



# Twin Triode Type DET 19

(POWER AMPLIFIER, OSCILLATOR AND MULTIPLIER)

**General.** The DET 19 is a low-power transmitting valve, consisting of two triodes in one envelope, suitable for use as a power amplifier, oscillator or frequency multiplier, at frequencies up to 250 Mc/s. It is necessary to neutralise the valve under all conditions of amplifier service; two capacitors which may each have a maximum value of 5 pF, are required for each valve.

**Cooling.** The valve must be adequately ventilated as it becomes very hot under normal operating conditions. No visible heating of the anodes should occur under any condition of operation.

## APPROXIMATE DATA

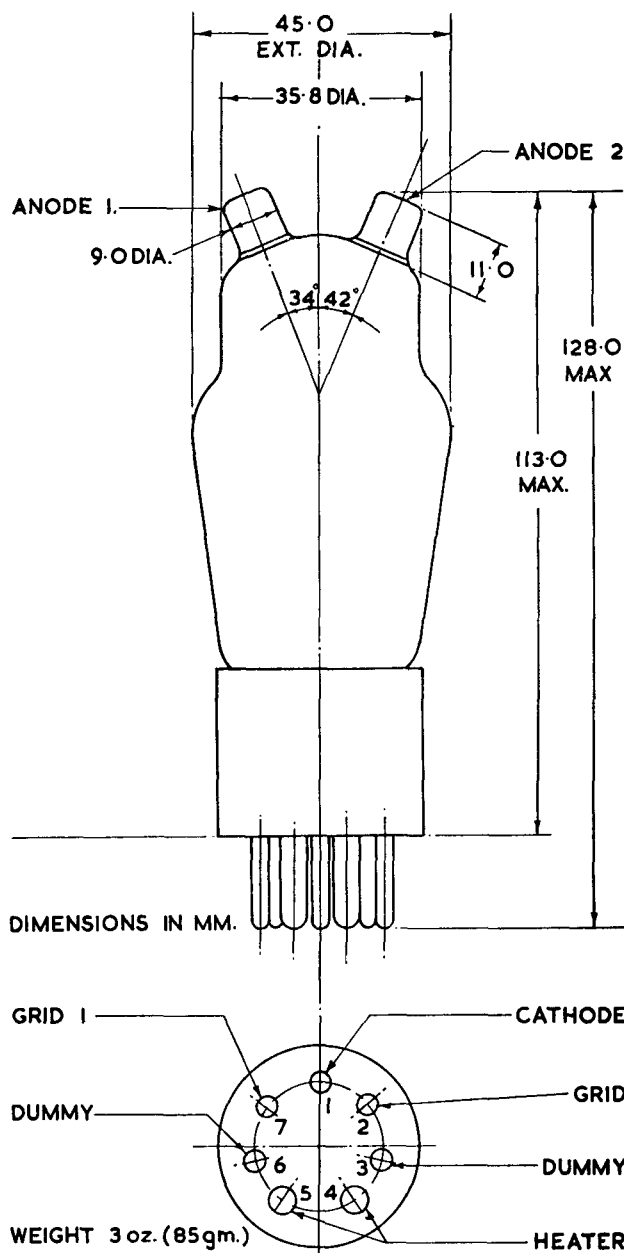
|                                       |             |                |
|---------------------------------------|-------------|----------------|
| $V_h$                                 | 6.3         | V              |
| $I_h$                                 | 0.8         | A              |
| $V_{a(max)}$                          | 300         | V              |
| $I_{a(max)}$ per anode                | 40          | mA             |
| $P_{a(max)}$ per anode                | 5           | W              |
| $g_m$                                 | taken at    | 2.1 mA/V       |
| $\mu$                                 | $V_a$ 300 V | 7              |
| $r_a$                                 | $I_a$ 25 mA | 3,340 $\Omega$ |
| $V_{h-k(max)}$                        | 100         | V              |
| $C_{a'-a''}$                          | 1           | pF             |
| $C_{a-gl}$ (other electrodes earthed) | 2.3         | pF             |
| $C_{a-k}$                             | 0.6         | pF             |
| $C_{gl-k}$                            | 4.2         | pF             |

## (1) PUSH-PULL RF AMPLIFIER. CLASS C TELEGRAPHY

(Key down conditions, per valve, without modulation)  
Maximum permissible ratings

|          |      |    |
|----------|------|----|
| $V_a$    | 300  | V  |
| $V_{gl}$ | -150 | V  |
| $I_a$    | 80   | mA |
| $I_{gl}$ | 25   | mA |
| $P_a$    | 24   | W  |
| $P_a$    | 10   | W  |

both triodes



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| Typical Operation                          |       |       |       |       |      |
|--------------------------------------------|-------|-------|-------|-------|------|
| f                                          | 7     | 7     | 7     | 7     | Mc/s |
| V <sub>a</sub>                             | 300   | 250   | 200   | 150   | V    |
| I <sub>a</sub>                             | 80    | 80    | 70    | 65    | mA   |
| V <sub>g1</sub> (i) from a fixed supply of | -50   | -50   | -50   | -50   | V    |
| (ii) via R <sub>k</sub>                    | 625   | 625   | 715   | 770   | Ω    |
| (iii) via R <sub>g1-k</sub>                | 3,300 | 2,800 | 2,800 | 2,500 | Ω    |
| I <sub>g1</sub> (a)                        | 15    | 18    | 18    | 20    | mA   |
| v <sub>g1'-g1''</sub> (pk)                 | 210   | 220   | 220   | 230   | V    |
| P <sub>dr</sub> (a)                        | 2     | 2.5   | 2.5   | 3     | W    |
| P <sub>out</sub>                           | 15.9  | 12.5  | 8.5   | 5.4   | W    |
| η                                          | 66.5  | 62.5  | 60.5  | 55.5  | %    |

## (2) PUSH-PULL ANODE MODULATED RF AMPLIFIER. CLASS C TELEPHONY

(Carrier conditions, per valve, permissible modulation 100%)

Maximum permissible ratings

|                 |      |    |
|-----------------|------|----|
| V <sub>a</sub>  | 250  | V  |
| V <sub>g1</sub> | -150 | V  |
| I <sub>a</sub>  | 55   | mA |
| I <sub>g1</sub> | 25   | mA |
| P <sub>a</sub>  | 13.5 | W  |
| P <sub>a</sub>  | 6.5  | W  |

| Typical Operation                         |       |       |      |
|-------------------------------------------|-------|-------|------|
| f                                         | 7     | 7     | Mc/s |
| V <sub>a</sub>                            | 250   | 200   | V    |
| I <sub>a</sub>                            | 50    | 50    | mA   |
| V <sub>g</sub> (i) from a fixed supply of | -45   | -40   | V    |
| (ii) via R <sub>k</sub>                   | 900   | 800   | Ω    |
| (iii) via R <sub>g1-k</sub>               | 6,500 | 5,000 | Ω    |
| I <sub>g1</sub>                           | 7     | 8     | mA   |
| v <sub>g1'-g1''</sub> (pk)                | 180   | 170   | V    |
| P <sub>dr</sub> (a)                       | 1     | 1     | W    |
| P <sub>out</sub>                          | 8.5   | 6.5   | W    |
| η                                         | 68    | 65    | %    |

## (3) PUSH-PULL RF AMPLIFIER. CLASS B TELEPHONY

(Carrier conditions, per valve, permissible modulation 100%)

Maximum permissible ratings

|                 |      |    |
|-----------------|------|----|
| V <sub>a</sub>  | 300  | V  |
| I <sub>a</sub>  | 45   | mA |
| I <sub>g1</sub> | 25   | mA |
| P <sub>a</sub>  | 13.5 | W  |
| p <sub>a</sub>  | 10   | W  |

| Typical Operation                             |      |      |      |
|-----------------------------------------------|------|------|------|
| f                                             | 7    | 7    | Mc/s |
| V <sub>a</sub>                                | 300  | 200  | V    |
| I <sub>a</sub>                                | 40   | 40   | mA   |
| V <sub>g</sub> (i) from a fixed supply of (c) | -21  | -13  | V    |
| (ii) via R <sub>k</sub> (c)                   | 525  | 325  | Ω    |
| I <sub>g1</sub> (a)                           | 1.8  | 3    | mA   |
| v <sub>g1'-g1''</sub> (pk)                    | 70   | 70   | V    |
| P <sub>dr</sub> (a) (b)                       | 1.5  | 2.2  | W    |
| P <sub>out</sub>                              | 3.5  | 2.3  | W    |
| η                                             | 29.3 | 28.3 | %    |

## (4) PUSH-PULL FREQUENCY DOUBLER

Maximum permissible ratings

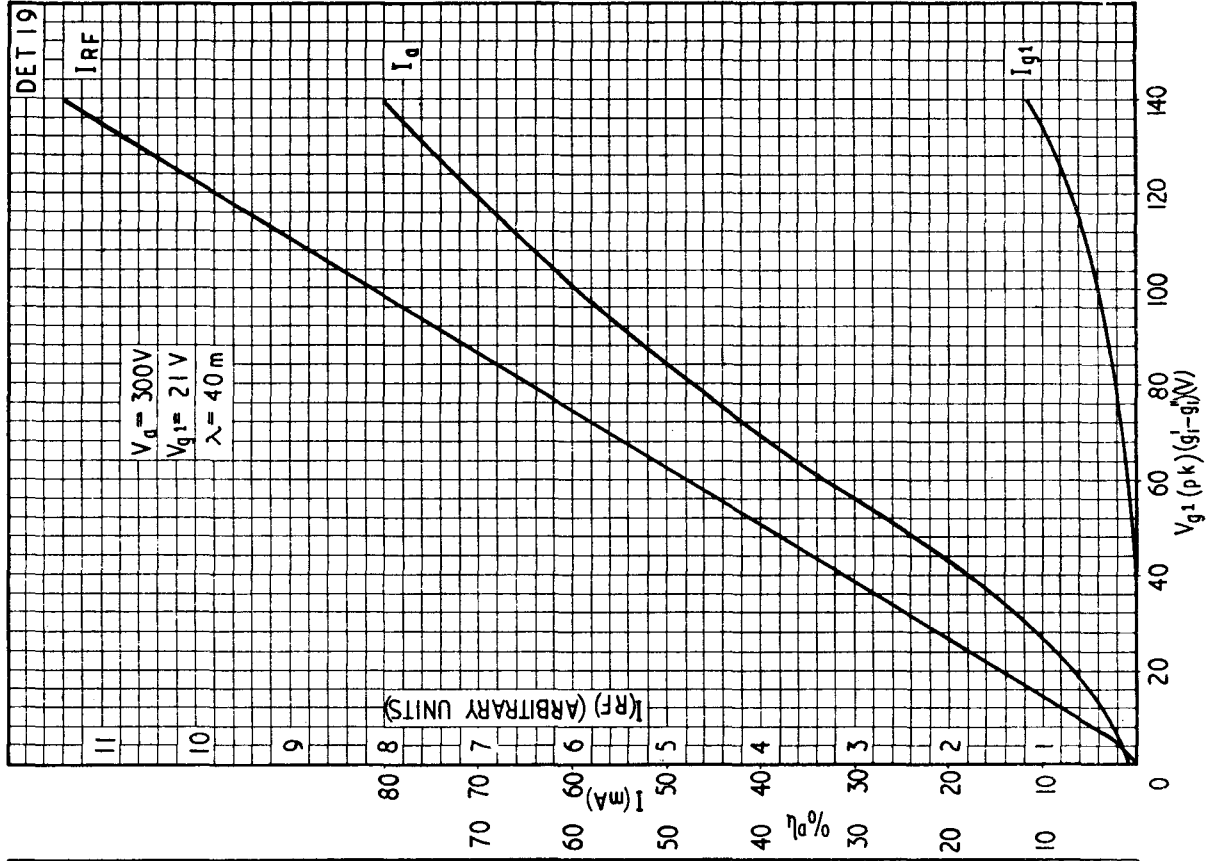
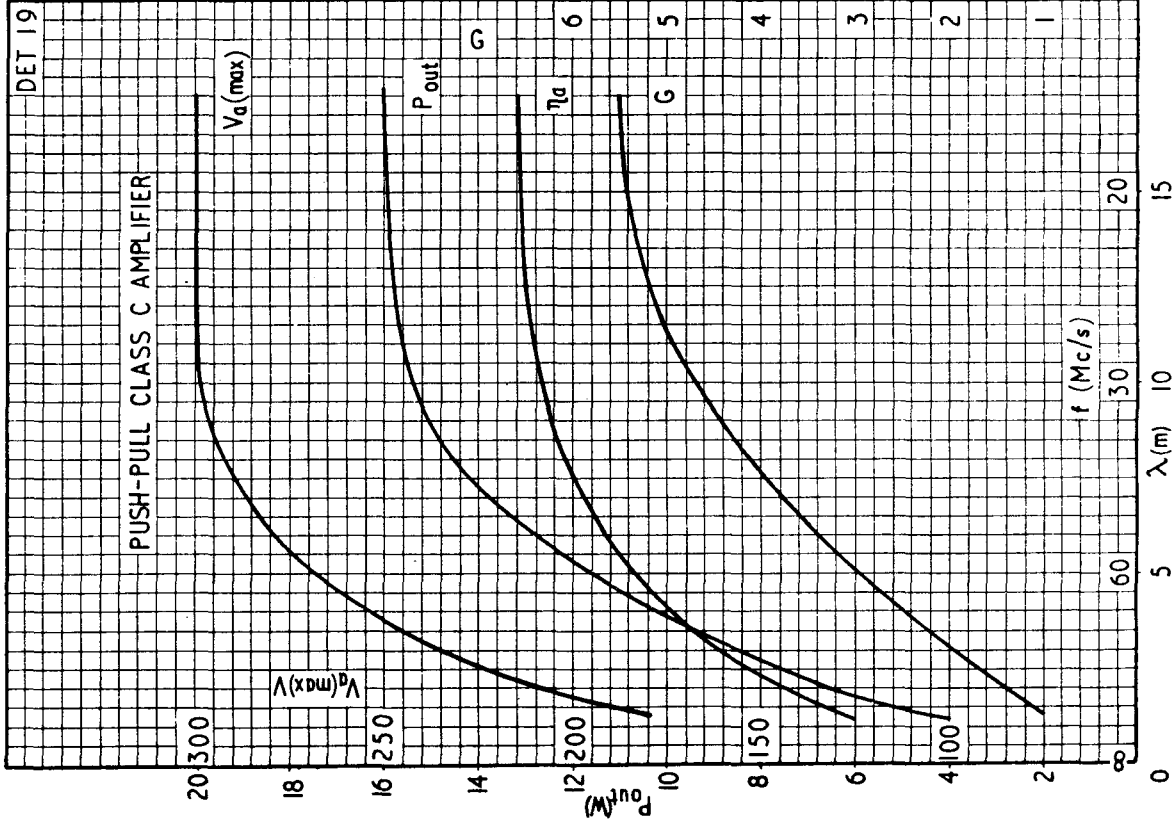
|                 |      |    |
|-----------------|------|----|
| V <sub>a</sub>  | 300  | V  |
| V <sub>g1</sub> | -150 | V  |
| I <sub>a</sub>  | 80   | mA |
| I <sub>g1</sub> | 25   | mA |
| P <sub>a</sub>  | 24   | W  |
| p <sub>a</sub>  | 10   | W  |

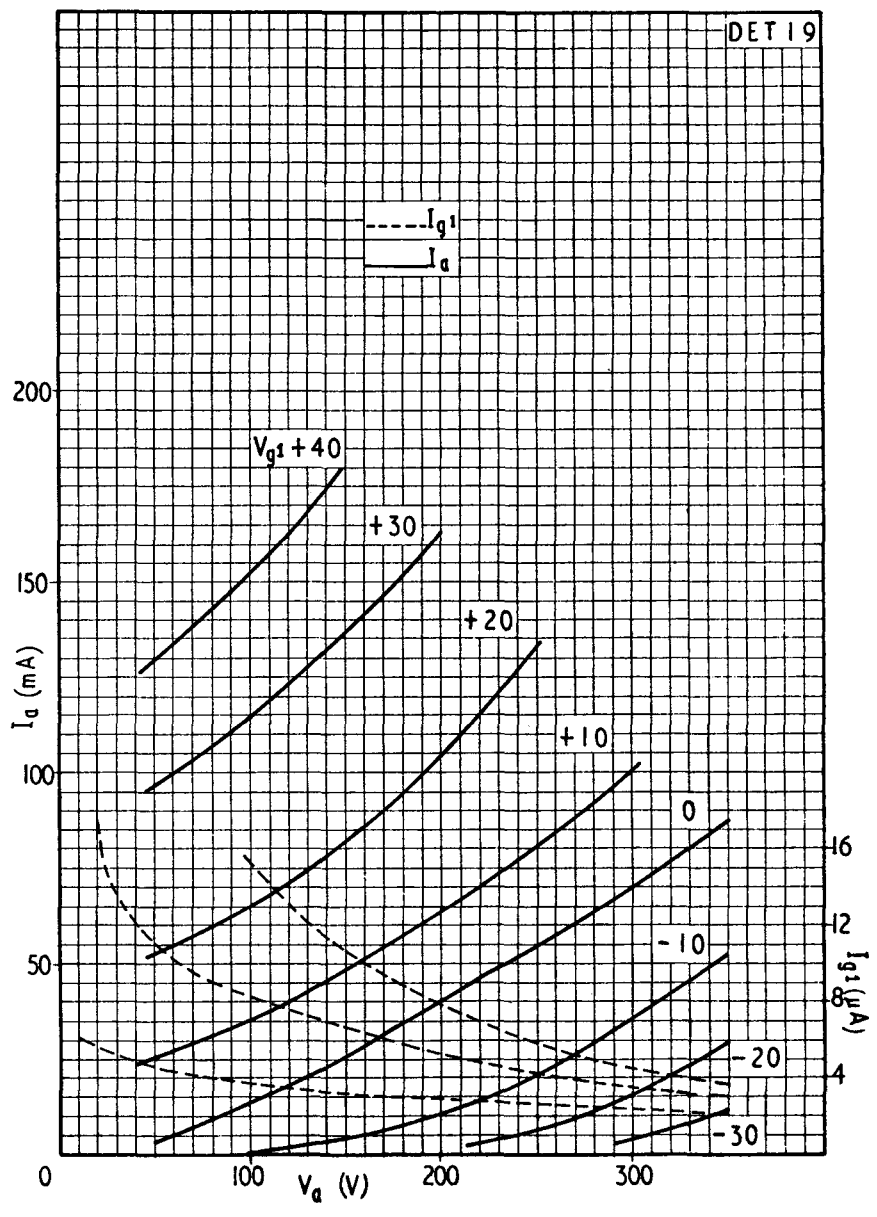
| Typical Operation  |     |     |     |         |
|--------------------|-----|-----|-----|---------|
| f <sub>(exc)</sub> | 7   | 7   | 7   | 40 Mc/s |
| f <sub>(out)</sub> | 14  | 14  | 14  | 80 Mc/s |
| V <sub>a</sub>     | 300 | 250 | 200 | 250 V   |
| I <sub>a</sub>     | 70  | 70  | 70  | 60 mA   |

|                                           |       |       |       |        |          | Typical Operation                    |        |          |
|-------------------------------------------|-------|-------|-------|--------|----------|--------------------------------------|--------|----------|
| $V_{g1}$ (i) from a fixed supply of       | -70   | -70   | -70   | -150   | V        | $f_{(xtal)}$                         | 7      | Mc/s     |
| (ii) via $R_k$                            | 1,000 | 1,000 | 1,000 | —      | $\Omega$ | $f_{out}$                            | 14     | Mc/s     |
| (iii) via $R_{g1-k}$                      | 5,800 | 4,400 | 3,900 | 30,000 | $\Omega$ | <b>Triode (1) Crystal Oscillator</b> |        |          |
| $I_{g1}$ (a)                              | 12    | 16    | 18    | 5      | mA       | $V_a$ (d)                            | 250    | V        |
| $V_{g1}'-g1''$ (pk)                       | 240   | 250   | 250   | —      | V        | $I_a$                                | 15     | mA       |
| $P_{dr}$                                  | 2.5   | 3     | 3     | —      | W        | $V_{g1}$ via $R_{g1-k}$              | 30,000 | $\Omega$ |
| $P_{out}$                                 | 10.5  | 8     | 6.3   | 5.1    | W        | $I_{g1}$                             | 0.8    | mA       |
| $\eta$                                    | 50    | 45.5  | 45    | 33     | %        | <b>Triode (2) Frequency Doubler</b>  |        |          |
| <b>(5) CRYSTAL OSCILLATOR AND DOUBLER</b> |       |       |       |        |          | $V_a$                                | 300    | V        |
| <i>Maximum permissible ratings</i>        |       |       |       |        |          | $I_a$                                | 26     | mA       |
| $V_a$                                     |       |       | 300   |        | V        | $V_{g1}$ (i) from a fixed supply of  | -90    | V        |
| $V_{g1}$                                  |       |       | -150  |        | V        | (ii) via $R_{g1-k}$                  | 45,000 | $\Omega$ |
| $I_a$                                     |       |       | 40    |        | mA       | $I_{g1}$                             | 2      | mA       |
| $P_a$                                     |       |       | 5     |        | W        | $P_{out}$                            | 2.8    | W        |

#### NOTES

- Subject to wide variations depending on the impedance of the load circuit.
- At crest of modulation cycle.
- Grid leak operation is not permissible.
- The anode voltage applied to the first triode should be kept as low as is consistent with adequate output.











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