



TECHNICAL
INFORMATION
SERVICE

Technical Information

5814WA

DOUBLE TRIODE

The 5814WA is a heater-cathode type medium-Mu double triode of miniature construction designed for use in general purpose amplifier, oscillator, and multivibrator applications. It employs separate cathode connections and a heater center-tap permitting either series or parallel operation. The 5814WA is similar in characteristics to the type 12AU7 and is intended for use in applications requiring a tube of sturdy, shock resistant design to withstand rugged service conditions.

MECHANICAL RATINGS:

| | |
|--|--------|
| Maximum Impact Acceleration (Shock Test-Note 2) | 450 G |
| Maximum Vibrational Acceleration (96 Hour Fatigue Test-Note 3) | 2.5 G |
| Maximum Bulb Temperature | 165 °C |

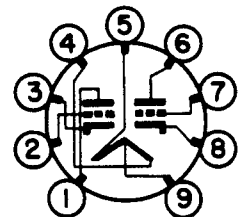
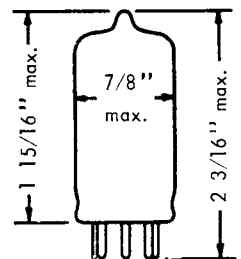
ELECTRICAL DATA

CAUTION - To electronic equipment design engineers: Special attention should be given to the temperatures at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if absolute maximum ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.

| Ratings and Normal Operation | MIL-E-1 Symbol | Absolute Minimum | Normal Test Conditions (Note 5) | Normal Operation (Note 4) | | Absolute Maximum | MIL-E-1 Units |
|------------------------------|----------------|------------------|---------------------------------|---------------------------|------|------------------|------------------|
| Heater Voltages (Note 6) | Ef Series | 11.4 | 12.6 | 12.6 | 12.6 | 13.8 | V |
| | Parallel | 5.7 | | 6.3 | 6.3 | 6.9 | V |
| Plate Voltage | Eb | --- | 250 | 100 | 250 | 330 | Vdc |
| Grid Voltage | Ec1 | --- | -8.5 | 0 | -8.5 | --- | Vdc |
| Plate Dissipation | Pp/p | --- | --- | 1.18 | 2.62 | 3.0 | W |
| Heater-Cathode Voltage | Ehk | -200 | --- | --- | --- | +200 | Vdc |
| Plate Current (Note 8) | Ib/p | --- | --- | 11.8 | 10.5 | 22 | mA _{dc} |
| Grid Circuit Resistance | Rg/g | --- | --- | 1.0 | 0.25 | --- | Meg. |

ENVELOPE.....T-6½ Glass
BASE....Miniature Button 9-Pin
MOUNTING POSITION.....Any

PHYSICAL DIMENSIONS



BOTTOM VIEW

TERMINAL CONNECTIONS:

- Pin 1 Plate, Unit #2
- Pin 2 Grid, Unit #2
- Pin 3 Cathode, Unit #2
- Pin 4 Heater
- Pin 5 Heater
- Pin 6 Plate, Unit #1
- Pin 7 Grid, Unit #1
- Pin 8 Cathode, Unit #1
- Pin 9 Heater Center-Tap



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ELECTRICAL DATA (Cont'd.)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)

In the following tests, each unit is tested separately.

| TEST | CONDITIONS | AQL % | MIL - E - 1 SYMBOL | MIN. | LAL | BOGIE | UAL | MAX. | ALD | MIL - E - 1 UNITS |
|--|---|-------|--|------------|------|-------|------|------|-----|-------------------|
| ACCEPTANCE TEST - GROUP C | | | | | | | | | | |
| Continuity and Short: | | 0.4 | --- | --- | --- | --- | --- | --- | --- | --- |
| ACCEPTANCE TEST - GROUP D Combined AQL = 1.0% | | | | | | | | | | |
| Heater Current: | | 0.65 | I _f : | 160 | --- | 175 | --- | 190 | --- | mA |
| Heater Cathode Leakage: | E _{hk} = 100 Vdc Heater Positive | 0.65 | I _{hk} : | --- | --- | --- | --- | 10 | --- | μA _{dc} |
| | E _{hk} = 100 Vdc Heater Negative | | I _{hk} : | --- | --- | --- | --- | 10 | --- | μA _{dc} |
| | Units connected in parallel | | | | | | | | | |
| Grid Current (1): | R _g = 0.5 Meg. | 0.65 | I _c (1): | --- | --- | --- | --- | -0.5 | --- | μA _{dc} |
| Plate Current (1): | | 0.65 | I _b (1): | 6.5 | 9.0 | 10.5 | 12.0 | 14.5 | 3.5 | mA _{dc} |
| Transconductance (1): | | 0.65 | S _m (1): | 1750 | 2000 | 2200 | 2400 | 2650 | 450 | μmhos |
| ACCEPTANCE TESTS - GROUP E | | | | | | | | | | |
| Insulation of Electrodes: | E _f = 12.6 V E _g - all = -100 Vdc E _p - all = -300 Vdc | 2.5 | R _g - all: R _p - all: | 500 500 | --- | --- | --- | --- | --- | Meg. Meg. |
| Plate Current (2): | E _c = -25 Vdc | 2.5 | I _b (2): | --- | --- | --- | --- | 20 | --- | μA _{dc} |
| Plate Current (3): | E _c = -18 Vdc | 2.5 | I _b (3): | 5 | --- | --- | --- | --- | --- | μA _{dc} |
| Transconductance (2): | E _f = 11.4 V (Note 7) | 2.5 | ΔS _m (2): | --- | --- | --- | --- | 15 | --- | % |
| Grid Current (2): | After 5 minutes at E _f = 14.0 V; measure Grid Current at E _f = 14.0 V; 3 minutes test not permitted | 2.5 | I _c (2): | --- | --- | --- | --- | -1.5 | --- | μA _{dc} |
| RF Noise: | E _c = -9 Vdc; E _{cal} = 7.0 mVac; Units connected in parallel | 2.5 | | --- | --- | --- | --- | 3.0 | --- | mW |
| Noise and Microphonics: | E _f = 12.6 Vac; E _{bb} = 300 Vdc; E _c = 0; R _p = 50,000 ohms; Units connected in parallel R _k = 1500 ohms | 2.5 | E _p : | --- | --- | --- | --- | 50 | --- | mVac |
| Plate Current (1): Difference between sections | | 2.5 | ΔI _b (1): | --- | --- | --- | --- | 3.5 | --- | mA _{dc} |
| ACCEPTANCE TESTS - GROUP F | | | | | | | | | | |
| Vibration (2): | F = 25 cps; G = 2.5; R _p = 2000 ohms Units connected in parallel | 6.5 | E _p : | --- | --- | --- | --- | 100 | --- | mVac |
| Transconductance (3): | E _b = 100 Vdc; E _c = 0 | 6.5 | S _m (3): | 2500 | 2775 | 3100 | 3425 | 3700 | 750 | μmhos |
| Amplification Factor: | | 6.5 | μ _v : | 15.5 | 16.2 | 17.0 | 17.8 | 18.5 | 1.8 | --- |
| Low Pressure Voltage Breakdown: | | 6.5 | | 500 | --- | --- | --- | --- | --- | Vac |



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ELECTRICAL DATA (Cont'd.)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (Cont'd.)

In the following tests, each unit is tested separately.

| TEST | CONDITIONS | AQL % | MIL - E - 1 SYMBOL | MIN. | LAL | BOGIE | UAL | MAX. | ALD | MIL - E - 1 UNITS |
|---|---|-------|--------------------|------|-----|-------|-----|----------|-----|-------------------|
| ACCEPTANCE TESTS - GROUP A | | | | | | | | | | |
| Shock: | Hammer angle=30°; Note 2 | | | | | | | | | |
| Fatigue: | 96 hours; Note 3 | | | | | | | | | |
| Post Shock and Fatigue Test End Points: | | | | | | | | | | |
| Vibration (2): | F=25 cps; G= 2.5; Rp=2000 ohms; Units connected in parallel | | Ep: | --- | --- | --- | --- | 150 | --- | mVac |
| Heater - Cathode Leakage: | Ehk=+100 Vdc Ehk=-100 Vdc Units connected in parallel | | lhk: lhk: | --- | --- | --- | --- | 30 30 | --- | μAdc μAdc |
| Transconductance (3): | Eb=100 Vdc; Ec1=0 | | Sm(3): | 2000 | --- | --- | --- | --- | --- | μmhos |
| Grid Current (1): | | | Ic(1): | --- | --- | --- | --- | -1.5 | --- | μAdc |

ACCEPTANCE TESTS - GROUP B

| TEST | CONDITIONS | AQL % | MIL - E - 1 SYMBOL | MIN. | MAX. | MIL - E - 1 UNITS | Maximum Defects per Characteristics 1st Sample | Combined Samples |
|---------------|------------|-------|--------------------|------|------|-------------------|--|------------------|
| Glass Strain: | | 2.5 | --- | --- | --- | --- | --- | --- |

ACCEPTANCE LIFE TEST

| | | | | | | | | | |
|---|--|------|--------------|------|----------|--------------|-----|-----|--|
| Heater Cycling | Ef=7.5 V; Ehk=+135 Vdc; Eb=Ec=0; 1 min. on, 1 min. off | --- | --- | 2000 | --- | Cycles | --- | --- | |
| Heater Cycling Life Test End Points: | | | | | | | | | |
| Heater - Cathode Leakage: | Heater Positive Heater Negative | --- | lhk: lhk: | --- | 20 20 | μAdc μAdc | --- | --- | |
| 1 Hour Stability Life Test: | TA=room; Ehk=+135 Vdc; Rg=0.5 Meg. | | | | | | | | |
| 1 Hour Stability Life Test End Points: | | | | | | | | | |
| Transconductance (1) change of individual tubes from initial: | (Typical sample size= 50 tubes) | 1.0 | ΔSm(1): | --- | 10 | % | --- | --- | |
| 100 Hour Survival Rate Life Test: | TA=room; Ehk=+135 Vdc; Rg1=0.5 Meg. | | | | | | | | |
| 100 Hour Survival Rate Life Test End Points: | | | | | | | | | |
| Inoperatives: | (Typical Sample Size=200 tubes) | 0.65 | --- | --- | --- | --- | --- | --- | |



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ELECTRICAL DATA (Cont'd.)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (Cont'd.)

In the following tests, each unit is tested separately.

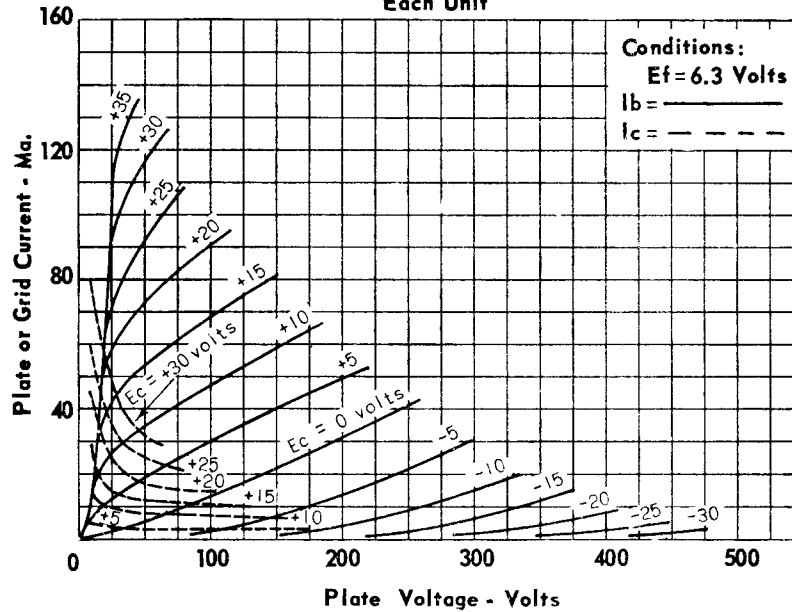
| TEST | CONDITIONS | AQL % | MIL - E - 1 SYMBOL | MIN. | MAX. | MIL - E - 1 | Maximum Defects per Characteristics | |
|---|--|----------|-----------------------|------|------|-------------|---|---------------------|
| | | | | | | | 1st Sample | Combined Samples |
| 500 and 1000 Hour Intermittent High Temperature Life Test: | T Bulb=165 °C; Ehk= +135 Vdc; Rg1=0.5 Meg. | | | | | | | |
| 500 Hour Intermittent High Temperature Life Test End Points: | (Typical Sample Sizes= 20 tubes 1st sample, 40 tubes 2nd sample, Total allowable combined defects=4 tubes 1st sample, 8 tubes 1st and 2nd samples) | | | | | | | |
| Inoperatives: | | --- | --- | --- | --- | --- | 1 | 3 |
| Heater Current: | | --- | If: | 160 | 190 | mA | 1 | 3 |
| Heater - Cathode Leakage: | | --- | Ihk: | --- | 10 | μAdc | 1 | 3 |
| Grid Current (1): | | --- | Ic(1): | 0 | -0.5 | μAdc | 1 | 3 |
| Transconductance (1) | | --- | Sm(1): | 1600 | 2650 | μmhos | 1 | 3 |
| Transconductance (1) Average change (Note 9) | | --- | Avg. ΔtSm(1): | --- | 15 | % | --- | --- |
| Electrode Insulation: (g-all) | | --- | Rg-all: | 50 | --- | Meg. | 2 | 5 |
| (p-all) | | --- | Rp-all: | 50 | --- | Meg. | | |
| Transconductance (2) (Note 7) | | --- | ΔEfSm(2): | --- | 15 | % | 2 | 5 |
| 1000 Hour Intermittent High Temperature Life Test End Points: | (Typical Sample Size= 20 tubes 1st sample, 40 tubes 2nd sample) | | | | | | | |
| Inoperatives: | | --- | --- | --- | --- | --- | 2 | 5 |
| Heater Current: | | --- | If: | 160 | 190 | mA | 2 | 5 |
| Heater - Cathode Leakage: | | --- | Ihk: | --- | 10 | μAdc | 2 | 5 |
| Grid Current (1): | | --- | Ic(1): | 0 | -0.5 | μAdc | 2 | 5 |
| Transconductance (1): | | --- | Sm(1): | 1500 | 2650 | μmhos | 2 | 5 |

NOTES:

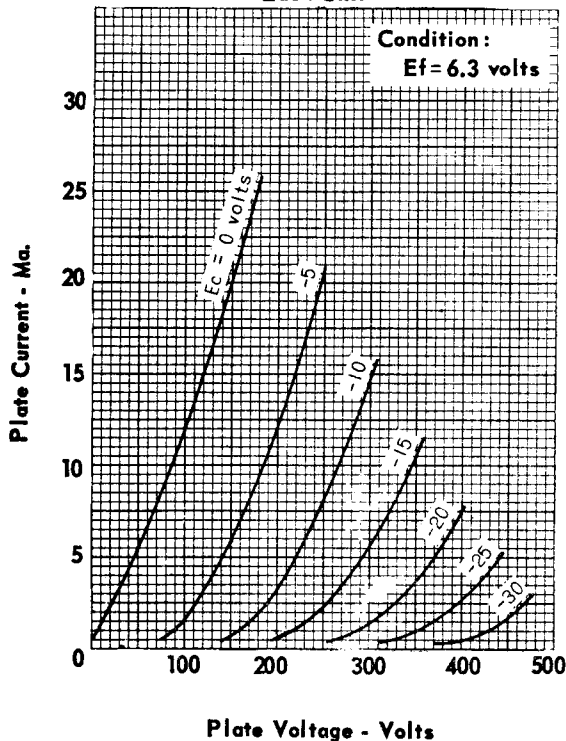
- Note 1: Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL - E - 1 and MIL - STD - 105A.
- Note 2: Test Conditions and Acceptance Criteria per Shock Test procedures of MIL - E - 1 basic specifications.
- Note 3: Test Conditions and Acceptance Criteria per Fatigue Test procedures of MIL - E - 1 basic specifications.
- Note 4: These normal values represent conditions at which control of reliability may be expected.
- Note 5: These normal test conditions are used for all characteristics unless otherwise stated under the individual test item.
- Note 6: For most applications the performance will not be adversely affected by ±10% heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.
- Note 7: Change of transconductance for individual tubes from that value measured at Ef=12.6V to that value measured at Ef=11.4V.
- Note 8: Difficulty may be encountered if this tube is operated for long periods of time with very small values of cathode current.
- Note 9: The average percentage change shall be ascertained from the determination of the individual changes for each tube (inoperatives excluded) from the zero hour value for the referenced characteristic.

DOUBLE TRIODE

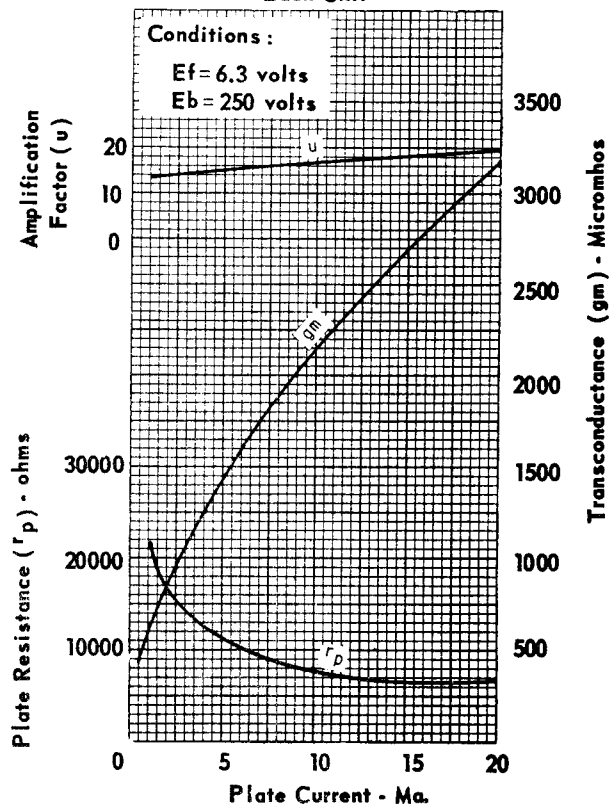
AVERAGE PLATE CHARACTERISTICS
Each Unit



AVERAGE PLATE CHARACTERISTICS
Each Unit



AVERAGE CHARACTERISTICS
Each Unit





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RESISTANCE - COUPLED AMPLIFIER CHART (One Triode Unit)

| R_L | R_g^* | Ebb=90 Volts | | | Ebb=180 Volts | | | Ebb=300 Volts | | |
|-------|---------|--------------|-------|-------|---------------|-------|-------|---------------|-------|-------|
| | | R_k | E_o | Gain+ | R_k | E_o | Gain+ | R_k | E_o | Gain+ |
| .047 | .047 | 1600 | 9 | 10 a | 920 | 20 | 11 | 870 | 38 | 12 |
| | 0.1 | 1800 | 11 | 11 b | 1200 | 26 | 12 | 1200 | 52 | 12 |
| 0.1 | 0.1 | 3000 | 10 | 11 b | 2000 | 24 | 12 | 1900 | 44 | 12 |
| | 0.22 | 3800 | 15 | 11 | 2800 | 33 | 12 | 3000 | 68 | 12 |
| 0.22 | 0.22 | 6800 | 14 | 11 | 5300 | 31 | 12 | 5300 | 57 | 12 |
| | 0.47 | 9500 | 20 | 11 | 8300 | 44 | 12 | 8800 | 82 | 12 |

E_o = Voltage across R_g at the grid-current point.
 * = Megohms
 + = At 5 volts (RMS) output unless index letter indicates otherwise.
 a. At 3 volts (RMS) output.
 b. At 4 volts (RMS) output.

Value of C selected for desired frequency response. R_k should be adequately by-passed.

AVERAGE CHARACTERISTICS (Each Section)

