5636 PREMIUM TYPE

5636

SHARP-CUTOFF PENTODE

SUBMINIATURE TYPE

Intended for applications at altitudes up to 60,000 feet where dependable performance under shock and vibration is paramount

GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential Cathode:

Voltage	6.3	ac or dc volts
Current	0.150	amp

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield**	
Grid No.1 to plate	0.034 max.	0.02 max.	μμf
Grid No.1 to all other electrodes	4	4	μμf
Grid No.3 to all other electrodes	3.8	4	μμf
Plate to all other electrodes	1.9	3.4	μμf
Grid No.1 to grid No.3	0.17 max.	0.15 max.	μμf
Grid No.3 to plate	1.1 max.	1.1 max.	μμf

Characteristics, Class A_1 Amplifier:

Plate-Supply Voltage	100	100	volts
Grid No.3	♦	–	
Grid-No.3 Supply Voltage	–	-1	volt
Grid-No.2 Supply Voltage	100	100	volts
Cathode Resistor	150	150	ohms
Plate Resistance (Approx.)	0.11	0.05	megohm
Transconductance:			
Grid No.1 to plate	3200	1950	μmhos
Grid No.3 to plate	500	950	μmhos
Plate Current	5.6	4	ma
Grid-No.2 Current	4	5.8	ma
Grid-No.1 Voltage (Approx.) for plate current of 10 μa	-7.5	–	volts
Grid-No.3 Voltage (Approx.) for plate current of 10 μa	–	-8	volts

Mechanical:

Mounting Position	Any
Maximum Length (Excluding flexible leads)	1-3/8"
Length, Bulb Seat to Bulb Top (Excluding tip)	1.075" ± 0.060"
Diameter	0.366" to 0.400"
Dimensional Outline	*See General Section*
Bulb	T3
Leads, Flexible	8
Length	1-1/2" to 1-3/4"
Orientation and diameter	*See Dimensional Outline*

* With external shield having inside diameter of 0.405" connected to lead 8.

♦ Connected to cathode at socket.

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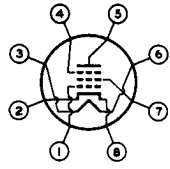
BOTTOM VIEW



Lead 1 - Grid No.1
Lead 2 - Cathode
Lead 3 - Heater
Lead 4 - Grid No.3
Lead 5 - Plate
Lead 6 - Heater
Lead 7 - Grid No.2
Lead 8 - Cathode

AMPLIFIER - Class A_1

Maximum Ratings, *Absolute Values:*

For Operation at Altitudes up to 60,000 Feet

PLATE VOLTAGE	165 max.	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE:		
Positive bias value	30 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	155 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias value	55 max.	volts
Positive bias value	0 max.	volts
PLATE CURRENT	11 max.	ma
GRID-No.2 CURRENT	7 max.	ma
GRID-No.2 INPUT	0.7 max.	watt
PLATE DISSIPATION	1.1 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	250 max.	°C

Characteristics as Mixer:■

Plate-Supply Voltage	100	volts
Grid-No.3 Supply Voltage (RMS)	15	volts
Grid-No.2 Supply Voltage	100	volts
Cathode Resistor	150	ohms
Plate Resistance (Approx.)	0.32	megohm
Conversion Transconductance	1280	μmhos
Plate Current	3.5	ma
Grid-No.2 Current	5.7	ma

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For cathode-bias operation	1.1 max.	megohms

■ With local oscillator injection to grid No.3. DC grid-No.3-circuit resistance should be kept as low as possible at high frequencies.

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CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN•

Values are Initial, Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current	1	0.140	0.160	amp
Direct Interelectrode Capacitances:				
Grid No.1 to all other electrodes	2	3.5	4.5	μμf
Grid No.3 to all other electrodes	2	3.5	4.5	μμf
Plate to all other electrodes	2	2.9	3.9	μμf
Plate Current (1)	1,3	3.7	6.9	ma
Plate Current (2)	1,4	-	100	μa
Plate Current (3)	1,5	-	100	μa
Grid-No.2 Current	1,3	2.8	5.4	ma
Transconductance, Grid No.1 to Plate:				
Range with heater volts = 6.3	3	2700	4000	μmhos
Change with heater volts = 5.7	3	-	15	%
Change at end of 500 hours with heater volts = 6.3	3	-	20	%
Change at end of 500 hours with heater volts = 5.7	3	-	15	%
Difference between average transconductance initially, and average after 500 hours, expressed as a percentage of the initial average	1,3	-	15	%
Transconductance, Grid No.3 to Plate	1,6	500	1800	μmhos
Reverse Grid-No.1 Current	1,7	-	0.3	μa
Reverse Grid-No.1 Current at 500 hours	1,7	-	0.9	μa
Grid-No.1 Emission Current	8	-	0.5	μa
Heater-Cathode Leakage Current:				
Heater 100 volts negative with respect to cathode	1,3	-	5	μa
Heater 100 volts positive with respect to cathode	1,3	-	5	μa
Heater-Cathode Leakage Current at 500 hours:				
Heater 100 volts negative with respect to cathode	1,3	-	10	μa

•, Notes 1 to 8: See next page.

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	Note	Min.	Max.	
Heater 100 volts positive with respect to cathode. . . .	1,3	–	10	μa
Leakage Resistance:				
Grid No.1 to all other electrodes	1,9	100	–	megohms
Plate to all other electrodes	1,10	100	–	megohms
Leakage Resistance at 500 hours:				
Grid No.1 to all other electrodes	1,9	50	–	megohms
Plate to all other electrodes	1,10	50	–	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With external shield having inside diameter of 0.405" connected to lead 8.

Note 3: With plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, and cathode resistor (ohms) = 150.

Note 4: With plate volts = 100, grid No.3 connected to cathode, grid-No.2 volts = 100, and grid-No.1 volts = −7.5.

Note 5: With plate-supply volts = 100, grid-No.3 supply volts = −8, grid-No.2 supply volts = 100, and cathode resistor (ohms) = 150.

Note 6: With plate-supply volts = 100, grid-No.3 supply volts = −1, grid-No.2 supply volts = 100, and cathode resistor (ohms) = 150.

Note 7: With plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, cathode resistor (ohms) = 150, and grid-No.1-circuit resistance (megohms) = 1.

Note 8: With ac or dc heater volts = 7.5, plate volts = 100, grid-No. 3 volts = 0, grid-No.2 volts = 100, grid-No.1 volts = −7.5, and grid-No.1-circuit resistance (megohms) = 1.

Note 9: With grid No.1 100 volts negative with respect to all other electrodes connected together.

Note 10: With plate 300 volts negative with respect to all other electrodes connected together.

• Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life-test conditions.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration. . . . . 450 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are tested in four different positions. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

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Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 60 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 6.3, plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, cathode resistor (ohms) = 150, cathode-bypass capacitor (μf) = 1000, plate-load resistance (ohms) = 10,000, and vibrational acceleration of 15 g at 40 cycles per second.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . 2000 min. cycles

Under the following conditions: heater volts = 7 cycled one minute on and one minute off, heater 140 volts rms with respect to cathode, and all other electrodes connected to ground.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage . . . . . 70 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 6.3, plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 19, cathode resistor (ohms) = 150, grid-No.1-circuit resistance (megohms) = 0.1, grid-No.2-circuit resistance (ohms) = 1000, plate-load resistance (megohms) = 0.2, and cathode-bypass capacitor (μf) = 1000. The output voltage of a tube, when tapped, will not cause a reading on a vu meter greater than that produced when a calibrating signal of 70 millivolts rms is applied to the plate of the tube.

Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid-No.1 current in excess of 1.0 microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid-No.1 current.

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1-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are checked for transconductance under conditions specified under 500-Hour Intermittent Life Performance. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 15 per cent.

100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions specified under 500-Hour Intermittent Life Performance to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit or a grid-No.1-to-plate transconductance of less than 2350 micromhos under the conditions specified in CHARACTERISTICS RANGE VALUES.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: heater volts = 6.3, plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, heater 200 volts positive with respect to cathode, cathode resistor (ohms) = 150, grid-No.1-circuit resistance (megohms) = 1, and bulb temperature (°C) = 220. At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, grid-No.1-to-plate transconductance change, grid-No.3-to-plate transconductance, and 500-hour limits for reverse grid-No.1 current, heater-cathode leakage current, leakage resistance, and the difference in the grid-No.1-to-plate transconductance between the initial value and the average value shown under CHARACTERISTICS RANGE VALUES.

OPERATING CONSIDERATIONS

The *heater supply* should be well regulated because life and reliability of the 5636 are adversely affected by departures from the 6.3-volt value. The extent to which life is affected is a function of the amount of these departures and their durations.

The *flexible leads* of the 5636 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation may crack the glass seals of the leads and damage the tube.

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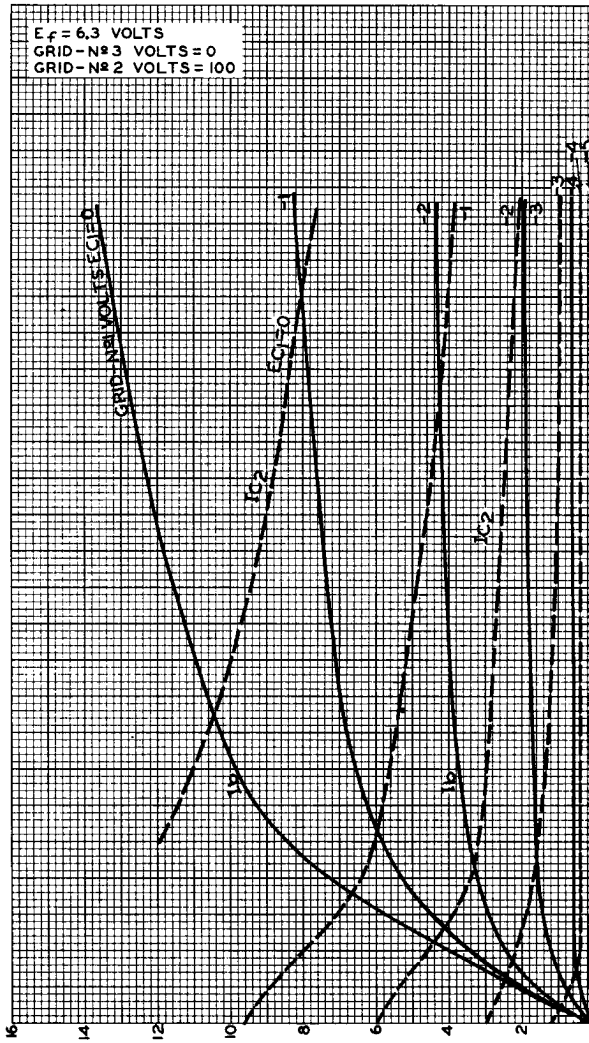
AVERAGE CHARACTERISTICS



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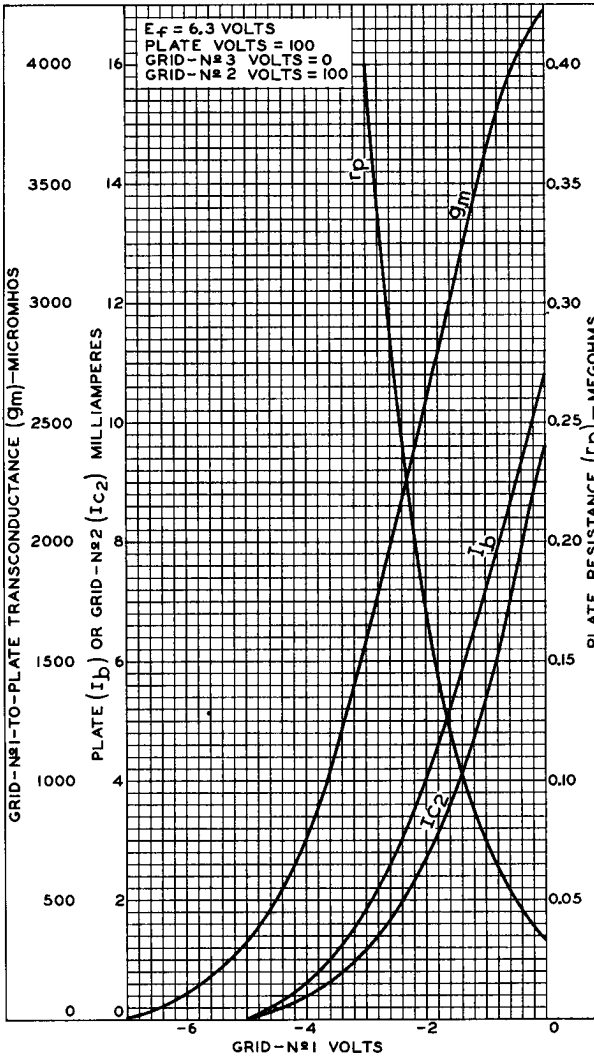
AVERAGE CHARACTERISTICS



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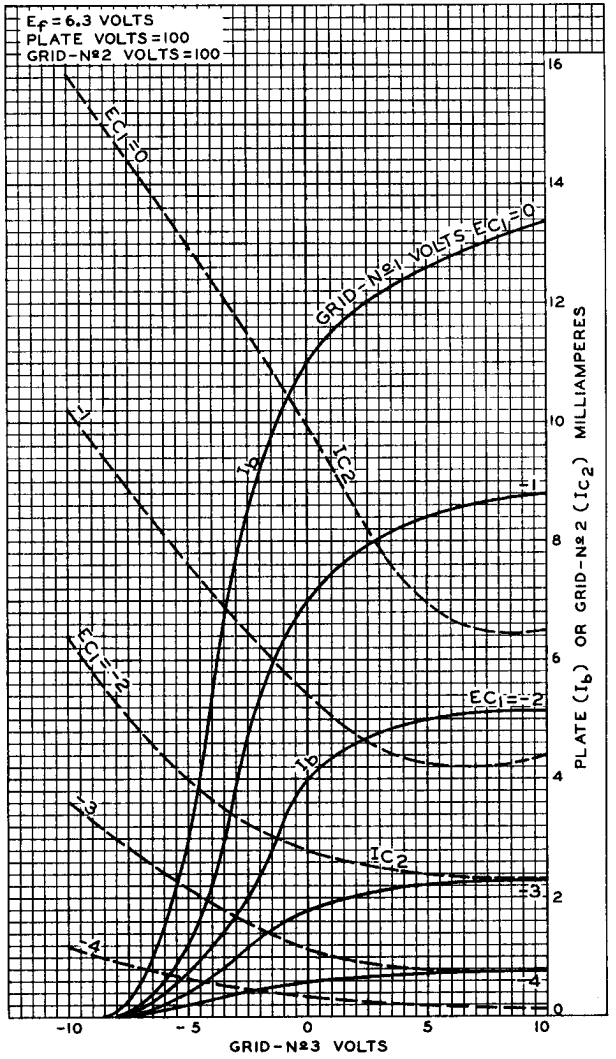

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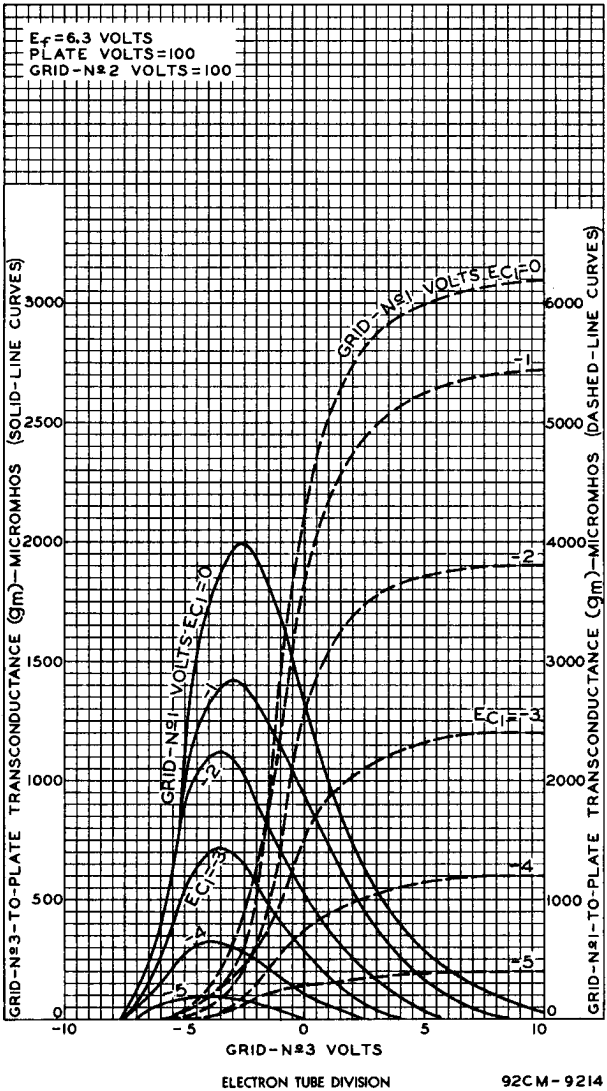
AVERAGE CHARACTERISTICS



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AVERAGE CHARACTERISTICS