



BEAM POWER TUBE

DESCRIPTION

The GL-2E30 is an instant-heating 10-watt miniature beam pentode power tube for use in both audio- and radio-frequency service. Its versatility permits its use in all stages of an entire low-power transmitter. This tube, because of the low-plate-voltage requirement, is especially adapted to portable and mobile applications. In such service the instant-heating filament can be turned off during standby periods. When the 2E30 is used as an audio-frequency output tube which is turned on only during active reception periods by a signal-

actuated relay, the resultant saving in battery drain, when the transmitting or receiving time is a small percentage of the total time, provides appreciable power savings. When the 2E30 filament is heated from a transformer with a nominal output of 6.3 volts, the filament connections may be made with small wire to introduce the necessary voltage drop of 0.3 volts. The 2E30 in properly designed circuits requires no neutralization at frequencies up to 165 megacycles and can be used at full ratings at that frequency.

TECHNICAL INFORMATION

These data are for reference only. For design information refer to specifications.

GENERAL

Number of electrodes.....5

Electrical Data

Filament—Center-tapped oxide-coated

Filament voltage, a-c or d-c..... $6.0 \pm 10\%$ volts

Filament current.....0.65 ampere

Filament heating time.....0.2 approx second

Amplification factor, G_1 to G_2 7


Electronic
TUBE

GENERAL  ELECTRIC

Supersedes ETX-229 dated 7-48

TECHNICAL INFORMATION (CONT'D)

Direct interelectrode capacitances	With Close-fitting Shield	Without Shield
Grid-plate, maximum	0.18	0.2 uuf
Input	9.6	9.5 uuf
Output	14	6.6 uuf

Mechanical Data

Mounting position—filament plane must be vertical.
Net weight.....0.4 ounce

The plate supply must be turned off before, or simultaneously with, the filament in all applications. When the 2E30 is used as an r-f driver for a tube with a thoriated-tungsten filament, provision must be made so that the driven tube(s) is not operated without a bias voltage when plate and screen potential is applied during the time interval required for the 2E30 to reach operating temperature. When the stand-by period is generally less than 15 minutes, additional life can be obtained by reducing the filament potential to 80 per cent of the nominal operating voltage: For longer stand-by periods the filament should be turned off.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR—CLASS A1

Maximum Ratings, Design-center Values

D-c plate voltage	250 max	volts
D-c grid No. 2 voltage	250 max	volts
D-c grid No. 2 input	2.5 max	watts
Plate dissipation†	10 max	watts

Typical Operation and Average Characteristics

Filament voltage	6.0 d-c	6.0 d-c	6.0 a-c	6.0 a-c	volts
D-c plate voltage	180	250	180	250	volts
D-c grid No. 2 voltage	180	250	180	250	volts
D-c grid No. 1 voltage‡	a. -10	-16.5	-13	-20	volts
	b.				
	c.		400	450	ohms
Peak A-F grid No. 1 voltage	9	14	11	14	volts
Zero signal d-c plate current	30	40	30	40	milliamperes
Maximum signal d-c plate current	32	44	32	44	milliamperes
Zero signal d-c grid No. 2 current	2.5	3.3	2.5	3.3	milliamperes
Maximum signal d-c grid No. 2 current	4.3	7.4	5.2	7.4	milliamperes
Plate resistance	59000	63000	59000	63000	ohms
Transconductance	3450	3700	3450	3700	micromhos
Load resistance	4500	4500	4500	4500	ohms
Maximum signal power output	1.8	4.5	2.25	4.5	watts
Total harmonic distortion	6.5	8	8	8	per cent

Typical Operation—Push-pull Amplifier

Unless otherwise specified, values are for two tubes

Filament voltage	6.0 d-c	6.0 d-c	6.0 a-c	6.0 a-c	volts
D-c plate voltage	180	250	180	250	volts
D-c grid No. 2 voltage	180	250	180	250	volts
D-c grid No. 1 voltage‡	a. -10	-16.5	-13	-20	volts
	b.				
	c.		200	225	ohms
Peak A-F grid to grid voltage	18	28	22	28	volts
Zero signal d-c plate current	60	80	60	80	milliamperes
Maximum signal d-c plate current	64	88	64	88	milliamperes
Zero signal d-c grid No. 2 current	5	6.6	5	6.6	milliamperes
Maximum signal d-c grid No. 2 current	8.6	14.8	10.4	14.8	milliamperes
Effective load resistance, plate to plate	9000	9000	9000	9000	ohms
Maximum signal power output	3.6	9	4.5	9	watts
Total harmonic distortion	5	6	6	6	per cent

AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR—CLASS AB₁

Maximum Ratings, Design-center Values

D-c plate voltage	275 max	volts
D-c grid No. 2 voltage	250 max	volts
D-c grid No. 2 input	2.5 max	watts
Plate dissipation	10 max	watts

TECHNICAL INFORMATION (CONT'D)

AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR—CLASS AB₁ (Cont'd)

Typical Operation and Average Characteristics (Cont'd)

Unless otherwise specified the values are for two tubes

A-c filament voltage #	6.0	6.0	6.0	volts
D-c plate voltage	180	250	250	volts
D-c grid No. 2 voltage	180	250	250	volts
D-c grid No. 1 voltage #	-17.5	-25	-25	volts
Peak A-F grid to grid voltage	31	45	45	volts
Zero signal d-c plate current	38	48	48	milliamperes
Maximum signal d-c plate current	54	80	82	milliamperes
Zero signal d-c grid No. 2 current	2	3	3	milliamperes
Maximum signal d-c grid No. 2 current	7.6	13.5	10	milliamperes
Effective load resistance, plate to plate	7000	8000	6000	ohms
Maximum signal power output	5	12.5	10	watts
Total harmonic distortion	4.5	7.5	3.6	per cent

AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR—CLASS AB₂

Maximum Ratings, Absolute Values

D-c plate voltage	300 max	volts
D-c grid No. 2 voltage	275 max	volts
Peak position A-F grid No. 1 voltage	20 max	volts
Maximum signal d-c plate current**	60 max	milliamperes
Maximum signal plate input**	15 max	watts
Maximum signal grid No. 2 input**	2.5 max	watts
Plate dissipation**	10 max	watts

Typical Operation and Average Characteristics

Unless otherwise specified, values are for two tubes

A-c filament voltage #	6.0	6.0	volts
D-c plate voltage	180	250	volts
D-c grid No. 2 voltage	180	250	volts
D-c grid No. 1 voltage #	-22.5	-30	volts
Peak A-F grid to grid voltage	75	87	volts
Zero signal d-c plate current	16	40	milliamperes
Maximum signal d-c plate current	100	120	milliamperes
Zero signal d-c grid No. 2 current	1	4	milliamperes
Maximum signal d-c grid No. 2 current	16	20	milliamperes
Maximum signal d-c grid No. 1 current	3	2.3	milliamperes
Effective load resistance, plate to plate	2500	3800	ohms
Maximum signal grid No. 1 driving power	0.23	0.2	watts
Maximum signal power output	7.4	17	watts
Total harmonic distortion	3	4	per cent

RADIO-FREQUENCY POWER AMPLIFIER—CLASS C TELEPHONY
PLATE AND SCREEN-GRID AMPLITUDE MODULATED

Carrier conditions for use with a maximum modulation factor of 1

Maximum Ratings, Absolute Values

D-c plate voltage	200 max	volts
D-c grid No. 2 voltage	200 max	volts
D-c grid No. 1 voltage	-150 max	volts
Grid No. 1 resistor	100,000 max	ohms
D-c plate current	60 max	milliamperes
D-c grid No. 1 current	2.5 max	milliamperes
D-c plate input power Δ	12 max	watts
D-c grid No. 2 input power Δ	2.5 max	watts
Plate dissipation Δ	6.6 max	watts

Typical Operation and Average Characteristics

D-c plate voltage	200	volts
D-c grid No. 2 voltage	200	volts
D-c grid No. 1 voltage $\dagger$	a. -46	volts
	b. 20000	ohms
	c. 850	ohms

TECHNICAL INFORMATION (CONT'D)

RADIO-FREQUENCY POWER AMPLIFIER—CLASS C TELEPHONY (CONT'D)

Typical Operation and Average Characteristics (Cont'd)

Peak R-F grid No. 1 voltage	66	volts
D-c plate current	45	milliamperes
D-c grid No. 2 current	10	milliamperes
D-c grid No. 1 current	2.3	milliamperes
Grid No. 1 driving power	0.15 approx	watts
Power output	5 approx	watts

RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR—CLASS C TELEGRAPHY AND FREQUENCY MODULATION

Key-down conditions per tube without amplitude modulation ¶

Maximum Ratings, Absolute Values

D-c plate voltage	300 max	volts
D-c grid No. 2 voltage	250 max	volts
D-c grid No. 1 voltage	—150 max	volts
Grid No. 1 resistor	100,000 max	ohms
D-c plate current	60 max	milliamperes
D-c grid No. 1 current	3 max	milliamperes
Peak positive R-F grid No. 1 voltage	30 max	volts
D-c plate input	18 max	watts
D-c screen input	2.5 max	watts
Plate dissipation	10 max	watts

Typical Operation and Average Characteristics

	Low Frequency	165 Megacycles
D-c plate voltage	200	300 volts
D-c grid No. 2 voltage	200	250 volts
D-c grid No. 1 voltage ‡	a. b. c.	—46 —50 —70 20,000 20,000 100,000 850 850 1250 ohms
Peak R-F grid No. 1 voltage	66	75 volts
D-c plate current	45	50 milliamperes
D-c grid No. 2 current	10	5 milliamperes
D-c grid No. 1 current	2.3	0.7 milliamperes
Grid No. 1 Driving Power, approximate	0.15	0.2 1.7 watts
Power output, approximate	5	7.5 6 watts
Useful power output, approximate		5 watts

Typical Operation—Frequency Doubler

	To 82.5 mc	To 165 mc
D-c plate voltage	250	300 volts
D-c grid No. 2 voltage	220	225 volts
D-c grid No. 1 voltage ‡	a. b. c.	—100 —70 —70 70000 30000 100,000 1750 1250 1400 ohms
Peak r-f grid No. 1 voltage	120	90 volts
D-c plate current	50	45 milliamperes
D-c grid No. 2 current	7	5 3.8 milliamperes
D-c grid No. 1 current	1.4	2.3 0.7 milliamperes
Grid No. 1 driving power, approximate	0.2	0.5 0.2 watts
Plate power output***, approximate	5	4 4.5 watts
Useful power output, approximate	4	3 3.5 watts

† Class A₁ dissipation rating is based upon tubes having average plate current. In the case of tubes whose plate current is the maximum acceptable under the testing specification, dissipation will be greater with somewhat higher power output capability.

‡ Obtained from (a) fixed supply (b) control-grid resistor (c) cathode resistor, or by a combination of these methods.

** Averaged over any audio-frequency cycle of sine-wave form.

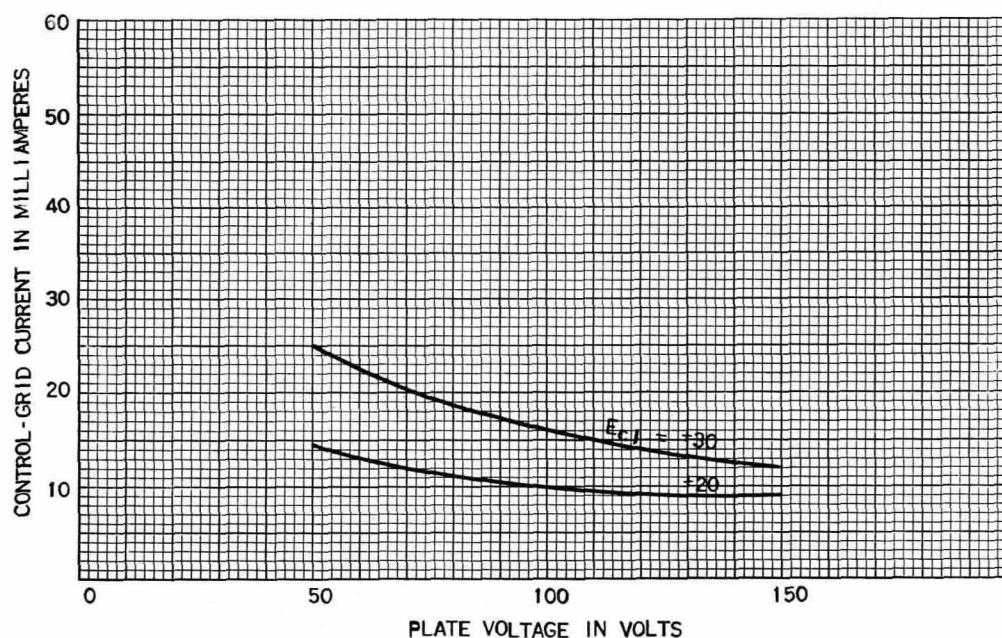
*** Plate power output includes circuit losses and radio-frequency radiation as well as useful power delivered to the load.

When d-c is used on the filament, the bias should be reduced approximately $3\frac{1}{2}$ volts, and the grid return made to the negative leg of the filament.

△ When modulated 100 per cent with a sine wave, the average power increases by 50 per cent. With a complex wave form, such as is produced by speech or music, the average power increases approximately 20 per cent to 25 per cent.

¶ Modulation essentially negative may be used if the positive peak of the envelope does not exceed 115 per cent of the carrier conditions.

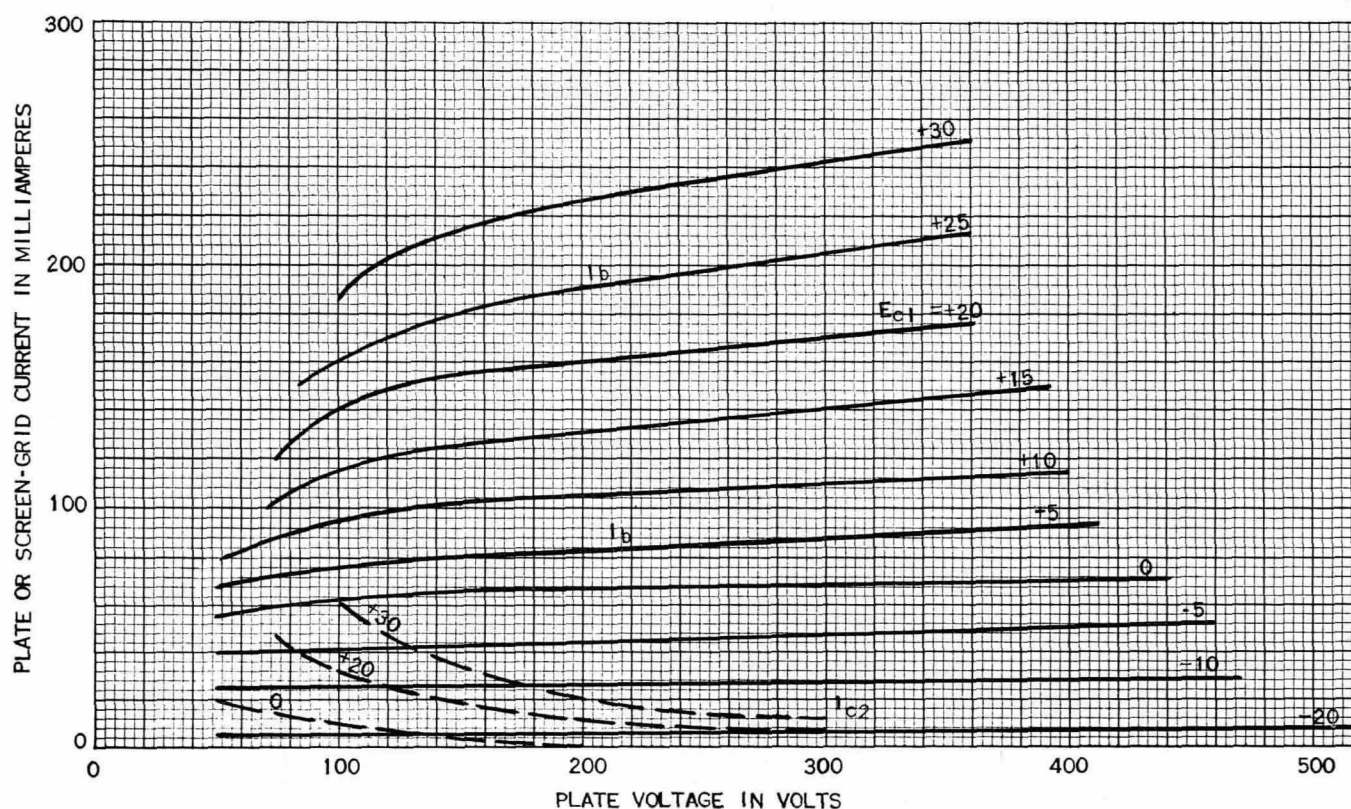
GL-2E30 AVERAGE PLATE CHARACTERISTICS
SCREEN VOLTAGE = 150 VOLTS D-C
 $E_i = 6$ VOLTS A-C



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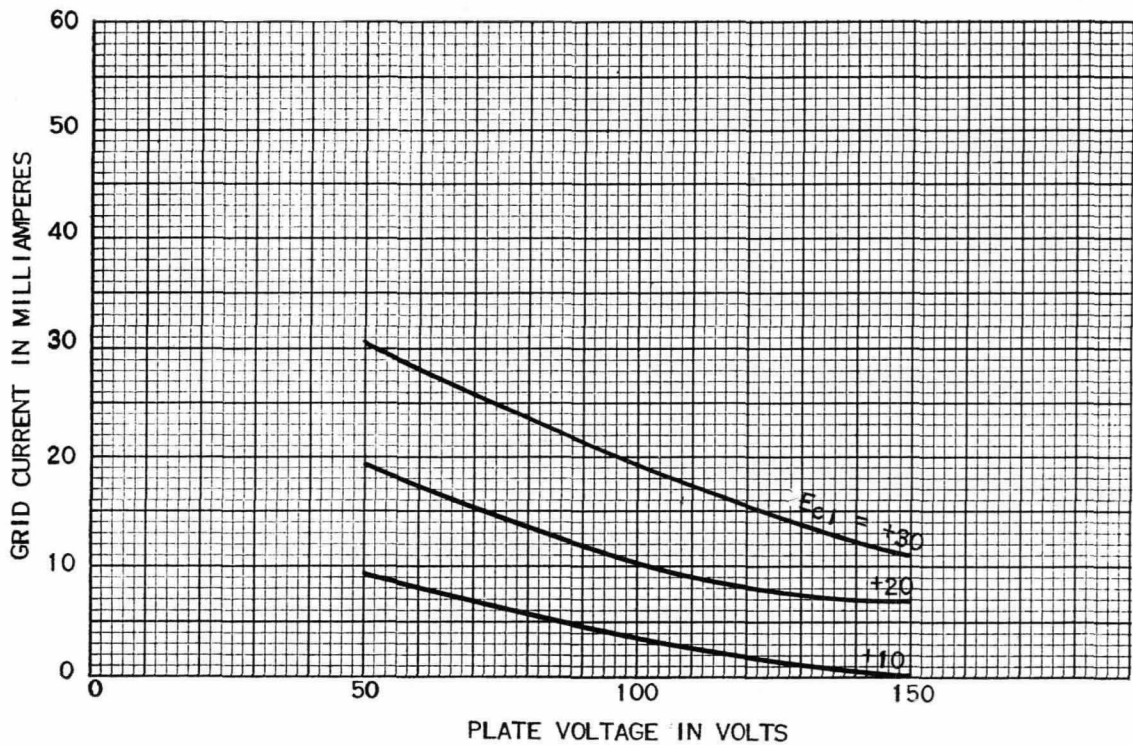
GL-2E30 AVERAGE PLATE CHARACTERISTICS
SCREEN VOLTAGE = 150 VOLTS D-C
 $E_i = 6$ VOLTS A-C



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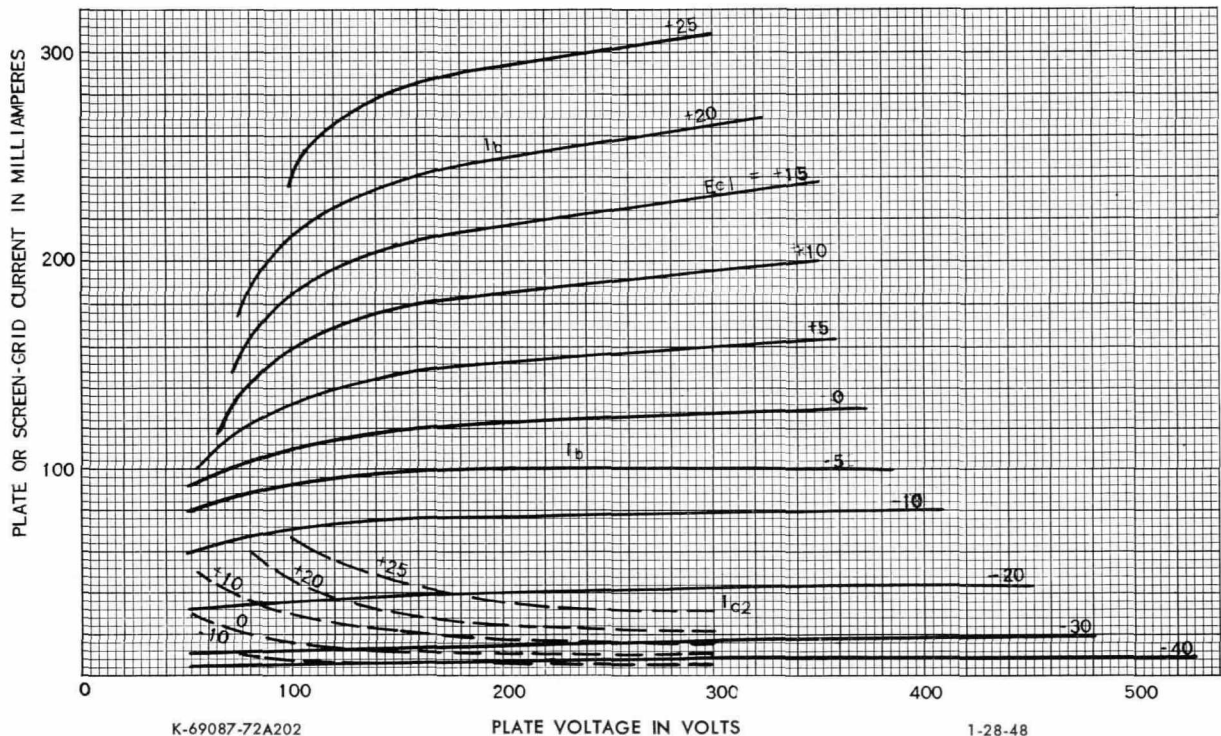
GL-2E30 CONTROL GRID CHARACTERISTICS
SCREEN VOLTAGE=200 VOLTS D-C
 $E_f=6$ VOLTS A-C



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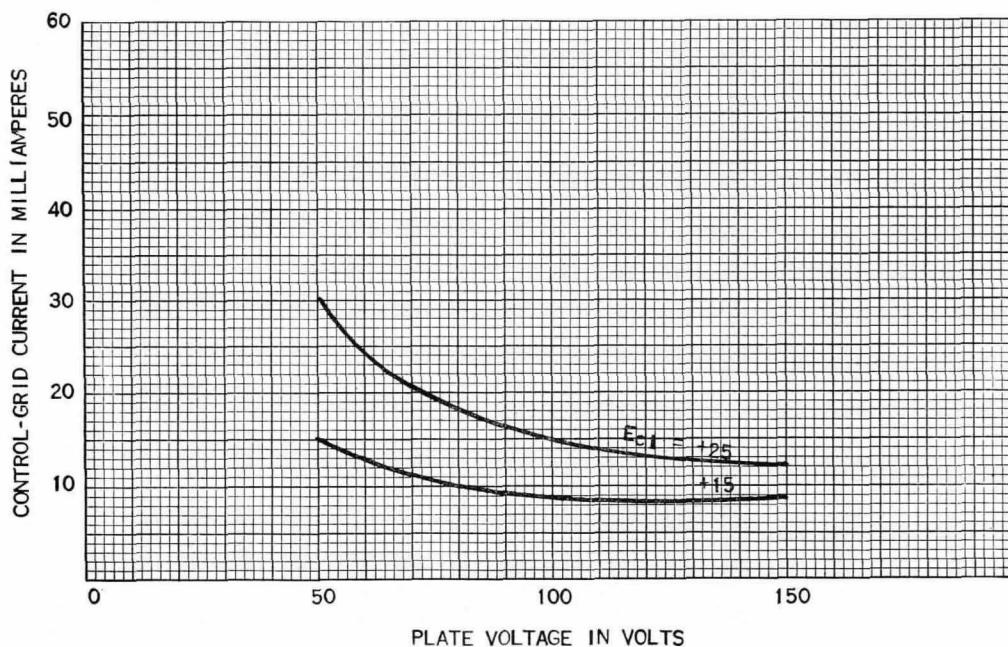
GL-2E30 AVERAGE PLATE CHARACTERISTICS
SCREEN VOLTAGE=200 VOLTS D-C
 $E_f=6$ VOLTS A-C



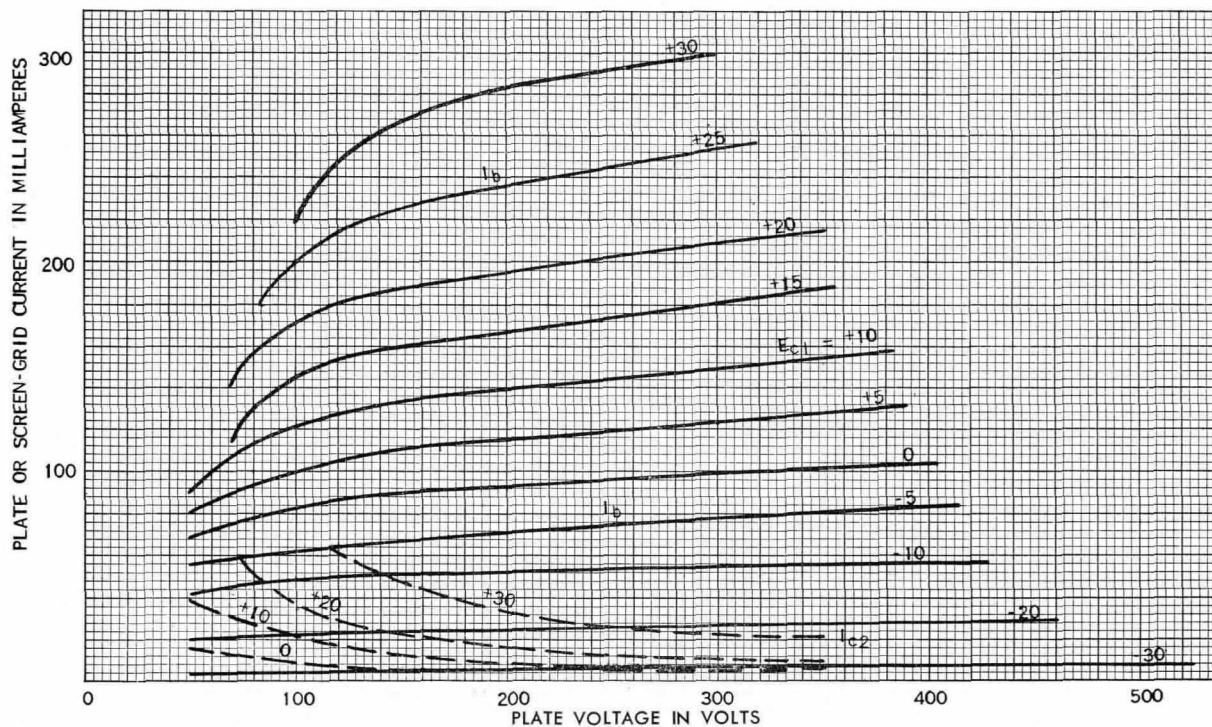
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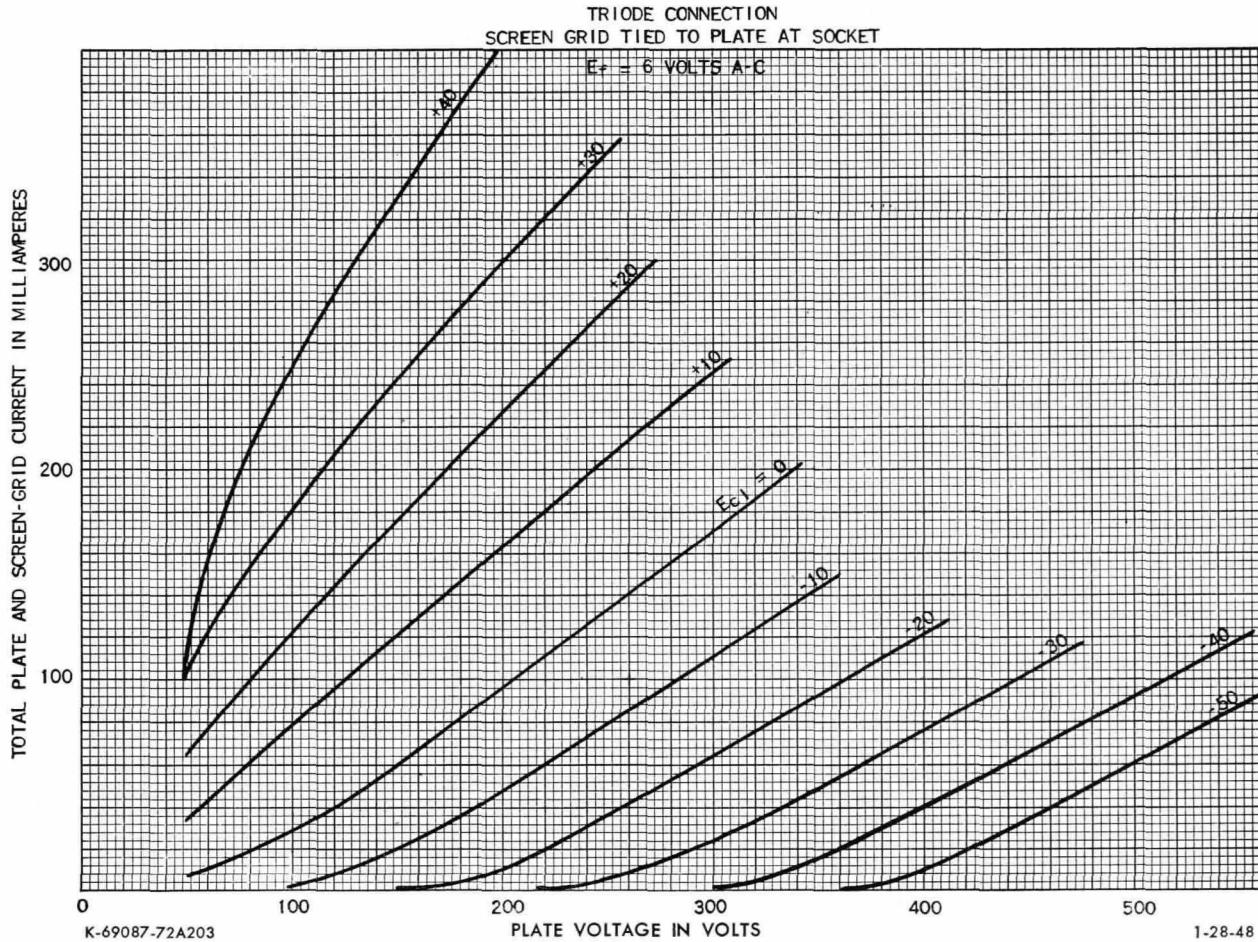
GL-2E30 CONTROL GRID CHARACTERISTICS
SCREEN VOLTAGE=250 VOLTS D-C
 $E_i=6$ VOLTS A-C



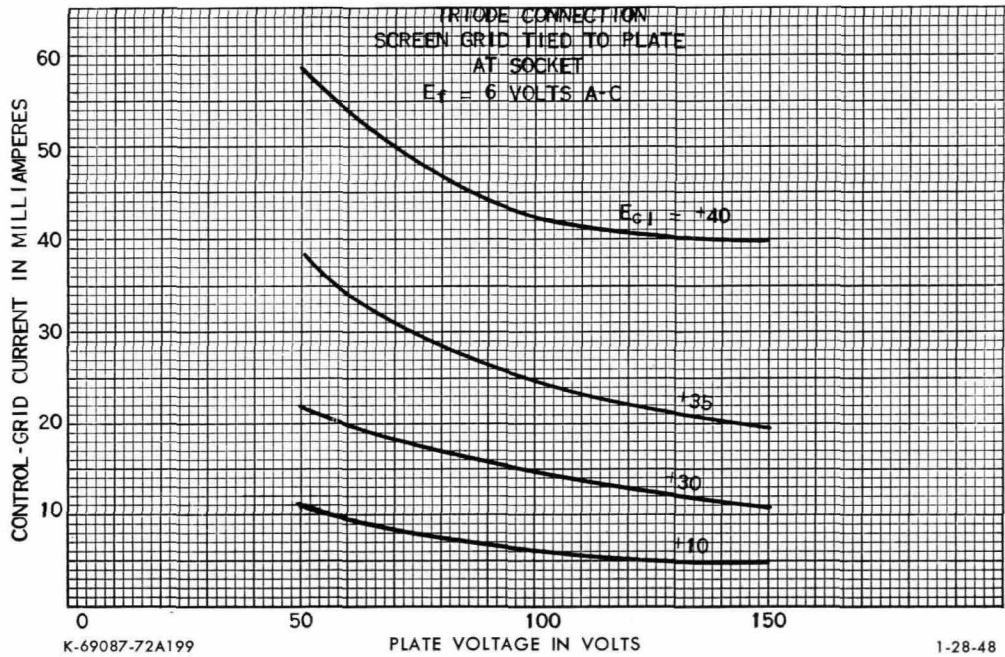
GL-2E30 AVERAGE PLATE CHARACTERISTICS
SCREEN VOLTAGE=250 VOLTS D-C
 $E_i=6$ VOLTS A-C

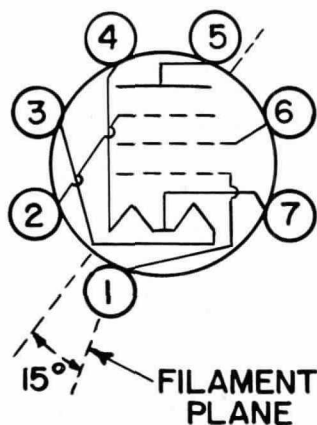
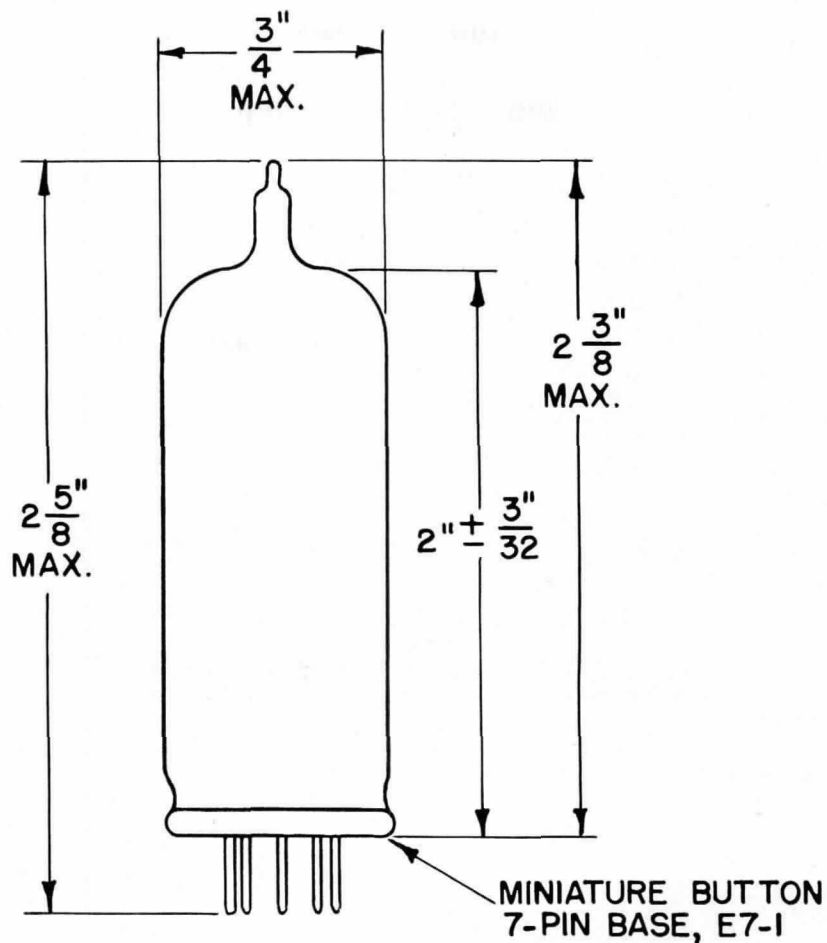


GL-2E30 AVERAGE PLATE CHARACTERISTICS



GL-2E30 CONTROL GRID CHARACTERISTICS





THE BEAM PLATES SHOULD BE CONNECTED DIRECTLY TO GROUND OR FILAMENT CENTER TAP. IN VERY-HIGH-FREQUENCY CIRCUITS THE CENTER TAP SHOULD BE BY-PASSED TO, OR GROUNDED TO, A COMMON POINT TO PROVIDE LOWEST EFFECTIVE FILAMENT INDUCTANCE.

BASING DIAGRAM
TRANSMITTING TUBE
GL-2E30

Electronics Department
GENERAL ELECTRIC
Schenectady, N. Y.