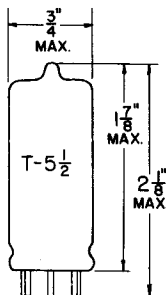


**TUNG-SOL**

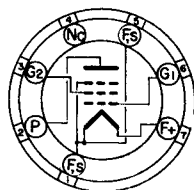
**PENTODE  
MINIATURE TYPE**



**GLASS BULB**

HEATER

ANY MOUNTING POSITION



**BOTTOM VIEW  
MINIATURE BUTTON  
7 PIN BASE**

6AR

THE 1T4WA IS A FILAMENT TYPE SEMI-REMOTE CUTOFF PENTODE IN THE 7 PIN MINIATURE CONSTRUCTION. IT IS DESIGNED FOR USE AS A RADIO FREQUENCY OR INTERMEDIATE FREQUENCY AMPLIFIER IN BATTERY OPERATED EQUIPMENT WHERE EXTREME CONDITIONS OF MECHANICAL SHOCK OR VIBRATION ARE ENCOUNTERED. THE TUBE IS PARTICULARLY USEFUL IN VOLTAGE AMPLIFIER CIRCUITS WHERE ITS LOW MICROPHONIC NOISE AND VIBRATION OUTPUT ARE ESSENTIAL FOR SPECIALIZED MILITARY ELECTRONIC EQUIPMENT.

**RATINGS**

MECHANICAL

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

**RATINGS**

AND NORMAL OPERATION

	MIL E 1 SYMBOL	DES. MIN.	NORM. TEST COND. NOTE 5	NORM. OPER ATION NOTE 4	DES. MAX.	MIL-E-1 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:	---	67.5	67.5	75	Vdc
PLATE DISSIPATION	Pp:	---	---	---	0.4	WATTS
GRID #2 DISSIPATION	Pg2:	---	---	---	0.15	WATTS
GRID RESISTANCE	Rg(1):	---	---	---	2.0	MEG.
TRANSCONDUCTANCE	Sm:	---	---	900	---	μMHOS
PLATE CURRENT	Ib1:	---	---	3.5	---	mAdc
CATHODE CURRENT	Ik:	---	---	---	6.5	mAdc

CONTINUED ON FOLLOWING PAGE

PRINTED IN U. S. A.

## TUNG-SOL

CONTINUED FROM PRECEDING PAGE

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

TEST	AQL MIL-E-1					MAX. A.L.D	MIL-E-1 UNITS
	%	SYMBOL	MIN	LAL	BOG		
MEASUREMENTS ACCEPTANCE TESTS, PART 1							
COMBINED AQL=1.0% EXCLUDING MECH. AND INOPERATIVES							
GRID CURRENT (1):							
Eb=Ec2=90 Vdc							
Ec1=-2.0 Vdc	0.65	Ic1:	0	---	---	-1.0	μAdc
PLATE CURRENT (1):	0.65	Ib1:	2.3	---	---	4.7	mAdc
SCREEN GRID CURRENT:	0.65	Ic2:	0.65	---	---	2.15	mAdc
TRANSCONDUCTANCE (1):	0.65	Sm(1):	660	---	---	1125	μMHOS
NOISE AND MICROPHONICS:							
Ebb=90 Vdc; Ecc2=67.5 Vdc;							
Eca1=10.0 mVac; Rp=1.0 MEG;							
Rg2=4.7 MEG; Cg2=0.1 μf;							
Rg1=0	0.65	EB:	---	---	---	17	VU
CONTINUITY AND SHORTS: (INOPERATIVES)							
	0.4	---	---	---	---	---	---
MECHANICAL:							
ENVELOPE OUTLINE (6-2)	---	---	---	---	---	---	---
MEASUREMENTS ACCEPTANCE TESTS, PART 2							
INSULATION OF ELECTRODES:							
g-all=-100 Vdc		Rg-all:	100	---	---	---	MEG.
p-all=-100 Vdc	4.0	Rp-all:	100	---	---	---	MEG.
TRANSCONDUCTANCE (2):							
Ef=1.0 Vdc; Eb=75 Vdc;							
Ec2=55 Vdc	6.5	Sm(2):	500	---	---	1125	μMHOS
TRANSCONDUCTANCE (3):							
Ec1=-16 Vdc	6.5	Sm(3):	1	---	---	50	μMHOS
FILAMENT CURRENT:							
	6.5	If:	44	---	---	56	mA
GRID VOLTAGE:							
Ec1/Ic1=0.1 μAdc							
Ec2=45 Vdc (NOTE 9)	6.5	Ec(1):	---	---	---	2.0	Vdc
PLATE CURRENT (2):							
Ef=1.25 Vdc; Rg=50,000							
OHMS; Ec1=25 Vac (NOTE 10)	6.5	Ib:	2.0	---	---	---	mAdc
PLATE RESISTANCE:							
Eb=Ec2=45 Vdc	6.5	rp:	0.17	---	---	---	MEG.
CAPACITANCE: (SHIELD 316)		Cg1p:	---	---	---	0.02	μμf
CAPACITANCE:(WITHOUT SHIELD)	6.5	Cin:	3.0	---	---	4.7	μμf
CAPACITANCE:(WITHOUT SHIELD)		Cout:	4.5	---	---	8.5	μμf
VIBRATION (1):							
Rp=10,000 OHMS;							
40 cps; 15g	6.5	Ep:	---	---	---	10	mVac
VIBRATION (2):							
F=40 cps-3500 cps;							
Rp=10,000 OHMS (NOTE 8)	6.5	Ep(2):	---	---	---	20	mVac

CONTINUED ON FOLLOWING PAGE

**TUNG-SOL**

CONTINUED FROM PRECEDING PAGE

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

TEST	AQL MIL-E-1 % SYMBOL MIN.	LAL	BOG	UAL	MAX. ALD	MIL-E-1 UNITS
DEGRADATION RATE						
ACCEPTANCE TESTS						
SHOCK:						
HAMMER ANGLE=30° (NOTE 2)	---	---	---	---	---	---
FATIGUE:						
G=2.5; F=25cps MIN; 60 cps MAX.; FIXED FREQUENCY (NOTE 3)	6.5	---	---	---	---	---
POST SHOCK AND FATIGUE						
TEST END POINTS:						
TRANSCONDUCTANCE (1):	---	Sm(1): 570	---	---	---	μMHOS
VIBRATION (1):	---	Ep: ---	---	---	15	mVac
MINIATURE TUBE BASE STRAIN:	---	---	---	---	---	---
GLASS STRAIN (THERMAL SHOCK):	2.5	---	---	---	---	---

TEST	ALLOW. DEF. PER CHARACTER.		AQL %	MIL-E-1 SYMBOL	MIN.	MAX.	MIL-E-1 UNITS
	1st SAMP.	COMB. SAMP.					
ACCEPTANCE LIFE TEST							
INTERMITTENT LIFE TEST:							
EF=1.25 Vdc OR Vac WITH EQUIVALENT BIAS; GROUP A	---	---	---	t:	500	---	HOURS
INTERMITTENT LIFE TEST							
END POINTS:							
TRANSCONDUCTANCE (1):	---	---	---	Sm(1):	540	---	μMHOS
GRID CURRENT:	---	---	---	Ic(1):	---	-1.0	μAdc

**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.
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.

CONTINUED ON FOLLOWING PAGE

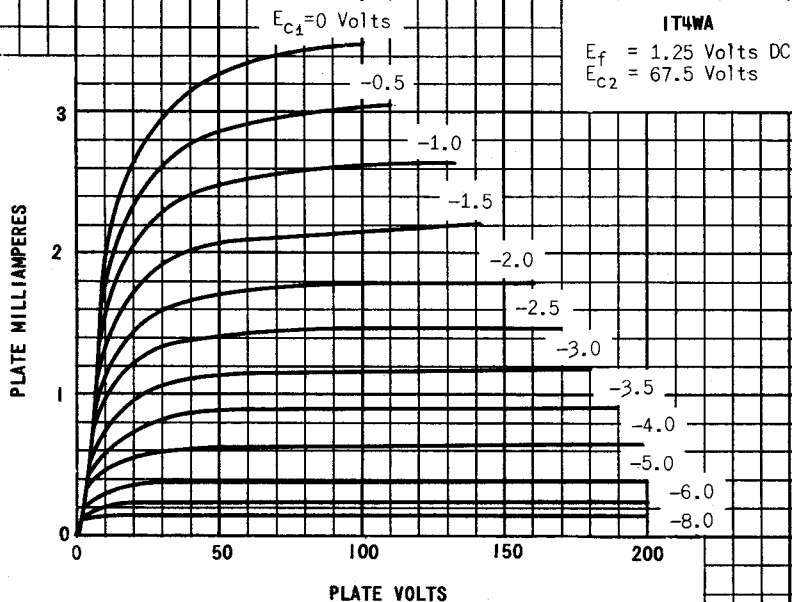
PRINTED IN U. S. A.

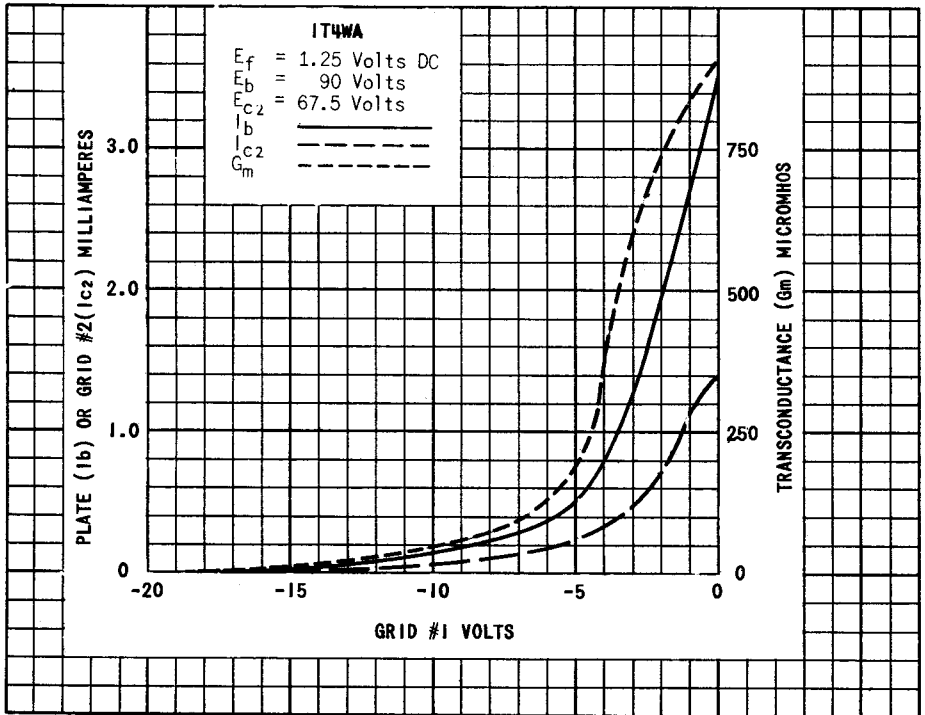
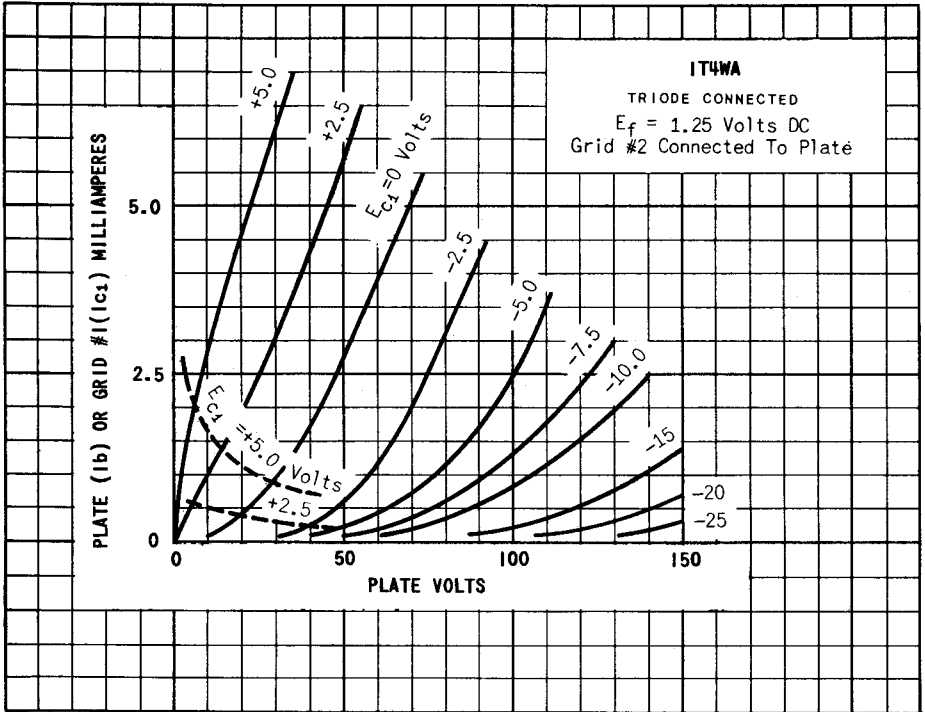
## TUNG-SOL

CONTINUED FROM PRECEDING PAGE

## NOTES - cont'd.

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 SUPPLY VOLTAGES SHOULD NOT EXCEED THESE VALUES UNDER ANY CIRCUMSTANCES.
8. THE TUBE UNDER TEST SHALL BE RIGIDLY MOUNTED ON A VIBRATION TABLE 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. THE VOLTAGE DROP IN THE GRID CURRENT METER SHALL BE INCLUDED IN THE GRID VOLTAGE REQUIRED FOR THE  $0.1\mu\text{A}_{dc}$  GRID CURRENT.
10. THE SIGNAL SHALL BE COUPLED THROUGH A  $1\mu\text{f}$  CONDENSER AND SHALL HAVE A SOURCE IMPEDENCE OF APPROXIMATELY 500 OHMS.





PRINTED IN U. S. A.