7061

BEAM POWER TUBE

9-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage range	12 to 15	ac or dc volts
Current (Approx.) at 13.5 volts	0.21	amp
Direct Interelectrode Capacitances:[o]		
Grid No.1 to plate	0.7 max.	μμf
Grid No.1 to all other electrodes except plate	8	μμf
Plate to all other electrodes except grid No.1	8.5	μμf

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	*See General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JETEC No.E9-1)
Basing Designation for BOTTOM VIEW	9EU

Pin 1 - Grid No.2
Pin 2 - No Connection
Pin 3 - Grid No.1
Pin 4 - Heater
Pin 5 - Heater

Pin 6 - Grid No 1
Pin 7 - Cathode, Grid No.3
Pin 8 - Grid No.2
Pin 9 - Plate

AMPLIFIER — Class A_1

Maximum Ratings, *Absolute Values:*

PLATE VOLTAGE	345 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	310 max.	volts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	9 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	120 max.	volts
Heater positive with respect to cathode	120 max.	volts

Typical Operation and Characteristics:

Heater Voltage	13.5	volts
Plate Voltage	200	volts
Grid-No.2 Voltage	200	volts
Grid-No.1 (Control-Grid) Voltage	-10	volts

[o] Without external shield.

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BEAM POWER TUBE

Peak AF Grid-No.1 Voltage	10	volts
Zero-Signal Plate Current	35.5	ma
Max.-Signal Plate Current	38	ma
Zero-Signal Grid-No.2 Current	9	ma
Max.-Signal Grid-No.2 Current	7.5	ma
Plate Resistance (Approx.)	60000	ohms
Transconductance	4200	μmhos
Load Resistance	5000	ohms
Total Harmonic Distortion	7	%
Max.-Signal Power Output	3	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:

For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.19	0.23	amp
Transconductance	1,2	3100	5800	μmhos
Plate Current	1,2	26	45	ma
Grid-No.2 Current	1,2	–	6.5	ma
Reverse Grid-No.1 Current	1,3	–	-2	μa
Power Output	1,4	2.4	–	watts
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	50	μa
Heater positive with respect to cathode	1,5	–	50	μa
Leakage Resistance:				
Between grid No.1 and all other electrodes tied together	1,6	50	–	megohms
Between plate and all other electrodes tied together	1,7	50	–	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With dc plate volts = 200, grid-No.2 volts = 200, grid-No.1 volts = -10, and grid No.3 connected to cathode.

Note 3: With grid-No.1 resistor (megohms) = 0.1.

Note 4: With load resistor (ohms) = 5000, and rms signal volts = 7.1.

Note 5: With 100 volts dc between heater and cathode.

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 & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent

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operation is applied under the following conditions: heater volts = 17 cycled one minute on and four minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 13.5, plate volts = 200, grid-No.2 volts = 200, grid-No.1 volts = -10, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 500 millivolts.

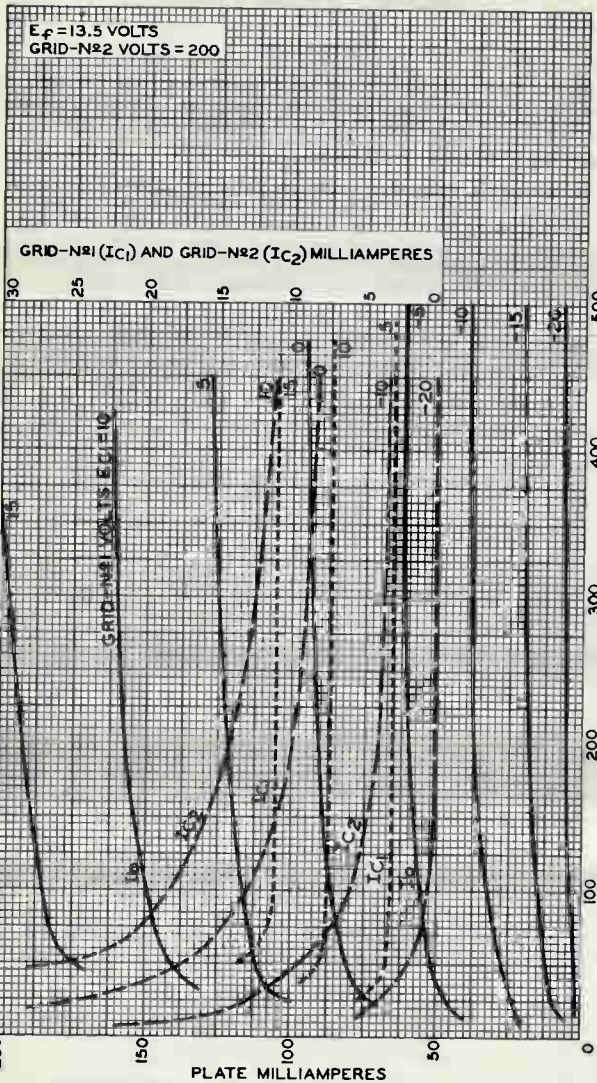
500-Hour Intermittent Life Performance:

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. Life testing is conducted under the following conditions: heater volts = 15, and maximum-rated plate dissipation and grid-No.2 input.

RCA

7061

AVERAGE CHARACTERISTICS



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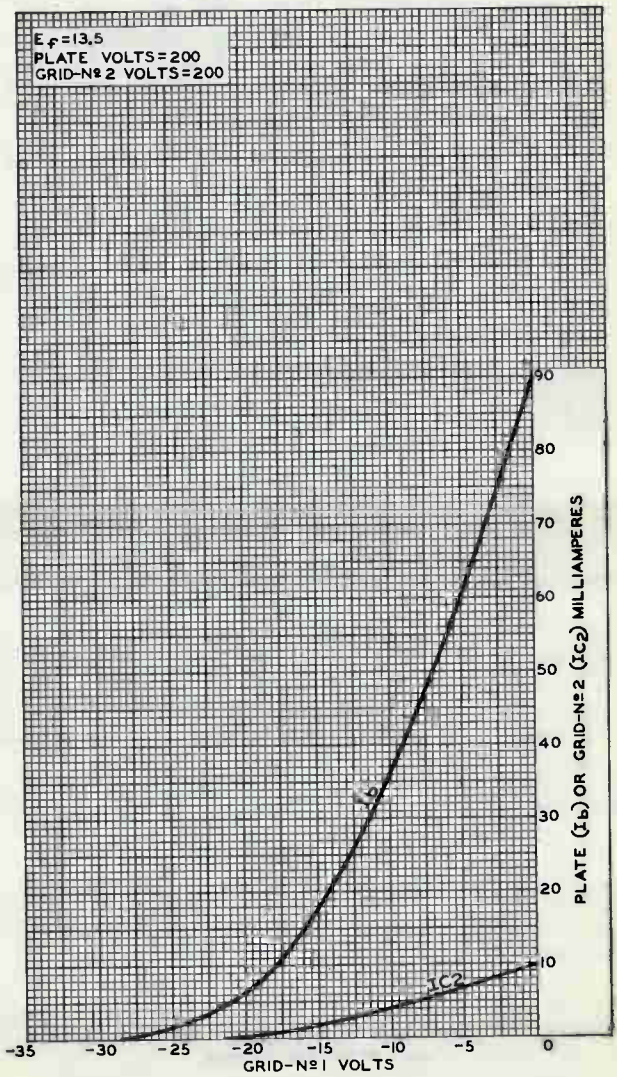
92CM-9802

7061

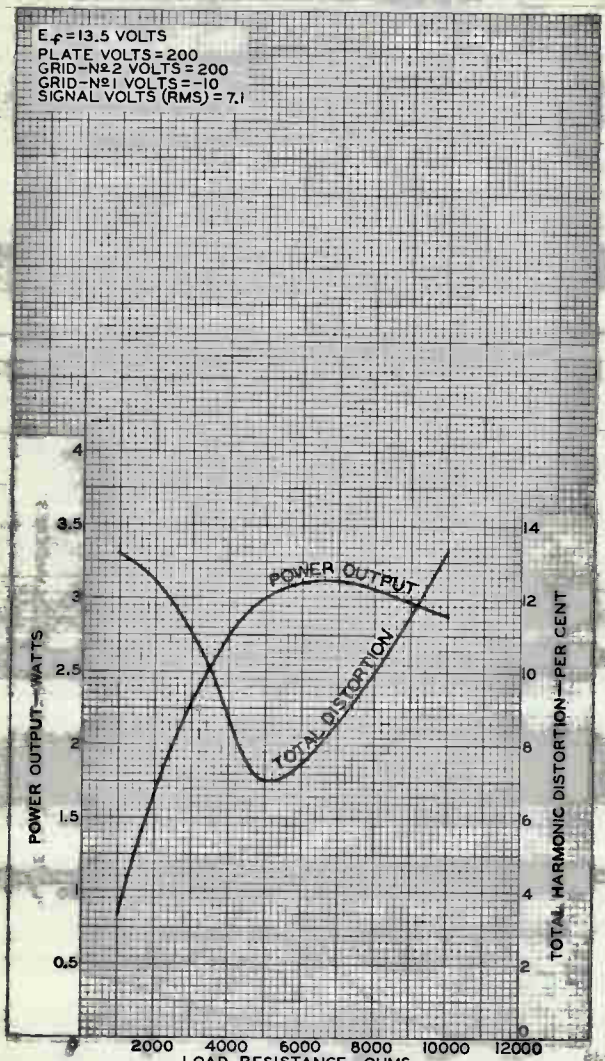
AVERAGE CHARACTERISTICS



RCA

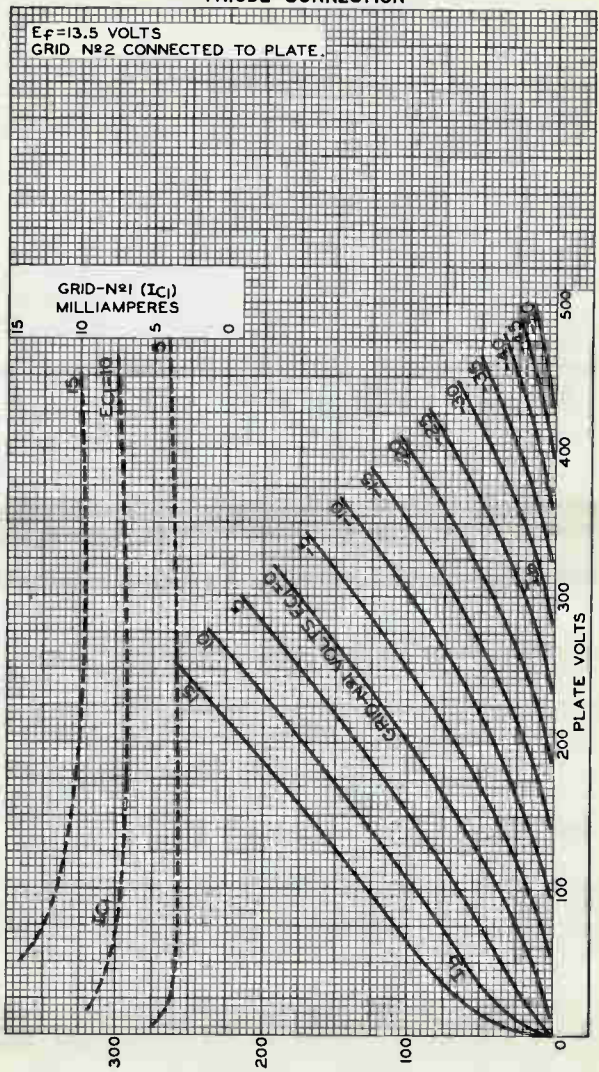
7061

OPERATION CHARACTERISTICS



7061

AVERAGE CHARACTERISTICS
TRIODE CONNECTION



ELECTRON TUBE DIVISION
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92CM-9801

Beam-Deflection Tube

9-PIN MINIATURE TYPE

For Use in Balanced-Modulator, Balanced Mixer, and Frequency-Converter Applications in Single- and Double-Sideband, Suppressed-Carrier Communication Equipment Operating at Frequencies up to 100 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.35	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to all other electrodes except plate	7.5	μμf
Grid No.1 to deflecting electrode No.1	0.015	μμf
Grid No.1 to deflecting electrode No.2	0.015	μμf
Grid-No.1 to plate No.1	0.003	μμf
Grid No.1 to plate No.2	0.003	μμf
Plate No.1 to all other electrodes except deflecting electrode No.1	0.8	μμf
Plate No.2 to all other electrodes except deflecting electrode No.2	0.8	μμf
Plate No.1 to plate No.2	0.3	μμf
Deflecting electrode No.1 to all other electrodes except plate No.1	4.6	μμf
Deflecting electrode No.2 to all other electrodes except plate No.2	4.6	μμf
Deflecting electrode No.1 to plate No.1	4	μμf ←
Deflecting electrode No.2 to plate No.2	4	μμf ←
Deflecting electrode No.1 to deflecting electrode No.2	1.4	μμf

Characteristics, Class A_1 Amplifier:

Plate-No.1 Supply Voltage	150	volts
Plate-No.2 Supply Voltage	150	volts
Deflecting-Electrode-No.1 Supply Voltage	25	volts
Deflecting-Electrode-No.2 Supply Voltage	25	volts
Grid-No.2 Supply Voltage	175	volts
Cathode Resistor	150	ohms
Total Beam Current (Plate-No.1 current plus plate-No.2 current)	8.5	ma ←
Grid-No.2 Current	2.1	ma ←

← Indicates a change.

→ connected together	5400	μmhos
Deflecting electrode No.1 to plate No.1[b]	800	μmhos
Deflecting electrode No.2 to plate No.2[b]	800	μmhos
Switching Voltage[c]	11	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9KS

Pin 1 – Cathode, Internal Shield
Pin 2 – Grid No.2
Pin 3 – Grid No.1
Pin 4 – Heater
Pin 5 – Heater

Pin 6 – Plate No.2
Pin 7 – Plate No.1
Pin 8 – Deflecting Electrode No.2
Pin 9 – Deflecting Electrode No.1

BALANCED MODULATOR

Maximum Ratings, ***Absolute-Maximum Values:***

PLATE-No.1 VOLTAGE	300	max.	volts
PLATE-No.2 VOLTAGE	300	max.	volts
DEFLECTING-ELECTRODE-No.1 VOLTAGE	±100	max.	volts
DEFLECTING-ELECTRODE-No.2 VOLTAGE	±100	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250	max.	volts
GRID-No.2 INPUT	0.5	max.	watt
PLATE-No.1 DISSIPATION	1.5	max.	watts
PLATE-No.2 DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	180	max.	volts
Heater positive with respect to cathode	180[d]	max.	volts

Typical Operation:

In accompanying balanced-modulator circuit utilizing separate excitation[e]

Plate Voltage (Each plate)	150	volts
Deflecting-Electrode Voltage (Approx., each electrode)	25	volts
Grid-No.2 Voltage	175	volts

→ Indicates a change.

Cathode Resistor	1200		ohms
Peak-to-Peak AF Deflecting-Electrode Voltage[f]	2.8		volts
Peak-to-Peak RF Grid-No.1 Voltage	10		volts
Plate Current (Each plate)	1.5		ma
Grid-No.2 Current	0.75		ma
Plate-to-Plate Load Impedance (Approx.)	5000		ohms
Push-Pull, Peak-to-Peak Double-Sideband Output Voltage	4		volts
Carrier Suppression[g]	60		db ←
Third-Order Distortion[g]	-47		db
Fourth-Order Distortion[g]	-45		db

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	2.2	max.	megohms
Deflecting-Electrode-Circuit Resistance (Per deflecting electrode)	0.05	max.	megohm

BALANCED MIXER

Maximum Ratings, ***Absolute-Maximum Values:***

PLATE-No.1 VOLTAGE	300	max.	volts
PLATE-No.2 VOLTAGE	300	max.	volts
DEFLECTING-ELECTRODE-No.1 VOLTAGE	±100	max.	volts
DEFLECTING-ELECTRODE-No.2 VOLTAGE	±100	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250	max.	volts
GRID-No.2 INPUT	0.5	max.	watt
PLATE-No.1 DISSIPATION	1.5	max.	watts
PLATE-No.2 DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	180	max.	volts
Heater positive with respect to cathode	180[d]	max.	volts

Typical Operation:

In accompanying balanced-mixer circuit utilizing separate excitation[e]

Plate Voltage (Each plate)	150	volts
Deflecting-Electrode Voltage (Approx., each electrode)	25	volts
Grid-No.2 Voltage	175	volts
Cathode Resistor	1200	ohms
Peak-to-Peak Single-Sideband Deflecting-Electrode Voltage[f]	8	volts
Peak-to-Peak RF Grid-No.1 Voltage	10	volts
Plate Current (Each plate)	1.5	ma
Grid-No.2 Current	0.75	ma

← Indicates a change.

Plate-to-Plate Load Impedance (Approx.)	10000	ohms
Push-Pull, Peak-to-Peak Single-Sideband Output Voltage	40	volts
Oscillator Rejection[g]	-40	db
Third-Order Distortion[g]	-40	db
Fourth-Order Distortion[g]	-38	db

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	2.2	max.	megohms
Deflecting-Electrode-Circuit Resistance (Per deflecting electrode)	0.05	max.	megohm

[a] Without external shield.

[b] Defined as the partial derivative of the plate current with respect to the difference between the deflecting-electrode voltages, evaluated about the point of equal plate currents.

[c] Defined as the sum of (a) the absolute value of the difference between the deflecting-electrode voltages when the current to one plate is equal to 90% of the total beam current and (b) the absolute value of the difference between the deflecting-electrode voltages when the current to the same plate is equal to 10% of the total beam current. This sum, expressed in terms of signal voltage, corresponds to the peak-to-peak value of signal voltage that is required between the deflecting electrodes to produce peak-to-peak signal current at either plate equal to 80% of the total beam current.

[d] The dc component must not exceed 100 volts.

[e] Operation with self-excitation and cathode resistor of 300 ohms is similar to operation with separate excitation.

[f] To either deflecting electrode. The other deflecting electrode is bypassed.

[g] Referred to single-sideband output voltage.

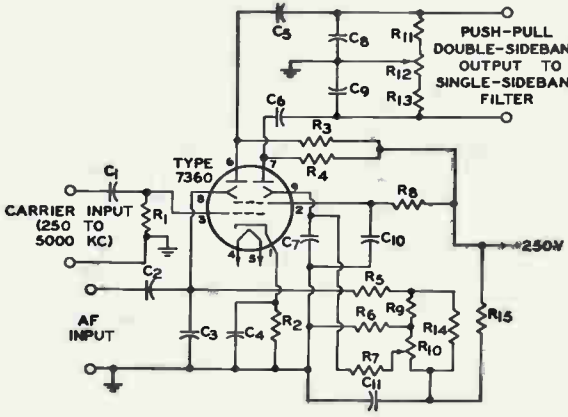
OPERATING CONSIDERATIONS

Deflecting-electrode-circuit resistance should be kept below 0.05 megohm to prevent nonlinear tube operation. The resistances of the two deflecting-electrode circuits should be approximately equal to minimize unbalance. The current drawn by each *deflecting-electrode* is in the order of 40 microamperes.

Magnetic fields adversely affect the intrinsic operating plate-current balance of the 7360. Although this tube is internally shielded to minimize this effect, the tube should be mounted as far as possible from all devices producing extraneous magnetic fields such as transformers, chokes, motors, or similar components. It is recommended that an external shield be used in those applications critical for balance.

Chassis layout should be such that all components and wiring associated with the plates and deflecting electrodes is symmetrical. This consideration is particularly important in rf applications where very small differences in stray capacitance can result in unbalance. Chassis layouts which permit heat or vibration to affect the components associated with one deflecting-electrode circuit or plate circuit more than the other, should be avoided. All components should be rigidly mounted.

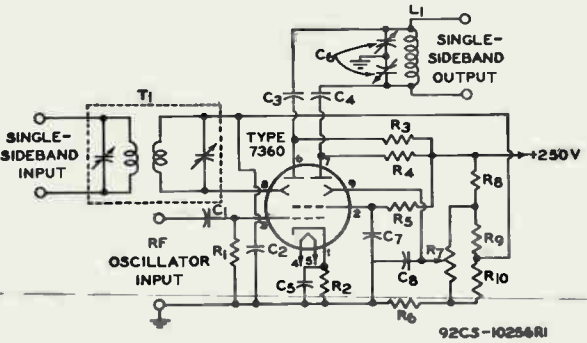
BALANCED-MODULATOR CIRCUIT
With Separate Excitation



92CS-10258

C_1: 0.001 μf
C_2: 0.22 μf
C_3: 0.001 μf
C_4: 0.01 μf
C_5 C_6: 0.0033 μf
C_7: 0.1 μf
C_8 C_9: Sufficient to resonate input of SSB filter
C_{10}: 0.22 μf
C_{11}: 0.47 μf
R_1: 0.47 megohm
R_2: 1200 ohms
R_3 R_4: 68000 ohms
R_5: 47000 ohms
R_6: 12000 ohms
R_7: 47000 ohms
R_8: 0.1 megohm
R_9: 2700 ohms
R_{10}: Carrier-Balance Potentiometer, 5000 ohms
R_{11}: 2700 ohms
R_{12}: Quadrature-Balance Potentiometer, 2500 ohms
R_{13} R_{14}: 2700 ohms
R_{15}: 0.1 megohm
NOTE: All resistors 1/2 watt, ± 10% unless specified. All capacitors 400 volts.

BALANCED-MIXER CIRCUIT
With Separate Excitation



C_1: 0.001 μf
C_2: 0.04 μf
C_3 C_4: 0.001 μf
C_5: 0.04 μf
C_6: Split-Stator Tuning Capacitor to Resonate with L_1
C_7 C_8: 0.04 μf
L_1: Inductor
R_1: 0.47 megohm
R_2: 1200 ohms
R_3 R_4: 68000 ohms
R_5: 0.1 megohm
R_6: 12000 ohms
R_7: Oscillator-Rejection Potentiometer, 5000 ohms
R_8: 0.1 megohm
R_9 R_{10}: 2700 ohms
T_1: Tuned Input Transformer
NOTE: All resistors 1/2 watt, ± 10%, unless specified. All capacitors 400 volts.

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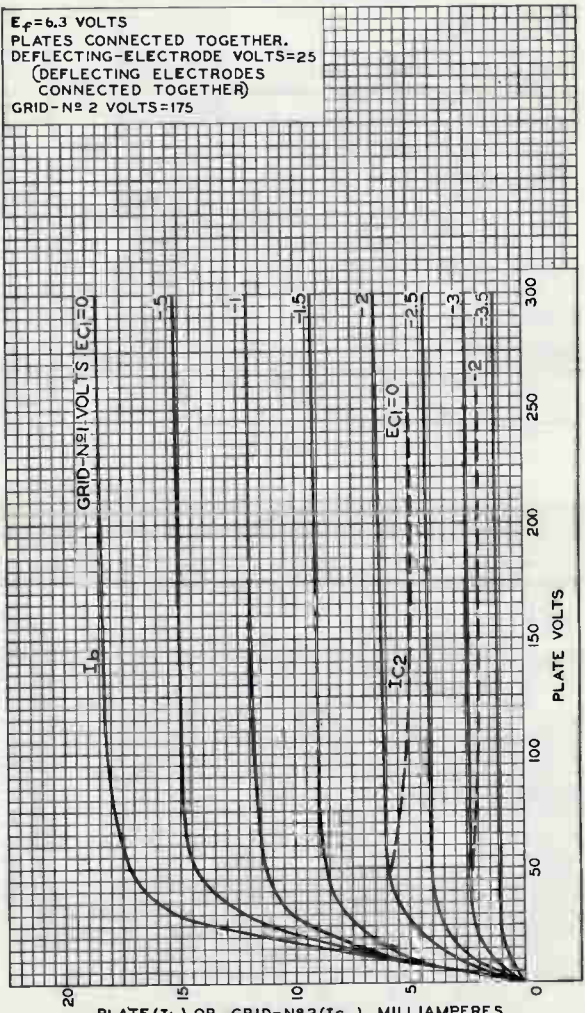
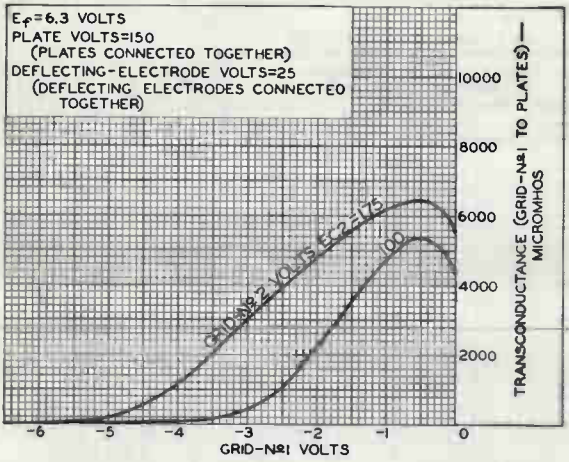
Electron Tube Division Harrison, N. J.

AVERAGE CHARACTERISTICS

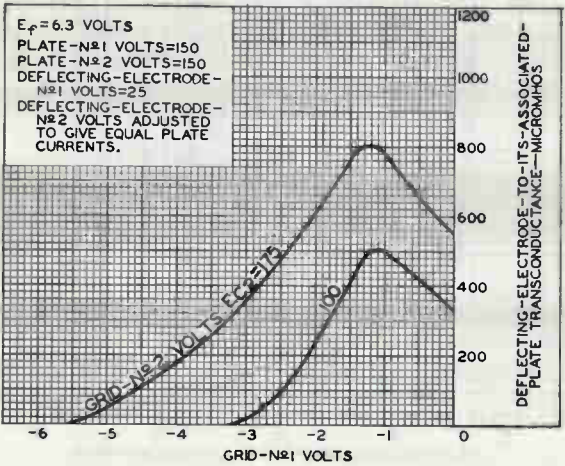


92CM-10253RI

AVERAGE CHARACTERISTICS

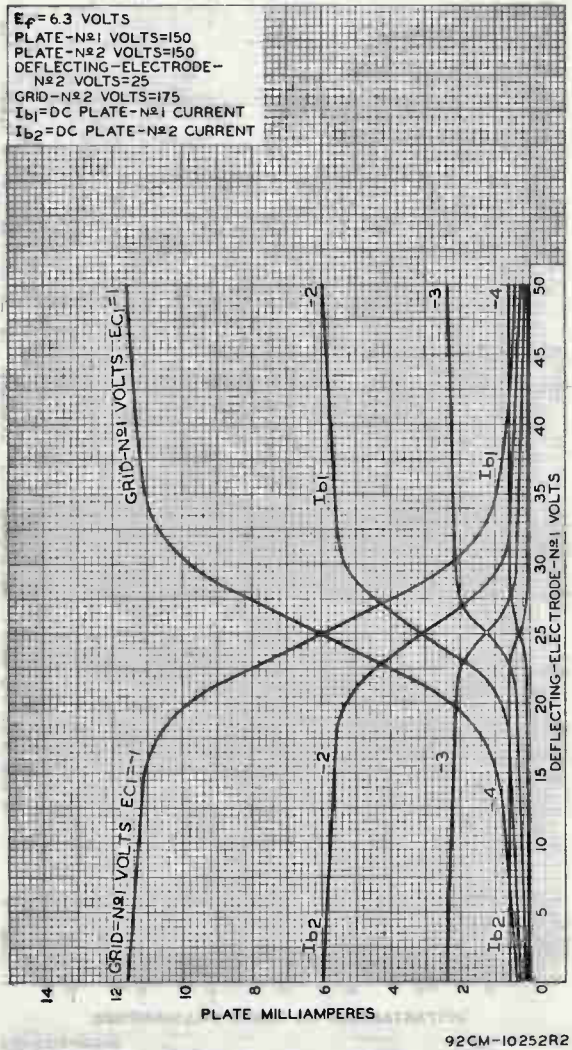


92CS-10250R2



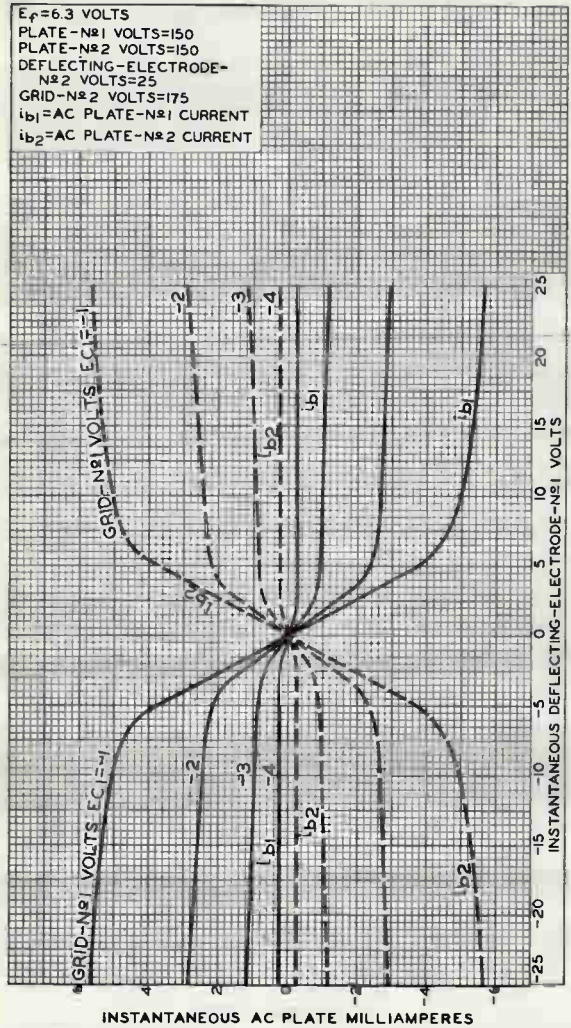
92CS-10249R1

AVERAGE CHARACTERISTICS



92CM-10252R2

OPERATION CHARACTERISTICS



92CM-10264R2

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

Beam Power Tube

9-PIN MINIATURE TYPE

For Use in Communications Equipment Operating from 6-Cell Storage-Battery Systems

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Voltage range	12 to 15	volts
Current at heater volts = 13.5	0.360	amp
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:[o]		
Grid No.1 to plate	0.15 max.	pf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	10.0	pf
Plate to cathode, grid No.3, grid No.2, and heater	5.5	pf

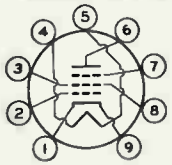
Characteristics, Class A_1 Amplifier:

Heater Voltage	13.5	volts
Plate Voltage	250	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage	-18	volts
Mu-Factor, Grid No.2 to Grid No.1	8.7	
Transconductance	5300	μmhos
Plate Current	40	ma
Grid-No.2 Current	3	ma

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No. E9-1)
Basing Designation for BOTTOM VIEW	9LK

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Grid No.2
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Plate
Pin 7 – Grid No.3
Pin 8 – Grid No.2
Pin 9 – Cathode

point on bulb surface). . . . . 225 max. °C

AF POWER AMPLIFIER & MODULATOR — Class AB$_1$♦

Maximum CCS● Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	volts
MAX.-SIGNAL DC PLATE CURRENT■	70 max.	ma
MAX.-SIGNAL PLATE INPUT■	21 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT■	2 max.	watts
PLATE DISSIPATION■	10 max.	watts

Typical CCS Push-Pull Operation:

Values are for 2 tubes

Heater Voltage	13.5	volts
DC Plate Voltage	300	volts
Grid No.3	*Connected to cathode at socket*	
DC Grid-No.2 Voltage§	250	volts
DC Grid-No.1 Voltage§	−21	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	40	volts
Zero-Signal DC Plate Current	40	ma
Max.-Signal DC Plate Current	125	ma
Zero-Signal DC Grid-No.2 Current	2	ma
Max.-Signal DC Grid-No.2 Current	14	ma
Effective Load Resistance (Plate to plate)	5000	ohms
Max.-Signal Driving Power	0	watts
Total Harmonic Distortion	5	%
Max.-Signal Power Output (Approx.)	20.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy† and RF POWER AMPLIFIER — Class C FM Telephony

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc CCS♦	*Up to 175 Mc* ICAS●●	
DC PLATE VOLTAGE	375 max.	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	−125 max.	−125 max.	volts
DC PLATE CURRENT	70 max.	80 max.	ma
DC GRID-No.2 CURRENT	15 max.	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	21 max.	24 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts

→ indicates a change.

Typical Operation:

	As amplifier at 175 Mc			
	CCS		*ICAS*	
Heater Voltage	13.5	13.5	13.5	volts
DC Plate Voltage	250	300	300	volts
Grid No.3	*Connected to cathode at socket*			
DC Grid-No.2 Voltage[□□]	200	200	250	volts
DC Grid-No.1 Voltage[●●]	−40	−42	−55	volts
Peak RF Grid-No.1 Voltage	47	52	62	volts
DC Plate Current	60	70	80	ma
DC Grid-No.2 Current	3.7	3.7	5.1	ma
DC Grid-No.1 Current (Approx.)	1.5	2.1	1.6	ma
Driver Power Output (Approx.)[▲▲]	1	1	1.5	watts
Useful Power Output (Approx.)*	6.5	8.5	10	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony ←

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc		
	CCS	*ICAS*	
DC PLATE VOLTAGE	300 max.	300 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	−125 max.	−125 max.	volts
DC PLATE CURRENT	60 max.	70 max.	ma
DC GRID-No.2 CURRENT	10 max.	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	15 max.	17.5 max.	watts
GRID-No.2 INPUT	1.4 max.	1.4 max.	watts
PLATE DISSIPATION	7 max.	8 max.	watts

Typical Operation:

	At 175 Mc		
Heater Voltage	13.5	13.5	volts
DC Plate Voltage	250	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage[▲]	250	250	volts
DC Grid-No.1 Voltage[★]	−70	−75	volts
From a grid-No.1 resistor of	33000	33000	ohms
RF Grid-No.1 Voltage	75	80	volts
DC Plate Current	60	70	ma
DC Grid-No.2 Current	2.5	3	ma
DC Grid-No.1 Current (Approx.)	2.1	2.3	ma
Driving Power (Approx.)[▲▲]	1	1	watt
Useful Power Output*	6.5	7.5	watts

← Indicates a change.

	CCS	ICAS	
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance. .	0.1 max.	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	ICAS	
DC PLATE VOLTAGE.	375 max.	375 max.	volts
GRID No.3 (SUPPRESSOR GRID) . .	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	-125 max.	volts
DC PLATE CURRENT.	50 max.	60 max.	ma
DC GRID-No.2 CURRENT.	15 max.	15 max.	ma
DC GRID-No.1 CURRENT.	5 max.	5 max.	ma
~~PLATE INPUT . . . . . .~~	~~13 max.~~	~~15 max.~~	~~watts~~
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts

Typical Operation:

As doubler to 175 Mc

Heater Voltage.	13.5	13.5	volts
DC Plate Voltage.	250	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage.	200	250	volts

→ Indicates a change.

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DC Grid-No.1 Voltage[●●]. . . .	-53	-66	volts
From a grid-No.1 resistor of	53000	44000	ohms
Peak RF Grid-No.1 Voltage . .	60	74	volts
DC Plate Current.	50	60	ma
DC Grid-No.2 Current.	2.6	3.5	ma
DC Grid-No.1 Current (Approx.) . . . . . [▲▲] . .	1	1.5	ma
Driving Power (Approx.)[▲▲] . .	0.4	0.6	watt
Useful Power Output*.	3	4.5	watts
	As tripler to 175 Mc		
Heater Voltage.	13.5	13.5	volts
DC Plate Voltage.	200	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage.	200	250	volts
DC Grid-No.1 Voltage[●●]. . . .	-90	-120	volts
From a grid-No.1 resistor of	50000	70000	ohms
Peak RF Grid-No.1 Voltage . .	105	130	volts
DC Plate Current.	50	60	ma
DC Grid-No.2 Current.	3	3.9	ma
DC Grid-No.1 Current (Approx.) . . . . . [▲▲] . .	1.85	1.7	ma
Driving Power (Approx.)[▲▲] . .	0.4	0.6	watt
Useful Power Output*.	1.4	2.3	watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance.	0.1 max.	0.1 max.	megohm

- ○ Without external shield.
- ♦ Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.
- ● Continuous Commercial Service.
- ■ Averaged over any audio-frequency cycle of sine-wave form.
- § Obtained preferably from a fixed supply.
- † Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.
- ●● Intermittent Commercial and Amateur Service.
- ▭ Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider. If a series resistor is used, it should be adjustable to obtain the desired operating plate current after initial tuning adjustments are completed.
- ▲▲ Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

  Driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics, and tube characteristics during life.
- * Measured at load.
- ▲ Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to obtain the desired operating plate current after initial tuning adjustments are made.

RCA

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* Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor. The combination of grid-No.1 resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.33	0.39	amp
Transconductance	1,2	4200	6400	μmhos
Plate Current	1,2	30	50	ma
Plate Current	1,3	–	50	μa
Grid-No.2 Current	1,2	–	7.5	ma
Reverse Grid-No.1 Current	1,4	–	2	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	20	μa
Heater positive with respect to cathode	1,5	–	20	μa
Leakage Resistance:				
Between grid No.1 and all other electrodes tied together	1,6	100	–	megohms
Between plate and all other electrodes tied together	1,7	100	–	megohms

Note 1: With 13.5 volts ac or dc on heater.

Note 2: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of −18 volts.

Note 3: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of −48 volts.

Note 4: With plate voltage of 180 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, grid-No.1 resistor of 0.1 megohm, and cathode resistor of 170 ohms.

Note 5: With 100 volts dc between heater and cathode.

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 & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: Heater voltage of 17 volts cycled one minute on and two minutes off, heater = 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater

BEAM POWER TUBE

voltage of 13.5 volts, plate voltage of 250 volts, grid-No.2 voltage of 250 volts, grid-No.1 voltage of -18 volts, plate load resistor of 2000 ohms, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 200 millivolts.

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. Life testing is conducted under the following conditions: Heater voltage of 15 volts and at maximum rated plate dissipation and grid-No.2 input.

CURVES
shown under Type 7558 also apply for the 7551 with the exception that E_f = 13.5 volts

High-Mu Triode

CERAMIC-METAL PENCIL TYPE
FAST WARM-UP TIME **STURDY COAXIAL-ELECTRODE STRUCTURE**

For Use as a Low-Noise-Amplifier Tube in Receiver Applications up to 1500 Mc under Severe Shock and Vibration

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at heater volts = 6.3	0.225	amp
Cathode Warm-Up Time (Average) to reach 80% of operating plate current for dc plate-supply volts = 80, dc grid volts = 0, cathode resistor (ohms) = 0, load resistor (ohms) = 10, and heater volts = 6.3	10	sec
Amplification Factor	80	
Transconductance for dc plate ma. = 13, dc plate volts = 125, and cathode resistor (ohms) = 50	13500	μmhos
Direct Interelectrode Capacitances:[a]		
Grid to plate	2.4	μμf
Grid to cathode and heater	4.4	μμf
Plate to cathode and heater	0.04 max.	μμf
Heater to cathode	2.6	μμf
Cathode to plate	0.04 max.	μμf
Cathode to grid and heater	7.0	μμf
Plate to grid and heater	2.0	μμf

Mechanical:

Operating Position . . . . . Any
Dimensions . . . . . See *Dimensional Outline*
Weight (Approx.) . . . . . 0.3 oz
Sockets:
Heater-terminals connector . . . . . Amerac[b] No.1018-88[c], Grayhill[d] No.22-5, or equivalent
Socket for operation up to about 550 Mc (Including heater-terminals connector) . . . . . Jettron[e] No.CD7010, or equivalent
Cavities (Including heater-terminals connector) . . . . . J-V-M[f] No.D-7980 Series, Resdel[g] No.10 Series, or equivalent

→ Indicates a change.

H – Heater
K – Cathode

G – Grid
P – Plate

RADIO-FREQUENCY AMPLIFIER — Class A_1

Maximum CCS[h] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 1500 Mc

DC PLATE VOLTAGE	250 max.	volts
DC GRID VOLTAGE	−50 max.	volts
DC PLATE CURRENT	25 max.	ma
PLATE DISSIPATION	2.5 max.	watts
PEAK HEATER–CATHODE VOLTAGE:		
Heater negative with respect to cathode	50 max.	volts
Heater positive with respect to cathode	50 max.	volts
PLATE-SEAL TEMPERATURE	225 max.	°C

Typical CCS[h] Operation in Cathode-Drive Circuit:

	At 550 Mc	*At 800 Mc*	*At 1100 Mc*	
DC Plate-to-Grid Voltage	125	125	150	volts
Cathode Resistor	50	50	50	ohms
Input-Signal-Level Range	−70 to −20	−70 to −20	−70 to −20	dbm
DC Plate Current	13	13	13.5	ma
Power Gain	16.5	18	16	db
Bandwidth	5	5	10	Mc
Noise Figure	6.5	8.5	12.5	db

Maximum Circuit Values:

Grid-Circuit Resistance:

For fixed-bias operation	Not recommended	
For cathode-bias operation	0.25 max.	megohm

[a] Without external shield.

[b] Amerac, Inc., Dunham Road, Beverly, Massachusetts.

[c] For use with cavities.

[d] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

[e] Jettron Products, Inc., 56 Route 10, Hanover, N.J.

[f] J-V-M Microwave Co., 9300 W. 47th St., Brookfield, Illinois. Indicated No. applies to a series of cavities covering range from 220 up to 1000 Mc and above.

[g] Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavities covers the range from 215 to 2325 Mc.

[h] Continuous Commercial Service.

→ Indicates a change.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.205	0.245	amp
Direct Interelectrode Capacitances:				
Grid to plate	–	2.0	2.7	μμf
Grid to cathode	–	3.7	4.9	μμf
Plate to cathode	–	–	0.04	μμf
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,2	–	30	μa
Heater positive with respect to cathode	1,3	–	30	μa
Leakage Resistance:				
From grid to plate and cathode connected together	1,4	100	–	megohms
From plate to grid and cathode connected together	1,5	100	–	megohms
Reverse Grid Current	1,6	–	0.3	μa
Emission Voltage	7	–	4	volts
Amplification Factor	1,8	60	100	
Transconductance	1,8	10000	17000	μmhos
Plate Current (1)	1,8	8.5	17.5	ma
Plate Current (2)	1,9	–	50	μa
Plate Current (3)	1,10	100	–	μa
Power Gain	1,11	13	–	db
Noise Figure	1,11	–	7.5	db
Change in Power Gain	11,12	–	–1	db
Change in Noise Figure	11,12	–	0.5	db
Change in Transconductance	11,12	–	15	%

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

Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode.

Note 3: With 60 volts dc between heater and cathode, heater positive with respect to cathode.

Note 4: With grid 100 volts negative with respect to plate and cathode which are connected together.

Note 5: With plate 300 volts negative with respect to grid and cathode which are connected together.

Note 6: With dc plate voltage of 200 volts, dc grid voltage of –2 volts, grid resistor of 0.5 megohm.

Note 7: With dc voltage on grid and plate which are connected together adjusted to produce a cathode current of 30 ma., and with 5.5 volts on heater.

Note 8: With dc plate supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1000 μf.

Note 9: With dc plate voltage of 125 volts and dc grid voltage of –5 volts.

Note 10: With dc plate voltage of 125 volts and dc grid voltage of –2.5 volts.

Note 11: With dc plate supply voltage of 125 volts and cathode resistor of 50 ohms in a single-tube rf amplifier of the cavity type having a bandwidth of 5 ± 0.5 Mc, signal input of –70 dbm, and operating frequency of 550 ± 10 Mc.

Note 12: Reduce heater voltage to 5.7 volts. Change in Power Gain, Noise Figure, and Transconductance values from those obtained with 6.3 volts on heater will not exceed indicated values.

◄ Indicates a change.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage-Breakdown Test:

This test (similar to MIL-E-ID, paragraph 4.9.12.1) is performed on a sample lot of tubes every 90 days. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-cycle rms voltage of 300 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 40 cycles per second at an acceleration of 10 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

Variable-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.20.3) is performed on a sample lot of tubes from each production run. Tube operating conditions are the same as for *Low-Frequency Vibration Performance.* The tubes are vibrated perpendicular to the major axis through a frequency range from 5 to 1000 cps and back. From 5 to 50 cps, the tubes are vibrated at a constant displacement of 0.0400 ± 0.0025 inch. From 50 to 1000 cps, the tubes are vibrated at a constant acceleration of 10 ± 2 g. Total time to complete a sweep cycle is 10 ± 5 minutes. During the test, the tubes will not show an rms output voltage across the plate load resistor in excess of 150 millivolts. Each tube is vibrated for 60 seconds at the frequency which gives maximum vibrational noise output. If, at the end of 60 seconds the vibrational noise output is still increasing, the test shall continue until there is no further increase.

The rms output voltage across the plate load resistor as a result of the vibration of the tube will not exceed the specified limit at any time during the test.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-Cathode Leakage Current. . . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		

→ Indicates a change.

Shock Test:

This test (similar to MIL-E-ID, paragraph 4.9.20.5) is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in three different positions to an impact acceleration of 500 g, 5 blows in each position.

At the end of this test, tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-Cathode Leakage Current. . . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		
Low-Frequency Vibration Output. . . .	200 max.	mv
For conditions shown above under *Low-Frequency Vibration Performance.*		
Change in Transconductance.	-20 max.	%
From initial value for conditions shown under *Characteristics Range Values, Notes 1,8.*		

Fatigue Vibration Test:

This test (similar to MIL-E-ID, paragraph 4.9.20.6) is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected to 2.5 g vibrational acceleration in two positions (XI, YI) for 32 hours each. At the end of this test, tubes will meet the limits specified for the *Shock Test.*

Shorts and Continuity Test:

This test (similar to MIL-E-ID, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in paragraph 4.7.7 of MIL-E-ID, Amendment 5.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

Ceramic-Seal-Fracture Test:

This test is performed on a sample lot of tubes every 90 days. With the cathode- and plate-cylinder-supports spaced 15/16" ± 1/64", and with the grid flange centered between these supports, the tubes will withstand gradual application of a force of 30 pounds, perpendicular to the axis of the tubes,

insulation.

Seal Strain Test:

This test (similar to MIL-E-ID, paragraph 4.9.6.3) is performed on a sample lot of tubes every 90 days. Tubes are tested by first immersing in water, having a temperature of at least 97° C for at least 15 seconds, and then immersing immediately in water at not more than 5° C for 5 seconds. After drying for 48 hours at room temperature, the tubes will meet the following test limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

Heater-Cycling Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.3 volts on heater and no voltage on plate or grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles.

At the end of this test, tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-to-Cathode Leakage Current . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		
Grid-to-Cathode Leakage Resistance. .	50 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4.*		

1-Hour Stability Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Types are operated under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 215 volts, and cathode resistor of 150 ohms.

At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value for conditions shown under *Characteristics Range Values, Notes 1,8.*

In addition, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

100-Hour Survival Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.b) is performed on a sample lot of tubes from each production run

to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *1-Hour Stability Life Performance* except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off.

At the end of 100 hours, the tubes will meet the following limits:

Transconductance.	8000 min.	μmhos
For conditions shown under *Characteristics Range Values, Notes 1,8.*		
Plate Current (2)	50 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,9.*		

In addition, the tubes will not show permanent shorts or open circuits, and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

500- and 1000-Hour Average Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure excellent overall performance and to guard against epidemic failures of tubes to meet any of the characteristics indicated below.

Each tube is life tested under the following conditions: Heater voltage of 6.3 volts; plate-supply voltage of 215 volts; cathode resistor of 150 ohms; heater positive with respect to cathode by 67.5 volts; and plate-seal temperature of 225° C. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the 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 meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Leakage Resistance:		
From grid to plate and cathode connected together.	60 min.	megohms
From plate to grid and cathode connected together.	60 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4, and 1,5.*		
Power Gain.	12 min.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		
Noise Figure.	8.5 max.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		
Change in Power Gain.	-1	db
For conditions shown under *Characteristics Range Values, Notes 1,11,12.*		

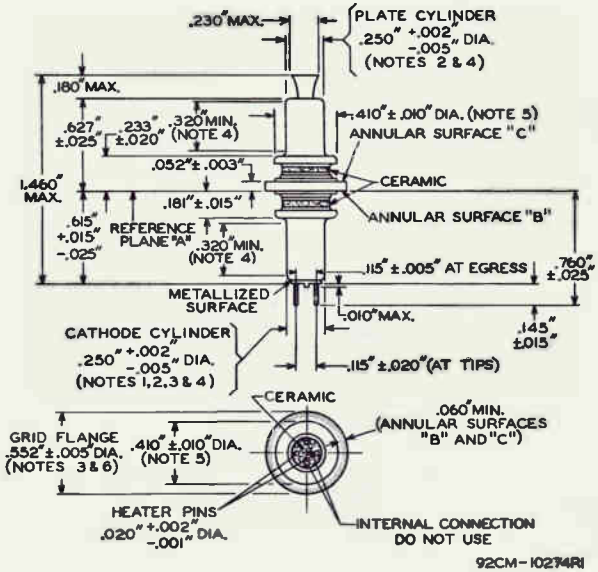
At the end of 1000 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Power Gain.	11 min.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		
Noise Figure.	9.5 max.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		

OPERATING CONSIDERATIONS

Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm, large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum-rated values shown in the tabulated data.



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REFERENCE PLANE "A" IS DEFINED AS THAT PLANE AGAINST WHICH ANNULAR SURFACE "B" OF THE GRID FLANGE ABUTS.

ANNULAR SURFACE "B" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE CATHODE CYLINDER.

ANNULAR SURFACE "C" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE PLATE CYLINDER.

NOTE 1: WITH ANNULAR SURFACE "B" RESTING ON REFERENCE PLANE "A". THE AXIS OF THE CATHODE CYLINDER WILL BE WITHIN 2^{o} OF A LINE PERPENDICULAR TO REFERENCE PLANE "A".

NOTE 2: THE AXES OF THE PLATE CYLINDER AND CATHODE CYLINDER WILL COINCIDE WITHIN 0.010".

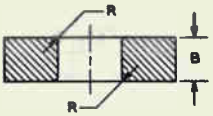
NOTE 3: THE AXES OF THE CATHODE CYLINDER AND GRID FLANGE WILL COINCIDE WITHIN 0.005".

NOTE 4: THE DIAMETER ALONG THE 0.320" MINIMUM LENGTH IS MEASURED WITH "GO" AND "NO-GO" RING GAUGES G_1-1 AND G_1-2, RESPECTIVELY.

NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_2-1 AND G_2-2, RESPECTIVELY.

NOTE 6: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_3-1 AND G_3-2, RESPECTIVELY.

GAUGES



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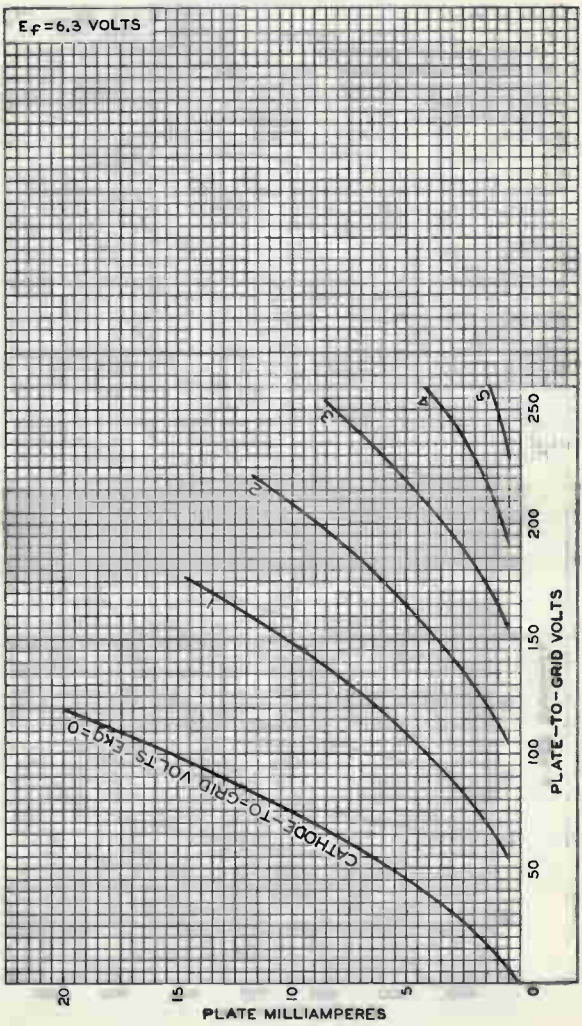
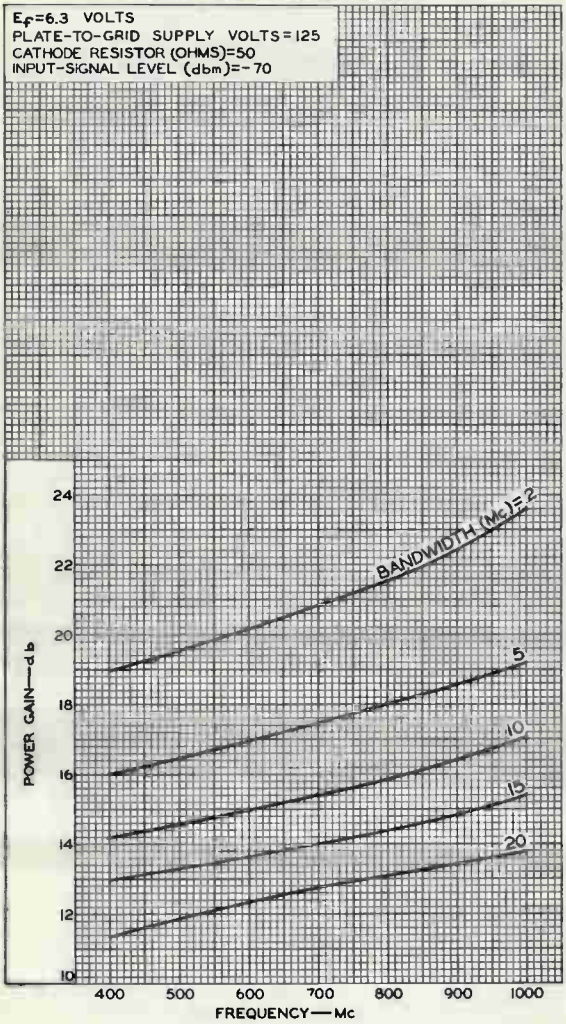
Gauge	Type	Dimension		
		Diameter A	Thickness B	Radius R
G_1-1	GO	$0.25200"^{+0.00000"}_{-0.00007"}$	$0.320"^{+0.001"}_{-0.000"}$	0.003" MAX.
G_1-2	NO-GO	$0.24500"^{+0.00007"}_{-0.00000"}$	–	–
G_2-1	GO	$0.42000"^{+0.00000"}_{-0.00007"}$	–	–
G_2-2	NO-GO	$0.40000"^{+0.00007"}_{-0.00000"}$	–	–
G_3-1	GO	$0.55700"^{+0.00000"}_{-0.00007"}$	–	–
G_3-2	NO-GO	$0.54700"^{+0.00007"}_{-0.00000"}$	–	–

AVERAGE PLATE CHARACTERISTICS
Cathode-Drive Service

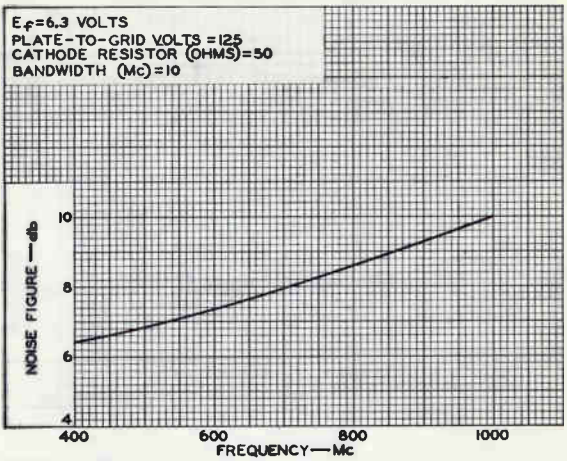


92CM-10458

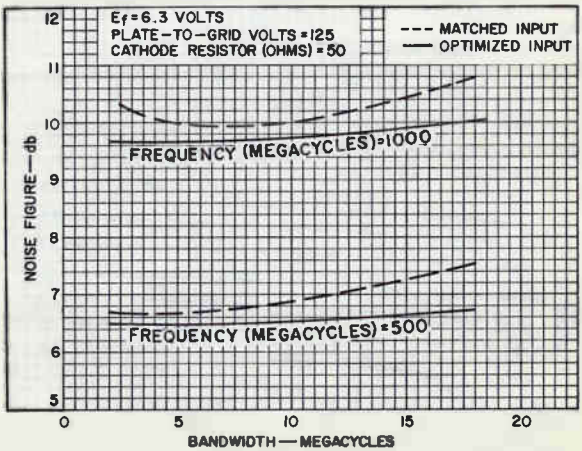


92CM-10271RI

NOISE-FIGURE CHARACTERISTICS
Cathode-Drive Service

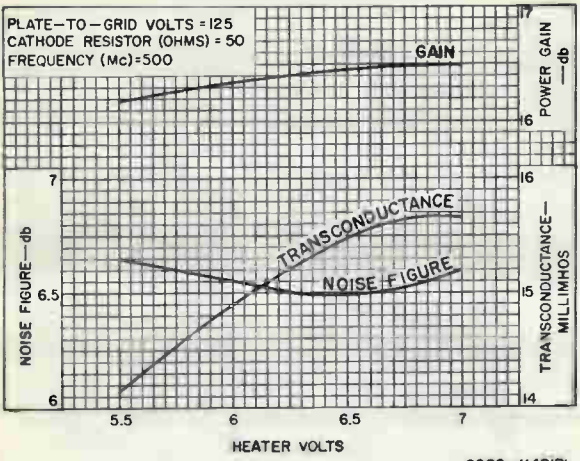


92CS-10870RI



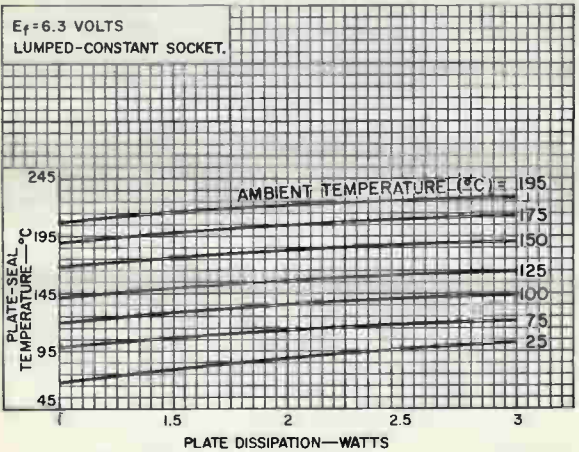
92CS-11497RI

Cathode-Drive Service



92CS-11491RI

PLATE-SEAL-TEMPERATURE CHARACTERISTICS



92CS-11488

High-Mu Triode

CERAMIC-METAL PENCIL TYPE
FAST WARM-UP TIME **STURDY COAXIAL-ELECTRODE STRUCTURE**

For Use as a Low-Noise-Amplifier Tube in Receiver Applications up to 1500 Mc under Severe Shock and Vibration

GENERAL DATA

Electrical:

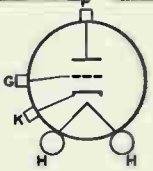
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at heater volts = 6.3	0.225	amp
Cathode Warm-Up Time (Average) to reach 80% of operating plate current for dc plate-supply volts = 80, dc grid volts = 0, cathode resistor (ohms) = 0, load resistor (ohms) = 10, and heater volts = 6.3	10	sec
Amplification Factor	80	
Transconductance for dc plate ma. = 12.5, dc plate volts = 125, and cathode resistor (ohms) = 50.	13000	μmhos
Direct Interelectrode Capacitances:[a]		
Grid to plate	2.4	μμf
Grid to cathode and heater	4.4	μμf
Plate to cathode and heater	0.03 max.	μμf
Heater to cathode	2.6	μμf
Cathode to plate	0.03 max.	μμf
Cathode to grid and heater	7	μμf
Plate to grid and heater	2.4	μμf

Mechanical:

Operating Position . . . . . Any
Dimensions . . . . . See *Dimensional Outline*
Weight (Approx.) . . . . . 0.3 oz
Sockets:
Heater-terminals connector . . . . . Amerac[b] No.1018-88,[c] Grayhill[d] No.22-5, or equivalent
Socket for operation up to about 550 Mc (Including heater-terminals connector) . . . . . Jettron[e] No.CD7010, or equivalent
Cavities (Including heater-terminals connector) . . . . . J-V-M[f] No.D-7980 Series, Resdel[g] No.10 Series, or equivalent

→ indicates a change.

H - Heater
K - Cathode



G - Grid
P - Plate

→ RADIO-FREQUENCY AMPLIFIER — Class A_1

Maximum CCS[h] Ratings, *Absolute-Maximum Values:*

For altitudes up to 100,000 feet and frequencies up to 1500 Mc

DC PLATE VOLTAGE	250 max.	volts
DC GRID VOLTAGE	-50 max.	volts
DC PLATE CURRENT	25 max.	ma
PLATE DISSIPATION	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	50 max.	volts
Heater positive with respect to cathode	50 max.	volts
PLATE-SEAL TEMPERATURE	225 max.	°C

Typical CCS[h] Operation in Cathode-Drive Circuit:

	At 550 Mc	*At 700 Mc*	
DC Plate-to-Grid Voltage	125	125	volts
Cathode Resistor	50	50	ohms
Input-Signal-Level Range	-70 to -20	-70 to -20	dbm
DC Plate Current	12.5	12.5	ma
Power Gain for a bandwidth of 5 Mc	16.5	17	db
Noise Figure	6.5	7	db

	At 1100 Mc	
DC Plate-to-Grid Voltage	150	volts
Cathode Resistor	50	ohms
Input-Signal-Level Range	-70 to -20	dbm
DC Plate Current	14	ma
Power Gain for a bandwidth of:		
4 Mc	20	db
8 Mc	18	db
Noise Figure	11.5	db

Maximum Circuit Values:

Grid-Circuit Resistance:

For fixed-bias operation	Not recommended	
For cathode-bias operation	0.25 max.	megohm

→ Indicates a change.

[a] Without external shield.

[b] Amerac, Inc., Dunham Road, Beverly, Massachusetts.

[c] For use with cavities.

[d] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

[e] Jettron Products, Inc., 56 Route 10, Hanover, N.J.

[f] J-V-M Microwave Co., 9300 W. 47th St., Brookfield, Illinois. Indicated No. applies to a series of cavities covering range from 220 up to 1000 Mc and above.

[g] Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavities covers the range from 215 up to 2325 Mc.

[h] Continuous Commercial Service.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.205	0.245	amp
Direct Interelectrode Capacitances:				
Grid to plate	-	2.1	2.8	μμf
Grid to cathode	-	3.8	4.8	μμf
Plate to cathode	-	-	0.03	μμf
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,2	-	30	μa
Heater positive with respect to cathode	1,3	-	30	μa
Leakage Resistance:				
From grid to plate and cathode connected together	1,4	100	-	megohms
From plate to grid and cathode connected together	1,5	100	-	megohms
Reverse Grid Current	1,6	-	0.3	μa
Emission Voltage	7	-	3	volts
Amplification Factor	1,8	60	100	
Transconductance	1,8	10000	16000	μmhos
Plate Current (1)	1,8	8.5	16.5	ma
Plate Current (2)	1,9	-	50	μa
Plate Current (3)	1,10	100	-	μa
Power Gain	1,11	14	-	db
Noise Figure	1,11	-	7	db
Change in Power Gain	11,12	-	-1	db
Change in Noise Figure	11,12	-	+0.5	db
Change in Transconductance	11,12	-	15	%

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

Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode.

Note 3: With 60 volts dc between heater and cathode, heater positive with respect to cathode.

Note 4: With grid 100 volts negative with respect to plate and cathode which are connected together.

Note 5: With plate 300 volts negative with respect to grid and cathode which are connected together.

Note 6: With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohm.

← Indicates a change.

Note 8: With dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1000 μf.

Note 9: With dc plate voltage of 125 volts and dc grid voltage of −5 volts.

Note 10: With dc plate voltage of 125 volts and dc grid voltage of −2.5 volts.

Note 11: With dc plate-supply voltage of 125 volts and cathode resistor of 50 ohms in a single-tube rf amplifier of the cavity type having a bandwidth of 5 ± 0.5 Mc, signal input of −70 dbm, and operating frequency of 550 ± 10 Mc.

Note 12: Reduce heater voltage to 5.7 volts. Change in Power Gain, Noise Figure, and Transconductance values from those obtained with 6.3 volts on heater will not exceed indicated values.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage-Breakdown Test:

This test (similar to MIL-E-1D, paragraph 4.9.12.1) is performed on a sample lot of tubes every 90 days. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-cycle rms voltage of 300 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions: heater voltage of 6.3 volts, dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 40 cycles per second at an acceleration of 10 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Heater Current.	300 max.	ma

For conditions shown under *Characteristics Range Values, Note 1.*

Variable-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.20.3) is performed on a sample lot of tubes from each production run. Tube operating conditions are the same as for *Low-Frequency Vibration Performance.* The tubes are vibrated perpendicular to the major tube axis through a frequency range from 5 to 2000 cps and back. From 5 to 50 cps, the tubes are vibrated at a constant displacement of 0.0400 ± 0.0025 inch. From 50 to 2000 cps, the tubes are vibrated at a constant acceleration of 10 ± 2 g. Total time to complete a sweep cycle is 10 ± 5 minutes. During the test, the tubes will not show an rms output voltage across the plate load resistor in excess of 50 millivolts. Each tube is vibrated for 60 seconds at the frequency which

→ Indicates a change.

gives maximum vibrational noise output. If, at the end of 60 seconds the vibrational noise output is still increasing, the test is continued until there is no further increase.

The rms output voltage across the plate load resistor as a result of the vibration of the tube will not exceed the specified limit at any time during the test.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current. . . . . 300 max. ma
For conditions shown under *Characteristics Range Values, Note 1.*

Heater-Cathode Leakage Current. . . . 60 max. μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*

Shock Test:

This test (similar to MIL-E-1D, paragraph 4.9.20.5) is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in three different positions to an impact acceleration of 500 g, 5 blows in each position.

At the end of this test, tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current. . . . . 300 max. ma
For conditions shown under *Characteristics Range Values, Note 1.*

Heater-Cathode Leakage Current. . . . 60 max. μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*

Low-Frequency Vibration Output. . . . 200 max. mv
For conditions shown above under *Low-Frequency Vibration Performance.*

Change in Transconductance. . . . . −20 max. %
From initial value for conditions shown under *Characteristics Range Values, Notes 1,8.*

Fatigue Vibration Test:

This test (similar to MIL-E-1D, paragraph 4.9.20.6) is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected to 2.5 g vibrational acceleration in two positions (X1, Y1) for 32 hours each. At the end of this test, tubes will meet the limits specified for the *Shock Test.*

Shorts and Continuity Test:

This test (similar to MIL-E-1D, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the

curve shown in paragraph 4.7.7 of MIL-E-1D, Amendment 5.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current.	300 max.	ma

For conditions shown under *Characteristics Range Values, Note 1.*

Ceramic-Seal-Fracture Test:

This test is performed on a sample lot of tubes every 90 days. With the cathode- and plate-cylinder-supports spaced 15/16" ± 1/64", and with the grid flange centered between these supports, the tubes will withstand gradual application of a force of 30 pounds, perpendicular to the axis of the tubes, upon the grid flange, without causing fracture of the ceramic insulation.

Seal Strain Test:

This test (similar to MIL-E-1D, paragraph 4.9.6.3) is performed on a sample lot of tubes every 90 days. Tubes are tested by first immersing in water having a temperature of at least 97° C for at least 15 seconds and then immersing immediately in water at not more than 5° C for 5 seconds. After drying for 48 hours at room temperature, the tubes will meet the following test limit:

Heater Current.	300 max.	ma

For conditions shown under *Characteristics Range Values, Note 1.*

Grid Blackout:

This test is performed as follows on a sample lot of tubes from each production run:

Signal-output voltage is measured under conditions with heater voltage of 6.3 volts, dc plate-supply voltage of 200 volts, plate load resistor of 10,000 ohms, grid resistor of 15 ohms, and a sine-wave voltage having a frequency of 100 kc and a peak-to-peak value of 0.1 volt applied between the grid and cathode. Then, in addition to the above conditions, a pulse signal with repetition rate of 2000 pps, peak-to-peak voltage of 5 volts, and pulse duration of 0.25 μsec is applied between the grid and cathode. Next, measurement of signal-output voltage is made 0.8 μsec after the leading edge of a pulse. This value of signal-output voltage referred to the initial value will not show a change in excess of -5 db.

Heater-Cycling Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.3 volts on heater and no voltage on plate or grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles.

At the end of this test, tubes will not show temporary or permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Heater-to-Cathode Leakage Current . .	60 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,3.*		
Grid-to-Cathode Leakage Resistance. .	50 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4.*		

1-Hour Stability Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions:

Heater voltage of 6.3 volts, plate-supply voltage of 215 volts, and cathode resistor of 150 ohms.

At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value for conditions shown under *Characteristics Range Values, Notes 1,8.*

In addition, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

44-Hour Grid-Emission Life Performance:

This test is performed on a sample lot of tubes from each production run to insure excellent over-all performance and to guard against epidemic failures of tubes to meet this test requirement. Tubes are operated under the following conditions:

Heater voltage of 7.5 volts, dc plate voltage of 215 volts, grid voltage of -2 volts, and grid resistor of 0.5 megohm.

At the end of 44 hours, the reverse grid current will not exceed 2 microamperes when grid resistor is shorted and grid voltage is increased to -5 volts, other conditions remaining unchanged from the above values.

100-Hour Survival Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1.b) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *1-Hour Stability Life Performance* except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off.

At the end of 100 hours, the tubes will not show permanent shorts or open circuits and will meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Transconductance.	8000 min.	μmhos
For conditions shown under *Characteristics Range Values, Notes 1,8.*		
Plate Current (2)	50 max.	μa
For conditions shown under *Characteristics Range Values, Notes 1,9.*		

500- and 1000-Hour Average Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure excellent over-all performance and to guard against epidemic failures of tubes to meet any of the characteristics indicated below. Each tube is life-tested under the following conditions:

Heater voltage of 6.3 volts, plate-supply voltage of 215 volts, cathode resistor of 150 ohms, heater positive with respect to cathode by 67.5 volts, and plate-seal temperature of 225° C. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the 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 meet the following limits:

Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		
Leakage Resistance:		
From grid to plate and cathode connected together. . . .	60 min.	megohms
From plate to grid and cathode connected together. . . .	60 min.	megohms
For conditions shown under *Characteristics Range Values, Notes 1,4 and 1,5.*		
Power Gain.	13 min.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		
Noise Figure.	8 max.	db
For conditions shown under *Characteristics Range Values, Notes 1,11.*		
Change in Power Gain.	-1 max.	db
For conditions shown under *Characteristics Range Values, Notes 1,11,12.*		

At the end of 1000 hours, the 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 meet the following limits:

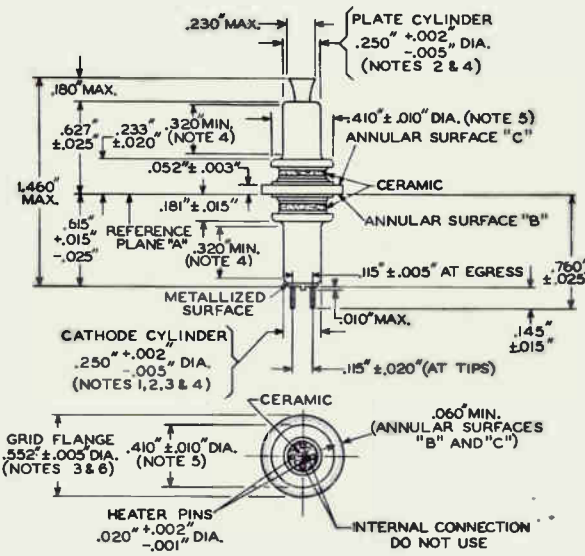
Heater Current.	300 max.	ma
For conditions shown under *Characteristics Range Values, Note 1.*		

Power Gain. . . . . 12 min. db
For conditions shown under *Characteristics Range Values, Notes 1, 11.*
Noise Figure. . . . . 9.5 max. db
For conditions shown under *Characteristics Range Values, Notes 1, 11.*

OPERATING CONSIDERATIONS

Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm, large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum-rated values shown in the tabulated data.



92CM-10274RI

REFERENCE PLANE "A" IS DEFINED AS THAT PLANE AGAINST WHICH ANNULAR SURFACE "B" OF THE GRID FLANGE ABUTS.

ANNULAR SURFACE "B" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE CATHODE CYLINDER.

ANNULAR SURFACE "C" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE PLATE CYLINDER.

NOTE 1: WITH ANNULAR SURFACE "B" RESTING ON REFERENCE PLANE "A". THE AXIS OF THE CATHODE CYLINDER WILL BE WITHIN 2° OF A LINE PERPENDICULAR TO REFERENCE PLANE "A".

NOTE 2: THE AXES OF THE PLATE CYLINDER AND CATHODE CYLINDER WILL COINCIDE WITHIN 0.010".

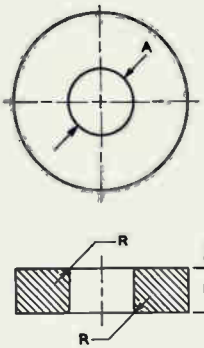
NOTE 3: THE AXES OF THE CATHODE CYLINDER AND GRID FLANGE WILL COINCIDE WITHIN 0.005".

NOTE 4: THE DIAMETER ALONG THE 0.320" MINIMUM LENGTH IS MEASURED WITH "GO" AND "NO-GO" RING GAUGES G_1-1 AND G_1-2, RESPECTIVELY.

NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_2-1 AND G_2-2, RESPECTIVELY.

NOTE 6: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_3-1 AND G_3-2, RESPECTIVELY.

GAUGES

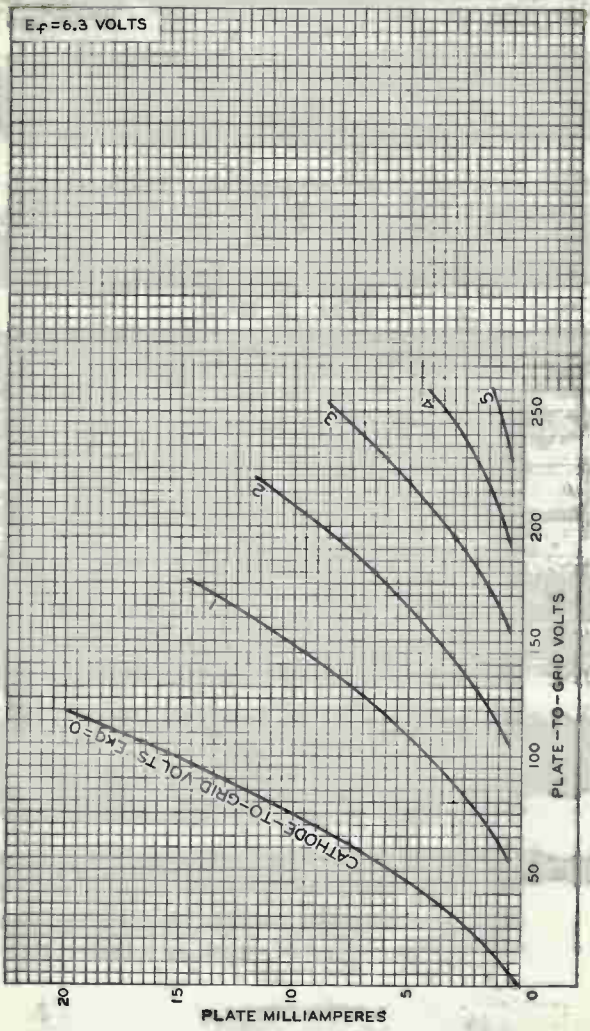


92CS-10370

Gauge	Type	Dimension		
		Diameter A	Thickness B	Radius R
G_1-1	GO	$0.25200"^{+0.00000"}_{-0.00007"}$	$0.320"^{+0.001"}_{-0.000"}$	0.003" MAX.
G_1-2	NO-GO	$0.24500"^{+0.00007"}_{-0.00000"}$	-	-
G_2-1	GO	$0.42000"^{+0.00000"}_{-0.00007"}$	-	-
G_2-2	NO-GO	$0.40000"^{+0.00007"}_{-0.00000"}$	-	-
G_3-1	GO	$0.55700"^{+0.00000"}_{-0.00007"}$	-	-
G_3-2	NO-GO	$0.54700"^{+0.00007"}_{-0.00000"}$	-	-

7553

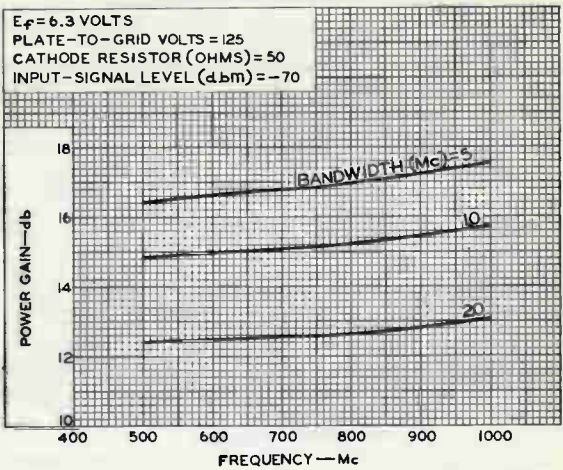
AVERAGE PLATE CHARACTERISTICS
Cathode-Drive Service



92CM-10458

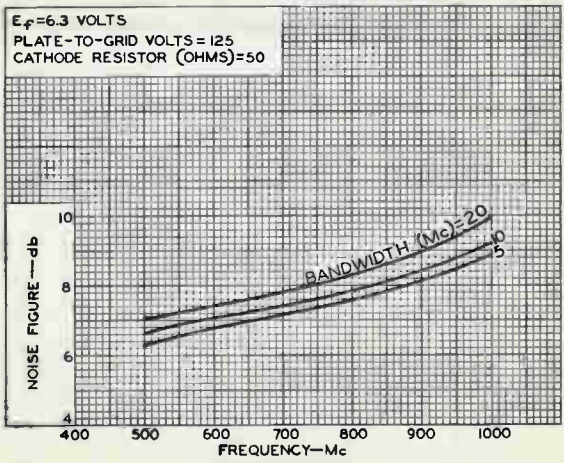
RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

POWER-GAIN CHARACTERISTICS
Cathode-Drive Service



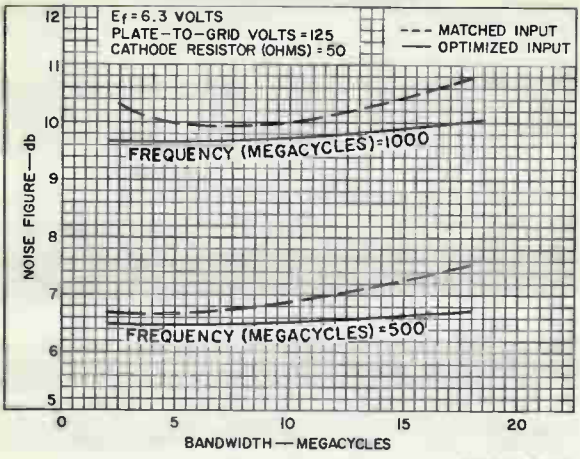
92CS-10456RI

NOISE-FIGURE CHARACTERISTICS
Cathode-Drive Service

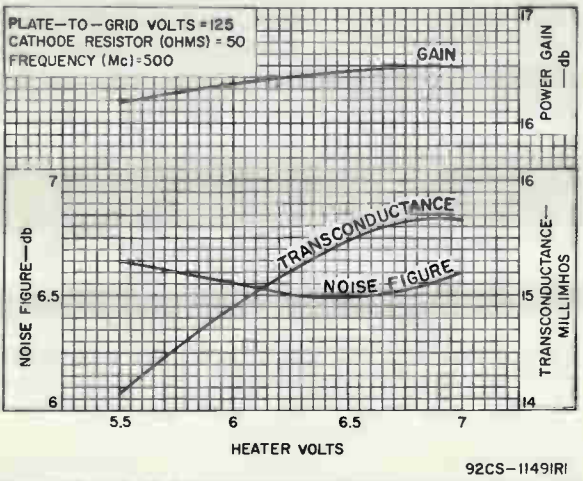


92CS-10455R2

CHARACTERISTICS
Cathode-Drive Service

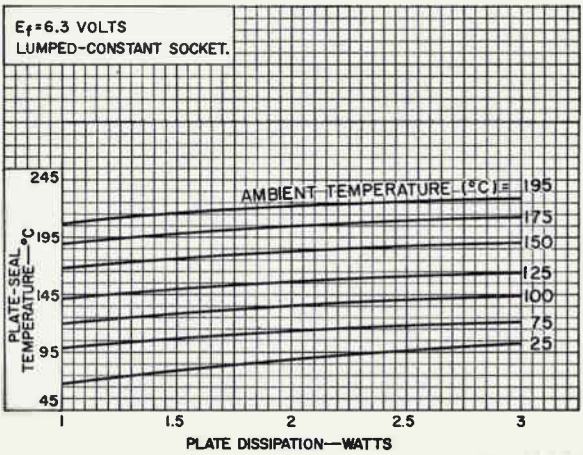


92CS–11497RI



92CS–11491RI

PLATE-SEAL-TEMPERATURE CHARACTERISTICS



92CS-11488

Beam Power Tube

For Use in Communications Equipment at Frequencies Up to 175 Mc.

9-PIN MINIATURE TYPE

Electrical:

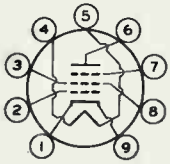
Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ± 5%	volts
Current	0.800	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
Direct Interelectrode Capacitances:[c]		
Grid No.1 to plate	0.15	pf
Grid No.1 to cathode, grid No.3, grid No.2, and heater	10.0	pf
Plate to cathode, grid No.3, grid No.2, and heater	5.5	pf

Characteristics, Class A_1 Amplifier:

Plate Voltage	250	volts
Grid No.3	*Connected to cathode at socket*	
Grid-No.2 Voltage	250	volts
Grid-No.1 Voltage	-18	volts
Mu-Factor, Grid No.2 to Grid No.1	8.7	
Transconductance	5300	μmhos
Plate Current	40	ma
Grid-No.2 Current	3	ma

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ±3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9LK



Pin 1 - Cathode
Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Plate
Pin 7 - Grid No.3
Pin 8 - Grid No.2
Pin 9 - Cathode

Bulb Temperature (At hottest point on bulb surface)	225 max.	°C

AF POWER AMPLIFIER & MODULATOR — Class AB_1♦

Maximum CCS● Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	volts
MAX.-SIGNAL DC PLATE CURRENT■	70 max.	ma
MAX.-SIGNAL PLATE INPUT■	21 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT■	2 max.	watts
PLATE DISSIPATION■	10 max.	watts

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage	300	volts
Grid No.3	*Connected to cathode at socket*	
DC Grid-No.2 Voltage§	250	volts
DC Grid-No.1 Voltage§	−21	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	40	volts
Zero-Signal DC Plate Current	40	ma
Max.-Signal DC Plate Current	125	ma
Zero-Signal DC Grid-No.2 Current	2	ma
Max.-Signal DC Grid-No.2 Current	14	ma
Effective Load Resistance (Plate to plate)	5000	ohms
Max.-Signal Driving Power	0	watts
Total Harmonic Distortion	5	%
Max.-Signal Power Output (Approx.)	20.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy†
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc		
	CCS●	*ICAS*●●	
DC PLATE VOLTAGE	375 max.	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	−125 max.	−125 max.	volts
DC PLATE CURRENT	70 max.	80 max.	ma
DC GRID-No.2 CURRENT	15 max.	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	21 max.	24 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts

→ Indicates a change.

Typical Operation:

As amplifier at 175 Mc

	CCS	ICAS	
DC Plate Voltage	250	300	300 volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage[□□]	200	200	250 volts
DC Grid-No.1 Voltage[●●]	-40	-42	-55 volts
Peak RF Grid-No.1 Voltage	47	52	62 volts
DC Plate Current	60	70	80 ma
DC Grid-No.2 Current	3.7	3.7	5.1 ma
DC Grid-No.1 Current (Approx.)	1.5	2.1	1.6 ma
Driver Power Output (Approx.)[▲▲]	1	1	1.5 watts
Useful Power Output (Approx.)	6.5	8.5	10 watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony ←

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc		
	CCS	ICAS	
DC PLATE VOLTAGE	300 max.	300 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	-125 max.	volts
DC PLATE CURRENT	60 max.	70 max.	ma
DC GRID-No.2 CURRENT	10 max.	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	15 max.	17.5 max.	watts
GRID-No.2 INPUT	1.4 max.	1.4 max.	watts
PLATE DISSIPATION	7 max.	8 max.	watts

Typical Operation:

At 175 Mc

DC Plate Voltage	250	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage	250	250	volts
DC Grid-No.1 Voltage*	-70	-75	volts
From a grid-No.2 resistor of	33000	33000	ohms
RF Grid-No.1 Voltage	75	80	volts
DC Plate Current	60	70	ma
DC Grid-No.2 Current	2.5	3	ma
DC Grid-No.1 Current (Approx.)	2.1	2.3	ma
Driving Power (Approx.)[▲▲]	1	1	watt
Useful Power Output*	6.5	7.5	watts

← Indicates a change.

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	*ICAS*	
DC PLATE VOLTAGE	375 max.	375 max.	volts
GRID No.3 (SUPPRESSOR GRID)	0 max.	0 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max.	300 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-125 max.	-125 max.	volts
DC PLATE CURRENT	50 max.	60 max.	ma
DC GRID-No.2 CURRENT	15 max.	15 max.	ma
DC GRID-No.1 CURRENT	5 max.	5 max.	ma
PLATE INPUT	13 max.	15 max.	watts
GRID-No.2 INPUT	2 max.	2 max.	watts
PLATE DISSIPATION	10 max.	12 max.	watts

Typical Operation:

As doubler to 175 Mc

DC Plate Voltage	250	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage	200	250	volts
DC Grid-No.1 Voltage[●●]	-53	-66	volts
From a grid-No.1 resistor of	53000	44000	ohms

→ Indicates a change.

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BEAM POWER TUBE

Peak RF Grid-No.1 Voltage	60	74	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	2.6	3.5	ma
DC Grid-No.1 Current (Approx.)	1	1.5	ma
Driving Power (Approx.)▲▲	0.4	0.6	watt
Useful Power Output*	3	4.5	watts
As tripler at 175 Mc			
DC Plate Voltage	200	250	volts
Grid No.3	*Connected to cathode at socket*		
DC Grid-No.2 Voltage	200	250	volts
DC Grid-No.1 Voltage●●	-90	-120	volts
From a grid-No.1 resistor of	50000	70000	ohms
Peak RF Grid-No.1 Voltage	105	130	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	3	3.9	ma
DC Grid-No.1 Current (Approx.)	1.85	1.7	ma
Driving Power (Approx.)▲▲	0.4	0.6	watt
Useful Power Output*	1.4	2.3	watts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance	0.1 max.	0.1 max.	megohm

○ Without external shield.

♦ Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

● Continuous Commercial Service.

■ Averaged over any audio-frequency cycle of sine-wave form.

§ Obtained preferably from a fixed supply.

† Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of cf the audio-frequency envelope does not exceed 115% of the carrier conditions.

●● Intermittent Commercial and Amateur Service.

□□ Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider. If a series resistor is used, it should be adjustable to obtain the desired operating plate current after initial tuning adjustments are completed.

●● Obtained from a grid-No.1 resistor, or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

▲▲ Driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics, and tube characteristics during life.

* Measured at load.

▲ Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to obtain the desired operating plate current after initial tuning adjustments are made.

RCA

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BEAM POWER TUBE

★ Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor. The combination of grid-No.1 resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.745	0.855	amp
Transconductance	1,2	4200	6400	μmhos
Plate Current	1,2	30	50	ma
Plate Current	1,3	–	50	μa
Grid-No.2 Current	1,2	–	7.5	ma
Reverse Grid-No.1 Current	1,4	–	2	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	20	μa
Heater positive with respect to cathode	1,5	–	20	μa
Leakage Resistance:				
Between grid-No.1 and all other electrodes tied together	1,6	100	–	megohms
Between plate and all other electrodes tied together	1,7	100	–	megohms

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

Note 2: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of −18 volts.

Note 3: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of −48 volts.

Note 4: With plate voltage of 180 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, grid-No.1 resistor of 0.1 megohm, and cathode resistor of 170 ohms.

Note 5: With 100 volts dc between heater and cathode.

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.

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RCA

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AVERAGE CHARACTERISTICS

E_f=6.3 VOLTS
GRID Nº 3 CONNECTED TO CATHODE AT SOCKET.
GRID-Nº2 VOLTS=200

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10305RI

RCA

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AVERAGE CHARACTERISTICS

E_f=6.3 VOLTS
GRID N°3 CONNECTED TO CATHODE AT SOCKET.
GRID-N°2 VOLTS=250

92CM-10304RI

ELECTRON TUBE DIVISION

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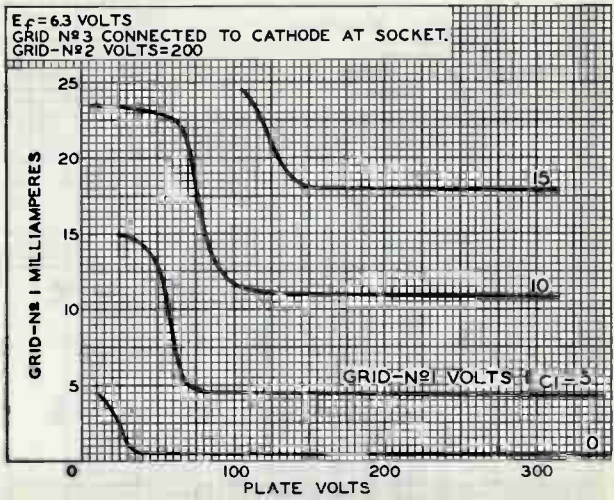
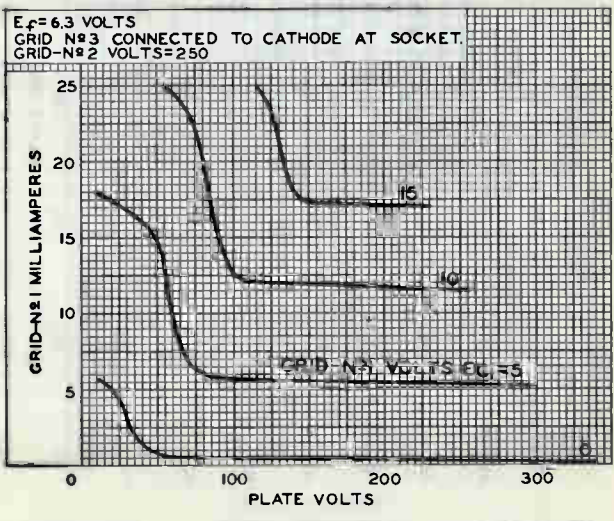
AVERAGE CHARACTERISTICS



92CS-10306RI



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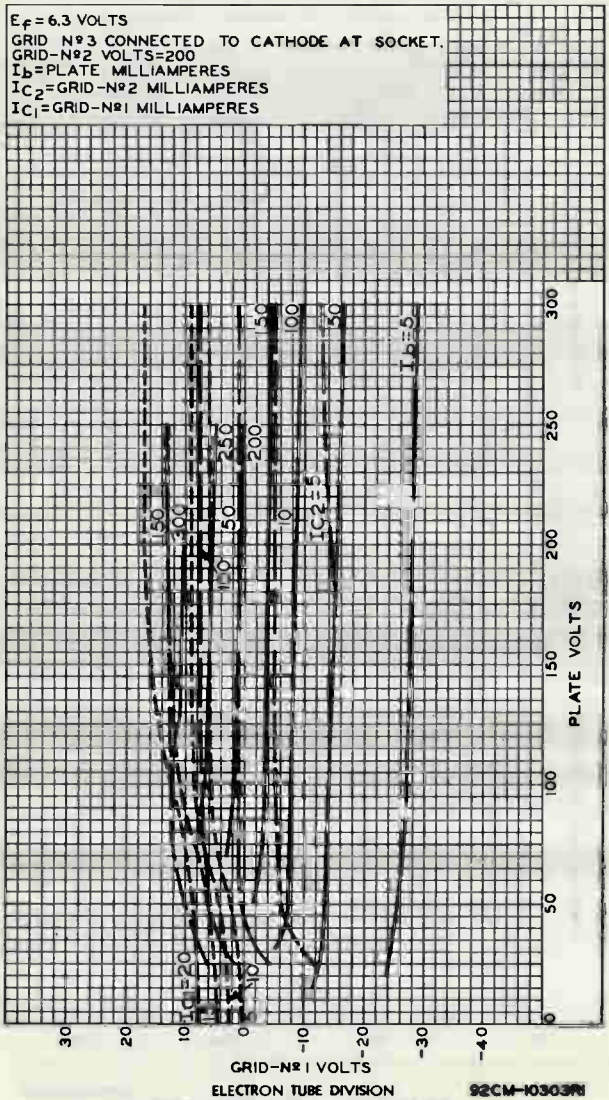
AVERAGE CONSTANT-CURRENT CHARACTERISTICS



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10303R1

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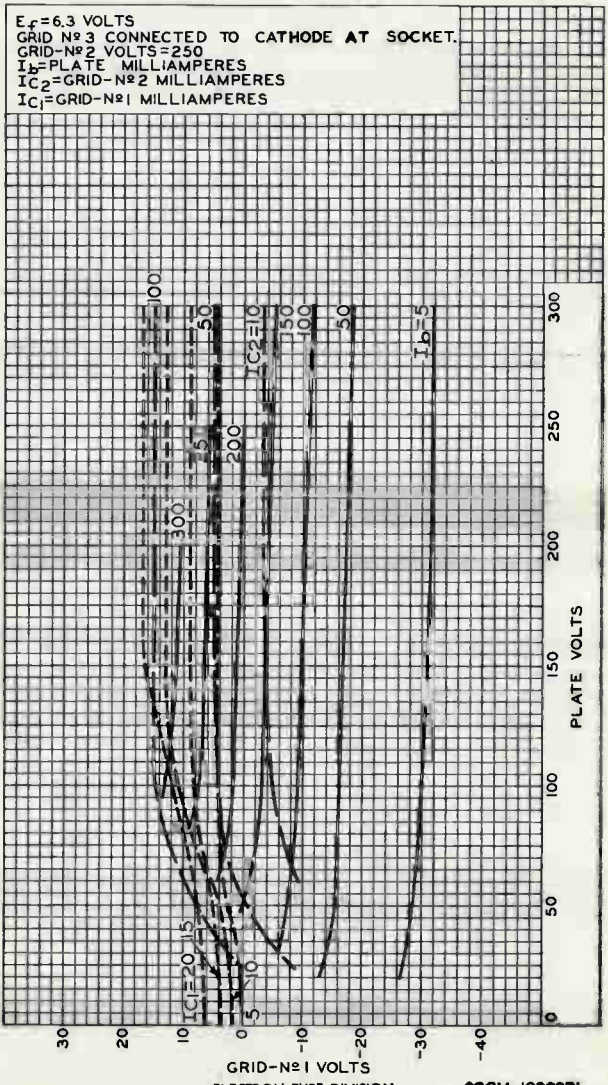
AVERAGE CONSTANT-CURRENT CHARACTERISTICS



Medium-Mu Triode

NUVISTOR TYPE

ALL-CERAMIC-AND-METAL CONSTRUCTION

Designed to Withstand Severe Mechanical Shock and Vibration in Industrial Applications, the 7586 is a General-Purpose Tube for Use in Amplifier and Oscillator Service at Frequencies Extending into the UHF Region.

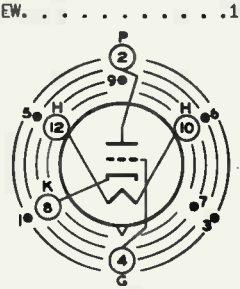
Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3 ±0.6	volts
Current at heater volts = 6.3	0.135	amp
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
Input: G to (K,S,H)	4.2	pf
Output: P to (K,S,H)	1.6	pf
Cathode to plate	0.26	pf
Heater to cathode	1.4	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1.9 grams
Envelope	Metal Shell MT4
Socket	See *Socket & Connector Information for RCA Nuvistor Tubes* at front of this Section
Base. . . Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)	
Basing Designation for BOTTOM VIEW	12AQ

Pin 1[a] – Do Not Use
Pin 2 – Plate
Pin 3[a] – Do Not Use
Pin 4 – Grid
Pin 5[a] – Do Not Use
Pin 6[a] – Do Not Use
Pin 7[a] – Do Not Use
Pin 8 – Cathode
Pin 9[a] – Do Not Use
Pin 10 – Heater
Pin 12 – Heater



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

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	–	–	75	volts
Plate Voltage	26.5	40	–	volts

←Indicates a change.

Grid Supply Voltage	0	0	0	volts
Cathode Resistor	–	–	100	ohms
Amplification Factor	31	35	35	
Grid Resistor	0.5	0.5	–	megohm
Plate Resistance (Approx.)	4400	3000	3000	ohms
Transconductance	7000	11500	11500	μmhos
Plate Current	2.8	7.5	10.5	ma
Grid Voltage (Approx.) for plate μa = 10	–	–	-7	volts

INDUSTRIAL SERVICE

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

Plate Supply Voltage	330	volts
Plate Voltage	110	volts
Grid Voltage:		
Negative-bias value	55	volts
Peak-positive value	4	volts
Grid Current	2	ma
Cathode Current	15	ma
Plate Dissipation	1	watt

Maximum Circuit Values:

Grid-Circuit Resistance:[b]		
For fixed-bias operation	0.5	megohm
For cathode-bias operation	1	megohm

[a] Pin is cut off close to ceramic wafer.

→ [b] For operation at metal-shell temperature of 150° C. For operation at other metal-shell temperatures, see *Grid-Circuit Resistance Rating Chart.* Metal-shell temperatures are measured in Zone "A" (See accompanying *Dimensional Outline).*

CHARACTERISTICS RANGE VALUES

	Note	*Min.*	*Max.*	
Heater Current	1	0.125	0.145	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.8	2.6	pf
Input: G to (K,S,H)	2	3.8	4.6	pf
Output: P to (K,S,H)	2	1.4	1.8	pf
Heater to cathode	2	1.1	1.7	pf
Cathode to plate	2	0.20	0.32	pf
Plate Current (1)	1,3	9	12.5	ma
Plate Current (2)	1,4	–	50	μa
Transconductance (1)	1,3	10000	13000	μmhos
Transconductance (2)	3,5	9000	–	μmhos
Transconductance Change: Difference between Transconductance (1) and Transconductance (2), expressed in per cent of Transconductance (1)	–	–	15	%
Reverse Grid Current	1,6	–	0.1	μa
→ Amplification Factor	1,3	28	42	

→ Indicates a change.

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	1000	–	megohms
Between plate and all other electrodes tied together.	1,9	1000	–	megohms

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

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

Note 3: With dc plate supply volts = 75, dc grid supply volts = 0, cathode resistor = 100 ohms, cathode-bypass capacitor = 1000 μf, and metal shell connected to ground. ←

Note 4: With dc plate volts = 75, dc grid volts = –7, and metal shell connected to ground.

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With dc plate volts = 80, grid supply volts = –1.2, grid resistor = 0.5 megohm, and metal shell connected to ground.

Note 7: With 100 volts dc applied between heater and cathode.

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 RATINGS & PERFORMANCE DATA ←

Shock Rating:

Peak Impact Acceleration. . . . . 1000 g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in four different positions (X_1, X_2, Y_1, Y_2) in a Navy Type, High-impact (flyweight) Shock Machine, and with tube electrodes 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 change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

Fatigue Rating:

Peak Vibrational Acceleration. . . . . 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified Peak Vibrational Acceleration. Tubes are rigidly mounted, supplied with center heater voltage only, and subjected for 48 hours to 2.5-g Peak Vibrational Acceleration at 60 cycles per second in the X_1 position. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

Variable-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms.

← Indicates a change.

During operation, tube is vibrated in the X_1 position through the frequency range from 50 to 15,000 cycles per second with a constant vibrational acceleration of 1g. During the test, tube must not show an rms output voltage across the plate-load resistor in excess of:

25 millivolts over the frequency range of 3000 to 6000 cps
500 millivolts over the frequency range of 6000 to 15000 cps

Post-Impact and Post-Fatigue Vibration Limits:

35 millivolts over the frequency range of 3000 to 6000 cps
700 millivolts over the frequency range of 6000 to 15000 cps

Low-Pressure Voltage-Breakdown Test:

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

Heater Cycling:

Cycles of Intermittent Operation. . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts= 8.5 cycled one minute on and two minutes off; heater 180 volts negative with respect to cathode; grid, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters and heater-cathode shorts, open cathode circuits, and heater-cathode leakage currents.

Shorts and Continuity:

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 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper[c]. See accompanying Shorts-Test Acceptance-Limits curve. Tubes are criticized for permanent or temporary shorts and open circuits.

Early-Hour Stability Life Performance (20 hours):

This test is performed on a sample lot of tubes from each production run to insure that tubes are properly stabilized. Tubes are operated at center heater voltage for 20 hours at maximum-rated plate dissipation. After 2 hours of operation and again after 20 hours of operation, tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

Survival-Rate Life (100 hours):

This test is performed on a sample lot of tubes from each production run to assure a minimum of early-hour inoperatives. Tubes are operated with center heater voltage cycled 100 minutes on and 20 minutes off for 100 hours at maximum-rated plate

[c] Specification for tapper supplied on request.

dissipation, and then subjected to the Shorts and Continuity Test Transconductance (1), and Reverse Grid Current. Tubes must then show a transconductance of not less than 8300 micromhos and reverse grid current no greater than 0.2 microampere.

Intermittent Conduction Life (1000 hours):

This test is performed on a sample lot of tubes from each production run to assure the high quality of individual tubes and to prevent epidemic failures due to excessive changes in tube characteristics. Tubes are operated with center heater voltage cycled 110 minutes on and 10 minutes off, and maximum rated plate dissipation, at a shell temperature of 150° C.

Tubes are criticized at 500 and 1000 hours for Inoperatives,[d] reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, a tube is rejected if its Transconductance (1) after 500 hours has changed more than 20 per cent or after 1000 hours has changed more than 25 per cent from the 0-hour value. The average change in Transconductance (1) of the lot from the 0-hour value must not exceed 15 per cent at 500 hours and 20-per cent at 1000 hours.

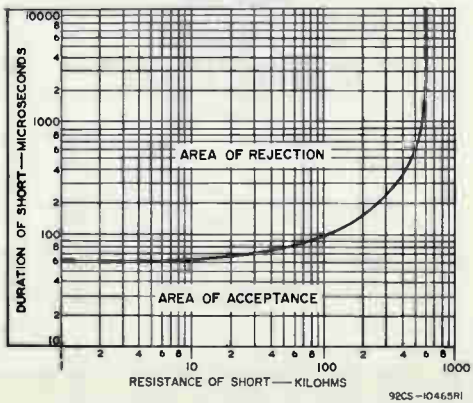
Standby Life (1000 hours):

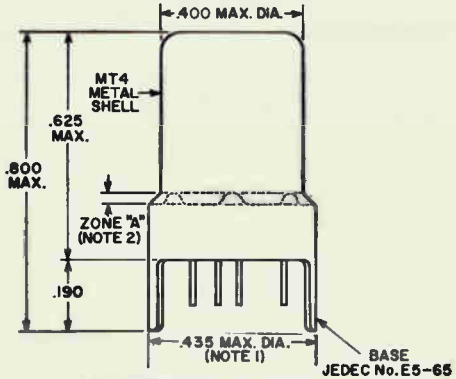
This test is performed on a sample lot of tubes from each production run. Tubes are operated with only the center heater voltage applied.

At 500 and 1000 hours the tubes are criticized for leakage resistance, reverse grid current, the change in Transconductance (1) of individual tubes from the 0-hour values, and for cathode interface resistance greater than 25 ohms. Interface resistance is measured by Method B of ASTM specification F300-61T.

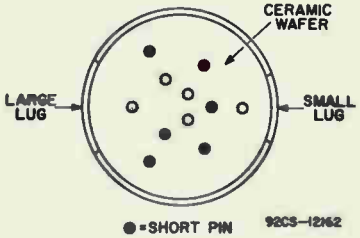
[d] An inoperative is defined as a tube having a discontinuity, permanent short, or air leak.

SHORTS-TEST ACCEPTANCE LIMITS

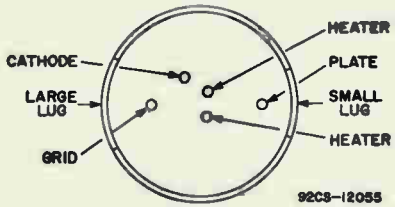




BOTTOM VIEW
Showing Arrangement of All 11 Base Pins



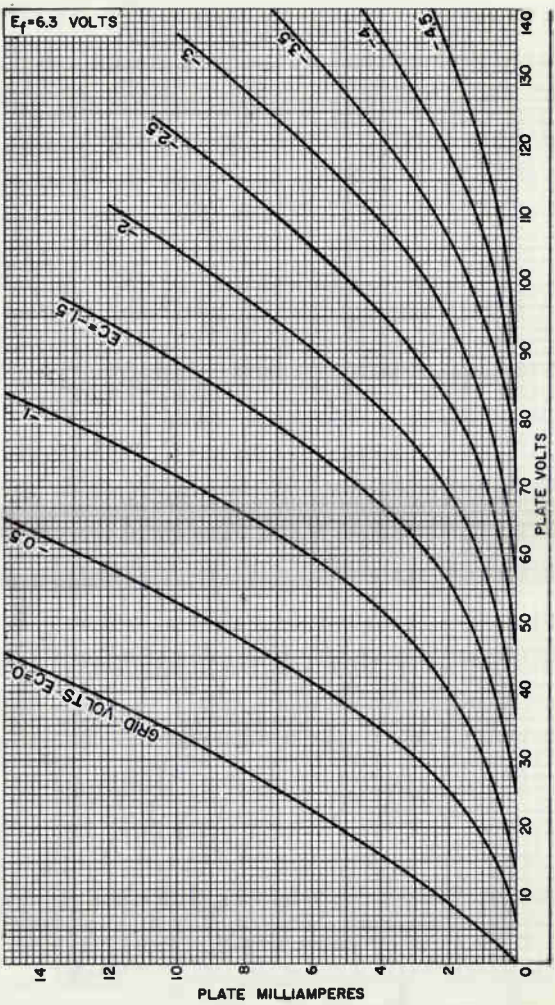
MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown



Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

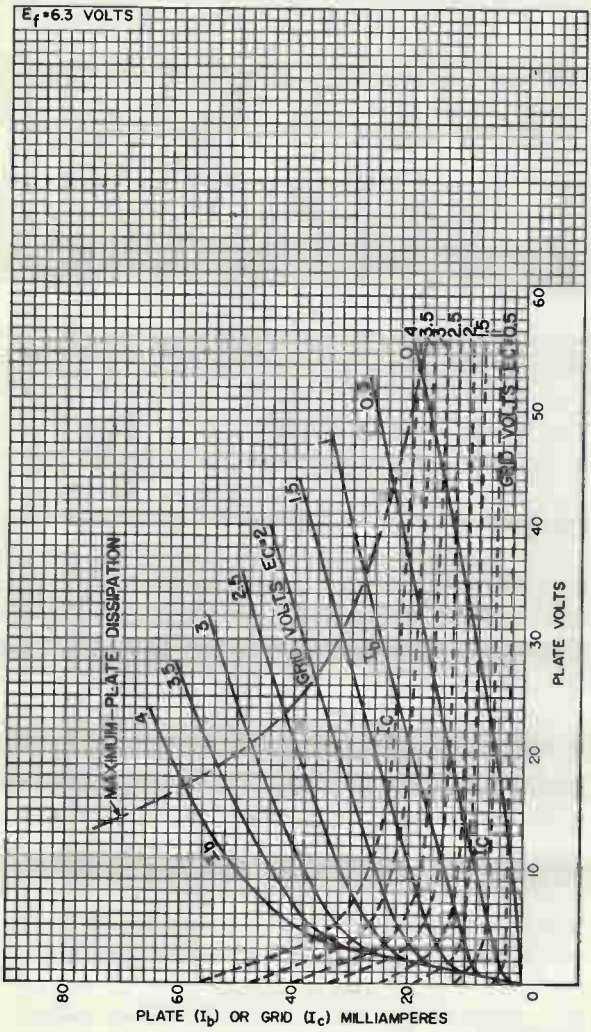
Note 2: Metal-shell temperature should be measured in Zone "A".

AVERAGE PLATE CHARACTERISTICS

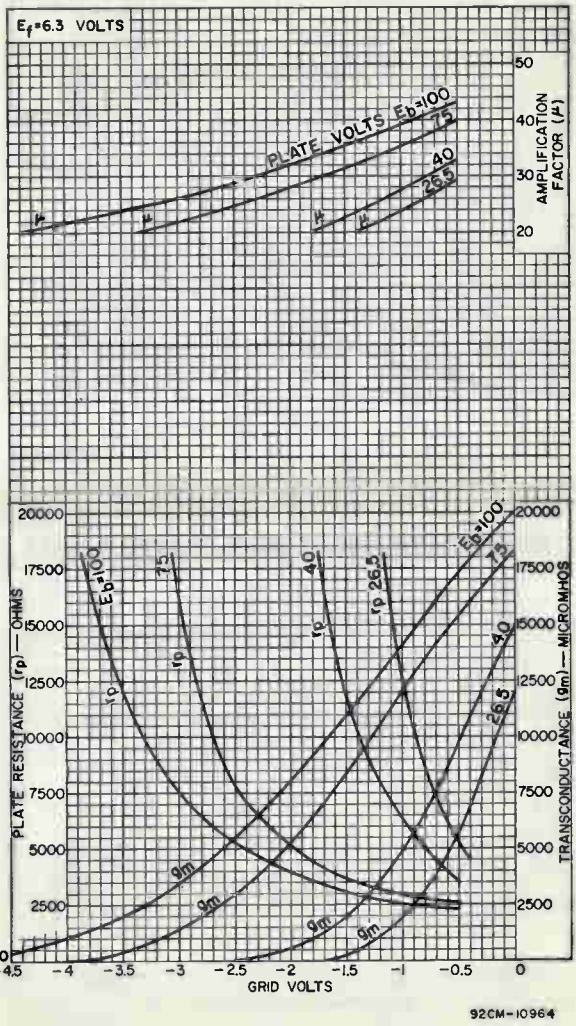


92CM-10460R2

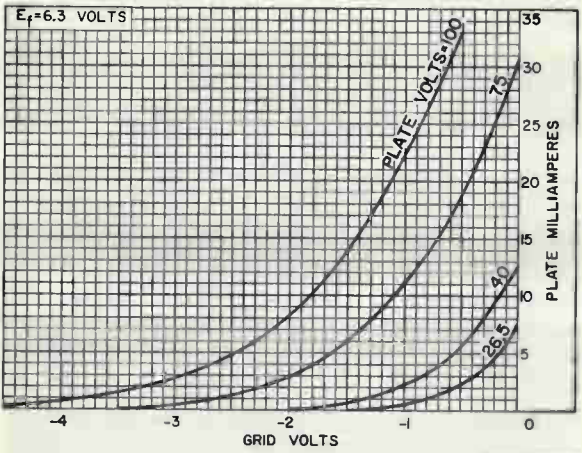
AVERAGE CHARACTERISTICS



AVERAGE CHARACTERISTICS

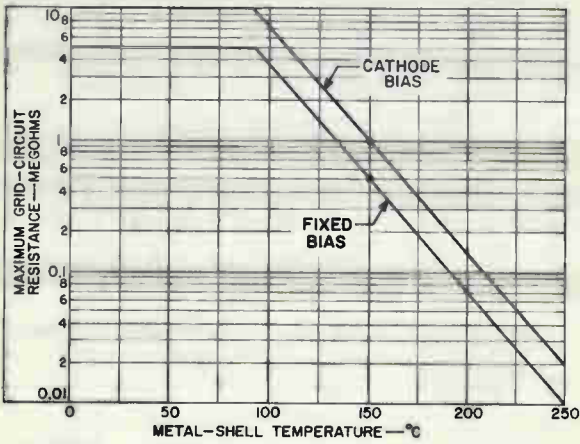


AVERAGE CHARACTERISTICS



92CS-1046RI

GRID-CIRCUIT-RESISTANCE RATING CHART



92CS-11911

7587

Sharp-Cutoff Tetrode

NUVISTOR TYPE

For Industrial Applications

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values)*:		
Voltage (AC or DC)	6.3 ± 0.6	volts
Current at heater volts = 6.3	0.150	amp
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:

Plate Supply Voltage	125	volts
Grid-No.2 Supply Voltage	50	volts
Cathode Resistor	68	ohms
Plate Resistance (Approx.)	0.2	megohm
Transconductance	10600	μmhos
Plate Current	10	ma
Grid-No.2 Current	2.7	ma
Grid-No.1 Voltage (Approx.) for plate μa = 10	-4.5	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	1.050"
Maximum Seated Length	0.840"
Maximum Diameter	0.440"
Weight (Approx.)	1/10 oz
Envelope	Metal Shell MT4 and Ceramic Cylinder
Cap	Skirted Miniature (JEDEC No.C1-44)
Socket	Cinch Mfg. Corp. No.133 65 10 001, or equivalent
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)

◄ Indicates a change.

7587

Basing Designation for BOTTOM VIEW. 12AS

Pin 1[a] – Do Not Use
Pin 2 – Grid No.2
Pin 3 – Same as Pin 1
Pin 4 – Grid No.1
Pin 5 – Same as Pin 1
Pin 6 – Same as Pin 1

INDEX = LARGE LUG
• = SHORT PIN

Pin 7 – Same as Pin 1
Pin 8 – Cathode
Pin 9 – Same as Pin 1
Pin 10 – Heater
Pin 12 – Heater
Cap – Plate

INDUSTRIAL SERVICE

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

PLATE SUPPLY VOLTAGE.	330 max.	volts
PLATE VOLTAGE	250 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE. . .	330 max.	volts
GRID-No.2 VOLTAGE	110 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	55 max.	volts
Peak-positive value	2 max.	volts
CATHODE CURRENT	20 max.	ma
GRID-No.1 CURRENT	2 max.	ma
GRID-No.2 INPUT	0.2 max.	watt
PLATE DISSIPATION	2.2 max.	watts

Maximum Circuit Values:

Grid-Circuit Resistance:[b]		
For fixed-bias operation.	0.5 max.	megohm
For cathode-bias operation.	1 max.	megohm

[a] Pin is of a length such that its end does not touch the socket insertion plane.
[b] For operation at metal-shell temperatures up to 150° C.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current.	1	0.140	0.160	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	8.5	11.5	ma
Plate Current (2)	1,4	–	50	μa
Grid-No.2 Current	1,3	–	3.6	ma
Transconductance (1).	1,3	9000	12000	μmhos

→ Indicates a change.

Transconductance (2).	3,5	8000	–	μmhos
Transconductance Change:				
Difference between Transconductance (1) and Transconductance (2), expressed in per cent of Transconductance (1).	–	–	.20	%
Reverse Grid Current.	1,6	–	0.1	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode.	1,8	–	5	μa
Heater positive with respect to cathode.	1,8	–	5	μa
Leakage Resistance:				
Between grid No.2 and all other electrodes tied together. . . .	1,7	500	–	megohms
Between grid No.1 and all other electrodes tied together. . . .	1,9	500	–	megohms
Between plate and all other electrodes tied together. . . .	1,10	500	–	megohms

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

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

Note 3: With dc plate supply volts = 125, grid-No.2 supply volts = 80, cathode resistor = 68 ohms, and cathode-bypass capacitor = 1000 μf.

Note 4: With dc plate volts = 125, dc grid-No.2 volts = 50, dc grid-No.1 volts = -6, and metal shell connected to ground.

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With dc plate volts = 200, dc grid-No.2 volts = 70, dc grid-No.1 supply volts = -1.6, grid-No.1 resistor = 0.5 megohm, and metal shell connected to ground.

Note 7: With grid No.2 100 volts negative with respect to all other electrodes tied together.

Note 8: With 100 volts dc applied between heater and cathode.

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

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

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 1000 max. g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-Impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

Vibrational Acceleration. . . . . 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted, supplied with rated heater voltage only, and subjected for 48 hours to 2.5-g vibrational acceleration at 60 cycles per second in a direction perpendicular to the longitudinal axis of the tube. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

Variable-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in a direction perpendicular to the longitudinal axis of the tube through the frequency range from 50 to 15,000 cycles per second with a constant vibrational acceleration of 1 g. During the test, tube will not show an rms output voltage across the plate-load resistor in excess of: (1) 35 millivolts from 50 to 6000 cps, (2) 500 millivolts from 6000 to 15,000 cps.

Low-Pressure Voltage-Breakdown Test:

The test is performed on a sample lot of tubes from each production run. In this test, tubes are operated with 240 rms volts applied between plate and all other electrodes and will not break down or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet.

Heater Cycling:

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

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100 volts negative with respect to cathode; grid No.1, grid No.2, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters and heater-cathode shorts.

Shorts and Continuity:

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, Ammendent 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper[c]. See accompanying *Shorts-Test Acceptance-Limits* curve. Tubes are criticized for permanent or temporary shorts and open circuits.

Early-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that tubes are properly stabilized. In this test, tubes are operated for 20 hours at maximum-rated plate dissipation. After 2 hours of operation and again after 20 hours of operation, tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

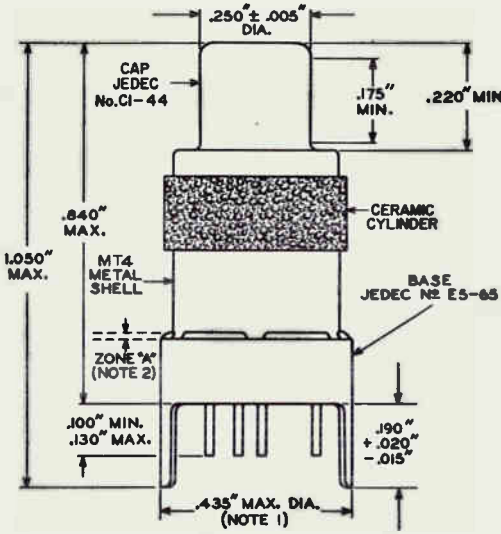
100-Hour Life Performance:

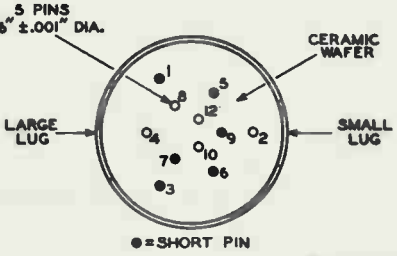
This test is performed on a sample lot of tubes from each production run to insure a low percentage of early-hour inoperatives. Tubes are operated for 100 hours at maximum-rated plate dissipation, and then subjected to the *Shorts and Continuity* Test previously described. Tubes must then show a transconductance of not less than 7500 micromhos under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1).

1000-Hour 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 guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation, and then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 20 per cent at 500 hours, and 25 per cent at 1000 hours.

[c] Specifications for tapper supplied on request.



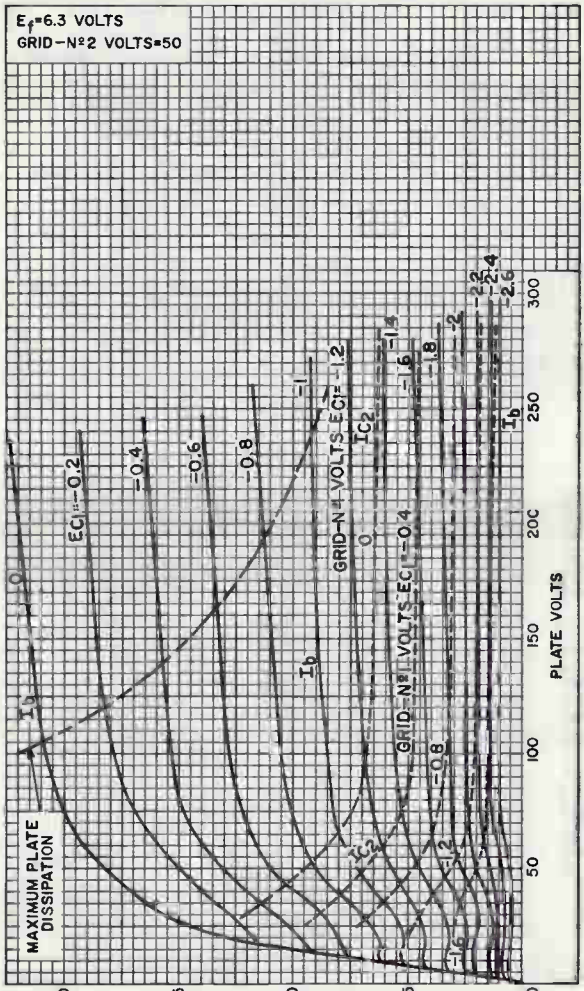


92CS-10852R2

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

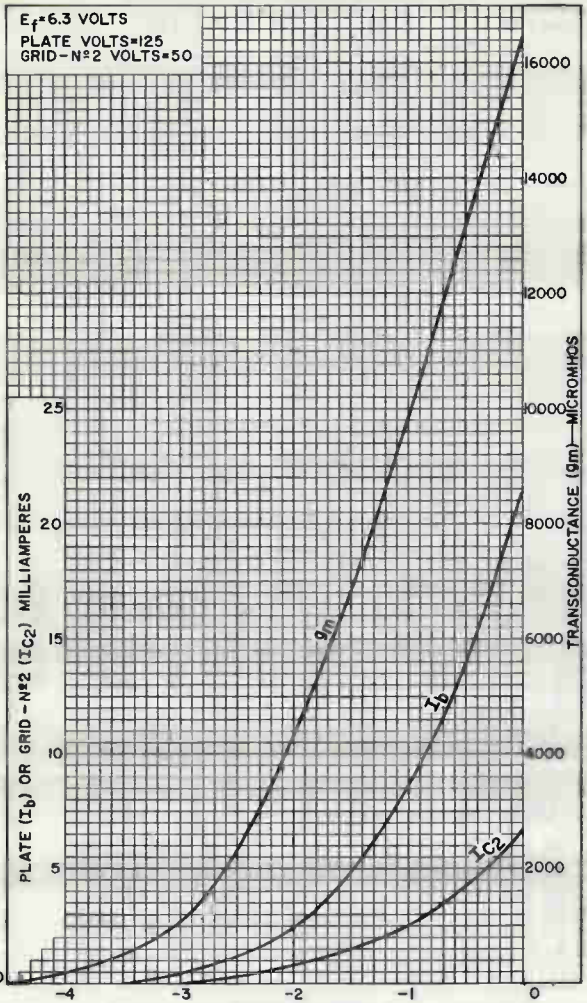
NOTE 2: SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A" BETWEEN BROKEN LINES.

AVERAGE CHARACTERISTICS



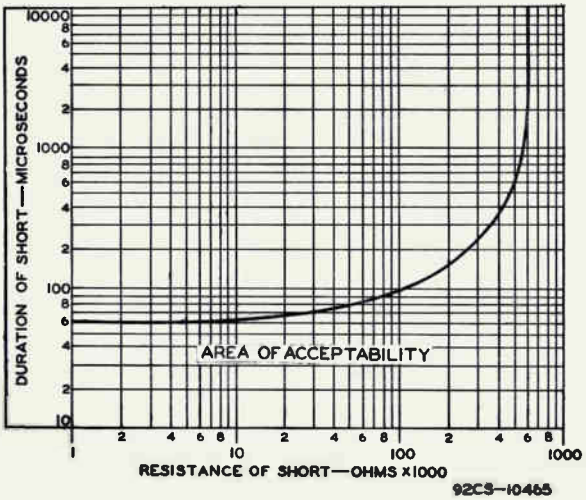
92CM-10926

AVERAGE CHARACTERISTICS



92CM-10927

SHORTS-TEST ACCEPTANCE LIMITS



7717/6CY5

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

For Mobile-Communications Equipment

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values):*

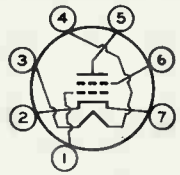
Voltage (AC or DC)	6.3 $^{+1.2}_{-0.3}$		volts
Current at heater volts = 6.3	0.200		amp
Peak heater-cathode voltage:			
Heater negative with respect to cathode	100	max.	volts
Heater positive with respect to cathode	100[a]	max.	volts
Direct Interelectrode Capacitances:[b]			
Grid No.1 to plate	0.03	max.	μμf
Grid No.1 to cathode & internal shield, grid No.2, and heater	4.4		μμf
Plate to cathode & internal shield, grid No.2, and heater	2.74		μμf

Characteristics, Class A_1 Amplifier:

Plate Voltage	125	volts
Grid-No.2 Voltage	80	volts
Grid-No.1 Voltage	-1	volt
Plate Resistance (Approx.)	0.125	megohm
Transconductance	8000	μmhos
Plate Current	10	ma
Grid-No.2 Current	1.4	ma
Grid-No.1 Voltage (Approx.) for transconductance (μmhos) = 100	-5	volts

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
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"
Diameter	0.650" to 0.750"
Dimensional Outline	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7EW



Pin 1 - Grid No.1
Pin 2 - Cathode, Internal Shield
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Plate
Pin 6 - Grid No.2
Pin 7 - Cathode, Internal Shield

AMPLIFIER — Class A1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE	180 max.	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	180 max.	volts
GRID-No.2 VOLTAGE	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Positive-bias value	0 max.	volts
CATHODE CURRENT	20 max.	ma
GRID-No.2 INPUT:		
For grid-No.2 voltages up to 90 volts	0.5 max.	watt
For grid-No.2 voltages between 90 and 180 volts.	See *Grid-No.2 Input Rating Chart* at front of Receiving Tube Section	
PLATE DISSIPATION	2 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.5 max.	megohm

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling:

Cycles of Intermittent Operation	2000 min.	cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage:

Average Value	5900	μmhos

With heater volts = 5.0, plate volts = 125, grid-No.2 volts = 80, grid-No.1 volts = -1.

[a] The dc component must not exceed 50 volts.
[b] With external shield JEDEC No.316 connected to cathode.

7724/14GT8

Twin Diode—High-Mu Triode

9-PIN MINIATURE TYPE

For Mobile-Communications Equipment

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Design-Maximum Values)*:			
Voltage (AC or DC)	14.0[a]		volts
Current at heater volts = 14.0	0.150		amp
Peak heater-cathode voltage (Each unit):			
Heater negative with respect to cathode	200	max.	volts
Heater positive with respect to cathode	200[b]	max.	volts
Direct Interelectrode Capacitances:[c]			
Triode Unit:			
Grid to plate	1.8		μμf
Grid to cathode and heater	1.6		μμf
Plate to cathode and heater	0.24		μμf
Diode Units:			
Diode-No.1 plate to triode grid	0.09	max.	μμf
Diode-No.2 plate to triode grid	0.07	max.	μμf
Either diode cathode to all other tube electrodes	6.5		μμf
Diode plate to cathode and heater (Each unit)	2.4		μμf

Characteristics, Class A_1 Amplifier (Triode Unit):

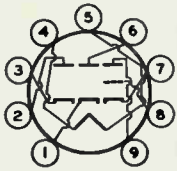
Plate Voltage	250	volts
Grid Voltage	-3	volts
Amplification Factor	72	
Plate Resistance (Approx.)	72000	ohms
Transconductance	1000	μmhos
Plate Current	0.7	ma

Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

Basing Designation for BOTTOM VIEW. 9KR

Pin 1 – Diode–No.2 Cathode
Pin 2 – Diode–No.1 Plate
Pin 3 – Diode–No.1 Cathode
Pin 4 – Heater



Pin 5 – Heater
Pin 6 – Diode–No.2 Plate
Pin 7 – Triode Cathode
Pin 8 – Triode Grid
Pin 9 – Triode Plate

TRIODE UNIT — AMPLIFIER — Class A_1

Maximum Ratings, *Design-Maximum Values:*

PLATE VOLTAGE.	330 max.	volts
GRID VOLTAGE:		
Positive–bias value.	0 max.	volts
PLATE DISSIPATION.	1.1 max.	watts

DIODE UNITS — Two

Values are for Each Unit

Maximum Ratings, *Design-Maximum Values:*

PLATE CURRENT.	5 max.	ma

Characteristics, Instantaneous Value:

Plate Current for plate volts = 5.	18	ma

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling:

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

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 18.9 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater–cathode shorts and open circuits.

Transconductance at Reduced Heater Voltage (Triode Unit):

Average Value. . . . . 900 μmhos

With heater volts = 10.8, plate volts = 250, and grid volts = −3.

[a] For satisfactory operation, it is recommended that the heater be operated within the voltage range of 12.0 to 15.0 volts.

[b] The dc component must not exceed 100 volts.

[c] Without external shield.

7895

High-Mu Triode

NUVISTOR TYPE

For Industrial Applications

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.135	amp
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	0.9	μμf
Grid to cathode, shell, and heater	4.2	μμf
Plate to cathode, shell, and heater	1.7	μμf
Plate to cathode	0.22	μμf
Heater to cathode	1.3	μμf

Characteristics, Class A_1 Amplifier:

Plate Supply Voltage	110	volts
Grid Supply Voltage	0	volts
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
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1/15 oz
Envelope	Metal Shell
Socket	Cinch Mfg. Corp. No.133 65 10 001, or equivalent
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)
Basing Designation for BOTTOM VIEW	12AQ

Pin 1[a] - Internal Connection—Do Not Use
Pin 2 - Plate
Pin 3 - Same as Pin 1
Pin 4 - Grid
Pin 5 - Same as Pin 1
Pin 6 - Same as Pin 1
Pin 7 - Same as Pin 1
Pin 8 - Cathode
Pin 9 - Same as Pin 1
Pin 10 - Heater
Pin 12 - Heater

INDEX = LARGE LUG
● = PIN CUT OFF

INDUSTRIAL SERVICE

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

PLATE SUPPLY VOLTAGE	330 max.	volts
PLATE VOLTAGE	110 max.	volts
GRID VOLTAGE:		
Negative-bias value	55 max.	volts
Peak-positive value	2 max.	volts
GRID CURRENT	2 max.	ma
PLATE CURRENT	20 max.	ma
CATHODE CURRENT	15 max.	ma
PLATE DISSIPATION	1 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance:[b]		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1 max.	megohm

[a] Pin is cut off close to ceramic wafer.

[b] For operation at metal-shell temperatures up to 150° C.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.125	0.145	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	0.8	1	μμf
Grid to cathode, shell, and heater	2	3.4	5	μμf
Plate to cathode, shell, and heater	2	1.3	2.1	μμf
Heater to cathode	2	1	1.6	μμf
Plate to cathode	2	0.16	0.28	μμf
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	6900	–	μmhos
Transconductance Change: Difference between Transconductance (1) and Transconductance (2), expressed in per cent of Transconductance (1)	–	–	15	%
Reverse Grid Current	1,6	–	0.1	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	1000	– megohms
Between plate and all other electrodes tied together	1,9	1000	– megohms

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

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

Note 3: With dc plate supply volts = 110, cathode resistor = 150 ohms, and cathode-bypass capacitor = 1000 μf.

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

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With dc plate volts = 150, grid supply volts = -1.7, grid resistor = 0.5 megohm, and metal shell connected to ground.

Note 7: With 100 volts dc applied between heater and cathode.

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 RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 1000 max. g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-Impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted, supplied with normal heater voltage only, and subjected for 48 hours to 2.5-g vibrational acceleration at 60 cycles per second in a direction perpendicular to the longitudinal axis of the tube. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

Variable-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in a direction perpendicular to the longitudinal axis of the tube through the frequency range from 50 to 15,000 cycles per second under the following conditions: a sweep rate of one octave per 30 seconds from

50 to 3000 cps, a 7-second sweep from 3000 to 15,000 cps, and a constant vibrational acceleration of 1 g. During the test, tube must not show an rms output voltage in excess of: (1) 35 millivolts from 50 to 3000 cps, (2) 60 millivolts from 3000 to 6000 cps, and (3) 500 millivolts from 6000 to 15,000 cps.

Low-Pressure Voltage-Breakdown Test:

This test is performed on a sample lot of tubes from each production run. In this test, tubes are operated with 240 rms volts applied between plate and all other electrodes and will not break down or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet.

Heater Cycling:

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

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100 volts negative with respect to cathode; grid, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters, heater-cathode shorts, and heater-cathode leakage current.

Shorts and Continuity:

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 2, paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper[c]. See accompanying *Shorts-Test Acceptance-Limits* curve. Tubes are criticized for permanent or temporary shorts and open circuits.

Early-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that tubes are properly stabilized. In this test, tubes are operated for 20 hours at maximum-rated plate dissipation. After 2 hours of operation and again after 20 hours of operation, tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after two or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early-hour inoperatives. Tubes are operated for 100 hours at maximum-rated plate dissipation, and then subjected to the Shorts and Continuity test previously described. Tubes must show a value not less than 6200 micromhos for Transconductance (1), and a value not greater than 0.2 microamperes for reverse grid current under conditions specified in CHARACTERISTICS RANGE VALUES.

1000-Hour Conduction Life Performance:

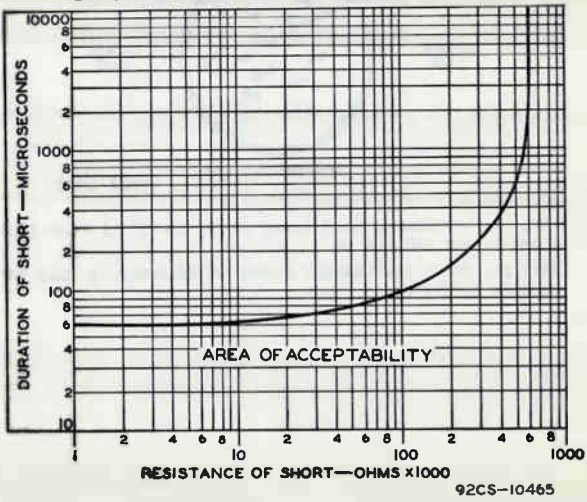
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation, and then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent at 500 hours, and 20 per cent at 1000 hours.

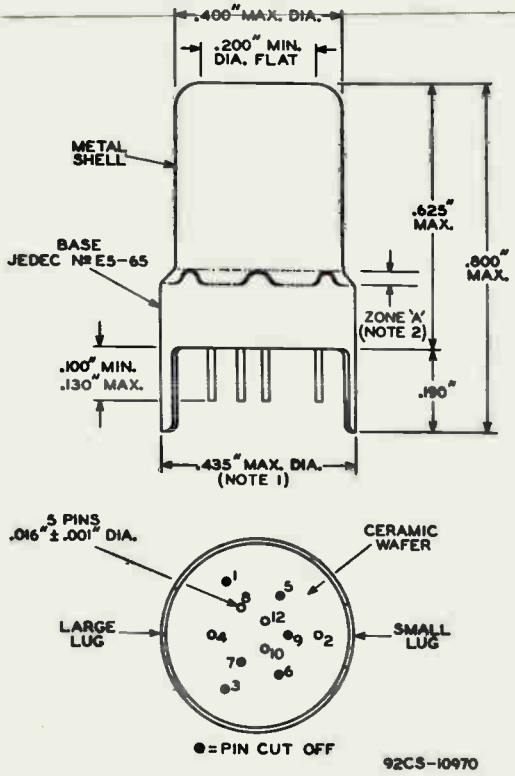
1000-Hour Standby Life Performance:

This test is performed on a sample lot of tubes from each production run. The tubes are operated for 1000 hours with only normal heater voltage applied. Tubes are criticized for inter-electrode leakage, reverse grid current, change in trans-conductance of individual tubes from values at 0-hours and cathode interface resistance greater than 25 ohms. Interface resistance is measured by Method B of ASTM specification F300-57T.

[c] Specifications for tapes supplied on request.

SHORTS-TEST ACCEPTANCE LIMITS

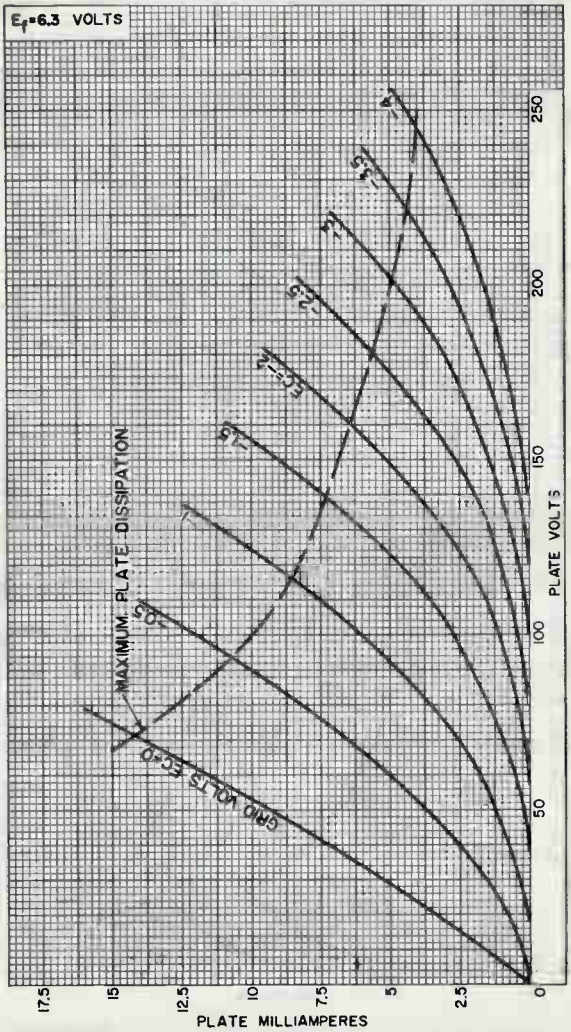




NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

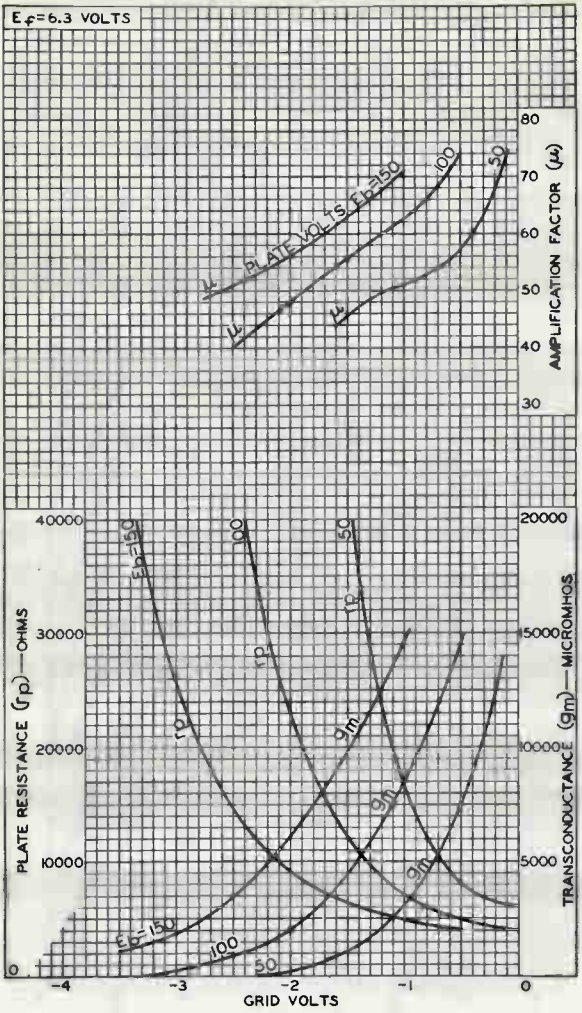
NOTE 2: SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A" BETWEEN BROKEN LINES.

AVERAGE PLATE CHARACTERISTICS



92CM-10965

AVERAGE CHARACTERISTICS



92CM-10967

High-Mu Twin Triode

9-PIN MINIATURE TYPE

For Use in Mobile-Communications Equipment Operating from 6-Cell Storage-Battery Systems

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values):*		
Voltage (AC or DC)[a]	13.5 ± 1.5	volts
Current at heater volts = 13.5	0.150	amp
Peak heater–cathode voltage (Each unit):		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Direct Interelectrode Capacitances (Approx.):

	Without External Shield	*With External Shield*[b]	
Grid-Drive Operation:			
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)	0.45	1.2	μμf
Plate to cathode and heater (Unit No.2)	0.38	1.3	μμf
Cathode-Drive Operation:			
Cathode to plate (Unit No.1)	0.2	0.18[d]	μμf
Cathode to plate (Unit No.2)	0.24	0.2[d]	μμf
Cathode to grid and heater (Each unit)	5	5[d]	μμf
Plate to grid and heater (Unit No.1)	1.9	2.7[d]	μμf
Plate to grid and heater (Unit No.2)	1.8	2.7[d]	μμf
Heater to cathode (Each unit)	2.8	2.8[c]	μμf
Plate to plate	0.24	–	μμf

Characteristics, Class A_1 Amplifier (Each Unit):

Heater Voltage	13.5	volts
Plate Supply Voltage	250	volts
Cathode Resistor	200	ohms
Amplification Factor	60	
Plate Resistance (Approx.)	10900	ohms
Transconductance	5500	μmhos
Plate Current	10	ma
Grid Voltage (Approx.) for plate μa = 10	−12	volts

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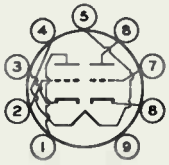
Mechanical:

Operating Position	Any
Type of Cathodes	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9EP

Pin 1 - Plate of Unit No.2
Pin 2 - Grid of Unit No.2
Pin 3 - Cathode of Unit No.2
Pin 4 - Heater
Pin 5 - Heater



Pin 6 - Plate of Unit No.1
Pin 7 - Grid of Unit No.1
Pin 8 - Cathode of Unit No.1
Pin 9 - Do Not Use

AMPLIFIER — Class A1

Values are for Each Unit

Maximum Ratings, *Absolute-Maximum 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
BULB TEMPERATURE (At hottest point on bulb surface)	180 max.	°C

Maximum Circuit Values:

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

[a] Heater will withstand momentary excursions from 11.0 to 16.0 volts.
[b] With external shield JEDEC No.315 connected to cathode of unit under test except as noted.
[c] With external shield JEDEC No.315 connected to ground.
[d] With external shield JEDEC No.315 connected to grid of unit under test.

SPECIAL RATINGS AND PERFORMANCE DATA

Heater-Cycling:

Cycles of Intermittent Operation . . . . . 1160 min. cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater volts = 19.5 cycled one minute on and two minutes off; heater 135 volts negative with respect to cathode; all other elements

connected to ground. At the end of this test, tubes are tested for heater–cathode shorts and open circuits.

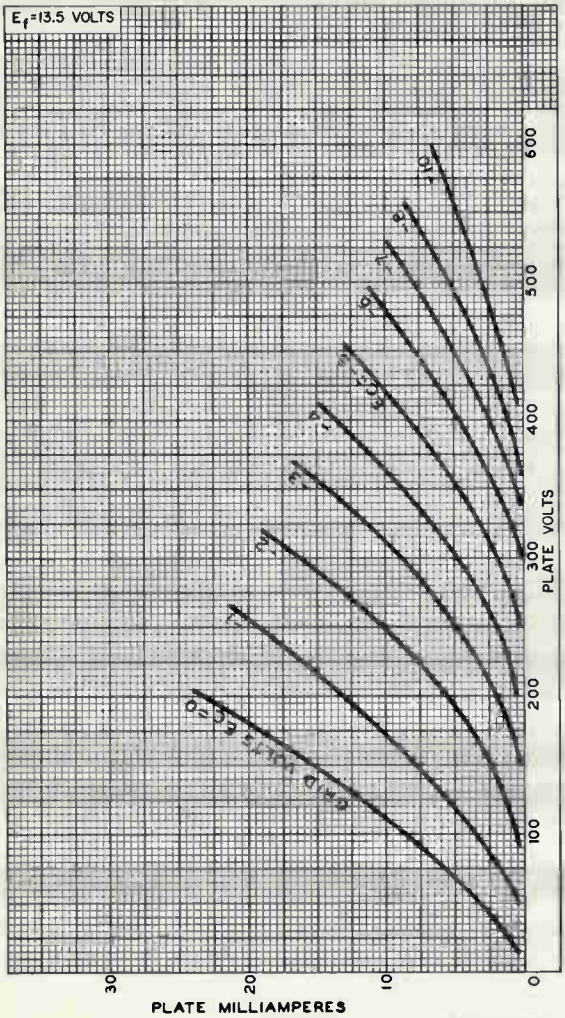
Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: Units connected in parallel, heater volts = 13.5, plate-supply volts = 250, grid volts = -3, plate load resistor (ohms) = 2000, and vibrational acceleration = 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 150 millivolts.

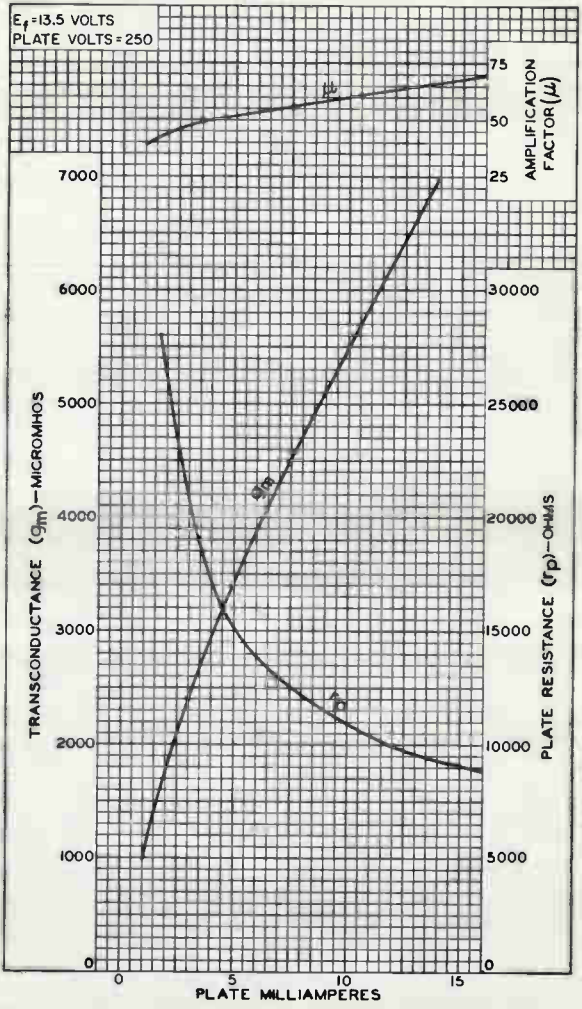
500-Hour Intermittent Life Performance:

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. Life testing is conducted under the following conditions: Heater volts = 15.0 and maximum-rated plate dissipation.

AVERAGE PLATE CHARACTERISTICS



AVERAGE CHARACTERISTICS



92CM-11486

Beam Power Tube

9-PIN MINIATURE TYPE

Quick-Heating-Filament Type for Mobile-Communications Equipment

GENERAL DATA

Electrical:

Filament, Coated:		
Voltage (AC or DC)	6.3 ± 10%	volts

When operated from storage-battery systems, the filament may be subjected to voltage variations as great as ± 20 per cent. Although such extremes in filament voltage may be tolerated for short periods, increased equipment reliability can be achieved with improved supply-voltage regulation.

Current at 6.3 volts	0.65	amp
Heating time	Less than 1	second
Direct Interelectrode Capacitances:[a]		
Grid No.1 to plate	0.14 max.	pf
Grid No.1 to filament, grid No.3, and grid No.2	8.5	pf
Plate to filament, grid No.3, and grid No.2	5.5	pf

Characteristics, Class A_1 Amplifier:

Plate Voltage	200	volts
Grid No.3	*Connected to pin 1 at socket*	
Grid-No.2 Voltage	185	volts
Grid-No.1 Voltage	-6	volts
Mu-Factor, Grid No.2 to Grid No.1	11.5	
Transconductance	6700	μmhos
Plate Current	36	ma
Grid-No.2 Current	2.5	ma

Mechanical:

Operating Position	Vertical, base up or down, or Horizontal with pins 2 and 8 in vertical plane
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

7905

Basing Designation for BOTTOM VIEW. 9P8

Pin 1 – Filament (–)
Pin 2 – Grid No.1
Pin 3 – Grid No.2
Pin 4 – LC (See NOTE)
Pin 5 – LC (See NOTE)
Pin 6 – Plate
Pin 7 – Grid No.3
Pin 8 – Grid No.2
Pin 9 – Filament (+)

NOTE: May be used only under conditions specified in *Operating Considerations*.

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[b]
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum ICAS[c] Ratings, ***Absolute-Maximum Values:***

	Up to 175 Mc	
DC PLATE VOLTAGE	300 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to pin 1 at socket*	
DC GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 max.	volts
DC GRID-No.2 VOLTAGE	250 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	–125 max.	volts
DC PLATE CURRENT	60 max.	ma
DC GRID-No.2 CURRENT	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	ma
PLATE INPUT	18 max.	watts
GRID-No.2 INPUT	1.5 max.	watts
PLATE DISSIPATION	10 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	°C

Typical ICAS[c] Operation:[d]

	As amplifier at 175 Mc		
DC Plate Voltage	300	300	volts
Grid No.3	*Connected to pin 1 at socket*		
DC Grid-No.2 Voltage[e]	160	185	volts
DC Grid-No.1 Voltage[f] from a grid-No.1 resistor of 18,000 ohms	–36	–39	volts
Peak RF Grid-No.1 Voltage	41	43	volts
DC Plate Current	50	60	ma
DC Grid-No.2 Current	2.5	4	ma
DC Grid-No.1 Current (Approx.)	2	2.2	ma
Driving Power[g] (Approx.)	1	1	watt
Useful Power Output[h] (Approx.)	5.5	7	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

PLATE MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum ICAS[c] Ratings, *Absolute-Maximum Values:*

	Up to 175 Mc	
DC PLATE VOLTAGE	250 max.	volts
GRID No.3	*Connect to pin 1 at socket*	
DC GRID-No.2 VOLTAGE	250 max.	volts
DC GRID-No.1 VOLTAGE	−125 max.	volts
DC PLATE CURRENT	60 max.	ma
DC GRID-No.2 CURRENT	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	ma
PLATE INPUT	15 max.	watts
GRID-No.2 INPUT	1.4 max.	watts
PLATE DISSIPATION	7 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	°C

Typical ICAS[c] Operation:[d]

	At 175 Mc	
DC Plate Voltage	250	volts
Grid No.3	*Connected to pin 1 at socket*	
DC Grid-No.2 Voltage	250	volts
DC Grid-No.1 Voltage[f] from a grid-No.1 resistor of 33,000 ohms	−70	volts
Peak RF Grid-No.1 Voltage	75	volts
DC Plate Current	60	ma
DC Grid-No.2 Current	2.5	ma
DC Grid-No.1 Current (Approx.)	2.1	ma
Driving Power[g] (Approx.)	1	watt
Useful Power Output[h] (Approx.)	8.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

FREQUENCY MULTIPLIER

Maximum ICAS[c] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	300 max.	volts
GRID No.3	*Connect to pin 1 at socket*	
DC GRID-No.2 SUPPLY VOLTAGE	300 max.	volts
DC GRID-No.2 VOLTAGE	250 max.	volts
DC GRID-No.1 VOLTAGE	−125 max.	volts
DC PLATE CURRENT	50 max.	ma
DC GRID-No.2 CURRENT	10 max.	ma
DC GRID-No.1 CURRENT	5 max.	ma
PLATE INPUT	15 max.	watts
GRID-No.2 INPUT	1.5 max.	watts
PLATE DISSIPATION	10 max.	watts
BULB TEMPERATURE (At hottest point on bulb surface)	225 max.	°C

Typical ICAS[c] Operation:

As doubler to 175 Mc			
DC Plate Voltage	250	300	volts
Grid No.3	*Connected to pin 1 at socket*		
DC Grid-No.2 Voltage[e]	200	215	volts
DC Grid-No.1 Voltage[f] from a grid-No.1 resistor of 53,000 ohms	-53	-80	volts
Peak RF Grid-No.1 Voltage	60	87	volts
DC Plate Current	45	50	ma
DC Grid-No.2 Current	3.4	3.4	ma
DC Grid-No.1 Current (Approx.)	1	1.5	ma
Driving Power[g] (Approx.)	0.4	0.5	watt
Useful Power Output[j] (Approx.)	2.5	3.5	watts
As tripler to 175 Mc			
DC Plate Voltage	250	250	volts
Grid No.3	*Connected to pin 1 at socket*		
DC Grid-No.2 Voltage[e]	180	225	volts
DC Grid-No.1 Voltage[g] from a grid-No.1 resistor of:			
50,000 ohms	-90	-	volts
60,000 ohms	-	-108	volts
Peak RF Grid-No.1 Voltage	105	118	volts
DC Plate Current	40	50	ma
DC Grid-No.2 Current	2.5	3.4	ma
DC Grid-No.1 Current (Approx.)	1.8	1.8	ma
Driving Power[g] (Approx.)	0.4	0.6	watt
Useful Power Output[h] (Approx.)	1.4	2	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	0.1 max.	megohm

[a] Without external shield.

[b] Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

[c] Intermittent Commercial and Amateur Service.

[d] Pins 4 and 5 at rf ground.

[e] Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider. If a series resistor is used, it should be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed.

[f] Obtained from a grid-No.1 resistor, or from a combination of grid-No.1 resistor and either fixed supply or cathode resistor. The combination of grid-No.1 resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

[g] Driving power includes circuit losses and is the actual power measured at the input to the grid circuit.

[h] Measured at load.

[j] Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are made.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current	1	0.59	0.71	amp
Transconductance	1,2	5700	–	μmhos
Plate Current	1,2	27	52	ma
Plate Current	1,3	–	75	μa
Grid-No.2 Current	1,2	–	5	ma
Reverse Grid-No.1 Current	1,4	–	1	μa
Leakage Resistance:				
Between grid No.1 and all other electrodes tied together.	1,5	100	–	megohms
Between plate and all other electrodes tied together.	1,6	100	–	megohms

Note 1: With 6.3 volts dc on filament.

Note 2: With dc plate volts = 200, grid No.3 connected to pin 1 at socket, dc grid-No.2 volts = 185, and dc grid-No.1 volts = −6.

Note 3: With dc plate volts = 200, grid No.3 connected to pin 1 at socket, dc grid-No.2 volts = 185, and dc grid-No.1 volts = −36.

Note 4: With dc plate volts = 215, grid No.3 connected to pin 1 at socket, dc grid-No.2 volts = 215, and dc grid-No.1 resistor = 0.1 megohm.

Note 5: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 6: With plate 300 volts negative with respect to all other electrodes tied together.

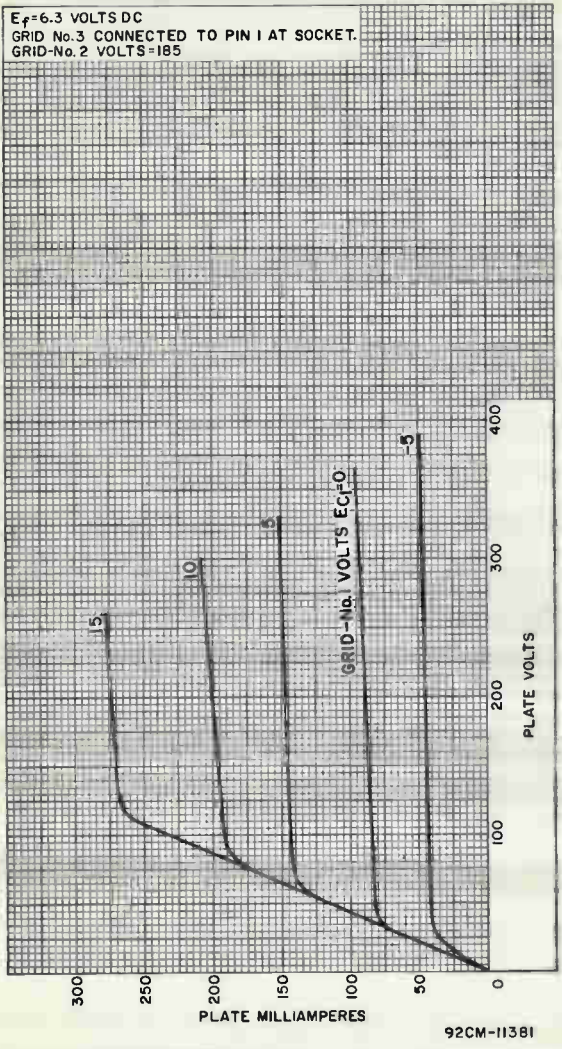
OPERATING CONSIDERATIONS

The socket connections to pins 4 and 5, which are designated LC on the basing diagram, may be used to minimize the absorption of rf power in the filament circuit by connecting pins 4 and 5 to ground through a capacitor, close to the socket. Pin 1 is directly grounded and pin 9 is bypassed by using a feedthrough capacitor when bringing this filament lead through the chassis.

Shielding of the 7905 may be used in "straight-through" rf amplifier service to minimize external feedback from the plate to grid No.1. A grounded shield crossing the terminal end of the tube socket through the space between pins 2 and 3 and the space between pins 8 and 9, is generally adequate for this purpose. No shielding is necessary for either frequency doubler or tripler operation.

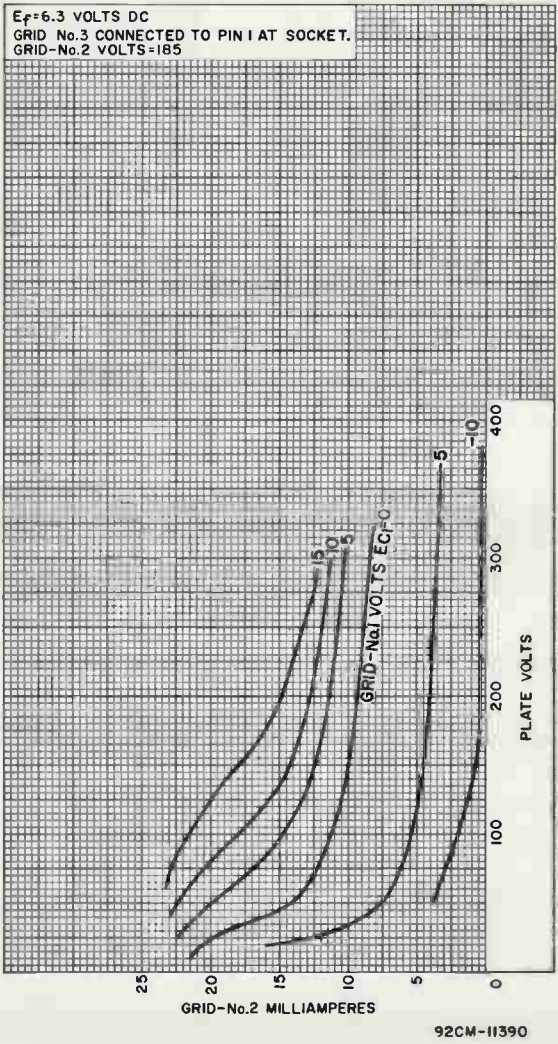
7905

AVERAGE PLATE CHARACTERISTICS

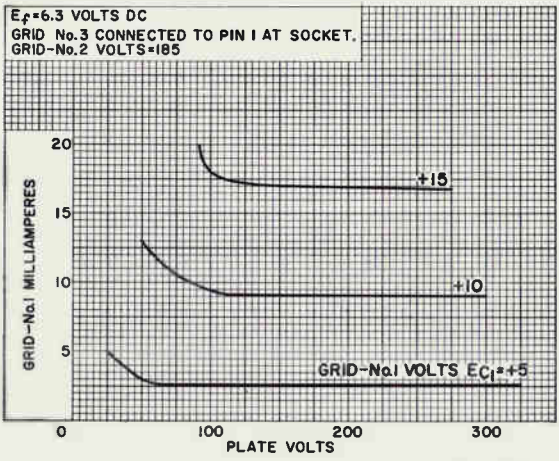


92CM-11381

AVERAGE CHARACTERISTICS



AVERAGE CHARACTERISTICS



92CS-11383

Medium-Mu Triode

NUVISTOR TYPE

For Use with Low-Voltage Power Supplies in Industrial and Military Applications

GENERAL DATA

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	6.3±0.6	volts
Current at heater volts = 6.3	0.135	amp
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: ←

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
Type of Cathode	Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1.9 grams
Envelope	Metal Shell MT4

Socket:

Crimp Mounting —
Cinch Mfg.,Co., 1026 South Homan Ave., Chicago 24, Ill., No.133 65 10 001.
Industrial Electronic Hardware Corp., 109 Prince Street, New York 12, N.Y., No.MSN 0905-1, MSN 0905-2, MSN 0905-3; or equivalent.

Flange Mounting —
Cinch Mfg. Co., No.133 65 10 003, or equivalent.

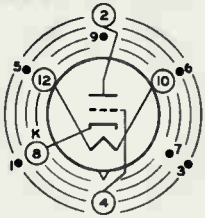
Printed Board (Stand-off) —
Cinch Mfg. Co., No.133 65 10 041, or equivalent.

← Indicates a change.

8056

Base. . . Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)
Basing Designation for BOTTOM VIEW. 12AQ

Pin 1[a] - Do Not Use
Pin 2 - Plate
Pin 3 - Same as Pin 1
Pin 4 - Grid
Pin 5 - Same as Pin 1
Pin 6 - Same as Pin 1
Pin 7 - Same as Pin 1
Pin 8 - Cathode
Pin 9 - Same as Pin 1
Pin 10 - Heater
Pin 12 - Heater



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

INDUSTRIAL SERVICE

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:

Plate Supply Voltage	12	24	volts
Grid Supply 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:[b]

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

→ [a] Pin is of a length such that its end does not touch the socket insertion plane.

[b] For operation at metal-shell temperatures up to 150° C., metal-shell temperatures are measured in zone "A" (See *Dimensional Outline*). For temperatures above 150° C., see accompanying *Grid-Circuit-Resistance Rating Chart*.

→ **CHARACTERISTICS RANGE VALUES**

	Note	Min.	Max.	
Heater Current	1	0.125	0.145	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.8	2.4	pf

→ Indicates a change.

	Note	Min.	Max.	
Grid to cathode, shell, and heater	2	3.4	4.6	pf
Plate to cathode, shell, and heater	2	1.4	2.0	pf
Heater to cathode	2	1.1	1.7	pf
Plate to cathode	2	0.26	0.42	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
Transconductance Change: Difference between transconductance (1) and transconductance (2), expressed in per cent of transconductance (1)	–	–	15	%
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
Leakage Resistance:				
Between grid and all other electrodes tied together	1,8	1000	–	megohms
Between plate and all other electrodes tied together	1,9	1000	–	megohms

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

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

Note 3: With dc plate supply volts = 24, cathode resistor = 100 ohms, and cathode-bypass capacitor = 1000 μf.

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

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With dc plate volts = 40, grid supply volts = -2, grid resister = 1 megohm, and metal shell connected to ground.

Note 7: With 100 volts dc applied between heater and cathode.

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

Note 9: With plate 100 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . . 1000 max. g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid

current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Test described below.

Fatigue Rating:

Vibrational Acceleration. . . . . 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted, supplied with nominal heater voltage only, and subjected for 48 hours to 2.5-g vibrational acceleration at 60 cycles per second in the X_1 position. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

Variable-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in the X_1 position through the frequency range from 50 to 15,000 cycles per second under the following conditions: a sweep rate of one octave per 30 seconds from 50 to 3000 cps, a 7-second sweep from 3000 to 15,000 cps, and a constant vibrational acceleration of 4 g. During the test, tube must not show an output voltage across the plate-load resistor in excess of: (1) 20 rms millivolts from 50 to 3000 cps, (2) 50 peak millivolts from 3000 to 6000 cps, and (3) 500 peak millivolts from 6000 to 15,000 cps.

Low-Pressure Voltage-Breakdown Test:

This test is performed on a sample lot of tubes from each production run. In this test, tubes are operated with 250 rms volts applied between plate and all other electrodes and will not break or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet.

Heater Cycling Life Performance:

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

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 8.5 cycled one minute on and two minutes off; heater 180 volts negative with respect to cathode; grid, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters and heater-cathode shorts.

Shorts and Continuity:

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-ID, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper[c]. See accompanying *Shorts-Test Acceptance-Limits* curve. Tubes are criticized for permanent or temporary shorts and open circuits.

Early-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that tubes are properly stabilized. In this test, tubes are operated for 20 hours at maximum-rated plate dissipation. After 2 hours of operation and again after 20 hours of operation, tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early-hour inoperatives. Tubes are operated for 100 hours at maximum-rated plate dissipation, and then subjected to the Shorts and Continuity Test previously described. Tubes must then show a transconductance of not less than 5500 μmhos under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1).

1000-Hour Conduction 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 guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation[d], and then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent at 500 hours, and 20 per cent at 1000 hours.

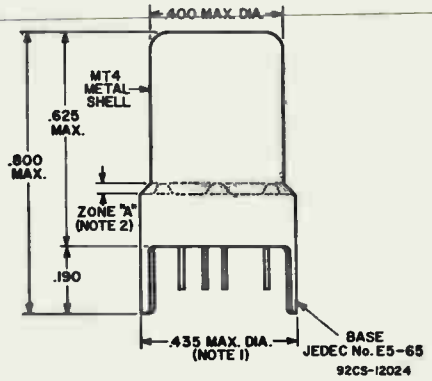
1000-Hour Standby Life Performance:

This test is performed on a sample lot of tubes from each production run. The tubes are operated for 1000 hours with only heater voltage applied. Tubes are criticized for interelectrode leakage, reverse grid current, and for cathode interface resistance greater than 25 ohms. Interface resistance is measured by Method B of ASTM specification F300-57T.

[c] Specifications for tapper supplied on request.
[d] At metal-shell temperature of 150° C.

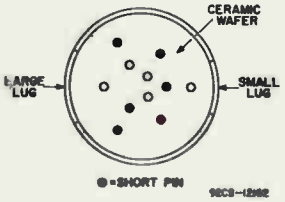
← Indicates a change.

8056

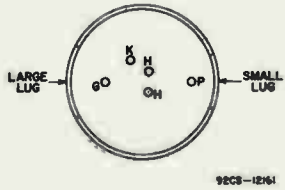


DIMENSIONS IN INCHES

BOTTOM VIEW
Showing Arrangement for All 11 Base Pins



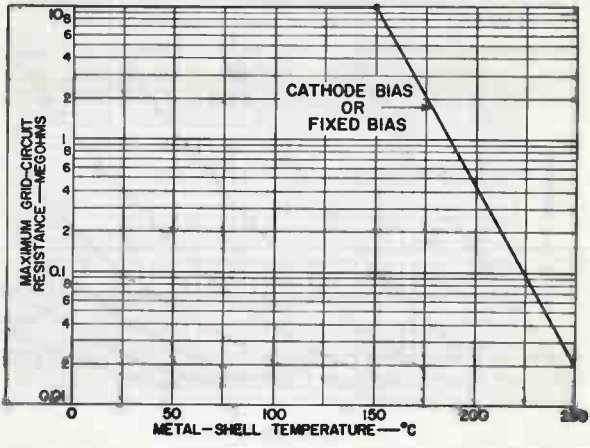
MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown



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

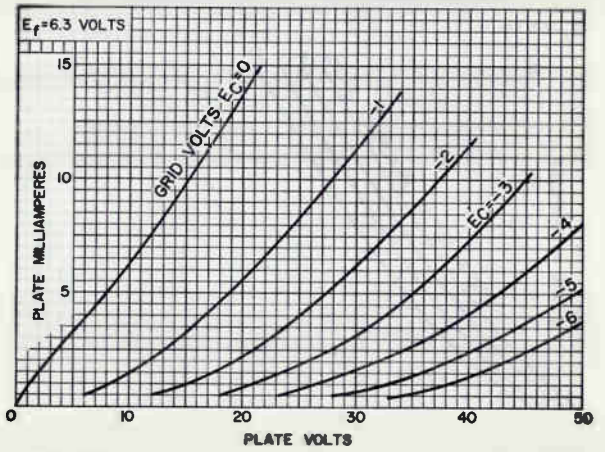
NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

GRID-CIRCUIT-RESISTANCE RATING CHART



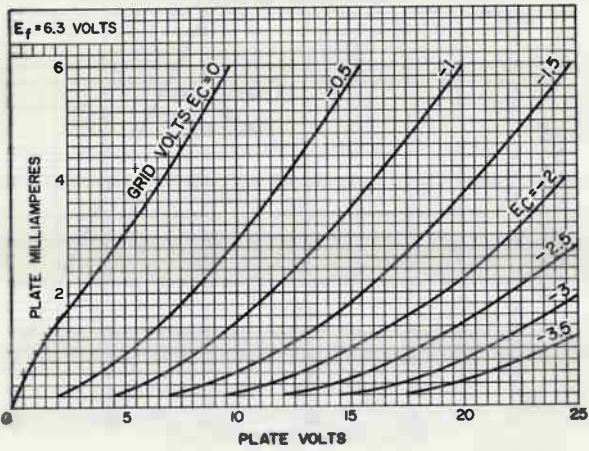
92CS-11479RI

AVERAGE PLATE CHARACTERISTICS



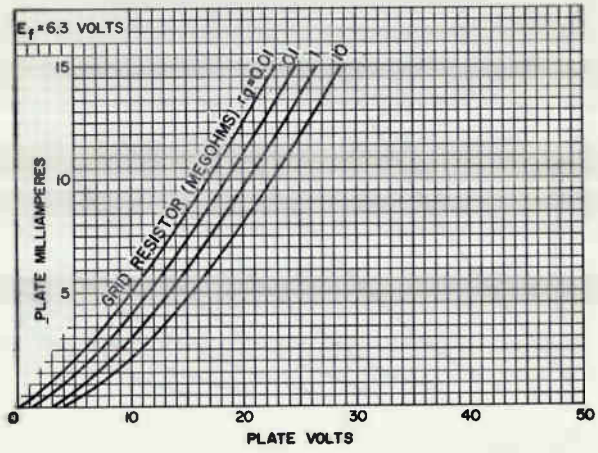
92CS-11469RI

AVERAGE PLATE CHARACTERISTICS



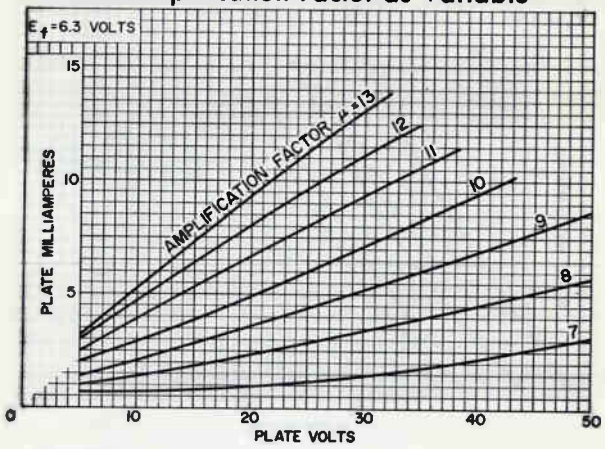
92CS-11467

AVERAGE PLATE CHARACTERISTICS
With Grid Resistor as Variable



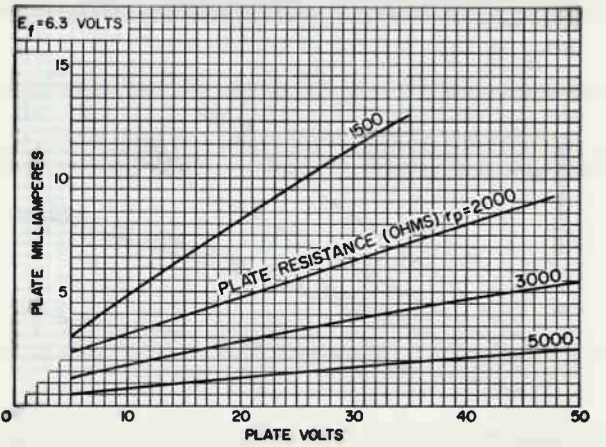
92CS-11466

AVERAGE PLATE CHARACTERISTICS
With Amplification Factor as Variable



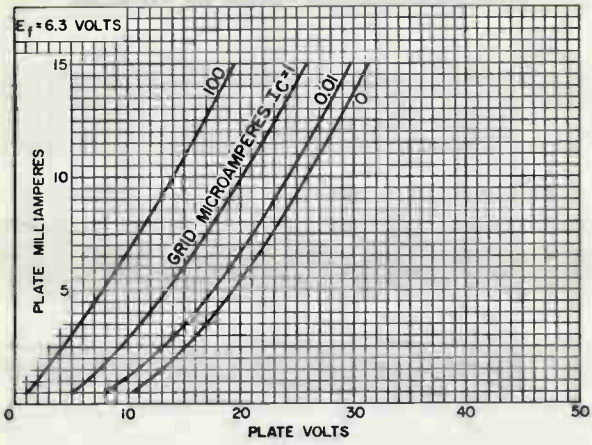
92CS-11471R1

AVERAGE PLATE CHARACTERISTICS
With Plate Resistance as Variable



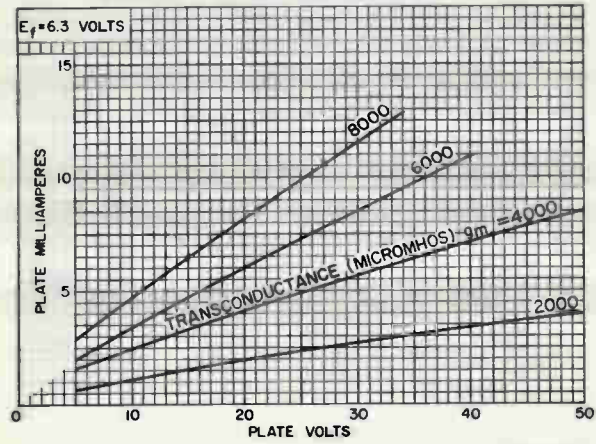
92CS-11465R2

AVERAGE PLATE CHARACTERISTICS
With Grid Current as Variable



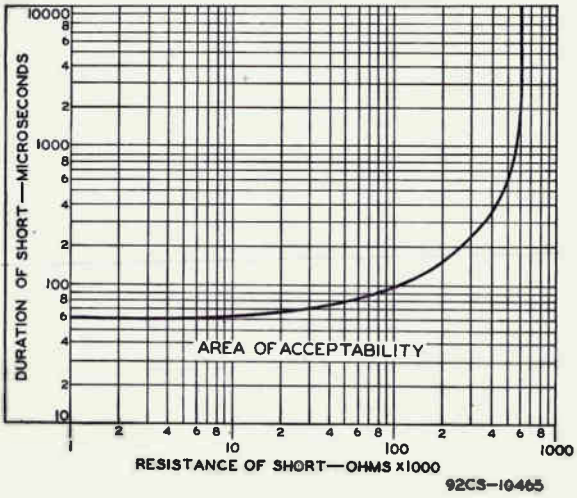
92CS-11468

AVERAGE PLATE CHARACTERISTICS
With Transconductance as Variable



92CS-11470R2

SHORTS-TEST ACCEPTANCE LIMITS



High-Mu Triode

NUVISTOR TYPE

For Cathode-Drive-Amplifier Applications at Frequencies Up to 1200 MHz and as an Oscillator Tube having Excellent Stability Over a Wide Range of Frequencies

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage, AC or DC	E_h	6.3	V
Heater Current at E_h = 6.3 V	I_h	135	mA
Direct Interelectrode Capacitances			
Input: K to (G, S, H)	c_i	6.0	pF
Output: P to (G, S, H)	c_o	1.3	pF
Cathode to plate	c_{kp}	0.046 max	pF
Heater to cathode	c_{hk}	1.4	pF

CLASS A$_1$ AMPLIFIER

For Following Characteristics see Conditions

Amplification Factor	μ	70	
Plate Resistance (Approx.)	r_p	5600	Ω
Transconductance	g_m	12400	μmho
DC Plate Current	I_b	10	mA
Cutoff DC Grid Voltage for I_b = 10 μA	$E_{c(co)}$	-5	V

Conditions

Heater Voltage	E_h	6.3	V
Plate Supply Voltage	E_{bb}	110	V
Grid Supply Voltage	E_{cc}	0	V
Cathode Resistor	R_k	47	Ω

ABSOLUTE-MAXIMUM RATINGS

For operation at any altitude

Plate Supply Voltage	E_{bb}	330	V
DC Plate Voltage	E_b	150	V
Grid Voltage			
DC positive value	E_c	0	V
DC negative value	E_c	-55	V
Peak Heater-Cathode Voltage	e_{hkm}	±100	V
Heater Voltage, AC or DC	E_h	5.7 to 6.9	
Average Cathode Current	$I_{k(av)}$	15	mA
Plate Dissipation	P_b	1.5	W

MAXIMUM CIRCUIT VALUES

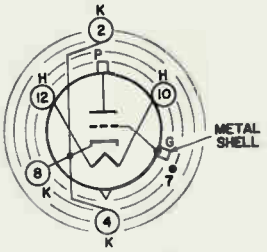
Grid-Circuit Resistance[a]			
For fixed-bias operation	$R_{g(ckt)}$	0.5	MΩ
For cathode-bias operation	$R_{g(ckt)}$	1	MΩ

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length (l_m)	0.985 in
Maximum Seated Length (l_{sm})	0.780 in
Maximum Diameter (d_m)	0.440 in
Weight (Approx.)	2.2 g
Dimensional Outline	JEDEC No.4-6
Envelope	JEDEC MT4
Base	Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-79)

BASING DIAGRAM (Bottom View)

Pin 2 – Cathode
Pin 4 – Cathode
Pin 7[b] – Do Not Use
Pin 8 – Cathode
Pin 10 – Heater
Pin 12 – Heater
Metal Shell–Grid
Top Cap – Plate



INDEX = LARGE LUG
● = SHORT PIN—IC

12CT

TYPICAL OPERATION

As Cathode-Drive RF Amplifier

Frequency	f	450	700	1200	MHz
Heater Voltage	E_h	6.3	6.3	6.3	V
Plate Supply Voltage	E_{bb}	110	110	110	V
Cathode Resistor	R_k	47	47	47	Ω
Average Plate Current	$I_{b(av)}$	10	10	10	mA
Bandwidth	–	6	12	12	MHz
Power Gain	–	16.5	12.5	10.5	dB
Noise Factor[c]	NF	6.5	9.5	12.2	dB

[a] For operation at metal-shell temperature of 150 °C. For operation at other metal-shell temperatures, see *Grid-Circuit Resistance Chart*. Metal-shell temperature are measured in zone "A" (See *Dimensional Outline*).

[b] Pin 7 is of such a length such that its end does not touch the socket insertion plane.

[c] Argon noise source. Input is tuned for optimum value.

→ Indicates a change.

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Electronic Components and Devices
Harrison, N. J.

INITIAL CHARACTERISTICS LIMITS

		Note	Min	Max	
Heater Current	I_h	1	0.125	0.145	A
Direct Interelectrode Capacitances					
Cathode to plate	c_{kp}	2	-	0.046	pF
Cathode to grid & shell and heater	c_i	2	5	7	pF
Plate to grid & shell and heater	c_o	2	1.1	1.5	pF
Heater to cathode	c_{hk}	2	1.1	1.7	pF
Plate Current (1)	1 I_b	1,3	7.8	13.2	mA
Plate Current (2)	2 I_b	1,4	-	50	μA
Transconductance (1)	1 g_m	1,3	10000	14800	μmho
Transconductance (2)	2 g_m	3,5	8700	-	μmho
Reverse Grid Current	$-I_c$	1,6	-	0.1	μA
Amplification Factor	μ	1,3	54	86	
Heater-Cathode Leakage Current	I_{hk}	1,7	-	±5	μA
Leakage Resistance:					
Between grid and all other electrodes tied together	r_{g-all}	1,8	5000	-	MΩ
Between plate and all other electrodes tied together	r_{p-all}	1,9	10000	-	MΩ

Note 1: With E_f = 6.3 V.

Note 2: Measured without external shield in accordance with the current issue of EIA Standard RS-191.

Note 3: With E_{bb} = 110 V, R_k = 47 Ω, C_k = 1000 μF.

Note 4: With E_b = 110 V, E_c = -5 V.

Note 5: With E_f = 5.7 V.

Note 6: With E_b = 150 V, E_c = -1.3 V, R_g = 0.5 MΩ.

Note 7: With E_{hk} = ±100 V.

Note 8: With E_g-all = -100 V.

Note 9: With E_p-all = -300 V.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating

Impact Acceleration . . . . . 1000 max g ←

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

← Indicates a change.

Variable-Frequency Vibration Performance

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in a direction perpendicular to the logitudinal axis of the tube through the frequency range from 50 to 15,000 c/s per second under the following conditions: a sweep rate of one octave per 30 seconds from 50 to 3000 c/s, a 7-second sweep from 3000 to 15,000 c/s, and a constant vibrational acceleration of 1 g. During the test, tube must not show an output voltage in excess of: (1) 35 millivolts rms from 50 to 3000 c/s, (2) 80 millivolts peak from 3000 to 6000 c/s, and (3) 700 millivolts peak from 6000 to 15,000 c/s.

Low-Pressure Voltage-Breakdown Test

This test is performed on a sample lot of tubes. In this test, tubes are operated with 250 volts rms applied between plate and all other electrodes and will not break down or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet.

Heater Cycling

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

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100 volts negative with respect to cathode; grid & metal shell and plate connected to ground. At the end of this test, tubes are tested for open heaters, heater-cathode shorts, and heater-cathode leakage current.

Shorts and Continuity

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-ID, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapperd. See accompanying Shorts-Teat Acceptance-Limits curve. Tubes are criticized for permanent or temporary shorts and open circuits.

1000-Hour Conduction 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 guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation and with a metal-shell temperature of 150 °C; then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent of 500 hours, and 20 per cent at 1000 hours.

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Interelectrode Leakage

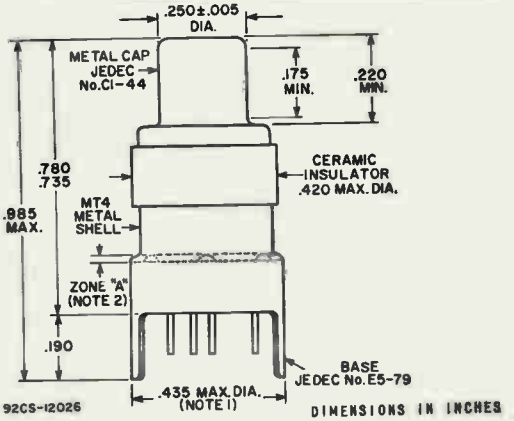
Leakage Resistance between plate and all other electrodes tied together . . . 10000 min megohms

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts (ac or dc) = 6.3, plate volts = 300 negative with respect to all other electrodes tied together.

Leakage Resistance between grid and all other electrodes tied together . . . 5000 min megohms

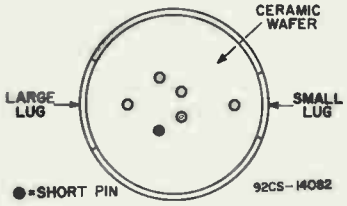
This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts (ac or dc) = 6.3, grid volts = 100 negative with respect to all other electrodes tied together.

Specification for tapper will be supplied on request.



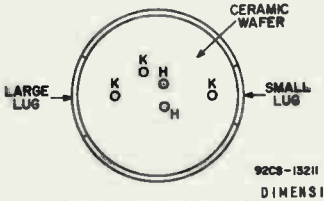
BOTTOM VIEW

Showing Arrangement of All 6 Base Pins



MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pin Not Shown



Note 1: Maximum outside diameter of 0.440 inch is permitted along 0.190" lug length.

Note 2: Metal-shell temperature should be measured in zone "A".

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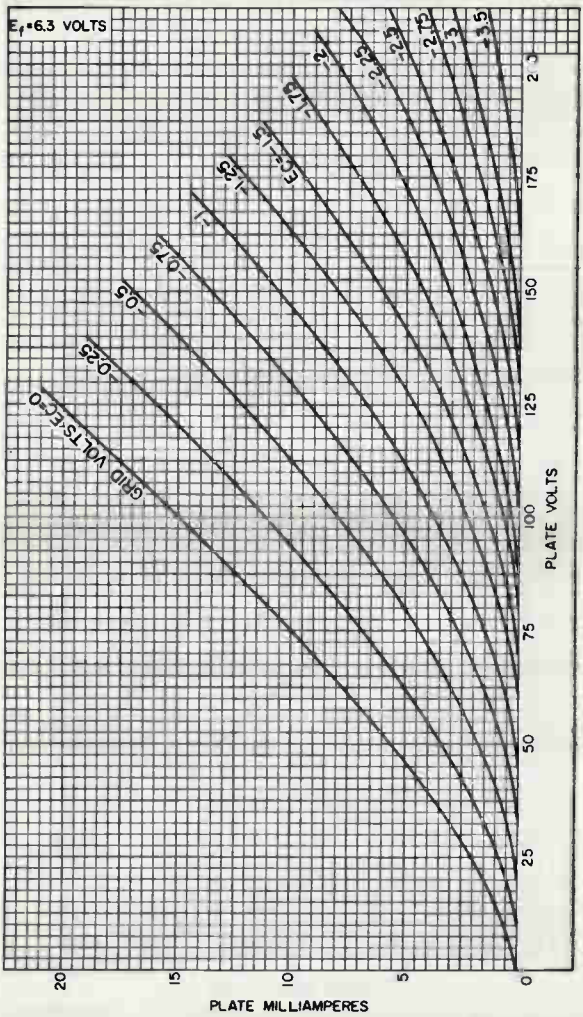
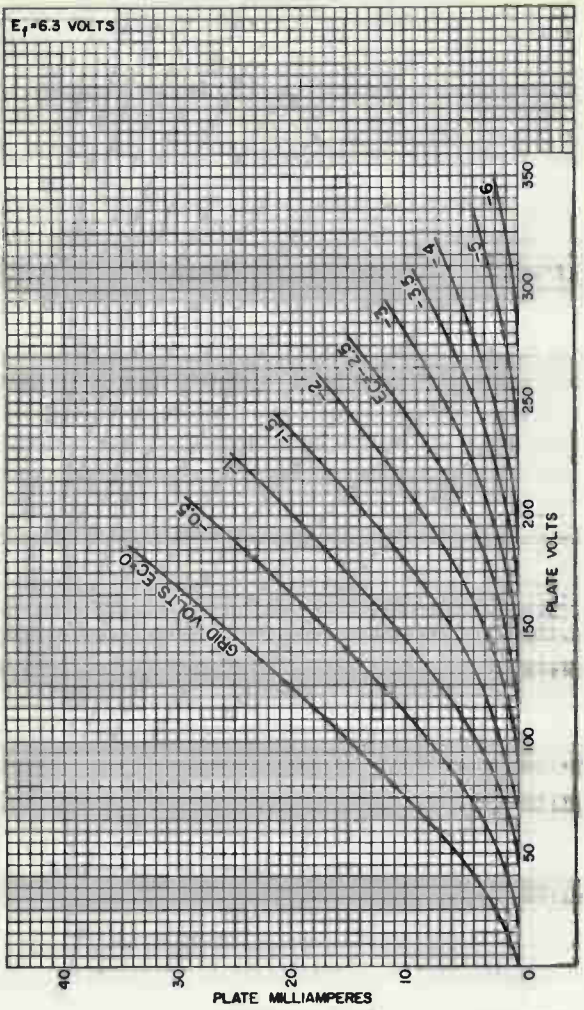
Average Plate Characteristics



92CM-11426RI

Average Plate Characteristics



92CM-11430RI

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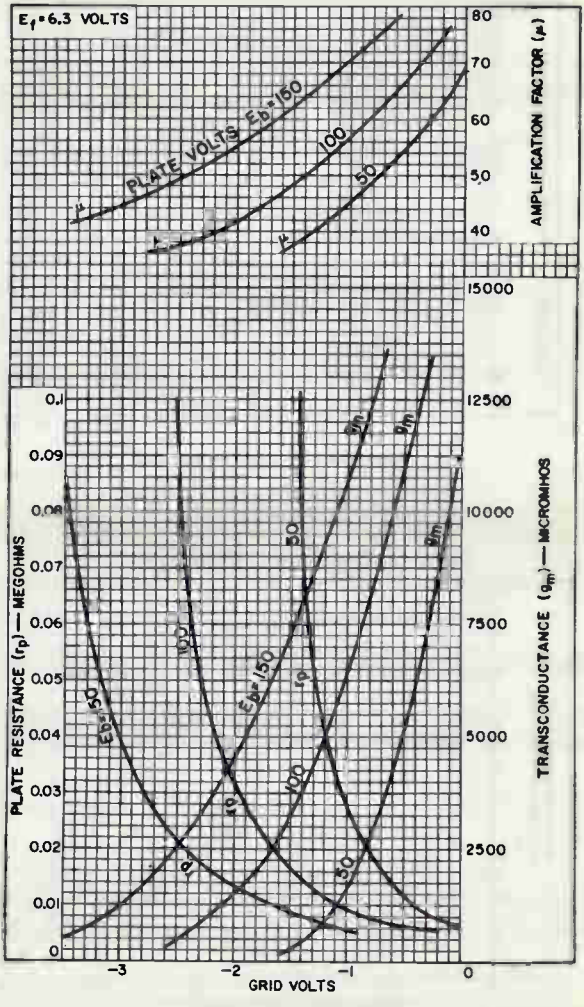
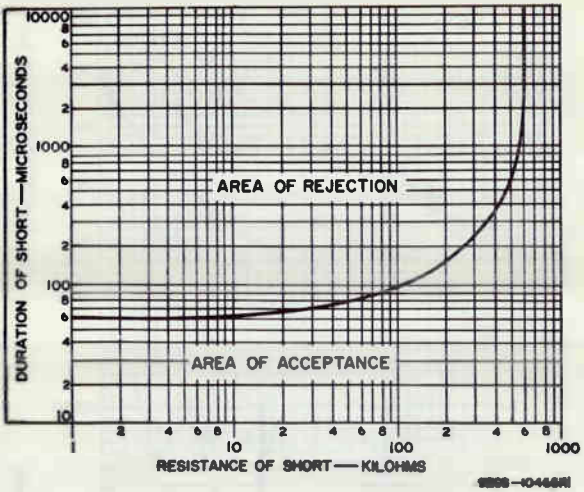
Average Characteristics

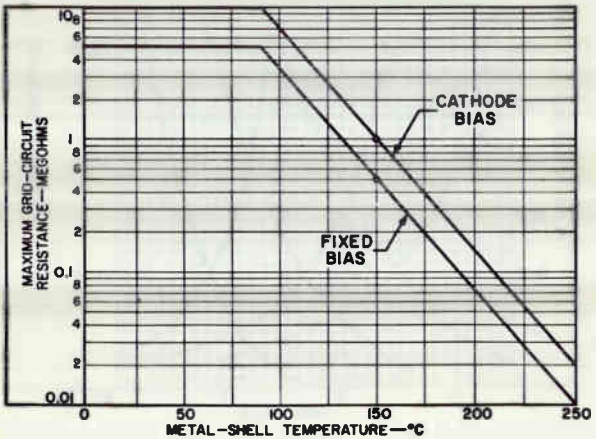


92CM-11410

Shorts-Test Acceptance Limits



Grid-Circuit-Resistance Chart



92CS-12022

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Power Pentode

9-PIN MINIATURE TYPE

For Mobile-Communications Equipment Operating from 6-Cell Storage-Battery Systems. Useful as a Class-C RF-Power-Amplifier, Oscillator, and Frequency-Multiplier Tube up to 40 Mc, and as a Modulator and AF-Power-Amplifier Tube.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings *(Absolute-Maximum Values)*:		
Voltage (AC or DC)[a]	13.5 ± 1.5	volts
Current at heater volts = 13.5	0.275	amp
Peak heater–cathode voltage:		
Heater negative with respect to cathode	120 max.	volts
Heater positive with respect to cathode	120 max.	volts
Direct Interelectrode Capacitances (Approx.):[b]		
Grid No.1 to plate	0.063	μμf
Grid No.1 to all other electrodes except plate	10.2	μμf
Plate to all other electrodes except grid No.1	3.5	μμf

Characteristics, Class A1 Amplifier:

Heater Voltage	13.5	volts
Plate Supply Voltage	250	volts
Grid No.3	*Connected to cathode at socket*	
Grid No.2 Supply Voltage	150	volts
Cathode Resistor	120	ohms
Plate Resistance (Approx.)	0.1	megohm
Transconductance	11500	μmhos
Plate Current	19	ma
Grid-No.2 Current	3.5	ma
Grid-No.1 Voltage (Approx.) for plate μa = 20	−10	volts

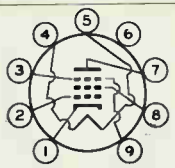
Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length	2-3/16"
Maximum Seated Length	1-15/16"
Length, Base Seat to Bulb Top (Excluding tip)	1-9/16" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)

8077/7054

Basing Designation for BOTTOM VIEW. 9GK

Pin 1 – Cathode
Pin 2 – Grid No.1
Pin 3 – Grid No.3, Internal Shield
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – No Internal Connection
Pin 7 – Plate
Pin 8 – Grid No.2
Pin 9 – Grid No.3, Internal Shield

AF POWER AMPLIFIER — Class A_1

Maximum Ratings, *Absolute-Maximum Values:*

PLATE VOLTAGE	330 max.	volts
GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
GRID-No.2 (SCREEN-GRID) VOLTAGE	180 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	55 max.	volts
Positive-bias value	0 max.	volts
GRID-No.2 INPUT	1 max.	watt
PLATE DISSIPATION	5 max.	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.25 max.	megohm

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[c] and RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE	300 max.	volts
DC GRID No.3 (SUPPRESSOR GRID)	*Connect to cathode at socket*	
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	175 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	50 max.	volts
DC PLATE CURRENT	33 max.	ma
DC GRID-No.2 CURRENT	5.5 max.	ma
DC GRID-No.1 CURRENT	3 max.	ma
GRID-No.2 INPUT	1 max.	watt
PLATE DISSIPATION	5 max.	watts

Typical Operation:

At frequencies up to 40 Mc

Heater Voltage	13.5	13.5	13.5	volts
DC Plate Voltage	200	250	300	volts
Grid No.3	*Connected to cathode at socket*			
DC Grid-No.2 Voltage	115	145	175	volts
DC Grid-No.1 Voltage	−7	−9	−12	volts
Peak RF Grid-No.1 Voltage	9	11	16	volts
DC Plate Current	14.5	20	26	ma
DC Grid-No.2 Current	3	4.1	5.5	ma
DC Grid-No.1 Current (Approx.)	0.6	0.85	1	ma

Driving Power (Approx.)	10	12	15	mw
Power Output (Approx.)	1.5	2.7	4	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 0.1 max. megohm

FREQUENCY MULTIPLIER

Maximum CCS[d] Ratings, *Absolute-Maximum Values:*

Same as for RF POWER AMPLIFIER & OSCILLATOR

Typical Operation:

As doubler up to 40 Mc

DC Plate Voltage	200	250	300	volts
Grid No.3	*Connected to cathode at socket*			
DC Grid-No.2 Voltage	115	145	175	volts
DC Grid-No.1 Voltage	-16	-20	-25	volts
Peak RF Grid-No.1 Voltage	19	24	31	volts
DC Plate Current	11	15	20	ma
DC Grid-No.2 Current	2	3	4	ma
DC Grid-No.1 Current (Approx.)	0.3	0.45	0.6	ma
Driving Power (Approx.)	5	9	13	mw
Useful Power Output (Approx.)	1.4	1.9	2.5	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 0.1 max. megohm

[a] The heater will take momentary excursions of 11.0 to 16.0 volts.

[b] Without external shield.

[c] Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

[d] Continuous Commercial Service.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.260	0.290	amp
Transconductance	1,2	8500	14500	μmhos
Plate Current	1,3	13	25	ma
Grid-No.2 Current	1,3	2	5	ma
Reverse Grid-No.1 Current	1,4	–	1.5	μa
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	20	μa
Heater positive with respect to cathode	1,5	–	20	μa
Leakage Resistance:				
Between grid-No.1 and all other electrodes tied together	1,6	50	–	megohms
Between plate and all other electrodes tied together	1,7	50	–	megohms

Note 1: With ac or dc heater volts = 13.5.

Note 2: With dc-plate-supply volts = 250, grid-No.2 volts = 150, grid No.3 connected to cathode at socket, cathode resistor (ohms) = 120, and cathode-bypass capacitor (μf) = 1000.

Note 3: With dc plate-supply volts = 250, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, and cathode resistor (ohms) = 120.

Note 4: With dc plate-supply volts = 250, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, cathode resistor (ohms) = 120, and grid-No.1 resistor (megohms) = 1.

Note 5: With 100 volts dc between heater and cathode.

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 & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 19.5 cycled one minute on and two minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

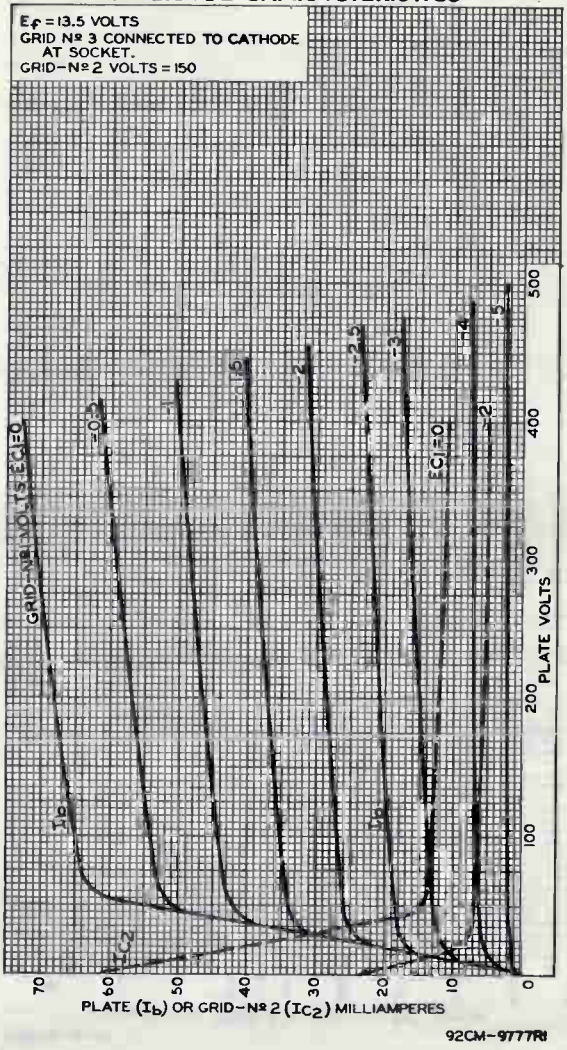
Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 13.5, plate-supply volts = 250, grid No.3 connected to cathode, grid-No.2 supply volts = 150, cathode resistor (ohms) = 120, cathode-bypass capacitor (μf) = 1000, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 150 millivolts.

500-Hour Intermittent Life Performance:

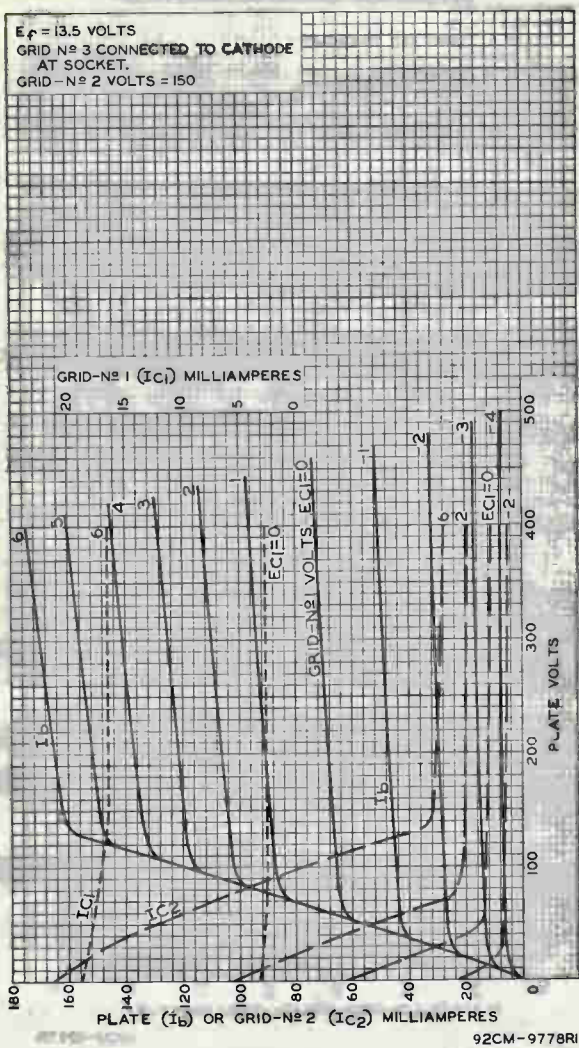
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate dissipation and grid-No.2 input.

AVERAGE CHARACTERISTICS



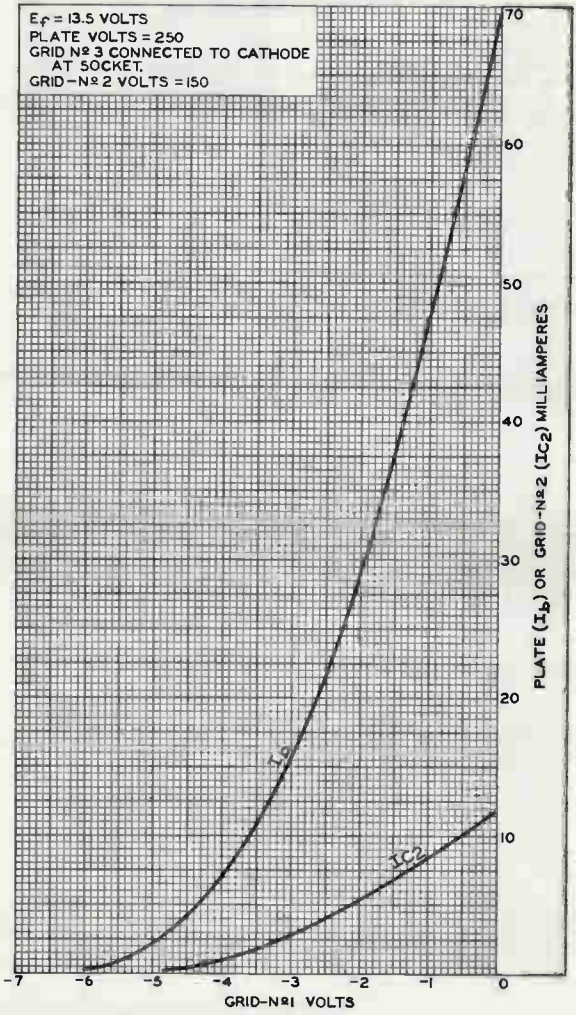
92CM-9777R1

AVERAGE CHARACTERISTICS



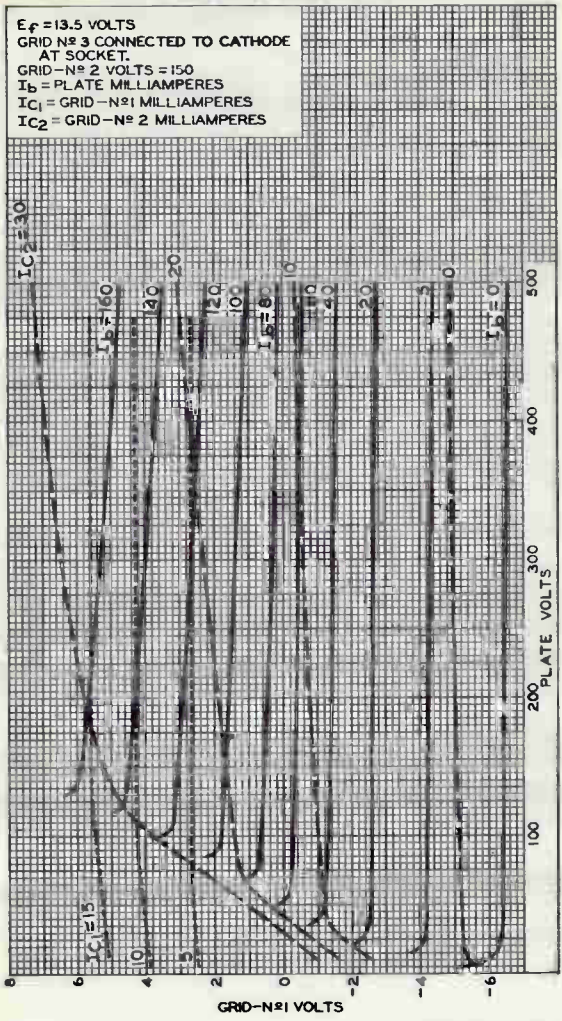
92CM-9778RI

AVERAGE CHARACTERISTICS



92CM-9775RI

AVERAGE CONSTANT-CURRENT CHARACTERISTICS



92CM–9776RI

Power Tetrode

NUVISTOR TYPE

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

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	watts
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
Type of Cathode	Coated Unipotential
Maximum Overall Length.	1.050"
Seated Length	0.790" to 0.840"
Maximum Diameter.	0.440"
Weight (Approx.).	2.4 grams
Envelope.	Metal Shell MT4 with Ceramic Insulator
Socket and Connector	See *Socket & Connector Information for RCA Nuvistor Tubes* at front of this Section
Cap	Skirted Miniature (JEDEC No.C1-44)
Base. . . .	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)

8380

Basing Designation for BOTTOM VIEW. 12AS

Pin 1[a] – Do Not Use
Pin 2 – Grid No.2
Pin 3[a] – Do Not Use
Pin 4 – Grid No.1
Pin 5[a] – Do Not Use
Pin 6[a] – Do Not Use
Pin 7[a] – Do Not Use
Pin 8 – Cathode
Pin 9[a] – Do Not Use
Pin 10 – Heater
Pin 12 – Heater
Top Cap – Plate

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

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:[b]		
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:[c]

	Specified	center value	
Heater Voltage			
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[d]	260	650	mw

Maximum Circuit Values:

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

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

[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-No.1-Circuit-Resistance Rating Chart*.

[c] 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.

[d] Measured at load.

CHARACTERISTICS RANGE VALUES

	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

	Note	Min.	Max.	
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 80-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) $\leq$ 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 = 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) $\leq$ 2, plate- and grid-No.1-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 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-ID, 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 = 1.35x 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.

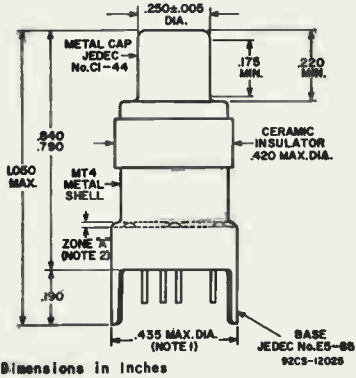
At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

Combined Oscillator-Doubler Life (100 Hours):

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

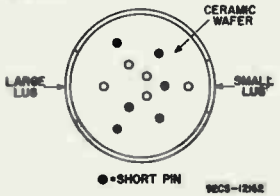
During this test, tubes are operated as a combined oscillator and frequency doubler at maximum-rated plate dissipation.

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.

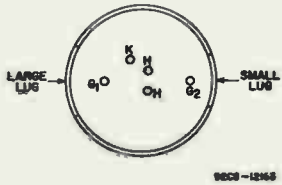


Dimensions in Inches

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins



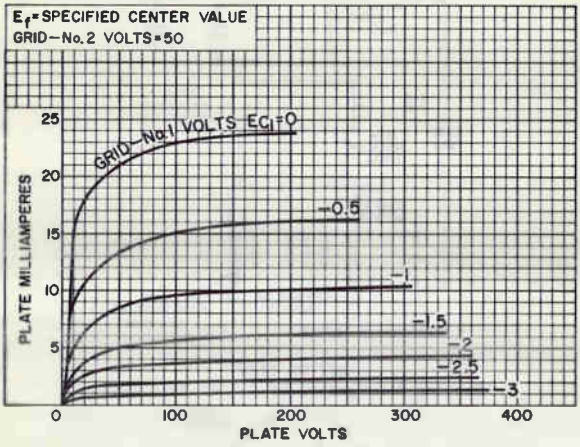
MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown



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

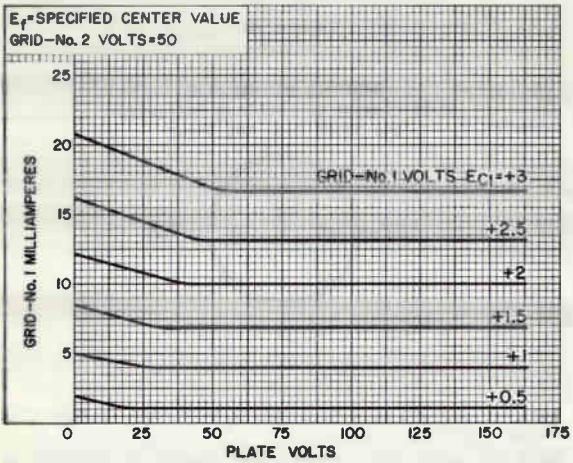
NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

AVERAGE PLATE CHARACTERISTICS



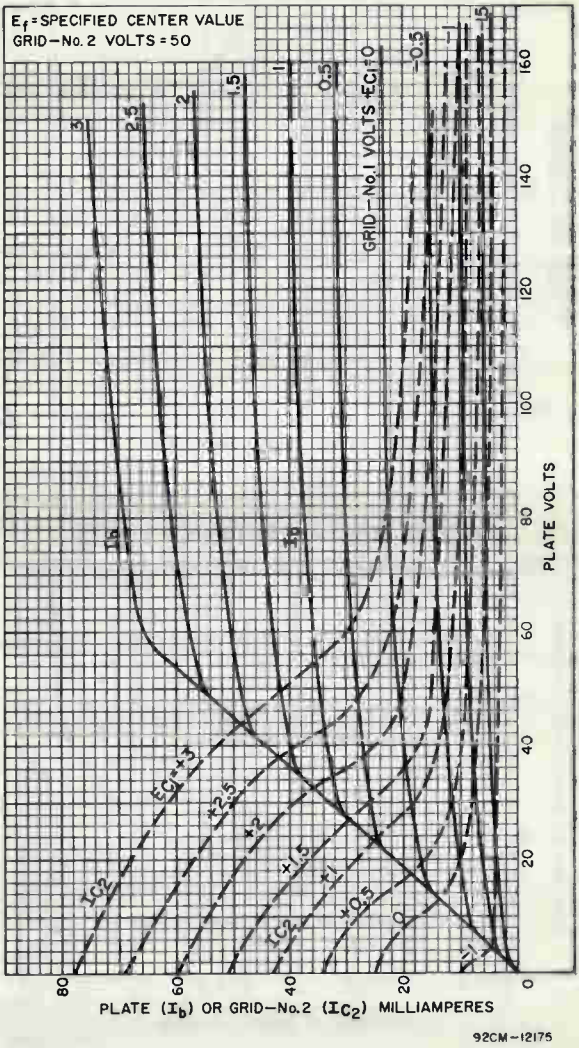
9220-12173

AVERAGE CHARACTERISTICS



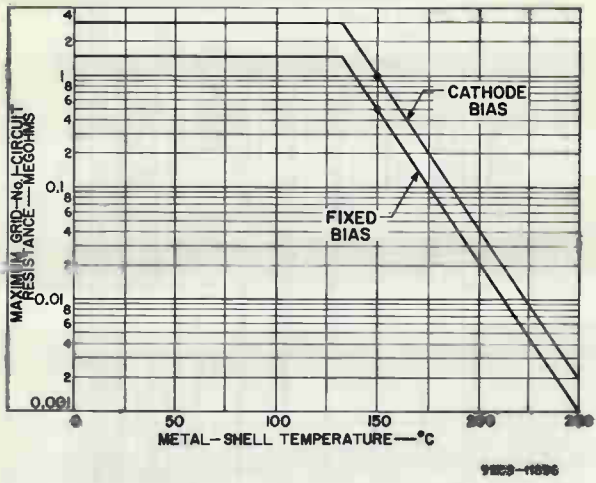
92CS-12172

AVERAGE CHARACTERISTICS



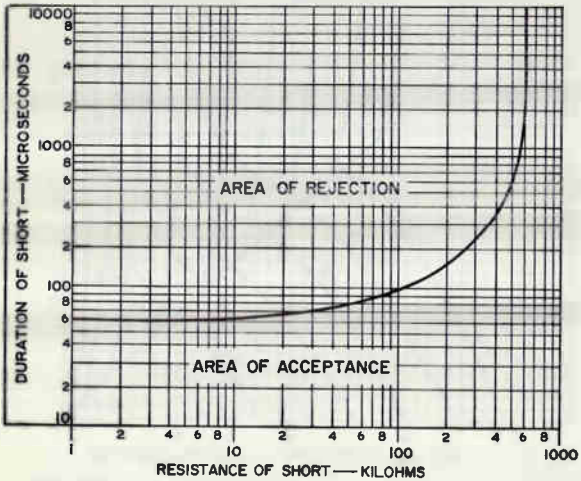
92CM-12175

Class A Amplifier



92CS-11696

SHORTS-TEST ACCEPTANCE LIMITS



92CS-10465RI

Power Triode

NUVISTOR TYPE

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

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, 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

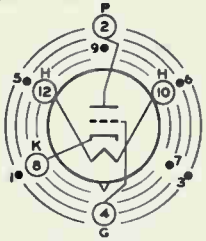
Mechanical:

Operating Position	.Any
Type of Cathode.	.Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length.	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1.9 grams
Envelope	Metal Shell MT4
Socket	See *Socket & Connector Information* for *RCA Nuvistor Tubes* at front of this section
Base . . .Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)	

8382

Basing Designation for BOTTOM VIEW. 12AQ

Pin 1[a] – Do Not Use
Pin 2 – Plate
Pin 3[a] – Do Not Use
Pin 4 – Grid
Pin 5[a] – Do Not Use
Pin 6[a] – Do Not Use
Pin 7[a] – Do Not Use
Pin 8 – Cathode
Pin 9[a] – Do Not Use
Pin 10 – Heater
Pin 12 – Heater



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

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[b]	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[b]	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[b]	800	mw

Maximum Circuit Values:

Grid-Circuit Resistance	0.05 max.	megohm

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

[b] Measured at load.

CHARACTERISTICS RANGE VALUES

	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	

	Note	Min.	Max.	
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, end 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) $\cong$ 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) $\cong$ 2, plate– and grid–voltage supplies each bypassed with capacitor (μf) $\cong$ 500, end 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-10, 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 = 1.35x 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.

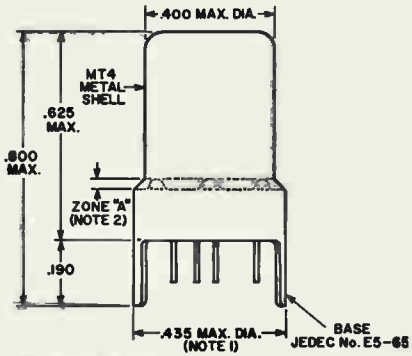
At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

Oscillator Life (100 Hours):

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

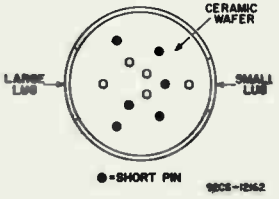
During this test, tubes are operated as 175-Mc oscillator at maximum-rated plate dissipation.

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.

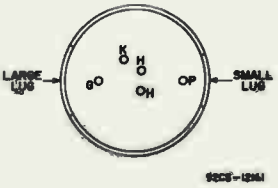


Dimensions in Inches

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins



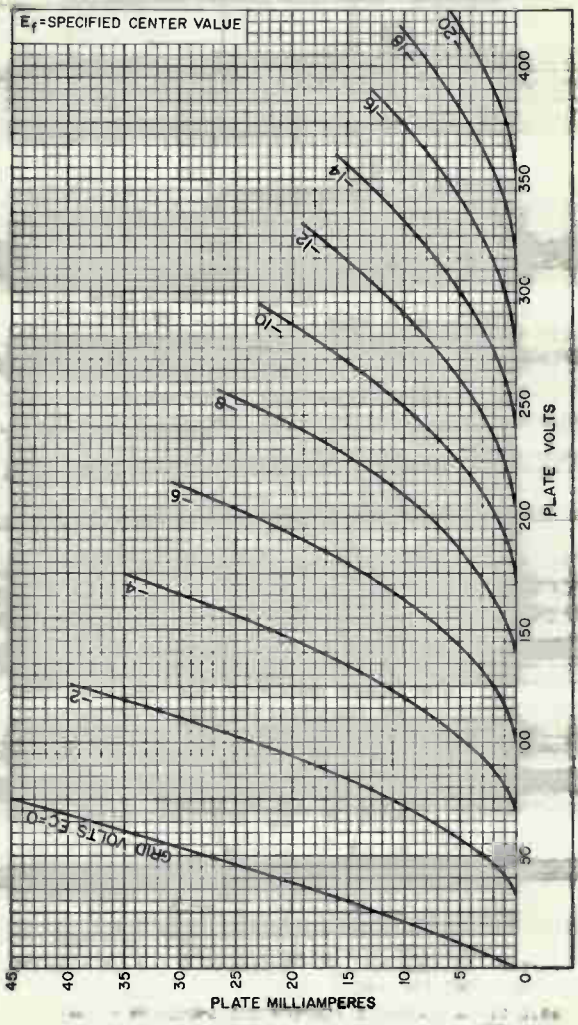
MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown



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

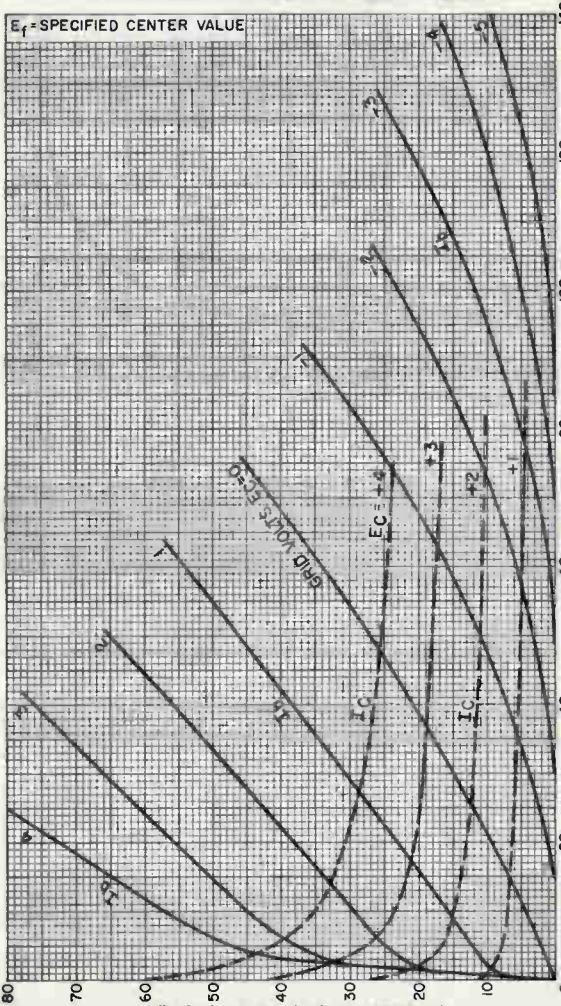
NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

AVERAGE PLATE CHARACTERISTICS



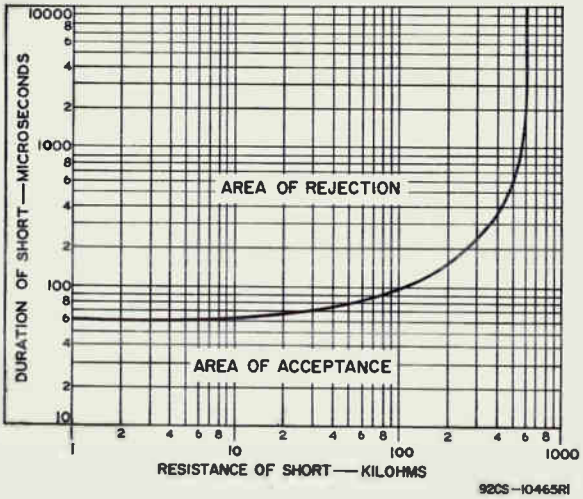
92CM-12169

AVERAGE CHARACTERISTICS



92CM-12174

SHORT-TEST ACCEPTANCE LIMITS



Medium-Mu Triode

NUVISTOR TYPE

ALL-CERAMIC-AND-METAL CONSTRUCTION

Designed to Withstand Severe Mechanical Shock and Vibration in Industrial Applications, the 8393 is a General-Purpose Tube for Use in Amplifier and Oscillator Service at Frequencies Extending into the UHF Region

The 8393 is the same as the 7586 except for the following items:

Electrical:

Heater Characteristics and Ratings:		
Voltage (AC or DC)	13.5 ± 1.4	volts
Current at heater volts = 13.5	0.060	amp
Direct Interelectrode Capacitances (Approx.):		
Grid to plate	2.4	pf
Input: G to (K,S,H)	4.4	pf
Heater to cathode	1.7	pf

CHARACTERISTICS RANGE VALUES

	Note[a]	*Min.*	*Max.*	
Heater Current	10	0.055	0.065	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	2.0	2.8	pf
Input: G to (K,S,H)	2	4.0	4.8	pf
Heater to cathode	2	1.4	2.0	pf
Transconductance (2)	11	9000	–	μmhos

Note 10: With 13.5 volts ac or dc on heater.
Note 11: With 12.0 volts ac or dc on heater.

SPECIAL RATINGS & PERFORMANCE DATA

Heater Cycling:
Heater volts = 18.0

[a] Notes 1 and 5 shown in 7586 data sheets are to be substituted by Notes 10 and 11 respectivaly for type 8393.

High-Mu Triode

NUVISTOR TYPE

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

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

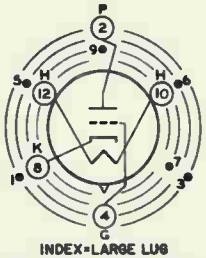
Mechanical:

Operating Position	.Any
Type of Cathode.	.Coated Unipotential
Maximum Overall Length	0.800"
Maximum Seated Length.	0.625"
Maximum Diameter	0.440"
Weight (Approx.)	1.9 grams
Envelope	.Metal Shell MT4
Socket	See *Socket & Connector Information for RCA Nuvistor Tubes* at front of this Section
Base. . . .Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)	

8441

Basing Designation for BOTTOM VIEW. 12AQ

Pin 1[a] – Do Not Use
Pin 2 – Plate
Pin 3[a] – Do Not Use
Pin 4 – Grid
Pin 5[a] – Do Not Use
Pin 6[a] – Do Not Use
Pin 7[a] – Do Not Use
Pin 8 – Cathode
Pin 9[a] – Do Not Use
Pin 10 – Heater
Pin 12 – Heater



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

AMPLIFIER — Class A

Maximum Ratings, *Absolute-Maximum Values:*

For operation at any altitude

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

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

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

[c] 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*.

CHARACTERISTICS RANGE VALUES

	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

	Note	Min.	Max.	
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

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) ≤ 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-ID, 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 (I), 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 = 1.35x 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.

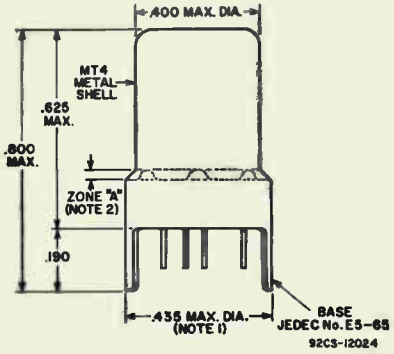
At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

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).

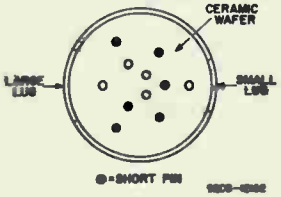
At the end of this test, tubes are criticized for Transconductance (I), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered inoperative if it has a discontinuity, permanent short, or air leak.



DIMENSIONS IN INCHES

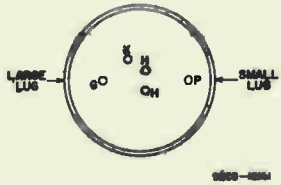
BOTTOM VIEW

Showing Arrangement of All 11 Base Pins



MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pins Not Shown



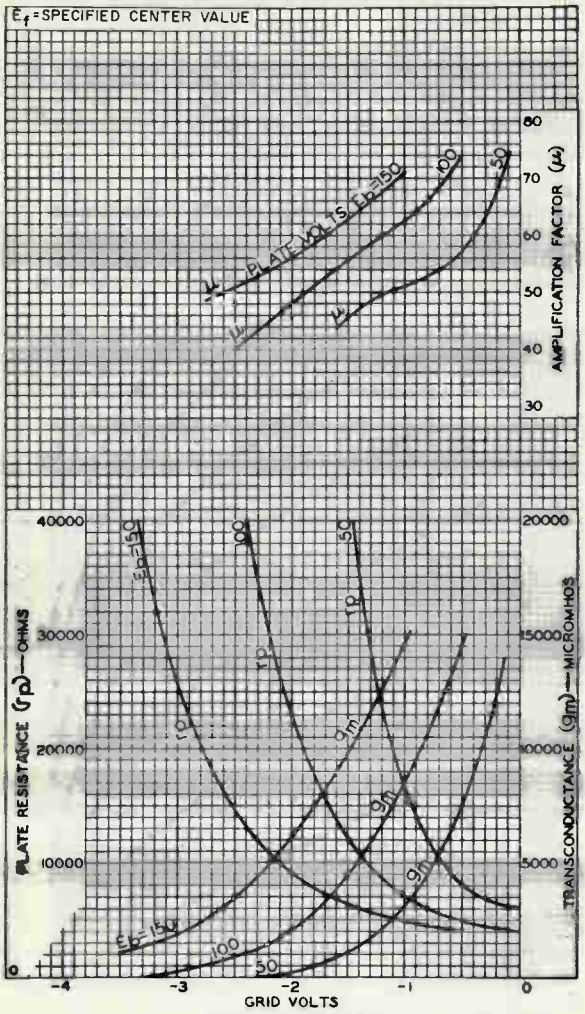
NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

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

AVERAGE PLATE CHARACTERISTICS

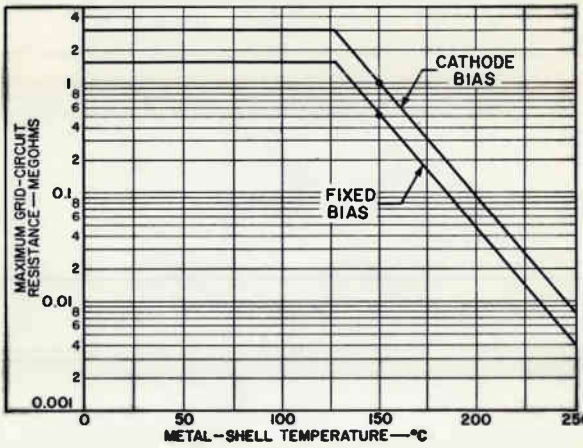
92CM-12170

AVERAGE CHARACTERISTICS



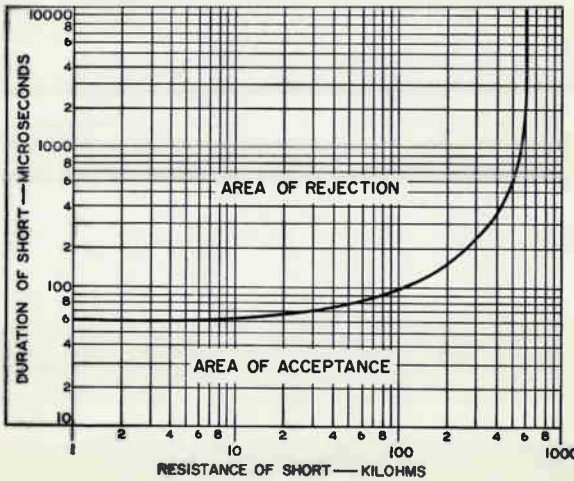
92CM-12168

GRID-CIRCUIT-RESISTANCE RATING CHART
Class A Amplifier—Rating 1



92CS-12023

SHORTS TEST ACCEPTANCE LIMITS



92CS-10465RI

Medium-Mu Triode

NUVISTOR TYPE

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

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

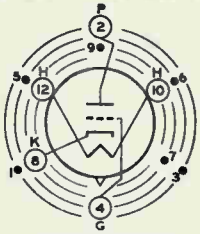
Mechanical:

Operating Position.	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length.	0.800"
Maximum Seated Length	0.625"
Maximum Diameter.	0.440"
Weight (Approx.).	1.9 grams
Envelope.	Metal Shell MT4
Socket.	See *Socket & Connector Information for RCA Nuvistor Tubes* at front of this Section
Base. . .	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No. E5-65)

8456

Basing Designation for BOTTOM VIEW 12AQ

Pin 1[a] – Do Not Use
Pin 2 – Plate
Pin 3[a] – Do Not Use
Pin 4 – Grid
Pin 5[a] – Do Not Use
Pin 6[a] – Do Not Use
Pin 7[a] – Do Not Use
Pin 8 – Cathode
Pin 9[a] – Do Not Use
Pin 10 – Heater
Pin 12 – Heater



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

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:

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

Maximum Circuit Values:

Grid-Circuit Resistance:[b]		
For fixed-bias operation	10 max.	megohms
For cathode-bias operation	10 max.	megohms

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

[b] 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*.

CHARACTERISTICS RANGE VALUES

	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
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) ≤ 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 longtudinal 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-10, 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 = 1.35x 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.

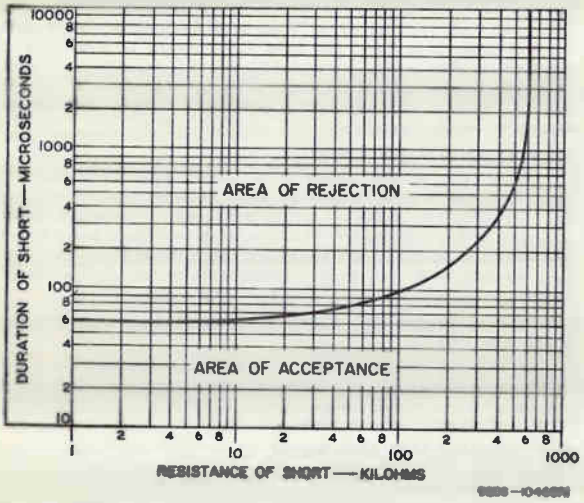
Intermittent Life (100 Hours):

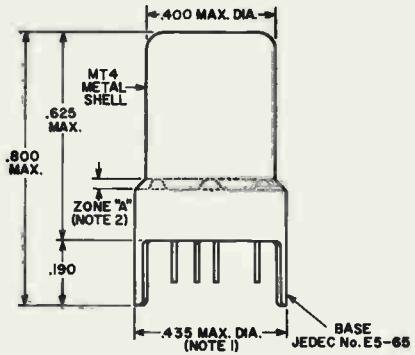
This test is performed on a sample lot of tubes from each production run.

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.

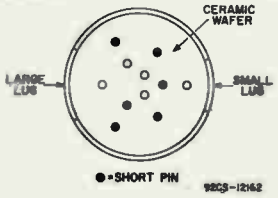
SHORTS-TEST ACCEPTANCE LIMITS



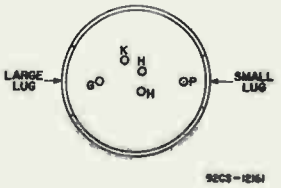


Dimensions In Inches

BOTTOM VIEW
Showing Arrangement of All 11 Base Pins



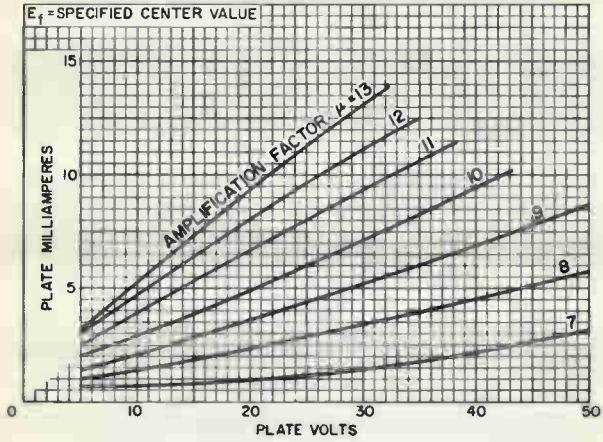
MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pins Not Shown



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

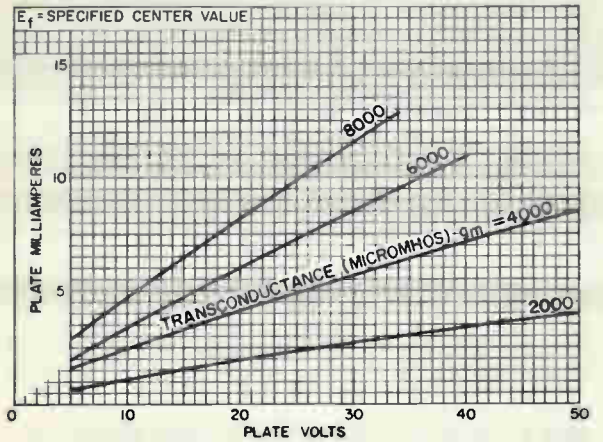
NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".

AVERAGE PLATE CHARACTERISTICS
With Amplification Factor as Variable



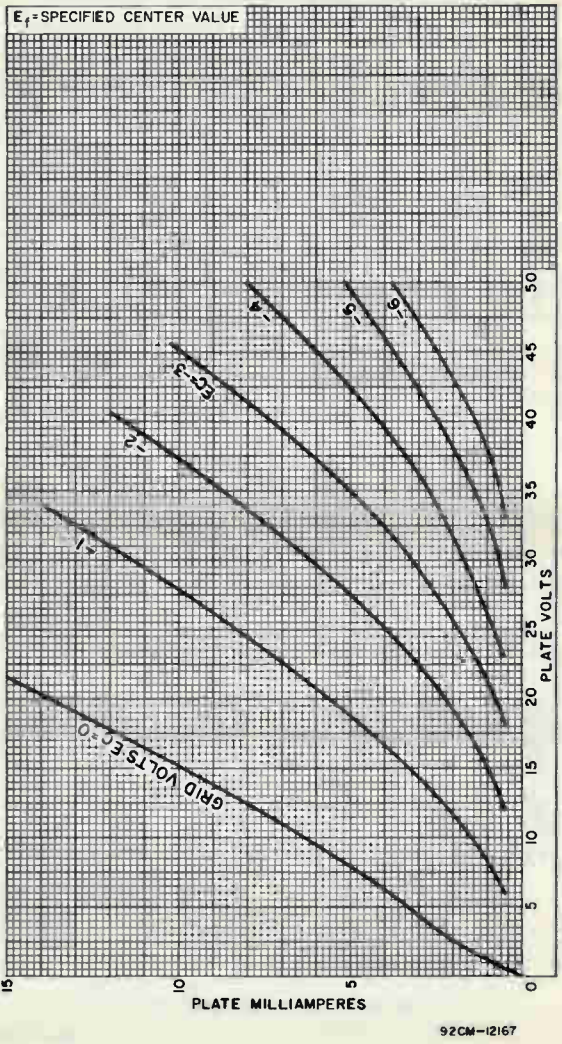
92CS-12166

AVERAGE PLATE CHARACTERISTICS
With Transconductance as Variable



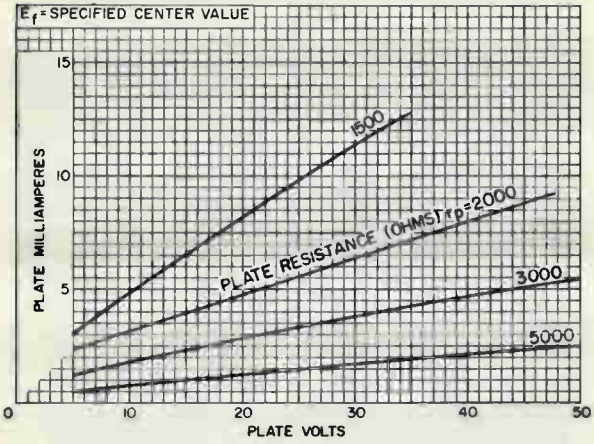
92CS-12166

AVERAGE PLATE CHARACTERISTICS



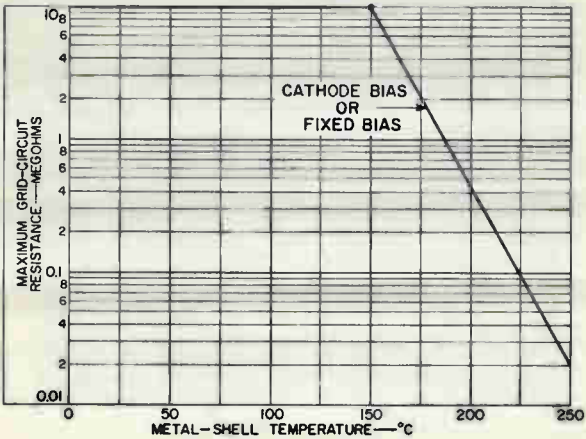
92CM-12167

AVERAGE PLATE CHARACTERISTICS
With Plate Resistance as Variable



92CS-12164

GRID-CIRCUIT-RESISTANCE RATING CHART



92CS-11479RI

8532/6J4WA

High-Mu Triode

7-PIN MINIATURE TYPE

FRAME-GRID CONSTRUCTION **"PREMIUM" VERSION OF 6J4**

For Cathode-Drive UHF Amplifier Applications (up to 500 Mc) in Equipment Requiring Exceptional Stability and Reliability under Severe Environmental Conditions

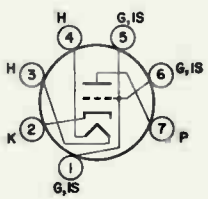
Electrical:

Heater Ratings and Characteristics:		
Voltage (AC or DC)	6.3 ± 0.3	volts
Current at heater volts = 6.3	0.400	amp
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:[a]		
Cathode to plate	0.2 max.	pf
Input (Cathode-drive operation):		
K to (G + IS, H)[b]	7.5	pf
Output (Cathode-drive operation):		
P to (G + IS, H)[b]	5.0 max.	pf
Grid and internal shield to plate	2.8	pf
Heater to cathode	2.8	pf

Mechanical:

Operating Position	Any
Type of Cathode	Coated Unipotential
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"
Diameter	0.650" to 0.750"
Dimensional Outline (JEDEC No.5-2)	See *General Section*
Bulb	T5-1/2
Base	Small-Button Miniature 7-Pin (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7BQ

Pin 1 - Grid, Internal Shield
Pin 2 - Cathode
Pin 3 - Heater
Pin 4 - Heater
Pin 5 - Same as Pin 1
Pin 6 - Same as Pin 1
Pin 7 - Plate



Characteristics, Class A$_1$ Amplifier:

Plate Supply Voltage	150	volts
Grid	Connected to negative end of cathode resistor	
Cathode Resistor	100	ohms
Amplification Factor	52.5	
Plate Resistance (Approx.)	4800	ohms
Transconductance	11000	μmhos

Plate Current	13.5	ma
Grid Voltage (Approx.) for plate μa = 60	−15	volts

CLASS A_1 AMPLIFIER

Maximum Ratings, *Absolute-Maximum Values:*

For operation at altitudes up to 80,000 feet and frequencies up to 500 Mc

Plate Voltage	150	volts
Grid Voltage:		
Negative-bias value	55	volts
Positive-bias value	0	volts
Cathode Current	20	ma
Plate Dissipation	2.5	watts
Bulb Temperature (At hottest point on bulb surface)	120	°C

Maximum Circuit Values:

Grid-Circuit Resistance:		
For grid-resistor-bias operation	0.25	megohm

[a] With external shield JEDEC No.316 connected to ground except as noted.
[b] With external shield JEDEC No.316 connected to grid.

CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
Heater Current	1	0.375	0.425	amp
Direct Interelectrode Capacitances:	2			
Cathode to plate	3	–	0.2	pf
Input (Cathode-drive operation): K to (G + IS, H)	4	5.5	9.5	pf
Output (Cathode-drive operation): P to (G + IS, H)	4	–	5.0	pf
Grid and Internal shield to plate	3	2.3	3.3	pf
Heater to cathode	3	1.0	4.5	pf
Plate Current (1)	1,5	9	18	ma
Plate Current (2)	1,6	–	60	μa
Transconductance (1)	1,5	8800	13200	μmhos
Transconductance (2) for an individual tube expressed as a per cent of Trans-conductance (1)	5,7	–	15	%
Reverse Grid Current	1,8	0	0.5	μa
Amplification Factor	1,5	40	65	
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,9	–	10	μa
Heater positive with respect to cathode	1,9	–	10	μa

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.

Leakage Resistance:

Between grid and all other elements connected together .	1,10	500 –	megohms
Between plate and all other elements connected together .	1,11	500 –	megohms

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

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

Note 3: With external shield JEDEC No.316 connected to ground.

Note 4: With external shield JEDEC No.316 connected to grid.

Note 5: With dc plate-supply volts = 150, grid connected to negative end of cathode resistor, cathode resistor (ohms) = 100, and cathode-bypass capacitor (μf) = 1000.

Note 6: With dc plate volts = 150 and dc grid volts = -15.

Note 7: With ac or dc heater volts = 5.7.

Note 8: With dc plate supply volts = 175, grid-circuit resistance (megohms) = 0.25, and cathode resistor (ohms) = 150.

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

Note 10: With grid 100 volts negative with respect to all other elements connected together.

Note 11: With plate 300 volts negative with respect to all other elements connected together.

SPECIAL TESTS

High-Impact, Short-Duration Shock:

Peak Impact Acceleration.	450	g
Duration of half-sine-wave mechanical-shock pulse.	1	msec

This test is performed on sample tubes from each production lot to determine the ability of the tubes to withstand the specified acceleration for a short time interval. Tubes are rigidly mounted 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 are subjected to 20 blows (5 in each position) under the following conditions; heater volts = 6.3, dc plate supply volts = 150, dc grid volts = -1.5, grid resistor (megohms) = 0.1, and dc heater-cathode volts = 100.

Tubes are then criticized for Transconductance change (1), Reverse Grid Current, and Heater-Cathode Leakage Current under the conditions specified in the CHARACTERISTICS RANGE VALUES and are subjected to the Constant-Frequency Vibration Test and the Continuity and Shorts Test described below.

Fatigue Vibration:

Peak Vibrational Acceleration	5	g
Vibration Frequency	25	cps
Duration of Test.	96	hours

This test is performed periodically on sample tubes to determine the ability of the tubes to withstand the specified acceleration at a constant vibration frequency for an extended time interval. Tubes are rigidly mounted on a platform vibrating with simple harmonic motion at a constant vibration frequency of 25 cps and, with heater volts = 6.3, are subjected to the specified acceleration for 96 hours (32 hours in each of three different positions X_1, X_2, and Y_1).

Tubes are then criticized for changes in Transconductance (1), Reverse Grid Current, and Heater-Cathode Leakage Current under the conditions specified in the CHARACTERISTICS RANGE VALUES and are subjected to the Constant-Frequency Vibration Test and the Continuity and Shorts Test described below.

Constant-Frequency Vibration:

Peak Vibrational Acceleration	10	g
Vibration Frequency	40	cps
RMS Voltage across plate load resistor	150 max.	mv

This test is performed on sample tubes from each production lot to determine if loose parts or mechanical resonance are present at the specified acceleration and vibration frequency. Tubes are rigidly mounted on a platform vibrating with simple harmonic motion at a constant frequency of 40 cps and, with the tubes operating under the conditions specified in the CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate load resistor of 2000 ohms, are subjected to the specified acceleration. During this test, the rms voltage across the plate load resistor must not exceed 150 millivolts.

Variable-Frequency Vibration:

Peak Vibrational Acceleration	10	g
Vibration-Frequency Range	50 to 500	cps
RMS Voltage across plate load resistor	100 max.	mv

This test is performed periodically on sample tubes to determine if mechanical resonance is present at the specified acceleration over the specified frequency range. Tubes are rigidly mounted on a platform vibrating with simple harmonic motion over a frequency range of 50 to 500 cps and, with the tubes operating under the conditions specified in the CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate load resistor of 2000 ohms, are subjected to the specified acceleration in each of two different positions, X_1 and X_2. The acceleration over the frequency range is within ±20 per cent of the reference acceleration at 100 cps. The frequency is increased from 50 to 500 cps with approximately logarithmic progression and 4 to 5 minutes are required to traverse the frequency range. During this test, the rms voltage across the plate load resistor must not exceed 100 millivolts.

High-Altitude Voltage Breakdown:

Effective Altitude	80000	ft
Air Pressure	21 ± 2	mm Hg
Ambient Temperature	25 ± 5	°C
RMS Voltage between plate base pin and adjacent pins	500	volts

This test is performed periodically on sample tubes from each production lot to determine the ability of the tubes to withstand high-altitude (low-air-pressure) conditions. In this test at an ambient temperature of 25° ± 5° C, while the tubes

are subjected to a reduced air pressure of 21 ± 2 mm Hg corresponding to an altitude of 80,000 feet, a 60-cps, ac rms voltage of 500 volts is applied between the plate base pin and adjacent pins. Tubes must not break down (arc over) or show evidence of corona.

Continuity and Shorts:

This test is performed periodically on sample tubes from each production lot to determine the presence of open circuits, temporary or permanent shorts, or air leaks. Tubes are subjected to the Thyratron-Type Shorts Test described in Military Specification MIL-E-1E, method 1201.

Heater-Cycling Life:

Duration of Test. . . . . 2000 cycles

This test is performed on sample tubes from each production lot with heater volts = 7.0 cycled 1 minute ON and 4 minutes OFF for 2000 cycles, dc heater-cathode volts = 100 continuously ON, and no voltages applied to the plate or grid. After 2000 cycles, tubes are criticized for changes in Heater-Cathode Leakage Current and Leakage Resistance, and for Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

Stability Life (20 Hours):

This test is performed at room temperature on sample tubes from each production lot to determine if the tubes are stable. After 2 hours and again after 20 hours of operation under the conditions specified in the CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a grid resistor of 0.25 megohm and with dc heater-cathode volts = 100, tubes are criticized for the change in Transconductance (1).

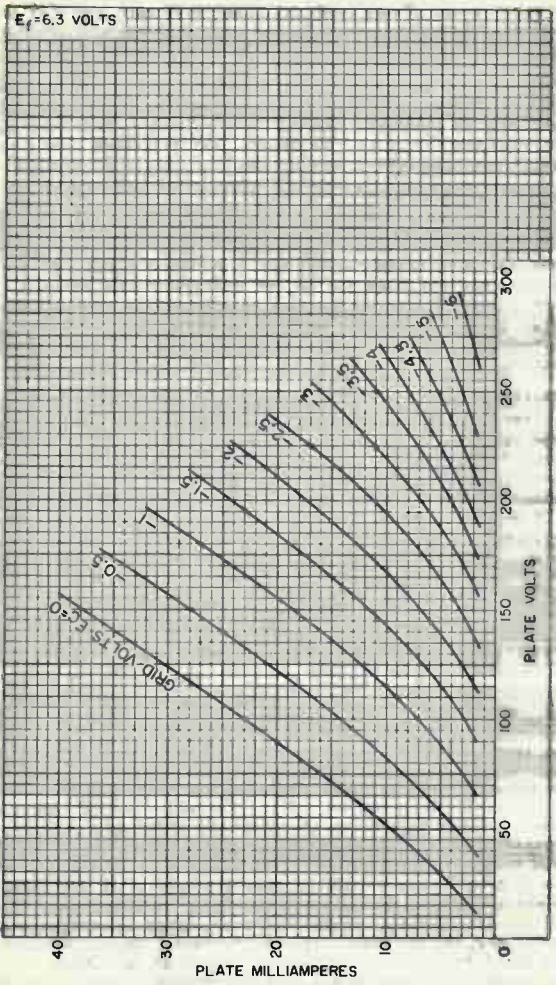
Early-Hour Survival-Rate Life (100 Hours):

This test is performed on sample tubes from each production lot to assure a high early-hour survival rate. After 100 hours of operation under the conditions specified for the Stability Life Test above, tubes are criticized for the change in Transconductance (1) and are then subjected to the Continuity and Shorts Test.

Intermittent-Conduction Life (1000 Hours):

This test is performed on sample tubes from each production lot to assure the high quality of individual tubes and to guard against epidemic failures due to excessive transconductance change in any of the characteristics specified below. After 500 hours of operation under the conditions specified for the Stability Life Test above and, in addition, with heater voltage cycled 110 minutes ON and 10 minutes OFF, and bulb temperature = 120° C, tubes are criticized for changes in Heater Current, Transconductance (1), Transconductance (2), Reverse Grid Current, Heater-Cathode Leakage Current, Leakage Resistance, and for Open Circuits, Permanent Shorts, Air Leaks, and Total Defectives. After 1000 hours of operation, tubes are again criticized for all of the preceding defects with the exception of the change in Transconductance (2).

AVERAGE PLATE CHARACTERISTICS



92CM-12534

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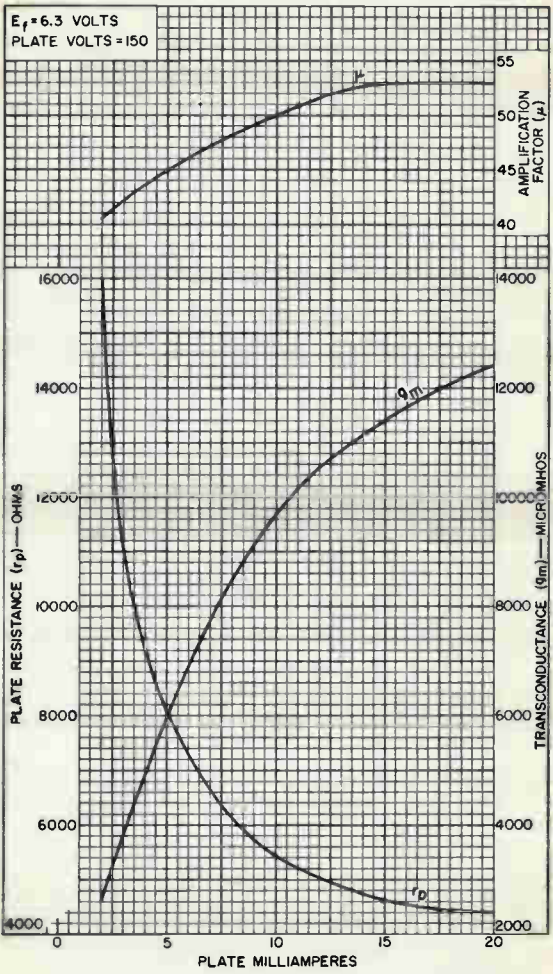
AVERAGE CHARACTERISTICS



92CM-12533

High-Mu Triode

ENVIRONMENTAL TESTS **NUVISTOR TYPE** **LIFE TESTS**

For Condenser-Microphone Preamplifiers, Piezoelectric- and Ceramic-Pickup Preamplifiers, and Other Voltage Amplifier Applications Requiring Amplification of Extremely Small Signals at DC to 200 kc/s

ELECTRICAL CHARACTERISTICS

		Bogey Values	
Heater Voltage, (DC or AC)	E_f	6.3	V
Heater Current at E_f = 6.3 V	I_f	100	mA
Heater Input	P_f	0.63	W
Direct Interelectrode Capacitances			
Without external shield			
Input: G to (K, S, H)	c_i	3.4	pF
Output: P to (K, S, H)	c_o	1.7	pF
Plate to cathode	c_{pk}	0.20	pF
Grid to cathode	c_{gk}	2.6	pF
Heater to cathode	c_{hk}	1.0	pF

CLASS A_1 AMPLIFIER

For Following Characteristics see **Conditions**

Amplification Factor	μ	127	
Plate Resistance (Approx.)	r_p	41	kΩ
Transconductance	g_m	3100	μmho
DC Plate Current	I_b	1.5	mA
Cutoff DC Grid Voltage for I_b = 10 μA	$E_{c(co)}$	-1.7	V
Conditions			
Heater Voltage	E_f	6.3	V
Plate Supply Voltage	E_{bb}	120	V
Grid Supply Voltage	E_{cc}	0	V
Cathode Resistor	Rk	200	Ω
Metal Shell	Connected to system ground		

ABSOLUTE MAXIMUM RATINGS

For operation as a Class-A_1 Amplifier Tube at frequencies up to 200 kc/s

Plate Supply Voltage	E_{bb}	330	V
DC Plate Voltage	E_b	250	V
Grid Voltage			
Peak positive value	e_{cm}	0	V
DC positive value	E_c	0	V
DC negative value	E_c	-55	V
Peak Heater-Cathode Voltage	e_{hkm}	±100	V
Heater Voltage, DC or AC	E_f	5.7 to 6.9	V
Instantaneous Voltage (Between base pins and metal shell)	See *Breakdown-Voltage Characteristics Curve*		
Average Cathode Current	$I_{k(av)}$	2	mA
Plate Dissipation	P_b	0.3	W
Envelope Temperature[C]	T_E	150	°C

MAXIMUM CIRCUIT VALUES

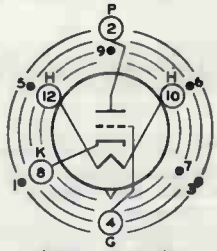
Grid-Circuit Resistance

For fixed-bias operation	$R_{g(ckt)}$	80	MΩ
For cathode-bias operation	$R_{g(ckt)}$	100	MΩ

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length (l_m)	0.800 in
Maximum Seated Length (l_{sm})	0.625 in
Maximum Diameter (d_m)	0.440 in
Weight (Approx.)	1.9 g
Dimensional Outline	JEDEC No. 4-4
Envelope	JEDEC Designation MT4
Base[a]	Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-65)
Basing Designation for BOTTOM VIEW	12AQ

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



INDEX=LARGE LUG
●=SHORT PIN—NC

TYPICAL OPERATION

In High-Input-Impedance, Cathode-Follower Circuit

Heater Voltage	E_f	6.3	V
Plate Supply Voltage	E_{bb}	150	V
Cathode Bias Resistor (Bypassed)	$R_{k(bias)}$	3.3	kΩ
Cathode Load Resistor	$R_{k(load)}$	15	kΩ
Grid Resistor	R_g	100	MΩ
Input Resistance (Approx.)	R_i	1	GΩ
Output Resistance (Approx.)			
Source resistance (R_S) = 1 GΩ	R_o	7	kΩ
Average Grid Current	$I_{c(av)}$	-0.1	mA
Average Plate Current	$I_{b(av)}$	0.3	mA

[a] Designed to mate with Cinch Mfg. Co. Socket No. 133 65 92 025, 133 65 91 084, or equivalent.

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

[c] Measured on metal shell in Zone "A" (See *Dimensional Outline*).

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INITIAL CHARACTERISTICS LIMITS

	Note	Min	Max	
Heater Current	1	90	110	mA
Direct Interelectrode Capacitances				
Grid to plate	2	-	0.7	pF
Input: G to (K, S, H)	2	3.0	3.8	pF
Output: P to (K, S, H)	2	1.5	1.9	pF
Plate to cathode	2	0.17	0.23	pF
Grid to cathode	2	2.2	3.0	pF
Heater to cathode	2	0.8	1.2	pF
Amplification Factor	3	95	160	
Transconductance	3	2200	4000	μmho
Plate Current	3	0.7	2.3	mA
Cutoff Plate Current	4	-	200	μA
AC Voltage Amplification	5	7	-	V
Total Grid Current	6	-	-0.05	μA
Heater-Cathode Leakage Current	7	-	±5	μA
Leakage Resistance				
Between grid and all other electrodes connected together	8	50	-	GΩ
Between plate and all other electrodes connected together	9	100	-	GΩ
Inoperatives	10	✓		

Note 1: With E_f = 6.3 V.

Note 2: Measured without external shield.

Note 3: With E_f = 6.3 V, E_{bb} = 120 V, E_{cc} = 0 V, R_k = 200 Ω, C_k = 1000 μF, metal shell grounded.

Note 4: With E_f = 6.3 V, E_b = 120 V, E_c = -1.7 V, metal shell grounded.

Note 5: With E_f = 6.3 V, E_{bb} = 120 V, E_{cc} = 0 V, R_g = 10 MΩ, $C_{c(in)}$ = 0.1 μF, grid-signal-source internal impedance < 2500 Ω, E_g = 0.2 V (rms, 60 c/s, sinewave), R_p = 0.5 MΩ, $C_{c(out)}$ = 0.5 μF. RMS voltage component measured across the series plate resistor with a 5 MΩ (min.) input impedance vacuum-tube voltmeter.

Note 6: With E_f = 6.3 V, E_b = 200 V, E_{cc} = -1 V, R_g = 1 MΩ, metal shell grounded.

Note 7: With E_f = 6.3 V, E_{hk} = ±100 V.

Note 8: With E_f = 6.3 V, $E_{g\text{-}all}$ = -100 V, metal shell grounded.

Note 9: With E_f = 6.3 V, $E_{p\text{-}all}$ = -300 V, metal shell grounded.

Note 10: Tubes are criticized for Shorts, Discontinuities, and Air Leaks.

ENVIRONMENTAL TESTS

High-Impact, Short-Duration Shock

Peak Impact Acceleration	1000	g
Duration of Approximate Half-Sine-Wave Mechanical-Shock Pulse	0.8 ± 0.2	ms

Operating Conditions during Test

E_f = 6.3 V, E_{bb} = 120 V, E_{cc} = 0 V, R_k = 200 Ω, R_g = 1 MΩ, E_{hk} = 100 V.

	Min	Max	
Post-Shock Limits and Rejection Criteria			
E_{Rp} (AC Voltage Amplification)	6	-	V
I_c	-	-0.1	μA
I_{hk}	-	±10	μA
E_{Rpm} (Variable-Frequency-Vibration Test Limits) over Vibration-Frequency Range of:			
3 to 6 kc/s	-	50	mV
6 to 15 kc/s	-	1000	mV
Tap and Permanent Shorts, and Discontinuities.	✓		

Low-Impact, Long-Duration Shock

Peak Impact Acceleration	50	g
Duration of Approximate Half-Sine-Wave Mechanical-Shock Pulse	11 ± 2	ms

Condition during Test
No tube-element voltages are applied.

Post-Shock Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test.

Sweep-Frequency-Vibration Fatigue

Vibration-Frequency Range (Overall)	5 to 500 to 5	c/s
Peak Displacement		
5 to 50 & 50 to 5 c/s	0.040	in
Peak-to-peak value	0.080	in
Peak Vibrational Acceleration.	10	g
50 to 500 to 50 c/s		
Period of 1 Sweep Cycle (Approx.)	15	m
5 to 500 to 5 c/s		
Duration of Test (Overall)	9	h
Along each of 3 mutually perpendicular axes.	3	h

Operating Condition during Test
E_f = 6.3 V

Post-Sweep-Frequency-Vibration-Fatigue Limits and Rejection Criteria
Same as those specified above for the High-Impact-Short-Duration Shock Test.

Variable-Frequency Vibration

Vibration-Frequency Range (Overall)	3 to 15	kc/s
Peak Vibrational Acceleration.	1	g
In X_1 position		
Period of 1 Sweep Cycle (3 to 15 kc/s)	7	s

Operating Conditions during Test
E_f = 6.3 V, E_{bb} = 120 V, E_{cc} = 0 V, R_k = 200 Ω, R_p = 2 kΩ.

Limits	Min	Max	
E_{Rpm} over Vibration-Frequency Range of:			
3 to 6 kc/s.	-	35	mV
6 to 15 kc/s.	-	700	mV

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LIFE TESTS

Heater Cycling

Duration of Test . . . . . 2000 cycles

Operating Conditions

E_f = 8.5 V cycled 1 minute ON and 2 minutes OFF, E_{hk} = −180 V continuously ON.

Rejection Criteria

Heater-Cathode Shorts, and Heater and Cathode Discontinuities.

Intermittent Operation (2, 20, 100, 500, and 1000 Hours)

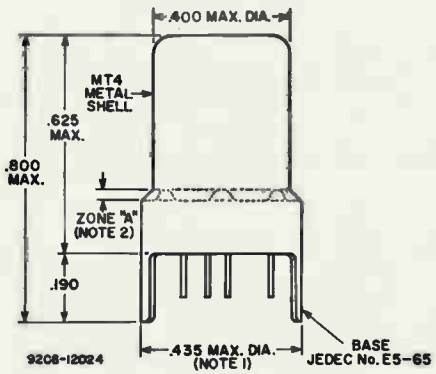
Operating Conditions

E_f = 6.3 V cycled 110 minutes ON and 10 minutes OFF, E_b = 120 V, E_{cc} = −1 V, E_{hk} = 100 V, R_k = 0 Ω, R_g = 1 MΩ, P_b = 0.3 W (approx.), T_E = 150°C min.

End-Point Limits At	2 and 20		100		500		1000		h
	Min	Max	Min	Max	Min	Max	Min	Max	
g_m	–	–	2000	–	–	–	–	–	μmho
$\Delta g_m/t$	–	±10	–	–	–	–	–	–	%
$\Delta E_{Rp}/t$	–	–	–	–	–	±10	–	±15	%
Avg $\lvert\Delta E_{Rp}/t\rvert$	–	–	–	–	–	7	–	10	%
I_c	–	–	–	−0.02	–	−0.1	–	−0.1	μA
I_{hk}	–	–	–	–	–	±10	–	±10	μA

DIMENSIONAL OUTLINE

JEDEC No. 4-4

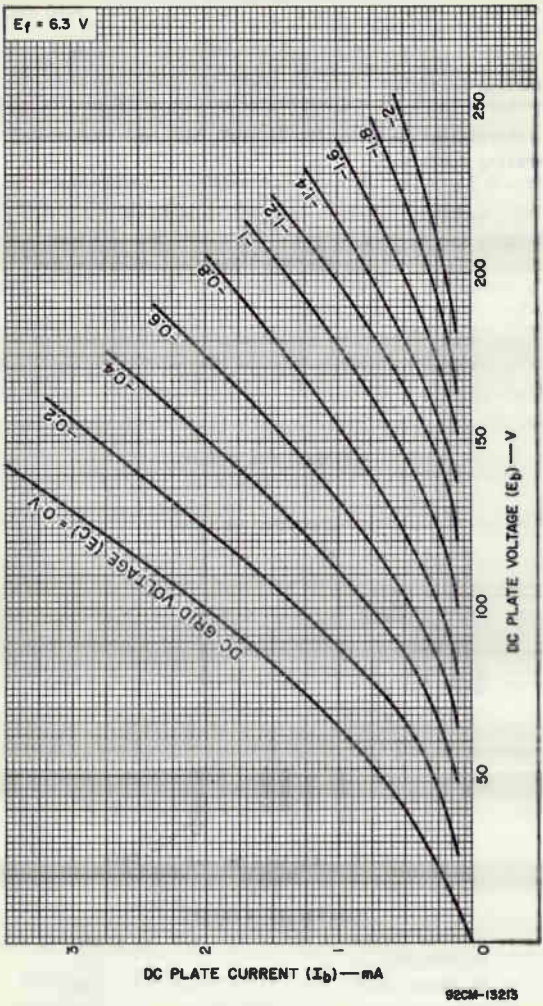


DIMENSIONS IN INCHES

Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

Note 2: Envelope temperature should be measured in zone "A".

Typical Plate Characteristics



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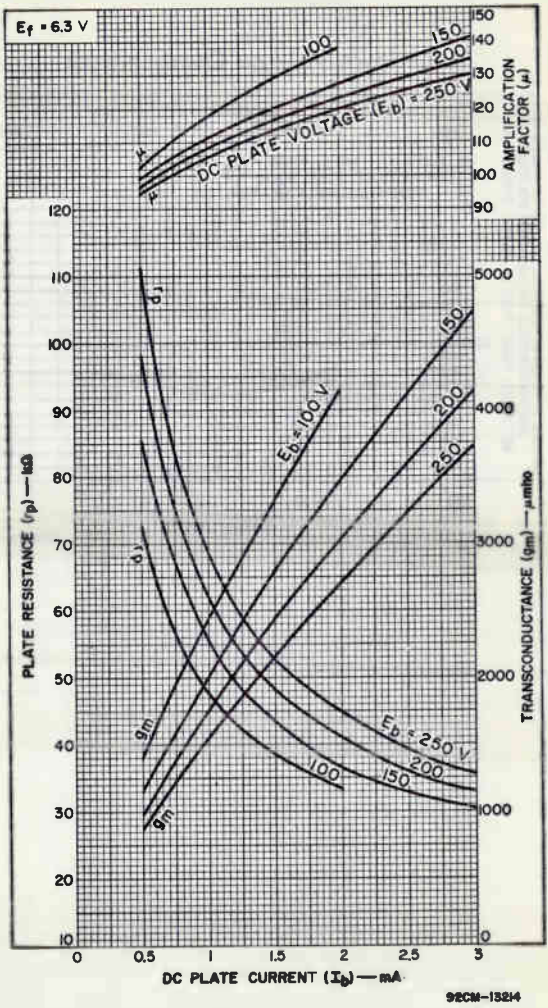
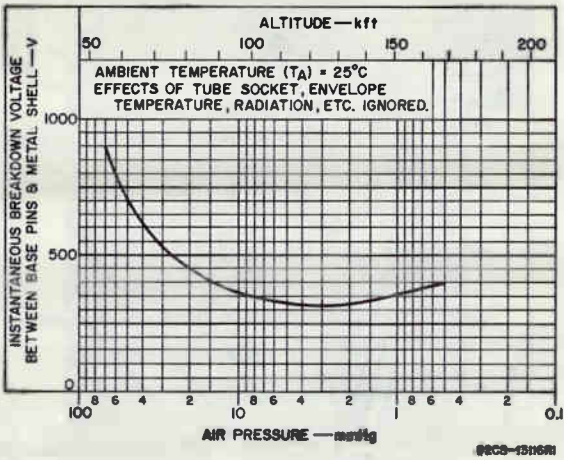
Typical Characteristics



Breakdown-Voltage Characteristic



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High-Mu Triode

NUVISTOR TYPE

For Cathode-Drive, Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Applications to 1.2 GHz

ELECTRICAL CHARACTERISTICS - Bogey Values

Heater Voltage, dc or ac	E_h	6.3	V
Heater Current at E_h = 6.3 V.	I_h	340	mA
Direct Interelectrode Capacitances:			
Without external shield			
Input: K to (G, S, H)	c_i	9.6	pF
Output: P to (G, S, H).....	c_o	2.7	pF
Heater to cathode	c_{hk}	2.6	pF
Plate to cathode	c_{pk}	0.050	pF
For the following characteristics, see Conditions below:			
Amplification Factor	μ	100	
Plate Resistance (Approx.) ..	r_p	6400	Ω
Transconductance	g_m	18000	μmho
DC Plate Current	I_b	15	mA
Cutoff DC Grid Voltage for I_b = 10 μA	$E_{c(co)}$	-5	V
Conditions			
Heater Voltage	E_h	6.3	V
Plate Supply Voltage	E_{bb}	200	V
Grid Supply Voltage	E_{cc}	0	V
Cathode Resistor	R_k	68	Ω

MECHANICAL CHARACTERISTICS

Dimensional Outline	See Outline Drawing
Maximum Overall Length (l_m)	0.985 in
Maximum Seated Length (l_{sm})	0.780 in
Maximum Diameter (d_m)	0.440 in
Envelope	JEDEC Designation MT4
Top Cap[a]	Small (JEDEC Designation C1-46)

Base[a] ..... Medium-Ceramic-Wafer Twelvar 6-Pin (JEDEC Designation E6-93)

Type of Cathode ..... Coated Unipotential

Operating Position ..... Any

Cooling ..... Conduction

MAXIMUM RATINGS - Absolute-Maximum Values[b]

For operation as a low-level class-C rf-power-amplifier, oscillator, or frequency-multiplier tube at frequencies up to 1.2 GHz

		ICAS[c]	
Plate Supply Voltage (E_{bb})			
Up to 50,000 feet		1000[d]	V
Above 50,000 feet	See *Breakdown-Voltage Characteristics*		
DC Plate Voltage	E_b	1000	V
Grid Voltage:			
Peak	e_c	30	V
DC	E_c	+0 -100	V V
Peak Heater-Cathode Voltage	e_{hk}	±100	V
Heater Voltage, dc or ac	E_h	5.7 to 6.9	V
Peak Cathode Current	i_k	1000 See *Pulse-Rating Chart*	mA
Average Cathode Current	I_k	75	mA
Plate Disaipation	P_b	6[e]	W
Grid Dissipation	P_g	200	mW
	See *Grid-Dissipation Rating Chart*		
Envelope Temperature[f]	T_E	200	°C

MAXIMUM CIRCUIT VALUES

		ICAS	
Grid-Circuit Resistance:	R_g		
For fixed-bias or cathode-bias operation:		50	kΩ
	See *Grid-Circuit-Resistance Rating Chart*		

TYPICAL OPERATION - CCS[g]

As cathode-drive rf power amplifier

Frequency	f	1	GHz
Heater Voltage	E_h	6.3	V
DC Plate-to-Grid Voltage	E_{bg}	206	V

DC Cathode-to-Grid Voltage ..	E_{kg}	5.8	V
From grid resistor of	R_g	300	Ω
Average Plate Current	I_b	50	mA
Average Grid Current	I_c	19	mA
Driving Power (Approx.).....	P_g	1.0	mW
Useful Power Output (Approx.)	P_o	5	W

As cathode-drive frequency doubler

Output Frequency	f_o	1.2	GHz
Heater Voltage	E_h	6.3	V
DC Plate-to-Grid Voltage.....	E_{bg}	200	V
DC Cathode-to-Grid Voltage.	E_{kg}	11	V
From grid resistor of	R_g	1000	Ω
Average Plate Current	I_b	38	mA
Average Grid Current	I_c	10.5	mA
Driving Power (Approx.).....	P_g	1	W
Uaeful Power Output (Approx.).	P_o	2	W

TYPICAL OPERATION

As pulsed cathode-drive class-C amplifier

Output Frequency	f_o	1	1	GHz
DC Plate-to-Grid Voltage	E_{bg}	500	1000	V
DC Cathode-to-Grid Voltage ...	E_{kg}	16	20	V
Average Plate Current	I_b	9	4.75	mA
Average Grid Current	I_c	5.5	1.4	mA
Duty Factor	-	2.5	1	%
Pulae Length	-	5	5	μs
Peak Driving Power	-	30	50	W
Average Driving Power	-	0.75	0.5	W
Peak Useful Power Output (Approx.)	-	105	240	W
Average Power Output	-	2.5	2.4	W
Plate Dissipation (Approx.) ..	-	2.4	2.7	W
Gain.....	-	5.4	6.8	dB

[a] See *Socket and Connector Information.*

[b] As defined in the current issue of EIA Standard RS-239.

[c] Intermittent Commercial and Amateur Service.

[d] Under no circumstances should this absolute-maximum value be exceeded. For high-altitude operation, the maxi-

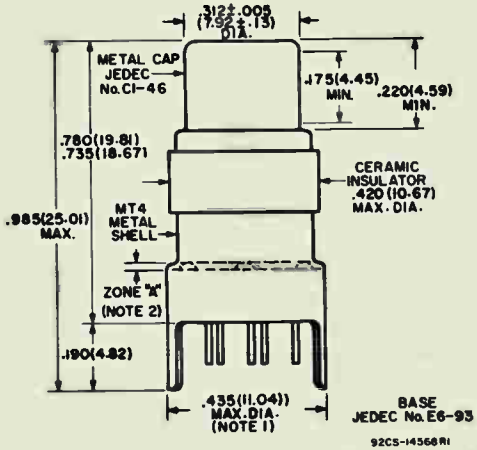
mum permissible plate voltage is dependent on atmospheric pressure.

• This rating applies when the plate-seal temperature is maintained below 200°C by means of an external heat sink such as the center conductor of a coaxial resonator. If no provision is made for additional heat removal, the maximum seal temperature of 200°C will not be exceeded with 4 watts of plate dissipation and a chassis temperature of 25°C.

f Measured on metal shell in Zone "A" (See *Dimensional Outline*).

g Continuous Commercial Service.

DIMENSIONAL OUTLINE - Dimensions in Inches (mm)

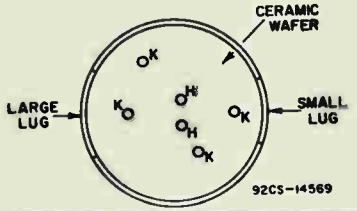


Note 1: Maximum outside diameter of 0.440" (11.17 mm) is permitted along 0.190" (4.83 mm) lug length.

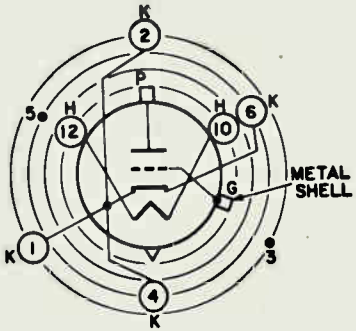
Note 2: Envelope temperature should be measured in zone "A".

MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pins Not Shown



TERMINAL DIAGRAM (Bottom View).



INDEX = LARGE LUG
● = SHORT PIN—IC

Pin 1 - Cathode	Pin 6 - Cathode
Pin 2 - Cathode	Pin 10 - Heater
Pin 3* - Do Not Use	Pin 12 - Heater
Pin 4 - Cathode	Metal Shell - Grid
Pin 5* - Do Not Use	Top Cap - Plate

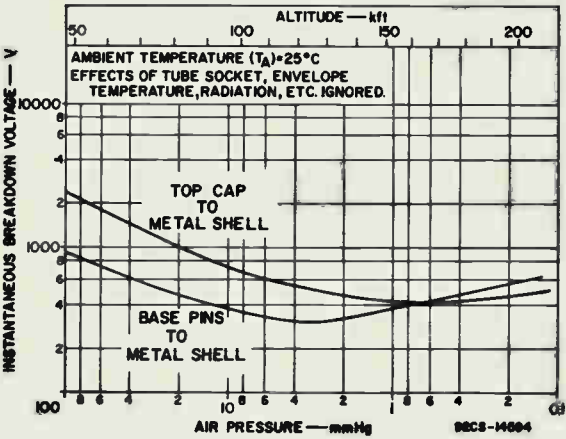
* Pin is of a length such that its end does not touch the socket insertion plane.

TYPE 8808 SOCKET AND CONNECTOR INFORMATION

SOCKET			
Mounting	**Body Material**	**Cinch Mfg. Co.▲ No.**	**Cinch-Jones Sales-Division Distributor No.**
Crimp	HALON□	133 67 90 040§	SNS-4
TOP-CAP CONNECTOR			
For Distributed-Constant Circuit	International Electronic Research Corp.⊕ Therma-Link Retainer Part No. TXBE-032-031G, or equivalent		
For Lumped-Constant Circuit	Wakefield Engineering, Inc.● Semiconductor Cooler Type NF207, or equivalent		

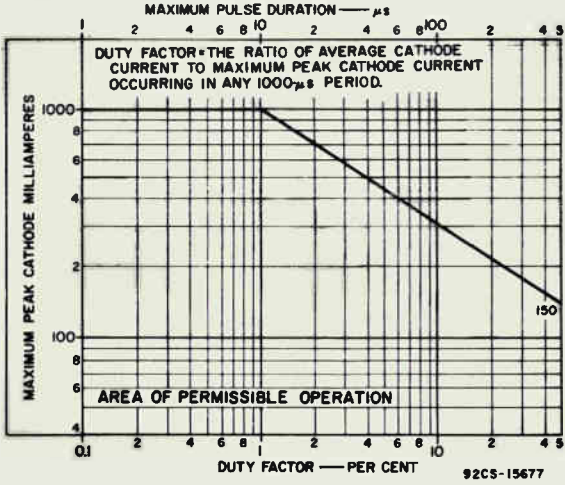
▲ 1026 South Homan Ave., Chicago, Illinois 60624.
□ TRADE MARK: Allied Chemical Corp., Morristown, N. J.
⊕ 135 West Magnolia Blvd., Burbank, Calif. 91502.
● 139 Foundry St., Wakefield, Mass. 01880.
§ This UHF heat-dissipating socket, or equivalent, is recommended to insure adequate electrical and thermal connection to the index rim.

BREAKDOWN-VOLTAGE CHARACTERISTICS

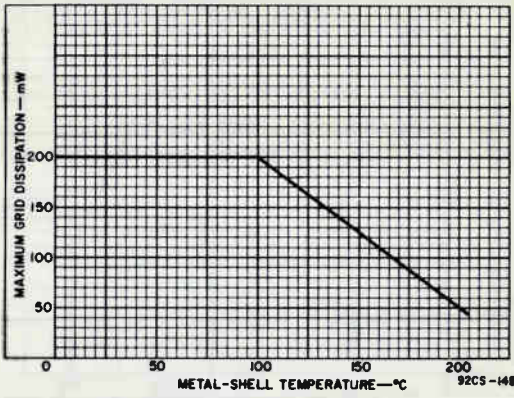


PULSE RATING CHART

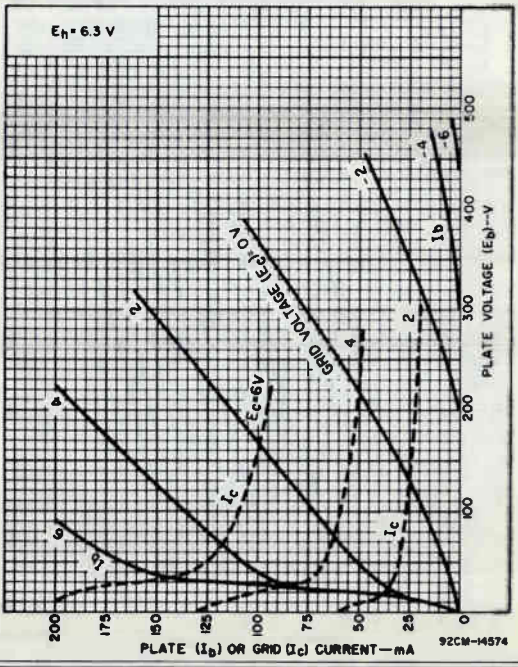
The peak cathode current is for a duty factor of up to 1% or pulse duration up to 10 μs, whichever is greater.



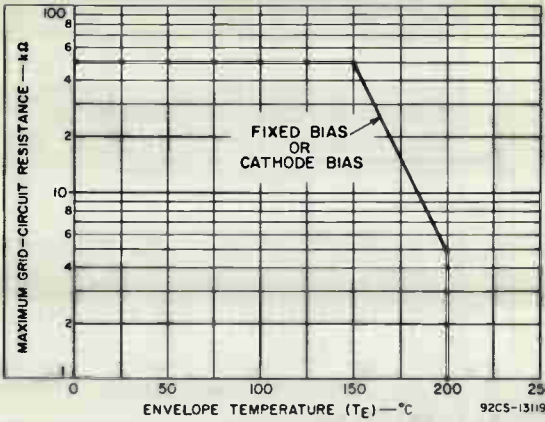
GRID-DISSIPATION RATING CHART



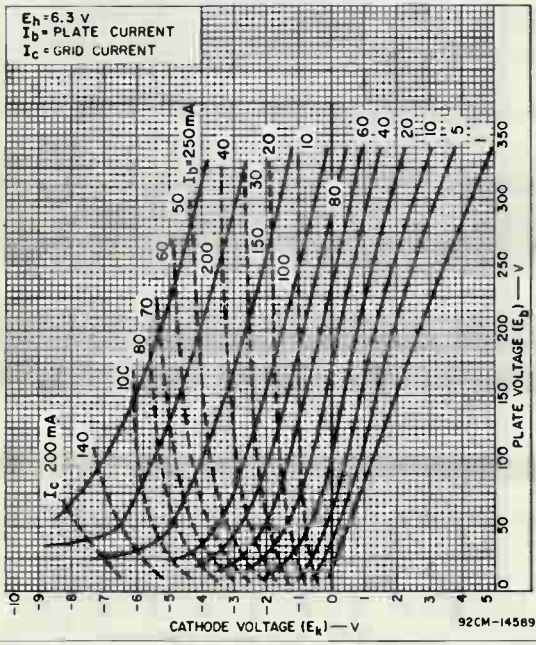
TYPICAL CHARACTERISTICS



GRID-CIRCUIT-RESISTANCE RATING CHART



TYPICAL CONSTANT-CURRENT CHARACTERISTICS



RCA

9001

DETECTOR AMPLIFIER PENTODE

MIDGET TYPE

Heater ■	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances:		
Grid to Plate	0.01 max.	μμf
Input	3.6	μμf
Output	3.0	μμf
Maximum Overall Length		1-13/16"
Maximum Seated Height		1-9/16"
Length from Base Seat to Bulb Top (excluding tip)		1-3/16" ± 3/32"*
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base▲		Miniature Button 7-Pin
Pin 1 - Grid		Pin 5 - Plate
Pin 2 - Cathode		Pin 6 - Screen
Pin 3 - Heater		Pin 7 - Cathode, Grid No. 3, Internal Shield
Pin 4 - Heater		
RCA Socket		Stock No. 9914
Mounting Position	BOTTOM VIEW	Any

Maximum and Minimum Ratings Are Design-Center Values

AMPLIFIER

Plate Voltage		250 max.	volts
Screen Voltage		100 max.	volts
Grid Voltage		-3 min.	volts
Plate Dissipation		0.5	watt
Screen Dissipation		0.1	watt
Typical Operation and Characteristics - Class A_1 Amplifier:			
Plate Voltage	90	250	volts
Screen Voltage	90	100	volts
Grid Voltage	-3	-3	volts
Plate Resistance	1.0	•	approx. megohm
Transconductance	1100	1400	μmhos
Plate Current	1.2	2.0	ma.
Screen Current	0.5	0.7	ma.
Typical Operation as Mixer in Superheterodyne Circuit:			
Plate Voltage	100	250	volts
Screen Voltage	100	100	volts
Grid Voltage #	-5	-5	approx. volts
Conversion Transconductance	-	550	approx. μmhos

Shielding and ***r-f by-passing*** of each r-f amplifier stage may be required in order to prevent interstage coupling and to provide the shortest possible circuit returns when the tube is operated at the ultra-high frequencies. R-f by-passing can be accomplished by the use of small condensers having short leads placed close to the tube terminals. It may also be advisable in some applications to supplement the action of the by-pass condensers by r-f chokes close to the condensers in the return or supply leads for the grid, screen, ■, ▲, • #: See next page.

*Temporary minimum length = 1-1/16".

-◄- Indicates a change.

9001

DETECTOR AMPLIFIER PENTODE

(continued from preceding page)

plate and heater. The 9001 has two cathode leads in order that the plate and screen r-f circuits may be completed with a minimum of circuit inductance in common with the grid circuit. The grid return may be connected to one cathode terminal and the plate and screen returns may be connected to the other cathode terminal.

■ The cathode of the 9001, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.

• Greater than 1.0 megohm.

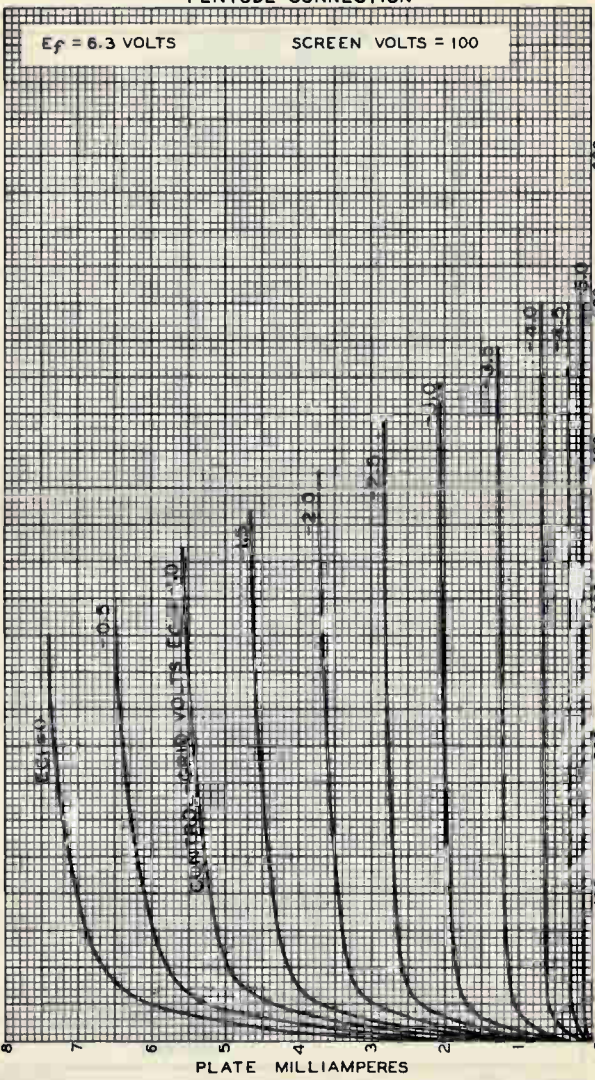
The grid bias is minimum for an oscillator peak voltage of 4 volts. These values are optimum.

▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

9001

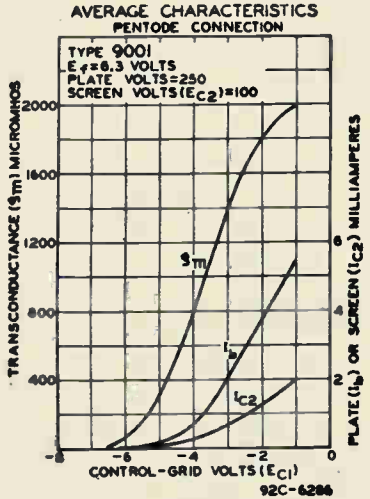
AVERAGE PLATE CHARACTERISTICS

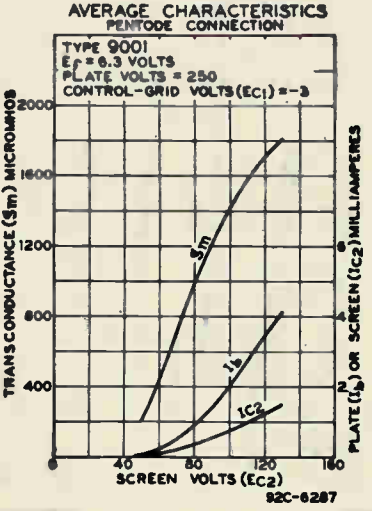
PENTODE CONNECTION



9001

DETECTOR AMPLIFIER PENTODE





9002

DETECTOR, AMPLIFIER, OSCILLATOR

MIDGET TYPE

Heater ■	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances:		
Grid to Plate	1.4	μμf
Grid to Cathode	1.2	μμf
Plate to Cathode	1.1	μμf
Maximum Overall Length		1-13/16"
Maximum Seated Height		1-9/16"
Length from Base Seat to Bulb Top (excluding tip)		1-3/16" ±3/32"* ←
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base ▲		Miniature Button 7-Pin
Pin 1 - Plate		Pin 5 - Plate
Pin 2 - Cathode		Pin 6 - Grid
Pin 3 - Heater		Pin 7 - Cathode
Pin 4 - Heater		
RCA Socket		Stock No. 9914 ←
Mounting Position	BOTTOM VIEW	Any

Maximum Ratings Are Design-Center Values

AMPLIFIER

Plate Voltage	250 max.	volts
Plate Dissipation	1.6 max.	watts ←

Typical Operation and Characteristics - Class A_1 Amplifier:

Plate	90	135	180	250	volts
Grid	-2.5	-3.75	-5	-7	volts
Amp. Fact.	25	25	25	25	
Plate Res.	14700	13200	12500	11400	ohms
Transcond.	1700	1900	2000	2200	μmhos
Plate Cur.	2.5	3.5	4.5	6.3	ma.

■ The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.

▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

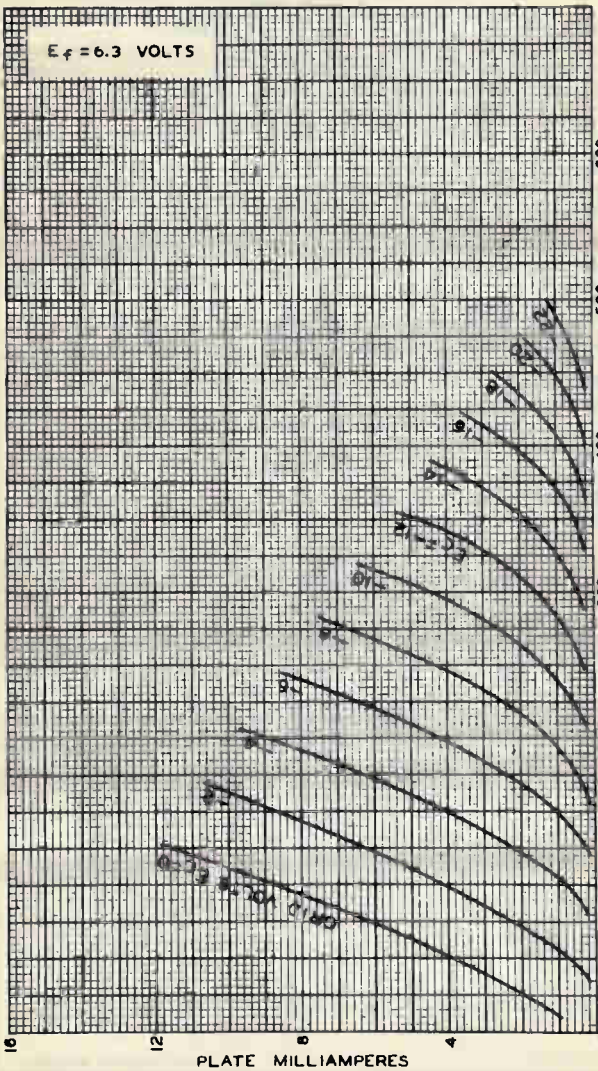
*Temporary minimum length = 1-1/16".

← Indicates a change.

9002

9002

AVERAGE PLATE CHARACTERISTICS



SEPT. 17, 1943

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

92C-6264

9003

SUPER-CONTROL R-F AMPLIFIER PENTODE

MIDGET TYPE

Heater	Coated Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances:		
Grid to Plate	0.01 max.	μμf
Input	3.4	μμf
Output	3.0	μμf
Maximum Overall Length		1-13/16"
Maximum Seated Height		1-9/16"
Length from Base Seat to Bulb Top (excluding tip)		1-3/16" ± 3/32"* ←
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base▲		Miniature Button 7-Pin
Pin 1 - Grid		Pin 5 - Plate
Pin 2 - Cathode		Pin 6 - Screen
Pin 3 - Heater		Pin 7 - Cathode, Grid No. 3, Internal Shield
Pin 4 - Heater		
RCA Socket		Stock No. 9914 ←
Mounting Position	BOTTOM VIEW	Any

Maximum and Minimum Ratings Are Design-Center Values

AMPLIFIER

Plate Voltage	250 max.	volts
Screen Voltage	100 max.	volts
Grid Voltage	-3 min.	volts
Plate Dissipation	1.7 max.	watts ←
Screen Dissipation	0.3 max.	watt ←
Typical Operation and Characteristics - Class A_1 Amplifier:		
Plate Voltage	250	volts
Screen Voltage	100	volts
Grid Voltage	-3	volts
Plate Resistance	0.7 approx.	megohm
Transconductance	1800	μmhos
Grid Bias for Transcond. of 15 μmhos	-36	volts
Grid Bias for Transcond. of 2 μmhos	-45	volts
Plate Current	6.7	ma.
Screen Current	2.7	ma.

Typical Operation as Mixer in Superheterodyne Circuit:			
Plate Voltage	100	250	volts
Screen Voltage	100	100	volts
Grid Voltage #	-10	-10 approx.	volts
Conversion Transconductance	-	600 approx.	μmhos

\# The grid bias is minimum for an oscillator peak voltage of 9 volts. These values are optimum.

▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

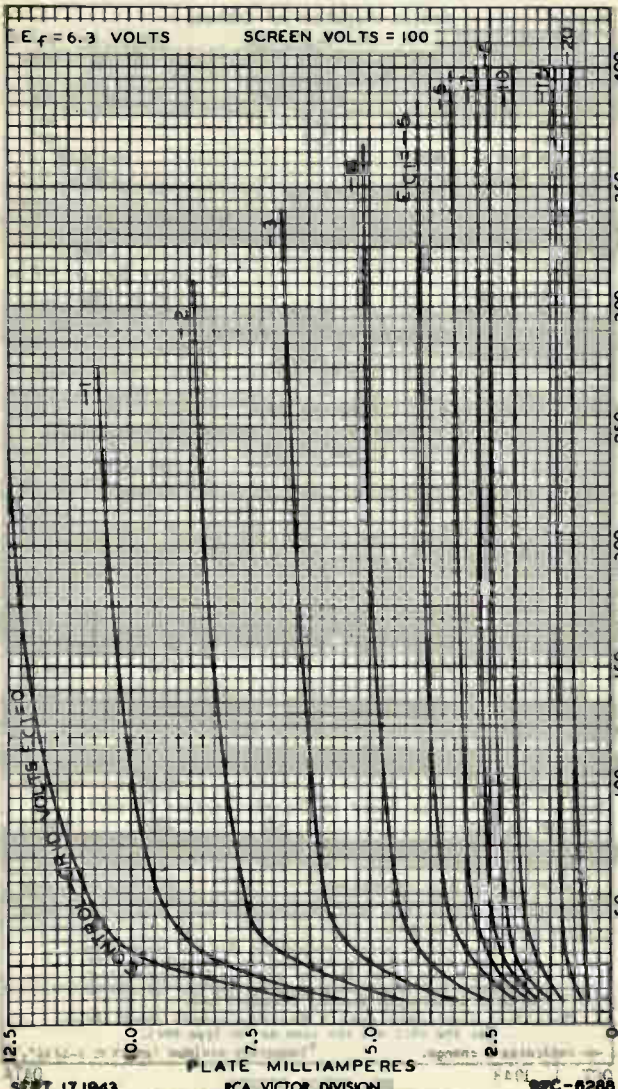
Shielding Considerations & Heater-Cathode Connections for the 9003 are the same as for Type 9001.

← Indicates a change. *Temporary minimum length = 1-1/16".

9003

9003

AVERAGE PLATE CHARACTERISTICS



SEPT. 17, 1943

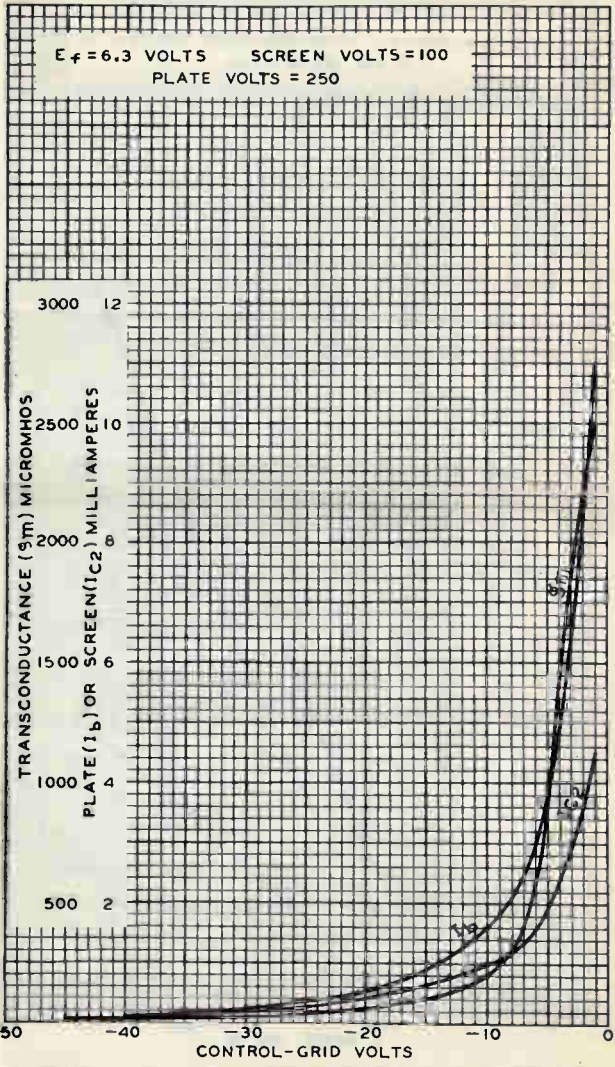
RCA VICTOR DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RC-6288

9003

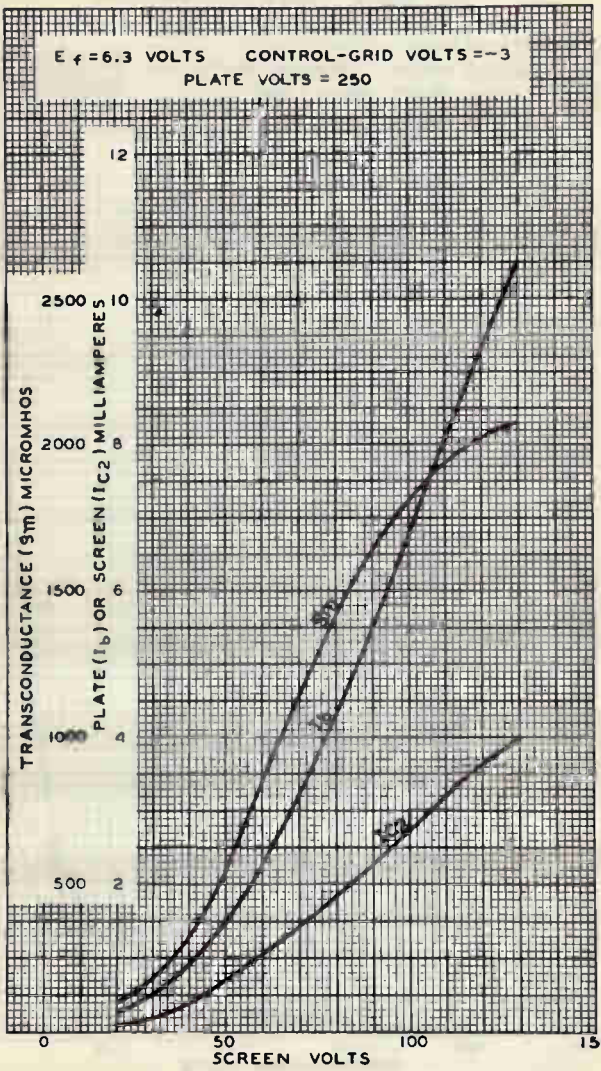
AVERAGE CHARACTERISTICS



9003

9003

AVERAGE CHARACTERISTICS



MAY 29, 1941

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

92C-6290

9005

U-H-F DIODE

ACORN TYPE

Heater	Coated Unipotential Cathode	
Voltage	3.6	a-c or d-c volts
Current	0.165	amp.
Direct Interelectrode Capacitances:*		
Plate to Cathode	0.8	μμf
Plate to Heater	0.2 approx.	μμf
Heater to Cathode	1.1 approx.	μμf
Overall Length		1-7/32" ±5/32"
Overall Diameter		1-3/32" ±1/16"
Bulb		T-4½
RCA Socket		Stock No.9925
Mounting Position		Any

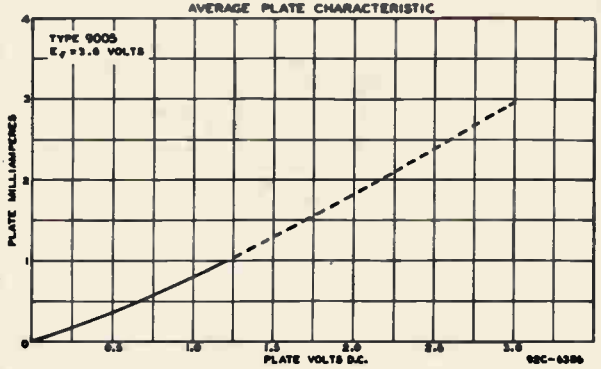
Maximum Ratings are Design-Center Values

RECTIFIER

A-C Plate Voltage (RMS)	117 max. volts
D-C Output Current	1.0 max. ma.

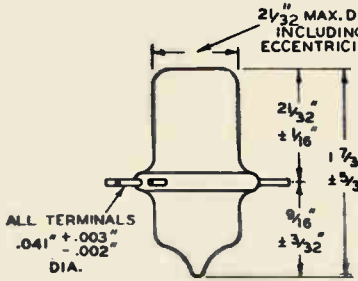
The resonant frequency of the 9005 is approximately 1500 Mc.

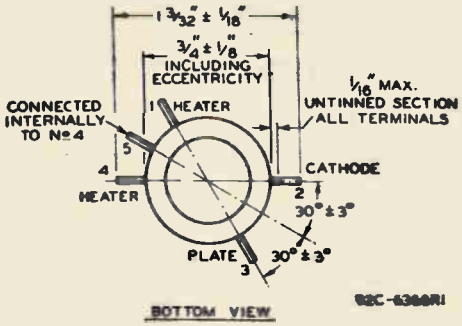
*With no external shield.



9005

U-H-F DIODE





BOTTOM VIEW

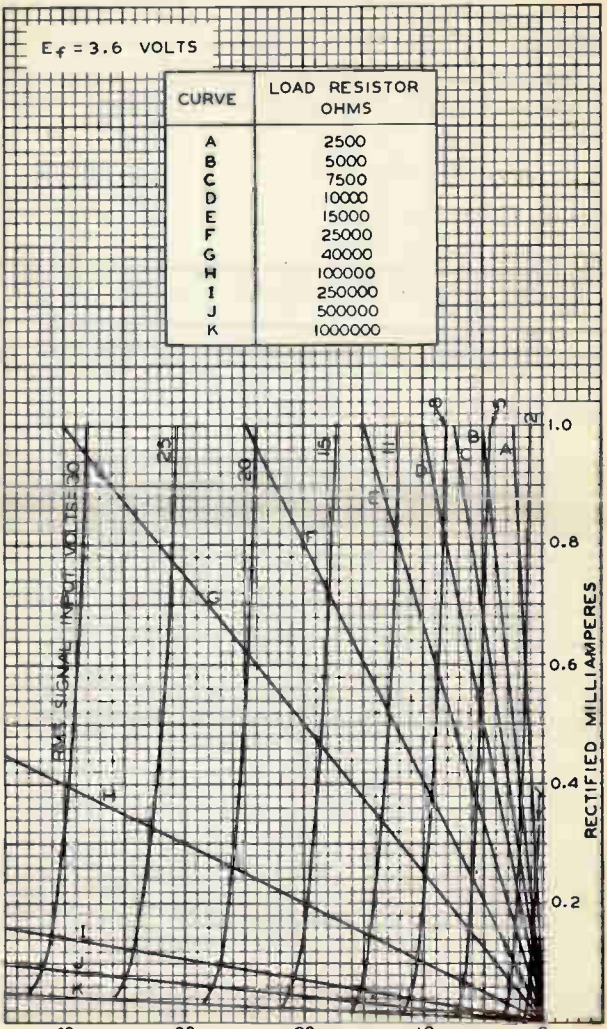
→ Indicates a change.

9005

AVERAGE CHARACTERISTICS

$E_f = 3.6$ VOLTS

CURVE	LOAD RESISTOR OHMS
A	2500
B	5000
C	7500
D	10000
E	15000
F	25000
G	40000
H	100000
I	250000
J	500000
K	1000000



9006

U-H-F DIODE

MIDGET TYPE

Heater	Unipotential Cathode	
Voltage	6.3	a-c or d-c volts
Current	0.15	amp.
Direct Interelectrode Capacitances:●		
Plate to Cathode	1.4	μμf
Plate to Heater	0.2	μμf
Cathode to Heater	2.2	μμf
Maximum Overall Length		1-13/16"
Maximum Seated Height		1-9/16"
Length from Base Seat to Bulb Top (excluding tip)		1-3/16 ± 3/32"*
Maximum Diameter		3/4"
Bulb		T-5-1/2
Base▲		Miniature Button 7-Pin
Pin 1 - Plate		Pin 5 - Plate
Pin 2 - Cathode		Pin 6 - No Connection
Pin 3 - Heater		Pin 7 - Cathode
Pin 4 - Heater		
RCA Socket		Stock No. 9914
Mounting Position	BOTTOM VIEW (6BH)	Any

Maximum Ratings Are Design-Center Values

RECTIFIER

Peak Inverse Plate Voltage	750 max.	volts
Peak Plate Current	15 max.	ma.
D-C Output Current	5 max.	ma.
D-C Heater-Cathode Potential	100 max.	volts
Typical Operation as Rectifier:		
A-C Plate Supply Voltage (RMS)	270	volts
Min. Total Effective Plate-Supply Impedance	100	ohms
D-C Output Current	5	ma.

● With no external shield.

The resonant frequency of the 9006 is 700 megacycles(approx).

▲ *The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.*

*Temporary minimum length = 1-1/16".

9006

U-H-F DIODE

AVERAGE PLATE CHARACTERISTIC