

Planar triode for use as microwave amplifier, mixer and oscillator at frequencies of about 4000 Mc. High transconductance gives the tube a superior figure of merit. Exceptionally low noise factor makes it particularly suitable as a pre-amplifier at very high frequencies ranging from 200 Mc to 4000 Mc. The frame grid, which is similar in principle to that described in Section A, has a lateral wire diameter of only .0065 mm.

## CAPACITANCES

|                                                      |     |                  |
|------------------------------------------------------|-----|------------------|
| Grid to Plate, cold tube . . . . .                   | 1.5 | $\mu\mu\text{F}$ |
| Grid to Shell*, cold tube . . . . .                  | 10  | $\mu\mu\text{F}$ |
| Grid to Shell*, $E_f = 6.1$ v, $E_b = 0$ v . . . . . | 9   | $\mu\mu\text{F}$ |
| Plate to Shell*, cold tube . . . . .                 | .02 | $\mu\mu\text{F}$ |
| Cathode to Shell, cold tube . . . . .                | 45  | $\mu\mu\text{F}$ |

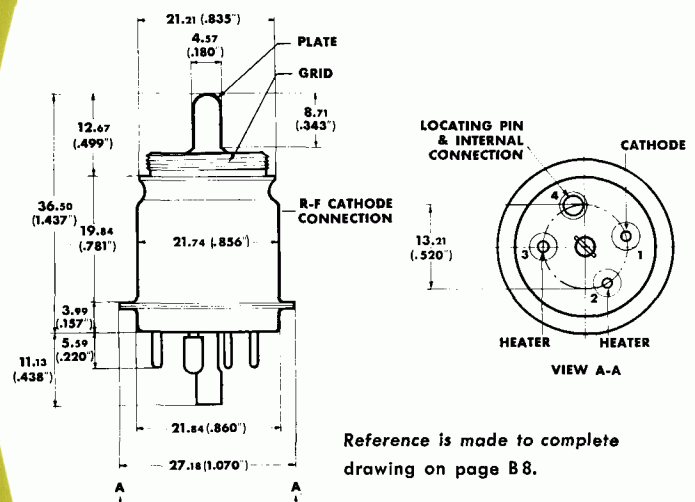
\* Cathode connected to Shell through "cathode to shell" capacitance.

## ABSOLUTE MAXIMUM RATINGS

|                                        |       |       |
|----------------------------------------|-------|-------|
| Plate Voltage . . . . .                | 270   | volts |
| Grid Voltage, positive value . . . . . | + 1.5 | volts |
| Grid Voltage, negative value . . . . . | - 15  | volts |
| Plate Current . . . . .                | 33    | ma    |
| Grid Current . . . . .                 | 15    | ma    |
| Plate Dissipation . . . . .            | 7.5   | watts |
| Heater — Cathode Voltage . . . . .     | 45    | volts |
| Plate Seal Temperature . . . . .       | 150   | °C    |
| Grid Seal Temperature . . . . .        | 100   | °C    |

## MECHANICAL DATA

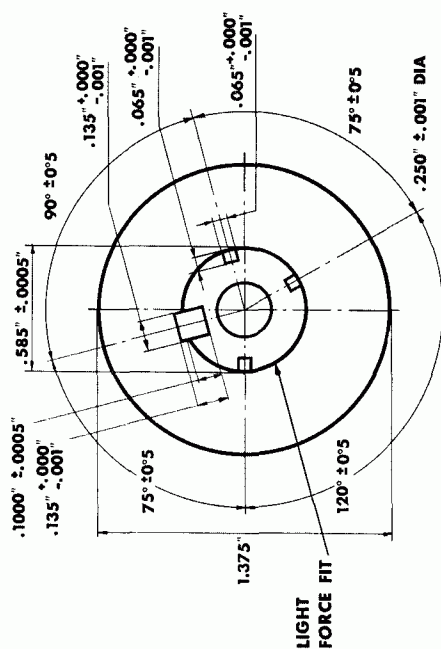
Base: See drawing  
Dimensions: See drawing  
Mounting Position: Any  
Socket: KS 14134



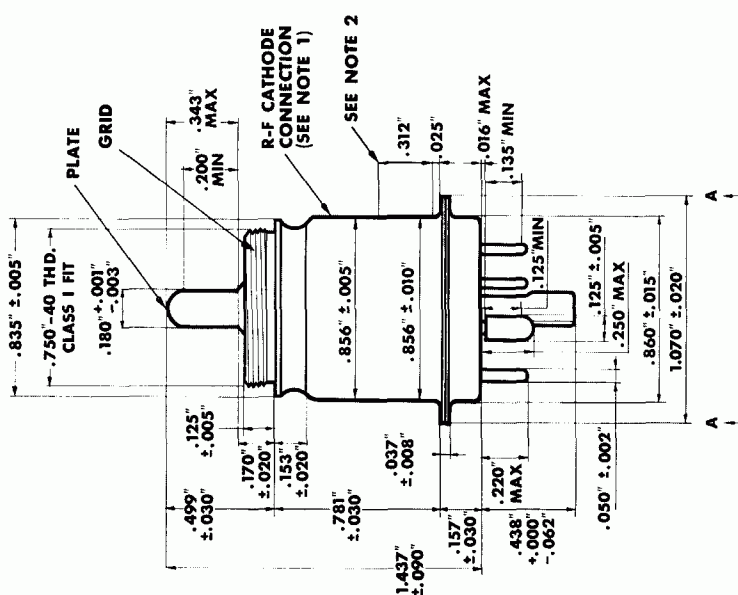
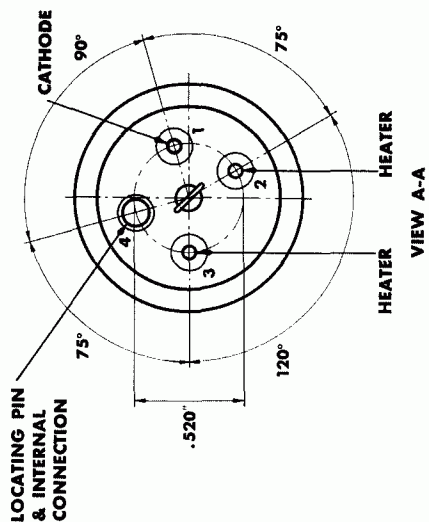
# 416B MICROWAVE TRIODE



## MECHANICAL DATA



GAUGE — BOTTOM VIEW  
BASE SHALL BE CAPABLE OF BEING INSERTED FREELY INTO A  
7.16 THICKNESS GAUGE WITH 5 HOLES DISPOSED AS SHOWN



NOTE 1: Surfaces of R-F cathode, grid, anode and pin connections are gold plated.

NOTE 2:  $.856 \pm .010$  dimension applies only over the  $.312$  length.



# MICROWAVE TRIODE 416B

## ELECTRICAL DATA

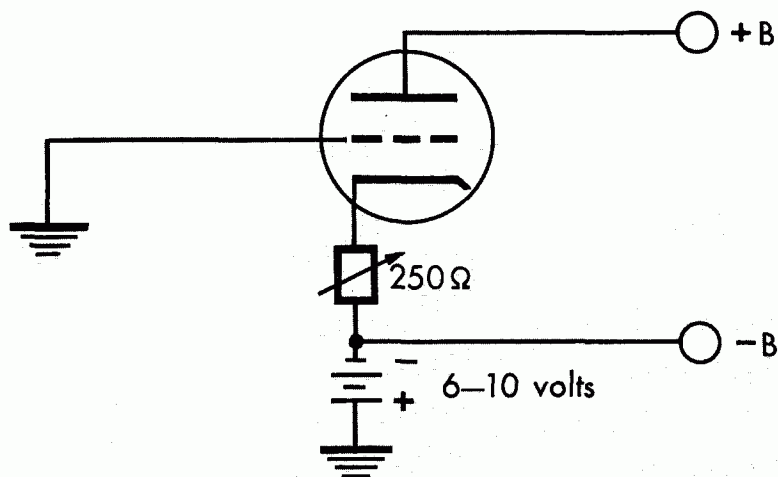
|                                                     |         |            |
|-----------------------------------------------------|---------|------------|
| Heater Voltage . . . . .                            | 6.3     | volts      |
| Heater Current . . . . .                            | 1.18    | amps       |
| Amplification Factor . . . . .                      | 300     |            |
| Transconductance at Plate Current = 30 ma . . . . . | 50,000  | $\mu$ mhos |
| Noise Figure at 500 Mc . . . . .                    | below 6 | db         |

## TYPICAL OPERATION

|                                      |      |       |    |
|--------------------------------------|------|-------|----|
| Heater Voltage . . . . .             | 6.1  | volts |    |
| Heater Current . . . . .             | 1.15 | amps  |    |
| Plate Voltage . . . . .              | 200  | volts |    |
| Bias Circuit — see Diagram           |      |       |    |
| Frequency . . . . .                  | 4200 | Mc    |    |
| Gain:                                | MIN  | AVE   |    |
| High Level (500 mw Output) . . . . . | 3    | 6     | db |
| Low Level (50 mw Output) . . . . .   | 8    | 10    | db |
| Band Width (3 dB down) . . . . .     |      | 100   | Mc |

## SPECIAL DATA

### RECOMMENDED GRID BIAS



# 416B MICROWAVE TRIODE



## HEATER VOLTAGE

The bogie value of heater voltage is 6.3 volts. For optimum tube life, however, the heater voltage should be kept as close as possible to 6.1 volts and should not under any condition fall below 6.0 or exceed 6.6 volts.

## TUBE TEMPERATURE

Sufficient conduction and convection cooling must be provided to limit the grid and plate temperatures under all operating conditions to:

|                |             |
|----------------|-------------|
| Grid Terminal  | max. 100° C |
| Anode Terminal | max. 150° C |

When using the 416B in a closed cavity it is recommended that cooling air be admitted through the tube cavity to the anode terminal. Normal temperature ranges are:

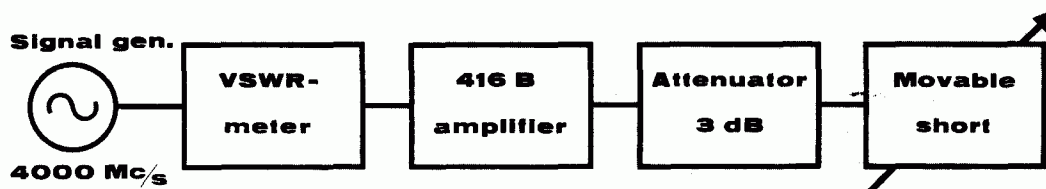
|                |                            |
|----------------|----------------------------|
| Tube Shell     | $55 \pm 10^\circ \text{C}$ |
| Grid Terminal  | $35 \pm 10^\circ \text{C}$ |
| Anode Terminal | $85 \pm 10^\circ \text{C}$ |

## TESTING

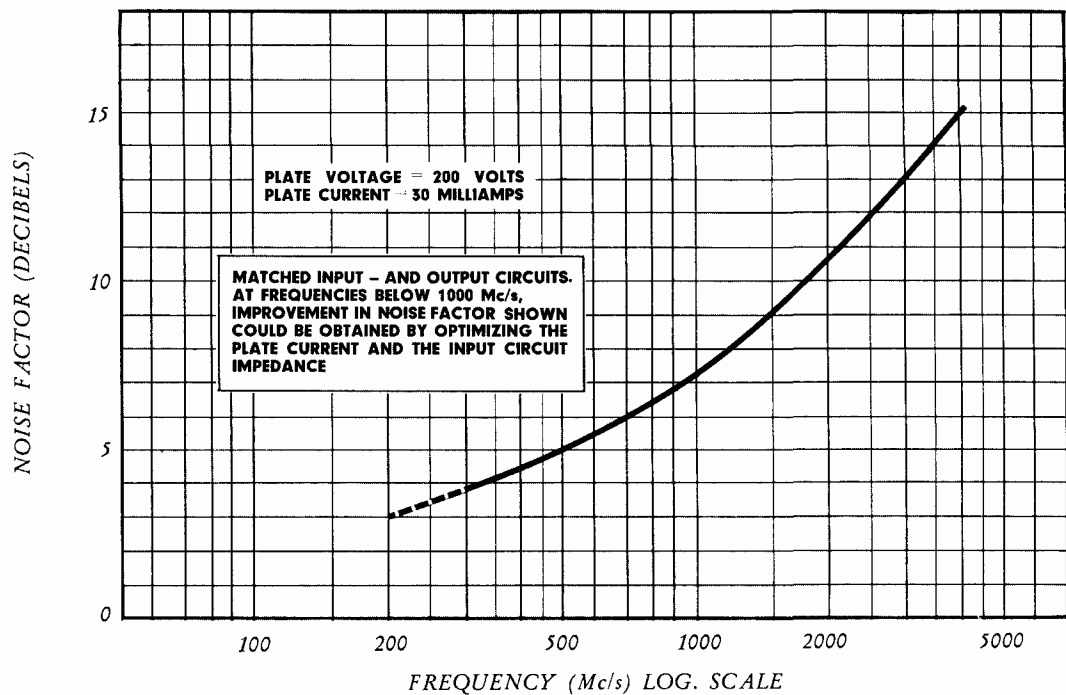
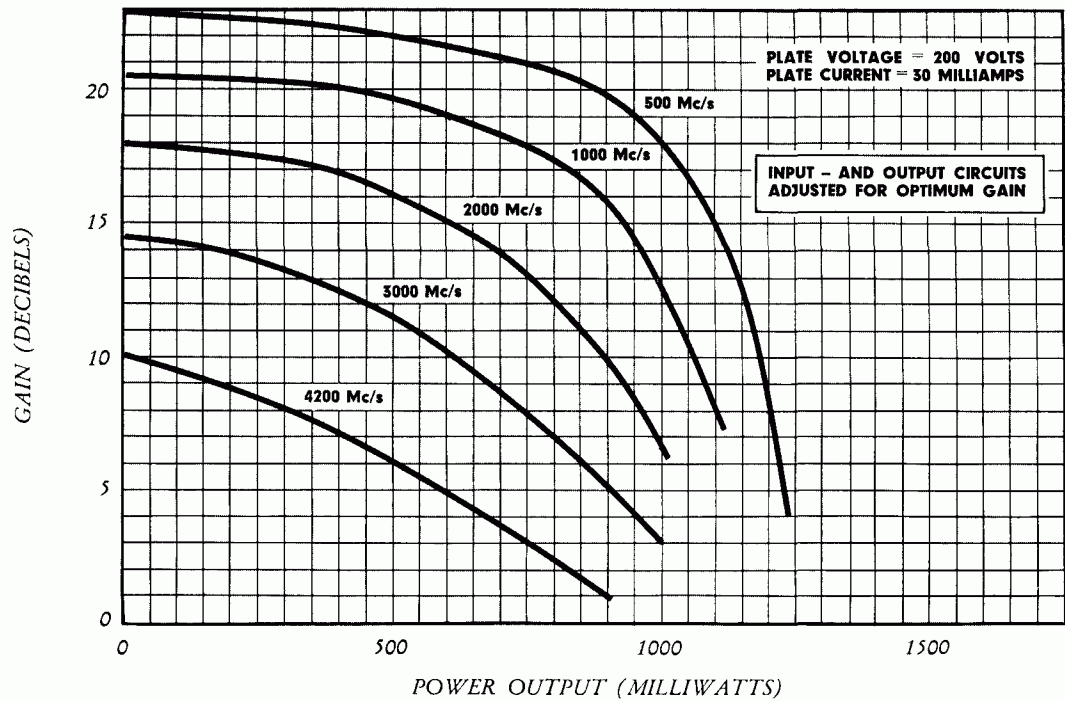
Owing to the fact that the 416B will start to oscillate at a plate current of 2 ma in test circuits, where high unbypassed resistances can not be used, it is strongly recommended that the tube be tested by inserting it into a properly designed cavity with forced air cooling.

## INPUT IMPEDANCE

416B has an extremely high amplification factor. This means for example that the isolation is high between the input and output circuit which is an important feature when several RF-amplification stages are used in cascade. In the application shown the maximum input standing wave ratio was measured when the position of a movable short in the output line was varied through all phases. It was found that the maximum voltage standing wave ratio can be expected not to exceed 1.60.



## AVERAGE CHARACTERISTICS



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## AVERAGE CHARACTERISTICS

