

TUNG-SOL

TWIN TRIODE

MINIATURE TYPE

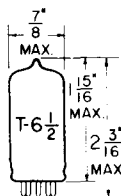
COATED UNIPOTENTIAL CATHODE

HEATER

6.3 VOLTS 0.3 AMP.
12.6 VOLTS 0.150 AMP.

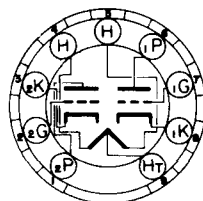
AC OR DC

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

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RATINGS

ABSOLUTE MAXIMUM VALUES

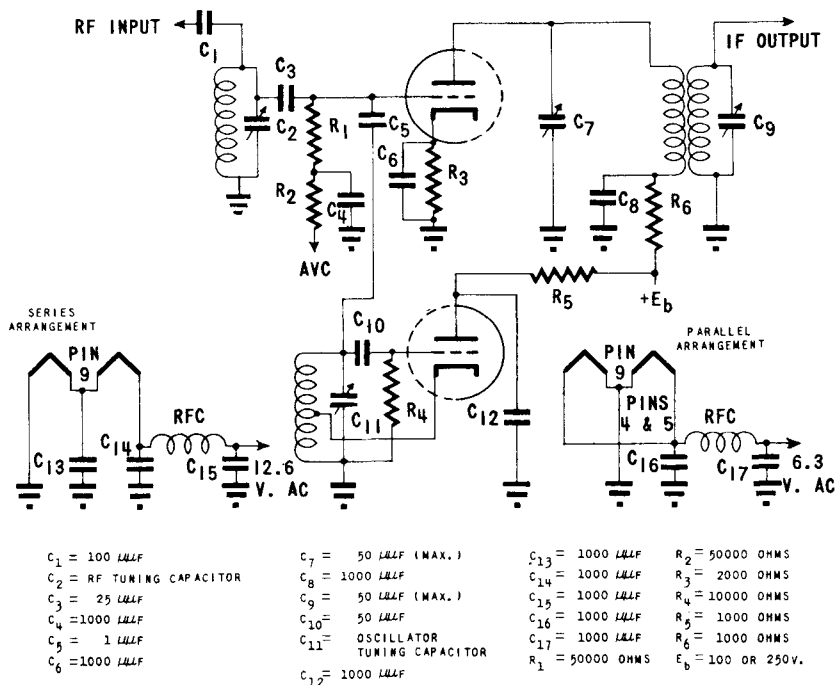
HEATER VOLTAGE	6.3±10%	12.6±10%	VOLTS
MAXIMUM DC PLATE VOLTAGE	330		VOLTS
MAXIMUM NEGATIVE DC GRID VOLTAGE	-55		VOLTS
MAXIMUM PLATE DISSIPATION (EACH SECTION)	2.8		WATTS
MAXIMUM HEATER CATHODE VOLTAGE	±100		VOLTS
MAXIMUM BULB TEMPERATURE	200		°C
MAXIMUM ALTITUDE	10 000		FEET
MAXIMUM SHOCK	600		G

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



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.	INDIVIDUAL MIN.	MAX.
HEATER CURRENT	138	162	144	156
HEATER-CATHODE LEAKAGE ^A (E _{hk} = ±100Vdc)	---	±10	---	±2
GRID CURRENT ^B (R _g = 0.5 MEG.)	---	-0.7	---	-0.2
PLATE CURRENT (1) ^B	7.0	14.0	8.5	11.5
TRANSCONDUCTANCE (1)	4500	6500	4880	6120
Δ AVERAGE TRANS- CONDUCTANCE (1)	---	---	---	20
INSULATION OF ELECTRODES ^{CB} (E _f = 12.6 V, E _{p-all} = -100Vdc, E _{p-all} = -300Vdc)	100	---	---	50
R _{g-all}	100	---	---	50
R _{p-all}	---	---	---	---
PLATE CURRENT (2) ^{DB} (E _c = -20Vdc, R _p = 0.1MEG, R _k = 0, C _k = 0)	---	100	---	---
PLATE CURRENT DIFFERENCE ^B BETWEEN SECTIONS	---	3.2	---	---
TRANSCONDUCTANCE (2) ^{EB} (E _f = 11.0V)	4000	---	4400	---
AMPLIFICATION FACTOR ^{FB}	50	70	---	---
GRID EMISSION ^{GB} (E _f = 15.0V, E _c = 20Vdc, R _g = 0.5MEG, R _k = 0, C _k = 0)	---	-1.5	---	---

SPECIAL REQUIREMENTS

	MIN.	MAX.
VARIABLE FREQUENCY VIBRATION ^{HA} (E _c = -3Vdc, R _p = 2000, R _k = 0, C _k = 0)	---	100
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
HEATER CATHODE LEAKAGE	---	30
TRANSCONDUCTANCE (1)	3800	---
GRID CURRENT	---	-1.5
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
LOW FREQUENCY VIBRATION ^{QA} (E _c = -3Vdc, R _p = 2000, R _k = 0, C _k = 0)	---	100
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	---
HEATER CYCLING LIFE TEST END POINT HEATER CATHODE LEAKAGE	---	20

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NOTES

A TEST WITH UNITS TIED TOGETHER.

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

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

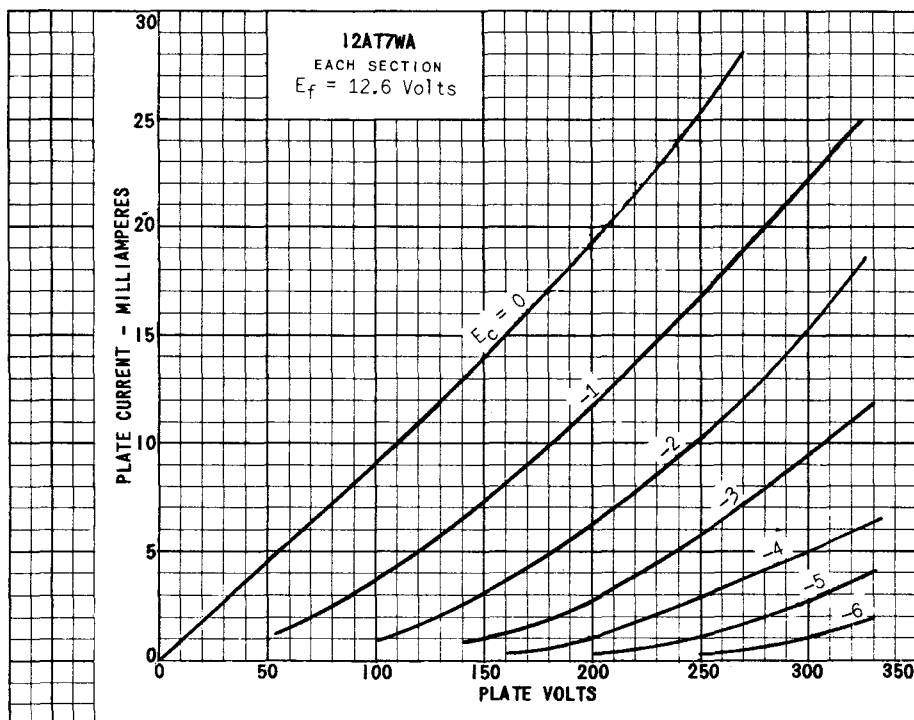
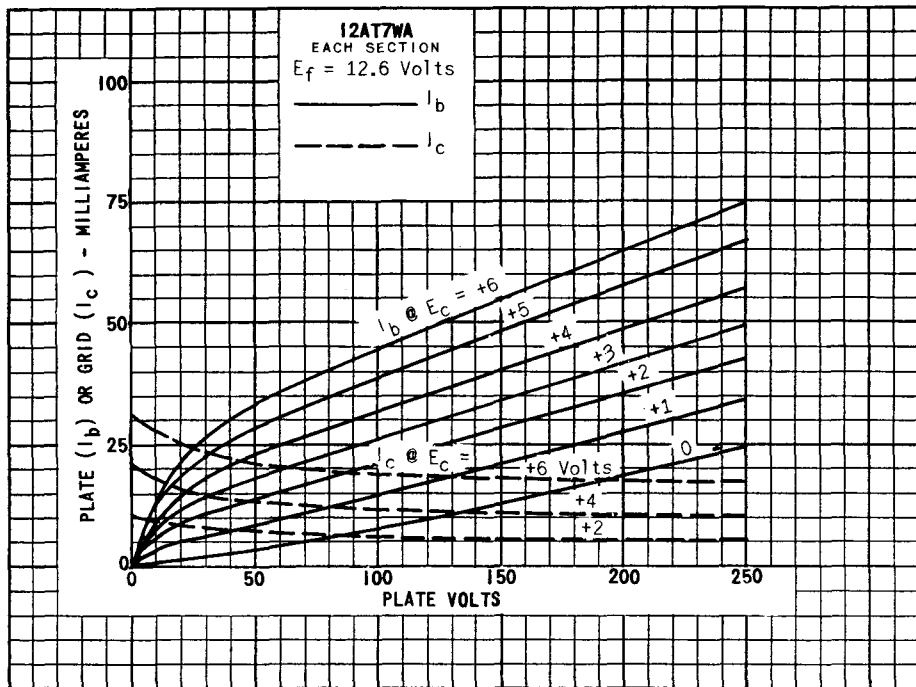
L SEE MIL-E-1C 4.6.2

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 GROUNDED.

Q SEE MIL-E-1C 4.9.20.4



12AT7WA
PREMIUM TUBE

