6072-A

TWIN TRIODE

Five-Star Tube

★ ★ ★ ★ ★

DESCRIPTION AND RATING

FOR LOW-LEVEL AMPLIFIER APPLICATIONS

HIGH MU
9-PIN MINIATURE
SHOCK, VIBRATION RATINGS
HEATER-CYCLING RATING
LOW NOISE

The 6072-A is a low-noise, low-microphonic miniature twin triode designed primarily for use in the low-level stages of high-gain audio-frequency amplifiers.

The 6072-A 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.

The 6072-A differs from the 6072 in having controls on interface resistance and higher interelectrode leakage resistance.

GENERAL

ELECTRICAL

Cathode—Coated Unipotential

Heater Characteristics and Ratings

	Series	Parallel	
Heater Voltage,			
AC or DC*	12.6 ± 1.3	6.3 ± 0.6	Volts
Heater Current	0.175†	0.35‡	Amperes

Direct Interelectrode Capacitances§

Grid to Plate, Each Section: (g to p)	1.4	pf
Input, Each Section: g to (h+k)	1.5	pf
Output, Section 1: p to (h+k)	0.48	pf
Output, Section 2: p to (h+k)	0.38	pf

MECHANICAL

Mounting Position—Any

Envelope—T-6½, Glass

Base—E9-1, Small Button 9-Pin

Outline Drawing—EIA 6-2

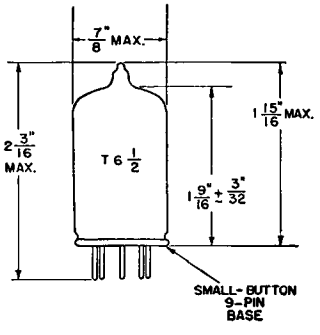
Maximum Diameter	7/8	Inches
Maximum Over-all Length	2 3/16	Inches
Maximum Seated Height	1 15/16	Inches

MAXIMUM RATINGS

ABSOLUTE-MAXIMUM VALUES, EACH SECTION

Plate Voltage	330	Volts
Positive DC Grid Voltage	0	Volts
Plate Dissipation, Each Plate	1.6	Watts
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	100	Volts
Heater Negative with Respect to Cathode	100	Volts
Bulb Temperature at Hottest Point¶	165	C

PHYSICAL DIMENSIONS

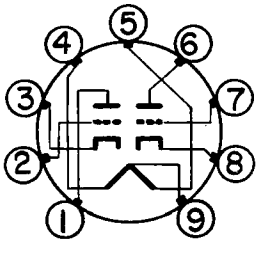


EIA 6-2

TERMINAL CONNECTIONS

Pin 1—Plate (Section 2)
Pin 2—Grid (Section 2)
Pin 3—Cathode (Section 2)
Pin 4—Heater
Pin 5—Heater
Pin 6—Plate (Section 1)
Pin 7—Grid (Section 1)
Pin 8—Cathode (Section 1)
Pin 9—Heater Center Tap

BASING DIAGRAM



EIA 9A

GENERAL ELECTRIC

Supersedes ET-T1102 dated 8-54

MAXIMUM RATINGS (Continued)

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making no allowance for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration and of all other electron devices in the equipment.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of the tube under consideration and of all other electron devices in the equipment.

CHARACTERISTICS AND TYPICAL OPERATION

CLASS A_1 AMPLIFIER, EACH SECTION

Plate Voltage	250	Volts
Grid Voltage	−4.0	Volts
Amplification Factor	44	
Plate Resistance, approximate	25000	Ohms
Transconductance	1750	Micromhos
Plate Current	3.0	Milliamperes
Grid Voltage, approximate		
Ib = 10 Microamperes	−8	Volts

LOW-LEVEL AMPLIFIER SERVICE, EACH SECTION

Heater Voltage#	6.3	Volts
Plate-Supply Voltage	150	Volts
Plate Load Resistor	20000	Ohms
Grid Resistor	0.1	Megohm
Cathode-Bias Resistor	2700	Ohms
Cathode-Bypass Capacitor	40	Microfarads
Voltage Gain	12.5	

* The equipment designer should design the equipment so that heater voltage is centered at the specified bogey value, with heater supply variations restricted to maintain heater voltage within the specified tolerance.

† Heater current of a bogey tube with series-connected heaters at Ef = 12.6 volts.

‡ Heater current of a bogey tube with parallel-connected heaters at Ef = 6.3 volts.

§ Without external shield.

¶ The indicated maximum bulb-temperature rating should never be exceeded under any circumstances. Tube life and reliability of performance will be enhanced by operation at lower temperatures.

Pin 9 connected to negative B supply.

CLASS A RESISTANCE-COUPLED AMPLIFIER

EACH SECTION

LOW IMPEDANCE DRIVE (APPROXIMATELY 200 OHMS)

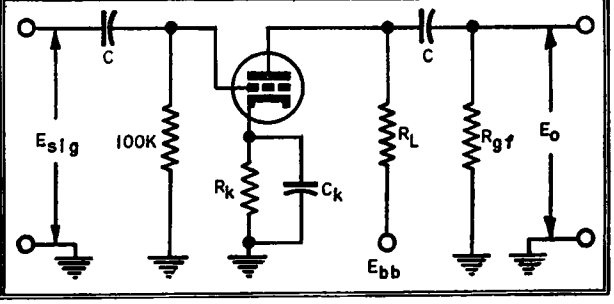
R_L	R_{gf}	Ebb = 90 Volts			Ebb = 180 Volts			Ebb = 300 Volts		
		R_k	E_o	Gain	R_k	E_o	Gain	R_k	E_o	Gain
0.10	0.10	1900	6.9	22	1300	18	25	1000	34	27
0.10	0.24	2100	9.6	25	1500	24	28	1300	45	29
0.24	0.24	4200	8.2	26	2700	20	28	2200	36	30
0.24	0.51	4800	11	27	3100	25	28	2700	45	31
0.51	0.51	8800	8.6	26	6000	20	29	4700	36	30
0.51	1.0	10000	11	27	7200	25	29	6000	45	31

HIGH IMPEDANCE DRIVE (APPROXIMATELY 100K OHMS)

R_L	R_{gf}	Ebb = 90 Volts			Ebb = 180 Volts			Ebb = 300 Volts		
		R_k	E_o	Gain	R_k	E_o	Gain	R_k	E_o	Gain
0.10	0.10	2600	8.8	21	1600	20	24	1300	36	26
0.10	0.24	3000	12	23	1900	27	27	1600	48	28
0.24	0.24	5500	11	24	3500	24	27	2800	41	29
0.24	0.51	6200	13	25	4100	29	28	3400	51	30
0.51	0.51	11000	11	25	6800	25	28	5500	49	30
0.51	1.0	12000	14	26	8100	31	29	6700	54	30

Notes:

1. E_o is maximum RMS voltage output for approximately five percent total harmonic distortion.
2. Gain is measured for an output voltage of two volts RMS.
3. R_k is in ohms; R_L and R_{gf} are in megohms.
4. Coupling capacitors (C) should be selected to give desired frequency response. R_k should be adequately by-passed.



CHARACTERISTICS LIMITS

		Minimum	Maximum	
Heater Current				
Ef = 12.6 volts	Initial	160	190	Milliamperes
	500-Hr	160	190	Milliamperes
	1000-Hr	160	190	Milliamperes
Plate Current, Each Section				
Ef = 12.6 volts, Eb = 250 volts, Ec = −4.0 volts	Initial	1.9	4.0	Milliamperes
Plate Current Difference between Sections				
Difference between plate currents for each section at Ef = 12.6 volts, Eb = 250 volts, Ec = −4.0 volts	Initial	....	0.9	Milliamperes
Transconductance, Each Section				
Ef = 12.6 volts, Eb = 250 volts, Ec = −4.0 volts	Initial	1350	2150	Micromhos
Transconductance Change with Heater Voltage, Each Section				
Difference between Transconductance and Transconductance at Ef = 11.4 volts (other conditions the same) expressed as a percentage of Transconductance	Initial	....	15	Percent
	500-Hr	....	15	Percent
	1000-Hr	....	20	Percent
Transconductance Change with Operation, Each Section				
Difference between Transconductance initially and after operation expressed as a percentage of initial value	500-Hr	....	20	Percent
	1000-Hr	....	25	Percent
Average Transconductance Change with Operation, Each Section				
Average of values for "Transconductance Change with Operation"	500-Hr	....	10	Percent
Amplification Factor, Each Section				
Ef = 12.6 volts, Eb = 250 volts, Ec = −4.0 volts	Initial	38	50	
Plate Current Cutoff, Each Section				
Ef = 12.6 volts, Ebb = 250 volts, Ec = −10.5 volts, R_L = 0.1 meg	Initial	....	24	Microamperes
AC Amplification, Each Section (RMS Output Voltage from Fixed Input Signal)				
Ef = 12.6 volts, Ebb = 100 volts, Ecc = 0 volts, R_L = 0.5 meg, Rg = 10 meg, Esig = 0.2 volts, RMS	Initial	5.5	....	Volts
Interelectrode Capacitances				
Grid to Plate (g to p), Each Section	Initial	1.1	1.7	pf
Input (g to k+h), Each Section	Initial	1.2	1.8	pf
Output (p to k+h), Section 1	Initial	0.24	0.72	pf
Output (p to k+h), Section 2	Initial	0.19	0.57	pf
Measured without external shield				
Negative Grid Current, Each Section				
Ef = 12.6 volts, Eb = 250 volts, Ecc = −4.0 volts, Rg = 0.25 meg	Initial	....	0.5	Microamperes
	500-Hr	....	0.5	Microamperes
	1000-Hr	....	0.5	Microamperes
Heater-Cathode Leakage Current				
Ef = 12.6 volts, Ehk = 100 volts (parallel sections)				
Heater Positive with Respect to Cathode	Initial	....	7	Microamperes
	500-Hr	....	10	Microamperes
	1000-Hr	....	10	Microamperes
Heater Negative with Respect to Cathode	Initial	....	7	Microamperes
	500-Hr	....	10	Microamperes
	1000-Hr	....	10	Microamperes

CHARACTERISTICS LIMITS (Continued)

		Minimum	Maximum	
Interelectrode Leakage Resistance				
Ef = 12.6 volts. Polarity of applied d-c interelectrode voltage is such that no cathode emission results.				
Grid (Each Section) to All at 100 volts d-c	Initial	2000	....	Megohms
	500-Hr	1000	....	Megohms
	1000-Hr	750	....	Megohms
Plate (Each Section) to All at 300 volts d-c	Initial	2000	....	Megohms
	500-Hr	1000	....	Megohms
	1000-Hr	750	....	Megohms
Vibrational Noise Output Voltage, RMS				
Ef = 12.6 volts, Ebb = 250 volts, Ec = −4.0 volts, R_L = 2000 ohms, Vibrational acceleration = 10 G at 40 cps	Initial	....	40	Millivolts
Grid Emission Current, Each Section				
Ef = 15 volts, Eb = 250 volts, Ecc = −10 volts, Rg = 0.25 meg	Initial	....	1.5	Microamperes
Cathode-Interface Impedance, Each Section				
Ef = 5.7 volts (parallel-heater connection) Eb = 90 volts, Ec adjusted for Ib = 1.0 ma	500-Hr	....	25	Ohms

The indicated 500 and 1000-hour values are life-test end points for the following conditions of operation for each section: Ef = 12.6 volts, Eb = 250 volts, Rk = 375 ohms, Rg = 0.25 meg, Ehk = 2 volts with heater negative with respect to cathode, and bulb temperature = 165 C minimum; except for cathode-interface life test where the conditions of operation are Ef = 6.9 volts (parallel-heater connection), and all other electrodes disconnected.

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 minimum to evaluate and control heater-cathode defects. Conditions of test include Ef = 7.5 volts (parallel-heater connection) cycled for one minute on and one minute off, Eb = Ec = 0 volts, and Ehk = 135 volts with heater positive with respect to cathode.

Shock Rating—600 G

Statistical sample subjected to five impact accelerations of 600 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 minimum in each of three different positions. The sinusoidal vibration is applied at a fixed frequency between 25 and 60 cycles per second.

Altitude Rating—60000 Feet

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

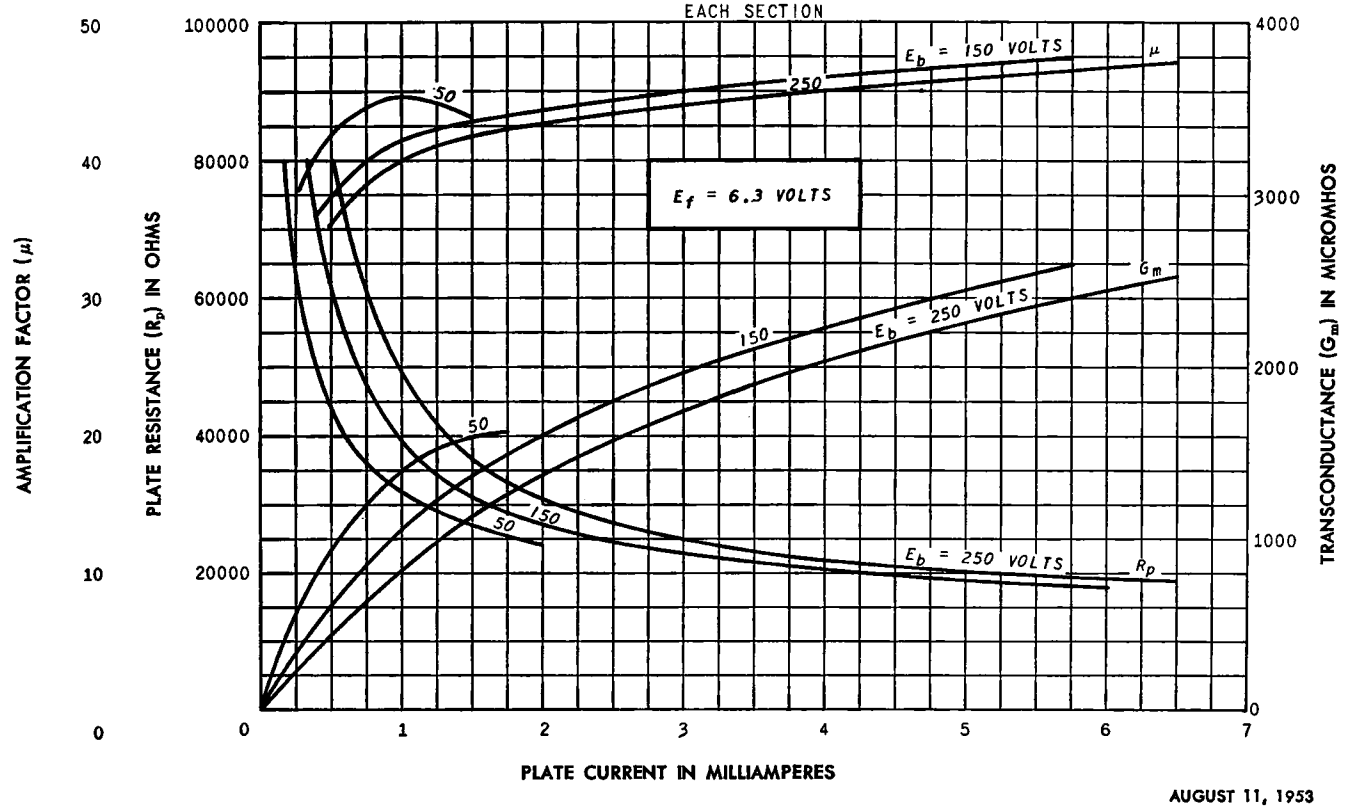
Hiss and Hum Control

Hiss and hum output voltages are controlled to limits consistent with the requirements of low-level amplifier applications.

Note: The conditions for some of the indicated test 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 CHARACTERISTICS

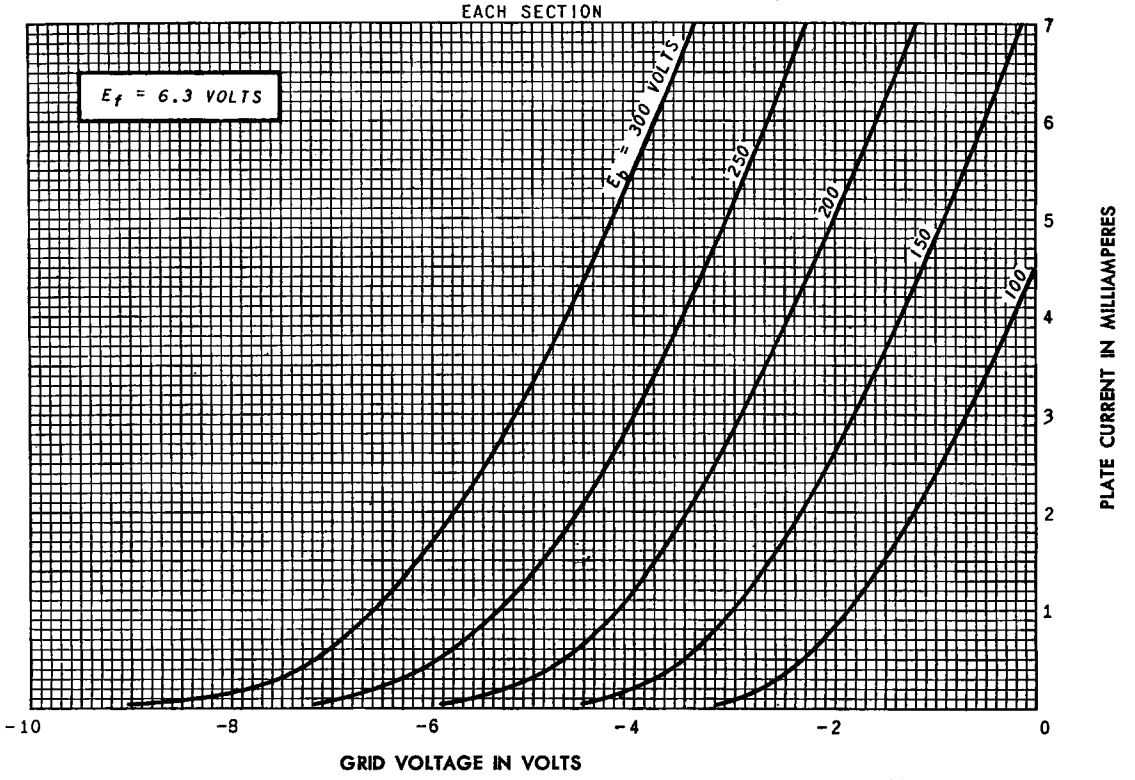
EACH SECTION



AUGUST 11, 1953

AVERAGE TRANSFER CHARACTERISTICS

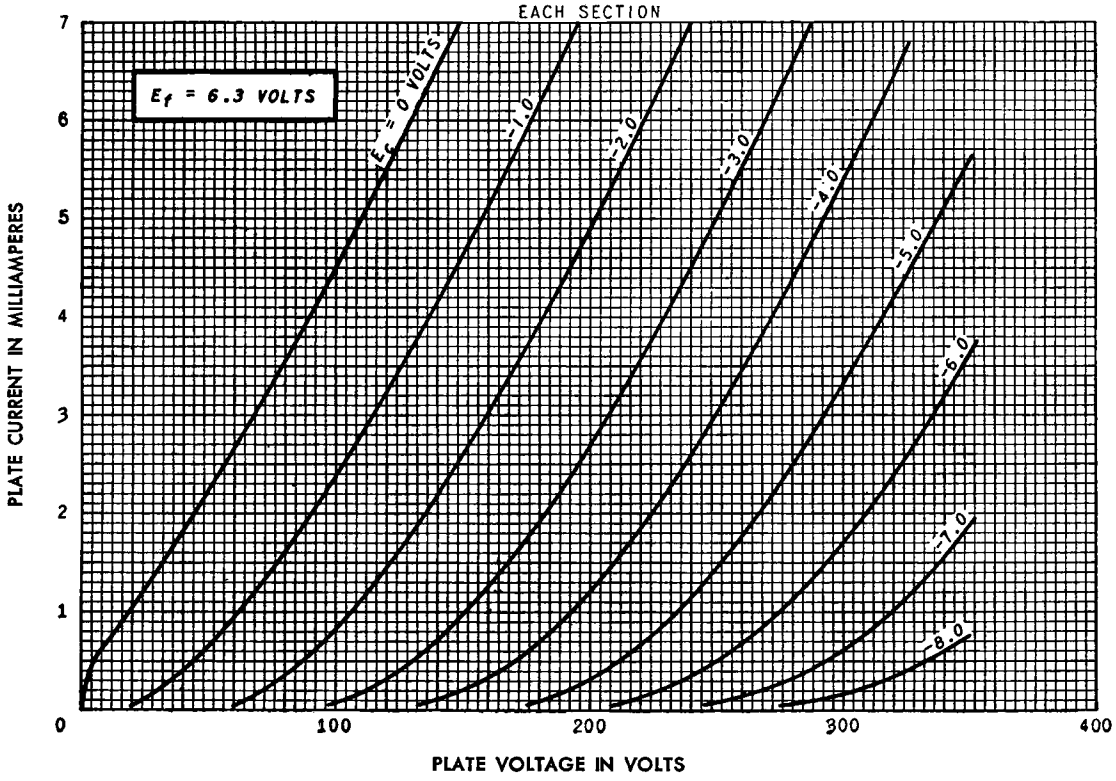
EACH SECTION



AUGUST 11, 1953

AVERAGE PLATE CHARACTERISTICS

EACH SECTION



AUGUST 11, 1953

RECEIVING TUBE DEPARTMENT
GENERAL ELECTRIC
Owensboro, Kentucky