6136

SHARP-CUTOFF PENTODE

"Premium" 7-Pin Miniature Type

TENTATIVE DATA

RCA-6136 is a sharp-cutoff pentode of the 7-pin miniature type intended particularly for use as an intermediate-frequency or rf amplifier in high-gain, wide-band circuits of vhf communications receivers. Constructed to give dependable performance under conditions of shock and vibration, this "premium" tube, which is similar to the 6AU6, is especially suited for use in critical industrial and military applications.

Actual Size

Featured in the design of the 6136 is a structure utilizing tube parts which are precisely made and accurately fitted to minimize variations in electrical characteristics due to mechanical movement and to minimize microphonic effects. In addition, the design incorporates a pure-tungsten heater having high mechanical strength to give long life under conditions of frequent "on-off" switching.

The 6136 is manufactured under rigid control and undergoes rigorous tests to insure its "premium" quality as follows: test readings at the end of 1 hour, 100 hours, and 500 hours to insure that tubes fall within the established tight characteristics limits and that early failures are held to a low percentage.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.3	amp
Direct Interelectrode Capacitances (Without external Shield):		
Grid No.1 to plate	0.0035 max.	μμf
Grid No.1 to cathode, heater, grid No.2 and grid No.3 & internal shield	6	μμf
Plate to cathode, heater, grid No.2 and grid No.3 & internal shield	5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-1/8"
Maximum Seated Length	1-7/8"
Length, Base Seat to Bulb Top (Excluding tip)	1-1/2" ± 3/32"
Maximum Diameter	3/4"
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JETEC No.E7-1)

AMPLIFIER -- Class A_1

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	330 max.	volts
GRID-No.3 (SUPRESSOR-GRID) VOLTAGE	0 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	165 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive bias value	0 max.	volts
GRID-No.2 INPUT	0.7 max.	watt
PLATE DISSIPATION	3.3 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)	165 max.	°C

Characteristics:

Plate Supply Voltage	100	250	volts
Grid No.3	Connected to cathode at socket		
Grid-No.2 Supply Voltage	100	150	volts
Cathode Resistor	150	68	ohms
Plate Resistance (Approx.)	0.5	1	megohm
Transconductance	3900	5200	μmhos
Plate Current	5	10.6	ma
Grid-No.2 Current	2.1	4.3	ma
Grid-No.1 Voltage (Approx.) for plate current of 10 μa	-4.2	-6.5	volts

Typical Operation as Resistance-Coupled Amplifier:

See Chart on Page 3.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For cathode-bias operation	0.5 max.	megohm
For fixed-bias operation	0.25 max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Values are Initial, Unless Otherwise Specified

	Note	Min.	Max.	
Heater Current	1	0.275	0.325	amp
Direct Interelectrode Capacitances: (Without external shield):				
Grid No.1 to plate	-	-	0.0035	μμf
Grid No.1 to cathode, heater, grid No.2, and grid No.3 & internal shield	-	4.8	7.2	μμf
Plate to cathode, heater grid No.2, and grid No.3 & internal shield	-	3.9	5.9	μμf
Plate Current (1)	1,2	8	13.5	ma
Plate Current (2)	1,3	-	35	μa
Grid-No.2 Current	1,2	2.6	6	ma
Transconductance Grid No.1 to Plate:				
With heater volts = 6.3	1,2	4150	6250	μmhos
With heater volts = 5.5	2	3900	-	μmhos
At end of 500 hours with heater volts = 6.3	1,2	3600	6250	μmhos

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Difference between average transconductance initially, and average after 500 hours, expressed as a percentage of the initial average.	1,2	-	17	per cent
Reverse Grid Current. . . .	1,4	-	1	μa
Reverse Grid Current at 500 hours	1,4	-	1	μa
Grid-Emission Current . . .	5	-	2	μa
Heater-Cathode Leakage Current:				
Heater 100 volts negative with respect to cathode.	1	-	10	μa
Heater 100 volts positive with respect to cathode.	1	-	10	μa
Heater-Cathode Leakage Current at 500 Hours:				
Heater 100 volts negative with respect to cathode.	1	-	10	μa
Heater 100 volts positive with respect to cathode.	1	-	10	μa
Leakage Resistance:				
Grid No.1 to all other electrodes.	1,6	100	-	megohms
Plate to all other electrodes.	1,7	100	-	megohms
Leakage Resistance at 500 Hours:				
Grid No.1 to all other electrodes.	1,6	50	-	megohms
Plate to all other electrodes.	1,7	50	-	megohms

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

Note 2: With plate supply voltage of 250 volts, grid-No.2 supply voltage of 150 volts, cathode resistor of 68 ohms, cathode-bypass capacitor of 1000 μf, and grid No.3 tied to cathode.

Note 3: With plate voltage of 250 volts, grid-No.2 voltage of 150 volts, grid-No.1 voltage of -9 volts, plate load resistor of 0.1 megohm, and grid No.3 tied to cathode.

Note 4: With plate voltage of 250 volts, grid-No.3 voltage, of 0 volts, grid-No.2 voltage of 150 volts, grid-No.1 voltage of -1 volt, and grid-No.1 resistor of 0.25 megohm

Note 5: With 7.5 volts ac or dc on heater, plate voltage of 250 volts, grid-No.3 voltage of 0 volts, grid-No.2 voltage of 150 volts, grid-No.1 voltage of -10 volts, and grid-No.1 resistor of 0.25 megohm.

Note 6: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 7: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS AND 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, reverse grid 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 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, reverse grid current, and transconductance.

Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . 300 max. mv

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, plate supply voltage of 250 volts, grid No.3 tied to cathode, grid-No.2 supply voltage of 150 volts, cathode resistor of 68 ohms, cathode-bypass capacitor of 1000 μf, plate load resistor 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: Heater voltage of 7.5 volts cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements grounded.

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 1.0 microampere 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. 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 10 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 value of reverse grid current in excess of 1.0 microampere 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 voltage of 6.3 volts, plate supply voltage of 300 volts, grid No.3 tied to cathode, grid-No.2 supply voltage of 150 volts, heater-cathode voltage of 135 volts (heater positive with respect to cathode), cathode resistor of 80 ohms and grid-No.1 resistor of 0.5 megohm. 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, and 500 hour limits for reverse grid current, heater-cathode leakage current, leakage resistance, transconductance range, and the difference in transconductance between the initial value and average value shown under Characteristics Range Values.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data for the 6136 are limiting values above which the serviceability of the 6136 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 below each absolute rating by an amount such that the absolute values will never be exceeded under any usual condition of supply voltage variation, load variation, or manufacturing variation in the equipment itself.

Operating Conditions as Resistance-Coupled Amplifier (Each Unit)

Plate Supply Voltage	*90*			*180*			*300*			*volts*
Plate Load Resistor	0.1	0.22	0.47	0.1	0.22	0.47	0.1	0.22	0.47	megohm
Grid-No.2 Resistor	0.09	0.26	0.75	0.15	0.43	1	0.24	0.5	1.1	megohm
Grid-No.1 Resistor (of following stage)	0.22	0.47	1	0.22	0.47	1	0.22	0.47	1	megohm
Cathode Resistor	2100	3200	6500	900	1700	3400	600	1000	1900	ohms
Peak Output Voltage[O]	32	32	32	82	67	65	103	108	105	volts
Voltage Gain[□]	72	99	126	116	171	232	145	230	318	

[O] Obtained across grid-No.1 resistor of following stage and is for the condition where the signal level is adequate to swing the grid of the resistance-coupled amplifier tube to the point where its grid starts to draw current.

[□] At 5 volts (RMS) output.

Note: Coupling capacitors should be selected to give desired frequency response. Cathode and grid-No.2 resistors should be adequately bypassed.

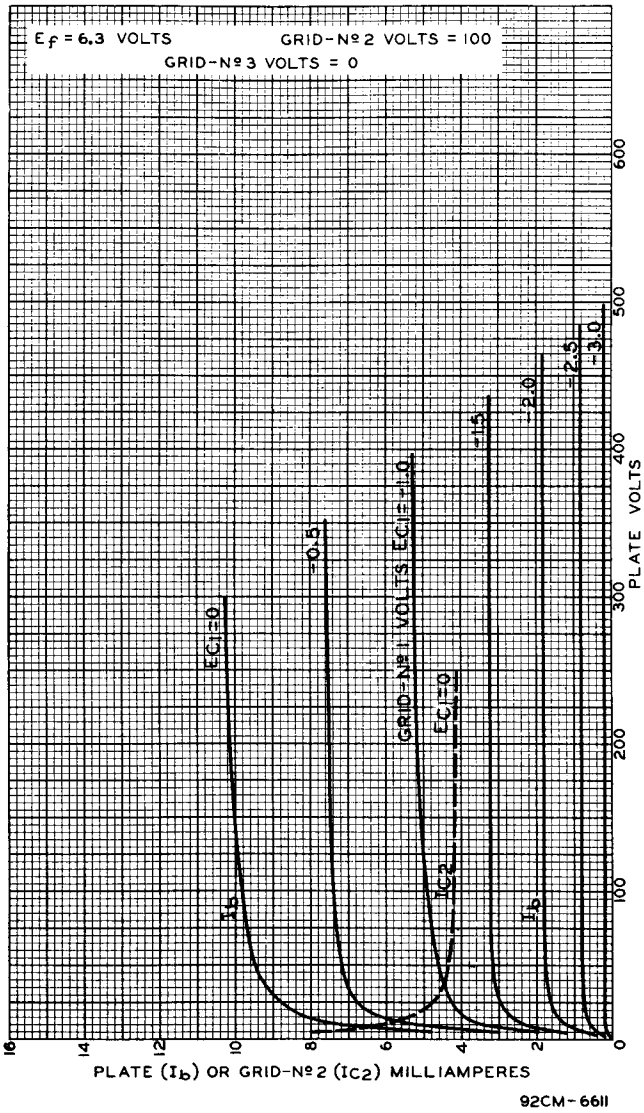


Fig. 1 - Average Characteristics for Each Unit of Type 6136.

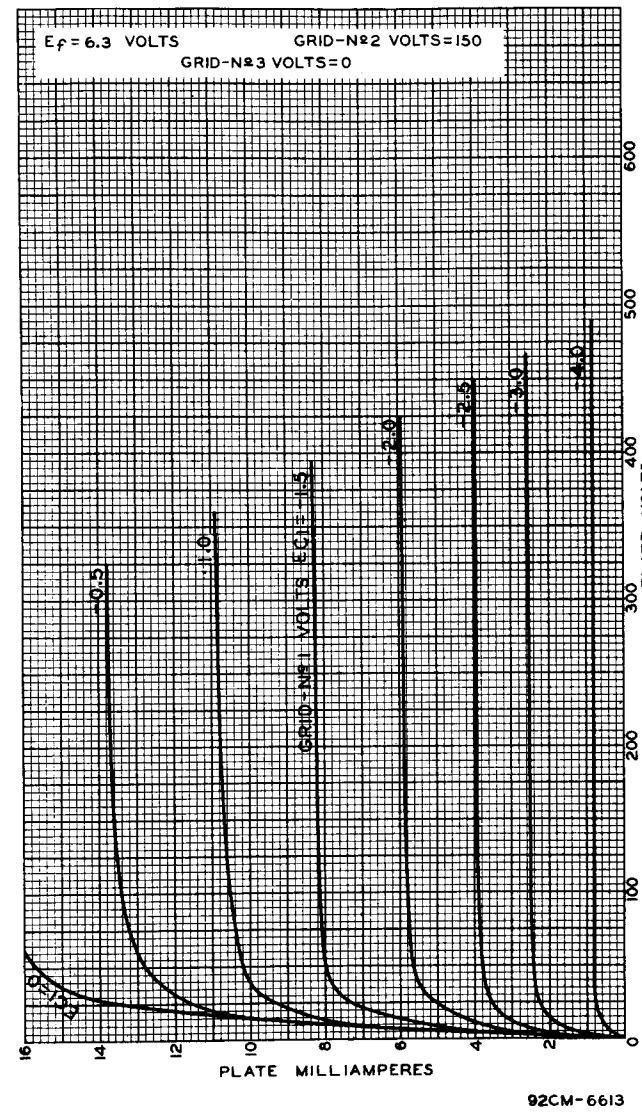


Fig. 2 - Average Characteristics for Each Unit of Type 6136.

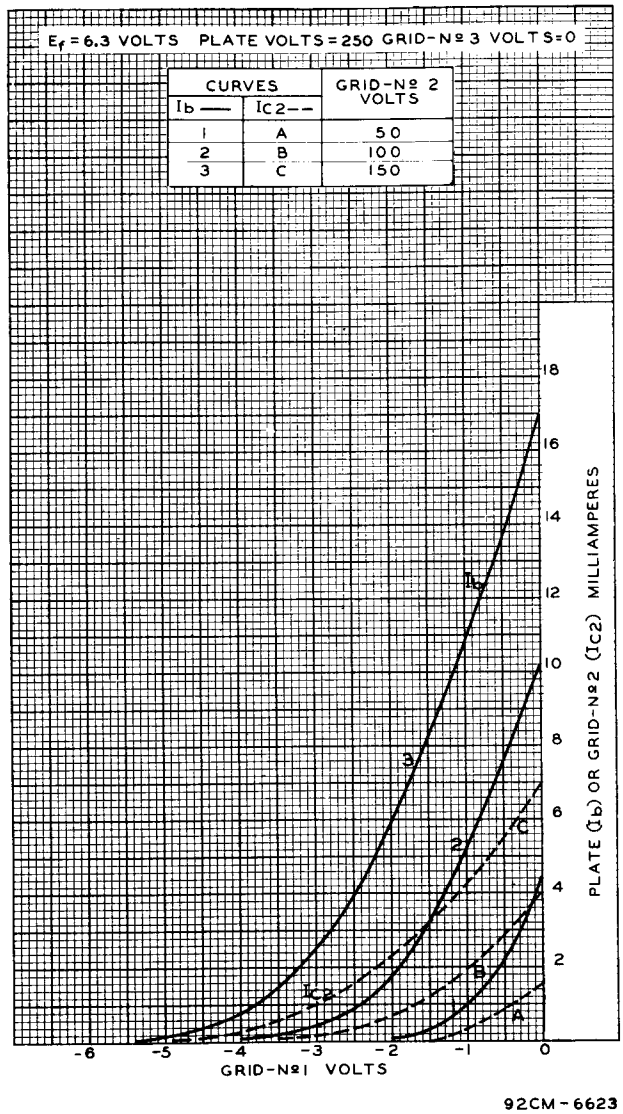


Fig. 3 - Average Characteristics for Each Unit of Type 6136.

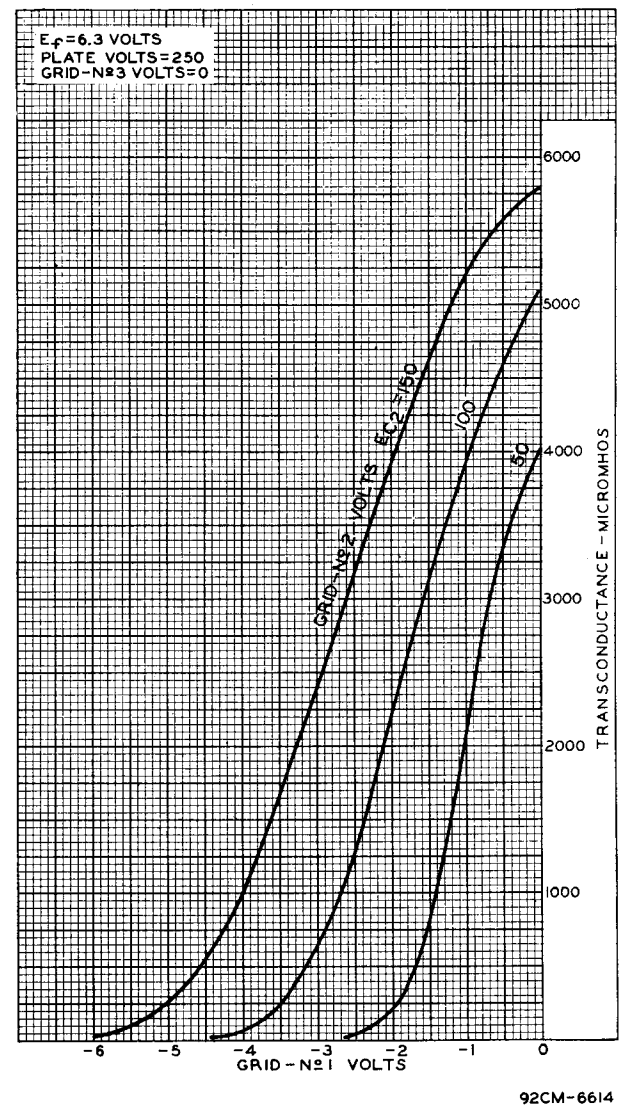
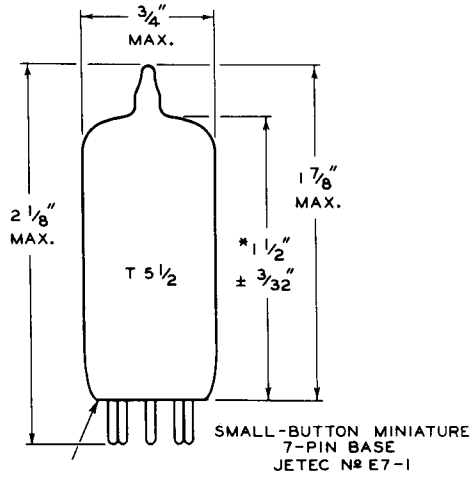


Fig. 4 - Average Characteristics for Each Unit of Type 6136.

DIMENSIONAL OUTLINE

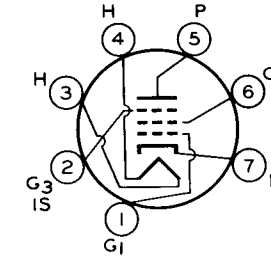


* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY RING GAUGE OF 7/16" I.D.

SOCKET CONNECTIONS

Bottom View

PIN 1: GRID NO.1
PIN 2: GRID NO.3, INTERNAL SHIELD
PIN 3: HEATER
PIN 4: HEATER
PIN 5: PLATE
PIN 6: GRID NO.2
PIN 7: CATHODE



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