6201

HIGH-MU TWIN TRIODE

"Premium" 9-Pin Miniature Type

TENTATIVE DATA

RCA-6201 is a high-mu twin triode of the heater-cathode type. It is intended for use in a wide variety of applications including mixers, oscillators, and amplifiers at frequencies up to 300 megacycles, multivibrators, synchronizing amplifiers, and numerous critical industrial control devices. Constructed to give dependable performance under conditions of shock and vibration, this "premium" version of the 12AT7 is especially suited for use in mobile and aircraft equipment.

In the 6201, special attention has been given to structural features which improve its strength for resistance to both shock and vibration. These features include a special "U"-frame construction to keep the mount rigid, and special tube parts which are precisely made and accurately fitted to lock the parts firmly in place and thus eliminate variations in electrical characteristics. Other features include grid rods having high heat conductivity to provide cool operation thereby minimizing grid emission, a pure-tungsten heater having high mechanical strength to give long life under conditions of frequent on-off switching, and a special getter shield to prevent deposit of getter flash on tube elements. Furthermore, the 6201 is controlled for cathode interface to insure dependable performance in "on-off" control applications involving long periods of operation under cutoff conditions. These features in addition to rigid controls and rigorous tests to insure "premium" quality, make this tube especially useful in critical industrial applications.

The 6201 utilizes separate terminals for each cathode to permit flexibility of circuit arrangement, and a mid-tapped heater to permit operation from either a 6.3- or a 12.6-volt supply.

GENERAL DATA

Electrical:

Heater for Unipotential Cathodes:

Heater Arrangement	*Series*	*Parallel*	
Voltage (AC or DC)	12.6	6.3	volts
Current	0.15	0.3	amp

Direct Interelectrode Capacitances:

Grid-Drive Service

	*With External Shield**	*Without External Shield*	
Grid to plate (Each unit)	1.6	1.6	μμf
Grid to cathode and heater (Each unit)	2.5	2.5	μμf
Plate to cathode and heater (Unit No.1)	1.2	0.45	μμf
Plate to cathode and heater (Unit No.2)	1.3	0.38	μμf
Heater to cathode (Each Unit)	2.8	2.8	μμf
Plate to plate	–	0.24	μμf

Cathode-Drive Service

	With External Shield°	*Without External Shield*	
Plate to cathode (Unit No.1)	0.18	0.2	μμf
Plate to cathode (Unit No.2)	0.2	0.24	μμf
Cathode to grid and heater (Each Unit)	5	5	μμf
Plate to grid and heater (Unit No.1)	2.7	1.9	μμf
Plate to grid and heater (Unit No.2)	2.7	1.8	μμf

Mechanical:

Mounting Position	Any
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length from Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Maximum Diameter	7/8"
Bulb	T-6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)

AMPLIFIER--Class A_1

Values are for Each Unit

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts
GRID VOLTAGE:		
Negative bias value	55 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	2.75 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	180 max.	°C

Characteristics:

Plate Supply Voltage	100	250	volts
Cathode-Bias Resistor	270	200	ohms
Amplification Factor	57	60	
Plate Resistance (Approx.)	14300	10900	ohms

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

Transconductance	4000	5500	μmhos
Grid Voltage (Approx.) for plate current of 10 μamp	-5	-12	volts
Plate Current	3.3	10	ma

Maximum Circuit Values:

Grid-Circuit Resistance:		
For fixed bias operation	0.25 max.	megohm
For cathode-bias operation	1 max.	megohm

* With external shield, JETEC No.315, connected to cathode of unit under test.

○ With external shield, JETEC No.315, connected to grid of unit under test.

Operating Conditions as Resistance-Coupled Amplifier (Each Unit)

Plate Supply Voltage	*90*			*180*			*300*			*volts*
Plate Load Resistor	0.1	0.24	0.51	0.1	0.24	0.51	0.1	0.24	0.51	megohm
Grid Resistor (of following stage)	0.24	0.51	1	0.24	0.51	1	0.24	0.51	1	megohm
Cathode Resistor	2400	5300	11000	1400	3600	7100	1200	2900	6400	ohms
Peak Output Voltage	13	15	16	28	31	33	47	52	55	volts
Voltage Gain▲	27	28	28	33	33	32	33	34	34	

▲ At 2 volts (RMS) output

Note: Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN●

Values Are For Each Unit and are Initial, Unless Otherwise Specified

	Note	*Min.*	*Max.*	
Heater Current	1	0.138	0.162	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.3	1.9	μμf
Grid to cathode and heater	2	2	3	μμf
Plate to cathode and heater (Unit No.1)	2	0.2	0.7	μμf
Plate to cathode and heater (Unit No.2)	2	0.16	0.6	μμf
Heater to cathode	2	2.1	3.5	μμf
Plate to plate	3	0.15	0.33	μμf
Amplification Factor	1,4	50	70	
Plate Current (1)	1,4	7	14	ma
Plate-Current Difference Between Units	1,4	-	3.2	ma
Plate Current (2)	1,5	-	100	μamp
Transconductance (1)	1,4	4500	6500	μmhos
Transconductance (1) at 500 Hours	1,4	3800	6500	μmhos
Transconductance (2)	3,6	4100	-	μmhos
Transconductance Change: Difference between average transconductance (1) initially, and average after 500 hours, expressed as a percentage of the initial average	1,4	-	15	per cent
Reverse Grid Current	1,7	-	0.7	μamp
Grid Emission Current	7,9	-	1.5	μamp
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,10	-	10	μamp
Heater positive with respect to cathode	1,10	-	10	μamp
Leakage Resistance:				
Between grid and all other electrodes tied together	1,11	100	-	megohms
Between plate and all other electrodes tied together	1,12	100	-	megohms
Leakage Resistance at 500 Hours:				
Between grid and all other electrodes tied together	1,11	50	-	megohms
Between plate and all other electrodes tied together	1,12	50	-	megohms

Note 1: With 12.6 volts ac or dc on heater (series connection).

Note 2: With no external shield and electrodes of unit not under test grounded.

Note 3: With no external shield.

Note 4: With dc plate-supply voltage of 250 volts, cathode resistor od 200 ohms, and cathode bypass capacitor of 1000 μf. Each unit is tested separately. Electrodes of units not under test are grounded.

Note 5: With dc plate-supply voltage of 250 volts, plate load resistance of 0.1 megohm, and dc grid voltage of -20 volts. Each unit is tested separately. Electrodes of unit not under test are grounded.

Note 6: With 11.0 volts ac or dc on heater (series connection).

Note 7: With dc plate-supply voltage of 250 volts, grid resistor of 0.5 megohm, cathode resistor of 200 ohms, and cathode bypass capacitor of 1000 μf. Each unit is tested separately. Electrodes of unit not under test are grounded.

Note 8: With 15.0 volts ac or dc on heater (series connection).

Note 9: With dc plate voltage of 250 volts, grid resistor of 0.5 megohm, and dc grid voltage of -20 volts. Each unit is tested separately.

Note 10: With 100 volts dc between heater and cathode and units connected in parallel.

Note 11: With grid 100 volts negative with respect to all other electrodes tied together.

Note 12: With plate 300 volts negative with respect to all other electrodes tied 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 AND PERFORMANCE DATA

Shock Rating:

Impact Acceleration. . . . . 600 max. g

This test is performed on a sample lot of tubes from each production run in a Navy Type, High-Impact (fly-weight) Shock Machine. Tubes are held rigid in four different positions and are subjected to 20 blows at the specified maximum impact acceleration. 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 vibrational acceleration, heater-cathode leakage current, and transconductance.

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 25 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 impact acceleration, heater-cathode leakage current, and transconductance.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Plate of unit No.1 tied to plate of unit No.2 and grid of unit No.1 tied to grid of unit No.2; heater voltage of 12.6 volts, dc plate voltage of 250 volts, dc grid voltage of -3 volts, plate load resistance of 2000 ohms, and vibrational acceleration of 2.5 g at 25 cps.

Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . 2000 min. cycles

Under the following conditions and with heaters of unit No.1 and unit No.2 connected in parallel: Heater voltage of 7.5 volts cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and plate and grid voltage = 0 volts.

Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage . . . . . 100 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 tied to grid of unit No.2; heater voltage of 12.6 volts dc, plate-supply voltage of 300 volts, cathode-bias resistor of 200 ohms common to both units, and plate load resistance of 10000 ohms.

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 current in excess of 1.4 microamperes under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

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. With both units operating, each unit is checked for variation in transconductance under conditions of maximum rated plate dissipation. At the end of 1 hour, the value of transconductance of each unit is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions of maximum rated plate dissipation 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 value of reverse grid current in excess of 1.4 microamperes under the conditions specified in CHARACTERISTICS RANGE VALUES for reverse grid current.

500-Hour Average Life Performance:

This 500-hour test is made 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. With both units operating, each unit is life tested separately at room temperature under the following conditions: heater voltage of 12.6 volts ac or dc (series Connection), plate-supply voltage of 250 volts, cathode resistor of 200 ohms, grid-No.1 resistor of 0.5 megohm and dc heater-cathode voltage of 135 volts (heater positive with respect to cathode), and bulb temperature of 180°C. 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 the established initial limits of heater current, reverse grid current, heater-cathode leakage current, and 500-hour limits for Transconductance (1), Transconductance Change, and Leakage Resistance as shown under CHARACTERISTICS RANGE VALUES.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data for the 6201 are limiting values above which the serviceability of the 6201 may be impaired from the viewpoint of life and satisfactory performance. Therefore, in order not to exceed these absolute ratings, the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating by an amount such that the absolute values will never be exceeded under any usual conditions of supply-voltage variation, load variation, or manufacturing variation in the equipment itself.

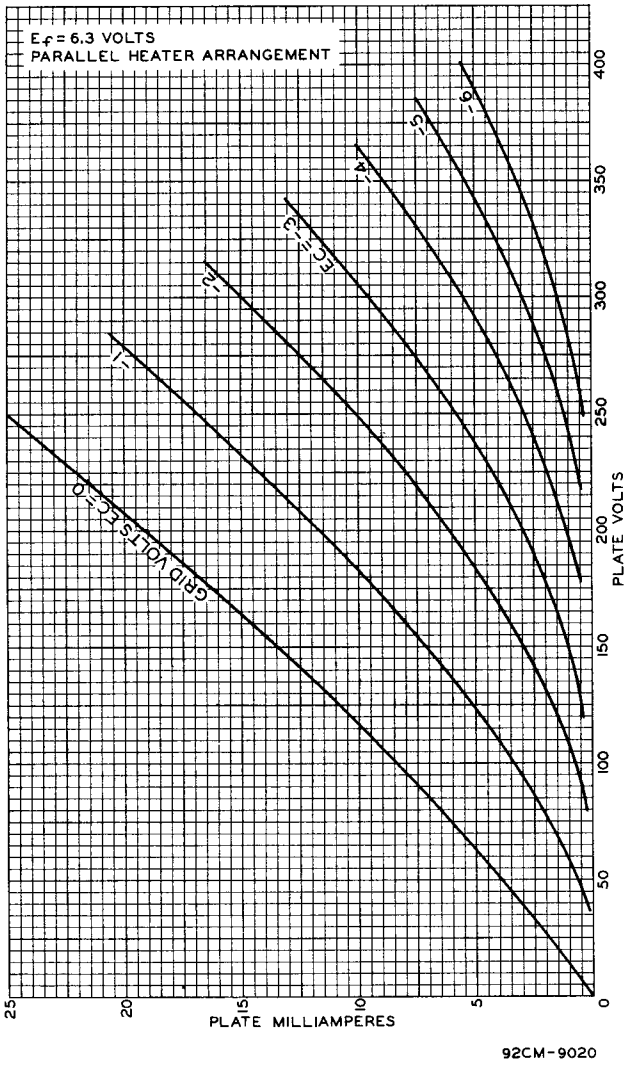


Fig. 1 - Average Plate Characteristics for Each Unit of Type 6201.

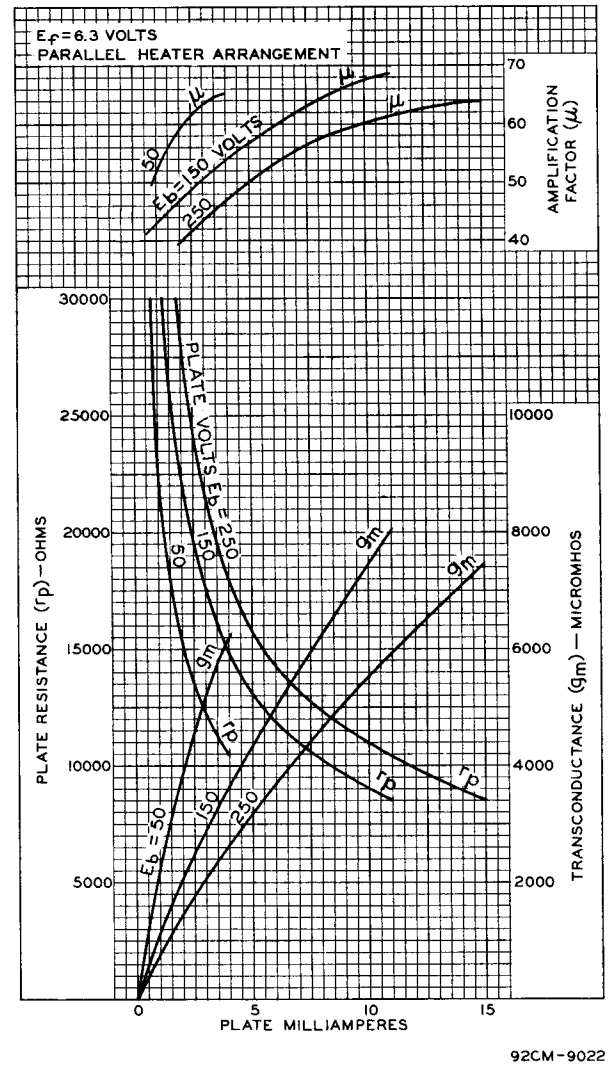


Fig. 2 - Average Characteristics for Each Unit of Type 6201.

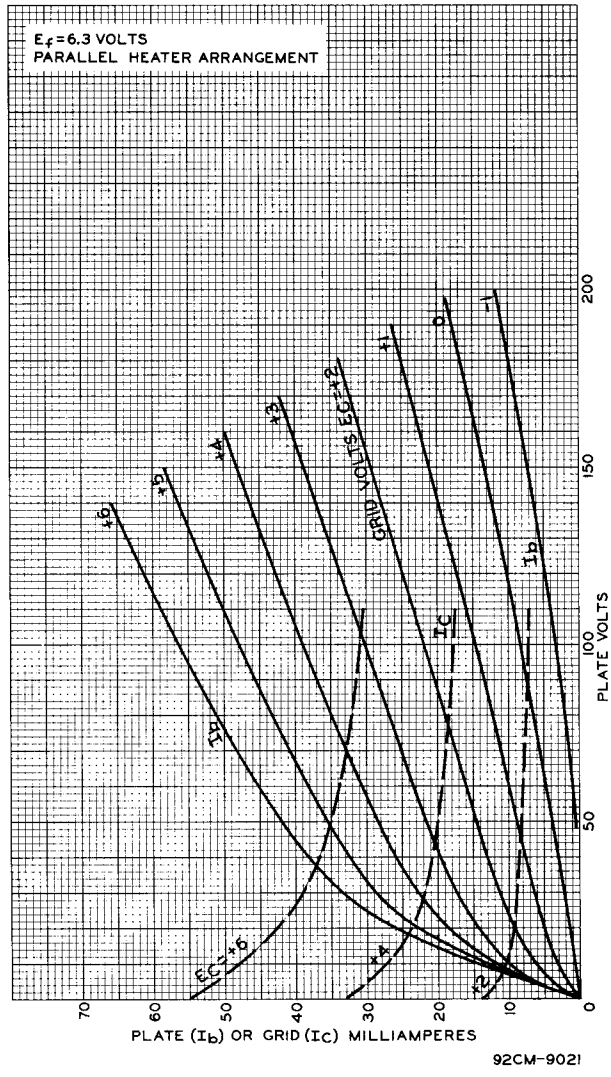


Fig. 3 - Average Plate Characteristics for Each Unit of Type 6201.

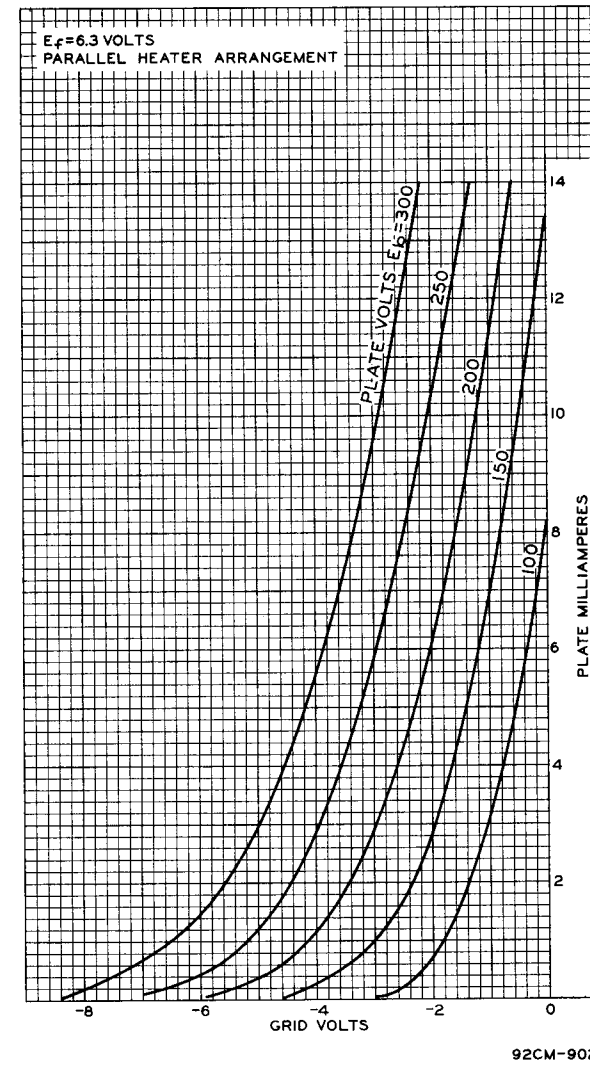
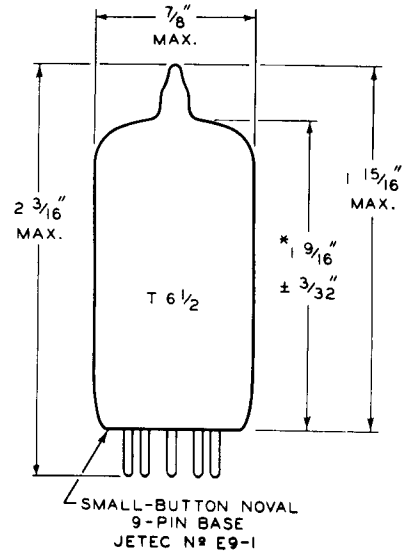


Fig. 4 - Average Characteristics for Each Unit of Type 6201.

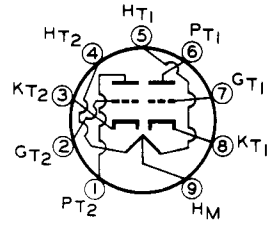
DIMENSIONAL OUTLINE



* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY RING GAUGE OF 7/16" I.D.

SOCKET CONNECTIONS

Bottom View



9A

PIN 1: PLATE OF TRIODE UNIT No.2
PIN 2: GRID OF TRIODE UNIT No.2
PIN 3: CATHODE OF TRIODE UNIT No.2
PIN 4: HEATER OF TRIODE UNIT No.2
PIN 5: HEATER OF TRIODE UNIT No.1
PIN 6: PLATE OF TRIODE UNIT No.1
PIN 7: GRID OF TRIODE UNIT No.1
PIN 8: CATHODE OF TRIODE UNIT No.1
PIN 9: HEATER MID-TAP