**Amperex® Electronic Corporation**
A NORTH AMERICAN PHILIPS COMPANY
PROFESSIONAL TUBE DIVISION
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Telephone: 516/931-6200 TWX: 510/221-1839

# TUBE TYPES 4-125A/4D21 6155

| | |
|---|---|
| TYPE | TETRODE |
| COOLING | RADIATION |
| ENVELOPE | GLASS |
| MAX. PWR INPUT | 625 W |
| MAX. PLATE DISS. | 125 W |
| MAX. FREQ. | 200 MHz |

The Amperex 4–125A/4D21 is a Premium version of the 4–125A, featuring a zirconium-coated heavy graphite anode for high intermittent overload capability and superior gas sorption for long life.

The 6155 is the same tube, but without the metal base. In most cases, the metal base, with its associated additional cost, is unnecessary except in critical neutralization applications. The tubes are intended for use as an RF or audio amplifier.

## GENERAL CHARACTERISTICS

### MECHANICAL

| | |
|---|---|
| Base | giant 5 pin, medium shell |
| Cooling[1] | radiation and air |
| Maximum Operating Temperatures[1] | |
| Bulb | 350°C |
| Plate Seal | 220°C |
| Pin Seals | 180°C |
| Mounting Position | vertical, base up or down |
| Accessories | |
| Plate Connector | S-25671 |
| Socket | Johnson #122-275 or equiv. |


### ELECTRICAL

| | |
|---|---|
| Filament | thoriated tungsten |
| Voltage | 5.0 volts |
| Current | 6.5 amps |
| Direct Interelectrode Capacitances | |
| Input | 10.8 pF |
| Output | 3.5 pF |
| Grid to Plate | 0.05 pF |
| Amplification Factor, $G_2$ to $G_1$ | 6.2 |
| Transconductance ($I_b$ = 40 ma) | 2200 μmhos |

[1] Radiation cooling of the tube is usually sufficient at frequencies below 50 MHz. Above 50 MHz, a low velocity air flow directed upon the anode seal and the bottom of the envelope is required, when tube is used at or near the maximum ratings.

**Amperex®**

AF Power Amplifier and Modulator
Class $AB_1$

Maximum Ratings, Absolute Values

| | CCS |
|---|---|
| DC Plate Voltage | 3000 volts |
| DC Grid No. 2 Voltage | 600 volts |
| DC Grid No. 1 Voltage | -500 volts |
| Maximum Signal DC Plate Current[3] | 225 mA |
| Maximum Signal Grid No. 2 Input[3] | 20 watts |
| Plate Dissipation[3] | 125 watts |

Typical Operation
Unless otherwise specified, values are for two tubes

| | CCS | CCS | CCS |
|---|---|---|---|
| DC Plate Voltage | 1,500 | 2,000 | 2,500 volts |
| DC Grid No. 2 Voltage | 600 | 600 | 600 volts |
| DC Grid No. 1 Voltage | -94 | -95.5 | -97 volts |
| Peak AF Grid No. 1 to Grid No. 1 Voltage | 185 | 186 | 190 volts |
| Zero Signal DC Plate Current | 60 | 60 | 60 mA |
| Maximum Signal DC Plate Current | 208 | 222 | 216 mA |
| Zero Signal DC Grid No. 2 Current | 0.3 | 0.2 | 0.2 mA |
| Maximum Signal DC Grid No. 2 Current | 27 | 24 | 26 mA |
| Effective Load Resistance, Plate to Plate | 12,000 | 17,600 | 25,000 ohms |
| Maximum Signal Driving Power[4] | 0 | 0 | 0 watts |
| Maximum Signal Power Output | 170 | 260 | 345 watts |

AF Power Amplifier and Modulator
Class $AB_2$

Maximum Ratings, Absolute Values

| | CCS |
|---|---|
| DC Plate Voltage | 3000 volts |
| DC Grid No. 2 Voltage | 400 volts |
| DC Grid No. 1 Voltage | -500 volts |
| Maximum Signal DC Plate Current[3] | 225 mA |
| Maximum Signal Grid No. 2 Input[3] | 20 watts |
| Plate Dissipation[3] | 125 watts |

[2] Maximum ratings apply up to 120 megahertz. The tube may be operated at higher frequencies provided the maximum values of plate voltage and power input are reduced according to the tabulation below (other maximum ratings are the same as shown above). Special attention should be given to adequate ventilation of the bulb at these frequencies.

| Frequency | 120 | 170 | 200 MHz |
|---|---|---|---|
| Rated Plate Input | | | |
| Class B | 200 | 190 | 150 watts |
| Class C Plate Telephony | 415 | 375 | 290 watts |
| Class C Telegraphy | 625 | 560 | 435 watts |
| Rated Plate Voltage | | | |
| Class B | 3000 | 2500 | 2200 volts |
| Class C Plate Telephony | 2500 | 2100 | 1800 volts |
| Class C Telegraphy | 3000 | 2500 | 2200 volts |

[3] Averaged over any audio-frequency cycle of sine-wave form.
[4] The effective resistance per grid No. 1 circuit of the class $AB_1$ stage should be kept below 0.15 megohms.

Typical Operation
Unless otherwise specified, values are for two tubes

| | CCS | CCS | CCS | |
|---|---|---|---|---|
| DC Plate Voltage | 1,500 | 2,000 | 2,500 | volts |
| DC Grid No. 2 Voltage | 350 | 350 | 350 | volts |
| DC Grid No. 1 Voltage | -48 | -50 | -51 | volts |
| Peak AF Grid No. 1 to Grid No. 1 Voltage | 330 | 296 | 240 | volts |
| Zero Signal DC Plate Current | 60 | 60 | 60 | mA |
| Maximum Signal DC Plate Current | 455 | 395 | 302 | mA |
| Zero Signal DC Grid No. 2 Current | 0.5 | 0.3 | 0.2 | mA |
| Maximum Signal DC Grid No. 2 Current | 84 | 64 | 36 | mA |
| Effective Load Resistance, Plate to Plate | 7,200 | 12,000 | 20,000 | ohms |
| Maximum Signal Driving Power[5] | 4.8 | 3.2 | 1.8 | watts |
| Maximum Signal Power Output | 455 | 550 | 550 | watts |

RF Power Amplifier
Class B

Carrier conditions per tube for use with a maximum modulation factor of 1.0

Maximum Ratings, Absolute Values[2]

| | CCS | |
|---|---|---|
| DC Plate Voltage | 3000 | volts |
| DC Grid No. 2 Voltage | 400 | volts |
| DC Plate Current | 135 | mA |
| Plate Input | 200 | watts |
| Grid No. 2 Input | 14 | watts |
| Plate Dissipation | 125 | watts |

Typical Operation

| | CCS | CCS | CCS | |
|---|---|---|---|---|
| DC Plate Voltage | 2000 | 2500 | 3000 | volts |
| DC Grid No. 2 Voltage | 350 | 350 | 350 | volts |
| DC Grid No. 1 Voltage | -50 | -50 | -50 | volts |
| Peak RF Grid No. 1 Voltage | 65 | 55 | 50 | volts |
| DC Plate Current | 83 | 70 | 60 | mA |
| DC Grid No. 2 Current | 1.5 | 1 | 1 | mA |
| DC Grid No. 1 Current (approx.)[6] | 4 | 4 | 4.5 | mA |
| Driving Power (approx.)[6] | 0.52 | 0.44 | 0.45 | watt |
| Power Output (approx.) | 54 | 55 | 58 | watts |

Plate and Screen Grid Modulated
RF Power Amplifier
Class C-Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1.0

Maximum Ratings, Absolute Values[2]

| | CCS | |
|---|---|---|
| DC Plate Voltage | 2500 | volts |
| DC Grid No. 2 Voltage | 400 | volts |
| DC Grid No. 1 Voltage | -500 | volts |
| DC Plate Current | 200 | mA |
| DC Grid No. 1 Current | 15 | mA |
| Plate Input | 415 | watts |
| Grid No. 2 Input | 20 | watts |
| Plate Dissipation | 83 | watts |

[5] Driver stage should be capable of supplying the No. 1 grids of the class $AB_2$ stage with the specific driving power at low distortion. When a bias supply is used, the DC-resistance of the bias source should not exceed 250 ohms.

[6] At crest of audio-frequency cycle with modulation factor of 1.0

Typical Operation

| | CCS | CCS | CCS |
|---|---|---|---|
| DC Plate Voltage | 1500 | 2000 | 2500 volts |
| DC Grid No. 2 Voltage | 300 | 350 | 350 volts |
| DC Grid No. 1 Voltage | − 150 | -220 | -210 volts |
| Peak AF Grid No. 2 Voltage | 255 | 300 | 300 volts |
| Peak RF Grid No. 1 Voltage | 250 | 390 | 380 volts |
| DC Plate Current | 160 | 150 | 152 mA |
| DC Grid No. 2 Current | 33 | 33 | 30 mA |
| DC Grid No. 1 Current (approx.) | 10 | 5 | 4.5 mA |
| Driving Power (approx.) | 2.5 | 2 | 1.7 watts |
| Power Output (approx.) | 157 | 225 | 300 watts |
| Modulation Factor | 100 | 100 | 100 % |
| Modulation Power | 120 | 150 | 190 watts |
| Efficiency | 65 | 75 | 79 % |

RF Power Amplifier and Oscillator
Class C-Telegraphy
Key-down conditions per tube without amplitude modulation[7]
Maximum Ratings, Absolute Values[2]

| | CCS |
|---|---|
| DC Plate Voltage | 3000 volts |
| DC Grid No. 2 Voltage | 400 volts |
| DC Grid No. 1 Voltage | -500 volts |
| DC Plate Current | 225 mA |
| DC Grid No. 1 Current | 15 mA |
| Plate Input | 625 watts |
| Grid No. 2 Input | 20 watts |
| Plate Dissipation | 125 watts |

Typical Operation

| | CCS | CCS | CCS | CCS |
|---|---|---|---|---|
| DC Plate Voltage | 1500 | 2000 | 2500 | 3000 volts |
| DC Grid No. 2 Voltage | 350 | 350 | 350 | 350 volts |
| DC Grid No. 1 Voltage | − 150 | -100 | -150 | -150 volts |
| Peak RF Grid No. 1 Voltage | 225 | 260 | 330 | 300 volts |
| DC Plate Current | 110 | 200 | 200 | 167 mA |
| DC Grid No. 2 Current | 56 | 50 | 40 | 30 mA |
| DC Grid No. 1 Current (approx.) | 8 | 9 | 9 | 6.5 mA |
| Driving Power (approx.) | 1.7 | 2.4 | 3.0 | 2.0 watts |
| Power Output (approx.) | 110 | 275 | 375 | 375 watts |
| Efficiency | 67 | 69 | 75 | 75 % |

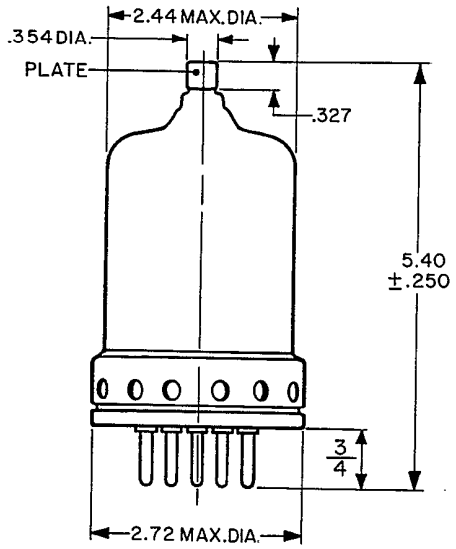
Class $AB_1$ Linear RF Amplifier
Single Sideband Suppressed Carrier Operation
Maximum Ratings, Absolute Values[2]

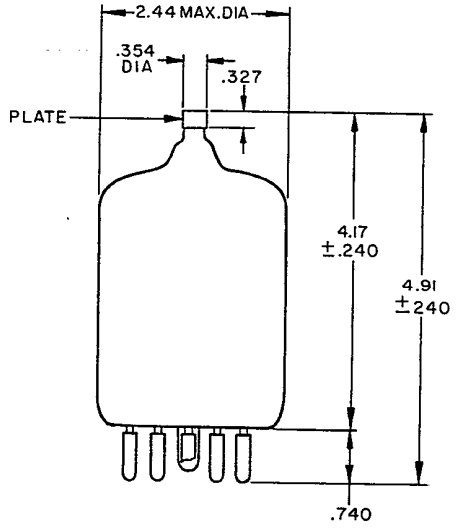
| | CCS |
|---|---|
| DC Plate Voltage | 3000 volts |
| DC Grid No. 2 Voltage | 660 volts |
| DC Grid No. 1 Voltage | -500 volts |
| DC Plate Current | 225 mA |
| Plate Input | 625 watts |
| Plate Dissipation | 125 watts |
| Grid No. 2 Input | 20 watts |
| DC Grid No. 1 Current | 15 mA |

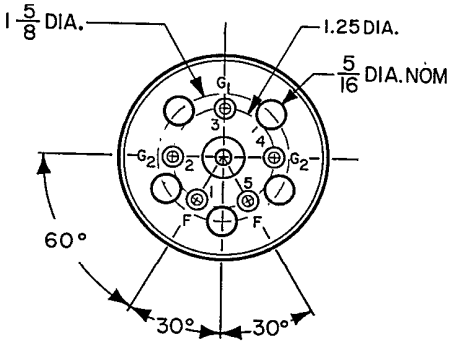
[7] Modulation essentially negative may be used if the positive peak of the envelope does not exceed 115 per cent of the carrier conditions.

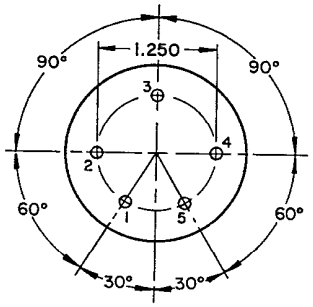
Typical Operation
Single Tone and/or Two Tone Modulation

| | CCS | CCS | CCS | CCS |
|---|---|---|---|---|
| DC Plate Voltage | 3,000 | 2,500 | 2,000 | 1,500 volts |
| DC Grid No. 2 Voltage | 600 | 600 | 600 | 600 volts |
| DC Grid No. 1 Voltage | -108 | -103 | -99 | -100 volts |
| Zero Signal DC Plate Current | 23 | 27 | 30 | 26 mA |
| Zero Signal DC Grid No. 2 Current | 2 | 2 | 1 | 1 mA |
| Effective RF Load Resistance | 15,000 | 13,000 | 11,000 | 7,500 ohms |
| **Single Tone Modulation** | | | | |
| Maximum Signal DC Plate Current | 115 | 111 | 103 | 114 mA |
| Maximum Signal DC Grid No. 2 Current | 14 | 18 | 27 | 16 mA |
| Maximum Signal DC Grid No. 1 Current | 0 | 0 | 0 | 0 mA |
| Maximum Signal Peak RF Grid Voltage | 108 | 103 | 99 | 100 volts |
| Maximum Signal Driving Power | 0 | 0 | 0 | 0 watts |
| Maximum Signal Plate Power Output | 228 | 162 | 142 | 98 watts |
| **Two Tone Modulation** | | | | |
| Average DC Plate Current | 77 | 73 | 74 | 77 mA |
| Average DC Grid No. 2 Current | 7 | 5 | 11 | 8 mA |
| Average DC Grid No. 1 Current | 0 | 0 | 0 | 0 mA |
| Maximum Resultant Peak RF Grid Voltage | 108 | 103 | 99 | 100 volts |
| Average Plate Power Output | 103 | 75 | 64 | 44 watts |
| Peak Envelope Plate Power Output | 206 | 150 | 128 | 88 watts |
| 3rd Order Intermodulation Distortion | 30 | 32 | 34 | 35 dB |




**GIANT 5 PIN BASE**

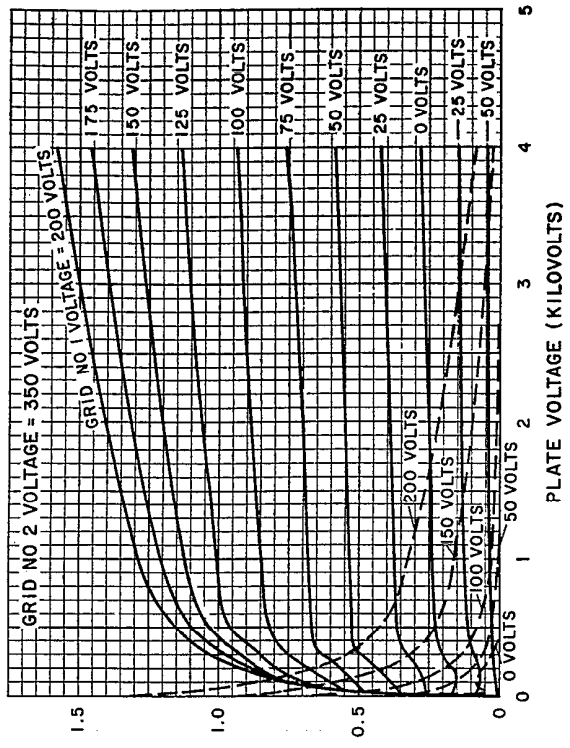
5 PINS, .187 ± .003 DIA.

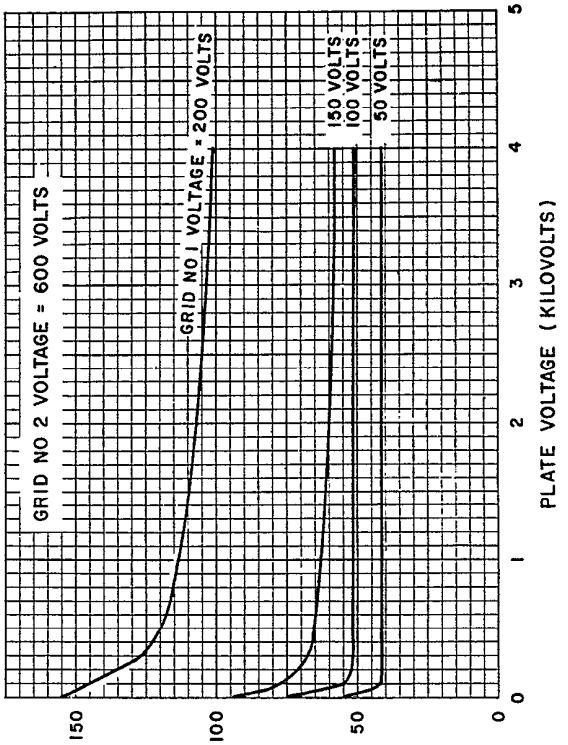
**PIN CONNECTIONS**

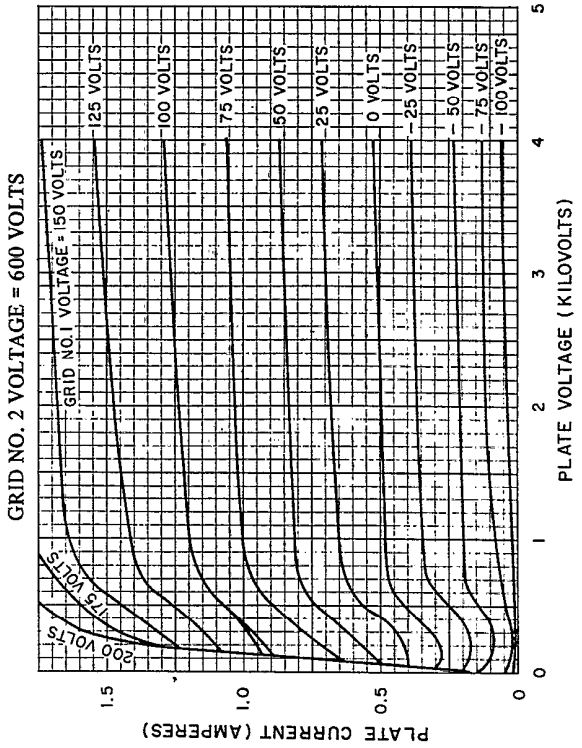
1 - FILAMENT
2 - GRID NO. 2
3 - GRID NO. 1
4 - GRID NO. 2
5 - FILAMENT

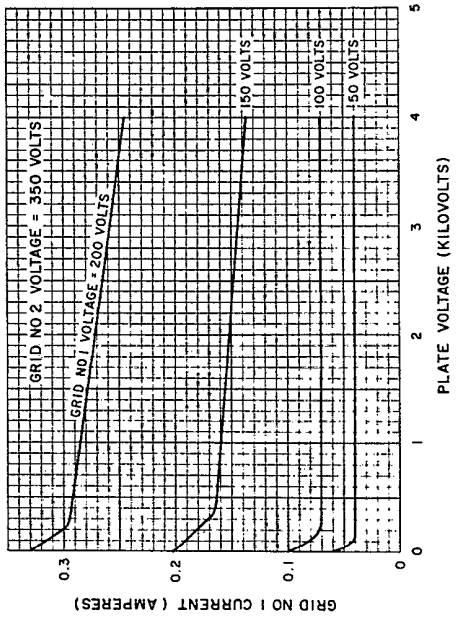
**4-125A/4D21** **6155** **4-125A/4D21 6155**

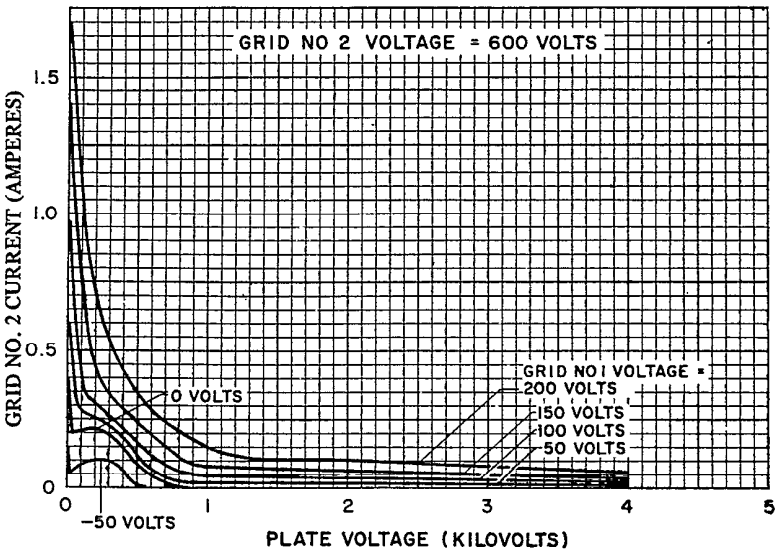
NOTE: IN ORDER TO PREVENT OVERHEATING OF THE GRID NO. 2 PINS IT IS RECOMMENDED THAT BOTH PINS BE CONNECTED TO THE CIRCUIT.

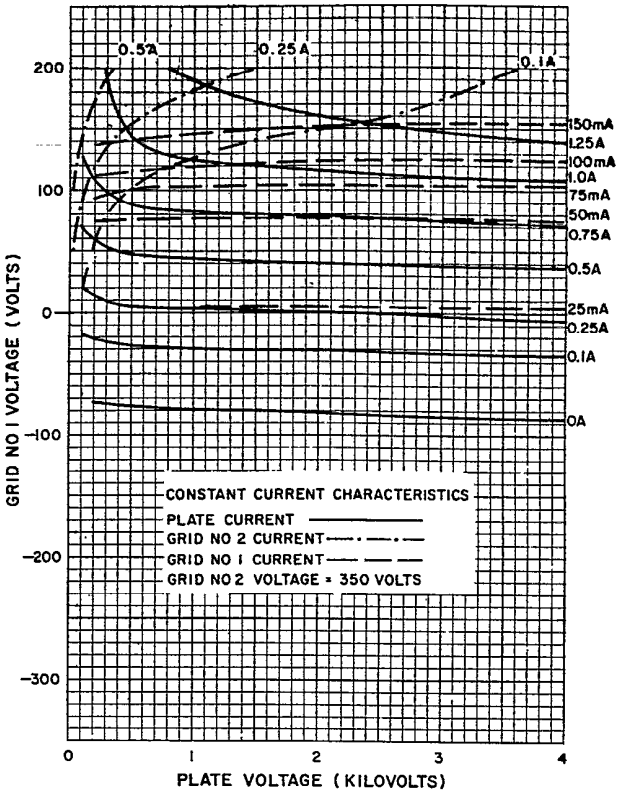

GRID NO 2 VOLTAGE = 350 VOLTS
GRID NO 1 VOLTAGE = 200 VOLTS
175 VOLTS
150 VOLTS
125 VOLTS
100 VOLTS
75 VOLTS
50 VOLTS
25 VOLTS
0 VOLTS
-25 VOLTS
-50 VOLTS
200 VOLTS
150 VOLTS
100 VOLTS
50 VOLTS
PLATE VOLTAGE (KILOVOLTS)
PLATE & GRID NO. 2 CURRENT (AMPERES)

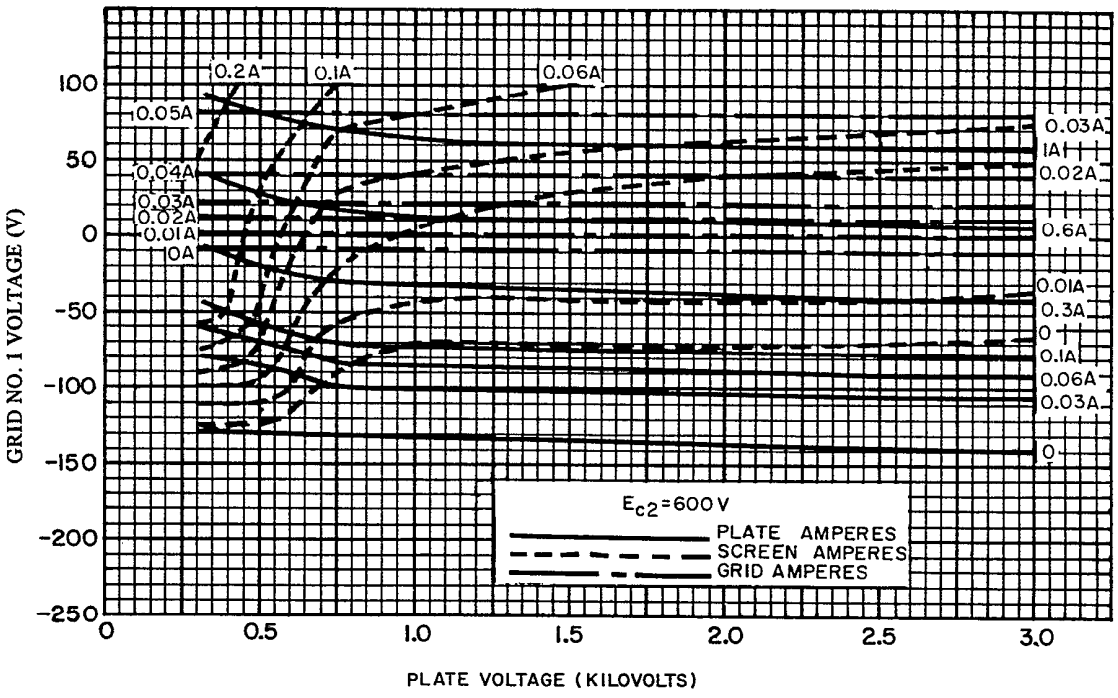

GRID NO 2 VOLTAGE = 600 VOLTS
GRID NO 1 VOLTAGE = 200 VOLTS
150 VOLTS
100 VOLTS
50 VOLTS
PLATE VOLTAGE (KILOVOLTS)
GRID NO 1 CURRENT (MILLIAMPERES)


GRID NO. 2 VOLTAGE = 600 VOLTS
GRID NO.1 VOLTAGE = 150 VOLTS
200 VOLTS
175 VOLTS
150 VOLTS
125 VOLTS
100 VOLTS
75 VOLTS
50 VOLTS
25 VOLTS
0 VOLTS
-25 VOLTS
-50 VOLTS
-75 VOLTS
-100 VOLTS
PLATE VOLTAGE (KILOVOLTS)
PLATE CURRENT (AMPERES)


GRID NO 2 VOLTAGE = 350 VOLTS
GRID NO 1 VOLTAGE = 200 VOLTS
150 VOLTS
100 VOLTS
50 VOLTS
PLATE VOLTAGE (KILOVOLTS)
GRID NO 1 CURRENT (AMPERES)


GRID NO 2 VOLTAGE = 600 VOLTS
GRID NO. 2 CURRENT (AMPERES)
1.5
1.0
0.5
0
0 VOLTS
GRID NO I VOLTAGE =
200 VOLTS
150 VOLTS
100 VOLTS
50 VOLTS
-50 VOLTS
0
1
2
3
4
5
PLATE VOLTAGE (KILOVOLTS)


0.5A
0.25A
0.1A
200
100
0
-100
-200
-300
GRID NO I VOLTAGE (VOLTS)
150mA
1.25A
100mA
1.0A
75mA
50mA
0.75A
0.5A
25mA
0.25A
0.1A
0A
CONSTANT CURRENT CHARACTERISTICS
PLATE CURRENT
GRID NO 2 CURRENT
GRID NO I CURRENT
GRID NO2 VOLTAGE = 350 VOLTS
0
1
2
3
4
PLATE VOLTAGE (KILOVOLTS)


0.2A
0.1A
0.06A
0.05A
0.04A
0.03A
0.02A
0.01A
0A
100
50
0
-50
-100
-150
-200
-250
GRID NO. 1 VOLTAGE (V)
0.03A
IA
0.02A
0.6A
0.01A
0.3A
0
0.1A
0.06A
0.03A
0
Ec2=600V
PLATE AMPERES
SCREEN AMPERES
GRID AMPERES
0
0.5
1.0
1.5
2.0
2.5
3.0
PLATE VOLTAGE (KILOVOLTS)