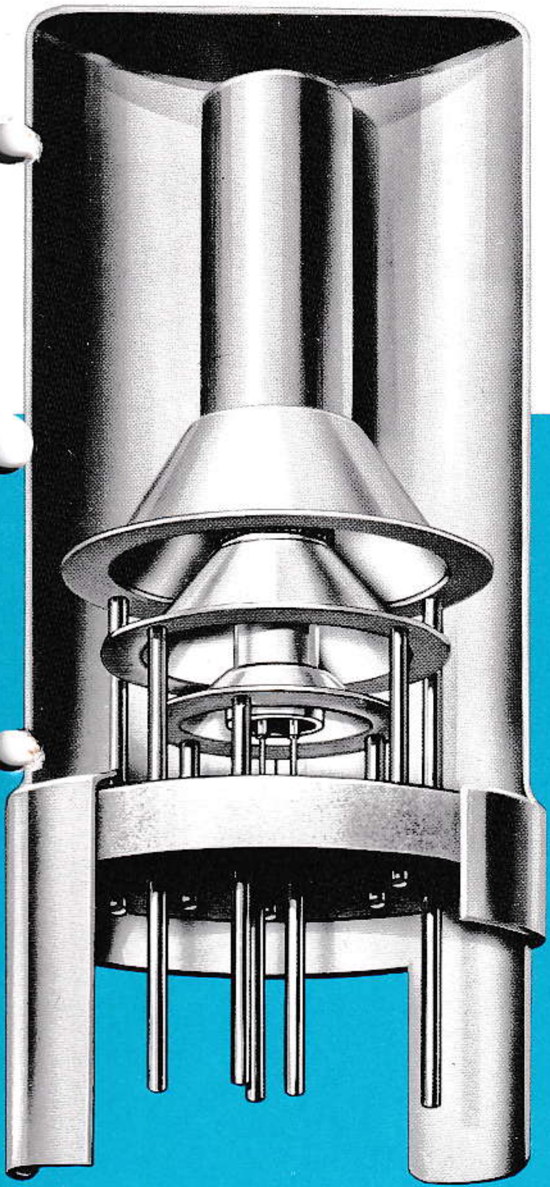
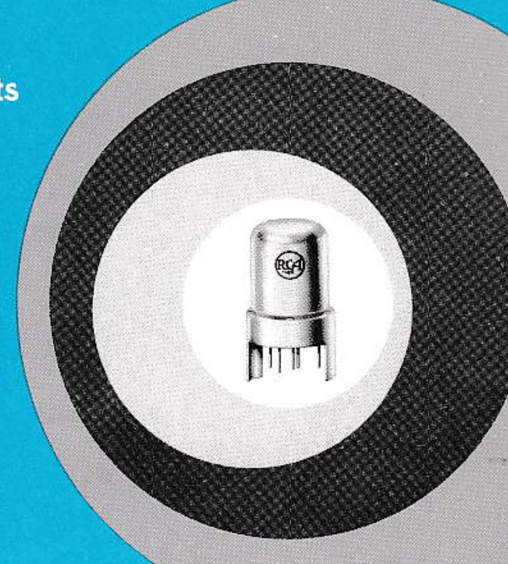
RCA nuvistor TUBES

for SONOBUOY and Other Expendable Equipment



- ☑ Heaters designed to meet battery-supply requirements
- ☑ Special 20-hour reliability life tests
- ☑ Small size
- ☑ Low drain
- ☑ High resistance to nuclear radiation, shock, and vibration
- ☑ Exceptional uniformity of characteristics



RADIO CORPORATION of AMERICA

ELECTRONIC COMPONENTS AND DEVICES HARRISON, N.J.

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RCA
NUVISTOR TUBES
For Sonobuoy and Other Expendable Equipment

This brochure presents data on nuvistor tubes intended for use in sonobuoy and other expendable equipment.

Because this type of equipment is operated from a battery supply, the heaters of tubes used in the equipment must be specially designed for such operation. Although all nuvistors of a given type require the same heater power, the specific voltage rating of the heater will be determined by the characteristics of the battery from which the tube is to be operated. These nuvistor tubes for sonobuoy applications will be supplied with heaters designed to operate within ±10% of any specified center heater voltage between 6.0 and 8.5 volts.

The nuvistor design, developed by RCA, utilizes a light-weight, cantilever-supported, cylindrical electrode structure housed in an all-ceramic-and-metal envelope (See *CUTAWAY VIEWS*). This unique design represents a combination of materials, processes, and fabrication techniques which has provided a major breakthrough in electron-tube performance, reliability, and size.

This combination of strong structural assembly with all-brazed connections and seals, all-ceramic-and-metal construction, and high-temperature processing provides very small tubes which give dependable performance under extreme environmental conditions, such as thermal or mechanical shock, continuous vibration, and high temperature.

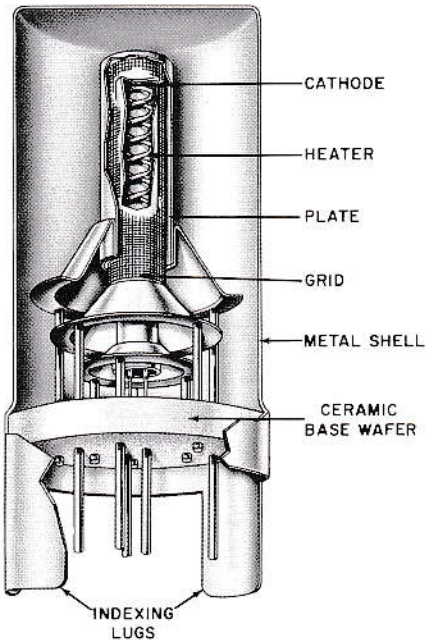
Another important and novel feature of the nuvistor design is the use of two peripheral lugs of unequal width which (1) provide visual and/or mechanical indexing, (2) provide protection for the base pins, and (3) permit safe, easy, and rapid insertion of tubes into sockets.

The advantages of the nuvistor design are numerous. The cylindrical symmetry of the electrode structure assures a uniform emission pattern. This symmetry together with the cantilever construction permits the use of close-tolerance jigs for extremely precise tube assembly. High-temperature brazing of the assemblies in these jigs eliminates the need for spot-welding and produces a virtually strain-free structure. The inherent symmetry of the assembly of these tubes also eliminates the need for mica spacers and thus removes one of the usual limitations to high-temperature operation.

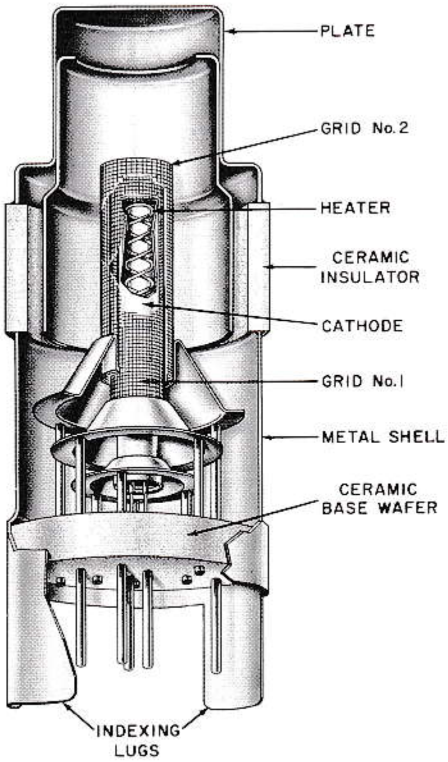
The basic design of nuvistor tubes makes it possible to maintain a high degree of control over the fabrication of parts and assemblies. Consequently, extremely close electrode spacings with an exceptionally high degree of mechanical uniformity can be achieved. The precise control over processing also contributes to exceptional uniformity of electrical characteristics from tube to tube. Because the nuvistor tube contains no glass or mica components, has a short low-mass structure, and is processed at very high temperatures, it is capable of operating reliably under severe environmental conditions.

CUTAWAY VIEWS

Showing Cylindrical Electrodes and Tripod-Like Supports



Typical
Single-Ended
Nuvistor Triode



Typical
Double-Ended
Nuvistor Tetrode

RCA-8441
HIGH-MU TRIODE

Nuvistor

Having Heater Designed to Operate from Battery Supplies Used in Sonobuoy and Other Expendable Equipment

RCA-8441 is a high-mu triode of the nuvistor type especially useful in the high-input-impedance, low-noise pre-amplifier stage of sonobuoy hydrophone amplifiers.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:

Voltage (DC)	Tubes will be supplied with the heater designed to operate within ±10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.	
Input	0.85	watt
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Direct Interelectrode Capacitances (Approx.):

Grid to plate	0.9	pf
Grid to cathode, shell, and heater	4.2	pf
Plate to cathode, shell, and heater	1.7	pf
Plate to cathode	0.22	pf
Heater to cathode	1.3	pf

Characteristics, Class A_1 Amplifier:

Heater Voltage	Specified center value	
Plate Supply Voltage	110	volts
Grid	Connected to negative end of cathode resistor	
Cathode Resistor	150	ohms
Amplification Factor	64	
Plate Resistance (Approx.)	6800	ohms
Transconductance	9400	μmhos
Plate Current	7	ma
Grid Voltage (Approx.) for plate μa = 10	-4	volts

Mechanical:

Operating Position	Any
Weight (Approx.)	1.9 grams
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Envelope	Metal Shell MT4
Dimensional Outline	JEDEC No. 4-4
Socket	See *SOCKET INFORMATION*
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No. E5-65)

AMPLIFIER — Class A

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

	Rating 1	*Rating 2*[a]	
Plate Supply Voltage	300 max.	300 max.	volts
Plate Voltage	250 max.	250 max.	volts
Grid Voltage:			
Negative-bias value	55 max.	55 max.	volts
Positive-bias value	-	0 max.	volts
Peak-positive value	2 max.	-	volts
Cathode Current	15 max.	2.5 max.	ma
Plate Dissipation	1 max.	0.2 max.	watt

Maximum Circuit Values:

	Rating 1	*Rating 2*[a]	
Grid-Circuit Resistance:			
For fixed-bias operation	0.5[b] max.	40 max.	megohms
For cathode-bias operation	1[b] max.	40 max.	megohms

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	$0.95\left[\frac{0.85}{E_f(ctr)}\right]$	$1.05\left[\frac{0.85}{E_f(ctr)}\right]$	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	0.8	1.0	pf
Grid to cathode, shell, and heater	2	3.4	5.0	pf
Plate to cathode, shell, and heater	2	1.3	2.1	pf
Plate to cathode	2	0.16	0.28	pf
Heater to cathode	2	1.0	1.6	pf
Plate Current (1)	1,3	5.5	8.8	ma
Plate Current (2)	1,4	-	50	μa
Transconductance (1)	1,3	7900	10900	μmhos
Transconductance (2)	3,5	6700	-	μmhos
Reverse Grid Current	1,6	-	0.05	μa
Amplification Factor	1,3	54	74	
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,7	-	5	μa
Heater positive with respect to cathode	1,7	-	5	μa
Leakage Resistance:				
Between grid and all other electrodes tied together	1,8	5000	-	megohms
Between plate and all other electrodes tied together	1,9	10000	-	megohms

[a] For high-reliability, 20-hour-life applications.

[b] For operation at metal-shell temperature of 150° C measured in Zone "A" as shown on DIMENSIONAL OUTLINE. For operation at other metal-shell temperatures, see *GRID-CIRCUIT-RESISTANCE RATING CHART*.

Note 1: With dc heater volts = specified center value, E_f(ctr).

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 110, grid and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 150, and cathode-bypass capacitor (μf) = 1000.

Note 4: With dc plate volts = 110, dc grid volts = -5, and metal shell connected to ground.

Note 5: With dc heater volts = 0.9 specified center value.

Note 6: With dc plate supply volts = 150, dc grid supply volts = -1.7, grid-circuit resistance (megohms) $\leq$ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.

Note 7: With dc heater-cathode volts = 100.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together.

Note 9: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL TESTS

Short-Duration Shock (1):

Peak Impact Acceleration . . . . . . 1000 g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four different positions (X_1, X_2, Y_1, and Y_2) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Long-Duration Shock (2):

Peak Impact Acceleration . . . . . . 50 g

This test is performed, using a half-sine-wave, 11-millisecond, mechanical shock pulse, on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of two positions in three mutually perpendicular axes on a free-fall table. The longitudinal axis of the tube is coincident with one of the three axes. The table is dropped a total of 18 times to a horizontal surface from a height sufficient to produce the specified Peak Impact Acceleration. The material of the horizontal surface is such that the duration of the half-sine-wave shock pulse is 11 milliseconds. No tube-electrode voltages are applied during this test.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dc heater-cathode volts = 100. During operation, the tube is vibrated through the frequency range from 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. This cycle is repeated for a period of 3 hours along each of three mutually perpendicular axes for a total of 9 hours. The longitudinal axis of the tube is coincident with one of the three axes. The vibrations are applied as follows:

a. The vibration from 5 to 50 cps is applied with a constant peak amplitude of 0.040 inch (0.080 inch peak-to-peak).

b. The vibration from 50 to 500 cps is applied with a constant acceleration of 10 g.

c. The vibration from 500 to 50 cps and then to 5 cps follows the same procedure, but in reverse.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 volts rms (60-cycle, ac) applied between plate and all other electrodes and metal shell connected together. Tubes must not break down or show evidence of corona when subjected to an air pressure (8.0 ± 0.5 mm Hg) corresponding to an altitude of 100,000 feet.

Continuity and Shorts:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-1D, Amendment 5, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied upon request). The areas of acceptance and rejection for this test are shown in the accompanying SHORTS-TEST ACCEPTANCE-LIMITS graph. In this test, tubes are criticized for permanent or temporary shorts and open circuits.

Reliability Life (20 Hours):

This test is performed on a sample size (minimum of 80 tubes/lot for a 5-lot sampling plan or a minimum of 400 tubes for a single-lot sampling plan) designed to assure a process average AFR (Acceptable Failure Rate) of 0.5 per cent for Inoperatives and 2.1 per cent for Total Defectives and a process average RFR (Rejectable Failure Rate) of 2.0 per cent for Inoperatives and 4.7 per cent for Total Defectives.

During this test, tubes are operated at maximum-rated plate dissipation (*Rating 2*—0.2 watt).

At the end of this test, tubes are criticized for Change in Transconductance (1), Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.

Heater-Cycling Life (100 Hours):

Intermittent Operation . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35 x specified center value cycled 1 minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

Intermittent Life (100 Hours):

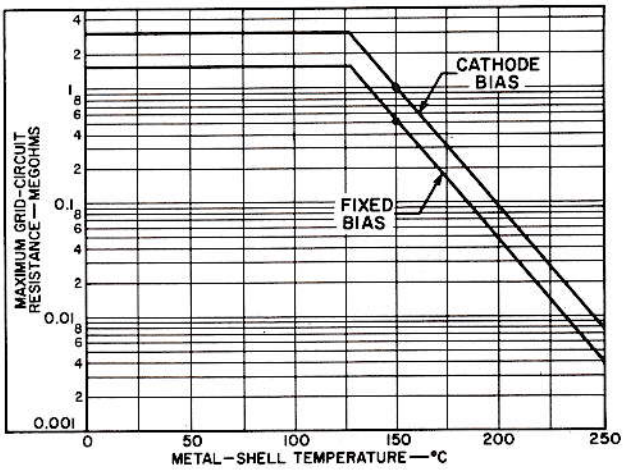
This test is performed on a sample lot of tubes from each production run.

During this test, tubes are operated at maximum-rated plate dissipation (*Rating 1*—1 watt).

At the end of this test, tubes are criticized for Transconductance (1), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.

GRID-CIRCUIT-RESISTANCE RATING CHART

Class A Amplifier—Rating 1



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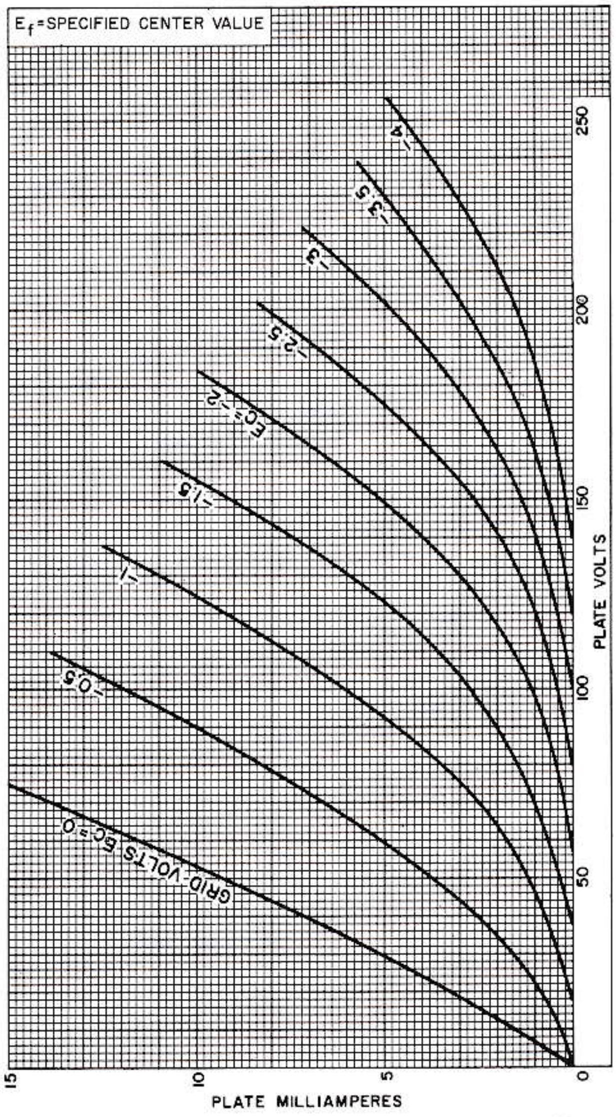
AVERAGE PLATE CHARACTERISTICS



92CM-12170

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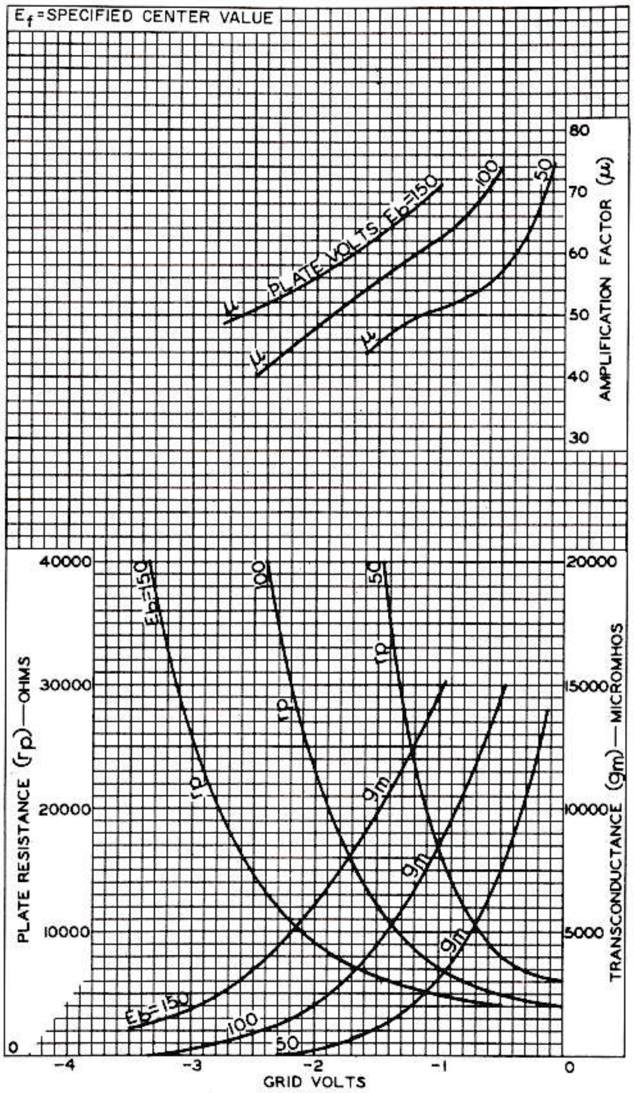
AVERAGE CHARACTERISTICS



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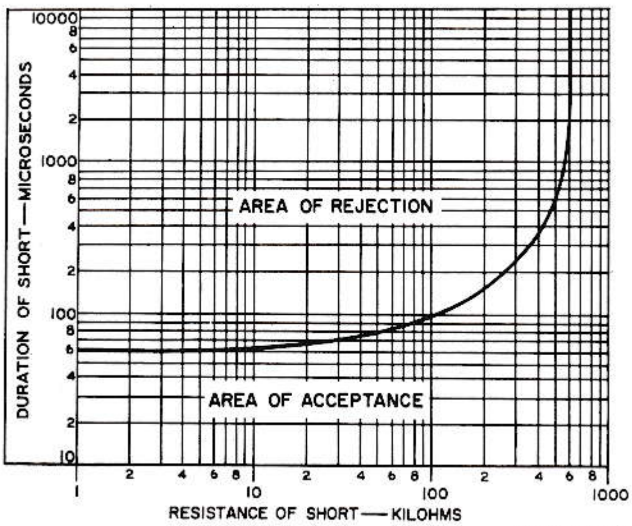
SHORTS-TEST ACCEPTANCE LIMITS



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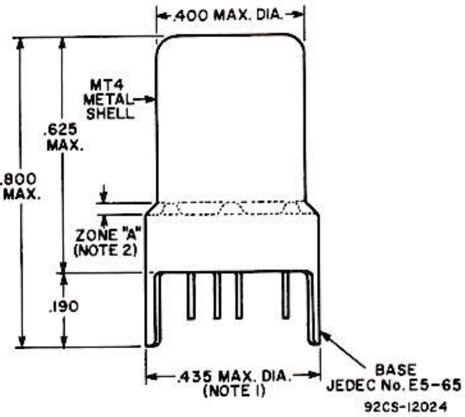
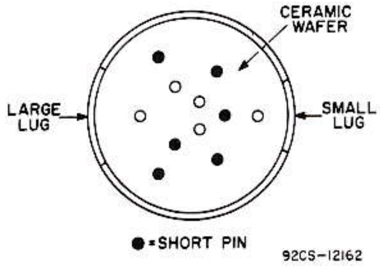
DIMENSIONAL OUTLINE JEDEC No. 4-4
Dimensions in Inches



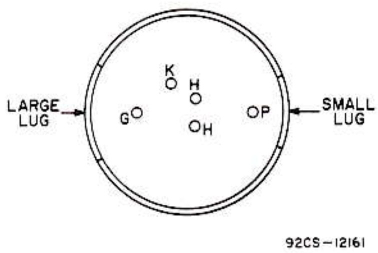
NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins

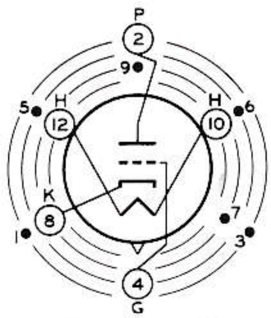


MODIFIED BOTTOM VIEW
With Element Connections Indicated and Short Pins Not Shown



TERMINAL DIAGRAM
Bottom View

Pin 1[c] – Do Not Use
Pin 2 – Plate
Pin 3[c] – Do Not Use
Pin 4 – Grid
Pin 5[c] – Do Not Use
Pin 6[c] – Do Not Use



INDEX = LARGE LUG
● = SHORT PIN; IC – DO NOT USE

JEDEC 12AQ

Pin 7[c] – Do Not Use
Pin 8 – Cathode
Pin 9[c] – Do Not Use
Pin 10 – Heater
Pin 11 – Omitted
Pin 12 – Heater

[c] Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.

SOCKET INFORMATION

The sockets listed below by manufacturer's or distributor's part number have contacts and an annular groove designed to mate, respectively, with the base pins and the two indexing lugs of the base utilized on this RCA nuvistor tube. Information on sockets having different casting materials, contact materials, or finishes may be obtained from the manufacturers. Sockets having mechanical and electrical characteristics comparable to these sockets may be available from other component manufacturers.

Description		Manufacturer or Distributor and Part No.		
Application	Mounting	Cinch Mfg. Co.[d]	Cinch-Jones Sales Division[e] Distributors	Industrial Electronic Hardware Corp.[f]
General Purpose Type	Crimp mounting	133 65 10 001	5NS	MSN 0905-1 MSN 0905-2 MSN 0905-3
	Flange mounting	133 65 10 003	5NS-1	-
	Printed Board ("Stand-off")	133 65 10 009	5NS-2	-
UHF Heat-Dissipating Type	Crimp mounting	133 65 10 041	5NS-3	-

[d] 1026 South Homan Avenue, Chicago 24, Illinois.
[e] Cinch-Jones Sales Division of Cinch Mfg. Co.
[f] 109 Prince Street, New York 12, N.Y.

RCA-8382
POWER TRIODE

Nuvistor

Having Heater Designed to Operate from Battery Supplies Used in Sonobuoy and Other Expendable Equipment

RCA-8382 is a power triode of the nuvistor type especially useful as a class C rf-amplifier, rf-oscillator, or frequency-doubler tube in sonobuoy transmitters.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:

Voltage (DC)	Tubes will be supplied with the heater designed to operate within ±10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.	
Input	0.85	watt
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Direct Interelectrode Capacitances (Approx.):

Grid to plate	2.2	pf
Grid to cathode, shell, and heater	4.2	pf
Plate to cathode, shell, and heater	1.6	pf
Plate to cathode	0.26	pf
Heater to cathode	1.4	pf

Characteristics, Class A_1 Amplifier:

Heater Voltage	Specified center value	
Plate Supply Voltage	75	volts
Grid	Connected to negative end of cathode resistor	
Cathode Resistor	100	ohms
Amplification Factor	28	
Plate Resistance (Approx.)	2200	ohms
Transconductance	12800	μmhos
Plate Current	15	ma
Grid Voltage (Approx.) for plate μa = 10	-8	volts

Mechanical:

Operating Position	Any
Weight (Approx.)	1.9 grams
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Envelope	Metal Shell MT4
Dimensional Outline	JEDEC No. 4-4
Socket	See *SOCKET INFORMATION*
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No. E5-65)

RF AMPLIFIER or OSCILLATOR — Class C

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

	Up to 175 Mc	
Plate Supply Voltage	300 max.	volts
Plate Voltage	250 max.	volts
Grid Voltage:		
Negative-bias value	55 max.	volts
Peak-positive value	4 max.	volts
Grid Current	5 max.	ma
Cathode Current	25 max.	ma
Plate Dissipation	2 max.	watts
Metal-Shell Temperature (Measured in Zone "A" as shown on DIMENSIONAL OUTLINE)	150 max.	°C

Typical Operation:

As cathode-drive rf amplifier

	At 175 Mc	
Heater Voltage	Specified center value	
Plate Supply Voltage	150	volts
Grid Resistor	4700	ohms
Driver Power Output	250	mw
Useful Power Output[a]	1.6	watts

As oscillator

	At 175 Mc	
Heater Voltage	Specified center value	
Plate Supply Voltage	170	volts
Grid Resistor	4700	ohms
Plate Input	3	watts
Useful Power Output[a]	1.5	watts

Maximum Circuit Values:

Grid-Circuit Resistance	0.05 max.	megohm

FREQUENCY DOUBLER — Class C

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

	Up to 175 Mc	
Plate Supply Voltage	300 max.	volts
Plate Voltage	250 max.	volts
Grid Voltage:		
Negative-bias value	200 max.	volts
Peak-positive value	4 max.	volts
Grid Current	5 max.	ma
Cathode Current	22 max.	ma
Plate Dissipation	2 max.	watts
Metal-Shell Temperature (Measured in Zone "A" as shown on DIMENSIONAL OUTLINE)	150 max.	°C

Typical Operation:

	80-to-160 Mc	
Heater Voltage	Specified center value	
Plate Supply Voltage	135	volts
Grid Resistor	30000	ohms
Driver Power Output	150	mw
Useful Power Output[a]	800	mw

Maximum Circuit Values:

Grid-Circuit Resistance	0.05 max.	megohm

[a] Measured at load.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	$0.95\left[\frac{0.85}{E_f(ctr)}\right]$	$1.05\left[\frac{0.85}{E_f(ctr)}\right]$	amp
Direct Interelectrode Capacitances:				
Grid to plate. . . .	2	1.8	2.6	pf
Grid to cathode, shell, and heater.	2	3.8	4.6	pf
Plate to cathode, shell, and heater.	2	1.4	1.8	pf
Plate to cathode . .	2	0.20	0.32	pf
Heater to cathode. .	2	1.1	1.7	pf
Plate Current (1). . .	1,3	11	19	ma
Plate Current (2). . .	1,4	-	100	μa
Transconductance (1) .	1,3	11400	14200	μmhos
Useful Power Output (1)	1,5	1.4	-	watts
Useful Power Output (2)	5,6	1.3	-	watts
Reverse Grid Current .	1,7	-	0.3	μa
AC Emission.	1,8	20	-	ma
Amplification Factor .	1,3	22	34	
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode.	1,9	-	5	μa
Heater positive with respect to cathode.	1,9	-	5	μa
Leakage Resistance:				
Between grid and all other electrodes tied together. . .	1,10	5000	-	megohms
Between plate and all other electrodes tied together. . .	1,11	10000	-	megohms

Note 1: With dc heater volts = specified center value, $E_f(ctr)$.

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 75, grid and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 100, and cathode-bypass capacitor (μf) = 1000.

Note 4: With dc plate volts = 75, dc grid volts = -9, and metal shell connected to ground.

Note 5: Measured at load in 175-Mc, cathode-drive, rf-amplifier circuit with dc plate supply volts = 150, grid resistor (ohms) = 2500, and driver power output (milliwatts) = 250.

Note 6: With dc heater volts = 0.9 specified center value.

Note 7: With dc plate supply volts = 80, dc grid supply volts = -1.2, grid-circuit resistance (megohms) $\leq$ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.

Note 8: With dc plate supply volts = 40, dc grid supply volts = -6.5, rms 60-cps ac grid signal volts = 8, dc grid-circuit resistance (ohms) $\leq$ 2, plate- and grid-voltage supplies each bypassed with capacitor (μf) $\geq$ 500, and metal shell connected to ground. "AC Emission" is measured as the dc component of current in the plate circuit.

Note 9: With dc heater-cathode volts = 100.

Note 10: With grid 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 11: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

SPECIAL TESTS

Short-Duration Shock (1):

Peak Impact Acceleration . . . . . . 1000 g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four different positions (X_1, X_2, Y_1, and Y_2) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Long-Duration Shock (2):

Peak Impact Acceleration . . . . . . 50 g

This test is performed, using a half-sine-wave, 11-millisecond, mechanical shock pulse, on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of two positions in three mutually perpendicular axes on a free-fall table. The longitudinal axis of the tube is coincident with one of the three axes. The table is dropped a total of 18 times to a horizontal surface from a height sufficient to produce the specified Peak Impact Acceleration. The material of the horizontal surface is such that the duration of the half-sine-wave shock pulse is 11 milliseconds. No tube-electrode voltages are applied during this test.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dc heater-cathode volts = 100. During operation, the tube is vibrated through the frequency range from 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. This cycle is repeated for a period of 3 hours along each of three mutually perpendicular axes for a total of 9 hours. The longitudinal axis of the tube is coincident with one of the three axis. The vibrations are applied as follows:

a. The vibration from 5 to 50 cps is applied with a constant peak amplitude of 0.040 inch (0.080 inch peak-to-peak).
b. The vibration from 50 to 500 cps is applied with a constant acceleration of 10 g.
c. The vibration from 500 to 50 cps and then to 5 cps follows the same procedure, but in reverse.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 volts rms (60-cycle, ac) applied between plate and all other electrodes and metal shell connected together. Tubes must not break down or show evidence of corona when subjected to an air pressure (8.0 ± 0.5 mm Hg) corresponding to an altitude of 100,000 feet.

Continuity and Shorts:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-1D, Amendment 5, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied upon request). The areas of acceptance and rejection for this test are shown in the accompanying SHORTS-TEST ACCEPTANCE-LIMITS graph. In this test, tubes are criticized for permanent or temporary shorts and open circuits.

Reliability Life (20 Hours):

This test is performed on a sample size (minimum of 80 tubes/lot for a 5-lot sampling plan or a minimum of 400 tubes for a single-lot sampling plan) designed to assure a process average AFR (Acceptable Failure Rate) of 0.5 per cent for Inoperatives and 2.1 per cent for Total Defectives and a process average RFR (Rejectable Failure Rate) of 2.0 per cent for Inoperatives and 4.7 per cent for Total Defectives.

During this test, tubes are operated at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Useful Power Output (2), Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.700 watt.

Heater-Cycling Life (100 Hours):

Intermittent Operation . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35 x specified center value cycled 1 minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

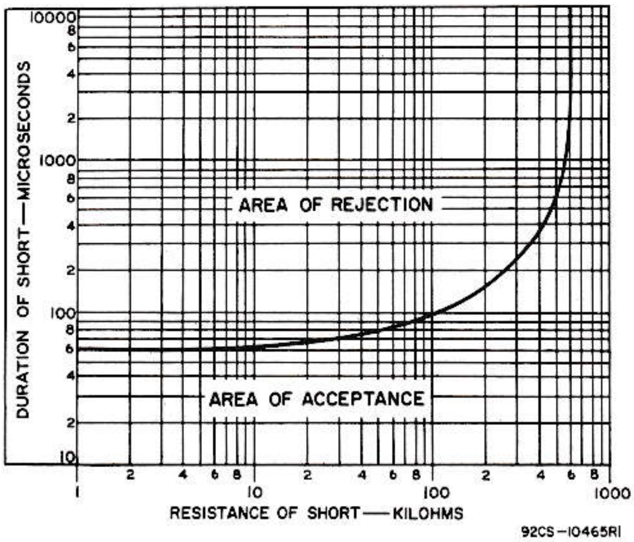
Oscillator Life (100 Hours):

This test is performed on a sample lot of tubes from each production run.

During this test, tubes are operated as 175-Mc oscillator at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Useful Power Output (2), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.700 watt.

SHORTS-TEST ACCEPTANCE LIMITS



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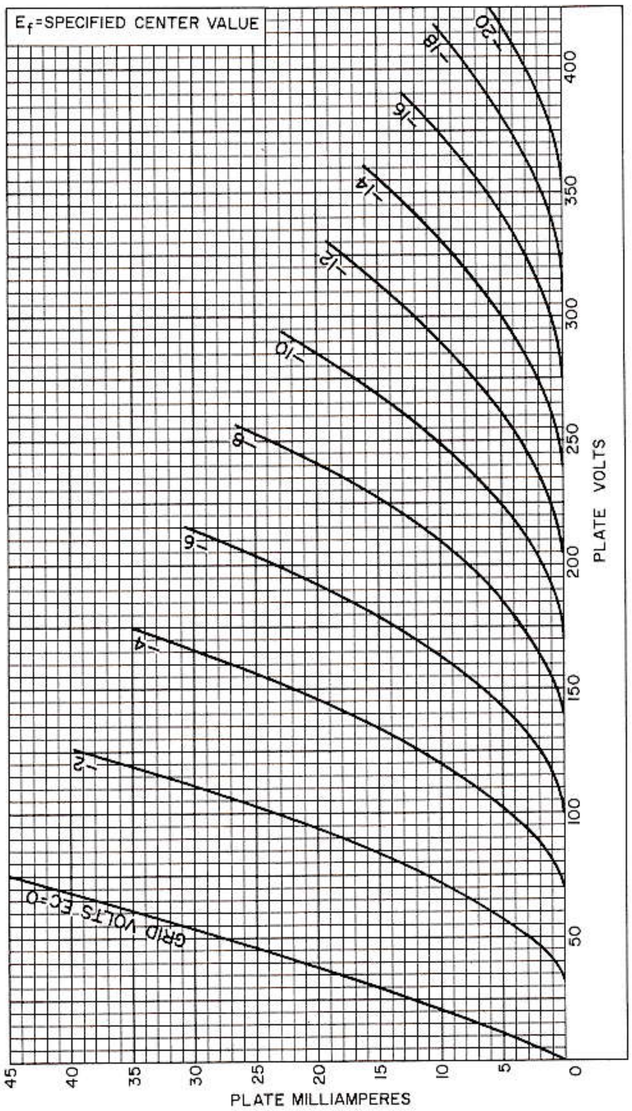
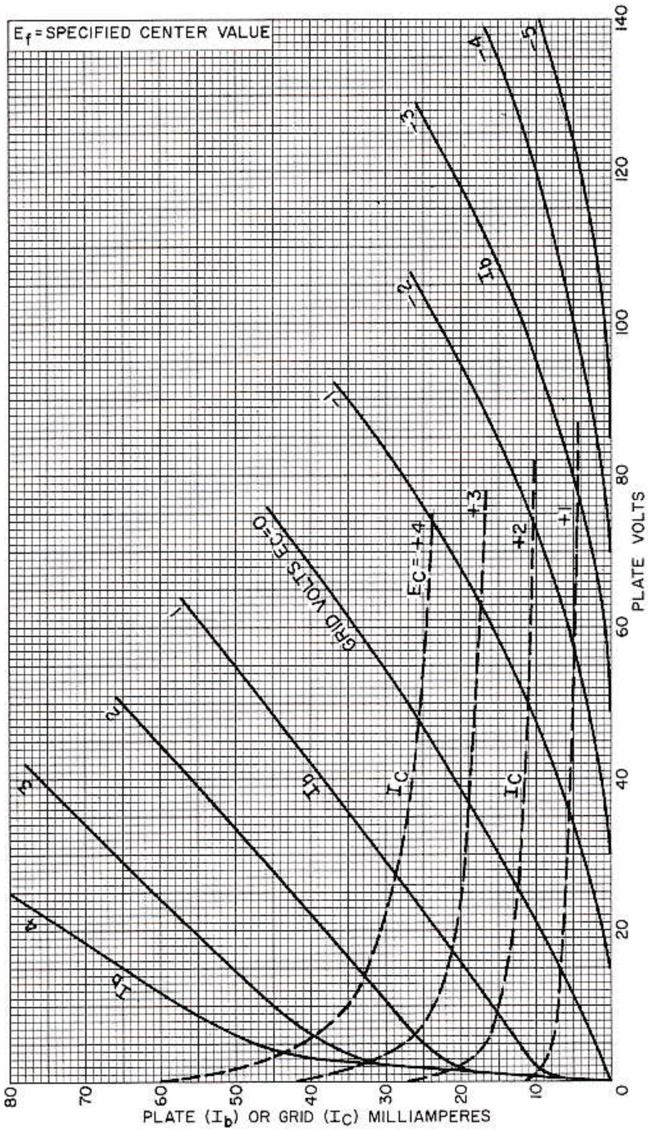
AVERAGE PLATE CHARACTERISTICS



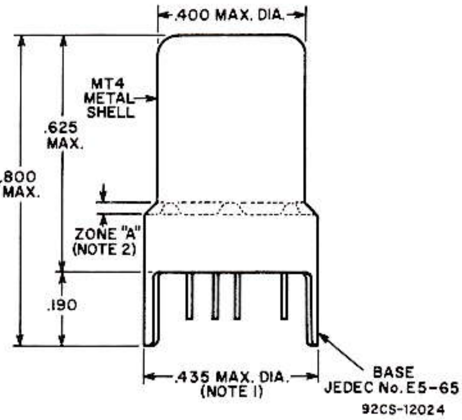
92CM-12169

AVERAGE CHARACTERISTICS



92CM-12174

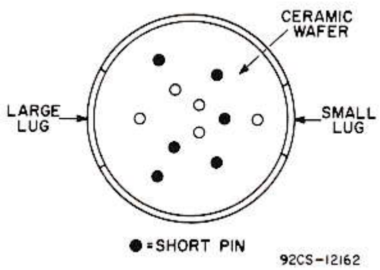
DIMENSIONAL OUTLINE JEDEC No. 4-4
Dimensions in Inches



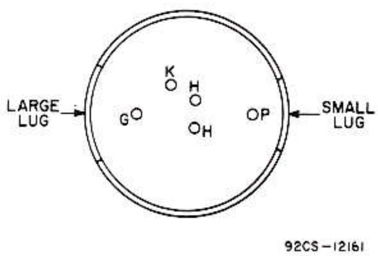
NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins

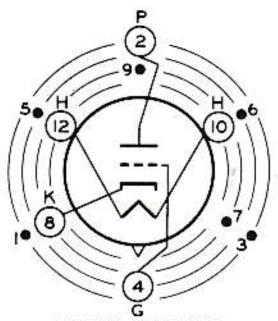


MODIFIED BOTTOM VIEW
With Element Connections Indicated and Short Pins Not Shown



TERMINAL DIAGRAM
Bottom View

Pin 1[b] – Do Not Use
Pin 2 – Plate
Pin 3[b] – Do Not Use
Pin 4 – Grid
Pin 5[b] – Do Not Use
Pin 6[b] – Do Not Use



INDEX = LARGE LUG
● = SHORT PIN; IC – DO NOT USE

JEDEC 12AQ

Pin 7[b] – Do Not Use
Pin 8 – Cathode
Pin 9[b] – Do Not Use
Pin 10 – Heater
Pin 11 – Omitted
Pin 12 – Heater

[b] Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.

RCA-8456

MEDIUM-MU TRIODE

Nuvistor

Having Heater Designed to Operate from Battery Supplies
Used in Sonobuoy and Other Expendable Equipment

RCA-8456 is a medium-mu triode of the nuvistor type especially useful in multivibrator and cathode-follower circuits and in other applications in sonobuoy equipment requiring a device having high input impedance and capable of operating directly from a saltwater-activated battery.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:

Voltage (DC)	Tubes will be supplied with the heater designed to operate within ±10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.	
Input	0.85	watt
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Direct Interelectrode Capacitances (Approx.):

Grid to plate	2.1	pf
Grid to cathode, shell, and heater	4.0	pf
Plate to cathode, shell, and heater	1.7	pf
Plate to cathode	0.34	pf
Heater to cathode	1.4	pf

Characteristics, Class A$_1$ Amplifier:

Heater Voltage	Specified center value	
Plate Supply Voltage	24	volts
Grid	Connected to negative end of cathode resistor	
Cathode Resistor	100	ohms
Amplification Factor	11.5	
Plate Resistance (Approx.)	1530	ohms
Transconductance	7500	μmhos
Plate Current	8.7	ma
Grid Voltage (Approx.) for plate μa = 50	-5	volts

Mechanical:

Operating Position	Any
Weight (Approx.)	1.9 grams
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Envelope	Metal Shell MT4
Dimensional Outline	JEDEC No. 4-4
Socket	See *SOCKET INFORMATION*
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No. E5-65)

AMPLIFIER — Class A

Maximum Ratings, *Absolute-Maximum Values:*
For operation at any altitude

Plate Voltage	50 max.	volts
Grid Voltage:		
Negative-bias value	55 max.	volts
Peak-positive value	2 max.	volts
Grid Current	2 max.	ma
Cathode Current	15 max.	ma
Plate Dissipation	0.45 max.	watt

Typical Operation:

Heater Voltage	Specified center value		
Plate Supply Voltage	12	24	volts
Grid Voltage	-	-0.7	volt
Grid Resistor	33000	-	ohms
Amplification Factor	12	12	
Plate Resistance (Approx.)	1500	1500	ohms
Transconductance	8000	8000	μmhos
Plate Current	5.5	9.5	ma

Maximum Circuit Values:

Grid-Circuit Resistance:[a]

For fixed-bias operation	10 max.	megohms
For cathode-bias operation	10 max.	megohms

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	$0.95\left[\frac{0.85}{E_f(ctr)}\right]$	$1.05\left[\frac{0.85}{E_f(ctr)}\right]$	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.8	2.4	pf
Grid to cathode, shell, and heater	2	3.4	4.6	pf
Plate to cathode, shell, and heater	2	1.4	2.0	pf
Plate to cathode	2	0.26	0.42	pf
Heater to cathode	2	1.1	1.7	pf
Plate Current (1)	1,3	6.7	10.7	ma
Plate Current (2)	1,4	-	50	μa
Transconductance (1)	1,3	6500	8500	μmhos
Transconductance (2)	3,5	5700	-	μmhos
Reverse Grid Current	1,6	-	0.05	μa
Amplification Factor	1,3	9	14	
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,7	-	5	μa
Heater positive with respect to cathode	1,7	-	5	μa

[a] For operation at metal-shell temperatures up to 150° C measured in Zone "A" as shown on DIMENSIONAL OUTLINE. For operation at metal-shell temperatures above 150° C, see accompanying *GRID-CIRCUIT-RESISTANCE RATING CHART*.

Leakage Resistance:

Between grid and all other electrodes tied together. . .	1,8	5000	-	megohms
Between plate and all other electrodes tied together. . .	1,9	10000	-	megohms

Note 1: With dc heater volts = specified center value, E_f(ctr).

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 24, grid and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 100, and cathode-bypass capacitor (μf) = 1000.

Note 4: With dc plate volts = 24, dc grid volts = -10, and metal shell connected to ground.

Note 5: With dc heater volts = 0.9 specified center value.

Note 6: With dc plate supply volts = 40, dc grid supply volts = -2, grid circuit resistance (megohms) $\leqq$ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.

Note 7: With dc heater-cathode volts = 100.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 9: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

SPECIAL TESTS

Short-Duration Shock (1):

Peak Impact Acceleration . . . . . . 1000 g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four different positions (X_1, X_2, Y_1, and Y_2) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Long-Duration Shock (2):

Peak Impact Acceleration . . . . . . 50 g

This test is performed, using a half-sine-wave, 11-millisecond, mechanical shock pulse, on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of two positions in three mutually perpendicular axes on a free-fall table. The longitudinal axis of the tube is coincident with one of the three axes. The table is dropped a total of 18 times to a horizontal surface from a height sufficient to produce the specified Peak Impact Acceleration. The material of the horizontal surface is such that the duration of the half-sine-wave shock pulse is 11 milliseconds. No tube-electrode voltages are applied during this test.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dc heater-cathode volts = 100. During operation, the tube is vibrated through the frequency range from 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. This cycle is repeated for a period of 3 hours along each of three mutually perpendicular axes for a total of 9 hours. The longitudinal axis of the tube is coincident with one of the three axes. The vibrations are applied as follows:

a. The vibration from 5 to 50 cps is applied with a constant peak amplitude of 0.040 inch (0.080 inch peak-to-peak).

b. The vibration from 50 to 500 cps is applied with a constant acceleration of 10 g.

c. The vibration from 500 to 50 cps and then to 5 cps follows the same procedure, but in reverse.

At the end of this test, tubes are criticized for Continuity and Shorts, Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 volts rms (60-cycle, ac) applied between plate and all other electrodes and metal shell connected together. Tubes must not break down or show evidence of corona when subjected to an air pressure (8.0 ± 0.5 mm Hg) corresponding to an altitude of 100,000 feet.

Continuity and Shorts:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-1D, Amendment 5, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied upon request). The areas of acceptance and rejection for this test are shown in the accompanying SHORTS-TEST ACCEPTANCE-LIMITS graph. In this test, tubes are criticized for permanent or temporary shorts and open circuits.

Reliability Life (20 Hours):

This test is performed on a sample size (minimum of 80 tubes/lot for a 5-lot sampling plan or a minimum of 400 tubes for a single-lot sampling plan) designed to assure a process average AFR (Acceptable Failure Rate) of 0.5 per cent for Inoperatives and 2.1 per cent for Total Defectives and a process average RFR (Rejectable Failure Rate) of 2.0 per cent for Inoperatives and 4.7 per cent for Total Defectives.

During this test, tubes are operated at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Change in Transconductance (1), Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.

Heater-Cycling Life (100 Hours):

Intermittent Operation . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35 x specified center value cycled 1 minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

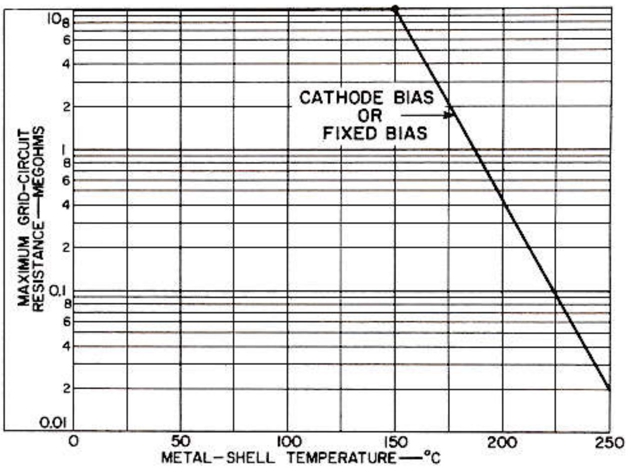
Intermittent Life (100 Hours):

This test is performed on a sample lot of tubes from each production run.

During this test, tubes are operated at maximum-rated plate dissipation.

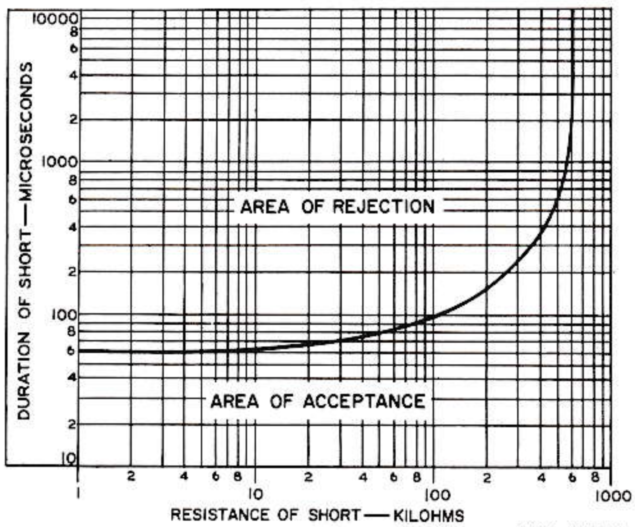
At the end of this test, tubes are criticized for Transconductance (1), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.

GRID-CIRCUIT-RESISTANCE RATING CHART



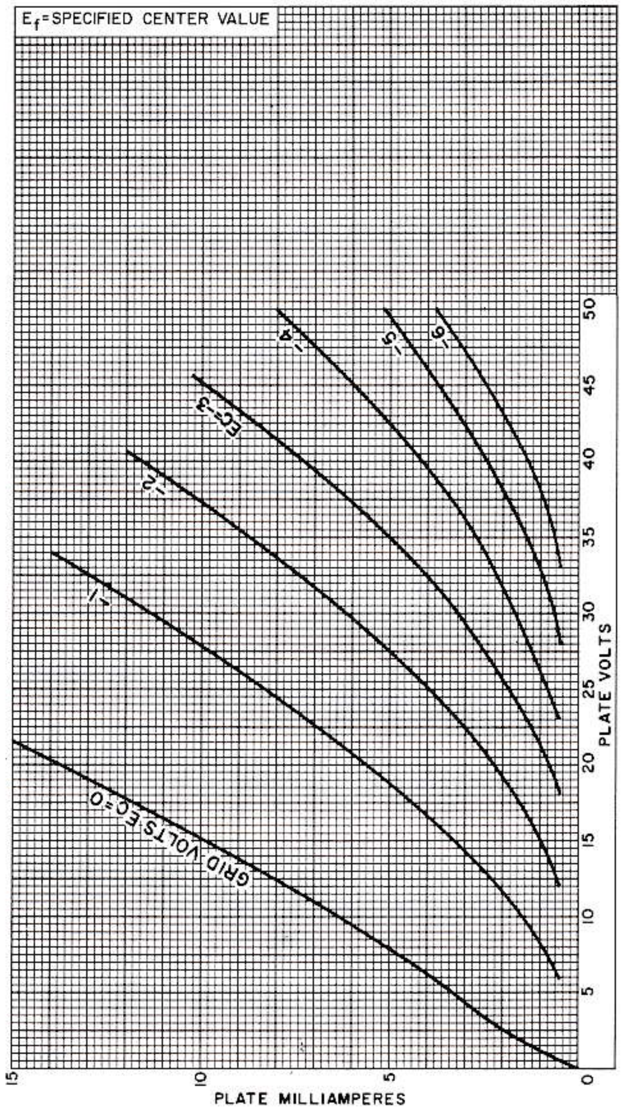
92CS-11479R1

SHORTS-TEST ACCEPTANCE LIMITS



92CS-10465R1

AVERAGE PLATE CHARACTERISTICS



92CM-12167

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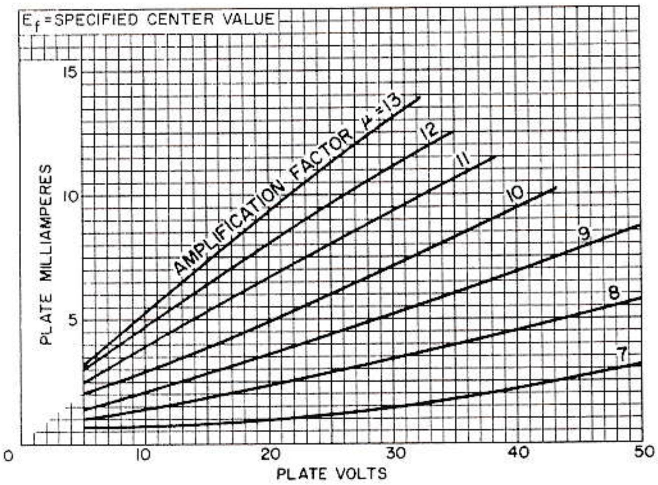
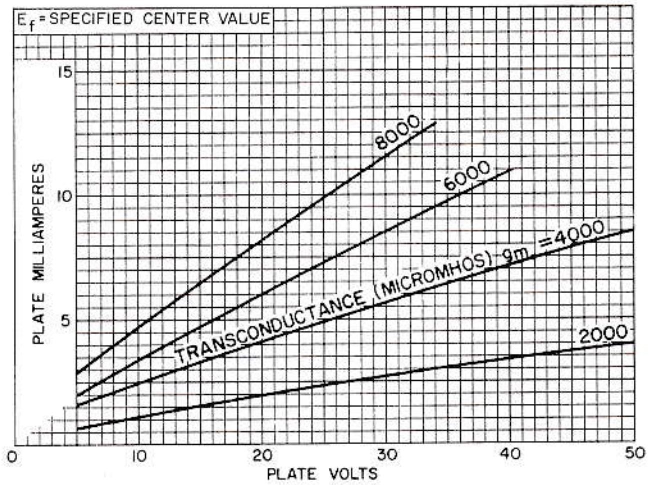
AVERAGE CHARACTERISTICS

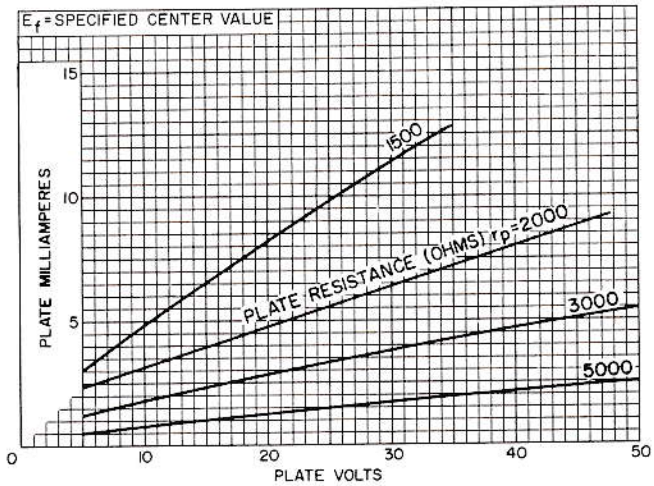


92CS-12165



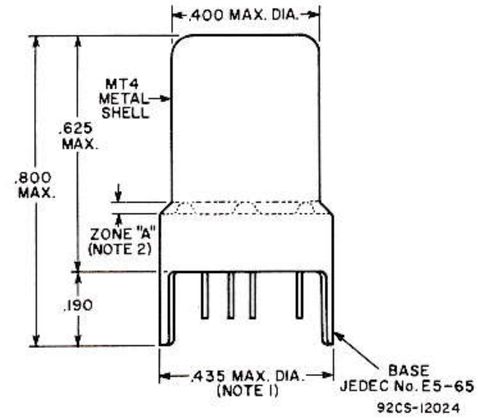
92CS-12166

AVERAGE CHARACTERISTICS



92CS-12164

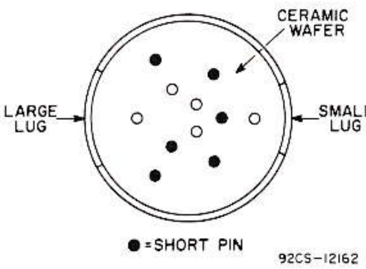
DIMENSIONAL OUTLINE JEDEC No. 4-4
Dimensions in Inches



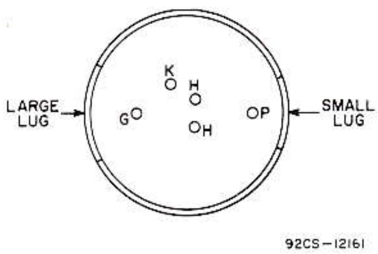
NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins

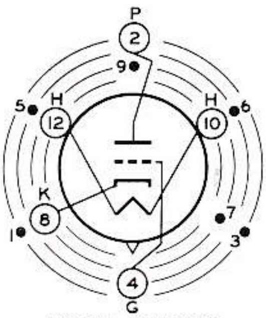


MODIFIED BOTTOM VIEW
With Element Connections Indicated and Short Pins Not Shown



TERMINAL DIAGRAM
Bottom View

Pin 1[b] – Do Not Use
Pin 2 – Plate
Pin 3[b] – Do Not Use
Pin 4 – Grid
Pin 5[b] – Do Not Use
Pin 6[b] – Do Not Use



INDEX=LARGE LUG
● = SHORT PIN; IC–DO NOT USE

JEDEC 12AQ

Pin 7[b] – Do Not Use
Pin 8 – Cathode
Pin 9[b] – Do Not Use
Pin 10 – Heater
Pin 11 – Omitted
Pin 12 – Heater

[b] Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.

RCA-8380
POWER TETRODE

Nuvistor

Having Heater Designed to Operate from Battery Supplies Used in Sonobuoy and Other Expendable Equipment

RCA-8380 is a power tetrode of the nuvistor type especially useful as a class C combined rf-oscillator and frequency-doubler tube in sonobuoy transmitters. It is also useful in the high-gain audio-frequency stages of sonobuoy hydrophone amplifiers.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:

Voltage (DC)	Tubes will be supplied with the heater designed to operate within ±10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.	
Input	1.1	watt
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances:		
Grid No. 1 to plate	0.015 max.	pf
Grid No. 1 to cathode, grid No. 2, shell, and heater	7.0	pf
Plate to cathode, grid No. 2, shell, and heater	1.4	pf
Heater to cathode	1.4	pf

Characteristics, Class A$_1$ Amplifier:

Heater Voltage	Specified center value	
Plate Supply Voltage	100	volts
Grid-No. 2 Supply Voltage	50	volts
Grid No. 1	Connected to negative end of cathode resistor	
Cathode Resistor	68	ohms
Transconductance	11000	µmhos
Plate Current	11	ma
Grid-No. 2 Current	2.9	ma
Grid-No. 1 Voltage (Approx.) for plate µa = 10	-7	volts

Mechanical:

Operating Position	Any
Weight (Approx.)	2.4 grams
Maximum Overall Length	1.050"
Seated Length	0.790" to 0.840"
Maximum Diameter	0.440"
Envelope	Metal Shell MT4 with Ceramic Insulator
Dimensional Outline	JEDEC No. 4-5
Socket and Connector	See *SOCKET & CONNECTOR INFORMATION*
Cap	Skirted Miniature (JEDEC No. C1-44)
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No. E5-65)

AMPLIFIER — Class A

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

Plate Supply Voltage	300 max.	volts
Plate Voltage	250 max.	volts
Grid-No. 2 (Screen-Grid) Supply Voltage	300 max.	volts
Grid-No. 2 Voltage	100 max.	volts
Grid-No. 1 (Control-Grid) Voltage:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
Cathode Current	25 max.	ma
Grid-No. 2 Input	0.2 max.	watt
Plate Dissipation	1.6 max.	watts

Maximum Circuit Values:

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

COMBINED RF OSCILLATOR and FREQUENCY DOUBLER — Class C

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

	Up to 80 Mc	
Plate Supply Voltage	300 max.	volts
Plate Voltage	250 max.	volts
Grid-No. 2 (Screen-Grid) Supply Voltage	300 max.	volts
Grid-No. 2 Voltage	100 max.	volts
Grid-No. 1 (Control-Grid) Voltage:		
Negative-bias value	55 max.	volts
Peak-positive value	3 max.	volts
Cathode Current	25 max.	ma
Grid-No. 1 Current	3 max.	ma
Grid-No. 2 Input	0.5 max.	watt
Plate Dissipation	1.6 max.	watts
Metal-Shell Temperature (Measured in Zone "A" as shown on DIMENSIONAL OUTLINE)	150 max.	°C

Typical Operation:[b]

Heater Voltage	Specified center value		
Plate Supply Voltage	80	150	volts
Grid-No. 2 Supply Voltage	80	150	volts
Grid-No. 2 Resistor	-	12000	ohms
Grid-No. 1 Resistor	27000	10000	ohms
Plate Current	7.5	10	ma
Grid-No. 2 Current	6	6	ma
Useful Power Output at 80 Mc[c]	260	650	mw

Maximum Circuit Values:

Grid-No. 1-Circuit Resistance	0.05 max.	megohm

[a] For operation at metal-shell temperature of 150° C measured in Zone "A" as shown on DIMENSIONAL OUTLINE. For operation at other metal-shell temperatures, see *GRID-No. 1-CIRCUIT-RESISTANCE RATING CHART.*

[b] Cathode, grid No. 1, and grid No. 2 are operated as a 40-Mc, Colpitts-type, electron-coupled oscillator with grid No. 2 functioning as the "plate" of the oscillator, and the plate circuit tuned to 80 Mc.

[c] Measured at load.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	$0.95\left[\frac{1.1}{E_f(ctr)}\right]$	$1.05\left[\frac{1.1}{E_f(ctr)}\right]$	amp
Direct Interelectrode Capacitances:				
Grid No. 1 to plate .	2	-	0.015	pf
Grid No. 1 to cathode, grid No. 2, shell, and heater	2	6.0	8.0	pf
Plate to cathode, grid No. 2, shell, and heater	2	1.2	1.6	pf
Heater to cathode. .	2	1.1	1.7	pf
Plate Current (1). . .	1,3	9	13	ma
Plate Current (2). . .	1,4	-	50	μa
Grid-No. 2 Current. . .	1,3	-	4	ma
Transconductance (1) .	1,3	9000	13000	μmhos
Transconductance, Grid No. 1 to Grid No. 2.	1,3	2000	-	μmhos
Useful Power Output (1)	1,5	0.550	-	watt
Useful Power Output (2)	5,6	0.500	-	watt
Reverse Grid-No. 1 Current.	1,7	-	0.3	μa
AC Emission.	1,8	15	-	ma
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode.	1,9	-	10	μa
Heater positive with respect to cathode.	1,9	-	10	μa
Leakage Resistance:				
Between grid No. 1 and all other electrodes tied together	1,10	5000	-	megohms
Between grid No. 2 and all other electrodes tied together	1,11	5000	-	megohms
Between plate and all other electrodes tied together	1,12	10000	-	megohms

Note 1: With dc heater volts = specified center value, E_f(ctr).

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate supply volts = 100, dc grid-No. 2 supply volts = 50, grid No. 1 and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 68, and cathode-bypass capacitor (μf) = 1000.

Note 4: With dc plate volts = 100, dc grid-No. 2 volts = 50, dc grid-No. 1 volts = -7, and metal shell connected to ground.

Note 5: Measured at load in 40-Mc oscillator-80-Mc doubler circuit with dc plate supply volts = 150, dc grid-No. 2 supply volts = 150, grid-No. 2 resistor (ohms) = 12000, and grid-No. 1 resistor (ohms) = 10000.

Note 6: With dc heater volts = 0.9 specified center value.

Note 7: With dc plate supply volts = 125, dc grid-No. 2 supply volts = 60, dc grid-No. 1 supply volts = -1.5, grid-No. 1-circuit resistance (megohms) $\leqq$ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.

Note 8: With dc plate supply volts = 100, dc grid-No. 2 supply volts = 50, dc grid-No. 1 supply volts = -6.5, rms 60-cps ac grid-No. 1 signal volts = 7.5, dc grid-No. 1-circuit resistance (ohms) $\leqq$ 2, plate- and grid-No. 1-voltage supplies each bypassed with capacitor (μf) $\geqq$500, and metal shell connected to ground. "AC Emission" is measured as the dc component of current in the plate circuit.

Note 9: With dc heater-cathode volts = 100.

Note 10: With grid No. 1 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 11: With grid No. 2 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 12: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

SPECIAL TESTS

Short-Duration Shock (1):

Peak Impact Acceleration . . . . . . 1000 g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four different positions (X_1, X_2, Y_1, and Y_2) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid-No. 1 Current, and Heater-Cathode Leakage Current.

Long-Duration Shock (2):

Peak Impact Acceleration . . . . . . 50 g

This test is performed, using a half-sine-wave, 11-millisecond, mechanical shock pulse, on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of two positions in three mutually perpendicular axes on a free-fall table. The longitudinal axis of the tube is coincident with one of the three axes. The table is dropped a total of 18 times to a horizontal surface from a height sufficient to produce the specified Peak Impact Acceleration. The material of the horizontal surface is such that the duration of the half-sine-wave shock pulse is 11 milliseconds. No tube-electrode voltages are applied during this test.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid-No. 1 Current, and Heater-Cathode Leakage Current.

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dc heater-cathode volts = 100. During operation, the tube is vibrated through the frequency range from 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. This cycle is repeated for a period of 3 hours along each of three mutually perpendicular axes for a total of 9 hours. The longitudinal axis of the tube is coincident with one of the three axes. The vibrations are applied as follows:

a. The vibration from 5 to 50 cps is applied with a constant peak amplitude of 0.040 inch (0.080 inch peak-to-peak)

b. The vibration from 50 to 500 cps is applied with a constant acceleration of 10 g.

c. The vibration from 500 to 50 cps and then to 5 cps follows the same procedure, but in reverse.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (1), Reverse Grid-No. 1 Current, and Heater-Cathode Leakage Current.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 volts rms (60-cycle, ac) applied between plate and all other electrodes and metal shell connected together. Tubes must not break down or show evidence of corona when subjected to an air pressure (8.0 ± 0.5 mm Hg) corresponding to an altitude of 100,000 feet.

Continuity and Shorts:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-1D, Amendment 5, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied upon request). The areas of acceptance and rejection for this test are shown in the accompanying SHORTS-TEST ACCEPTANCE-LIMITS graph. In this test, tubes are criticized for permanent or temporary shorts and open circuits.

Reliability Life (20 Hours):

This test is performed on a sample size (minimum of 80 tubes/lot for a 5-lot sampling plan or a minimum of 400 tubes for a single-lot sampling plan) designed to assure a process average AFR (Acceptable Failure Rate) of 0.5 per cent for Inoperatives and 2.1 per cent for Total Defectives and a process average RFR (Rejectable Failure Rate) of 2.0 per cent for Inoperatives and 4.7 per cent for Total Defectives.

During this test, tubes are operated at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Useful Power Output (2), Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.200 watt.

Heater-Cycling Life (100 Hours):

Intermittent Operation . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35 x specified center value cycled 1 minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

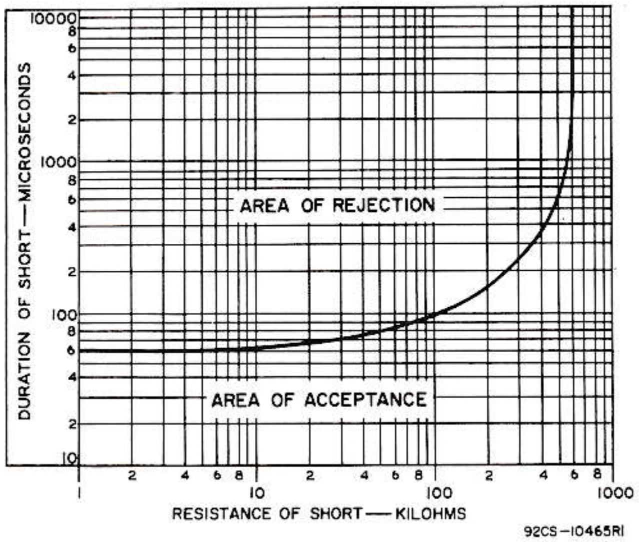
Combined Oscillator-Doubler Life (100 Hours):

This test is performed on a sample lot of tubes from each production run.

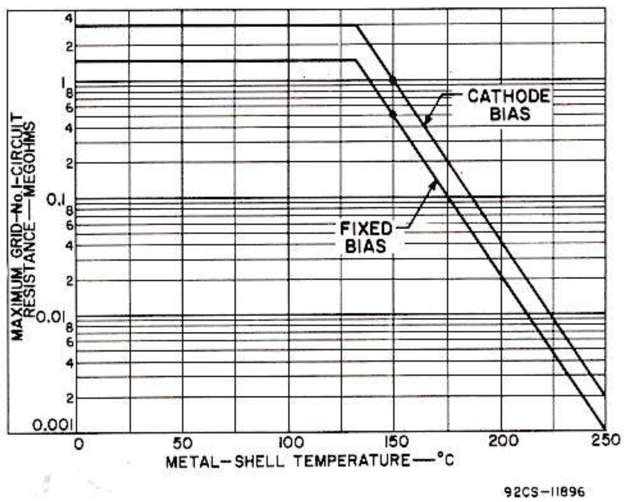
During this test, tubes are operated as a combined oscillator and frequency doubler at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Useful Power Output (2), Reverse Grid-No. 1 Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.200 watt.

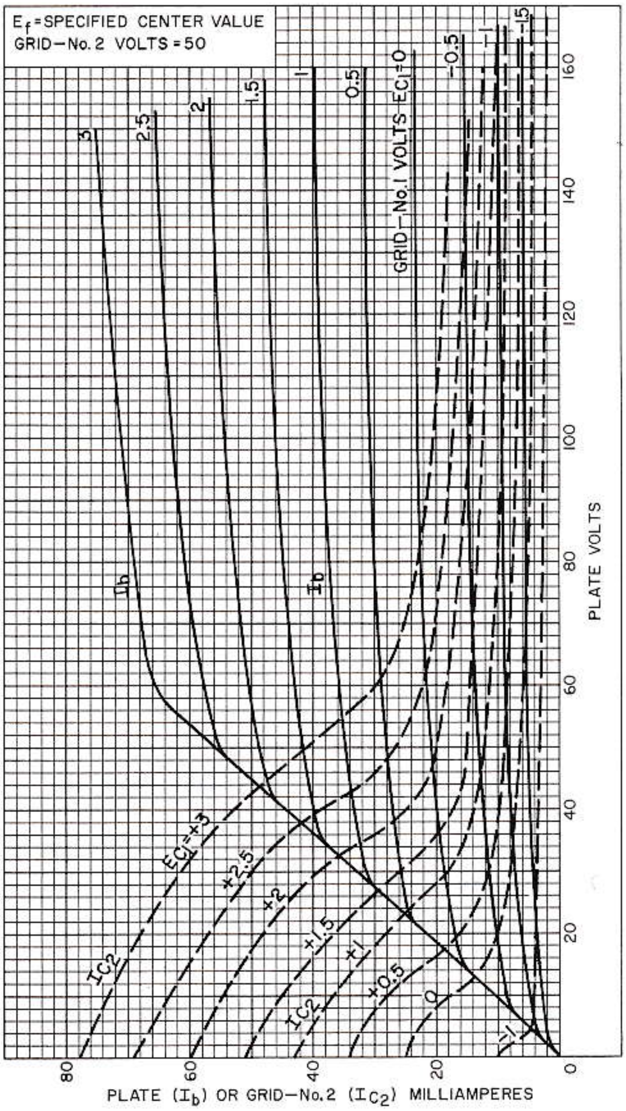
SHORTS-TEST ACCEPTANCE LIMITS



GRID-No.1-CIRCUIT-RESISTANCE RATING CHART
Class A Amplifier

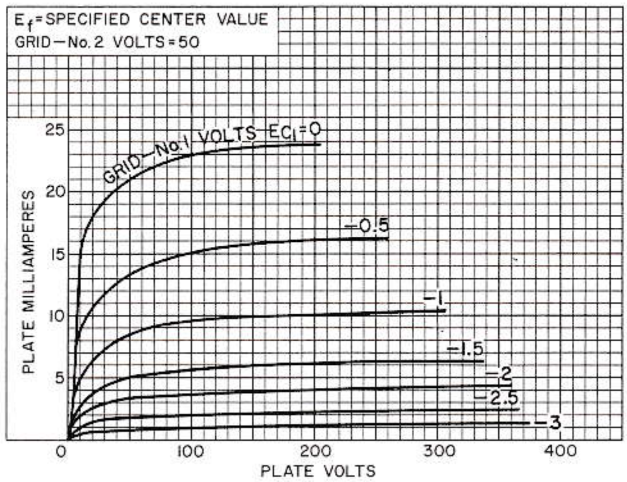


AVERAGE CHARACTERISTICS



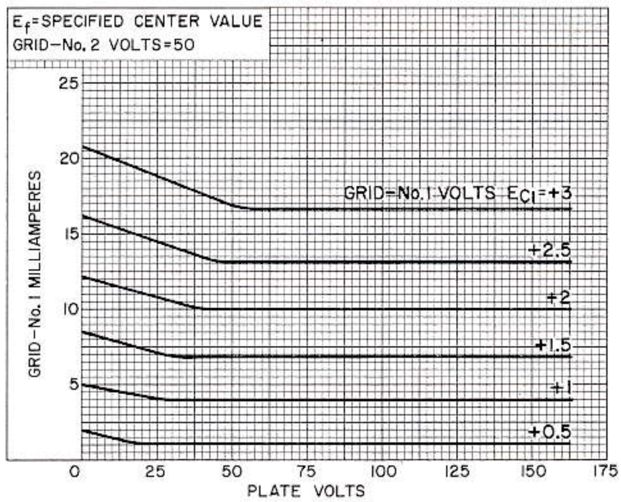
92CM-12175

AVERAGE PLATE CHARACTERISTICS



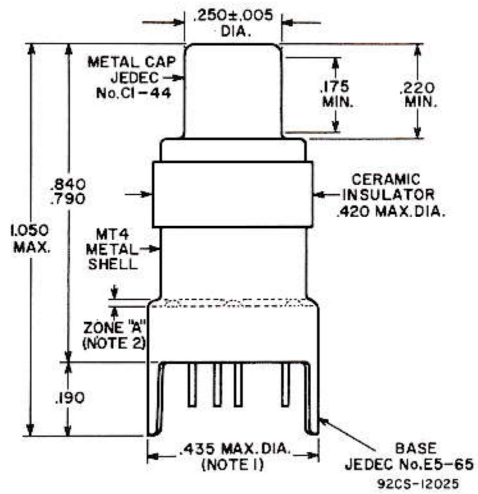
92CS-12173

AVERAGE CHARACTERISTICS



92CS-12172

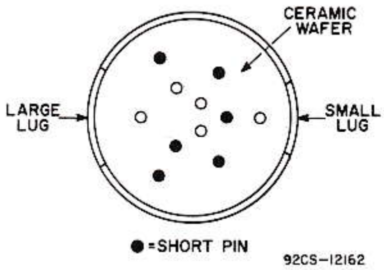
DIMENSIONAL OUTLINE JEDEC No.4-5
Dimensions in Inches



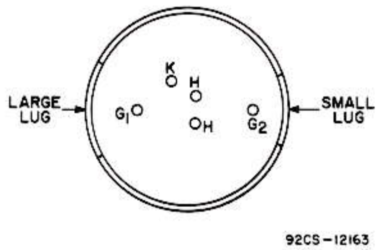
NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins

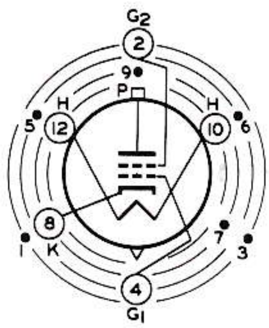


MODIFIED BOTTOM VIEW
With Element Connections Indicated and Short Pins Not Shown



TERMINAL DIAGRAM
Bottom View

Pin 1[d] – Do Not Use
Pin 2 – Grid No.2
Pin 3[d] – Do Not Use
Pin 4 – Grid No.1
Pin 5[d] – Do Not Use
Pin 6[d] – Do Not Use
Pin 7[d] – Do Not Use



INDEX = LARGE LUG
● = SHORT PIN; IC – DO NOT USE

JEDEC 12AS

Pin 8 – Cathode
Pin 9[d] – Do Not Use
Pin 10 – Heater
Pin 11 – Omitted
Pin 12 – Heater
Top Cap – Plate

[d] Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.