TUNG-SOL

TWIN TRIODE

MINIATURE TYPE

COATED UNIPOTENTIAL CATHODE

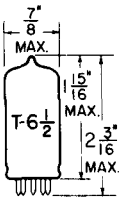
HEATER

6.3 VOLTS 0.3 AMP.
12.6 VOLTS 0.150 AMP.

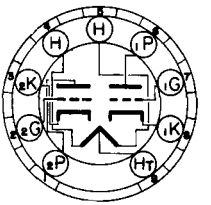
AC OR DC

ANY MOUNTING POSITION

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.



GLASS BULB



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	μμf
MAXIMUM	---	1.90	μμf
MINIMUM	---	1.30	μμf
INPUT SECTION #1 (RATED)	2.2	2.2	μμf
MAXIMUM	---	3.00	μμf
MINIMUM	---	2.00	μμf
OUTPUT (SECTION#1) (RATED)	1.2	0.5	μμf
MAXIMUM	---	0.70	μμf
MINIMUM	---	0.20	μμf
OUTPUT (SECTION#2) (RATED)	1.5	0.4	μμf
MAXIMUM	---	0.60	μμf
MINIMUM	---	0.16	μμf
PLATE TO PLATE			
MAXIMUM	---	0.33	μμf
MINIMUM	---	0.15	μμf
HEATER TO CATHODE #1 (RATED)	2.4	2.4	μμf
MAXIMUM	---	3.50	μμf
MINIMUM	---	2.10	μμf
HEATER TO CATHODE #2 (RATED)	2.4	2.4	μμf
MAXIMUM	---	3.50	μμf
MINIMUM	---	2.10	μμf
GRID TO PLATE #2 (RATED)	1.5	1.5	μμf
MAXIMUM	---	1.90	μμf
MINIMUM	---	1.30	μμf
INPUT SECTION #2 (RATED)	2.2	2.2	μμf
MAXIMUM	---	3.00	μμf
MINIMUM	---	2.00	μμf

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RATINGS

ABSOLUTE MAXIMUM VALUES

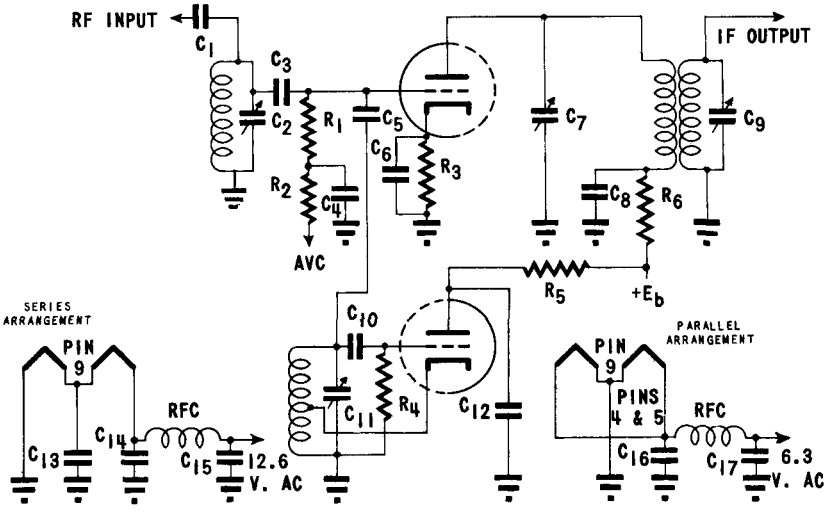
HEATER VOLTAGE	6.3±10%	12.6±10%	VOLTS
MAXIMUM DC PLATE VOLTAGE	330		VOLTS
MAXIMUM NEGATIVE DC GRID VOLTAGE	−55		VOLTS
MAXIMUM PLATE DISSIPATION (EACH SECTION)	2.8		WATTS
MAXIMUM HEATER CATHODE VOLTAGE	±100		VOLTS
MAXIMUM BULB TEMPERATURE	200		°C
MAXIMUM ALTITUDE	10 000		FEET
MAXIMUM SHOCK	600		G

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

CLASS A_1 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 μμf
C_2 = RF TUNING CAPACITOR
C_3 = 25 μμf
C_4 = 1000 μμf
C_5 = 1 μμf
C_6 = 1000 μμf

C_7 = 50 μμf (MAX.)
C_8 = 1000 μμf
C_9 = 50 μμf (MAX.)
C_{10} = 50 μμf
C_{11} = OSCILLATOR TUNING CAPACITOR
C_{12} = 1000 μμf

C_{13} = 1000 μμf
C_{14} = 1000 μμf
C_{15} = 1000 μμf
C_{16} = 1000 μμf
C_{17} = 1000 μμf
R_1 = 50000 OHMS

R_2 = 50000 OHMS
R_3 = 2000 OHMS
R_4 = 10000 OHMS
R_5 = 1000 OHMS
R_6 = 1000 OHMS
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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CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

(E_f = 12.6V, E_b = 250Vdc, RK/K = 200 OHMS)
EXCEPT AS MODIFIED BELOW

	INITIAL				500 HOUR LIFE TEST		
	INDIVIDUAL MIN.	INDIVIDUAL MAX.	PROD. MIN.	AVG. MAX.	INDIVIDUAL MIN.	INDIVIDUAL 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	---	---	mAdc
TRANSCONDUCTANCE (1)	4500	6500	4880	6120	3800	6500	μMHOS
Δ AVERAGE TRANSCONDUCTANCE (1)	---	---	---	---	---	20	PERCENT
INSULATION OF ELECTRODES[CB] (E_f=12.6 V, E(g-all)=-100Vdc, E(p-all)=-300Vdc)							
R_g-all	100	---	---	---	50	---	MEGOHM
R_p-all	100	---	---	---	50	---	MEGOHM
PLATE CURRENT (2)[DB] (E_c=-20Vdc, R_p=0.1MEG, R_k=0, C_k=0)	---	100	---	---	---	---	μAdc
PLATE CURRENT DIFFERENCE[B] BETWEEN SECTIONS	---	3.2	---	---	---	---	mAdc
TRANSCONDUCTANCE (2)[EB] (E_f = 11.0V)	4000	---	4400	---	---	---	μMHOS
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	---	---	---	---	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, Ebb=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 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, Rk = 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

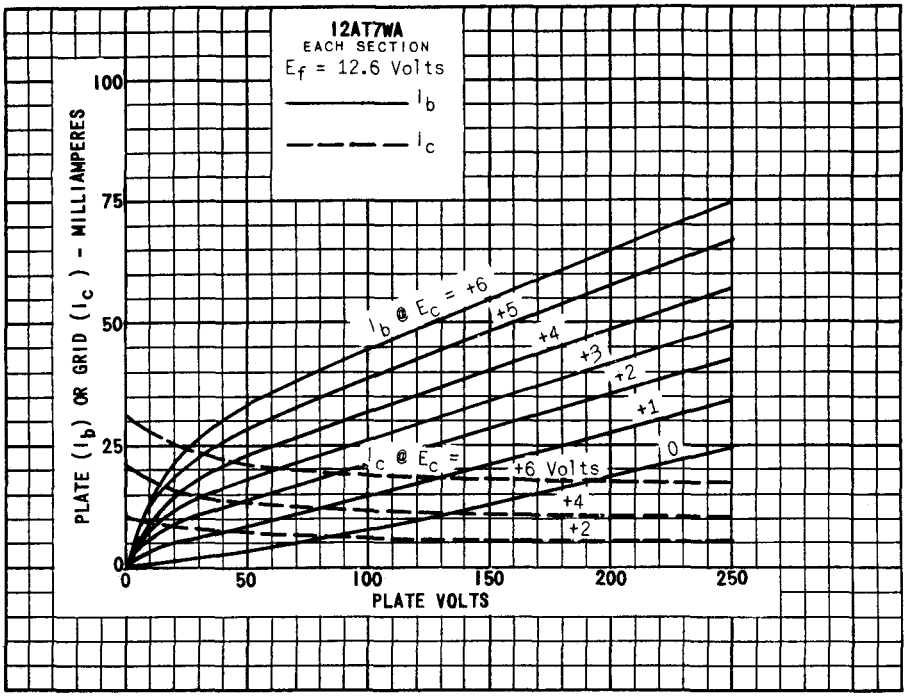
L SEE MIL-E-1C 4.6.2

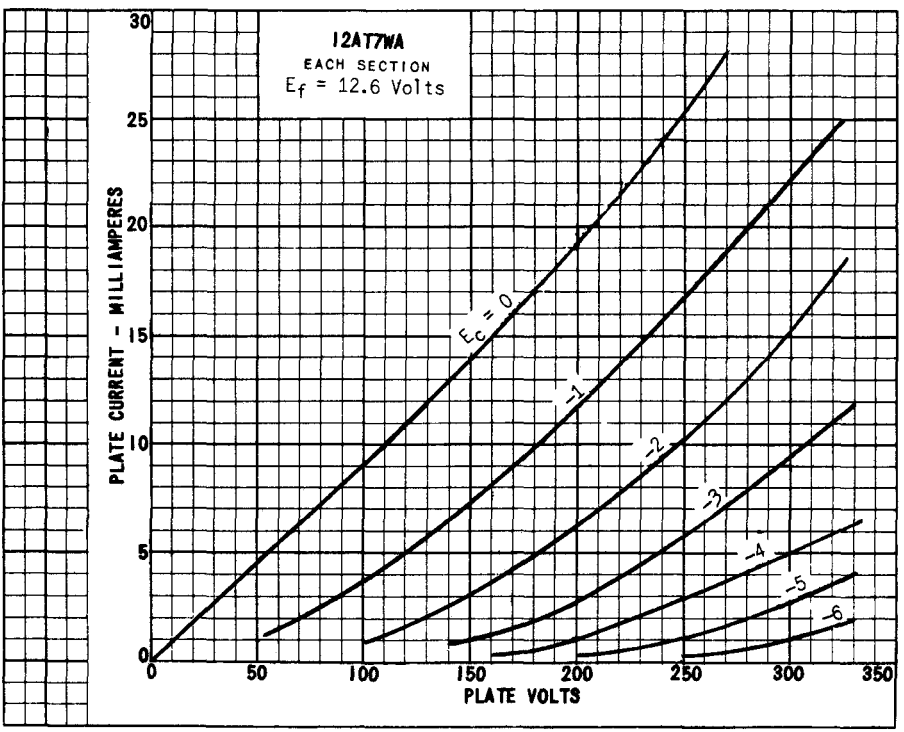
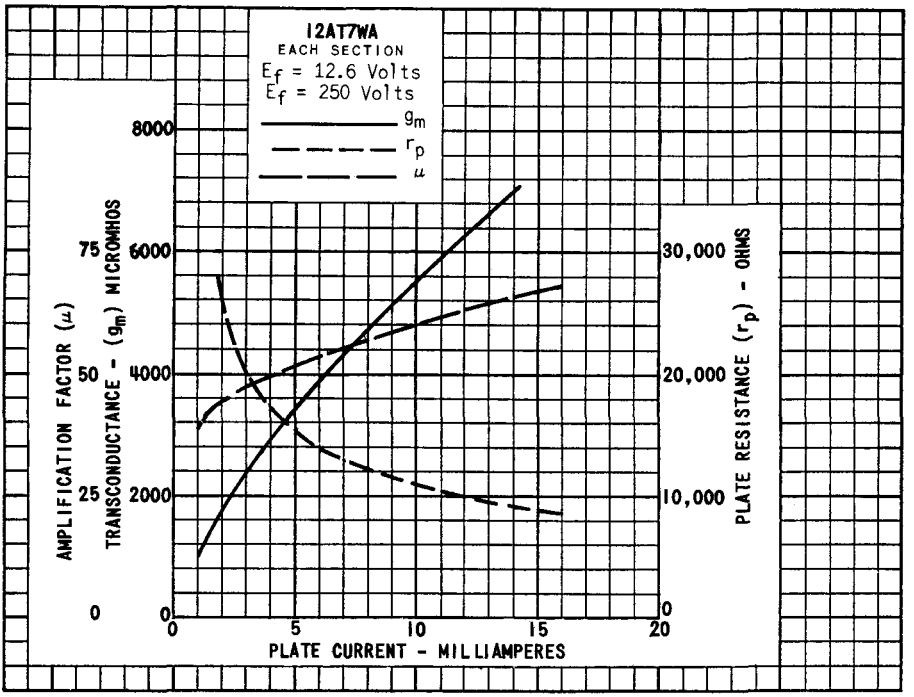
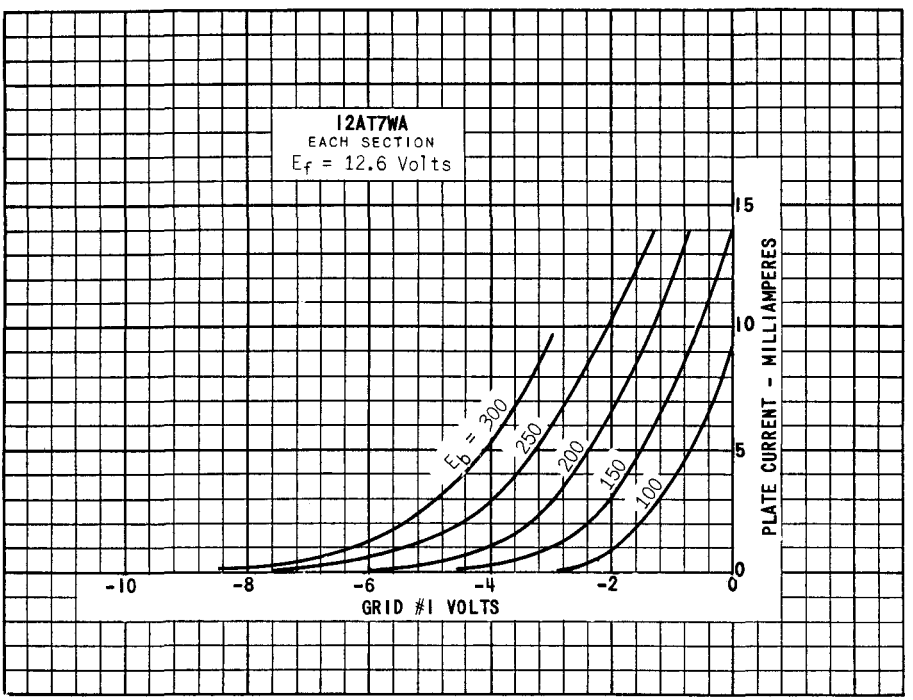
M SEE MIL-E-1C 4.9.20.5

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
EACH SECTION
Ef = 12.6 Volts
Ib
Ic
Ib @ Ec = +6
+5
+4
+3
+2
+1
0
Ic @ Ec =
+6 Volts
+4
+2
PLATE (Ib) OR GRID (Ic) - MILLIAMPERES
PLATE VOLTS
0
25
50
75
100
0
50
100
150
200
250


12AT7WA
EACH SECTION
Ef = 12.6 Volts
Ec = 0
-1
-2
-3
-4
-5
-6
PLATE CURRENT - MILLIAMPERES
PLATE VOLTS
0
5
10
15
20
25
30
0
50
100
150
200
250
300
350

12AT7WA
PREMIUM TUBE