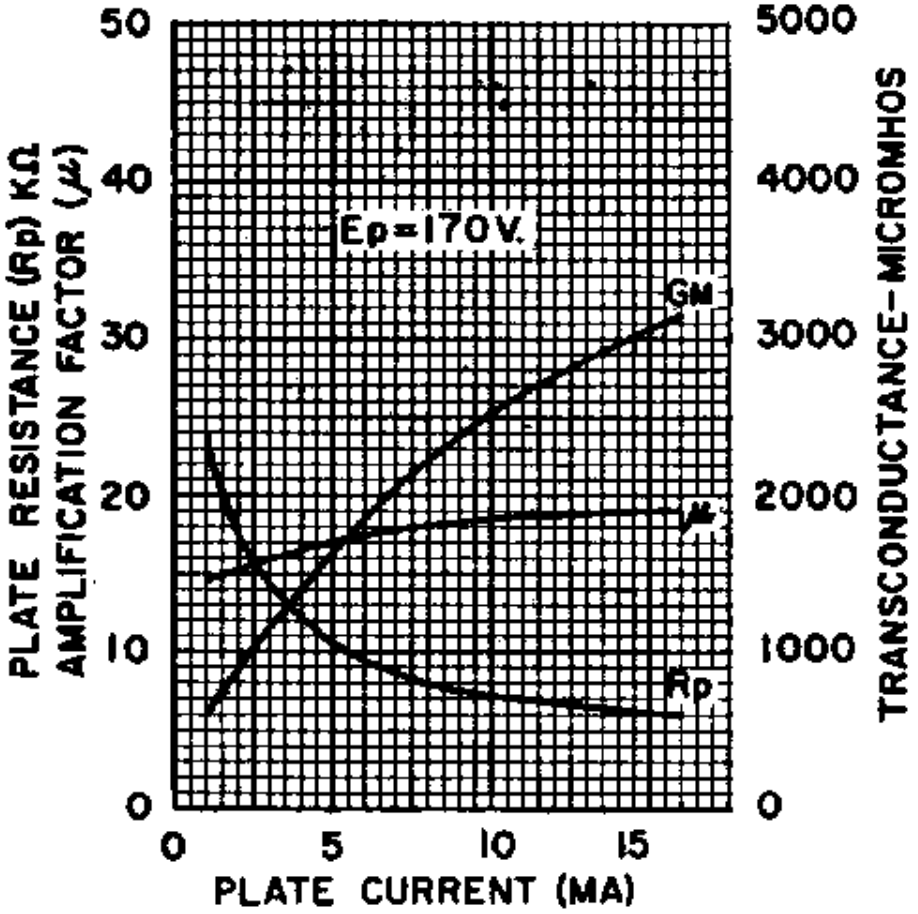
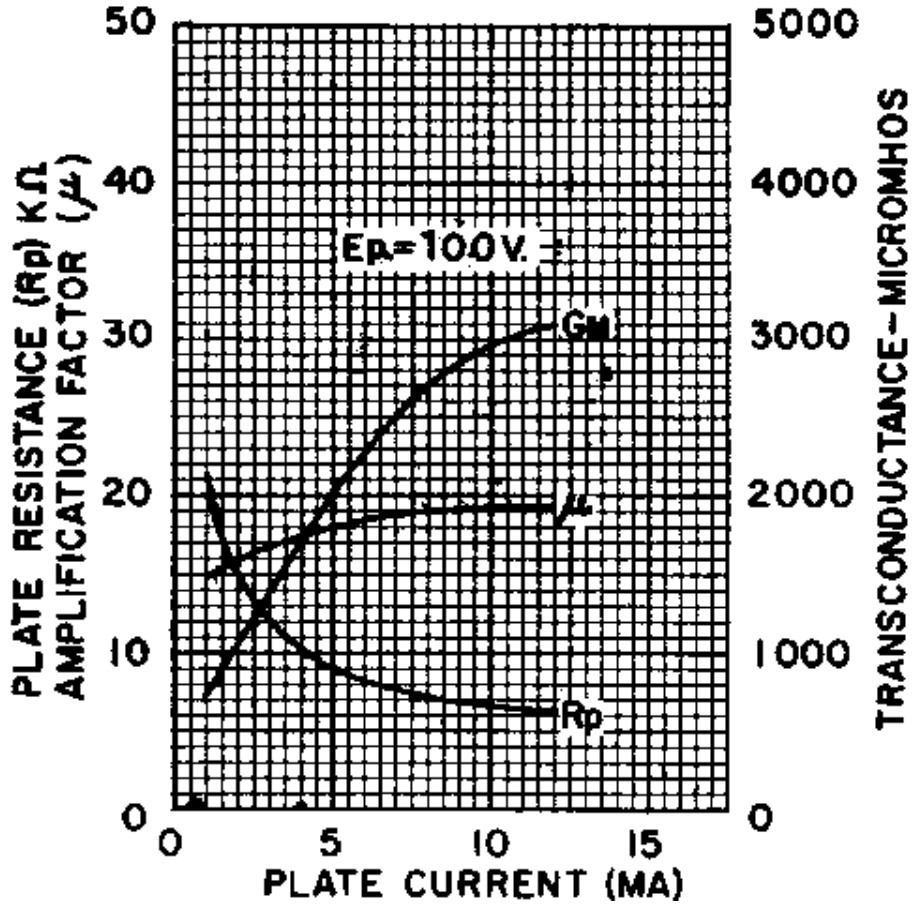

Ep=170V.
GM
μ
Rp
PLATE RESISTANCE (Rp) KΩ
AMPLIFICATION FACTOR (μ)
TRANSCONDUCTANCE-MICROMHOS
PLATE CURRENT (MA)
0
10
20
30
40
50
1000
2000
3000
4000
5000
5
15


Ep=100V.
GM
μ
Rp
PLATE RESISTANCE (Rp) KΩ
AMPLIFICATION FACTOR (μ)
TRANSCONDUCTANCE-MICROMHOS
PLATE CURRENT (MA)
0
10
20
30
40
50
1000
2000
3000
4000
5000
5
15

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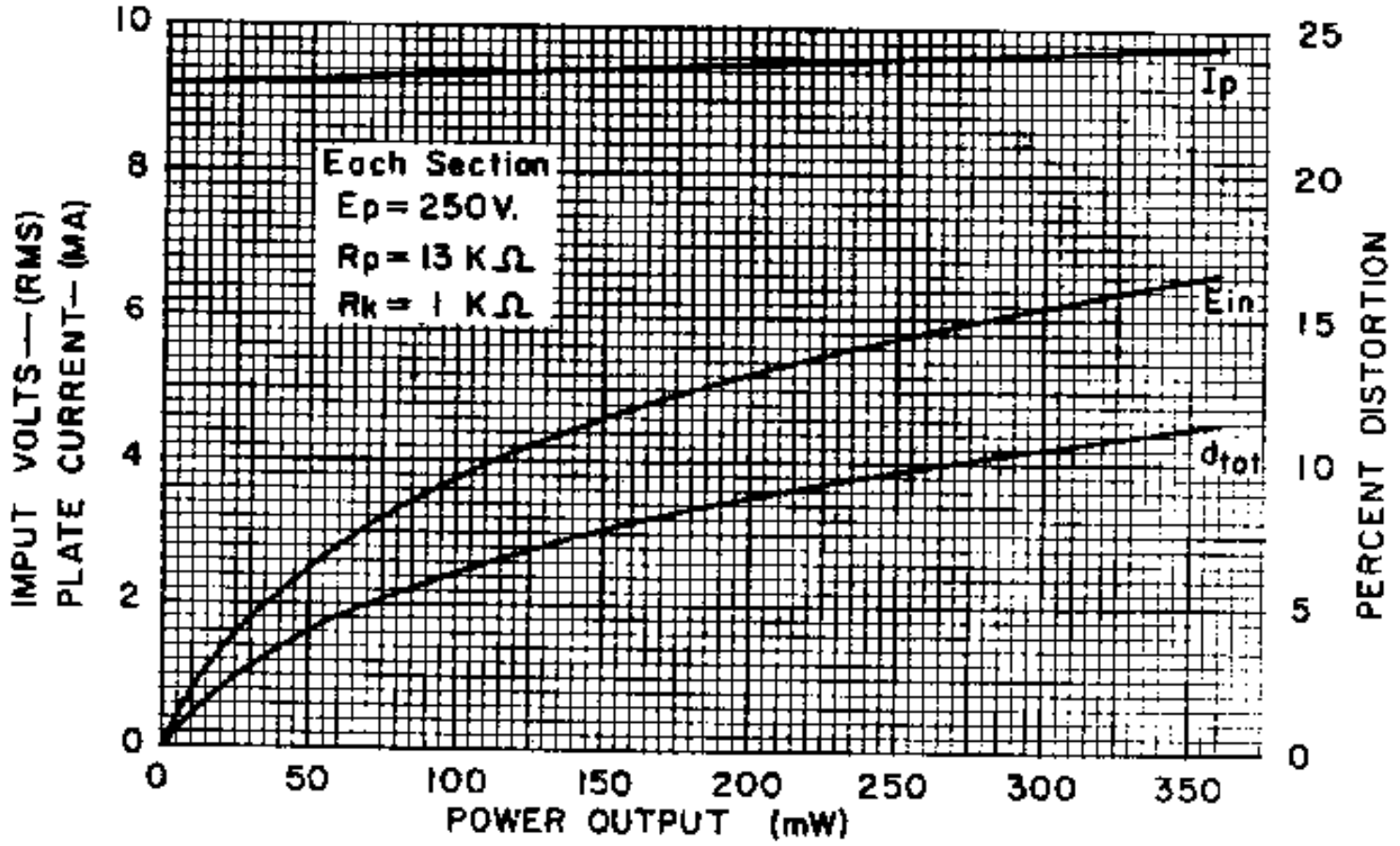
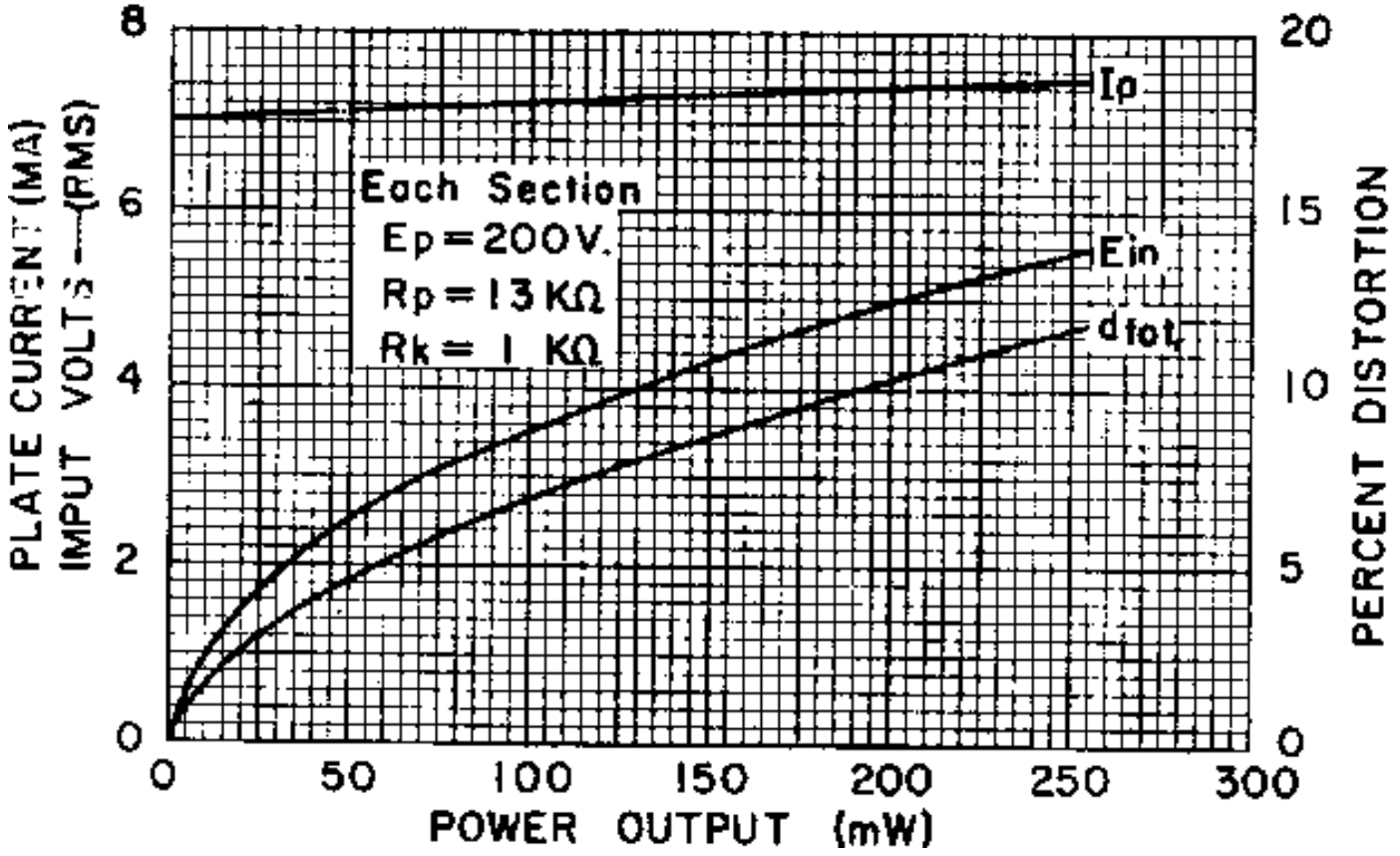
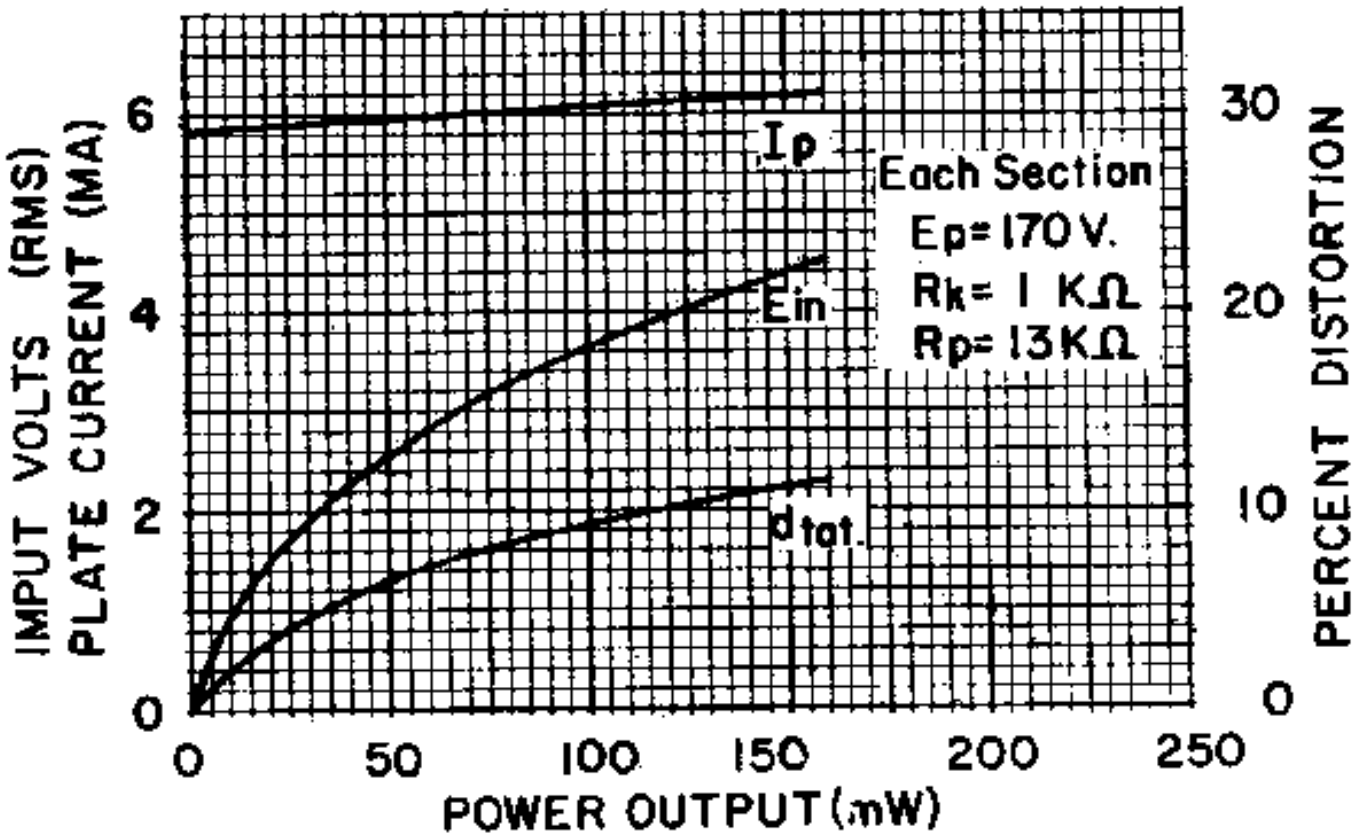
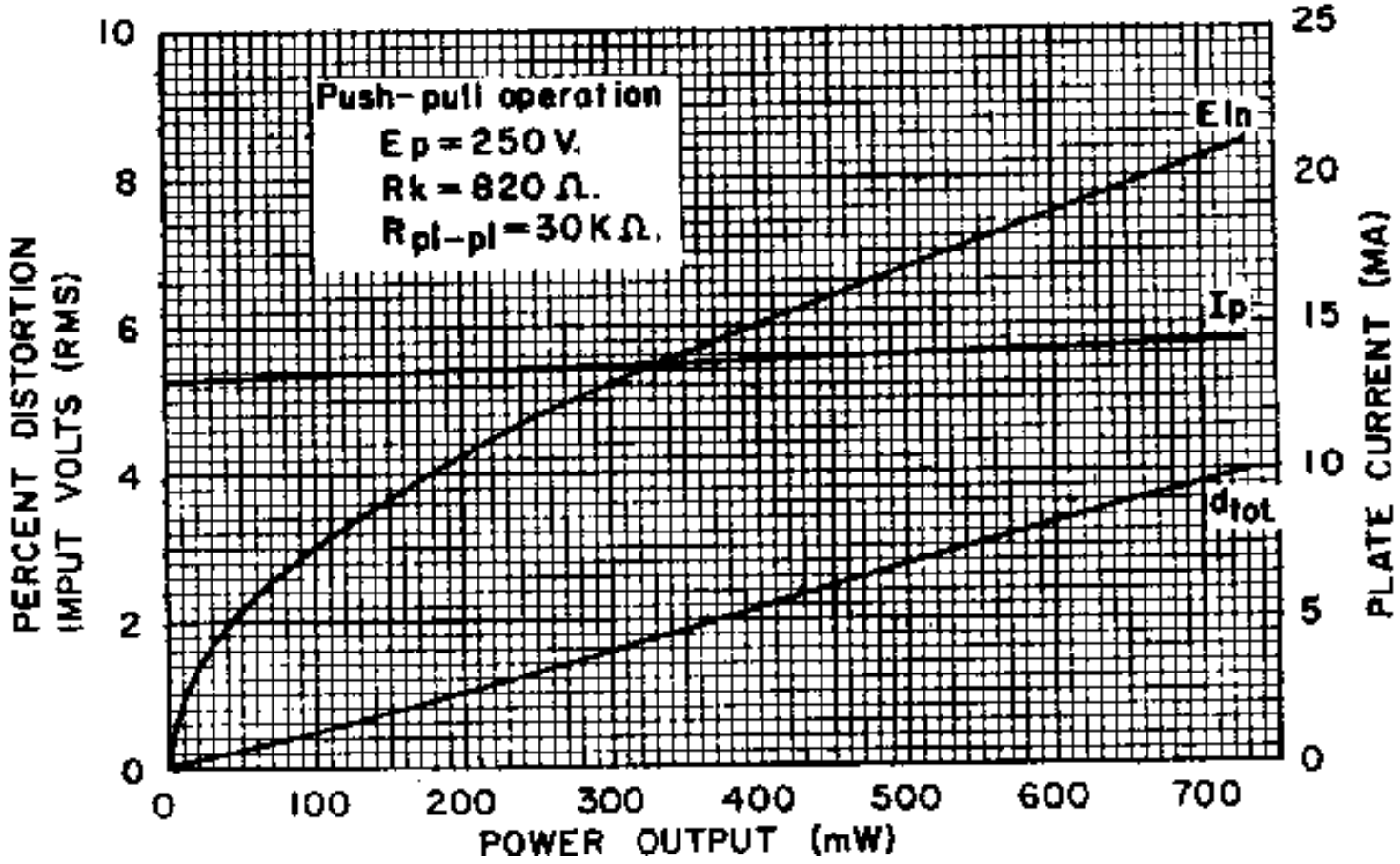

Each Section
Ep = 250V.
Rp = 13 KΩ
Rk = 1 KΩ
Ip
Ein
dtot
IMPUT VOLTS — (RMS)
PLATE CURRENT — (MA)
PERCENT DISTORTION
POWER OUTPUT (mW)
0
2
4
6
8
10
0
5
10
15
20
25
0
50
100
150
200
250
300
350

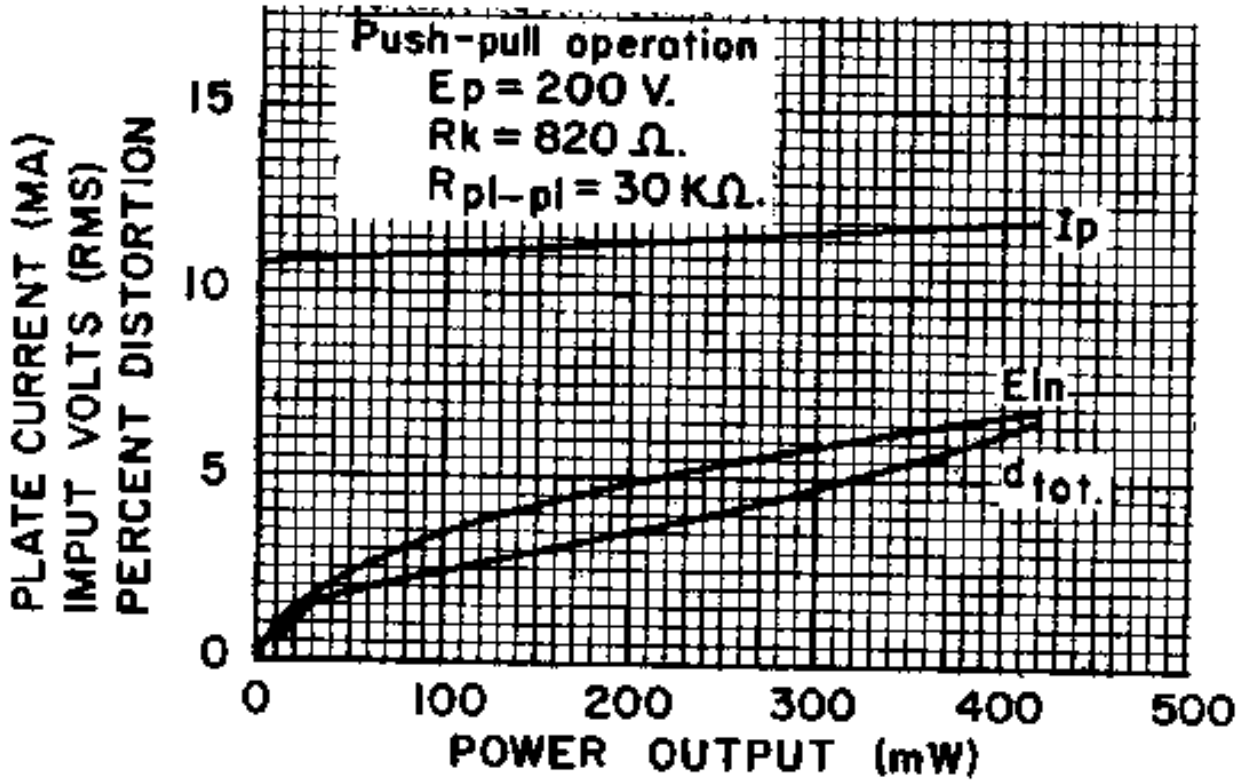

Each Section
Ep = 200V.
Rp = 13 KΩ
Rk = 1 KΩ
Ip
Ein
dtot
PLATE CURRENT (MA)
IMPUT VOLTS — (RMS)
PERCENT DISTORTION
POWER OUTPUT (mW)
0
2
4
6
8
0
5
10
15
20
0
50
100
150
200
250
300

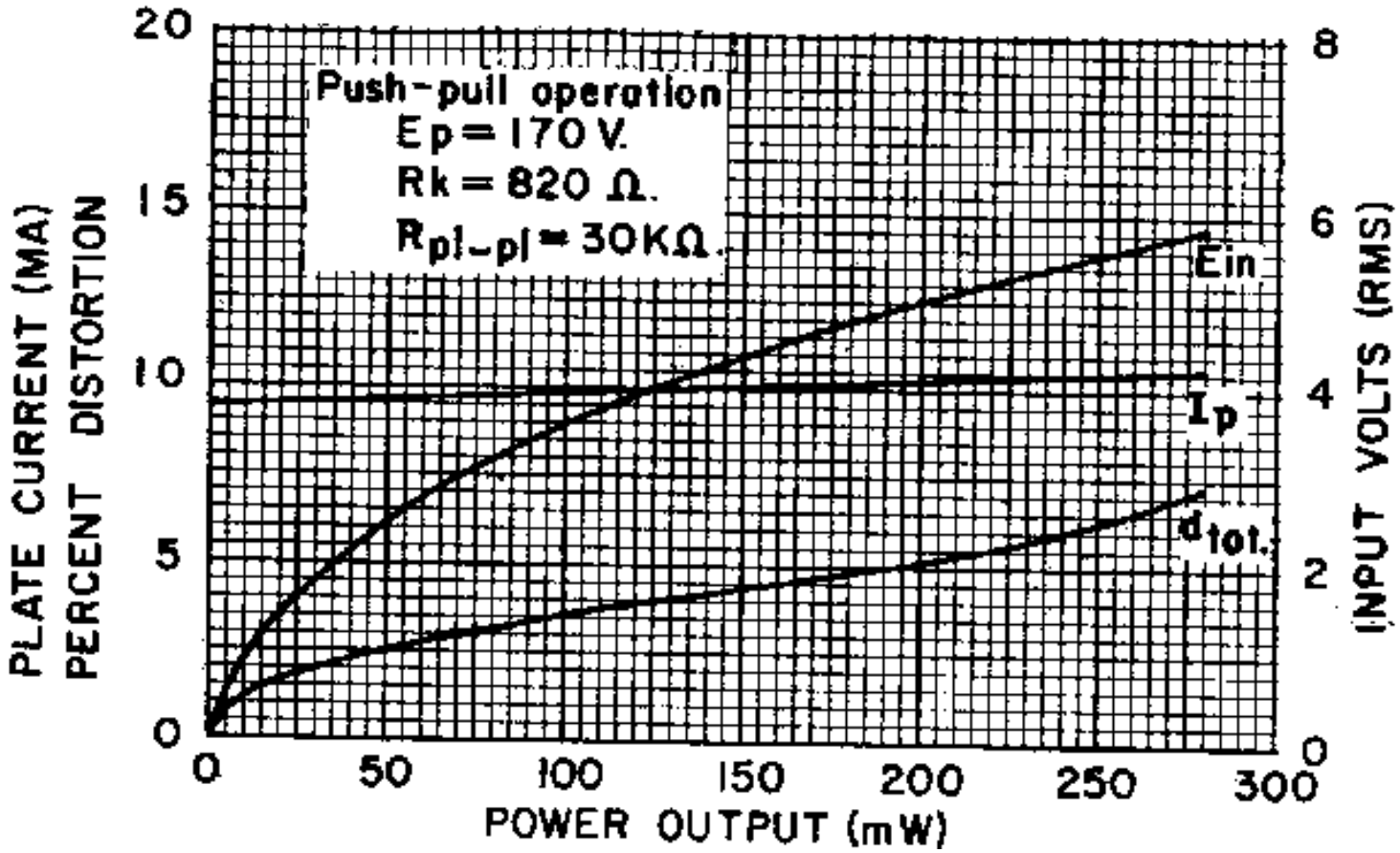
ECC82 /12AU7


Each Section
Ep=170V.
Rk= 1 KΩ
Rp=13KΩ
Ip
Ein
dtot.
IMPUT VOLTS (RMS)
PLATE CURRENT (MA)
PERCENT DISTORTION
POWER OUTPUT (mW)
0
2
4
6
10
20
30
50
100
150
200
250


Push-pull operation
Ep=250V.
Rk=820Ω.
Rpl-pl=30KΩ.
Ein
Ip
dtot
PERCENT DISTORTION
IMPUT VOLTS (RMS)
PLATE CURRENT (MA)
POWER OUTPUT (mW)
0
2
4
6
8
10
5
15
20
25
100
200
300
400
500
600
700

ECC82 / 12AU7


Push-pull operation
Ep = 200 V.
Rk = 820 Ω.
Rpl-pl = 30 KΩ.
Ip
Ein
d tot.
PLATE CURRENT (MA)
IMPUT VOLTS (RMS)
PERCENT DISTORTION
0
5
10
15
0
100
200
300
400
500
POWER OUTPUT (mW)


Push-pull operation
Ep = 170 V.
Rk = 820 Ω.
Rpl-pl = 30KΩ.
Ein
Ip
d tot.
PLATE CURRENT (MA)
PERCENT DISTORTION
(INPUT VOLTS (RMS)
0
5
10
15
20
0
2
4
6
8
0
50
100
150
200
250
300
POWER OUTPUT (mW)