

# U.H.F. POWER DOUBLE TETRODE

# QQV03-25

## QUICK REFERENCE DATA

Double tetrode intended for use as v.h.f. power amplifier or frequency multiplier.

|                                    | Frequency Class 'C' | Class 'C'   |                |
|------------------------------------|---------------------|-------------|----------------|
|                                    | Multiplier          | Telephony   | Telegraphy or  |
|                                    |                     | Anode and   | F.M. Telephony |
|                                    |                     | Screen Grid |                |
|                                    |                     | Modulation  |                |
| f                                  | 158/475             | 180         | 180 Mc/s       |
| P <sub>out</sub>                   | 10                  | 43          | 67 W           |
| f max.                             | 600                 | 600         | 600 Mc/s       |
| V <sub>a</sub> max. (f < 250 Mc/s) | 750                 | 600         | 750 V          |
| (f = 600 Mc/s)                     | 600                 | 400         | 500 V          |
| p <sub>a</sub> max.                | 2 x 12.5            | 2 x 8.3     | 2 x 12.5 W     |

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS - TRANSMITTING VALVES.

## CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY

Maximum operating conditions

|                            |         |         |         |         |          |      |
|----------------------------|---------|---------|---------|---------|----------|------|
| f                          | 180     | 180     | 180     | 470     | 600      | Mc/s |
| P <sub>out</sub>           | 35      | 56      | 67      | 38      | 22       | W    |
| P <sub>load</sub>          | 31      | 48      | 57      | 31      | 17       | W    |
| $\eta_a$                   | 73      | 78      | 80      | 63      | 47       | %    |
| V <sub>a</sub>             | 400     | 600     | 700     | 500     | 400      | V    |
| I <sub>a</sub>             | 2 x 60  | 2 x 60  | 2 x 60  | 2 x 60  | 2 x 59   | mA   |
| V <sub>g2</sub>            | 250     | 250     | 250     | 250     | 250      | V    |
| I <sub>g2</sub>            | 2 x 4.5 | 2 x 4.5 | 2 x 4.5 | 2 x 3.0 | 2 x 3.0  | mA   |
| - V <sub>g1</sub>          | 50      | 60      | 65      | 55      | 50       | V    |
| I <sub>g1</sub>            | 2 x 1.0 | 2 x 1.0 | 2 x 1.0 | 2 x 1.0 | 2 x 0.8  | mA   |
| P <sub>load</sub> (driver) | 1.2     | 1.8     | 2.0     | 3.0     | 6.0      | W    |
| p <sub>a</sub>             | 2 x 6.5 | 2 x 8.0 | 2 x 8.5 | 2 x 11  | 2 x 12.5 | W    |

# CLASS 'C' TELEPHONY ANODE AND SCREEN-GRID MODULATION

Maximum operating conditions (Carrier conditions for 100% modulation)

|                            |          |         |          |          |          |      |
|----------------------------|----------|---------|----------|----------|----------|------|
| f                          | 180      | 180     | 180      | 180      | 470      | Mc/s |
| P <sub>out</sub>           | 19.5     | 26      | 35.5     | 43       | 17.5     | W    |
| P <sub>load</sub>          | 16.5     | 21      | 29       | 37       | 14.5     | W    |
| $\eta_a$                   | 68       | 71      | 74       | 75       | 60       | %    |
| V <sub>a</sub>             | 300      | 400     | 500      | 600      | 300      | V    |
| I <sub>a</sub>             | 2 x 48   | 2 x 41  | 2 x 48   | 2 x 48   | 2 x 48   | mA   |
| V <sub>g2</sub>            | 250      | 250     | 250      | 250      | 250      | V    |
| I <sub>g2</sub>            | 2 x 4.5  | 2 x 4.5 | 2 x 4.5  | 2 x 4.5  | 2 x 3.5  | mA   |
| - V <sub>g1</sub>          | 50       | 65      | 75       | 80       | 50       | V    |
| I <sub>g1</sub>            | 2 x 1.5  | 2 x 1.5 | 2 x 1.5  | 2 x 1.5  | 2 x 1.5  | mA   |
| P <sub>load (driver)</sub> | 2.0      | 2.5     | 3.0      | 3.5      | 3.0      | W    |
| p <sub>a</sub>             | 2 x 4.75 | 2 x 3.5 | 2 x 6.25 | 2 x 7.25 | 2 x 5.75 | W    |

For 100% modulation

|                     |      |      |     |     |      |   |
|---------------------|------|------|-----|-----|------|---|
| P <sub>mod</sub>    | 16.5 | 18.5 | 25  | 31  | 16.5 | W |
| v <sub>g2(pk)</sub> | 185  | 185  | 185 | 185 | 185  | V |

## FREQUENCY MULTIPLIER

Maximum operating conditions

|                                   |          |         |      |
|-----------------------------------|----------|---------|------|
| f <sub>out</sub> /f <sub>in</sub> | 180/60   | 475/158 | Mc/s |
| P <sub>out</sub>                  | 15       | 10      | W    |
| P <sub>load</sub>                 | 12       | 8.0     | W    |
| $\eta_a$                          | 38       | 27      | %    |
| V <sub>a</sub>                    | 400      | 300     | V    |
| I <sub>a</sub>                    | 2 x 50   | 3 x 50  | mA   |
| V <sub>g2</sub>                   | 250      | 250     | V    |
| I <sub>g2</sub>                   | 2 x 4.0  | 2 x 4.0 | mA   |
| - V <sub>g1</sub>                 | 175      | 175     | V    |
| I <sub>g1</sub>                   | 2 x 1.5  | 2 x 1.5 | mA   |
| P <sub>load (driver)</sub>        | 4.0      | 6.0     | W    |
| p <sub>a</sub>                    | 2 x 12.5 | 2 x 10  | W    |

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## ABSOLUTE MAXIMUM RATINGS

|                                                 | Frequency<br>Multiplier | Class 'C'<br>Telephony | Class 'C'<br>Telegraphy |            |
|-------------------------------------------------|-------------------------|------------------------|-------------------------|------------|
| $V_a$ max.<br>( $f < 250\text{Mc/s}$ )          | 750                     | 600                    | 750                     | V          |
| ( $f = 600\text{Mc/s}$ )                        | 600                     | 400                    | 500                     | V          |
| $V_{g2}$ max.                                   | 300                     | 300                    | 300                     | V          |
| $-V_{g1}$ max.                                  | 200                     | 200                    | 200                     | V          |
| $I_k$ max.                                      | 2 x 60                  | 2 x 50                 | 2 x 66                  | mA         |
| $p_a$ max.                                      | 2 x 12.5                | 2 x 8.3                | 2 x 12.5                | W          |
| $p_{g2}$ max.                                   | 2 x 1.5                 | 2 x 1.2                | 2 x 1.5                 | W          |
| $I_{g1}$ max.                                   | 2 x 2.5                 | 2 x 2.5                | 2 x 2.5                 | mA         |
| $p_{g1}$ max.                                   | 2 x 0.5                 | 2 x 0.5                | 2 x 0.5                 | W          |
| $R_{g1-k}$ max. per section<br>(fixed bias)     | 50                      | 50                     | 50                      | k $\Omega$ |
| $R_{g1-k}$ max. per section<br>(automatic bias) | 100                     | 100                    | 100                     | k $\Omega$ |
| $V_{h-k}$ max.                                  | 100                     | 100                    | 100                     | V          |
| $V_{g2(b)}$ max.                                | 600                     | 600                    | 600                     | V          |

## CATHODE

Indirectly heated. The heater is centre tapped and the two sections may be operated in series or parallel.

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

## CAPACITANCES

|                                       |     |     |
|---------------------------------------|-----|-----|
| * $c_{a-g1}$ (each section)           | 40  | mpF |
| $c_{g1-all}$ (each section)           | 7.5 | pF  |
| $c_{a-all}$ (each section)            | 2.6 | pF  |
| $c_{out}$ (two sections in push pull) | 1.6 | pF  |
| $c_{in}$ (two sections in push pull)  | 4.4 | pF  |

\* Internally neutralised for push-pull operation.

CHARACTERISTICS (each section) measured at  $I_a = 40\text{mA}$

|               |     |      |
|---------------|-----|------|
| $g_m$         | 2.5 | mA/V |
| $\mu_{g1-g2}$ | 8.0 |      |

MOUNTING POSITION

Any

COOLING

Radiation and convection cooled

Maximum temperatures

|            |     |                    |
|------------|-----|--------------------|
| Base pin   | 180 | $^{\circ}\text{C}$ |
| Bulb       | 250 | $^{\circ}\text{C}$ |
| Anode seal | 250 | $^{\circ}\text{C}$ |

Anode connectors providing a high degree of heat transfer by radiation or by conduction should be used.

Natural cooling is sufficient with:-

$V_a = 600\text{V}$  at frequencies up to  $150\text{Mc/s}$

$V_a = 500\text{V}$  at frequencies up to  $200\text{Mc/s}$

$V_a = 300\text{V}$  at frequencies up to  $430\text{Mc/s}$

Above these limits or with high ambient temperatures it may be necessary to direct a flow of air (up to  $5\text{ft}^3/\text{min}$ ,  $0.15\text{m}^3/\text{min}$ ) on the top of the bulb to keep the seal temperature within the stated limit.

PHYSICAL DATA

|                 |     |    |
|-----------------|-----|----|
|                 | oz  | g  |
| Weight of valve | 2.0 | 57 |

ACCESSORIES

socket 40202

DIMENSIONS

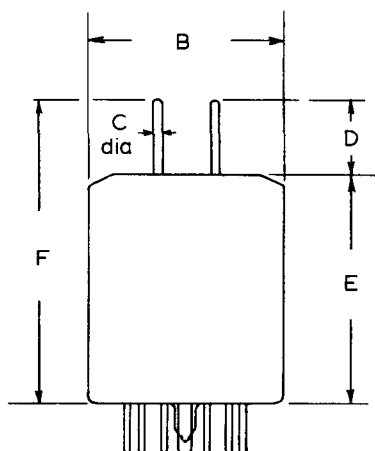
|   | Inches            | millimetres    |
|---|-------------------|----------------|
| B | $1.772 \pm 0.039$ | $45 \pm 1$     |
| C | $0.079 \pm 0.001$ | $2.0 \pm 0.01$ |
| D | $0.650 \pm 0.059$ | $16.5 \pm 1.5$ |
| E | 2.165             | 55 max         |
| F | 2.874             | 73 max         |
| G | $0.098 \pm 0.001$ | $2.5 \pm 0.03$ |
| H | $0.551 \pm 0.001$ | $14 \pm 0.03$  |

Inch dimensions are derived from original millimetre dimensions.

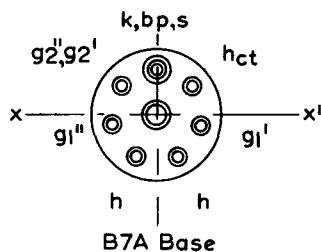
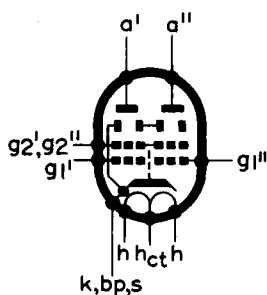
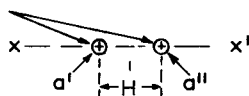
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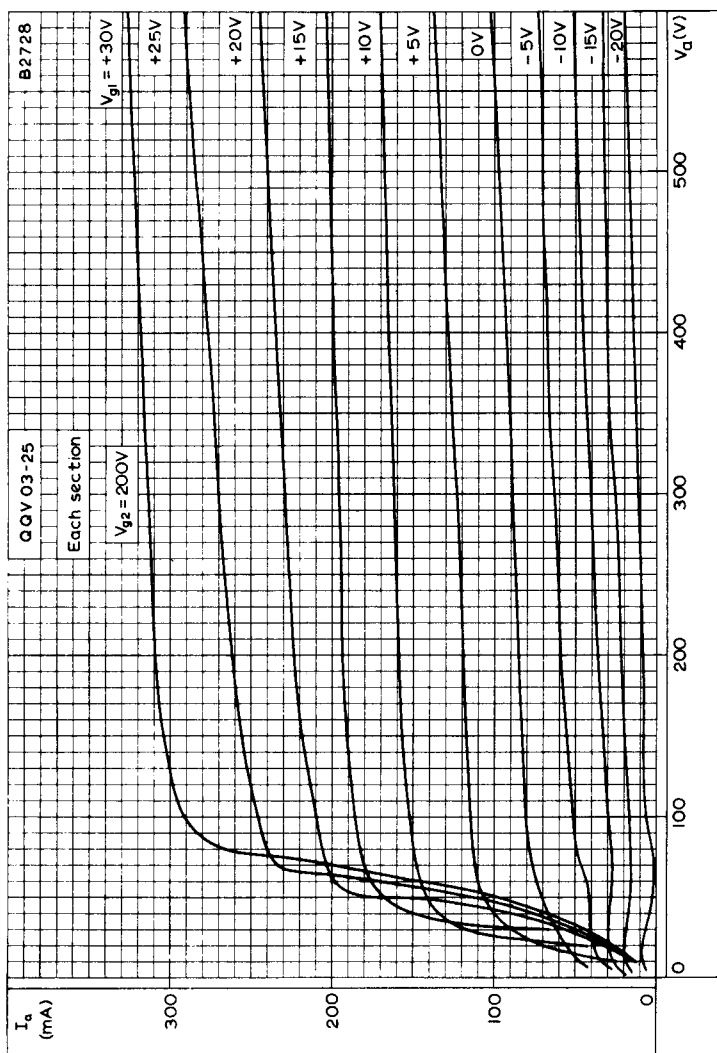


Location of  
anode pins  
within circles  
of dia G.

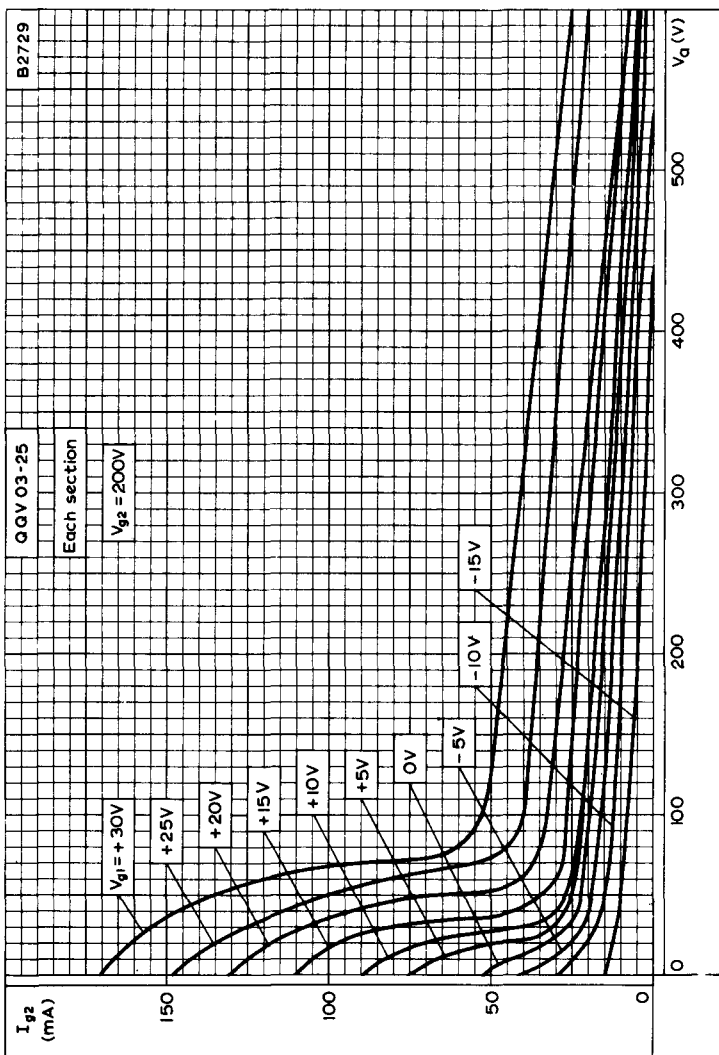


# U.H.F. POWER DOUBLE TETRODE

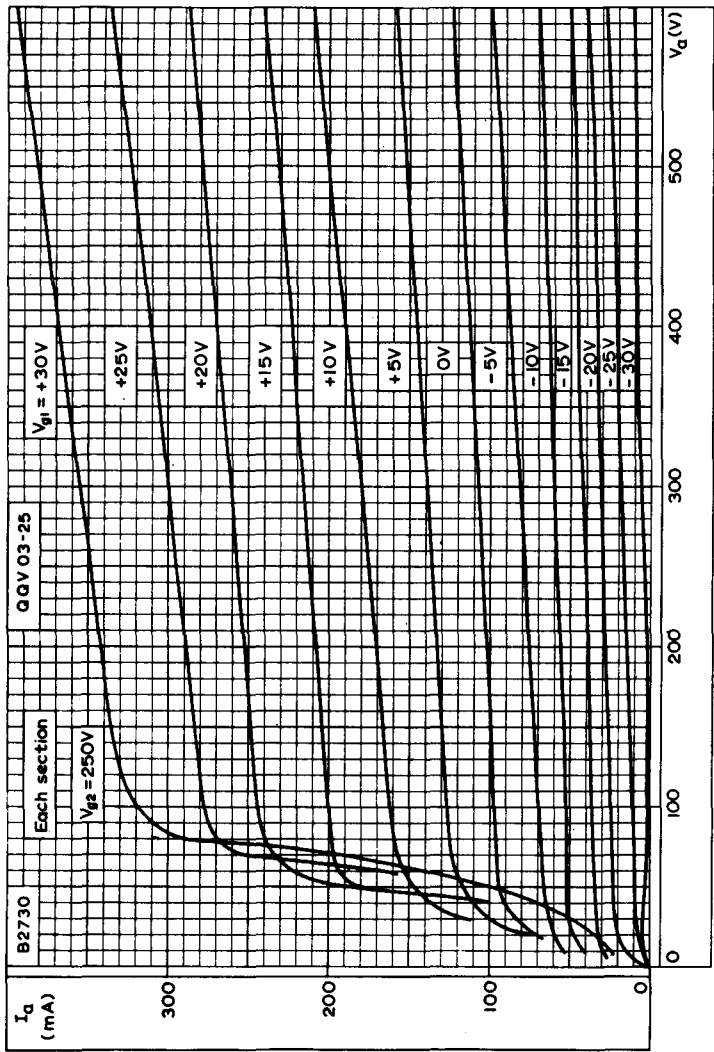
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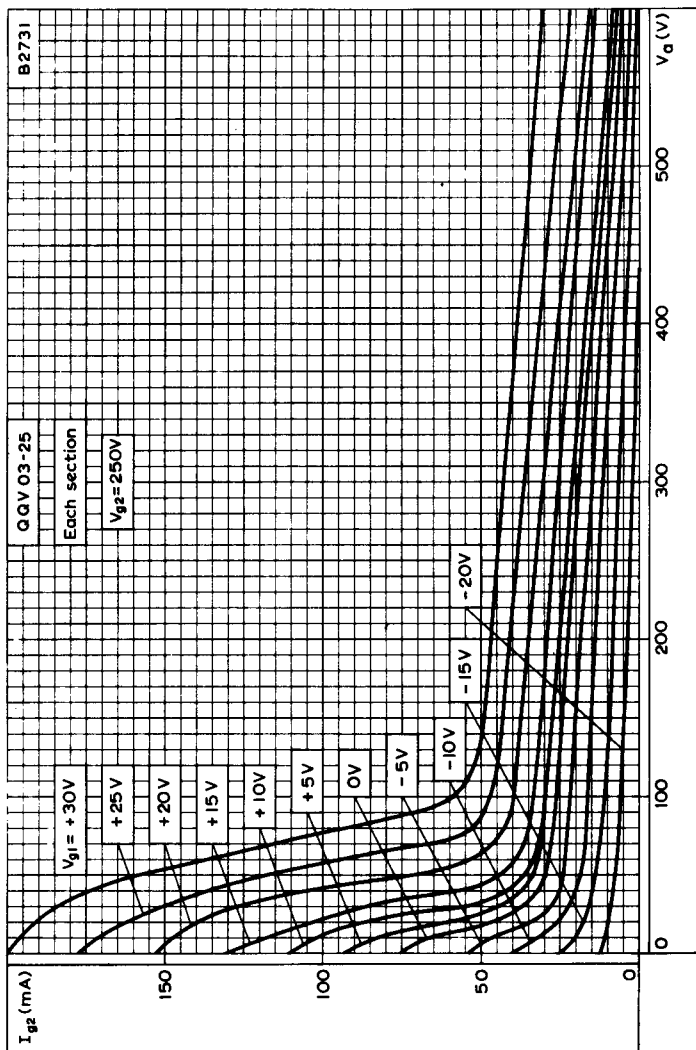
ANODE CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE  
WITH CONTROL-GRID VOLTAGE AS PARAMETER  $V_{g2} = 200V$



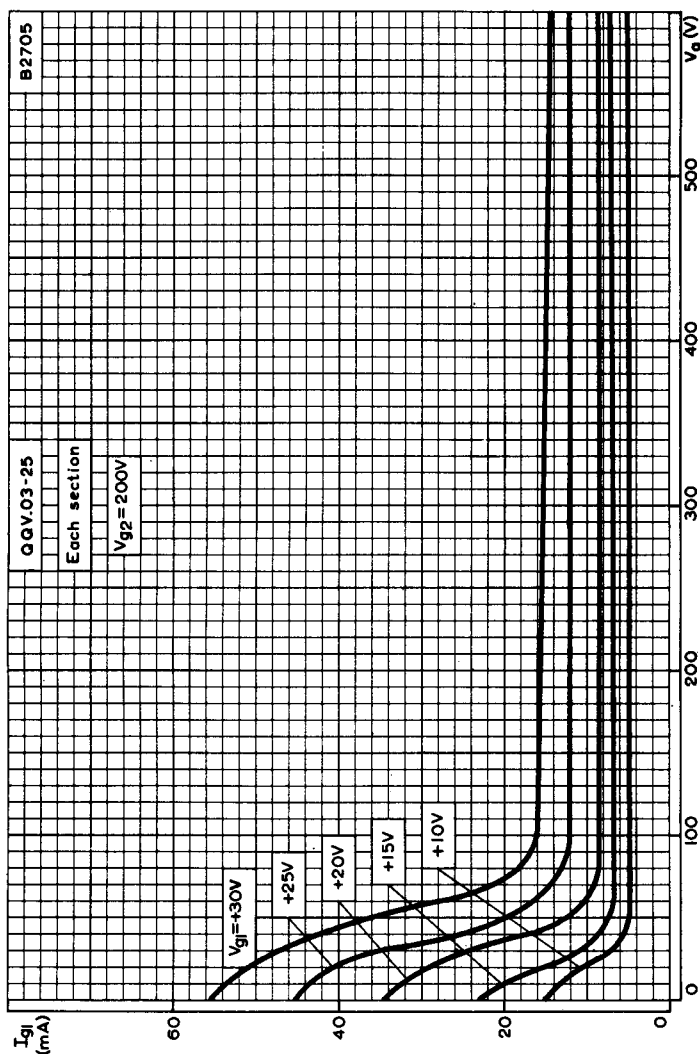
SCREEN-GRID CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER  $V_{g2} = 200V$



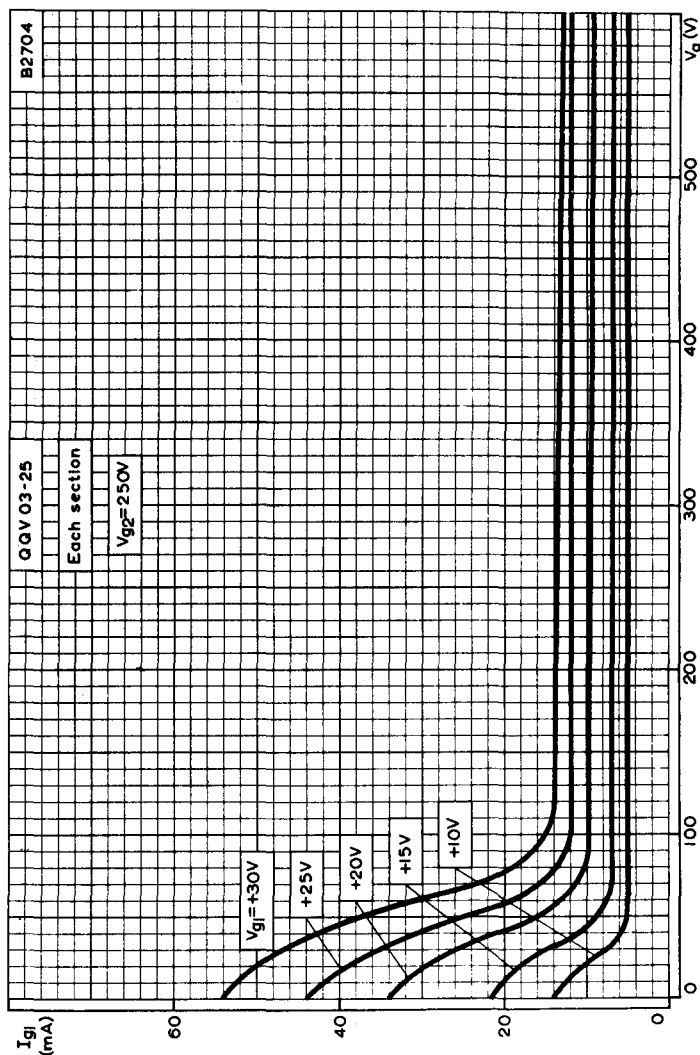
ANODE CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE  
WITH CONTROL-GRID VOLTAGE AS PARAMETER  $V_{g2} = 250V$



SCREEN-GRID CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER  $V_{g2} = 250V$



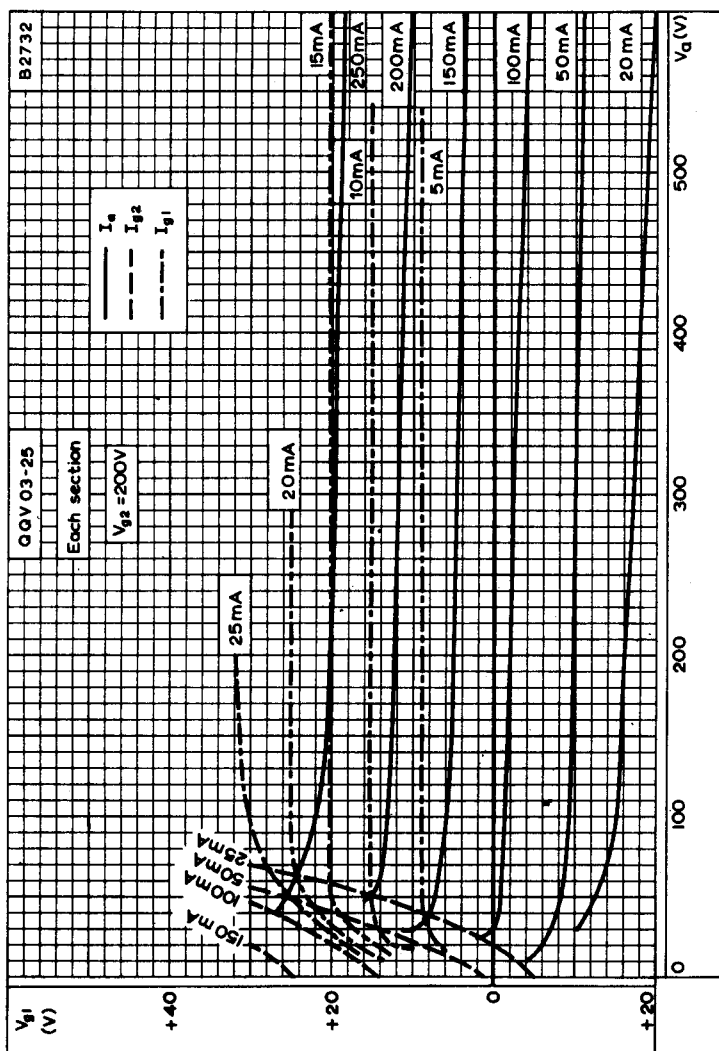
CONTROL-GRID CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER  $V_{g2} = 200V$



CONTROL-GRID CURRENT FOR EACH SECTION PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER  $V_{g2} = 250V$

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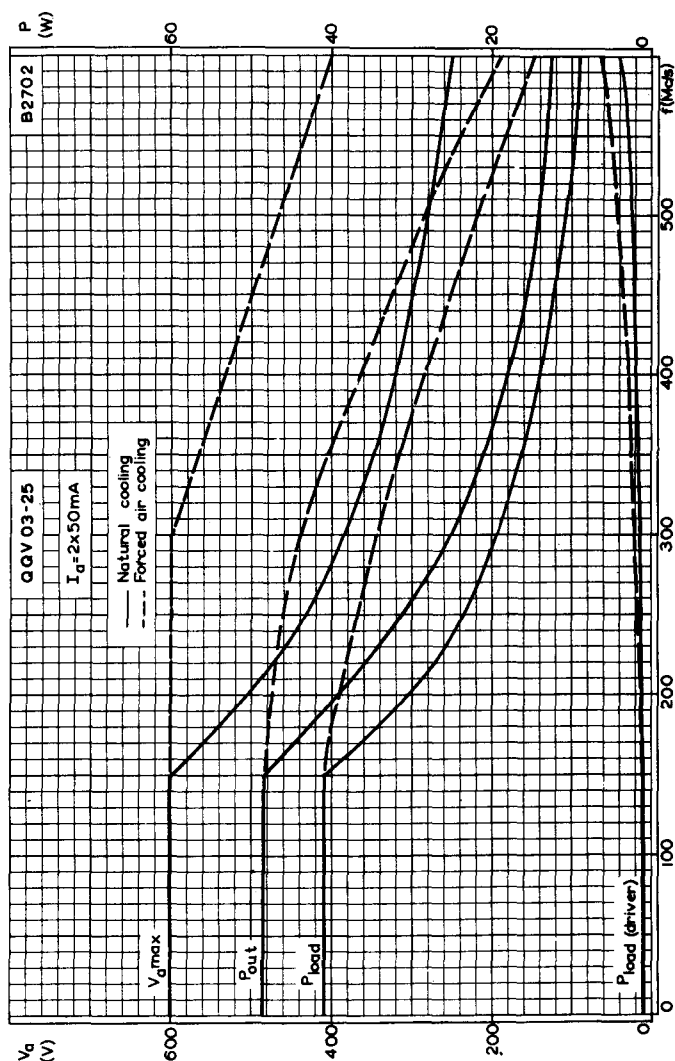


CONSTANT CURRENT CHARACTERISTICS FOR EACH SECTION  $V_{g2} = 200V$

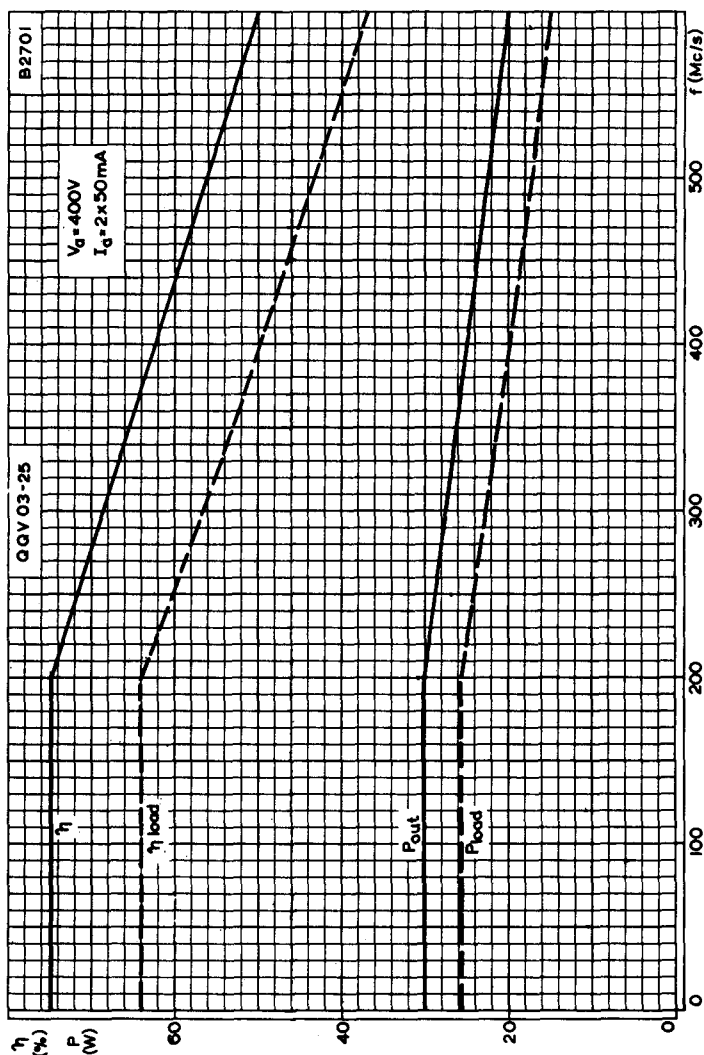


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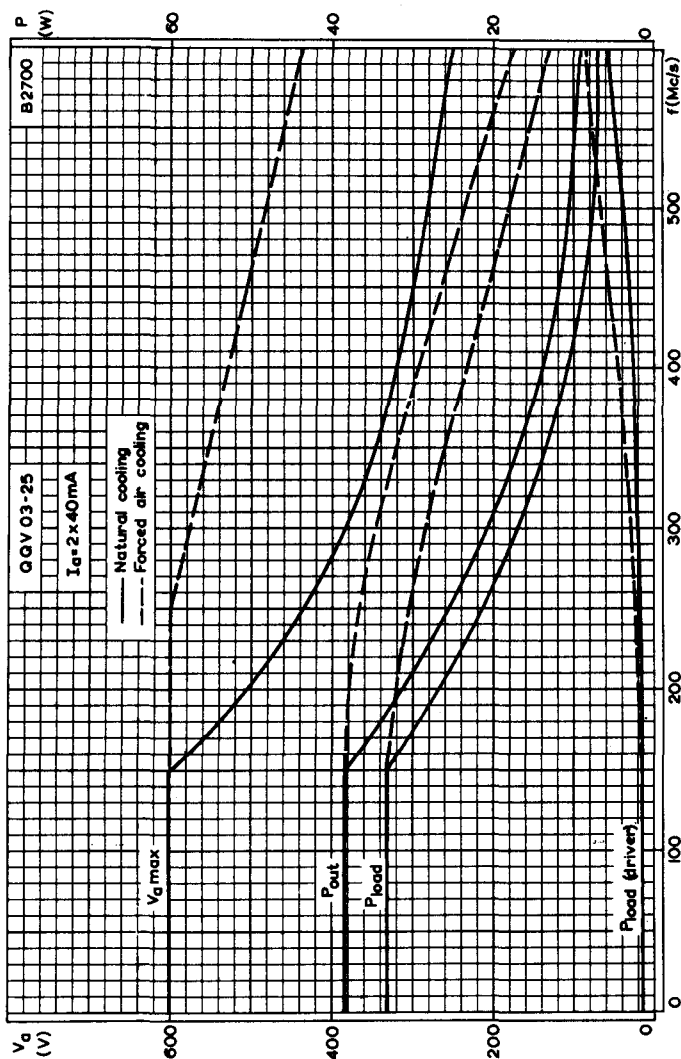
MAXIMUM OPERATING CONDITIONS FOR A PUSH-PULL R. F. POWER  
AMPLIFIER (CLASS 'C' TELEGRAPHY OR F. M. TELEPHONY)



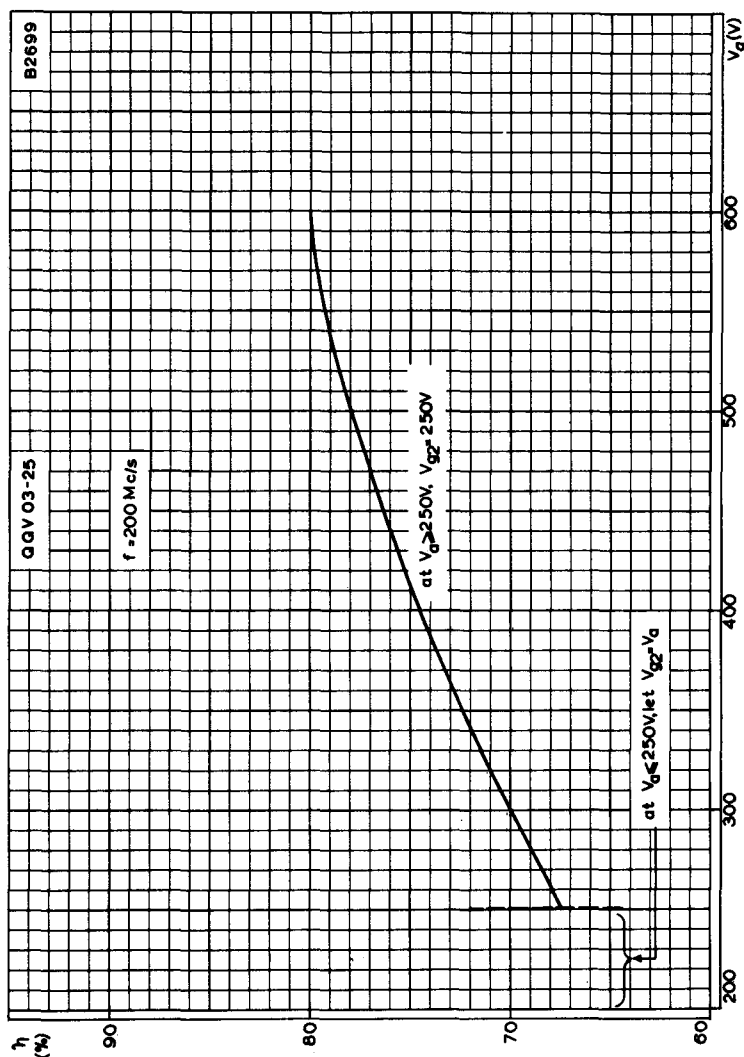
FREQUENCY CHARACTERISTICS FOR OPERATING CONDITIONS AS A PUSH-PULL R.F. POWER AMPLIFIER (CLASS 'C' TELEGRAPHY OR F.M. TELEPHONY)

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MAXIMUM OPERATING CONDITIONS FOR AN ANODE AND SCREEN-GRID  
MODULATED R. F. POWER AMPLIFIER (CLASS 'C' TELEPHONY)



ANODE EFFICIENCY PLOTTED AGAINST ANODE VOLTAGE FOR CLASS 'C'  
PUSH-PULL TELEGRAPHY