

## Gas Thyatron

## TETRODE TYPE

For Relay and Grid-Controlled-Rectifier Service

## GENERAL DATA

## Electrical:

Heater, for Unipotential Cathode:

|                                |           |       |
|--------------------------------|-----------|-------|
| Voltage (AC or DC) . . . . .   | 6.3 ± 10% | volts |
| Current at 6.3 volts . . . . . | 0.6       | amp   |

Cathode:

|   |    |     |
|---|----|-----|
| Minimum heating time prior to tube conduction . . . . . | 10 | sec |
|---|----|-----|

Direct Interelectrode Capacitances (Approx.):<sup>a</sup>

|  |      |     |
|--|------|-----|
| Grid No.1 to anode . . . . .                 | 0.15 | μmf |
| Grid No.1 to cathode and grid No.2 . . . . . | 2.2  | μmf |

Ionization Time (Approx.):

|  |     |      |
|--|-----|------|
| For dc anode volts = 100, grid-No.1 volts (square-wave pulse) = 50, peak anode amperes during conduction = 1 . . . . . | 0.5 | μsec |
|--|-----|------|

Deionization Time (Approx.):

|   |    |      |
|---|----|------|
| With dc anode volts = 125, grid-No.1 volts = -250, grid-No.1 resistor (ohms) = 1000, dc anode amperes = 0.1 . . . . . | 50 | μsec |
|---|----|------|

|  |     |      |
|--|-----|------|
| With dc anode volts = 125, grid-No.1 volts = -10, grid-No.1 resistor (ohms) = 1000, dc anode amperes = 0.1 . . . . . | 100 | μsec |
|--|-----|------|

Maximum Critical Grid-No.1 Current for

|  |     |    |
|--|-----|----|
| dc anode supply volts (rms) = 460, average anode amperes = 0.1 . . . . . | 0.5 | μa |
|--|-----|----|

Anode Voltage Drop (Approx.) . . . . . 8 volts

Grid-No.1 Control Ratio (Approx.) for grid-

|  |     |
|--|-----|
| No.1 resistor (ohms) = 0, grid No.2 connected to cathode at socket . . . . . | 250 |
|--|-----|

Grid-No.2 Control Ratio (Approx.) for

|  |     |
|--|-----|
| grid-No.1 resistor (ohms) = 0, grid-No.2 resistor (ohms) = 0, grid No.1 connected to cathode at socket . . . . . | 800 |
|--|-----|

## Mechanical:

Operating Position . . . . . Any

Maximum Overall Length . . . . . 3-1/16"

Maximum Seated Length . . . . . 2-1/2"

Maximum Diameter . . . . . 1-9/32"

Dimensional Outline . . . . . See *General Section*

Bulb . . . . . T9

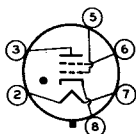
Base . . . . . Intermediate-Shell Octal 6-Pin, Arrangement 3, with External Barriers (JEDEC Group 1, B6-229)



# 2050-A

Basing Designation for BOTTOM VIEW. . . . . 6BS

Pin 2 - Heater  
Pin 3 - Anode  
Pin 5 - Grid No.1



Pin 6 - Grid No.2  
Pin 7 - Heater  
Pin 8 - Cathode

## RELAY AND GRID-CONTROLLED-RECTIFIER SERVICE

### Maximum and Minimum Ratings, Absolute-Maximum Values:

*For anode supply frequency of 60 cps*

|                                      |            |            |       |
|--------------------------------------|------------|------------|-------|
| PEAK ANODE VOLTAGE:                  |            |            |       |
| Forward. . . . .                     | 180 max.   | 650 max.   | volts |
| Inverse. . . . .                     | 360 max.   | 1300 max.  | volts |
| GRID-No.2 (SHIELD-GRID)<br>VOLTAGE:  |            |            |       |
| Peak, before tube                    |            |            |       |
| conduction . . . . .                 | -100 max.  | -100 max.  | volts |
| Average <sup>b</sup> , during tube   |            |            |       |
| conduction . . . . .                 | -10 max.   | -10 max.   | volts |
| GRID-No.1 (CONTROL-GRID)<br>VOLTAGE: |            |            |       |
| Peak, before tube                    |            |            |       |
| conduction . . . . .                 | -250 max.  | -250 max.  | volts |
| Average <sup>b</sup> , during tube   |            |            |       |
| conduction . . . . .                 | -10 max.   | -10 max.   | volts |
| CATHODE CURRENT:                     |            |            |       |
| Peak . . . . .                       | 1 max.     | 1 max.     | amp   |
| Average <sup>b</sup> . . . . .       | 0.2 max.   | 0.1 max.   | amp   |
| Fault, for duration of 0.1           |            |            |       |
| second maximum . . . . .             | 10 max.    | 10 max.    | amp   |
| GRID-No.2 CURRENT:                   |            |            |       |
| Average <sup>b</sup> . . . . .       | +0.01 max. | +0.01 max. | amp   |
| GRID-No.1 CURRENT:                   |            |            |       |
| Average <sup>b</sup> . . . . .       | +0.01 max. | +0.01 max. | amp   |
| PEAK HEATER-CATHODE VOLTAGE:         |            |            |       |
| Heater negative with                 |            |            |       |
| respect to cathode . . .             | 100 max.   | 100 max.   | volts |
| Heater positive with                 |            |            |       |
| respect to cathode . . .             | 25 max.    | 25 max.    | volts |
| AMBIENT-TEMPERATURE RANGE. . .       |            |            |       |
|                                      | -75 to +90 | -75 to +90 | °C    |

### Typical Operation for Relay Service:

|   |                                       |      |        |
|---|---------------------------------------|------|--------|
| RMS Anode Voltage. . . . .                        | 117                                   | 400  | volts  |
| Grid No.2. . . . .                                | <i>Connected to cathode at socket</i> |      |        |
| RMS Grid-No.1 Bias Voltage <sup>c</sup> . . . . . | 5                                     | -    | volts  |
| DC Grid-No.1 Bias Voltage. . . . .                | -                                     | -6   | volts  |
| Peak Grid-No.1 Signal                             |                                       |      |        |
| Voltage. . . . .                                  | 5                                     | 6    | volts  |
| Grid-No.1-Circuit                                 |                                       |      |        |
| Resistance . . . . .                              | 1                                     | 1    | megohm |
| Anode-Circuit Resistance <sup>d</sup> . . . . .   | 1200                                  | 2000 | ohms   |



**Maximum Circuit Values:**

## Grid-No.1-Circuit Resistance:

|                                 |                 |
|---------------------------------|-----------------|
| For average anode current below |                 |
| 0.1 ampere. . . . .             | 10 max. megohms |
| For average anode current above |                 |
| 0.1 ampere. . . . .             | 2 max. megohms  |

- a Without external shield.  
 b Averaged over any interval of 30 seconds maximum.  
 c Approximately  $180^{\circ}$  out of phase with the anode voltage.  
 d Sufficient resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the current ratings.

**OPERATING CONSIDERATIONS**

The *heater* is designed to operate on either ac or dc at 6.3 volts. Regardless of the heater-voltage supply used, *the heater voltage must never be allowed to deviate from its rated range.* Heater operation outside of this voltage range will impair tube performance and may cause tube failure. Low heater voltage causes low cathode temperature with resultant cathode sputtering and consequent destruction of the cathode; high heater voltage causes high cathode temperature with resultant heating of the grid and consequent grid emission which produces unpredictable shifts in the critical grid-No.1 voltage for conduction.

The *cathode* should be allowed to reach normal operating temperature before anode current is drawn. *The delay period should not be less than 10 seconds after application of heater voltage.* Unless this recommendation is followed, the cathode will be damaged.

The *shield grid* (grid No.2) is normally connected to the cathode at socket. It may, however, be used as a control electrode because the control characteristic of grid No.1 may be shifted by varying the potential of grid No.2. As grid No.2 is made negative, the grid-No.1 characteristic is shifted in the positive direction. The use of grid No.2 as the control electrode (with grid No.1 connected to cathode at socket) has the advantage of increased sensitivity but consideration must be given to the higher pre-conduction current, higher capacitance to anode, and less stability of operation.

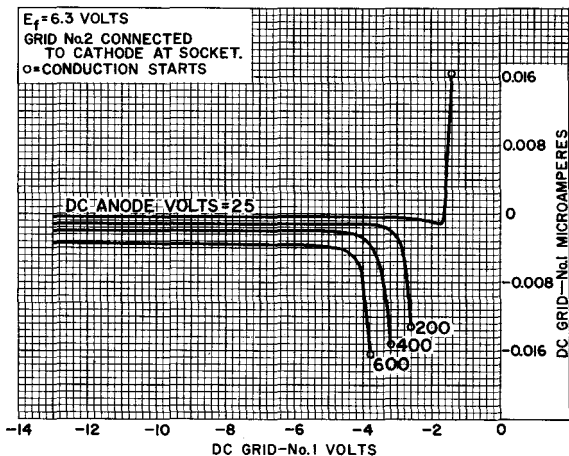
A *grid-No.1 resistor* having a value as high as 10 megohms to give circuit sensitivity can be used with the 2050-A because its control-grid current is very low. However, when a high value of grid resistor is used, care should be taken to keep the tube base and socket clean and dry in order to make the effect of leakage currents between the control-grid base pin and anode base pin very small.

*Sufficient anode-circuit resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the current ratings of the tube.*



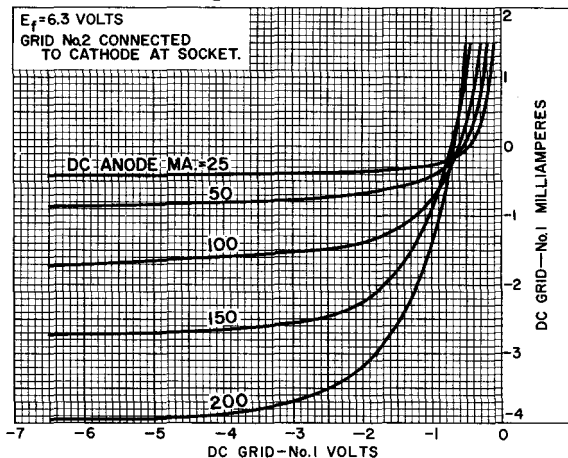
# 2050-A

## AVERAGE GRID-No.1 CHARACTERISTICS Before Tube Conduction



92CS-6541R2

## During Tube Conduction



92CS-6275R2



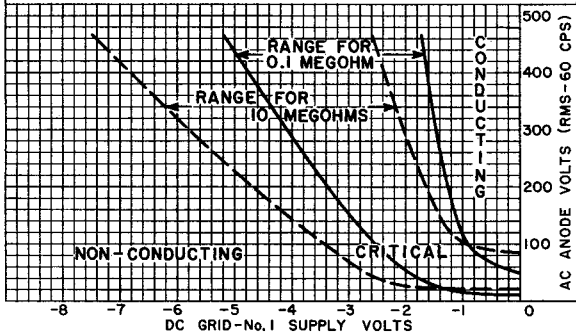
## OPERATIONAL RANGE OF CRITICAL GRID-No.1 VOLTAGE

$E_f = 6.3 \pm 10\%$  VOLTS

GRID No.2 CONNECTED TO CATHODE AT SOCKET.

AMBIENT-TEMPERATURE RANGE ( $^{\circ}\text{C}$ ) = -75 TO +90

RANGES SHOWN ARE FOR TWO VALUES OF GRID-No.1 RESISTOR AND TAKE INTO ACCOUNT INITIAL DIFFERENCES BETWEEN INDIVIDUAL TUBES AND SUBSEQUENT DIFFERENCES DURING TUBE LIFE.



92CS-6540R3



# 2050-A

## AVERAGE CONTROL CHARACTERISTICS

