

708,

## 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 a Current (Approx.) at	
13.5 volts 0.21	amp
Grid No.1 to plate	0.7 max. μμf
Grid No.1 to all other electrodes except plate	8 μμf
except grid No.1	8.5 m
dechanical:	
Operating Position  Maximum Overall Length  Maximum Seated Length  Length, Base Seat to Bulb Top (Excluding tip)  Diameter  O.  Dimensional Outline.  See Go  Bulb  Base  Small-Button Noval 9-Pin (S  Basing Designation for BOTTOM VIEW	2-3/8" 2" ± 3/32" 750" to 0.875" eneral Section 76-1/2
Pin 2 - No Connection  Pin 3 - Grid No.1  Pin 3 - Grid No.1  Pin 8	- Grid No 1 - Cathode, Grid No.3 - Grid No.2 - Plate
AMPLIFIER - Class A	
Maximum Ratings. Absolute Values:	
PLATE VOLTAGE 345	max. volt:
GRID-No.2 (SCREEN-GRID) VOLTAGE 310	max. volts
	max. watt:
PEAK HEATER-CATHODE VOLTAGE:	
	max. volt
Typical Operation and Characteristics:	The state of the s
Heater Voltage	volt
Plate Voltage	
Grid-No.2 Voltage 200	volt
Grid-No.2 Voltage	volt
O without external shield.	
-	NTATIVE DATA

## BEAM POWER TUBE

DEMINITOWE	SKI	DE		
Peak AF Grid-No.1 Voltage		10		volts
Zero-Signal Plate Current		35.5		ma
MaxSignal Plate Current		38		ma
Zero-Signal Grid-No.2 Current		9		ma
MaxSignal Grid-No.2 Current		7.5		ma
Plate Resistance (Approx.)		60000		ohms
Transconductance		4200		umhos
Load Resistance		5000		ohms
Total Harmonic Distortion		7		%
MaxSignal Power Output		3		watts
Maximum Circuit Values:				
Grid-No.1-Circuit Resistance:				- 1
For fixed-bias operation		0.1	max.	megohm
For cathode-bias operation	<u> </u>	0.5		megohm
CHARACTERISTICS RANGE VALUES	FOR EQ	JIPMENT	DESIGN	
	Note	Hin.	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	4.6		50	1
respect to cathode	1,5	-	50	ua
respect to cathode	4 12		E0.	1
Leakage Resistance:	1,5	-	50	μa
Between grid No.1 and all other				1
electrodes tied together	1.8	50		aabaa
Between plate and all other	7.40	50	- m	egohms
electrodes tied together	1.7	50		egohms
		00	- 111	cgomis
Note 1: With ac or dc heater volts = 13.	5.			
Note 2: With dc plate volts = 200, grid- = -10, and grid No.3 connected t		s = 200,	grid-No.	1 volts
Note 3: With grid-No.1 resistor (megohms	cathode			
Note 4: With load resistor (ohms) = 5000	, and rme	sional w	olfe s	
Note 5: With 100 volts dc between heater	and cati	node.	D1 68 - 1	
			to all	other
Note 6: With grid No.1 100 volts negat electrodes tied together.				
Note 7: With plate 300 volts negative with tied together.	respect	to all ot	ner elec	trodes
SPECIAL RATINGS & PER	FORMARCI	F DATA		
deater-Cycling Life Performance:	INTRICT			
This test is performed on a same	nia let			

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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TENTATIVE DATA 1 ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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## BEAM POWER TUBE

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.

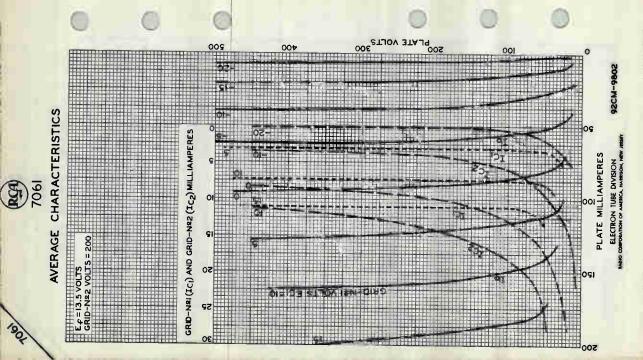
#### Low-Frequency Vibration Performance:

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:

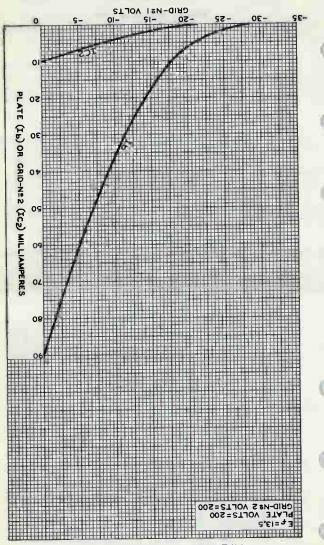
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15, and maximum-rated plate dissipation and grid-No.2 input.

TENTATIVE DATA 2



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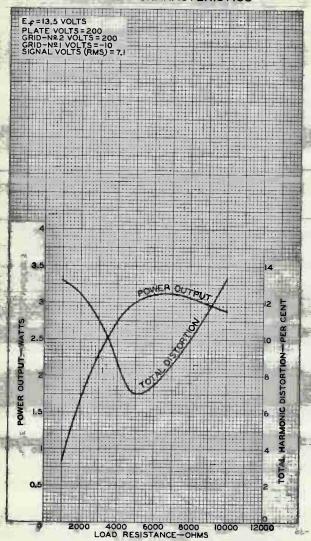
## AVERAGE CHARACTERISTICS



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## OPERATION CHARACTERISTICS



**RCA** 7061

## AVERAGE CHARACTERISTICS TRIODE CONNECTION

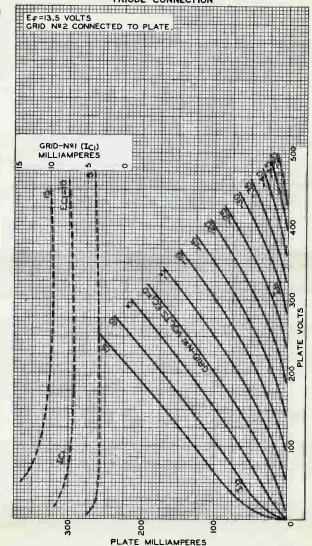
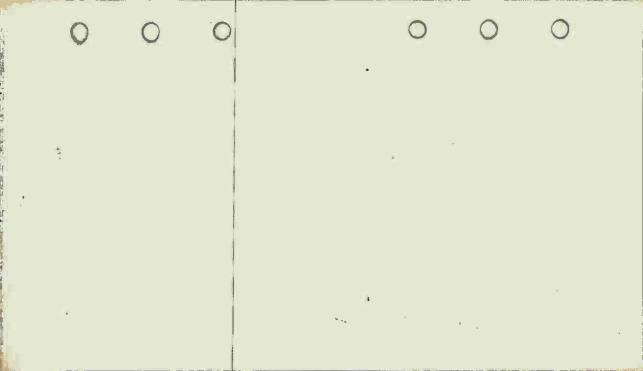


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ELECTRON TUBE DIVISION
BADIO CORPORATION OF AMERICA, HARRISON, NEW JERSE

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

GENERAL DATA		
Electrical:		
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.35	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to all other electrodes		
except plate	7.5	puf
Grid No.1 to deflecting	0.045	
electrode No.1	0.015	μμε
Grid No.1 to deflecting electrode No.2	0.015	Met
Grid-No.1 to plate No.1	0.003	<i>put</i>
Grid No.1 to plate No.2	0.003	
Plate No.1 to plate wo.2	0.005	put
except deflecting electrode No.1	0.8	<sub>µu</sub> f
Plate No.2 to all other electrodes	0.0	paper
except deflecting electrode No.2	0.8	<sub>J</sub>
Plate No.1 to plate No.2	0.3	Juf
Deflecting electrode No.1 to all		· ·
other electrodes except plate No.1.	4.6	Jul
Deflecting electrode No.2 to all		7 ,44
other electrodes except plate No.2.	4.6	ppef
Deflecting electrode No.1		**
to plate No.1	4	μμ.f <
Deflecting electrode No.2		
to plate No.2	4	HH1 =
Deflecting electrode No.1 to	4.4	
deflecting electrode No.2	1.4	puf
Characteristics, Class A, Amplifier:		
Plate-No.1 Supply Voltage	150	volts
Plate-No.2 Supply Voltage	150	volts
Deflecting-Electrode-No.1 Supply	100	40163
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	µmhos (	
to plate No.1b 800 Deflecting electrode No.2	μπhos	
to plate No.2b 800 Switching Voltage <sup>c</sup>	µmhos volts	
Mechanical:		
Operating Position.  Maximum Overall Length.  Maximum Seated Length	2-5/8" 2-3/8" ± 3/32" 0.875" Section .T6-1/2	
Pin 3 - Grid No.1 Pin 4 - Heater  Pin 9 - Defle	No.1 cting trode cting trode	
- BALANCED MODULATOR		
Maximum Ratings, Absolute-Naximum Values:		
PLATE-No.1 VOLTAGE	volts volts volts volts watt watts watts	
Typical Operation:	Carl Carl	
In accompanying balanced-modulator cir- cuit utilizing separate excitation	Secretary.	
Plate Voltage (Each plate) 150 Deflecting-Electrode Voltage	volts	
(Approx., each electrode)	volts (	
→ Indicates	a change.	_
RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.	RCA	

	and the second s		_		-
		1.			
	Cathode Resistor	1200		ohms	
	Electrode Voltagef	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	
	(Approx.)	5000		ohms	
	Sideband Output Voltage	4		volts	
	Carrier Suppression <sup>9</sup>	60		db -	-
	Third-Order Distortion	-47		db	
	Fourth-Order Distortion <sup>9</sup>	-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	
	electione,	0.00	max.	megerini	
	BALANCED MIXER				
	Maximum Ratings, Absolute-Haximum 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	4004		24.	
	respect to cathode	180°	max.	volts	
	Typical Operation:				
	In accompanying balanced-mix cuit utilizing separate exci				
	Plate Voltage (Each plate) Deflecting-Electrode Voltage	150		voits	
	(Approx., each electrode)	25		volts	
	Grid-No.2 Voltage	175		volts	
	Cathode Resistor	1200		ohms	
	Deflecting-Electrode Voltage	. 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	
		01.10		*******	



-Indicates a change.

Plate-to-Plate Load Impedance				
(Approx.)	10000		Ofms	
Sideband Output Voltage	40		volts	
Oscillator Rejection <sup>9</sup>	-40			
Third Order Distanting			db	
Third-Order Distortion9	-40		đb	
Fourth-Order Distortion	-98		db	
Maximum Circuit Values:				
Grid-No.1-Circuit Resistance:				
For fixed-bias operation	0.5	max.	meaohm	7
For cathode-bias operation	2.2	MEDY.		
Deflecting-Electrode-Circuit				
Resistance (Per deflecting				
electrode)	A 05	300034	manaha	
	200		1	

Without external shield.

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

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.

The dc component must not exceed 100 volts.

e Operation with self-excitation and cathode resistor of 900 chas Fa similar to operation with separate excitation.

To either deflecting electrode. The other deflecting electrode ha bypassed.

Referred to single-sideband output voltage.

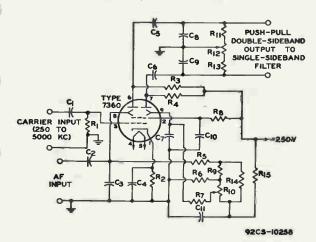
#### OPERATING CONSIDERATIONS

Deflecting-electrode-circuit resistance should be kept below 0.05 megohm to prevent nonlinear tube operation. 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 tabe 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



 $\begin{array}{l} C_2^-: 0.22 \ \mu\text{T} \\ C_3^-: 0.001 \ \mu\text{T} \\ C_4^-: 0.001 \ \mu\text{T} \\ C_5^-: C_6^-: 0.0033 \ \mu\text{T} \\ C_7^-: 0.1 \ \mu\text{T} \\ C_8^-: C_9^-: Sufficient to resonate input of SSB filter \\ C_{10}^-: 0.22 \ \mu\text{T} \\ C_{11}^-: 0.47 \ \mu\text{T} \\ R_1^-: 0.47 \ \text{megohm} \\ R_2^-: 1200 \ \text{ohms} \\ R_2^-: R_1^-: 68000 \ \text{ohms} \end{array}$ 

Re: 47000 ohms

C,: 0.001 µf

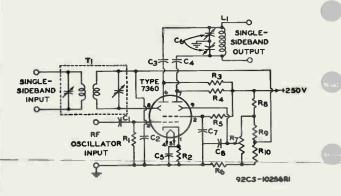
R<sub>6</sub>: 12000 ohms
R<sub>7</sub>: 47000 ohms
R<sub>8</sub>: 0.1 megohm
R<sub>9</sub>: 2700 ohms
R<sub>10</sub>: Carrier-Balance Potentiometer, 5000 ohms
R<sub>11</sub>: 2700 ohms
R<sub>12</sub>: Quadrature-Balance
Potentiometer, 2500 ohms
R<sub>13</sub>: R<sub>14</sub>: 2700 ohms
R<sub>15</sub>: 0.1 megohm
MOTE: All resistors 1/2 watt, ±

10% unless specified.

All capacitors 400 volts.

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## BALANCED-MIXER CIRCUIT With Separate Excitation



R. R.: 68000 ohms

C1: 0.001 #f

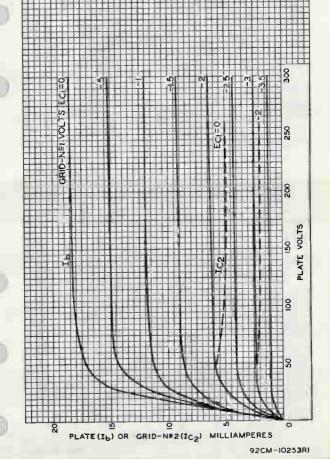
R<sub>5</sub>: 0.1 megohm
R<sub>6</sub>: 12000 ohms
R<sub>7</sub>: Oscillator-Rejection Potentioneter, 5000 ohms
R<sub>8</sub>: 0.1 megohm
R<sub>9</sub>: R<sub>10</sub>: 2700 ohms
T<sub>1</sub>: Tuned input Transformer
NOTE: All resistors 1/2 wett, ±
10%, unless specified.
All capacitors 4/00 volts.

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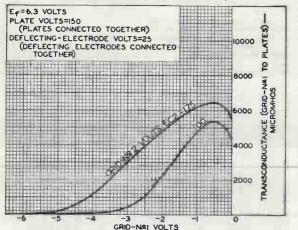


## **AVERAGE CHARACTERISTICS**

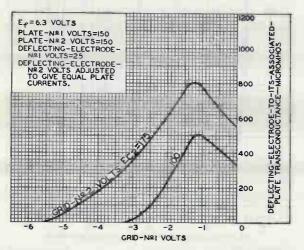
E<sub>P</sub>=6.3 VOLTS
PLATES CONNECTED TOGETHER.
DEFLECTING-ELECTRODE VOLTS=25
(DEFLECTING ELECTRODES
CONNECTED TOGETHER)
GRID-№ 2 VOLTS=175



## **AVERAGE CHARACTERISTICS**



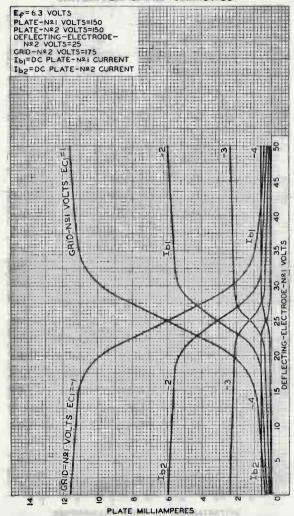
92CS-10250R2



92CS-10249R1



### **AVERAGE CHARACTERISTICS**



92CM-10252R2



## **OPERATION CHARACTERISTICS**

Ex=6.3 VOLTS PLATE-Nº1 VOLTS=150
PLATE-Nº2 VOLTS=150
DEFLECTING-ELECTRODENº2 VOLTS=25 GRID-Nº2 VOLTS=175 INITAC PLATE-NºI CURRENT iba=AC PLATE-Nº2 CURRENT 2 9

INSTANTANEOUS AC PLATE MILLIAMPERES

92CM-10264R2



## **Beam Power Tube**

#### 9-PIN MINIATURE TYPE

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

#### GENERAL DATA

#### Electrical:

Liecti Icai.			
Heater Characteristics and Ratings: Voltage range	12	to 15	volts
Current at heater volts = 13.5 !  Peak heater-cathode voltage:  Heater negative with	0.360		amp
respect to cathode	100	max.	wolts
respect to cathode  Direct Interelectrode Capacitances;	100	max.	volts
Grid No.1 to plate	0.15	max.	pf
grid No.2, and heater	10.0		pf
grid No.2, and heater	5.5		pf
Characteristics, Class A, Amplifier:			
Heater Voltage	13.5		volts
Plate Voltage	250		volts
Grid No.3	to car	thode 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		umhos
Plate Current	40		ma
Grid-No.2 Current	3		ma
Mechanical:			
Operating Position		ed Unipot	. Any

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



Pin 7-Grid No.3 Pin 8-Grid No.2 Pin 9-Cathode

		( )	
-	AF POWER AMPLIFIER & MODULATOR Class AB	_	
	Maximum CCS Ratings, Absolute-Haximum Values:		
	DC PLATE VOLTAGE	volts	
	GRID No.3 (SUPPRESSOR GRID) O max.	volts	
	DC GRID-No. 2 (SCREEN-GRID) VOLTAGE 300 max.	volts	
	MAXSIGNAL DC PLATE CURRENT 70 max.	ma 🦳	
	MAXSIGNAL PLATE INPUT	watts	
	MAXSIGNAL GRID-No. 2 INPUT 2 max.	watts	
	PLATE DISSIPATION 10 max.	watts	
	Typical CCS Push-Pull Operation:		
	Values are for 2 tubes		
	Heater Voltage	volts	
	Grid No.3	volts	
	DC Grid-No.2 Voltage§	volts	
		volts	
	DC Grid-No.1 Voltage§21 Peak AF Grid-No.1-to-Grid-No.1 Voltage 40	volts	
	Zero-Signal DC Plate Current 40	ma	
	MaxSignal DC Plate Current	ma	
	Zero-Signal DC Grid-No.2 Current	ma	
	MaxSignal DC Grid-No.2 Current	ma	
	Effective Load Resistance (Plate to plate). 5000	ohms	
	Max.—Signal Driving Power 0	watts	
	Total Harmonic Distortion 5	%	
	MaxSignal Power Output (Approx.) 20.5	watts	
	Maximum Circuit Values:		
	Grid-No.1-Circuit Resistance 0.1 max.	megohm	
+	RF POWER AMPLIFIER & OSCILLATOR — Class C Telegrap	hyt	
	and RF POWER AMPLIFIER —— Class C FM Telephony	(-)	
	Maximum Ratings, Absolute-Haximum Values:		
	CCS ICAS C		
	DC PLATE VOLTAGE 375 max. 375 max.	volts	
	GRID No.3 (SUPPRESSOR GRID) O max. O max.	volts	
	DC GRID-No.2 (SCREEN-GRID)		Ì
	VOLTAGE 300 max. 300 max.	volts	
	DC GRID-No.1 (CONTROL-GRID)		
	VOLTAGE125 max125 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 (	1
	GRID-No.2 INPUT 2 max. 2 max.	watts	
	PLATE DISSIPATION 10 max. 12 max.	watts	
	→ Indicates a	change.	

point on bulb surface). . .

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



Typical	Operation:

Typical Operation:			
As amplifier	at 175 Mc CCS	ICAS	
DC Grid-No.2 Voltage DC Grid-No.1 Voltage Peak RF Grid-No.1 Voltage DC Grid-No.1 Voltage	. 250 onnected to . 200 40 . 47	3.5 13.5 300 300 cathode at 200 250 -42 -55 52 62	volts volts volts
DC Plate Current.  DC Grid-No.2 Current  DC Grid-No.1 Current (Approx.).  Driver Power Output (Approx.).  Useful Power Output (Approx.).	. 1	70 80 3.7 5.1 2.1 1.6 1 1.5 8.5 10	ma ma watts watts
Maximum Circuit Values:	0 1 max	e. 0.1 max.	merchm
Grid-No.1-Circuit Resistance	. U.1 max	e. U.I max.	magorin
PLATE-MODULATED RF POWER AMPL  Carrier conditions;  with a maximum moduli	per tube fo	r use	nony -
Maximum Ratings, Absolute-Naximum	_		
		175 Nc	
	CCS	ICAS	
DC PLATE VOLTAGE	. 300 max.	300 max.	volts
GRID No.3 (SUPPRESSOR GRID) DC GRID-No.2 (SCREEN-GRID)	. 0 max.	0 max.	volts
DC GRID-No.1 (CONTROL-GRID)	. 300 max.	300 max.	volts
10211100	125 max.		volts
DC PLATE CURRENT		70 max.	ma
DC GRID-No.2 CURRENT	. 10 max.	10 max.	ma
PLATE INPUT	. 5 max.	5 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
		cathode at	
DC Grid-No. 2 Voltage	250	250	volts
DC Grid-No.1 Voltage* From a grid-No.1	-70	-75	volts
	33000	33000	ohms
RF Grid-No.1 Voltage	75	80 70	volts ma
DC Plate Current DC Grid-No.2 Current	60 2.5	3	ma
DC Grid-No. 2 Current (Approx.).	2.1	2.3	ma
Driving Power (Approx.)	1	1	watt
Useful Power Output*	6.5	7.5	watts

CCS

**ICAS** 

15 max.

2 max.

12 max.

watts

watts

watts

Maximum Circuit Values:

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



## FREQUENCY MULTIPLIER

### Maximum Ratings, Absolute-Maximum Values:

	CCO	IVAD	
DC PLATE VOLTAGE GRID No. 3 (SUPPRESSOR GRID) . DC GRID-No. 2 (SCREEN-GRID)		375 max. 0 max.	volts
DC GRID-NO. 2 (SCREEN-GRID)			

VOLTAGE . . . . . . . . . . . . 300 max. 300 max. volts DC GRID-No.1 (CONTROL-GRID) volts VOLTAGE . . . . .-125 max. -125 max. 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

13 max.

2 max.

10 max.

PLATE DISSIPATION . Typical Operation:

PLATE INPUT . .-

GRID-No. 2 INPUT . .

## As doubler, to 175 Me

Heater Voltage			. 13.5	13.5		volts
DC Plate Voltage			. 250	250		volts
Grid No.3					at	socket
DC Grid-No. 2 Voltage.	6		. 200	250		volts







7551

## BEAM POWER TUBE

DC Grid-No.1 Voltage From a grid-No.1	•	-53	-66	volts
resistor of		53000	44000	ohms
Peak RF Grid-No.1 Voltage .			74	volts
DC Plate Current			60	ma
DC Grid-No. 2 Current			3.5	ma
DC Grid-No.1 Current				
		1	1.5	ma
Oriving Power (Approx.)		0.4	0.6	watt
Useful Power Output*		3	4.5	watts
Social Tomor Garpar I I I	•		****	
As trip	Le	r to 175 Mc		
Heater Voltage		13.5	13.5	volts
DC Plate Voltage		200	250	volts
Grid No.3			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.)			0.6	watt
Useful Power Output*		1.4	2.3	watts
	•			

#### Maximum Circuit Values:

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

- O 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 re-sistor. It is recommended that this resistor be adjustable to ob-tain the desired operating plate current after initial tuning ad-justments are made.



## 755

### 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 blas-supply compensation.

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	ROLE	Hin.	RGX.	
Heater Current	1	0.33	0.39	атр
Transconductance	1,2	4200	6400	µmhos
Plate Current		30	50	ma
Plate Current		_	50	μа
Grid-No.2 Current		-	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. . . . . . Leakage Resistance:

Between grid No.1 and all other
electrodes tied together. . 1,6

Between plate and all other
electrodes tied together. . 1,7

megohms

megohms

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

Note 2: With plate voltege of 250 volts, grid No.3 connected to cethode, grid—No.2 voltage of 250 volts, and grid—No.1 voltege of —18 volts.

Note 3: With plete voltage of 250 volts, grid No.3 connected to cethode, grid—No.2 voltage of 250 volts, end grid—No.1 voltage of —N8 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 do 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





μa

20









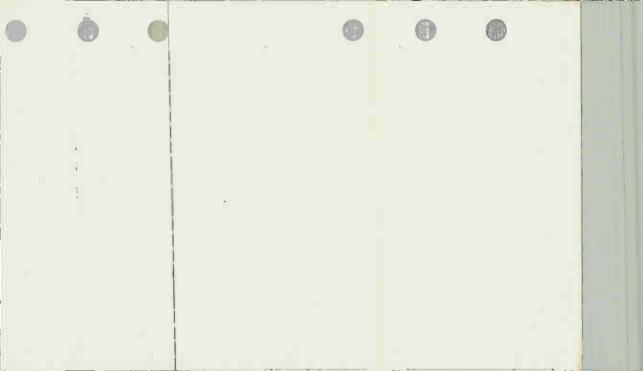
## BEAM POWER TUBE

voltage of 13.5 voits, 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.

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)	lts amp
	sec
	hos
Grid to plate	purf purf purf purf purf purf
Mechanical:	
Operating Position	oz 8°, -5,
Socket for operation up to about  550 Mc (Including heater— terminals connector)Jettron® No.CD70 or equival	10,
Cavities (Including heater- terminals connector)	

- Indicates a change.

or equivalent



Flactrical.



G-Grid P-Plate

RADIO-FREQUENCY AMPLIFIER - Class A

Maximum CCSh Ratings, Absolute-Maximum Values:

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

DC PLATE VOLTAGE	250 max.	
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.	oc.

#### Typical CCSh Operation in Cathode-Drive Circuit:

At 550 Nc At 800 Nc At 1100 Nc

DC Plate-to-Grid Vo	oltage.	125	125	150	volts
Cathode Resistor.		50	50	50	ohms
Input-Signal-Level			-70 to -20	-70 to -20	dbm
DC Plate Current.			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.
- Amerac, Inc., Dunham Road, Beverly, Massachusetts.
- c For use with cevities.
- d Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.
- Jettron Products, Inc., 56 Route 10, Hanover, N.J.
- J-Y-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.
- Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavities covers the range from 215 to 2325 Mc.
- Continuous Commercial Service.

-Indicates a change.

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



		MADAATEDISTIAS	DAMAE VAL	1150 FAD	CO111 DMC	MT DEGI	011
	U	HARACTERISTICS	KANGE YAL		• .		GN
				Note	Hin.	Max.	
6		Current		1	0.205	0.245	amp
		Interelect rode	•				
		itances:			2.0	2.7	
		to plate to cathode		-	2.0	2.7	μμή
		to cathode		7	3.7	0.04	μμή
-		Cathode Leakag	e Current			0.04	μμε
		r negative wit					
COLOR		pect to cathod		1.2	_	30	μα
		r positive wit		-7		,	-
		pect to cathod		1,3	_	30	μa
	Leakage	Resistance:					-
	From	grid to plate	and				
	cat	hode connected	together.	1,4	100	***	megohms
(年)		plate to grid					
1		hode connected		1,5	100	-	megohms
		Grid Current.		1,6	-	0.3	μα
		n Voltage		7	-	4	volts
		cation Factor.		1,8	60	100	
		nductance		1,8	10000	17000	µmhos
		urrent (1) urrent (2)		1,8	8.5	17.5	ma
		urrent (3)		1,9 1,10	100	50	μa
				1,11	13	_	μa db
		igure		1.11		7.5	db
		in Power Gain.		11,12		-1	db
		in Noise Figur		11.12	-	0.5	db
		in Transconduc		11.12	-	15	*
	Note 1:	With 6.3 volts					
	Note 2:	with 60 volts of with respect to	cathode.				
	Note 3:	with 60 volts of with respect to	cathode.				
	Nota 4:	with grid 100 v which are conne					
	Note 5:	With plate 300 which are conne	cted togethe	r.		-	
	Note 6:	with dc plate volts, grid res	voltage of istor of 0.5	200 volt megohm.	s, dc gr	id volta	ige of -2
	Note 7;	with dc voltage adjusted to pro volts on heater	on grid and oduce a catho	plate whode currer	ich are o it of 30	onnected ma., and	togathar with 5,5
	Note 8:	With dc plate s 50 ohms, and ca					
	Note 9;	With dc plate -5 volts.				•	•
	Note 10:	with dc plate -2.5 volts.					
	Note 11:	With dc plate s of 50 ohms in a having a bandwi operating frequ	upply voltag a single-tub dth of 5 ± 0 ency of 550	e of 125 e rf ampl .5 Mc, si ± 10 Mc.	volts and lifter of gnal inpu	the cavit of -70	resistor vity typa dbm, and
	Note 12:	Reduce heater Noise Figure, a with 6.3 voits	voltage to : ind Transcond on heater wi	5.7 volts luc'ance v 1) not ex	. Chang alues fr ceed indi	e in Pow om those cated va	er Galn, obtained lues.

-Indicates a change.



#### SPECIAL TESTS & PERFORMANCE DATA

#### Low-Pressure Voltage-Breakdown Test:

This test (similar to MIL-E-ID, paragraph 4.9.12.11 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 ms voltage of 500 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  $10 \pm 2$  g. Total time to complete a sweep cycle is  $10 \pm 5$ 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-Cathode Leakage Current. . . . 60 max. 
For conditions shown under Characteristics Range Values,
Notes 1,3. 
Indicates a change.

#### Shock Test:

This test (similar to MIL-E-ID, paragraph 4.9.20.51) 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-Cathode Leakage Current. . . . 60 max. μa For conditions shown under Characteristics Range Values, Motes 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  $15/16^{\circ}\pm 1/64^{\circ}$ , 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  $97^{\circ}$  C for at least 15 seconds, and then immersing immediately in water at not more than  $5^{\circ}$  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 M:L-E-ID, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.3 voits 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 mln. megohms For conditions shown under Characteristics Range Values, Notes 1,4.

#### I-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 I 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

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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 ! [mits:

8000 min. For conditions shown under Characteristics Range Values, Notes 1.8.

Plate Current (2) . . . . . . . . . . 50 max. For conditions shown under Characteristics Range Values,

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

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

#### 500- and 1000-Hour Average Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure excellent overall performance and to quard 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:

300 max. 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. For conditions shown under Characteristics Range Values,

Notes 1,4, and 1,5. 

For conditions shown under Characteristics Range Values. Notes 1, 11.

Noise Figure. . . . . . . . . . . . . . . . . . . 8.5 max. For conditions shown under Characteristics Range Values,

Change in Power Gain. . . . . . . . . . For conditions shown under Characteristics Range Values, Notes 1, 11, 12.

## 7552

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:

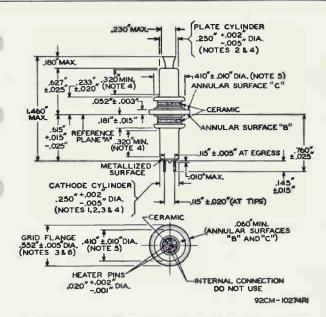
Heater Current. . . . . . . . . . . . . . . . 300 max. ma For conditions shown under Characteristics Range Values,

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.



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  $2^{\rm O}$  OF A LINE PERPENDICULAR TO REFERENCE PLANE "A".

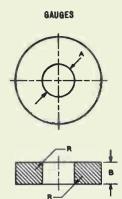
NOTE 2: THE AXES OF THE PLATE CYLINDER AND CATHODE CYLINDER WILL COINCIDE WITHIN 0.010".

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  $\mathbf{G_1}$ -1 AND  $\mathbf{G_1}$ -2, RESPECTIVELY.

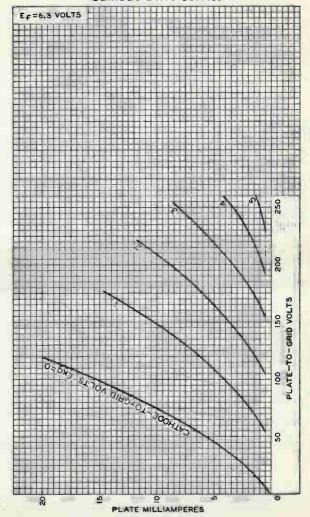
NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES  ${\sf G_2}$ -1 AND  ${\sf G_2}$ -2, RESPECTIVELY.

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



Gauge	Туре	Dimension				
oauge	Type	Diameter A	Thickness B	Radius R		
61-1	GO .	0.25200"+0.00000"	0.320"+0.001"	0.003" MAX.		
6,-2	NO-GO	0.24500"+0.00007"	-	-		
G <sub>2</sub> -1	GO	0.42000"+0.00000"	-	-		
62-2	NO-GO	0.40000"+0.00007"	_	_		
63-1	GO	0.55700"+0.00000"	-	-		
6,-2	NO-GO	0.54700"+0.00007"	_ =	-		

# **AVERAGE PLATE CHARACTERISTICS** Cathode-Drive Service

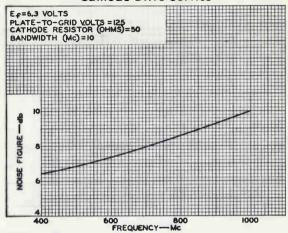


92CM-10458

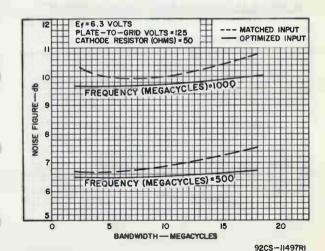
PLATE-TO-GRID SUPPLY VOLTS=125 CATHODE RESISTOR (OHMS)=50 INPUT-SIGNAL LEVEL (Abm)=-70

EF=6.3 VOLTS

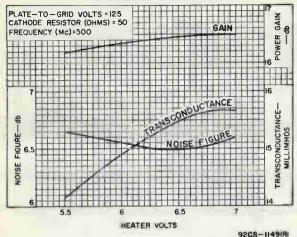
# NOISE-FIGURE CHARACTERISTICS Cathode-Drive Service



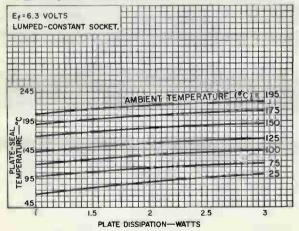
9000-10099000



# Cathode-Drive Service



# PLATE-SEAL-TEMPERATURE CHARACTERISTICS



92CS-II488

# High-Mu Triode

FAST WARM-UP TIME CERAMIC-METAL PENCIL TYPE
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,	12000	-6.4
and cathode resistor (ohms) = 50 Direct Interelectrode Capacitances:	13000	µmhoś
Grid to plate	2.4	Mrt
Grid to cathode and heater	4.4	Mrt
Plate to cathode and heater	0.03 max.	MAT
Heater to cathode	2.6	μμf
Cathode to plate	0.03 max.	μμε
Cathode to grid and heater	7	put
Plate to grid and heater	2.4	μμί
Mechanical:		
Operating Position		Any
	Dimensional	
Waight (Approx )		0 3 07

Operating Position												
Dimensions										See	Dimensional	Outline
Weight (Approx.) Sockets:	•	•	٠	•	•	•	٠	•	•		• • • • • •	0.3 oz
Heater-terminals	cor	n	ec	tor	٠.					/	Amerac <sup>b</sup> No.1	018-88, c

Socket for operation up to about 550 Mc (Including heater-terminals connector) . . . . Jettron® No.CD7010, or equivalent

Resdel<sup>9</sup> No.10 Series, or equivalent

J-V-Mf No.D-7980 Series.

-Indicates a change.



terminals connector).



G-Grid P-Plate

•	RADIO-FREQUENCY AMPLIFIER - C1		
	Maximum CCSh Ratings, Absolute-Naximum Valu	es:	
	For altitudes up to 100,000		
	and frequencies up to 1500		
	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	122	
	respect to cathode	50 max.	volts
	Heater positive with	FO	
	respect to cathode	50 max. 225 max.	volts
	PLATE-SEAL TEMPERATURE	ZZJ IIIdA.	C
	Typical CCSh Operation in Cathode-Drive Cir	cuit:	
	At 550 Mc	At 700 Mc	
	DC Plate-to-Grid Voltage 125	125	volts
	Cathode Resistor 50	50	ohms
	Input-Signal-Level Range70 to -20		dbm
	DC Plate Current 12.5	12.5	ma
	Power Gain for a bandwidth		-
	of 5 Mc	17	фb
	Noise Figure 6.5	7	db
		At 1100 Nc	
	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 11.5	db
	Noise Figure	17.9	db
	Maximum Circuit Values:		
	Grid-Circuit Resistance:		
	For fixed-bias operation	. Not recor	mended
	For cathode-bias operation	0.25 max.	megohm

-Indicates a change.





- a Without external shield.
- b Amerac, Inc., Dunham Road, Beverly, Massachusetts.
- For use with cavities.
  - Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.
  - Jettron Products, Inc., 56 Route 10, Hanover, N.J.
  - J-V-M Microwave Co., 9300 W. A7th St., Brookfield, Illinois. Andicated No. applies to a series of cavities covering range from 220 up to 1000 Mc and above.
  - Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavities covers the range from 215 up to 2325 Mc.

Continuous Commercial Service.

# CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Note Min.

Heater Current	1	0.205	0.245	amp
Direct Interelectrode		dage		
Capacitances:				
Grid to plate	-	2.1	2.8	μμτ
Grid to cathode	-	3.8	4.8	$\mu\mu$ †
Plate to cathode	-		0.03	put
Heater-Cathode Leakage Current:				
Heater negative with			-	
respect to cathode	1,2	-	30	μa
Heater positive with				
respect to cathode	1,3	der	30	μa
Leakage Resistance:				
From grid to plate and				
cathode connected together.	1,4	100	ma.	_ megohms.
From plate to grid and				
cathode connected together,	1,5	100	-	megohms
Reverse Grid Current	1,6	-	0.3	μа
Emission Voltage	7		3 1	volts
Amplification Factor	1,8	60	100	9:
Transconductance	1,8	10000	16000	anhos
Plate Current (1)	1.8	8.5	16.5	mit
Plate Current (2)	1.9		50	μа
Plate Current (3)	1,10	100	-	μa
Power Gain	1,11	14	-	db
Noise Figure	1,11		7	db
Change in Power Gain			-1	db
Change in Noise Figure			+0.5	db
Change in Transconductance		-	15	%
ondinge in it and on due canoes .	,			

- Note With 6,3 volts ac er dc on heater. 1:
- 2: with 60 volts dc between heater and cathode, heater negative Note with respect to cathode.
- with 60 volts do between heater and cathode, heater positive Note
- with respect to cethode. Note 4:
- With grid 100 volts negative with respect to plate and cathode which are connected together. with plate 300 volts negative with respect to grid and cathode which are connected together. Note 5:
- With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohm. Note 6:

-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.

  Wote 10: With dc plate voltage of 125 volts and dc grid voltage of -2.5 volts.
- Wote 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-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 4.9.19.11 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 10g. 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. me 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 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  $\pm$  0.0025 inch. From 50 to 2000 cps, the tubes are vibrated at a constant acceleration of 10  $\pm$  2 g. Total time to complete a sweep cycle is 10  $\pm$  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

-tndicates a change.

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



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-Cathode Leakage Current. . . . 60 max. μa For conditions shown under Characteristics Range Values, Notes 1,9.

#### 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-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

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:

300 max. For conditions shown under Characteristics Range Values.

## 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-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:

300 max. 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  $\mu$ sec 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-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 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.

## I-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 I hour, the change intransconductance 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 !imit:

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.

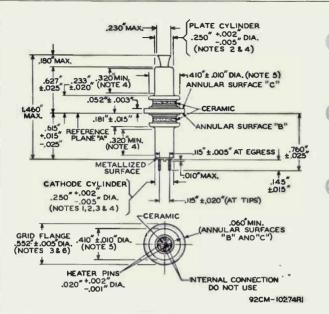
At the end of i00 hours, the tubes will not show permanent shorts or open circuits and will meet the following limits:  Heater Current	0
500- and 1000-Hour Average Life Performance:	
This test (similar to MIL-E-ID, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to 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:	0
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	0
Notes 1, 11.  Noise Figure	0
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	0

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.



REFERENCE PLANE "A" IS DEFINED AS THAT PLANE AGAINST WHIGH 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".

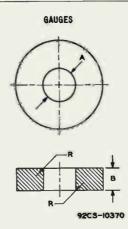
NOTE 2: THE AXES OF THE PLATE CYLINDER AND CATHODE CYLINDER WILL COINCIDE WITHIN 0.010",

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  $G_1-I$  AND  $G_1-2$ , RESPECTIVELY.

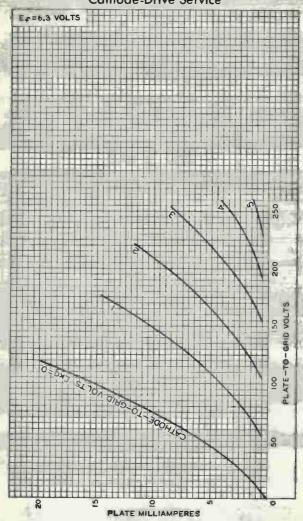
MOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES  ${\rm G_2-I}$  AND  ${\rm G_2-G}$ , RESPECTIVELY.

NOTE 6: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES  $\rm G_2$ -1 AND  $\rm G_3$ -2, RESPECTIVELY.



0	T	Dimension					
Gauge	Туре	Diameter A	Thickness B	Radius R			
G <sub>1</sub> -1	GO	0.25200"+0.00000"	0.320"+0.001"	0.003" MAX.			
G <sub>1</sub> -2	NO-GO	0.24500"+0.00007"		-			
G <sub>2</sub> -1	GO	0.42000"+0.00000"	-	-			
G <sub>2</sub> -2	NO-GO	0.40000"+0.00007"	<u>-</u>	-			
G <sub>3</sub> -1	GO	0.55700"+0.00000"	-	-			
G <sub>3</sub> -2	NO-GO	0.54700"+0.00007"		-			

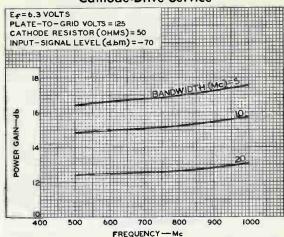
# **AVERAGE PLATE CHARACTERISTICS** Cathode-Drive Service



92CM-10458

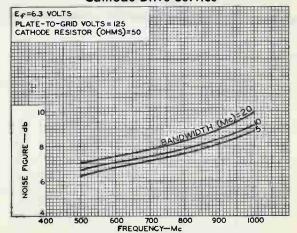


# POWER-GAIN CHARACTERISTICS Cathode-Drive Service



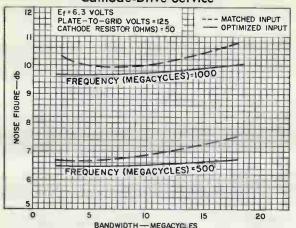
92CS-10456RI

# NOISE-FIGURE CHARACTERISTICS Cathode-Drive Service

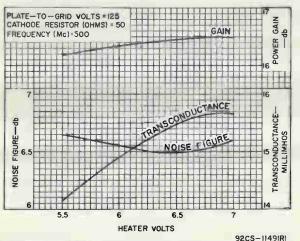


92CS-10455R2

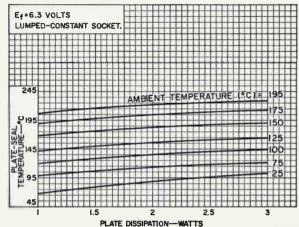
# CHARACTERISTICS Cathode-Drive Service



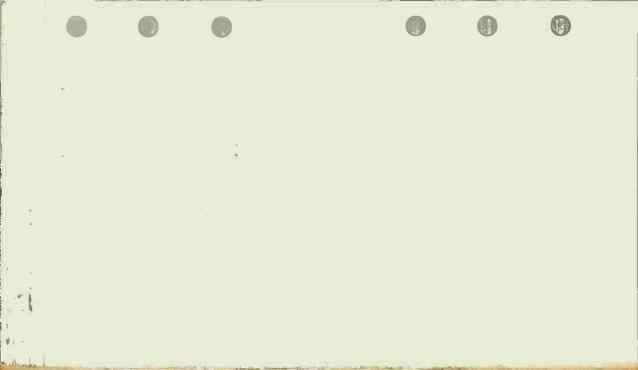
92CS-11497R1



# PLATE-SEAL-TEMPERATURE CHARACTERISTICS



92CS-II488



# Beam Power Tube

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

# 9-PIN MINIATURE TYPE

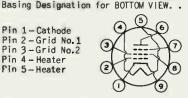
Electrical.	

Heater Characteristics and Ratings: Voltage (AC or DC)	6.3±5% 0.800	volts amp
Heater negative with respect to cathode Heater positive with respect	100 max.	volts
to cathode	100 max.	volts
Grid No.1 to plate	0,15	pf
grid No. 2, and heater	10.0	pf
grid No.2, and heater	5.5	pf
Characteristics, Class A <sub>1</sub> Amplifier:		
Plate Voltage	25Ô	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	umhos
Plate Current	40	ma
Grid-No.2 Current	3	ma
Mechanical:		
Operating Position	aated Union	. Any

2-5/B" Maximum Seated Length . 2-3/8" Length, Base Seat to Bulb Top (Excluding tip) Diameter. . . . . 0.750" to 0.875" Dimensional Outline . See General Section Bulb. . . . . . Base. . . Small-Button Noval 9-Pin (JEDEC No. E9-1)

Pin 1-Cathode	
Pin 2 - Grid No. 1	
Pin 3-Grid No.2	
Pin 4 - Heater	
Fin 5-Heater	

Maximum Overall Length.



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

Bulb	Temperature (At	hot test	point	
on	bulb surface).			

225 max.

OC

► AF POWER AMPLIFIER & MODULATOR Class AB							
Maximum CCS Ratings, Absolute-Naximum Values:	450						
DC PLATE VOLTAGE							
Typical CCS Push-Pull Operation:	Les						
Values are for 2 tubes							
DC Plate Voltage	0						
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-Naximum Values:							
Up to 175 Mc CCS ICAS ••	0						
DC PLATE VOLTAGE 375 max. 375 max. volts GRID No.3 (SUPPRESSOR GRID) 0 max. 0 max. volts							
DC GRID-No.2 (SCREEN-GRID)  VOLTAGE300 max. 300 max. volts  DC GRID-No.1 (CONTROL-GRID)							
VOLTAGE125 max125 max. volts	1						
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							

	Typical Operation:	
	As amplifier at 175 No	
	CCS ICAS	
	DC Plate Voltage 250 300 300	volts
		socket
	Grid No.3 Connected to cathode at DC Grid-No.2 Voltage <sup>DD</sup> 200 200 250	volts
	DC Grid-No.1 Voltage40 -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
	DC Grid-No.1 Current (Approx.) 1.5 2.1 1.6 Driver Power Output (Approx.) 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 Telep	hony =
		irong.
	Carrier conditions per tube for use with a maximum modulation factor of 2	
	Maximum Ratings, Absolute-Maximum Values:	
	Up to 175 Nc	
	CCS ICAS	
	DC PLATE VOLTAGE 300 max. 300 max.	volts
	GRID No.3 (SUPPRESSOR GRID) O max. O max.	volts
	DC GRID-No.2 (SCREEN-GRID)	volts
	VOLTAGE 300 max. 300 max. DC GRID-No.1 (CONTROL-GRID)	VOITS
	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 275 Mc	
	DC Plate Voltage	volts
	Grid No.3 Connected to cathode at DC Grid-No.2 Voltage 250 250	
	DC Grid-No.2 Voltage 250 250	volts
	DC Grid-No.1 Voltage*70 -75 From a grid-No.2	volts
	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	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.

From a grid-No.1 resistor of . .

#### Maximum Circuit Values: Grid-No. 1-Circuit megohm Resistance . . . 0.1 max. 0.1 max. FREQUENCY MULTIPLIER Maximum Ratings. Absolute-Naximum Values: ICAS CCS DC PLATE VOLTAGE 375 max. 375 max. volts GRID No.3 (SUPPRESSOR GRID) . . . 0 max. 0 max. volts DC GRID-No.2 (SCREEN-GRID) 300 max. volts VOLTAGE. . . . . . . 300 max. DC GRID-No.1 (CONTROL-GRID) -125 max. -125 max. volts VOLTAGE. . . . . 50 max. 60 max. DC PLATE CURRENT . me 15 max. 15 max. ma DC GRID-No. 2 CURRENT 5 max. DC\_GRID-No.1\_CURRENT 5 max. ma PLATE INPUT. . . . 13 max. 15 max. watts 2 max. GRID-No.2 INPUT. . . 2 max. watts 12 max. wat ts PLATE DISSIPATION. . 10 max. Typical Operation: As doubler to 175 No DC Plate Voltage . . . . . . . . 250 250 volts volts volts

· · 53000

- Indicates a change.

440D0

ohms





# BEAM POWER TUBE

	eak RF Grid-No.1 Voltage	60	74	volts					
	C Plate Current	50 2.6	60 3.5	ma. ma					
1-	C Grid-No.1 Current								
	(Approx.).	1	1.5	ma					
	riving Power (Approx.)	0.4	0.6 4.5	watt.					
		er at 175 No							
				lan					
	C Plate Voltage	200	to cathode a	volts					
	Grid-No.2 Voltage	200	250	volts					
	Grid-No.1 Voltage	-90	-120	volts					
4	From a grid-No.1								
Pe	resistor of	50000	70000	ohms					
	Voltage	105	130	volts					
DO	Plate Current	50	60	ma.					
	C Grid-No.2 Current C Grid-No.1 Current	3	3.9	me.					
	(Approx.)	1.85	1.7	ma					
	iving Power (Approx.)	0.4	0.6	watt					
Us	seful Power Output*	1.4	2.3	watts					
Ma	ximum Circuit Values:								
Gı	id-No.1-Circuit								
	Resistance	0.1 max.	0.1 max.	megohin					
0	Without external shield.								
1	Subscript 1 indicates that grid	-No.1 current	does not flow	during any					
	part of the input cycle.								
وان	Continuous Commercial Service.  Averaged over any audio-frequency cycle of sine-wave form.								
Ş	Obtained preferably from a fixe								
	Key-down conditions per tube wi modulation essentially negative of the audio-frequency envelop- conditions.	thout amplitue e may be used e does not ex	de modulation. if the positiv ceed 1155 of th	Amplitude e peak of e carrier					
	Intermittent Commercial and Ama	teur Service.							
O	Obtained preferably from a sepa supply with a voltage divider, be adjustable to obtain the de		r from the plat	e-voltage it should					
)	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 recircuit losses.								
	Driver stage is required to sup The driver stage should be de- above the indicated values to ta components, initial tube chare during life.	signed to pro ke care of va- cteristics, a	vide an excess riations in line and tube charac	of power voltage, teristica					
	Measured at load.								
	Obtained preferably from a sep- plate supply, or from the mod- resistor. It is recommended the tain the desired operating plat- ments are made.	arate source ulated plate at this resis e current afte	modulated along supply through stor be adjustat er initial tunin	with the a series de to ob- ng adjust-					



# 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

ı		Note	Hin.	Max.	
ı	Heater Current	1	0.745	0.855	amp
İ	Transconductance	1,2	4200	6400	μmhos
	Plate Current	1,2	30	50	ma
	Plate Current	1,3		50	μal
i	Grid-No.2 Current	1,2	-	7.5	ma
	Reverse Grid-No.1 Current	1,4	-	2	μa
	Heater-Cathode Leakage Current:				- 1
	Heater negative with				
	respect to cathode	1,5		20	μa
	Heater positive with				
	respect to cathode	1,5	-0-	20	143
ľ	Leakage Resistance:				
	Between grid-No.1 and all				l l
	other electrodes tied				
	together	1,6	100	-	megohms
	Between plate and all				
	other electrodes tied		400		
	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.

Mote 3: With plate voltage of 250 volts, grid—No.1 voltage of -18 volts.
grid—No.2 voltage of 250 volts, and grid—No.1 voltage of -48 volts.

Rote 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.

PLATE VOLTS CHARACTERISTIC SOCKET CATHODE 2

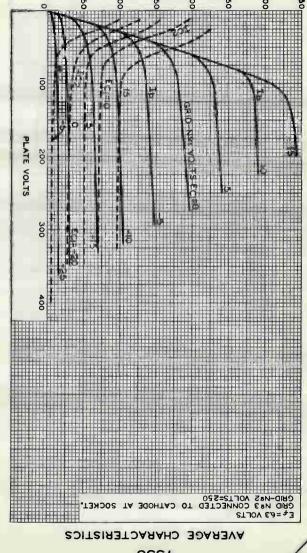
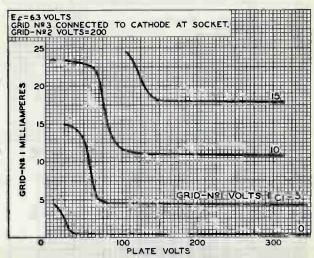


PLATE  $(\mathbf{I_b})$  OR GRID-Ne2  $(\mathbf{I_{C_2}})$  MILLIAMPERES ELECTRON TUBE DIVISION 92 CM-10304 RI MAIO COSPOIRTION OF AMERICA HARRISON, NEW 16958



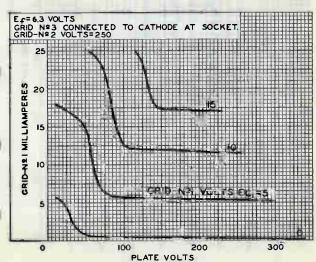
7558

# AVERAGE CHARACTERISTICS



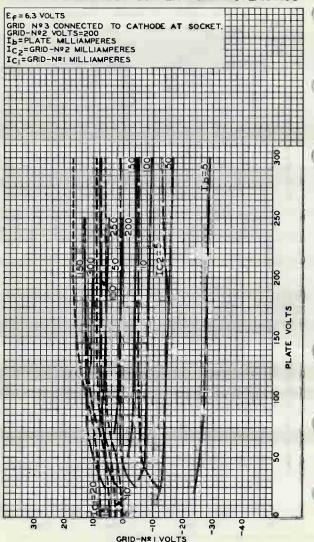
92CS-10306RI

1550



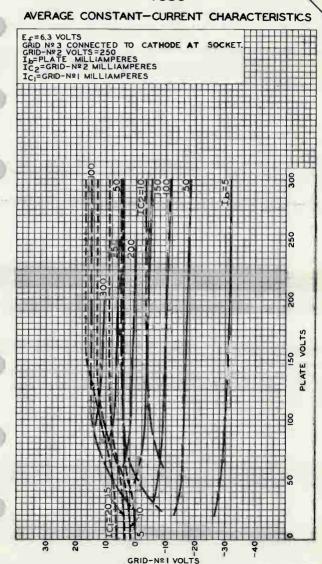


# AVERAGE CONSTANT-CURRENT CHARACTERISTICS



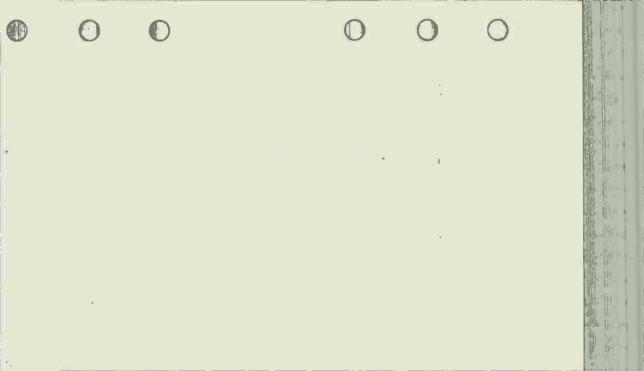
ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-10303RI



ELECTRON TUBE DIVISION

92CM-10306RJ



# 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)	volts
Current at heater volts = 6.3 0.135	атр
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			 Coa	ted Un	ipotential
Maximum Overall Length					
Maximum Seated Length					
Maximum Diameter					
Weight (Approx.)					
Envelope			 	Metal	Shell MT4

Pi	n	2 -	· P1a	ate	
Pi	n j	3 <b>*</b> -	Do	Not	Use
Pi	n	4 -	Gri	id	
Pi	n	54 -	Do	Not	Use
Pi	n	6ª -	Do	Not	Use
Pi	n	74	Do	Not	Use
Pi	n .	8 -	Cat	thode	9
Pi	n	9ª -	Do	Not	Use
Pi	n 1	0 -	Hea	ater	
Pi	n 1	2 -	Hea	ater	

Pin 1ª - Do Not Use



INDEX=LARGE LUG -SHORT PIN; IC-DO NOT USE

# Characteristics, Class A, Amplifier:

						_
	Grid Supply Voltage. Cathode Resistor. Amplification Factor Grid Resistor. Plate Resistance (Approx.) Transconductance Plate Current. Grid Voltage (Approx.) forplate	0. 440 700	0 0 31 35 .5 0.5 00 3000 00 11500 .8 7.5	10.5	volts ohms megohm ohms µmhos ma	
	μa = 10	_	-	-7	valts	
	INDUSTRIAL SE	ERVICE				
	Maximum Ratings, Absolute-Naximum	Values	s:			
	For operation at a					
	Plate Supply Voltage			330 110	volts volts	
	Grid Voltage:  Negative—bias value.  Peak—positive value.  Grid Current.  Cathode Current.  Plate Dissipation.			55 4 2 15 1	volts volts ma ma watt	
	Maximum Circuit Values:					
-	Grid-Circuit Resistance:  For fixed-bias operation  For cathode-bias operation  A pin is cut off close to ceramic wafer  For operation at metal-shell temperature  metal-shell temperatures, see Grid-G  Metal-shell temperatures are measure ptewnstonal Outline).	of 150 <sup>0</sup> ircuit d in Z	C. For op Resistanc	0.5 1 eration e Ratin See acco	megohm megohm at other g Chart. mpanying	
	CHARACTERISTICS RA	ANGE V	ALUES			
	Heater Current	Note 1	Min. 0.125	Max. 0.145	amp	
	Capacitances: Grid to plate	2 2 2	1.8 3.8 1.4	2.6 4.6 1.8	pf pf pf	
	Heater to cathode Cathode to plate	2 2 1,3	1.1 0.20 9	1.7 0.32 12.5	pf pf ma	
	Plate Current (2)	1,4 1,3 3,5	10000	13000 -	μα μπhos μπhos	
•	Difference between Trans- conductance (1) and Trans- conductance (2), expressed in per cent of Transconductance (1) Reverse Grid Current	1,6 1,3	- 28	15 0,1 42	% µa	

- 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	MA.
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.	
electrodes tied together 1,9 1000 -	megohms

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

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

Hote 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:

# Fatigue Rating:

below.

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

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified Peak Vibrational

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 XI 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:

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 Ig. During the test, tube must not show an rms output voltage across the plate-load resistor in excess of:

25 millivoits over the frequency range of 3000 to 6000 cps 500 millivoits overthe 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

# 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-ID, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper. 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 CHARACTER-ISTICS RANGE VALUES for Transconductance (I). 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 (I), 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 micromampere.

#### 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 IIO minutes on and IO minutes off, and maximum rated plate dissipation, at a shell temperature of 150°C.

Tubes are criticized at 500 and 1000 hours for Inoperatives, deverse grid current, heater-cathode leakage current, and leakage resistance. In addition, a tube is rejected if its Transconductance (I) 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 (I) of the lot from the 0-hour value must not exceed 15 per cent at 500 hours and 20-per cent at 1000 hours.

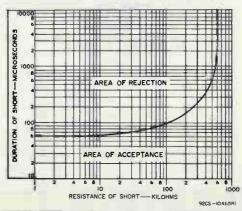
#### Standby Life (1000 hours):

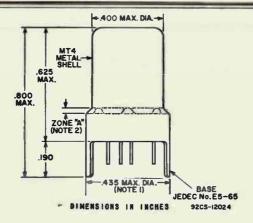
This test is performed on a sample lot of tubes from each production run. Tubes are operated with only the center heater voltage applied.

At 500 and 1000 hours the tubes are criticized for leakage resistance, reverse grid current, the change in Transconductance (I) 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.

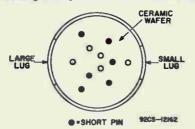
d An inoperative is defined as a tube having a discontinuity, permanent short, or air leak.

#### SHORTS-TEST ACCEPTANCE LIMITS

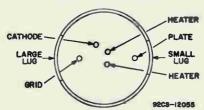




#### BOTTOM VIEW Showing Arrangement of All 11 Base Pina



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

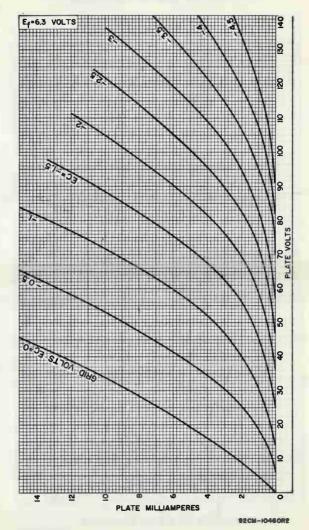


Note |: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

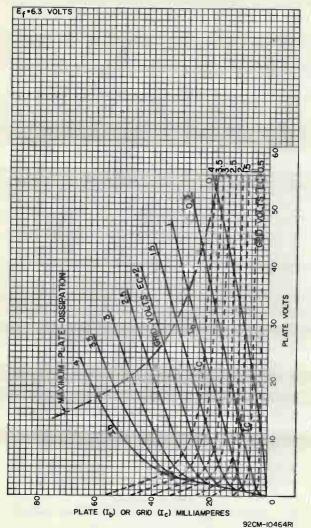
Note 2: Metal-shell temperature should be measured in Zone "A".



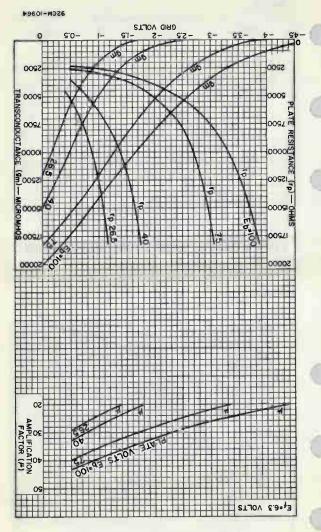
# **AVERAGE PLATE CHARACTERISTICS**



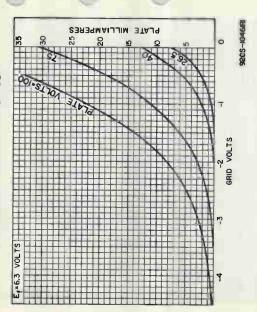
# **AVERAGE CHARACTERISTICS**



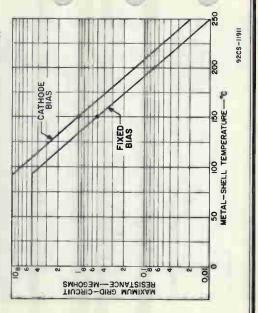
# AVERAGE CHARACTERISTICS



# CHARACTERISTICS AVERAGE



# CHART GRID-CIRCUIT-RESISTANCE



# **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,
Plate to cathode, grid No.2,
shell, and heater 1.4 pf Heater to cathode 1.4
Heater to cathode 1.4 pf
Characteristics, Class &; Amplifler:
Plate Supply Voltage 125 volts
Grid-No.2 Supply Voltage 50 volts
Cathode Resistor 68 ohms
Plate Resistance (Approx.)0.2 megohm
Transconductance
Plate Current
Grid-No.2 Current 2.7 mma Grid-No.1 Voltage (Approx.)
for plate wa = 10
for plate $\mu a = 10 \dots -4.5$ volts
Mechanical:
Operating Position Any
Type of Cathode Coated Unipotential
Maximum Overall Length
Maximum Seated Length 0.840"
Maximum Diameter 0.440"
Weight (Approx.)
Weight (Approx.)
Cap
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 12AS	
Pin 1 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 Pin 6 - Same as Pin 1 Pin 1 Pin 6 - Same as Pin 1 Pin 10 - Heater Pin 12 - Heater Cap - Plate	9
• = SHORT PIN	
INDUSTRIAL SERVICE	
Maximum Ratings, Absolute-Naximum Values:	(3)
For operation at any altitude	1
PLATE SUPPLY VOLTAGE.       330 max. volts         PLATE VOLTAGE.       250 max. volts         GRID-Mo.2 (SCREEN-GRID) SUPPLY VOLTAGE.       330 max. volts         GRID-Mo.2 VOLTAGE.       110 max. volts         GRID-Mo.1 (CONTROL-GRID) VOLTAGE:       55 max. volts         Negative-bias value       2 max. volts         Peak-positive value       2 max. volts         CATHODE CURRENT       20 max. ma         GRID-Mo.1 CURRENT       2 max. ma         GRID-Mo.2 INPUT       0.2 max. watt         PLATE DISSIPATION       2.2 max. watts	
Maximum Circuit Values:	
Grid-Circuit Resistance:  For fixed-bias operation 0.5 max. megohm For cathode-bias operation 1 max. megohm	
Pin is of a length such that its end does not touch the socket insertion plane. For operation at metal-shell temperatures up to 150° C.	0
	4.39
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN	
Note Nin. 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,	0
shell, and heater 2 6.0 8.0 pf Plate to cathode, grid No.2,	
shell, and heater	
Transconductance (1)	VED.
Indicates a change.	

	Tran: Di du	scor ffer ctar	nductance (2)3,5 Iductance Change: Tence between Transcon- Ince (1) and Transcon- Ince (2), expressed in	8000	-	µmhos
			ent of Transconductance (1)	-	.20	4
			Grid Current 1.6	-	0.1	μA
	Heat	er-(	Cathode Leakage Current:			
			pect to cathode 1,8	-	5	ua
	Hea	ater	positive with			,
		resp	pect to cathode 1,8	-	5	μа
			Resistance:			
	Be <sup>*</sup>	twee	en grid No.2 and all other			
	_ (	elec	trodes tied together 1,7	500	-2	megohms
			en grid No.1 and all other			
			trodes tied together 1,9	500	-	megohms
			en plate and all other	500		
		ere c	trodes tied together 1,10	300	-	megohms
	Note	1:	With 6.3 volts ac or dc on heater.			
	Note	2:	Measured in accordance with EIA Standar	rd RS-1	91-A.	
	Note	3:	With dc plate supply volts = 125, grid- cathode resistor = 68 ohms, and cath	No.2 s	apply vo	lts = 50,
			cathode resistor = 68 ohms, and cath $1000 \mu f$ .	ode-by	ass car	pacitor =
	Note	4:	With dc plate volts = 125, dc grid-No.2	volts =	50. dc	grid-No.1
			volts = -6, and metal shell connected	to groui	nd.	
	Note	5:	With 5.7 volts ac or dc on heater.			
•	Note	6:	With dc plate volts = 200. dc grid-No. Mo.1 supply volts = -1.6. grid-No.1 and metal shell connected to ground.	resist	= 70. or = 0.5	dç grid- 5 megohm.
	Note	7:	With grid No.2 100 volts negative with electrodes tied together.	th resp	ect to	all other
	Note	8:	With 100 volts dc applied between heat	er and	cathode.	
	Note	9:	With grid No.1 100 volts negative with electrodes tied together.	h resp	ect to	all other

#### SPECIAL RATINGS & PERFORMANCE DATA

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

#### Shock Rating:

Vibrational Acceleration. . . . . . . . . 2.5 max.

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 adirection 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 ! 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 voits 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:

#### 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, Ammendent 2, Paragraph 4,7.7, except that tapping is done by hand with a soft rubber tapper. 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 CHARACTER-ISTICS RANGE VALUES for Transconductance (I). 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.

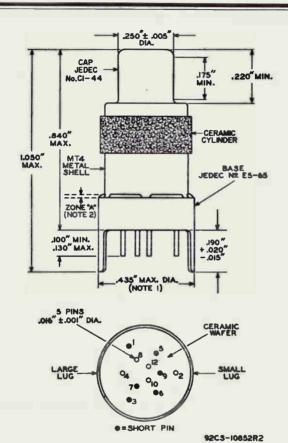
#### 100-Hour Life Performance:

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 fallures 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.

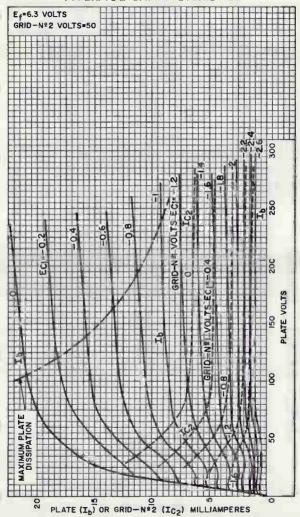
G Specifications for tapper supplied on request.



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.

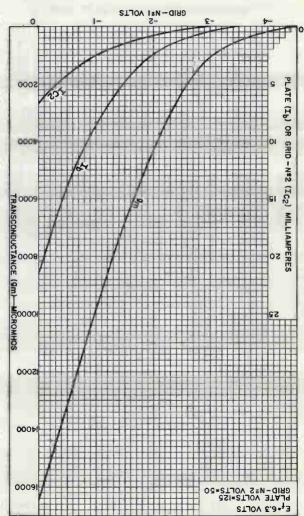
#### **AVERAGE CHARACTERISTICS**



92CM-10926

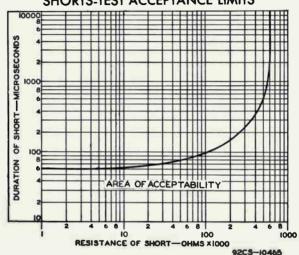


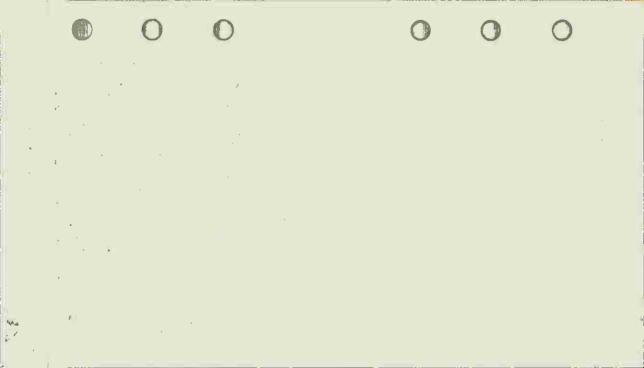
## **AVERAGE CHARACTERISTICS**



92CM-10927

## SHORTS-TEST ACCEPTANCE LIMITS





# Sharp-Cutoff Tetrode

#### 7-PIN MINIATURE TYPE

For Mobile-Communications Equipment

#### GENERAL DATA

ectr	

Heater Characteristics and Ratings (Design		es):
Voltage (AC or DC)	$6.3^{+1.2}_{-0.3}$	volts
Current at heater volts = 6.3 Peak heater—cathode voltage:  Heater negative with	0.200	amp
respect to cathode Heater positive with	100 max.	volts
respect to cathode Direct Interelectrode Capacitances:	100ª max.	volts
Grid No.1 to plate	0.03 max.	μμf
grid No.2, and heater	4.4	$\mu\mu$ f
grid No.2, and heater	2.74	μμf
Characteristics, Class A; Amplifier:		
Plate Voltage	125	volts
Grid-No.1 Voltage		volt
Plate Resistance (Approx.)		megohm
Transconductance		umhos
Plate Current		ma
Grid-No.2 Current	1.4	ma
transconductance ( $\mu$ mhos) = 100	-5	volts
	Voltage (AC or DC)	Current at heater volts = 6,3

#### Mechanical:

Operating P	05   T	on.												Any
Type of Cat														
Maximum Ove	rall	Leng	th.										. 2-	-1/8"
Maximum Sea	ted L	.engt	h .										. 1-	-7/8"
Length, Base	Seat	to B	ulb	Top	(E)	xe î	ud i	ng	tip	1	1	-1/2	" ± 3	3/32"
Diameter														
Dimensional	Out 1	ine								See	Ge	nera	1 Sec	tion
Bulb														
Race		Sma	11_	24	00	Mi	nia		-0 7	Di.	. (1	EDEC	Mo F	7 41

Basing Designation for BOTTOM VIEW. Pin 1-Grid No.1 Pin 2-Cathode, (3 6 Internal

Shield Pin 3-Heater Pin 4-Heater



Pin 5 - Plate Pin 6 - Grid No. 2 Pin 7 - Cathode. Internal Shield

# 7717/6CY5

#### AMPLIFIER - Class AL

Maximum Ratings, Design-Haximum Values:

For grid-No.2 voltages up to 90 volts . . . . .

For grid-No.2 voltages between 90 and 180 volts. See Grid-No.2 Input Rating Chart at front of Receiving Tube Section

.... 0.5 max.

watt

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.

The dc component must not exceed 50 volts.

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

Heater Characteristics and Ratings (Design-Maximum Value	sj:
	volts
Current at heater volts = 14.0 0.150 Peak heater-cathode voltage (Each unit):	amp
Heater negative with	
respect to cathode 200 max.	volts
Heater positive with	
respect to cathode 200 max.  Direct Interelectrode Capacitances:	voits
Triode Unit:	
Grid to plate 1.8	<sub>µµ</sub> f
Grid to cathode and heater 1.6	<sub>µµ</sub> f

Grid to plate 1.8	Just
Grid to cathode and heater 1.6	Just
Plate to cathode and heater 0.24	μμ1
Diode Units:	
Diode-No.1 plate to triode grid 0.09 max.	Just
Diode-No.2 plate to triode grid 0.07 max.	Just
Fither diade cathode to all other	

	te to triode grid . athode to all other	•	0.07	max.	ЩТ
tube electro	des		6.5		μμf
	· · · · · · · · · · · · ·	٠	2.4		μμf

Characteristics, Class At Amplither	(IFtose Unit):
Plate Voltage	250 volts
Grid Voltage	3 volts
Amplification Factor	72
Plate Resistance (Approx.)	
Transconductance	1000 µmhos

did follage	) 40113
Amplification Factor	<b>7</b> 2
Plate Resistance (Approx.)	
Transconductance	1000 µmhos
Plate Current	0.7 ma
Mechanical:	

Operating Po	ositi	on.															Any
Type of Cath																	
Maximum Over	rall	Len	ath													. 2-3/	16"
Maximum Seat	ted L	ena	th													1-15/	16"
Length, Base	Seat	tol	Bul	þ.	To	p (	E	(c)	uc	die	10	ti	p)	) 1 <u>-</u>	9/16	" ± 3/	32"
Diameter														. 0.7	50"	to 0.8	75"
Dimensional																	
Bulb																	

				.Small-Button		

Electrical:

Basing Designation for BOTTOM VIEW. . Pin 1 - Diode-No. 2 Pin 5 - Heater Cathode Pin 6 - Diode-No.2 Pin 2 - Diode-No.1 Plate Plate Pin 7 - Triode Pin 3 - Diode-No. 1 Cathode Pin 8-Triode Grid Cat hode Pin 4 - Heater Pin 9-Triode Plate TRIODE UNIT - AMPLIFIER - Class & Maximum Ratings, Design-Haximum Values: volts 330 max. GRID VOLTAGE . Positive-bias value. . . . . volts O max. 1.1 max. watts DIODE UNITS - Two Values are for Each Unit Maximum Ratings, Design-Maximum Values: 5 max. Characteristics. Instantaneous Value: Plate Current for plate volts = 5. . . . . ma

#### SPECIAL RATINGS'& PERFORMANCE DATA

#### Weater-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):

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

The dc component must not exceed 100 volts.

c Without external shield.



# High-Mu Triode

# NUVISTOR TYPE For Industrial Applications

#### GENERAL DATA

FI	ac.	t۳	ica	11:

LIGGII IGAIZ
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
Grid to cathode, shell, and heater 4.2
Plate to cathode, shell, and heater . 1.7 $\mu\mu$ f
Plate to cathode Q.22 µµf
Heater to cathode 1.3
Characteristics, Class A, Amplifier:
Plate Supply Voltage
Cathode Resistor
Plate Resistance (Approx.) 6800 ohms
Transconductance 9400 µmhos
Plate Current 7
Grid Voltage (Approx.) for plate
$\mu a = 10 \dots $
Mechanical:
Operating Position Any
Maximum Overall Length 0.800"
Maximum Seated Length 0.625"
Maximum Diameter 0.440"
Weight (Approx.)
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)

Pin 1ª - 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

Basing Designation for BOTTOM VIEW. .

Pin 8 - Cathode Pin 9 - Same as Pin 1 Pin 10 - Heater

Pin 12 - Heater



INDEX=LARGE LUC

12A0

**************************************	ERVICE				
Maximum Ratings, Absolute-Maximum	Values	s:			
For operation at a	iny al	titude			A A
DI LITE MOLTING			30 max. 10 max.	volts volts	
Negative—bias value Peak—positive value		::	55 max. 2 max. 2 max.	volts volts	
PLATE CURRENT			20 max. 15 max.	ma ma	0
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to c			1 max.	volts	
Heater positive with respect to c	athode	1	.00 max.	volts	
Maximum Circuit Values:					(B)
Grid-Circuit Resistance: For fixed-bias operation For cathode-bias operation		6	0.5 max. 1 max.	megohm megohm	0
Pin is cut off close to ceramic wafer. For operation at metal-shell temperatu	res up	to 150 <sup>0</sup>	c.		
CHARACTERISTICS RANGE VALUES	S FOR	EOU I PMI	ENT DESIG	a A	
	Note	Min.	Max.		
Heater Current	1	0.125	0.145	amp	
Grid to plate	2	0.8	1	μμf	
heater	2	3.4	5	μμf	
heater	2 2 2	1.3	2.1 1.6 0.28	pp.f pp.f pp.f	
Plate Current (1)	1,3	5.5	8.8 50	ma. μα	
Transconductance (1) Transconductance (2) Transconductance Change:	1,3 3,5	7900 6900	10900	µmhos µmhos	
Difference between Trans- conductance (1) and Trans- conductance (2), expressed in per cent of Transconduc-					0
tance (1)	-	-	15	*	
Reverse Grid Current	1.6		0.1	pa.	
Heater-Cathode Leakage Current:	1,3	54	74		
Heater-Cathode Leakage Current: Heater negative with respect to cathode Heater positive with	1,7	54	74	µiā.	0

Leakage Resistance:

Between grid and all other

electrodes tied together . . . 1.8 1000 - megding 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-193-A.

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

Note 4: With dc plate volts = 110, dc grid volts = -5, and metal 5hell 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 95 With plate 300 volts negative with respect to all other electrodes tied together.

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

Impact Acceleration. . . . . . . . . . . . . 1000 max.

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.

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 character—lstics 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 loo
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 heatercathode 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 tapper 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 (I). 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 (II, 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:

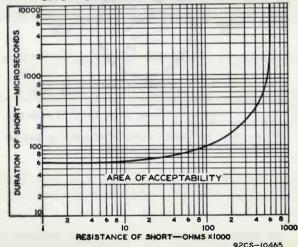
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation, 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 its per cent at 500 hours, and 20 per cent at 1000 hours.

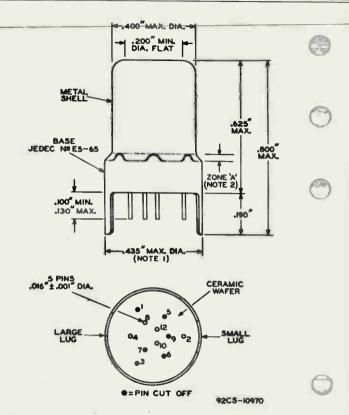
#### 1000-Hour Standby Life Performance:

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 interelectrode leakage, reverse grid current, change in transconductance 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 tagger sugglige on request.

#### SHORTS-TEST ACCEPTANCE LIMITS



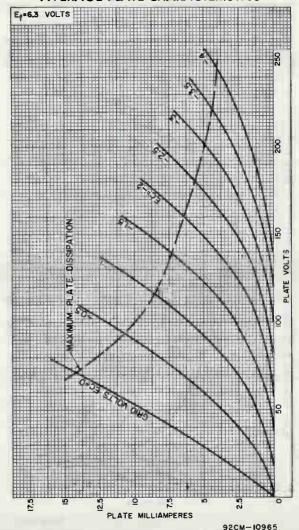


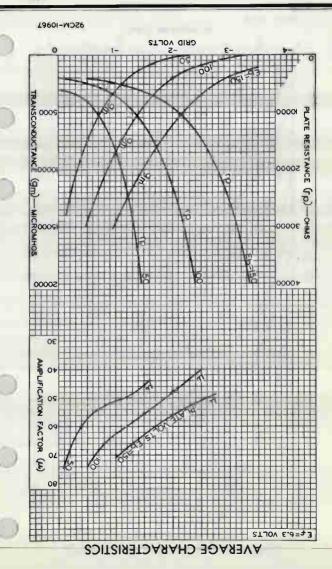
MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

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



#### **AVERAGE PLATE CHARACTERISTICS**







# High-Mu Twin Triode

#### 9-PIN MINIATURE TYPE

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

#### GENERAL DATA

-			
- 31	ect	ri	 10

Electical:			
Heater Characteristics and Ratings Voltage (AC or DC)* Current at heater volts = 13.5. Peak heater-cathode voltage (Eacl Heater negative with	n unit):	13.5 ± 1.5 0.150	volts amp
respect to cathode Heater positive with		100 max.	volts
respect to cathode Direct Interelectrode Capacitances	(Approx.)	100 max.	volts
	Without External Shield	With External Shield <sup>b</sup>	
Grid-Drive Operation:			
Grid to plate (Each unit) Grid to cathode and heater	1.6	1.6	ppf
(Each unit)	2.5	2.5	puf
(Unit No.1)	0.45	1.2	ццеf
(Unit No.2)	0.38	1.3	puf
Cathode-Drive Operation:			
Cathode to plate (Unit No.1) Cathode to plate	0.2	0.18 <sup>d</sup>	puf
(Unit No.2)	0.24	0. 24	HAT
(Each unit) Plate to grid and heater	5	54	HILE
(Unit No.1)	1.9	2.74	puf
(Unit No.2)	1.8	2.74	$\mu\mu$ f
(Each unit)	2.8	2.8°	<sub>pyr</sub> f <sub>pyr</sub> f
Characteristics, Class A Amplifier		1+):	pop. 1
Heater Voltage	,	13.5	volts
Plate Supply Voltage		250	volts
Cathode Resistor		200	ohms
Amplification Factor		60 10900	ohms
Transconductance		5500	umhos
Plate Current,		10	ma
Grid Voltage (Approx.) for plate $\mu a$	= 10	-12	volts

#### Mechanical:

Operating Position
Type of Cathodes Coated Unipotential
Maximum Overall Length
Maximum Seated Length
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
Base Small-Button Noval 9-Pin (JEDEC No. E9-1)
Basing Designation for BOTTOM VIEW 9FP

Pin 1-Plate of Unit No.2 Pin 2-Grid of Unit No.2

Pin 3 - Cathode of Unit No.2 Pin 4 - Heater

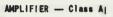
Pin 5 - Heater



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



#### Values are for Each Unit

maximum katings, Absolute-Aaximum values:		
PLATE VOLTAGE:	max.	volts
Negative-bias value	max.	volts
Positive-bias value 0	max.	volts
PLATE DISSIPATION 2.75	max.	watts
BULB TEMPERATURE (At hottest		
point on bulb surface) 180	max.	oC

#### Maximum Circuit Values:

Grid-C	ircu	it	Resistanc	:e:

For fixed-bias operation . . . . . . 0.25 max. megohm
For cathode-bias operation . . . . . . 1 max. megohm

Heater will withstand momentary excursions from 11.0 to 16.0 volts.

With external shield JEDEC No.315 connected to cathode of unit under test except as noted.

With external shield JEDEC No.315 connected to ground.

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

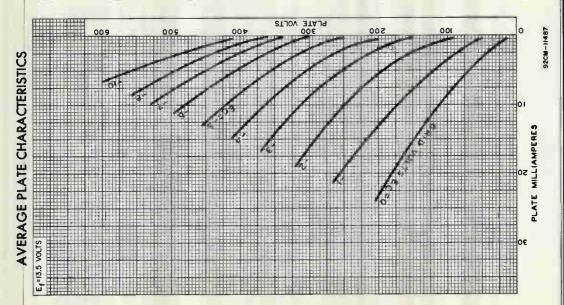
connected to ground. At the end of this test, tubes are tested for heater-cathode shorts and open circuits.

#### 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.

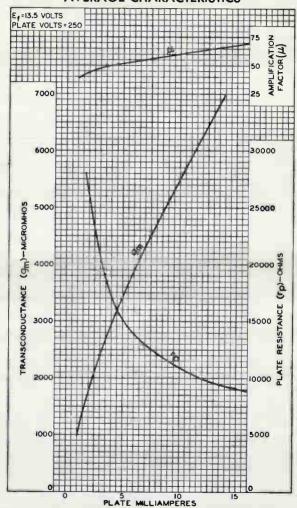
#### 500-Hour Intermittent Life Performance:

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.



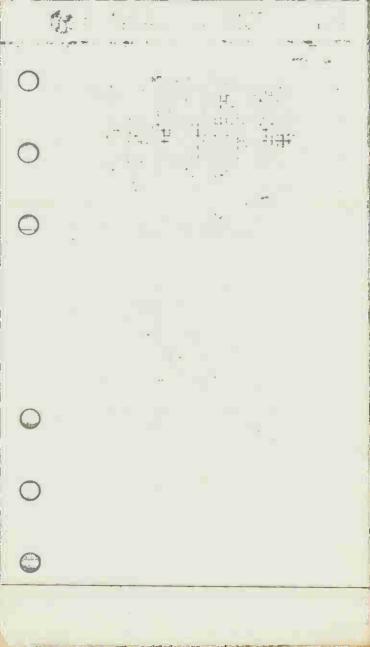


#### **AVERAGE CHARACTERISTICS**



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 fila- ment 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:*
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
Characteristics, Ciass A, Amplifier:
Plate Voltage
Grid-No.2 Voltage
Transconductance 6700 µmhos
Plate Current
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
Maximum Seated Length
Bulb
Base Small-Button Noval 9-Pin (JEDEC No.E9-1)

Basing Designation for BOTTOM VIEW. . . . . Pin 1 - Filament (-) Pin 6 - Plate Pin 7-Grid No.3 Pin 2-Grid No.1 Pin 8-Grid No. 2 Pin 3-Grid No.2 Pin 4 - LC (See NOTE) 2 Pin 5 - LC (See NOTE) Pin 9 - Filament (+) NOTE: May be used only under conditions specifled in Operating Considerations. RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy RF POWER AMPLIFIER - Class C FM Telephony Maximum ICAS Ratings, Absolute-Maximum Values: Up to 175 Mc volts DC PLATE VOLTAGE. 300 max. 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 60 max. ma 10 max. DC GRID-No.2 CURRENT. . . ma 5 max. ma 18 max. watts 1.5 max. watts PLATE DISSIPATION . . . . . 10 max. watts BULB TEMPERATURE (At hottest point on bulb surface). . . . . . . . . OC 225 max. Typical ICAS Coperation: d As amplifier at 175 Mc 300 volts DC Plate Voltage. . . . . . . . . . . . . 300 Grid No.3 . . . . . . . . . . . . . . . . . Connected to pin 1 at socket DC Grid-No.2 Voltage® 160 185 volts DC Grid-No.1 Voltage from a grid-No.1 -36 -39 volts resistor of 18,000 ohms . . . . . . . . 43 volts Peak RF Grid-No.1 Voltage . . . . . . . 41 50 60 ma 2.5 DC Grid-No.2 Current. . . . . 4 ma 2.2 2 DC Grid-No.1 Current (Approx.). . . . . . ma 1 1 Driving Power (Approx.)..... watt

watts

5.5

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

Useful Power Outputh (Approx.). . . . .

Maximum Circuit Values:

#### PLATE MODULATED RF POWER AMPLIFIER - Class C Telephony

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

#### Maximum ICASC Ratings, Absolute-Maximum Values:

								U	p to	175 H	•	
DC PLATE VOLTAGE			٠						250	max.		volts
GRID No.3						.6	on	mect	to	bin 1	at	socket
DC GRID-No.2 VOLTAGE					٠				250	max.		volts
DC GRID-No.1 VOLTAGE									-125	max.		volts
DC PLATE CURRENT									60	max.		ma
DC GRID-No.2 CURRENT				٠					10	max.		ma
DC GRID-No.1 CURRENT						٠			5	max.		ma
PLATE INPUT			,						15	max.		watts
GRID-No.2 INPUT									1.4	max.		watts
PLATE DISSIPATION									7	max.		watts
BULB TEMPERATURE (At ho												
point on bulb surface	).								225	max.		eC.
Tuning! ICARC Assertion	. 4											
Typical ICAS <sup>c</sup> Operation	12.											
									At 17	15 Mc		
DC Plate Voltage									250			volts
Grid No.3					.0	on	ne	cted	to i	in 1	at	socket
DC Grid-No.2 VoltageJ .												volts
DC Grid-No.1 Voltage f	ron	ı a	Q	ri	d-	No	. 1					
resistor of 33,000 oh	ms								-70			volts
Peak RF Grid-No.1 Volta	ge								75			volts
DC Plate Current									60			- 000

ts Maximum Circuit Values: Grid-No.1-Circuit Resistance. 0.1 max. magohm

2.5 2.1

#### FREQUENCY MULTIPLIER

#### Maximum ICASC Ratings, Absolute-Maximum Values: DC PLATE VOLTACE

DC Grid-No.2 Current.......
DC Grid-No.1 Current (Approx.)...

DU PLATE VOLIAGE		•	•				200	max.		VOITS	
GRID No.3				.0	on	nect	to p	in 1	at	socket	
DC GRID-No.2 SUPPLY VOLTAGE							300	max.		volts	
DC GRID-No.2 VOLTAGE			4				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 hottes	t										
point on hulb curfecol							225	-		90	

ma

att

#### Typical ICASC Operation:

Grid No.3. . . . . .

DC Plate Current

DC Plate Voltage . . . . .

Peak RF Grid-No.1 Voltage. . .

resistor of 53,000 ohms. . . . . . . .

DC Hate Culters	
DC Grid-No.2 Current 3.4 3.4 ma	-
DC Grid-No.1 Current (Approx.) 1 1.5 ma	-6
Driving Power9 (Approx.) 0.4 0.5 watt	
bitting tonot treprint to the contract of	
Useful Power Output (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* 180 225 volts	
DC Grid-No.1 Voltages from a grid-No.1	- 6
resistor of:	
50,000 ohms	
60,000 ohms108 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	
DO GLIO HOLL COLLONE L'APPRONTY L'APPRONTY	
Useful Power Output (Approx.) 1.4 2 watts	
Mustana Atanula Valuasa	
Maximum Circuit Values:	

As doubler to 175 No

. . . . . . .

Without external shield.

Grid-No.1-Circuit Resistance .

- C Intermittent Commercial and Amateur Service.
- Pins 4 and 5 at rf ground.

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.

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.

9 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.





volts

volts

volts

volts

250 300

215

-80

87

50

0.1 max. megohm

. . Connected to pin 1 at socket

200

-53

60

45

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

Note Win Mar

#### CHARACTERISTICS RANGE VALUES FOR EOU! PMENT DESIGN

Filament Current 1	0.59 0.71 amp
Transconductance 1,2	2 5700 – µmhos
Plate Current 1,2	2 27 52 ma
Plate Current 1,3	3 – 75 μa
Grid-No.2 Current	
Reverse Grid-No.1 Current 1.4	
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.

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

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.

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

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

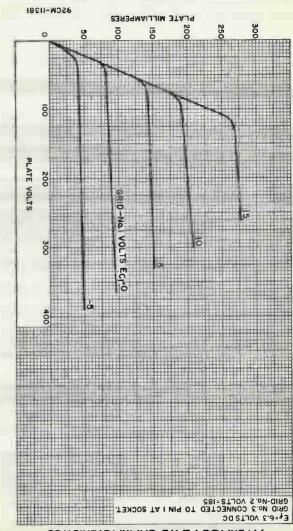
Note 6: With plate 300 volts negative with respect to all other electrodes tied together.

#### OPERATING CONSIDERATIONS

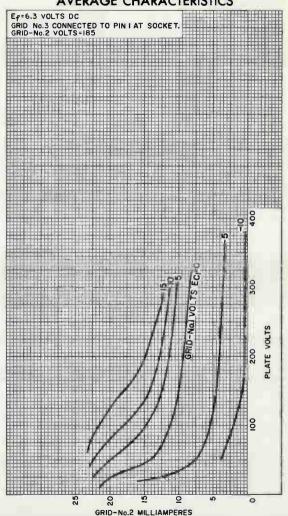
The socket connections to pins 4 and 5, which are designated LC on the basing diagram, may be used to minimize the absorption of rf power in the filament circuit by connecting pins 4 and 5 to ground through a capacitor, close to the socket. Pin I is directly grounded and pin 9 is bypassed by using a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

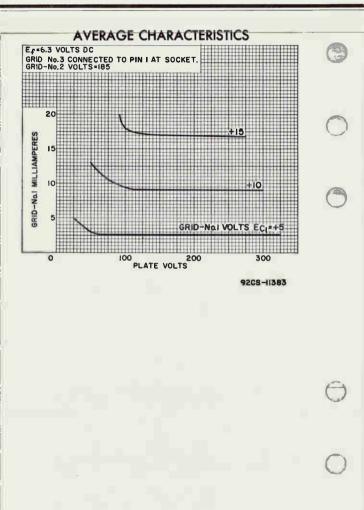
## AVERAGE PLATE CHARACTERISTICS



#### **AVERAGE CHARACTERISTICS**



92CM-11390





# Medium-Mu Triode

#### MUVISTOR TYPE

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

#### GENERAL DATA

GENERAL PAIN	
Electrical:	
Heater Characteristics and Ratings;	
Voltage (AC or DC) 6.3±0.6 volts	ŝ
Current at heater volts = 6.3 0.135	0
Peak heater-cathode voltage:	
Heater negative with respect to cathode . 100 max. volts	5
Heater positive with respect to cathode . 100 max. wolts	ŝ
Direct Interelectrode Capacitances (Approx.):	
Grid to plate 2.1 pf Grid to cathode, shell, and heater 4.0 pf	
Grid to cathode, shell, and heater 4.0 pt	
Plate to cathode, shell, and heater 1.7 pt	
Plate to cathode 0.34 pf	
Heater to cathode	ľ
Characteristics, Class A; Amplifier:	
Plate Supply Voltage 24 volts	
Grid Connected to negative end of cathode resistor	
Cathode Resistor 100 ohms	
Amplification Factor	•
Plate Resistance (Approx.) 1530 ohms	5
Transconductance	5
Plate Current 8.7 me	9
Grid Voltage (Approx.) for plate $\mu a = 50$ -5 volts	ŝ
Machanical e	
Mechanical:	
Operating Position	
Type of Cathode Coated Unipotential	1
Maximum Overall Length 0.800'	
Maximum Seated Length	
Weight (Approx.),	
Envelope	
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) —	
0' ME. O. N. 422 CE 40 044 am	

- Indicates a change.



Cinch Mfg. Co., No.133 65 10 041, or equivalent.

Basing Designation for BOTTOM V		
bearing beargnaction for borrow v	<u> </u>	
Pin 1ª - Do Not Use	90	
Pin 2 - Plate Pin 3 - Same as Pin 1	5.0	
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 S		()
Maximum Ratings, Absolute-Haximum  For operation at a		
PLATE VOLTAGE	50 max. volts	
GRID VOLTAGE:		
Negative-bias value Peak-positive value	55 max. volts	
GRID CURRENT	2 max. ma	
CATHODE CURRENT	15 max. ma	
	U.45 max. watt	
→ Typical Operation: Plate Supply Voltage	12 24 volts	
Grid Supply Voltage	0.7 volt	
Grid Resistor	33000 - ohms	
Plate Resistance (Approx.)	1500 1500 ohms	
Transconductance	8000 8000 µmhos	
	5.5 9.5 ma	(A)
Maximum Circuit Values:  Grid-Circuit Resistance:		
For fixed-bias operation	10 max. megohms	
For cathode-bias operation	10 max. megohms	
Pin is of a length such that its end doe plane.	es not touch the socket insertion	
	es up to 150° C., metal-shell tem-	()
For operation at metal-shell temperatur peratures are measured in zone "A" (See peratures above 150°C., see accompany in Chart.	e Dimensional Outline]. For tem- ng Grid-Circuit-Resistance Rating	
0,007 0.		
- CHARACTERISTICS R	ANGE VALUES	
	Note Min. Nax.	_
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.	
		to cathode.	shell,					10.00	
		heater to cathode,	abol 1	• •		2	3.4	4.6	pf
		heater				2	1.4	2.0	pf
		r to cathode				2	1.1	1.7	of
		to cathode.				2	0.26	0.42	pf
		urrent (1) .				1,3	6.7	10.7	ma
Tion.	Plate C	urrent (2) . nductance (1			•	1,4	-	50	μa
		nductance (1			•	1,3	6500 5700	8500	μmhos μmhos
		nductance Ch			•	7.5	3700		μιιιος
	Diffe	rence betwee	n trans-						
		ctance (1) a							
		ctance (2).		l					
		r cent of tr	anscon-					45	
		Grid Curren			•	1.6	_	0.05	70
		cation Facto		: :	•	1.3	9	14	μa
		Cathode Leak		nti		-12			
		r negative w							
		pect to cath				1,7	-	5	μa
		r positive w				4.7		00	
		Resistance:			•	1,7	-	5	μα
		en grid and							
		ctrodes tied				1,8	1000	-	megohms
		en plate and							
	ele	ctrodes tied	together		٠	1,9	1000	-	megohms
	Note 1:	With 6.3 volts	ac or dc	on he	ate	r.			
	Note 2:	Measured in ac					d RS-19	1-A.	
	Note 9:	with dc plate and cathode-by	Supply vo	lts =	_24	, catho	de resi	stor = 1	00 ohms,
	Note 4:	With dc plate							
		connected to g	round.				10,	, uno mo	or short
	Note 5:	With 5.7 volts							
	MOTE 0:	with dc plate = 1 megohm, ar	voits = 40 nd metal sh	ell c	a s onn	upply vected t	olts = .	-2, grid	resister
	Note 7:	with 100 volts	dc applie	d bet	wee	n heate	r and c	athode.	
	Note 8:	With grid 100 v	olts negat	ive w	ith	respec	t to all	other el	ectrodes
	Note 9:	With plate 100	volts nega	tive	11 81	h respec	t to all	other el	ectrodes
		tied together.							

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

Impact Acceleration . . . . . . . . . . . . 1000 max.

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



8056

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

#### Fatique Rating:

Vibrational Acceleration. . . . . . . 2.5 max.

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 nomimal heater voltage only, and subjected for 48 hours to 2.5-q vibrational acceleration at 60 cycles per second in the X1 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<sub>1</sub> 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 q. 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 tapperc. 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 (I). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the O-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<sup>6</sup>, 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 for per cent at 500 hours, and 20 per cent at 1000 hours.

#### 1000-Hour Standby Life Performance:

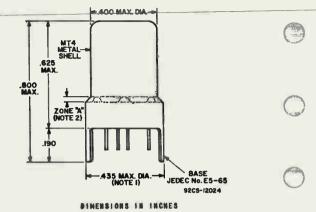
This test is performed on a sample lot of tubes from each production run. The tubes are operated for 1000 hours with only heater voltage applied. Tubes are criticized for interelectrode leakage, reverse grid current, and for cathode interestace resistance greater than 25 ohms. Interface resistance is measured by Method 8 of ASTM specification F300-57T.

Specifications for tappar supplied on request.

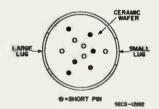
At metal-shell temperature of 150° C.

- Indicates a change.

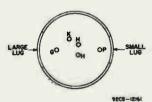




BOTTOM VIEW
Showing Arrangement for All II Base Pins



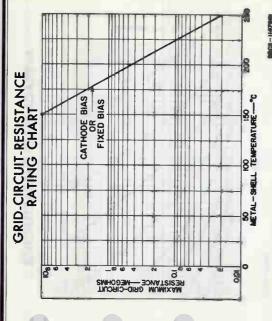
With Element Connections Indicated and Short Pins Not Shown

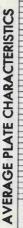


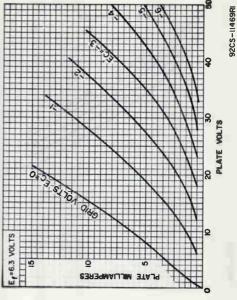
MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED

ALONG 0.190" LUG LENGTH.

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

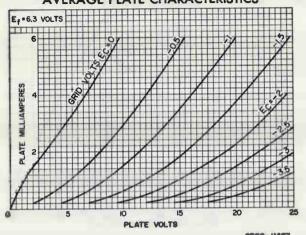






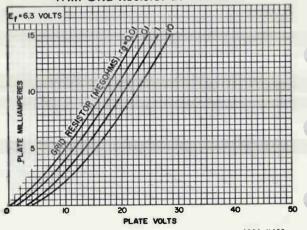


#### **AVERAGE PLATE CHARACTERISTICS**



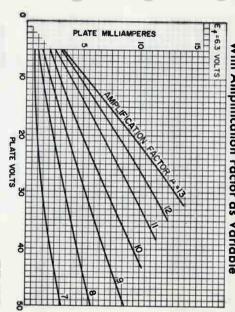
98CS-11467

#### **AVERAGE PLATE CHARACTERISTICS** With Grid Resistor as Variable

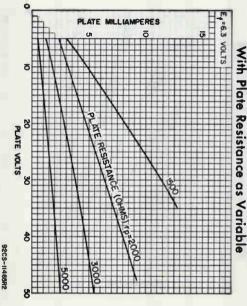


92CS-II466

# With Amplification ERAGE PLATE CHARA! QS TERISTICS S Variable



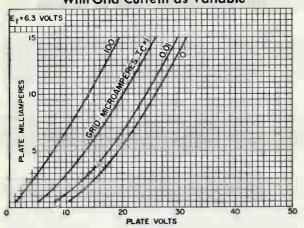
# AVERAGE P With Plate PLATE CHARACTERISTICS e Resistance as Variable





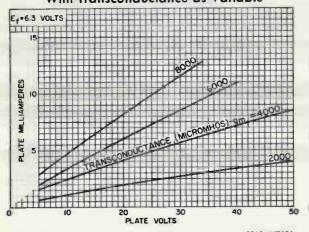
8056

# AVERAGE PLATE CHARACTERISTICS With Grid Current as Variable



92CS-11468

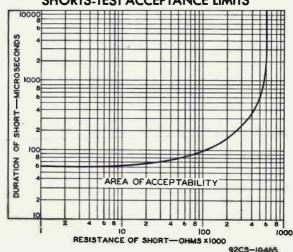
#### **AVERAGE PLATE CHARACTERISTICS** With Transconductance as Variable



92CS-11470R2









# 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

	Hanka- A	or cago, A		-	٠•	•	•	•	•	•	•	⊑h	0.3	¥
	neater C	urrent at	Eh =	6.3	٧.	٠	•	•	•		•	Ih	<b>135</b>	mA
	Direct	nterelecti	ode	Cap	aci	ta	nce	86						
	Input:	K_to (G,	S, F	1) •						•		CI	6.0	pF
	Output	: P to (G,	S,	H)								eo	1.3	pF
	Cathod	e to plate							_			Ckp	0.046 m	
	Heater	to cathod	le									chk	1.4	pF
												1715		
				CLAS	3 A	1	AMI	PL	IF	IE	R			
		For Follo	sing	Cha	rac	te	ris	s t :	i c			Condit	ions	
1	Amplifica	ation Fact	^-											
ı	Plate Re	sistance (	400-			•	•	•	•	•	•	$\mu$	70	
-	Transcone	ductance .	whhi	OX.		•	•	•	•	•	•	rp	5600	Ω
-	C Plata	Current .	٠.	• (	•	•	•	•	•	•	•	9m	12400	μmho
- 7	utoff D	Current .				٠.	:	٠.	•	•	•	_ 16	10	mA
,	Jucoli Di	Grid Vol	cage	TOF	ıЬ	=	0	μĄ	•	•	•	Ec(co)	-5	٧
					Cor	nd i	tic	ดก	8			.,,		
- 1	leater Vo	Itage										e.		
	Plate Sur	ply Volta	~					•		•	•	Eh	6.3	
-	arid Sun	ly Voltag	ye .	• •	•	•	•	•	•	•	•	EPP	110	
-	athode	Resistor .	٠	• •		•	•	•	•	•	•	Ecc	0	V
					•	•	•	•	•	•		#Ck	47	Ω
			ABSC	DLUT	E-M	AX	IMI	М	R	AT	IMA	10		

MK.	57 52
ABSOLUTE-MAXIMUM RATINGS	
For operation at any altitude	
Plate Supply Voltage	٧
DC Plate Voltage	V
DC positive value.	v
DC negative value	v
Peak Heater-Cathode Voltage ehkm ±100	V
Heater Voltage, AC or DC Eh 5.7 to 6.	9
Average Cathode Current	mA
Plate Dissipation	W

#### MAXIMUM CIRCUIT VALUES

10-	PILCUIT KESIZEAUCE.							
For	fixed-bias operation .	•				· Ra(ckt)	0.5	MO
FOI	cathode-bias operation		•	•	•	· Rg(ckt)	1	MO

#### MECHANICAL CHARACTERISTICS

Operating Position									Any
Type of Cathode							. Co	ated	Unipotential
Maximum Overall Length (lm)									. 0.900 III
Marinum Seated Length (lem)									. 0./80 III
Maximum Diameter (dm)									. 0.440 in
Waight (Approv.)									2.2 9
Dimensional Outline									JEDEC No.4-6
Envelope									. JEDEC MT4
Base Medium-Ceramic	 la 1	er	·ì	Γwe	iv	ar	5.	Pin	(JEDEC E5-79)
Dase Medium-ceramit	 ,	٠,					_		,

#### BASING DIAGRAM (Bottom View)

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



INDEX = LARGE LUG

12CT

#### TYPICAL OPERATION

As Cathode-Drive RF Amplifier

Frequency f	450	700	1200	MHZ
Heater Voltage Eh	6.3	6.3	6.3	٧
Plate Supply Voltage Ebb	110	110	110	٧
Cathode Resistor Rk	47	47	47	Ω
Average Plate Current  b(av)	10	10	10	mA
Bandwidth	6	12	12	MHz
Power Gain	16.5	12.5	10.5	dB
Moise FactorC	6.5	9.5	12.2	dB



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







Harrison, N. J.



Argon noise source. Input is tuned for optimum value.

#### INITIAL CHARACTERISTICS LIMITS

		OU LIMI	10		
Heater Current	Ih	Note	Min 0.125	<i>Max</i> 0.145	A
Capacitances Cathode to plate Cathode to grid & shell	ckp	2	-	0.046	pF
and heater	C	2	5	7	pF
and heater. Heater to cathode. Plate Current (1). Plate Current (2). Transconductance (1). Transconductance (2). Reverse Grid Current. Amplification Factor. Heater-Cathode Leakage Current. Leakage Resistance: Between grid and all other	co chk l Ib 2 Ib 2 Ib 1 9m 2 9m -Ic $\mu$ Ihk	2 1,3 1,4 1,3 3,5 1,6 1,3	1.1 1.1 7.8 10000 8700 54	1.7	pF mA μA
electrodes tied together. Between plate and all other	rg-all	1,8	5000	-	MΩ
electrodes tied together.	$r_{p}\text{all}$	1,9	00001	-	MΩ
Note I: With Ef = 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  $\Omega$ ,  $Q_k$  = 1000  $\mu F$ .

Note 4: With Eh = 110 V, Ec = -5 V.

Note 5: With Ef = 5.7 V.

Note 6: With  $E_b = 150 \text{ V}$ ,  $E_c = -1.3 \text{ V}$ ,  $R_g = 0.5 \text{ M}\Omega$ .

Note 7: With Ehk = ±100 V. Note 8: With Eg-all = -100 V.

Note 9: With  $E_{p}^{B}$ -all = -300 V.

#### SPECIAL RATINGS & PERFORMANCE DATA Shock Rating

Impact Acceleration. . . . 1000 max

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 c/s, and (3) 700 millivolts peak from 6000 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 criticised 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.

#### Interelectrode Leakage

Leakage Resistance between plate

and all other electrodes tied together . . . 10000 min megohms

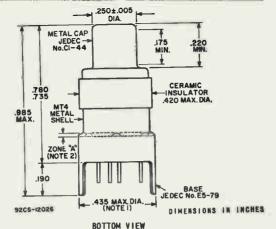
This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts (ac or dc) = 6.3, plate volts = 300 negative with respect to all other electrodes tied together.

Leakage Resistance between grid

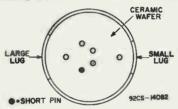
and all other electrodes tied together . . . 5000 min megohms

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.

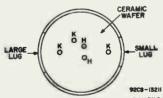


Showing Arrangement of All 6 Base Pins



#### MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pin Not Shown



DIMENSIONS IN INCHES

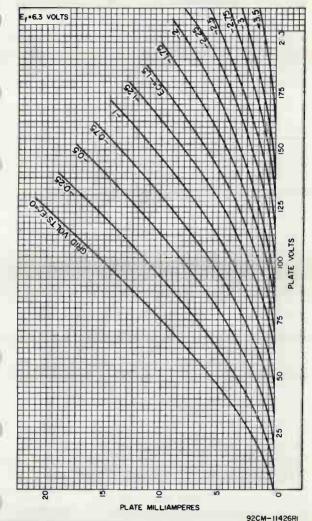
Note 1: Maximum outside diameter of 0.440 inch is permitted along 0.190" lug length.

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

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

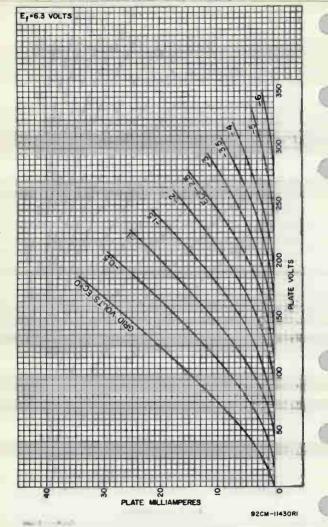


# **Average Plate Characteristics**

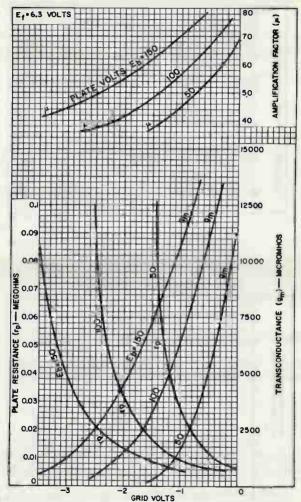




# **Average Plate Characteristics**

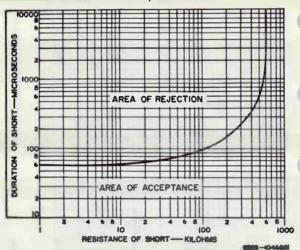


## **Average Characteristics**

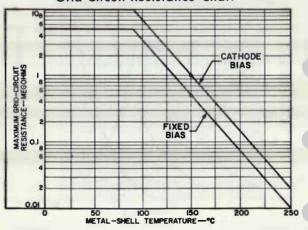




### Shorts-Test Acceptance Limits



#### Grid-Circuit-Resistance Chart



RCA

92CS-12022

## **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 Value Voltage (AC or DC) <sup>a</sup>	s):
Current at heater volts = 13.5 0.275 Peak heater-cathode voltage: Heater megative with	amp
	lts
	olts
	μμf
except plate 10.2 Plate to all other electrodes	щf
	μμf
Characteristics, Class A; Amplifler:	
Heater Voltage	lts
Plate Supply Voltage	lts
Grid No.3 Connected to cathode at soc	ket
Grid No. 2 Supply Voltage 150 vc	lts
	hms
Plate Resistance (Approx.) 0.1 meg	ohm
Transconductance 11500	hos
Plate Current 19	ma
Grid-No.2 Current 3.5 Grid-No.1 Voltage (Approx.) for	ma
	lts
Mechanical:	
Operating Position	Any
Type of Cathode Coated Unipotent	ial
Maximum Overall Length	16"
Maximum Seated Length	16"
Length, Base Seat to Bulb Top (Excluding tip) . 1-9/16" ± 3/	32"
Diameter 0.750" to 0.8 Dimensional Outline See General Sect	75"
Dimensional Outline See General Sect	ion
Bulb	1/2
pase	<b>⊢1</b> }

Electrical:

# 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





Maximum Ratings, Absolute-Naximum Values: PLATE VOLTAGE . . . . . . . . . . . . . . . . . 330 max. volts
GRID No.3 (SUPPRESSOR GRID) . . . . . . . . . . . . cathode at socket GRID-No.2 (SCREEN-GRID) VOLTAGE . . . . . . 180 max. GRID-No.1 (CONTROL-GRID) VOLTAGE; 55 max.

volts Positive-bias value . . . 0 max. volts 1 max. watt PLATE DISSIPATION . . 5 max. watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation. . . . . . . 0.1 max. meaohm 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 CCSd Ratings, Absolute-Maximum Values:

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

#### Typical Operation:

At frequencies up to 40 Mc Heater Voltage........ 13.5 13.5 13.5 volts 250 200 300 volts Grid No.3 . . . . . . . . . . . . . . . . Connected to cathode at socket 145 175 volts -7 -9 -12 volts Peak RF Grid-No.1 Voltage . . . . 11 16 volts DC Plate Current. . . . . . . . . 14.5 20 26 ma 3 4.1 5.5 ma 0.85 ma

# 8077/7054

Driving Power (Approx.) Power Output (Approx.)		1.5			
Maximum Circuit Values:					
Grid-No.1-Circuit Resistance			Λ	.1 max.	manaha
Grid-No.1-Circuit Resistance	• •	• •	0	. I max.	megohm
FREQUENCY M	ULTI	PLIER			
Maximum CCSd Ratings, Absolute-M	axin	num Vo	ilues:		
Same as for RF POWER AM	PLI	FIER (	oscii	LLATOR	
Typical Operation:					
As doubler u	p to	40 M	c		
DC Plate Voltage		20	0 25	300	volts
	onn	cted		thode a	_
DC Grid-No. 2 Voltage		11			
DC Grid-No.1 Voltage		-10	6 -2	025	volts
Peak RF Grid-No.1 Voltage		1	9 2	4 31	volts
DC Plate Current		1	1 1	5 20	ma
DC Grid-No.2 Current				3 4	***************************************
DC Grid-No.1 Current (Approx.).		0.	3 0.4		
Driving Power (Approx.)	• •		-	9 13	
Useful Power Output (Approx.) .	• •	1.	4 1.9	9 2.5	watts
Maximum Circuit Values:					
Grid-No.1-Circuit Resistance			0	.1 max.	megohm
a The heater will take momentary excur b without external shield.	sion	s of i	1.0 to	16.0 vol	ts.
Key-down conditions per tube withou modulation essentially negative may the audio-frequency envelope does not rier conditions.	t amp	litude used cceed	modula if the 115 per	tion. positive	Amplitude peak of the car-
d Continuous Commercial Service.					
00.000					
CHARACTERISTICS RANGE VALU	ES I	FOR E	QU I PMEI	T DESI	en
	H	te	Min.	Max.	
Heater Current		1 (	0.260	0.290	amp
Transconductance		,2	8500	14500	umhos
Plate Current		.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	4			90	
respect to cathode	. 4	.,5	-	20	μа
Heater positive with respect to cathode	1	5		20	419
Leakage Resistance:	. 1	,5		EU	μa
Between grid-No.1 and all other	er:				
electrodes tied together		,6	50	-	megohms
Between plate and all other			-		-90
electrodes tied together	. 1	.7	50		
			0.0		megohms

# 8077/7054

- Note 1: With ac or do heater volts = 13 5.
- 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 (µt) = 1000. Note 2:
- 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 3:
- 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 (negohms) = 1. Note 4:
- with 100 volts do between heater and cathode. 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. Note 7:

#### 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:

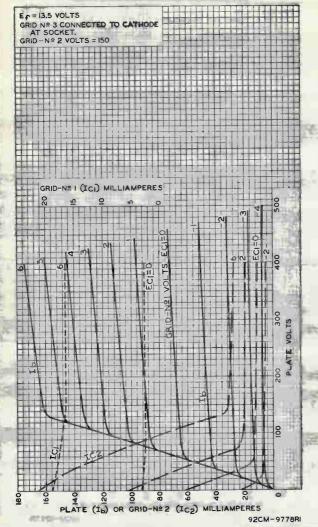
This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 13.5, plate-supply volts = 250, grid No.3 connected to cathode, grid-No.2 supply volts = 150, cathode resistor (ohms) = 120, cathode-bypass capacitor ( $\mu$ f) = 1000, plate load resistor (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.



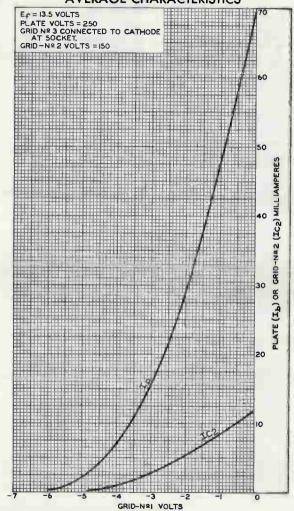
## **AVERAGE CHARACTERISTICS**



RADIO CORPORATION OF AMERICA Semiconductor & Materials Division Somerville, N. J.



#### **AVERAGE CHARACTERISTICS**

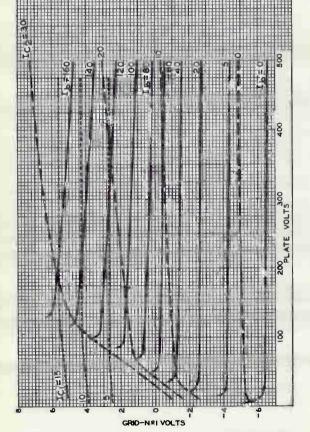


92CM-9775RI



# AVERAGE CONSTANT-CURRENT CHARACTERISTICS

E<sub>F</sub> = 13.5 VOLTS
GRID N# 3 CONNECTED TO CATHODE
AT SOCKET.
GRID-N\* 2 VOLTS = 150
T<sub>b</sub> = PLATE MILLIAMPERES
IC<sub>1</sub> = GRID-N\*1 MILLIAMPERES
IC<sub>2</sub> = GRID-N\*2 MILLIAMPERES



92CM-9776RI

# Power Tetrode

#### NUVISTOR TYPE

Haater 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 designed to operate within ±10% of any specified heater voltage between 6.0 and 8.5 volts to meet s battery-supply requirements in sonobuoy and other able equipment.	center
Input 1.1	watts
Peak heater-cathode voltage: Heater negative with respect to cathode. Heater positive with respect to cathode. Direct Interelectrode Capacitances:	
Grid No.1 to plate 0.015 max.	pf
Grid No.1 to cathode, grid No.2, shell, and heater	pf
and heater 1.4	pf
Heater to cathode 1.4	pf
Characteristics, Class A, Amplifier:	
Heater Voltage Specified cente	r value
Plate Supply Voltage 100	volts
Grid-No.2 Supply Voltage 50	volts
Grid No.1 Connected to negative end of cathode r Cathode Resistor	esistor ohms
Transconductance	umhos
Plate Current	ma
Grid-No 2 Current	ma
Grid-No.1 Voltage (Approx.) for plate $\mu$ a = 10 -7	volts
Mechanical:	
Operating Position. Type of Cathode	1.050" 0.840" 0.440" 4 grams sulator rmation Section
Base Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No	.E5-65)

Basing Designation for BOTTOM VIEW. 12AS  Pin 1ª - Do Not Use Pin 2 - Grid No. 2	
Pin 3a - Do Not Use Pin 4 - Grid No.1 Pin 5a - Do Not Use Pin 6a - Do Not Use Pin 7a - Do Not Use	
Pin 8 - Cathode Pin 9a - Do Not Use Pin 10 - Heater Pin 12 - Heater Ton Can - Plate	$\bigcirc$
INDEX=LARGE LUG  = SHORT PIN; IC-DO NOT USE	
AMPLIFIER - Class A	
Maximum Ratings, Absolute-Haximum Values:	(3
For operation at any altitude	
Plate Supply Voltage 300 max. volts	
Plate Voltage	
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:	
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	
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	
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. OC	

ypical Operation: c	
eater Voltage	2
late Supply Voltage 80 150 volts	
rid-No.2 Supply Voltage 80 150 volts	ŝ
rid-No.2 Resistor 12000 ohms	s
rid-No.1 Resistor 27000 10000 ohms	s
late Current 7.5 10 ma	à
rid-No.2 Current 6 6 ma seful Power Output at 80 Mc <sup>d</sup> 260 650 mw	à
seful Power Output at 80 Mcd 260 650 mw	¥

#### Maximum Circuit Values:

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

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

For operation at metal-shell temperature of 150° C measured in Zone "A" as shown on Jimensional Outline. For operation at other metal-shell temperatures, see Grid-Foll-Circuit-Resistance Rating Chart.

Cathode, grid No.1, and grid No.2 are operated as a 40-Hc, Colpittstype, electron-coupled oscillator with grid No.2 functioning as the "plate" of the oscillator, and the plate circuit tuned to 80 Hc.

d Measured at load.

### CHARACTERISTICS RANGE VALUES

UNARAUIER	CHARACTER 1311CO RANGE TALDES									
Note	Min.	Max.								
Heater Current 1 Direct Interelectrode	$0.95 \left[ \frac{1.1}{E_{f}(ctr)} \right]$	$1.05 \left[ \frac{1.1}{E_{f}(ctr)} \right]$	amp							
Capacitances: Grid No.1 to plate . 2 Grid No.1 to cathode, grid No.2, shell,	-	0.015	pf							
and heater 2 Plate to cathode, grid No.2, shell,	6.0	8.0	pf							
and heater 2	1.2	1.6	pf							
Heater to cathode . 2	1.2	1.7	pf							
Plate Current (1) 1,3	9	13	ma							
Plate Current (2) 1,4	-	13 50	μа							
Grid-No.2 Current 1,3	-	4	ma							
Transconductance (1) . 1.3	9000	13000	umhos							
Transconductance, Grid No.1 to		1,000	<u>p</u> unios							
Grid No.2 1,3	2000	-	umhos							
Useful Power Out put (1)1,5	0.550	-	watt							
Useful PowerOutput (2)5,6 Reverse Grid-No.1	0.500	**	watt							
Current 1,7	••	0.3	μα							
AC Emission 1,8 Heater-Cathode Leakage Current:	15	<b>₽</b>	ma							
Heater negative with		10								
respect to cathode 1,9	-	10	μ8							
Heater positive with respect to cathode 1.9	-	10	μa							

Hote Hon. Han.	-
Leakage Resistance:	1
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	
	ر '
Mote 1: With dc heater volts = specified center value, E, (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 (µt) = 1000.	
Note 4: With dc plate volts = 100, dc grid-Mo. 2 volts = 50, dc grid-Mo. 1 volts = -7, and metal shell connected to ground.	
Note 5: Measured at load in 40-Mc oscillator-80-Mc doubler circuit with dc plate supply volts = 150, dc grid-No.2 supply volts = 150, grid-No.2 resistor (ohms) = 12000, and grid-No.1 resistor (ohms) = 10000.	
Note 6: With dc heater volts = 0.9 specified center value.	
Mote 7: With dc plate supply volts = 125, dc grid-Mo.2 supply volts = 60, dc grid-Mo.1 supply volts = -1.5, grid-Mo.1-circuit resistance (megohns) = 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, ms 60-cps ac grid-No.1 signal volts = 7.5, dc grid-No.1-circuit resistance (ohms) = 2, plate- and grid-No.1-voltage supplies each bypassed with capacitor (pf) \$ 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 elec- trodes tied together, and metal shell connected to ground.	,
SPECIAL TESTS	
Short-Duration Shock (1):	
Peak Impact Acceleration 1000	
This test is performed on a sample lot of tubes to de- termine 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 Continu-	
ity and Shorts, Useful Power Output (1), Reverse Grid-No.1 Current, and Heater-Cathode Leakage Current.	

# Long-Duration Shock (2):

this test.

Peak Impact Acceleration . . . . .

50

This test is performed, using a half-sine-wave, il-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 II

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

milliseconds. No tube-electrode voltages are applied during

# Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubesfrom each production run to determine the ability of the tube to with—stand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dc heater-cathode volts = 100. Ouring 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-topeak)
- b. The vibration from 50 to 500 cps is applied with a constant acceleration of 10 g.
- e. 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 Continu-Ity and Shorts, Useful Power Output (1), Reverse Grid-No.l 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  $\pm$  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 c

cycles

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

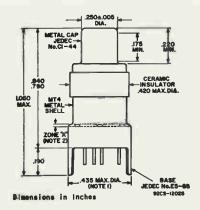
At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

# Combined Oscillator-Doubler Life (100 Hours):

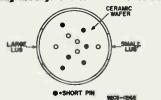
This test is performed on a sample lot of tubes from each production run.

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

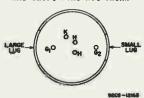
At the end of this test, tubes are criticized for Useful Power Output (2), Reverse Grid-No.! Current, Inoperatives, and Total Defectives. A tube is considered Inoperative If Useful Power Output (2) is less than 0.200 watt.



# BOTTOM VIEW Showing Arrangement of All II Base Pins



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

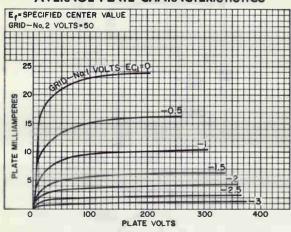


NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

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

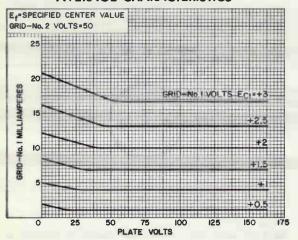


# AVERAGE PLATE CHARACTERISTISTICS



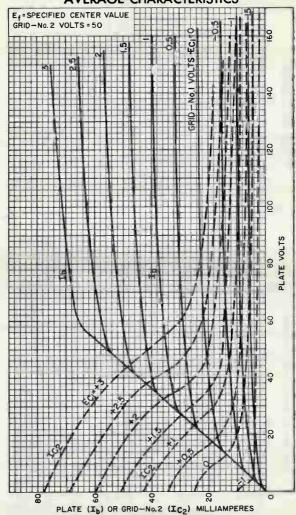
100-10175

# **AVERAGE CHARACTERISTICS**

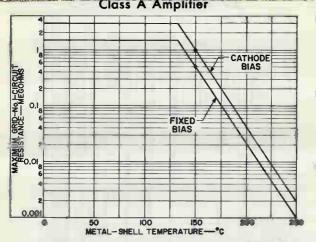


92CS-12172

# **AVERAGE CHARACTERISTICS**

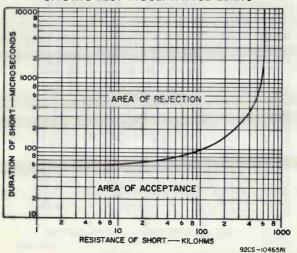


92CM-12175



9803-11096

# SHORTS-TEST ACCEPTANCE LIMITS



# Power Triode

#### NUVISTOR TYPE

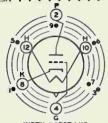
Heater Designed to Operate from Battery Supplies Used in Sonobuoy and Other Expendable Equipment

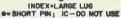
#### Electrical:

)	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
	and heater 4.2 pf Plate to cathode, shell,
	and heater
	Characteristics, Class A <sub>j</sub> Amplifier:
	Heater Voltage
	Mechanical:
)	Operating Position
	The state of the s

Basing Designation for BUTTOM VIEW. Pin 1ª - Do Not Use Pin 2 - Plate Pin 3ª - Do Not Use 4 -Grid Pin Pin 5ª - Do Not Use Pin 6\* - Do Not Use Pin 7ª - Do Not Use Pin 8 - Cathode Pin 9ª - Do Not Use

Pin 10 - Heater Pin 12 - Heater





### RE AMPLIFIER or OSCILLATOR - Class C

## Maximum Ratings, Absolute-Naximum Values:

shown on Dimensional Outline) .

For operation at any altitude

										Up	to	175 Nc	
Plate Supply Voltage													volts
Plate Voltage											250	max.	volts
Grid Voltage:													
Negative-bias value .								٠			55	max.	volts
Peak-positive value .													volts
Grid Current					٠								ma
Cathode Current											25	max.	ma
Plate Dissipation											2	max.	watts
Metal-Shell Temperature													
(Measured in Zone "A"	a	S											
	Plate Voltage Grid Voltage: Negative-bias value . Peak-positive value . Grid Current Cathode Current	Plate Voltage Grid Voltage:  Negative-bias value Peak-positive value Grid Current Cathode Current	Plate Voltage	Negative-bias value	Plate Supply Voltage. Plate Voltage	Plate Supply Voltage.       300         Plate Voltage.       250         Grid Voltage:       55         Negative-bias value.       4         Grid Current.       5         Cathode Current       25         Plate Dissipation       2         Metal-Shell Temperature	Plate Voltage       250 max.         Grid Voltage:       55 max.         Negative-bias value       4 max.         Feak-positive value       5 max.         Grid Current       5 max.         Cathode Current       25 max.         Plate Dissipation       2 max.         Metal-Shell Temperature						

# Typical Operation:

#### As cathode-drive of amblifier

At 175 Mc . . . Specified center value Heater Voltage. . . . . 150 volts Plate Supply Voltage. 4700 ohms Grid Resistor . . . . 250 TOW Driver Power Output . .

As oscillator

# 1.6 At 175 Nc

150 max.

90

watts

.Specified center value Heater Voltage. . . . Plate Supply Voltage. . 170 volts 4700 ohms Grid Resistor . . . . watts 1.5 watts

Maximum Circuit Values:

Useful Power Outputb. . .

0.05 max. megohm Grid-Circuit Resistance

# FREQUENCY DOUBLER - Class C

# Maximum Ratings, Absolute-Maximum Values:

For operation at any altitude

7								,					
										U	to	175 Mc	
	Plate Supply Vol-	tage.									300	max.	volts
	Plate Voltage										250	max.	volts
	Grid Voltage:												
	Negative-bias	value				٠					200	max.	volts
	Peak-positive	value									4	max.	volts
	Grid Current										5	max.	ma
	Cathode Current										22	max.	ma
	Plate Dissipation	n									2	max.	watts
	Metal-Shell Temp												
	(Measured in Z												0.0
	shown on Dimen:	sional	02	tl	in	e)	•				150	max.	90
	Tueles   Opendin												
	Typical Operation	11 i											

#### Typical operation:

80-to-160 Mc

											, .	00. 200 110	
Heater Voltage									.5	Spe	ec i	fied center	value
Plate Supply Voltage.												135	volts
Grid Resistor													ohms
Driver Power Output .	٠	•	•	٠	•	•	٠	•	•	•	•	150 800	mw
Useful Power Outputb.	•	٠	•	٠	•	•	•	٠		•	•	800	THW
Maximum Circuit Value													

#### Maximum Circuit Values:

Grid-Circuit Resistance . . . . . . . 0.05 max. megohm

Measured at load.

# CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
Heater Current	1	0.95 0.85 Effetr)	$1.05 \left[ \frac{0.85}{E_{f}(ctr)} \right]$	amp
Direct Interelectrode				
Capacitances:	2	1.8	2.6	-6
Grid to plate Grid to cathode.	4	1.6	2.0	pf
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 2 2	0.20	0.32	pf
Heater to cathode.		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		umhos
Useful Power Output (1		1.4	- 1	watts
Useful PowerOutput (2	1)5,6	1.3	- 1	watts
Reverse Grid Current	1,7	-	0.3	μa
AC Emission	1,8	20	-	ma
Amplification Factor	1,3	22	34	

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

		Note Min. Max.
		Cathode
		ge Current:
		r negative with pect to cathode 1.9 - 5 wa
		r positive with
		pect to cathode 1,9 - 5 ua
		Resistance:
		en grid and all
		er electrodes d together 1,10 5000 - megohms
		d together 1,10 5000 - megohms en plate and all
		er electrodes
1	tied	together 1,11 10000 - megohms
Note	1:	With do bester welter a generalist content walnut & fatal
Hote	2:	With dc heater volts = specified center value, E <sub>f</sub> (ctr).  Measured in accordance with EIA Standard RS-191-A.
Note	3:	
		With dc plate supply volts = 75, grid and metal shell connect— ed to negative end of cathode resistor, cathode resistor (ohms) = 100, and cathode—bypass capacitor $\{\mu f\}$ = 1000.
Note	11:	With dc plate volts = 75, dc grid volts = -9, end metel 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.
Wote	6:	With dc heater volts = 0.9 specified center value.
Hote	7:	With dc plate supply volts = 80, dc grid supply volts = $-1.2$ , grid—circuit resistance (megohms) $\stackrel{\leftarrow}{=} 1$ (the internal resistance of the current meter used for this measurement), and metal
		of the current meter used for this measurement), and metal shell connected to ground.
Rote	8:	With dc plate supply volts = 40, dc orid supply volts = -6.5.
		rms 60-cps ac grid signel volts = 8, dc grid-circuit resistance (ohms) = 2, plate-and grid-voltage supplies each bypassed
		with capacitor (\( \mu^r \)) \( \frac{1}{2} \) 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.

the plate circuit.

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

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

#### SPECIAL TESTS

# Short-Duration Shock (1):

Peak Impact Acceleration . .

1000

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, II-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 IB 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 II 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 (I), Reverse Grid Eurrent, 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 dcheater-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 q.
- 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 Continue ity and Shorts, Useful Power Output (I), 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 voits 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  $\pm$  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-IO, 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 Iminimum 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.

Ouring 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 I minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

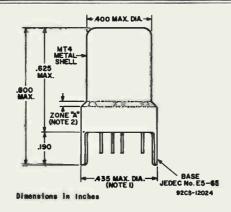
At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

# Oscillator Life (100 Hours):

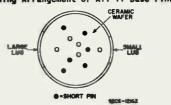
This test is performed on a sample lot of tubes from each production run.

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

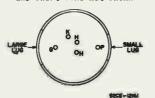
At the end of this test, tubes are criticized for Useful Power Output (2), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.700 watt.



# BOTTOM VIEW Showing Arrangement of All II Base Pins



# With Element Connections Indicated and Short Pins Not Shown

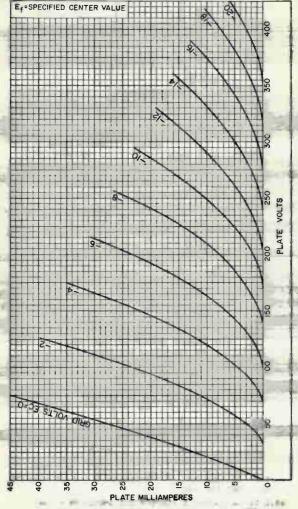


NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

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



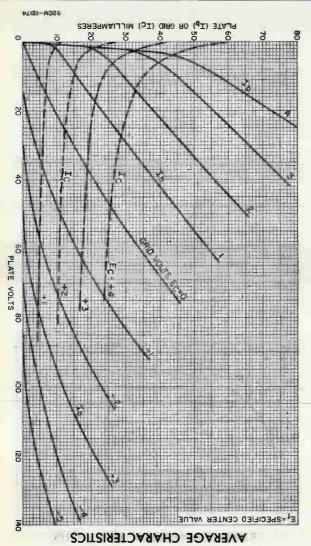
# AVERAGE PLATE CHARACTERISTICS

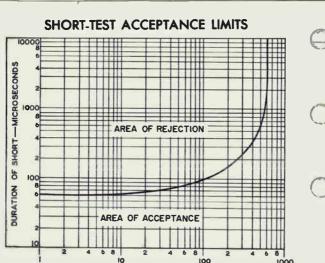


92CM-12169









RESISTANCE OF SHORT-

100

-KILOHMS



1000

920S-10465RI

# Medium-Mu Triode

#### NUVISTOR TYPE

### ALL-CFRAMIC-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 8202 is the same as the 7586 except for the following items: Flectrical:

Heater Characteristics and Ratings:	
Voltage (AC or DC)	1.4 volts
Current at heater volts = 13.5 0.06	50 amp
Direct Interelectrode Capacitances (Approx.):	
Grid to plate 2.4	4 pf
Input: G to (K,S,H) 4.4	4 pf
Heater to cathode 1.7	7 pf

#### CHARACTERISTICS RANGE VALUES

					Note a	Min.	Max.	
Heater Current Direct Interelectrode		٠	۰	٠	10	0.055	0.065	amp
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)	•			4	11	9000	-	umhos

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

# SPECIAL RATINGS & PERFORMANCE DATA

Heater Cycling: Heater volts = 18.0

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



# High-Mu Triode

#### NUVISTOR TYPE

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

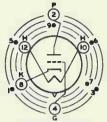
ΕI	e	ct	ri	Ca	ıl:

)	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 ex-
	pendable equipment.
	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 <sub>1</sub> Amplifier:
	Heater Voltage Specified center value
	Plate Supply Voltage
	Grid Connected to negative end of cathode resistor
	Cathode Resistor 150 ohms
	Amplification Factor 64
	Plate Resistance (Approx.) 6800 ohms
	Transconductance 9400 µmhos
1	Plate Current 7 ma
	Grid Voltage (Approx.) for plate $\mu a = 10$ . $-4$ volts
	Mechanical:
	Operating Position
	Type of Cathode Coated Unipotential
	Maximum Overall Length 0.800"
	Maximum Seated Length 0.625
	Maximum Diameter 0.440"
	Weight (Approx.)
	Envelope
	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 1a - Do Not Use
Pin 2 - Plate
Pin 3a - Do Not Use
Pin 4 - Grid
Pin 5a - Do Not Use
Pin 6a - Do Not Use
Pin 7a - Do Not Use
Pin 7a - Do Not Use
Pin 8 - Cathode
Pin 9a - Do Not Use
Pin 10 - Heater

Pin 12 - Heater



INDEX=LARGE LUG ==SHORT PIN; IC-DO NOT USE

### AMPLIFIER - Class A

# Maximum Ratings, Absolute-Haximum Values:

For operation at any altitude

	Harried T Hearing -
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
	<ul> <li>0 max. volts</li> </ul>
Positive-bias value	
Peak-positive value	2 max volts
Cathode Current	15 max. 2.5 max. ma
Plate Dissipation	1 max. 0.2 max. watt
riate bissipation	_ 110,117
Maniana Alaunia Maluana	

# Maximum Circuit Values: Grid-Circuit Resistance:

Rating 2 Rating ab

Pating . Pating a

For fixed-bias operation . . . . . 0.5 max. 40 max. megohms For cathode-bias operation . . . . . . . 1 max. 40 max. megohms

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

For high-reliability, 20-hour-life applications.

6 For operation at metal-shell temperature of 150° C measured in Zome "A" as shown on Disensional Outline. For operation at other metal-shell temperatures, see Grid-Circuit-Resistance Rating Chart.

# CHARACTERISTICS RAMBE VALUES

	Note	Hin.	Max		
Heater Current	1 0.	.95 0.85 F-(ctr)	$1.05 \left[ \frac{0.85}{6.0000} \right]$	amp	
Direct Interelectrode		Franctivi	France, J		
Capacitances: Grid to plate	2	0.8	1.0	pf	
Grid to cathode, shell, and heater.	2	3.4	5.0	pf	

			Note	Min.	Nax.	
	to cathode,		2	4.2	2.4	
	ll, and heater to cathode	• •	2	0.16	0.28	pf
	r to cathode		2	1.0	1.6	pt
	urrent (1)		1,3	5.5	8.8	pf ma
	urrent (2)		1.4	-	50	μa
	nductance (1)	•	1,3	7900	10900	μπhos
	nductance (2)		3,5	6700	_	umhos
	Grid Current		1,6	_	0.05	μa
	cation Factor		1,3	54	74	-
Heater-	Cathode					
Leaka	ge Current:					
Heate	r negative with		200			
	pect to cathode		1,7	_	5	μa
	r positive with				127	
	pect to cathode		1,7	-	5	μa
	Resistance:					
	en grid and all					
	er electrodes		+ 0	5000		
	d together en plate and all		1,8	3000	-	megohms
	er electrodes					
	d together		1,9	10000		megohms
	a together	• •	-,0	10000		megorans
Note 1:	With dc heater volts = :	spec	ified c	enter value	. E,(ctr)	
Wote 2:	Measured in accordance					
Note 3:	With dc plate supply volto negative end of cati	ts=	110, 9	rid and met	al shall	connected
	= 150, and cathode-bypa:	SS C	apacito	r (µf) = 10	e resist	or (onms)
Note 4:	With dc plate volts = 1 connected to ground.					ital shell
Note 5:	With dc heater volts = 0	).9	specifi-	ed center v	alue.	
Note 6:	With dc plate supply vo	155	= 150,	de grid su	pply volt	s = -1.7
	With dc plate supply vo grid-circuit resistance of the current meter user connected to ground.	(me	gohms) r this	∠ 1 (the i measurement	), and me	esistance stal shell
Note 7:	With dc heater-cathode	vol t	s = 100			
Note 8:	With grid 100 volts negatied together.	tive	with r	espect to al	) other e	electrodes
Hote 9:	With plate 300 volts neg	ativ	e with r	espect to al	) other	electrodes

#### SPECIAL TESTS

1000

# Short-Duration Shock (1):

Peak Impact Acceleration . . . .

at the specified Peak impact Acceleration.

tied together.

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  $(X_1, X_2, Y_1, \text{ and } Y_2)$  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 end of this test, tubes are criticized for continuity and Shorts, Transconductance (I), 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, limilisecond, 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 il milliseconds. No tube-electrode voltages are applied during this test.

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

# Sweep-Frequency Fatigue Vibration:

This test is performed on a sample let of tubes from each production run to determine the ability of the tube to with-stand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with dcheater-cathode volts = 100. During operation, the tube is vibrated through the frequency range from 5to 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 5to 50 cps is applied with a constant peak amplitude of 0.040 inch (0.080 inch peak-to-peak).
- a. 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 fellows 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 with—stand 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 I minute ON and 2 minutes OFF, dc haatar-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

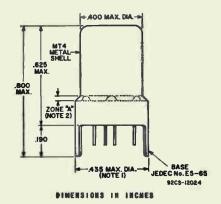
At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

# Intermittent Life (100 Hours):

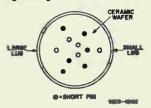
This test is performed on a sample lot of tubes from each production run.

During this test, tubes are operated at maximum rated plata dissipation ( $Rating\ 2-1$  watt).

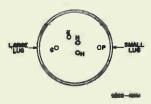
At the end of this test, tubes are criticized for Transconductance (I), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.



BOTTOM VIEW
Showing Arrangement of All II Base Pins



# With Element Connections Indicated and Short Pins Not Shown

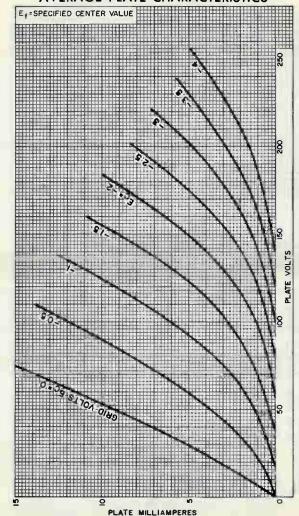


NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

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

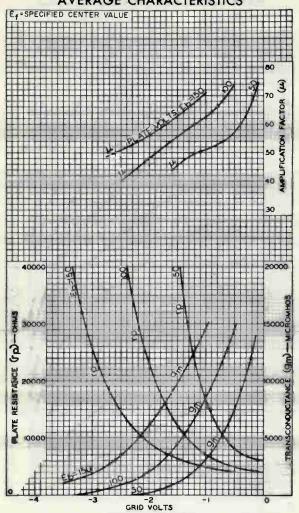


# **AVERAGE PLATE CHARACTERISTICS**



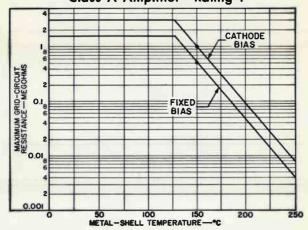
92CM-12170

# **AVERAGE CHARACTERISTICS**



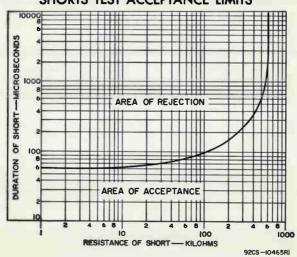
92CM-12168

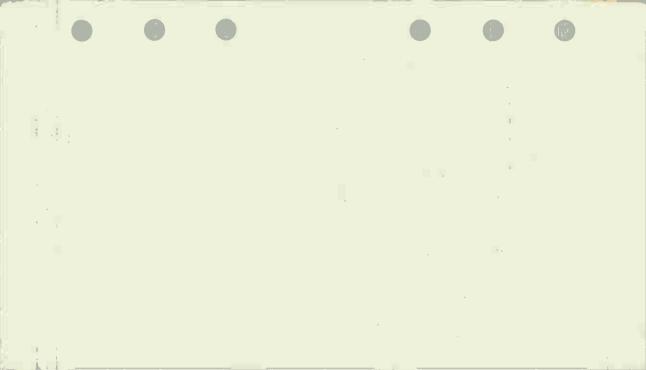
# GRID-CIRCUIT-RESISTANCE RATING CHART Class A Amplifier—Rating 1



92CS-12023

# SHORTS TEST ACCEPTANCE LIMITS





# Medium-Mu Triode

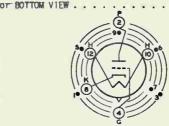
#### NUVISTOR TYPE

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

Heater Characteristics and Ratings:  Voltage (DC)Tubes will be supplied with the designed to operate within ± 10% of any specified wheater voltage between 6.0 and 8.5 volts to meet speature-supply requirements in sonobuoy and other pendable equipment.	center ecific
Input 0.85  Peak heater-cathode voltage: Heater negative with respect	watt
to cathode	volts
to cathode 100 max.  Direct Interelectrode Capacitances (Approx.):	volts
	pf
	pf
di id to odimoto, and i	pf
Plate to cathode, shell, and heater 1.7	
Plate to cathode 0.34	pf
Heater to cathode 1.4	pf
Characteristics, Class A, Amplifier:	
Heater Voltage Specified center	val u <b>e</b>
Plate Supply Voltage	volts
Grid Connected to negative end of cathode re	sistor
Cathode Resistor 100	ohms
Amplification Factor	0
	ohms
Plate Resistance (Approx.)	umhos
Transconductance	y
Plate Current 8.7	ma
Grid Voltage (Approx.) for plate µa = 50 -5	volts
Mechanical:	
Operating Position	. Any
Type of Cathode Coated Unipot	ential
Maximum Overall length	0.800"
Maximum Seated Length	0.625"
Maximum Seated Length	0.440"
Waximum Diameter	a rams
Weight (Approx.).         1.9           Envelope.         Metal She	11 MTA
Socket See Socket & Connector Infor	
Socket See Socket & Connector Injor	mution
for RCA Nuvistor Tubes at front of this S	CE CEI
Rase Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.	FD-02)

Electrical:

-	60.5	ng	Desti	gnat	ion To
	Pin	14	– Do	Not	Use.
	Pin	2	- Pla	ate	
	Pin	3*	- Do	Not	Use
	Pin	4	- Gr	id	
	Pin	5ª	- Do	Not	Use
	Pin	6*	- Do	Not	Use
	Pin	7*	- Do	Not	Use
	Pin	8	- Ca	thode	9
	Pin	9*	- Do	Not	Use
	Pin	10	- He	ater	
	Pin		- He		



12A0

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.				4		55	max.	volts
Peak-positive value.			٠				max.	
Grid Current						2	max.	ma
Cathode Current							max.	ma
Plate Dissipation						0.45	max.	watt

# Typical Operation:

Heater Voltage .										
Plate Supply Vol	tage							12	24	volts
Grid Voltage								-	-0.7	volt
Grid Resistor										ohms
Amplification Fa	ctor							12	12	
Plate Resistance	(Ap)	pro	XC	.)				1500	1500	ohms
Transconductance			٠					8000	8000	µmhos .
Plate Current								5.5	9.5	ma

# Maximum Circuit Values:

Grid-C	ircu	it	Resistanc	e:	Ь

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

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

For operation at metal-shell temperatures up to 150° C, measured in Zone "A" as shown on Dimensional Owline. For operation at metal-shell temperatures above 150° C, see accompanying Grid-Gircuit-Resistance Rating Chart.

#### CHARACTERISTICS RANGE VALUES

CHARACTERISTICS RANGE VALUES					
		Note	Hin.	Max.	
	Heater Current	1	$0.95 \left[ \frac{0.85}{E_{f}(ctr)} \right]$	1.05 0.85 E <sub>f</sub> (ctr)	amp
	Direct Interelectrode				
	Capacitances:	4	4.0	2.4	
	Grid to plate Grid to cathode.	2	1.8	2.4	pf
	shell, and heater	2	3.4	4.6	pf
	Plate to cathode,		· ·	11.0	Ρ,
	shell, and heater		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	μα
	Transconductance (1)	1,3	6500	8500	µmhos
	Transconductance (2) Reverse Grid Current	3.5	5700	0.05	μmhos
	Amplification Factor		9	14	μα
	Heater-Cathode	100	<b>W</b>	74	
	Leakage Current:				
	Heater negative				
	with respect to				
		1,7	-	5	μa
	Heater positive				
	with respect to cathode	1.7		5	
	Leakage Resistance:	2,1		5	μa
	Between grid and				
	all other				
	electrodes tied				
	together	1,8	5000	-	megohms
	Between plate and				
	all other				
	electrodes tied	10	10000		megohms
	together	1,9	10000	-	megonins

- Note 1: With dc heater volts = specified center value, E,(ctr).
- Note 2: Measured in accordance with ElA Standard RS-191-A.
- with dcplate supply volts = 24, grid and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 100, and cathode-bypass capacitor  $(\mu^*)$  = 1000. Note 3:
  - 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.
- with dc plate supply volts = 40, dc grid supply volts = -2, grid circuit resistance (megohms)  $\leq 1$  (the internal resistance of the current meter used for this measurement), and metal shell connected to ground. Note 6:
- #ote 7: With dc heater-cathode volts = 100.
- with grid 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground. Note 8:
- Hote 9: with plate 300 volts negative with respect to allother electrodes tied together, and metal shell connected to ground.

#### SPECIAL TESTS

# Short-Duration Shock (1):

Peak Impact Acceleration. . . . . . . . . . . . . . . . . 1000

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

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

### Long-Duration Shock (2):

Peak Impact Acceleration.

This test is performed, using a half-sine-wave, il-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 II-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. Ouring 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.
- e. 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)

2000 cycles Intermittent Operation . . . .

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35x specified center value cycled I 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.

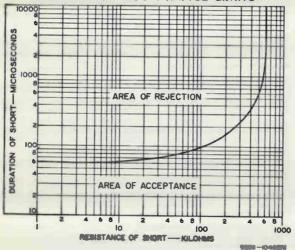
#### Intermittent Life (100 Hours):

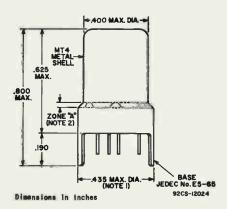
This test is performed on a sample let of tubes from each production run.

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

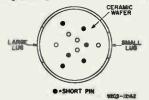
At the end of this test, tubes are criticized for Transconductance (i), Reverse Grid Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if it has a discontinuity, permanent short, or air leak.

#### SHORTS-TEST ACCEPTANCE LIMITS

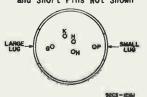




#### BOTTOM VIEW Showing Arrangement of All II Base Pins



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

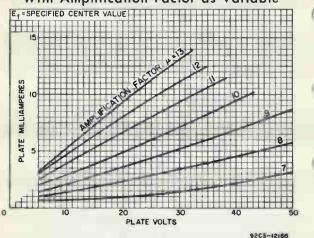


NOTE 1: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

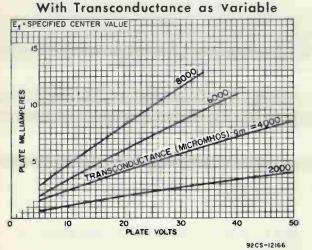
NOTE 2: METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".



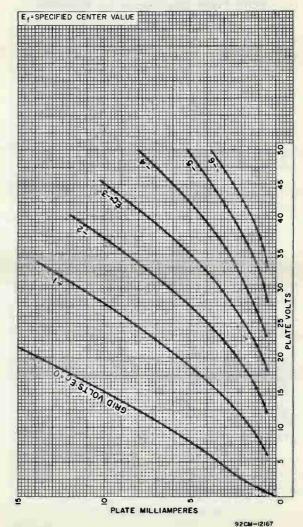
# AVERAGE PLATE CHARACTERISTICS With Amplification Factor as Variable



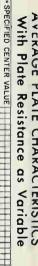
# AVERAGE PLATE CHARACTERISTICS

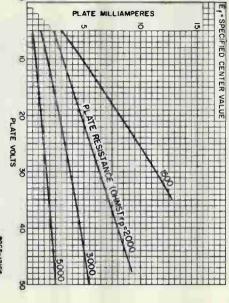


#### AVERAGE PLATE CHARACTERISTICS

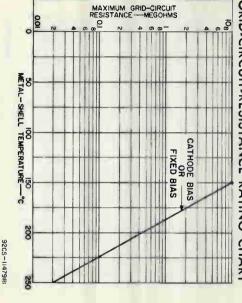


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# GRID-CIRCUIT-RESISTANCE RATING CHART







# 8532/6J4WA

# High-Mu Triode

•			
7-PIN MINIATURE T	YPE		
FRAME-GRID CONSTRUCTION	PREMIUM	" VERSION	OF 6J4
For Cathode-Drive UHF Amplifier	Applica	tions (up	to
500 Mc) in Equipment Requiring Ex	ception	al Stabili	ity
and Reliability under Severe Envi	ronmenta	al Condition	ons
Electrical:			
Heater Ratings and Characteristics:		62102	
Voltage (AČ or DC) Current at heater volts = 6.3		6.3 ± 0.3 0.400	volts
Peak heater-cathode voltage:		0.400	
Heater negative with respect to cat		100 max.	
Heater positive with respect to cat Direct Interelectrode Capacitances:	hode.	100 max.	volts
Cathode to plate		0.2 max.	pf
Cathode to plate			
K to (G + IS, H)b		7.5	pf
Output (Cathode-drive operation): P to (G + IS, H) b		5 0 may	pf
Grid and internal shield to plate.		2.8	pf
Heater to cathode		2.8	pf
Mechanical:			
Operating Position			. Any
Operating Position Type of Cathode	Coa	ted Unipot	ential
Maximum Overall Length			2-1/8"
Maximum Seated Length Length, Base Seat to Bulb Top (Excluding	tipl	1-1/2" ±	3/32"
Diameter		0.650" to	0.750"
Dimensional Outline (JEDEC No.5-2)	See	General S	ection
Bulb	e 7-Pin	(JEDEC No	.E7-1)
Basing Designation for BOTTOM VIEW.			
	н	G,IS	
Pin 1-Grid, Internal Shield	(	(5)	
Pin 2 - Cathode	H(3)	16	G,IS
Pin 3 - Heater Pin 4 - Heater	4		
Pin 5 - Same as Pin 1	2	- V	1
Pin 6 - Same as Pin 1	KEL		/P
Pin 7-Plate			
	G,	S	
Characteristics, Class A: Amplifier:			
Plate Supply Voltage			volts
Grid Ce		to negati cathode re	
Cathode Resistor		. 100	ohms
Amplification Factor		. 52.5	ahma

Plate Resistance (Approx.). .

Transconductance.

ohms

umhos

4800

11000

Plate Current	= 6015 volts
CLACC A . AMPLIE	150
CLASS A   AMPLIF	
Maximum Ratings, Absolute-Haximum Va	lues:
For operation at altitude	s up to 80,000
feet and frequencies	p 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	120 °C
point on bulb surface)	120
Maximum Circuit Values:	
Grid-Circuit Resistance:	
For grid-resistor-bias operation.	0.25 megohm
With external shield JEDEC No.316 connect	
b With external shield JEDEC No.316 connect	ed to grid.
CHARACTERISTICS RAN	E VALUES
No	te Nin. Wax.
Heater Current	0.375 0.425 amp
Direct Interelectrode	0.515 0.425 @ilp
Cathode to plate	- 0.2 pf
Input (Cathode-drive	
operation):	
	5.5 9.5 pf
Output (Cathode-drive	
operation): P to (G + IS, H).	6.0
P to (G + IS, H)	- 5.0 pf
to plate	2.3 3.3 pf
	1.0 4.5 pf
Plate Current (1) 1	5 9 18 ma
Plate Current (2) 1	6 – 60 μa.
	5 8800 13200 µmhos
Transconductance (2) for an	
individual tube expressed	
as a per cent of Trans-	7 - 15 \$
	7 - 15 % 8 0 0.5 μα
	5 40 65
Heater-Cathode Leakage Current:	
Heater negative with	
	9 - 10 μα
Heater positive with	
respect to cathode 1	9 – 10 μα

			Resistance:		
			en grid and all other		
		eler	ments connected together . 1,10 590	-	megohms
1	Be	twee	en plate and all other		
		eler	ments connected together . 1,11 500	-40	megohms
	Hote	1:	With ac or dc heater volts = 6.3.		
	Hote	2:	Measured in accordance with EIA Standard #3-1	91-A.	
	Hote	3:	With external shield JEDEC No.316 connected t	o groun	d.
h.	Note	4:	With external shield JEDEC No.316 connected t	o grid.	
	Mate	8 +	With do plate-supply wolts a 150 orid const	t betoe	o penative

with oc plate-supply volts = 150, grid connected to negative end of cathode resistor, cathode resistor (ohms) = 100, and cathode-bypass capacitor  $(\mu f)$  = 1000.

**Bate** 6: With dc plate volts = 150 and dc grid volts = -18.

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

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

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

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

with plate 300 volts negative with respect to all other ete-Mote 11:

#### SPECIAL TESTS

#### High-Impact, Short-Duration Shock: Peak Impact Acceleration. . Duration of half-sine-wave mechanical-shock pulse. . 1

Inis test is performed on sample tubes from each production lot to determine the ability of the tubes to withstend the specified acceleration for a short time interval. Tubes are rigidly mounted in each of four different positions (X1, X2, Y1, and Y2) 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 imagohms) = 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							9
Vibration Frequency							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  $Y_1$ ).

# 8532/6J4WA

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	1
Vibration Frequency	40 ср	3
RMS Voltage across plate load	resistor 150 max. mm	V

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 (!) 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	0
Vibration-Frequency Range	50 to 500 cps	ě.
RMS Voltage across plate load	resistor 100 max. m	

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 CHARAC-TERISTICS 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, X1 and X2. 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.	•										ft
Air Pressure			٠	•							mm Hg
Ambient Temperature					٠				25 ±	8	96
RMS Voltage between	D	la	te								
base pin and adja									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  $25^{\circ}\pm5^{\circ}$  C, while the tubes



are subjected to a reduced air pressure of  $21\pm2$  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-IE, 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 0N and 4 minutes 0FF for 2000 cycles, dc heater-cathode volts = 100 continuously 0N, 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 (I) 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 (I).

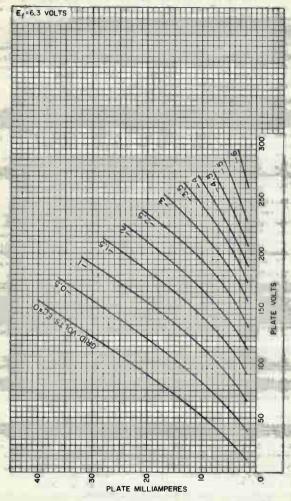
#### Early-Hour Survival-Rate Life (100 Hours):

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 (I) and are then subjected to the Continuity and Shorts Test.

#### Intermittent-Conduction Life (1000 Hours):

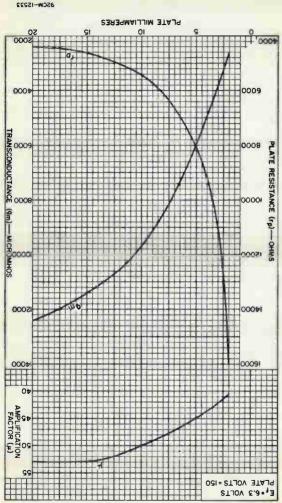
This test is performed on sample tubes from each production lot to assure the high quality of individual tubes and to guard against epidemic failures due to excessive transconductance change in any of the characteristics specified below. After 500 hours of operation under the conditions specified for the Stability Life Test above and, in addition, with heater voltage cycled 110 minutes ON and 10 minutes OF, 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

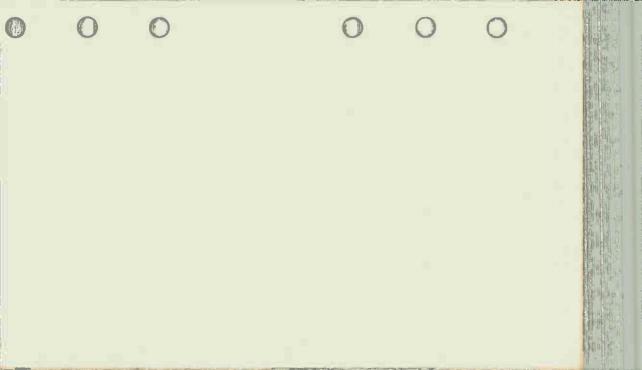


92CM-12534

## AVERAGE CHARACTERISTICS







# High-Mu Triode

#### ENVIRONMENTAL TESTS

#### NUVISTOR TYPE

LIFE TESTS

For Condenser-Microphone Preamplifiers, Piezoelectric- and Geramic-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) Ef Heater Current at Ef = 6.3 V	6.3	WA.
Heater Input	0.63	W
Direct Interelectrode Capacitances		
Without external shield		
Input: G to (K, S, H)	3.4	pF
Output: P to (K, S, H)	1.7	pF
Plate to cathode	0.20	øF
Grid to cathode cak	2.6	pF
Heater to cathode.	1.0	25

#### CLASS AT AMPLIETED

	•	,,,	3.	, ,	ч	AF	*	.,,		· K			
For Followin	g	Ch	aı	. a c	te	ri	31	tie	c s	56	e Condit	ions	
Amplification Factor Plate Resistance (Ap Transconductance DC Plate Current Cutoff DC Grid Voltage	•	•	i	•	-	10	· ·	A.	٠	۰	<u> </u>	127 41 3100 1.5 -1.7	kΩ μαθο mA V
Heater Voltage											Ef	6.3	٧
Plate Supply Voltage											FLL	120	٧
Grid Supply Voltage.											Ecc	0	v
Cathode Resistor											Rk	200	Ó
Metal Shell								C	001	10			maund.

#### ABSOLUTE MAXIMUM RATINGS

For operation as a Class-A<sub>1</sub> Amplifier Tube
at frequencies up to 200 kc/s

Plate Supply Voltage	•										Еьь	330	٧
DC Plate voltage	•	•	•	•	•	•	•	•	•		Eb	250	V
Grid Voltage													
Peak positive value	9.	•	•			•					ecm.	0	٧
DC positive value.											En	0	٧
DC negative value.						-					Fa	-55	٧
Peak Heater-Cathode \	lo'	۱ta	age	3.							6h km	+100	٧
Heater Voltage, DC or	٠,	AC.									Fe	5.7 to 6.9	٧
instantaneous Voitage	١.										See Brea	kdown-Volta	
between base pins an	d r	net	ta i	- 2	shi	el i	)			- 4	Characte	rictice Cur	ve
Average Cathode Curre	'n	t.									14/04/1	2	mĀ
riate Dissipation											Ph	0.3	W
Envelope Temperature	•										TE		OC

Arid-Circuit Resistance

#### MAXIMUM CIRCUIT VALUES

For cathode-bias operation Rg(ckt)	in in
MECHANICAL CHARACTERISTICS	
Operating Position	ay .
Type of Cathode	al
Maximum Overall Length (1 <sub>m</sub> ) 0.800	in
Maximum Seated Length (1sm) 0.625	in
Maximum Diameter (dm) 0.440	in
Weight (Approx.)	9
Dimensional Outline JEDEC No.4	
Envelope JEDEC Designation M	E)
Basea Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-6	
Basing Designation for BOTTOM VIEW	'nΨ

Pin	10	- Do Not Use
Pin		- Plate
Pin	30	- Do Not Use
Pin	4.	-Grid
Pin	50	- Do Not Use
Pin	6 <b>b</b>	- Do Not Use
Pin	7 <b>b</b>	- Do Not Use
		- Cathode
Pin	9b	- Do Not Use
Pin	10	- Heater
Pin	11	- Omitted
		-Heater



-SHORT PIN-IC

#### TYPICAL OPERATION

In High-Input-Impedance, Cathode-Follower Gircuit

6.3	¥
1.00	
3.3	lcΩ
	kΩ
100	MO
ă.	<b>6</b> 03
-	
7	kΩ
	må.
0.3	Am
	190

Designed to mate with Cinch Mfg. Co. Socket No. 133 65 92 025, 133 65 91084, or equivalent.

6 Measured on metal shell in Zone "A" (See Dimensional Outtine).



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

#### INITIAL CHARACTERISTICS LIMITS

INITIAL CHARACTERIST	CS LIM	ITS		
	Note	Min	Max	
Neater Current	1	90	110	mA
Direct Interelectrode Capacitances		00	110	-
Grid to plate	2	-	0.7	pF
Input: G to (K, S, H)	2	3.0	3.8	ρF
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	μ <b>m</b> ho
Plate Current	3	0.7	2.3	mA
Cutoff Plate Current			200	$\mu$ A
AC Voltage Amplification	5	7		V
Total Grid Current	6	-	-0.05	μA
Leakage Resistance	7	-	±5	μΑ.
Between grid and all other				
electrodes connected together	8	50	_	eΩ
Between plate and all other	•	30		GI I
electrodes connected together	9	100	_	80
Inoperatives	10		/	022
Note 1: With $E_f = 6.3 \text{ V}$ .				
Note 2: Measured without external a				
Note 3: With $E_f = 6.3 \text{ V}$ , $E_{bb} = 120$	V, E <sub>cc</sub>	= 0 V,	Pk = 2	00 Ω,
$C_k = 1000 \mu F$ , metal shell g	rounded			
Note 4: With $E_f = 6.3 \text{ V}$ , $E_b = 120 \text{ V}$	, E <sub>c</sub> =	-1.7 V,	, metal	shell
grounded.				
Note 5: With Ef = 6.3 V, Ebb = 120	V, E <sub>cc</sub>	= 0 V,	$R_g = 1$	0 ΜΩ,
$C_{c(in)} = 0.1 \mu F$ , grid-signal	-source	interr	al impe	dance
< 2500 Ω, E <sub>g</sub> = 0.2 V (rms, 60 c/	s, sine	wave), i	<sup>t</sup> p = 0.∶	5 ML2,
$C_{c(out)} = 0.5 \mu F$ . RMS volta the series plate resistor with	ge compo	onent m	easured	acros s
pedance vacuum-tube voltmet	ne om	az (min	./ inpu	C 1m-
Note 6: With Ef = 6.3 V, Eb = 200 V, Ecc	= -1 V	В -	1 MO	1
shell grounded.	1 +	, 1.g -	T Mar'	metal
Note 7: With $E_f = 6.3 \text{ V}$ , $E_{hk} = \pm 100$	V.			
Note 8: With $E_f = 6.3 \text{ V}$ , $E_{g-all} = -100$		tal she	ell gro	unded
<b>Mote 9:</b> With $E_f = 6.3 \text{ V}$ , $E_{p-all} = -300$	) V, met	al she	ll grou	nded.
Note 10: Tubes are criticized for Shor	rts, Di	sconti	nuities	, and
Air Leaks.				
ENVIRONMENTAL TI	ете			
High-Impact, Short-Dura	_	nock		
Peak Impact Acceleration			1000	g
Duration of Approximate Half-Sine-Wave				
Mechanical-Shock Pulse		(	0.8 ± 0.	2 ms
Operating Conditions during Test				
$E_f = 6.3 \text{ V}, E_{bb} = 120 \text{ V}, E_{cc} = 0 \text{ V}, R_k = 120 \text{ V}$	200 Ω	, Rg =	1 MΩ,	Ehk =
100 V.				

	м: м		
Back Charle Limits and Releation Criteria	Min Max		
Post-Shock Limits and Rejection Criteria ERo (AC Voltage Amplification)	6 -	٧	
ic	0.	μÅ	4
labore e e e e e e e e e e e e e e e e e e	- ±10	μA C	
Epom (Variable-Frequency-Vibration lest			
Limits) over Vibration-Frequency Range of:	72	n	
3 to 6 kc/s	- 1000		
6 to 15 kc/s			
			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Low-Impact, Long-Duration Shock			
Peak Impact Acceleration	5	e g	
Duration of Approximate Half-Sine-Wave Mechanical-Shock Pulse	. 11+	2 85	
Condition during Test			
No tube-element voltages are applied.			
Post_Shock Limits and Rejection Criteria			
Same as those specified above for the High-In	mpact, Shør	t-Du-	
ration Shock Test.			
Sweep-Frequency-Vibration Fatigu	je .		
Vibration-Frequency Range (Overall)	5 to 500 to 5	c/s	
Peak Displacement		200	
5 to 50 & 50 to 5 c/s	0.040	in in	
Peak-to-peak value	0.080	q	
Peak Vibrational Acceleration	10	39	
Period of I Sweep Cycle (Approx.)	15		
5 to 500 to 5 c/s			
Duration of Test (Overall)	9 3	h	
Along each of 3 mutually perpendicular axes	3	en en	
Operating Condition during Test			
$E_f = 6.3 \text{ V}$ Post-Sweep-Frequency-Vibration-Fatigue Limits			
and Polection Criteria			
Same as those specified above for the High-	Impact-Shor	rt-0u-	
ration Shock Test.			
Variable-Frequency Vibration			
Wibration-Frequency Range (Overall)	. 3 to 15	kc/s	
Peak Vibrational Acceleration	. 1	9	
In Xa position			
Period of I Sweep Cycle (3 to 15 kc/s)	. 7		
Operating Conditions during Test $E_f=6.3\text{V},\ E_{bb}=120\text{V},\ E_{cc}=0\text{V},\ R_k=200\Omega,$	$R_0 = 2 k\Omega$		(2)
Limits	Min Me	ıx.	
E <sub>Rom</sub> over Vibration—Frequency Range of:			
3 to 6 kc/s		35 mV	
6 to 15 kc/s	70	OO mV	



#### LIFE TESTS

#### Heater Cycling

continuously ON.

Rejection Criteria

Heater-Cathode Shorts, and Heater and Cathode Discontinuities.

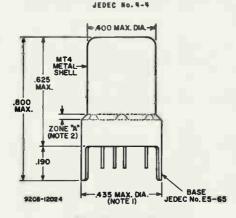
#### Intermittent Operation (2, 20, 100, 500, and 1000 Hours)

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,  $R_k=0$   $\Omega$ ,  $R_g=1$  M $\Omega$ ,  $P_b=0.3$  W (approx.),  $T_F=150^{\circ}C$  min.

End-Point Limits At	2 and 20	100	500	1000	h
	Min Max	Min Max	Min Max	Min Max	
g <sub>m</sub>		2000			μmho.
$\Delta g_m/t$	→ ±10				1 %
ΔERp/t			- ±10	- ±15	1 %
Avg   \DERp/t			- 7	- 10	1 %
lc		0.00	0.1	0.1	μA
lhk			- ±10	- ±10	μΑ

# DIMENSIONAL OUTLINE

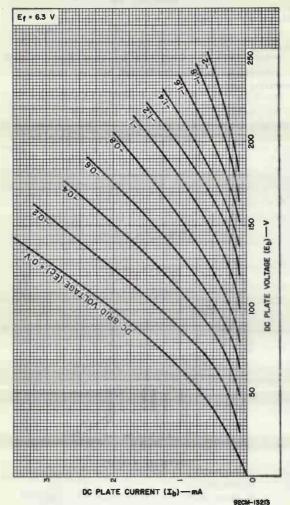


#### DIMENSIONS IN INCHES

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".

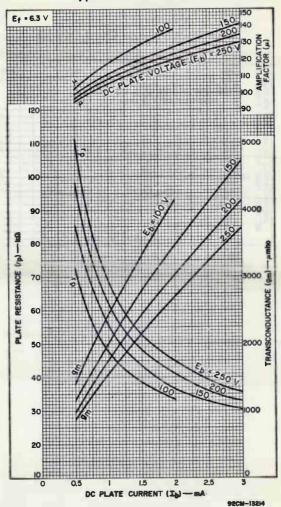
# Typical Plate Characteristics



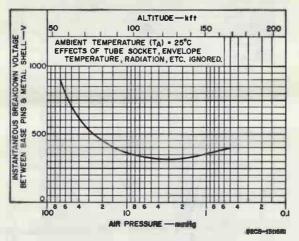
RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J.



# Typical Characteristics



# Breakdown-Voltage Characteristic



# High-Mu Triode

#### NUVISTOR TYPE

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

EI ECTD		ACTEDICTICS	- Bogey Values
ELECIK	ICAL CHAR	ACIEKISIICS	- DOGEY VALUES

		-	
Heater Voltage, dc or ac	$\mathbf{E_h}$	6.3	v
Heater Current at $E_h = 6.3 \text{ V}$ .	I <sub>h</sub>	340	mA
Direct Interelectrode Capacitan	nces:		
Without external shield			
Input: K to (G, S, H)	Ci	9.6	pF
Output: P to (G, S, H)	Co	2.7	pF
Heater to cathode	chk	2.6	pF
Plate to cathode	cpk	0.050	pF
For the following characteristic:	-	itions below	:
Amplification Factor	μ	100	
Plate Resistance (Approx.)	r <sub>p</sub>	6400	Ω
Transconductance	8 <sub>m</sub>	18000	μmho
DC Plate Current	I <sub>b</sub>	15	mA
Cutoff DC Grid Voltage for			
$I_b = 10 \ \mu A \dots$	Ec(co)	-5	V
Conditions			
Heater Voltage	Eh	6.3	V
Plate Supply Voltage	Ebb	200	v
Grid Supply Voltage	Ecc	0	v
Cathode Resistor	R.	68	Ω

#### MECHANICAL CHARACTERISTICS

Dimensional Outline .....

Maximum Overall Length (1m)	0.985 in
Maximum Seated Length (I <sub>Sm</sub> )	0.780 in
Maximum Diameter (d <sub>m</sub> )	0.440 in
Envelope JEDEC Designa	tion MT4
Top Capa Small (JEDEC Designation	on C1-46)

See Outline Drawing

Medium-Ceramic-Wafer Twelvar 6-Pin (JEDEC Designation E6-93)   Type of Cathode		
Operating Position		
Cooling	Type of Cathode Coated Unipotential	4
MAXIMUM RATINGS - Absolute-Maximum Values  For operation as a low-level class-C rf-power-amplifier, oscillator, or frequency-multiplier tube at frequencies up to 1.2 GHz  ICASC  Plate Supply Voltage (Ebb)  Up to 50,000 feet	Operating Position Any	
For operation as a low-level class-C rf-power-amplifier, oscillator, or frequency-multiplier tube at frequencies up to 1.2 GHz  ICASC  Plate Supply Voltage (Ebb)  Up to 50,000 feet	Cooling Conduction	
For operation as a low-level class-C rf-power-amplifier, oscillator, or frequency-multiplier tube at frequencies up to 1.2 GHz  ICASC  Plate Supply Voltage (Ebb)  Up to 50,000 feet	MAXIMUM RATINGS - Absolute-Maximum Values	
Plate Supply Voltage (Ebb)  Up to 50,000 feet		
Plate Supply Voltage (E <sub>bb</sub> )  Up to 50,000 feet	oscillator, or frequency-multiplier tube at frequencies up	0
Up to 50,000 feet	ICAS <sup>c</sup>	
Up to 50,000 feet	Plate Supply Voltage (Eph)	
Above 50,000 feet See Breakdown-Voltage Characteristics  DC Plate Voltage E 1000 V  Grid Voltage:  Peak e 30 V  DC E 1000 V  Peak Heater-Cathode Voltage e 1100 V  Heater Voltage, dc or ac E 5.7 to 6.9 V  Peak Cathode Current I 1000 mA  See Pulse-Rating Chart  Average Cathode Current I 75 mA  Plate Disaipation P 6  W  Grid Dissipation P 200 mW  See Grid-Dissipation Rating Chart  Envelope Temperature TE 200 °C  MAXIMUM CIRCUIT VALUES  Grid-Circuit Resistance:  For fixed-bias or cathode-bias operation:  See Grid-Circuit-Resistance Rating Chart  TYPICAL OPERATION - CCS  As cathode-drive rf power amplifier  Frequency f 1 GHz  Heater Voltage E 6.3 V		
DC Plate Voltage   E		
Peak		1
Peak   Peak		
DC		
DC	c	
Peak Heater-Cathode Voltage	DC E	
Heater Voltage, dc or ac Eh 5.7 to 6.9 V  Peak Cathode Current Ik 1000 mA  See Pulse-Rating Chart  Average Cathode Current Ik 75 mA  Plate Disaipation Pb 6 W  Grid Dissipation Pc 200 mW  See Grid-Dissipation Rating Chart  Envelope Temperature Te 200 °C  MAXIMUM CIRCUIT VALUES  Grid-Circuit Resistance: Rg  For fixed-bias or cathode-bias operation: See Grid-Circuit-Resistance Rating Chart  TYPICAL OPERATION - CCS  As cathode-drive rf power amplifier  Frequency f 1 GHz  Heater Voltage f 6.3 V		
Peak Cathode Current	nk	
See Pulse-Rating Chart  Average Cathode Current Ik 75 mA  Plate Disaipation Pb 6° W  Grid Dissipation Pg 200 mW  See Grid-Dissipation Rating Chart  Envelope Temperature TE 200 °C  MAXIMUM CIRCUIT VALUES  Grid-Circuit Resistance: Rg  For fixed-bias or cathode-bias operation: See Grid-Circuit-Resistance Rating Chart  TYPICAL OPERATION - CCS  As cathode-drive rf power amplifier  Frequency f 1 GHz  Heater Voltage Eh 6.3 V		
Plate Disaipation		
Plate Disaipation	Average Cathode Current I <sub>L</sub> 75 mA	
See Grid-Dissipation Rating Chart Envelope Temperature		
Envelope Temperature		
Envelope Temperature	See Grid-Dissipation Rating Chart	
MAXIMUM CIRCUIT VALUES  Grid-Circuit Resistance: Rg  For fixed-bias or cathode- bias operation: 50 kΩ  See Grid-Circuit-Resistance Rating Chart  TYPICAL OPERATION - CCS <sup>9</sup> As cathode-drive rf power amplifier  Frequency	- · - •	/ 3
Grid-Circuit Resistance:  For fixed-bias or cathodebias operation:  See Grid-Circuit-Resistance Rating Chart  TYPICAL OPERATION - CCS <sup>9</sup> As cathode-drive rf power amplifier  Frequency	· · · · · · · · · · · · · · · · · · ·	0
Grid-Circuit Resistance:  For fixed-bias or cathodebias operation:  See Grid-Circuit-Resistance Rating Chart  TYPICAL OPERATION - CCS <sup>9</sup> As cathode-drive rf power amplifier  Frequency		
For fixed-bias or cathode- bias operation:  See Grid-Circuit-Resistance Rating Chart  TYPICAL OPERATION - CCS <sup>9</sup> As cathode-drive rf power amplifier  Frequency		
bias operation:  See Grid-Circuit-Resistance Rating Chart  TYPICAL OPERATION - CCS <sup>9</sup> As cathode-drive rf power amplifier  Frequency		
TYPICAL OPERATION - CCS <sup>g</sup> As cathode-drive rf power amplifier  Frequency	bias operation: 50 kg	0
As cathode-drive rf power amplifier           Frequency	See Grid-Circuit-Resistance Rating Chart	(2)
Frequency f 1 GHz Heater Voltage E <sub>h</sub> 6.3 V	TYPICAL OPERATION - CCS9	
Heater Voltage E <sub>h</sub> 6.3 V	As cathode-drive rf power amplifier	
Heater Voltage E <sub>h</sub> 6.3 V	Frequency f 1 GHz	
	2.0-quoto, militaria in a constanti de la cons	
DC Plate-to-Grid Voltage Ebg 200 V		
	DC Flate-to-Grid voitage Ebg 200 V	

			U	000
DC Cathode-to-Grid Voltage	Ekg		5.8	V
From grid resistor of	Rg		300	Ω
Average Plate Current	Ib		50	mA
Average Grid Current	Ic		19	mA
Driving Power (Approx.)	Pg		1.0	mW
Useful Power Output (Approx.)	Po		5	W
As cathode-drive frequency do				
Output Frequency	f.		1.2	GHz
Heater Voltage	Eh		6.3	V
DC Plate-to-Grid Voltage	Ebg		200	v
DC Cathode-to-Grid Voltage.	Eke		11	V
From grid resistor of	R,		1000	Ω
Average Plate Current	Lb		38	mA
Average Grid Current	Ic		10.5	mA
Driving Power (Approx.)	P		1	W
Useful Power Output (Approx.).	Po		2	W
TYPICAL OPERATION				
As pulsed cathode-drive class-(	C ampl	ifier		
Output Frequency	ľ,	4 1	1	GHs
DC Plate-to-Grid Voltage	Ebg	500	1000	V
DC Cathode-to-Grid Voltage	Ekg	16	20	V
Average Plate Current	Ib	9	4.75	mA
Average Grid Current	Ic	5.5	1.4	mA
Duty Factor	•	2.5	1	%
Pulae Length	•	5	5	με
Peak Driving Power	-	30	50	W
Average Driving Power	•	0.75	0.5	W
Peak Useful Power		105	0.00	_
	-			w
				-
	•	-		45
Jaiii	•	5.4	0.5	dB
	Average Plate Current Average Grid Current Driving Power (Approx.)  Useful Power Output (Approx.)  As cathode-drive frequency down Output Frequency Heater Voltage  DC Plate-to-Grid Voltage.  From grid resistor of Average Plate Current Driving Power (Approx.)  Useful Power Output (Approx.)  TYPICAL OPERATION  As pulsed cathode-drive class-to Output Frequency DC Plate-to-Grid Voltage  Output Frequency DC Plate-to-Grid Voltage  Average Plate Current  Driving Power (Approx.)  TYPICAL OPERATION  As pulsed cathode-drive class-to Output Frequency DC Plate-to-Grid Voltage  Average Plate Current  Average Grid Current  Duty Factor  Pulse Length  Peak Driving Power  Average Driving Power	From grid resistor of	From grid resistor of	DC Cathode-to-Grid Voltage         Ekg         5.8           From grid resistor of         Rg         300           Average Plate Current         Ib         50           Average Grid Current         Ic         19           Driving Power (Approx.)         Pg         1.0           Useful Power Output (Approx.)         Po         5           As cathode-drive frequency doubler         5         6           Output Frequency         fo         1.2           Heater Voltage         Eh         6.3           DC Plate-to-Grid Voltage         Ebg         200           DC Cathode-to-Grid Voltage         Ekg         11           From grid resistor of         Rg         1000           Average Plate Current         Ic         10.5           Driving Power (Approx.)         Pg         1           Uaeful Power Output (Approx.)         Pg         1           TYPICAL OPERATION         As pulsed cathode-drive class-C amplifier           Output Frequency         fo         1         1           Output Frequency         fo         1         1           DC Plate-to-Grid Voltage         Ebg         500         1000           DC Cathode-to-Grid Voltage         Ekg

See Socket and Connector Information.

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

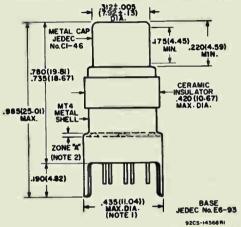
Intermittent Commercial and Amateur Service.

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 Out-
- 9 Continuous Commercial Service.

#### DIMENSIONAL OUTLINE - Dimensions in Inches (mm)

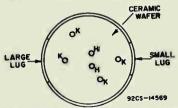


Note 1: Maximum autside diameter of 0.440" (11.17 mm) is permitted along 0.190" (4.83 mm) lug length.

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

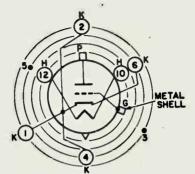
#### MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pins Not Shown



#### TERMINAL DIAGRAM (Bottom View).





# INDEX - LARGE LUG

Pin 1 - Cathode

Pin 2 - Cathode

Pin 3\* - Do Not Use

Pin 4 . - Cathode

Pin 5\* - Do Not Use

Pin 6 - Cathode

Pin 10 - Heater

Pin 12 - Heater Metal Shell - Grid

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

ī	À	
	ij	ŀ
	144	

Cinch-Jones Cinch Mfg. Co. A No. Body Mounting Sales-Division Material Distributor No. HALON -133 67 90 0409 Crimp 5NS-4 TOP-CAP CONNECTOR For Distributed-Con-International Electronic Research Corp® stent Circuit Therma-Link Retainer Part No. TXBE-032-031G.

SOCKET



- For Lumped-Constant Circuit

  Therma-Link Retainer Part No.TXBE-032-031G

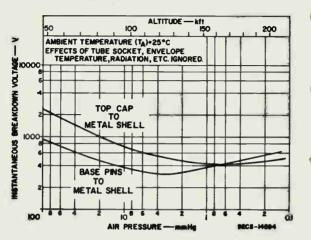
  or equivalent

  Wakefield Engineering, Inc.

  Semiconductor

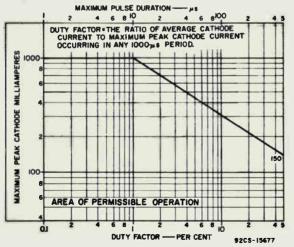
  Cooler Type NF207, or equivalent
- 1026 South Homan Ave., Chicago, Illinois 60624.
- TRADE MARK: Allied Chemical Corp., Morristown, N. J.
- 135 West Magnolia Blvd., Burbank, Calif. 91502.
   139 Foundry St., Wakefield, Mass. 01880.
- This UHF heat-dissipating socket, or equivalent, is recommended to insure adequate electrical and thermal connection to the index rim.

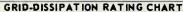
#### BREAKDOWN-VOLTAGE CHARACTERISTICS

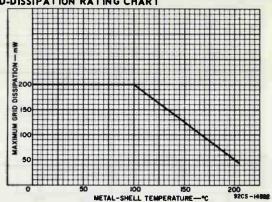


#### PULSE RATING CHART

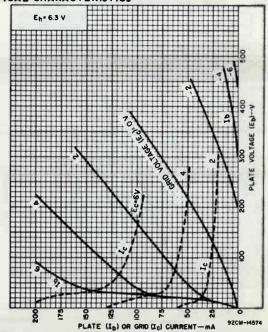
The peak cathode current is for a duty factor of up to 1% or pulse duration up to 10  $\mu s,$  whichever is greater.

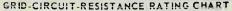


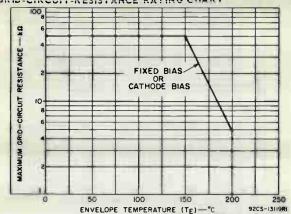




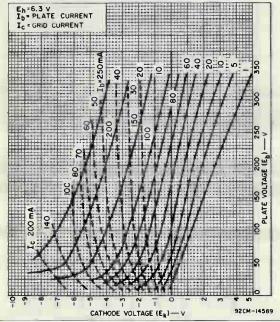
#### TYPICAL CHARACTERISTICS







#### TYPICAL CONSTANT-CURRENT CHARACTERISTICS





# 9001

DETECTOR AMPLIFIER PENTODE MIDGET TYPE Heater • Coated Unipotential Cathode Voltage | 6.3 or d-c volts 0.15 Current атр. Direct Interelectrode Capacitances: Grid to Plate 0.01 max. Buf 1 nput 3.6 μμf Output 3.0 1-13/16" Maximum Overall Length 1-9/16" Maximum Seated Height Length from Base Seat to Bulb Top 1-3/16" ± 3/32" 3/4" T-5-1/2 lexcluding tipl Maximum Diameter Bu<sub>1b</sub> Base\* Miniature Button 7-Pin Pin 1-Grid Pin 5 - Plate Pin 2 - Cathoda Pin 6 - Screen Pin 3-Heater Grid No. 3 Pin 4 -- Heater Internal Shield RCA Socket Stock No. 9914 Mounting Position BOTTOM VIEW Any Haximum 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 watt Screen Dissipation 0.1 wat t Typical Operation and Characteristics - Class A. Amplifier: 250 Plate Voltage 90 volts Screen Voltage 90 100 volts. Grid Voltage -3 -3 volts. Plate Resistance 1.0 approx. megohn Transconductance 1100 1400 unhos Plate Current 2.0 1.2 ma. Screen Current 0.5 0.7 ma. Typical Operation as Wixer in Superheterodyne Circuit: Plate Voltage 100 250 volts 100 Screen Voltage 100 volts Grid Voltage # -5 -5 approx. volts Conversion Transconductance 550 approx. umhos Shielding and r-f by-possing of each r-f amplifler 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, , e #: See next page. \*Temporary minimum length = 1-1/16". - Indicates a change.



#### DETECTOR AMPLIFIER PENTODE

(continued from preceding page)

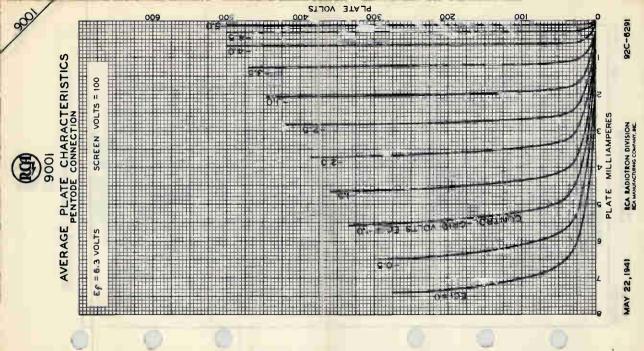
The 900! has two cathode leads in order plate and heater. that the plate and screen r-f circuits may be completed with a minimum of circuit inductance in common with the grid circuit. The grid return may be connected to one cathode terminal and the plate and screen returns may be connected to the other 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 magohs.

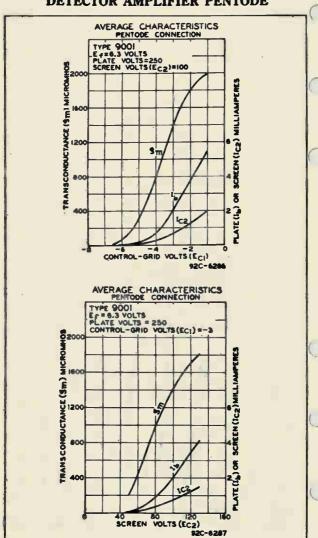
The grid bias is minimum for an oscillator peak voltage of % volts. These values are optimum.

A The center hole in sochets designed for this base provides for the possibility that this tube type may be memsfactured with the exhaust-tube tip at the base and. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the sochet hole.





## **DETECTOR AMPLIFIER PENTODE**





9002

## DETECTOR, AMPLIFIER, OSCILLATOR

MIDGET TYPE

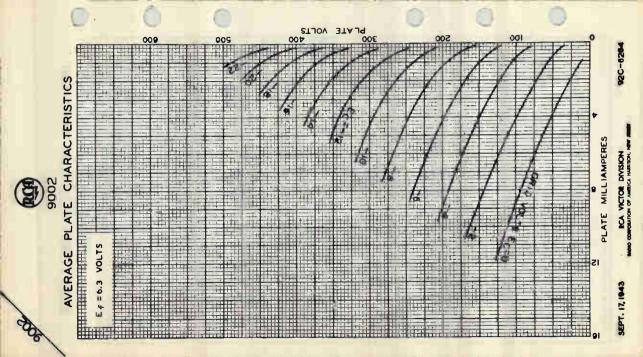
Heater -	Coated	Unipotential	Cathode		
Voltage		6.3		a-c or	d-c voits
Current		0.15			amp.
Direct Interelect	trode C	apacitances:			
Grid to Plate		1.4			μμf
Grid to Cathod	e	1.2			μμf
Plate to Catho	de	1.1			μμf
Maximum Overall L	Length				3/16"
Maximum Seated He	eight			1-9	/16"
Length from Base	Seat to	o Bulb Top			5.8
lexcluding tip	)				6" ± 3/32"
Maximum Diameter				_	/ 4"
Bu 1b					<b>⊢1/2</b>
Base ▲			Minia		ton 7-Pin
Pin 1 - Plate		0_3		Pin 5-	
Pin 2 - Cathode				Pin 6-	
Pin 3 - Heater				Pin 7 -	Cathode
Pin 4 - Heater		Sarra			
RCA Socket		0		Stock	No. 9914
Mounting Position	n	BOTTOM VIEW			Any
Maximu	Rat . n	es Are Design.	-Center	Values	

Mounting Posi	tion	ROLLOW A	I EW		Any
Max	imum Rat . n	gs Are Des	ign-Center	Values	
		•			
1		AMPLIFI	ER		
Plate Voltage				<b>2</b> 50 ı	max. volts
Plate Dissipa				1.6	max, watts
Typical Operas	tion and (	Characteris	tics - Cla	ss A. Am	plifier:
Plate	90	135	180	<b>25</b> 0	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.
					14 4

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.

A flee center hole in sochets 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.

<sup>\*</sup>Temporary minimum length = 1-1/16".





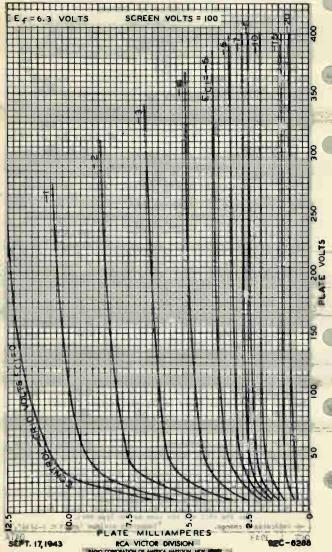
# SUPER-CONTROL R-F AMPLIFIER PENTODE

Hantar Contain	MIDGET TYPE	node		
	Unipotential Cath	a-c or d-	c volte	
Voltage	6.3	a-c 01 u-		
Current	0.15		amp.	
Direct Interelectrode (				
Grid to Plate	0.01 max.		µµ f	
Input	3.4		μμf	
Output	3.0		μμf	
Maximum Overall Length		1-13		
Maximum Seated Height		1-9/	16"	
Length from Base Seat t	o Bulb Top	10 Marian	*	
lexcluding tipl		1-3/16" ± 3/32"*		
Maximum Diameter		21.	4	
Bu 1b		T-5-		
Base*		Miniature Butto	on 7-Pir	
Pin 1-Grid		Pin 5 - Pla		
Pin 2 - Cathode	0.0	Pin 6 - Scr	een	
Pin 3-Heater	3/20	Cat	hode, d No. 3,	
Pin 4 - Heater		Pin 7- 1 int	ernai	
	affro 10	L	Shield	
RCA Socket	0	Stock I	lo. 9914	
Mounting Position	BOTTOM VIEW		Any	
Naximum and Ninim	im Ratings Are Des AMPLIFIER	sign-Center Va	lues	
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 -		ifier:	
Plate Voltage		250	volts	
Screen Voltage		100	volts	
Grid Voltage		-3	volts	
Plate Resistance		0.7 approx	-megohi	
Transconductance		1800	umhos	
Grid Bias for		1000	,,,,,,,	
Transcond, of 15 m	eboe	-35	volts	
Grid Bias for	nrios		10163	
Transcond. of 2 pm		-45	volts	
Plate Current	100	6.7	ma.	
Screen Current		2.7	ma.	
Typical Operation as M	inam in Cutambata			
Plate Voltage	100	250	volts	
Screen Voltage	100	100	volts	
Grid Voltage #	-10	-10 approx		
Conversion Transcond		600 appro		
# The grid bias is minimum				
Inese values are optimum	•			
he center hole in so the possibility that the exhaust-tube tip recommended that in terial be permitted	this tube type may be at the base end. For equipment employing this to obstruct the societ	this reason, it is tube type, no ma	à 3	
Shielding Considera	tions & Heater-Ca are the same as for	thode Connecti Type 9001.	ons	
- Indicates a change.	*Temporary	ninimum length =	1-1/16.	
OCT. 1, 1943			DA'	

900



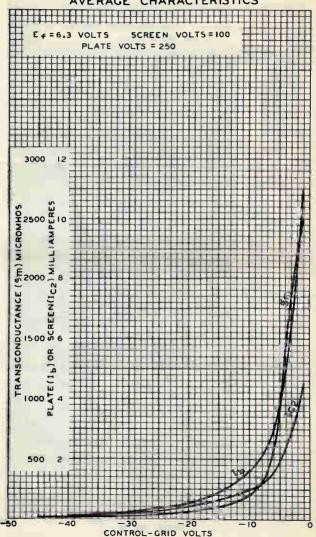
#### AVERAGE PLATE CHARACTERISTICS





903

#### AVERAGE CHARACTERISTICS







#### U-H-F DIODE

ACORN TYPE

	Heater Coate	ed Unipotential Cat	thode
	Voltage	3.6	a-c or d-c volts
Ì	Current	0.165	amp.
	Direct Interelectron	le Capacitances:	
	Plate to Cathode	0.8	μμf
-	Plate to Heater	0.2 approx	c. µµf
	Heater to Cathode	1.1 approx	
	Overall Length		1-7/32" ±5/32"
	Overall Diameter		1-3/32" ±1/16"
	Bulb Bulb		T-4½
	RCA Socket		Stock No.9925
	Mounting Position		Any
	Manimum Dat	ings are Design Co	nter Values

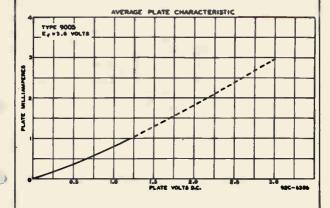
Naximum Ratings are Design—Center Falues
RECTIFIER

A-C Plate Voltage (RMS)

117 max. volts
D-C Output Current

1.0 max. ma.

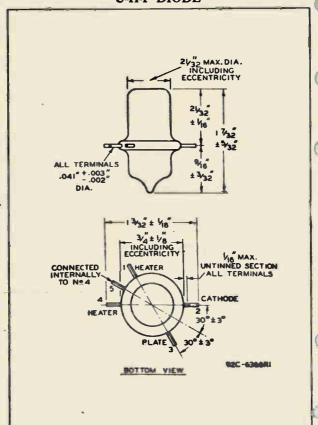
The resonant frequency of the 900% is approximately 1500 Mc. Owith no external shield.







#### **U-H-F DIODE**

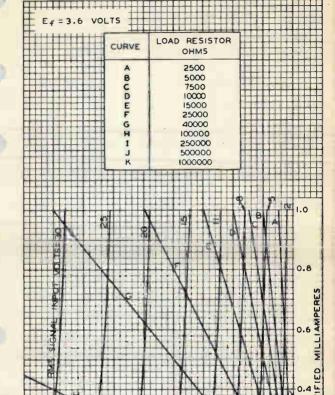


- Indicates a change.





#### AVERAGE CHARACTERISTICS



30 20 10 D-C VOLTS DEVELOPED BY DIODE

40





# 9006

# U-H-F DIODE

1	Heater	Unig	otential Cath	ode .	
	Voltage		6.3		d-c volts
ı	Current		0.15		amp.
U	Direct Int	erelectrode Ca	pacitances:		
	Plate to	Cathode	1.4		μμ̂f
	Plate to	Heater	0.2		μμf
		to Heater	2.2		μμf
		erall Length			1-13/16"
i		ated Height			1-9/16"
		m Base Seat to	Bulb Top		
	lexcludi			1-3/	16 ± 3/32"*
	Maximum Di	ameter			
	D. 16				T 5 1/2

Bulb Base\* Pin 1-Plate Pin 2-Cathode

Pin 1-Plate
Pin 2-Cathode
Pin 3-Heater
Pin 4-Heater
RCA Socket

Mounting Position

Osition BOTTOM VIEW (6BH)
Maximum Ratings Are Design-Center Values

Miniature Button 7-Pin Pin 5-Plate Pin 6-No Connection Pin 7-Cathode

> Stock No. 9914 Any

## RECTIFIER

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

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 uninfactual with the saluestible 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".





### U-H-F DIODE

