

6111 TWIN TRIODE

Five-Star Tube

FOR GENERAL-PURPOSE AMPLIFIER APPLICATIONS

8-LEAD SUBMINIATURE MEDIUM MU

SHOCK, VIBRATION RATINGS HEATER-CYCLING RATING

DESCRIPTION AND RATING=

The 6111 is a subminiature medium-mu twin triode for use in general-purpose amplifier applications. Each section has an individual cathode and is electrically independent. The tube may also be used as a combined oscillator and mixer in high-frequency circuits.

The 6111 is a special-quality tube intended for use in critical industrial and military applications in which operational dependability is of primary importance. Features of the tube include a high degree of mechanical strength and a heater-cathode construction capable of withstanding many-thousand cycles of intermittent operation. When used in on-off control applications, the tube will maintain its emission capabilities after long periods of operation under cutoff conditions.

GENERAL

ELECTRICAL

Cathode—Coated Unipotential		
Heater Voltage, AC or DC	$6.3 \pm 5\%$	Volts
Heater Current	0.3	Amperes

Direct Interelectrode Capacitances

	Mitu Suleia.	Without Shield
Grid to Plate, Each Section	1.4	1.5 μμf
Input, Each Section	2.1	1.9 μμ f
Output, Section 1	1.3	0.28 μμf
Output, Section 2	1.4	0.32 μμf
Grid to Grid, maximum	0.010	0.011 μμf
Plate to Plate, maximum	0.3	0.5 μμ f

^{*}With external shield of 0.405-inch inside diameter connected to cathode of section under test.

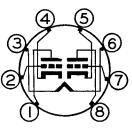
MECHANICAL

Mounting Position—Any
Envelope—T-3, Glass
Base—E8-10, Subminiature Button 8-Lead



Supersedes ET-T1104 dated 8-54

BASING DIAGRAM



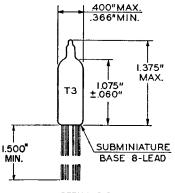
RETMA 8DG

TERMINAL CONNECTIONS

Lead 1—Plate (Section 2)
Lead 2—Grid (Section 2)
Lead 3—Heater
Lead 4—Cathode (Section 2)
Lead 5—Cathode (Section 1)
Lead 6—Heater
Lead 7—Grid (Section 1)

Lead 8—Plate (Section 1)

PHYSICAL DIMENSIONS



RETMA 3-1

MAXIMUM RATINGS

ABSOLUTE MAXIMUM VALUES, EACH SECTION		
Plate Voltage	165	Volts
Negative DC Grid Voltage	55	Volts
Plate Dissipation).95	Watts
DC Plate Current	22	Milliamperes
DC Grid Current	5.5	Milliamperes
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	200	Volts
Heater Negative with Respect to Cathode	200	Volts
Grid Circuit Resistance	1.1	Megohms
Bulb Temperature at Hottest Point	220	С

CHARACTERISTICS AND TYPICAL OPERATION

CLASS A1 AMPLIFIER, EACH SECTION

Plate Voltage	Volts
Cathode-Bias Resistor	Ohms
Amplification Factor	
Plate Resistance, approximate	Ohms
Transconductance	Micromhos
Plate Current	Milliamperes
Grid Voltage, approximate	
Ib = 10 Microamperes	Volts

CLASS A RESISTANCE-COUPLED AMPLIFIER

LOW IMPEDANCE DRIVE (APPROXIMATELY 200 OHMS)							Notes:						
RL	Rgf	Ebb = 9			Ebb =		olts	Ebb =	225 V	olts	 E_o is maximum RMS voltage output for approximately five percent total harmonic distortion. 		
	9.	Rk	Eo	Gain	R _k	Eo	Gain	Rk	Eo	Gain			
0.10	0.10	2400	8.4	13	2100	16	14	1900	25	15	Gain is measured for an output voltage of two volts RMS.		
0.10	0.24	3100	12	14	2800	22	15	2600	34	16	7 D is in ohms: D and D are in megohms		
0.24	0.24	6200	10	14	5600	19	15	5200	30	16	3. R_k is in ohms; R_L and R_{gf} are in megohms.		
0.24	0.51	7800	13	14	7200	25	15	7000	38	15	 Coupling capacitors (C) should be selected to give desired frequency response. R_k should be 		
0.51	0.51	14000	11	13	13000	21	14	12000	32	15	adequately by-passed.		
0.51	1.0	19000	14	13	17000	26	14	16000	40	15			
	HIGH IMPEDANCE DRIVE (APPROXIMATELY TOOK OHMS)										0, 1(+)		
RL	Rgf	R_{-4} Ebb = 90 Volts Ebb = 150 Volts Ebb = 225		225 V	olts								
	91	Rk	Eo	Gain	R _k	Eo	Gain	R _k	Eo	Gain			
0.10	0.10	3200	11	13	2500	21	14	2100	32	15			
0.10	0.24	4200	15	14	3400	28	15	3000	43	15	Esig 100K		
0.24	0.24	8400	13	13	6800	24	14	6000	36	15			
0.24	0.51	10000	16	13	8700	29	15	7800	45	15			
0.51	0.51	17000	13	13	15000	25	14	13000	38	15	┃ ○└ ┴ ┴ <u>◆</u> ○		
0.51	1.0	21000	17	13	19000	30	14	17000	47	15	THE THE BOD THE THE		

CHARACTERISTICS LIMITS

	Minimum	Maximum	
Heater Current	200	220	AA:H:
Ef = 6.3 volts	280 · 276	320 328	Milliamperes Milliamperes
Plate Current, Each Section	270	320	Milliamperes
Ef = 6.3 volts, Eb = 100 volts, Rk = 220 ohms (by-passed)	6.0	11	Milliamperes
Plate Current Difference between Sections Difference between plate currents for each section at Ef = 6.3 volts, Eb = 100 volts, Rk = 220 ohms (by-passed)		2.0	Milliamperes
Transconductance (1), Each Section Ef = 6.3 volts, Eb = 100 volts, Rk = 220 ohms (by-passed)	4100	5900	Micromhos
Transconductance Change with Heater Voltage, Each Section Difference between Transconductance (1) and Transconductance at Ef = 5.7 volts (other conditions the same) expressed as a percentage of		15	Daniel
Transconductance (1)		15 15	Percent Percent
Transconductance Change with Operation, Each Section Difference between Transconductance (1) initially and after operation expressed as a percentage of initial value500-Hi		20	Percent
Average Transconductance Change with Operation, Each Section			
Average of values for "Transconductance Change with Operation"500-H	r	15	Percent
Amplification Factor, Each Section Ef = 6.3 volts, Eb = 100 volts, Rk = 220 ohms (by-passed)	17	23	
Plate Current Cutoff, Each Section Ef = 6.3 volts, Eb = 100 volts, Ec = -9.0 volts	••••	100	Microamperes
Interelectrode Capacitances			
Grid to Plate (g to p), Each Section	1.2	1.8	$\mu\mu$ f
Input (g to k + h), Each Section	1.4	2.4	$\mu\mu$ f
Output (p to k + h), Section 1	0.20	0.36	$\mu\mu$ f
Output (p to k + h), Section 2	0.22	0.42	$\mu\mu$ f
Grid to Grid (g to g)		0.011	$\mu\muf$
Plate to Plate (p to p)Initial Measured without external shield	• • • •	0.50	$\mu\mu$ f
Negative Grid Current, Each Section			
Ef = 6.3 volts, $Eb = 100 volts$, $Rk = 220 ohms$ (by-passed), $Rg = 1.0 meg$. Initial		0.3	Microamperes
500-Hi	•	0.9	Microamperes
Heater-Cathode Leakage Current			
Ef = 6.3 volts, Ehk = 100 volts		5.0	Microamperes
Heater Positive with Respect to Cathode	• • • • • • • • • • • • • • • • • • • •	3.0 10	Microamperes Microamperes
Heater Negative with Respect to Cathode		5 .0	Microamperes
Tredier Negative with Respect to Cambae		10	Microamperes
Interelectrode Leakage Resistance	• • • •	10	Microdinperes
Ef = 6.3 volts. Polarity of applied d-c interelectrode voltage is such that no cathode emission results.			
Grid (Each Section) to All at 100 Volts DC	100		Megohms
500-Hi	r 50		Megohms
Plate (Each Section) to All at 300 Volts DC	100		Megohms
500-Hi	· 50		Megohms
Vibrational Noise Output Voltage, RMS Ef = 6.3 volts, Ebb = 100 volts, Rk = 220 ohms (by-passed), R_L = 10,000 ohms, Vibrational acceleration = 15 G at 40 cps		50	Millivolts
Grid Emission Current, Each Section Ef = 7.5 volts, Eb = 100 volts, Ecc = -9.0 volts, Rg = 1.0 meg		0.5	Microamperes
Pulse Cathode Current Ef = 6.0 volts, Pulse of 25 microseconds duration, 200-cycle repetition rate, and 50 volt amplitude is applied to plate and grid tied together. Pulse cathode current is measured for each section with opposite section floating	300	••••	Milliamperes



SPECIAL TESTS AND RATINGS

Stability Life Test

Statistical sample operated for one hour to evaluate and control initial variations in transconductance.

Survival Rate Life Test

Statistical sample operated for one hundred hours to evaluate and control early-life electrical and mechanical inoperatives.

Heater-Cycling Life Test

Statistical sample operated for 2000 cycles to evaluate and control heater-cathode defects. Conditions of test include Ef = 7.0 volts cycled for one minute on and four minutes off, Eb = Ec = 0 volts, and Ehk = 140 volts RMS.

Shock Rating—450 G

Statistical sample subjected to five impact accelerations of 450 G in each of four different positions. The accelerating forces are applied by the Navy-type, High Impact (flyweight) Shock Machine for Electronic Devices or its equivalent.

Fatigue Rating-2.5 G

Statistical sample subjected to vibrational acceleration of 2.5 G for 32 hours in each of three different positions. The sinusoidal vibration is applied at a fixed frequency between 25 and 60 cycles per second.

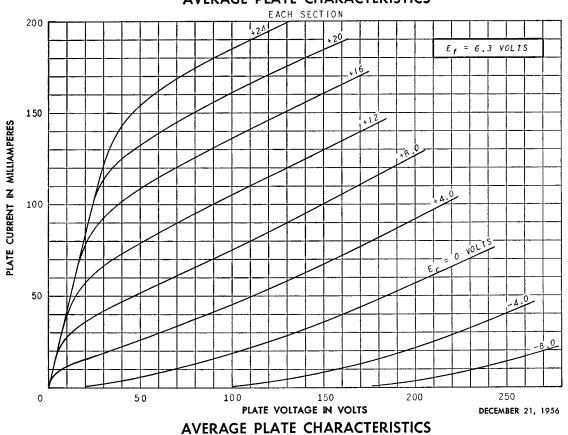
Altitude Rating-60,000 Feet

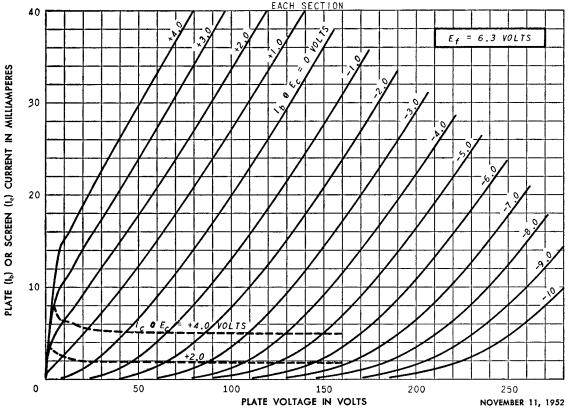
Statistical sample subjected to pressure of 55 millimeters of mercury to evaluate and control arcing and corona.

Note: The conditions for some of the indicated tests have deliberately been selected to aggravate tube failures for test and evaluation purposes. In no sense should these conditions be interpreted as suitable circuit operating conditions.

In the design of military equipment employing this tube, reference should be made to the appropriate MIL-E-1 specification.

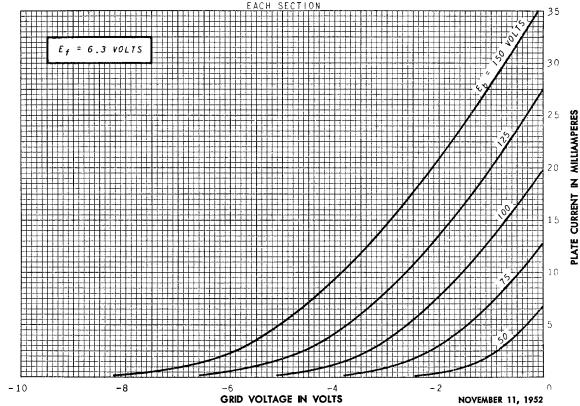
AVERAGE PLATE CHARACTERISTICS



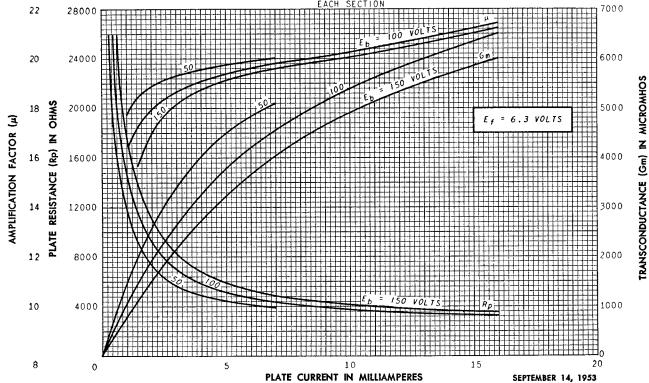




AVERAGE CHARACTERISTICS







ELECTRONIC COMPONENTS DIVISION

