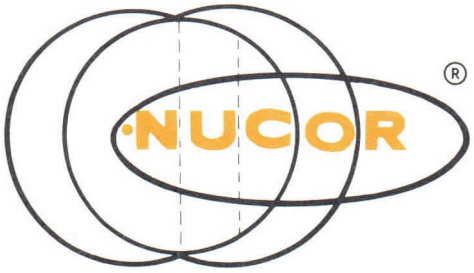
Item (1)




# ELECTRON TUBES
## FOR INDUSTRY AND COMMUNICATION

CATALOG 2250

NUCLEAR CORPORATION OF AMERICA

CENTRAL ELECTRONIC MANUFACTURERS DIVISION

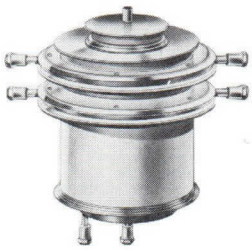
DENVILLE, NEW JERSEY

# Electron Tubes

## POWER TRIODES

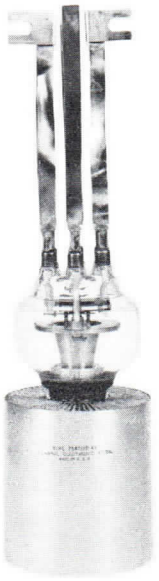
| TUBE TYPE | DESCRIPTION | CHARACTERISTICS | | | | | |
|---|---|---|---|---|---|---|---|
| | | Filament | | MU | Interelectrode Capacitances | | |
| | | $E_f$ Volts | $I_f$ Amps. | | Cgp$\mu\mu$f | Cpk$\mu\mu$f | Cgk$\mu\mu$f |
| **7C25** | Forced air cooled triode, for industrial and communication applications | 11 | 29 | 25 | 13.2 | 1.7 | 14.5 |
| **5680** | Forced air cooled triode, for communication use as an oscillator, amplifier, or modulator | 13 | 36 | 25 | 12 | 1.8 | 15 |
| **5736** | Forced air cooled triode for communication and industrial use as oscillator, amplifier, or modulator. Integral air cooling fins for high overload protection | 6 | 60 | 22 | 16 | 0.8 | 19 |
| **5996** | Forced air cooled triode specifically designed for industrial applications | 13 | 36 | 25 | 12 | 1.7 | 14.5 |
| **6009** | Water cooled triode, integral water jacket version of 5996 | 13 | 36 | 25 | 12 | 1.4 | 14.5 |
| **6366** | Forced air cooled triode for industrial and communications applications; features a high efficiency low pressure drop radiator | 11 | 29 | 25 | 13 | 1.7 | 14.5 |
| **6367** | Forced air cooled triode, similar to 6366 but allowing higher input power | 13 | 36 | 25 | 14.7 | 1.7 | 14.5 |
| **6399** | Water cooled triode, integral water jacket version of 6366 | 11 | 29 | 25 | 11.5 | 1.7 | 13.8 |
| **6400** | Water cooled, integral water jacket version of 6367 | 13 | 36 | 25 | 13.4 | 1.8 | 15.0 |
| **6623** | Forced air cooled triode, similar to 5736, but features a high efficiency low pressure drop radiator | 6 | 60 | 22 | 16 | 1.0 | 19 |
| **7012** | Forced air cooled triode for industrial and communication use as an oscillator, amplifier, or modulator | 15 | 36 | 25 | 14.2 | 1.9 | 16.3 |
| **7545/XD45** | Forced air cooled triode for industrial and communication use as an oscillator, amplifier, or modulator | 10 | 120 | 30 | 19 | 2.5 | 23.5 |

## POWER TUBES



| TUBE TYPE | DESCRIPTION | CHARACTERISTICS | | | | | |
|---|---|---|---|---|---|---|---|
| | | Filament | | Ampli-fication Factor | Interelectrode Capacitances | | |
| | | Voltage $E_f$ | Current $I_f$ | | Input $\mu\mu$f | Output $\mu\mu$f | Grid plate $\mu\mu$f |
| **4C27 4C28 4C29** | Forced air cooled triodes designed for pulsed application. Oxide coated, unipotential cathode. | 6 | 6.5 | 23 | 10.0 | 2.0 | 6.9 |
| **XD5** | Forced air cooled or water cooled triode specifically designed for high voltage pulse operation | 14 | 38 | 25 | 15.0 | 1.8 | 12.0 |
| **7C23** | Forced air cooled triode specifically designed for high voltage pulse operation | 11 | 29 | 25 | 12.5 | 1.7 | 12.0 |
| **5680** | Forced air cooled triode specifically designed for high voltage pulse operation | 13 | 36 | 25 | 15.0 | 1.8 | 12.0 |
| **7012** | Forced air cooled triode specifically designed for high voltage pulse operation. | 15 | 36 | 25 | 16.3 | 1.9 | 14.2 |
| **7545/XD45** | Forced air cooled triode specifically designed for high voltage pulse operation | 10 | 120 | 25 | 19 | 2.5 | 23.5 |
| **6544** | Forced air cooled tetrode, equipotential cathode, for use in pulse modulator service | 6 | 60 | 90 | 250 | 40 | 4.0 |
| **XD-32** | Water cooled tetrode, unipotential matrix cathode for use in pulse modulator service Tentative specifications. | 6 | 233 | — | — | — | — |

# General Specifications



| MAXIMUM RATINGS | | | | | | TYPICAL OPERATING CONDITIONS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plate Voltage $E_b$ Vdc | Plate Current $I_b$ Adc | Grid Current $I_c$ Adc | Power Input Kw | Plate Dissipation Kw | Max. Freq. MC/S | Plate Voltage $E_b$ Vdc | Grid Voltage $E_c$ Vdc | Plate Current $I_b$ Adc | Grid Current $I_c$ Adc | Approx. Driving Power W | Power Output Kw |
| 5000 | 1.3 | 0.150 | 7 | 2.5 | 30 | 4500 | —500 | 1.2 | 0.100 | 110 | 3.1 |
| 6000 | 2.0 | 0.200 | 12 | 2.5 | 30 | 6000 | —800 | 1.4 | 0.160 | 225 | 6 |
| 5000 | 1.4 | 0.500 | 5 | 2.5 | 60 | 5000 | —850 | 1.0 | 0.210 | 250 | 4.1 |
| 6000 | 2.0 | 0.200 | 12 | 2.5 | 30 | 6000 | —800 | 1.4 | 0.160 | 225 | 6 |
| 6000 | 2.0 | 0.200 | 12 | 6.0 | 30 | 6000 | —800 | 1.4 | 0.160 | 225 | 6 |
| 5500 | 1.3 | 0.150 | 7 | 3.0 | 30 | 5000 | —600 | 1.2 | 0.130 | 160 | 4 |
| 6200 | 2.0 | 0.200 | 12 | 3.0 | 30 | 6000 | —800 | 1.4 | 0.160 | 225 | 6 |
| 6200 | 1.3 | 0.150 | 7 | 5.0 | 30 | 5000 | —600 | 1.2 | 0.130 | 160 | 4 |
| 9200 | 2.0 | 0.200 | 18 | 6.0 | 30 | 9000 | —800 | 2.0 | 0.150 | 225 | 12 |
| 5000 | 1.4 | 0.500 | 5 | 2.5 | 60 | 5000 | —850 | 1.0 | 0.210 | 250 | 4.1 |
| 6000 | 2.3 | 0.230 | 13.8 | 2.5 | 30 | 6000 | —800 | 1.6 | 0.180 | 225 | 6.7 |
| 8000 | 6.0 | 0.500 | 48 | 6.0 | 60 | 8000 | —1000 | 3.0 | 0.300 | 350 | 18.0 |

## FOR PULSE OPERATION

| MAXIMUM RATINGS | | | | | | | | | | TYPICAL OPERATING CONDITIONS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Plate Voltage Kv dc | Duty Cycle | Grid Voltage $E_c$ Vdc | Grid Current $I_c$ Adc | Pulse Width $\mu$s | Peak Plate Current Adc | Peak Cathode Current Adc | Peak Anode Voltage Kv | Plate Dissipation Kw | Freq. Mc/s | Plate Voltage $E_b$ Kvdc | Grid Voltage $E_c$ Vdc | Plate Current $I_b$ Adc | Grid Current $I_c$ Adc | Peak Power Output Kw | Notes |
| 7.5 | .0012 | — 750 | — | 2 | 2.0 | 2.7 | 8.0 | 0.150 | 750 | 4.2 Kv peak | —700 | tp 0.5 $\mu$ sec., PRR 9300 pps | | 6.5 | |
| 35 | .030 | —5000 | 0.150 | 90 | 30 | 45 | 40 | 1.5 | | 30 | —1500 | 0.25 | 0.003 | 750 Kw | Mount vertically. 75 cfm for 1.5 Kw diss. Mounting socket available from Central. |
| 17.5 | .005 | —2000 | 0.010 | 90 | 16 | 25 | 20 | 1.2 | | 15 | —750 (during pulse) | 0.16 | .0012 | 60 Kw | 75 cfm for 1.2 Kw diss. |
| 17.5 | .030 | —5000 | 0.150 | 90 | 25 | 35 | 20 | 1.2 | | 15.5 | —750 (during pulse) | 0.20 | 0.013 | 90 Kw | 75 cfm for 1.2 Kw diss. .023 duty |
| 17.5 | .030 | —5000 | 0.170 | 90 | 30 | 40 | 20 | 1.2 | | 15.5 | —750 (during pulse) | 0.20 | 0.013 | 90 Kw | 75 cfm for 1.2 Kw diss. .023 duty |
| 25 | .030 | —5000 | 0.300 | 90 | 130 | 200 | 30 | 6.0 | | 15.5 | —600 (during pulse) | 0.57 | 0.06 | 390 Kw | 200 cfm for 6 Kw diss. |
| 20 | .0015 | —600 | 0.030 | 6 | 70 | 80 | 25 | 1.0 | | 18 | —500 | 0.100 | 0.008 | 1000 Kw | 150 cfm for 1 Kw diss. at 0.8" water |
| 65 | .01 | —2500 | 3.5 | 25 | 750 | 1310 | 65 | 44 | | 65 | —1500 | 7.5 | 3.5 | 45000 | Requires 6 gpm for 44 Kw dissipation. |

NUCOR®

# Electron Tubes

# RECTIFIER AND CLIPPER DIODES

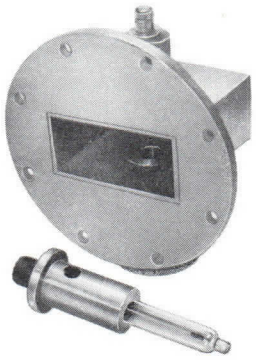
| TUBE TYPE | DESCRIPTION | RECTIFIER OPERATION | | | | |
|---|---|---|---|---|---|---|
| | | Heater or Filament | | Maximum Peak Inverse Voltage epx Kv | Plate Current $i_b$ Amps. Peak | Plate Current $I_b$ Adc |
| | | $E_f$ Volts | $I_f$ Amps. | | | |
| **371B** | Thoriated tungsten filament diode for use as a rectifier | 5.0 | 10.3 | 25 | 1.5 | 0.300 |
| **561** | Bonded thoria filament diode for use as a rectifier or clipper diode | 11.5 | 15.25 | 33 | 2.7 | 0.860 |
| **576A** | Thoriated Tungsten filament diode for use as a rectifier or a clipper diode | 5.0 | 14.0 | 25 | 2.5 | 0.500 |
| **577** | Thoriated tungsten filament diode for use as a rectifier. Same rating as 371B but 1¼" shorter and more rugged | 5.0 | 10.3 | 25 | 1.5 | 0.300 |
| **593** | Thoriated tungsten filament diode for use as a rectifier | 5.0 | 10.3 | 25 | 1.5 | 0.300 |
| **XD-11 XD-11R** | Thoriated tungsten diode for use as a rectifier or clipper diode Supplied forced air type XD-11R or liquid cooled type XD-11 | 15 | 36 | 65 | 25 | 7 |
| **XD-18 XD-18R** | Thoriated tungsten diode for use as a rectifier or clipper diode Supplied forced air type XD-18R or liquid cooled type XD-18 | 10 | 120 | 40 | 50 | 15 |
| **XD-21** | Thoriated tungsten filament diode for use as a rectifier or clipper diode | 11.5 | 15.3 | 40 | 2.5 | 0.750 |
| **6303/X-80** | Bonded thoria filament diode for use as a rectifier or clipper diode | 11.5 | 15.25 | 40 | 2.5 | 0.700 |
| **7129/XD-1 7130/XD-1** | Special thoria tungsten filament diode for use as rectifier or clipper diode. Can be supplied forced air type 7129, or liquid cooled type 7130 | 13 | 36 | 40 | 15 | 3 |
| **7131/XD-2 7132/XD-2** | Special thoria tungsten filament diode for use as rectifier or clipper diode. Can be supplied forced air type 7131, or liquid cooled type 7132 | 13 | 36 | 40 | 15 | 3 |
| **7133/XD-3 7134/XD-3** | Special thoria tungsten filament diode for use as rectifier or clipper diode. Can be supplied forced air type 7133, or liquid cooled type 7134 | 13 | 36 | 80 | 15 | 3 |
| **7135/XD-6** | Special thoria tungsten filament diode for use as rectifier or clipper diode. Similar to XD-3 except special cooling jacket for use with fluids other than water | 13 | 36 | 80 | 15 | 3 |
| **XD-27 XD-27R** | Low impedance thoriated tungsten diode for use as a rectifier or clipper diode Supplied forced air type XD-27R or liquid cooled type XD-27 | 13 | 36 | 30 | 15 | 3 |
| **XD-28** | Thoriated tungsten filament diode for use as a rectifier or clipper diode | 11.5 | 15.3 | 33 | 2.7 | 0.900 |
| **XD-47** | Thoriated tungsten diode for rectifier operation | 7.5 | 24 | 32 | 8 | 1 |
| **XD-49 XD-49R** | Low impedance thoriated tungsten diode for use as a rectifier or clipper diode Supplied forced air type XD-49R or liquid cooled type XD-49 | 15 | 36 | 25 | 25 | 7 |
| **XD-31** | Forced air diode, unipotential oxide coated cathode for rectifier or clipper service | 6 | 65 | 17 | 2.7 | 0.7 |
| **XD-53** | Water cooled diode, woven thoriated tungsten filament, for rectifier or clipper service | 10 | 120 | 40 | 60 | 20 |
| **XD-56** | Forced air cooled diode, thoriated tungsten bifilar helix cathode, for rectifier or shunt diode service | 13 | 36 | 25 | 30 | 6 |
| **7030** | Forced air cooled diode, thoriated tungsten bifilar helix cathode, for use in rectifier or clipper service | 13 | 36 | 25 | 20 | 6 |

# General Specifications

| CLIPPER DIODE OPERATION | | | | | | |
|---|---|---|---|---|---|---|
| Heater or Filament | | Maximum Peak Inverse Voltage epx Kv | Plate Current $I_b$ Amps. Peak | Plate Current $I_b$ Adc | Plate Current $i_b$ Amps. RMS | Notes |
| $E_f$ Volts | $I_f$ Amps. | | | | | |
| 5.0 | 10.3 | — | — | — | — | Tube must be vertically mounted with adequate space allowed for ventilation. Anode temp. not to exceed 800°C. |
| 11.5 | 15.25 | 33 | 50 | — | 1.25 | Tube must be mounted vertically with base down. Maximum anode temperature 800°C. Anode dissipation 450 watts. |
| 5.4 | 15.0 | 25 | 12.0 | — | 0.800 | Tube must be vertically mounted with adequate air space allowed for ventilation. Anode temp. not to exceed 800°C. |
| 5.0 | 10.3 | — | — | — | — | Tube must be vertically mounted with adequate space allowed for ventilation. Anode temp. not to exceed 800°C. |
| 5.0 | 10.3 | — | — | — | — | Tube must be vertically mounted with adequate space allowed for ventilation. Anode temp. not to exceed 800°C. |
| 16.2 | 39 | 65 | 160 | — | 8 | Mount tube vertically—water cooled 4 gpm for 6.5 Kw dissipation—air cooled 190 cfm for 3 Kw dissipation. |
| 11.0 | 125 | 40 | 300 | — | 15 | Mount tube vertically—200 cfm at 1.0" water for 6 Kw dissipation Water cooled 6 gpm for 15 Kw dissipation. |
| 12.2 | 15.5 | 40 | 50 | — | 1.30 | Tube must be mounted vertically with base down. Maximum anode temperature 800°C. Anode dissipation 550 watts. |
| 12.2 | 15.5 | 33 | 50 | — | 1.25 | Tube must be mounted vertically with base down. Maximum anode temperature 800°C. Anode dissipation 550 watts. |
| 14.5 | 40 | 40 | 150 | — | 6 | Mount tube vertically. Water cooled 3 gpm for 5 Kw dissipation. Air cooled 190 cfm for 3 Kw dissipation. |
| 14.5 | 40 | 40 | 150 | — | 6 | Mount tube vertically. Water cooled 3 gpm for 5 Kw dissipation. Air cooled 190 cfm for 3 Kw dissipation. |
| 14.5 | 40 | 80 | 150 | — | 6 | Mount tube vertically. Water cooled 3 gpm for 5 Kw dissipation. Air cooled 190 cfm for 3 Kw dissipation. |
| 14.5 | 40 | 80 | 150 | — | 6 | Mount tube vertically. Liquid flow dependent on coolant selected. Consult factory. Specially designed for oil type coolants. |
| 14.5 | 40 | 30 | 150 | — | 6 | Mount tube vertically. Water cooled 3 gpm for 5 Kw dissipation. Air cooled 190 cfm for 3 Kw dissipation. |
| 12.2 | 15.5 | 33 | 50 | — | 1.30 | Tube must be mounted vertically with base down. Maximum anode temperature 800°C. Anode dissipation 550 watts. |
| — | — | — | — | — | — | Tube must be mounted vertically with base down. Maximum anode temperature 800°C. Anode dissipation 550 watts. |
| 16.2 | 39 | 25 | 160 | — | 8 | Mount tube vertically—water cooled 4 gpm for 6.5 Kw dissipation—air cooled 190 cfm for 3 Kw dissipation. |
| 6 | 6.5 | 15 | 20 | — | 1.5 | Mount tube in any position. Cooling 50 cfm for .15 Kw dissipation. |
| 10.8 | 130 | 40 | 250 | — | 42.5 | Mount tube vertically. 15 gpm for 30 Kw dissipation. |
| 13.75 | 36 | 25 | 75 | 0.7 | — | Mount tube vertically-anode up or down. 190 cfm for 3 Kw dissipation. |
| 13.75 | 38 | 30 | 50 | — | .700 | Mount tube vertically-anode up or down. 190 cfm for 2.5 Kw dissipation. |

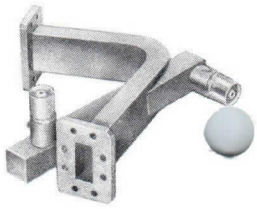
## 10° E PLANE REPLACEMENT GAS NOISE TUBES

| Central Type No. | EIA Number | Frequency Band | Class of Operation | Fil. Current | Anode Current | Tube Voltage Drop | Excess Noise Db | Notes |
|---|---|---|---|---|---|---|---|---|
| CNT-S15A-1 | — | 2.6-3.95 Kmc | D.C. and A.C. | 300 | 250 | 85 | 15.3 | For RG 48/U Waveguide |
| CNT-S15D-1 | 6358 | 2.6-3.95 Kmc | D.C. | 300 | 250 | 80 | 15.3 | For RG 48/U Waveguide |
| CNT-S15P-1 | — | 2.6-3.95 Kmc | Pulse | 0 | 250 | 90 | 15.3 | For RG 48/U Waveguide |
| CNT-S18A-1 | — | 2.6-3.95 Kmc | D.C. and A.C. | 300 | 250 | 170 | 18.0 | For RG 48/U Waveguide |
| CNT-S18D-1 | — | 2.6-3.95 Kmc | D.C. | 300 | 250 | 165 | 18.0 | For RG 48/U Waveguide |
| CNT-S18P-1 | — | 2.6-3.95 Kmc | Pulse | 0 | 250 | 190* | 18.0 | For RG 48/U Waveguide |
| CNT-C15A-1 | — | 3.95-5.85 Kmc | D.C. and A.C. | 170 | 250 | 75 | 15.3 | For RG 49/U Waveguide |
| CNT-C15D-1 | 6356 | 3.95-5.85 Kmc | D.C. | 170 | 250 | 70 | 15.3 | For RG 49/U Waveguide |
| CNT-C15P-1 | — | 3.95-5.85 Kmc | Pulse | 0 | 250 | 80 | 15.3 | For RG 49/U Waveguide |
| CNT-C18A-1 | — | 3.95-5.85 Kmc | D.C. and A.C. | 170 | 250 | 120 | 18.0 | For RG 49/U Waveguide |
| CNT-C18D-1 | — | 3.95-5.85 Kmc | D.C. | 170 | 250 | 110 | 18.0 | For RG 49/U Waveguide |
| CNT-C18P-1 | — | 3.95-5.85 Kmc | Pulse | 0 | 250 | 130 | 18.0 | For RG 49/U Waveguide |
| *This group is also recommended for use with RG50/U waveguide over the frequency range 5.85—8.20 Kmc.* | | | | | | | | |
| CNT-X15D-1 | — | 8.2-12.4 Kmc | D.C. | 170 | 200 | 60 | 15.3 | For RG 52/U Waveguide |
| CNT-X15D-2 | — | 8.2-12.4 Kmc | D.C. | 170 | 200 | 85 | 15.3 | For RG 52/U Waveguide |
| CNT-X15D-3 | 6357 | 8.2-12.4 Kmc | D.C. | 170 | 200 | 85 | 15.3 | For RG 52/U Waveguide |
| CNT-X15D-4 | — | 7.0-10.0 Kmc | D.C. | 170 | 200 | 70 | 15.3 | For RG 51/U Waveguide |
| CNT-X15P-1 | — | 8.2-12.4 Kmc | Pulse | 0 | 200 | 60 | 15.3 | For RG 52/U Waveguide |
| CNT-X15P-2 | — | 8.2-12.4 Kmc | Pulse | 0 | 200 | 85 | 15.3 | For RG 52/U Waveguide |
| CNT-X15P-3 | — | 8.2-12.4 Kmc | Pulse | 0 | 200 | 85 | 15.3 | For RG 52/U Waveguide |
| CNT-X15P-4 | — | 7.0-10.0 Kmc | Pulse | 0 | 200 | 70 | 15.3 | For RG 51/U Waveguide |
| CNT-X18D-1 | — | 8.2-12.4 Kmc | D.C. | 170 | 200 | 105 | 18.0 | For RG 52/U Waveguide |
| CNT-X18D-2 | 6882 | 8.2-12.4 Kmc | D.C. | 170 | 200 | 145 | 18.0 | For RG 52/U Waveguide |
| CNT-X18D-3 | — | 7.0-10.0 Kmc | D.C. | 170 | 200 | 120 | 18.0 | For RG 51/U Waveguide |
| CNT-X18P-1 | — | 8.2-12.4 Kmc | Pulse | 0 | 200 | 105 | 18.0 | For RG 52/U Waveguide |
| CNT-X18P-2 | — | 8.2-12.4 Kmc | Pulse | 0 | 200 | 120 | 18.0 | For RG 52/U Waveguide |
| CNT-X18P-3 | — | 7.0-10.0 Kmc | Pulse | 0 | 200 | 145 | 18.0 | For RG 51/U Waveguide |
| CNT-Ku15D-1 | 6684 | 12.4-18.0 Kmc | D.C. | 170 | 200 | 70 | 15.3 | For RG-91/U Waveguide |
| CNT-Ku15P-1 | — | 12.4-18.0 Kmc | Pulse | 0 | 200 | 75 | 15.3 | For RG-91/U Waveguide |
| CNT-Ku18D-1 | — | 12.4-18.0 Kmc | D.C. | 170 | 200 | 110 | 18.0 | For RG-91/U Waveguide |
| CNT-Ku18P-1 | — | 12.4-18.0 Kmc | Pulse | 0 | 200 | 115 | 18.0 | For RG-91/U Waveguide |



## 90° H PLANE REPLACEMENT GAS NOISE TUBES

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CNT-L15A-1 | — | 1.12-1.70 Kmc | D.C. & A.C. | 300 | 250 | 75 | 15.3 | For RG 69/U Waveguide |
| CNT-L15D-1 | 6881 | 1.12-1.70 Kmc | D.C. | 300 | 250 | 65 | 15.3 | For RG 69/U Waveguide |
| CNT-L15P-1 | — | 1.12-1.70 Kmc | Pulse | 0 | 250* | 75* | 15.3 | For RG 69/U Waveguide |
| CNT-L18A-1 | 7101 | 1.12-1.70 Kmc | D.C. & A.C. | 300 | 250 | 130 | 18.0 | For RG 69/U Waveguide |
| CNT-L18D-1 | — | 1.12-1.70 Kmc | D.C. | 300 | 250 | 140 | 18.0 | For RG 69/U Waveguide |
| CNT-L18P-1 | — | 1.12-1.70 Kmc | Pulse | 0 | 250* | 140 | 18.0 | For RG 69/U Waveguide |
| CNT-S15A-2 | 6782 | 2.6-3.95 Kmc | D.C. & A.C. | 170 | 250 | 45 | 15.3 | For RG 48/U Waveguide |
| CNT-S15P-2 | — | 2.6-3.95 Kmc | Pulse | 0 | 250 | 50 | 15.3 | For RG 48/U Waveguide |
| CNT-S18A-2 | — | 2.6-3.95 Kmc | D.C. & A.C. | 170 | 250 | 80 | 18.0 | For RG 48/U Waveguide |
| CNT-S18P-2 | — | 2.6-3.95 Kmc | Pulse | 0 | 250 | 85 | 18.0 | For RG 48/U Waveguide |

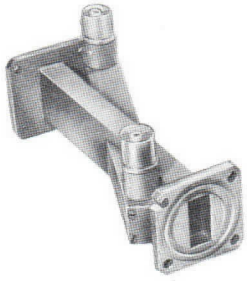


## 90° E PLANE REPLACEMENT GAS NOISE TUBES

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CNT-S15P-3 | — | 2700-2900 | D.C. & Pulse | 6.3-1.25A | 75 | 30 | 15.3 | Requires Holder CNM-S90 E-1 |
| CNT-S18P-3 | — | 2700-2900 | D.C. & Pulse | 6.3-1.25A | 75 | 40 | 18.0 | Requires Holder CNM-S90 E-1 |
| CNT-S18P-4 | — | 3300-3700 | D.C. & Pulse | 6.3-1.25A | 150 | 30 | 18.0 | Requires Holder CNM-S90 E-2 |

## GAS NOISE TUBE MOUNTS

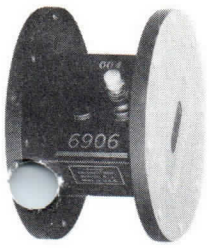
| Noise Tube Mount | Description | Insert Tube Characteristics | | | |
|---|---|---|---|---|---|
| | | Type | Excess Noise | Anode Current | Anode Drop |
| CNM-S90E-1 | RG 48/U Waveguide 2700-2900 Mc | CNT-S18P-3 | 18.0 | 75 | 30 |
| CNM-S90E-2 | RG 48/U Waveguide 3300-3700 Mc | CNT-S18P-4 | 18.0 | 150 | 30 |
| CNM-VHF-1 | 3/8" Coax 400-450 Mc | CNT-X15P-3 | 15.3 | 100 | 80 |
| CNM-VHF-2 | 3/8" Coax 400-450 Mc | CNT-X18D-1 | 18.0 | 100 | 80 |
| CNM-UHF-1 | 3/8" Coax 1200-1400 Mc | CNT-X18D-1 | 18.0 | 100 | 80 |
| CNM-X10E-1 | RG 52/U 8500-9600 Mc Single Ended | CNT-X15D-1 | 15.3 | 200 | 60 |
| CNM-X10E-2 | RG 51/U 7000-10000 Mc Single Ended | CNT-X15D-4 | 15.3 | 200 | 60 |



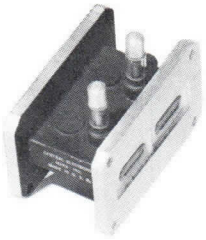
## GAS NOISE SOURCES

| Central Type | Frequency Band Mc | Excess Noise Db | Anode Current | Anode Voltage | Notes |
|---|---|---|---|---|---|
| CNS-Coax-1 | 1000-2000 | 18.0 | 50 | 175 | 7/8" Coax—Double Ended |
| CNS-Coax-2 | 2000-4000 | 18.0 | 85 | 135 | 3/8" Coax—Double Ended |
| CNS-Coax-4 | 2000-4000 | 15.3 | 40 | 60 | 3/8" Coax—Double Ended |
| CNS-X90E-1 | 8500-9600 | 13.0* | 100 | 50 | RG 52/U Double Ended |
| CNS-X90E-2 | 8500-9600 | 18.0 | 100 | 50 | RG 52/U Single Ended |
| CNS-X90E-3 | 7500-8600 | 13.0* | 100 | 40 | RG 51/U Double Ended |
| CNS-Ku90E-1 | 16000-17000 | 18.0 | 50 | 60 | RG 91/U Single Ended |
| CNS-X20E-1 | 8500-9600 | 14.8 | 100 | 95 | RG 52/U 20° Spec. Flanges |
| CNS-X20E-Z | 8500-9600 | 14.8 | 100 | 95 | RG 52/U 20° Spec. Flanges |

* *Tentative data*




# TR Tubes



| Tube Designation | Description | Frequency Band | Max. VSWR in Band | Frequency Range Mc | Frequency Center Mc | Power Level Kw Max. |
|---|---|---|---|---|---|---|
| IB23 | Cell type, 1 disk fixed tuned | L | — | 900-1200 | 1000 | 450 |
| 6906 | Phase control | C | 2.0 | 5395-5905 | 5650 | 5 |
| 5865/CEM 148 | Band pass fixed tuned | C | 1.9 | 5395-5905 | 5650 | 300 |
| IB63A | Band pass fixed tuned | X | 1.9 | 8490-9578 | 9000 | 200 |
| CEM 306 | 6334 which mates to RG 51/U guide | X | 1.4 | 8490-9578 | 9000 | 250 |
| 6232 | IB63A which mates with RG 51/U | X | 1.9 | 8490-9578 | 9000 | 250 |
| 6334 | Dual IB63A | X | 1.4 | 8490-9578 | 9000 | 200 |
| 6795 | A physically shorter IB63A | X | 1.9 | 8490-9578 | 9000 | 200 |
| CEM 147 | Band pass fixed tuned | Ku | 1.9 | 15000-17000 | 16000 | 90 |
| 6560/CEM 35 | Dual TR | Ku | 1.4 | 15000-17000 | 16000 | 100 |



# Ionization Gauge Tube VG1A

## DESCRIPTION

Ionization gauge tube VG1A is a triode that utilizes positive ion current for sensing purposes. It is connnected into a vacuum system and is capable of measuring pressures between the regions of $10^{-3}$ mm Hg. and $10^{-8}$ mm Hg. A spiral grid structure accessible at both ends for out-gassing with current of 7 amperes facilitates the removal of gases from the elements of the gauge tube. The collector is a platinum deposit on the inside of the glass bulb that only requires heating with a torch for out-gassing.

## SPECIFICATIONS

Any type of tubulation is available upon request. Stock tubulations are:

VGIA/1 — 24/40 inner joint
VGIA/2 — 3/4" O. D. open tubulation
VGIA/3 — 1/2" O. D. open tubulation
VGIA/4 — 3/8" O. D. open tubulation

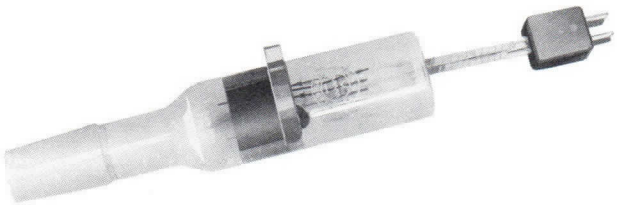
Sensitivity under normal conditions — approximately 100 microamperes per micron of gas pressure. Jones plugs (4 or 6 prong) are available to your specifications.

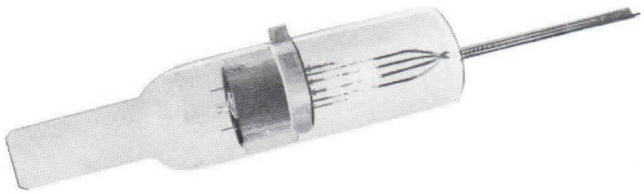
## TYPICAL CHARACTERISTICS

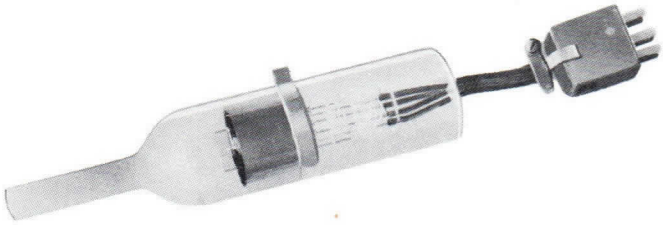
$E_p = -25V$ $E_g = 120V$ $I_g = 5.0$ ma
$E_f = 3.0 — 7.5V$ $I_f = 3.5 — 5a$ Construction, standard pyrex glass.

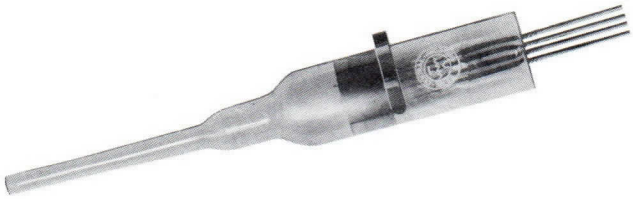
## SPECIAL GAUGES

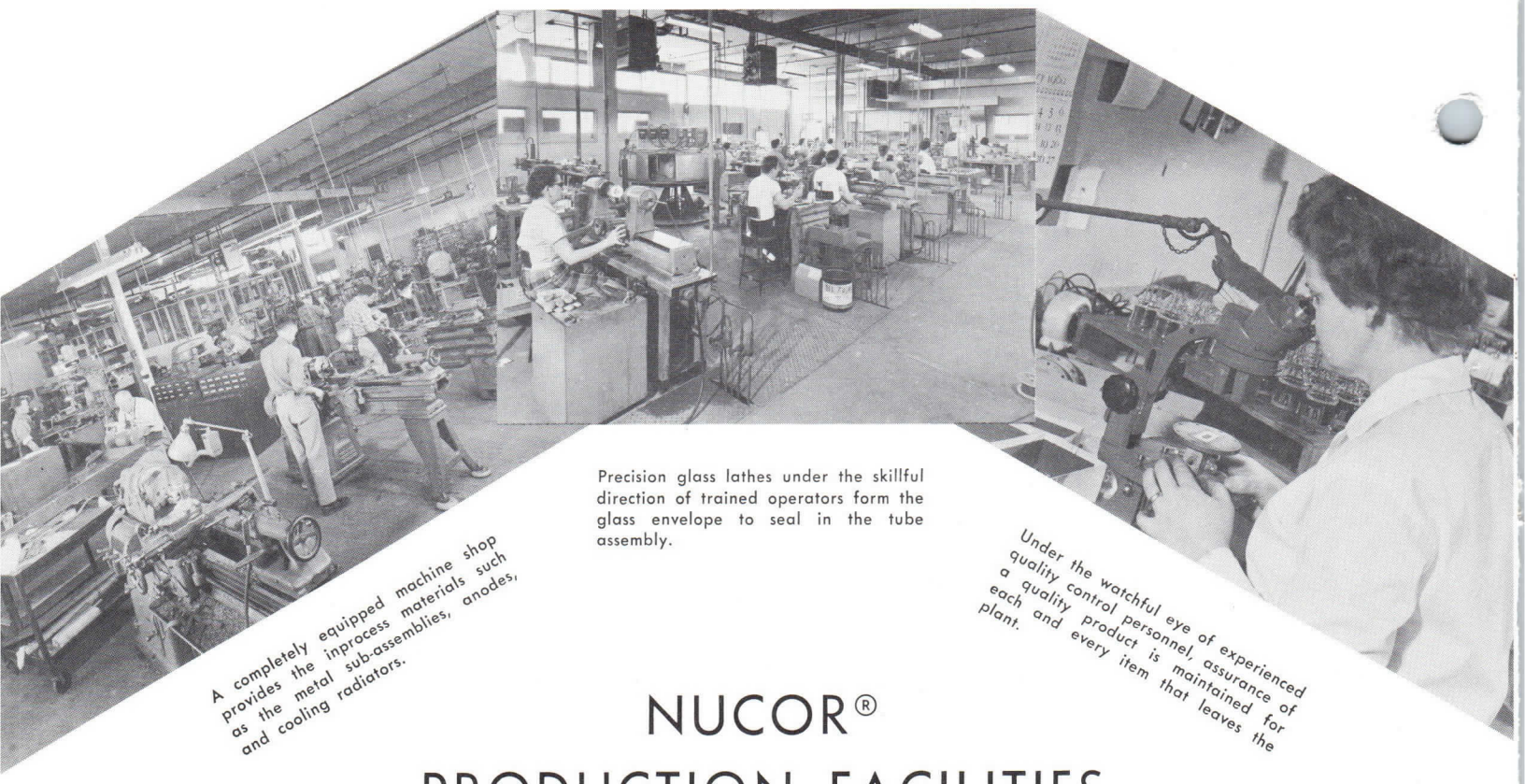
Our engineering staff is available to design and custom-produce specialized ionization gauges to meet your particular operating requirements.











A completely equipped machine shop provides the inprocess materials such as the metal sub-assemblies, anodes, and cooling radiators.

Precision glass lathes under the skillful direction of trained operators form the glass envelope to seal in the tube assembly.

Under the watchful eye of experienced quality control personnel, assurance of a quality product is maintained for each and every item that leaves the plant.

# NUCOR®
# PRODUCTION FACILITIES

From material fabrication to prototype, from pilot run to production run, NUCOR's production facilities embody every facet in the manufacture of modern high quality electron tubes. Led by a full force of engineering personnel that is second to none, the Central Electronic Manufacturers Division is a leader in the field of special purpose tubes for industry and defense.

Modern and well equipped machine shops, white rooms for sub-assemblies, well trained glass lathe operators, constant and dependable exhaust stations and a rigid quality control system add up to a precision production capability for products of the highest quality.

# NUCOR®
# RESEARCH & DEVELOPMENT

Increased demands on electronic equipment require probing deeper and further into electron tube applications. Many new and powerful tubes for radar and communications are the result of our R & D teams. In addition, our work carries us into the fields of microwave noise tubes, gaseous discharge tubes and solid state devices. The many groups doing R & D at the Central Electronic Manufacturers Division are fully qualified to undertake research and development programs of the broadest scope and complexity.

# YOUR NUCOR® TUBE REPRESENTATIVE

# POWER TRIODES

The data presented in this section is printed on either a pink or white sheet.

A pink data sheet signifies provisional information.

A white data sheet signifies permanent information.

*For further technical information write to:*
Applications Engineering Department

CENTRAL ELECTRONIC MANUFACTURERS
2 RICHWOOD PLACE, DENVILLE, N. J.
*A Division of Nuclear Corporation of America*

Central ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

SERVICE NOTES

POWER TUBES

# SERVICE NOTES PERTAINING TO POWER TUBES

## I. GENERAL

Power tubes are used:

1) to transform uni-directional current to radio-frequency current (generator or oscillator);
2) to magnify alternating current power (amplifier); or
3) to multiply an alternating current or voltage to a higher frequency (frequency multiplier).

Applications exist for transmitting tubes in diverse equipment such as dielectric heaters, induction heaters, radar, radio, and television transmitters.

Power tubes are high-vacuum thermionic emission devices containing an emitter, commonly referred to as the filament or cathode; a grid to control electron flow; none, one, or more additional grids which give the tube specific characteristics and an anode which receives the electrons and is the electrode connected to a high voltage power source. The manufacture of quality power tubes requires rugged structural design, meticulous assembly, careful processing and stringent testing. The close adherence to these requirements makes Central Electronic's tubes outstanding in performance and reliability.

The purpose of this presentation is to disclose general application and rating information on Power Tubes supplementing that contained in the individual data sheets for each tube type.

## II. TUBE CHARACTERISTICS

In the design of equipment employing tubes, it must be borne in mind that the characteristics given in the data sheets are average characteristics and some variation either side of this average must be anticipated. Also, the characteristics will change with life. In designing equipment, consideration must be given to the accumulated characteristic changes that will affect performance from the average shown in the data sheets. For most power tubes, a tolerance of plus or minus 20% is adequate. Equipment should be designed to perform satisfactorily throughout the full range of tube characteristic variation.

## III. CATHODES

Thermionic cathodes commonly used in power tubes are classified as directly heated or indirectly heated.

A directly heated or filamentary cathode is a wire or ribbon heated by the direct passage of current through it. The filament materials in common use are tungsten, thoriated tungsten and nickel base metal or alloys thereof, coated with alkaline earth oxides. Each material has a distinct advantage which is utilized in a tube designed for a particular application.

An indirectly heated cathode comprises a filament, commonly referred to as a heater, usually tungsten, enclosed in a thin metal sleeve coated externally with an electron emitter similar to that employed on coated filaments. The tungsten filament may or may not be covered with an insulating coating. The function of heater and emitter are thus divorced.

### 1) Tungsten

Pure tungsten filaments are used in very high-voltage power tubes but suffer from the disadvantage of requiring high filament power. For long life, it is desirable to operate the filament at slightly reduced voltage if the available reduced emission current permits. Normal end of life usually occurs from burn-out.

### 2) Thoriated Tungsten

Thoriated tungsten filaments are made from tungsten impregnated with thoria. Due to the presence of thorium, electrons are emitted at a lower temperature than for pure tungsten and thus require less filament heating power. The emission efficiency, (i.e.: amperes emission per watt heating power) is much greater than for pure tungsten.

The operating voltage of a thoriated tungsten filament should be held within ±5% of the rated value. If the tube is lightly loaded, the filament may be operated as much as 5% below the nominal voltage.

### 3) Bonded Thoria

Bonded thoria filaments have a refractory metal core, such as tungsten, coated with a layer of thoria. Compared to thoriated tungsten filaments, bonded thoria filaments have the advantage of added strength and comparable emission at a slightly lower temperature. They are used mainly as an emission source in diodes.

### 4) Oxide Coated

Oxide coated filaments and cathodes are used in lower anode voltage power tubes, usually 2,500 volts maximum. However, in pulse applications, voltages up to 25 kilovolts are frequently employed with short duty cycles, .001 or less.

Coated filaments employ a relatively thick coating of alkaline earth oxides on a special metal base, usually nickel or an alloy thereof. Coated filaments are operated at or about 800°C and are very conservative in heater power. Their emission efficiency is also much greater than for pure tungsten. In service, with light loading, the filament voltage may be reduced as much as 5% without deleterious effects.

Where the application, such as in audio equipment, requires a low hum level or where the emitter source power may modulate the tube output, it is advantageous to use indirectly heated cathode type tubes.

It is desirable and frequently necessary to apply filament or heater power prior to the application of anode voltage. The emitter must be permitted to assume full emitting potentiality before the application of anode voltage. This warm-up time is invariably shorter for directly heated emitters (tungsten, thoriated tungsten and oxide coated filaments) than for indirectly heated cathodes of the same heater power.

## IV. MAXIMUM RATINGS

### 1) General

A rating is a designation, as established by definite standards, of an operating limit of a tube. Each maximum rating for a given tube type must be considered in relation to all other maximum ratings for that type, so that no one maximum rating will be exceeded in utilizing any other maximum rating.

### 2) Maximum Anode Dissipation

Anode dissipation is the average power dispensed by the anode. The specified anode dissipation listed in data sheets is the maximum anode dissipation expressed in watts, that can be safely dispensed by the anode commensurate with good life and economical operation. Continuous operation may be maintained at maximum anode dissipation with specified maximum dissipation on other electrodes. Three types of cooling, depending upon their application are employed to maintain tubes within the maximum dissipation limit. These are: a) radiation; b) forced air and c) water cooling.

#### a) Radiation Cooling

The ability of the anode to dispose of the heat energy received by it through radiation and conduction from other heat sources within the tube, plus the heat developed at the anode due to electron bombardment, depends upon the total emissivity of the anode material and the heat transmission properties of the envelope surrounding the anode. Graphite, which is frequently used in radiation cooled tubes, approaches the radiation properties of a black body. It operates at a much lower temperature than a bright metal anode of the same surface area with the same received heat energy. Graphite also has the advantage of being rigid and distortionless at well above the temperature corresponding to maximum dissipation, thus assuring minimum electrical characteristic variation.

Anode dissipation affects other electrodes, primarily the grids, which if hot enough can emit electrons, sometimes changing the tube characteristics appreciably and causing erratic operation. Excessive anode dissipation will also affect the envelope and emitter temperature.

#### b) Forced-Air Cooling

Forced-air cooling eliminates electrolysis, water purification, power losses through the cooling water column, and insulating hose reels and tubing associated with water-cooled tubes. However, in air cooling, filters are required to keep the spaces between radiator fins from clogging with dust.

Forced-air cooled tubes may be of external anode construction surrounded by a multi-finned radiator in intimate contact with the external surface of the anode or may be of conventional glass envelope construction requiring forced-air for envelope and seal cooling. The higher power forced-air cooled tubes invariably have external anodes and radiators.

Forced-air cooled external-anode tube radiators require moving air furnished by a blower to pass through the fins axially and with little static pressure. Although rated anode dissipation may be exceeded if the air flow is increased, it is not recommended because of decreased cooling efficiency, higher air velocity and increased noise. It is more economical to use a larger radiator if increased dissipation is required.

Forced-air cooled glass envelope tubes generally require a small quantity of air to pass by the envelope, sometimes by a surrounding chimney – the air passing between the outside of the envelope and the inside of the chimney. In addition, air from the same source may frequently be used to cool the stem-seal and base. The forced-air requirements specified in the data sheets must be adhered to.

**c) Water Cooling**

Water cooled tube anodes are surrounded by a water jacket. Through this thin annular space water flows at high velocity. The poor thermal conductivity of water dictates that a rapid flow rather than a large quantity of water around the anode is required for efficient cooling.

Scale formation must be eliminated as it is a poor heat conductor and its rough surface inhibits smooth water flow over the anode, creating pockets where localized boiling can be damaging.

In the data sheets a minimum water flow is specified. This is an absolute minimum and must not be decreased, regardless of anode dissipation. This is because the minimum flow specified assumes a uniform film with an axial velocity sufficient to eliminate the formation of bubbles and air pockets. The flow cannot be decreased although dissipation is lowered. In forced-air cooled tubes the air flow can be adjusted to correspond to the anode dissipation; in water-cooled tubes the specified flow must be maintained under all operating conditions.

**3) Maximum Anode Voltage**

If a perfect vacuum were attainable, the maximum voltage between anode and other elements would be determined by the dielectric strength of the glass or ceramic between the anode and the other tube electrodes. In most power tubes, no insulators are used within the structure to maintain spacings or alignment of the anode with respect to the other electrodes. Therefore, the only mechanical connection between the anode and the other electrodes is through the supporting glass or ceramic, and this largely determines the maximum anode voltage.

In addition, the magnitude of the anode and filament lead radio-frequency charging current may be sufficient to cause heating of the glass adjacent to these leads. The radio-frequency charging current is proportional to the radio-frequency anode voltage which in turn is a function of the dc anode voltage. Thus, the maximum limit on anode voltage conveniently monitors the radio-frequency charging current.

The maximum anode voltage cannot be permitted to exceed the maximum value specified in the individual tube rating sheets.

**4) Maximum Anode Current**

It would be very desirable to have unlimited emission current available for use. This ideal is unattainable. All the emission current from a pure tungsten filament may be considered available and may be used without fear of impairing filament life. Therefore, a pure tungsten filament may be used at saturation current values.

The thoriated tungsten filament or oxide coated emitter cannot be used at more than one-half available emission or saturation for good life.

The maximum instantaneous anode current should never exceed the specified value. The saturation current referred to above is the emission current from the electron source (i.e.: the filament or cathode), and is the sum of the instantaneous grid and anode currents which usually occur simultaneously. The relationship between dc anode current and instantaneous anode current depends upon the

type of operation and is subject to considerable variation.

### 5) Maximum Grid Power Ratings

Grid dissipation is frequently a limiting factor in tube performance. Excessive dissipation can cause grid emission, grid distortion, which will affect electrical characteristics and performance and in extreme cases, complete destruction of the grid and tube. It is therefore very important to maintain the grid dissipation within the specified limits.

The grid, being located between the hot emitter and anode receives radiated heat energy from both, plus the heat generated on the grid during positive or conduction portions of the cycle. The grid is in the peculiar position of being very close to a copious emitter of electrons (the filament or cathode) and at a temperature where it can emit electrons due to deposits or films of emitting materials on it. Yet, emission from the grid is undesirable. Special precautions in choosing grid materials and processing are required to keep grid emission to a minimum.

The user usually has some warning of excessive grid dissipation prior to imminent trouble. Due to excessive grid temperature, the grid will emit electrons and as this current is opposite to the normal grid current, the resulting grid current as indicated on a meter will decrease. This serves as an indirect measure of excessive grid dissipation.

### 6) Maximum Frequency Rating

The Maximum Frequency Rating given in the data sheets for individual tubes apply only when the tube is operated at frequencies lower than the specified maximum frequency. As the frequency is increased, the radio-frequency currents, dielectric losses, and heating effects increase rapidly. Most tubes may be operated above the specified maximum frequency if the anode voltage and anode power input are reduced as recommended on the data sheets.

As the frequency is increased, losses in the various lead-ins, connecting caps, etc., increase. Overheating of these can be detected by a change in color at the glass-to-metal seals. A change in color from that normally existing on a non-operating tube is a danger sign.

ISSUED 6-60

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CENTRAL ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

POWER TRIODE TYPE
**7C25**
PLATE DISSIPATION —2.5KW

# POWER TRIODE

## DESCRIPTION

The Nucor tube type 7C25 is a forced-air-cooled general purpose, three electrode tube, specifically designed for industrial and communication applications. The anode is capable of dissipating 2.5 kilowatts. It features a sturdily-supported, double-spiral thoriated tungsten filament. Rugged kovar grid and filament seals insure greater protection against mechanical stress and shock. The wide spacing between elements is an additional feature of this tube. Flexible leads constructed of O.F.H.C. copper can be modified to individual customer requirements.

Full input ratings apply to 30 mc. Reduced ratings, as indicated, are applicable for useful power outputs extending to 50 mc.

## SPECIFICATIONS

### ELECTRICAL:

| | |
|---|---|
| Filament Voltage | 11 Volts |
| Filament Current | 28 Amperes |
| Filament Starting Current | 56 Amperes |
| Filament Cold Resistance | 0.047 Ohms |
| Peak Cathode Current | 10 Amperes |
| Amplification Factor | 25 |
| $E_b$ = 3,000 Volts, $1_b$ = 0.200 Amps. | |
| Interelectrode Capacitances | |
| Grid-Plate | 13.2 $\mu\mu$f |
| Grid-Filament | 14.5 $\mu\mu$f |
| Plate-Filament | 1.7 $\mu\mu$f |

### PHYSICAL:

Mounting Position —
Vertical, Anode Down

Type of Cooling — Forced Air
Maximum Incoming Air Temperature .... 45°C

Required Air Flow on Anode

| | | | |
|---|---|---|---|
| Plate Dissipation (Kilowatts) | 2.5 | 2.0 | 1.5 |
| Air Flow—Cubic Feet per min. | 150 | 120 | 90 |
| Pressure — Inches Water | 2.5 | 1.6 | 0.9 |

Maximum Glass Temperature ..... 150°C
Net Weight, Approximate ..... 5 pounds

# MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

### FOR MAXIMUM FREQUENCY OF 50 MEGACYCLES

## RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR -- CLASS C TELEGRAPHY

### MAXIMUM RATINGS

| | |
|---|---|
| DC Plate Voltage | 5,000 Volts |
| DC Grid Voltage | —1,500 Volts |
| DC Plate Current | 1.3 Amperes |
| DC Grid Current | 0.150 Amperes |
| Plate Input | 6.5 Kilowatts |
| Plate Dissipation | 2.5 Kilowatts |

### TYPICAL OPERATION

| | | | |
|---|---|---|---|
| DC Plate Voltage | 4,000 | 4,500 | 5,000 Volts |
| DC Grid Voltage | —400 | —500 | —600 Volts |
| Peak R-F Grid Voltage | 1,000 | 1,150 | 1,300 Volts |
| DC Plate Current | 1.0 | 1.2 | 1.2 Amperes |
| DC Grid Current | 0.08 | 0.1 | 0.13 Amperes |
| Driving Power, Approx. | 80 | 110 | 160 Watts |
| Power Output | 2.5 | 3.1 | 4.0 Kilowatts |

## PLATE-MODULATED RADIO-FREQUENCY POWER AMPLIFIER -- CLASS C TELEPHONY

(Carrier conditions per tube use with a maximum modulator factor of 1.0)

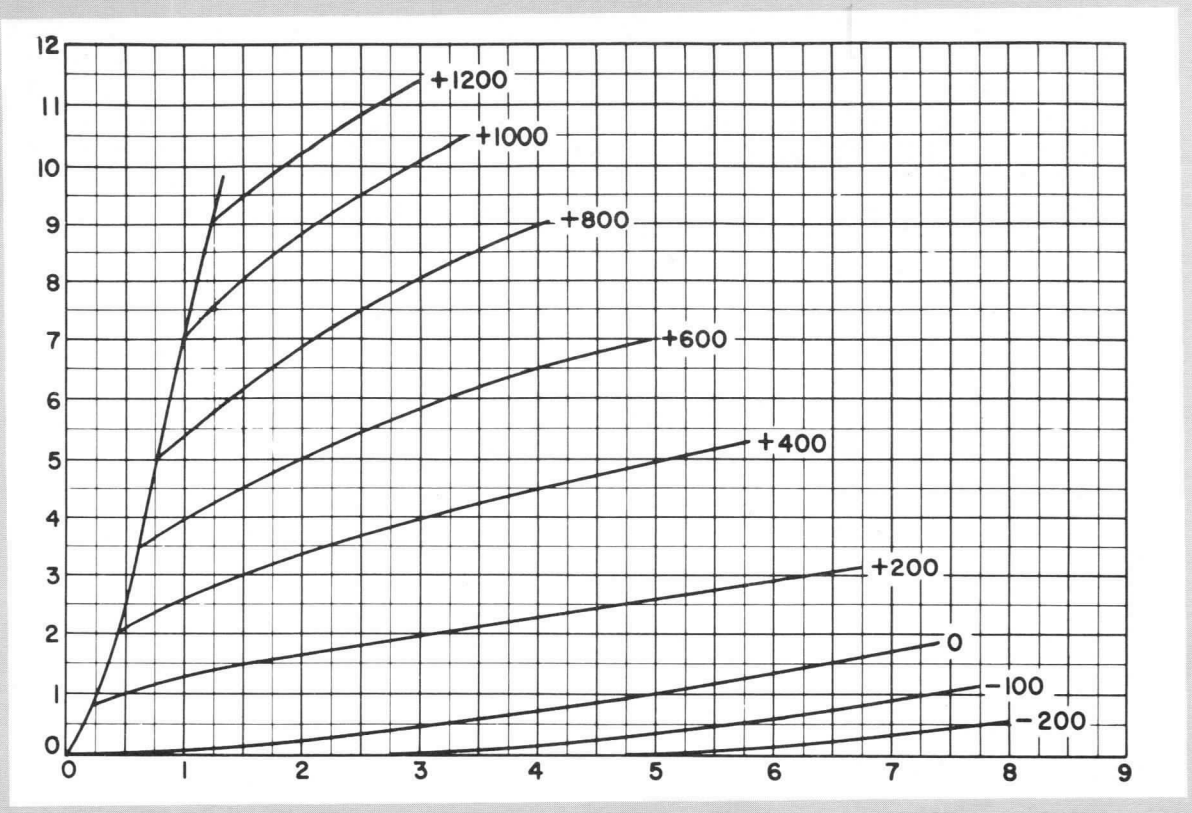
### MAXIMUM RATINGS

| | |
|---|---|
| DC Plate Voltage | 4,000 Volts |
| DC Grid Voltage | —1,500 Volts |
| DC Plate Current | 1.0 Amperes |
| DC Grid Current | 0.15 Amperes |
| Plate Input | 4.0 Kilowatts |
| Plate Dissipation | 1.6 Kilowatts |

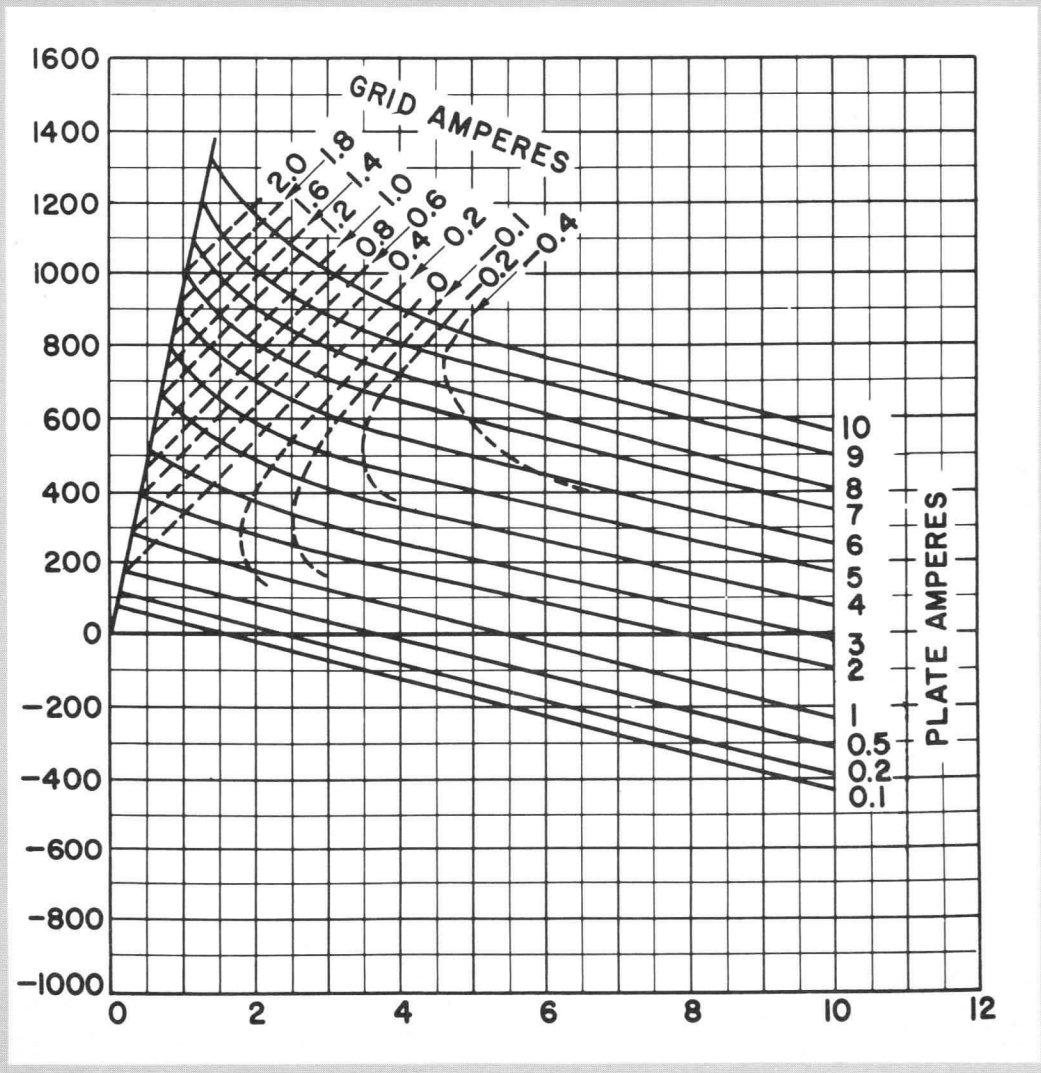
### TYPICAL OPERATION

| | |
|---|---|
| DC Plate Voltage | 3,500 Volts |
| DC Grid Voltage | —500 Volts |
| Peak R-F Grid Voltage | 1,000 Volts |
| DC Plate Current | 0.825 Amperes |
| DC Grid Current | 0.110 Amperes |
| Driving Power, Approx. | 100 Watts |
| Power Output | 2 Kilowatts |

## PLATE CHARACTERISTICS




## CONSTANT CURRENT CHARACTERISTICS



POWER TRIODE

TYPE

**7C25**

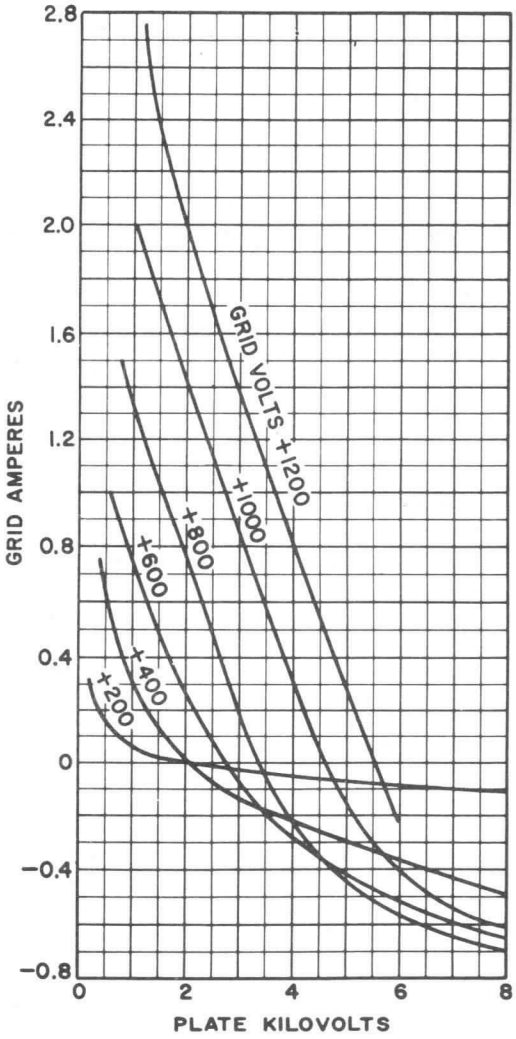
PLATE DISSIPATION —2.5KW

# CENTRAL ELECTRONIC

## MANUFACTURERS

DENVILLE, NEW JERSEY

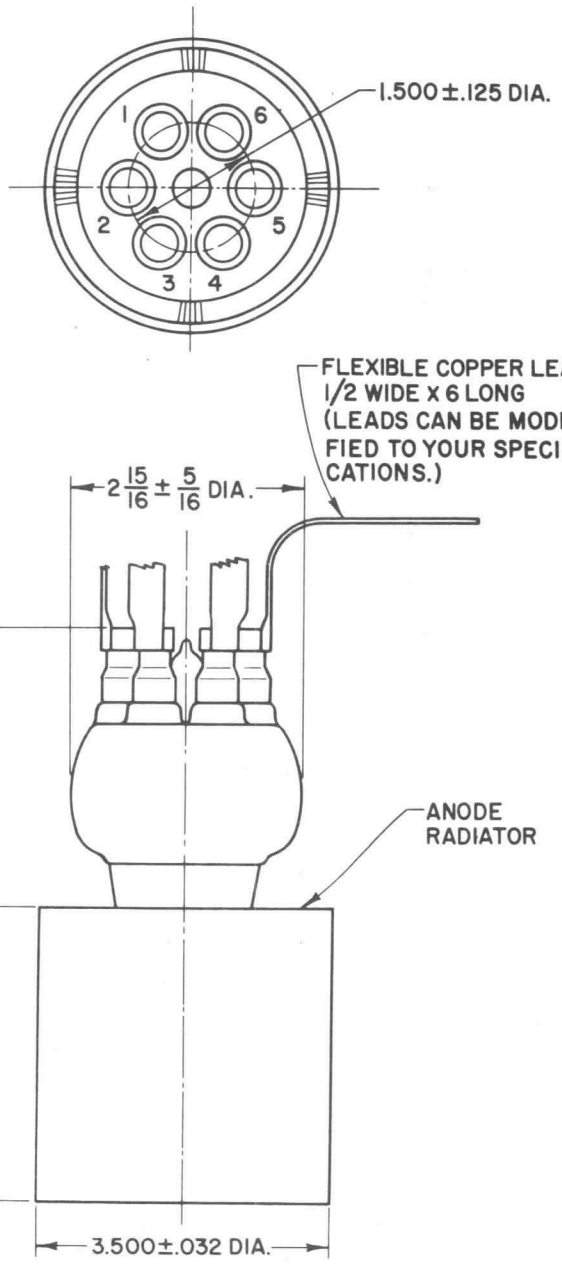
GRID CHARACTERISTICS




## TERMINAL COLOR CODE

1=GRID -- BLACK
2=FIL. -- YELLOW
3=GRID -- BLACK
4=F.C.T. -- RED
5=GRID -- BLACK
6=FIL. -- YELLOW

OUTLINE




DIVISION OF NUCLEAR CORPORATION OF AMERICA

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CENTRAL ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

POWER TRIODE
TYPE
5680
PLATE DISSIPATION
—2.5KW

# POWER TRIODE

## DESCRIPTION

The Nucor tube type 5680 is a forced-air-cooled general purpose, three electrode tube, specifically designed for industrial and communication applications. The anode is capable of dissipating 2.5 kilowatts. It features a sturdily-supported, double-spiral thoriated tungsten filament. Rugged kovar grid and filament seals insure greater protection against mechanical stress and shock. The wide spacing between elements is an additional feature of this tube. Full input ratings apply to 30 mc. Reduced ratings as indicated, are applicable for useful power outputs extending to 50 mc.

## SPECIFICATIONS

### ELECTRICAL:

| | |
|---|---|
| Filament Voltage | 13.0 Volts |
| Filament Current | 36 Amperes |
| Filament Starting Current | 72 Amperes |
| Filament Cold Resistance | 0.040 ohms |
| Amplification Factor | 25 |
| $E_c$ = —200V, $I_b$ = 0.2A | |
| Interelectrode Capacitances | |
| Grid-Plate | 12.0 $\mu\mu$f |
| Grid-Filament | 15.0 $\mu\mu$f |
| Plate-Filament | 1.8 $\mu\mu$f |

### PHYSICAL:

Mounting Position — Vertical, Anode Down
Type of Cooling — Forced Air Maximum Incoming Air Temperature ..... 45°C

| Required Air Flow on Anode Plate Dissipation (Kilowatts) | 2.5 | 2.0 | 1.5 |
|---|---|---|---|
| Air Flow — Cubic Feet Per Min. | 150 | 120 | 90 |
| Pressure — Inches Water | 2.5 | 1.6 | 0.9 |

Maximum Glass Temperature ..... 150°C
Net Weight, Approximate ..... 5¼ Pounds

# MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

## AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR -- CLASS B

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 6,000 Volts |
| Maximum Signal DC Plate Current* | 2.0 Amperes |
| Maximum Signal Plate Input* | 6.0 Kilowatts |
| Plate Dissipation* | 2.5 Kilowatts |

### TYPICAL OPERATION

(Unless otherwise specified, values are for two tubes)

| | |
|---|---|
| DC Plate Voltage | 5,000 Volts |
| DC Grid Voltage | —150 Volts |
| Peak A-F Grid-to-Grid Voltage | 1,260 Volts |
| Zero Signal DC Plate Current | 0.4 Amperes |
| Maximum Signal DC Plate Current | 2.25 Amperes |
| Effective Load Resistance, Plate to Plate | 4,000 Ohms |
| Maximum Signal Driving Power, Approximate | 175 Watts |
| Maximum Signal Power Output, Approximate | 7.2 Kilowatts |

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

## RADIO-FREQUENCY POWER AMPLIFIER -- CLASS B

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

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 6,000 Volts |
| DC Plate Current | 1.5 Amperes |
| Plate Input | 3.75 Kilowatts |
| Plate Dissipation | 2.5 Kilowatts |

### TYPICAL OPERATION

| | |
|---|---|
| DC Plate Voltage | 6,000 Volts |
| DC Grid Voltage | —160 Volts |
| Peak R-F Grid Voltage | 300 Volts |
| DC Plate Current | 0.56 Amperes |
| DC Grid Current, Approximate | 0.0 Amperes |
| Driving Power, Approximate** | 47 Watts |
| Power Output, Approximate | 1 Kilowatt |

**At crest of audio-frequency cycle with modulation factor of 1.0.

## PLATE-MODULATED RADIO-FREQUENCY POWER AMPLIFIER -- CLASS C TELEPHONY

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

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 5,000 Volts |
| DC Grid Voltage | —2,000 Volts |
| DC Plate Current | 1.5 Amperes |
| DC Grid Current | 0.2 Amperes |
| Plate Input | 7.5 Kilowatts |
| Plate Dissipation | 1.6 Kilowatts |

### TYPICAL OPERATION

| | |
|---|---|
| DC Plate Voltage | 5,000 Volts |
| DC Grid Voltage | —800 Volts |
| Peak R-F Grid Voltage | 1,370 Volts |
| DC Plate Current | 0.74 Amperes |
| DC Grid Current, Approximate | 0.10 Amperes |
| Driving Power, Approximate | 130 Watts |
| Power Output, Approximate | 2.7 Kilowatts |

## RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR CLASS C TELEGRAPHY

(Key-down conditions per tube without amplitude modulation) †

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 6,000 Volts |
| DC Grid Voltage | —2,000 Volts |
| DC Plate Current | 2.0 Amperes |
| DC Grid Current | 0.2 Amperes |
| Plate Input | 12 Kilowatts |
| Plate Dissipation | 2.5 Kilowatts |

### TYPICAL OPERATION

| | |
|---|---|
| DC Plate Voltage | 6,000 Volts |
| DC Grid Voltage | —800 Volts |
| Peak R-F Grid Voltage | 1,510 Volts |
| DC Plate Current | 1.4 Amperes |
| DC Grid Current, Approximate | 0.16 Amperes |
| Driving Power, Approximate | 225 Watts |
| Power Output, Approximate | 6 Kilowatts |

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

## RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR -- PULSED OPERATION

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 17,500 Volts |
| DC Grid Voltage | —5,000 Volts |
| Peak Cathode Current | 35 Amperes |
| Plate Dissipation † | 1.2 Kilowatts |
| Duty Cycle | .030 |

† Air Flow = 75 CFM

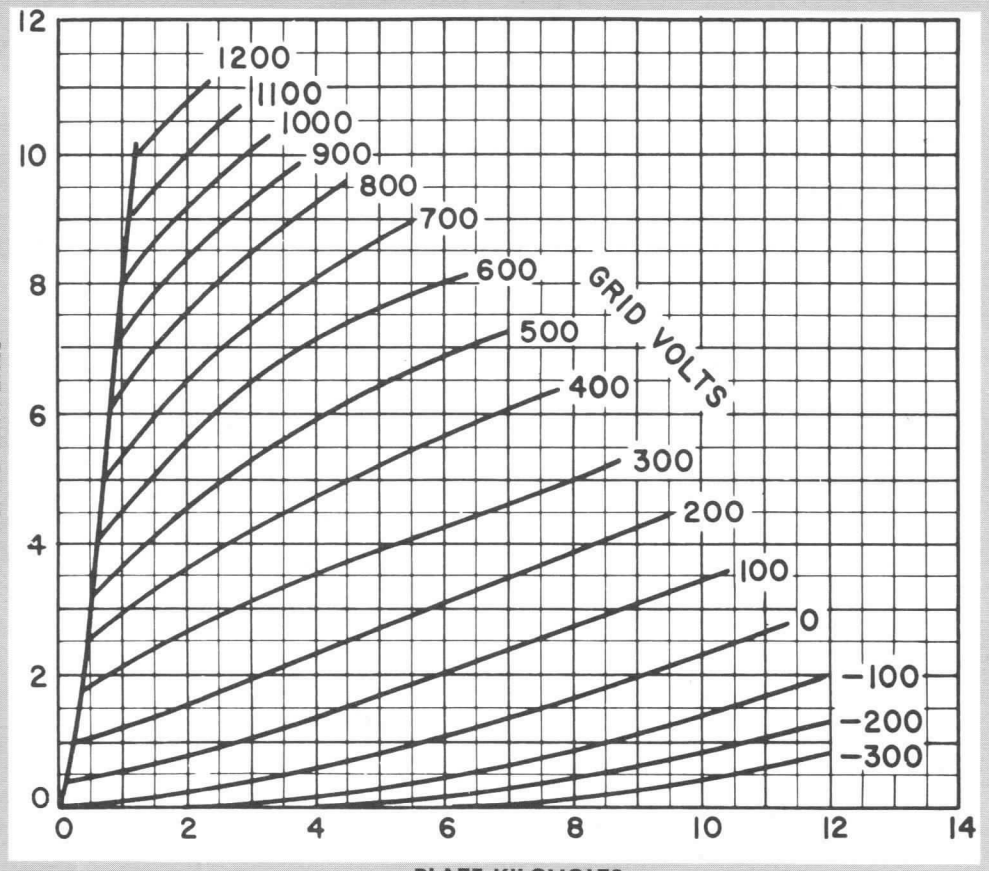
### TYPICAL OPERATION

| | |
|---|---|
| DC Plate Voltage | 15,500 Volts |
| DC Grid Voltage (during pulse) | —750 Volts |
| DC Plate Current | 0.20 Amperes |
| DC Grid Current | 0.013 Amperes |
| Duty Cycle | .023 |
| Peak Power Output | 90 Kilowatts |

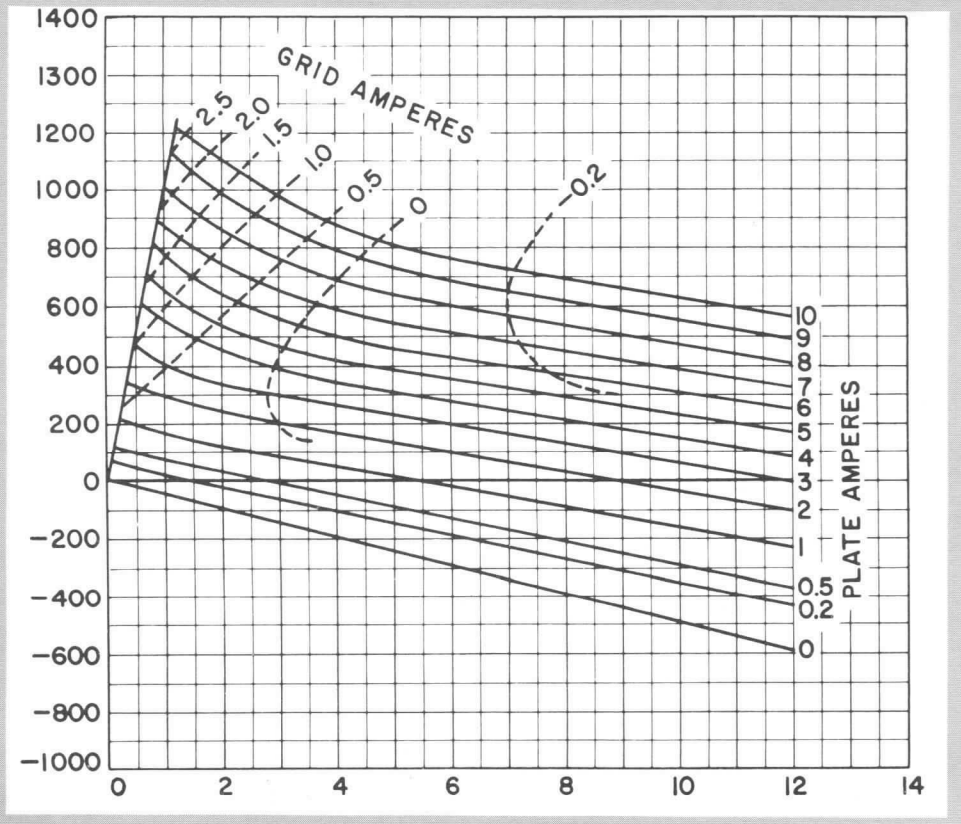
### MAXIMUM RATINGS vs. OPERATING FREQUENCY

| | | |
|---|---|---|
| Frequency | 30 | 50 Megacycles |
| Percentage of Maximum rated Plate Voltage and Plate Input | | |
| Class C — Telegraphy | 100 | 75 Per Cent |

PLATE CHARACTERISTICS




CONSTANT CURRENT CHARACTERISTICS



POWER TRIODE

TYPE

# 5680

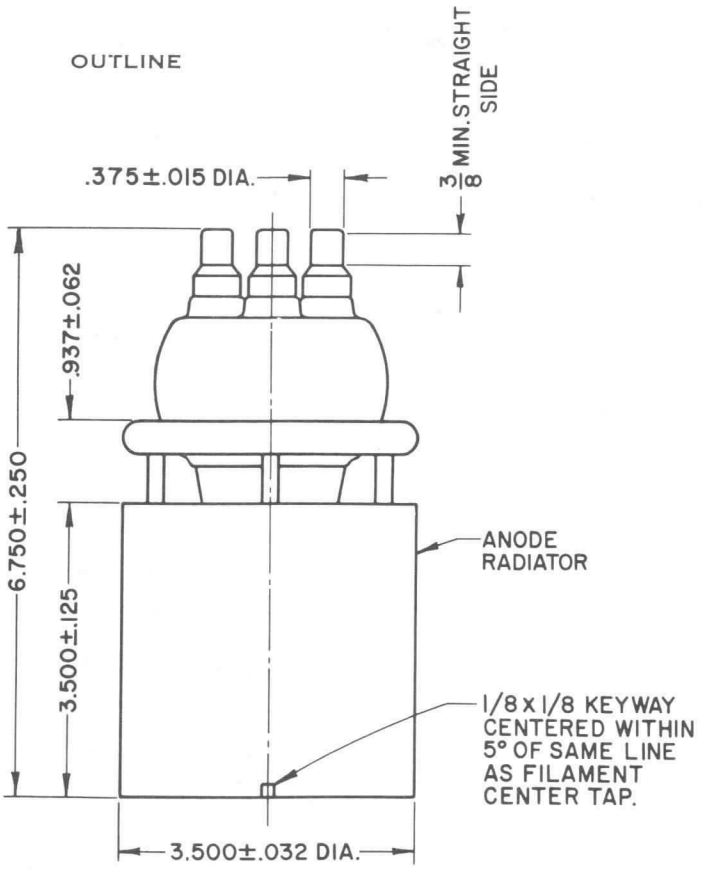
PLATE DISSIPATION —2.5KW

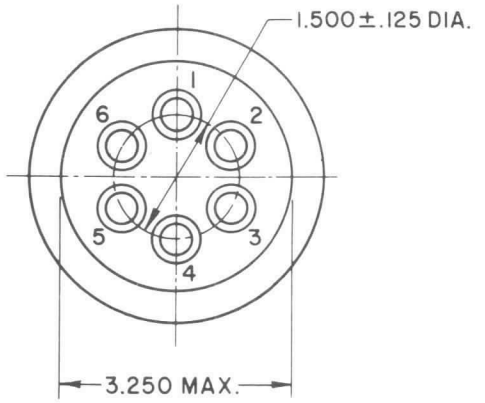
# CENTRAL ELECTRONIC

## MANUFACTURERS

DENVILLE, NEW JERSEY

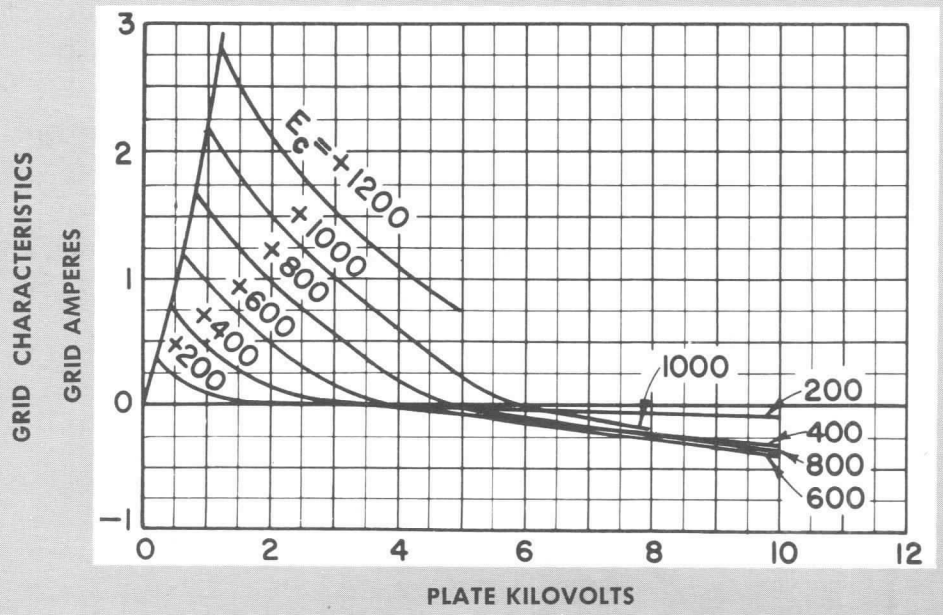
OUTLINE




## TERMINAL COLOR CODE

1=GRID -- BLACK
2=FIL. -- YELLOW
3=GRID -- BLACK
4=F.C.T. -- RED
5=GRID -- BLACK
6=FIL. -- YELLOW

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Printed in U. S. A.

Central ELECTRONIC
MANUFACTURERS
DENVILLE. NEW JERSEY

CENTRAL
POWER
TRIODE
TYPE
**5736**

PLATE DISSIPATION
–3KW

# POWER TRIODE

## DESCRIPTION

The 5736 is a three-electrode tube designed for use as a modulator, amplifier or oscillator in AM, FM and TV broadcasting service, high-frequency communications systems, and induction and dielectric heating equipments. Four grid terminals provide a low-inductance connection to the grid making the tube suited especially to cathode-drive operation. The cathode is a thoriated-tungsten filament connected for single-phase operation. The anode is forced-air cooled and can readily dissipate 2.5 kw with nominal air flow. Special features include: precise and stable alignment of electrodes to prevent grid-cathode shorts and to assure reliability and uniform operation, brazed radiator construction to eliminate hot-spotting and its detrimental effects. Maximum ratings of 5.0 kv dc plate voltage and 5.0 kw plate input apply at frequencies up to 60 mc; operation at 100 mc is permissible with plate voltage and input reduced to 80% of maximum ratings.


## SPECIFICATIONS

### ELECTRICAL

| | |
|---|---|
| Filament Voltage | 6.0 Volts |
| Filament Current | 60 Amps |
| Filament Cold Resistance | 0.016 Ohms |
| Amplification Factor | 22 |
| Interelectrode Capacitances: | |
| Grid-Plate | 16 $\mu\mu$f |
| Grid-Filament | 19 $\mu\mu$f |
| Plate-Filament | 0.8 $\mu\mu$f |

### PHYSICAL

| | |
|---|---|
| Mounting Position | Vertical, Anode Up or Down |
| Type of Cooling | Forced Air |
| Maximum Incoming Air Temperature | 45°C |
| Required Air-Flow on Anode** | 150 cfm |
| Static Pressure, Inches Water | 2.8 Inches |
| Maximum Radiator Temperature | 180°C |
| Required Air-Flow to Bulb and Seals | |
| Air-Flow through radiator normally is sufficient | |
| Maximum Bulb Temperature | 160°C |
| Net Weight, approximate | 3 lbs. |

**Except television ratings which require 180 cfm of cooling air at 4 inches water static pressure.

# MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

(CONTINUOUS COMMERCIAL SERVICE)

## AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR CLASS B

**MAXIMUM RATINGS, ABSOLUTE VALUES**

| | |
|---|---|
| D-C Plate Voltage | 3000 volts |
| Maximum Signal D-C Plate Current* | 1.4 amps |
| Maximum Signal Plate Input* | 4200 watts |
| Plate Dissipation* | 2500 watts |

**TYPICAL OPERATION**

(Unless otherwise specified, values are for two tubes)

| | |
|---|---|
| D-C Plate Voltage | 3000 volts |
| D-C Grid Voltage | —160 volts |
| Peak A-F Grid-to-Grid Voltage | 820 volts |
| Zero Signal D-C Plate Current | 0.66 amp |
| Maximum Signal D-C Plate Current | 2.80 amps |
| Effective Load Resistance, Plate-to-Plate | 3060 ohms |
| Maximum Signal Driving Power, approx. | 140 watts |
| Maximum Signal Power Output, approx. | 4350 watts |
| Load Resistance (per tube) | 765 ohms |

## RADIO-FREQUENCY AND POWER AMPLIFIER -- CLASS B

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

**MAXIMUM RATINGS, ABSOLUTE VALUES**

| | |
|---|---|
| D-C Plate Voltage | 3500 volts |
| D-C Plate Current | 1.75 amps |
| Plate Input | 3500 watts |
| Plate Dissipation | 2500 watts |

**TYPICAL OPERATION**

| | |
|---|---|
| D-C Plate Voltage | 3000 volts |
| D-C Grid Voltage | —160 volts |
| Peak R-F Grid Voltage | 280 volts |
| D-C Plate Current | 1.1 amps |
| D-C Grid Current, approx. | 0.050 amp |
| Driving Power, approx.†† | 15 watts |
| Power Output, approx. | 800 watts |

## RADIO-FREQUENCY POWER AMPLIFIER -- CLASS B

Grounded-Grid, Wide-Band Television Service, Maximum Frequency — 88 Megacycles

**MAXIMUM RATINGS, ABSOLUTE VALUES**

| | |
|---|---|
| D-C Plate Voltage | 3500 volts |
| D-C Plate Current | 1.75 amps |
| Plate Input | 4000 watts |
| Plate Dissipation## | 2800 watts |

**TYPICAL OPERATION**

| | |
|---|---|
| D-C Plate Voltage | 2600 volts |
| D-C Plate Current: | |
| Synchronizing Level | 2.32 amps |
| Black Level | 1.47 amps |
| D-C Grid Voltage | —160 volts |

**PEAK R-F GRID VOLTAGES:**

| | |
|---|---|
| Synchronizing Level | 535 volts |
| Black Level | 400 volts |

**D-C GRID CURRENT:**

| | |
|---|---|
| Synchronizing Level | 0.430 amp |
| Black Level | 0.136 amp |

**DRIVING POWER, APPROX.:**

| | |
|---|---|
| Synchronizing Level | 1160 watts |
| Black Level | 535 watts |

**POWER OUTPUT, APPROX. #:**

| | |
|---|---|
| Synchronizing Level | 3680 watts |
| Black Level | 1690 watts |

## RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR CLASS C TELEGRAPHY

Key-down conditions per tube without amplitude modulation†

**MAXIMUM RATINGS, ABSOLUTE VALUES**

| | 60 mc | 110 mc |
|---|---|---|
| D-C Plate Voltage | 5000 | 3500 volts |
| D-C Grid Voltage | —1000 | —700 volts |
| D-C Plate Current | 1.4 | 1.4 amps |
| D-C Grid Current | 0.5 | 0.5 amp |
| Plate Input | 5000 | 3500 watts |
| Piate Dissipation | 2500 | 2500 watts |

**TYPICAL OPERATION**

| | 60 mc | 110 mc | |
|---|---|---|---|
| D-C Plate Voltage | 5000 | 3500 | 3500 volts |
| D-C Grid Voltage | —850 | —600 | —300 volts |
| Peak R-F Grid Voltage | 1200 | 940 | 555 volts |
| D-C Plate Current | 1.0 | 1.0 | 1.0 amps |
| D-C Grid Current | 0.210 | 0.250 | 0.155 amp |
| Driving Power, approx. | 250 | 235 | 85 watts |
| Power Output, approx. | 4100 | 2800 | 2550 watts |

## PLATE-MODULATED RADIO-FREQUENCY POWER AMPLIFIER CLASS C TELEPHONY

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

**MAXIMUM RATINGS, ABSOLUTE VALUES**

| | |
|---|---|
| D-C Plate Voltage | 3500 volts |
| D-C Grid Voltage | —1000 volts |
| D-C Plate Current | 1.4 amps |
| D-C Grid Current | 0.5 amp |
| Plate Input | 4000 watts |
| Plate Dissipation | 1650 watts |

**TYPICAL OPERATION**

| | |
|---|---|
| D-C Plate Voltage | 3500 volts |
| D-C Grid Voltage | —600 volts |
| Peak R-F Grid Voltage | 950 volts |
| D-C Plate Current | 1.14 amps |
| D-C Grid Current, approx. | 0.28 amp |
| Driving Power, approx. | 270 watts |
| Power Ouptut, approx. | 3200 watts |

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

††At crest of audio-frequency cycle with modulation factor of 1.0.

##Requires 180 cfm of cooling air at 4 inches static pressure.

#Includes power transferred from driver stage.

†Modulation essentially negative may be used if the positive peak of the carrier envelope does not exceed 115% of the carrier condition.

## APPLICATION NOTES

Maximum ratings apply up to 60 megacycles. The tube may be operated at higher frequencies provided the maximum values of the plate voltage and power input are reduced according to the tabulation below. All other maximum ratings remain as shown above. Special attention should be given to adequate ventilation of the bulb at these frequencies. See special television service ratings.

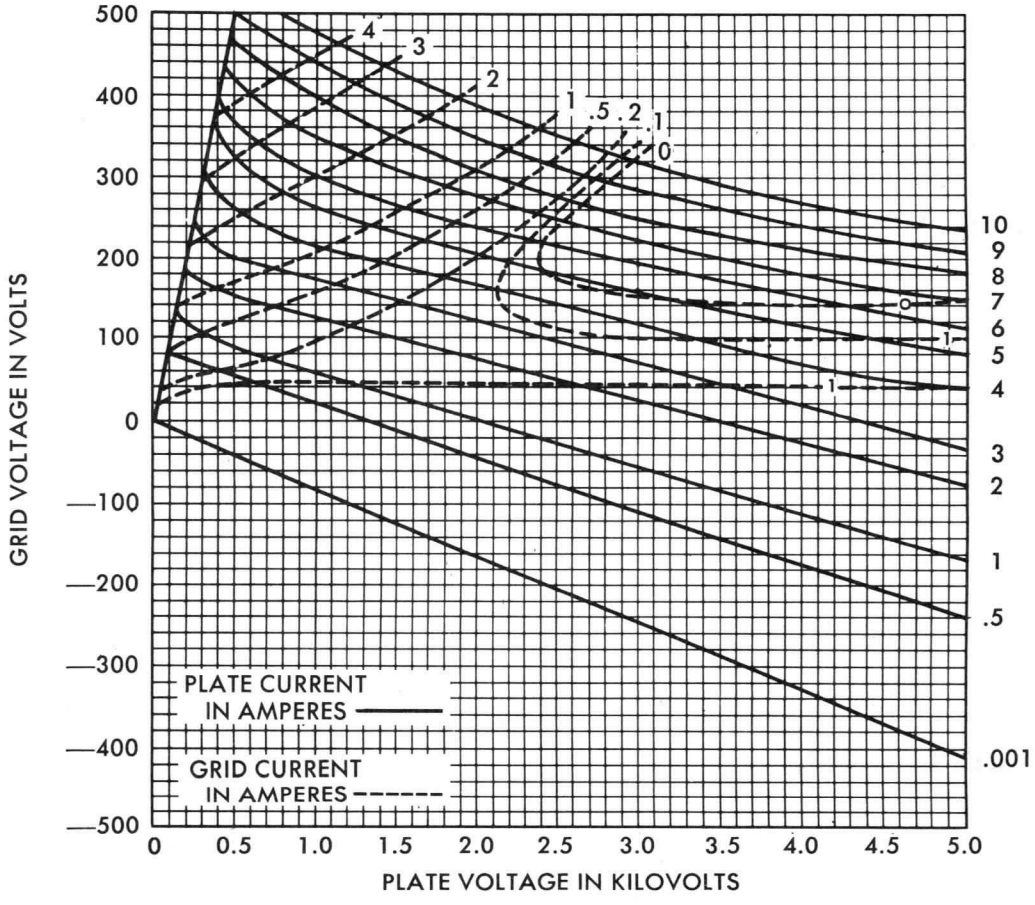
Percentage of Maximum Rated Plate Voltage and Plate Input:

| Frequency | 60 | 100 | 200 mc |
|---|---|---|---|
| Class B | 100 | 85 | 60% |
| Class C Plate Modulated | 100 | 80 | 50% |
| Class C Unmodulated | 100 | 80 | 50% |

## CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

| CHARACTERISTIC: | CONDITIONS | LIMITS | |
|---|---|---|---|
| | | Min. | Max. |
| Grid Voltage | $e_b$ = 1000 volts; $i_b$ = 6 amps | —— | 360 Volts |
| Grid Current | $e_b$ = 1000 volts; $i_b$ = 6 amps | —— | 2.2 Amps. |
| Plate Voltage | $E_c$ = —20 volts; $I_b$ = 0.40 amp $E_b$ | 1150 | 1650 Volts |
| Plate Voltage | $E_c$ = —30 volts; $I_b$ = 0.40 amp $E_b$ | 1370 | 1870 Volts |
| Peak Cathode Current* | | 10 | —— Amps. |
| Power Output | $E_b$ = 5000 volts; $I_b$ = 1.0 amp<br>$E_c$ = —850 volts; $I_g$ = 0.3 amp<br>f = 60 megacycles | 3800 | —— Watts |

*Represents maximum usable cathode current for tube as plate current plus grid current for any condition of operation.



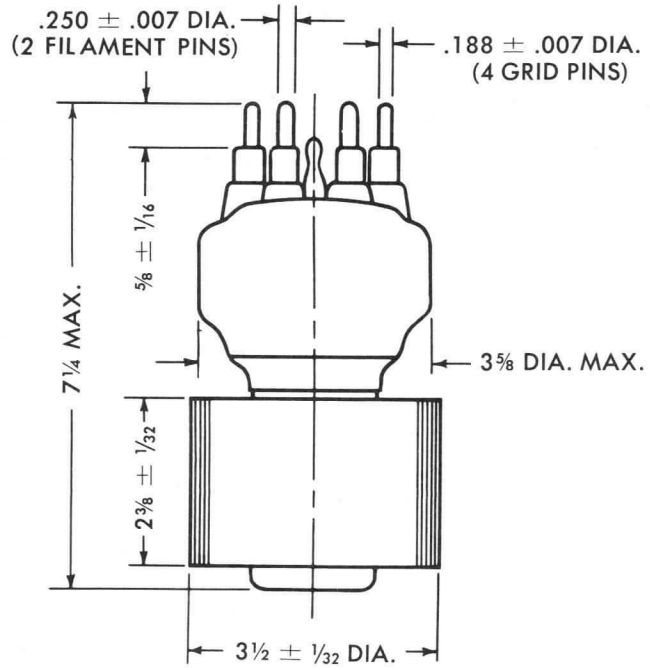

## CONSTANT CURRENT CHARACTERISTICS

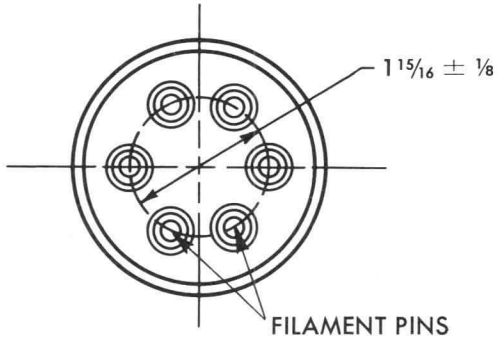
CENTRAL
POWER
TRIODE
TYPE

# 5736

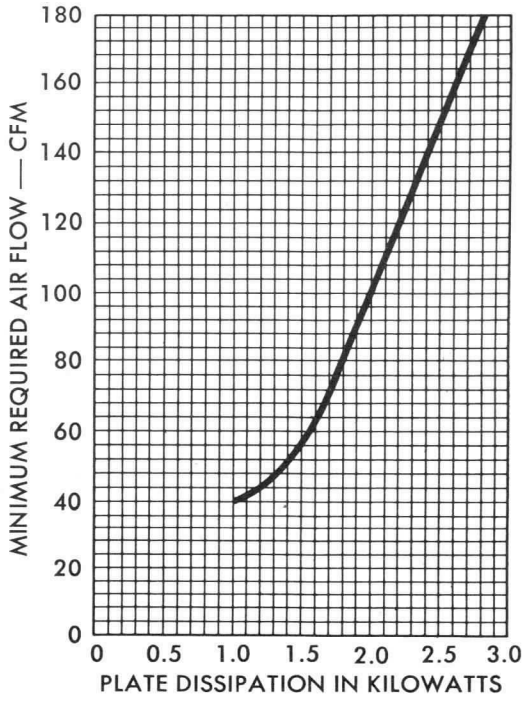
PLATE DISSIPATION
–3KW

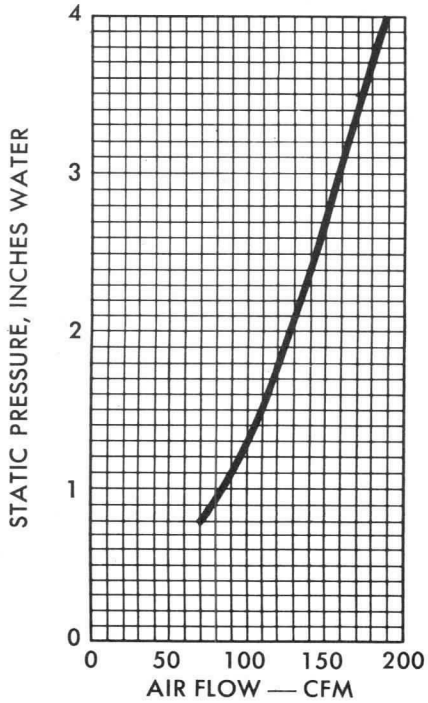
Central ELECTRONIC
MANUFACTURERS
DENVILLE NEW JERSEY




NOTE
6 PINS TO BE
CONCENTRIC




1M 8-60

## AIR COOLING CHARACTERISTICS

CENTRAL ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

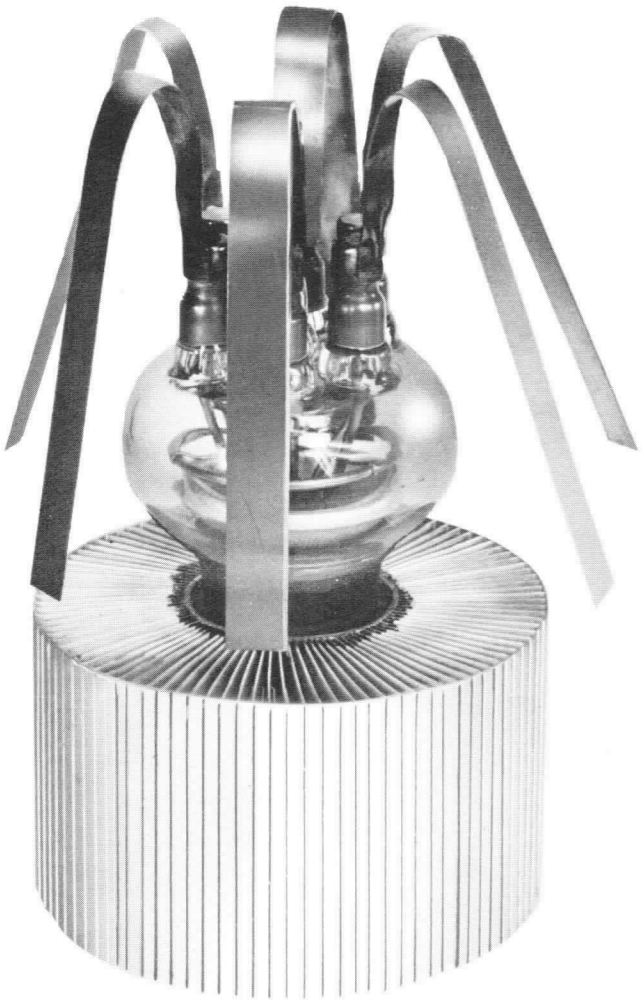
POWER TRIODE
TYPE
6366
PLATE DISSIPATION —3KW

# POWER TRIODE

## DESCRIPTION

The Nucor tube type 6366 is a forced-air-cooled, three electrode tube, specifically designed for use as an industrial oscillator. The anode is capable of dissipating 3 kilowatts. It features a sturdily-supported, double-spiral, thoriated tungsten filament. Rugged kovar grid and filament seals insure greater protection against mechanical stress and shock. The wide spacing between elements and the high efficiency, low pressure radiator are additional features of this tube. Flexible leads constructed of O.F.H.C. copper can be modified to individual customer requirements.

Full input ratings apply to 30 mc. Reduced ratings as indicated, are applicable for useful power outputs extending to 50 mc.



## SPECIFICATIONS

### ELECTRICAL:

| | |
|---|---|
| Filament Voltage | 11 Volts |
| Filament Current | 29 Amperes |
| Amplification Factor | 25 |
| $E_c$ = −200V, $I_b$ = 0.2 A | |
| Interelectrode Capacitances | |
| Grid-Plate | 13 $\mu\mu$f |
| Grid-Filament | 14.5 $\mu\mu$ |
| Plate-Filament | 1.7 $\mu\mu$f |

### PHYSICAL:

Mounting Position — Vertical, Anode Down
Type of Cooling — Forced Air

| | |
|---|---|
| Maximum Incoming Air Temperature | 45°C |

Required Air Flow on Anode

| | | | |
|---|---|---|---|
| Plate Dissipation (Kilowatts) | 3 | 2.4 | 1.8 |
| Air Flow—Cubic Feet per min | 190 | 125 | 75 |
| Pressure — Inches Water | 1.21 | 0.58 | 0.26 |

| | |
|---|---|
| Maximum Glass Temperature | 150°C |
| Net Weight, Approximate | 4¼ pounds |

# MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

## RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR -- CLASS C TELEGRAPHY

(Key-down conditions per tube without amplitude modulation)†

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 5,500 Volts |
| DC Grid Voltage | —1,500 Volts |
| DC Plate Current | 1.3 Amperes |
| DC Grid Current | 0.15 Amperes |
| Plate Input | 7 Kilowatts |
| Plate Dissipation | 3 Kilowatts |

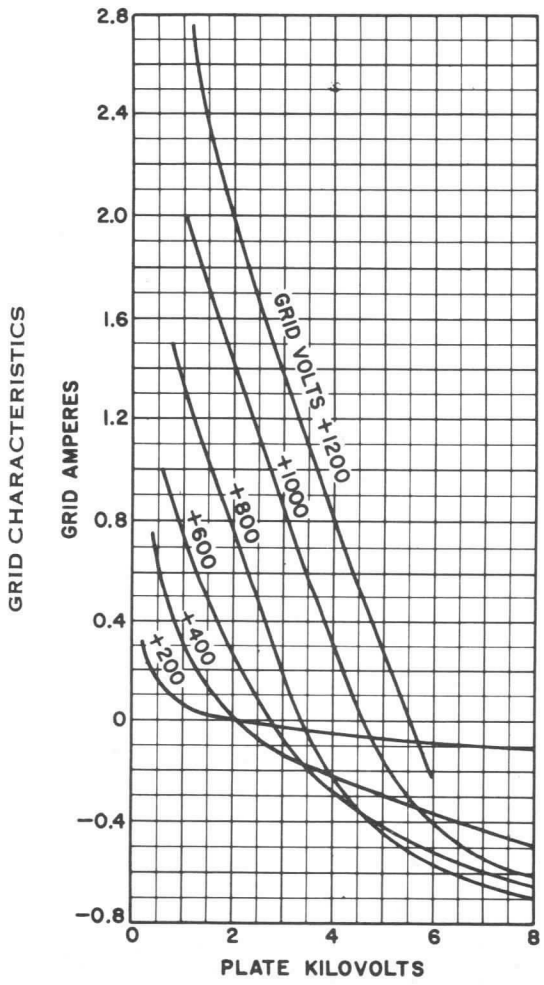
### TYPICAL OPERATION

| | | |
|---|---|---|
| DC Plate Voltage | 4,500 | 5,000 Volts |
| DC Grid Voltage | —500 | —600 Volts |
| Peak R-F Grid Voltage | 1,100 | 1,300 Volts |
| DC Plate Current | 1.0 | 1.2 Amperes |
| DC Grid Current, Approximate | 0.12 | 0.13 Amperes |
| Driving Power, Approximate | 120 | 160 Watts |
| Power Output, Approximate | 3.0 | 4 Kilowatts |

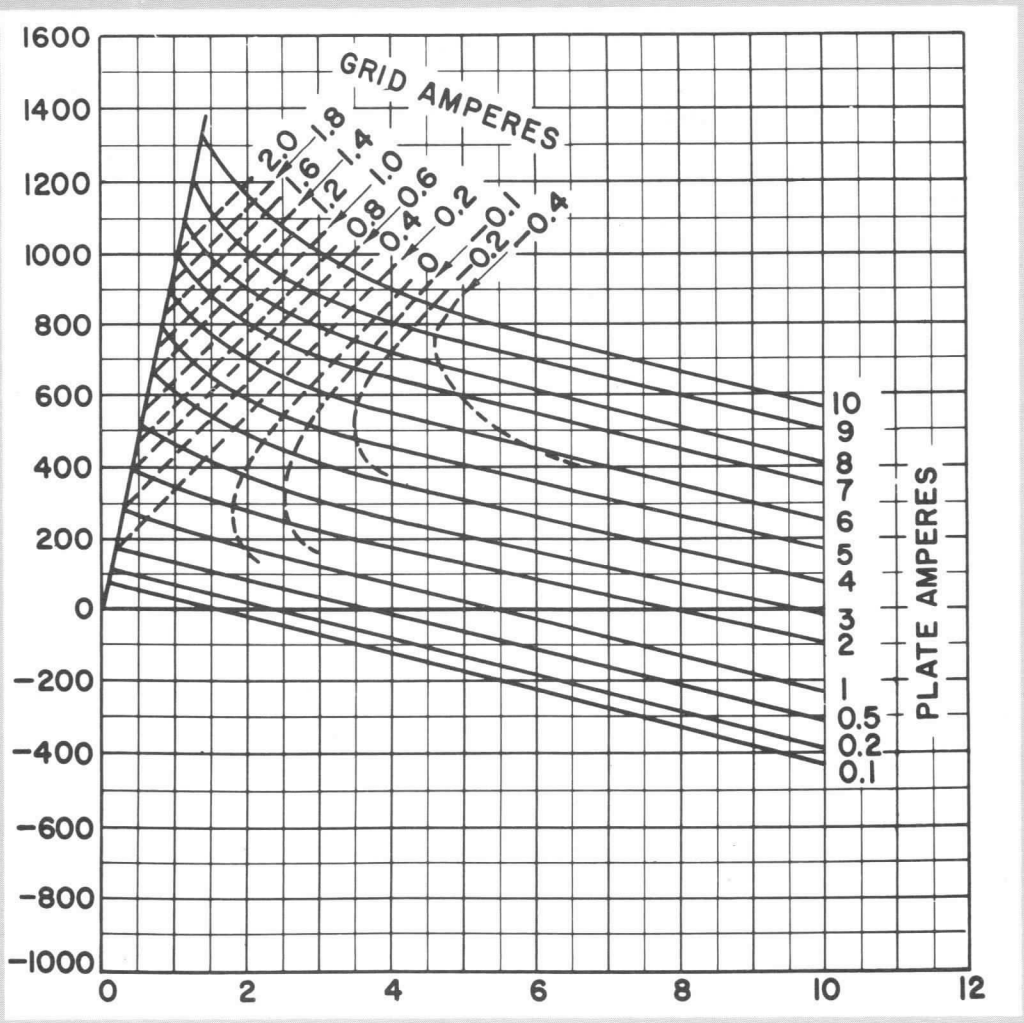
† Modulation essentially negative may be used if the positive peak of the envelope does not exceed 115 per cent of the carrier conditions.

### MAXIMUM RATINGS vs. OPERATING FREQUENCY

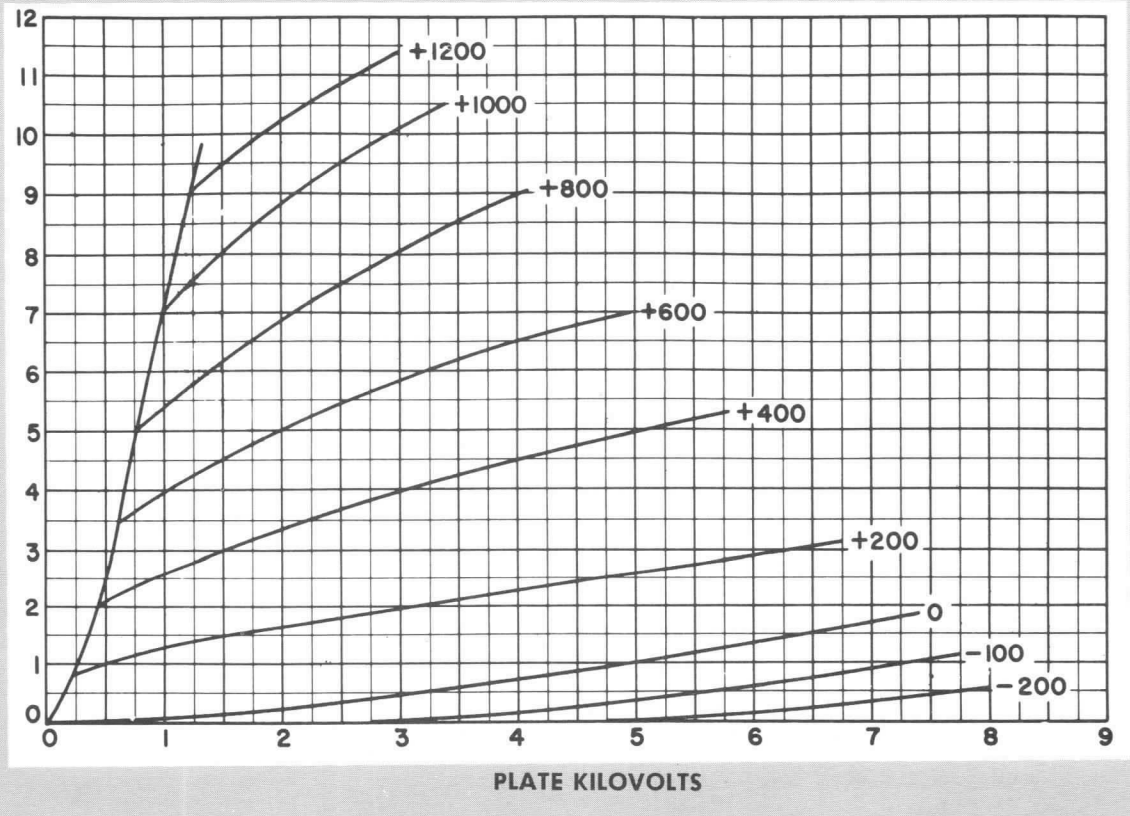
| | | |
|---|---|---|
| Frequency | 30 | 50 Megacycles |
| Percentage of Maximum Rated Plate Voltage and Plate Input | | |
| Class C — Telegraphy | 100 | 75 Per Cent |



## CONSTANT CURRENT CHARACTERISTICS




## PLATE CHARACTERISTICS



**POWER TRIODE**

TYPE

**6366**

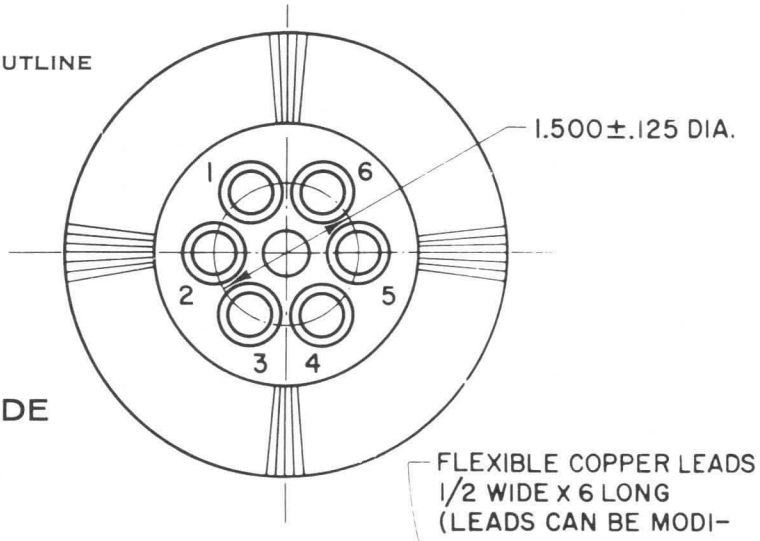
PLATE DISSIPATION —3KW

# CENTRAL ELECTRONIC

## MANUFACTURERS

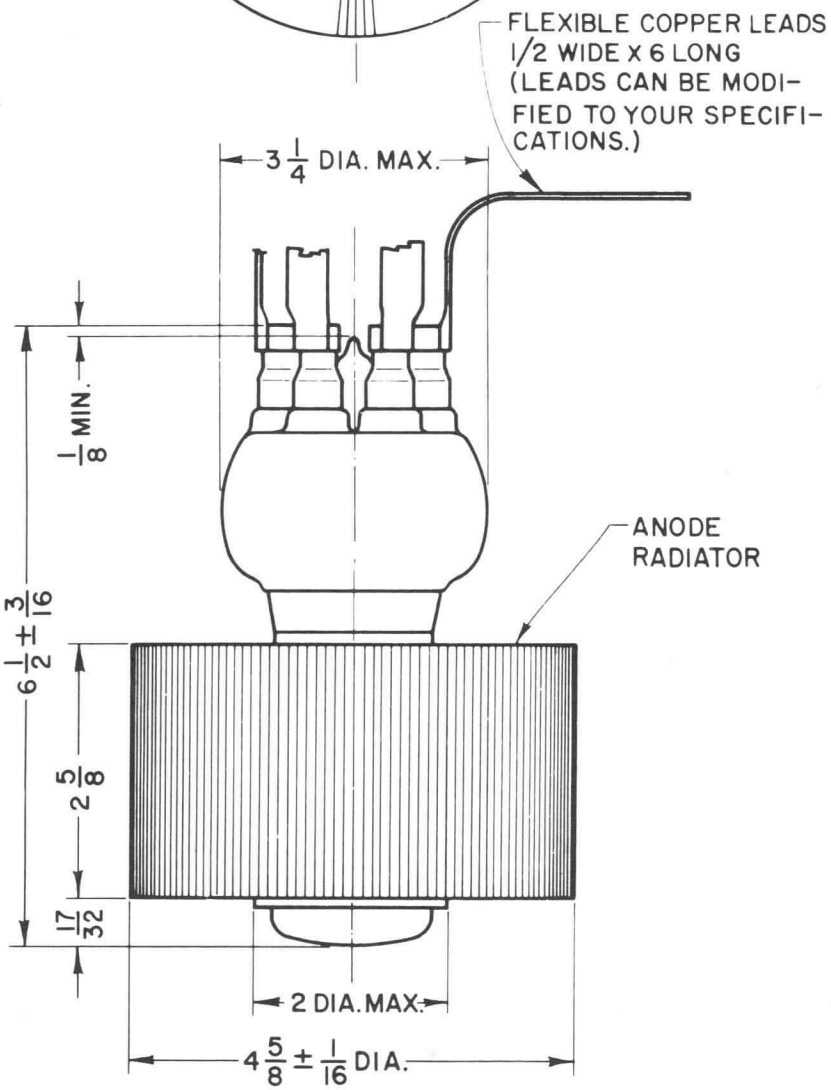
DENVILLE, NEW JERSEY

OUTLINE




## TERMINAL COLOR CODE

1=GRID -- BLACK
2=FIL. -- YELLOW
3=GRID -- BLACK
4=F.C.T. -- RED
5=GRID -- BLACK
6=FIL. -- YELLOW

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CENTRAL ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

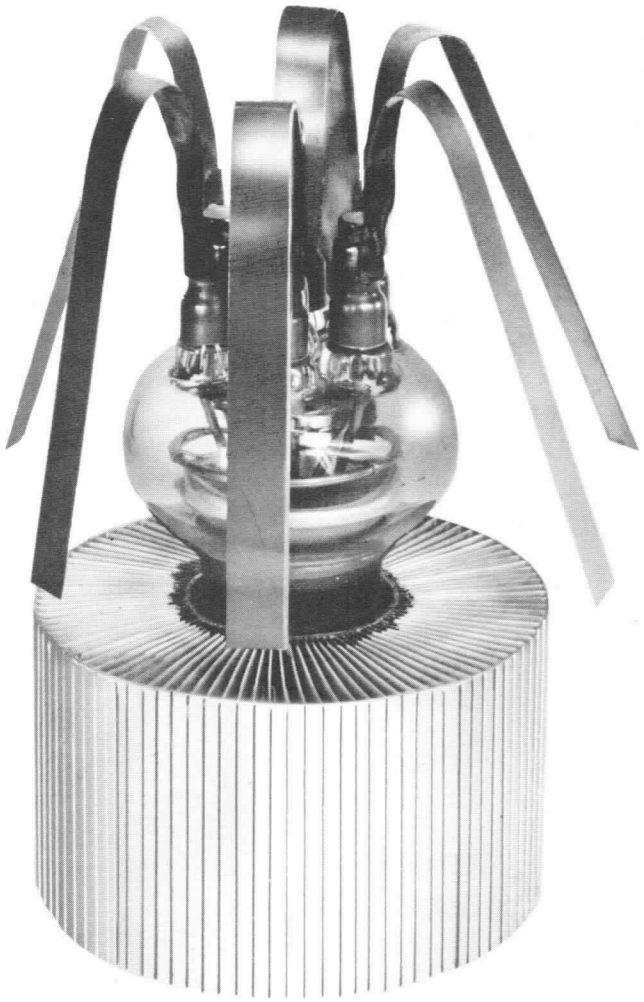
POWER TRIODE
TYPE
6367
PLATE DISSIPATION —3KW

# POWER TRIODE

## DESCRIPTION

The Nucor tube type 6367 is a forced-air-cooled general purpose, three electrode tube, specifically designed for industrial and communication applications. The anode is capable of dissipating 3 kilowatts. It features a sturdily-supported, double-spiral thoriated tungsten filament. Rugged kovar grid and filament seals, insures greater protection against mechanical stress and shock. The wide spacing between elements and the high efficiency, low pressure radiator are additional features of this tube. Flexible leads constructed of O.F.H.C. copper can be modified to individual customer requirements.

Full input ratings apply to 30 mc. Reduced ratings, as indicated, are applicable for useful power outputs extending to 50 mc.



## SPECIFICATIONS

### ELECTRICAL:

| | |
|---|---|
| Filament Voltage | 13.0 Volts |
| Filament Current | 36 Amperes |
| Amplification Factor, $E_c$ = —200V, $I_b$ = 0.2A | 25 |
| Interelectrode Capacitances | |
| Grid-Plate | 14.7 $\mu\mu$f |
| Grid-Filament | 14.5 $\mu\mu$f |
| Plate-Filament | 1.7 $\mu\mu$f |

### PHYSICAL:

Mounting Position — Vertical

Type of Cooling — Forced-Air

| | | | |
|---|---|---|---|
| Maximum Incoming Air Temperature | | | 45°C |
| Required Air Flow on Anode | | | |
| Plate Dissipation (Kilowatts) | 3 | 2.4 | 1.8 |
| Air Flow — Cubic Feet Per Min. | 190 | 125 | 75 |
| Pressure — Inches Water | 1.21 | 0.58 | 0.26 |
| Maximum Glass Temperature | | | 150°C |
| Net Weight Approximate | | | 4¼ Pounds |

# MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

## AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR -- CLASS B

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 6,200 Volts |
| Maximum Signal DC Plate Current* | 2.0 Amperes |
| Maximum Signal Plate Input* | 6.0 Kilowatts |
| Plate Dissipation* | 3 Kilowatts |

### TYPICAL OPERATION

(Unless otherwise specified, values are for two tubes)

| | |
|---|---|
| DC Plate Voltage | 5,000 Volts |
| DC Grid Voltage | —150 Volts |
| Peak A-F Grid-to-Grid Voltage | 1,260 Volts |
| Zero Signal DC Plate Current | 0.4 Ampere |
| Maximum Signal DC Plate Current | 2.25 Amperes |
| Effective Load Resistance, Plate-to-Plate | 4,000 Ohms |
| Maximum Signal Driving Power, Approximate | 175 Watts |
| Maximum Signal Power Output, Approximate | 7.2 Kilowatts |

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

## PLATE MODULATED RADIO-FREQUENCY POWER AMPLIFIER -- CLASS C TELEPHONY

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

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 5,000 Volts |
| DC Grid Voltage | —1,500 Volts |
| DC Plate Current | 1.5 Amperes |
| DC Grid Current | 0.2 Ampere |
| Plate Input | 7.5 Kilowatts |
| Plate Dissipation | 2 Kilowatts |

### TYPICAL OPERATION

| | |
|---|---|
| DC Plate Voltage | 5,000 Volts |
| DC Grid Voltage | —800 Volts |
| Peak R-F Grid Voltage | 1,370 Volts |
| DC Plate Current | 0.74 Ampere |
| DC Grid Current, Approximate | 0.10 Ampere |
| Driving Power, Approximate | 130 Watts |
| Power Output, Approximate | 2.7 Kilowatts |

## RADIO-FREQUENCY POWER AMPLIFIER -- CLASS B

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

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 6,200 Volts |
| DC Plate Current | 1.5 Amperes |
| Plate Input | 4.5 Kilowatts |
| Plate Dissipation | 3 Kilowatts |

### TYPICAL OPERATION

| | |
|---|---|
| DC Plate Voltage | 6,000 Volts |
| DC Grid Voltage | —160 Volts |
| Peak R-F Grid Voltage | 300 Volts |
| DC Plate Current | 0.56 Ampere |
| DC Grid Current, Approximate | 0.0 Amperes |
| Driving Power, Approximate** | 47 Watts |
| Power Output, Approximate | 1 Kilowatt |

**At crest of audio-frequency cycle with modulation factor of 1.0.

## RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR -- CLASS C TELEGRAPHY

(Key-down conditions per tube without amplitude modulation) †

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 6,200 Volts |
| DC Grid Voltage | —1,500 Volts |
| DC Plate Current | 2.0 Amperes |
| DC Grid Current | 0.2 Ampere |
| Plate Input | 12 Kilowatts |
| Plate Dissipation | 3 Kilowatts |

### TYPICAL OPERATION

| | |
|---|---|
| DC Plate Voltage | 6,000 Volts |
| DC Grid Voltage | —800 Volts |
| Peak R-F Grid Voltage | 1,510 Volts |
| DC Plate Current | 1.4 Amperes |
| DC Grid Current, Approximate | 0.16 Ampere |
| Driving Power, Approximate | 225 Watts |
| Power Output, Approximate | 6 Kilowatts |

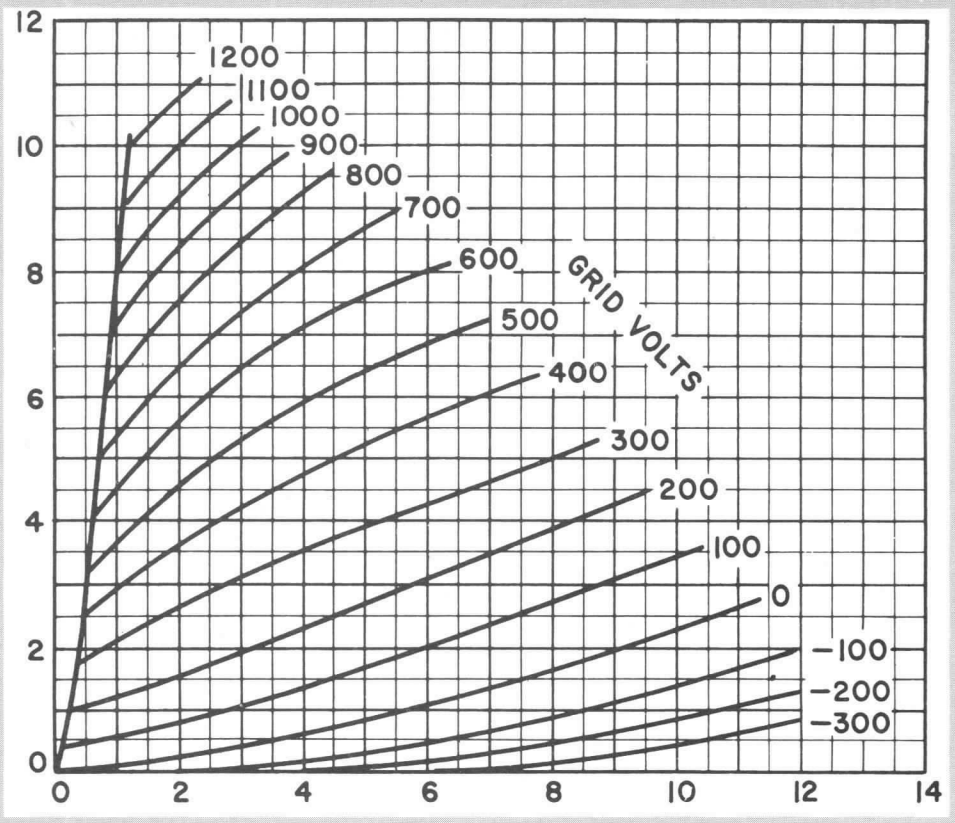
† Modulation, essentially negative, may be used if the positive peak of the envelope does not exceed 115 per cent of the carrier conditions.

### MAXIMUM RATINGS vs. OPERATING FREQUENCY

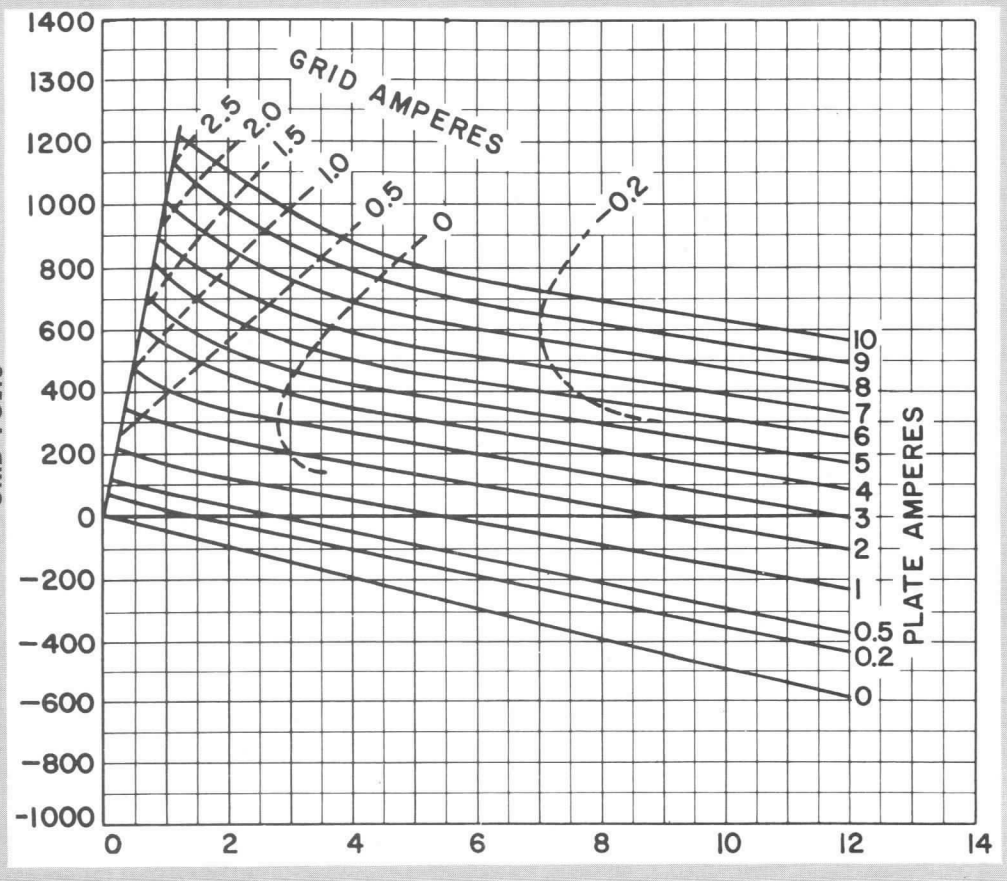
| | 30 | 50 Megacycles |
|---|---|---|
| Percentage of Maximum Rated Plate Voltage and Plate Input | | |
| Class C — Telegraphy | 100 | 75 Per Cent |

(Unless otherwise specified, values are for two tubes)

PLATE CHARACTERISTICS




CONSTANT CURRENT CHARACTERISTICS



**POWER TRIODE**

TYPE

# 6367

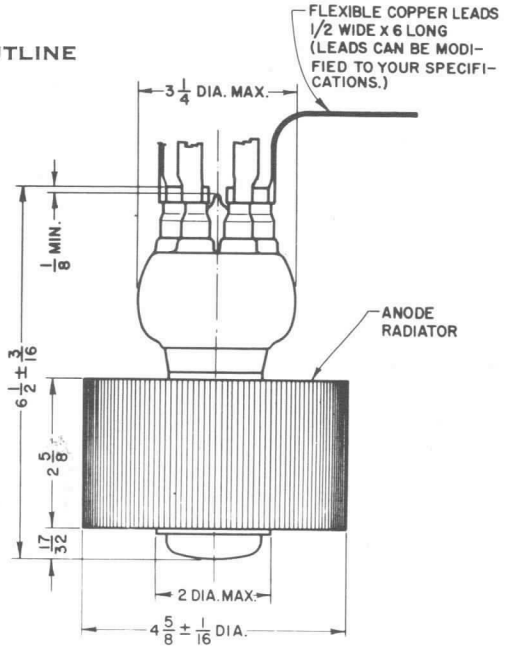
PLATE DISSIPATION —3KW

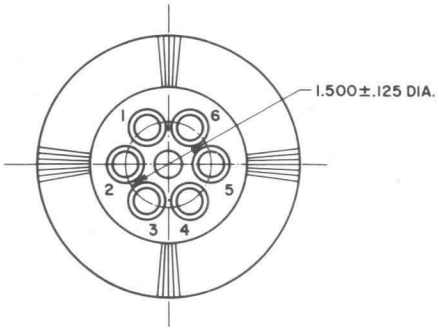
# CENTRAL ELECTRONIC

## MANUFACTURERS

DENVILLE, NEW JERSEY

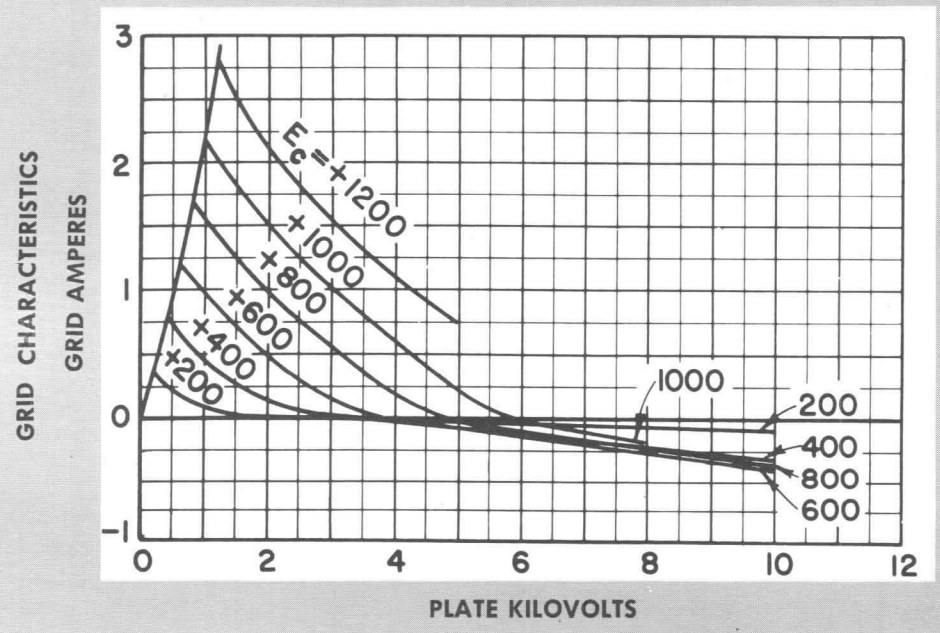
OUTLINE




## TERMINAL COLOR CODE

1=GRID -- BLACK
2=FIL. -- YELLOW
3=GRID -- BLACK
4=F.C.T. -- RED
5=GRID -- BLACK
6=FIL. -- YELLOW

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Central ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

POWER TRIODE

TYPE 6623
PLATE DISSIPATION —3KW

# POWER TRIODE

## DESCRIPTION

The 6623 is a three-electrode tube designed for use as a modulator, amplifier or oscillator in AM, FM and TV broadcasting service, high-frequency communications systems, and induction and dielectric heating equipments. Two grid terminals provide a low-inductance connection to the grid making the tube suited especially to cathode-drive operation. The emitter is a thoriated-tungsten filament connected for single-phase operation. The anode is forced-air cooled and can readily dissipate 2.5 kw with nominal air flow. Special features include: precise and stable alignment of electrodes to prevent grid-cathode shorts and to assure reliability and uniform operation, brazed radiator construction to eliminate hot-spotting and its detrimental effects. Maximum ratings of 5.0 kv dc plate voltage and 5.0 kw plate input apply at frequencies up to 60 mc; operation at 100 mc is permissible with plate voltage and input reduced to 80% of maximum ratings.

## SPECIFICATIONS

### ELECTRICAL

| | |
|---|---|
| Filament | Thoriated tungsten |
| Filament Voltage | 6.0 Volts |
| Filament Current | 60 Amps |
| Filament Cold Resistance | 0.016 Ohms |
| Amplification Factor | 22 |
| Interelectrode Capacitances: | |
| Grid-Plate | 16 $\mu\mu$f |
| Grid-Filament | 19 $\mu\mu$f |
| Plate-Filament | 1.0 $\mu\mu$f |
| Mounting Socket | CAS-A or CAS-B series |

### PHYSICAL

| | |
|---|---|
| Mounting Position | Vertical, Anode Up or Down |
| Type of Cooling | Forced Air |
| Maximum Incoming Air Temperature | 45°C |
| Required Air-Flow on Anode | 150 cfm |
| Static Pressure, Inches Water | 0.9 Inches |
| Maximum Radiator Temperature | 180°C |
| Required Air-Flow to Bulb and Seals | |
| Air-Flow through radiator normally is sufficient | |
| Maximum Bulb Temperature | 160°C |
| Net Weight, approximate | 4 lbs. |

Note: Cooling of header and envelope may be provided by deflecting anode cooling air or by a separate blower delivering 10 cfm air.

# MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

(CONTINUOUS COMMERCIAL SERVICE)

## AUDIO-FREQUENCY POWER AMPLIFIER AND MODULATOR CLASS B

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| D-C Plate Voltage | 3000 volts |
| Maximum Signal D-C Plate Current* | 1.75 amps |
| Maximum Signal Plate Input* | 4200 watts |
| Plate Dissipation* | 2500 watts |

### TYPICAL OPERATION

(Unless otherwise specified, values are for two tubes)

| | |
|---|---|
| D-C Plate Voltage | 3000 volts |
| D-C Grid Voltage | —160 volts |
| Peak A-F Grid-to-Grid Voltage | 820 volts |
| Zero Signal D-C Plate Current | 0.66 amp |
| Maximum Signal D-C Plate Current | 2.80 amps |
| Effective Load Resistance, Plate-to-Plate | 3060 ohms |
| Maximum Signal Driving Power, approx. | 140 watts |
| Maximum Signal Power Output, approx. | 4350 watts |
| Load Resistance (per tube) | 765 ohms |

## RADIO-FREQUENCY AND POWER AMPLIFIER -- CLASS B

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

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| D-C Plate Voltage | 3500 volts |
| D-C Plate Current | 1.75 amps |
| Plate Input | 3500 watts |
| Plate Dissipation | 2500 watts |

### TYPICAL OPERATION

| | |
|---|---|
| D-C Plate Voltage | 3000 volts |
| D-C Grid Voltage | —160 volts |
| Peak R-F Grid Voltage | 280 volts |
| D-C Plate Current | 1.1 amps |
| D-C Grid Current, approx. | 0.050 amp |
| Driving Power, approx.†† | 15 watts |
| Power Output, approx. | 800 watts |

## RADIO-FREQUENCY POWER AMPLIFIER -- CLASS B

Grounded-Grid, Wide-Band Television Service, Maximum Frequency — 88 Megacycles

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| D-C Plate Voltage | 3500 volts |
| D-C Plate Current | 1.75 amps |
| Plate Input | 4000 watts |
| Plate Dissipation## | 2800 watts |

### TYPICAL OPERATION

| | |
|---|---|
| D-C Plate Voltage | 2600 volts |
| D-C Plate Current: | |
| Synchronizing Level | 2.32 amps |
| Black Level | 1.47 amps |
| D-C Grid Voltage | —160 volts |
| **PEAK R-F GRID VOLTAGES:** | |
| Synchronizing Level | 535 volts |
| Black Level | 400 volts |
| **D-C GRID CURRENT:** | |
| Synchronizing Level | 0.430 amp |
| Black Level | 0.136 amp |
| **DRIVING POWER, APPROX.:** | |
| Synchronizing Level | 1160 watts |
| Black Level | 535 watts |
| **POWER OUTPUT, APPROX. #:** | |
| Synchronizing Level | 3680 watts |
| Black Level | 1690 watts |

## RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR CLASS C TELEGRAPHY

Key-down conditions per tube without amplitude modulation†

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | 60 mc | 110 mc |
|---|---|---|
| D-C Plate Voltage | 5000 | 3500 volts |
| D-C Grid Voltage | —1000 | —700 volts |
| D-C Plate Current | 1.4 | 1.4 amps |
| D-C Grid Current | 0.5 | 0.5 amp |
| Plate Input | 5000 | 3500 watts |
| Plate Dissipation | 2500 | 2500 watts |

### TYPICAL OPERATION

| | 60 mc | 110 mc | |
|---|---|---|---|
| D-C Plate Voltage | 5000 | 3500 | 3500 volts |
| D-C Grid Voltage | —850 | —600 | —300 volts |
| Peak R-F Grid Voltage | 1200 | 940 | 555 volts |
| D-C Plate Current | 1.0 | 1.0 | 1.0 amps |
| D-C Grid Current | 0.210 | 0.250 | 0.155 amp |
| Driving Power, approx. | 250 | 235 | 85 watts |
| Power Output, approx. | 4100 | 2800 | 2550 watts |

## PLATE-MODULATED RADIO-FREQUENCY POWER AMPLIFIER CLASS C TELEPHONY

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

### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| D-C Plate Voltage | 3500 volts |
| D-C Grid Voltage | —1000 volts |
| D-C Plate Current | 1.4 amps |
| D-C Grid Current | 0.5 amp |
| Plate Input | 4000 watts |
| Plate Dissipation | 1650 watts |

### TYPICAL OPERATION

| | |
|---|---|
| D-C Plate Voltage | 3500 volts |
| D-C Grid Voltage | —600 volts |
| Peak R-F Grid Voltage | 950 volts |
| D-C Plate Current | 1.14 amps |
| D-C Grid Current, approx. | 0.28 amp |
| Driving Power, approx. | 270 watts |
| Power Ouptut, approx. | 3200 watts |

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

††At crest of audio-frequency cycle with modulation factor of 1.0.

##Requires 180 cfm of cooling air at 4 inches static pressure.

#Includes power transferred from driver stage.

†Modulation essentially negative may be used if the positive peak of the carrier envelope does not exceed 115% of the carrier condition.

## APPLICATION NOTES

Maximum ratings apply up to 60 megacycles. The tube may be operated at higher frequencies provided the maximum values of the plate voltage and power input are reduced according to the tabulation below. All other maximum ratings remain as shown above. Special attention should be given to adequate ventilation of the bulb at these frequencies. See special television service ratings.

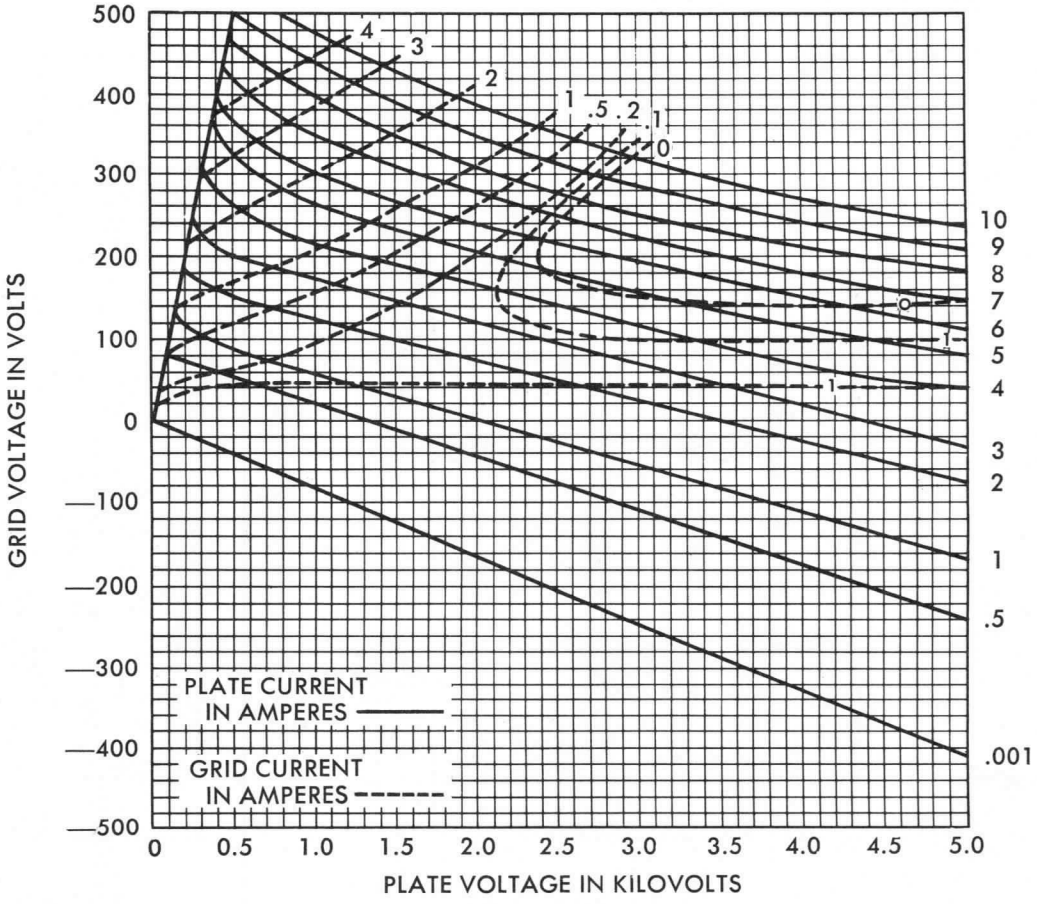
Percentage of Maximum Rated Plate Voltage and Plate Input:

| Frequency | 60 | 100 | 200 mc |
|---|---|---|---|
| Class B | 100 | 85 | 60% |
| Class C Plate Modulated | 100 | 80 | 50% |
| Class C Unmodulated | 100 | 80 | 50% |

## CHARACTERISTIC RANGE VALUES FOR EQUIPMENT DESIGN

| CHARACTERISTIC: | CONDITIONS | LIMITS | |
|---|---|---|---|
| | | Min. | Max. |
| Grid Voltage | $e_b$ = 1000 volts; $i_b$ = 6 amps | —— | 360 Volts |
| Grid Current | $e_b$ = 1000 volts; $i_b$ = 6 amps | —— | 2.2 Amps |
| Plate Voltage | $E_c$ = −20 volts; $I_b$ = 0.40 amp $E_b$ | 1150 | 1650 Volts |
| Plate Voltage | $E_c$ = −30 volts; $I_b$ = 0.40 amp $E_b$ | 1370 | 1870 Volts |
| Peak Cathode Current* | | 10 | —— Amps |
| Power Output | $E_b$ = 5000 volts; $I_b$ = 1.0 amp<br>$E_c$ = −850 volts; $I_g$ = 0.3 amp<br>f = 60 megacycles | 3800 | —— Watts |

*Represents maximum usable cathode current for tube as plate current plus grid current for any condition of operation.



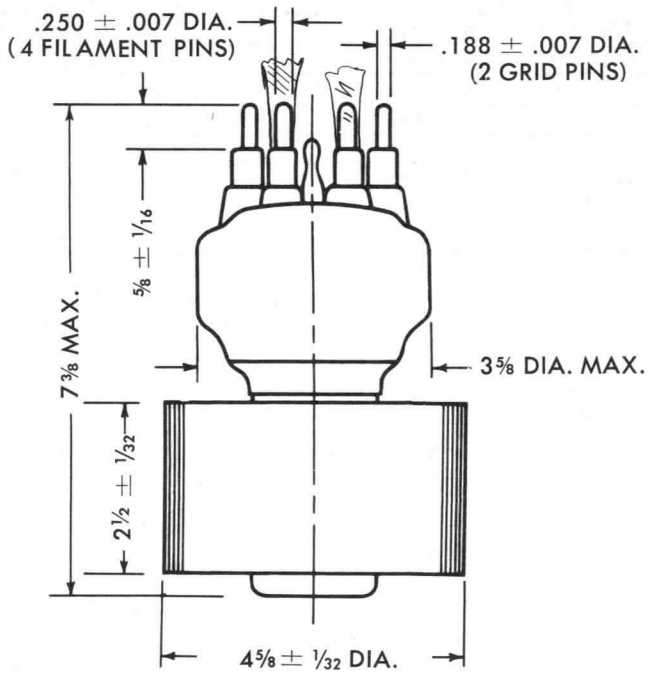

## CONSTANT CURRENT CHARACTERISTICS

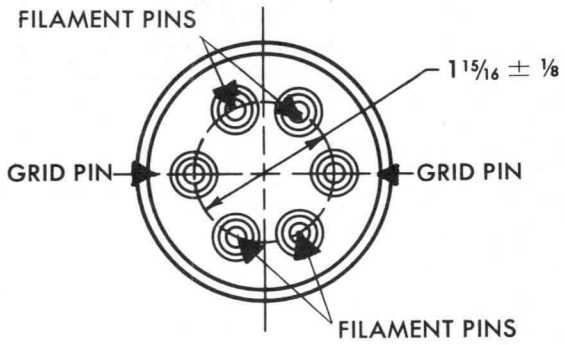
**POWER TRIODE**

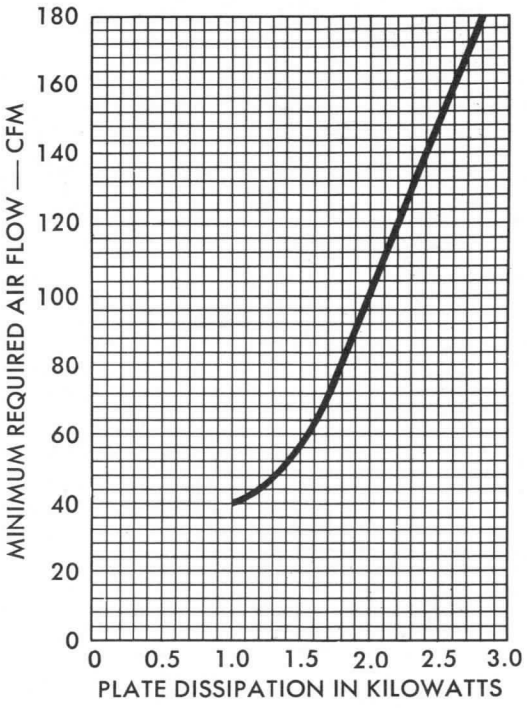
TYPE
**6623**
PLATE DISSIPATION
—3KW

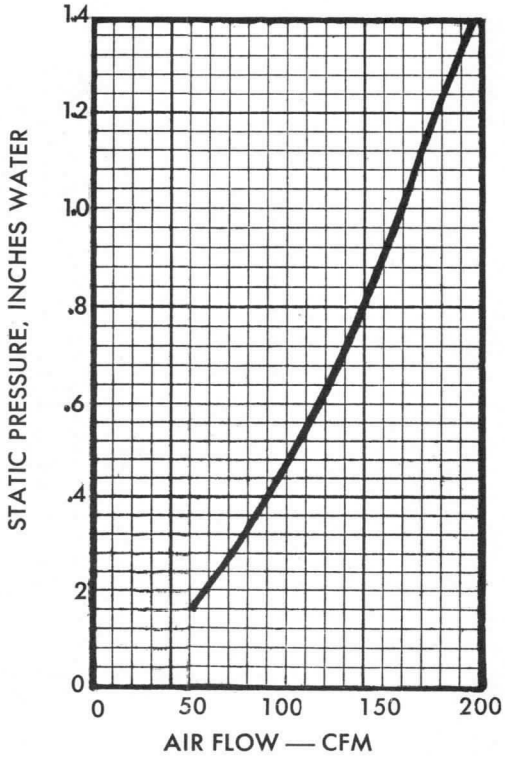
# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY




**AIR COOLING CHARACTERISTICS**

**DIVISION OF NUCLEAR CORPORATION OF AMERICA**

Printed in U. S. A.

# PULSE TUBES

The data presented in this section is printed on either a pink or white sheet.

A pink data sheet signifies provisional information.

A white data sheet signifies permanent information.

*For further technical information write to:*
Applications Engineering Department

CENTRAL ELECTRONIC MANUFACTURERS
2 RICHWOOD PLACE, DENVILLE, N. J.
*A Division of Nuclear Corporation of America*

Central ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

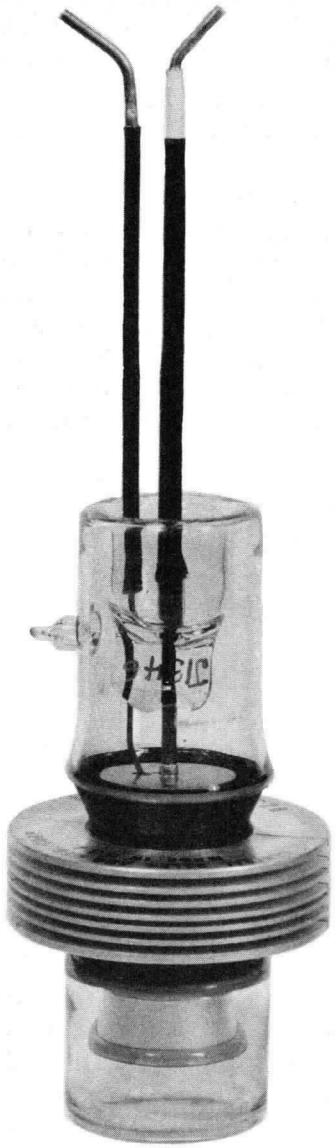
**PULSE MODULATOR TRIODE TYPE 4C28**

6.5 Kilowatts

# PULSE MODULATOR TRIODE

## *DESCRIPTION*

The 4C28 is a physically small transmitting triode for use in small loran and shoran; radar, and other types of pulse transmitters. This forced air cooled tube features an oxide coated, unipotential cathode, light weight at high power output and may be used either as a final or a driver for larger tubes.



## SPECIFICATIONS
### *PHYSICAL*

| | |
|---|---|
| Overall Length | 3⅞ inches |
| Overall Diameter | 2 inches |
| Weight | 6 ounces |
| Mounting Position | Vertical |
| Type of Cooling | Forced air |
| Required Air Flow on Anode | (NOTE 1) |
| Maximum Incoming Air Temperature | 45°C |
| Maximum Glass Seal Temperature | 180°C |

NOTE 1 — For an anode dissipation of 150 watts, an air blast of at least 5 cfm should be directed upon the anode cooling fins and a blast of 1 cfm on the grid seal and lead.

**PULSE MODULATOR TRIODE TYPE 4C28**

6.5 Kilowatts

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

## *ELECTRICAL*

Filament Oxide coated unipotential cathode
Filament Voltage . . . . . 6.0 Volts
Filament Current . . . . . 6.5 Amperes
Filament Starting Surge Current . . . . . 13.0 Amperes
Filament Cold Resistance . . . . . .071 Ohms
Amplification factor . . . . . 22

$E_c$ = −23 Volts DC
$E_b$ = 500 Volts DC

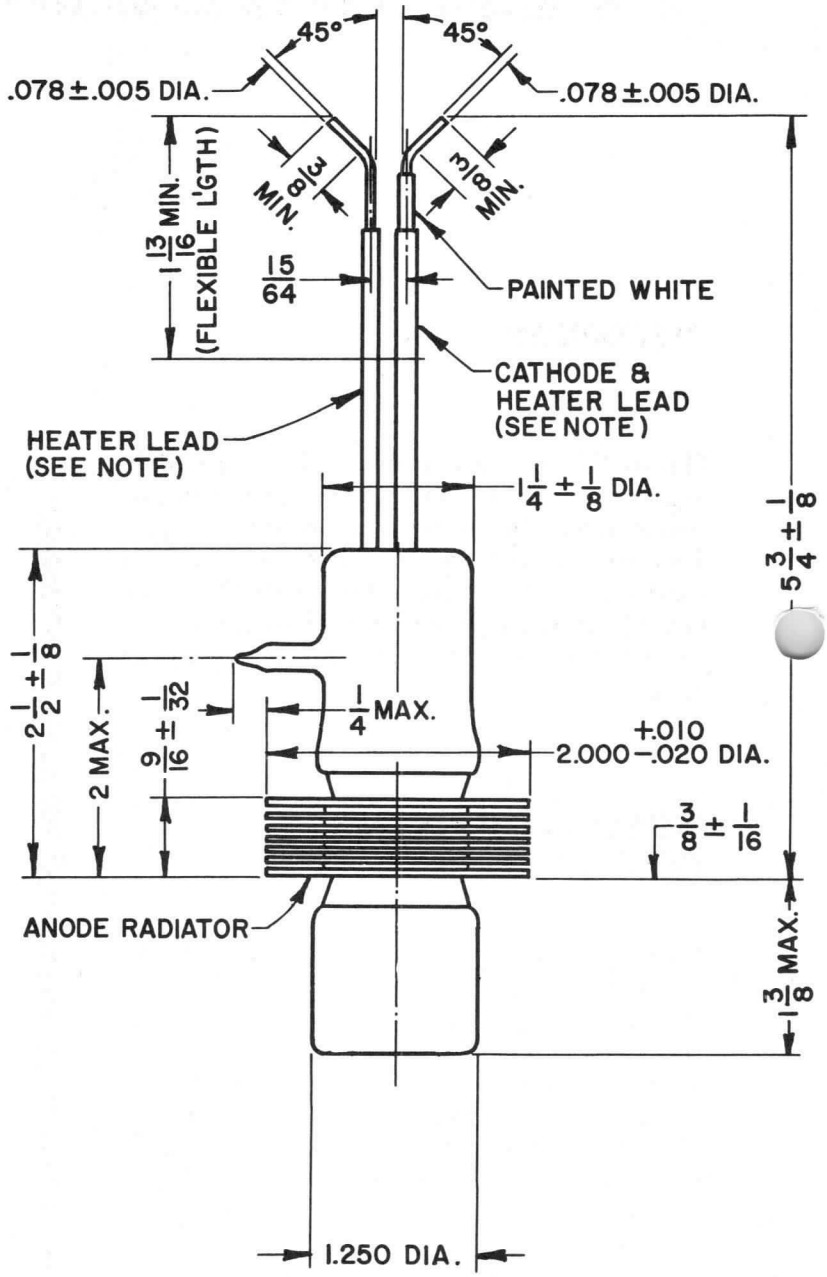
Interelectrode Capacitances
Grid to Anode . . . . . 6.9 uuf
Grid to Filament . . . . . 10.0 uuf
Anode to Filament . . . . . 2.0 uuf
Cathode Warm-up Time . . . . . 3 Min.
Peak Cathode Current . . . . 2.7 Amperes
Peak Inverse Voltage . . . . 8.0 Kilovolts DC
Peak Anode Current . . . . . 2.0 Amperes

## *TYPICAL OPERATION (PULSE)*

DC Anode Voltage . . . . . 4.2 Kilovolts DC
DC Grid Voltage . . . . . −700 Volts DC
Peak Power Output . . . . . 6.5 Kilowatts
Duty . . . . . 0.0005

## *MAXIMUM RATINGS*

DC Anode Voltage . . . . . 7.5 Kilovolts
DC Grid Voltage . . . . . −750 Volts
DC Anode Current . . . . . 2.0 Amperes
Maximum Duty . . . . . 0.0012
Peak Anode Current . . . . . 2.0 Amperes
Peak Cathode Current . . . . . 2.7 Amperes
Peak Anode Voltage . . . . . 8.0 Kilovolts
Peak Power Output . . . . . 6.5 Kilowatts




NOTE: LEAD INSULATED WITH BRAIDED FIBRE GLASS TUBING.

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CENTRAL ELECTRONIC
MANUFACTURERS
DENVILLE NEW JERSEY

POWER TRIODE
TYPE
7C23
PLATE DISSIPATION
— 1.2KW

# POWER TRIODE

## DESCRIPTION

The Nucor tube type 7C23 is a forced-air-cooled, three electrode tube, specifically designed for use in high voltage pulse operation. The anode is capable of dissipating 1.2 kilowatts. It features a sturdily-supported, double-spiral thoriated tungsten filament. Rugged kovar grid and filament seals insure greater protection against mechanical stress and shock. The wide spacing between elements is an additional feature of this tube. Maximum ratings apply up to 5 megacycles.


## SPECIFICATIONS

### ELECTRICAL:

| | |
|---|---|
| Filament Voltage | 11.0 Volts |
| Filament Current | 29.0 Amperes |
| Filament Starting Current | 58 Amperes |
| Amplification Factor, at $E_c = -50V$; $I_b = 0.2$ Amp. | 25 |
| Interelectrode Capacitances | |
| Grid-Plate | 12.0 $\mu\mu$f |
| Grid-Filament | 12.5 $\mu\mu$f |
| Plate-Filament | 1.7 $\mu\mu$f |

### PHYSICAL:

Mounting Position — Vertical, Anode Down

Type of Cooling — Forced-Air

| | |
|---|---|
| Maximum Incoming Air Temperature | 45°C |
| Required Air Flow on Anode | |
| Cubic Feet Per Minute | 75 |
| Maximum Glass Temperature | 150°C |
| Net Weight, Approximate | 5¼ Pounds |

# MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

## RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR -- PULSED OPERATION

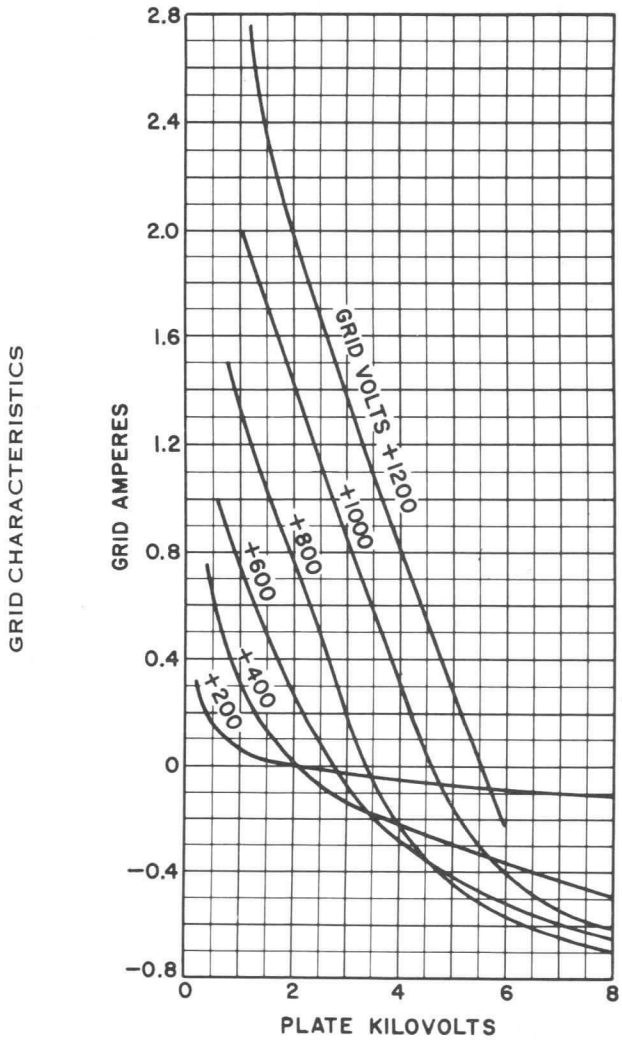
### MAXIMUM RATINGS, ABSOLUTE VALUES

| | |
|---|---|
| DC Plate Voltage | 17,500 Volts |
| DC Grid Voltage | —2,000 Volts |
| DC Plate Current | 0.100 Ampere |
| DC Grid Current | 0.010 Ampere |
| Plate Dissipation | 1200 Watts |
| Maximum Pulse Width | 90 $\mu$ Seconds |
| Maximum Duty | 0.005 |

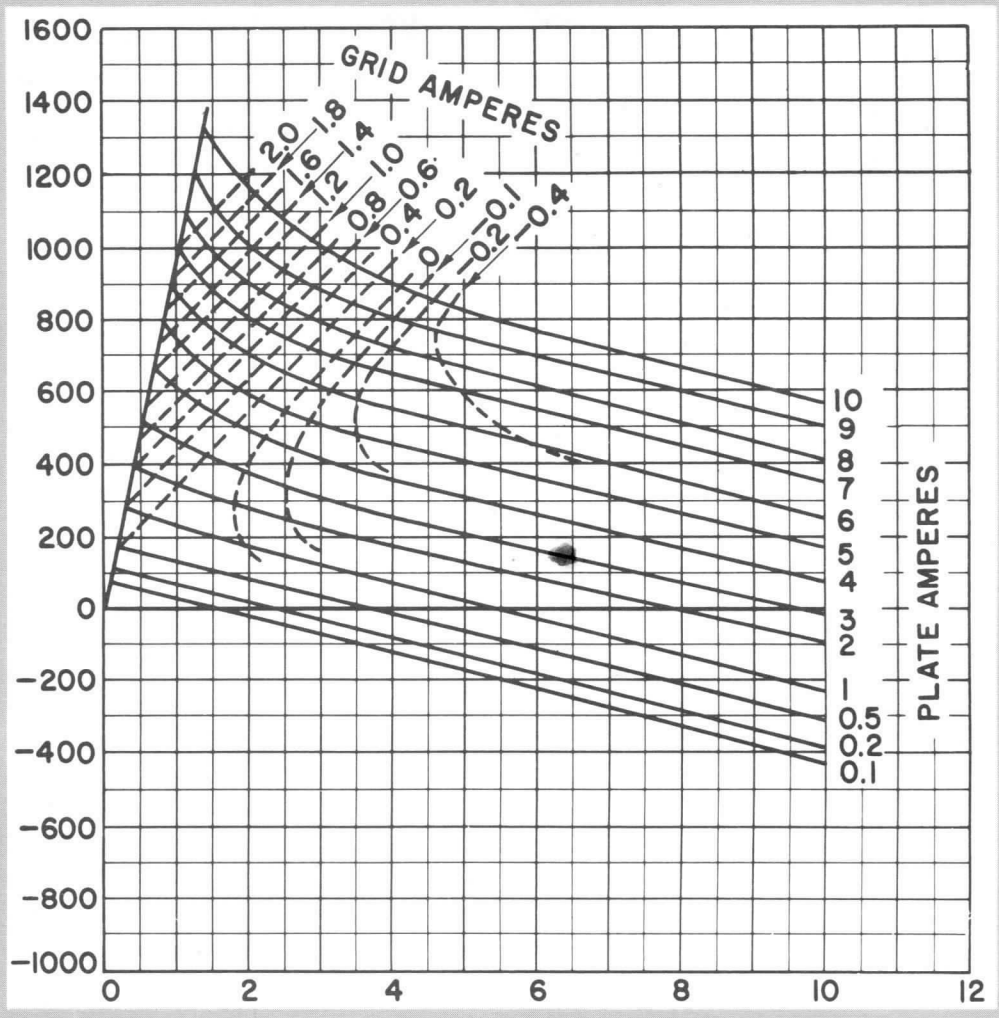
### TYPICAL OPERATION

(Unless otherwise specified, values are for two tubes)

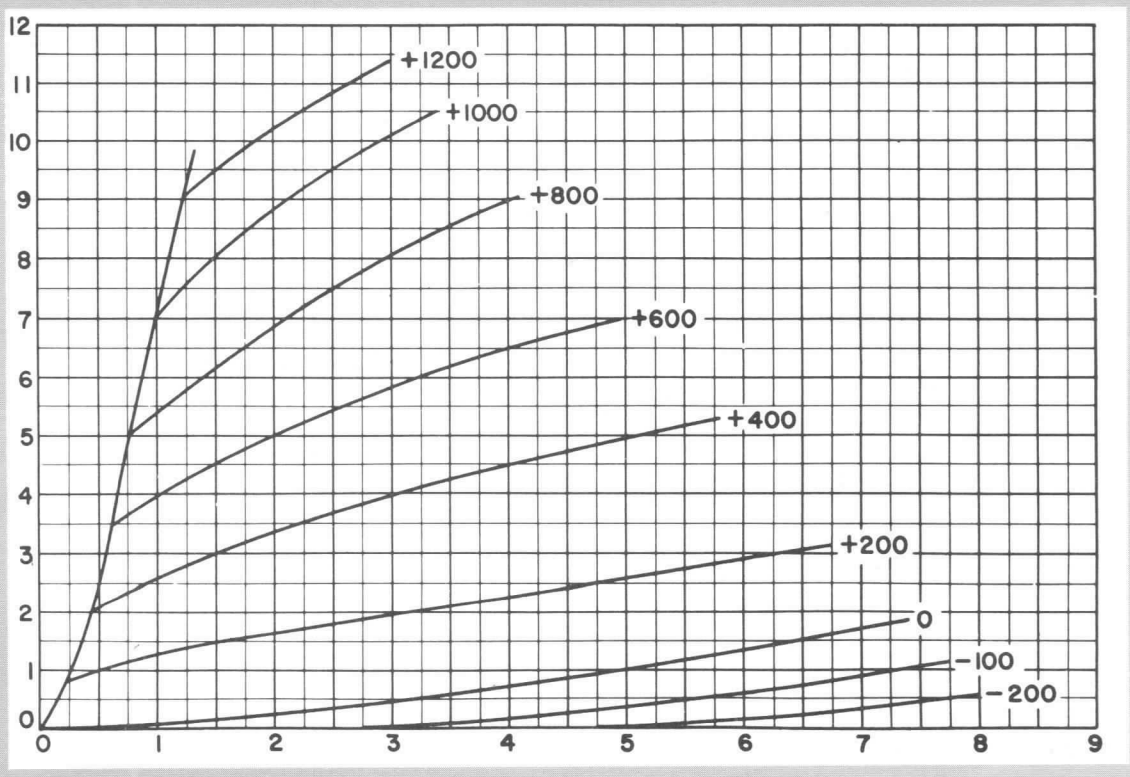
| | |
|---|---|
| DC Plate Voltage | 15,000 Volts |
| DC Plate Current | 0.16 Ampere |
| DC Grid Current | 1.25 Ma |
| Average Power Output | 120 Watts |
| Peak Power Output | 120 Kilowatts |



## CONSTANT CURRENT CHARACTERISTICS




## PLATE CHARACTERISTICS



POWER TRIODE

TYPE **7C23**

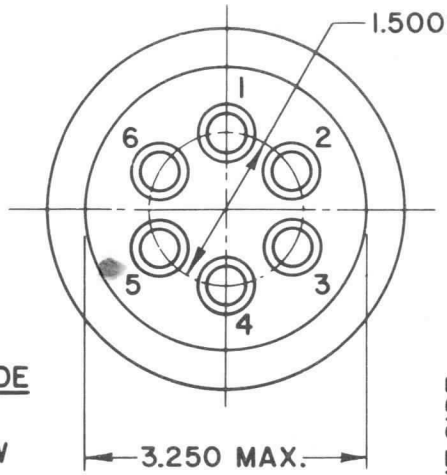
PLATE DISSIPATION — 1.2KW

# CENTRAL ELECTRONIC

## MANUFACTURERS

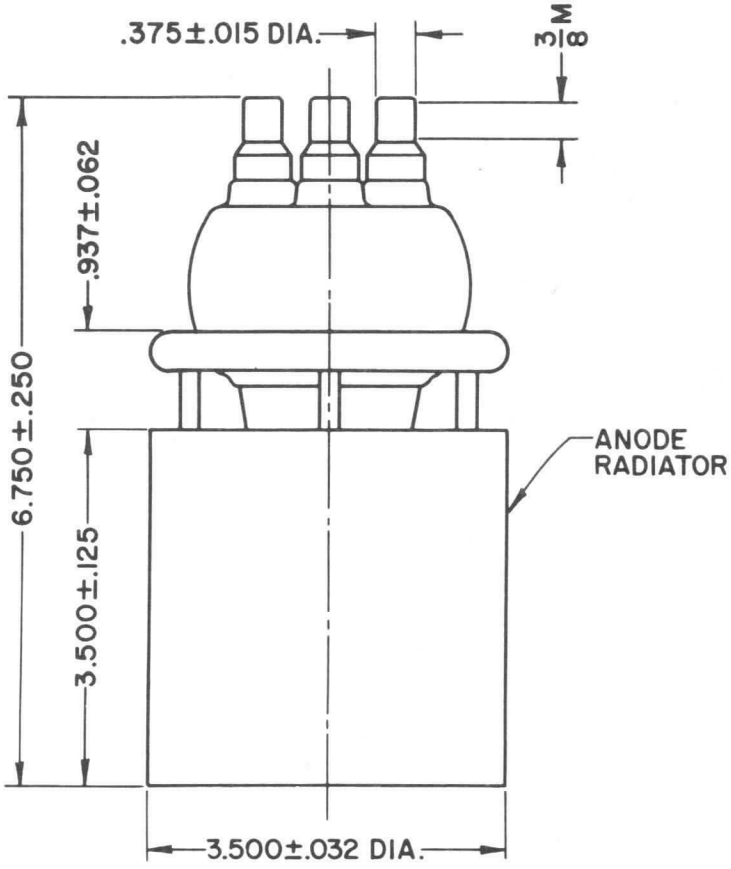
DENVILLE, NEW JERSEY

OUTLINE




**TERMINAL COLOR CODE**

1 = GRID — BLACK
2 = FIL. — YELLOW
3 = GRID — BLACK
4 = F.C.T. — RED
5 = GRID — BLACK
6 = FIL. — YELLOW

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DENVILLE, NEW JERSEY

**PULSE MODULATOR TRIODE TYPE 6544**

Anode Dissipation 1 Kw

# HIGH VOLTAGE PULSE MODULATOR TRIODE

## *DESCRIPTION*

The CENTRAL tube type 6544 is a forced-air-cooled high vacuum tube, specifically designed for radar pulse modulation applications. The tube can capably provide 1 megawatt output pulses with 8 kilowatts peak driving power. The tube design features a beamed oxide coated cathode structure, a squirrel cage control grid, a shield grid internally connected to the cathode and a forced air cooled anode capable of dissipating 1 kilowatt continuously.

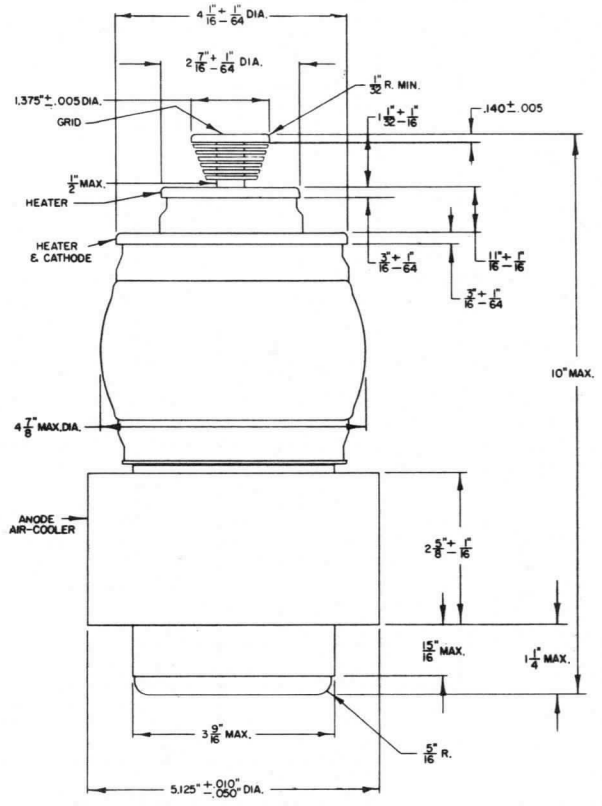
## SPECIFICATIONS

### *MECHANICAL*

| | |
|---|---|
| Mounting Position (support tube by anode radiator only) | Any |
| Type of Cooling | Forced-air (1) |
| Air flow on anode (at 75°C and 14.7 psi ambient atmospheric pressure) | 150 cfm (2) |
| Static pressure, inches of water | 0.8 |
| Air flow on grid radiator, minimum | 5 cfm |
| Maximum incoming air temperature | 75°C |
| Maximum Glass Temperature | 175°C (1) |
| Net Weight, approximate | 12 pounds |

### *ELECTRICAL*

| | |
|---|---|
| Heater Voltage | 6.0 ± 5% volts |
| Heater Current | 60 amperes |
| Heater Starting Current, maximum | 300 amperes |
| Cathode Warm-Up Time (3) | 10 minutes |
| Amplification Factor | 90 |
| Interelectrode Capacitances: | |
| Grid-Anode, maximum | 4 uuf |
| Grid-Cathode | 250 uuf |
| Anode-Cathode | 40 uuf |



**PULSE MODULATOR TRIODE TYPE 6544**

Anode Dissipation 1 Kw

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

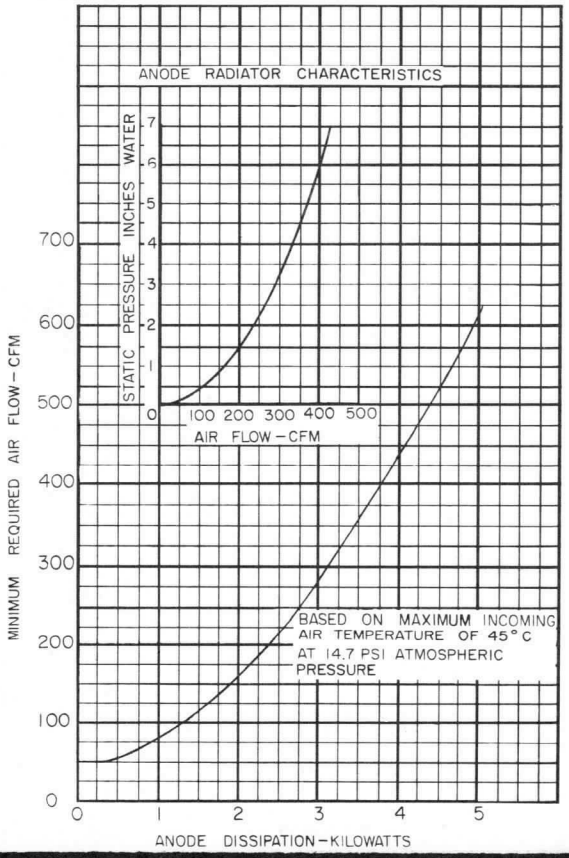
## MAXIMUM RATINGS

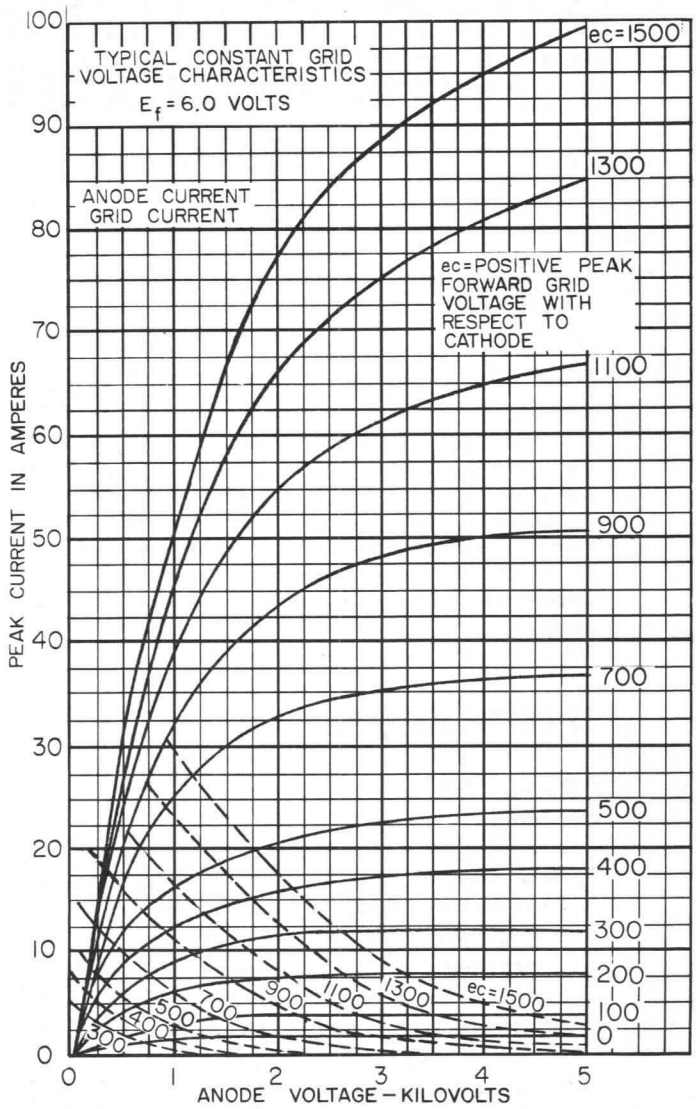
Maximum Ratings, Absolute Values

| | |
|---|---|
| Pulse Width (4 & 5) | 6 microseconds |
| Duty Factor | .03 |
| Peak Anode Voltage | 25 kilovolts |
| DC Anode Voltage | 20 kilovolts |
| DC Grid Voltage | —600 volts |
| Peak Positive Grid Voltage | 1500 volts |
| Peak Cathode Current | 70 amperes |
| DC Anode Current | 250 milliamperes |
| Grid Dissipation | 75 watts |
| Anode Dissipation (150 cfm @ 0.8" water) | 1000 watts |

Typical Operation: Pulse Modulator or Amplifier
Class C (5)

| | |
|---|---|
| DC Anode Voltage | 18 kilovolts |
| DC Grid Voltage | —500 volts |
| Pulse Positive Grid Voltage | 1200 volts |
| Pulse Anode Current | 65 amperes |
| Pulse Grid Current | 5 amperes |
| Load Resistance | 225 ohms |
| Duty Factor | .0015 |
| Pulse Power Input | 12 kilowatts |
| Pulse Power Output | 1000 kilowatts |




(1) Sufficient air cooling must be provided to keep glass seal temperatures at less than 175°C under all conditions of operation.

(2) For air-flow requirements at other temperatures and pressures, consult the Central Engineering Department.

(3) For accelerated cathode warm-up, the heater may be energized at 7 volts for 5 minutes and then reduced to 6 volts for high-voltage operation. If a heater stand-by voltage of 5 volts is used, the minimum cathode warm-up time is 1 minute at 6 volts.

(4) Under certain conditions of operation, longer pulses may be possible.

(5) For information concerning specific tube problems or applications not covered, consult the Central Engineering Department.

CENTRAL ELECTRONIC MANUFACTURERS
2 RICHWOOD PLACE
DENVILLE, NEW JERSEY

# TECHNICAL SPECIFICATIONS FOR XD-5

The Central tube type XD-5 is a forced air cooled triode specifically designed for use in high voltage pulse operation.

SPECIFICATIONS:

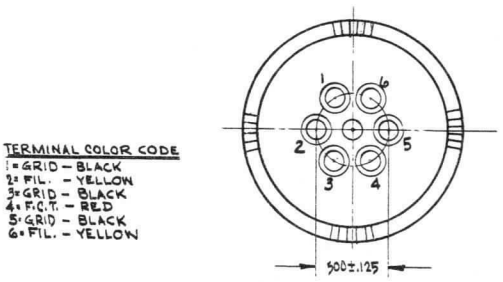
| PHYSICAL | |
|---|---|
| Length | $6\frac{1}{2}$ inches |
| Diameter | 4 5/8 inches |
| Weight | 4 1/4 pounds |
| Mounting Position | Vertical |
| Mounting Socket-CASA or CASB ser. | |
| Type of Cooling | Forced air |
| Required Air Flow on Anode | |
| 190 cfm @ 1.21 psi for 3 Kw. | |
| Max. Inc. Air Temp. | 45°C |
| Max. Glass Seal Temp. | 180°C |

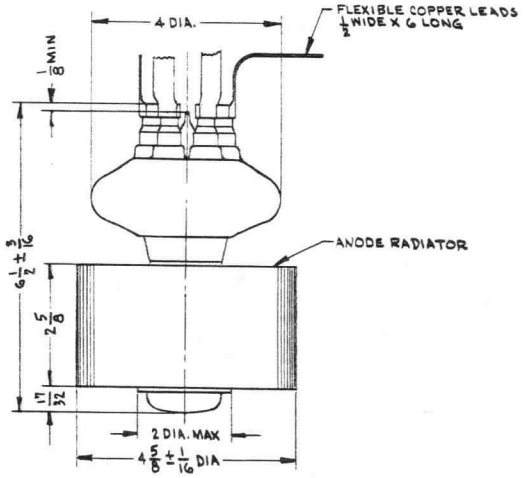
| ELECTRICAL | |
|---|---|
| Filament | Thoriated Tungsten |
| Filament V. | 14.0 Volts |
| Filament Current | 38.0 Amps. |
| Filament Starting Cur. | 80.0 Amps. |
| Amplification Factor | 25 |
| $E_c$ = -200 V. $E_b$ = 0.2 Amps. | |
| Interelectrode Capacitances | |
| Grid to Filament | 15.0 uuf |
| Anode to Filament | 1.8 uuf |
| Grid to Anode. | 12.0 uuf |

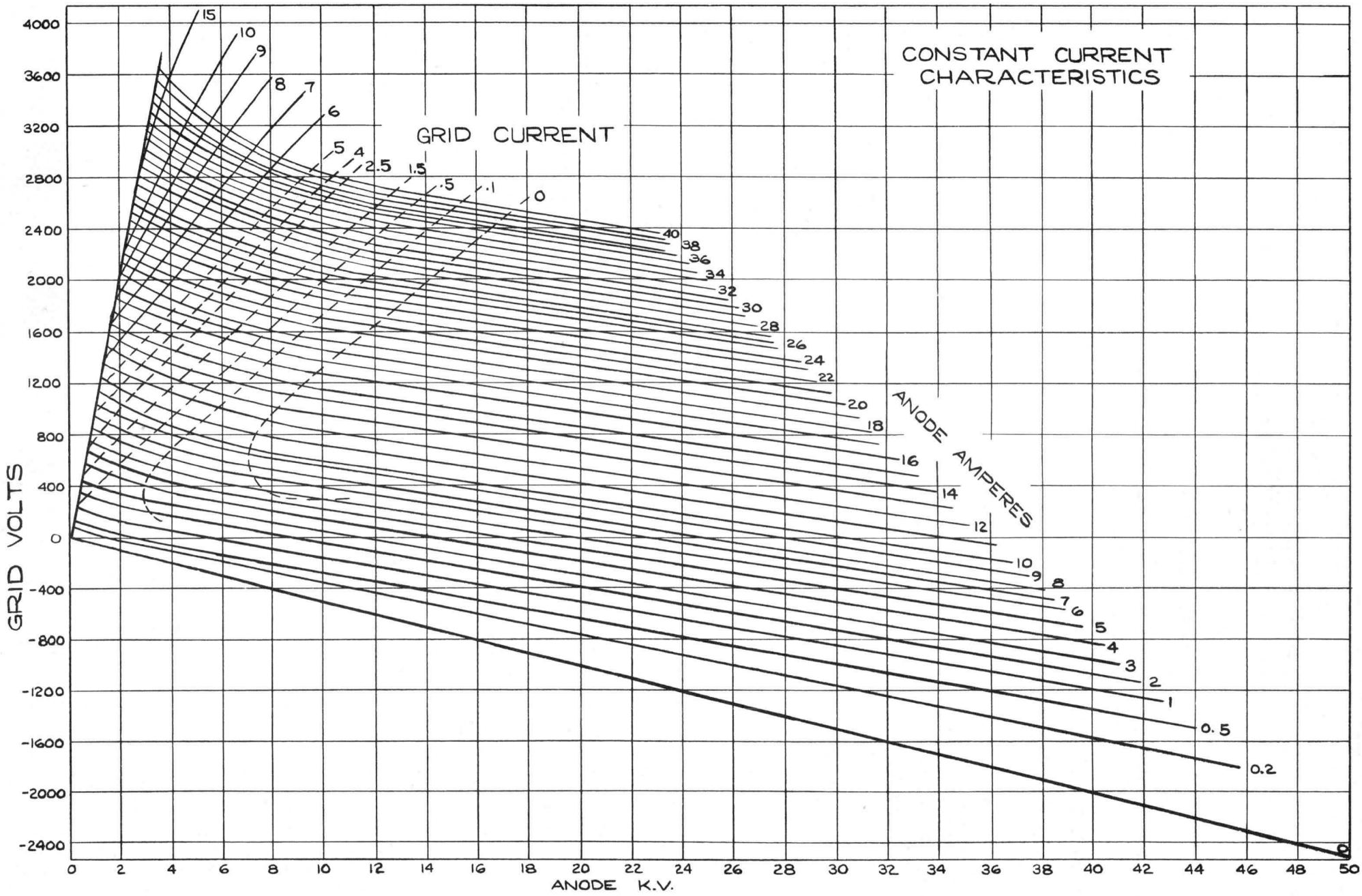
| TYPICAL OPERATION (PULSE) | |
|---|---|
| Peak Anode Voltage | 30 Kilovolts |
| Grid Voltage - | 1500 Volts DC |
| Peak Anode Current | 25 Amps. |
| DC Anode Current | 0.025 Amps. |
| DC Grid Current | 0.003 Amps. |
| Average Power Output | 750 Watts |
| Duty | .001 |

| MAXIMUM RATINGS | |
|---|---|
| DC Anode Voltage | 35Kv. |
| DC Grid Voltage - | 5000 V. |
| DC Anode Current | 0-130 Amps. |
| DC Grid Current | 0.150 Amps. |
| Pulse Width | 90 u sec. |
| Peak Anode Current | 30 Amps. |
| Peak Cathode Current | 45 Amps. |
| Max. Duty | .30 |
| Peak Anode Voltage | 40 Kilovolts |
| Peak Power Output | 750 Kilovolts |

TUBE TYPE XD-5




CONSTANT CURRENT CHARACTERISTICS
GRID CURRENT
15
10
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8
7
6
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4
2.5
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18
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14
12
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5
4
3
2
1
0.5
0.2
0
ANODE AMPERES
GRID VOLTS
4000
3600
3200
2800
2400
2000
1600
1200
800
400
0
-400
-800
-1200
-1600
-2000
-2400
0
2
4
6
8
10
12
14
16
18
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28
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32
34
36
38
40
42
44
46
48
50
ANODE K.V.

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

**PULSE TUBE**

**XD-32**

**44 MEGAWATTS**

## DESCRIPTION

The Central tube type XD-32 is a completely water-cooled tetrode, having a unipotential matrix cathode, specifically designed for pulse service as a hard tube modulator or switch tube.

## SPECIFICATIONS

### ELECTRICAL:

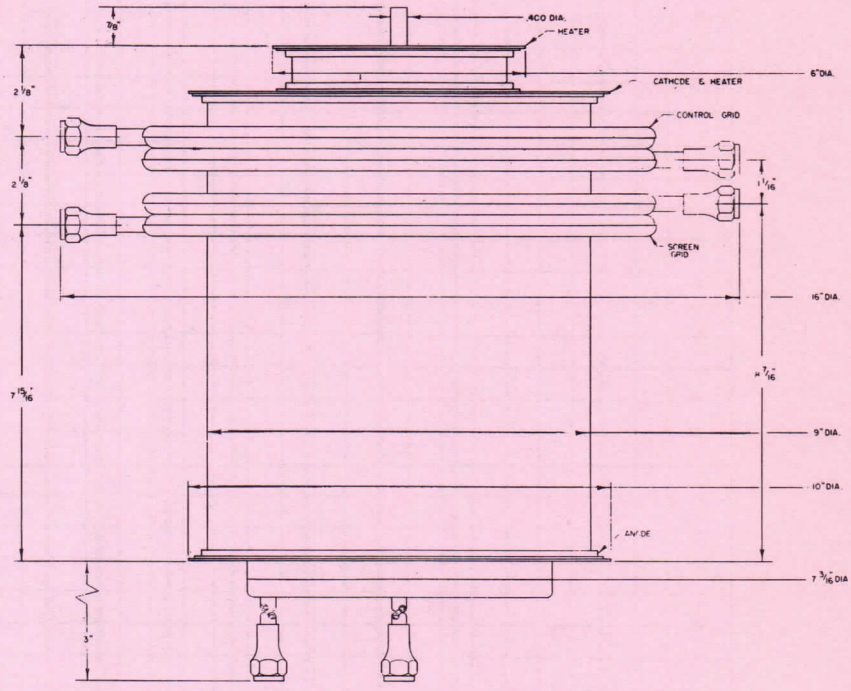
| | |
|---|---|
| Heater Voltage | 6.0 volts |
| Heater Current | 233 amperes |
| Amplification (Triode) Factor | 4 |

### PHYSICAL:

Mounting Position – Vertical, Anode Down

| | |
|---|---|
| Cooling – Anode | 6 GPM |
| Screen Grid | 6 GPM |
| Control Grid | 6 GPM |
| Pressure | 30 psi |

Dimensions – As shown on outline



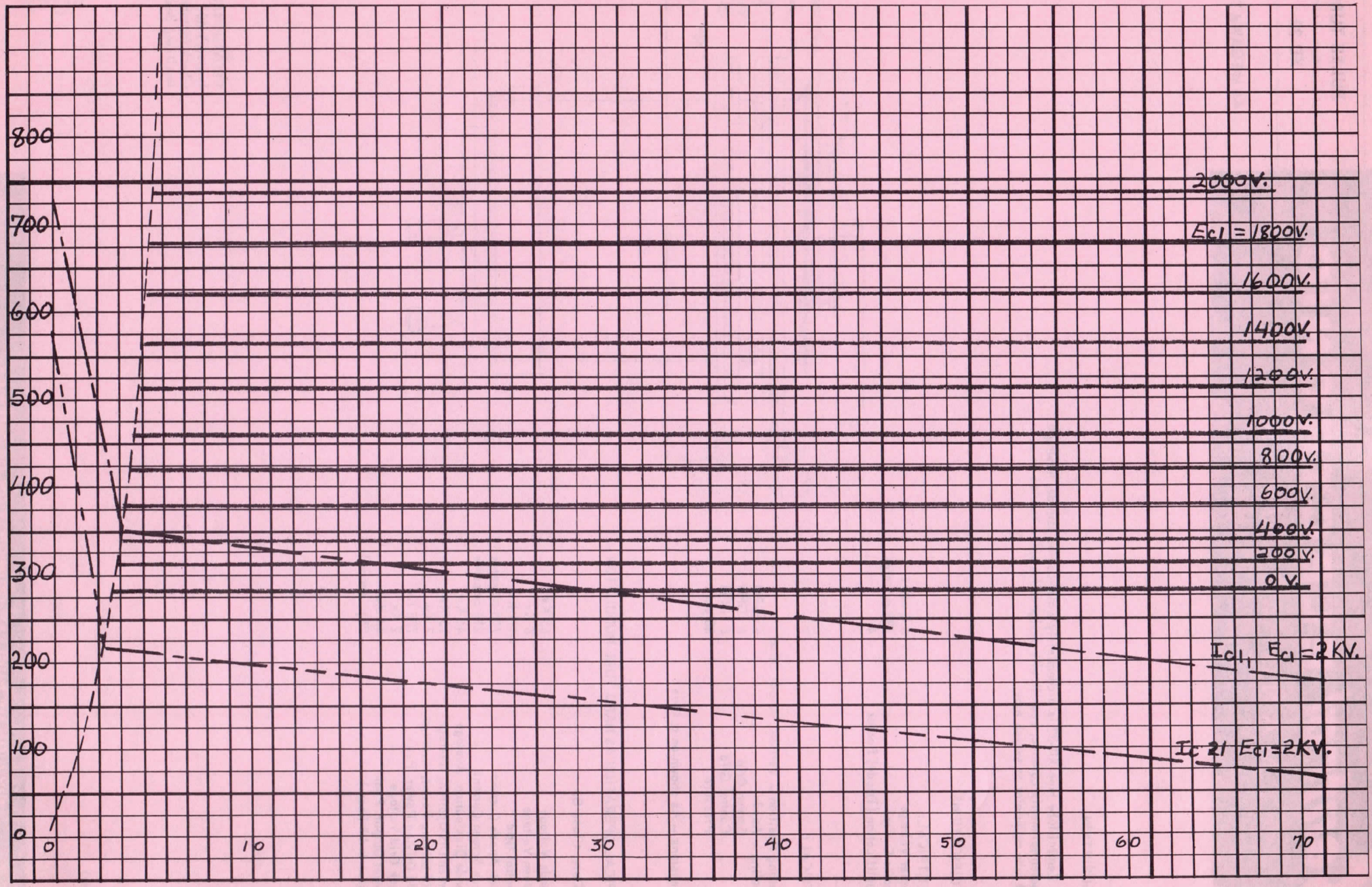

## TYPICAL OPERATION AS HARD TUBE MODULATOR

.01 Duty, Class B.

| | |
|---|---|
| Anode Voltage | 65 Kv |
| Screen Voltage | 6 Kv |
| Control Grid | –1.5 Kv |
| Peak Anode Current | 750 amperes |
| Peak Screen Current | 218 amperes |
| Anode Dissipation, Average | 44 Kw |
| Screen Dissipation, Average | 13 Kw |
| Grid Driving Power, Average | 7 Kw |
| Grid Driving Power, Peak | 708 Kw |
| Peak Grid Voltage | 2 Kv |
| Power Output, Peak | 44 Mw |
| Pulse Width (max.) | 25 $\mu$ seconds |

PROVISIONAL DATA
Issued 5/60
Check factory before finalizing designs.

(Over)


800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
2000V.
Ec1 = 1800V.
1600V.
1400V.
1200V.
1000V.
800V.
600V.
400V.
200V.
0 V.
Ic1, Ec1 = 2 KV.
Ic 21 Ec1 = 2KV.

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

**PULSE TUBE**

**7545/XD-45**

**3.4 MEGAWATTS**

Description

The Central tube type 7545/XD-45 is a forced-air-cooled triode specifically designed for use in pulsed service as an amplifier and modulator switch tube.

Filament-thoriated tungsten

| | |
|---|---|
| $E_f$ | 10V |
| $I_f$ | 120A |
| Mu | 30 |

Maximum Ratings:

| | |
|---|---|
| Plate Voltage – | 25000 volts dc for pulse application |
| Plate Voltage – | 8000 volts dc for cw application |
| Cathode Current – | 200 peak amperes |
| Plate Current – | 6 amperes dc |
| Plate Dissipation | 6 Kw forced air cooled |
| Power Input – | 48 Kw for class C Telegraphy |

Typical Operation

Pulsed RF power amplifier .03 duty class B

| | |
|---|---|
| Plate Voltage | 15000 volts dc |
| Grid Voltage | –600 volts dc |
| Peak RF Grid Voltage | 2560 volts |
| D.C. Plate Current | 0.573 amperes |
| Driving Power | 461 watts |
| Pulse Power Output | 390 Kw |
| Air Flow for 6 Kw | 200 cfm @ 1" water back pressure |

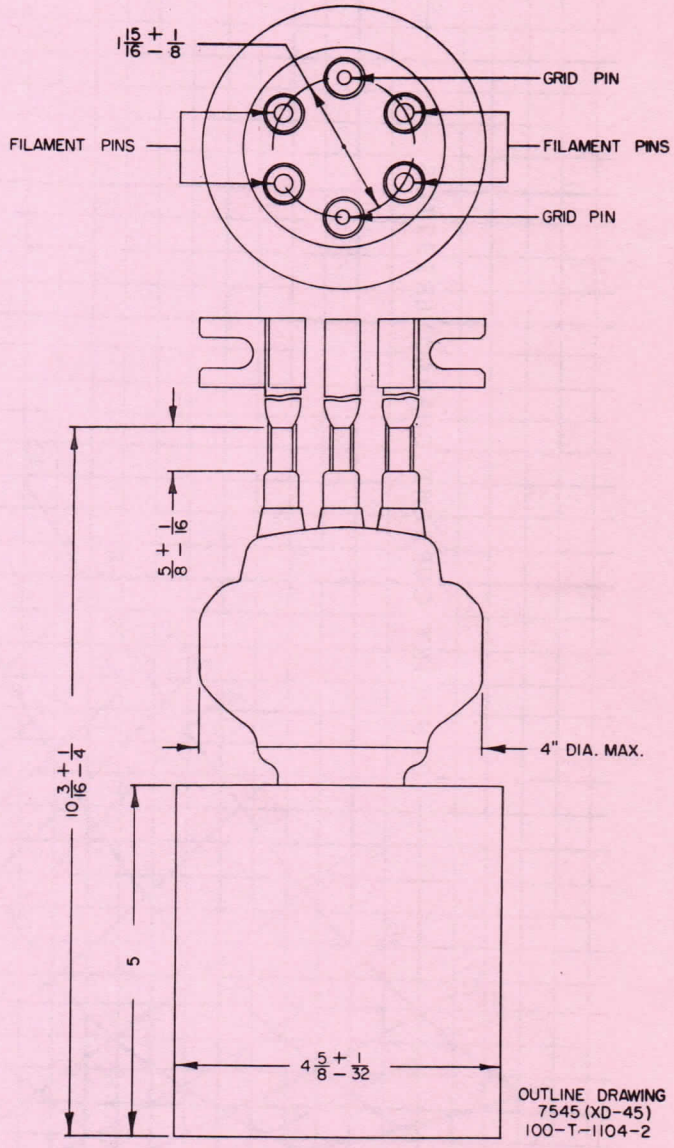
## PULSED SWITCH TUBE 0.002 DUTY

| | |
|---|---|
| $E_f$ 10 Vdc | |
| Plate Voltage | 25000 volts dc |
| Peak Plate Current | 130 amperes |
| Peak Grid Current | 70 amperes |
| Average Plate Dissipation | 6 Kw forced air cooled |
| Pulse Width | 25 $\mu$ seconds |
| Peak Power Switched | 2.6 Mw |

| | |
|---|---|
| $E_f$ 10.8 Vdc | |
| Plate Voltage | 25000 volts dc |
| Peak Plate Current | 180 amperes |
| Peak Grid Current | 100 amperes |
| Average Plate Dissipation | 6 Kw forced air cooled |
| Pulse Width | 25 $\mu$ seconds |
| Peak Power Switched | |

## PULSED SWITCH TUBE 0.06 DUTY

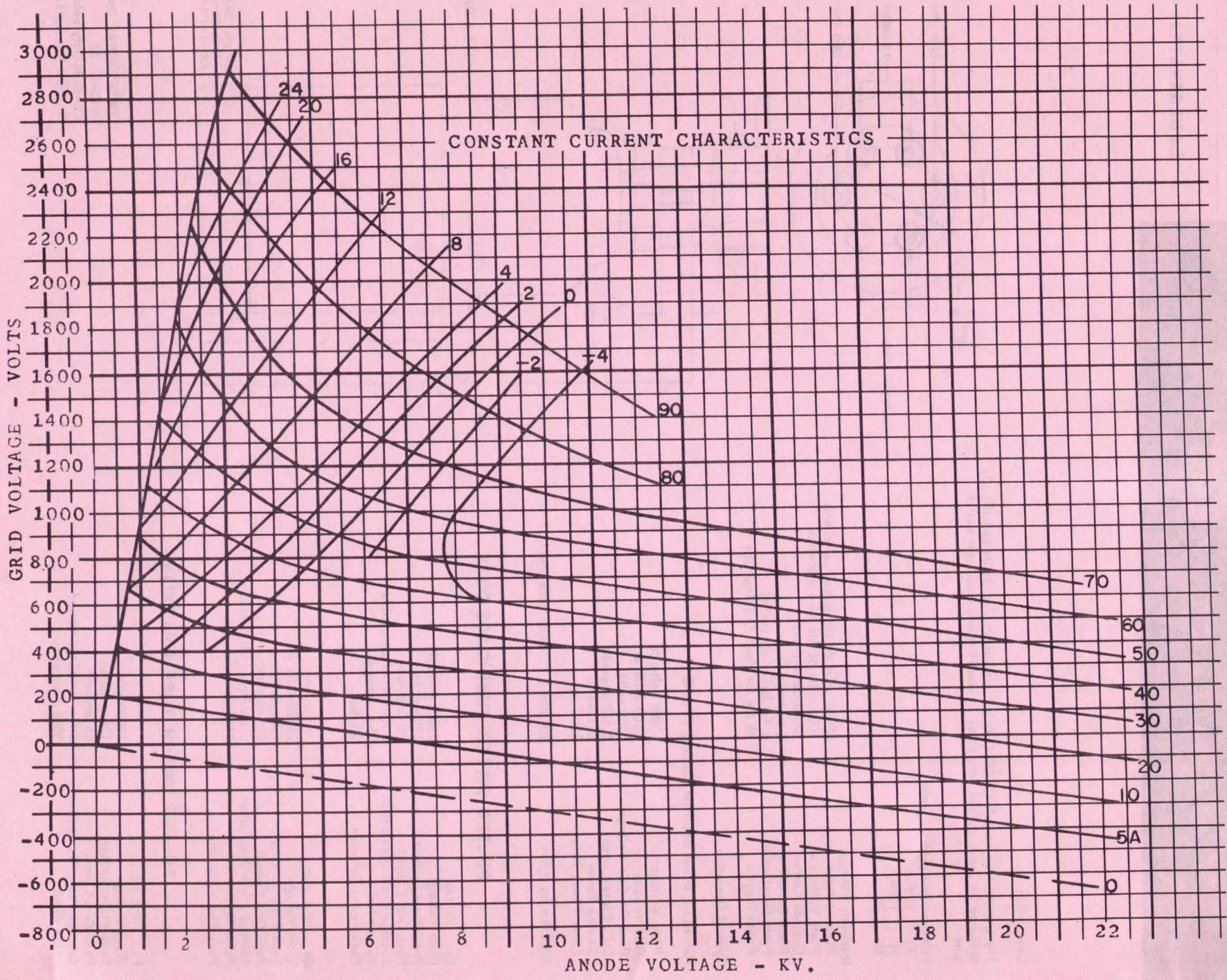
| | |
|---|---|
| $E_f$ 10.8 Vdc | |
| Plate Voltage | 25000 Vdc |
| Peak Plate Current | 120 amperes |
| Peak Grid Current | 65 amperes |
| Average Plate Dissipation | 6 Kw forced air cooled |
| Pulse Width | 3000 $\mu$ seconds |




OUTLINE DRAWING
7545 (XD-45)
100-T-1104-2

PROVISIONAL DATA
Issued 5/60
Check factory before finalizing designs.

(Over)


CONSTANT CURRENT CHARACTERISTICS
GRID VOLTAGE - VOLTS
ANODE VOLTAGE - KV.
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
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400
200
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-200
-400
-600
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80
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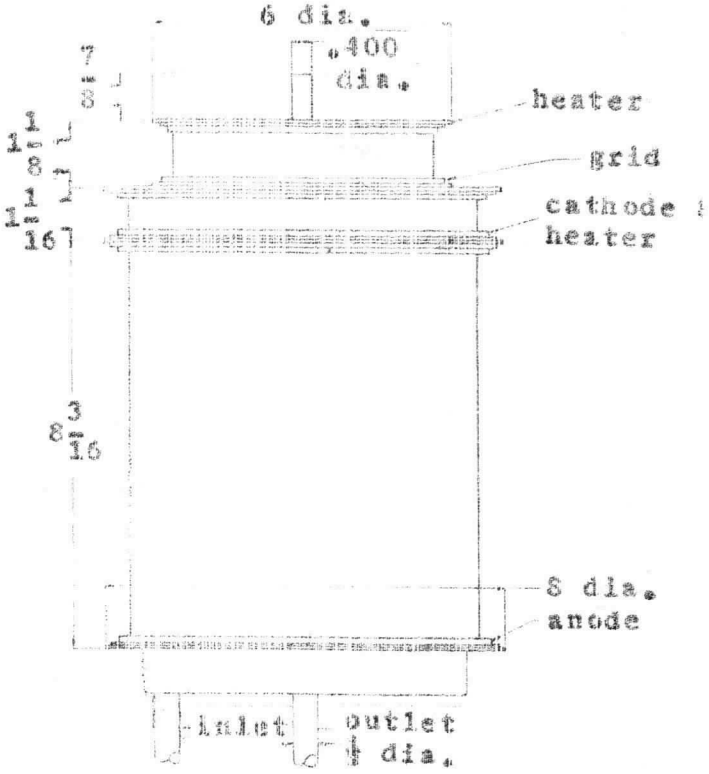
# PRE-PROVISIONAL TECHNICAL SPECIFICATIONS FOR XD-55

The Central XD-55 is a completely oil immersed tetrode with forced oil circulation, having a thoriated tungsten filament specifically designed for pulse service as a hard tube modulator or switch tube.

| | |
|---|---|
| Heater Voltage | 10.0 V. |
| Heater Current | 350 Amps |
| Amplification Factor | 50 |
| $E_{bb}$ = 180 Kv. Ecc = -3.6 Kv. | |
| Interelectrode Capacitance | |
| anode to cathode | 25 uuf |
| anode to grid | 2 uuf |
| cathode to grid | 300 uuf |
| Mounting Position - Vertical | |
| Maximum Altitude | 10,000 ft. |

MAXIMUM RATINGS

| | |
|---|---|
| Anode Voltage | 180 Kv. |
| Estimated Tube Drop | 30 Kv. |
| Peak Anode Current | 130 A. |
| Average Anode Current | 400 mA. |
| Anode Dissipation | 25 Kw. |
| Maximum Duty | .003 |
| Peak Cathode Current | 175A. |
| Maximum Pulse Width | 12 u sec. |



# RECTIFIERS & CLIPPER DIODES

The data presented in this section is printed on either a pink or white sheet.

A pink data sheet signifies provisional information.

A white data sheet signifies permanent information.

*For further technical information write to:*
Applications Engineering Department

CENTRAL ELECTRONIC MANUFACTURERS
2 RICHWOOD PLACE, DENVILLE, N. J.
*A Division of Nuclear Corporation of America*

Central ELECTRONIC
MANUFACTURERS
DENVILLE NEW JERSEY



# SERVICE NOTES PERTAINING TO THERMIONIC HIGH VOLTAGE HIGH VACUUM DIODES

## I. GENERAL

Thermionic rectifier tubes or diodes are used to transform alternating current into uni-directional current. Numerous applications exist for high voltage thermionic rectifiers such as dust precipitators, paint sprayers and high voltage power supplies.

Thermionic rectifiers may be divided into two general classes: 1) high vacuum and 2) gas filled. The latter require considerably more care in application than the high vacuum class. High vacuum rectifier tubes are virtually immune to ambient temperature variations. This inherent characteristic plus extremely rugged structural design, meticulous assembly, careful processing and stringent testing, make Central Electronic Tubes outstanding in performance and reliability.

The purpose of this presentation is to disclose general application and rating information on high vacuum, high voltage thermionic rectifiers supplementary to that contained in the individual data sheets for each tube type.

## II. TUBE CHARACTERISTICS

In the design of equipment employing tubes, one must bear in mind the characteristics given in the data sheets are average characteristics and some variation either side of this average must be anticipated. Also, the characteristics will change with the tube life. In designing equipment, consideration must be given to the accumulated characteristic changes from the average, shown in the data sheets, that will affect performance. For high vacuum rectifier tubes, a tolerance of plus or minus 20% is adequate. Equipment should be designed to perform satisfactorily throughout the full range of tube characteristic variation.

## III. CATHODES

Thermionic cathodes commonly used in high-vacuum rectifier tubes are classified as directly heated or indirectly heated.

A directly heated or filamentary cathode is a wire or ribbon heated by the direct passage of current through it. The filament materials in common use are tungsten, thoriated tungsten and a nickel base metal or an alloy thereof, coated with alkaline earth oxides. Each material has a distinct advantage which is utilized in a tube designed for a particular application.

### 1) Tungsten

Pure tungsten filaments are used in very high-voltage rectifiers but suffer from the disadvantage of requiring very high filament power. For long life it is desirable to operate the filament at slightly reduced voltage if the reduced emission current available permits. Normal end of life usually results from burn-out.

### 2) Thoriated Tungsten

Thoriated tungsten filaments are made from tungsten impregnated with thoria. Due to the presence of thorium, electrons are emitted at a lower temperature than for pure tungsten, and thus require less filament power. The emission efficiency, (i.e. amperes emission per watt heating power), is much greater than for pure tungsten.

The operating voltage of a thoriated-tungsten filament should be held to within ± 5% of rated value. If the tube is lightly loaded, the filament may be operated as much as 5% below the nominal voltage.

### 3) Bonded Thoria

Bonded thoria filaments have a refractory metal core, such as tungsten, coated with a layer of thoria. Compared to thoriated tungsten filaments, bonded thoria filaments have the advantage of added strength and comparable emission at a slightly lower temperature. They are used mainly as an emission source in diodes.

### 4) Oxide Coated

Oxide coated filaments and cathodes are used in lower anode voltage rectifiers.

Coated filaments employ a relatively thick coating of alkaline earth oxides on a special metal base. Coated filaments are operated at 800°C and are very conservative in heater power. Their emission efficiency is also much greater than for pure tungsten. In service, with light loading, the filament voltage may be reduced as much as 5% without deleterious effects.

An indirectly heated cathode comprises a filament, usually tungsten, enclosed in a thin metal sleeve coated on the outside with an electron emitter similar to that employed on coated filaments. The function of heater and emitter are thus divorced.

It is desirable and frequently necessary to apply filament power prior to the application of anode voltage. The emitter must be permitted to assume full emitting potentiality before the application of anode voltage. This warm up time is invariably shorter for directly heated emitters (tungsten, thoriated tungsten and oxide coated filaments), than for indirectly heated cathodes of the same filament power.

## IV. MAXIMUM RATINGS

### 1) General

A rating is a designation as established by definite standards of an operating limit of a tube. Each maximum rating for a given tube type must be considered in relation to all other maximum ratings for that type, so that no one maximum rating will be exceeded in utilizing any other maximum rating.

### 2) Maximum Peak Inverse Voltage Rating

Maximum peak inverse anode voltage is the greatest instantaneous anode voltage which the tube can withstand recurrently in the direction opposite to the forward current.

The relationship between peak inverse anode voltage, r.m.s. input voltage and average value of output voltage, depends largely on the characteristics of the particular rectifier circuit and power source which in turn influences the value of maximum peak inverse voltage. Furthermore, the presence of transients, such as line surges, keying surges, or waveform distortion, may increase the actual inverse anode voltage to a greater peak than that calculated for sine wave voltages. Therefore, the actual inverse anode voltage should never exceed the maximum peak inverse anode voltage rating for the tube.

A convenient table of inverse, r.m.s., and average voltage and current relations for several common types of rectifier circuits is given under circuit applications.

### 3) Peak Anode Current Rating

Maximum peak anode current is the highest instantaneous anode current that a tube can safely carry recurrently in the direction of normal current flow. The safe peak current value in hot cathode type rectifier tubes is a function of the electron emission available and the duration of the pulsating current flow from the rectifier in each half cycle.

The peak anode current value in a given rectifier circuit is largely dependent upon the filter constants. With a large choke at the filter input, the peak anode current is somewhat greater than the load current. With a large capacitor at the filter input, the peak current may be several times the load current. The peak anode current may be accurately determined with a peak indicating meter or oscilloscope. The table under Circuit Applications lists the relationships.

### 4) Anode Dissipation Rating

Anode dissipation is the average power dispensed by the anode. The specified anode dissipation listed in data sheets is the maximum anode dissipation expressed in watts that can be safely dispensed by the anode commensurate with good life and economical operation. The instantaneous anode dissipation is the product of the instantaneous voltage difference between anode and emitter, and the instantaneous space current in amperes flowing between anode and emitter. The average anode dissipation is the summation of the instantaneous power values over the conduction cycle. A rectifier tube with a thermionic emitter obeys a law relating anode current to anode voltage by the familiar equation $i_p = Ge_p^{3/2}$, where the constant G is known as the perveance and its value depends upon electrode geometry. For a sine wave output (i.e. resistive load), half-wave rectifier, if $E_p$ is the peak voltage between anode and emitter, and $I_p$ is the peak space current during the conduction half cycle, the average can be expressed as

$$P_{avg.} = \frac{1}{2\pi}\int_{\circ}^{\pi}\frac{I^{5/3}}{G^{2/3}}\ \sin^2\omega t\ .\ d(\omega t) = .25\frac{I^{5/3}}{G^{2/3}}$$

The value of G can be readily found from the curve relating anode current and anode voltage for the particular tube type.

### 5) Load Currents

The load current is the d.c. current delivered to the load. It is not the average anode current per tube.

The maximum load current is related to the maximum anode dissipation per tube for the circuit employed. For good life and reliable operation, the maximum load current contributed by each tube must not be exceeded. Depending upon the type of filter employed (i.e. no filter, choke input, capacitor input), an analysis to determine conformity within peak current and anode dissipation limits must be determined.

### 6) Circuit Conditions

A careful selection of the tube type must be made taking into account the multiplicity of applications and accepted circuit variations. The peak anode current and peak inverse voltage demands imposed on rectifier tubes for desired values of the load average output voltage and current, may differ considerably from circuit to circuit. For convenience, several common circuits with pertinent voltage and current value are shown

in Fig. 1. All values are given in terms of circuit output and transformer secondary voltages and circuit output currents. The following conditions are assumed: 1) Sine-wave supply; 2) Balanced phase voltages; 3) Zero tube drop; 4) Pure resistance load; 5) No filter. The introduction of capacitive filters and non-resistive loads will alter the current and voltage waveform which will invalidate the table values. The relationships can only be determined by a thorough analysis of the individual application.

**7) Installation**

Rectifier tubes require the same careful handling as other electron tubes. Care must be exercised to avoid mishandling causing shock to filaments, glass to metal seals, and tube envelopes. Tubes should be carefully unpacked, inspected for damage and defects, and tested preferably in equipment prior to storage, thus assuring that only good tubes exist in stock ready for use. Similar periodic tests conducted at 3 month intervals would give assurance and confidence that the stored product is always operable.

The mounting position of a rectifier tube should be checked prior to installation as the tube manufacturer's recommendation may specify a particular orientation although most high vacuum rectifier tubes may be mounted in any position. Whatever the method of mounting, no stresses should be imparted to the glass portions. In replacing a tube, inspection of socket contacts for cleanliness, spring tension, and other care to reduce contact loss should be exercised.

High voltage lead spacing must be adequate to eliminate all evidence of corona discharge in the vicinity of the tube. Corona discharge in the proximity of the glass envelope can cause a puncture which will make the tube inoperative.

It is important to provide meters for monitoring filament voltage and load current. It is also important to limit the filament inrush current when the cold filament is about to be energized. This can be done by using a resistor in series with the filament transformer primary winding or by using a high resistance filament transformer. Load current should be limited by an overload relay. A resistor in series with the high voltage transformer secondary will reduce the momentary surge effects due to arcing within the rectifier tube. Judiciously placed interlocks on the equipment for personnel protection is a recommended safeguard. In addition, adequate protection from X-Ray generation must be provided and should conform to the recommendations offered in ***Safety Code for the Industrial Use of X-Rays*** published by the American Standards Association.

The recommended method of cooling combined with the prescribed quantity of the cooling medium as indicated on the data sheets must be observed.

**8) Operation**

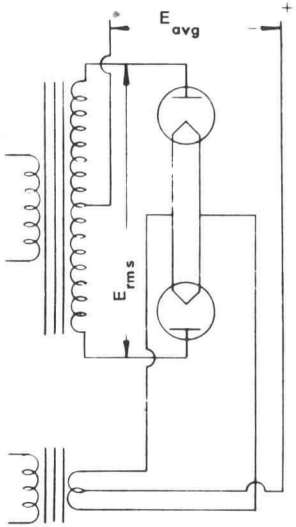
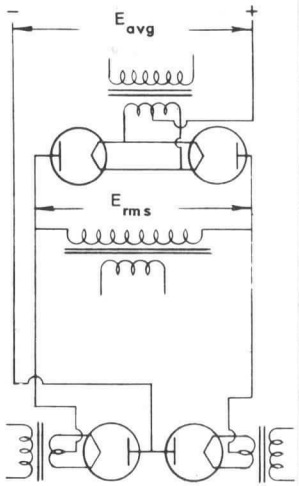
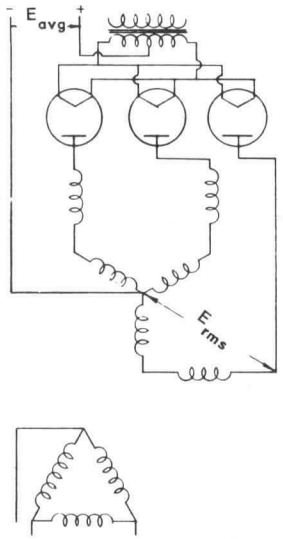
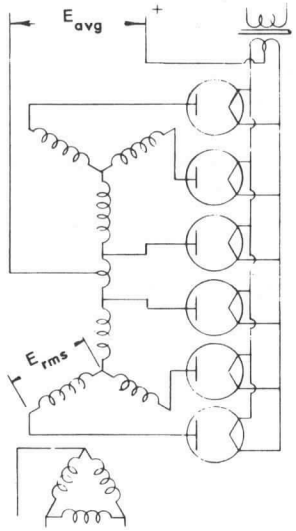
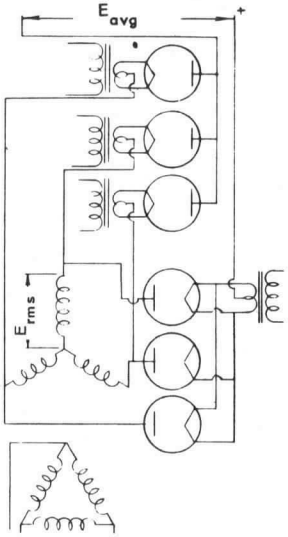
It is good practice to permit the filament to come to full operating temperature before anode voltage is applied. With filamentary emitters, a minimum of 30 seconds should be adequate. With indirectly heated cathodes a much longer time - sometimes several minutes - may be required. Adherence to the warm-up or operation time specified in the tube data sheets is advised.

Anode voltage commencing at one-half maximum specified rating should be supplied in steps until the maximum specified anode voltage is obtained in a 15 minute period. Overloading a high vacuum rectifier will impair the vacuum, sometimes to a degree where operational instability occurs. This condition can usually be mitigated by applying one-half the rated peak inverse anode voltage at peak anode current for 30 minutes and then gradually increasing the anode voltage in a few steps until the rated anode voltage is applied. Operation under these conditions for 1 hour or more should restore operational stability.

As suggested under ***III Cathodes,*** a 5% filament voltage reduction is recommended where feasible. However, due to line voltage fluctuations the filament voltage may decrease sufficiently to reduce the electron emission. The filament voltage should be adjusted so that the minimum value will produce more than the required emission current. The filament voltage should not exceed the recommended rated value as given in the data sheets. A 5% increase in filament voltage will shorten tube life 50%.

The emission from a thoriated tungsten filament depends upon a mono-molecular layer of thorium on the filament surface. If the filament temperature is excessive the thorium will evaporate quickly, resulting in a loss of emission. The filament voltage should be maintained within $\pm$ 5% of the rated value. It is possible to restore the emission by energizing the filament at 170% normal rated filament voltage without anode voltage for approximately 5 minutes, and then at 120% normal rated filament voltage for 15 minutes without anode voltage. If full emission has not been restored, the process may be repeated. After such treatment electrical cleanup as described under **part 8 Operation** above may be applied to improve stability.

Oxide coated filaments and indirectly heated cathode emission depends upon the availability of pure barium on the emitter surface. For long life, the evaporated barium must be continuously replenished from within the coating. The barium metal as well as its oxides are susceptable to poisoning and overloading. Therefore, care must be exercised in operating the filament or heater within the prescribed filament voltage range. However, as stated heretofore, in lightly loaded applications the filament voltage may be decreased as much as 5% below rating. With time (i.e. toward the end of life) this may gradually be increased to as much as 5% over rating.

| RECTIFIER CIRCUIT | SINGLE PHASE FULL WAVE 2 TUBES | SINGLE PHASE FULL WAVE 4 TUBE BRIDGE | THREE PHASE HALF WAVE 3 TUBE BROKEN STAR | THREE PHASE DOUBLE Y 6 TUBES | THREE PHASE FULL WAVE 6 TUBES |
|---|---|---|---|---|---|
| Following conditions are assumed:<br>1. Sine Wave Supply<br>2. Balanced Phase Voltage<br>3. Zero Tube Drop<br>4. Pure Resistance Load<br>5. No Filter<br><br>NOTE: Filament transformer secondaries insulated for greater than maximum peak inverse voltage. |  |  |  |  |  |
| $E_{Average}$ | $.450\ E_{rms.}$<br>$.636\ E_{max.}$ | $.900\ E_{rms.}$<br>$.636\ E_{max.}$ | $1.015\ E_{rms.}$<br>$.718\ E_{max.}$ | $1.170\ E_{rms.}$<br>$.827\ E_{max.}$ | $2.34\ E_{rms.}$<br>$4.65\ E_{max.}$ |
| $E_{Inverse}$ | $3.14\ E_{avg.}$ | $1.57\ E_{avg.}$ | $2.09\ E_{avg.}$ | $2.09\ E_{avg.}$ | $1.245\ E_{avg.}$ |
| $I_{Average}$ | $.636\ I_{max.}$ | $.636\ I_{max.}$ | $.781\ I_{max.}$ | $1.91\ I_{max.}$ | $.955\ I_{max.}$ |
| Ripple Frequency | 2X Supply Freq. | 2X Supply Freq. | 3X Supply Freq. | 6X Supply Freq. | 6X Supply Freq. |
| Ripple Voltage (rms) | 48.3% | 48.3% | 18.3% | 4.2% | 4.2% |
| *Ratio $\frac{\text{Secondary-Kva}}{\text{DC Output}}$ | 1.57 | 1.11 | 1.71 | 1.48 | 1.05 |
| *Ratio $\frac{\text{Primary-Kva}}{\text{DC Output-Kw}}$ | 1.11 | 1.11 | 1.21 | 1.05 | 1.05 |

*These ratios based on choke input filter to maintain substantially constant output current.

CENTRAL ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY



# RECTIFIER

## DESCRIPTION

The Nucor tube type 371B was designed for operation in high voltage rectifier circuits where ambient temperatures and inverse voltage requirements preclude the use of mercury vapor or gas filled diodes. The tube is rugged physically and has adequate overload capacity for use in industrial circuits.

## SPECIFICATIONS

### ELECTRICAL

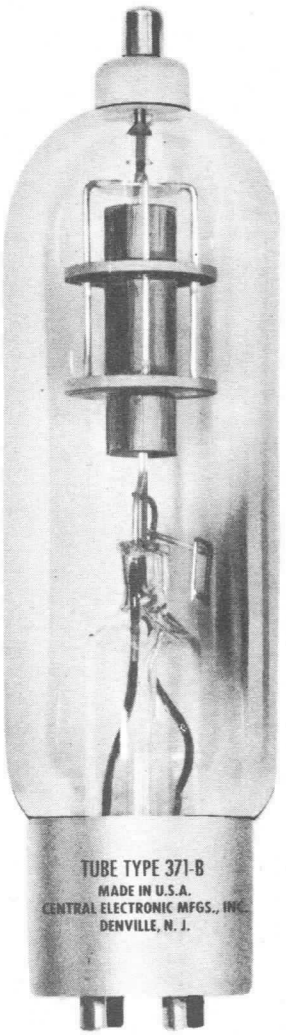
| | |
|---|---|
| Filament | Thoriated tungsten |
| Filament voltage | 5.0 volts ac |
| Filament current | 10.3 amperes |
| Peak inverse voltage | 25,000 volts max. |
| Peak anode current | 1.5 amperes max. |
| Average anode current | 0.300 ampere |

### PHYSICAL

| | |
|---|---|
| Overall length | 8.75 inches max. |
| Overall diameter | 2.31 inches max. |
| Cap | Small metal (C1-1) with ceramic insulator |
| Base | A4-29 jumbo 4 pin bayonet |
| Weight | 5¾ ounces |
| Type of cooling | Radiation (air) |

### OPERATING NOTES

Mount the Nucor tube type 371B vertically with adequate air space for ventilation. Anode temperature should not exceed 800°C. The base fits a standard "50 watt," 4 pin, bayonet socket. Connect the base shell and unused base pins to one filament terminal in the socket.

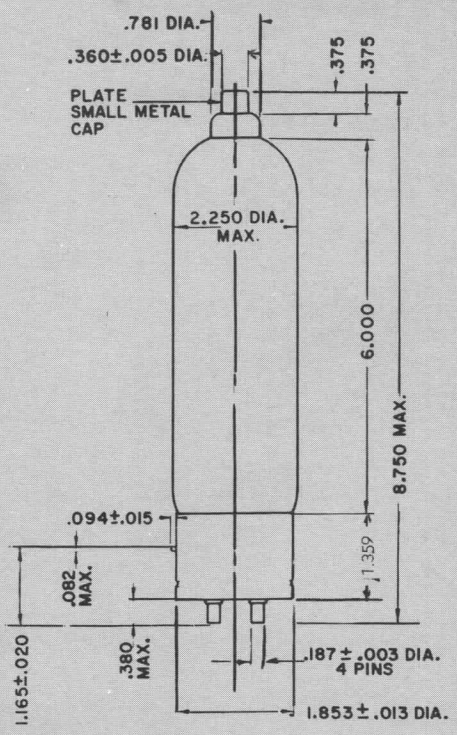


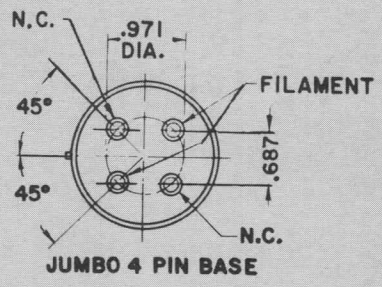
NUCOR
RECTIFIER
TYPE
**371B**

# CENTRAL ELECTRONIC

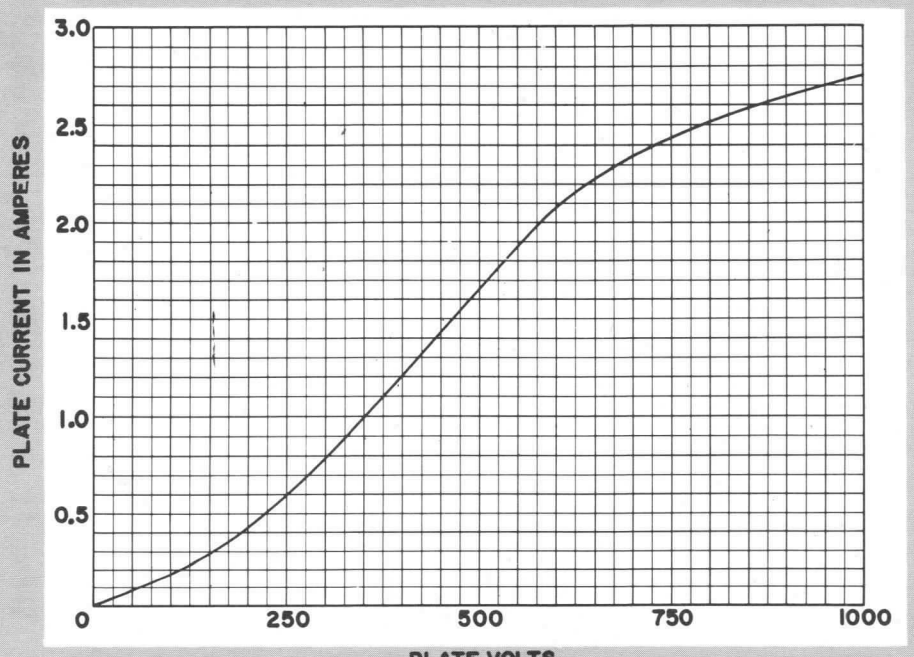
## MANUFACTURERS

DENVILLE. NEW JERSEY




JUMBO 4 PIN BASE




AVERAGE PLATE CHARACTERISTIC

**DIVISION OF NUCLEAR CORPORATION OF AMERICA**

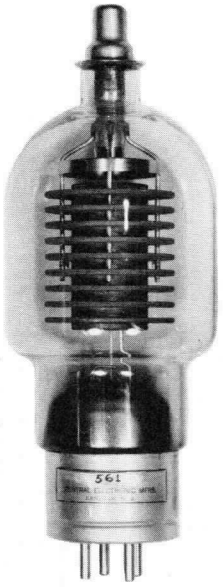
Central ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY



# HIGH VACUUM DIODE

## DESCRIPTION

The Central 561 was designed for rectifier and clipper diode applications. It is a rugged, high vacuum diode with high emission capabilities, desirable where high inverse voltages and ambient temperatures preclude the use of gas filled or mercury vapor tubes.




## SPECIFICATIONS

### PHYSICAL

| | |
|---|---|
| Length (max.) | 9¾ inches |
| Diameter (max.) | 3⅝ inches |
| Cap | .566 inches dia. |
| Base | A4-18 Super Jumbo 4 Pin Bayonet |
| Mounting Position | Vertical, Base Down |
| Weight | 10 Ounces |
| Type of Cooling | Radiation |

NOTE: Maximum anode temperature 800°C—Anode dissipation 450 watts.

### ELECTRICAL

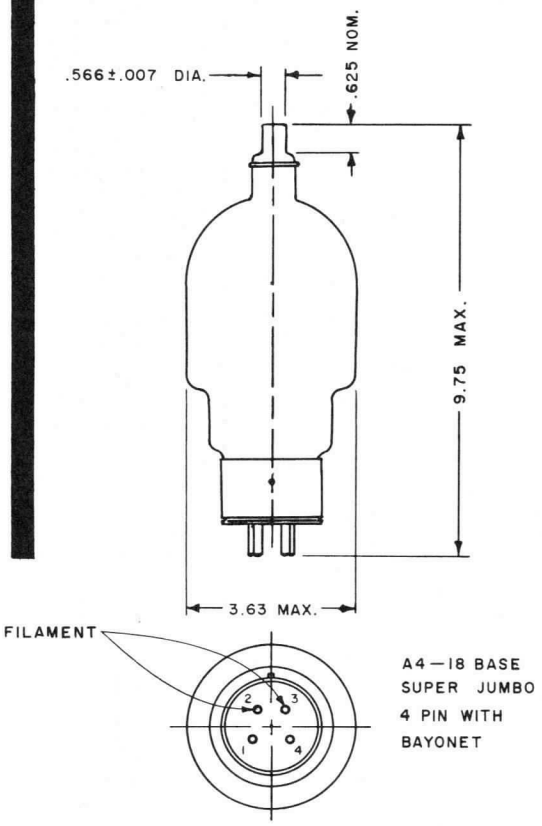
| | |
|---|---|
| Filament | Bonded Thoria Tungsten |
| Filament Voltage | 11.5 Volts |
| Filament Current | 15.25 Amperes |
| Filament Starting Surge Current | 98 Amperes |
| Filament Cold Resistance | .053 ohm |

### ELECTRICAL (RECTIFIER)

| | |
|---|---|
| Filament Voltage | 11.5 Volts |
| Filament Current | 15.25 Amperes |
| Peak Inverse Voltage (max.) | 33 Kilovolts |
| Average Anode Current | 0.86 Amperes |

### ELECTRICAL (CLIPPER)

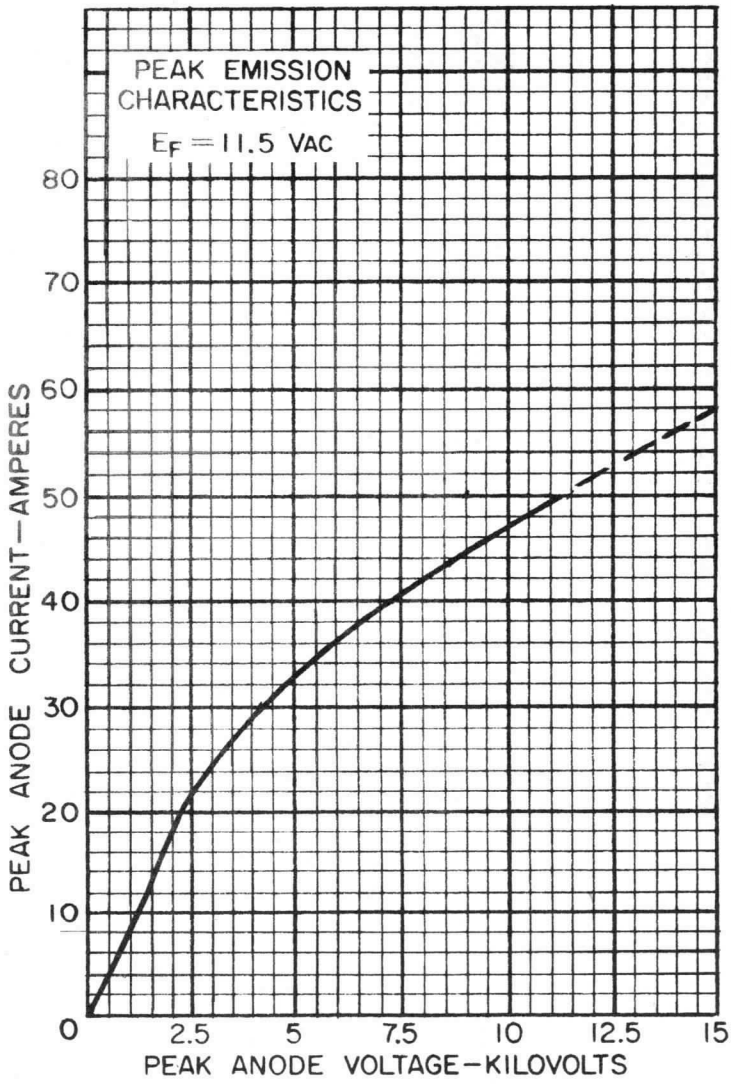
| | |
|---|---|
| Filament Voltage | 11.5 Volts |
| Filament Current | 15.25 Amperes |
| Peak Inverse Voltage (max.) | 33 Kilovolts |
| Peak Anode Current (max.) | 50 Amperes |
| RMS Anode Current | 1.25 Amperes |

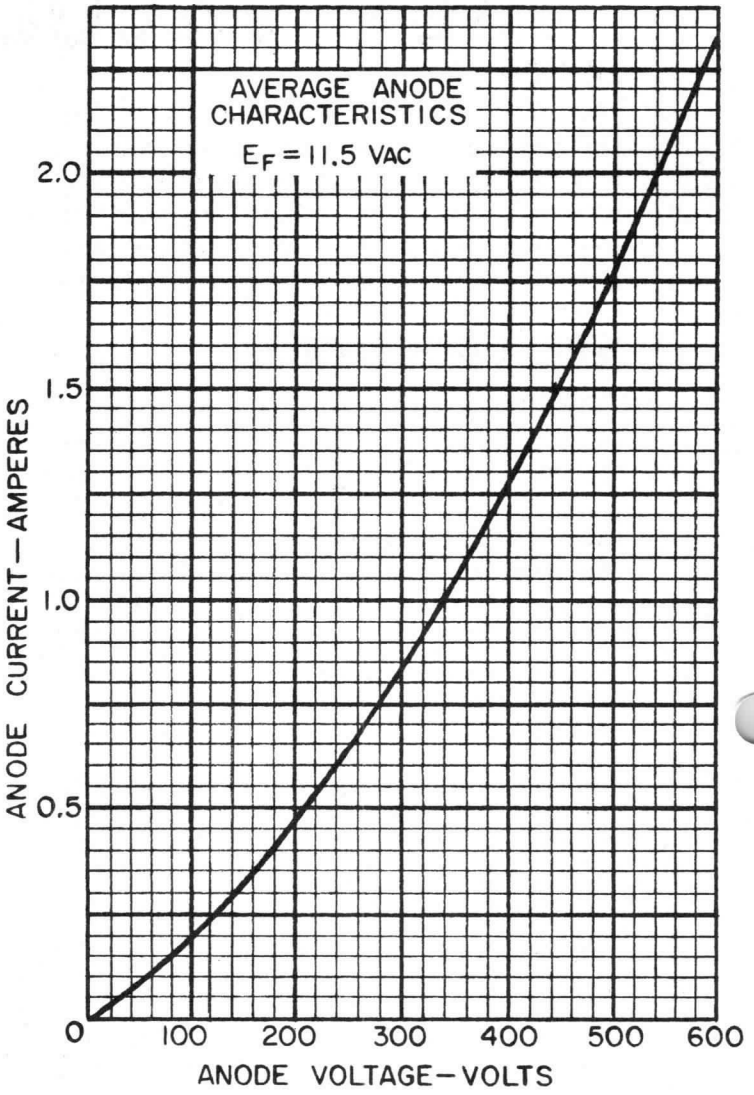


HIGH VACUUM DIODE TYPE 561

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

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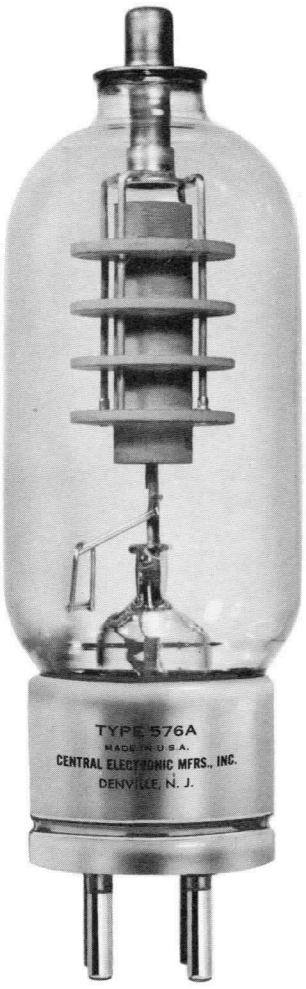
CENTRAL ELECTRONIC
MANUFACTURERS, INCORPORATED
DENVILLE, NEW JERSEY



# RECTIFIER AND CLIPPER DIODE

## DESCRIPTION

The Central Tube type 576A is a rugged, compact, high vacuum rectifier. This tube is most suitable in applications where high inverse voltages and ambient temperatures preclude the use of mercury vapor and gas filled rectifiers or clipper diodes. The Central 576A is mechanically and electrically interchangeable with its earlier version (tube type 576) and offers greater ruggedness in the anode supporting structure.




## SPECIFICATIONS

### ELECTRICAL

Filament ..... Thoriated Tungsten

| | Rectifier Service | Clipper Service |
|---|---|---|
| Filament voltage (volts a.c.) | 5.0 | 5.4 |
| Filament current (amps.) | 14.0 | 15.0 |
| Peak inverse voltage (volts max.) | 25,000 | 25,000 |
| Peak anode current (amps. max.) | 2.5 | 12.0 |
| Average anode current (amps.) | 0.500 | —— |
| R.M.S. Anode current (amps.) | —— | 0.800 |

### PHYSICAL

Overall length ..... 7.5 inches max.
Overall diameter ..... $2\frac{5}{16}$ inches max.
Bulb ..... T-18
Cap ..... Integral KOVAR cap
Base ..... Industrial 412 with metal shell
Weight ..... 5.7 ounces
Type of cooling ..... Radiation (air)

### OPERATING NOTES

Mount the Central tube type 576A tube vertically with adequate air space for ventilation. Anode temperature should not exceed 800°C. The base fits a standard 4 pin super jumbo wafer socket.

CENTRAL
RECTIFIER
TYPE
**576A**

# CENTRAL ELECTRONIC

## MANUFACTURERS, INCORPORATED

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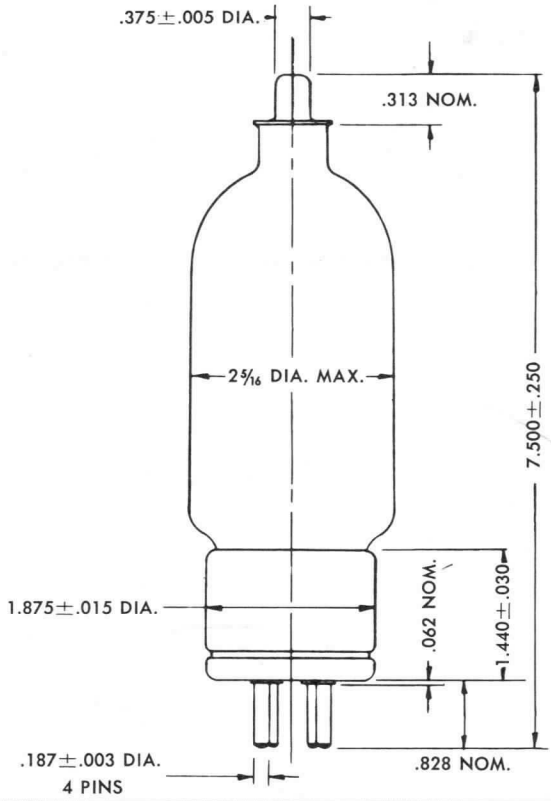


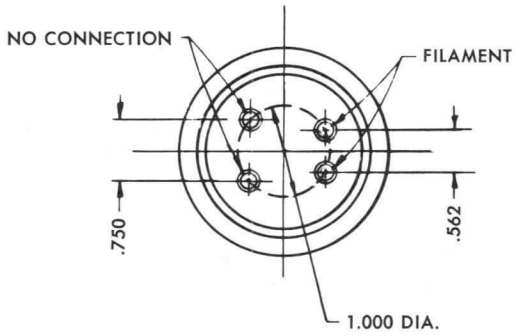


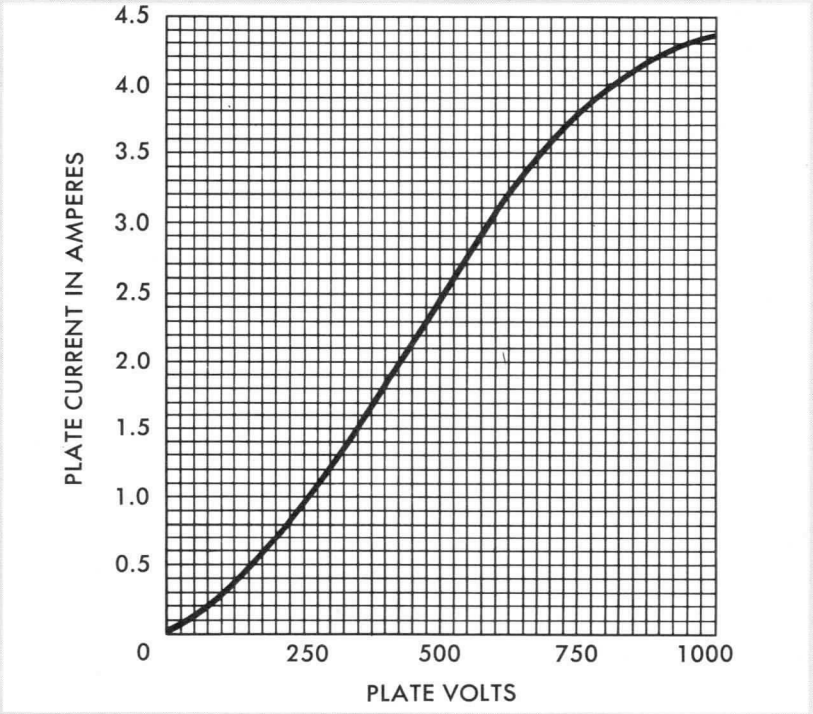


AVERAGE PLATE CHARACTERISTICS

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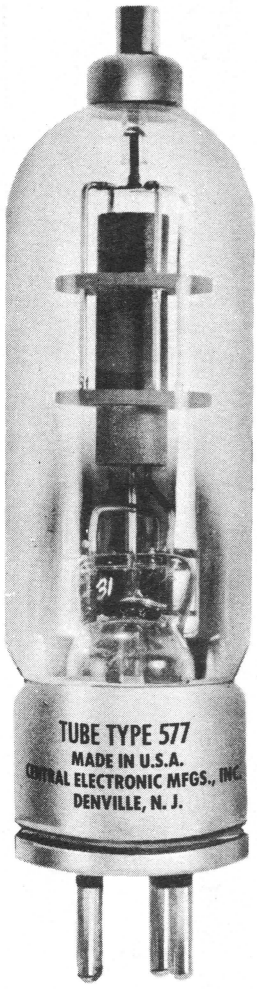
NUCOR
RECTIFIER
TYPE
577

# RECTIFIER

## DESCRIPTION

The Nucor tube type 577 is a lightweight, rugged, compact, high vacuum rectifier. This tube is most suitable in applications where high inverse voltages and ambient temperatures preclude the use of mercury vapor and gas filled rectifier tubes. These characteristics make the Nucor tube type 577 partic -ularly useful in airborne equipment. This tube is a miniaturized version of the 371B and may be directly electrically substituted.




## SPECIFICATIONS

### ELECTRICAL

| | |
|---|---|
| Filament | Thoriated tungsten |
| Filament voltage | 5.0 volts ac |
| Filament current | 10.3 amperes |
| Peak inverse voltage | 25,000 volts max. |
| Peak anode current | 1.5 amperes max. |
| Average anode current | 0.300 ampere |

### PHYSICAL

| | |
|---|---|
| Overall length | 7.5 inches max. |
| Overall diameter | 2.06 inches max. |
| Bulb | T-16 |
| Cap | Small metal (C1-1) with ceramic insulator |
| Base | Industrial 412 with metal shell |
| Weight | 5 ounces |
| Type of cooling | Radiation (air) |

### OPERATING NOTES

Mount the Nucor tube type 577 tube vertically with adequate air space for ventilation. Anode temperature should not exceed 800°C. The base fits a standard 4 pin super jumbo wafer socket.

NUCOR
RECTIFIER
TYPE
**577**

# CENTRAL ELECTRONIC

MANUFACTURERS

DENVILLE, NEW JERSEY

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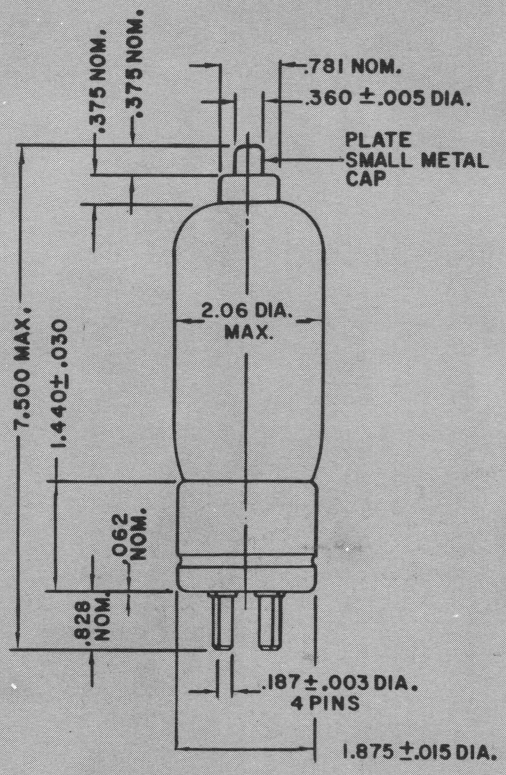


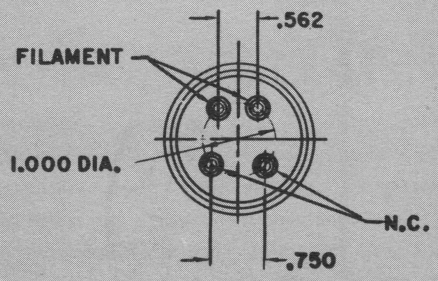


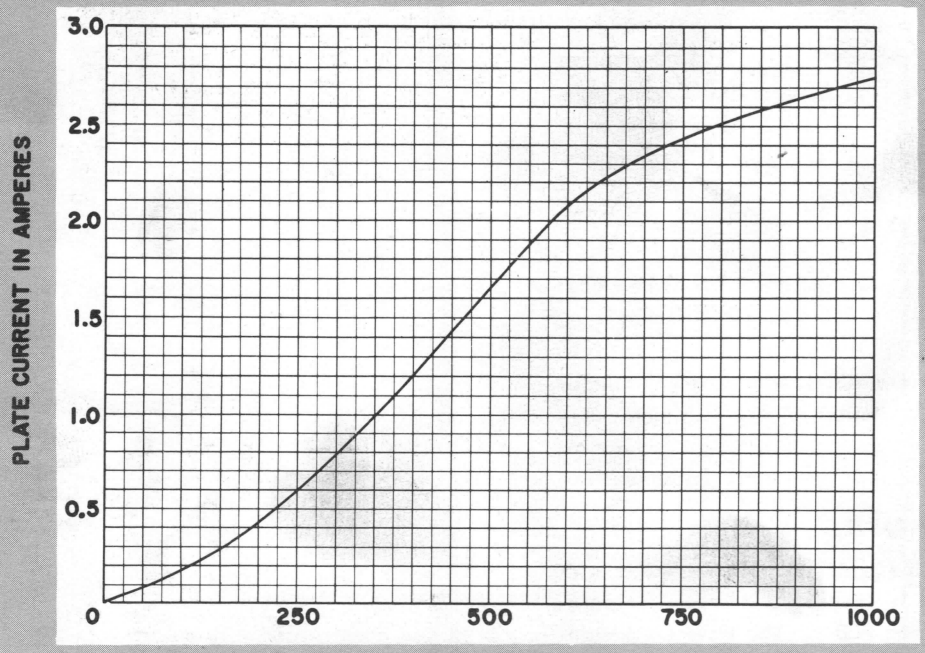


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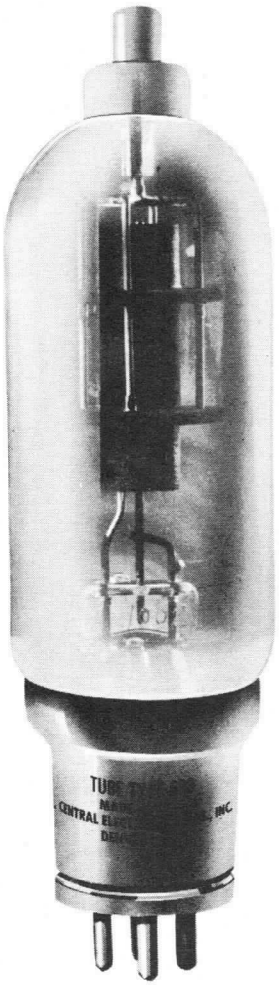
NUCOR
RECTIFIER
TYPE
593

# RECTIFIER

## DESCRIPTION

The Nucor type 593 is a rugged, lightweight, miniaturized high vacuum rectifier. This tube can withstand inverse voltages and operate at ambient temperatures at which similar gas or mercury vapor tubes would not be suitable. The tube can be electrically substituted for the much larger 371B. The long base pins on the Nucor 593 insure adequate electrical contact.



## SPECIFICATIONS

### ELECTRICAL

| | |
|---|---|
| Filament | Thoriated tungsten |
| Filament voltage | 5.0 volts ac |
| Filament current | 10.3 amperes |
| Peak inverse voltage | 25,000 volts max. |
| Peak anode current | 1.5 amperes max. |
| Average anode current | 0.300 ampere |

### PHYSICAL

| | |
|---|---|
| Overall length | 7.5 inches max. |
| Overall diameter | 2.06 inches max. |
| Bulb | T-16 |
| Cap | Small metal (C1-1) with ceramic insulator |
| Base | Medium, skirted, 4 pin, bayonet base |
| Weight | 4¾ ounces |
| Type of cooling | Radiation (air) |

### OPERATING NOTES

Mount the Nucor tube type 593 vertically with adequate air space for ventilation. Anode temperature should not exceed 800°C. The base fits a standard 4 pin medium socket.

NUCOR
RECTIFIER

TYPE
**593**

# CENTRAL ELECTRONIC

## MANUFACTURERS

DENVILLE, NEW JERSEY

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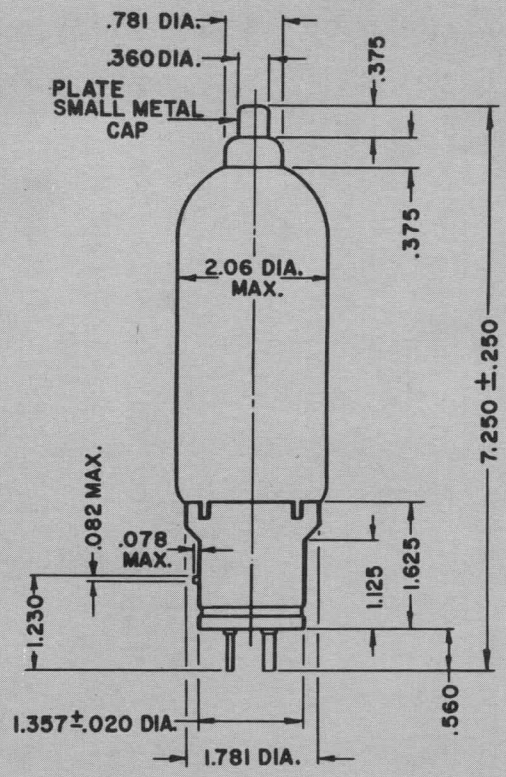


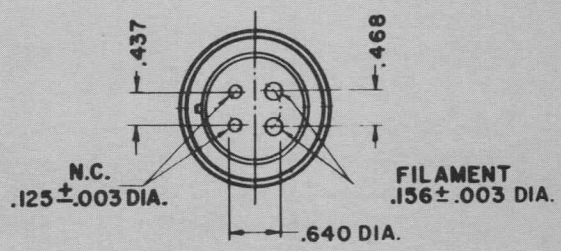


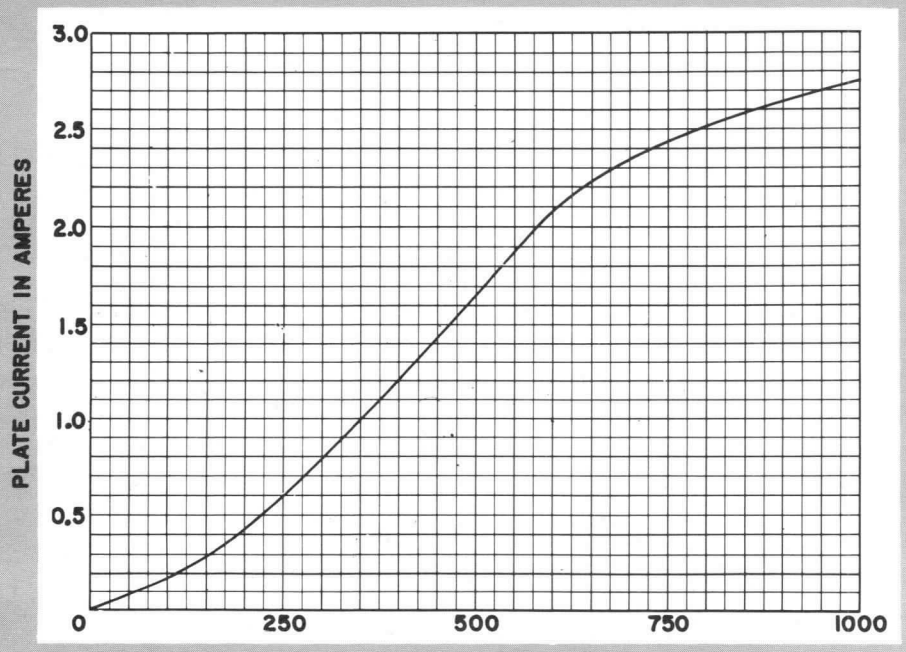


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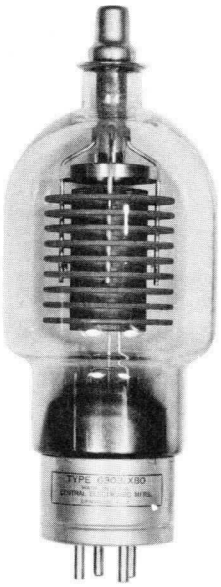
DENVILLE, NEW JERSEY

HIGH VACUUM DIODE TYPE
6303/X-80

# HIGH VACUUM DIODE

## DESCRIPTION

The Central 6303/X-80 was designed for rectifier and clipper diode applications. It is a rugged, high vacuum diode with high emission capabilities, desirable where high inverse voltages and ambient temperatures preclude the use of gas filled or mercury vapor tubes.

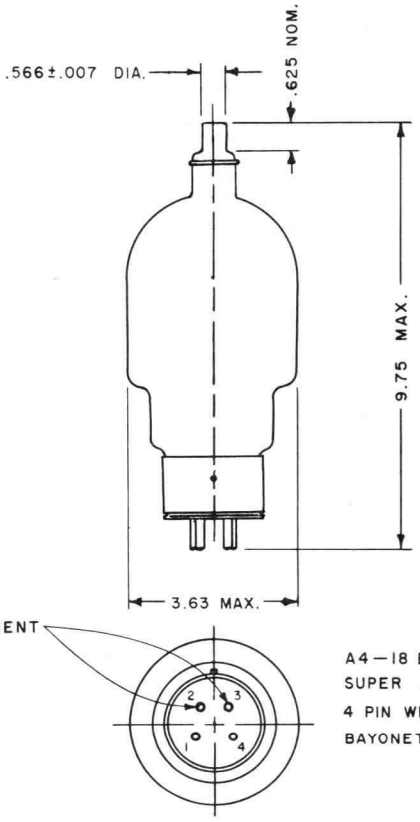


## SPECIFICATIONS:

### PHYSICAL

| | |
|---|---|
| Length (max.) | 9¾ inches |
| Diameter (max.) | 3⅝ inches |
| Cap | .566 inches dia. |
| Base | A4-18 Super Jumbo 4 Pin Bayonet |
| Mounting Position | Vertical, Base Down |
| Weight | 10 Ounces |
| Type of Cooling | Radiation (1) |

(1) Mount the tube so that forced air at the rate of 50 cfm is directed downward on the tube when operating at 60% of full rating. Maximum anode temperature 800°C. Anode dissipation 550 watts. Connect the base shell and unused pins externally to one filament terminal.




### ELECTRICAL (RECTIFIER)

| | |
|---|---|
| Filament | Bonded Thoria Tungsten |
| Filament Voltage | 11.5 Volts |
| Filament Current | 15.25 Amperes |
| Peak Inverse Voltage (max.) | 40,000 Volts |
| Peak Anode Current (max.) | 2.5 Amperes |
| Average Plate Current (max.) | 0.700 Amperes |

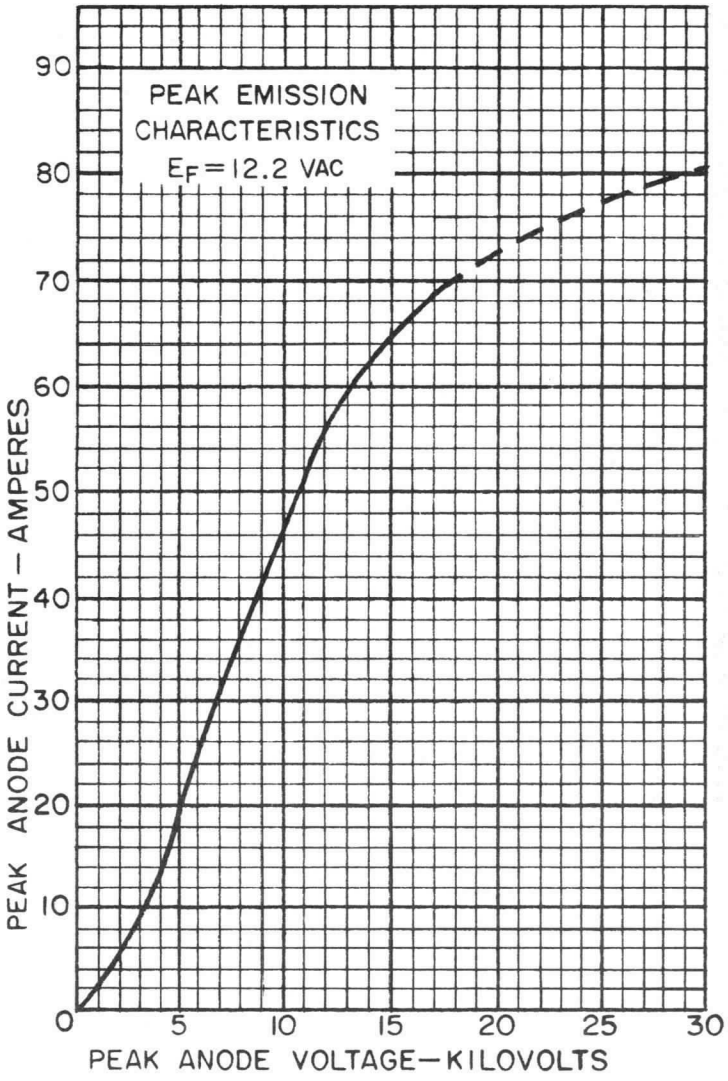
### ELECTRICAL (CLIPPER)

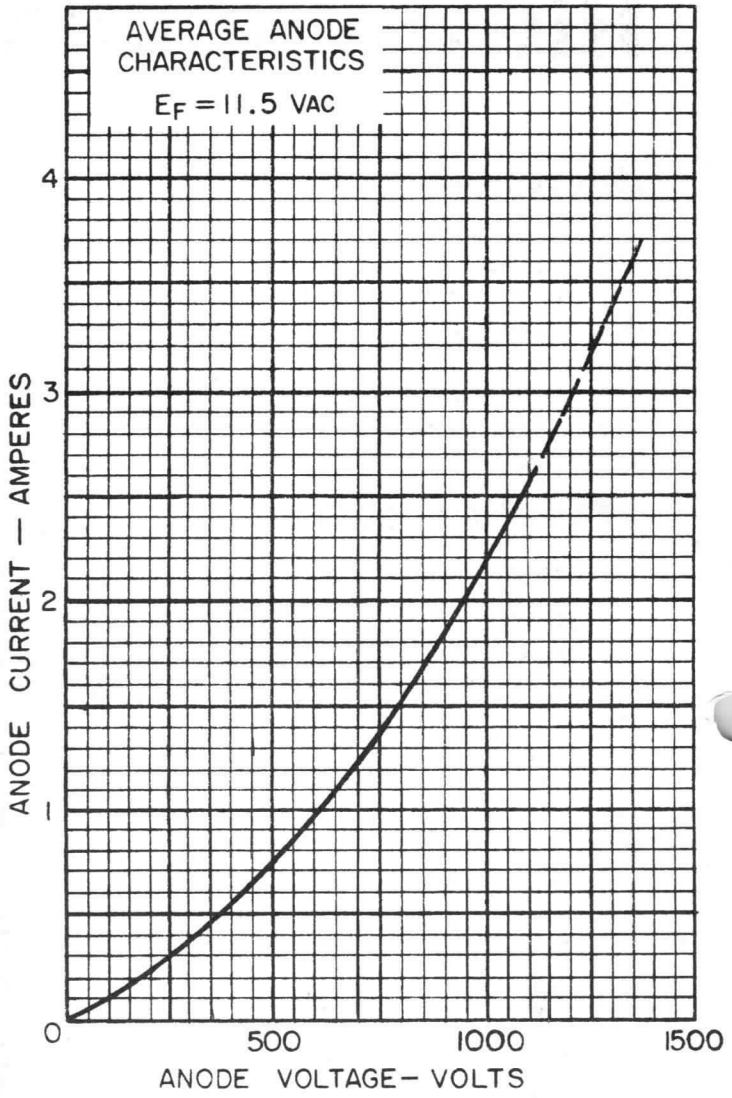
| | |
|---|---|
| Filament | 12.2 Volts |
| Filament Current | 15.5 Amperes |
| Peak Inverse Voltage (max.) | 33,000 Volts |
| Peak Anode Current (max.) | 50 Amperes |
| RMS Anode Current | 1.25 Amperes |

HIGH VACUUM DIODE TYPE 6303/X-80

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY




**WARNING FOR POSSIBLE X-RAY GENERATION**
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CENTRAL ELECTRONIC MANUFACTURERS
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DENVILLE, NEW JERSEY

# TECHNICAL SPECIFICATIONS FOR 7030

The Central 7030 is a forced-air cooled hard tube diode specifically designed for rectifier, charging and shunt diode service up to 30KV peak inverse voltage. The tube design features a special thoriated tungsten filament capable of high peak currents and long life. The external anode allows for high anode dissipation ratings and efficient air cooling. The 7030 can dissipate 2.5KW continuously at an air flow of 150 cfm.

SPECIFICATIONS:

PHYSICAL

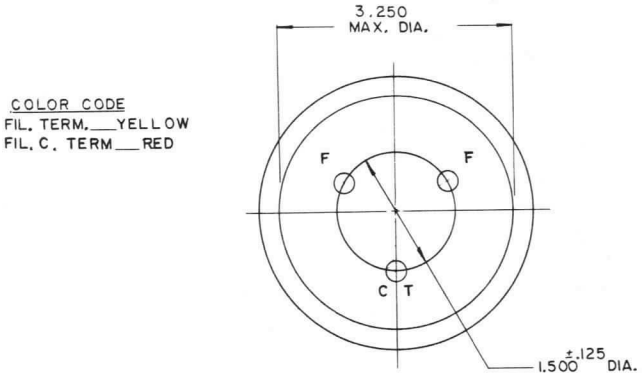
| | |
|---|---|
| Net Weight, Approximate | 6 1/4 pounds |
| Max. Input Air Temp. | 45°C |
| Max. Glass Seal Temp. | 180°C |
| Mounting Position | Vertical |
| Type of Cooling | Forced Air |

Air Flow Requirements

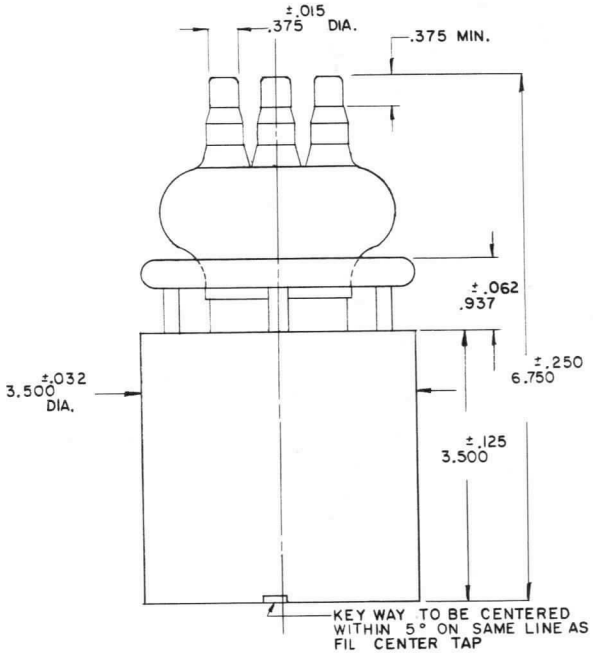
| cfm | Dissipation | Press. Drop (in. of water) |
|---|---|---|
| 150 | 2.5 | 2.5 |
| 120 | 2.0 | 1.6 |
| 90 | 1.5 | .9 |
| 65 | 1.0 | .65 |
| 50 | 0.5 | .5 |

Interelectrode Capacitance 12 $\mu\mu$f

TYPE 7030
HIGH VACUUM POWER DIODE




TUBULATION TIP-OFF TO BE 1/8 MIN. BELOW TERMINALS

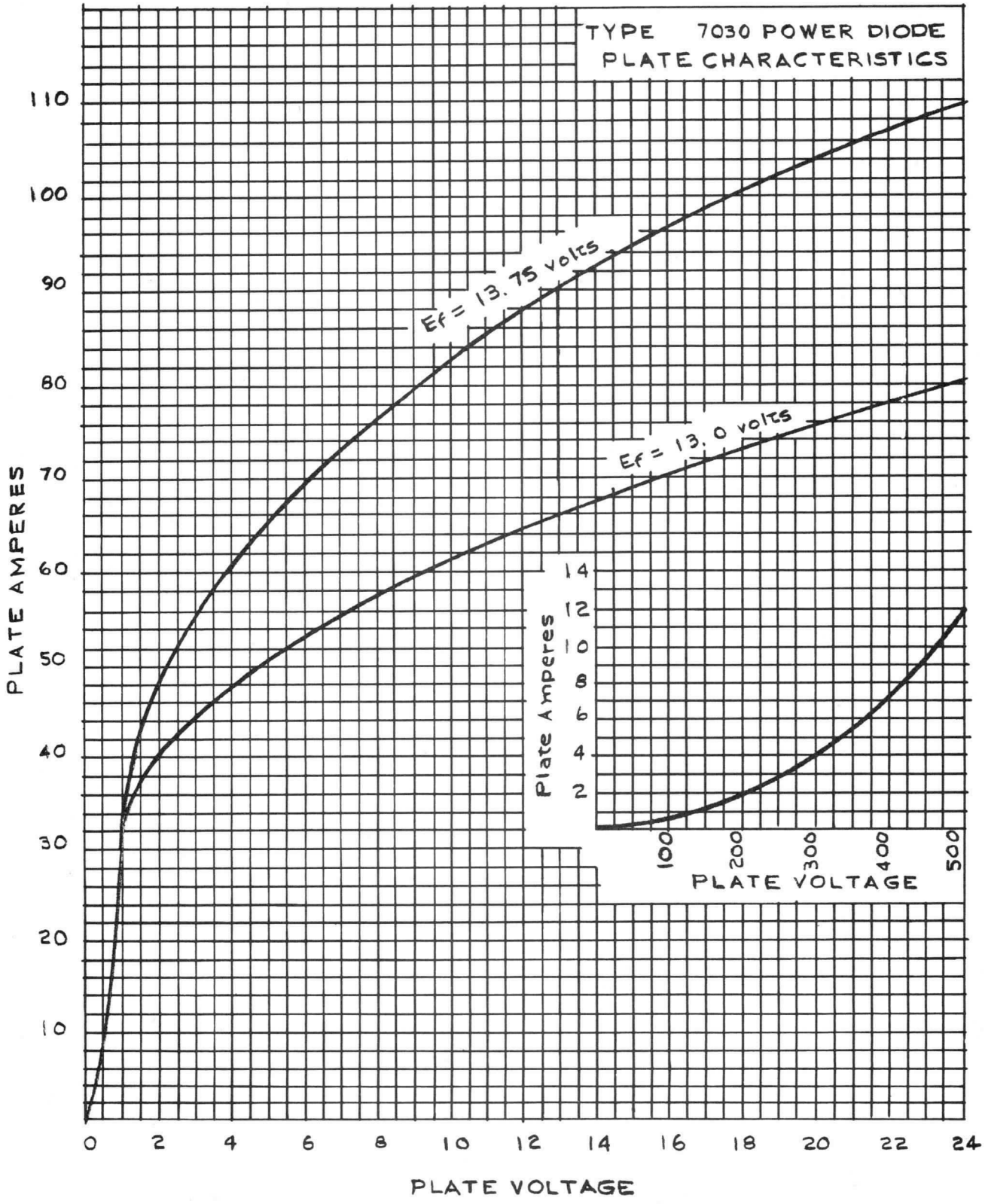



ELECTRICAL (RECTIFIER):

| | |
|---|---|
| Filament | Thoriated Tungsten |
| Filament Voltage | 13 Volts |
| Filament Current | 36 Amperes |
| Filament Starting Current | Full filament voltage may be applied to the cold filament. |
| Peak Inverse Voltage | 25KV |
| Peak Plate Current | 20 Amps. |
| Average Plate Current | 6 Amps. |

ELECTRICAL (CLIPPER AND SHUNT):

| | | |
|---|---|---|
| Filament Voltage | 13.75 volts. | |
| Filament Current | 38 Amps. | |
| Peak Inverse Voltage | 30KV | 30KV |
| Peak Plate Current | 50 Amps. | 75 Amps. |
| Average Plate Current | .7 Amps. | 2 Amps. |


TYPE 7030 POWER DIODE
PLATE CHARACTERISTICS
Ef = 13.75 volts
Ef = 13.0 volts
PLATE AMPERES
PLATE VOLTAGE
Plate Amperes
PLATE VOLTAGE
0
2
4
6
8
10
12
14
16
18
20
22
24
10
20
30
40
50
60
70
80
90
100
110
2
4
6
8
10
12
14
100
200
300
400
500

Central ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

**HIGH VOLTAGE**
**HIGH CURRENT**
**DIODE**
**TYPE**
**7131/XD-2**
Anode Dissipation
3 Kw

# HIGH VOLTAGE HIGH VACUUM DIODE

## *DESCRIPTION*

The Central 7131/XD-2 is a forced-air cooled hard tube diode specifically designed for rectifier, charging and shunt diode service up to 40Kv peak inverse voltage. The tube design features a special thoria-tungsten rilament capable of high peak currents and long life. The external anode allows for high anode dissipation ratings and efficient air cooling when used with the recommended Central air socket. This air socket permits maximum air flow at the anode. The 7131/XD-2 can dissipate 3Kw continuously at an air flow of 190 cfm.


## SPECIFICATIONS

### *PHYSICAL*

Overall Length . . . . . 6½ inches
Overall Diameter . . . . . 4⅝ inches
Weight . . . . . 5¼ pounds (approx.)
Mounting Position . . . . . Vertical
Mounting Socket . . . . . CAS-A or CAS-B Series
Type of Cooling . . . . . Forced air

Air Flow

| Velocity cfm | Anode Dissipation Rating | Pressure Drop (in. of water) |
|---|---|---|
| 50 | 1.0Kw | 0.20 |
| 75 | 1.8Kw | 0.26 |
| 125 | 2.4Kw | 0.58 |
| 190 | 3.0Kw | 1.21 |

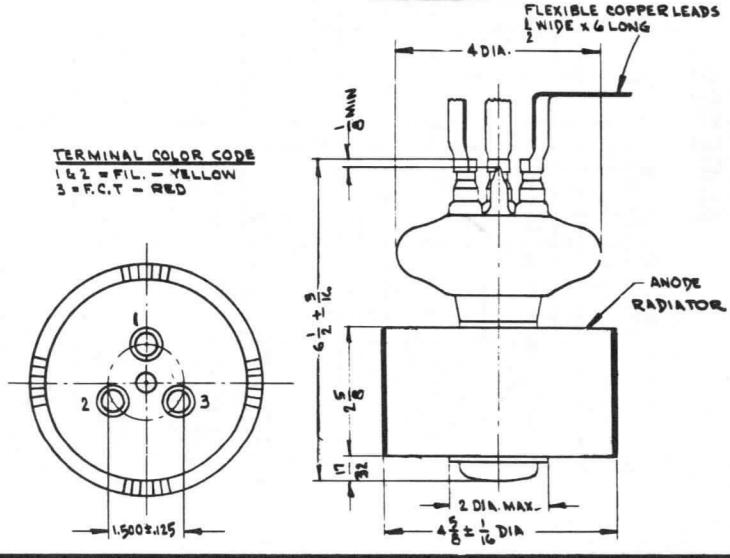
Max. Incoming Air Temperature . . . . . 45°C
Max. Glass Seal Temperature . . . . . 180°C

### *ELECTRICAL (RECTIFIER)*

Filament . . . . . Special Thoriated Tungsten
Filament Voltage . . . . . 13 Volts A.C.
Filament Current . . . . . 36 Amperes
Starting Filament Surge Current . 80 Amperes (max.)
Peak Inverse Voltage . . . . . 40,000 Volts (max.)
Anode Current . . . . . 3 Amperes
Peak Anode Current . . . . . 15 Amperes

### *ELECTRICAL (CLIPPER, SHUNT or CHARGING DIODE)*

Filament Voltage . . . . . 14.5 Volts A.C. (clipper)
13 Volts A.C. (charging)
Filament Current . . . . . 40 Amperes (clipper)
36 Amperes (charging)
Starting Filament Surge Current 80 Amperes (max.)
Peak Inverse Voltage . . . . . 40,000 Volts (max.)
Anode Current (RMS) . . . . . 6 Amperes
Peak Anode Current . . . . . 150 Amperes (clipper)

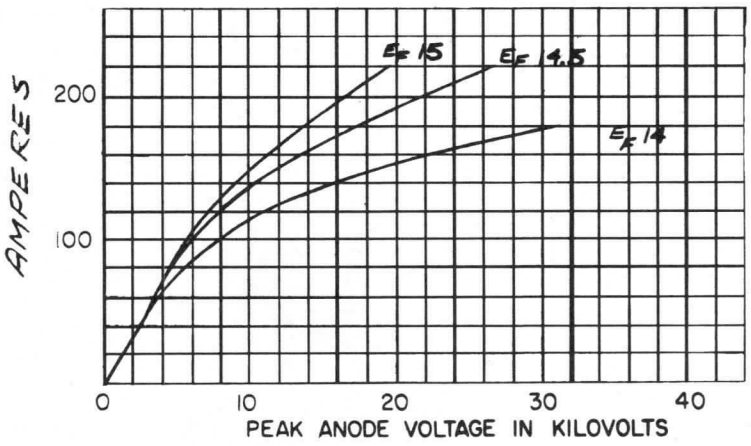


**HIGH VOLTAGE**
**HIGH CURRENT**
**DIODE**
**TYPE**
**7131/XD-2**
Anode Dissipation
3 Kw

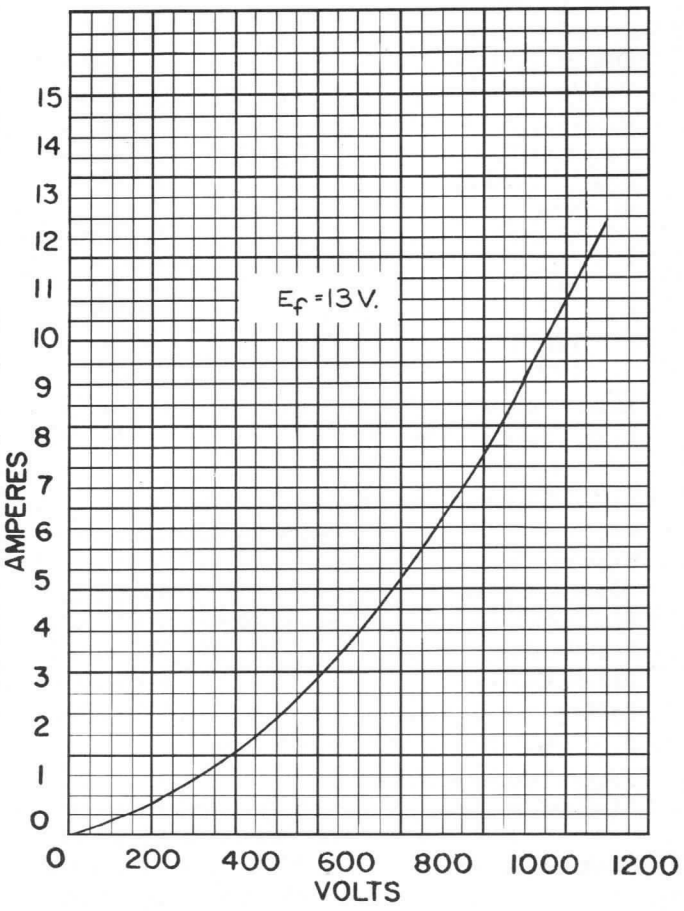
# Central ELECTRONIC
## MANUFACTURERS

DENVILLE, NEW JERSEY

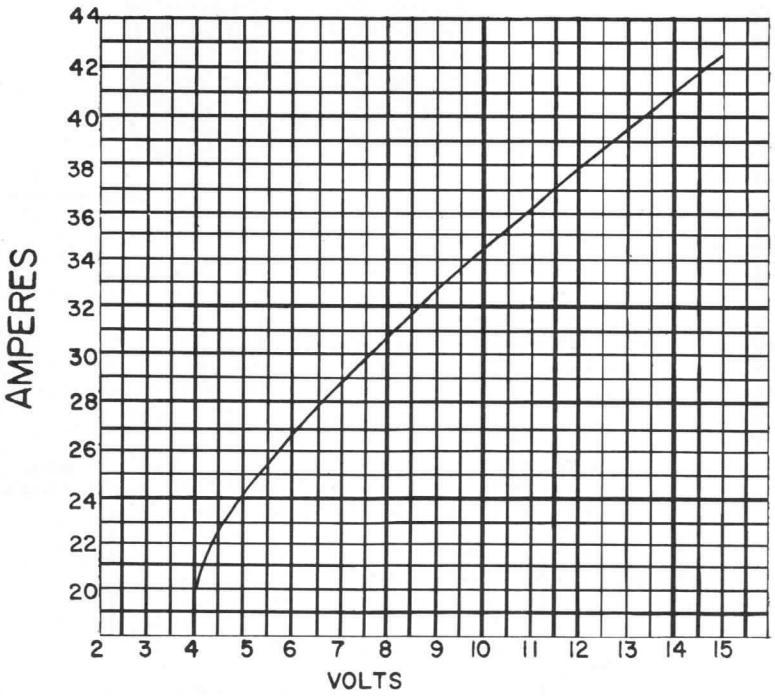
### PULSE CHARACTERISTICS




### AVERAGE ANODE CHARACTERISTICS




### FILAMENT CHARACTERISTICS




**DIVISION OF NUCLEAR CORPORATION OF AMERICA**

Printed U. S. A.

Central ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

**HIGH VOLTAGE**
**HIGH CURRENT**
**DIODE**
**TYPE**
**7132/XD-2**
Anode Dissipation
5 Kw

# HIGH VOLTAGE
# HIGH VACUUM DIODE

## *DESCRIPTION*

The Central 7132/XD-2 is a water cooled hard tube diode specifically designed for rectifier, charging and shunt diode service up to 40Kv peak inverse voltage. The tube design features a special thoria-tungsten filament capable of high peak currents and long life. The external anode allows for high anode dissipation ratings and efficient water cooling through its specially designed integral jacket. The 7132/XD-2 can dissipate 5Kw continuously at a water flow of 3 gpm.

## SPECIFICATIONS

### *PHYSICAL*

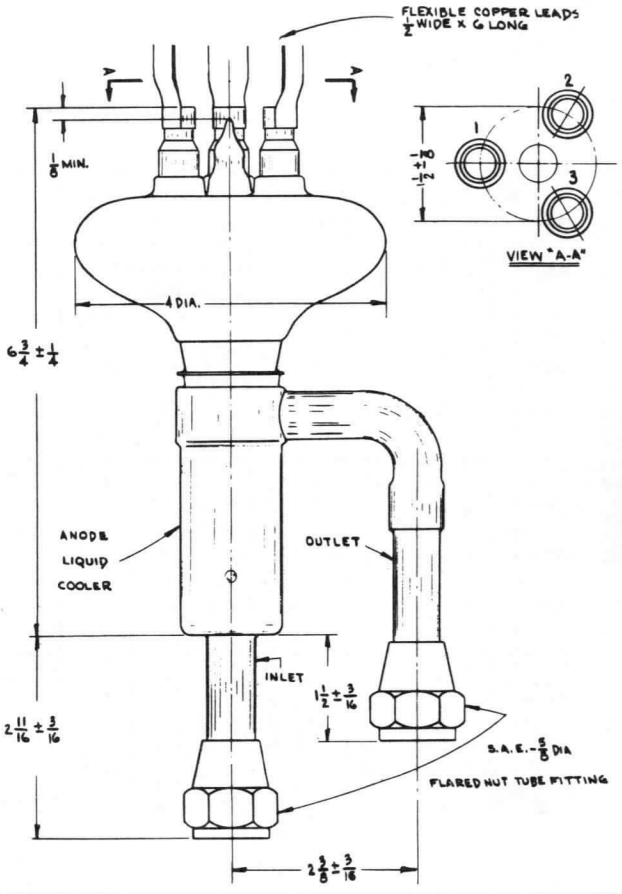
| | |
|---|---|
| Overall Length | 9 7/16 inches |
| Overall Diameter | 4 inches |
| Weight | 1½ pounds (approx.) |
| Mounting Position | Vertical |
| Type of Cooling | Water |
| Water Flow | 3 gpm (minimum) |
| Max. Outlet Temperature | 70°C |
| Max. Glass Seal Temperature | 180°C |

### *ELECTRICAL (RECTIFIER)*

| | |
|---|---|
| Filament | Special Thoriated Tungsten |
| Filament Voltage | 13 Volts A.C. |
| Filament Current | 36 Amperes |
| Starting Filament Surge Current | 80 Amperes (max.) |
| Peak Inverse Voltage | 40,000 Volts (max.) |
| Anode Current | 3 Amperes |
| Peak Anode Current | 15 Amperes |

### *ELECTRICAL (CLIPPER, SHUNT or CHARGING DIODE)*

| | |
|---|---|
| Filament Voltage | 14.5 Volts A.C. (clipper)<br>13 Volts A.C. (charging) |
| Filament Current | 40 Amperes (clipper)<br>36 Amperes (charging) |
| Starting Filament Surge Current | 80 Amperes (max.) |
| Peak Inverse Voltage | 40,000 Volts (max.) |
| Anode Current (RMS) | 6 Amperes |
| Peak Anode Current | 150 Amperes (clipper) |



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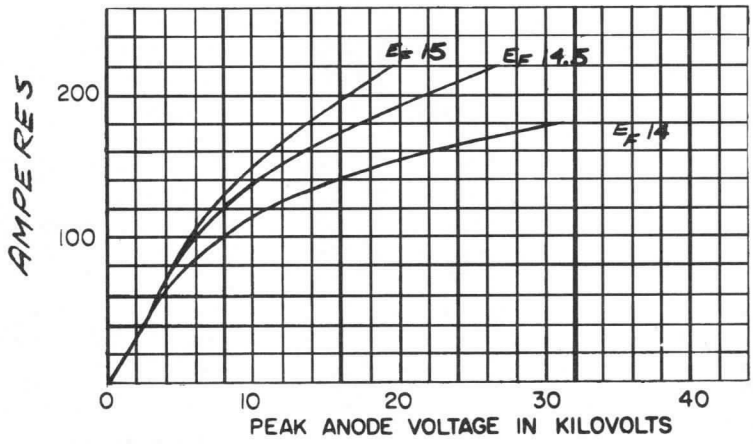
**HIGH VOLTAGE**
**HIGH CURRENT**
**DIODE**
**TYPE**
**7132/XD-2**
Anode Dissipation
5 Kw

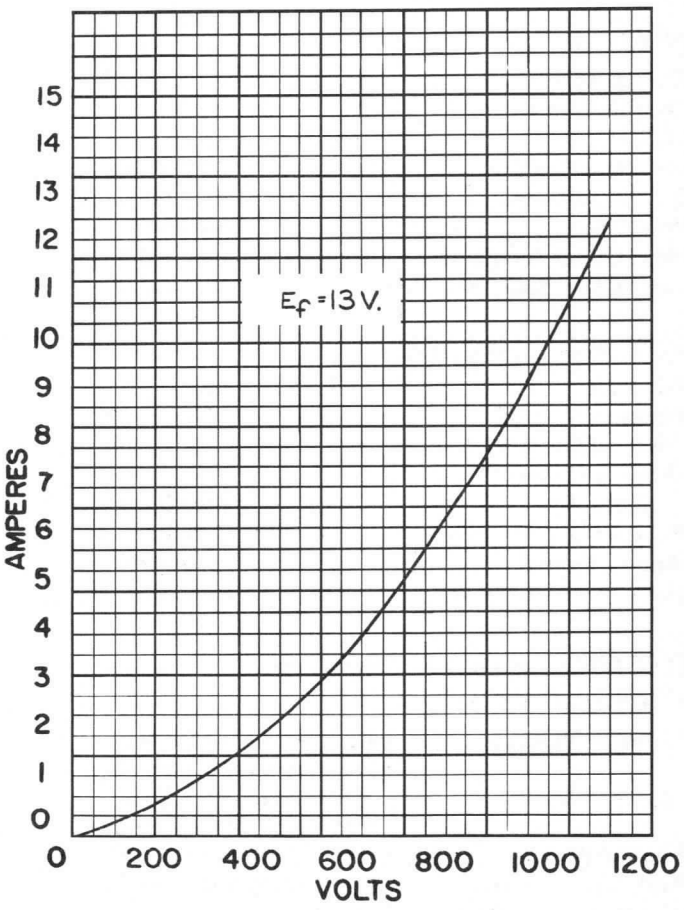
# Central ELECTRONIC
## MANUFACTURERS

DENVILLE, NEW JERSEY

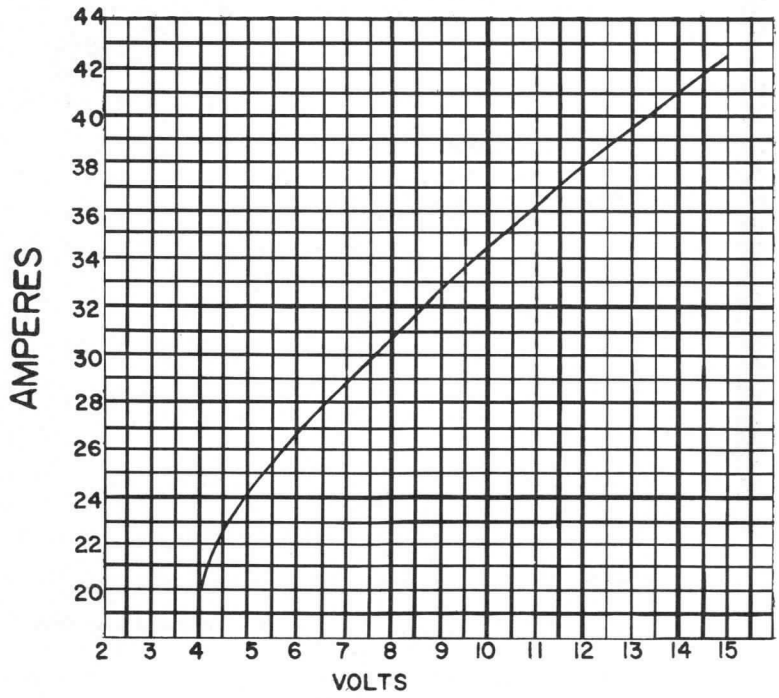
### PULSE CHARACTERISTICS




### AVERAGE ANODE CHARACTERISTICS




### FILAMENT CHARACTERISTICS

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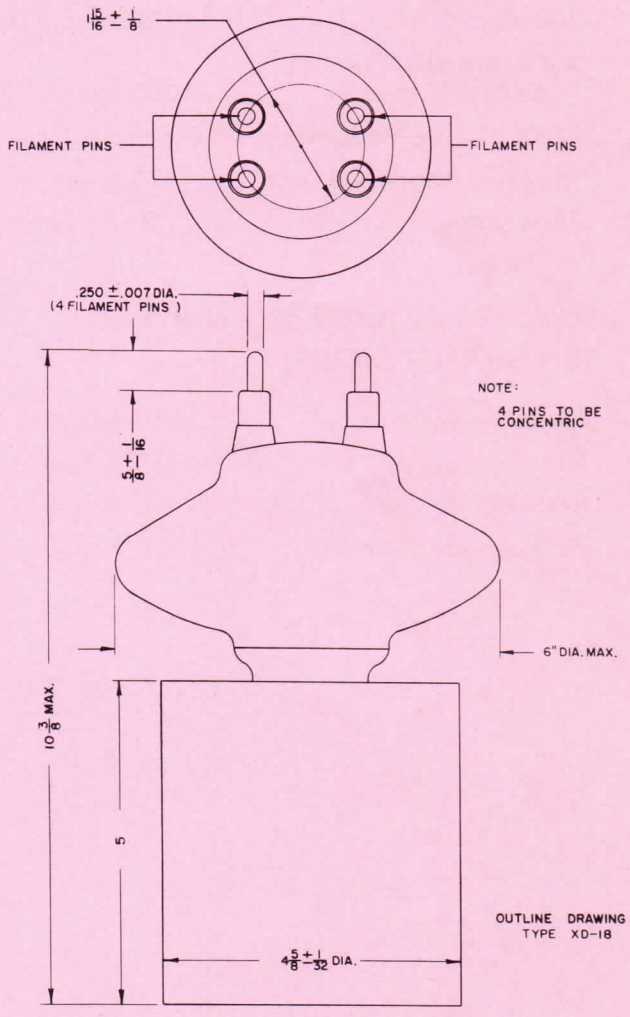
central ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

HIGH VACUUM DIODE TYPE XD-18

NOTE
This tube now designated XD-18R

# HIGH VOLTAGE HIGH VACUUM DIODE




OUTLINE DRAWING
TYPE XD-18

## *DESCRIPTION*

The Central Electronic Manufacturers tube type XD-18 is a forced-air-cooled high vacuum type diode for use in power supplies and modulators. Rugged kovar grid and filament seals insure greater protection against mechanical stress and shock.

## SPECIFICATIONS

### *PHYSICAL*

| | |
|---|---|
| Overall length | $10\frac{3}{8}$" max. |
| Overall diameter | $4\frac{5}{8}$" max. |
| Type of cooling | Forced air |
| Mounting position | Vertical |
| Mounting sockets | Central CAS-1, 4, 6 |
| Air flow | 300 cfm @ 2.5" back pressure for 13Kw dissipation |

HIGH VACUUM DIODE TYPE XD-18

# central ELECTRONIC MANUFACTURERS

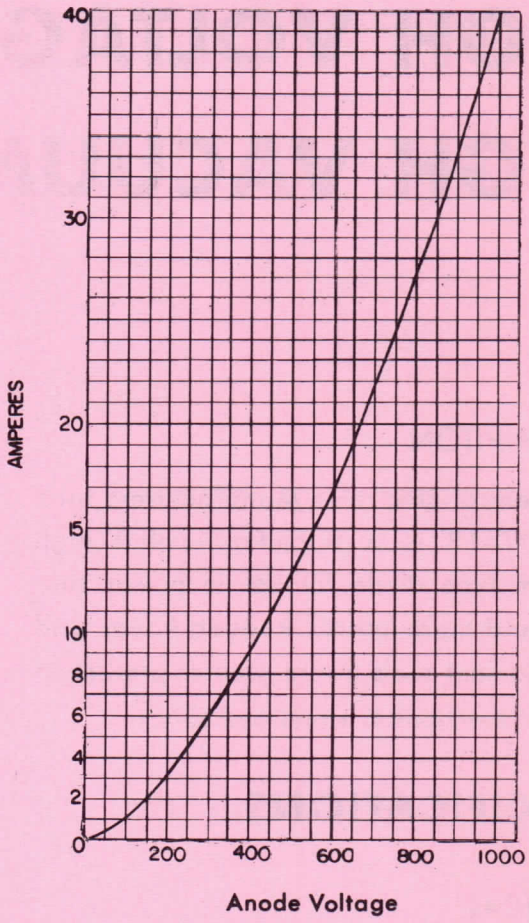
DENVILLE, NEW JERSEY

## *ELECTRICAL (RECTIFIER)*

| | |
|---|---|
| Filament | Thoriated Tungsten |
| Filament Voltage | 10 Volts A.C. |
| Filament Current | 120 Amperes |
| Max. Starting Filament Surge Current | 250 Amperes |
| Peak Inverse Voltage | 40,000 Volts max. |
| Average Anode Current | 15 Amperes |
| Peak Anode Current | 50 Amperes |

## *ELECTRICAL (CLIPPER, SHUNT or CHARGING DIODE)*

| | |
|---|---|
| Filament Voltage | 11 Volts A.C. |
| Filament Current | 125 Amperes |
| RMS Anode Current | 15 Amperes |
| Peak Anode Current | 300 Amperes |




A DIVISION OF NUCLEAR CORPORATION OF AMERICA

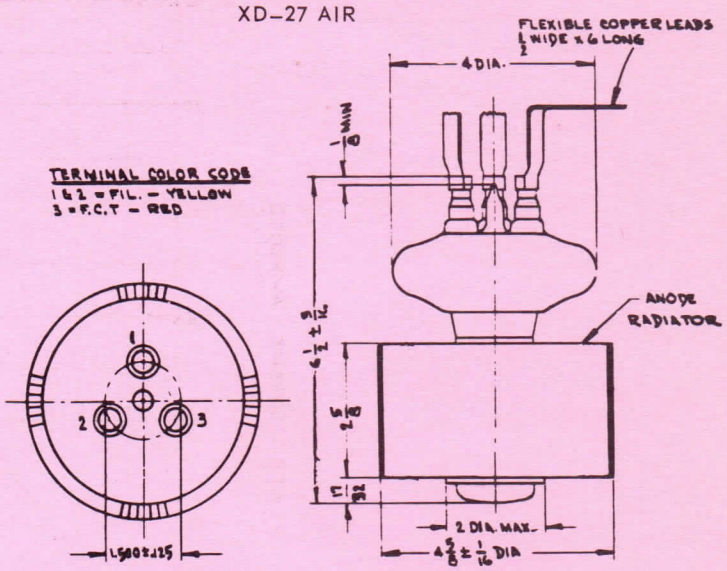
# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

**HIGH VACUUM DIODE**

**XD – 27**

XD–27 AIR




## DESCRIPTION

The Central XD–27 is a high vacuum high current diode of the low impedance type. This thoriated tungsten filament tube was designed for rectifier or clipper service, and is available in both water and air cooled versions.

## SPECIFICATIONS:

| PHYSICAL | Water | Air |
|---|---|---|
| Length | 9 7/16 | 6½ inches |
| Diameter | 4 | 4 5/8 inches |
| Weight | 1 1/2 | 5½ Pounds (approx.) |
| Mounting Position | Vertical | Vertical |
| Mounting Socket (air version) | | CAS-A or CAS-B series |
| Type of Cooling | | |

| Air | | | Water | |
|---|---|---|---|---|
| Velocity (cfm) | Anode Dissipation (Kw) | Pressure (in. of water) | Flow (gpm) | Anode Dis. (Kw) |
| 50 | 1.0 | 0.20 | 3 | 5 |
| 75 | 1.8 | 0.26 | | |
| 125 | 2.4 | 0.58 | | |
| 190 | 3.0 | 1.21 | | |

| | |
|---|---|
| Max. Incoming Air Temperature | 45°C (air version) |
| Max. Glass Seal Temperature | 180° C (air version) |
| Max. Outlet Temperature | 70° C (water version) |

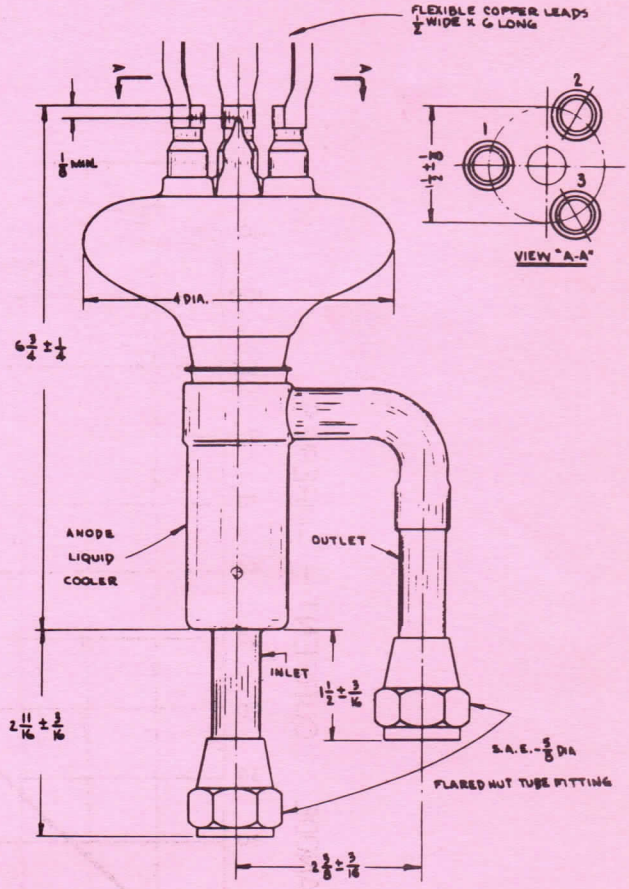
ELECTRICAL (RECTIFIER)

| | |
|---|---|
| Filament | Thoriated Tungsten |
| Filament Voltage | 13.0 Volt |
| Filament Current | 36.0 Ampere |
| Peak Inverse Voltage (max.) | 30 Kilovolts |
| Average Anode Current | 3 Amperes |
| Peak Anode Current (max.) | 15 Amperes |

ELECTRICAL (CLIPPER)

| | |
|---|---|
| Filament Voltage | 14.5 Volts |
| Filament Current | 40.0 Amperes |
| Peak Inverse Voltage (max.) | 30 Kilovolts |
| Peak Anode Current (max.) | 150 Amperes |
| RMS Anode Current | 6 Amperes |

XD–27 WATER



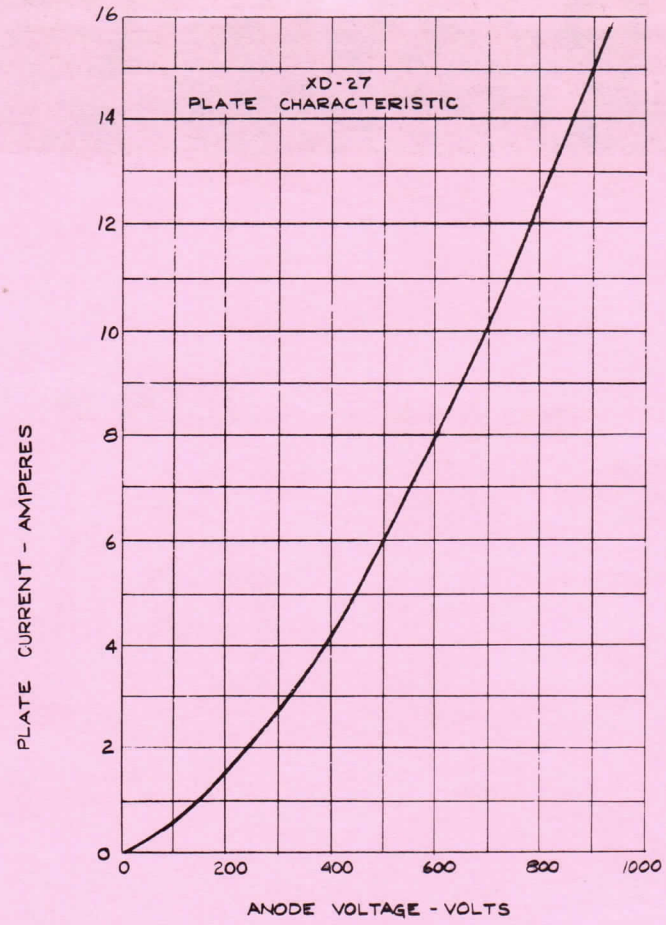

## X-RAY INFORMATION

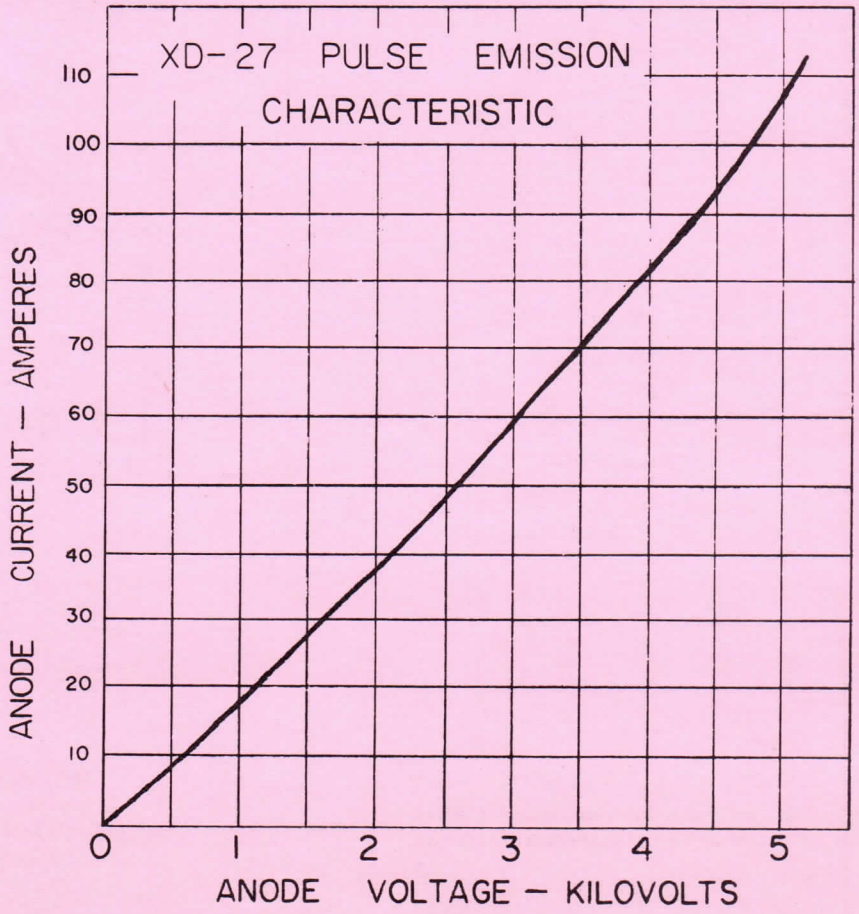
**WARNING FOR POSSIBLE X-RAY GENERATION**

See Safety Code for the Industrial Use of X-Rays published by the American Standards Association.

PROVISIONAL DATA
Issued 8-60
Check factory before finalizing designs.

Over


XD-27
PLATE CHARACTERISTIC
PLATE CURRENT - AMPERES
0
2
4
6
8
10
12
14
16
0
200
400
600
800
1000
ANODE VOLTAGE - VOLTS


XD-27 PULSE EMISSION
CHARACTERISTIC
ANODE CURRENT - AMPERES
10
20
30
40
50
60
70
80
90
100
110
0
1
2
3
4
5
ANODE VOLTAGE - KILOVOLTS

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

**HIGH VACUUM DIODE**

**XD – 31**

## DESCRIPTION

The Central tube type XD–31 is a forced air cooled high voltage, high current diode featuring a unipotential oxide coated cathode and an external anode. The XD–31 is designed for rectifier or clipper service.

## SPECIFICATIONS:

### PHYSICAL

| | |
|---|---|
| Length | 3½ inches |
| Diameter | 2 inches |
| Weight | 6 ounces |
| Mounting Position | Any |
| Type of Cooling | Forced Air |
| Required Air Flow on Anode | |

| Velocity (cfm) | Anode Dissipation (Kw) | Pressure (in. of water) |
|---|---|---|
| 50 | .15 | 1.0 |

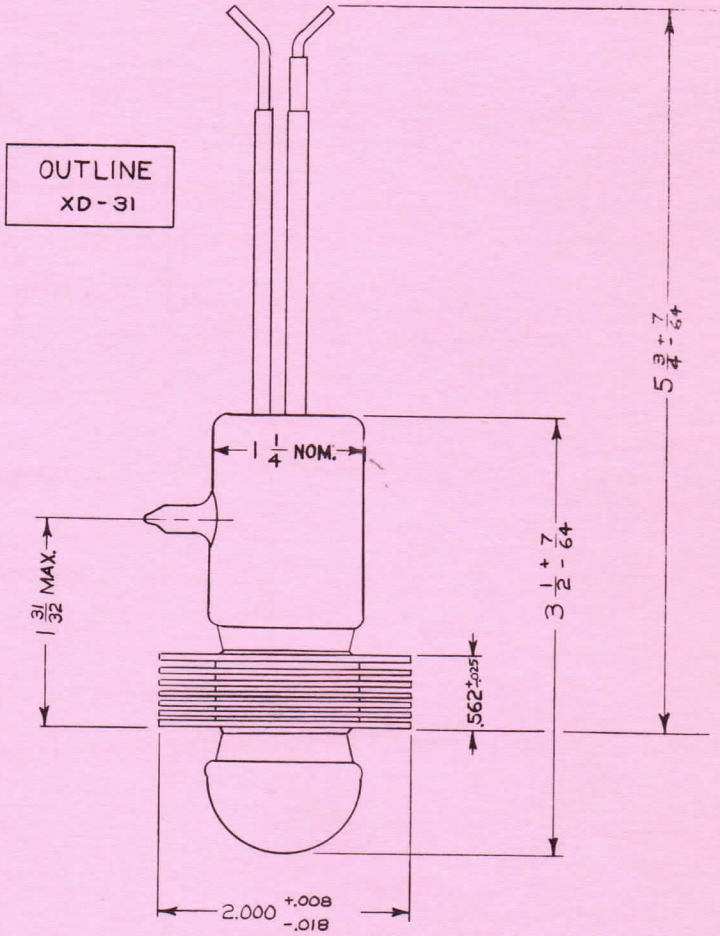
| | |
|---|---|
| Maximum Incoming Air Temperature | 45°C |
| Maximum Glass Seal Temperature | 180°C |

### ELECTRICAL (RECTIFIER)

| | |
|---|---|
| Filament | Oxide coated unipotential cathode |
| Heater Voltage | 6 Volts |
| Heater Current | 6.5 Amperes |
| Peak Inverse Voltage | 17 Kilovolts |
| Peak Anode Current | 2.7 Amperes |
| Average Anode Current | 0.7 Amperes |
| Anode Dissipation | 150 Watts |

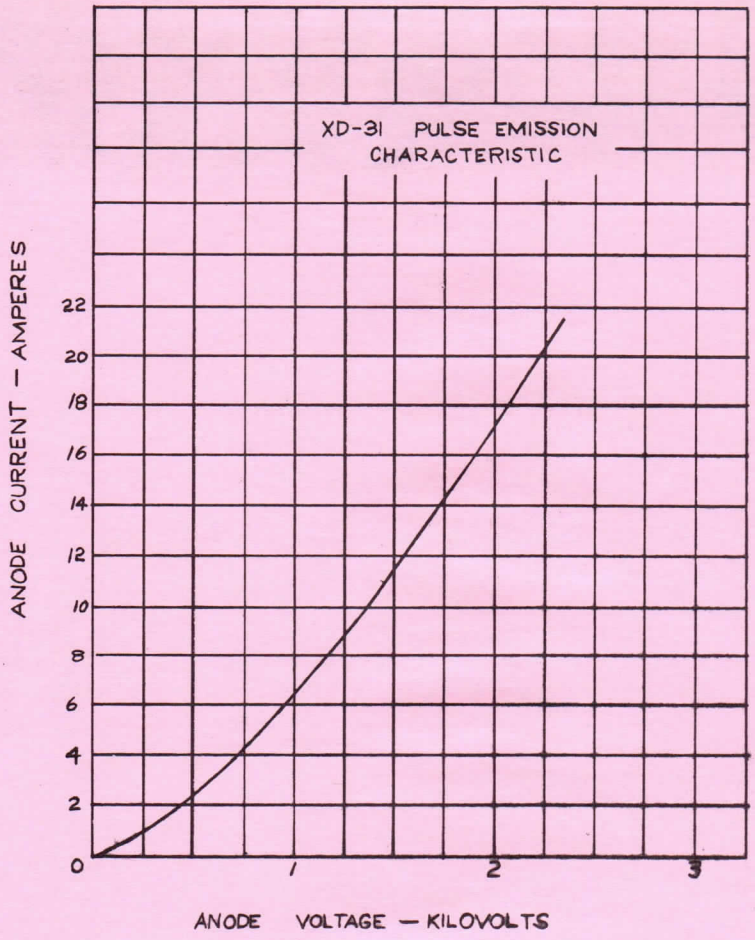
### ELECTRICAL (CLIPPER)

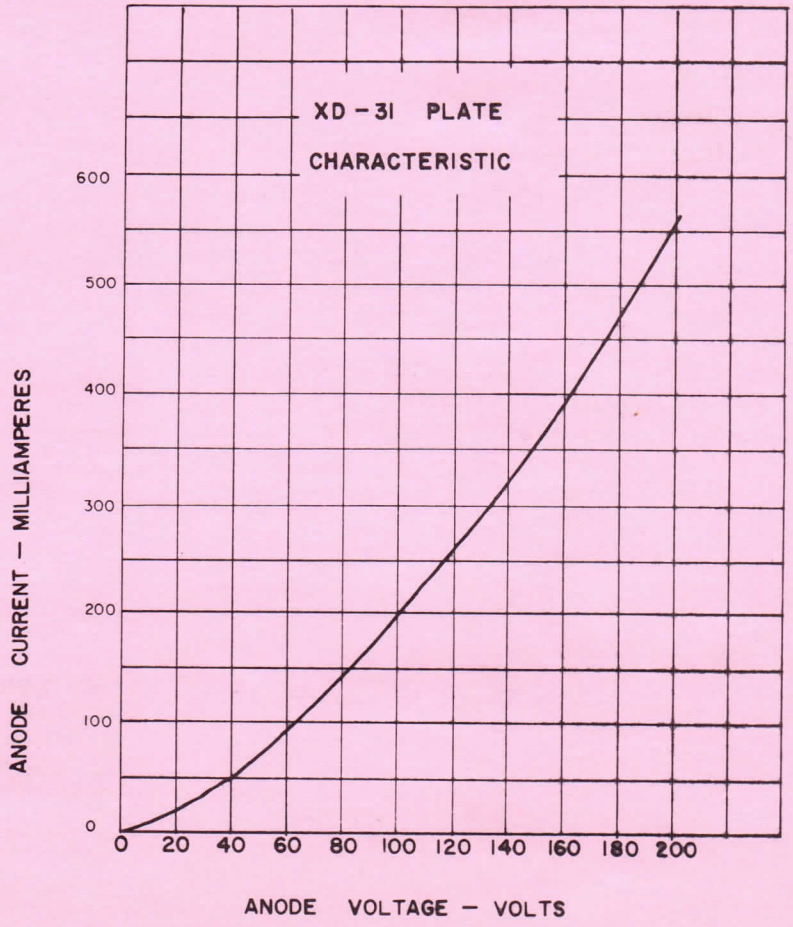
| | |
|---|---|
| Heater Voltage | 6 Volts |
| Heater Current | 6.5 Amperes |
| Peak Inverse Voltage | 15 Kilovolts |
| Peak Anode Current | 20 Amperes |
| RMS Anode Current | 1.5 Amperes |
| Pulse Width (max.) | 1 u second |
| Duty Cycle (max.) | 0.0012 |
| Anode Dissipation | 150 Watts |




**PROVISIONAL DATA**
**Issued** 8-60
**Check factory before finalizing designs.**

Over


XD-31 PULSE EMISSION
CHARACTERISTIC
ANODE CURRENT – AMPERES
0
2
4
6
8
10
12
14
16
18
20
22
1
2
3
ANODE VOLTAGE – KILOVOLTS


XD-31 PLATE
CHARACTERISTIC
ANODE CURRENT – MILLIAMPERES
0
100
200
300
400
500
600
0 20 40 60 80 100 120 140 160 180 200
ANODE VOLTAGE – VOLTS

NUCLEAR CORPORATION OF AMERICA
CENTRAL ELECTRONIC MANUFACTURERS DIVISION
Denville, New Jersey

# High Vacuum Diode
## Type XD-49R & XD-49W

## DESCRIPTION

The XD-49 is available as a forced air cooled XD-49R or water cooled diode (XD-49W) for use in rectifier and clipper services and features a special thoriated tungsten filament.

## SPECIFICATIONS

| PHYSICAL | XD-49W | XD-49R |
|---|---|---|
| Length | 9 7/8 max. | 7 3/8 max. |
| Diameter | 4 | 4 21/32 max. |
| Weight | 1 3/4 approx. | 5 1/2 pounds approx. |
| Mounting Position | Vertical | Vertical |
| Mounting Socket | -- | CAS-A or CAS-B Series |
| Type of Cooling | Water | Forced Air |

Required Air Flow on Anode (Air Cooled Tube)

| Anode Dissipation (kw) | Air Flow (cfm) | Pressure (in. of water) |
|---|---|---|
| 1.0 | 50 | 0.20 |
| 1.8 | 75 | 0.26 |
| 2.4 | 125 | 0.58 |
| 3.0 | 190 | 1.21 |

| | |
|---|---|
| Maximum Incoming Air Temperature | 45°C |
| Maximum Glass Seal Temperature | 180°C |
| Required Water Flow (Water Cooled Tube) | 3 gpm for 5 kw dissipation |
| Required Water Flow (Water Cooled Tube) | 70°C |

## ELECTRICAL

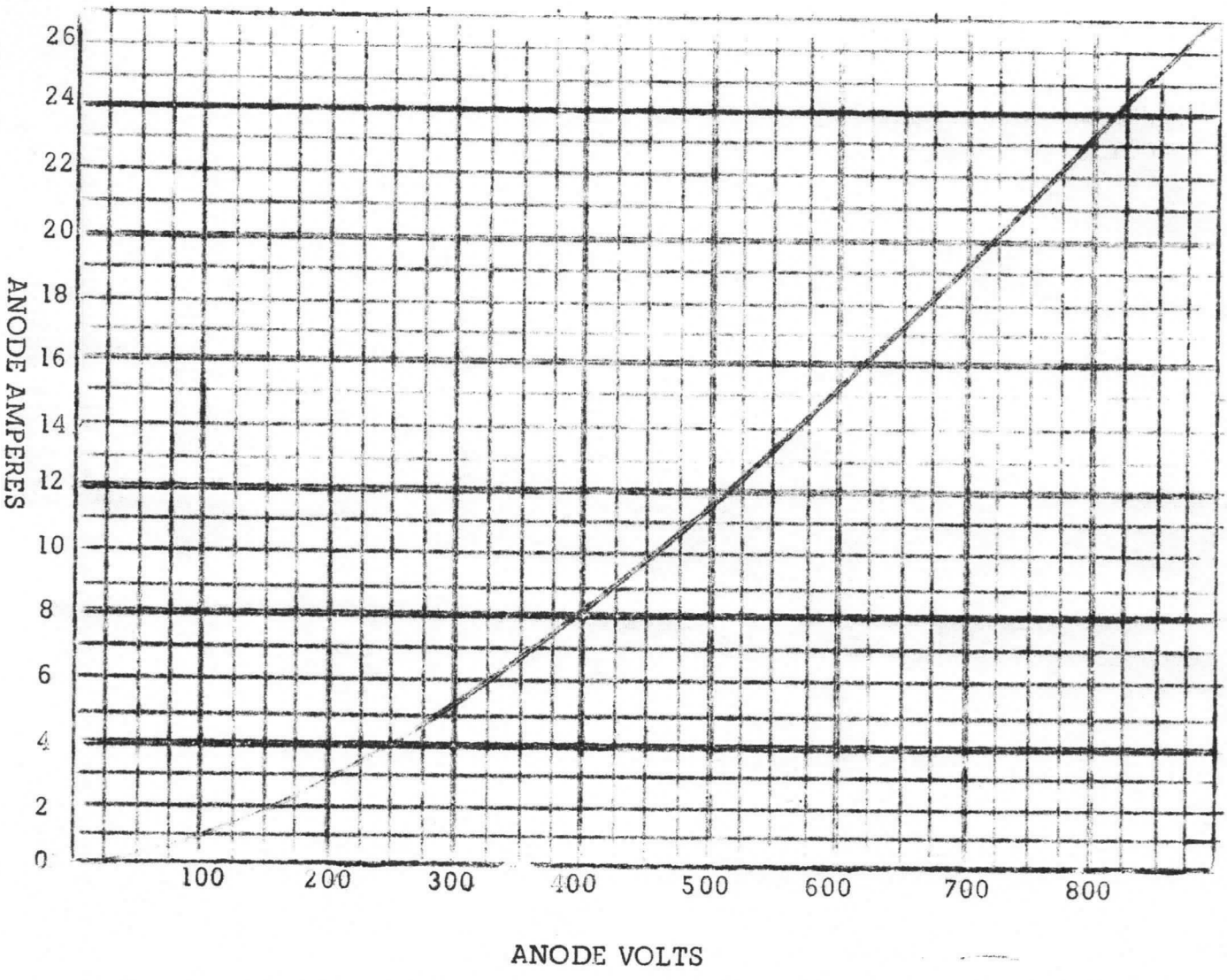
| | |
|---|---|
| Filament | Thoriated Tungsten |
| Filament Voltage | 15 Volts |
| Filament Current | 36 Amperes |
| Filament Starting Surge Current | 80 Amperes |
| Filament Cold Resistance | .042 Ohms |

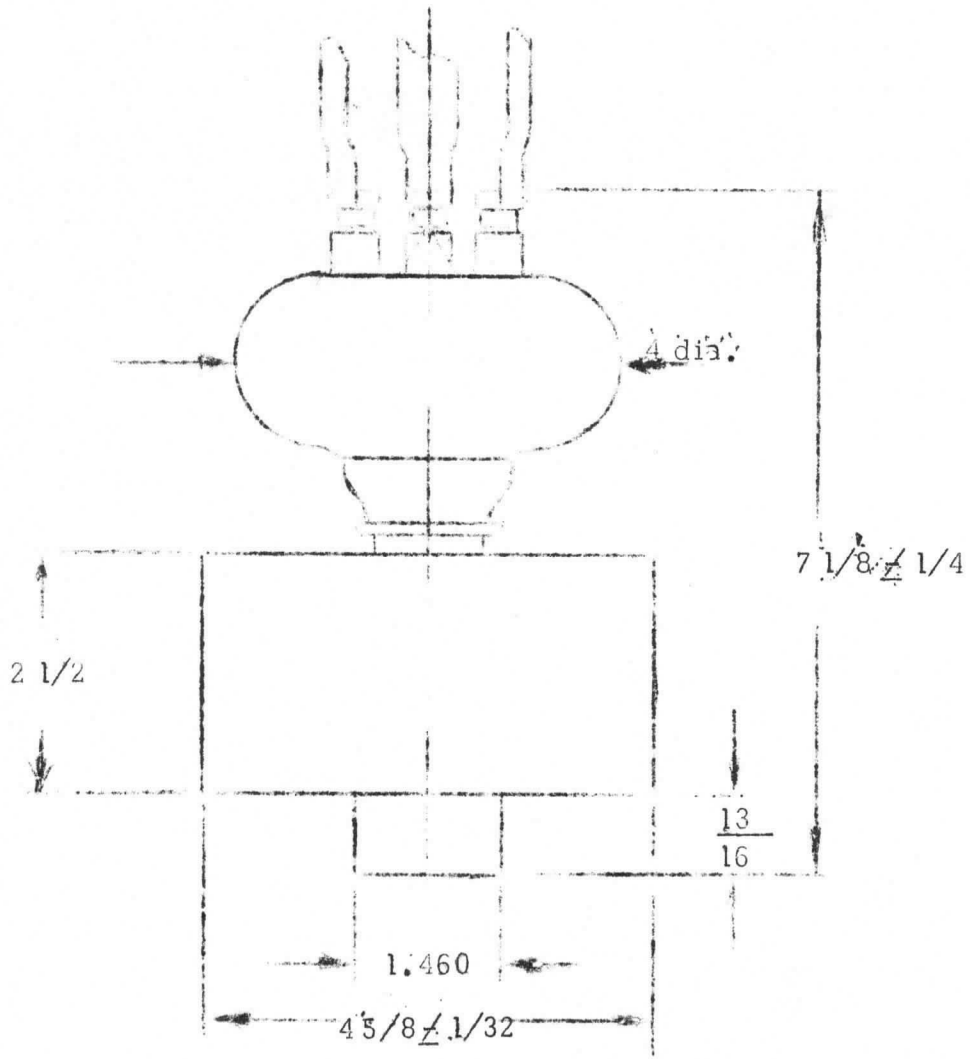
| ELECTRICAL (RECTIFIER) | XD-49W | XD-49R |
|---|---|---|
| Filament Voltage | 15 volts | 15 volts |
| Filament Current | 36 amperes | 36 amperes |
| Peak Inverse Voltage (max.) | 25 kilovolts | 25 kilovolts |
| Average Anode Current | 7 amperes | 3 amperes |

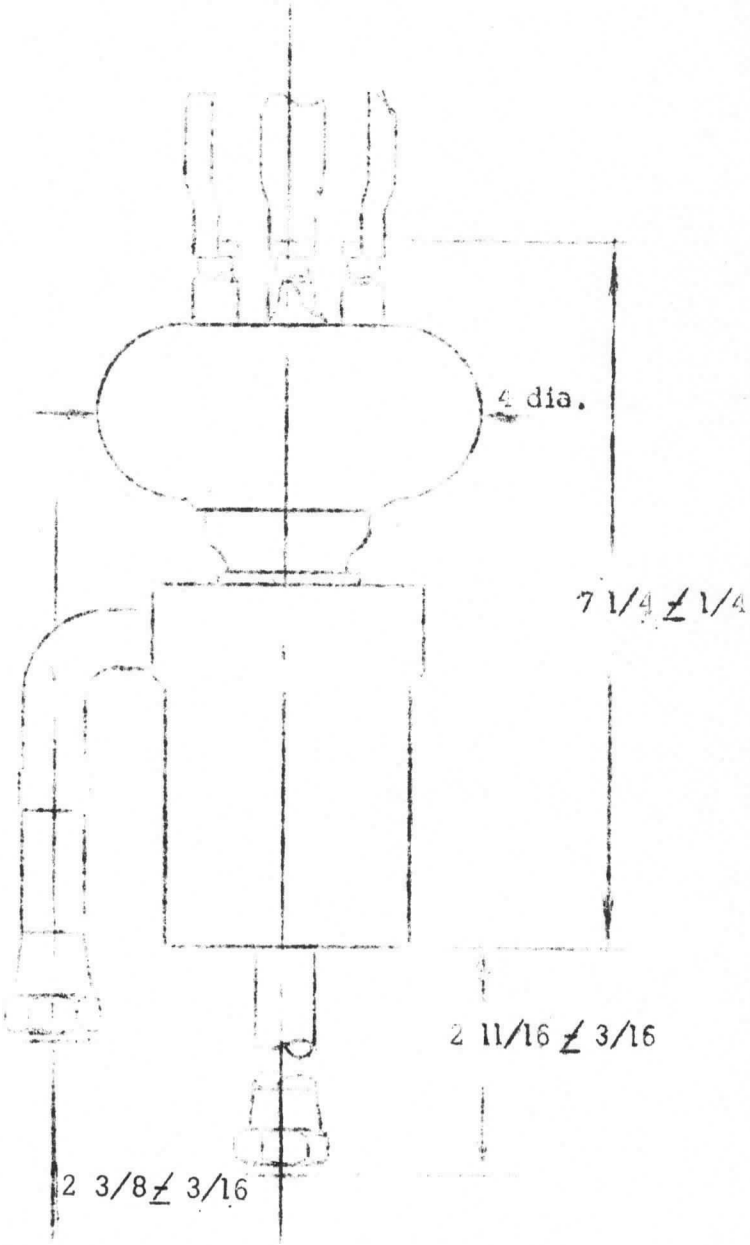
| ELECTRICAL (RECTIFIER) | XD-49W | XD-49R |
|---|---|---|
| Peak Anode Current (max.) | 25 amperes | 10 amperes |
| Maximum Dissipation | 5 kilowatts | 3 kilowatts |

| ELECTRICAL (CLIPPER) | | |
|---|---|---|
| Filament Voltage | 16.2 volts | 16.2 volts |
| Filament Current | 39 amperes | 39 amperes |
| Peak Inverse Voltage (max.) | 25 kilovolts | 25 kilovolts |
| Peak Anode Current (max.) | 160 amperes | 160 amperes |
| RMS Anode Current | 8 amperes | 4 amperes |

See Safety Code for Industrial Use of X-Rays published by A.S.A.

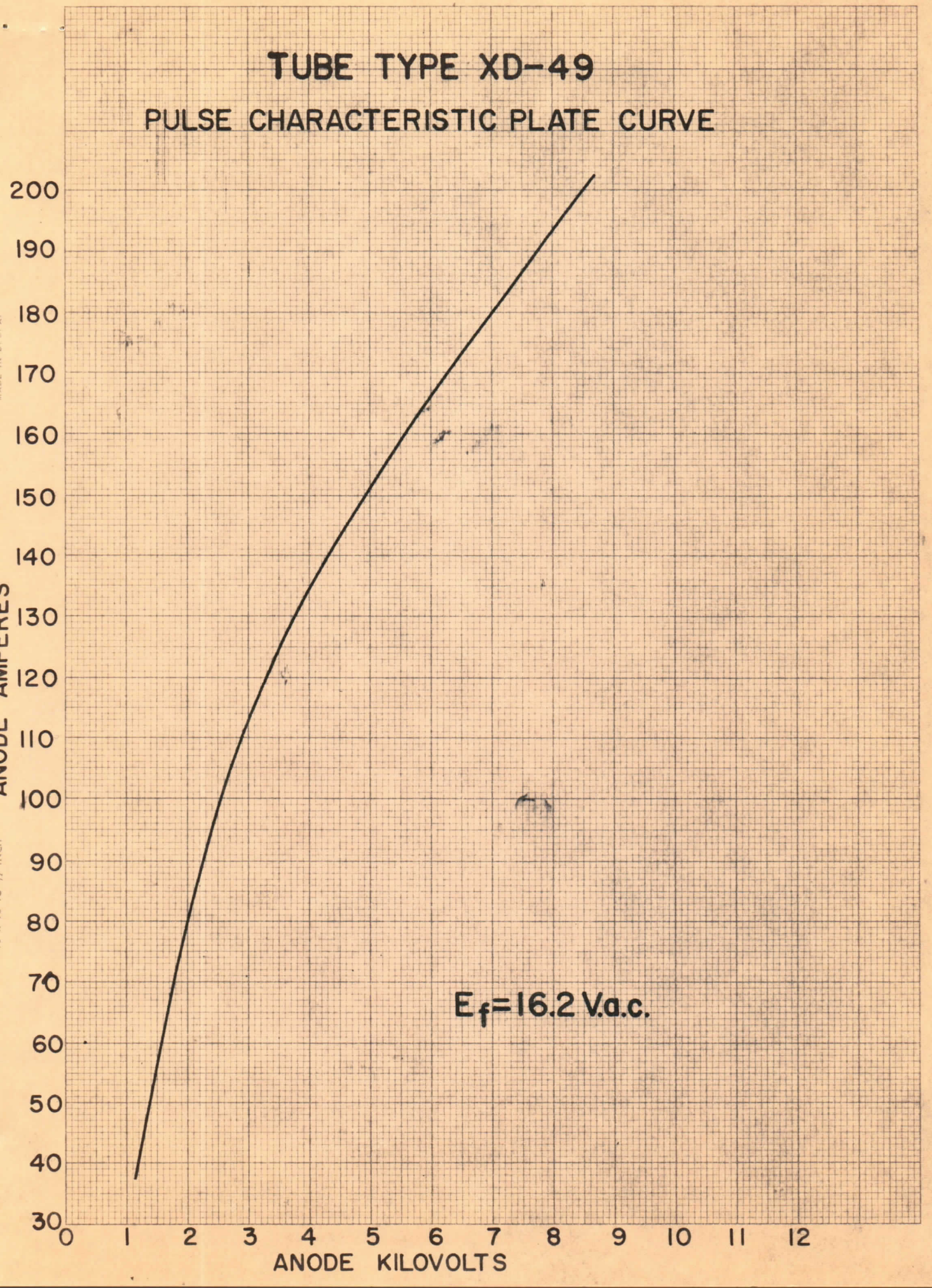



4 dia.
7 1/8 ± 1/4
2 1/2
13/16
1.460
4 5/8 ± 1/32


4 dia.
7 1/4 ± 1/4
2 11/16 ± 3/16
2 3/8 ± 3/16

# TUBE TYPE XD-49

## PULSE CHARACTERISTIC PLATE CURVE



# Central ELECTRONIC MANUFACTURERS

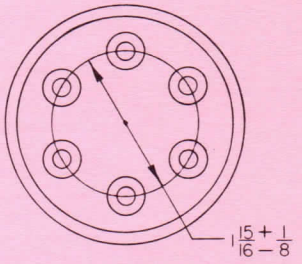
DENVILLE, NEW JERSEY

**HIGH VACUUM DIODE**

**XD – 53**

## DESCRIPTION

The Central XD–53 is a water cooled high voltage high current diode for use in rectifiers and modulators. The tube features a woven thoriated tungsten filament for greatest protection against shock and vibration.




## SPECIFICATIONS:

### PHYSICAL

| | |
|---|---|
| Length | 9 7/8 inches |
| Diameter | 4 13/16 inches |
| Weight | 10 pounds |
| Mounting Position | Vertical |
| Type of Cooling | Water |
| Required Water Flow on Anode | |

| Velocity (gpm) | Anode Dissipation (Kw) | Pressure (psi) |
|---|---|---|
| 15 | 30 | 30 |

| | |
|---|---|
| Maximum Outgoing Water Temperature | 70°C |
| Maximum Glass Seal Temperature | 180°C |

### ELECTRICAL

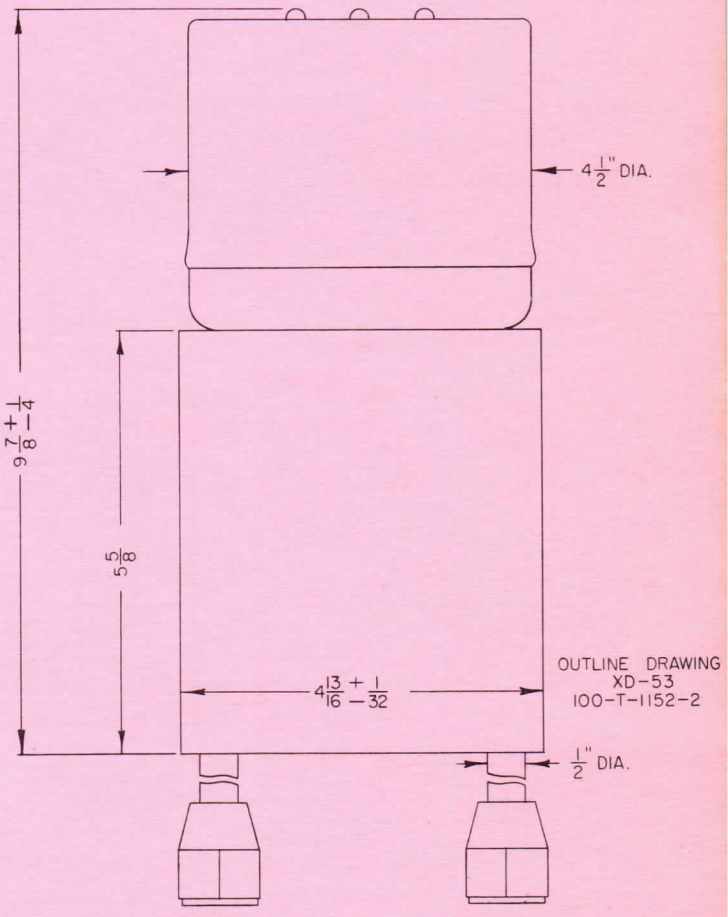
| | |
|---|---|
| Filament | Thoriated Tungsten |
| Filament Voltage | 10 Volts |
| Filament Current | 120 Amperes |
| Filament Starting Surge Current | 240 Amperes |
| Filament Cold Resistance | .008 Ohm |
| Interelectrode Capacitance Anode to Filament | 35 uuf |
| Cathode Warm–up Time | 30 Seconds |
| Average Cathode Current | 20 Amperes |
| Peak Inverse Voltage | 40 Kilovolts |
| Average Anode Current | 20 Amperes |
| Peak Anode Current | 60 Amperes |

### ELECTRICAL (RECTIFIER)

| | |
|---|---|
| Filament Voltage | 10.0 Volts |
| Filament Current | 120 Amperes |
| Peak Inverse Voltage (max.) | 40 Kilovolts |
| Average Anode Current (max.) | 60 Amperes |
| RMS Anode Current | 42.5 Amperes |

### ELECTRICAL (CLIPPER)

| | |
|---|---|
| Filament Voltage | 10.8 Volts |
| Filament Current | 130 Amperes |
| Peak Inverse Voltage (max.) | 40 Kilovolts |
| Peak Anode Current (max.) | 250 Amperes |




OUTLINE DRAWING
XD–53
100–T–1152–2

## X-RAY INFORMATION

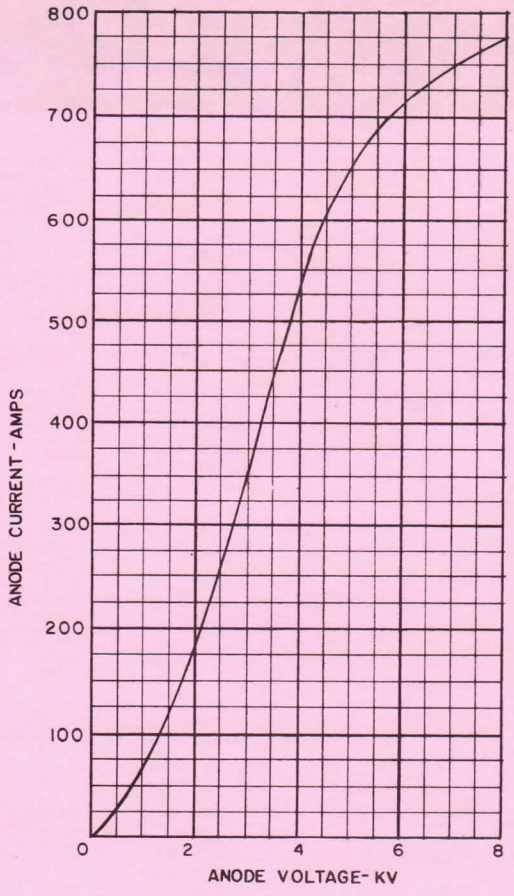
WARNING FOR POSSIBLE X-RAY GENERATION

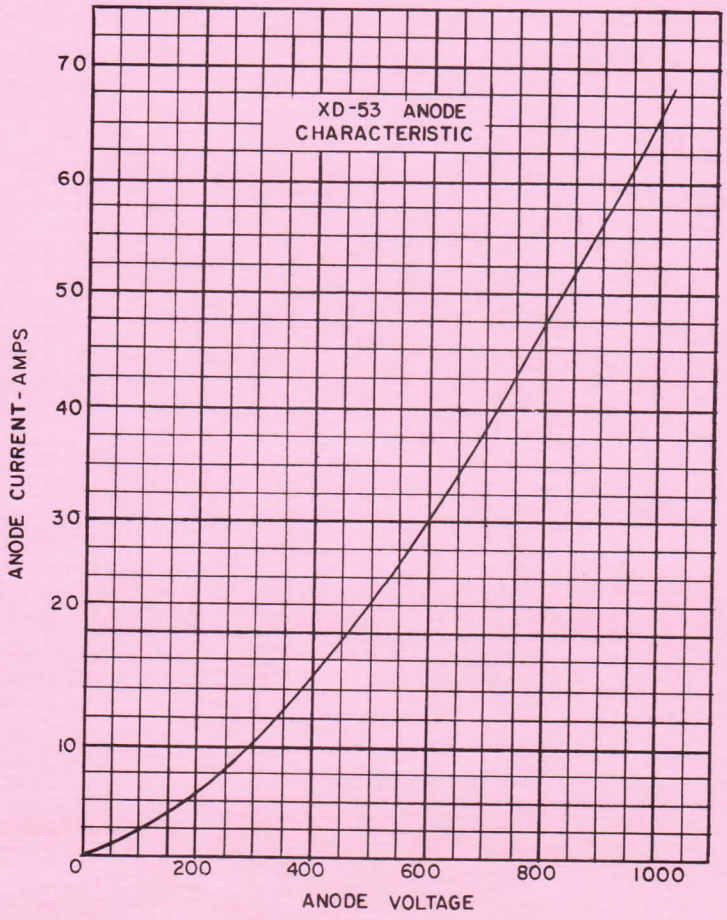
See Safety Code for the Industrial Use of X-Rays published by the American Standards Association.

Over

PROVISIONAL DATA
Issued 8-60
Check factory before finalizing designs.

XD-53 PULSE
EMISSION CHARACTERISTIC



CENTRAL ELECTRONIC MANUFACTURERS
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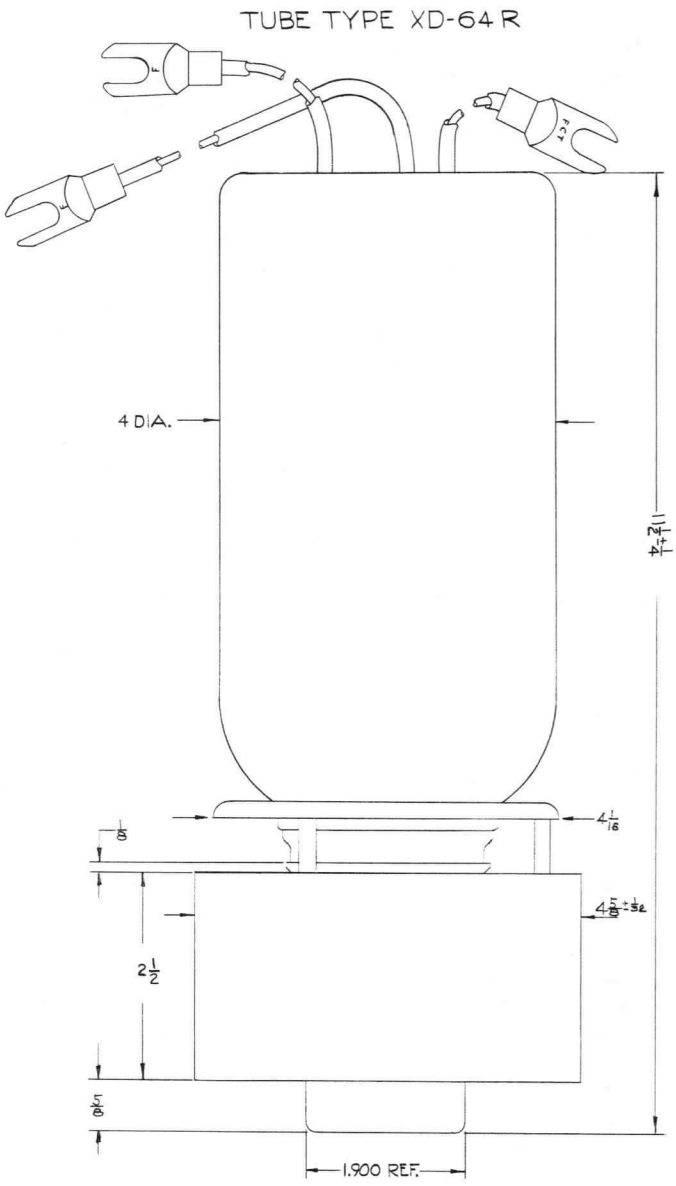
DENVILLE, NEW JERSEY

## TECHNICAL SPECIFICATIONS FOR TYPE XD-64R HIGH VOLTAGE, HIGH VACUUM DIODE

The Nucor XD-64R is a forced-air cooled high vacuum tube diode specifically designed for rectifier, charging and shunt diode service up to 80KV peak inverse voltage. The tube design features a special thoriated tungsten filament capable of high peak currents and long life. The external anode allows for high anode dissipation ratings and efficient air cooling when used with the recommended Nucor air socket. This air socket permits maximum air flow at the anode. The XD-64R can dissipate 3KW continuously at an air flow of 190 cfm.

SPECIFICATIONS:




PHYSICAL

| | |
|---|---|
| Overall Length (max) | 11 3/4 in. |
| Overall Diameter (max) | 4 21/32 in. |
| Weight (approx) | 8 1/2 lbs. |
| Mounting Position | Vertical |
| Mounting Socket | |
| Type of Cooling | Forced Air |
| Air Flow | |

| Velocity (cfm) | Anode Dissipation | Pressure Drop (in. of water) |
|---|---|---|
| 50 | 1.0 KW | 0.20 |
| 75 | 1.8 KW | 0.26 |
| 125 | 2.4 KW | 0.58 |
| 190 | 3.0 KW | 1.21 |

Maximum Incoming Air Temp. 45°C
Maximum Glass Seal Temp. 180°C

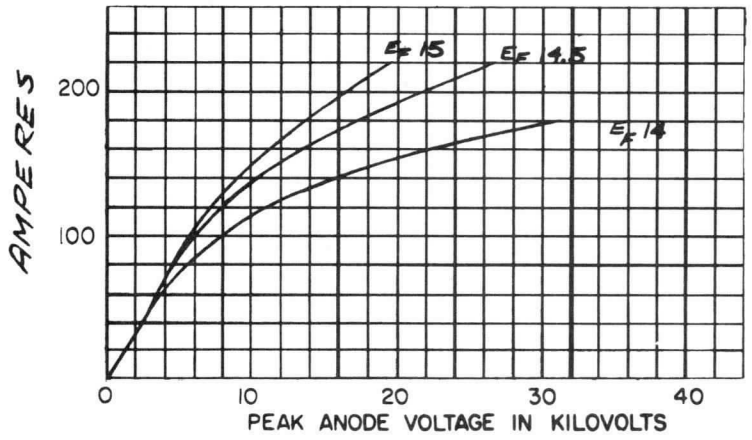
ELECTRICAL (Rectifier):

| | |
|---|---|
| Filament Voltage | 13 volts AC |
| Filament Current | 36 amperes |
| Filament Surge Current (max) | 80 amperes |
| Peak Inverse Voltage (max) | 80 kilovolts |
| Anode Current | 3 amperes |
| Peak Anode Current | 15 amperes |

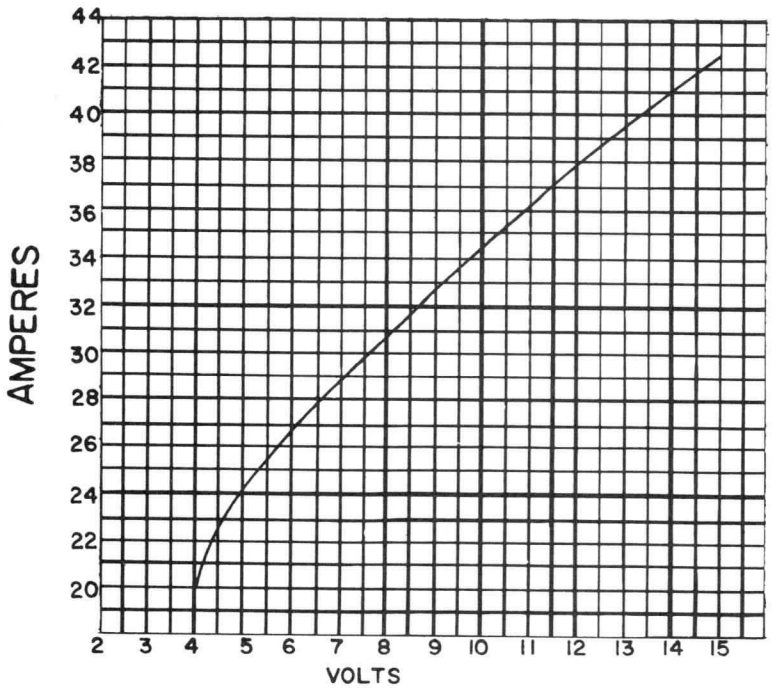
CLIPPER, SHUNT OR CHARGING DIODE

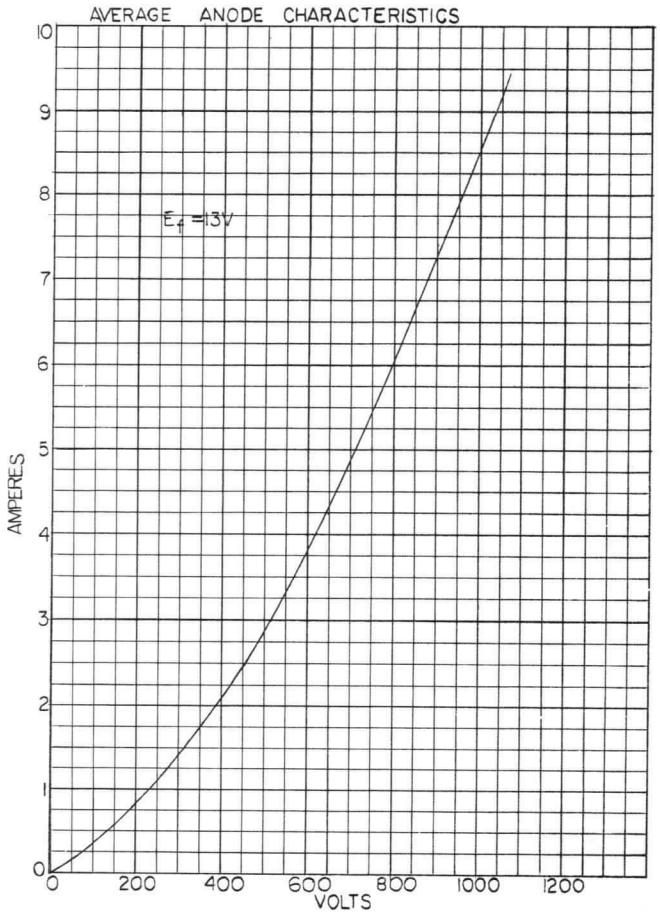
| | |
|---|---|
| Filament Voltage (clipper) | 14.5 volts AC |
| Filament Voltage (charging) | 13 volts AC |
| Filament Current (clipper) | 40 amperes |
| Filament Current (charging) | 30 amperes |
| Filament Surge Current (max) | 80 amperes |
| Peak Inverse Voltage (max) | 80 kilovolts |
| Anode Current (RMS) | 6 amperes |
| Peak Anode Current (clipper) | 150 amperes |

## PULSE CHARACTERISTICS




## FILAMENT CHARACTERISTICS



CENTRAL ELECTRONIC MANUFACTURERS
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DENVILLE, NEW JERSEY

## TECHNICAL SPECIFICATIONS FOR TYPE XD-64W HIGH VOLTAGE VACUUM DIODE

The Nucor XD-64W is a water cooled high vacuum diode specifically designed for rectifier, charging and shunt diode service up to 80KV peak inverse voltage. The tube design features a special thoriated-tungsten filament capable of high peak currents and long life. The external anode allows for high anode dissipation ratings and efficient water cooling through its specially designed integral jacket. The XD-64W can dissipate 5 KW continuously at a water flow of 3 gpm.

SPECIFICATIONS:

PHYSICAL

| | |
|---|---|
| Overall Length (max.) | 12 in. |
| Overall Diameter (max.) | 4 21/32 in. |
| Weight (approx.) | 4 lbs. |
| Mounting Position | Vertical |
| Type of Cooling | Water |
| Water Flow (min.) | 3 gpm |
| Maximum Outlet Temp. | 70°C |
| Maximum Glass Seal Temp. | 180°C |

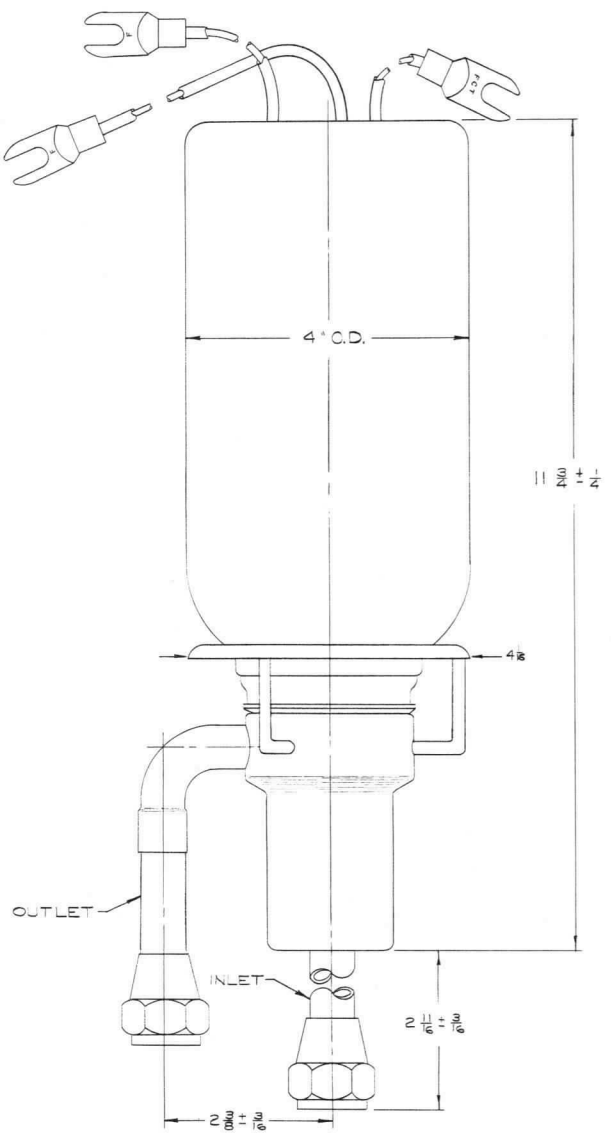
ELECTRICAL (Rectifier):

| | |
|---|---|
| Filament Voltage | 13 Volts AC |
| Filament Current | 36 Amperes |
| Filament Surge Current (max) | 80 Amperes |
| Peak Inverse Voltage (max) | 80 Kilovolts |
| Anode Current | 3 Amperes |
| Peak Anode Current | 15 Amperes |

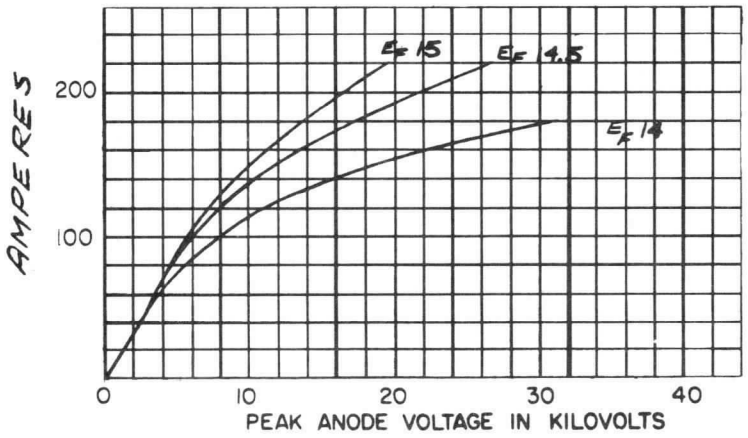
CLIPPER, SHUNT OR CHARGING

| | |
|---|---|
| Filament Voltage (clipper) | 14.5 Volts AC |
| Filament Voltage (charging) | 13 Volts AC |
| Filament Current (clipper) | 40 Amperes |
| Filament Current (charging | 30 Amperes |
| Filament Surge Current (max) | 80 Amperes |
| Peak Inverse Voltage (max) | 80 Kilovolts |
| Anode Current (RMS) | 6 Amperes |
| Peak Anode Current (clipper | 150 Amperes |

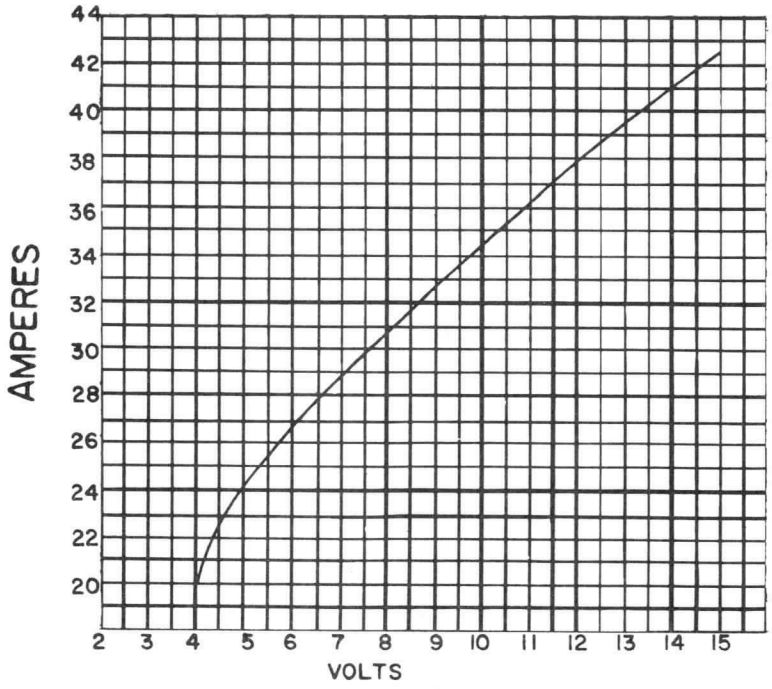
TUBE TYPE XD-64W

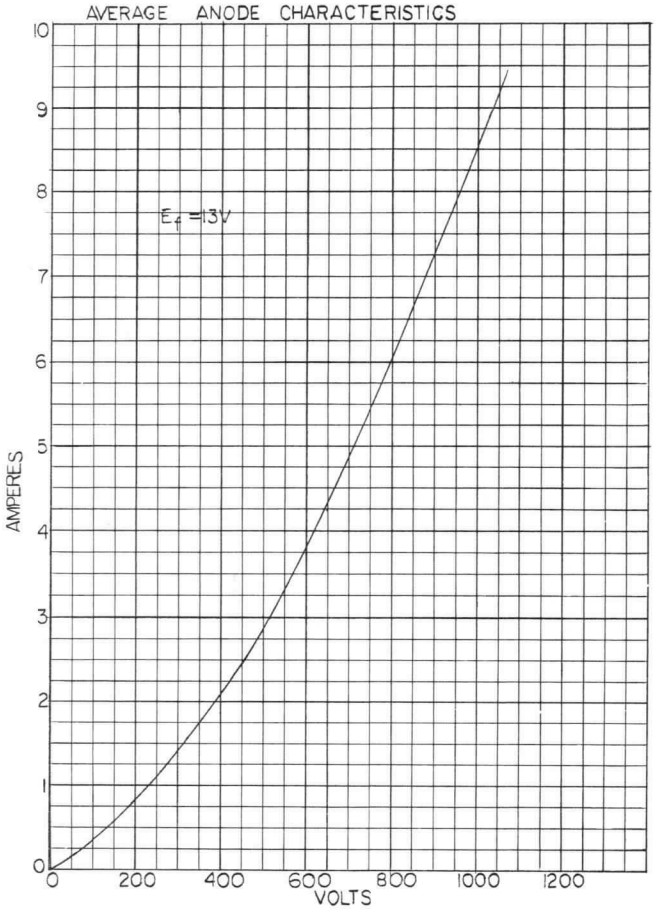


## PULSE CHARACTERISTICS




## FILAMENT CHARACTERISTICS



NUCLEAR CORPORATION OF AMERICA
CENTRAL ELECTRONIC MANUFACTURERS DIVISION
Denville, New Jersey

# High Vacuum Diode
# Type XD-66R & XD-66W

## DESCRIPTION

The XD-66 is available as a forced air cooled (XD-66R) or water cooled diode (XD-66W) for use in rectifier and clipper services and features a special thoriated tungsten filament.

## SPECIFICATIONS

| PHYSICAL | XD-66W | XD-66R |
|---|---|---|
| Length | 13 1/8 max. | 12 5/8 max. |
| Diameter | 5 1/8 max. | 4 21/32 max. |
| Weight | 6 pounds | 7 pounds |
| Mounting Position | Vertical | Vertical |
| Mounting Socket | -- | CAS-A or CAS-B Series |
| Type of Cooling | Water | Forced Air |

Required Air Flow on Anode (Air Cooled Tube)

| Anode Dissipation (kw) | Air Flow (cfm) | Pressure (in. of Water) |
|---|---|---|
| 2.4 | 75 | .35 |
| 2.8 | 125 | .78 |
| 3.5 | 190 | 1.6 |

| | |
|---|---|
| Maximum Incoming Air Temperature | 45°C |
| Maximum Glass Seal Temperature | 180°C |
| Required Water Flow (Water Cooled Tube) | 6 gpm for 12 Kw dissipation |

## ELECTRICAL

| | |
|---|---|
| Filament | Thoriated Tungsten |
| Filament Voltage | 15 Volts |
| Filament Current | 36 Amperes |
| Filament Starting Surge Current | 80 Amperes |
| Filament Cold Resistance | .042 Ohms |

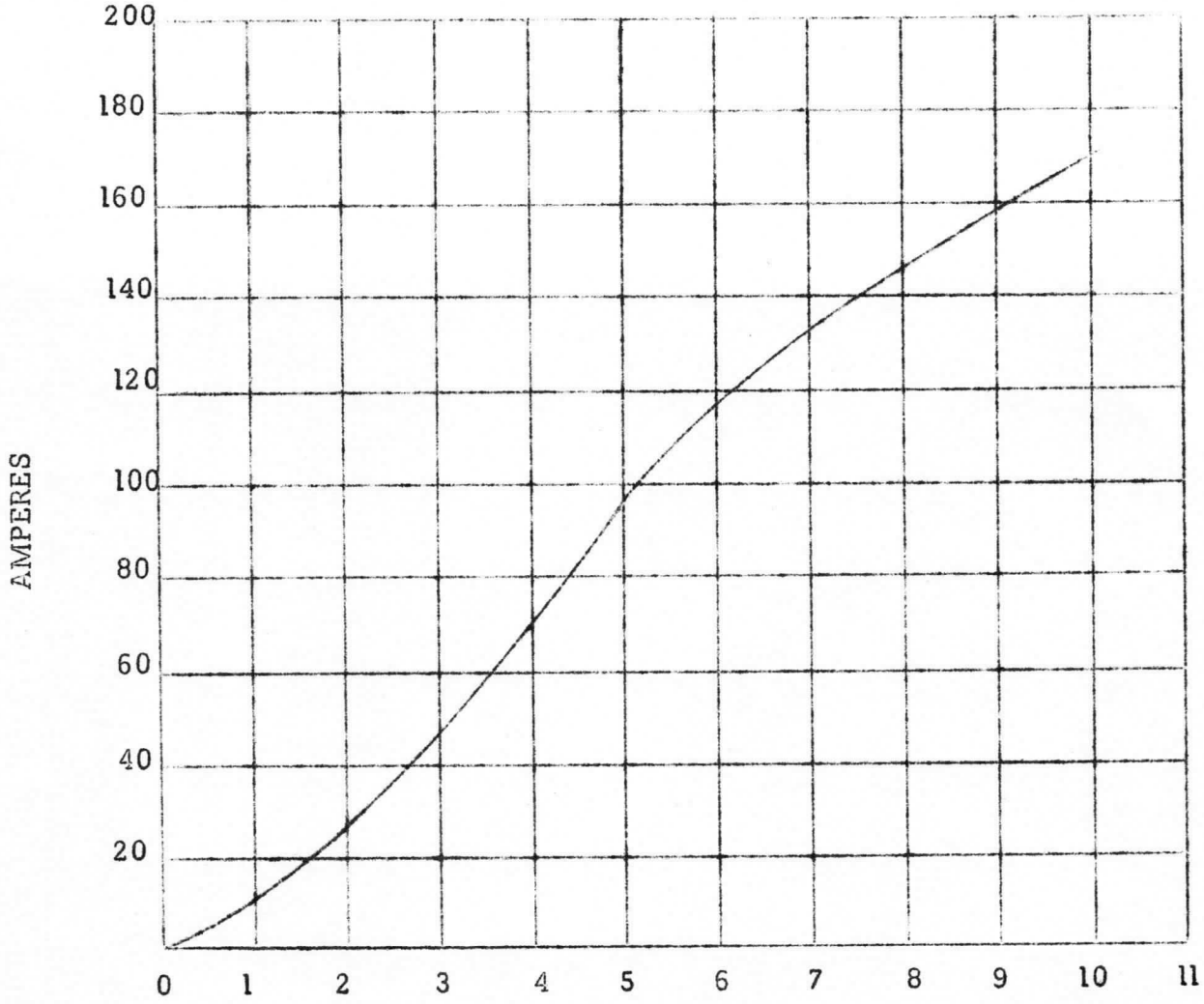
| ELECTRICAL (RECTIFIER) | XD-66W | XD-66R |
|---|---|---|
| Filament Voltage | 15 Volts | 15 Volts |
| Filament Current | 36 Amperes | 36 Amperes |
| Peak Inverse Voltage (max.) | 80 Kilovolts | 80 Kilovolts |
| Average Anode Current | 7 Amperes | 3 Amperes |

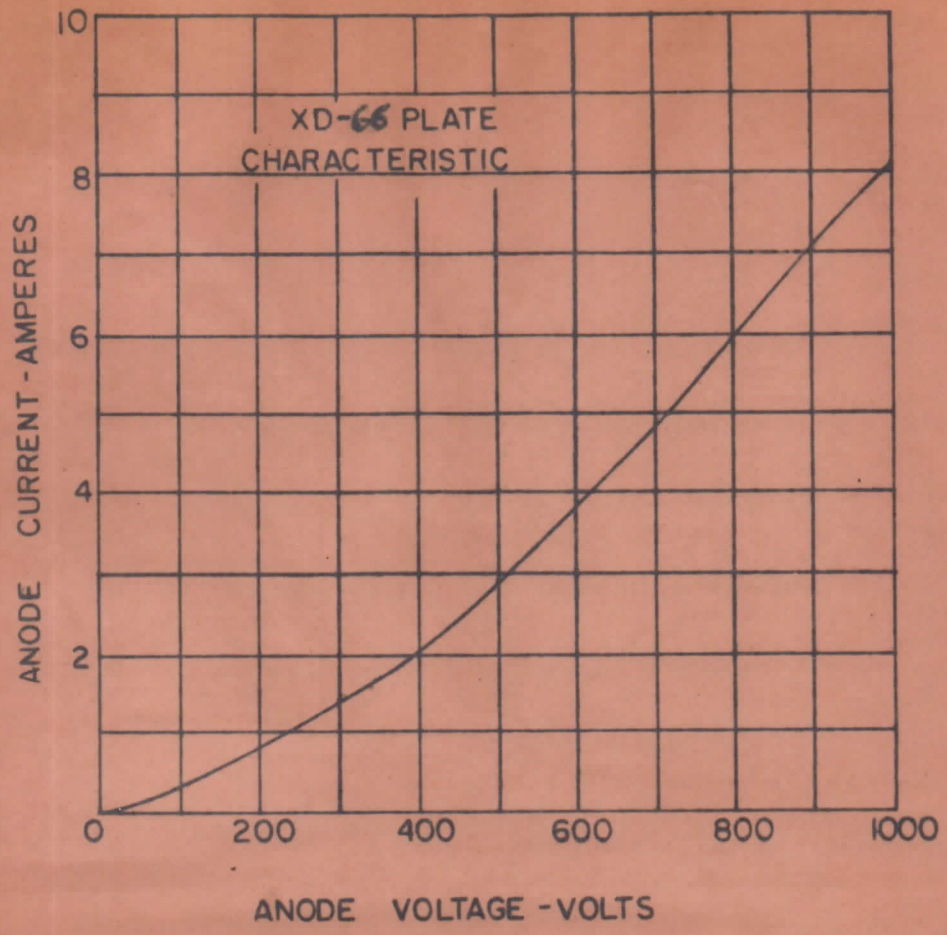
| ELECTRICAL (RECTIFIER) | WATER COOLED | AIR COOLED |
|---|---|---|
| Peak Anode Current (max.) | 25 Amperes | 10 Amperes |
| Maximum Dissipation | 12 Kilowatts | 3 1/2 Kilowatts |

| ELECTRICAL (CLIPPER) | | |
|---|---|---|
| Filament Voltage | 16.2 Volts | 16.2 Volts |
| Filament Current | 39 Amperes | 39 Amperes |
| Peak Inverse Voltage (max.) | 80 Kilovolts | 80 Kilovolts |
| Peak Anode Current (max.) | 160 Amperes | 160 Amperes |
| RMS Anode Current | 8 Amperes | 4 Amperes |

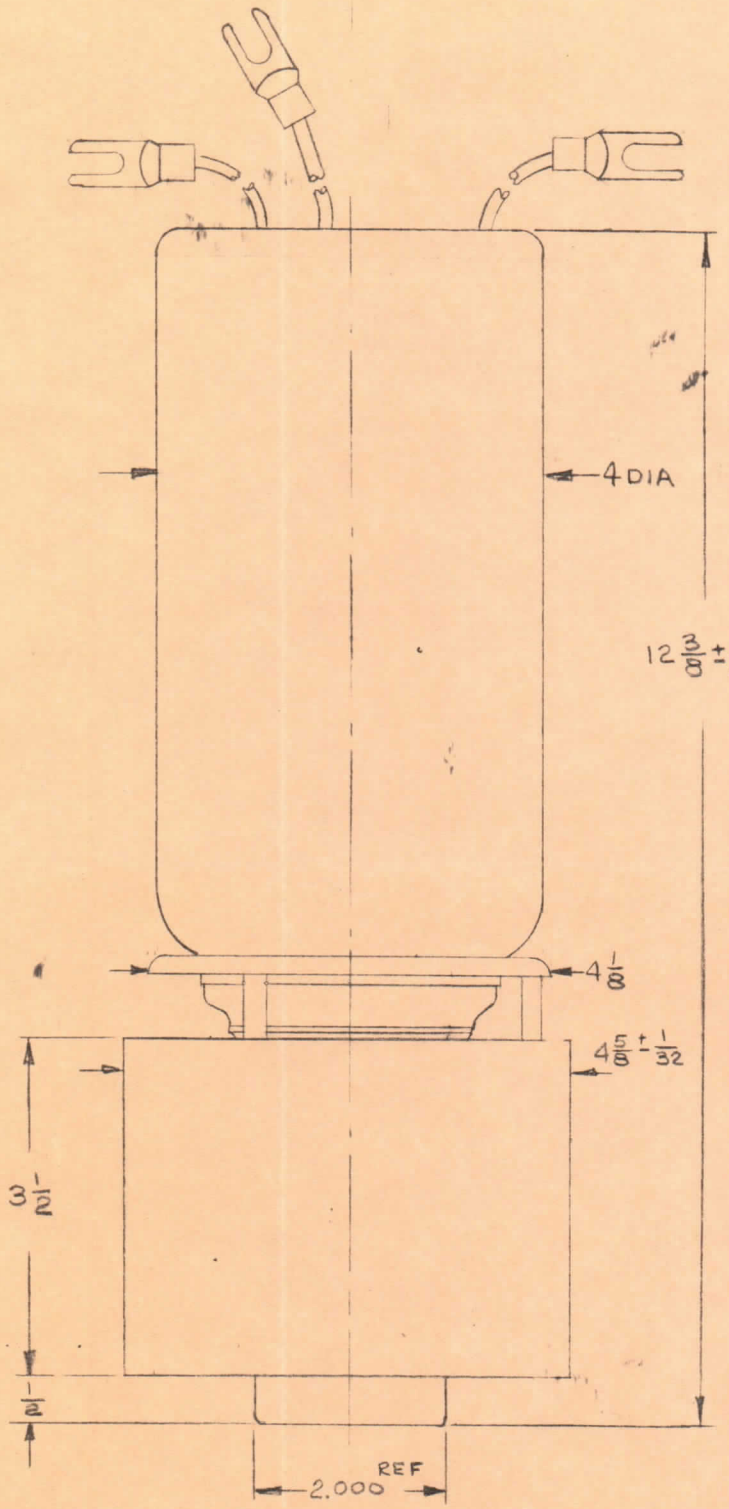
See Safety Code for Industrial Use of X-Rays published by A.S.A.

ANODE CURVE
PULSE CHARACTERISTICS

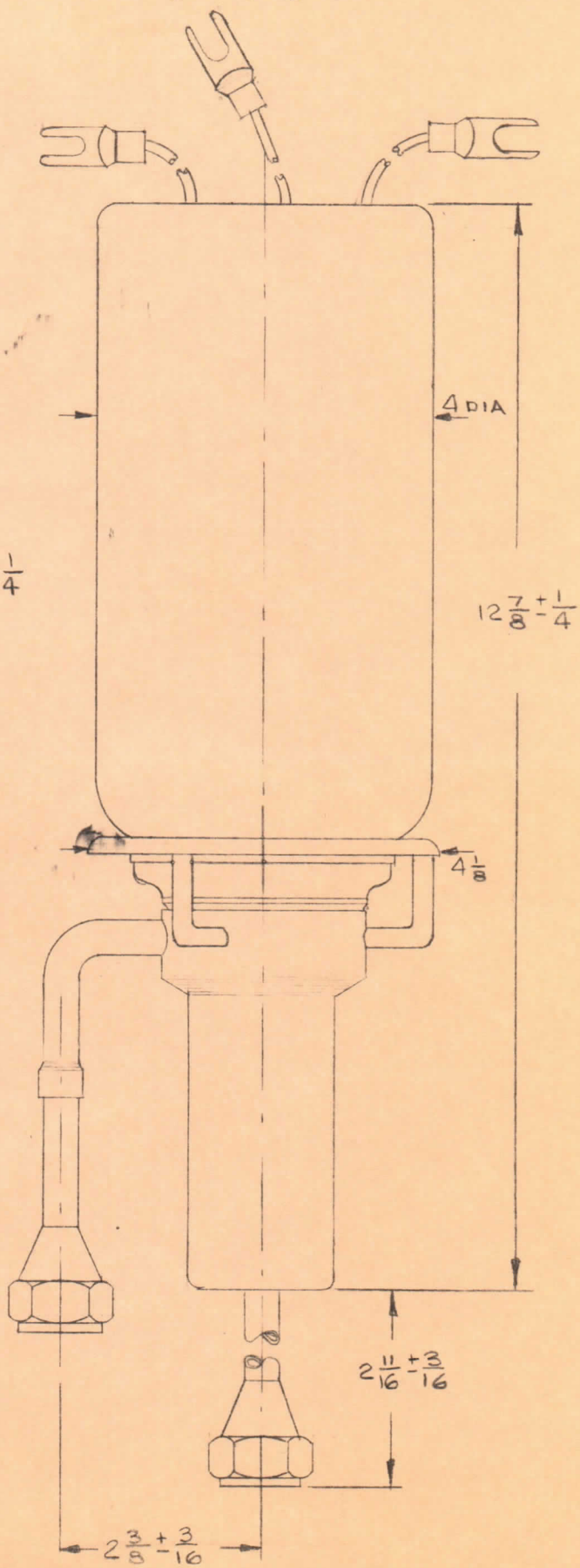



XD-66 PLATE
CHARACTERISTIC
ANODE CURRENT - AMPERES
10
8
6
4
2
0
200
400
600
800
1000
ANODE VOLTAGE - VOLTS

XD-66R


4 DIA
12 3/8 ± 1/4
4 1/8
4 5/8 ± 1/32
3 1/2
1/2
2.000 REF

XD-66W


4 DIA
12 7/8 ± 1/4
4 1/8
2 11/16 ± 3/16
2 3/8 ± 3/16

# GAS NOISE TUBES, MOUNTS & SOURCES

**The data presented in this section is printed on either a pink or white sheet.**

**A pink data sheet signifies provisional information.**

**A white data sheet signifies permanent information.**

*For further technical information write to:*
Applications Engineering Department

CENTRAL ELECTRONIC MANUFACTURERS
2 RICHWOOD PLACE, DENVILLE, N. J.
*A Division of Nuclear Corporation of America*

Central ELECTRONIC
MANUFACTURERS
DENVILLE. NEW JERSEY

| GAS NOISE TUBE | X |
|---|---|
| XD-9A/CNT-X15D-1 | 15.3 Db |

References and notations contained herein are taken from Military Specifications for Electron tubes MIL-E-1D 31 March '58.

Description: Gaseous Discharge Diode, X Band (Note 11)

Ratings:

| | If | Ib | TA | T Bulb |
|---|---|---|---|---|
| | mA | mAdc | °C | °C |
| Absolute Maximum: | . . | . . | +85 | +125 |
| Minimum: | . . | . . | −55 | . . |
| Test Conditions: | 0 | 250 | . . | . . |

Cathode: Filamentary Type.
Dimensions: Per Outline Drawing (Fig. 1)
Base: Per Outline Drawing (Fig. 1)
Mounting Position: Any

| Ref. Para. | Test | Conditions | Min. | Max. |
|---|---|---|---|---|
| . . . | Qualification: | Required. | | |
| 4.5 | Holding Period: | 168 hours | | |
| 4.9.18.1.10 | Carton Drop: | . . . | | |
| 4.9.20.3 | *Vibration: | No Voltages, Note 9. | | |
| 4.10.5.1 | Filament Voltage: | $I_f$ = 170mAdc | Ef . . . | 10Vdc |
| 4.13.2 | Tube Voltage Drop: | Note 1,2 | Etd55 | 65Vdc |
| . . . | Excess Noise Ratio: | F = 9000 Mc. Notes 3,4,5,10. | $N_r$-1 15.05 | 15.45Db |
| . . . | *Match (1): | F = 9000 Mc. Notes 4,6. $I_b$ = 200 mAdc | VSWR | 1.07:1 |
| . . . | *Match (2): | F = 9000 Mc. $I_b$ = 0 mAdc Notes 4,6. | VSWR | 1.07:1 |
| . . . | Intermittent Life Test | Notes 1,3,8,9. (One min. on, two min. off) Preheat time = 2 to 3 sec. | 2500 | Cycles |
| 4.11.4 | Intermittent Life Test End Points Excess Noise Ratio: Note 11. | | $N_r$-1 15.0 | 15.5Db |

Note 1. The tube shall be tested in the circuit of Fig. 3.
Note 2. In the test circuit of Fig. 3, with a filament current of 170 mAdc, the tube shall operate within three tries.
Note 3. The tube shall be tested in total darkness.
Note 4. The tube shall be tested in a tube mount as specified in Figure 2, or equivalent, terminated by a matched RG-52/U termination having a VSWR no greater than 1.01:1.
Excessive Noise Ratio Measurement tests shall be made using the circuit of block diagram Fig. 4, or equivalent.
Note 5. The frequency specified is that of the Local Oscillator.
Note 6. The frequency specified is that of the Signal Generator.
Note 7. Excess noise ratio should be measured by comparison with an approved standard.
Note 8. The tube shall be tested at an ambient temperature of +85°C.
Note 9. Intermittent Life Test end points shall apply.
Note 10. The Excess Noise Ratio $N_r$-1 is defined in Db as $N_r$-1 = 10 $\log\left(\frac{T_e}{290}-1\right)$ where $T_e$ is the effective electron temperature.
Note 11. The noise frequencies generated by this tube cover a broad band of frequencies. This bandwidth is limited only by the type of mount used. This tube is normally used with a mount in RG-52/U wave guide, at a 10 degree angle in the E plane. Other wave guide sizes may be used with properly adapted mounts.
Note 12. This tube has heretofore designated as the XD-9A.

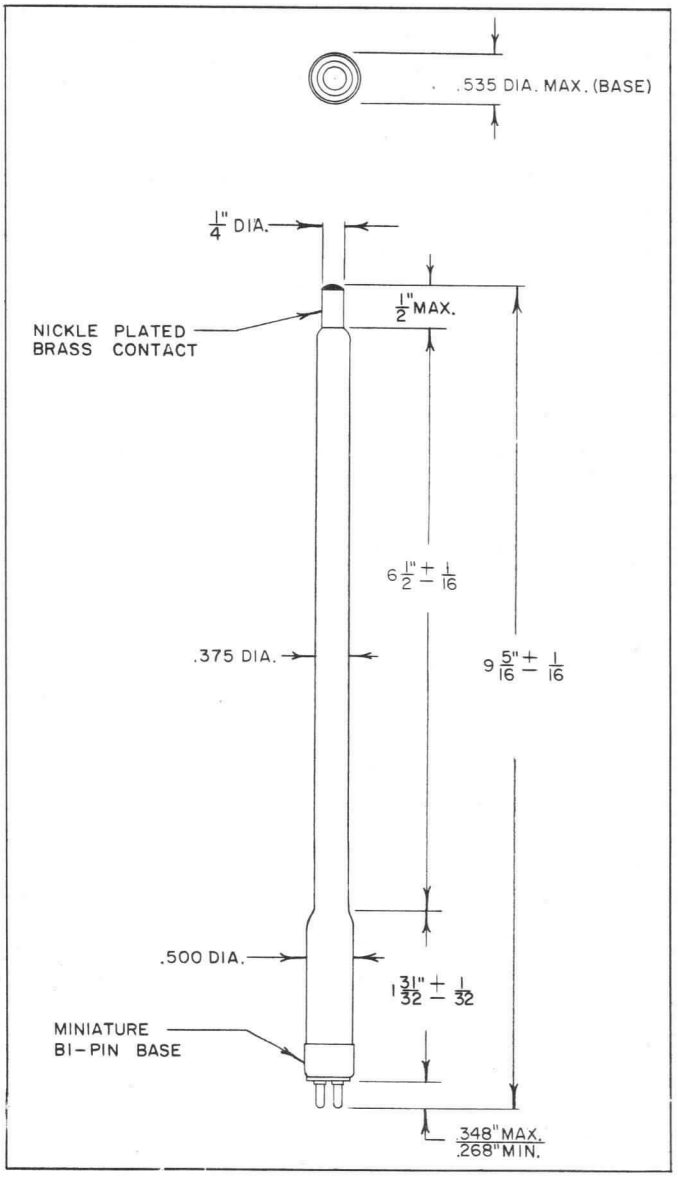



FIG. 1

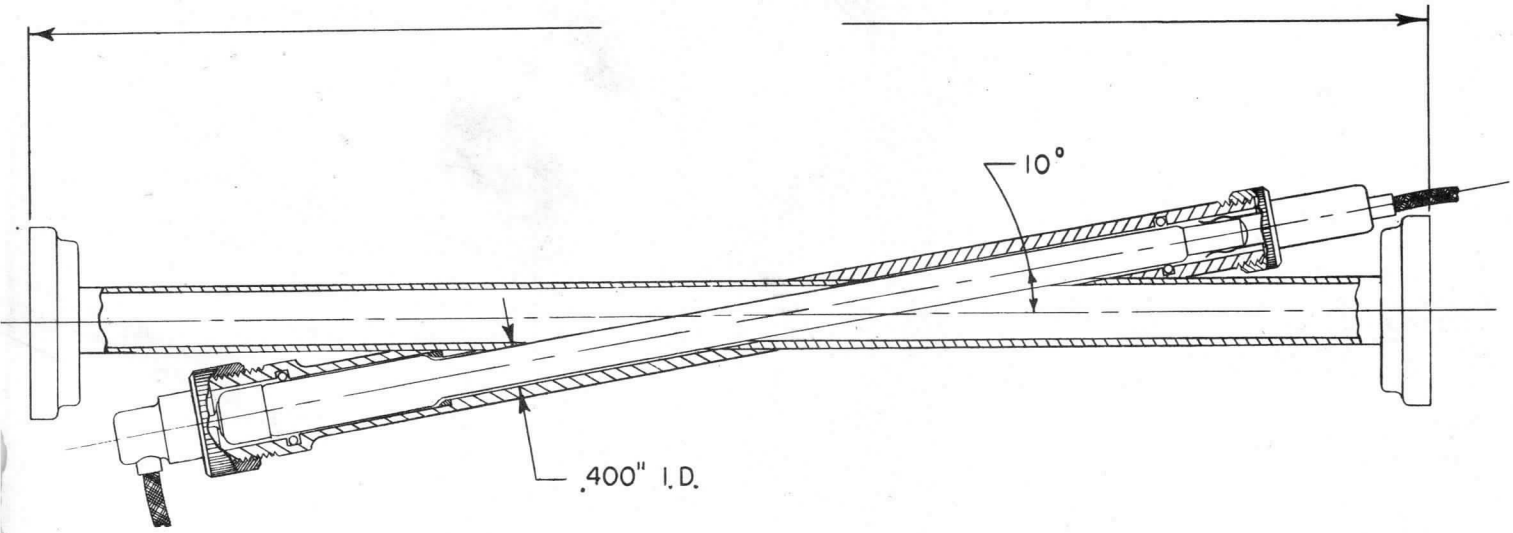
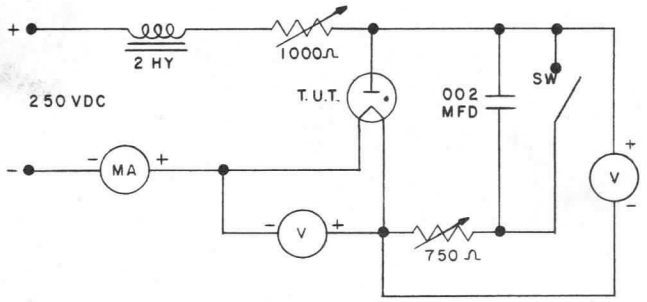
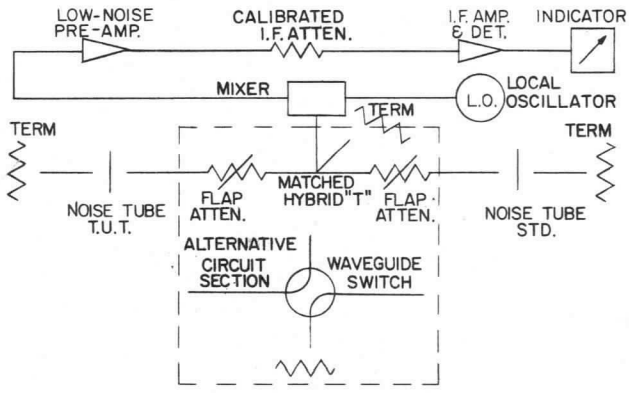



FIG. 2




D.C. TEST CIRCUIT

FIG. 3




TEST CIRCUIT FOR EXCESS NOISE MEASUREMENTS
FIG. 4

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

| GAS NOISE TUBE | S |
|---|---|
| CNT-S18D-1 | 18 Db |

References and notations contained herein are taken from Military Specifications for Electron tubes MIL-E-1D 31 March '58.

Description: Gaseous Discharge Diode, S Band (Note 11)

Ratings:

| | If | Ib | TA | T Bulb |
|---|---|---|---|---|
| | mA | mAdc | °C | °C |
| Absolute Maximum: | .. | .. | +85 | +125 |
| Minimum: | .. | .. | −55 | .. |
| Test Conditions: | 0 | 250 | .. | .. |

Cathode: Filamentary Type.
Dimensions: Per Outline Drawing (Fig. 1)
Base: Per Outline Drawing (Fig. 1)
Mounting Position: Any

| Ref. Para. | Test | Conditions | Min. | Max. |
|---|---|---|---|---|
| ... | Qualification: | Required. | | |
| 4.5 | Holding Period: | 168 hours | | |
| 4.9.18.1.10 | Carton Drop: | ... | | |
| 4.9.20.3 | *Vibration: | No Voltages, Note 9. | | |
| 4.10.5.1 | Filament Voltage: | $I_f$ = 300mAdc | $E_f$ ... | 10Vdc |
| 4.13.2 | Tube Voltage Drop: | Note 1,2 | $E_{td}$ 160 | 170Vdc |
| ... | Excess Noise Ratio: | F = 3300 Mc. Notes 3,4,5,10. | $N_r$-1 17.5 | 18.5Db |
| ... | Match (1): | F = 3270 Mc. Notes 4,6. $I_b$ = 250 mAdc | VSWR | 1.15:1 |
| ... | *Match (2): | F = 3270 Mc. $I_b$ = 0 mAdc Notes 4,6. | VSWR | 1.15:1 |
| ... | Intermittent Life Test | Notes 1,3,8,9. (One min. on, two min. off) Preheat time = 2 to 3 sec. | 2500 | Cycles |
| 4.11.4 | Intermittent Life Test End Points Excess Noise Ratio: Note 11. | | $N_r$-1 17.5 | 18.5Db |

Note 1. The tube shall be tested in the circuit of Fig. 3.
Note 2. In the test circuit of Fig. 3, with a filament current of 300 mAdc, the tube shall operate within three tries.
Note 3. The tube shall be tested in total darkness.
Note 4. The tube shall be tested in a tube mount as specified in Figure 2, or equivalent, terminated by a matched RG-48/U termination having a VSWR no greater than 1.01:1
Excessive Noise Ratio Measurement tests shall be made using the circuit of block diagram Fig. 4, or equivalent.
Note 5. The frequency specified is that of the Local Oscillator.
Note 6. The frequency specified is that of the Signal Generator.
Note 7. Excess noise ratio should be measured by comparison with an approved standard.
Note 8. The tube shall be tested at an ambient temperature of +85°C.
Note 9. Intermittent Life Test end points shall apply.
Note 10. The Excess Noise Ratio ($N_r$-1) is defined in Db as $N_r$-1 = 10 log $(\frac{T_e}{290}-1)$ where $T_e$ is the effective electron temperature.
Note 11. The noise frequencies generated by this tube cover a broad band of frequencies. This bandwidth is limited only by the type of mount used. This tube is normally used with a mount in RG-48/U wave guide, at a 10 degree angle in the E plane. Other wave guide sizes may be used with properly adaptedy mounts.

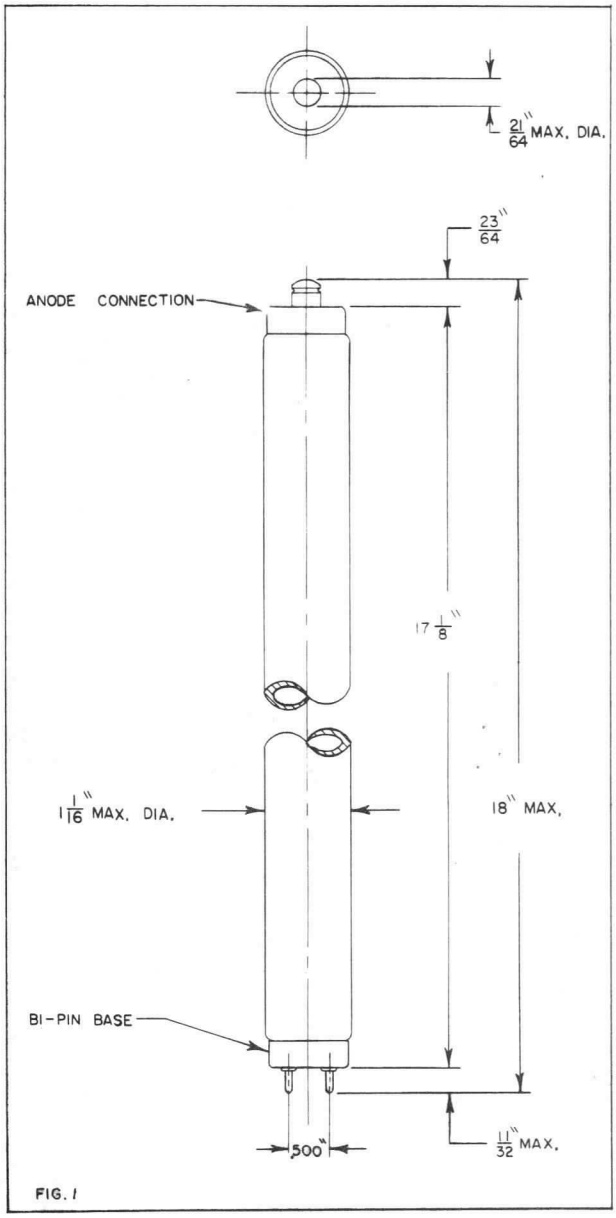


FIG. 1

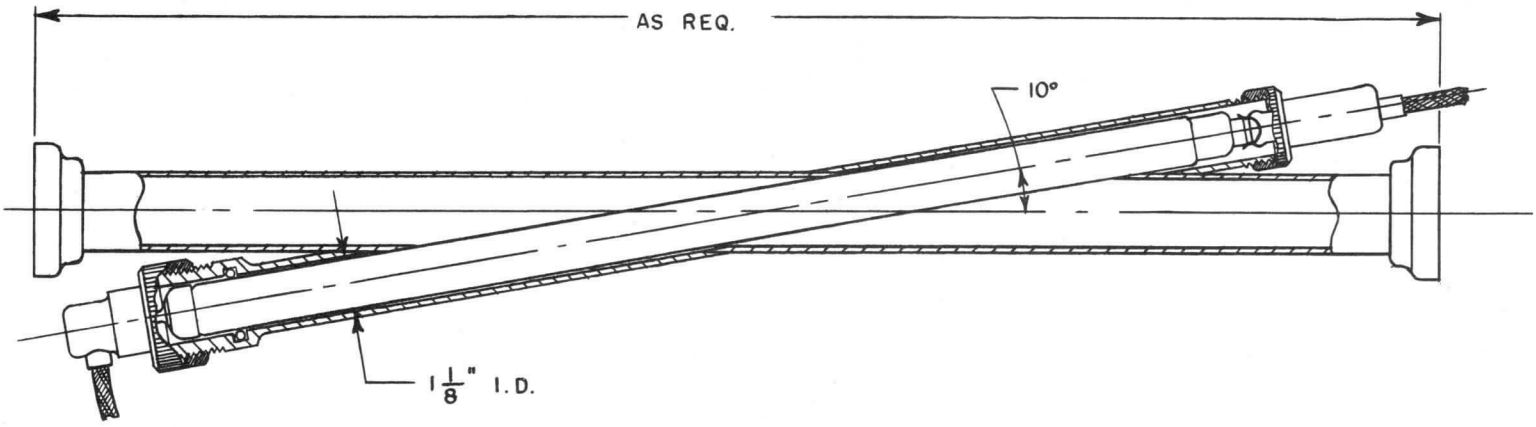
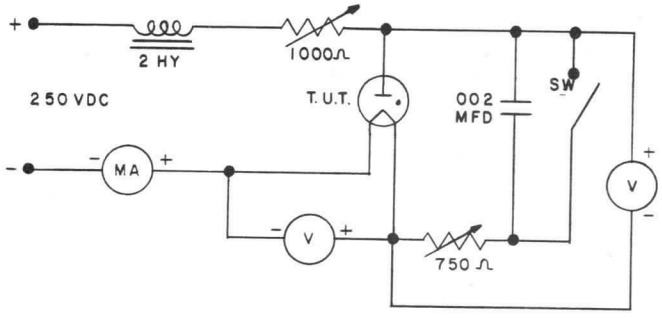
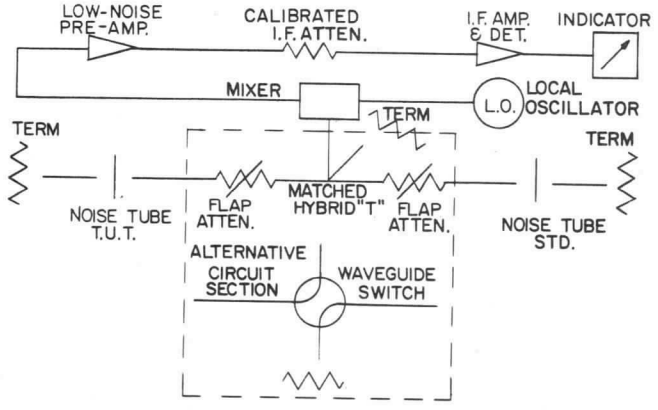



FIG. 2




D. C. TEST CIRCUIT

FIG. 3




TEST CIRCUIT FOR EXCESS NOISE MEASUREMENTS
FIG. 4

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

| GAS NOISE TUBE | X |
|---|---|
| XD-44A/CNT-X15D-4 | 15.3 Db |

References and notations contained herein are taken from Military Specifications for Electron tubes MIL-E-1D 31 March '58.

Description: Gaseous Discharge Diode, X Band (Note 11)

Ratings:

| | If | Ib | TA | T Bulb |
|---|---|---|---|---|
| | mA | mAdc | °C | °C |
| Absolute Maximum: | . . | . . | +85 | +125 |
| Minimum: | . . | . . | −55 | . . |
| Test Conditions: | 0 | 200 | . . | . . |

Cathode: Filamentary Type.
Dimensions: Per Outline Drawing (Fig. 1)
Base: Per Outline Drawing (Fig. 1)
Mounting Position: Any

| Ref. Para. | Test | Conditions | Min. | Max. |
|---|---|---|---|---|
| . . . | Qualification: | Required. | | |
| 4.5 | Holding Period: | 168 hours | | |
| 4.9.18.1.10 | Carton Drop: | . . . | | |
| 4.9.20.3 | *Vibration: | No Voltages, Note 9. | | |
| 4.10.5.1 | Filament Voltage: | $I_f$=170mAdc | $E_f$ . . . | 10Vdc |
| 4.13.2 | Tube Voltage Drop: | Note 1,2 | $E_{td}$ 65 | 75Vdc |
| . . . | Excess Noise Ratio: | F = 8500 Mc. Notes 3,4,5,10. | $N_r$-1 15.05 | 15.45Db |
| . . . | Match (1): | F = 8500 Mc. Notes 4,6. $I_b$ = 200 mAdc | VSWR | 1.07:1 |
| . . . | *Match (2): | F = 8500 Mc. $I_b$ = 0 mAdc Notes 4,6. | VSWR | 1.07:1 |
| . . . | Intermittent Life Test | Notes 1,3,8,9. (One min. on, two min. off) Preheat time = 2 to 3 sec. | 2500 | Cycles |
| 4.11.4 | Intermittent Life Test End Points Excess Noise Ratio: Note 11. | | $N_r$-1 15.0 | 15.5Db |

Note 1. The tube shall be tested in the circuit of Fig. 3.
Note 2. In the test circuit of Fig. 3, with a filament current of 170 mAdc, the tube shall operate within three tries.
Note 3. The tube shall be tested in total darkness.
Note 4. The tube shall be tested in a tube mount as specified in Figure 2, or equivalent, terminated by a matched RG-51/U termination having a VSWR no greater than 1.01:1.
Excessive Noise Ratio Measurement tests shall be made using the circuit of block diagram Fig. 4, or equivalent.
Note 5. The frequency specified is that of the Local Oscillator.
Note 6. The frequency specified is that of the Signal Generator.
Note 7. Excess noise ratio should be measured by comparison with an approved standard.
Note 8. The tube shall be tested at an ambient temperature of +85°C.
Note 9. Intermittent Life Test end points shall apply.
Note 10. The Excess Noise Ratio ($N_r$-1) is defined in Db as $N_r$-1 = 10 $\log\left(\frac{T_e}{290}-1\right)$ where $T_e$ is the effective electron temperature.
Note 11. The noise frequencies generated by this tube cover a broad band of frequencies. This bandwidth is limited only by the type of mount used. This tube is normally used with a mount in RG-51/U wave guide, at a 10 degree angle in the E plane. Other wave guide sizes may be used with properly adapted mounts.

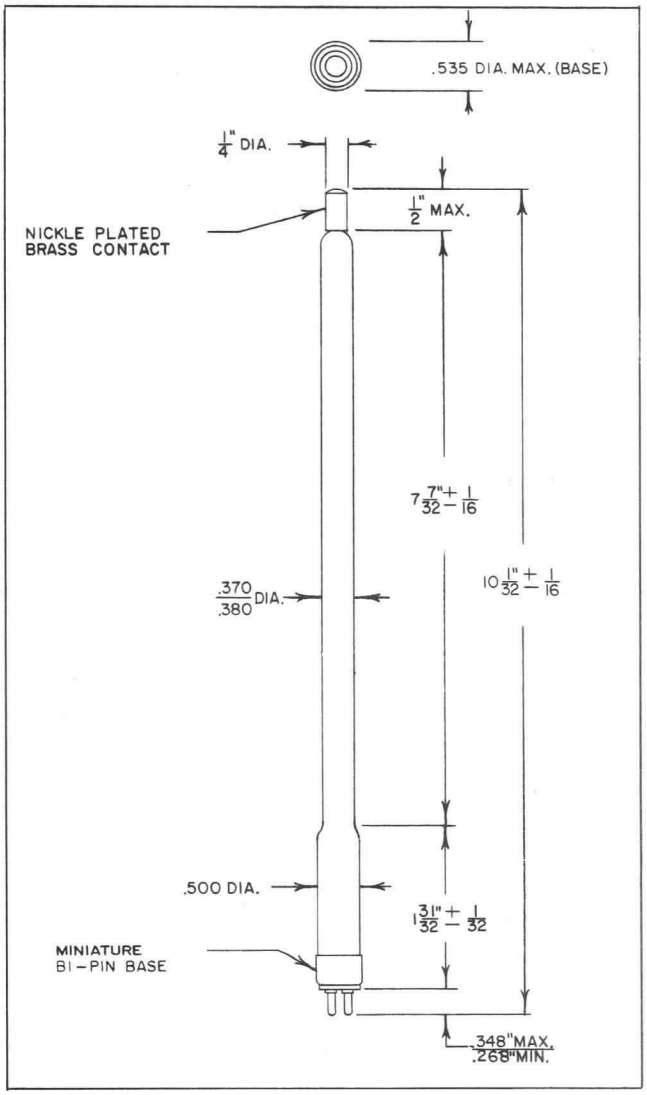



FIG. 1

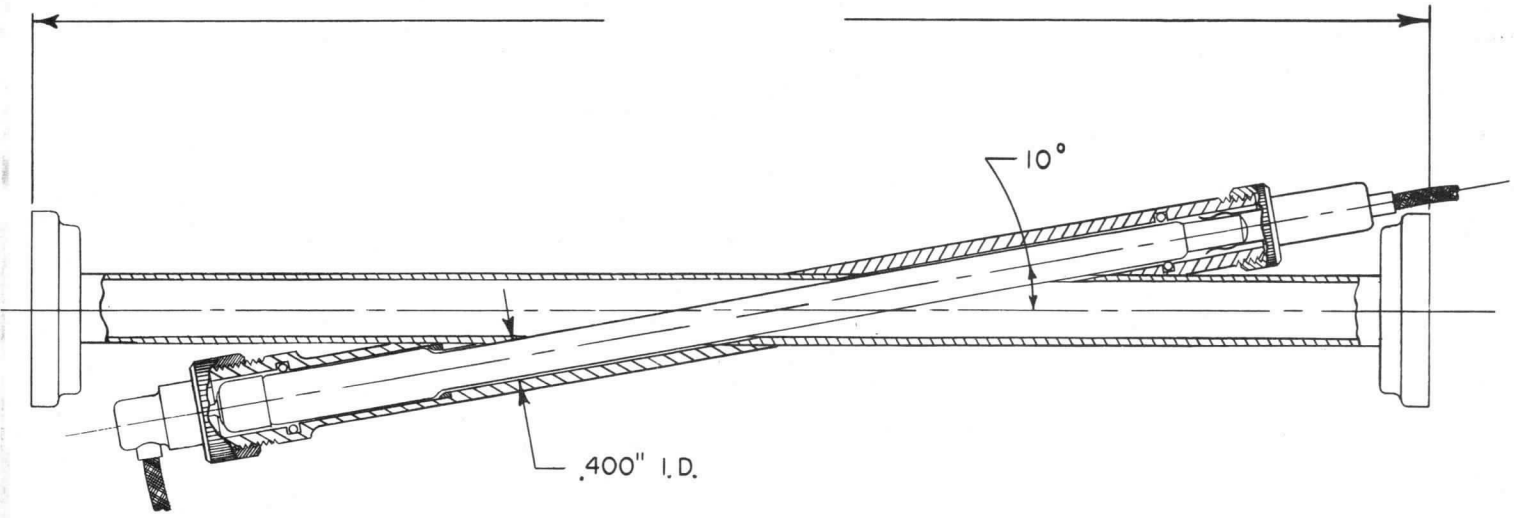
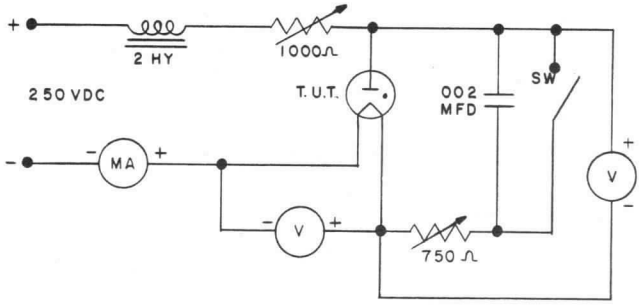
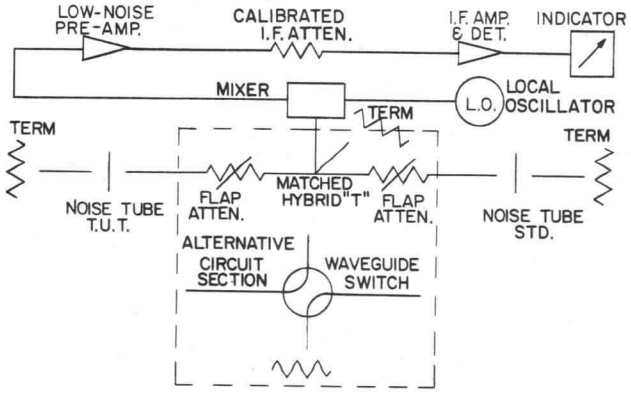



FIG. 2




D.C. TEST CIRCUIT

FIG. 3




TEST CIRCUIT FOR EXCESS NOISE MEASUREMENTS
FIG. 4

Central ELECTRONIC MANUFACTURERS
DENVILLE, NEW JERSEY

| GAS NOISE TUBE | C |
|---|---|
| 6356 | 15.3 Db |

References and notations contained herein are taken from Military Specifications for Electron tubes MIL-E-ID 31 March '58.

Description: Gaseous Discharge Diode, C Band (Note 11)

Ratings:

| | $I_f$ mA | $I_b$ mAdc | TA °C | T Bulb °C |
|---|---|---|---|---|
| Absolute Maximum: | .. | .. | +85 | +125 |
| Minimum: | .. | .. | −55 | .. |
| Test Conditions: | 0 | 250 | .. | .. |

Cathode: Filamentary Type.
Dimensions: Per Outline Drawing (Fig. 1)
Base: Per Outline Drawing (Fig. 1)
Mounting Position: Any

| Ref. Para. | Test | Conditions | Min. | Max. |
|---|---|---|---|---|
| ... | Qualification: | Required. | | |
| 4.5 | Holding Period: | 168 hours | | |
| 4.9.18.1.10 | Carton Drop: | ... | | |
| 4.9.20.3 | *Vibration: | No Voltages, Note 9. | | |
| 4.10.5.1 | Filament Voltage: | $I_f$ = 170mAdc | $E_f$ --- | 10Vdc |
| 4.13.2 | Tube Voltage Drop: | Notes 1, 2 | $E_{td}$ 80 | 90Vdc |
| ... | Excess Noise Ratio: | F = 5650 Mc. Notes 3, 4, 5, 10 | $N_r$-1 15.05 | 15.45 Db |
| ... | Match (1): | F = 5650 Mc. Notes 4, 6 $I_b$ = 250 mAdc | VSWR | 1.12:1 |
| ... | *Match (2): | F = 5650 Mc. $I_b$ = 0 mAdc Notes 4, 6 | VSWR | 1.12:1 |
| ... | Intermittent Life Test | Notes 1, 3, 8, 9 (One min. on, Two min. off) Preheat time = 2 to 3 sec. | 2500 | ...Cycles |
| 4.11.4 | Intermittent Life Test End Points Excess Noise Ratio: Note 11. | | $N_r$-1 15.0 | 15.5 Db |

Note 1. The tube shall be tested in the circuit of Fig. 3.
Note 2. In the test circuit of Fig. 3, with a filament current of 170 mAdc, the tube shall operate within three tries.
Note 3. The tube shall be tested in total darkness.
Note 4. The tube shall be tested in a tube mount as specified in Figure 2, or equivalent, terminated by a matched RG-49/U termination having a VSWR no greater than 1.01:1, such as Hewlett-Packard G-914A, or equivalent.
Excess Noise Ratio Measurement tests shall be made using the circuit of block diagram Fig. 2, or equivalent.
Note 5. The frequency specified is that of the Local Oscillator.
Note 6. The frequency specified is that of the Signal Generator.
Note 7. Excess noise ratio should be measured by comparison with an approved standard.
Note 8. The tube shall be tested at an ambient temperature of +85°C.
Note 9. Intermittent Life Test end points shall apply.
Note 10. The Excess Noise Ratio ($N_r$-1) is defined in Db as $N_r$-1 = 10 log $\left(\frac{T_e}{290}-1\right)$ where $T_e$ is the effective electron temperature.
Note 11. The noise frequencies generated by this tube cover a broad band of frequencies. This bandwidth is limited only by the type of mount used. This tube is normally used with a mount in RG-49/U or RG-50/U wave guide, at a 10 degree angle in the E plane. Other wave guide sizes may be used with properly adapted mounts.

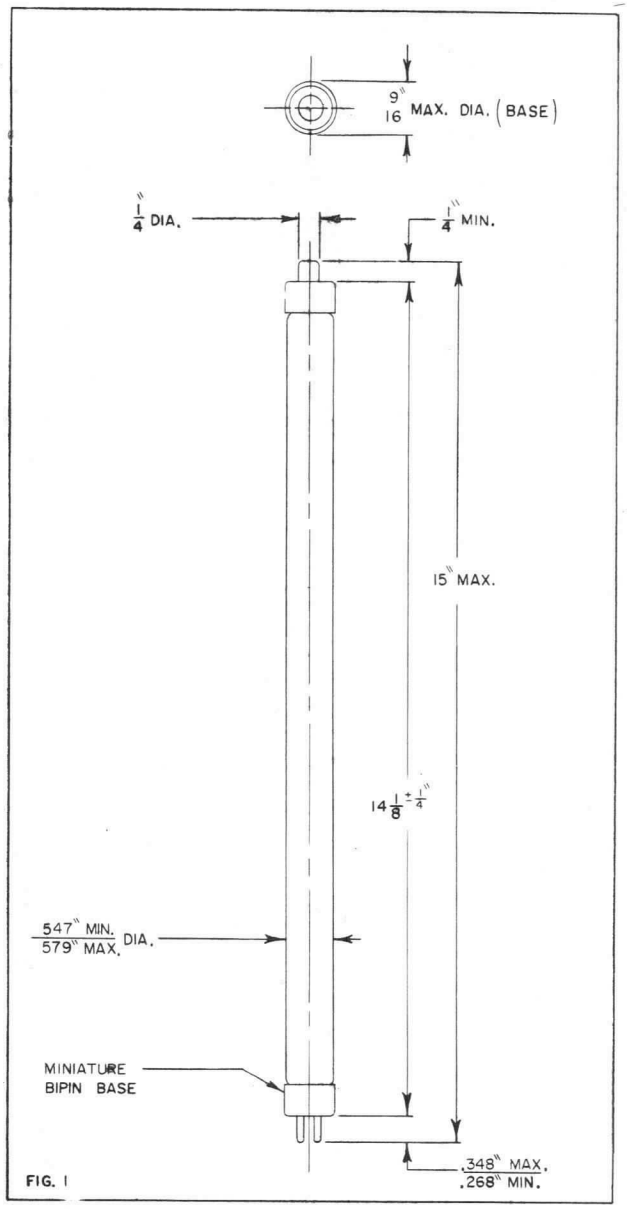


FIG. 1

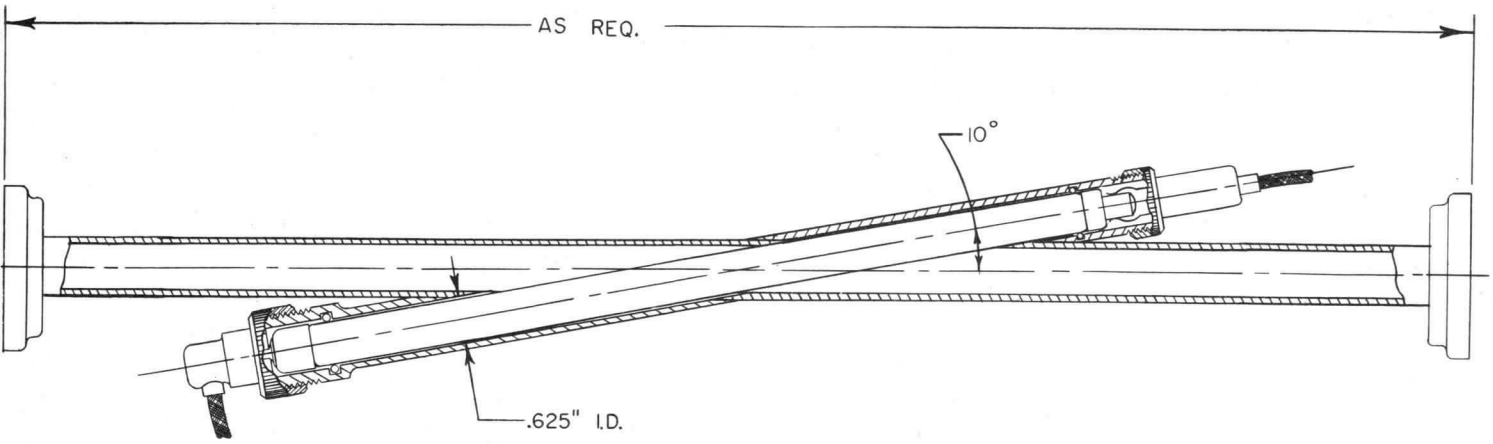
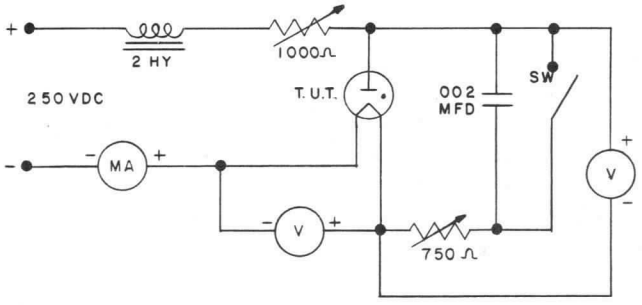
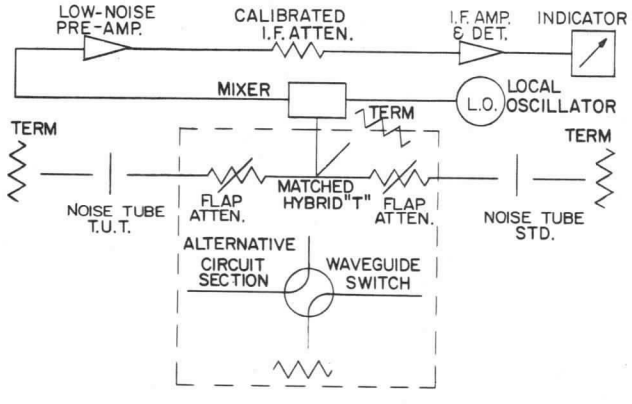



FIG. 2




D.C. TEST CIRCUIT

FIG. 3




TEST CIRCUIT FOR EXCESS NOISE MEASUREMENTS
FIG. 4

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

| GAS NOISE TUBE | X |
|---|---|
| 6357 | 15.3 Db |

References and notation contained herein are taken from Military Specifications for Electron tubes MIL-E-1D 31 March '58.

Description: Gaseous Discharge Diode, X Band (Note 11)

References and notations contained herein are taken from Military Specifications for Electron tubes MIL-E-1D 31 March '58.

Description: Gaseous Discharge Diode, X Band (Note 11)

Ratings:

| | If | Ib | TA | T Bulb |
|---|---|---|---|---|
| Absolute: | mA | mAdc | °C | °C |
| Maximum: | . . | . . | +85 | +125 |
| Minimum: | . . | . . | −55 | . . |
| Test Conditions: | 0 | 250 | . . | . . |

Cathode: Filamentary Type
Dimensions: Per Outline Drawing (Fig. 1)
Base: Per Outline Drawing (Fig. 1)
Mounting Position: Any

| Ref. Para. | Test | Conditions | Min. | Max. |
|---|---|---|---|---|
| . . . | Qualification: | Required | | |
| 4.5 | Holding Period: | 168 hours | | |
| 4.9.18.1.10 | Carton Drop: | . . . | | |
| 4.9.20.3 | *Vibration: | No Voltages, Note 9. | | |
| 4.10.5.1 | Filament Voltage: | If = 170mAdc | $E_f$ . . . | 10Vdc |
| 4.13.2 | Tube Voltage Drop: | Note 1,2 | $E_{td}$ 80 | 90Vdc |
| . . . | Excess Noise Ratio: | F = 9000 Mc. Notes 3,4,5,10. | $N_r$-1 15.05 | 15.45Db |
| . . . | Match (1) | F = 9000 Mc. Notes 4,6. $I_b$ = 250 mAdc | VSWR | 1.07:1 |
| . . . | *Match (2): | F = 9000 Mc. $I_b$ = 0 mAdc Notes 4,6. | VSWR | 1.07:1 |
| . . . | Intermittent Life Test | Notes 1,3,8,9. (One min. on, two min. off) Preheat time = 2 to 3 sec. | 2500 | Cycles |
| 4.11.4 | Intermittent Life Test End Points Excess Noise Ratio: Note 11. | | $N_r$-1 15.0 | 15.5Db |

Note 1. The tube shall be tested in the circuit of Fig. 3.
Note 2. In the test circuit of Fig. 3, with a filament current of 170 mAdc, the tube shall operate within three tries.
Note 3. The tube shall be tested in total darkness.
Note 4. The tube shall be tested in a tube mount as specified in Figure 2, or equivalent, terminated by a matched RG-52/U termination having a VSWR no greater than 1.01:1, such as Hewlett-Packard X-914A, or equivalent.
Excess Noise Ratio Measurement tests shall be made using the circuit of block diagram Fig. 4, or equivalent.
Note 5. The frequency specified is that of the Local Oscillator.
Note 6. The frequency specified is that of the Signal Generator.
Note 7. Excess noise ratio should be measured by comparison with an approved standard.
Note 8. The tube shall be tested at an ambient temperature of +85°C.
Note 9. Intermittent Life test end points shall apply.
Note 10. The Excess Noise Ratio ($N_r$-1) is defined in Db as $N_r$-1 = 10 log $\left(\frac{T_e}{290}-1\right)$ where $T_e$ is the effective electron temperature.
Note 11. The noise frequencies generated by this tube cover a broad band of frequencies. This bandwidth is limited only by the type of mount used. This tube is normally used with a mount in RG-52/U wave guide, at a 10 degree angle in the E plane. Other wave guide sizes may be used with properly adapted mounts.

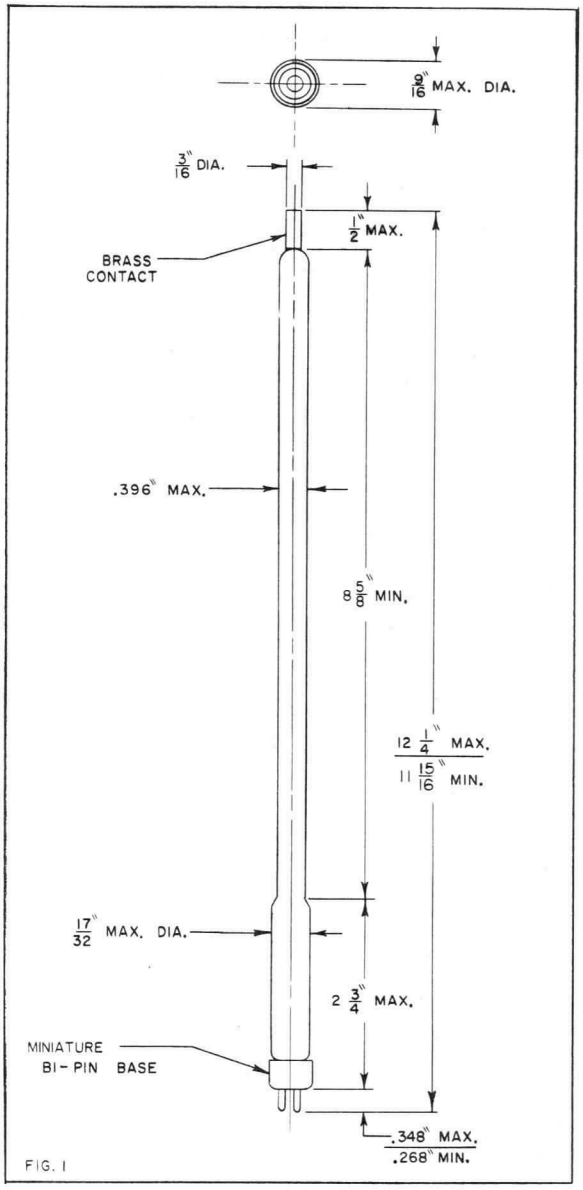


FIG. 1

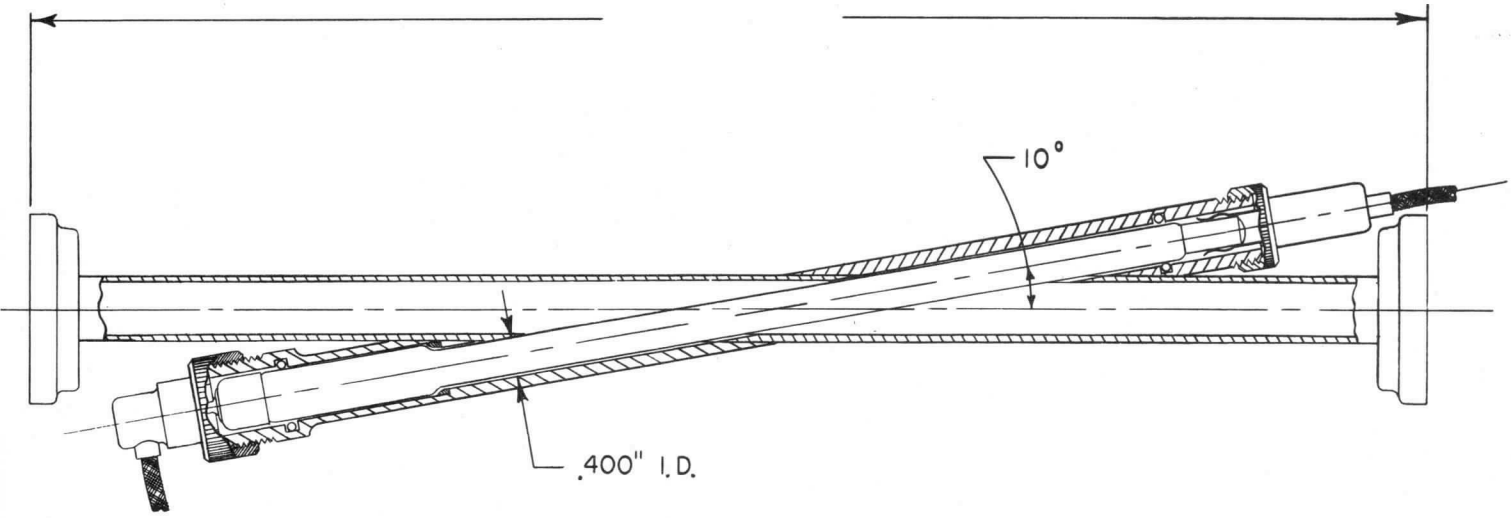
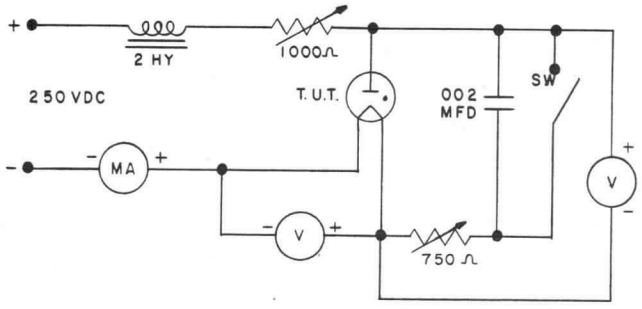
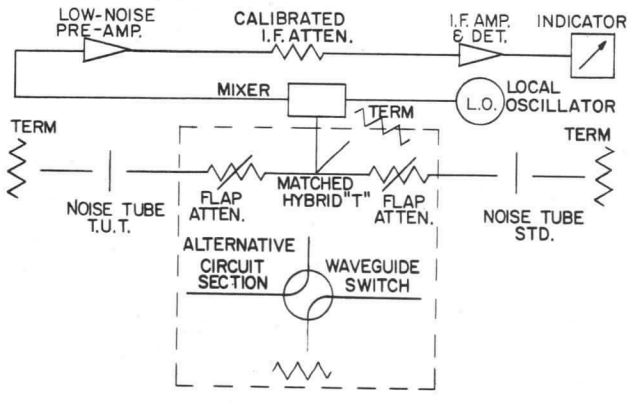



FIG. 2




D. C. TEST CIRCUIT

FIG. 3




TEST CIRCUIT FOR EXCESS NOISE MEASUREMENTS
FIG. 4

# Central ELECTRONIC MANUFACTURERS

DENVILLE, NEW JERSEY

| GAS NOISE TUBE | S |
|---|---|
| 6358 | 15.3 Db |

References and notations contained herein are taken from Military Specifications for Electron tubes MIL-E-1D 31 March '58.

Description: Gaseous Discharge Diode, S Band (Note 11)

Ratings:

| | If | Ib | TA | T Bulb |
|---|---|---|---|---|
| | mA | mAdc | °C | °C |
| Absolute Maximum: | .. | .. | +85 | +125 |
| Minimum: | .. | .. | −55 | .. |
| Test Conditions: | 0 | 250 | .. | .. |

Cathode: Filamentary Type.
Dimensions: Per Outline Drawing (Fig. 1)
Base: Per Outline Drawing (Fig. 1)
Mounting Position: Any

| Ref. Para. | Test | Conditions | Min. | Max. |
|---|---|---|---|---|
| ... | Qualification: | Required | | |
| 4.5 | Holding Period: | 168 hours | | |
| 4.9.18.1.10 | Carton Drop: | ... | | |
| 4.9.20.3 | *Vibration: | No Voltages, Note 9. | | |
| 4.10.5.1 | Filament Voltage: | $I_f$=300mAdc | $E_f$ ... | 10Vdc |
| 4.13.2 | Tube Voltage Drop: | Note 1,2, | $E_{td}$ 80 | 90Vdc |
| ... | Excess Noise Ratio: | F=3300 Mc. Notes 3,4,5,10. | $N_r$-1 15.05 | 15.45Db |
| ... | *Match (1): | F=3270 Mc. Notes 4,6. $I_b$=250 mAdc | VSWR | 1.15:1 |
| ... | *Match (2): | F=3270 Mc. $I_b$=0 mAdc Notes 4,6. | VSWR | 1.15:1 |
| ... | Intermittent Life Test | Notes 1,3,8,9. (One min. on, two min. off) Preheat time=2 to 3 sec. | 2500 | Cycles |
| 4.11.4 | Intermittent Life Test End Points Excess Noise Ratio: Note 11. | | $N_r$-1 15.0 | 15.5Db |

Note 1. The tube shall be tested in the circuit of Fig. 3.
Note 2. In the test circuit of Fig. 3, with a filament current of 300 mAdc, the tube shall operate within three tries.
Note 3. The tube shall be tested in total darkness.
Note 4. The tube shall be tested in a tube mount as specified in Figure 2, or equivalent, terminated by a matched RG-49/U termination having a VSWR no greater than 1.01:1, such as Hewlett-Packard S-914A, or equivalent.
Excess Noise Ratio Measurement tests shall be made using the circuit of block diagram Fig. 4, or equivalent.
Note 5. The frequency specified is that of the Local Oscillator.
Note 6. The frequency specified is that of the Signal Generator.
Note 7. Excess noise ratio should be measured by comparison with an approved standard.
Note 8. The tube shall be tested at an ambient temperature of +85°C.
Note 9. Intermittent life test end points shall apply.
Note 10. The Excess Noise Ratio ($N_r$-1) is defined in Db as $N_r$-1 = 10 log $(\frac{T_e}{290}-1)$ where $T_e$ is the effective electron temperature.
Note 11. The noise frequencies generated by this tube cover a broad band of frequencies. This bandwidth is limited only by the type of mount used. This tube is normally used with a mount in RG-48/U wave guide, at a 10 degree angle in the E plane. Other wave guide sizes may be used with properly adapted mounts.

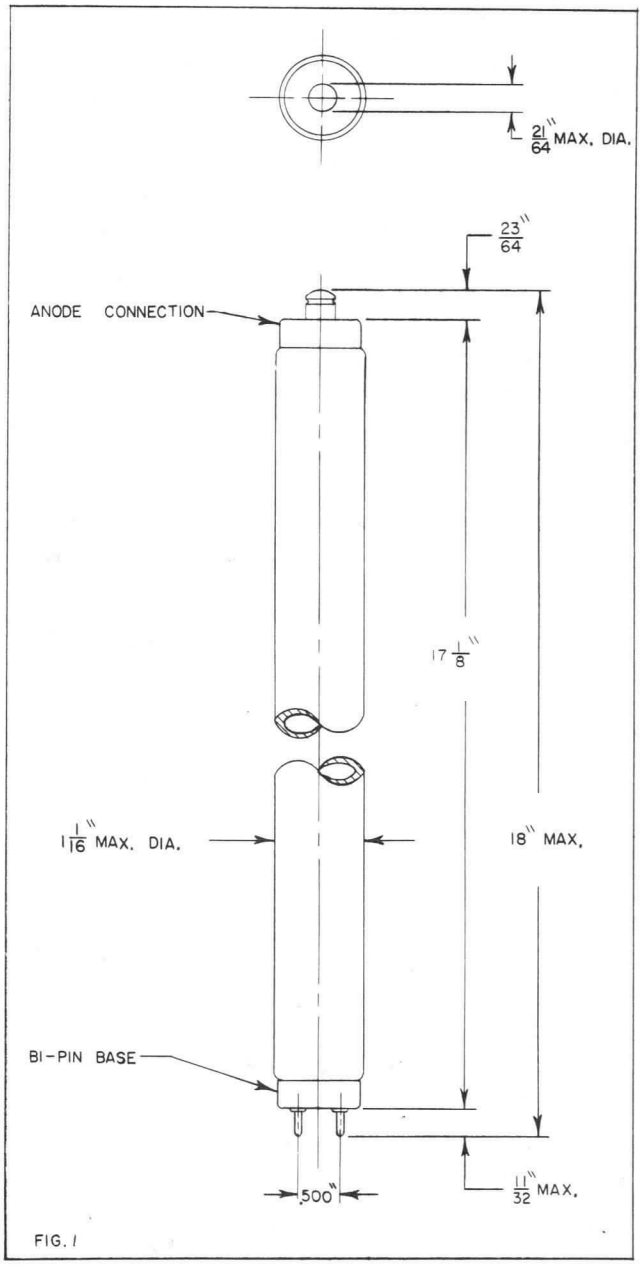


FIG. 1

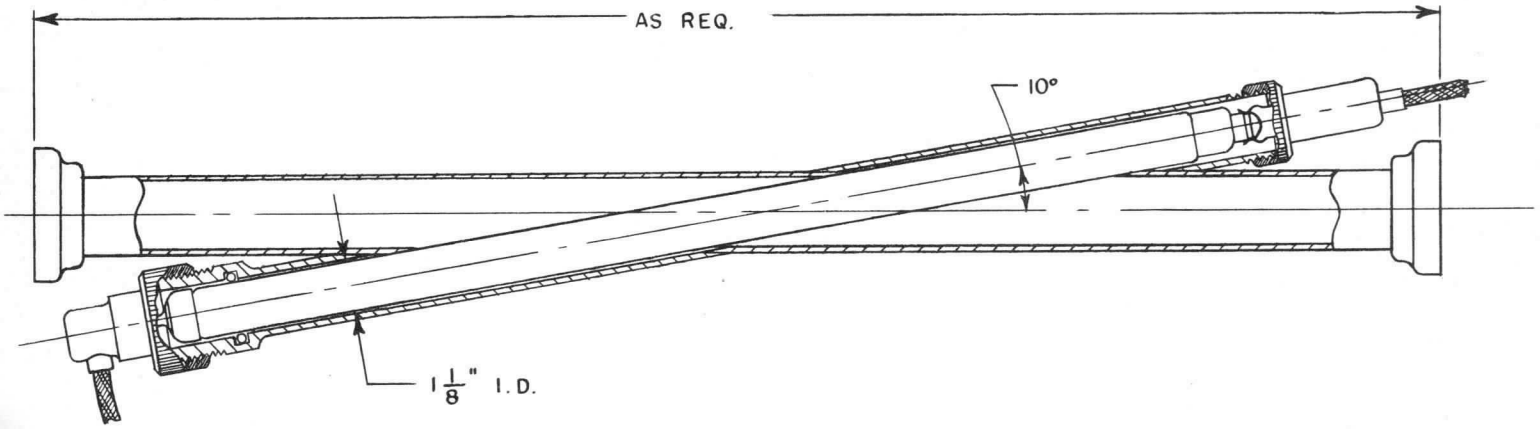
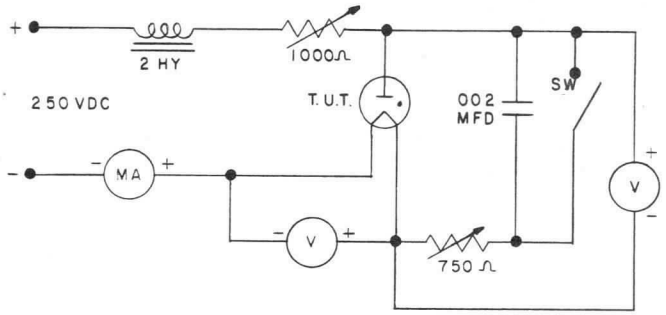
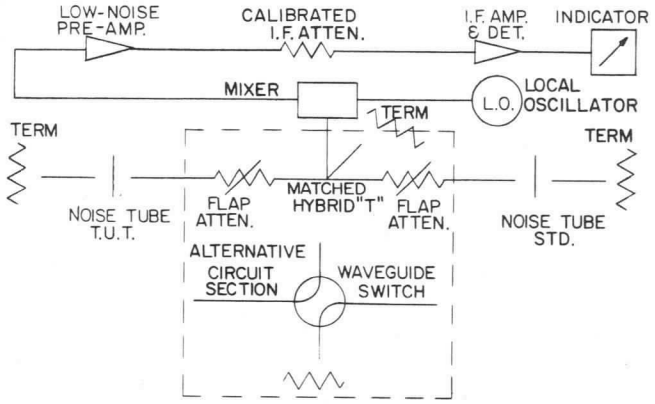



FIG. 2




D.C. TEST CIRCUIT

FIG. 3




TEST CIRCUIT FOR EXCESS NOISE MEASUREMENTS
FIG. 4

# IONIZATION GAUGES

The data presented in this section is printed on either a pink or white sheet.

A pink data sheet signifies provisional information.

A white data sheet signifies permanent information.

*For further technical information write to:*
Applications Engineering Department

CENTRAL ELECTRONIC MANUFACTURERS
2 RICHWOOD PLACE, DENVILLE, N. J.
*A Division of Nuclear Corporation of America*

NUCLEAR CORPORATION OF AMERICA
central electronic mfr's division
DENVILLE, NEW JERSEY

IONIZATION GAUGE TUBE TYPE **CEM-75**

# IONIZATION GAUGE TUBE

## DESCRIPTION

The CEM-75 is a burn out proof version of the Bayard-Alpert design. It is capable of vacuum measurement in the range of $10^{-4}$ to $10^{-10}$ millimeters of mercury. The burn out proof filament, incorporated in the CEM-75, makes it desirable for use in systems that are repeatedly opened to air.

## SPECIFICATIONS

### PHYSICAL:

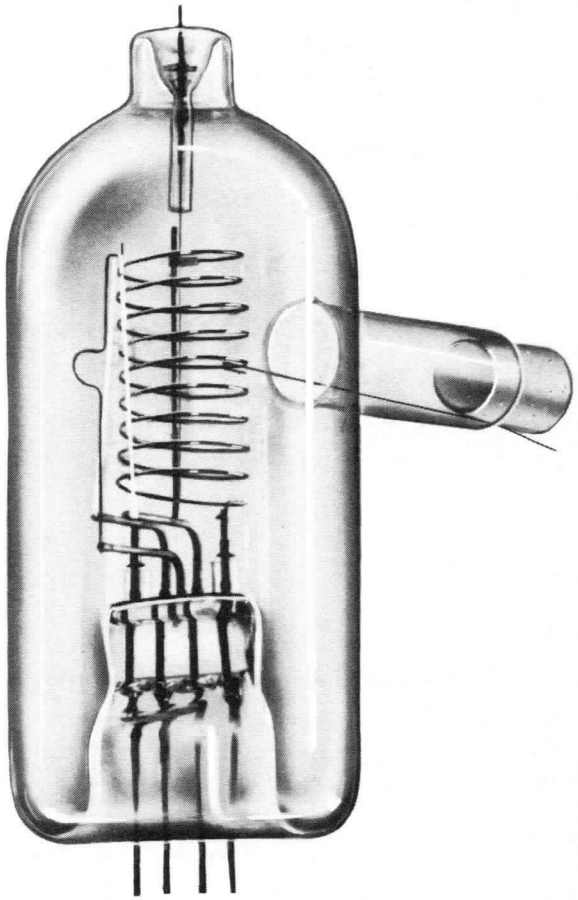
| | |
|---|---|
| LENGTH (Max.) | 6¾ |
| BULB DIAMETER (Max.) | 2⅜ |
| TUBULATION O.D. | ¾ |
| FILAMENT | thorium oxide coated iridium ribbon |

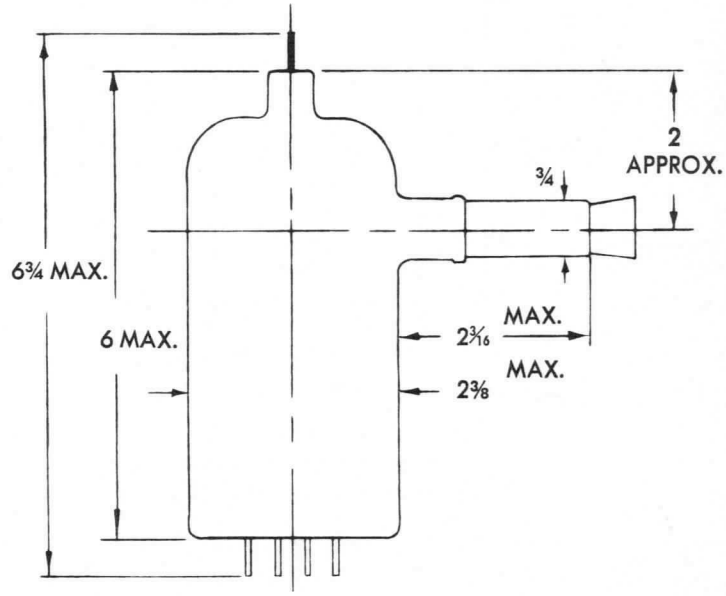
### ELECTRICAL:

| | |
|---|---|
| FILAMENT VOLTAGE | 3-5 VOLTS AC |
| FILAMENT CURRENT | 4-6 AMPS AC |
| GRID VOLTAGE | +150 VOLTS |
| COLLECTOR VOLTAGE | —30 VOLTS |
| GRID DEGASSING: | |
| VOLTAGE | 7.5-8 VOLTS AC |
| CURRENT | 10-11 AMPS AC |

SENSITIVITY (NITROGEN)

100 microamps per micron @ 10ma grid current or
10 microamps per micron per ma grid current

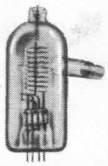





## SPECIAL GAUGES

Our engineering staff is available to design and custom-produce specialized ionization gauges to meet your particular operating requirements.

IONIZATION GAUGE TUBE



TYPE
# CEM-75

# NUCLEAR CORPORATION OF AMERICA
## *central electronic mfr's division*

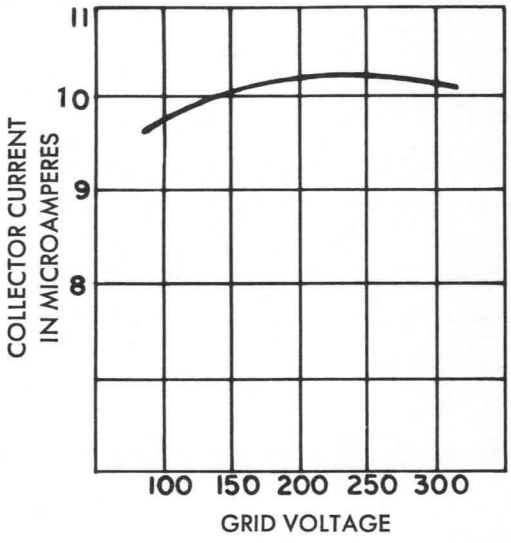
DENVILLE, NEW JERSEY

CEM-75

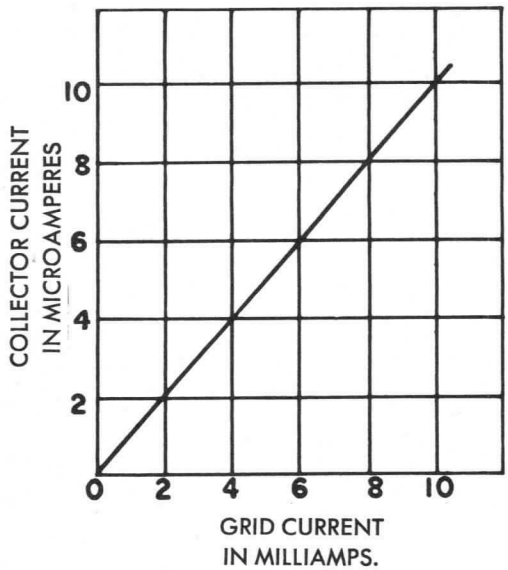
The ~~CSM-75~~ is available with three different types of tubulation that are designated by the letter following the gauge type.

CEM-75N (NONEX GLASS)
CEM-75P (PYREX GLASS)
CEM-75K (KOVAR TUBING)

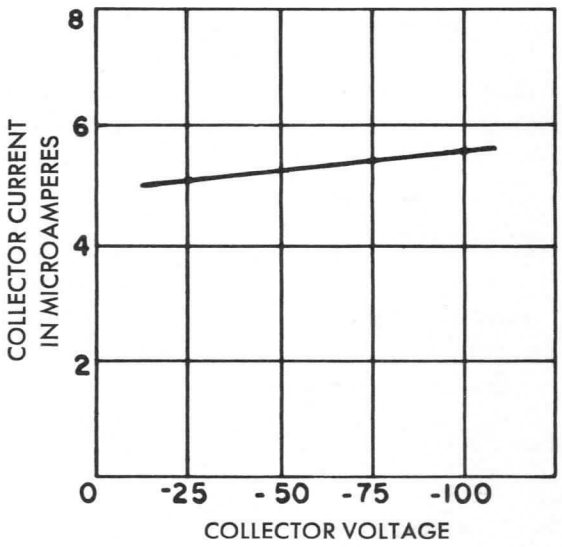
The standard tubulation size is ¾ inches in diameter but price and delivery on special sizes will be quoted on request.




PRESSURE = $1 \times 10^{-4}$ mm Hg
COLLECTOR VOLTAGE = —30 V.
GRID CURRENT = 10 ma




PRESSURE = $1 \times 10^{-4}$ mm Hg
COLLECTOR VOLTAGE = —30 V.
GRID VOLTAGE = +150 V.




PRESSURE = $5 \times 10^{-5}$ mm Hg
GRID VOLTAGE = 150 V.
GRID CURRENT = 10 ma




Printed in U. S. A.

# MISCELLANEOUS & ACCESSORIES

The data presented in this section is printed on either a pink or white sheet.

A pink data sheet signifies provisional information.

A white data sheet signifies permanent information.

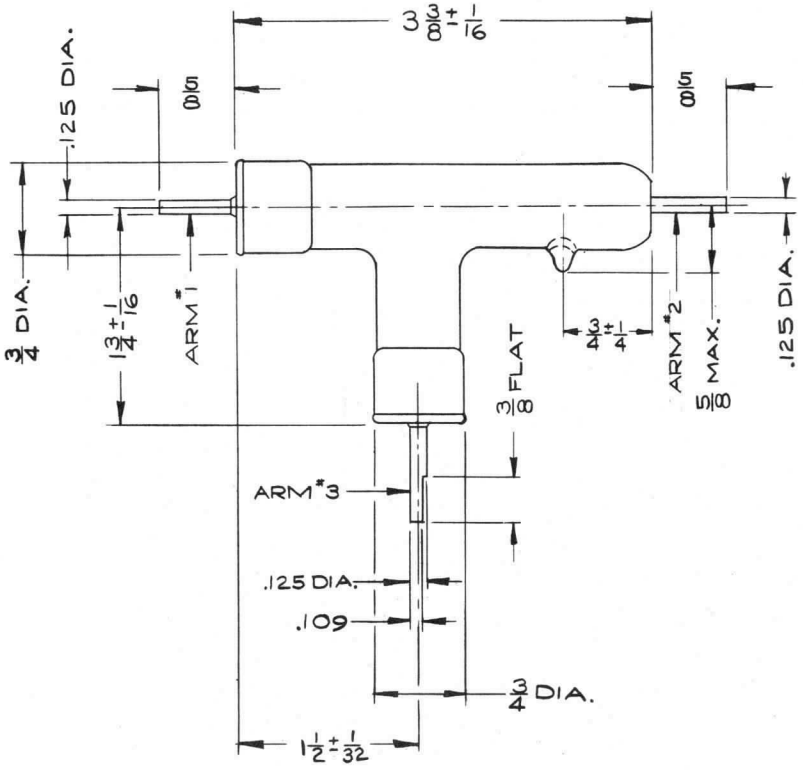
*For further technical information write to:*
Applications Engineering Department

CENTRAL ELECTRONIC MANUFACTURERS
2 RICHWOOD PLACE, DENVILLE, N. J.
*A Division of Nuclear Corporation of America*

Central ELECTRONIC
MANUFACTURERS
DENVILLE, NEW JERSEY

VACUUM SWITCH
CVS-1

# VACUUM SWITCH




| | |
|---|---|
| Maximum Voltage | 5000 Volts |
| Maximum Current at 10 Mcs. | 3 Amperes |
| Ambient Temperature | 125° C Max. |
| Metal Finish | Cadmium Plated |

DC resistance between arms 1 and 2 with a closed force of 3 inch ounces or more does not exceed .02 ohms

DC resistance between arms 1 and 3 with a closed force of 3 inch ounces or more does not exceed .02 ohms

Torque needed to open arms 1 and 2 by moving arm 1: 4 inch ounces ± 1 inch ounce

Torque needed to open arms 1 and 2 by moving arm 3: does not exceed 8 inch ounces

This switch will withstand 15G when properly mounted

Issued 8/60

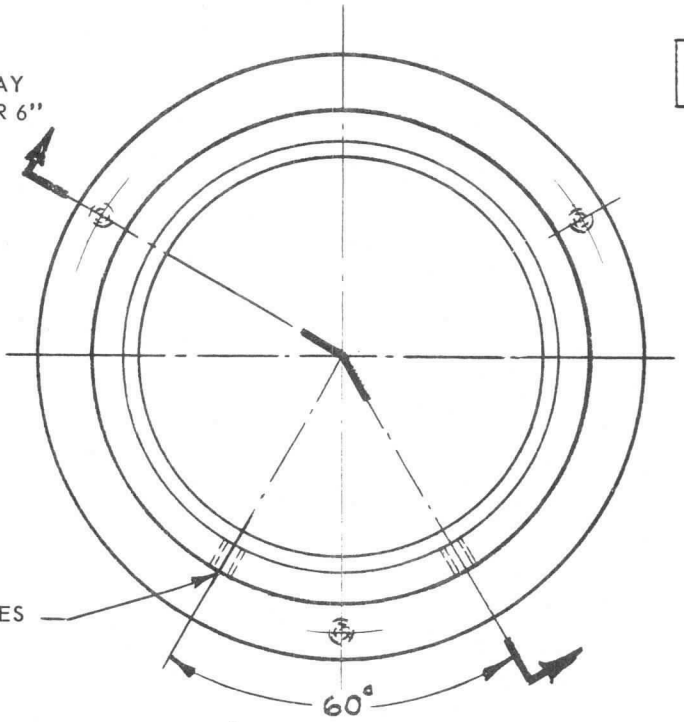
# CENTRAL ELECTRONIC MANUFACTURERS

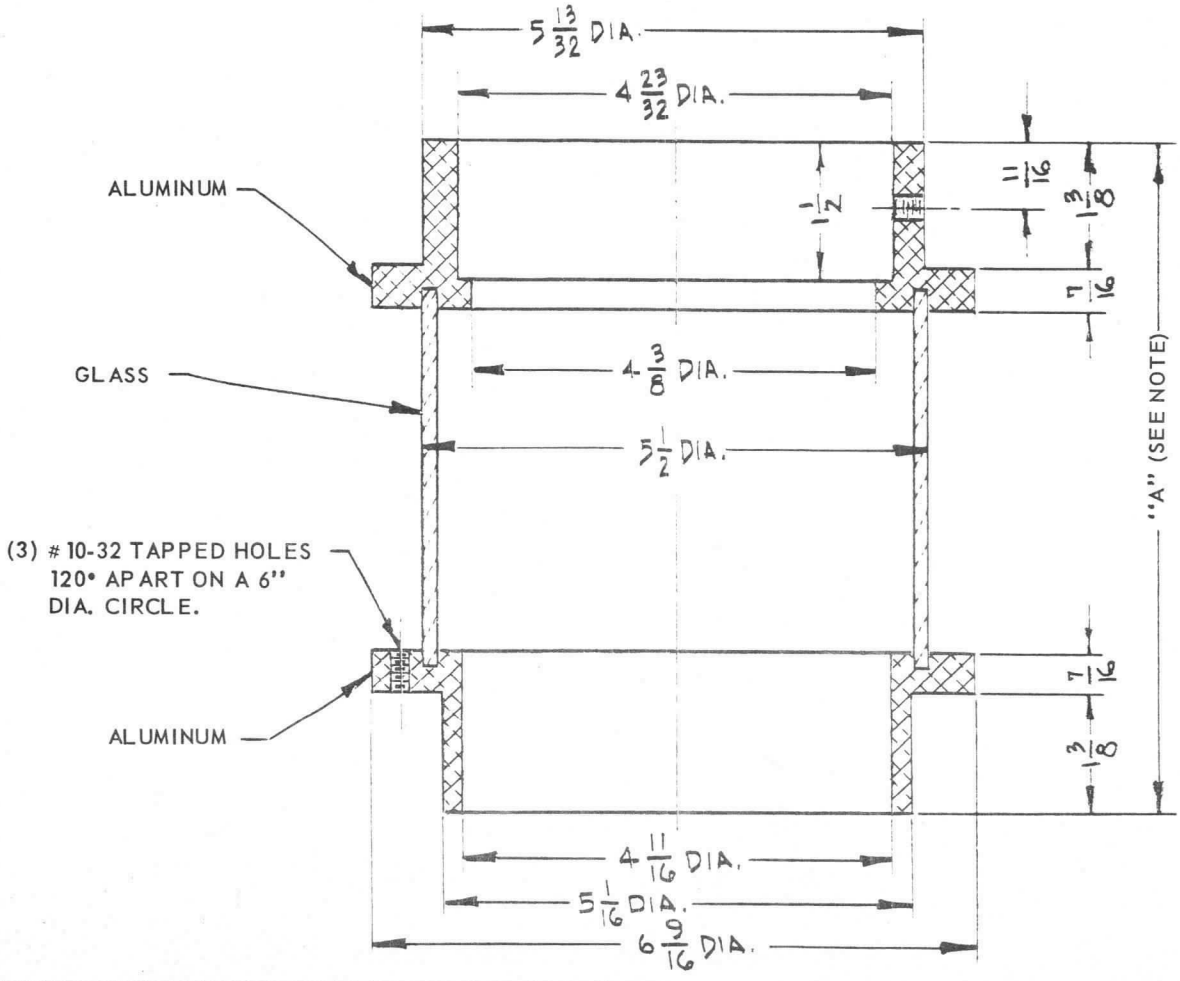
2 RICHWOOD PLACE — DENVILLE, N.J.

## AIR CHAMBER
## (#1201-T-1000)

NOTE:
AIR CHAMBER MAY HAVE EITHER 3¾" OR 6" OF GLASS BETWEEN ALUMINUM FLANGES.

| DIM. "A" | 7-3/8 |
|---|---|
| | 9-3/4 |






10-29-56