

# Tetrode Type TT20

UHF AMPLIFIER

**General.** The TT20 is a double tetrode suitable for use as an amplifier at frequencies up to 600 Mc/s. The two tetrode systems are mounted round a common indirectly-heated oxide-coated cathode.

**Frequency.** At frequencies above 150 Mc/s, with only natural cooling by ventilation, it is necessary to reduce the anode voltage: e.g.  $V_a = 500$  V at  $f = 200$  Mc/s and  $V_a = 300$  V at  $f = 430$  Mc/s. When the frequency exceeds 430 Mc/s, it is normally necessary to provide an air flow at any anode voltage.

**Cooling.** Suitable anode connectors having a high thermal capacity to transfer heat by radiation and/or conduction should be used. When the operating conditions ( $V_a/f$ ) exceed those stated above or at high ambient temperatures, it may be necessary to provide an air flow (approximately 0.5 cu. ft. per min.) sufficient to keep the seal temperature within the specified limit. The temperature of the pins must not exceed 180°C.

**Mounting.** This tube may be mounted in any position.

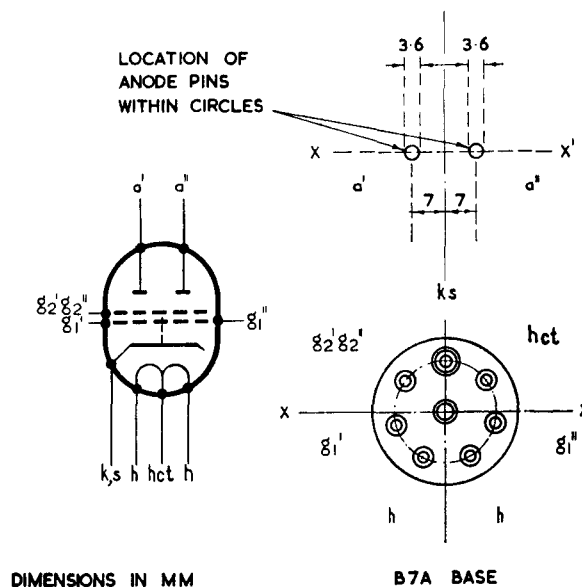
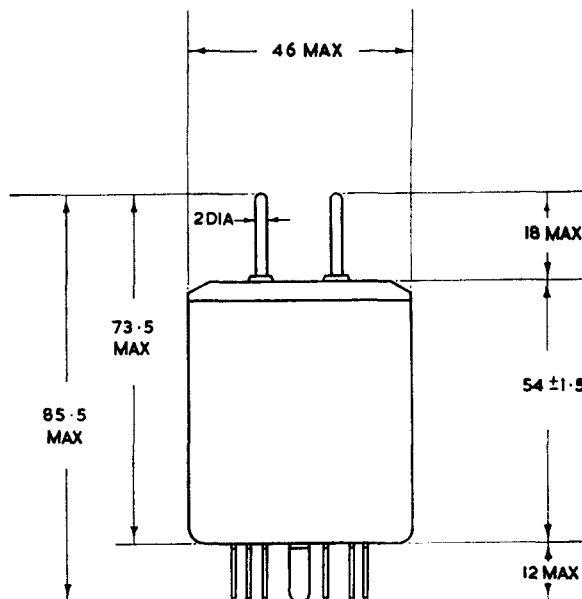
## APPROXIMATE DATA

### Heater

|       |     |      |   |
|-------|-----|------|---|
| $V_h$ | 6.3 | 12.6 | V |
| $I_h$ | 1.3 | 0.65 | A |

### Maximum Ratings (per system)

|            |      |    |
|------------|------|----|
| $V_a$      | 600  | V  |
| $V_{g2}$   | 250  | V  |
| $V_{g1}$   | -200 | V  |
| $P_a$      | 10   | W  |
| $P_{g2}$   | 1.5  | W  |
| $P_{g1}$   | 0.5  | W  |
| $i_k$ (pk) | 400  | mA |
| $V_{h-k}$  | 100  | V  |



MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED

Marconi House, Chelmsford. Telephone: Chelmsford 3221. Telex: 1953. Telegrams: Expanse Chelmsford Telex

**Characteristics (per system)**

|               |     |      |
|---------------|-----|------|
| $I_a$         | 20  | mA   |
| $g_m$         | 2.5 | mA/V |
| $\mu_{g1-g2}$ | 8   |      |

**Capacitances***Each system*

|                             |                        |    |
|-----------------------------|------------------------|----|
| $C_{a-g1}$                  | Internally neutralised |    |
| $C_{g1-all}$                | 7.5                    | pF |
| $C_{a-all}$                 | 2.6                    | pF |
| <i>Systems in push-pull</i> |                        |    |
| $C_{out}$                   | 1.6                    | pF |
| $C_{in}$                    | 4.4                    | pF |

**Weight: 2 oz. (53 g).****Operating Data****(1) RF POWER AMPLIFIER – CLASS C TELEGRAPHY AND FM TELEPHONY****Maximum Ratings**

|                         |                |            |
|-------------------------|----------------|------------|
| $V_a$                   | 600            | V          |
| $p_a$                   | $2 \times 10$  | W          |
| $V_{g2}$                | 250            | V          |
| $p_{g2}$                | $2 \times 1.5$ | W          |
| $V_{g1}$                | -75            | V          |
| $p_{g1}$                | $2 \times 0.5$ | W          |
| $I_k$                   | $2 \times 55$  | mA         |
| $i_k$ (pk)              | $2 \times 260$ | mA         |
| $R_{g1-k}$ (fixed bias) | 50             | k $\Omega$ |
| $R_{g1-k}$ (auto bias)  | 100            | k $\Omega$ |

**Typical Operation**

|              |                |                |                |      |
|--------------|----------------|----------------|----------------|------|
| $f$          | 200            | 400            | 600            | Mc/s |
| $V_a$        | 600            | 400            | 400            | V    |
| $I_a$        | $2 \times 50$  | $2 \times 50$  | $2 \times 50$  | mA   |
| $V_{g2}$     | 250            | 250            | 250            | V    |
| $I_{g2}$     | $2 \times 4$   | $2 \times 2.5$ | $2 \times 2.5$ | mA   |
| $V_{g1}$     | -60            | -50            | -50            | V    |
| $I_{g1}$ (a) | $2 \times 0.7$ | $2 \times 0.7$ | $2 \times 0.7$ | mA   |
| $P_{drive}$  | 1.5            | 2.0            | —              | W    |
| $p_a$        | $2 \times 6$   | $2 \times 8$   | $2 \times 10$  | W    |
| $P_{out}$    | 48             | 25             | 20             | W    |
| $P_{load}$   | 39             | 19             | 15             | W    |

**(2) RF POWER AMPLIFIER – CLASS C ANODE AND SCREEN-GRID MODULATED****Maximum Ratings**

|          |                |   |
|----------|----------------|---|
| $V_a$    | 500            | V |
| $p_a$    | $2 \times 10$  | W |
| $V_{g2}$ | 250            | V |
| $p_{g2}$ | $2 \times 1.5$ | W |

|            |                |    |
|------------|----------------|----|
| $V_{g1}$   | -100           | V  |
| $p_{g1}$   | $2 \times 0.5$ | W  |
| $I_k$      | $2 \times 50$  | mA |
| $i_k$ (pk) | $2 \times 400$ | mA |

**Typical Operation***Unmodulated carrier conditions*

|                            |               |               |                |      |
|----------------------------|---------------|---------------|----------------|------|
| $f$                        | 200           | 200           | 400            | Mc/s |
| $V_a$                      | 500           | 300           | 300            | V    |
| $I_a$                      | $2 \times 40$ | $2 \times 40$ | $2 \times 40$  | mA   |
| $V_{g2}$                   | 250           | 250           | 250            | V    |
| $I_{g2}$                   | $2 \times 4$  | $2 \times 4$  | $2 \times 3$   | mA   |
| $V_{g1}$                   | -80           | -50           | -50            | V    |
| $I_{g1}$ (a)               | $2 \times 1$  | $2 \times 1$  | $2 \times 1$   | mA   |
| $P_{drive}$                | 3             | 1.5           | —              | W    |
| $p_a$                      | $2 \times 4$  | $2 \times 3$  | $2 \times 5.5$ | W    |
| $P_{out}$                  | 31            | 17            | 13             | W    |
| $P_{load}$                 | 24            | 14            | 10             | W    |
| <i>for 100% Modulation</i> |               |               |                |      |
| $V_{g2}$ (pk) mod          | 185           | 185           | 185            | V    |
| $P_{mod}$                  | 20            | 12            | 12             | W    |

**(3) FREQUENCY TREBLER****Maximum Ratings**

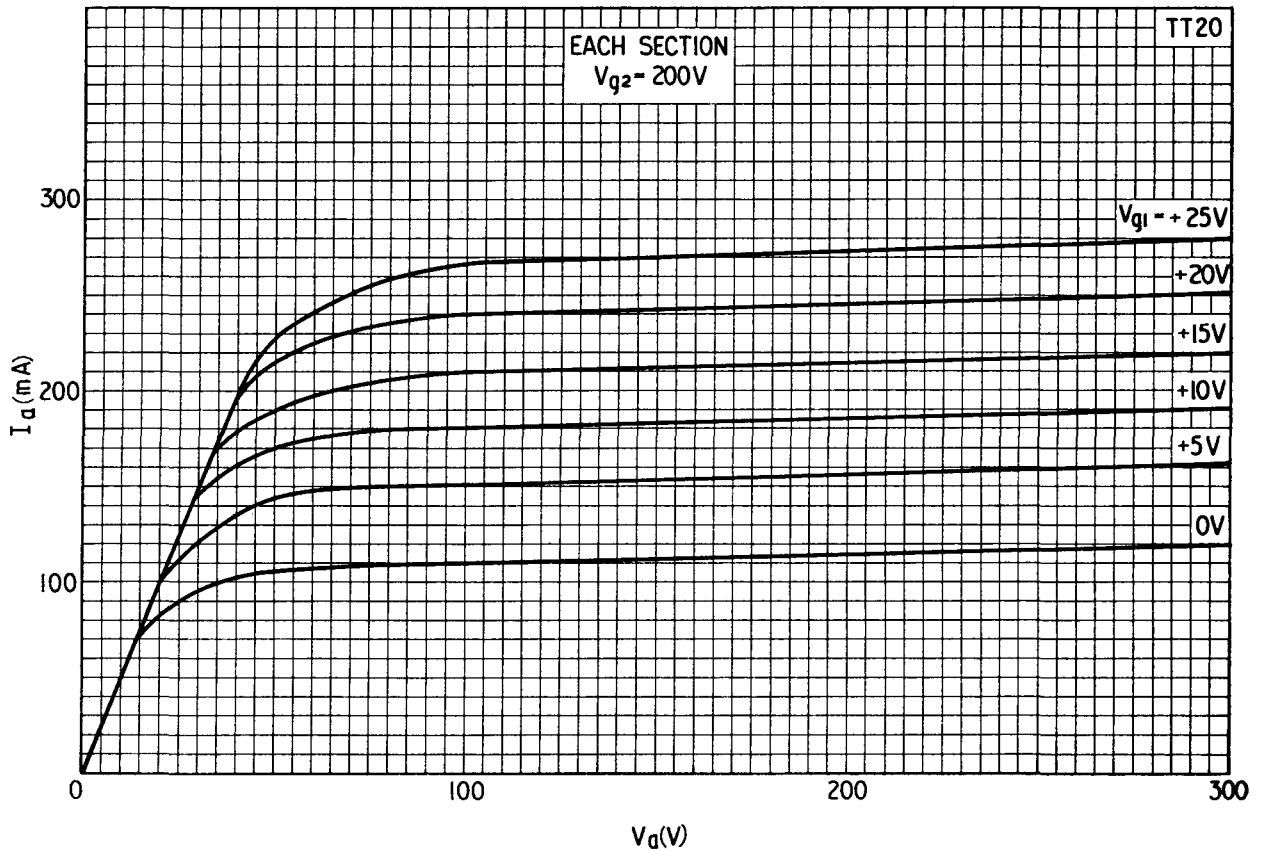
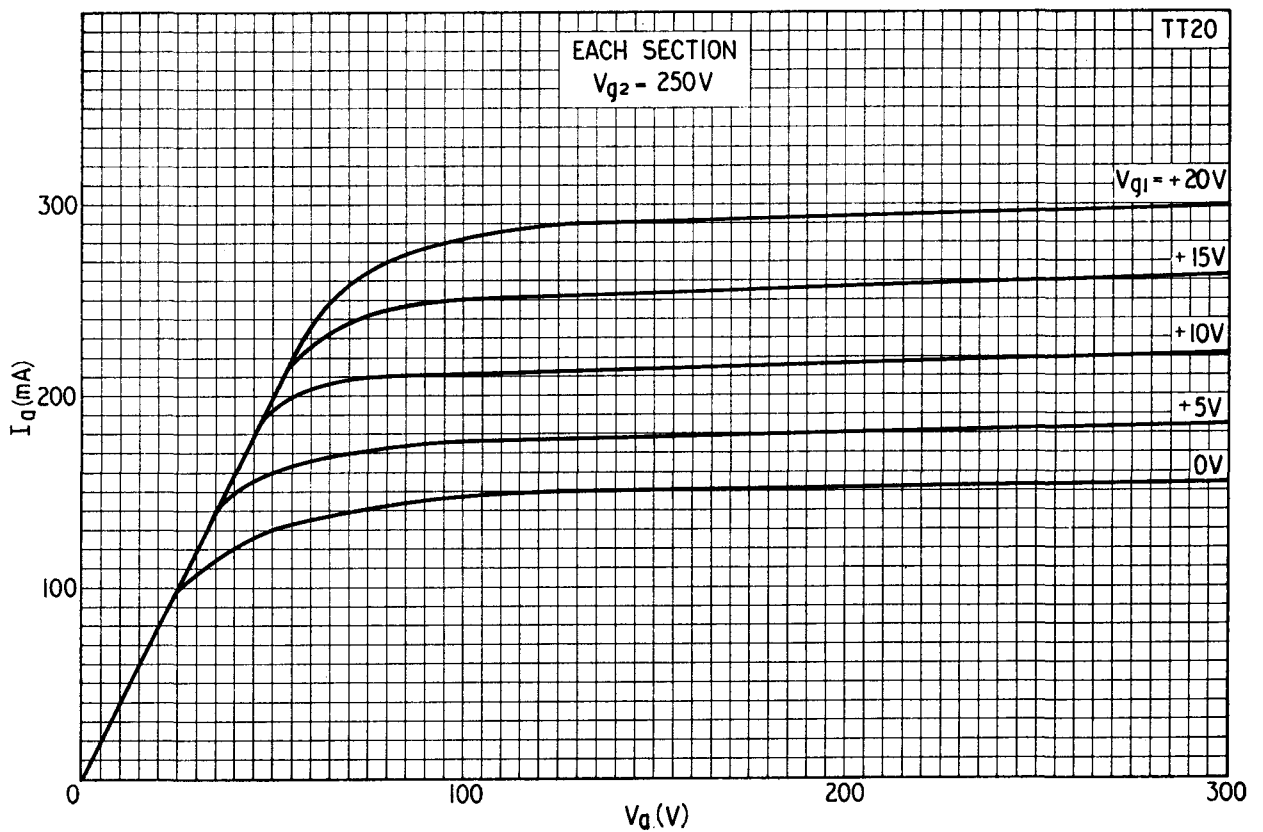
|                         |                |            |
|-------------------------|----------------|------------|
| $V_a$                   | 600            | V          |
| $p_a$                   | $2 \times 10$  | W          |
| $V_{g2}$                | 250            | V          |
| $p_{g2}$                | $2 \times 1.5$ | W          |
| $V_{g1}$                | -200           | V          |
| $p_{g1}$                | $2 \times 0.5$ | W          |
| $I_k$                   | $2 \times 50$  | mA         |
| $i_k$ (pk)              | $2 \times 275$ | mA         |
| $R_{g1-k}$ (fixed bias) | 50             | k $\Omega$ |
| $R_{g1-k}$ (auto bias)  | 100            | k $\Omega$ |

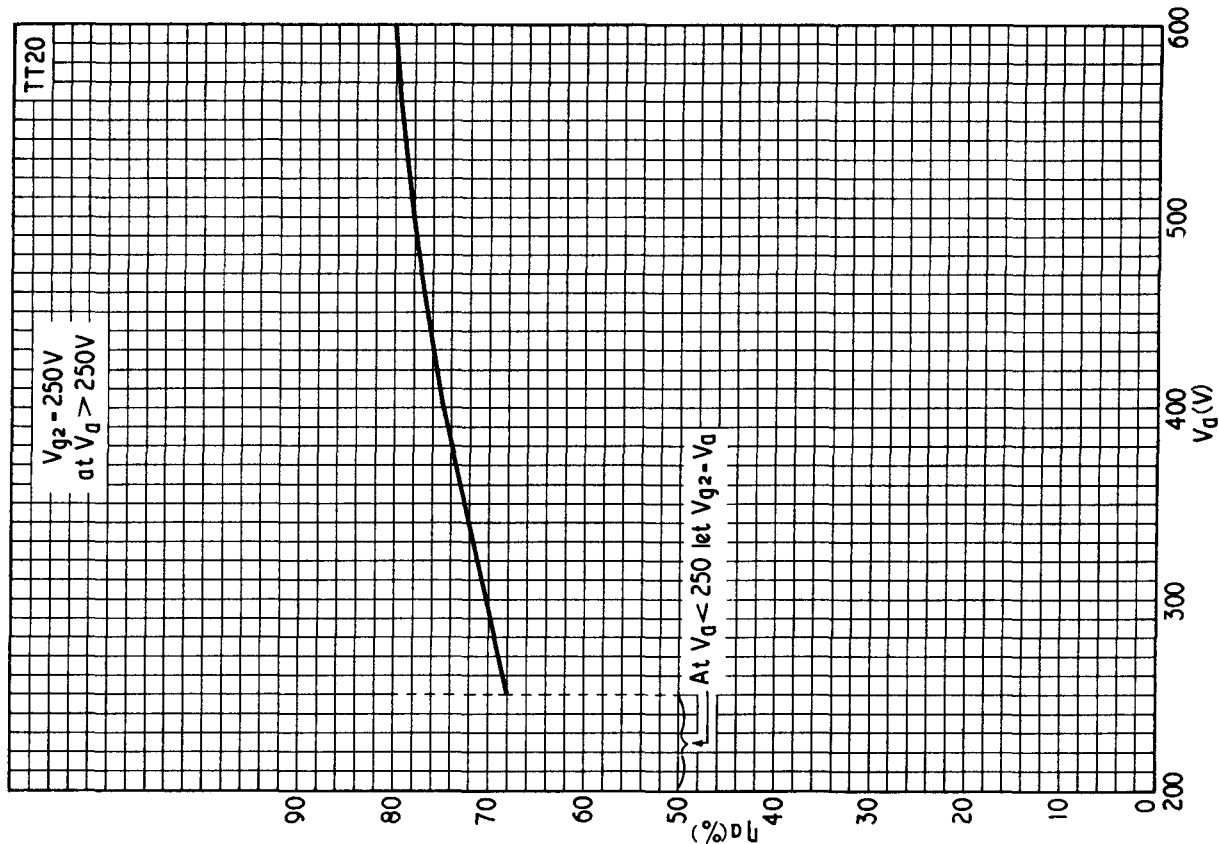
**Typical Operation**

|             |                |                |      |
|-------------|----------------|----------------|------|
| $f_{out}$   | 200            | 400            | Mc/s |
| $V_a$       | 300            | 300            | V    |
| $I_a$       | $2 \times 45$  | $2 \times 45$  | mA   |
| $V_{g2}$    | 250            | 250            | V    |
| $I_{g2}$    | $2 \times 3$   | $2 \times 2.8$ | mA   |
| $V_{g1}$    | -175           | -175           | V    |
| $I_{g1}$    | $2 \times 1.5$ | $2 \times 1.2$ | mA   |
| $P_{drive}$ | 4              | 5              | W    |
| $p_a$       | $2 \times 8$   | $2 \times 9.5$ | W    |
| $P_{out}$   | 10             | 8              | W    |
| $p_{load}$  | 8              | 6              | W    |

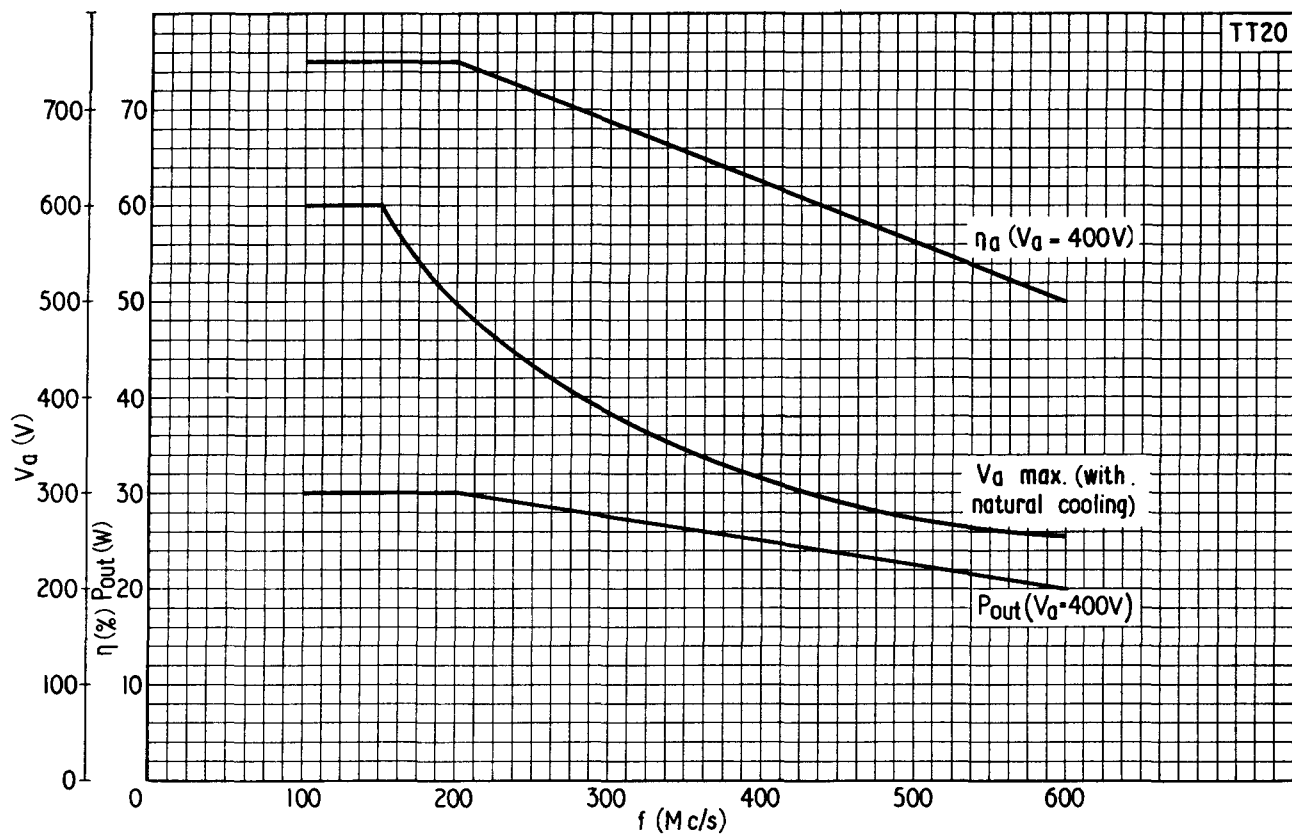
**NOTES**

(a) will vary between tubes.





Anode efficiency plotted against anode voltage for Class "C" push-pull telegraphy.



Frequency characteristic for "Class C" push-pull telegraphy showing anode efficiency and output power with  $V_a = 400V$ . The maximum anode voltage at which natural cooling is sufficient is also shown.