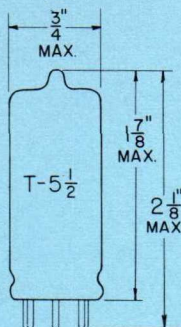


## TUNG-SOL

## HEPTODE CONVERTER

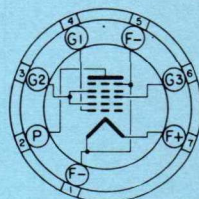
MINIATURE TYPE



GLASS BULB

HEATER

ANY MOUNTING POSITION

BOTTOM VIEW  
MINIATURE BUTTON

7AT

THE 1R5WA IS A FILAMENT TYPE HEPTODE CONVERTER IN THE 7 PIN MINIATURE CONSTRUCTION. IT IS DESIGNED FOR USE AS A COMBINED OSCILLATOR AND MIXER IN BATTERY OPERATED EQUIPMENT. ITS PRINCIPAL APPLICATION IS AS A MIXER IN OSCILLATOR SECTIONS OF PORTABLE RECEIVERS. THE 1R5WA IS PARTICULARLY USEFUL IN CIRCUITS WHERE ITS LOW MICROPHONIC NOISE AND VIBRATION OUTPUT ARE ESSENTIAL FOR SPECIALIZED MILITARY EQUIPMENT.

## RATINGS

MECHANICAL

|                                                               |     |   |
|---------------------------------------------------------------|-----|---|
| MAXIMUM IMPACT ACCELERATION (SHOCK TEST-NOTE 2)               | 450 | G |
| MAXIMUM VIBRATIONAL ACCELERATION (96 HR. FATIGUE TEST-NOTE 3) | 2.5 | G |

## RATINGS

AND NORMAL OPERATION

| MIL-E-1<br>SYMBOL        | DES.<br>MIN. | NORM.<br>TEST<br>CONDI-<br>TIONS<br>NOTE 5 | NORM.<br>OPER-<br>ATION<br>NOTE 4 | DES.<br>MAX. | MIL-E-1<br>UNITS |
|--------------------------|--------------|--------------------------------------------|-----------------------------------|--------------|------------------|
| HEATER VOLTAGE (NOTE 6)  | Ef: 1.00     | 1.25                                       | 1.25                              | 1.50         | Vdc              |
| PLATE VOLTAGE (NOTE 7)   | Eb: ---      | 90                                         | 90                                | 100          | Vdc              |
| GRID VOLTAGE             | Ec1: ---     | 0                                          | 0                                 | ---          | Vdc              |
| GRID VOLTAGE #2 (NOTE 7) | Ec2: ---     | 45                                         | 45                                | 75           | Vdc              |
| PLATE DISSIPATION        | Pp: ---      | ---                                        | ---                               | 0.1          | WATTS            |
| GRID #2 DISSIPATION      | Pg(2&4): --- | ---                                        | ---                               | 0.19         | WATTS            |
| GRID RESISTANCE          | Rg(1): ---   | 0.1                                        | 0.1                               | ---          | MEG.             |
| CONVERSION TRANSCON.     | Sc: ---      | ---                                        | 235                               | ---          | μMHOS            |
| PLATE CURRENT            | Ib1: ---     | ---                                        | 0.90                              | ---          | mAdc             |
| GRID VOLTAGE #3          | Ec3: ---     | 0                                          | 0                                 | 0            | Vdc              |
| CATHODE CURRENT          | Ik: ---      | ---                                        | ---                               | 6.5          | mAdc             |

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## TUNG-SOL

CONTINUED FROM PRECEDING PAGE

CHARACTERISTICS AND QUALITY CONTROL<sup>1</sup>

| TEST                                                                                                                                          | AQL<br>%                                           | MIL-E-1<br>SYMBOL | MIN. | LAL | BOG | UAL | MAX  | ALD | MIL-E-1<br>UNITS |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------|------|-----|-----|-----|------|-----|------------------|
| MEASUREMENTS ACCEPTANCE<br>TESTS PART 1                                                                                                       | COMBINED AQL=1.0% EXCLUDING MECH. AND INOPERATIVES |                   |      |     |     |     |      |     |                  |
| GRID CURRENT (1):<br>Ec3=-1 Vdc<br>Eg1=15 Vac<br>(NOTE 9)                                                                                     | 0.65                                               | Ic3:              | 0    | --- | --- | --- | -0.6 | --- | $\mu$ Adc        |
| PLATE CURRENT (1):<br>Eg1=15 Vac<br>(NOTE 9)                                                                                                  | 0.65                                               | Ib:               | 0.55 | --- | --- | --- | 1.25 | --- | mAdc             |
| CATHODE CURRENT:<br>Eg1=15 Vac;<br>(NOTE 9)                                                                                                   | 0.65                                               | Ik:               | 2.25 | --- | --- | --- | 4.75 | --- | mAdc             |
| CONVERSION TRANS-<br>CONDUCTANCE (1):<br>Eg1=15Vac; Ef =<br>1.0 Vdc (NOTE 9)                                                                  | 0.65                                               | Sc:               | 130  | --- | --- | --- | 340  | --- | $\mu$ MHOS       |
| OSCILLATOR GRID<br>CURRENT:<br>Ef=1.0 Vdc; PLATE<br>FLOATING (NOTE 10)                                                                        | 0.65                                               | Ic1:              | 125  | --- | --- | --- | ---  | --- | $\mu$ Adc        |
| NOISE AND MICROPHONICS:<br>Ebb=Ecc2&4 =Ecc3=135<br>Vdc; EcaI=10.0 mVac<br>Rp=2.2 MEG; Rg2&4<br>=4MEG; Cg2&4=0.01 $\mu$ f<br>TO F-; Rg3=8 MEG. | 0.65                                               | Eb:               | ---  | --- | --- | --- | 17   | --- | VU               |
| CONTINUITY AND SHORTS:<br>(INOPERATIVES)                                                                                                      | 0.4                                                | ---               | ---  | --- | --- | --- | ---  | --- | ---              |
| MECHANICAL:<br>ENVELOPE OUTLINE<br>(6-2)                                                                                                      | ---                                                | ---               | ---  | --- | --- | --- | ---  | --- | ---              |
| MEASUREMENTS ACCEPTANCE<br>TESTS, PART 2                                                                                                      |                                                    |                   |      |     |     |     |      |     |                  |
| INSULATION OF ELECTRODES:                                                                                                                     |                                                    |                   |      |     |     |     |      |     |                  |
| g1-all                                                                                                                                        |                                                    | Rg-all:           | 100  | --- | --- | --- | ---  | --- | MEG.             |
| p-all                                                                                                                                         | 4.0                                                | Rp-all:           | 100  | --- | --- | --- | ---  | --- | MEG.             |
| g3-all                                                                                                                                        |                                                    | Rg3-all:          | 100  | --- | --- | --- | ---  | --- | MEG.             |
| CONVERSION TRANSCON-<br>DUCTANCE (2):<br>Eg1=15 Vac<br>(NOTE 9)                                                                               | 6.5                                                | Sc:               | 160  | --- | --- | --- | 340  | --- | $\mu$ MHOS       |
| FILAMENT CURRENT:                                                                                                                             | 6.5                                                | If:               | 44   | --- | --- | --- | 56   | --- | mA               |
| CAPACITANCE:                                                                                                                                  |                                                    |                   |      |     |     |     |      |     |                  |
| WITHOUT SHIELD*                                                                                                                               |                                                    | Cg3-all:          | 4.7  | --- | --- | --- | 6.9  | --- | $\mu$ f          |
| WITHOUT SHIELD                                                                                                                                | 6.5                                                | Cp-all:           | 5.0  | --- | --- | --- | 7.5  | --- | $\mu$ f          |
| WITHOUT SHIELD                                                                                                                                |                                                    | Cg3-p:            | ---  | --- | --- | --- | 0.45 | --- | $\mu$ f          |
| VIBRATION (1):<br>Rp=10,000 OHMS; Ec1=-<br>5 Vdc; 40 cps; 15g; Rg1=0                                                                          | 6.5                                                | Ep(1):            | ---  | --- | --- | --- | 10   | --- | mVac             |
| VIBRATION (2):<br>F=50cps-3500 cps; Rp=<br>10,000 OHMS; Ec1=-5Vdc;<br>Rg1=0; (NOTE 8)                                                         | 6.5                                                | Ep(1):            | ---  | --- | --- | --- | 25   | --- | mVac             |

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## TUNG-SOL

CONTINUED FROM PRECEDING PAGE

CHARACTERISTICS AND QUALITY CONTROL<sup>1</sup> - cont'd.

| TEST                                                                                                  | AQL<br>%                                           | MIL-E-1<br>SYMBOL | MIN        | LAL | BOG | UAL | MAX. ALD  | MIL-E-1<br>UNITS   |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------|------------|-----|-----|-----|-----------|--------------------|
| DEGRADATION RATE<br>ACCEPTANCE TESTS                                                                  | COMBINED AQL=1.0% EXCLUDING MECH. AND INOPERATIVES |                   |            |     |     |     |           |                    |
| SHOCK:<br>HAMMER ANGLE=<br>30°                                                                        | ---                                                | ---               | ---        | --- | --- | --- | ---       | ---                |
| FATIGUE:<br>G=2.5; F=25 MIN;<br>60 MAX. FIXED<br>FREQUENCY                                            | 6.5                                                | ---               | ---        | --- | --- | --- | ---       | ---                |
| POST SHOCK AND FATIGUE<br>TEST END POINTS:<br>CONVERSION TRANS-<br>CONDUCTANCE (2):<br>VIBRATION (1): | ---                                                | Sc:<br>Ep:        | 125<br>--- | --- | --- | --- | 15<br>--- | $\mu$ MHOS<br>mVac |
| MINIATURE TUBE BASE<br>STRAIN:<br>GLASS STRAIN:                                                       | 2.5                                                | ---               | ---        | --- | --- | --- | ---       | ---                |

| ACCEPTANCE LIFE<br>TESTS                                                                                                                                  | ALLOWABLE DEF.<br>PER CHARACTER. |                | AQL<br>% | MIL-E-1<br>SYMBOL | LIMITS     |     | MIL-E-1<br>UNITS        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------|----------|-------------------|------------|-----|-------------------------|
|                                                                                                                                                           | 1st<br>SAMP.                     | COMB.<br>SAMP. |          |                   | MIN        | MAX |                         |
| INTERMITTENT LIFE<br>TEST:<br>Ef=1.25 Vdc; OR Vac<br>WITH EQUIVALENT BIAS:<br>GROUP A; Ecal=-16.0<br>Vdc; Esig=17.5 Vac; Ec<br>2&4=67.5 Vac;<br>(NOTE 12) | ---                              | ---            | ---      | t:                | 500        | --- | HOURS                   |
| INTERMITTENT LIFE<br>TEST END POINTS:<br>CONVERSION TRANS-<br>CONDUCTANCE (2):<br>OSCILLATOR GRID<br>CURRENT                                              | ---                              | ---            | ---      | Sc:<br>Ic1:       | 125<br>100 | --- | $\mu$ MHOS<br>$\mu$ Adc |

## NOTES

1. CHARACTERISTICS, QUALITY CONTROL PROCEDURES, AND INSPECTION LEVELS ARE MADE ACCORDING TO THE APPROPRIATE PARAGRAPH OF MIL-E-1, AND MIL-STD-105A.
2. TEST CONDITIONS AND ACCEPTANCE CRITERIA PER SHOCK TEST PROCEDURES OF MIL-E-1 BASIC SPECIFICATIONS.

CONTINUED ON FOLLOWING PAGE

## TUNG-SOL

CONTINUED FROM PRECEDING PAGE

## NOTES - CONT'D.

3. TEST CONDITIONS AND ACCEPTANCE CRITERIA PER FATIGUE TEST PROCEDURES OF MIL-E-1 BASIC SPECIFICATIONS.
4. THESE NORMAL VALUES REPRESENT CONDITIONS AT WHICH CONTROL OF RELIABILITY MAY BE EXPECTED.
5. THESE NORMAL TEST CONDITIONS ARE USED FOR ALL CHARACTERISTICS UNLESS OTHERWISE STATED UNDER THE INDIVIDUAL TEST ITEM.
6. FOR MOST APPLICATIONS THE PERFORMANCE WILL NOT BE ADVERSELY AFFECTED BY  $\pm 10\%$  HEATER VOLTAGE VARIATION, BUT WHEN THE APPLICATION CAN PROVIDE A CLOSER CONTROL OF HEATER VOLTAGE, AN IMPROVEMENT IN RELIABILITY WILL BE REALIZED.
7. PLATE AND SCREEN VOLTAGES SHOULD NOT EXCEED THESE VALUES UNDER ANY CIRCUMSTANCES.
8. THE TUBE UNDER TEST SHALL BE RIGIDLY MOUNTED ON A VIBRATION TABLE VIBRATING WITH SIMPLE HARMONIC MOTION. THE TEST CONDITIONS OF PARAGRAPH 4.9.19.1 OF MIL-E-1 SHALL BE APPLIED AND  $E_p$  MONITORED WHILE THE FREQUENCY OF VIBRATION IS CONTINUOUSLY SWEEPED FROM 50-3500 CPS AND THE PEAK ACCELERATION CONTROLLED CONSTANT AT 2G. A LOW PASS FILTER WHICH FOLLOWS THE LOAD RESISTOR OF THE TUBE UNDER TEST SHALL HAVE A CUT-OFF FREQUENCY OF 3500 CPS. THE TOTAL TIME OF SWEEP SHALL NOT BE LESS THAN ONE (1) MINUTE.
9. FOR RAPID TESTING USE EQUIPMENT WHICH CORRELATES WITH MIL-E-1 PARAGRAPH 4.10.12.
10. WITH CONVERTER OSCILLATOR TEST SET (DRAWING 195-JAN) HAVING  $R_{\theta 1} = 50,000$  OHMS AND WITH GRID TO FILAMENT RESONANT IMPEDANCE ADJUSTED TO 9500 OHMS.
11. TUBES SHALL BE SO SHIELDED THAT OPERATOR PROXIMITY OR MOVEMENT WILL NOT AFFECT OUTPUT READINGS.
12. BIAS OF GRID #1 MAY BE OBTAINED FROM A DC SOURCE OF SELF BIAS.

