VALVE ELECTRONIC **CV2494**

Specification Mintech./CV2494

Issue 1A, Dated December 1967

To be read in conjunction with K1001 except where otherwise stated.

**SECURITY**

| Specification | Valve |
|---|---|
| UNCLASSIFIED | UNCLASSIFIED |

TYPE OF VALVE - Tunable Reflex Klystron Oscillator

CATHODE - Indirectly Heated

Envelope - Metal Ceramic

Prototype - VA201B

**MARKING**
See K1001/4

**BASE**
Flying Leads 18" Long

**RATINGS AND CHARACTERISTICS**

Absolute non-simultaneous and not for inspection purposes

| | | | Note |
|---|---|---|---|
| Heater Voltage | (V) | 6.3 | |
| Heater Current | (A) | 1.2 | |
| Mechanical Tuning Frequency Range (Mode 6) | (MHz) | 8,500 to 9,655 | B |
| R.F. Power Output Range (Mode 5) | (mW) | 40 to 120 | |
| R.F. Power Output Range (Mode 6) | (mW) | 12 to 66 | |
| Min. R.F. Power Output (Mode 7) | (mW) | 8 | |
| Max. Resonator Voltage | (V) | 350 | |
| Max. Resonator Current | (mA) | 55 | |
| Reflector Voltage Range | (V) | 0 to -500 | C |
| Max. Resonator/Reflector Voltage | (V) | 550 | |
| Min. Electronic Tuning Range (Mode 5) | (MHz) | 20 | |
| Min. Electronic Tuning Range (Mode 6) | (MHz) | 30 | |
| Max. Heater-Cathode Voltage | (V) | 45 | |
| Max. Body Temperature | (°C) | 200 | |
| Max. Vibration, 20Hz to 1kHz, (2 mins. max. duration) | (g) | 10 | |
| Max. Shock (short duration) | (g) | 100 | |
| Min. Operating Pressure | (mm Hg) | 70 | |

**CONNECTIONS**

Lead Colour

| Code | Electrode | |
|---|---|---|
| Yellow | Heater | h |
| Yellow | Heater | h |
| Green | Cathode | k |
| Grey | Reflector | Ref. |
| Tan | Resonator | Res. |

Output Waveguide WG16

**DIMENSIONS.**

See Outline Drawing Page 7.

**Mounting Position**

Any

**CLIMATE**

Non Tropical

**ALTITUDE**

100,000 Feet

**NOTES**

A. Caution to Electronic Equipment Design Engineers. Special attention should be given to the temperature of valves to be operated in Guided Weapons and Aircraft. Reliability will be seriously impaired if the maximum body temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the valve and will be reduced appreciably if absolute maximum ratings are exceeded. Both reliability and performance will be jeopardized if Heater Voltage ratings are exceeded; life and reliability performance are directly related to the degree that regulation of the Heater Voltage is maintained at its centre-rated value. Under no circumstances should the heater voltage supply be allowed to deviate more than ± 10% from the rated value.

B. Clockwise rotation of the Tuner Shaft decreases the frequency.

C. The Reflector Voltage must always remain negative with respect to the Cathode. If under A.F.C. working there is any possibility of the Reflector Voltage becoming equal to or more positive than the Cathode a protective diode must be fitted to the Reflector.

D. Load. For correct functioning of the valve the load should meet the following conditions:-

(a) At the frequency of operation this should present a V.S.W.R. of less than 1.2 to the valve.

(b) Over the frequency ranges: 7,800 to 8,500 MHz and 9,655 to 10,500 MHz the load should present a V.S.W.R. of less than 1.5 to the valve.

Failure to meet condition (b) may result in the occurrence of spurious modes.

# CV2494

## TESTS

To be performed in addition to those tests applicable in K1001

TEST CONDITIONS: unless otherwise specified

| Note 1 | Vres.(V) | Vref.(V) | Load |
|---|---|---|---|
| Vh (V) 6.3 | 300 | Adjust for Max.Po at the appropriate Mode | V.S.W.R. not greater than 1.1:1 |

| K1001 5B | Test | Test Condition | AQL % | Insp. Level | Symbol | Limits Min. | Limits Max | Units |
|---|---|---|---|---|---|---|---|---|
| | GROUP A | | | | | | | |
| 3.1.1 | Heater Current | Vh only | | 100% | Ih | 1.0 | 1.32 | A |
| 3.3.1 | Reflector Current | Notes 4 and 5 | | 100% | Iref. | - | 2 | /uA |
| | Oscillation (1) | Frequency 8500 MHz Mode 5 | | | | | | |
| | Resonator Current | | | 100% | Ires. | - | 45 | mA |
| | Negative Reflector Voltage | | | 100% | Vref. | 80 | 135 | V |
| 4.1 | Power Output | | | 100% | Po | 40 | 120 | mW |
| | Oscillation (2) | Frequency 9655 MHz Mode 5 | | 100% | | | | |
| | Resonator Current | | | 100% | Ires. | - | 45 | mA |
| | Negative Reflector Voltage | | | 100% | Vref. | 130 | 190 | V |
| 4.1 | Power Output | | | 100% | Po | 40 | 120 | mW |
| 3.4 | Emission | | | | | | | |
| | Change in Ires. | Heater voltage varied from 5.7 to 6.3V. Note 5. | | 100% | $\frac{\Delta Ires.}{Ires.}$ | - | 15 | % |
| | Modulation Sensitivity | Measured at 8500 MHz and 9655 MHz. Mode 5. Maximum Frequency change ± 2.5 MHz. | | 100% | $\frac{\Delta f}{\Delta Vref.}$ | 0.5 | - | MHz/V |
| 4.2.3 | Mechanical Tuning Range | Mode 6 | | 100% | F | 8500 | 9655 | MHz |
| Section 11.1 | Vibration | At a random frequency between 8500 MHz and 9655 MHz. Notes 2 and 8. | | 100% | Iref. | - | 10 | /uA |
| 4.2.8 | Hysteresis | Mode 5 | | 100% | | - | 50 | % |

| K1001 | Test | Test Condition | AQL % | Insp. Level | Sym-bol | Limits Min. | Limits Max. | Units |
|---|---|---|---|---|---|---|---|---|
| | GROUPS B and C omitted. | | | | | | | |
| | GROUP D | | | | | | | |
| | Oscillation (1) | Frequency 8500 MHz. Vres = 250 Volts Mode 6. | | | | | | |
| | Negative Reflector Voltage | | 6.5 | I | Vref. | 40 | 90 | V |
| 4.1 | Power Output | | 6.5 | I | Po | 12 | 66 | mW |
| | Oscillation (2) | Frequency 9655 MHz. Vres. 250 Volts Mode 6. | | | | | | |
| | Negative Reflector Voltage | | 6.5 | I | Vref. | 90 | 125 | V |
| 4.1 | Power Output | | 6.5 | I | Po | 12 | 66 | mW |
| | Oscillation (3) | Frequency 9400 MHz. Vres. = 250 Volts Mode 6. | | | | | | |
| | Negative Reflector Voltage | | 6.5 | I | Vref. | 82 | 115 | V |
| | Oscillation (4) | Frequency 9350 MHz. Vres. = 235 Volts Mode 7. | | Q.A. | | | | |
| 4.1 | Power Output | | | | Po | 8 | - | mW |
| | Negative Reflector Voltage | | | | Vref. | 30 | 90 | V |
| 4.2.6 | Electronic Tuning Range (1) | Measured at 8500 MHz and 9655 MHz. Mode 5. Adjust Vref. to give ½ power points. | 6.5 | I | Δf | 20 | - | MHz |
| 4.2.6 | Electronic Tuning Range (2) | Measured at 8500 MHz and 9655 MHz. Vres. = 250 Volts. Mode 6. Adjust Vref. to give ½ power points. | 6.5 | I | Δf | 30 | - | MHz |

TESTS (Contd.)

| K1001 | Test | Test Condition | AQL % | Insp. Level | Symbol | Limits Min. | Limits Max. | Units |
|---|---|---|---|---|---|---|---|---|
| | Modulation Sensitivity | Measured at 8500 MHz and 9655 MHz. Vres. = 250 Volts Mode 6. Maximum frequency change ± 2.5 MHz. | 6.5 | I | $\frac{\Delta f}{\Delta Vref.}$ | 1.0 | - | MHz/V |
| 7 | Mechanical Tuning Torque | Tuning over the frequency range 8500 MHz to 9655 MHz. | 6.5 | I | | - | 50 | oz.ins. |
| | Frequency/Heater Voltage Coefficient | Frequency 8500 MHz Vres. = 250 Volts Mode 6. Heater Voltage varied from 5.7 to 7.0 volts. | | Q.A. | $\frac{\Delta f}{\Delta Vh}$ | - | 1.5 | MHz/V |
| 5.3 | Frequency/ Temperature Coefficient | At a random frequency between 8500 MHz and 9655 MHz. Mode 5. Body temperature to be varied from 25° to 95°C. | | Q.A. | $\frac{\Delta f}{\Delta T}$ | +0.05 | -0.10 | MHz/°C |
| | GROUP E | | | | | | | |
| | Vibration Frequency Modulation | At a random frequency between 8500 MHz and 9655 MHz. Mode 5 Note 9. | | Q.A. | $\frac{\Delta f}{\Delta g}$ | | 20 | kHz/g |
| | Pressure Test | At any random frequency between 8500 MHz and 9655 MHz. Mode 5 t = 10 secs. Note 6. | | Q.A. | $\Delta f$ | - | 2 | MHz |
| | Shock Test | At any random frequency between 8300 MHz and 9655 MHz. Shock duration = 6mS. Mode 5 Acceleration = 100g. Note 3. | | Q.A. | $\Delta f$ | - | 1.5 | MHz |

| K1001 | Test | Test Condition | AQL | Insp. Level | Sym-bol | Limits Min. | Limits Max. | Units |
|---|---|---|---|---|---|---|---|---|
| | GROUP F | | | | | | | |
| App. VI 5.3 | Life | At any random frequency between 8500 MHz and 9655 MHz. Mode 5 Note 10. | | | | | | |
| | Life test end point. 500 hours. | | | | | | | |
| 4.1 | Output Power | | | | Po | 32 | - | mW |
| | GROUP G | | | | | | | |
| | Electrical Retest after 14 day storage. | | | | | | | |
| | Inoperatives | No voltages | | 100% | | | | |
| 3.3.1 | Reflector Current | | | 100% | ΔIref. | - | 2 | μA |
| 3.4 | Emission | As in Group A. | | 100% | $\frac{\Delta Ires.}{Ires.}$ | - | 15 | % |

NOTES

1. All oscillation tests except vibration and shock tests shall be made with the valve rigidly connected to a UG-39/U flange on appropriate RG-52/U waveguide equipment and the load V.S.W.R. for the valve shall be less than 1.1:1.

2. The reflector current shall be recorded with a Brush Model BL 202 recorder or equivalent. There shall be no Reflector Current bursts greater than the limit shown.

3. The valve shall be given 5 shocks in each of 3 planes. The frequency shift, after each shock in any one plane, shall not exceed the value specified.

4. After two minutes with all voltages applied. Total Reflector Current shall not exceed the specified limits.

5. The valve shall not be oscillating during the test.

6. The frequency shall be stabilised at a pressure of 70 mm. Hg. The pressure shall be increased to atmospheric and the frequency at atmospheric read within the time specified. The resulting frequency change shall not exceed the limit specified.

7. Within the specified mechanical tuning range any spurious modes which exist shall be outside the frequency range of 8450 MHz to 9705 MHz. Any spurious modes which exist shall not interfere with or cause frequency discontinuities of the operating mode above the half power points of the operating mode.

8. The valve shall be attached by the waveguide flange to an approved mount. The valve shall be vibrated with a sinusoidal excitation of 50 Hz having a peak acceleration of 10 g. for a period of 2 minutes. The valve shall be vibrated in the direction of the electron beam.

NOTES (Cont'd)

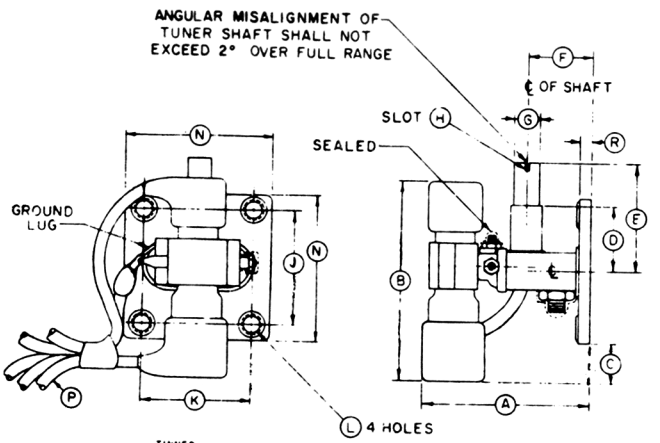
9. The vibration tests shall be performed with the valve attached by the waveguide flange to an approved mount. The valve shall vibrate with sinusoidal excitation having a peak acceleration of 10 g. in the direction of the electron beam. This test shall consist of a complete sequence of variation in vibration frequency from 20 Hz to 1000 Hz in a time of 2 minutes. The frequency deviation resulting from the peak acceleration to be within the specified limits.

10. The criterion for acceptance of the production for 1 calendar month from which the test samples are taken is that the average life expectancy at 500 hrs (2500 tuner cycles) shall be at least 90% where life expectancy :

$$= \frac{\text{total hours of operation}}{\text{number of samples x 500 hours}} \times 100\%$$

The number of samples shall not be less than one per month and may be increased above 4% of production at the manufacturer's discretion.

OUTLINE DRAWING




| CABLE CONNECTIONS | |
|---|---|
| #21 YELLOW | HEATER |
| GREEN | CATHODE |
| GREY | REFLECTOR |
| TAN | B+ |

| REF | DIMENSIONS |
|---|---|
| A | 1.937 MAX |
| B | 2.500 MAX |
| C | .490 MAX |
| D | .812 MAX |
| E | 1.500 MAX |
| F | .720 NOM |
| G | .281 MAX .278 MIN |
| H | .042 WIDE x .100 DP NOM |
| J | 1.284 MAX 1.276 MIN |
| K | 1.224 MAX 1.216 MIN |
| L | .219 DIA NOM WITH .185 DIA NOM REMOVABLE INSERTS |
| M | 1.500 MAX .250 MIN |
| N | 1.640 MAX 1.610 MIN |
| P | 18 NOM |
| R | .150 MAX .105 MIN |

All dimensions in inches.