



# 4CX10,000D

## R.F. POWER TETRODE

Service Type CV6184

The data should be read in conjunction with the Power Tetrode Preamble.

### ABRIDGED DATA

Forced-air cooled tetrode, coaxial metal-ceramic envelope, for audio, linear single sideband, or screen-modulated r.f. amplifiers.

|                                        |     |         |
|----------------------------------------|-----|---------|
| Anode dissipation (class C telegraphy) | 10  | kW max  |
| Anode voltage                          | 7.5 | kV max  |
| Frequency for full ratings             | 30  | MHz max |
| Frequency at reduced ratings           | 110 | MHz max |
| Output power (class C telegraphy)      | 16  | kW      |

### GENERAL

#### Electrical

|                                                                                                                |                    |
|----------------------------------------------------------------------------------------------------------------|--------------------|
| Filament                                                                                                       | thoriated tungsten |
| Filament voltage (see note 1)                                                                                  | 7.5 V              |
| Filament current                                                                                               | 75 A               |
| Grid-screen amplification factor<br>( $V_a = 2.0\text{ kV}$ , $V_{g2} = 750\text{ V}$ , $I_a = 1.0\text{ A}$ ) | 4.5                |
| Inter-electrode capacitances:                                                                                  |                    |

|          | Grounded<br>Filament |     | Grounded Grid<br>and Screen |      |    |
|----------|----------------------|-----|-----------------------------|------|----|
|          | Min                  | Max | Min                         | Max  |    |
| input    | 108                  | 122 | 48                          | 58   | pF |
| output   | 18                   | 23  | 18                          | 23   | pF |
| feedback | —                    | 1.0 | —                           | 0.16 | pF |

#### Mechanical

|                   |                            |
|-------------------|----------------------------|
| Overall length    | 9.125 inches (232mm) max   |
| Overall diameter  | 7.050 inches (179.1mm) max |
| Net weight        | 12.2 pounds (5.5kg) approx |
| Mounting position | vertical, either way up    |

### COOLING

Sufficient air must be passed over the concentric base terminals and through the radiator fins to maintain the temperatures of the ceramic to metal seals and the radiator core below the maximum rated value of  $250^{\circ}\text{C}$ . It is recommended that an air distribution socket MA87 and chimney type MA104A be used with the tube (see pages 10, 11 and 12).

The air flows required with the recommended air socket and chimney to maintain the seal temperatures at  $200^{\circ}\text{C}$  in an ambient temperature of  $50^{\circ}\text{C}$  at sea level and with an operating frequency of less than 30MHz are given

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below. At higher ambient temperatures, altitudes or frequencies the rate of flow must be adjusted to give equivalent cooling and should be determined individually in each case. An allowance of 1000 watts for the power dissipated by the filament and grids has been made in the values given.

| Anode,<br>dissipation<br>(kW) | Air flow             |                     | Water pressure drop |      |
|-------------------------------|----------------------|---------------------|---------------------|------|
|                               | ft <sup>3</sup> /min | m <sup>3</sup> /min | inches              | mm   |
| 4.0                           | 110                  | 3.1                 | 0.4                 | 10.2 |
| 6.0                           | 200                  | 5.7                 | 0.8                 | 20.4 |
| 8.0                           | 315                  | 8.9                 | 1.7                 | 43   |
| 10                            | 445                  | 12.6                | 2.8                 | 71   |
| 12                            | 600                  | 17.0                | 4.4                 | 110  |

### AUDIO FREQUENCY POWER AMPLIFIER OR MODULATOR (Class AB1) (See Note 2)

#### MAXIMUM RATINGS (Absolute values)

|                    |     |        |
|--------------------|-----|--------|
| Anode voltage      | 7.5 | kV max |
| Anode current      | 4.0 | A max  |
| Anode dissipation  | 12  | kW max |
| Screen voltage     | 1.5 | kV max |
| Screen dissipation | 250 | W max  |
| Grid dissipation   | 75  | W max  |

#### TYPICAL OPERATING CONDITIONS (Class AB1, two valves)

|                                           |      |      |      |      |    |
|-------------------------------------------|------|------|------|------|----|
| Anode voltage                             | 4.0  | 5.0  | 6.0  | 7.5  | kV |
| Screen voltage                            | 1.5  | 1.5  | 1.5  | 1.5  | kV |
| Grid voltage                              | -315 | -320 | -330 | -340 | V  |
| Peak a.f. voltage,<br>grid to grid        | 305  | 310  | 320  | 330  | V  |
| Anode current (zero signal)               | 1.0  | 1.0  | 1.0  | 1.0  | A  |
| Anode current (max. signal)               | 6.66 | 6.66 | 6.66 | 6.66 | A  |
| Screen current (zero signal)              | 0    | 0    | 0    | 0    | A  |
| Screen current (max. signal)              | 0.33 | 0.32 | 0.30 | 0.25 | A  |
| Anode dissipation<br>(maximum signal)     | 6.67 | 7.95 | 8.10 | 9.05 | kW |
| Effective load (anode<br>to anode)        | 0.94 | 1.32 | 1.70 | 2.28 | kΩ |
| Nominal driving power<br>(maximum signal) | 0    | 0    | 0    | 0    | W  |
| Output power (max. signal)                | 13.3 | 17.5 | 23.8 | 31.9 | kW |

## **RADIO FREQUENCY LINEAR AMPLIFIER**

**(Class AB1) (See Note 2)**

### **MAXIMUM RATINGS (Absolute values)**

|                    |     |        |
|--------------------|-----|--------|
| Anode voltage      | 7.5 | kV max |
| Anode current      | 4.0 | A max  |
| Anode dissipation  | 12  | kW max |
| Screen voltage     | 1.5 | kV max |
| Screen dissipation | 250 | W max  |
| Grid dissipation   | 75  | W max  |

### **TYPICAL OPERATING CONDITIONS**

**(Peak envelope or modulation crest conditions, below 30MHz)**

|                                 |       |    |
|---------------------------------|-------|----|
| Anode voltage                   | 7.5   | kV |
| Screen voltage                  | 1.5   | kV |
| Grid voltage (see note 3)       | -340  | V  |
| Peak r.f. grid voltage          | 330   | V  |
| Anode current (zero signal)     | 0.50  | A  |
| Anode current (maximum signal)  | 3.33  | A  |
| Screen current (maximum signal) | 0.125 | A  |
| Anode dissipation               | 9.05  | kW |
| Nominal driving power           | 0     | W  |
| Output power (see note 4)       | 15.95 | kW |

## **ANODE MODULATED R.F. POWER AMPLIFIER**

**(Class C Telephony, carrier conditions per valve for use with a maximum modulation factor of 1.0)**

### **MAXIMUM RATINGS (Absolute values)**

|                                |      |        |
|--------------------------------|------|--------|
| Anode voltage                  | 5.0  | kV max |
| Anode current                  | 2.5  | A max  |
| Anode dissipation (see note 5) | 6.65 | kW max |
| Screen voltage                 | 1.0  | kV max |
| Screen dissipation             | 250  | W max  |
| Grid dissipation               | 75   | W max  |

**TYPICAL OPERATING CONDITIONS (below 30MHz)**

|                                                |      |    |
|------------------------------------------------|------|----|
| Anode voltage                                  | 5.0  | kV |
| Screen voltage                                 | 500  | V  |
| Grid voltage                                   | -400 | V  |
| Peak a.f. screen voltage (for 100% modulation) | 450  | V  |
| Peak r.f. grid voltage                         | 520  | V  |
| Anode current                                  | 1.4  | A  |
| Screen current                                 | 0.26 | A  |
| Grid current                                   | 0.05 | A  |
| Anode dissipation                              | 1.1  | kW |
| Nominal driving power                          | 25   | W  |
| Output power                                   | 5.8  | kW |

**R.F. POWER AMPLIFIER OR OSCILLATOR****(Class C Telegraphy, key down conditions, one valve)****MAXIMUM RATINGS (Absolute values)**

|                    | Up to 30MHz | 30-60MHz | 60-110MHz |        |
|--------------------|-------------|----------|-----------|--------|
| Anode voltage      | 7.5         | 7.0      | 6.5       | kV max |
| Anode current      | 3.0         | 2.8      | 2.6       | A max  |
| Anode dissipation  | 10          | 10       | 10        | kW max |
| Screen voltage     | 1.5         | 1.5      | 1.5       | kV max |
| Screen dissipation | 250         | 250      | 250       | W max  |
| Grid dissipation   | 75          | 75       | 75        | W max  |

**TYPICAL OPERATING CONDITIONS (below 30MHz)**

|                        |      |    |
|------------------------|------|----|
| Anode voltage          | 7.5  | kV |
| Screen voltage         | 500  | V  |
| Grid voltage           | -350 | V  |
| Peak r.f. grid voltage | 590  | V  |
| Anode current          | 2.8  | A  |
| Screen current         | 0.5  | A  |
| Grid current           | 0.25 | A  |
| Anode dissipation      | 5.0  | kW |
| Nominal driving power  | 150  | W  |
| Output power           | 16   | kW |

## NOTES

1. The valve must be operated at the stated filament voltage. Fluctuation in filament voltage must not exceed  $\pm 5\%$ .
2. Grid current does not flow during any part of the audio frequency cycle.
3. The grid voltage is adjusted to obtain the specified zero-signal anode current.
4. The peak envelope or r.f. output power at the crest of the modulation envelope.
5. This corresponds to 10kW anode dissipation at 100% sine wave modulation.

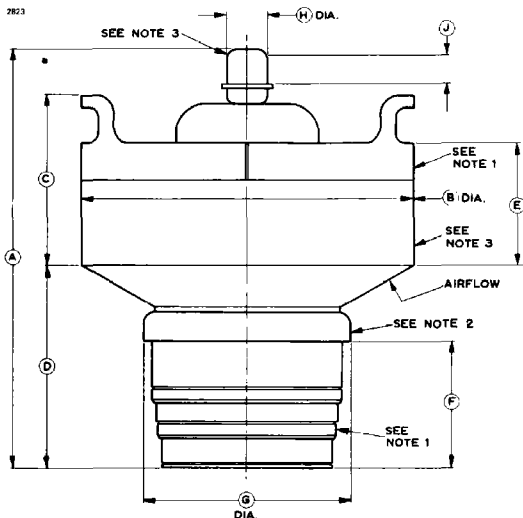


1. *Chlorophyll a* (Chl *a*)

[illegible]

# OUTLINE

2823

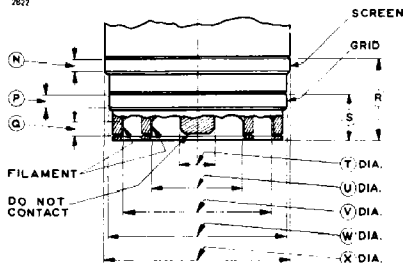


| Ref | Inches            | Millimetres      |
|-----|-------------------|------------------|
| A   | $8.875 \pm 0.250$ | $225.4 \pm 6.4$  |
| B   | $6.989 \pm 0.062$ | $177.5 \pm 1.6$  |
| C   | $3.600 \pm 0.188$ | $91.44 \pm 4.80$ |
| D   | $4.375 \pm 0.188$ | $111.1 \pm 4.8$  |
| E   | $2.600 \pm 0.188$ | $66.04 \pm 4.80$ |
| F   | $2.750 \pm 0.188$ | $69.85 \pm 4.80$ |
| G   | 4.425 max         | 112.4 max        |
| H   | $0.875 \pm 0.020$ | $22.23 \pm 0.51$ |
| J   | 0.375 min         | 9.53 min         |

Millimetre dimensions have been derived from inches.

## OUTLINE DETAILS

2822



| Ref | Inches            | Millimetres      |
|-----|-------------------|------------------|
| N   | 0.188 min         | 4.78 min         |
| P   | 0.188 min         | 4.78 min         |
| Q   | 0.188 min         | 4.78 min         |
| R   | $1.795 \pm 0.031$ | $45.59 \pm 0.79$ |
| S   | $1.018 \pm 0.032$ | $25.86 \pm 0.81$ |
| T   | $0.740 \pm 0.020$ | $18.80 \pm 0.51$ |
| U   | $1.916 \pm 0.020$ | $48.67 \pm 0.51$ |
| V   | $3.153 \pm 0.020$ | $80.09 \pm 0.51$ |
| W   | $3.812 \pm 0.020$ | $96.82 \pm 0.51$ |
| X   | $4.000 \pm 0.020$ | $101.6 \pm 0.5$  |

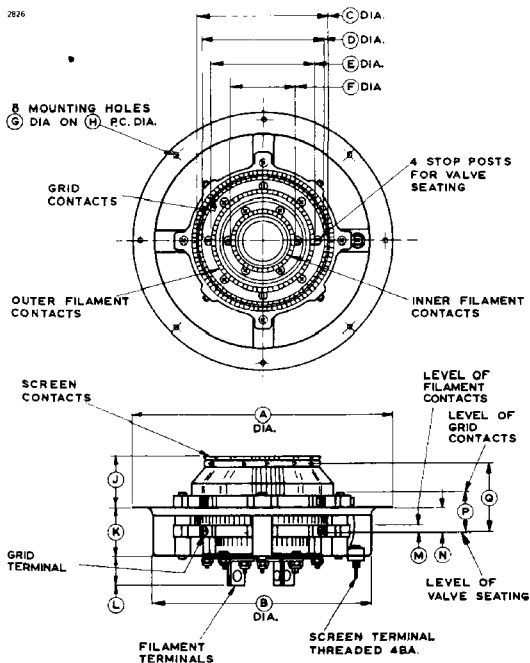
Millimetre dimensions have been derived from inches.

### Outline Notes

1. The eccentricity of the screen and filament contact surfaces will not exceed 0.040 inch (1.02mm) with respect to the anode and control grid contact surfaces when the valve is rotated on rollers at the points indicated by the arrows.
2. This surface must not be used as an electrical contact and it must not be clamped in any way.
3. This surface may be used for making electrical contact to the anode.

# OUTLINE OF AIR DISTRIBUTION SOCKET MA87

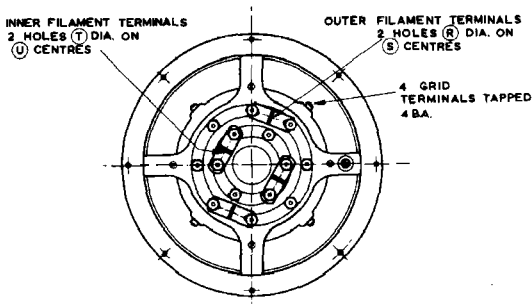
2826



# OUTLINE DETAIL OF MA87

View from underside showing terminals

2827

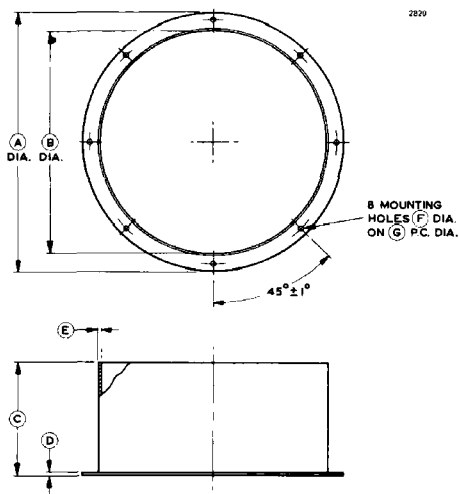


| Ref | Inches        | Millimetres  | Ref | Inches        | Millimetres  |
|-----|---------------|--------------|-----|---------------|--------------|
| A   | 8.266 max     | 210.0 max    | L   | 0.894 ± 0.031 | 22.71 ± 0.79 |
| B   | 6.766 max     | 171.9 max    | M   | 0.228 ± 0.012 | 5.79 ± 0.30  |
| C   | 3.910 ± 0.030 | 99.31 ± 0.76 | N   | 0.672 ± 0.017 | 17.07 ± 0.43 |
| D   | 3.702 ± 0.030 | 94.03 ± 0.76 | P   | 0.841 ± 0.015 | 21.36 ± 0.38 |
| E   | 3.281 ± 0.030 | 83.34 ± 0.76 | Q   | 1.626 ± 0.031 | 41.30 ± 0.79 |
| F   | 2.031 ± 0.030 | 51.59 ± 0.76 | R   | 0.250 ± 0.015 | 6.35 ± 0.38  |
| G   | 0.147         | 3.73         | S   | 1.562 ± 0.015 | 39.67 ± 0.38 |
| H   | 7.750         | 196.9        | T   | 0.250 ± 0.015 | 6.35 ± 0.38  |
| J   | 1.125 ± 0.015 | 28.58 ± 0.38 | U   | 0.937 ± 0.015 | 23.80 ± 0.38 |
| K   | 1.489 ± 0.028 | 37.82 ± 0.71 |     |               |              |

Millimetre dimensions have been derived from inches.

**OUTLINE OF AIR CHIMNEY MA104A**  
(All dimensions without limits are nominal)

2820



| Ref | Inches                                                           | Millimetres                                                    |
|-----|------------------------------------------------------------------|----------------------------------------------------------------|
| A   | 8.250                                                            | 209.6                                                          |
| B   | 7.000 $\begin{smallmatrix} + 0.062 \\ - 0.000 \end{smallmatrix}$ | 177.8 $\begin{smallmatrix} + 1.57 \\ - 0.00 \end{smallmatrix}$ |
| C   | 3.625                                                            | 92.08                                                          |
| D   | 0.093                                                            | 2.36                                                           |
| E   | 0.125 ± 0.031                                                    | 3.18 ± 0.79                                                    |
| F   | 0.157                                                            | 4.00                                                           |
| G   | 7.750                                                            | 196.8                                                          |

Millimetre dimensions have been derived from inches except dimension F.