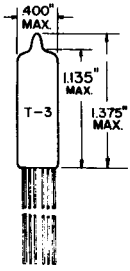
TUNG-SOL

DOUBLE-TRIODE

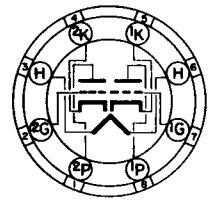
SUBMINIATURE TYPE



GLASS BULB

HEATER

ANY MOUNTING POSITION



BOTTOM VIEW
SUBMINIATURE BUTTON
8 PIN BASE
0.017" TINNED
FLEXIBLE LEADS
8DG

THE 6112WA IS A HEATER-CATHODE TYPE HIGH-MU DOUBLE TRIODE CAPABLE OF OPERATION IN THE UHF REGION. IT IS OF SUBMINIATURE CONSTRUCTION AND DESIGNED FOR SERVICE WHERE SEVERE CONDITIONS OF HIGH TEMPERATURE AND MECHANICAL SHOCK OR VIBRATION ARE ENCOUNTERED. THE FLEXIBLE LEADS MAY BE SOLDERED OR WELDED DIRECTLY TO THE TERMINALS OF CIRCUIT COMPONENTS WITHOUT THE USE OF SOCKETS. STANDARD SUBMINIATURE SOCKETS MAY BE USED BY CUTTING THE LEADS TO A SUITABLE LENGTH.

RATINGS

MECHANICAL

MAXIMUM IMPACT ACCELERATION (SHOCK TEST-NOTE 3)	450	G
MAXIMUM UNIFORM ACCELERATION (CENTRIFUGE TEST-NOTE 4)	1000	G
MAXIMUM VIBRATIONAL ACCELERATION (96 HR. FATIGE TEST-NOTE 5)	2.5	G
MAXIMUM BULB TEMPERATURE	220	°C

RATINGS

AND NORMAL OPERATION

	MIL-E-1 SYMBOL	DES. MIN.	NORM. TEST CONDITIONS NOTE 7	NORM. OPERATION NOTE 6	DES. MAX.	MIL-E-1 UNITS
HEATER VOLTAGE (NOTE 8)	Ef:	6.0	6.3	6.3	6.6	V
PLATE VOLTAGE	Eb:	---	100	100	250	Vdc
PEAK PLATE VOLTAGE	ep:	---	---	---	360	v
GRID #1 VOLTAGE	Ec1:	-55	0	0	---	Vdc
PLATE DISSIPATION (PER PLATE)	Pp/p:	---	---	0.08	0.3	W
GRID #1 CIRCUIT RESISTANCE	Rg/g:	---	---	1.0	1.1	MEG.
HEATER-CATHODE VOLTAGE	Ehk:	-200	---	100	+200	Vdc
PLATE CURRENT (PER PLATE)	Ib/p:	---	---	0.8	3.3	mAdc
GRID CURRENT	Ic/c:	---	---	---	---	mAdc
CATHODE RESISTANCE (PER UNIT)	Rk:	---	1500	1500	---	OHMS
TRANSCONDUCTANCE (PER PLATE)	Sm/p:	---	---	1800	---	μMHOS
AMPLIFICATION FACTOR	Mμ/p:	---	---	70	---	---

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TUNG-SOL

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CHARACTERISTICS AND QUALITY CONTROL TESTS[1]

(IN THE FOLLOWING TESTS, EACH UNIT IS TESTED SEPARATELY)

TEST	AQL %	MIL-E-1 SYMBOL	MIN	LAL	BOG	UAL	MAX	ALD	MIL-E-1 UNITS
MEASUREMENTS ACCEPTANCE TESTS - PART 1	COMBINED AQL=1.0% EXCLUDING MECH. AND INOPERATIVES.								
HEATER CURRENT:	0.4	If:	285	---	---	---	315	---	mA
HEATER-CATHODE LEAKAGE:									
Ehk=+100 Vdc	0.4	Ihk:	---	---	---	---	3.5	---	μAdc
Ehk=-100 Vdc		Ihk:	---	---	---	---	3.5	---	μAdc
GRID CURRENT: Eb=150 Vdc; Ec=0; Rk=820 OHMS; Rg= 1.0 MEG.	0.4	Ic(1):	---	---	---	---	-0.3	---	μAdc
PLATE CURRENT (1):	0.4	Ib(1):	0.50	---	0.8	---	1.10	---	mAdc
PLATE CURRENT (2): Ec1=-2.8 Vdc	0.4	Ib(2):	---	---	---	---	50	---	μAdc
TRANSCONDUCTANCE (1):	0.4	Sm(1):	1500	1650	1800	1950	2100	350	μMHOS
CONTINUITY AND SHORTS (INOPERATIVES): (NOTE 11)	0.4	---	---	---	---	---	---	---	---
MECHANICAL: ENVELOPE (8-1)	---	---	---	---	---	---	---	---	---
MEASUREMENTS ACCEPTANCE TESTS - PART 2									
INSULATION OF ELECTRODES:									
Ef=6.3 V; Eg-all=-100Vdc;	2.5	Rg-all:	250	---	---	---	---	---	MEG.
Ep-all=-300 Vdc;		Rp-all:	250	---	---	---	---	---	MEG.
TRANSCONDUCTANCE (2): Ef=5.7 V; (NOTE 9)	2.5	Δ_{Ef}Sm(2):	---	---	---	---	15	---	PERCENT
GRID EMISSION: Eb=250 Vdc; Rg=1.0 MEG; Rk=2700 OHMS; Ef=7.5 V; PREHEAT AT Ec=0; TEST AT Ec=-9.0 Vdc	6.5	Ic(2):	---	---	---	---	-0.5	---	μAdc
AF NOISE: Esig=45mVac; Rg= 0.5 MEG.; Rp=0.2 MEG ; Rk=750 OHMS; Ck= 1000 μf; UNITS CONNECTED IN PARALLEL	2.5	EB:	---	---	---	---	17	---	VU
AMPLIFICATION FACTOR:	6.5	Mu:	60	---	70	---	80	---	---
AC AMPLIFICATION: Esig=0.2 Vac; Ebb=100 Vdc; Ecc=0; Rk=0; Rg1= 10 MEG.;	6.5	Ep:	8.0	---	---	---	---	---	Vac
HEATER-CATHODE LEAKAGE (2): Ef=-6.7V; PIN 6 NEGATIVE; Ehk=+100 Vdc; CATHODE NEGATIVE t= 16 SEC.; (NOTE 12)	6.5	Ihk(2):	---	---	---	---	1.0	---	μAdc

TUNG-SOL

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CHARACTERISTICS AND QUALITY CONTROL TESTS[1]

(IN THE FOLLOWING TESTS, EACH UNIT IS TESTED SEPARATELY)

TEST	AQL %	MIL-E-1 SYMBOL	MIN	LAL	BOG	UAL	MAX	ALD	MIL-E-1 UNITS
MEASUREMENTS ACCEPTANCE TESTS PART 2 (CONT'D.)		COMBINED AQL=1.0% EXCLUDING MECH. AND INOPERATIVES							
CAPACITANCE:		Cgp:	0.8	---	1.00	---	1.20	---	μμf
CAPACITANCE:		Cin:	1.30	---	1.70	---	2.10	---	μμf
CAPACITANCE: (NOTE 2)	6.5	Cout: UNIT #1	0.16	---	0.23	---	0.30	---	μμf
CAPACITANCE:		Cout UNIT #2:	0.21	---	0.28	---	0.35	---	μμf
CAPACITANCE:		Cgg:	---	---	---	---	0.014	---	μμf
CAPACITANCE:		Cpp:	---	---	---	---	0.80	---	μμf
LOW PRESSURE BREAKDOWN: PRESSURE=21±3mmHG; VOLTAGE=300 Vac	6.5								
VIBRATION (2): F=40cps; G=15; Rp= 10,000 OHMS	2.5	Ep:	---	---	---	---	20	---	mVac
VIBRATION (3): F=70-2000; t=3 MINUTES; G=15; Rp=10,000 OHMS; POSITIONS X AND X2 ONLY.	6.5	ep:	---	---	---	---	75 peak to peak	---	mv
OPERATION TIME: (NOTE 10)	4.0	t:	---	---	---	---	20	---	sec.

TEST	ALLOWABLE DEF. PER CHARACTER. 1st SAMP.	COMB. SAMP.	AQL %	MIL-E-1 SYMBOL	MIN.	MAX.	MIL-E-1 UNITS
DEGRADATION RATE ACCEPTANCE TESTS							
SUBMINIATURE LEAD FATIGUE:	---	---	2.5	---	4.0	---	arcs
SHOCK (1): Ehk=+100 Vdc; Rg= 0.1 MEG.; HAMMER ANGLE = 30°; (NOTE 3)	---	---	20	---	---	---	---
FATIGUE (1): 96 HOURS; G=2.5; FIXED FREQUENCY; F=25 MIN; 60 MAX.; (NOTE 5)	---	---	6.5	---	---	---	---
SHOCK (2): Ehk=+100 Vdc; Rg= 0.1 MEG.; HAMMER ANGLE = 120 °+ RUBBER PAD; t=10 MILLISECONDS; G= 75 (NOTE 14)	---	---	20	---	---	---	---
FATIGUE (2): 6 HOURS; G=10; F=130-2000-130 cps (NOTE 13)	---	---	6.5	---	---	---	---

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CHARACTERISTICS AND QUALITY CONTROL TESTS[1] cont'd.

TEST	ALLOWABLE DEF. PER CHARACT. 1st SAMP.	COMB. SAMP.	AQL %	MIL-E-1 SYMBOL	MIN	MAX.	MIL-E-1 UNITS
DEGRADATION RATE ACCEPTANCE TESTS -CONT'D.							
POST SHOCK AND FATIGUE (1) AND (2) TEST END POINTS:							
VIBRATION (2): F=40 cps; G=15; Rp= 10,000 OHMS.	---	---	---	Ep:	80	---	mVac
HEATER-CATHODE LEAKAGE:							
Ehk=+100 Vdc	---	---	---	Ihk(1):	---	7	μAdc
Ehk=+100 Vdc	---	---	---	Ihk(1):	---	7	μAdc
CHANGE IN TRANS-CONDUCTANCE (1) OF INDIVIDUAL TUBES:							
Ef=6.3 V	---	---	---	Δ_tSm(1):	---	15	PERCENT
GRID CURRENT (1):	---	---	---	Ic(1):	---	-1.0	μAdc
GLASS STRAIN							
(THERMAL SHOCK):	---	---	6.5	---	---	---	---
ACCEPTANCE LIFE TESTS							
HEATER CYCLING: Ef=7.0V; Eb=Ec=0V; Ehk=140 Vac; 1 MIN. ON, 4 MIN. OFF	---	---	1.0	---	2000	---	CYCLES
HEATER CYCLING LIFE TEST END POINTS:							
HEATER-CATHODE LEAKAGE:							
Ehk=+100 Vdc	---	---	---	Ihk(1):	---	10	μAdc
Ehk=-100 Vdc	---	---	---	Ihk(1):	---	10	μAdc
2 & 20 HOUR STABILITY LIFE TEST: TA=ROOM; Ehk=+200 Vdc; Rg/g=1.0 MEG.: Eb=150 Vdc; Rk/k=820 OHMS	---	---	---	---	---	---	---
2 & 20 HOUR STABILITY LIFE TEST END POINTS: CHANGE IN TRANSCON-DUCTANCE (1) OF IN-DIVIDUAL TUBES: (TYPICAL SAMPLE SIZE= 50 TUBES)	---	---	1.0	Δ_tSm(1):	---	10	PERCENT
100 HOUR SURVIVAL RATE LIFE TEST: TA=ROOM; Ehk=+200 Vdc; Rg/g=1.0 MEG.; Eb=150 Vdc; Rk/k=820 OHMS							
100 HOUR SURVIVAL RATE LIFE TEST END POINTS: TYPICAL SAMPLE SIZE= 200 TUBES)	---	---	---	---	---	---	---
CONTINUITY AND SHORTS (INOPERATIVES):	---	---	0.65	---	---	---	---
TRANSCONDUCTANCE (1):	---	---	1.0	Sm(1):	1200	---	μMHOS

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CHARACTERISTICS AND QUALITY CONTROL TESTS[1] cont'd.

TEST	ALLOWABLE DEF. PER CHARACTER. 1st SAMP.	COMB. SAMP.	AQL %	MIL-E-1 SYMBOL	MIN.	MAX.	MIL-E-1 UNITS
ACCEPTANCE LIFE TESTS (CONT'D.)							
200 HOUR INTERMITTENT LIFE TEST (1): TA=ROOM; Eb=250 Vdc; Ehk=+200 Vdc; Rg/g= 1.0 MEG.; Rk/k=2700 OHMS							
200 HOUR INTERMITTENT LIFE TEST (1) END POINTS: (TYPICAL SAMPLE SIZE= 20 TUBES 1st SAMPLE; 40 TUBES 2nd SAMPLE)							
INOPERATIVES:	1	3	---	---	---	---	---
GRID CURRENT (1):	1	3	---	Ic1:	---	-0.9	μAdc
HEATER CURRENT:	1	3	---	If:	276	328	mA
CHANGE IN TRANSCONDUCTANCE OF INDIVIDUAL TUBES:	1	3	---	Δ_tSm(1):	---	25	PERCENT
TRANSCONDUCTANCE (2):	1	3	---	Δ_{Ef}Sm(2):	---	20	PERCENT
HEATER-CATHODE LEAKAGE (1):							
Ehk=+100 Vdc	1	3	---	Ihk(1):	---	10	μAdc
Ehk=-100 Vdc			---	Ihk(1):	---	10	μAdc
INSULATION OF ELECTRODES:							
g-all:	1	3	---	Rg-all:	100	---	MEG.
p-all:			---	Rp-all:	100	---	MEG.
TOTAL DEFECTIVES:	3	6	---	---	---	---	---
HOUR INTERMITTENT HIGH TEMPERATURE LIFE TEST(2): T BULB=220°C; Ehk=200 Vdc; Rg/g=1.0 MEG.; Eb=150 Vdc; Rk/k=820 OHMS	---	---	---	---	---	---	---
500 HOUR INTERMITTENT HIGH TEMPERATURE LIFE TEST (2) END POINTS: (TYPICAL SAMPLE SIZE= 20 TUBES 1st SAMPLE, 40 TUBES 2nd SAMPLE)	---	---	---	---	---	---	---
INOPERATIVES:	1	3	---	---	---	---	---
GRID CURRENT (1):	1	3	---	Ic(1):	---	-0.7	μAdc
HEATER CURRENT:	1	3	---	If:	276	328	mA
TRANSCONDUCTANCE (1) CHANGE OF INDIVIDUAL TUBES FROM INITIAL:	1	3	---	Δ_tSm(1):	---	20	PERCENT
TRANSCONDUCTANCE (2): (NOTE 9)	1	3	---	Δ_{Ef}Sm(2):	---	15	PERCENT
HEATER-CATHODE LEAKAGE (1):							
Ehk=+100 Vdc	1	3	---	Ihk(1):	---	10	μAdc
Ehk=-100 Vdc			---	Ihk(1):	---	10	μAdc

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CHARACTERISTICS AND QUALITY CONTROL TESTS[1] - cont'd.

TEST	ALLOWABLE DEF. PER CHARACTER. 1st SAMP.	COMB. SAMP.	AQL %	MIL-E-1 SYMBOL	MIN.	MAX.	MIL-E-1 UNITS
ACCEPTANCE LIFE TESTS (CONT'D.)							
INSULATION OF ELECTRODES:							
g-all:	1	3	---	Rg-all:	50	---	MEG.
p-all:			---	Rp-all:	50	---	MEG.
TRANSCONDUCTANCE (1) AVERAGE CHANGE:	1	3	---	Avg. Δ_tSm(1):	---	15	PERCENT
TOTAL DEFECTIVES:	3	6	---	---	---	---	---
1000 HOUR HIGH TEMPERATURE LIFE TEST (2) END POINTS: (TYPICAL SAMPLE SIZE = 20 TUBES 1st SAMPLE; 40 TUBES 2nd SAMPLE)	---	---	---	---	---	---	---
INOPERATIVES:	1	3	---	---	---	---	---
GRID CURRENT (1):	1	3	---	Ic1:	---	-1.0	μAdc
HEATER CURRENT:	1	3	---	If:	276	328	mA
TRANSCONDUCTANCE (1) CHANGE OF INDIVIDUAL TUBES FROM INITIAL:	1	3	---	Δ_tSm(1):	---	25	PERCENT
TRANSCONDUCTANCE (2): (NOTE 9)	1	3	---	Δ_{Ef}Sm(2):	---	20	PERCENT
HEATER-CATHODE LEAKAGE (1):							
Ehk(1) =+100 Vdc	1	3	---	Ihk(1):	---	10	μAdc
Ehk(1) =+100 Vdc			---	Ihk(1):	---	10	μAdc
INSULATION OF ELECTRODES:							
g1-all:	2	5	---	Rg-all:	25	---	MEG.
p-all:			---	Rp-all:	25	---	MEG.
TOTAL DEFECTIVES:	4	8	---	---	---	---	---

NOTES:

1 CHARACTERISTICS, QUALITY CONTROL TEST PRECEDURES, AND INSPECTION LEVELS ARE MADE ACCORDING TO THE APPROPRIATE PARAGRAPH OF MIL-E-1, "INSPECTION INSTRUCTIONS FOR ELECTRON TUBES", AND MIL-STD-105A.

2 WITHOUT SHIELD.

3 TEST CONDITIONS AND ACCEPTANCE CRITERIA PER SHOCK TEST PROCEDURES OF MIL-E-1 BASIC SPECIFICATIONS.

4 CENTRIFUGE TEST WITH FORCES APPLIED IN ANY DIRECTION.

5 TEST CONDITIONS AND ACCEPTANCE CRITERIA PER FATIGUE TEST PROCEDURES OF MIL-E-1 BASIC SPECIFICATIONS.

6 THESE NORMAL VALUES REPRESENT CONDITIONS AT WHICH CONTROL OF RELIABILITY MAY BE EXPECTED.

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NOTES - CONT'D.

7 THESE NORMAL TEST CONDITIONS ARE USED FOR ALL CHARACTERISTIC TESTS UNLESS OTHERWISE STATED UNDER THE INDIVIDUAL TEST ITEM.

8 FOR MOST APPLICATIONS THE PERFORMANCE WILL NOT BE ADVERSELY AFFECTED BY ± 5% HEATER VOLTAGE VARIATION, BUT WHEN THE APPLICATION CAN PROVIDE A CLOSER CONTROL OF HEATER VOLTAGE, AN IMPROVEMENT IN RELIABILITY WILL BE REALIZED.

9 CHANGE OF TRANSCONDUCTANCE FOR INDIVIDUAL TUBES FROM THAT VALUE MEASURED AT E_f = 6.3 V TO THAT VALUE MEASURED AT E_f = 5.7 V.

10. OPERATION TIME IS THE TIME IN SECONDS REQUIRED FOR THE PLATE CURRENT TO ATTAIN A VALUE WITHIN ± 10% OF THE THREE (3) MINUTE PLATE CURRENT (1) VALUE MEASURED AT PLATE CURRENT (1) TEST CONDITIONS. NO PREHEATING BEFORE THIS TEST IS ALLOWED, A COLD TUBE MUST BE USED.

11. DURING BOTH CONTINUITY AND SHORT TESTING, THE TUBE UNDER TEST SHALL BE TAPPED AT LEAST THREE TIMES IN EACH OF TWO PLANES 90° APART WITH A TAPPER WHICH SHALL BE ADJUSTED TO GIVE AN IMPULSE OF APPROXIMATELY ONE HALF SINE WAVE OF 300 ± 50 MICRO SECONDS DURATION AND HAVING A MINIMUM AVERAGE AMPLITUDE OF 80 G'S PEAK ACCELERATION AS MEASURED WITH A GULTON A-305 ACCELEROMETER AND KA-1 KIT. THE SHORTS DETECTING EQUIPMENT SHALL BE A DEVICE CAPABLE OF DETECTING AS SHORTS, THE FOLLOWING INTERELEMENT RESISTANCES OF THE GIVEN TIME DURATION.

DURATION	SENSITIVITY
PERMANENT SHORT	600,000 OHMS
500 MICRO SECONDS	500,000 OHMS
100 MICRO SECONDS	100,000 OHMS
60 MICRO SECONDS	1,000 OHMS

TUBES WHICH GIVE AN INDICATION OF ONE OR MORE OF THE FOLLOWING SHALL BE REJECTED AS INOPERABLE:

A. EITHER A PERMANENT OR TAP SHORT AT ANY TIME DURING THE TAPPING PROCEDURE

B. ANY OPEN CIRCUIT

C. AIR LEAKS

12. HEATER-CATHODE LEAKAGE (2) SHALL BE PERFORMED AS FOLLOWS:

A. PREHEAT TUBES FOR 10 SECONDS WITH E_f = 10.5 V

B. TEST IMMEDIATELY BY THE APPLICATION OF THE SPECIFIED TEST CONDITIONS FOR THIS TEST

C. AFTER 16 SECONDS READ HEATER-CATHODE LEAKAGE OF EACH SECTION.

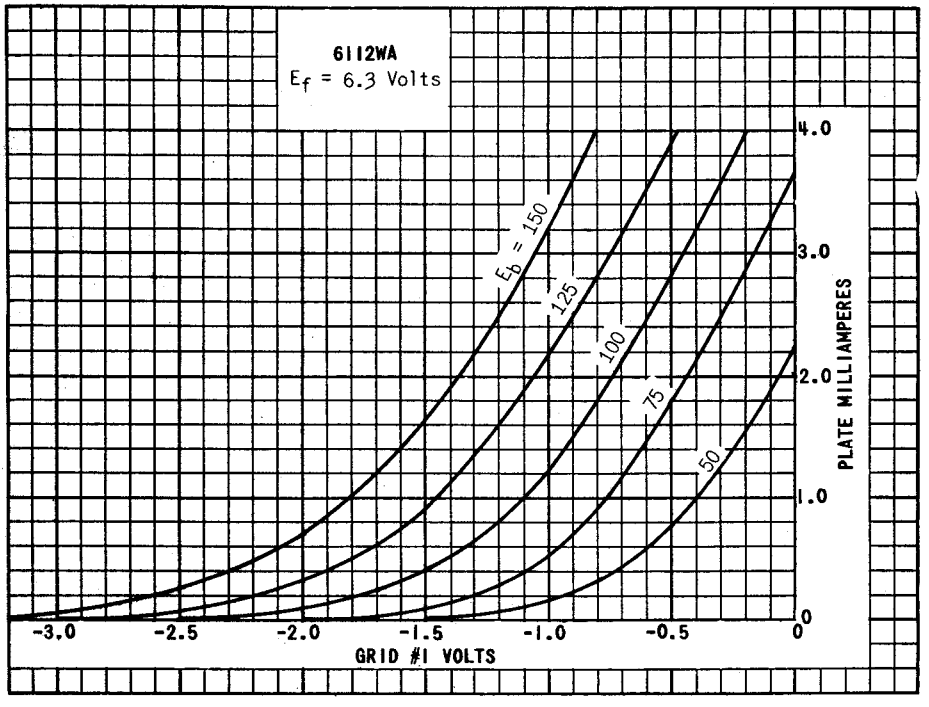
13. THE TUBES SHALL BE RIGIDLY MOUNTED ON A TABLE VIBRATING WITH SIMPLE HARMONIC MOTION. THE TUBES SHALL BE VIBRATED FOR A TOTAL OF 6 HOURS, 2 HOURS IN EACH OF THREE POSITIONS, X1, X2, AND Y1. ONLY RATED HEATER VOLTAGE SHALL BE APPLIED. TUBES WHICH SHOW ONE OR MORE OF THE FOLLOWING DEFECTS SHALL BE CONSIDERED FAILURES.

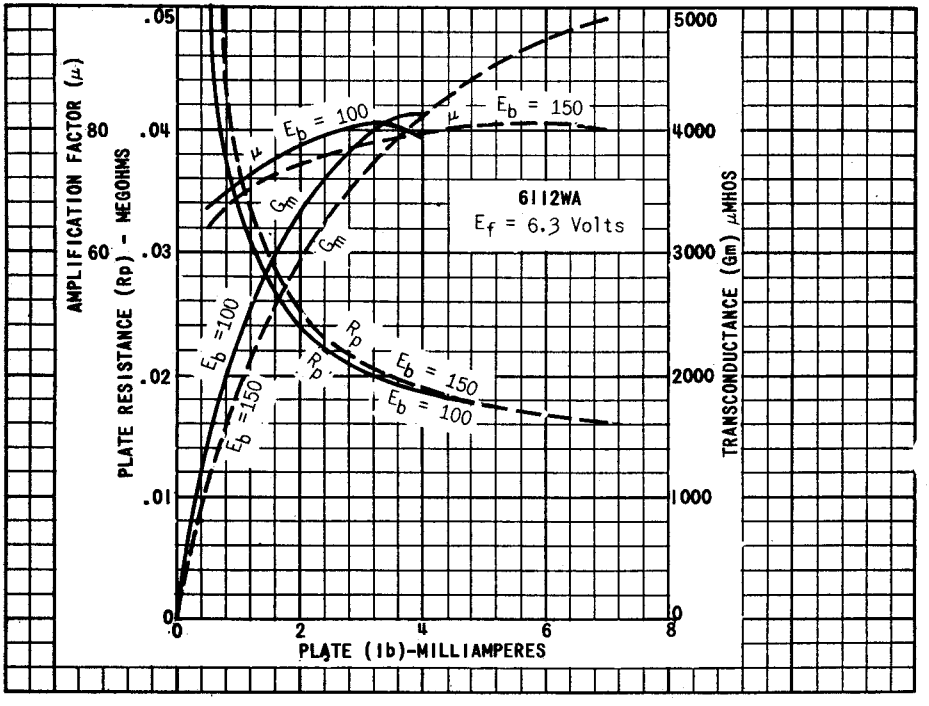
A. TUBES WHICH SHOW PERMANENT OR TAP SHORTS OR OPEN CIRCUITS FOLLOWING FATIGUE TEST, WHEN TESTED AS SPECIFIED IN 4.7.2 AND 4.7.3

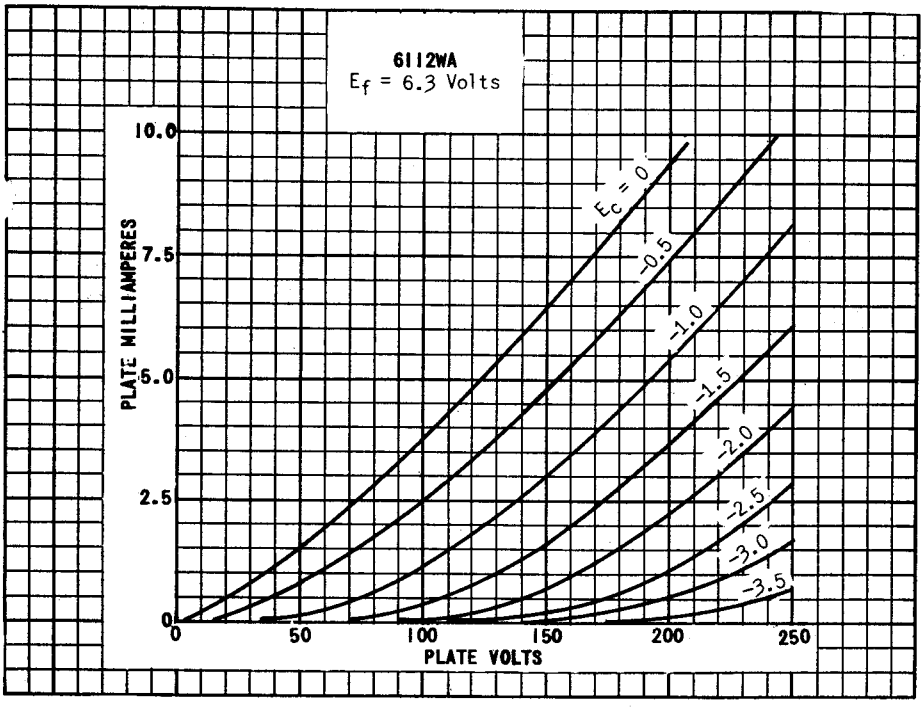
B. TUBES WHICH DO NOT COMPLY WITH POST FATIGUE LIMITS, THIS IS A DESTRUCTIVE TEST

14. THE PROVISIONS OF PARAGRAPH 4.9.20.5 OF SPECIFICATION MIL-E-1 SHALL APPLY, EXCEPT FOR EXCEPT FOR TEST CONDITIONS LISTED FOR SHOCK TEST (2).

TENTATIVE DATA






6112WA
E_f = 6.3 Volts
PLATE MILLIAMPERES
10.0
7.5
5.0
2.5
0
0
50
100
150
200
250
PLATE VOLTS
E_c = 0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5