

TUNG-SOL

TWIN TRIODE

MINIATURE TYPE

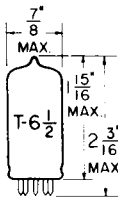
COATED UNIPOTENTIAL CATHODE

HEATER

6.3 VOLTS 0.3 AMP.
12.6 VOLTS 0.150 AMP.

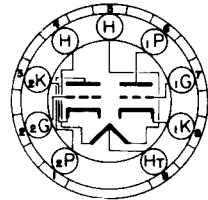
AC OR DC

ANY MOUNTING POSITION



GLASS BULB

FOR 12.6 VOLT OPERATION APPLY HEATER VOLTAGE BETWEEN PINS #4 AND #5. FOR 6.3 VOLT OPERATION APPLY HEATER VOLTAGE BETWEEN PIN #9 AND PINS #4 AND #5 CONNECTED TOGETHER.



BOTTOM VIEW
SMALL BUTTON
9 PIN BASE

9A

THE 12AT7WA IS A RUGGEDIZED TWIN TRIODE OF THE 9-PIN MINIATURE CONSTRUCTION. THE TWO HIGH TRANSCONDUCTANCE TRIODE SECTIONS ARE ELECTRICALLY INDEPENDENT, ALLOWING SIMULTANEOUS USE OF THE TWO IN COMPLETELY DIFFERENT APPLICATIONS. THE HIGH RATIO OF PLATE CURRENT TO TRANSCONDUCTANCE MAKES IT ADAPTABLE FOR USE AS A COMBINED HIGH FREQUENCY OSCILLATOR AND MIXER, OR AS A GROUNDED GRID RF AMPLIFIER. THE HEATER CENTER TAP PERMITS OPERATION FROM EITHER A 6.3 OR 12.6 VOLT SUPPLY. CONTROLS ON THE PRODUCT AVERAGE FOR SUCH CHARACTERISTICS AS HEATER CURRENT, PLATE CURRENT, AND TRANSCONDUCTANCE ASSURE THAT THESE CRITICAL CHARACTERISTICS WILL REMAIN WELL CENTERED. SINCE IT MUST BE ABLE TO WITHSTAND SEVERE MECHANICAL TESTS TO MEET TEST SPECIFICATIONS, THE 12AT7WA IS ESPECIALLY SUITED FOR USE IN INDUSTRIAL AND MILITARY AIRBORNE EQUIPMENT WHICH MAY BE SUBJECTED TO SEVERE SHOCK AND VIBRATION.

DIRECT INTERELECTRODE CAPACITANCES

EACH SECTION

	WITH SHIELD #316	WITHOUT SHIELD	
GRID TO PLATE #1 (RATED)	1.5	1.5	μuf
MAXIMUM	---	1.90	μuf
MINIMUM	---	1.30	μuf
INPUT SECTION #1 (RATED)	2.2	2.2	μuf
MAXIMUM	---	3.00	μuf
MINIMUM	---	2.00	μuf
OUTPUT (SECTION #1) (RATED)	1.2	0.5	μuf
MAXIMUM	---	0.70	μuf
MINIMUM	---	0.20	μuf
OUTPUT (SECTION #2) (RATED)	1.5	0.4	μuf
MAXIMUM	---	0.60	μuf
MINIMUM	---	0.16	μuf
PLATE TO PLATE	---	0.33	μuf
MAXIMUM	---	0.15	μuf
MINIMUM	---	---	---
HEATER TO CATHODE #1 (RATED)	2.4	2.4	μuf
MAXIMUM	---	3.50	μuf
MINIMUM	---	2.10	μuf
HEATER TO CATHODE #2 (RATED)	2.4	2.4	μuf
MAXIMUM	---	3.50	μuf
MINIMUM	---	2.10	μuf
GRID TO PLATE #2 (RATED)	1.5	1.5	μuf
MAXIMUM	---	1.90	μuf
MINIMUM	---	1.30	μuf
INPUT SECTION #2 (RATED)	2.2	2.2	μuf
MAXIMUM	---	3.00	μuf
MINIMUM	---	2.00	μuf

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12AT7WA

PREMIUM TUBE

TUNG-SOL

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RATINGS

ABSOLUTE MAXIMUM VALUES

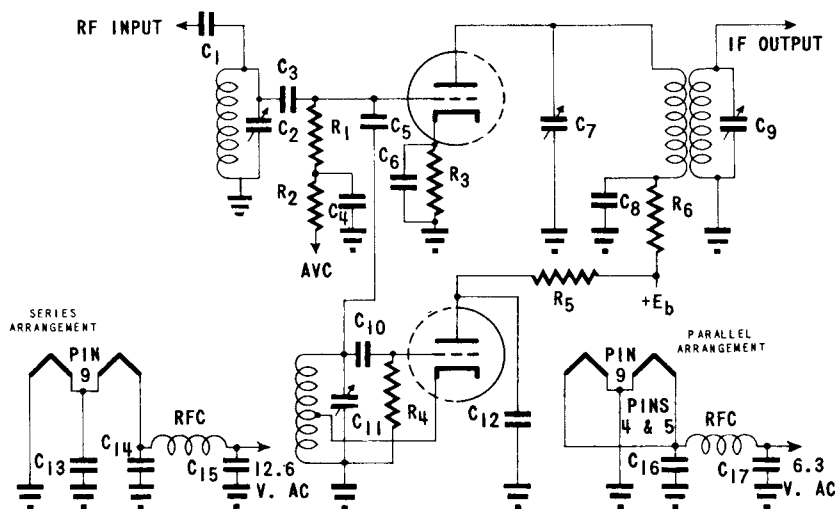
HEATER VOLTAGE	6.3±10%	12.6±10%	VOLTS
MAXIMUM DC PLATE VOLTAGE	330		VOLTS
MAXIMUM NEGATIVE DC GRID VOLTAGE	-55		VOLTS
MAXIMUM PLATE DISSIPATION (EACH SECTION)	2.8		WATTS
MAXIMUM HEATER CATHODE VOLTAGE	±100		VOLTS
MAXIMUM BULB TEMPERATURE	200		°C
MAXIMUM ALTITUDE	10 000		FEET
MAXIMUM SHOCK	600		G

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

CLASS A₁ AMPLIFIER -- EACH TRIODE UNIT

HEATER VOLTAGE	12.6	6.3	12.6	6.3	VOLTS
HEATER CURRENT	150	300	150	300	mA
PLATE VOLTAGE	100		250		VOLTS
CATHODE BIAS RESISTOR	270		200		OHMS
PLATE CURRENT	3.7		10		mA
PLATE RESISTANCE	15 000		10 900		OHMS
TRANSCONDUCTANCE	4 000		5 500		μMHOS
AMPLIFICATION FACTOR	60		60		
GRID VOLTAGE (APPROX.) FOR I _b = 10 μA.	-5		-12		VOLTS

TYPICAL CIRCUIT FOR CONVERTER OPERATION AT 100 MEGACYCLES



C ₁ = 100 μLUF	C ₇ = 50 μLUF (MAX.)	C ₁₃ = 1000 μLUF	R ₂ = 50000 OHMS
C ₂ = RF TUNING CAPACITOR	C ₈ = 1000 μLUF	C ₁₄ = 1000 μLUF	R ₃ = 2000 OHMS
C ₃ = 25 μLUF	C ₉ = 50 μLUF (MAX.)	C ₁₅ = 1000 μLUF	R ₄ = 10000 OHMS
C ₄ = 1000 μLUF	C ₁₀ = 50 μLUF	C ₁₆ = 1000 μLUF	R ₅ = 1000 OHMS
C ₅ = 1 μLUF	C ₁₁ = OSCILLATOR TUNING CAPACITOR	C ₁₇ = 1000 μLUF	R ₆ = 1000 OHMS
C ₆ = 1000 μLUF	C ₁₂ = 1000 μLUF	C ₁₈ = 1000 μLUF	E _b = 100 OR 250V.

OSCILLATOR VOLTAGE APPLIED TO MIXER SHOULD BE JUST SUFFICIENT TO CAUSE GRID CURRENT TO FLOW IN THE MIXER SECTION.

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TUNG-SOL

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CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

(E_f = 12.6V, E_b = 250Vdc, R_k/K = 200 OHMS)

EXCEPT AS MODIFIED BELOW

	INITIAL				500 HOUR LIFE TEST		
	INDIVIDUAL MIN.	MAX.	PROD. MIN.	AVG. MAX.	INDIVIDUAL MIN.	MAX.	
HEATER CURRENT	138	162	144	156	138	162	mA
HEATER-CATHODE LEAKAGE ^A (E _{hk} = ±100Vdc)	---	±10	---	±2	---	±10	μAdc
GRID CURRENT ^B (R _g = 0.5 MEG.)	---	-0.7	---	-0.2	---	-0.7	μAdc
PLATE CURRENT (1) ^B	7.0	14.0	8.5	11.5	---	---	mA
TRANSCONDUCTANCE (1)	4500	6500	4880	6120	3800	6500	μMHOS
Δ AVERAGE TRANS- CONDUCTANCE (1)	---	---	---	---	---	20	PERCENT
INSULATION OF ELECTRODES ^{CB} (E _f = 12.6 V, E _g = -all) = -100Vdc, E _p = -300Vdc)							
R _g -all	100	---	---	---	50	---	MEGOHM
R _p -all	100	---	---	---	50	---	MEGOHM
PLATE CURRENT (2) ^{DB} (E _c = -20Vdc, R _p = 0.1 MEG, R _k = 0, C _k = 0)	---	100	---	---	---	---	μAdc
PLATE CURRENT DIFFERENCE ^B BETWEEN SECTIONS	---	3.2	---	---	---	---	mA
TRANSCONDUCTANCE (2) ^{EB} (E _f = 14.0V)	4000	---	4400	---	---	---	μMHOS
AMPLIFICATION FACTOR ^{FB}	50	70	---	---	---	---	
GRID EMISSION ^{GB} (E _f = 15.0V, E _c = 20Vdc, R _g = 0.5 MEG, R _k = 0, C _k = 0)	---	-1.5	---	---	---	---	μAdc

SPECIAL REQUIREMENTS

	MIN.	MAX.	
VARIABLE FREQUENCY VIBRATION ^{HA} (E _c = -3Vdc, R _p = 2000, R _k = 0, C _k = 0)	---	100	mVac
VIBRATIONAL FATIGUE ^J	---	---	
MINIATURE TUBE BASE STRAIN ^K (NO VOLTAGES)	---	---	
STABILIZATION ^L (INTERMITTENT LIFE TEST CONDITIONS OR EQUIVALENT)	---	---	
SHOCK ^M (HAMMER ANGLE = 42°, E _{hk} = 100Vdc, R _g = 0.1 MEG.)	---	---	
POST SHOCK AND VIBRATIONAL FATIGUE TEST END POINTS	---	---	
LOW FREQUENCY VIBRATION	---	150	mVac
HEATER CATHODE LEAKAGE	---	30	μAdc
TRANSCONDUCTANCE (1)	3800	---	μMHOS
GRID CURRENT	---	-1.5	μAdc
SHORT AND CONTINUITY	---	---	
RF NOISE ^{NA} (E _{sig} = 15mVac, R _k = 100, C _k = 0.2 μf)	---	---	
NOISE AND MICROPHONICS ^P (E _f = 12.6Vdc, E _{bb} = 300Vdc, E _{cal} = 100mVac, R _p = 10,000)	---	100	mVac
LOW FREQUENCY VIBRATION ^{QA} (E _c = -3Vdc, R _p = 2000, R _k = 0, C _k = 0)	---	100	mVac
INTERMITTENT LIFE TEST (E _{hk} = 135Vdc, R _g = 0.5 MEG., C _k = 0)	---	---	
HEATER CYCLING LIFE TEST (E _f = 7.5V HEATERS IN PARALLEL, E _{hk} = 135Vdc)	2000	---	CYCLES
HEATER CYCLING LIFE TEST END POINT HEATER CATHODE LEAKAGE	---	20	μAdc

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NOTES

A TEST WITH UNITS TIED TOGETHER.

B TEST EACH UNIT SEPARATELY WITH ELEMENTS OF OPPOSITE SECTION GROUND.

C SEE MIL-E-1C 4.8.2

D THE PLATE CURRENT DIFFERENCE BETWEEN SECTIONS SHALL BE WITHIN THE SPECIFIED LIMIT.

E PREHEAT ALL TUBES TO BE TESTED FOR TRANSCONDUCTANCE (2) UNDER THE FOLLOWING CONDITIONS FOR A PERIOD OF 5 MINUTES PRIOR TO TESTING. PREHEAT WITH TRIODE SECTIONS OPERATING SEPARATELY. $E_f = 11.0V$, $E_b = 250Vdc$, $R_k = 200$, $R_g = 0.5MEG$.

F SEE MIL-E-1C 4.10.11.1

G PREHEAT ALL TUBES TO BE TESTED FOR GRID EMISSION UNDER THE FOLLOWING CONDITIONS FOR A PERIOD OF 5 MINUTES PRIOR TO TESTING: $E_f = 15.0V$, $E_b = 250Vdc$, $R_g = 0.5MEG$, $R_k = 200$. PREHEAT WITH TRIODE SECTIONS OPERATING SEPARATELY. TWO SECONDS SHALL BE THE MAXIMUM TIME BETWEEN PREHEAT AND TEST.

H SEE MIL-E-1C 4.9.20.3

J SEE MIL-E-1C 4.9.20.6

K SEE MIL-E-1C 4.9.6.1

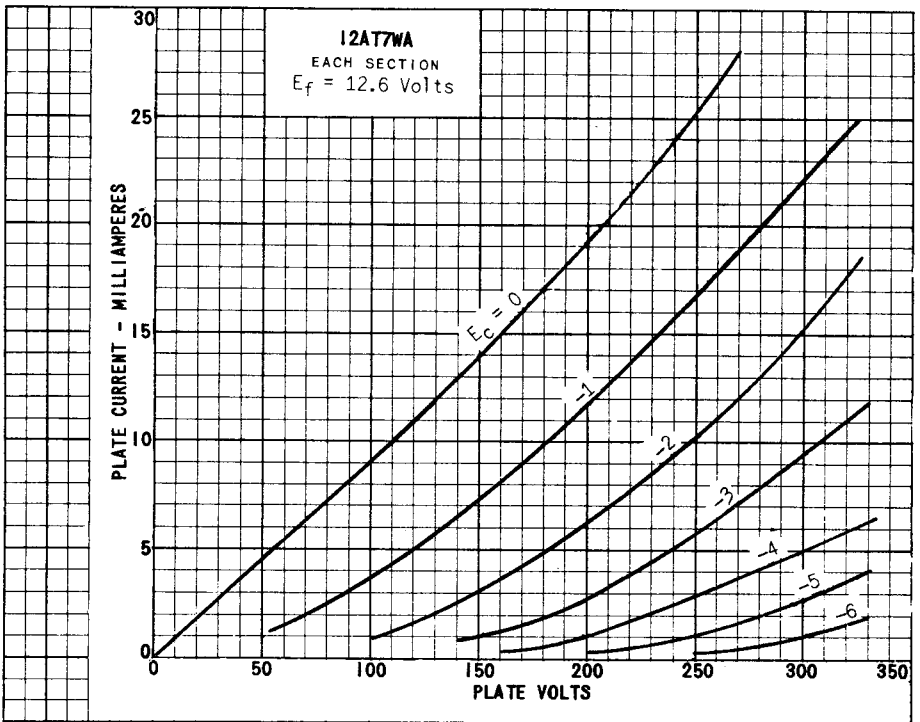
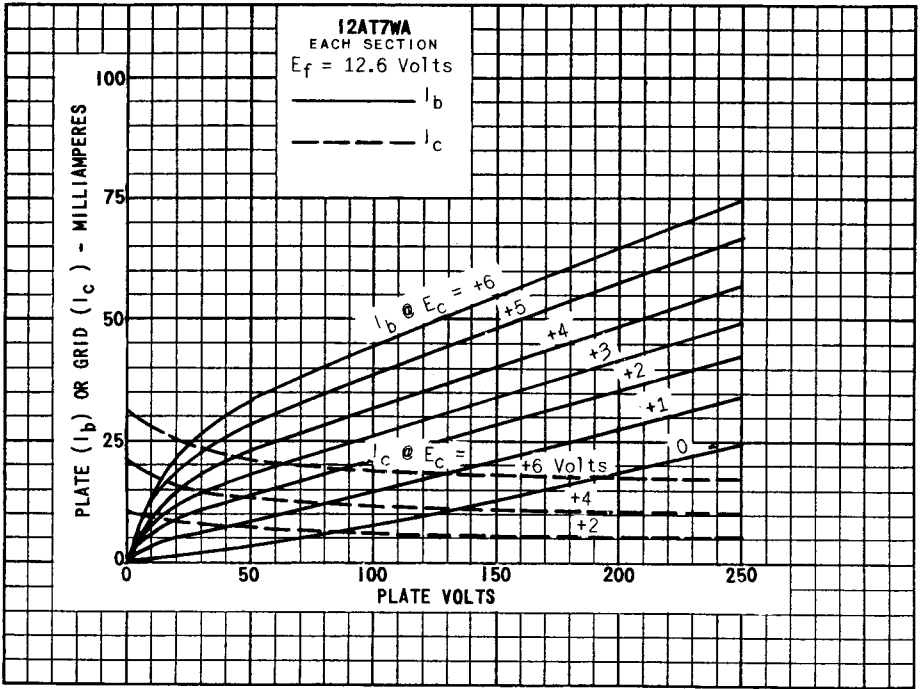
L SEE MIL-E-1C 4.6.2

M SEE MIL-E-1C 4.9.20.5

N SEE MIL-E-1C 4.10.3.1

P TEST WITH TWO SECTIONS CONNECTED IN PARALLEL. TIE CATHODE TOGETHER AND GROUND THRU A 200 OHM RESISTOR. GRIDS ARE GROUND.

Q SEE MIL-E-1C 4.9.20.4



12AT7WA
PREMIUM TUBE

