RCA TUBE Handbook HB-3

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# RECEIVING-TYPE INDUSTRIAL TUBE SECTION

This Section contains data on "special red" tubes; premium tubes; tubes for computer and "on-off" control applications; lowmicrophonic amplifier tubes; and similar special types.

For further Technical Information, write to Commercial Engineering, Tube Division, Radio Corporation of America, Harrison, N. J. Receiving-Type ndustrial Tubes

SEPARATOR

1. AF Amplifier	23. Low-Plate-Voltage
2. Automatic Gain Control	Nuvistor Type
3. Balanced Modulator/	24. Mixer
Balanced Mixer	25. Multivibrator
4. Cathode-Coupled,	20. MULLIVIDIALOI
Direct-Drive (RF)	28 "On-Off" Control
5. Cathode Drive (RF)	29 Phase Inverter
6 Cathode Follower	30 Pulse Amplifier
7 Clipper	31. Pulse Modulator
8. Converter	32. RF Power Amplifier
9. DC Amplifier	33 RE Voltage Amplifier
10. Delay Circuit	34 Rectifier
11. Demodulator	35 Belay
12. Detector, Audio	26 Swoon Circuit Oscillator
13. Driver	27 Switching
14. Frequency Converter	20 Transducer
15. Frequency Divider	30. Tubes Operating from
16. Frequency Multiplier	Battery Supplies
17. Gated Amplifier	40 Video Amplifier
18. Grid-Controlled Rectifier	41 Voltage Reference
19. Indicator, Voltage	41. Voltage Regulator
20. IF Ampinier	43 Voltage Regulator Series
22. limiter	44 Volume-Expander-Compressor
AF Amplifier	Sharp-Cutoff Pentodes
CLASS - A1	6AH6WA 1620
Twin Diode + Med - Mu Triodes	Power Pentodes
12SW7 26C6	6AG7Y 6677/6CL6
	6AK6 7054
High-Mu Triode - 5719	1621 8077/7034
Cower Triodes	Beam Power Tubes
955 5718 9002	1622 6550
Medium-Mu Twin Triodes	5686 6550/V1
▲5670 5692 ▲6189	5824 6669/6AQ5A 5881 7061
5687 6072	5902
Tigh-Mu Twin Triodes	Twin Beam Power Tube
6112 6681/12AX7A	ZOA/GI Pontanid Amplifier - 1612
Twin Power Triode - 345	Beam-Deflection Tube - 7360

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CLASS - AB1	Medium-Mu Twin Triodes						
Medium–Mu Twin Triode ▲ 5670	\$5670 6350 7044 5687 6922/E88CC 7308 5965						
Beam Power Tubes 1614 6669/6AQ5A 1619 7551 ▲6005 7558	7 Clipper Twin Diodes						
Twin Beam Power Tube 26A7GT	-5/26 /05						
CLASS - B	8 Converter						
Twin Power Triode - 1635	Pentagrid Converters 12SY7 26D6 5750						
2 Automatic Gain Control Remote-Cutoff Pentode	9 DC Amplifier						
▲5749	Sharp-Cutoff Pentode - 5693						
	Medium-Mu Twin Triode - 5692						
3 Balanced Modulator/ Balanced Mixer	High-Mu Twin Triode - 5691						
Beam-Deflection Tube 7360	10 Delay Circuit						
<ul> <li>I. The back of the set of the s</li></ul>	Sharp-Cutoff Pentodes						
4 Cathode-Coupled, Direct-Drive (RF)	5636 -5725						
Medium-Mu Twin Triodes	11 Demodulator						
6DJ8/ECC88 6922/E88CC	Beam-Deflection Tube - 7360						
5 Cathode Drive (RF)	12 Detector Audio						
(Grounded Grid)	Twin Diode - MedMu Triodes						
High-Mu Triodes	12SW7 26C6						
6J4 ▲8532 ■8058	VHF Twin Diodes						
6 Cathode Follower	5726 6663/6AL5 7055 5896 6887						
Medium-Mu Triodes	Diodes						
6814 8056	9005 9006						

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<b>13 Driver</b> Beam Power Tubes 5763 7551 7905 6417 7558	FREQUENCY TRIPLER Beam Power Tubes 5763 6417 7905 Twin Power Pentode - 6939
<ul> <li>14 Frequency Converter</li> <li>High-Mu Triode - 6664/6AB4</li> <li>High-Mu Twin Triode 6679/12AT7</li> <li>Beam-Deflection Tube - 7360</li> </ul>	17 Gated AmplifierSharp-Cutoff Pentodes6AS6 5636\$5725Pentagrid Amplifier5915
<b>15 Frequency Divider</b> Medium-Mu Twin Triodes <b>4</b> 5670 5964 6350 5687 6211 7044 5963 Power Pentode - 6197	18 Grid-Controlled RectifierTriodes (Thyratron)6D4884Tetrodes (Thyratron)2D212050A205056966012
16 Frequency Multiplier FREQUENCY DOUBLER	19 Indicator, Voltage Electron-Ray Tubes 1629 6977
High-Mu Triode B808 Power Triode B203 Twin Tetrode - 6360A Power Pentodes 7054 8077/7054	20 IF Amplifier VHF Medium-Mu Triodes ■7586 Medium-Mu Twin Triodes 5687 6386 7308
Beam Power Tubes           5763         7551         7905           6417         7558	Sharp-Cutoff Pentodes ▲GAUGWB∔ G676/6CB6A ▲5654 7056

Electronic Components

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Remote-Cutoff Pentodes ▲ 5749 6660/6BA6 Sharp-Cutoff Tetrode - 7587 High-Mu Triode - 7895 UHE Sharp-Cutoff Pentodes A 6186 5840 Semiremote-Cutoff Pentodes 5899 6206 Remote-Cutoff Pentode - 9003 21 Inverter Medium-Mu Triode 6814 Medium-Mu Twin Triodes 6350 7044 22 Limiter High-Mu Twin Triode - 7898 23 Low-Plate-Voltage Nuvistor Type for Hybrid Equipment - 8056 Medium-Mu Triode 24 Mixer VHF Medium-Mu Twin Triodes 407A \$5814A 6922/E88CC A5670 6386 High-Mu Twin Triodes ▲12AT7WA 7898 ▲ 12AT7WB

Medium-Mu Triode -Sharp-Cutoff Pentodes 6678/6U8A 7059 Sharp-Cutoff Tetrode - 7587 Sharp-Cutoff Pentodes \$ 5725 6AS6 Pentagrid Converters 12SY7 26D6 5750 UHF Diode -9005 Medium-Mu Twin Triode 46.16WA Sharp-Cutoff Pentodes 5636 9001 Remote-Cutoff Pentode - 9003 25 Modulator Twin Tetrode - 6360A Beam Power Tubes 7558 7551 Power Pentodes 8077/7054 7054 26 Multivibrator Medium-Mu Twin Triodes 6189 407A ▲5670 6350 5687 6680 /12AU7A 5692 6922/E88CC 5814A 7044 High-Mu Twin Triodes A 12AT7WA \$5751

Electronic Components APPLICATION GUIDE 2

	27 Oscillator, RF	28 "On-Off" Control
	VHF Power Triode - ■8203 High-Mu Triode - 6664/6AB4	(Involving Long Periods of Operation Under Cutoff Conditions) Twin Diode - 6887
	Medium-Mu Twin Triodes 407A ▲5814A 6680/12AU7A ▲5670 6111 High-Mu Twin Triodes ▲12AT7WA <sup>+</sup> 7898	Medium-Mu Triode - 6814 Medium-Mu Twin Triodes 5844 5965 6922/E88CC 5963 6211 7044 5964 6350
0	▲12AT7WB Medium-Mu Triode — Sharp-Cutoff Pentodes	Sharp-Cutoff Pentode - 6AS6 Power Pentode - 6197
	Twin Tetrode         6360A           Beam Power Tubes         3B4WA <sup>‡</sup> 3B4WA <sup>‡</sup> 5763         7558           1614         6417         7905           1619         7551         1619	29 Phase Inverter Medium-Mu Triode - 6814
	Power Pentodes 1613 7054 8077/7054 Medium-Mu Triode – Power Pentode 7060 Pentagrid Converters 12SY7 26D6 5750	Medium-Mu Twin Triodes \$5670 6350 5687 6680/12AU7 A \$5814A 6922/E88CC \$6189 7044 High-Mu Twin Triodes \$5691 7058
0	UHF Medium-Mu Triodes 6F4 8056 8393 7586	30 Pulse Amplifier Medium-Mu Triode - 6814
0	High-Mu Triodes 7895 8058 8808 Power Triodes 955 8627 9002 5718	Medium-Mu Twin Triodes ▲5670 6350 7044 5687
0	Medium-Mu Twin Triodes         ▲6J6WA↓       6021         Sharp-Cutoff Tetrode -       7587         Twin Power Pentode -       6939	31 Pulse Modulator Twin Diode ▲5726

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Electronic Components APPLICATION GUIDE 3

Single Diodes 9006 9005 PULSE Half-Wave Vacuum Type - 5642 35 Relay Glow-Discharge (Cold-Cathode) Tubes OA4G 1C21 5823 Triodes (Thyratron) 884 6D4 Tetrodes (Thyratron) \$5727 2021 5663 2050 5696 6012 2050A 36 Sweep-Circuit Oscillator Triode (Thyratron) - 884 37 Switching Twin Diode - 6887 Beam-Deflection Tube - 7360 38 Transducer Mechano-Electronic Transducer 5734 39 Tubes Operating from Battery Supplies NOMINAL-12- VOLT STORAGE BATTERY SYSTEMS Twin Diode - 7055 Twin Diode - High-Mu Triode 7724/14GT8 Aedium-Mu Twin Triode - 7057

High-Mu Twin Triodes 7898 7058 Medium-Mu Triode -Sharp-Cutoff Pentodes 7059 7258 Medium-Mu Triode -Power Pentode 7060 Sharp-Cutoff Pentode - 7056 Power Pentodes 7054 8077/7054 Beam Power Tubes 7061 7551 NOMINAL-6-VOLT STORAGE BATTERY SYSTEMS Twin Diode - 6663/6AL5 - 6664/6AB4 High-Mu Triode Medium-Mu Twin Triode 6680/12AU7A High-Mu Twin Triodes 6679/12AT7 6681/12AX7A Medium-Mu Triode -Sharp-Cutoff Pentode 6678/6U8A Twin Tetrode - 6360A Remote-Cutoff Pentodes 6660/6BA6 6662/6BJ6 Sharp-Cutoff Pentodes 6661/6BH6 6676/6CB6A Power Pentode - 6677/6CL6 Beam Power Tubes 6669/6A05A 7905

Electronic Components

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NOMINAL-24-VOLT STORAGE BATTERY SYSTEMS Twin Diode - Medium-Mu Triode 26C6	Power Pentodes 6AG7Y 6677/6CL6 6AN5 41 Voltage Reference
Twin Power Triode - 6082 Remote-Cutoff Pentode - 26A6 Pentagrid Converter - 26D6 Twin Beam Power Tube	Glow Discharge (Cold-Cathode) Tubes 5651A \$5651WA <sup>‡</sup> 5783 42 Voltage Regulator
26A7GT FILAMENTARY-CATHODE TYPES OPERATING FROM DRY-CELL BATTERY SUPPLIES Half-Wave Vacuum Rectifier 5642	Glow Discharge (Cold-Cathode) Tubes OA2 + OC2 6073 OA2WA+ OC3 6073/OA2 OA3 OC3A 6074 OA3A OD3 6074/OB2 OB2 + OD3A 6626/ OB2WA+ 991 OA2WA
Twin Power Triode - 3A5 Sharp-Cutoff Pentode - 1L4 Power Pentode - 3A4 Beam Power Tube - 1619	<b>43 Voltage Regulator,</b> Series Low-Mu Twin Triodes 6AS7G ▲6080WA 6336A 6080 6082
	Beam Power Tube - 5902
40 Video Amplifier Sharp-Cutoff Tetrode - 7587	44 Volume Expander- Compressor
Sharp-Cutoff Pentode - 5639	Pentagrid Mixer - 1612

Premium Type. Premium types are subjected to more rigorous tests and controls than other types.

Nuvistor Type.

<sup>‡</sup> For data on this type, refer to Military Specification. A copy of the applicable Military Specification may be obtained from: Specification Division, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pa. 19120.

Note:

For data on types in this guide which do not appear in the *Index of Types*, refer to RCA publication RIT-104G. A copy of this publication may be obtained from: RCA Commercial Engineering, Harrison, N.J. 07029.

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Electronic Components APPLICATION GUIDE 4

# Socket & Connector Information for RCA Nuvistor Tubes

The sockets listed below by manufacturer's or distributor's part number have contacts and an annular groove designed to mate, respectively, with the base pins and the 2 indexing lugs of the bases utilized on RCA nuvistor tubes. Information on sockets having different casting materials, contact materials, or finishes may be obtained from the manufacturers.

Sockets having mechanical and electrical characteristics comparable to those listed may be available from other component manufacturers.

Socke	t Descript	ion	Manufacturer or Distributor and Part No.									
Application	Mounting	For Types Having JEDEC Base No.	Cinch Mfg. Co. <sup>a</sup>	Cinch- Jones Sales Division <sup>b</sup> Distri- butors	Industrial Electronic Hardware Corp. <sup>C</sup>							
C	Crimp	E5-65 E5-79	133 65 10 001	5NS	MSN 0905-1 MSN 0905-2 MSN 0905-3							
General	Flange	E5-65 E5-79	133 65 10 003	5NS-1	-							
Purpose	Printed board ("Stand- off")	E5-65 E5-79	133 65 10 009	5NS-2	-							
UHF (Heat- Dissipating)	Crimp	E5–65 E5–79	133 65 10 041	5NS-3	-							
	Crimp	E7-77	133 67 90 040	5NS-4	-							
UHF	Crimp	E7-83	-	-	MSN 0907-1 MSN 0707-1							

#### Connector (Top Caps)

RCA Double-Ended Nuvistor Tubes: These types utilize a JEDEC No.Cl-44 top cap. Cinch Mfg. Co. Part Nos. 6005 or 422 03 22 017, 6014 or 422 03 22 024, or equivalent "1/4-inch" connectors, may be used.

- a 1026 South Homan Avenue, Chicago 24, Illinois.
- b Cinch-Jones Sales Division of Cinch Mfg. Co.
- C 109 Prince Street, New York 12, N.Y.



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





Ade

# POWER AMPLIFIER PENTODE

	trate it				
Filament	Coated				
Filament Arrangement	Series *	Paralle	1**		
Voltage	2.8	1.4		d-c	volts
Current	0 1	0.2			amp.
Direct Interelectrade Can	acitances	0			camp.
Call to Date	acriances.	24			£
Grid to Plate	0.	34 max.			μμι
Input	4	.8			μμτ
Output	2	.2			144
Maximum Overall Length				1	2-1/8"
Maximum Seated Height				1	1-7/8"
Maximum Diameter					3/4"
Dulk				Т	5 1/2
Durb					7 0:-
base		MINIA	ture bu	itton	7-Pin
Pin 1-Fil. (- series)	0 5	Die	- JF11.	Mid-	-lap
Pin 2-Plate	and Do	FIN	51(-	paral	llel)
Pin 3-Screen	The P	Pin	6-Plat	e	
Pin 4-Grid	2 marto	Pin	7-File	ment	+
RCA Socket	X		Sto	ck No	9914
Mounting Position POT	TOM VIEW (	7801	0.00		Any
Mounting rosteron bot		,001	77 1		Any
Maximum Katings	Are Desig	n-Center	Values		
A-F	POWER AMPL	IFIER	150		
Plate Voltage			150	max.	volts
Screen Voltage			90	max.	volts
Plate Dissipation			2.0	max.	watts
Screen Dissination			0.4	max.	watt
Tatal Zoro Sig Cathada Cu	rronte		19	may	ma
Total Zero-Sig. Cathode cu			10	max.	ma.
Typical Operation and Cha	racterist	ics-Class	A1 Am1	011510	er:•
Filament Arrangement		Para	lel **		
Plate Voltage		135	150		volts
Screen Voltage		90	90		volts
Grid Voltage		-7.5	-8.4		volts
Peak A-F Grid Voltage		7.5	8.4		volts
Zero-Sig, Plate Current	t	14.8	13.3		ma.
MaxSig. Plate Current		14.9	14.1		ma.
Zero-Sig. Screen Currer	nt	2.6	2.2		ma.
Max -Sig Screen Currer	ht	3 5	3 5		ma.
Plate Peristance		00000	100000		obme
Transconductance		1900	10000		umbo
Lood Desistence		2900	1900		phillios
Load Resistance		0000	8000		orinis
Iotal Harmonic Distorti	ION	5	6		76
MaxSig. Power Output		600	/00		mw
R-F F	POWER AMPL	IFIER			
D_C Plate Voltage			150	max	volt
D_C Screen Voltage			125	may	volt
D C Crid Valtage			20	max.	volt
D-C Grid voltage			-30	max.	voit
D-C Plate Current			20	max.	ma.
D-C Grid Current			0.25	max.	ma.
Total D-C Cathode Current	t 🎟		25	max.	ma.
Plate Input			3	max.	watts
Screen Input			0 á	max	watt
Plate Dissipation			0.0	may.	watt.
I LALE DISSIDALIUN			2	max.	Wall
*, **, 0, ▲, ■, •: See ne	xt page.	🔟 Ind	icates a	chang	e.



### **POWER AMPLIFIER PENTODE**

#### (continued from preceding page)

-	Typical Operation at 10 Mc with		1000
	Parallel Filamen	t Arrangement:**	
	D-C Plate Voltage	150	volts
	D-C Screen Voltage	135	volts
	Grid Resistor	0.2	megohm
	D-C Plate Current	18.3	ma.
	D-C Screen Current	6.5	ma.
	D-C Grid Current	0.13	ma.
	Power Output (approx.)	1.2	watts

Filament voltage applied across the two sections in series between pins No.1 and No.7. Grid voltage is referred to pin No.1.

\*\* Filament voltage applied across the two sections in parallel between pin No.5 and pins No.1 and No.7 connected together. Grid voltage is referred to pin No.5.

<sup>0</sup> With no external shield.

For series-filament operation. A shunting resistor must be connected across the section between pins No.1 and No.5 to by-pass excess cathode current in this section. The value of the shunting resistor should be adjusted to make the voltage across the shunted section equal to the voltage across the section between pins No.5 and No.7. When other tubes in series-filament arrangement contribute to the filament current of the 3AA, an additional shunting resistor may be required between pins No.1 and No.7.

 Typical operating values for the 3A4 with filament sections in series will be approximately the same as those shown for parallel-filament operation.

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

- Indicates a change.

RCA VICTOR DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY DATA









3. Real

# H-F TWIN TRIODE

	Filament Coated		
	Filament Arrangement Series* Parallel*	*	
	Voltage 2.8 1.4	d-c	volts
	Current 0.11 0.22		amp.
	Direct Interelectrode Capacitances:°		
	Triode Unit Ti Triode I	Unit T2	
	Grid to Plate 3.2 3.	2	uuf
	Crid to Filament 0.9	Q .	uuf
	Plate to Filament 1.0 1	0	unf
	Dista to Dista	0	unf
1	Waring Ougell Leasth	2	1/0"
	Maximum Overall Length	ے 1	7/0
	Maximum Seated Height	1	-//0
	Maximum Diameter	т	2/4
	Bulb	1-5	-1/2"
P. 1	Base <sup>A</sup> Miniature	Button	7-Pin
	Pin 1 - Filament - Pin 5 - Gr Pin 2 - Plate T. Q Pin 6 - Pl	ate T.	
	Pin 3 - Grid T2 3 Pin 7 - Fi	1. ( + se	ries)
	Pin 4-{(+ parallel)		
	PCA Socket	Stool No	0014
	Newsting Position POTTON VIEW (7PC)	SLUCK NU	. 3514
	Mounting Position Borrow VIEW (76C)		Ally
	For convenience, one triode unit is identified as $I_1$ ; t	the other o	is I2.
	Maximum Ratings Are Design-Center Val	ues	
	A-F POWER AMPLIFIER'		
	Plate Voltage	135 max.	volts
	Plate Current	5 max.	ma.
	Plate Dissipation C	).5 max.	watt
	Characteristics - Class A, Amplifier:		
	Plate Voltage	90	volts
	Grid Voltage -2	2.5	volts
	Amplification Factor	15	
	Plate Resistance 83	300	ohms
	Transconductance 18	300	umhos
	Plate Current	3.7	ma.
× 1	R F POWER ANDLIELER & OSCILLATOR CLOSE C T	alagraph	,
	INT TOWER AWILTTER & OSCILLATOR - CLASS C IN	eregraph	1
	Ley-down conditions per tube without modulat	ion	
	D-C Plate Voltage	135 max.	volts
	D-C Grid Voltage -	-30 max.	volts
	D-C Plate Current (per unit)	15 max.	ma.
	D-C Grid Current (per unit)	2.5 max.	ma.
7	Plate Input (per unit)	2.0 max.	watts
	Plate Dissipation (per unit)	1.0 max.	watt
	Typical Operation At 10 Mc With Both Units In 1	Push-Pull	:
	D-C Plate Voltage	135	volts
	(-	-20	volts
	D-C Grid Voltage • 40	000	ohms
		570	ohms
	Peak R-F Grid-to-Grid Voltage	90	volts
	D-C Plate Current	30	ma.
	D-C Grid Current (approx.)	5	ma.
	Driving Power (approx.)	0.2	watt
	Power Output (approx.)	2	watts
	[*, **, 0, g, A,:see next page		
	June 1, 1942	TENTATIV	E DATA

RCA RADIOTRON DIVISION RCA MANUFACTURING COMPANY, INC.



### H-F TWIN TRIODE

(continued from preceding page)

- Filament voltage applied across the two sections in series between pins No.1 and No.7. Grid voltage is referred to Pin No.1.For series filament operation, a shunting resistor must be connected across the section between pins No.1 and No.4. to by-pass excess cathode current in this section. The value of the shunting resistor should be adjusted to make the voltage across the shunted section equal to the voltage across the section between pins No.4 and No.7. When other tubes in series-filament arrangement contribute to the filament current of the 345, an additional shunting resistor may be required between pins No.1 and No.7.
- \*\* Filament voltage applied across the two sections in parallel between pin No.4 and pins No.1 and No.7 connected together. Grid voltage is referred to pins No.1 and No.7 tied together.
- o With no external shield
- Obtained by grid resistor (4000), cathode resistor (570), or fixed supply.

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

TENTATIVE DATA





## **Full-Wave Vacuum Rectifier**

For Industrial & Military Applications

GENERAL DATA

### Electrical:

Filament.	Coa	ted	: a																	
Voltage	(AC	or	DC)					X.	÷.	•		3	×.						5	volts
Current				÷	•	•	•	X	R	÷	•		•	÷	•	•	•	÷	2	amp

### Mechanical:

Operat	ir	ng	Po	osi	t	ior	n.				•			Ve	ert	tic	ca	١,	ba	ase	e i	dov	vn	or	up	, or
					ł	to	riz	zor	١t	al	wi	t	h I	pir	ns	2	ar	nd	4	ir	1	vei	rt	ica	1 p	lane
Maximu	Im	0	ve	ral	1	Le	eng	gth	٦.					۰.											4-	1/4"
Maximu	Im	S	ea	ted		Lei	ngt	th	2				1	÷	2						÷.			3	-11	/16"
Diamet	e	٢.	÷.						÷											1	1.	438	З"	to	1.	562"
Bulb.																				÷						T12
Base.		a.		1× 1						Sh	or	t	Me	di	um	-SI	he	11	00	cti	al	5	-P	in	Mic	anol
					1	wi	th	E)	xt	eri	nal	Ŭ -	Ba	rr	ie	rs,	, 1	Sty	116	e l	Β,	А	rr	ang	eme	nt 1
																(JE	ED	EC	GI	rol	up	1	,	No.	B5-	121)

Basing Designation for BOTTOM VIEW. . . . . . . . . . . . . 5T

Pin 1-No Connection Pin 2-Filament



Pin 4-Plate No.2 Pin 6-Plate No.1 Pin 8-Filament

#### FULL-WAVE RECTIFIER

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

For altitudes up to	40000	20000	feet										
PEAK INVERSE PLATE VOLTAGE AC PLATE SUPPLY VOLTAGE PER	2650 max.	3100 max.	volts										
PLATE (RMS, without load) PEAK PLATE CURRENT PER PLATE DC OUTPUT CURRENT PER PLATE HOT-SWITCHING TRANSIENT PLATE	See Ratin 715 max. See Ratin	g Chart I 715 max. g Chart I	ma										
CURRENT PER PLATE	b	b											
point on bulb surface)	230 max.	230 max.	°C										
Typical Operation:													
With capacitor-input filter													
For altitudes up to	40000	20000	feet										
AC-Plate-to-Plate Supply Voltage (RMS, without load) Filter-Input Capacitor Total Effective Plate Supply Impedance Per Plate <sup>c</sup>	1400 1500 20 20 225 250	2000 20 375	volts µf ohms										

RCA

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I 7-61

DC Output Voltage (Approx.) at Input to Filter:					
At half-load ma. = 75	- 750	910 -	1210	volts volts	0
150	- 605	800	1040	volts volts	
current DC Output Current	145 250	110 150	170 150	volts ma	0
With choke-in	put fil	ter			
For altitudes up to	40000	2	20000	feet	
AC Plate-to-Plate Supply Voltage (RMS, without load) . Filter-Input Choke DC Output Voltage (Approx.) at Input to Filter for dc out-	1500 5		1900 10	volts henrys	0
put ma. = 87.5	- 600 - 560		800  760	volts volts volts volts	
Voltage Regulation (Approx.): Half-load to full-load current	40 250		40 175	volts ma	

a See accompanying chart Operating Areas for Simultaneous and Delayed Application of Plate Foltage for conditions necessitating delay in application of plate voltage until filament has reached operating temperature.

b If hot-switching is required in operation, choke-input circuits are recommended. Such circuits limit the hot-switching current to a value no higher than that of the peak plate current. When capacitor-input circuits are used, amaximum value of 3 amperes should not be exceeded.

C Indicated values for conditions shown will limit peak plate current to the maximum-rated value. When a filter-input capacitor larger than 20 µf is used, it may be necessary to increase plate-supply impedance to a higher value than that shown in the data to limit the peak plate current to the maximum-rated value.

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





RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 2 7-61











Electron Tube Division

Harrison, N. J.

DATA 4 7-61





GALO

## POWER AMPLIFIER PENTODE

Heater Costed Uninotestial Cath	ada	
Voltage 6.3	a-c or d-	c volts
Current 0.15	a-c or or	amo
Direct Interelectrode Canacitances I Appr	ext •	ump.
Grid to Plate 0.12		unf
logut 36		hunf
Output 4.2		μμi
Maximum Overall Length		2-1/8"
Maximum Sostad Haight		1 7/8'
Longth from Base Sent to Bulh Tan		1-110
Length from base beat to build top	1 1/2"	. 2/ 22
Maximum Diamator	1-1/2	I ) 12
D.16		T 5 1/
	alatura Dutte	1-3-1/2
Dase MI	niature Butto	on /-Pir
Pin I - Grid No. I (4) (5)	Pin 5-Pia	ite
Pin 2 - Grid No. 2 3/12 XO		IO NO. Z
Pin 3- Heater	Pin / - Cat	thode
Prin 4 - heater	Steel. A	0014
New A Socket	CLOCK	10. 9914
Mounting Position Bullow VIEW 17BK		Any
Maximum Ratings Are Design-Cent	er Values	
A-F AMPLIFIER		
Plate Voltage	300 max.	volts
Screen Voltage (Grid No. 2)	250 max.	volts
Plate Dissipation	2.75 max.	watts
Screen Dissipation	0.75 max.	watt
D-C Heater-Cathode Potential	100 max.	volts
Typical Operation and Characteristics - C.	lass A. Ampli	fier:
Plate Voltage	180	volts
Suppressor (Grid No. 3) Connected	to cathode at	socket
Screen Voltage	180	volts
Grid Voltage (Grid No. 1)	-9	volts
Peak A-F Grid Voltage	9	volts
Zero-Signal Plate Current	15	ma.
Zero-Signal Screen Current	2.5	ma.
Plate Resistance	0.2	megohm
Transconductance	2300	umhos
Load Resistance	10000	ohms
Total Harmonic Distortion	10	%
Max-Sin. Power Output	1.1	watts
With an external shield		narro
The d-c resistance in the grid circuit under m should not exceed 0.5 megohm for cathode-bias for fixed-bias operation.	aximum rated co operation and 0	nditions .1 megohm
The canter hole in sockets designed provides for the possibility that may be manufactured with the exhau the base end. For this reason, it that in equipment employing this material be permitted to obstruct th	for this base this tube type st-tube tip at is recommended tube type, no e socket hole.	
OCT. 1, 1943	TENTAT	IVE DAT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY









6756

## SHARP-CUTOFF PENTODE

MINIATURE TYPE

#### GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:	
Voltage 6.3 ac or dc vo	olts
Current 0.175	amp
Direct Interelectrode Capacitances:	
Without Ex- With External	
ternal Shield Shield No. 316	
Grid No.1 to Plate . 0.025 max. 0.02 max.	μµf
	unf
Output 2.2 3.0	un f
Crid No. 1 to	Jupe 1
	f
Grid No. 2 0.15 max. 0.15 max.	μμi
$G_{r}$ $M_{r}$ $O_{r}$ $M_{r}$ $O_{r}$ $M_{r}$ $O_{r}$ $M_{r}$ $M_{r}$ $M_{r}$ $O_{r}$ $M_{r}$ $M_{r$	μμι
Grid No.3 to All	f
Uther Electrodes · · 3.5 3.4	μμι
Mechanical:	
	10.
Mounting Position.	Any
Maximum Overall Length	3/4
Maximum Seated Length	172"
Length, Base Seat to Bulb lop (Excluding tip) 1-1/8" ± 3	132"
Maximum Diameter	3/4"
Bulb	-1/2
Base Small-Button Miniature 7	-Pin
Basing Designation for BOTTOM VIEW	7CM1
a 6 Dia 5 Dia ta	
Pin 1-Grid No.1 Pin 5-Plate	
Pin 2-Cathode 🔾 🗹 🎾 Pin 6-Grid No	.2
Pin 3-Heater (\  ==== \text{V} Pin 7-Grid No	.3
Right Haster Ctt A XD	-
Pfn 4 - heater	
$\cup$	
AMPLIFIER - Class A <sub>1</sub>	
Maximum Patings Design Cantar Values'	
Maximum Katings, Design-center Vatues.	1.1
PLATE VOLTAGE	UITS
GRID-No.3 VOLTAGE	olts
GRID-No.2 VOLTAGE	olts
CATHODE CURRENT	ma
PLATE DISSIPATION 1.7 max. w	atts
GRID-No.2 INPUT 0.75 max.	watt
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode 90 max. v	olts
Heater positive with respect to cathode 90 max. v	olts
BULB TEMPERATURE (At hottest point	0
on bulb surface) 120 max.	C
Characteristics:	
Plate Voltage 120 120 V	olts

FEB. 1, 1950

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA



## SHARP-CUTOFF PENTODE

Grid-No.3 Voltage				-3	0	volts
Gild-No.2 vollage	•		•	120	120	voits
Grid-No.1 Voltage	٠			-2	-2	volts
Plate Resistance (Approx.) .					0.15	megohm
Transconductance, Grid No.1						
to Plate.			÷	1850	3200	µmhos
Transconductance, Grid No.3						
to Plate.	•			810	470	µmhos
Plate Current				3.6	5.2	ma
Max. Plate Current for						
Grid-No.1 Volts = -10.		8	÷.	-	100	µamp
Max. Plate Current for						
Grid-No.3 Volts = -15.					20	μamp
Grid-No.2 Current	•			4.8	3.5	ma

6450

TENTATIVE DATA










TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY 92CM-7404RI





6AS1C

# LOW-MU TWIN POWER TRIODE

### GENERAL DATA

Electrical:		
Heater, for Unipotential Cathodes:	ac or do w	1+0
Current	. ac or uc ve	amo
Direct Interelectrode Capacitances (Approx.,	each unit):0	amp
Grid to plate	10.5	μµf
Grid to heater and cathode	6.8	μμt
Heater to cathode	2.3	μμ1 muf
Grid of unit No.1 to grid of unit No.2	0.70	unt
Plate of unit No.1 to		
plate of unit No.2	1.65	μµf
Characteristics, Class A, Amplifier (Each un	it):	
Plate-Supply Voltage	135 vo	olts
Cathode-Bias Resistor	250 0	ohms
Amplification Factor	200	hmo
Transconductance (Approx.)	200 0 7000 w	nhos
Plate Current.	125	ma
Mechanical:		
Maximum Overall Length Maximum Seated Length Maximum Diameter Bulb Base		/16" 3/4" /16" [-16] -11] 880
Unit No.2	Unit No.	.1
Unit No.2 (2) A D Pin	8 – Heater	
Pin 4 - Grid of	5 Hourot	
Unit No.1		
DC AMPLIFIER		
Values are for Each Unit		
Maximum Ratings, Design-Center Values:		
PLATE VOLTAGE	250 max. vo	olts
PLATE CURRENT.	125 max.	ma
PLAIE DISSIPATION.	13 max. Wa	allS
Heater negative with respect to cathode.	300 max. v	olts
Heater positive with respect to cathode.	300 max. v	olts
O without external shield.		
Operation with fixed bias is not recommended.		
-	- Indicates a cha	ange.
MAY 1 1055		DAT

TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



## LOW-MU TWIN POWER TRIODE

Maximum Circuit Values (For maximum rated conditions):

Grid-Circuit Resistance: For cathode-bias operation . . . . . 1.0 max. megohm For fixed-bias operation . . . . . . Not recommended

#### BOOSTER SCANNING SERVICE

Values are for Each Unit

#### Maximum Ratings, Design-Center Values:

For operation in a 525-line, 30-frame system

PEAK I	VEGA	ATIV	E-I	PUL	SE	F	L	ATE		VOL	T	AGE					1700	max.	volts
DC PL	ATE	CUR	REI	NT											$\mathbf{x}$		125	max.	ma
PLATE	DIS	SSIP	AT	ION						2					×		13	max.	watts
PEAK I	HEAT	ER-	CA	THO	DE	V	101	TA	G	Ε:									
Hea	ter	neg	at	ive	W	it	ch	re	es.	ped	ct	to	C	at	hoo	de	300	max.	volts
Hea	ter	DOS	it	ive	W	it	h	re	S	ped	ct	to	C	ati	hoo	de	300	max.	volts

Maximum Circuit Values (For maximum rated conditions):

Grid-Circuit Resistance:

6457-6

For cathode-bias operation . . . . . 1.0 max, megohm For fixed-bias operation . . . . . . Not recommended

As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission.

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

MAY 1, 1955

DATA





# Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

### GENERAL DATA

### Electrical:

	Heater, for Unipotential Catho Voltage (AC or DC)	ode:		6.	.3	volts
	Current at 6.3 volts			0.	3 ± 6	% amp
7	Direct Interelectrode Capacita	inces:	• • •	-	11	sec
		With Exter Shie	out rnal eld	Ex Si	With ternal hield▲	
	Pentode Connection:					
	Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal	0.0035	max.	0.00	)35 ma:	x. μμf
	and heater.	5.5		1	5.5	шf
	Plate to cathode, grid No.3 & internal shield arid No.2					
	and heater	5			5	μµf
	Triode Connection:● Grid No.1 to plate, grid No.3 & internal					
	shield, and grid No.2.	2.6			2.6	μµf
	and heater	3.2			3.2	<i>µµ</i> f
	internal shield, and grid No.2 to cathode					
5	and heater	1.2		8	3.5	μµf
)	Characteristics, Class A <sub>1</sub> Amp	lifier:				
	Pentode	Connec	tion			
	Plate Supply Voltage		100	250	250	volts
	Grid No.3	Con	nected	l to ca	thode a	it socket
	Grid-No.2 Supply Voltage	• •	100	125	150	volts
	Cathode Resistor	• •	150	100	68	ohms
	Plate Resistance (Approx.).	• •	0.5	1.5	1	megohms
7	Plate Current	•••	3900	4500	5200	µmnos
	Crid No. 2 Current	•••	2 1	1.0	10.0	ma
	Grid-No.1 Voltage (Approx.)	•••	2.1	>	4.2	IIId
	for plate $\mu a = 10 \dots$		-4.2	-5.5	-6.5	volts
	Triode (	Connect	ion•			
	Plate Supply Voltage				250	volts
	Cathode Resistor	:::		•••	330 36	ohms



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I 10-60

Plate Resistance (Approx.)7500Transconductance4800Plate Current.12.2	ohms µmhos ma
Mechanical:	
Operating Position . Maximum Overall Length . Maximum Seated Length . Length, Base Seat to Bulb Top (Excluding tip). 1-1/2" ± Diameter . Dimensional Outline. Bulb . Base . Base . Basing Designation for BOTTOM VIEW . 	Any 2-1/8" 1-7/8" 3/32" 0.750" ection T5-1/2 0.E7-1) 7BK
Pin 1-Grid No.1 Pin 2-Grid No.3, Internal Shield Pin 3-Heater	r No.2 O
AMPLIFIER - Class A	
Maximum Ratings, Design-Maximum Values:	
Triode Pentode	
Connection <sup>•</sup> Connection	
PLATE VOLTAGE	volts athode socket
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE 330 max. GRID-No.2 VOLTAGE See Grid-No.2 Rating Chart at front of Receiving Tube S	volts Input ection
VOLTAGE:	
Positive-bias value 0 max. 0 max. GRID-No.2 INPUT: For grid-No.2 voltages up	volts 🔵
to 165 volts – 0.75 max. For grid-No.2 voltages between 165 and	watt
330 volts See Grid-No.2	Input
Rating Chart at front of Receiving Tube S PLATE DISSIPATION 3.5 max. 3.5 max. PEAK HEATER-CATHODE VOLTAGE: Heater negative with	watts
respect to cathode 200 max. 200 max. Heater positive with	volts
respect to cathode 200* max. 200* max.	volts
Typical Operation as Resistance-Coupled Amplifier:	
See RESISTANCE-COUPLED-AMPLIFIER CHART No.8	

at front of this Section

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



▲ With external shield JEDEC NO.316 connected to cathode.

- Grid No.3 and grid No.2 connected to plate.
- \* The dc component must not exceed 100 volts.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 2 10-60











Electron Tube Division

AMERICA Harrison, N. J. DATA 4



**Electron Tube Division** 

Harrison, N. J.



	LLATOR TRIC	DDE	
For use at fre	ACORN TYPE	Mc abbrox.	
Heater Coated	Uninotential Catho	de	
Voltage	6.3	a-c or d-c	volts
Current	0.225		amp.
Direct Interelectrode (	Capacitances:0		
Grid to Plate	1.9		μμt
Plate to Cathode & He	eater 0.6		uuf
Overall Length	0.0	1-7/32" +	5/32"
Overall Diameter (inclu	uding radial pins)	1-3/32" +	1/16"
Bulb ]	See Outline in ]	5	T-4½
Base J	General Section S	Small Radial	7-Pir
Pin 1 - Heater	3	Pin 5-Grid	-
Pin 3-Plate	0 - 0	Pin 7 - Catho	de
Pin 4 - Plate		i in / cacho	ac
Mounting Position	000		Any
E	BOTTOM VIEW (7BR)		
Maximum Rati	ngs Are Design-Cent	ter Values	
	A-F AMPLIFIER		
Plate Voltage		150 max.	volts
Plate Supply Voltage		300 max.	volts
Plate Current		15 max.	ma.
Plate Dissipation	add in 1	2 max.	watts
D-C Heater-Cathode Pote	ential Amblifiari	su max.	VOILS
Plate Voltage	S A1 Amplijier.	80	volts
Cathode-Bias Resistor	r <sup>a</sup>	150	ohms
Amplification Factor		17	
Plate Resistance		2900	ohms
Transconductance		5800	µmhos
Plate Current		13	ma.
R-F POWER AMPLIFIE	R & OSCILLATOR - C1	ass C Telegrap	hy
D-C Plate Voltage		150 max.	volts
D-C Plate Supply Volta	ge	300 max.	volts
D-C Plate Current		-50 max.	voits
D-C Grid Current		20 max.	ma.
Plate Dissipation		2 max.	watts
D-C Heater-Cathode Pot	ential	80 max.	volts
Typical Operation at M	oderate Frequencies	150	
D-C Plate Voltage		150	volts
D-C Grid Voltage		550	ohms
a s a ra rorrage r		2000	ohms
D-C Plate Current		20	ma.
D-C Grid Current IAp	prox. 10	7.5	ma.
Driving Power (Appro	x. 10	0.2	watt
Power Output (Approx	• /	1.8	walt
-			
0, □, •, •, 0: See next pa	ge.	TENTATIN	C DAT

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## **OSCILLATOR TRIODE**

(continued from preceding page)

O with no external shield.

6FA

- Fixed-bias operation is not recommended. Under maximum rated conditions, the d-c resistance in the grid circuit should not exceed 0.5 megohm.
- Approximately 45 milliwatts can be obtained when the 6F4 is used at 1200 megacycles as an oscillator with 100 volts on plate, maximum rated plate dissipation, and grid resistor of 2000 ohms.
- Obtained from fixed supply, or by cathode resistor (550), grid resistor (2000), or partial self-bias methods.
- Subject to wide variations &s explained under TUBE RATINGS in General Section.

The socket for the 6F4 should be electrically and mechanically compact, and be made with an insulating material having a loss factor not exceeding 0.035 to permit operation of the 6F4 at high frequencies. For most satisfactory performance of the 6F4, it is essential that the inductance of connections between tube and circuit be kept as low as possible.



6xA









67×

# U-H-F AMPLIFIER TRIODE

GROUNDED-GRID,	MINIATURE TY	PE	
For use at frequencie.	s up to 500 MC.	. approx.	
Voltere Coaled Unipol	2		
voltage 6	• 2	a-c or a-c	voit
Current 0	• 4		amp.
Direct Interelectrode Capacita	nces (Approx.)	:0	
Plate to Cathode & Heater 0.	24 max.		μµf
Grid to Cathode & Heater 5	.5		ццf
Grid to Plate	4		unt
Heater to Cathode 2	.8		unf
Maximum Overall Length			2-1/8
Naximum Sected Height			1 7/9
Maximum Sealed Herghi			1-//0
Length from base Seat		4 4 40 11	0.100
to Bulb lop (excluding tip)		1-1/2"	1 3132
Maximum Diameter			3/4
Bu1b		T-	-5-1/2
Base	Minia	ture Buttor	17-Pi
Pin 1-Grid		Pin 5-Gr	id
Pin 2 - Cathode	2	Pin 6-Gr	id
Pin 3-Heater	-the	Pin 7-Pla	te
Rin A Heater		1111 / -110	ice
PCA Sachat	20	Stool M	001
RCA SOCKET	,	SLOCK	10.991
Mounting Position			AL
BOLLOW	VIEW (/BQ)		
Harimum Ratings Are	Danian Conton	Values	
Haitmum Katings Are	Design-center	values	
GROUNDED-GR	ND AMPLIFIER		
Plate Voltage		150 max.	volt
Plate Dissipation		2 25 max	watt
Plate Current		20 max	mall
D C Heater Cathedre Datastist		20 max.	
D-c neater-cathode Potential		90 max.	voit
Typical Operation and Characte	ristics - Class	A1 Amplif	ier:
Plate Voltage	100	150	volt
Cathode-Bias Resistor*			
(Suitably by-passed)	100	100	ohms
Amplification Factor	55	55	
Plate Resistance	5000	4500	ohms
Transconductance	11000	12000	umbo
Plate Current	10	15	ma
riale current	10	10	lid.
O with close-fitting shield connected	ed to grid.		
* The 6J4 should always be used with	ha cathode-bias r	esistor suita	ably by
ditions should be limited to 0.25	grid circuit unde meachm.	r maximum rat	ed cor
	ino go tini a		
fhe center hole in socke	ts designed for	this base	
provides for the possib	oility that this	tube type	
may be manufacturea with the base end. For this	reason, it is re	commended	
that in equipment emplo	ying this tube	type, no	
material be permitted to	obstruct the soc	ket hole.	
		TENTATI	VE DA
APRIL 1 1944	D DUUCION	ICNIALI	VE DA

RCA VICTOR DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



# **U-H-F AMPLIFIER TRIODE**

(continued from preceding page)

#### NOTE:

614

For grounded-grid operation, all three grid terminals should be grounded to minimize the effects of grid-lead inductance on u-h-f performance.

In arranging the circuit for the 6J4 used as a groundedgrid r-f amplifier or mixer, it is preferable to have the heater operate at the same r-f potential as the cathode, so that the cathode-heater capacitance will not be added across the input-circuit capacitance. Placing r-f chokes in series with the heater leads is suggested as a suitable method of operating heater and cathode at the same r-f potential.















Re

## **BEAM POWER AMPLIFIER**





RCA MANUFACTURING COMPANY, INC.





JAN.10,1942

RCA RADIOTRON DIVISION RCA MANUFACTURING COMPANY, INC. 920-6354



# TWIN-PENTODE POWER AMPLIFIER

Voltage	12.6	8	-c or d-	-c volt
Current	0.15	1.0	1.1.1.1	amp.
Direct Interelectrode Cap	Dacitances (	Approx.):	a Amit P	
	O 7	1 1 1 1 1 1 1 0 0	0 7	
Grid to Plate	0.7	L	0.7	μμτ
Input	5.0	1.1.1	5.0	μμτ
Output	6.0	0.00	6.0	μμτ
Grid to Grid		0.08		μμτ
Plate to Plate		1.5		uut
Grid P1 to Plate P2		0.2		μμτ
Grid P2 to Plate P1		0.1		иµт
Maximum Overall Length			3	3-5/16"
Maximum Seated Height				2-3/4"
Maximum Diameter			1	L-5/16"
Bulb	11			T-9
Base	Inter	mediate Sh	ell Octa	1 8-Pi
Pin 1-Grid P1	<b>(4) (5)</b>	Pin 4-	Plate P.	2
Cathode	ave	Pin 5-	Screen	P1 & P
Pin 2 - Suppres-	YEND	Pin 6-	Heater	1.
C SOF P1 & P2	2 230	Pin 7-	Heater	
Pin 3-Grid P2	1 8	Pin 8-	Plate P	1
Mounting Position POT	TOM VIEW 18F	211)		Any
For convenience, one pentode	unit is ident	ified as P.	: the othe	r as Po.
Warden - Dating	. Ann Design	Conton V		2
Maximum Kating	s are Design	i-center vi	acues	
AMPL	IFIER - Each	Unit		
Plate Voltage		1. S.	180 max.	volts
Screen Voltage			180 max.	volts
Plate Dissipation			2.5 max.	watts
Screen Dissipation			1.0 max.	watt
D-C Heater-Cathode Poten	tial		100 max.	volts
Typical Operation and Ch	aracteristic	s - Class	A. Ampl	ifier:
Plate Voltage		11.11.11	180	volts
Scroop Voltage			180	volts
Grid Voltage (Grid No	11		-9	volts
Peak A_E Grid Voltage	-/		9	volts
Zero-Sig Plate Cur.			13	ma.
May _Sig. Plate Cur.		1	3 5	ma.
Zero-Sig. Screen Cur.		S. James T.	2.8	ma.
MaxSig. Screen Cur.			4.6	ma.
Plate Resistance		0	.16	megohr
Transconductance		2	150	umhos
Load Resistance		10	000	ohms
Power Output (Total harm	onic dist. 109	()	1.0	watt
<sup>0</sup> With no external shield.				
and a second second				

DATA

1210.CI





12-SMI

# **DUPLEX-DIODE TRIODE**

For use with 12-cell storage-battery supply

#### GENERAL DATA

Electrical:

Heater, for Unipotential Voltage. Current. Direct Interelectrode Can Grid to Plate. Grid to Cathode.	Cathode: 12.6 0.15 pacitance 2.4 . 3.0	s-Triode	ac Unit:0	or dc volts amp. μμf
Flate to Cathode	. 2.8	• •		µµı
Mechanical:				
Mounting Position Maximum Overall Length. Maximum Seated Length. Maximum Diameter Bulb. Base Basing Designation for Pin1-Shell Pin2-Triode Grid Pin3-Cathode Pin4-Diode Plate No.2		i EW	Metal Metal Pin5-Di No Pin6-Tr Pin7-He Pin8-He	Any 2-5/8" 2-1/16" Shell, MT8G Octal 8-Pin 3-2 - 80 ode Plate 1 iode Plate ater ater

## CLASS A1 AMPLIFIER

77 .

Maximum Katings, Design-Cente	er	values:			
PLATE VOLTAGE			• 250	max.	volts
PLATE DISSIPATION			. 2:5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			00	-	
Heater negative with respect	Ct :	to cathode.	. 90	max.	volts
meater positive with respec	CL	to cathode.	. 90	max.	VOILS
Characteristics:					
Plate Voltage		. 26.5	250		volts
Grid Voltage:			0		1.
From a fixed supply of	•	· -	-9	•••	volts
Amplification Factor		. 17	16	• 10	egonins
Plate Resistance		. 15500	8500		ohms
Transconductance		. 1100	1900		µmhos
Plate Current		. 1.1	9.5		ma.
Typical Operation with Resist	tan	ce Coupling:			
See DECLETANCE COUDLED AND U	E I E	D CUADT Tur	CD7		
See RESISTANCE-COUPLED AMPLIT	FIE	R CHARI, IYL	De OR/.		
0					
With shell connected to cathode.	. v.	alues are appr	oximate.		
L					

JUNE 20, 1946





**DUPLEX-DIODE TRIODE** 

## DIODE UNITS - Two

The two diode plates are placed around a cathode, the sleeve of which is common to the triode unit. Each diode plate has its own base pin. Diode curves in the front of the RECEIVING TUBE SECTION apply to the 12SW7.

> Additional curves applying to the 12SW7 are shown under Types 6R7, and 6SR7

JUNE 20, 1946



# **PENTAGRID CONVERTER** SINGLE-ENDED METAL TYPE For use with 12-cell storage-battery supply

### GENERAL DATA

Electrical:
Heater, for Unipotential Cathode: Voltage 12.6
Mechanical:
Mounting Position
CONVERTER
Maximum Ratings, Design-Center Values:   PLATE VOLTAGE. 300 max. volts   GRIDS-No.2 and No.4 (SCREEN) VOLTAGE 100 max. volts   GRIDS-No.2 and No.4 (SUPPLY VOLTAGE 300 max. volts   PLATE DISSIPATION. 1.0 max. watt   GRIDS-No.2 & No.4 DISSIPATION. 1.0 max. watt   TOTAL CATHODE CURRENT. 14 max. ma.   GRID-No.3 (CONTROL GRID) VOLTAGE: 0 max. volts   Positive bias value. 50 max. volts   Positive bias value. 0 max. volts   PEAK HEATER-CATHCDE VOLTAGE: 90 max. volts   Heater negative with respect to cathode 90 max. volts   With shell connected to cathode 90 max. volts

JUNE 20, 1946

TENTATIVE DATA

1252

TUBE DIVISION

RCA 2SY7

# PENTAGRID CONVERTER

Characteristics - Separate E	xcitation	: *		
Plate Voltage	26.5 .	100	250	volts
Grids-No.2 & No.4 Voltage	26.5	100	100	volts
Grid-No.3 Voltage	-1	-2	-2	volts
Grid-No.1 (Oscillator				
Grid) Resistor	20000	20000	20000	ohms
Plate Resistance (Approx.)		0.5	1.0	megohm
Conversion Transconductance	250	425	450	µmhos
Conversion Transconductance				
(Approx.)	8.	20	20	µmhos
Plate Current	0.45	3.3	3.5	ma.
Grids-No.2 & No.4 Current	1.7	8.5	8.5	ma.
Grid-No.1 Current	0.1	0.5	0.5	ma.
Total Cathode Current	2.25	12.3	12.5	ma.

NOTE: The transconductance between grid No.1 and grids No.2 and No.4 connected to plate (not oscillating) is approximately 4500 µmhos under the following conditions: grids No.1, No.3, No.5 and shell at 0 volts; grids No.2 and No.4 and plate at 100 volts. Under the same conditions, the plate current is 27 milliamperes, and the amplification factor is 13.

 The characteristics shown with separate excitation correspond very closely with those obtained in a self-excited oscillator circuit operating with zero bias.

With grid-No.3 bias of -6 volts.

12511

with grid-No.3 bias of -35 volts.

The curves under Type 6SA7 also apply to the 12SY7.



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY







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# R-F AMPLIFIER PENTODE

For use with 12-cell storage-battery supply

#### GENERAL DATA

E	ecτ	ricai	
1000		-	

Heater, for Unipotential Cathode:										
Voltage						ac	or	dc	vol	ts
Current 0.07	•								. 8	mp
Direct Interelectrode Capacitances: <sup>0</sup>										
Grid No.1 to Plate 0.0035 max.				÷	•				. +	ιµf
Input 6.0	•								· +	ιµf
Output 5.0	•	•	•	•	•				• +	ıμf
Mechanical:										
Mounting Position									. /	Any
Maximum Overall Length									2-1/	8"
Maximum Seated Length	•		•						1-7/	8"
Length from Base Seat to									~ 14	
Bulb Top (excluding tip)	•	•			•	1	-1/	2"±	3/3	32"
Maximum Diameter	•		•	•	•				31	4 "
Bulb	•	•	•	•			• •	Т	-5-1	./2
Base		Mi	ni	at	u	re	But	ton	7-1	rin
Basing Designation for BOTTOM VIEW									78	3K1
Pin 1-Grid No.1 (A) (S)				Pi	n	4 -	-He	ate	r	
Pin 2-Grid No.3,				Pi	n	5 -	- P1	ate		
Internal Shield 3 / - Xe	)			Pi	n	6 -	-Gr	id	No.	2
Pin 3-Heater				Pi	n	7 -	- Ca	tho	de	
	D									
Pin 3-Heater	シ			Pi	n	6 - 7 -	-Gr -Ca	id tho	No. de	2

# 0 CLASS A1 AMPLIFIER

Maximum Ratings, Design-Center Values:

	PLATE VOLTAGE							250	max.	volts
	GRID-No.2 (SCREEN) VOLTAGE					•		100	max.	volts
	GRID-No.2 SUPPLY VOLTAGE		•					250	max.	volts
	PLATE DISSIPATION							3	max.	watts
	GRID-No.2 DISSIPATION							0.4	max.	watt
	GRID-No.1 (CONTROL GRID) VOLTAG	GE:								1
	Negative bias value							50	max.	volts
	Positivo bias value				÷.	÷.		0	max	volts
	DEAK HEATED CATHODE VOLTACE.	•	•	•	•	•	•	0	max.	10110
	PEAK HEATER-CATHODE VOLTAGE.							00		upl+c
	Heater negative with respect	to	C	cat	ind	Da	е	90	max.	VOILS
	Heater positive with respect	to	C	cat	h	ode	9	90	max.	volts
	Typical Operation and Character	ris	st	ics	5:					
	Plate Voltage				28	5.5	5	250		volts
	Grid No. 3 (Suppressor)	C	h	ner	++	he	to	catho	de at	socket
	Crid No. 2 Voltage	C	011	ince	26	2	5	100	ao ac	volta
	Grid-No.2 Voltage.	•			20		5	100		vorug
	Grid-No.1 Voltage:						2			
	From a grid-No.1 resistor of						2	-		megonma
	From a cathode resistor of .							125		ohms
	Q with outgraph shield connected to	cat	tь	ode						
1	with external shield connected to	ca	• 11	000						

JUNE 20, 1946

TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY


### **R-F AMPLIFIER PENTODE**

Plate Resistance (Approx.)	0.25	1.0	megohm
Grid-No.1 Bias (Approx.) for	2000	4000	μιιπος
transconductance of 40 µmhos Grid-No 1 Bias (Approx.) for	-	-25	volts
transconductance of 20 µmhos	-8	-	volts
Plate Current	1.7	10.5	ma.
Grid-No.2 Current	0.7	4.0	ma.

JUNE 20, 1946

2640

TENTATIVE DATA











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## TWIN BEAM POWER TUBE

#### GENERAL DATA

	Flectrical						
	Heater for Uninotential Cathode:						
	Voltage						
1	Current 0.6						
1	Direct Interelectrode Capacitances (Approx.): <sup>0</sup>	*					
	Grid No.1 to plate $\mu\mu$ f						
	Grid No.1 to cathode & grid No.3,						
	grid No.2, and neater $\mu\mu$						
	arid No 2 and heater 13 wif						
	Grid No.1 of unit No.1 to						
	grid No.1 of unit No.2Ο.2 μμf						
	Plate of unit No.1 to						
	plate of unit No.2 0.2 μμf						
	Grid No.1 of unit No.1 to						
	Grid No. 1 of unit No.2 to						
	plate of unit No.1						
	u. t t t.						
	Mechanical:						
	Mounting Position						
	Maximum Overall Length						
	Maximum Diamotor 1_9/32"	-					
	Base Intermediate-Shell Octal 8-Pin (JETEC No. B8-6).	+					
	or Short Intermediate-Shell Octal 8-Pin (JETEC No.B8-58)						
	Basing Designation for BOTTOM VIEW 8BU						
	Pin 1 - Grid No.1 of () () Pin 4 - Plate of						
h	Unit No.1 Unit No.2						
	Pin 2 - Cathode, (3) - Fin 5 - Grid No.2						
	of Units						
	No.1 & No.2 Pin 6 - Heater						
	Pin 3 - Grid No.1 of () () Pin 7 - Heater						
	Unit No.2 Pin 8 - Plate of						
-	Unit No.1						
	AMPLIELER Class A						
	AMFLIFIER - Class A						
	Values are jor Each Onit						
	Maximum Ratings, Design-Center Values:						
	PLATE VOLTAGE						
-	PLATE DISSIPATION 2 may watte						
	The broom Arrow	Ί					
	Without external shield.	1					
	Each unit.	1					
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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY							

26A7-GT

3

1

## TWIN BEAM POWER TUBE

GRID-No.2 INPUT		0.5	max.	watt
Heater negative with respect to cathode		90	max	volts
Heater positive with respect to cathode.		90	max.	volts
Turical Acception and Observation inting (Fr				
Dista Valtaria	n	unit)		
Crid No 2 Voltage	•	20.0		volts
Crid No.1 (Control Crid) Voltage	•	20.5		volta
Peak AF Grid_No 1 Voltage	•	4.5		volte
Zero-Signal Plate Current	•	20		ma
MaxSignal Plate Current.		20.5		ma
Zero-Signal Grid-No.2 Current		1.9		ma
MaxSignal Grid-No.2 Current		5.5		ma
Transconductance		5700		µmhos
Load Resistance		1500		ohms
Total Harmonic Distortion	•	7		%
MaxSignal Power Output		180		mw
Maximum Circuit Values:				
Grid-No.1-Circuit Resistance:				
For maximum rated conditions:				
With cathode bias		0.5	max.	megohm
With fixed bias		0.1	max.	megohm
For conditions where the maximum				
design values of plate voltage and				
grid-No.2 voltage do not exceed				
With grid-resistor bias		0 5	max	meaohm
inter grite resistor brase		0.0	max.	negonin
AF POWER AMPLIFIER - Class	AB			
Unless otherwise specified, values are on	a	Per-1	lube .	Basis
Maximum Ratings, Design-Center Values:				
PLATE VOLTAGE		50	max.	volts
GRID-No.2 (SCREEN) VOLTAGE		50	max.	volts
PLATE DISSIPATION (Per unit)	• •	2	max.	watts
GRID-No.2 INPUT (Per unit)	· •	0.5	max.	watt
Heater perative with respect to cathode		90	may	volte
Heater nositive with respect to cathode		90	max.	volts
Tueleel Duck Dull Occentions		00		
Dista Valtara		20 E		1.0
Grid No. 2 Voltage	• •	20.0		volts
Grid-No.1 (Control-Grid) Voltage	• •	20.0		volte
Peak AF Grid-No.1-to-	• •	-/		vorts
Grid No.1 Voltage.		14		volts
Zero-Signal Plate Current		19		ma
		20		
		Indica	tos a	change
	~	110108	ives d	change.
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JAN. 3, 1955

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TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY





## TWIN BEAM POWER TUBE

 MaxSignal Plate Current	
(Plate to plate)	
Maximum Circuit Values: Grid-No.1-Circuit Resistance: For maximum rated conditions: With cathode bias0.5 max. megohm With fixed bias0.1 max. megohm For conditions where the maximum design values of plate voltage and grid-No.2 voltage do not exceed 26.5 volts:	
With grid-resistor bias 0.5 max. megohm	

JAN. 3, 1955

-Indicates a change.

TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY







(RCA)	1º6							
26C6 DUPLEX-DIODE TRIODE								
MINIATURE TYPE For use with 12-cell storage-hattery supply								
CENEDAL DATA								
Electrical:								
Heater, for Unipotential Cathode: Voltage	volts amp μμf μμf							
Mechanical:								
Mounting Position	Any 2-1/8" 1-7/8" 3/32" 3/4" -5-1/2 7-Pin . 7BT No.2 No.1							
TRIODE UNIT - Class A1 AMPLIFIER								
Maximum Ratings, Design-Center Values:PLATE VOLTAGE.250 max.PLATE DISSIPATION.2.5 max.PEAK HEATER-CATHODE VOLTAGE:90 max.Heater negative with respect to cathode90 max.Heater positive with respect to cathode90 max.	volts watts volts volts							
Characteristics:								
Plate Voltage.26.5250Grid Voltage:From a fixed supply ofFrom a grid resistor of .2.0-maplification Factor .1716Plate Resistance .155008500Transconductance .11001900Plate Current.1.19.5	volts volts egohms ohms µmhos ma.							
Typical Operation with Resistance Coupling:								
See RESISTANCE-COUPLED AMPLIFIER CHART, Type 6R7.								
O with external spield connected to cathode. Values are approxim	ate.							



### **DUPLEX-DIODE TRIODE**

#### DIODE UNITS - Two

The two diode plates are placed around a cathode, the sleeve of which is common to the triode unit. Each diode plate has its own base pin. Diode curves in the front of the RECEIVING TUBE SECTION apply to the 26C6.

Additional curves applying to the 26C6 are shown under Types 6R7, and 6SR7

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TENTATIVE DATA







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## PENTAGRID CONVERTER

For use with 12-cell storage-battery subply

### GENERAL DATA

	Electrical:		.
	Heater, for Unipotential Cathode: Voltage	ac or dc vo 14 5.8 0.30 max. 0.03 max. 2.9 2.8	lts amp μμf μμf μμf μμf μμf μμf μμf
	Cathode to External Shield and All Other	2.0	MA I
	Electrodes Except Grid #1	15.5	μµf
	Mechanical:		
	Mounting Position. Maximum Overall Length	· · · · 2-1 · · · 1-7	Any /8" /8"
	Bulb Top (excluding tip)	$1-1/2" \pm 3/2$	32"
	Maximum Diameter		1/2
	Base Miniatu	re Button 7-	Pin
	Basing Designation for BOTTOM VIEW Pin 1 - Grid No.1 Pin 2 - Cathode, Pin	5 - Plate 6 - Grid No.	2,
)	Pin 3 - Heater Pin 4 - Heater	7 - Grid No.	3
	CONVERTER		
	Maximum Ratings, Design-Center Values:		
h	PLATE VOLTAGE.	300 max. vo	lts
	GRIDS-NO.2 & NO.4 (SCREEN) VOLTAGE	100 max. vo 300 max. vo	lts
	PLATE DISSIPATION.	1.0 max. w	vatt
	GRIDS-No.2 & No.4 DISSIPATION	1.0 max. w	vatt
	GRID-No. 3 (CONTROL GRID) VOLTAGE:	14 max.	ma.
Ń	Negative bias value:	50 max. vo	lts
1	Positive bias value	0 max. vo	olts
	Heater negative with respect to cathode	90 max. vo	lts
	Heater positive with respect to cathode • with external shield connected to cathode. • with external shield connected to other electrodes.	90 max. vo	olts
	JUNE 20. 1946 THRE DIVISION	TENTATIVE	DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



## PENTAGRID CONVERTER

	Characteristics - Separate Exc	citation	a			
	Plate Voltage	26.5	100	250	volts	
	Grid-No.3 Voltage.	-0.5	-1.5	-1.5	volts	
	Grid-No.1 (Uscillator- Grid) Resistor	20000	20000	20000	ohms	
	Plate Resistance (Approx.) . Conversion Transconductance	270	0.5 455	1.0 475	megohm µmhos	
	(Approx.)*	-	4	4	µmhos	
	(Approx.)**	8	- 2 0	- 0	µmhos	
The second	Grids-No.2 & No.4 Current. Grid-No.1 Current.	1.6 0.1 2.15	8.0 0.5 11.3	7.8 0.5 11.3	ma. ma. ma.	
	Characteristics of Oscillator	Section				
And and and an other statements of the statement of the s	Plate Voltage Grids-No.2 & No.4 Voltage Grid-No.3 Voltage Grid-No.1 Voltage		26.5 26.5 0 0	100 100 0 22 7200	volts volts volts volts µmhos	
	Plate Current		0.0	21	ma.	
Contraction of the state of the	The characteristics shown with closely with those obtained in a ating with zero blas. With grid-No.3 blas of -30 volt With grid-No.3 blas of -6 volts Measured between grid No.1 and (not oscillating).	h separati a self-exc ts. s. grids-No.	e excitation ited oscilla 2 and No.4 c	correspo tor circu onnected	nd very it oper- to plate	
The rest of the re	The curves also appl	under Ty y to the	pe 6BE6 26D6			
		and the second second second second				

JUNE 20, 1946

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TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY TENTATIVE DATA



JULY 31,1946

GRID-Nº 3 VOLTS TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6789



## Full-Wave Mercury-Vapor Rectifier

	For DC Power Supplies Having Large Current Requirements
	GENERAL DATA
	Electrical:
)	Filament, Coated: Voltage (AC or DC)
	Mechanical:
)	Operating Position Vertical, base down Maximum Overall Length
	Pin 1-Filament Pin 2-Plate of Unit No.2 1
	FULL-WAVE RECTIFIER
	Maximum and Minimum Ratings:
	PEAK INVERSE VOLTAGE.       1550 max.       volts         PEAK PLATE CURRENT PER PLATE.       1 max.       amp         CONDENSED MERCURY TEMPERATURE RANGE       20 - 60       °C
	With Capacitor-Input Filter
)	AC PLATE VOLTAGE PER PLATE (RMS) 450 max. volts TOTAL EFFECTIVE PLATE-SUPPLY IMPEDANCE PER PLATE <sup>4</sup>
	With Choke-Input Filter
)	AC PLATE VOLTAGE PER PLATE (RMS) 550 max. volts INPUT-CHOKE INDUCTANCE 3 min. henries DC OUTPUT CURRENT 225 max. ma
	Characteristics:
	Tube Voltage Drop (Approx.) 15 volts

a When a filter-input capacitor larger than 40  $\mu f$  is used, it may be necessary to use more plate-supply impedance than the minimum value shown to limit the peak plate current to the rated value.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 7-63

#### HALF-WAVE RECTIFIER

As a half-wave rectifier, the 83 is operated with plates connected in parallel. Two 83's so connected in a full-wave circuit can supply twice the output current of a single tube. Both plates within the same tube should be connected to the same terminal of the plate transformer. To equalize the current distribution between plates, a resistor of not less than 50 ohms should be connected in series with each plate.

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



## Medium-Mu Twin Triode

#### 9-PIN MINIATURE TYPE

#### GENERAL DATA

#### Electrical:

Heater Characteristics and Ratings:	
Voltage (AC or DC) $40.0 \pm 2.0 \ 20.0 \pm 1.0$ Current $0.050^{a}$ $0.100^{b}$	volts amp
(Each unit):	
respect to cathode 100 max.	volts
respect to cathode 100 max.	volts
Grid to cathode internal shield	pf
and heater (Each unit)	pf
and heater (Each unit)	pf
Characteristics Class A Amplifier (Each Unit);	• p
Plate Supply Voltage 150	volte
Cathode Resistor	ohms
Plate Resistance (Approx.)	ohms
Transconductance	µmhos ma
Grid Voltage for maximum plate $\mu a$ =4510	volts
Mechanical:	
Operating Position	. Any
Maximum Overall Length	1-3/4"
Maximum Seated Length	1-1/2"
Diameter	0.875"
Dimensional Outline See General S	ection
Base	.E9-1)
Pins 1&5 - Heater of Pin 6 - Plate	of
Pin 2 - Cathode of Pin 7 - Grid o	f
Unit No.2 3 - Pin 8 - Cathod	No.1 le of
Unit No.2 Unit	No.1
Pin 4 - Plate of Unit No.2	No.1
Pin 5-Heater Tap,	
Internal Shield	



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

DATA 4-63

#### AMPLIFIER - Class A

Values are for Each Unit

Maximum	Ratings.	Absolute-Maximum	Values:
---------	----------	------------------	---------

PLATE VOLTAGE			•			330	max.	volts	
Negative-bias value	0					55	max.	volts	
Positive-bias value						0	max.	volts	
CATHODE CURRENT						18	max.	ma	
GRID CURRENT						3	max.	ma	
PLATE DISSIPATION						1.35	max.	watts	1
Maximum Circuit Values:									
Grid-Circuit Resistance.						0.5	max.	megohm	

a At heater volts = 40.0.

**b** At heater volts = 20.0.

c without external shield.





## Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

#### GENERAL DATA

#### Electrical:

Heater Characteristics and Ratings: Voltage (AC or DC)	20.0 ± 1.0 0.050	volts amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode Heater positive with	100 max.	volts
respect to cathode	100 max.	volts
Grid No.1 to plate	0.01	pf
internal shield, grid No.2, and heater Plate to cathode & grid No.3 &	4.0	pf
internal shield, grid No.2, and heater	2.8	pf
Characteristics, Class A, Amplifier:		
Plate Supply Voltage	120	volts
Grid-No.2 Supply Voltage	120	volts
Cathode Resistor <sup>b</sup>	200	ohms
Plate Resistance (Approx.)	0.34	megohm
Transconductance	5000	µmhos
Plate Current	7	ma
Grid-No.2 Current	2.2	ma
$\mu a = 200$	-10	volts
Mechanical:		

Operating Position. . . . . . . Any Type of Čathode . . . . . . . . . . . . . Coated Unipotential Maximum Overall Length. . . . Maximum Seated Length . . . . . . . . . . 1-3/4" . . 1-1/2" . . . . . . . . Length, Base Seat to Bulb Top (Excluding tip). . . 1-1/8" ± 3/32" Diameter. . . . . . . . . . . . . .... 0.650" to 0.750" Dimensional Outline . . See General Section Bulb. . . . . . . T6-1/2 Basing Designation for BOTTOM VIEW. . . . . . 7BD

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



Pin 5- Plate Pin 6-Grid No.2 Pin 7-Cathode, Grid No.3



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 4-63

#### AMPLIFIER - Class A

Maximum Ratings, Absolute-Maximum Values:

PLATE VOLTAGE . . . 180 max. volts GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE. . . 180 max. volts GRID-No.2 VOLTAGE . . . .See Grid-No.2 Input Rating Chart at front of Receiving Tube Section GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value . . 0 max. volts GRID-No. 2 INPUT: For grid-No.2 voltages up to 90 volts. . . 0.5 max. watt For grid-No.2 voltages between 90 and 180 volts. .See Grid-No.2 Input Rating Chart at front of Receiving Tube Section PLATE DISSIPATION . 1.7 max. watts

a With external shield JEDEC No.316 connected to cathode.
b Fixed-bias operation is not recommended.





# DETECTOR, AMPLIFIER, OSCILLATOR

Especially for wavelengths between 0.5	meter and 5 meters		
Heater Coated Unipotential C	Cathode		
Voltage 6.3	a-c or d-c volts		
Current 0.15	amp.		
Direct Interelectrode Capacitances:			
Grid to Plate 1.4	μµf		
Grid to Cathode 1.0	μµf		
Plate to Cathode 0.6	μµf		
Overall Length	1-7/32" ± 5/32"		
Overall Diameter	1-3/32" + 1/16"		
Bulb] See Outline in	∫ T-4½		
Base GENERAL SECTION	Small Radial 5-Pin -		
Pin 1-Heater	Pin 4 - Heater		
Pin 2-Plate	Pin 5 - Cathode		
Pin 3-Grid ( 📥 )			
RCA Socket	Stock No.9925		
Mounting Position 03@	Any		
Short Part of Bulb: Bot	ttom		
BOTTOM VIEW (5BC	()		
Maximum Ratings Are Design-	Center Values		
A-F AMPLIFIFR			
D-C Plate Voltage	250 max. volts		
Plate Dissipation	1.6 max. watts		
D-C Heater-Cathode Potential	80 max. volts		
Typical Operation and Characteristics.	- Class A Amplifier:		
D-C Plate Voltage 90 13	35 180 <sup>1</sup> 250 volts		
D-C Grid Voltage* $-2.5$ $-3.7$	75 -5 -7 volts		
Amplification Factor 25 2	25 25 25		
Plate Resistance 14700 1320	00 12500 11400 ohms		
Transconductance 1700 190	00 2000 2200 umhos		
D-C Plate Current 2.5 3.	5 4.5 6.3 ma.		
Load Resistance	20000 - ohms		
Second Harmonic Dist	5 - %		
Power Output	135 – mw		
Typical Operation with Resistance-Coupling:			
Plate-Supply Voltage <sup>0</sup>	180 volts		
D-C Grid Voltage*	-3.5 volts		
Load Resistance	250000 ohms		
Plate Current	0.42 ma.		
Second Harmonic Distortion	5 %		
Voltage Output	45 RMS volts		
Voltage Gain	20 approx.		
R-F POWER AMPLIFIER & OSCILLAT	TOR - Class C		
Plate Modulated or (	C. W.		
D-C Plate Voltage	180 max. volts		
D-C Plate Current	8 max. ma.		
D-C Grid Current	2 max. ma.		
D-C Heater-Cathode Potential	80 max. volts -		
Typical Operation:			
D-C Plate Voltage	180 volts		
D-C Grid Voltage	-35 approx. volts		
D-C Plate Current	7 ma.		
• * 0.			
, , See next page.	Indicates a change.		
JUNE 30, 1944 RCA VICTOR DIVISIO	DATA DATA		

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



### DETECTOR, AMPLIFIER, OSCILLATOR





MAY 7, 1941

RCA MANUFACTURING COMPANY, INC.



RCA MANUFACTURING COMPANY, INC.

925-5564



# DETECTOR, AMPLIFIER, OSCILLATOR

		and the second se		
	Filament Coated		uelte.	
	Voltage 1.25	d—c	voits	
	Direct Interplectrade Capacitances: <sup>0</sup>		amp.	
	Grid to Plate 1.2		unf	
	Grid to Filament 0.3		unf	
N	Plate to Filament 0.7		unf	
1	Overall Length	1 - 7/32" +	5/32"	
	Overall Diameter	1-3/32" +	1/16"	
1	Bulb) See Outline in	ſ	T-45	
	Base CENERAL SECTION	Small Radial	5-Pin	
	Pin 1 - Filament	Pin 5-Filam	ient -	
_	Pin 2-Plate	AA'- Plane	of	
	Pin 3-Grid	Elect	rodes	
2	Pin 4 - Filament - A-()-A			
	RCA Socket	Stock No	.9925	
	Mounting Position 060	Vert	ical	
	Short Part of Bulb: Botto	im .		
	BOTTOM VIEW (5BD)			
	Maximum Ratings Are Design-C	enter Values		
	AMPLIFIER			
	D-C Plate Voltage	135 max.	volts	
	Characteristics - Class A. Amplifier:			
	D-C Plate Voltage	135	volts	
	D-C Grid Voltage*	-5	volts	
	Amplification Factor	13.5		
	Plate Resistance	20800 approx.	ohms	
	Transconductance	650	µmhos	
	D-C Plate Current	2	ma.	
	Quite an entrance lasticited			
	with no external shield.	trodes is vertical	(olate	
on edge).				
	* Under maximum rated conditions, the resistance	in the grid circuit	should	
	not exceed 0.1 megonin with lixed bias, of 0.5 i	egoni with cathode	0103,	
	R-F prounding by means of condensers pla	ced close to the	s tube	
	pins is required if the full capabilities	of the 957 for u	ultra-	
	high-frequency uses are to be obtained.			
9				
1				
	and the second			
	👞 Indicates a change.			
	IUNE 30, 1944 PCA VICTOR DIVISION		DATA	
	RADIO CORPORATION OF AMERICA, HARRISON,	NEW JERSEY		





### DETECTOR AMPLIFIER PENTODE ACORN TYPE

Filament Coated	d-c	volts
Current 0.05	d	amp.
Grid to Plate <sup>0</sup> 0.015 max.		µµf
Input 1.8		µµf
Output 2.5	4 44 /4 01	uµt 2/1 CH
Overall Length	1-11/10" +	1/16"
Bulb	1-5/52 <u>+</u>	T-4±
End Terminals See Outline in	Į	Two
Base GENERAL SECTION	Small Radial	5-Pin
Pin 1-Filament	P - Plat	е
Pin 2-Grid No.2	G <sub>1</sub> - Grid	No.1
Pin 3-Grid No.3	AA' - Plan	e of
Pin 4 - Filament -	Elec	trodes
RCA Socket	Stock No	. 9925
RCA Grid & Plate Clips	Stock No	. 9939
Mounting Position	Ver	tica10
P is on Long Part of Bulb: T G is on Short Part of Bulb: Bo BOTTOM VIEW (5BE)	op ottom	
Maximum Ratings are Design-Cer	nter Values	
AMPLIFIER		
D-C Plate Voltage	145 max.	volts
D-C Screen (Grid No.2) Voltage	67.5 max.	volts
Characteristics — Class A <sub>1</sub> Amplifier:	125	vol+c
Suppressor (Grid No 3) Connected to f	filament(_) at	socket
D-C Screen Voltage	67.5	volts
D-C Grid (No.1) Voltage #	-3	volts
Plate Resistance	0.8 approx.	megohm
Transconductance	600	µmhos
D-C Plate Current	1.7	ma.
D-C Screen Lurrent	0.4	ma.
<ul> <li>With shield baffle.</li> <li>Ø Horizontal operation permitted if plane of elect</li> </ul>	rodes is vertical	(plate on
edge). # Under maximum rated conditions, the resistance in exceed 0.1 megohm with fixed bias, or 0.5 megohm w	the grid circuit s ith cathode bias.	hould not
R-f grounding by means of condensers placed cl	ose to the tube t	erminals
uses are to be obtained. It is important in the control-grid circuits that separate r-f groundi common point in order to avoid r-f inter-act	e cases of the p ng returns be m ion through commo	late and ade to a n return
circuits. It may also be advisable in some ap the action of the by-pass condensers by r-f c condensers in the return or supply lead for suppressor, the plate, and the filament.	plications to su hokes placed clos the grid, the scr	pplement e to the een, the
-Indicates a change.		
JUNE 30, 1944		DATA

RCA VICTOR DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
















# POWER AMPLIFIER PENTODE

The 1611 is a power pentode intended for use as a relay tube in equipment on ships for automatically announcing SOS signals. To meet the special requirements of such service, the 1611 features an  $i_p-e_g$  characteristic having suitable slope and minimized variation between tubes. Physical characteristics of the 1611 are the same as those of Type 6F6.

RCA-1611 is available only through Radiomarine Corporation of America, 75 Varick Street, New York, N.Y.

1611



(ep

# PENTAGRID AMPLIFIER

For applications critical as to microphonics





Plate Res. 1.0 ۸ megohm 1185 1225 Transcond. umhos Grid Bias for cathode current cut-off -7 -7 volts Plate Cur. 2.0 2.0 ma. Screen Cur. 0.5 0.5 ma. AMPLIFIER - Triode Connection00 Plate Voltage 250 max. volts Typical Operation and Characteristics - Class A1 Amblifier: Plate Grid # 180 250 volts -5.3 volts -8 Amp. Fact. Plate Res. 11000 10500 ohms Transcond. 1800 1900 µmhos Plate Cur. 5.3 6.5 ma.

For cathode-bias operation of the 1620 a minimum cathode-resistor by-pass condenser of 25 µf is recommended to minimuze hum, particularly in circuits where the 1620 is followed by high-pain stages. When a 25 µf condenser or larger is used, the voltage difference between heater and cathode is not critical, but it should be kept as low as possible. If less than a 25 µf condenser is used, positive or negative biasing of the heater with respect to the cathode is requeed, but it should be within the state of the sta

unger maximum rates conditions, the d-c resistance in the grid circuit should not exceed 1.0 megohm.
 Greater than 1.0 megohm.
 Greater and suppressor tied to plate.

OUTLINE DIMENSIONS for the 1620 are the same as for 1612.

Curves under Type 6J7 also apply to the 1620.

Jan. 1, 1943

RCA VICTOR DIVISION

DATA





RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



# **POWER AMPLIFIER PENTODE**

6.5	ma.
13	ma.
4000	ohms
3	%
5	watts
	6.5 13 4000 3 5

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. 0

With shell connected to cathode.

1621

With shell connected to cathode. Screen connected to plate. Type of input coupling used should not introduce too much resistance in the grid circuit. Transformer- or impedance-coupling devices are recommended. When the grid circuit has a resistance not higher than 0.05 megohm, fixed bias may be used; for higher values, cathode bias is required. With cathode bias, the grid circuit may have a resist-ance as high as, but not greater than, 0.5 megohm provided the heater voltage is not allowed to rise more than 10% above rated value under any conditions of operation. +\*

OUTLINE DIMENSIONS for the 1621 are the same as those for Type 12A6.

Curves under Type 6F6 also apply to the 1621.

DATA











**ELECTRON-RAY TUBE** INDICATOR TYPE WITH TRIODE UNIT Heater Coated Unipotential Cathode Voltage 12.6 a-c or d-c volts Current amp. 3/16" Overall Length 3-15/16" + ± 3/16" Seated Height 3-3/8" 1-3/16" Maximum Diameter Bu1b T-9 Small Shell Octal 7-Pin Base Pin 1 - No Connection Pin 5 - Grid Pin 7 - Heater Pin 2 - Heater Pin 3 - Plate Pin 8 - Cathode Pin 4 - Target Mounting Position 8 Any**A** BOTTOM VIEW (7AL) Maximum and Minimum Ratings Are Design-Center Values INDICATOR SERVICE Plate-Supply Voltage 250 max. volts ∫ 250 max. volts Target Voltage 1125 min. volts D-C Heater-Cathode Potential 90 max. volts Typical Operation: 250 Plate and Target Supply Voltage volts Series Triode Plate Resistor 1 1 megohm 2 4 Target Current † ◊ ma. Triode-Plate Current<sup>◊</sup> 0.19 0.24 ma. Triode-Grid Voltage (Approx.) For shadow angle of 00 -6.5 -8.0 volts For shadow angle of 90° volts Designated as R in the circuit diagram under Type 6E5, in the Receiving Tube Section. † Subject to wide variation. For triode-grid bias of 0 volts. A The plane of the ray-control electrode passes through the tube axis and base key. Curves for Type 1629 are the same as for the 6E5 in the Receiving-Tube Section. - Indicates a change.

DATA





# HIGH-MU TWIN POWER TRIODE

GENERAL DATA

1	Electrical:	
	Heater, for Unipotential Cathode: Voltage6.3ac or dc volts Current	
1	Nechanical:	
	Mounting Position	
	Pin 1-No Connection Pin 2-Heater Pin 3-Plate of Unit No.2 Pin 4-Grid of Unit No.2 Pin 4-Grid of Unit No.2 Pin 5-Grid of Unit No.1 Pin 6-Plate of Unit No.1 Pin 7-Heater Pin 8-Cathode	
	AF DOWED AND LELED CLOSE P	
	AF FUNER AMPLIFIER - CLASS D Maximum Ratings, Design-Center Values:	4
	DC PLATE VOLTAGE       300 max. volts         PEAK PLATE CURRENT (per plate)       90 max. ma.         PLATE DISSIPATION (per plate)       3 max. watts         PEAK HEATER-CATHODE VOLTAGE:       90 max. volts         Heater negative with respect to cathode       90 max. volts         Heater positive with respect to cathode       90 max. volts	
	Typical Operation:	-
	Palues are for 2 units unless otherwise specified	
	DC Plate Voltage       300       300       volts         DC Grid Voltage       0       volts         Peak AF Grid-to-Grid Voltage       70       108* volts         Zero-Signal DC Plate Current       6.6       6.6       ma.         MaxSignal DC Plate Current       54       54       ma.         Peak Grid Current (per unit)       38       39       ma.         Plate-Supply Impedance       0       1000* ohms	
	Effective Load Resistance (plate-to-plate) 12000 12000 ohms Effective Grid-Circuit Impedance (per unit) 0 516** ohms Total Harmonic Distortion 4 5 % MaxSignal Power Output 10.4 10.4 watts	
	●,*,**: See next page. ←Indicates a change.	

APRIL 15, 1947

635



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY









# PRENTISA INC. SHARP-CUTOFF PENTODE

SUBMINIATURE TYPE

Intended for applications at altitudes up to 60,000 feet where dependable performance under shock and vibration is paramount

#### GENERAL DATA

### Electrical:

Heater, Pure Tungsten, for Unipotential Cathode:	
Voltage 6.3	or dc volts
Current 0.150	amp
Direct Interelectrode Capacitances:	
Without	Nith
External Ext	ternal
Shield Sh	ield*
Grid No.1 to plate 0.034 max. 0.0	2 max. µµt
Grid No.1 to all other elec-	4
Crid No. 2 to all other also	4 μμ1
Grid No.3 to all other elec-	۸f
Dista to oll other plantroder 10 2	$4 \qquad \mu\mu 1$
Child No. 1 to participate Processor 1.9 2.	$\mu \mu \Gamma$
	1 max. µµ1
Grid No.3 to plate 1.1 max. 1.	1 max. µµ1
Characteristics, Class A, Amplifier:	
Plate-Supply Voltage 100 10	0 volts
Grid No 3	0 00100
Grid-No 3 Supply Voltage	1 volt
Grid-No.2 Supply Voltage 100 10	volts
Cathode Resistor	0 ohms
Plate Resistance (Approx.) 0.11 0.0	5 megohm
Transconductance:	0
Grid No.1 to plate	0 μmhos
Grid No.3 to plate	0 μmhos
Plate Current 5.6	4 ma
Grid-No.2 Current	8 🥁 ma
Grid-No.1 Voltage (Approx.) for	
plate current of 10 μa7.5 -	volts
Grid-No.3 Voltage (Approx.) for	
plate current of 10 µa	8 volts
Mechanical:	
	1.00
Mounting Position	• • • • Ally
Length Bulb Seat to Bulb Top (Excluding tip), 1.07	5" + 0.060"
Diameter 0.366	" to 0.400"
Dimensional Outline	ral Section
Bulb.	T3
Leads. Flexible	8
Length	" to 1-3/4"
Orientation and diameter See Dimensio	nal Outline
6	
* With external shield having inside diameter of 0.40 to lead 8.	5" connected
Connected to cathode at socket.	
6-57 TENTA	TIVE DATA 1



# SHARP-CUTOFF PENTODE

#### BOTTOM VIEW

Lead 1-Grid No.1 Lead 2 - Cathode Lead 3 - Heater

5030

Lead 4 - Grid No.3

4 5
3/1/0
e ( 7)

Lead 5 - Plate Lead 6 - Heater Lead 7-Grid No.2 Lead 8 - Cathode

### AMPLIFIER - Class A

#### Maximum Ratings, Absolute Values:

For Operation at Altitudes up to 60,000 Feet

PLATE VOLTAGE 165 max. volt	S
GRID-No.3 (SUPPRESSOR-GRID) VOLIAGE: Positive bias value	S
GRID-No.2 (SCREEN-GRID) VOLTAGE 155 max. volt	S
GRID-No.1 (CONTROL-GRID) VOLTAGE:	
Negative bias value	S
Positive bias value U max. Volt	S
PLATE CURRENT	a
GRID-NO.2 CURRENT	a
GRID-No.2 INPUL	t
PLATE DISSIPATION	S
Heater negative with respect to cathode. 200 max. volt	S
Heater positive with respect to cathode. 200 max. volt	S
BULB TEMPERATURE (At hottest point 250 max. 9	
characteristics as Mixer:-	
Plate-Supply Voltage 100 volt	5
Grid-No.3 Supply Voltage (RMS) 15 volt	S
Grid-No.2 Supply Voltage 100 volt	S
Cathode Resistor	S
Plate Resistance (Approx.)	m
Conversion Fransconductance $\dots$ $1280$ $\mu$ mho	S
Plate Current	а
Grid-No.2 Current 5.7 m	a
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance:	
For cathode-bias operation 1.1 max. megohm	S
With local oscillator injection to grid No.3. DC grid-No.3-circuit resistance should be kept as low as possible at high frequencies.	1



# SHARP-CUTOFF PENTODE

CHARACTERISTICS RANGE V	AL	UE	S	FOR EQU	IPMENT	DESIGN	
Values are Initial, U	Inl	es	s	Otherwi	se Spec	cified	
				Note	Min.	Max.	
Heater Current				1	0 140	0 160	amo
Direct Interelectrode Capacitances:	•	•	•	1	0.110	0.100	Samp
Grid No.1 to all other electrodes	•	•	•	2	3.5	4.5	μµf
electrodes				2	3.5	4.5	uuf
Plate to all other electro	des		ĉ	2	2.9	3.9	unt
Plate Current (1)	400			13	3.7	6.9	ma
Plate Current (2)	•	•	•	1 1	2.1	100	112
Plate Current (2)	•	•	•	1 5		100	112
Crid No. 2 Current	•	•	•	1 2	2 8	5 4	ma
Transconductance, Grid No.1 to Plate:				1,)	2.0	0.4	ind
Range with heater				0	0700	1000	
volts = 6.3	•	٠	•	3	2700	4000	µmnos
Change with heater				2		15	01
Volts = 5./	•	•	٠	3	-	10	<i>l</i> o
Change at end of 500							
hours with heater volts						0.0	01
= 6.3		•		3	-	20	10
Change at end of 500							
hours with heater volts							
= 5.7				3	-	15	%
Difference between							
average transconduct-							
ance initially, and							
average after 500 hours,							
expressed as a percentage	е						
of the initial average .				1,3	-	15	%
Transconductance, Grid No.3							
to Plate				1,6	500	1800	µmhos
Reverse Grid-No.1 Current				1,7	-	0.3	μa
Reverse Grid-No.1 Current at							
500 hours				1.7	-	0.9	μa
Grid-No.1 Emission Current .				8	-	0.5	μa
Heater-Cathode Leakage							
Current:							
Heater 100 volts negative							
with respect to cathode				13	_	5	ua
Heater 100 volts positive	•	•	•	1,7		0	
with respect to cathode				13	-	5	112
Heater-Cathode Leakage	•	•	•	-,/		5	pic
Current at 500 hours							
Heater 100 volts negative							
with respect to cathode				12	_	10	112
inter respect to cathode.	•	•	•	1,)		10	put
, Notes 1 to 8: See next page.							
6-57	-				TEI	VTATIVE	DATA 2
ELECTRON	I T	110	C 1	N/ICIONI	· 6		

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



# SHARP-CUTOFF PENTODE

										No	te	Min	. A	lax.		
He	ater	- 100	volt	s po	sit	ive				1	2			10		
eak	age	Resis	tanc	e:	atm	Jue	•••	•	•	1,	2	-		10		μ
Gr	id N elec	lo.1 to trodes	o al s.	1 ot	her					1.	9	100	)	-	me	eaohm
P1a	ate	to al	ot	her						1	10	100	i.		m	achm
eaka	age	Resist	tance	e at	• •	•	•••	•	•	1,	10	100		-	1110	egonina
500 Gr	) ho id N	ours: lo.1 to	al	l ot	her											
P1	elec	trodes	s .	 her		•	• •		•	1,	9	50		-	me	egohms
6	elec	trodes	5 .		• •		• •			1,	10	50		-	me	egohms
ote	1:	with 6	.3 v	olts	ac c	r d	c or	n he	ate	r.						
ote	2:	With e ted to	xter lead	nals 18.	hie	ld h	av i	ng	ins	ide	diam	neter	of	0.40	5" c	onnec-
ote	3:	With p grid-M 150.	1ate-	-supp supp	ly v ly v	olt	s = s =	100	, g ), a	rid and	No.; cath	3 con node	nect resi	ed t stor	o ca r (ol	thode, hms) =
ote	4:	With p No.2 v	late olts	volt = 10	s = 0, a	100 nd	, g grid	rid I-No	NO.	3 c vol	onne ts =	cted -7.5	to.	cath	ode,	grid-
ote	5:	With p grid-M 150.	late	-sup supp	p]y ]y ∨	vol olt	ts = s =	= 10 100	)), a	gri and	d-Nc cath	0.3 s lode	upp1 resi	y vo stor	olts r (ol	= -8, nms) =
ote	6:	With p grid-N 150.	olate o.2	-sup supp	ply ly ∨	vol olt:	ts = 5 =	= 10	)), a	gri and	d-Nc cath	.3 s iode	upp1 resi	y vo stor	olts r (ol	= -1, nms) =
ote	7:	with p grid-N and gr	late- o.2 id-No	-supp suppl	ly v ly v ircu	olt olts it	s = s = resi	100 100 sta	, g , c nce	rid ath (me	No.3 ode i	s con resis ns) =	nect stor 1.	ed t (ohr	o ca ns)	thode, = 150,
ote	8:	With a 3 volt and gr	c or s = id-No	dc h 0, g	eate rid- ircu	no. it	olt: 2 vo resi	s = olts sta	7.5 = nce	5, p 100 (me	late , gr	vol id-N ns) =	ts = 0.1 1.	100 volt	, gr	id-No. -7.5,
ote	9:	With g electr	rid odes	No.1 conn	100 ecte	d t	lts oget	neg	ati	ve	with	res	pect	to	a11	other
ote	10:	With p trodes	late	300 necte	volt d to	s n get	egat her.	ive	e wi	th	resp	ect	to a	11 0	ther	elec-
Eac	h tu	be is s	stabi	lize	d be	for	e cl	nara	acte	eris	tics	tes	ting	by	con	tinuou

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

5630

Impact Acceleration. . . . . . . . . . . . . . . . 450 max. g This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are tested in four different positions. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

6-57

TENTATIVE DATA 2

ELECTRON TUBE DIVISION



Se36

# SHARP-CUTOFF PENTODE

#### Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

#### Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . . . . . . . . . . . . 60 max. mv This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 6.3, plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, cathode resistor (ohms) = 150, cathode-bypass capacitor ( $\mu$ f) = 1000, plate-load resistance (ohms) = 10,000, and vibrational acceleration of 15 g at 40 cycles per second.

#### Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . 2000 min. cycles Under the following conditions: heater volts = 7 cycled one minute on and one minute off, heater 140 volts rms with respect to cathode, and all other electrodes connected to ground.

#### Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage . . . . . . . . . 70 max. mv This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 6.3, plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 19, cathode resistor (ohms) = 150, grid-No.1-circuit resistance (megohms) = 0.1, grid-No.2-circuit resistance (ohms) = 1000, plateload resistance (megohms) = 0.2, and cathode-bypass capacitor ( $\mu$ f) = 1000. The output voltage of a tube, when tapped, will not cause a reading on a vu meter greater than that produced when a calibrating signal of 70 millivolts rms is applied to the plate of the tube.

#### Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or avalue of reverse grid-No.I current in excess of I.O microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid-No.I current.

TENTATIVE DATA 3



### SHARP-CUTOFF PENTODE

#### I-Hour Stability Life Performance:

5030

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are checked for transconductance under conditions specified under 500-Hour Intermittent Life Performance. At the end of I hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 15 per cent.

#### 100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions specified under 500-Hour Intermittent Life Performance to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit or a grid-No. I-to-plate transconductance of less than 2350 micromhos under the conditions specified in CHARACTERISTICS RANGE VALUES.

#### 500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: heater volts = 6.3, plate-supply volts = 100, grid No.3 connected to cathode, grid-No.2 supply volts = 100, heater 200 volts positive with respect to cathode, cathode resistor (ohms) = 150, grid-No.1-circuit resistance (megohms) = 1, and bulb temperature  $(^{O}C) = 220$ . At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, grid-No. I-to-plate transconductance change, grid-No.3-to-plate transconductance. and 500-hour limits for reverse grid-No.1 current, heatercathode leakage current, leakage resistance, and the difference in the grid-No. I-to-plate transconductance between the initial value and the average value shown under CHARACTERISTICS RANGE VALUES.

#### OPERATING CONSIDERATIONS

The *heater supply* should be well regulated because life and reliability of the 5636 are adversely affected by departures from the 6.3-volt value. The extent to which life is affected is a function of the amount of these departures and their durations.

The *flexible leads* of the 5636 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation may crack the glass seals of the leads and damage the tube.

TENTATIVE DATA 3

ELECTRON TUBE DIVISION







ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY 92CM - 9210





ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY 92CM-9215





# HALF-WAVE VACUUM RECTIFIER

SUBMINIATURE TYPE

For compact, portable high-voltage-rectifier applications

#### GENERAL DATA

#### Electrical:

Filament. Coated:

	Volta	ge.									1.	25	5							ac		or	dc	V	olts
	Curre	nt.									C	).2	2												.amp
D	irect	Inte	ere	elec	tr	od	е	Ca	pad	cit	ar	nce	9	(A)	op	ro	Χ.	):(	0						
	Plate	to	fi	lan	nen	t.		•	•				•		•	•			1	0.6	5				μµf

#### Mechanical:

P-Plate Terminal



F-Filament Lead

SORR

#### PULSED-RECTIFIER SERVICE

Maximum and Minimum Ratings, Design-Center Values:

4-59	FLECTRO	N	TUR	E D		ISIC	N		TE	NTATIN	E DATA
o,□,⊕: See next page.									1	-	
Plate Current for pla	te vol	ts	Ŧ	30	•	•	·		4		ma
Characteristics:											
DC Output Current		• •	•	•	•	•	•	•	0.15		ma
DC Output Voltage (2	tubes	)							12000		volts
Peak-Pulse Plate Volt	age <sup>⊕</sup> .								8000		volts
Typical Operation:											
FREQUENCY OF SUPPLY V	OLTAGE	•	•		·	•	•	•	5	min.	kc
DC PLATE CURRENT									0.25	max.	ma
PEAK PLATE CURRENT .									5	max.	ma
PEAK INVERSE PLATE VO	LAGE								10000	max.	volts

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



# HALF-WAVE VACUUM RECTIFIER

<sup>O</sup> Without external shield.

5642

As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations," Federal Communications Commission.

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In 8525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

#### OPERATING CONSIDERATIONS

The flexible leads of the 5642 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button and the glass tip. If this precaution is not followed, the heat of the soldering operation will crack the glass seals of the leads and damage the tube.





PRENIUN.

# SHARP-CUTOFF PENTODE

MINIATURE TYPE

Intended for RF and IF Broad-Band Applications where dependable performance under shock and vibration are paramount. The 5654 is a "premium' version of the 6AK5.

GENERAL DATA	
Electrical:	
Heater, Pure Tungsten, for Unipotential Voltage 6.3±10% Current 0.175 Direct Interelectrode Capacitances: Grid No.1 to Plate . 0.020 max. Input 4.0 Output 2.85 Mechanical: Mounting Position Maximum Overall Length Maximum Seated Length	Cathode: ac or dc volts amp μμf μμf μμf μμf μμf μμf μμf μμf μμf
Maximum Deared Length Length from Base Seat to Bulb Top (Excluding tip) Maximum Diameter Bulb Base Small-Button Miniature BOTTOM VIEW	
Pin 1-Grid No.1 Pin 2-Cathode, Grid No.3, Int. Shield Pin 3-Heater Pin 4-Heater	Pin 5 - Plate Pin 6 - Grid No.2 Pin 7 - Cathode, Grid No.3, Int. Shield
AMPLIFIER - Class	4j
Maximum Ratings, Absolute Values:	
PLATE VOLTAGE GRID-No.2 (SCREEN) VOLTAGE PLATE DISSIPATION GRID-No.2 INPUT CATHODE CURRENT PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathor Heater negative with respect to cathor	. 200 max. volts . 155 max. volts . 1.85 max. valts . 0.55 max. watts . 20 max. ma de. 100 max. volts de. 100 max. volts
Typical Operation and Characteristics:	
Plate Voltage	0 180 volts 0 120 volts
1411 1 1052	TENTATIVE DATA

1953 JAN.

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



# SHARP-CUTOFF PENTODE

Cathode-Bias Resistor .				180	180	ohms
Plate Resistance (Approx	.)			0.30	0.50	megohm
Transconductance				5000	5100	µmhos
Plate Current				7.5	7.7	ma
Grid-No.2 Current				2.5	2.4	ma
Grid-No.1 Voltage (Appro	x.)					
for plate current of 1	0 µ	am	D	-8.5	-8.5	volts

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

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

5654

#### Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours.

#### Heater Cycling Life Performance:

Cycles of Intermittent Operation ... 2000 min. cycles Under the following conditions: With heater voltage of 7.5 volts cycled 1 minute on and 1 minute off, heater positive with respect to cathode by +100 volts dc, and plate, grid-No.2, and grid-No.1 voltage = 0 volts.

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

				Note	Min.	Max.	
Heater Current	•			1	0.160	0.190	amp
Grid-No.1-to-Plate							
Capacitance				-	- 4	0.020	144 f
Input Capacitance				-	3.4	4.6	μμ.f
Output Capacitance .				-	2.45	3.25	µµ f
Plate Current				1,2	3.0	12.0	ma
Transconductance				1,2	3500	6500	µmhos
Reverse Grid Current				1,3	-	0.1	µamp

CURVES

are the same as shown for Type 6AK5 in the Receiving Tube Section

JAN. 1, 1953

TENTATIVE DATA

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

	•	-	
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14100			mode

9-PIN MINIATURE TYPE

SHOCK AND VIBRATION RATINGS LIFE PERFORMANCE DATA

LOW MICROPHONISM RCA DARK HEATER

"Command" Type for a Wide Variety of Applications Including: Mixers, Oscillators and Amplifiers up through the VHF Region; Multivibrators, Synchronizing Amplifiers and Industrial Control Circuits; and Mobile, Military, and Aircraft Equipment at Altitudes up to 80,000 Feet

#### GENERAL DATA

#### Electrical:

Heater Characteristics and Ratings: Voltage (AC or DC)	lts amp
Heater negative with respect to cathode	lts
respect to cathode 100 max. vo	ts
Direct Interelectrode Capacitances: <sup>a</sup> Grid to plate (Each unit)	pf
unit)	pf
unit)	pf pf
Characteristics, Class A <sub>1</sub> Amplifier (Each Unit):	
Plate Supply Voltage.150voCathode Resistor.240olAmplification Factor.35Plate Resistance (Approx.)6400ol	lts hms hms
Plate Current	nos ma
Grid Voltage (Approx.) for plate $\mu a = 10 \dots -8$ vo	lts
Mechanical:	
Operating Position	Any ial

Maximum Overall Length. 1-3/4" 0.750" to 0.875" . See General Section Dimensional Outline . Bulb. . . . . . . .T6-1/2 . .Small-Button Noval 9-Pin (JEDEC No.E9-1) Base. . . .



RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.

DATA I 8-63

Basing Designation for BOTTOM VIEW. . . . . . 8CJ Pin 6 - Plate of Pin 1-Heater 5 Pin 2-Cathode of Unit No.1 Unit No.2 Pin 7-Grid of Pin 3-Grid of Unit No.1 3 Unit No.2 Pin 8-Cathode of Pin 4 - Plate of Unit No.1 2 8 Unit No.2 Pin 9-Heater Pin 5-Internal Shieldb

#### AMPLIFIER - Class A

Values are for Each Unit

Maximum Ratings, Absolute-Maximum Values:

PLATE VOLTAGE .											330	max.	volts	
GRID VOLTAGE:														
Negative-bias	V	al	ue								55	max.	volts	
Positive-bias	V	al	ue								0	max.	volts	
CATHODE CURRENT											18	max.	ma	
GRID CURRENT											3	max.	ma	
PLATE DISSIPATI	ON										1.35	max.	watts	
BULB TEMPERATUR	Ε	(A	tl	10	tte	es	t							
point on bulb	S	ur	fa	ce	).			•			165	max.	oC	

#### Maximum Circuit Values:

Grid-Circuit Resistance . . ... 0.5 max. megohm

#### PUSH-PULL AMPLIFIER - Class AB1

Values are for Each Unit

Maximum Ratings, Design-Maximum Values:

#### Same as for AMPLIFIER - Class A.

#### Typical Operation:

Values are for Both Units

Plate Supply Voltage	300	volts	
Cathode Resistor (Common to both units) .	800	ohms	
Peak AF Grid-to-Grid Voltage	19.8	volts	
Zero-Signal Plate Current	9.8	ma	
MaxSignal Plate Current	12.6	ma	
Effective Load Resistance (Plate-to-plate)	27000	ohms	
Total Harmonic Distortion	10	%	- 6
MaxSignal Power Output (Approx.)	1	watt	

#### Maximum Circuit Values:

Grid-Circuit Resistance . 0.5 max. megohm

a without external shield.

b Pin 5 should be connected to ground.

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



#### CHARACTERISTICS RANGE VALUES

Values are For Each Unit and Are Initial Unless Otherwise Specified

Heater Current			Note	Min.	Max.	
Heater Current at 500 Hours . 1 330 375 ma Heater Current at 1000 Hours . 1 330 380 ma Direct Interelectrode Capaci- tances: Grid to plate 2 0.8 1.4 pf Grid to cathode and heater . 2 1.7 2.7 pf Plate to cathode and heater . 2 0.7 1.3 pf Plate to cathode and heater . 2 0.7 1.3 pf Plate to cathode and heater . 2 - 0.10 pf Amplification Factor 1,3 2.6 44 Plate Current (1) 1,3 5.9 10.5 ma Plate Current (2) 1,4 - 45 $\mu$ a Plate Current (2) 1,4 - 45 $\mu$ a Plate Current (3) 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 . 3 4500 6500 $\mu$ mhos Change with heater volts = 6.3 . 3 - 15 % Change at end of 500 hours with heater volts = 6.3 . 3 - 20 % Change at end of 500 hours with heater volts = 6.3 . 3 - 20 % Change at end of 500 hours Transconductance Change: Difference between average transconductance change: Difference between average transconductance initially and average transconductance as a percentage of the initial average 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours		Heater Current	1	330	370	ma
Heater Current at 1000 Hours. 1 330 380 ma Direct Interelectrode Capaci- tances: Grid to plate 2 0.8 1.4 pf Grid to cathode and heater. 2 1.7 2.7 pf Plate to cathode and heater. 2 0.7 1.3 pf Plate to plate 1,3 26 44 Plate Current (1) 1,3 5.9 10.5 ma Plate Current Difference Between Units 1,3 - 1.8 ma Plate Current (2) 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change at end of 500 hours with heater volts = 6.3 3 - 15 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 500 hours from heater volts = 5.7 3 - 15 % Transconductance initially and average transconductance after 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a		Heater Current at 500 Hours	1	330	375	ma
Direct Interelectrode Capaci- tances: Grid to plate 2 0.8 1.4 pf Grid to cathode and heater . 2 1.7 2.7 pf Plate to cathode and heater . 2 0.7 1.3 pf Plate to plate 2 - 0.10 pf Amplification Factor 1,3 26 44 Plate Current (1) 1,3 5.9 10.5 ma Plate Current (2) 1,3 - 1.8 ma Plate Current (2) 1,4 - 45 $\mu$ a Plate Current (3) 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change with heater volts = 5.7 3 - 15 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of f000 hours with heater volts = 6.3 3 - 20 % Change at end of 500 hours from heater volts = 6.3 3 - 25 % Change at end of 500 hours at the heater volts = 5.7		Heater Current at 1000 Hours	1	330	380	ma
tances: Grid to plate 2 0.8 1.4 pf Grid to cathode and heater. 2 1.7 2.7 pf Plate to cathode and heater. 2 0.7 1.3 pf Plate to plate 2 - 0.10 pf Amplification Factor 1,3 26 44 Plate Current (1) 1,3 5.9 10.5 ma Plate Current Difference Between Units 1,3 - 1.8 ma Plate Current (2) 1,4 - 45 $\mu$ a Plate Current (3) 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change at end of 500 hours with heater volts = 6.3 3 - 15 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 500 hours with heater volts = 6.3 3 - 25 % Change at end of 500 hours from heater volts = 5.7		Direct Interelectrode Capaci-				
Grid to plate $\ldots$ $2$ $0.8$ $1.4$ pfGrid to cathode and heater $2$ $1.7$ $2.7$ $pf$ Plate to plate $\ldots$ $2$ $ 0.10$ $pf$ Applification Factor $1.3$ $2.6$ $44$ Plate Current Difference $1.3$ $5.9$ $10.5$ maBetween Units $1.4$ $ 45$ $\mu a$ Plate Current (3) $1.41$ $ 45$ $\mu a$ Plate Current (3) $1.11$ $5$ $ \mu a$ Transconductance: $3$ $4500$ $6500$ $\mu$ mhosChange with heater volts $6.3$ $3$ $ 20$ Change at end of 500 hours $3$ $ 25$ $3$ with heater volts $6.3$ $3$ $ 25$ $3$ Change at end of 500 hours $3$ $ 25$ $3$ with heater volts $5.7$ $3$ $ 15$ $3$ Change at end of 500 hours $3$ $ 25$ $3$ Transconductance Change: $1.3$ $ 15$ $3$ Difference between average $1.3$ $ 15$ $3$ Reverse Grid Current at end $0$ $100$ hours $ 1.5$ $ 0.3$ $\mu a$ $1.5$ $ 0.3$ $\mu a$ Reverse Grid Current at end $0$ $1.5$ $ 0.3$ $\mu a$ Reverse Grid Current at end $0$ $1.5$ $ 0.3$ $\mu a$ Heater cathode $-$ <td>N -</td> <td>tances:</td> <td></td> <td></td> <td></td> <td></td>	N -	tances:				
Grid to cathode and heater.21.72.7pfPlate to cathode and heater20.71.3pfPlate to plate.2-0.10pfAmplification Factor.1,32644Plate Current (1)1.35.910.5maPlate-Current Difference1,3-1.8maPlate Current (2)1.4-45 $\mua$ Plate Current (3)1.115- $\mua$ Plate Current (3)1.115- $\mua$ Transconductance:With heater volts3-15With heater volts3-15%Change at end of 500 hours3-20%With heater volts = 6.33-20%Change at end of 500 hours3-20%Mith heater volts = 5.73-15%Transconductance Change:001.5-Difference between average1.3-15%Reverse Grid Current at end0500 hoursof 1000 hours1.5-0.3Reverse Grid Current at end0.7-0.5 $\mua$ Reverse Grid Current at end0.7-0.5 $\mua$ Heater negative with1.8- $\mua$ Heater obsitive with1.8- $\mua$ Heater negative with	2	Grid to plate	2	0.8	1.4	pf
Plate to cathode and heater . 2 0.7 1.3 pf Plate to plate 2 - 0.10 pf Amplification Factor 1,3 26 44 Plate Current [1] 1,3 5.9 10.5 ma Plate-Current Difference Between Units 1,3 - 1.8 ma Plate Current (2] 1,4 - 45 $\mu$ a Plate Current (3) 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change with heater volts = 6.3 3 - 15 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 1000 hours with heater volts = 6.3 3 - 20 % Change at end of 500 hours from heater volts = 6.3 3 - 25 % Change at end of 500 hours with heater volts = 6.3 3 - 25 % Change at end of 500 hours from heater volts = 6.3 3 - 25 % Change at end of 500 hours at o heater volts = 5.7		Grid to cathode and heater	2	1.7	2.7	. pf
Plate to plate 2 - 0.10 pf Amplification Factor 1,3 26 44 Plate Current Difference Between Units 1,3 5.9 10.5 ma Plate-Current Difference Between Units 1,3 - 1.8 ma Plate Current (2) 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change with heater volts = 5.7 3 - 15 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 1000 hours with heater volts = 6.3 3 - 25 % Change at end of 500 hours from heater volts = 6.3 3 - 25 % Change at end of 500 hours from heater volts = 5.7 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours sepressed as a percentage of the initial average 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours		Plate to cathode and heater .	2	0.7	1.3	pf
Amplification Factor.1,32644Plate Current (1)1,35.910.5maPlate-Current DifferenceBetween Units1,3-1.8maPlate Current (2)1,4-45 $\mua$ Plate Current (3)1,115- $\mua$ Transconductance:1,115- $\mua$ With heater volts = 6.3345006500 $\mu$ mhosChange at end of 500 hours3-15%with heater volts = 6.33-20%Change at end of 500 hours3-25%Change at end of 500 hours3-25%Change at end of 500 hours3-25%Change at end of 500 hours3-15%Transconductance Change:01.5-0.3 $\mua$ no heater volts = 6.31.5-0.3 $\mua$ ad average transconductance1.5-0.3 $\mua$ Reverse Grid Current at end5 $\mua$ of 1000 hours1.5-0.3 $\mua$ Reverse Grid Current at end $\mua$ Grid Emission Current1.5-0.3 $\mua$ Heater negative with $\mua$ Heater negative with $\mua$ Heater negat		Plate to plate	2	-	0.10	pf
Plate Current (1) 1,3 5.9 10.5 ma Plate-Current Difference Between Units 1,3 - 1.8 ma Plate Current (2) 1,4 - 45 $\mu$ a Plate Current (3) 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change with heater volts = 5.7 3 - 15 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 500 hours with heater volts = 6.3 3 - 25 % Change at end of 500 hours from heater volts = 6.3 3 - 25 % Change at end of 500 hours from heater volts = 6.3 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours		Amplification Factor	1.3	26	44	
Plate-Current Difference Between Units 1,3 - 1.8 ma Plate Current (2) 1,4 - 45 $\mu$ a Plate Current (3) 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change with heater volts = 5.7 3 - 15 % Change at end of 500 hours with heater volts = 6.3 . 3 - 20 % Change at end of 1000 hours with heater volts = 6.3 . 3 - 25 % Change at end of 500 hours from heater volts = 6.3 . 3 - 25 % Change at end of 500 hours from heater volts = 6.3 . 3 - 25 % Change at end of 500 hours from heater volts = 5.7 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 6.7 - 0.5 $\mu$ a Heater cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode		Plate Current (1)	1.3	5.9	10.5	ma
Between Units 1.3 - 1.8 ma Plate Current (2) 1,4 - 45 $\mu_a$ Plate Current (3) 1,11 5 - $\mu_a$ Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change with heater volts = 5.7 3 - 15 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 500 hours with heater volts = 6.3 3 - 25 % Change at end of 500 hours from heater volts = 6.3 3 - 25 % Change at end of 500 hours if theater volts = 5.7 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,5 - 0.3 $\mu_a$ Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu_a$ Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu_a$ Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu_a$ Heater cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 $\mu_a$ Heater negative with respect to cathode 1,8 - 7 $\mu_a$ Heater negative with respect to cathode 1,8 - 7 $\mu_a$ Heater positive with respect to cathode 1,8 - 7 $\mu_a$		Plate-Current Difference				
Plate Current (2) 1,4 - 45 $\mu$ a Plate Current (3) 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change with heater volts = 3 - 15 % Change at end of 500 hours with heater volts = 6.3 . 3 - 20 % Change at end of 1000 hours with heater volts = 6.3 . 3 - 25 % Change at end of 500 hours from heater volts = 6.3 . 3 - 25 % Change at end of 500 hours from heater volts = 6.3 . 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours	0	Between Units	1,3		1.8	ma
Plate Current $(3)$ 1,11 5 - $\mu$ a Transconductance: With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change with heater volts = $6.3$ . 3 - 15 % Change at end of 500 hours with heater volts = $6.3$ . 3 - 20 % Change at end of 1000 hours with heater volts = $6.3$ . 3 - 25 % Change at end of 500 hours from heater volts = $6.3$ . 3 - 25 % Change at end of 500 hours from heater volts = $6.3$ . 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours		Plate Current (2)	1,4	—	45	μa
Transconductance: With heater volts = $6.3 \dots 3$ 4500 $6500 \mu$ mhos Change with heater volts = $5.7 \dots 3$ - 15 % Change at end of 500 hours with heater volts = $6.3 \dots 3$ - 20 % Change at end of 1000 hours with heater volts = $6.3 \dots 3$ - 25 % Change at end of 500 hours from heater volts = $6.3 \dots 3$ - 25 % Change at end of 500 hours from heater volts = $5.7 \dots 3$ - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours		Plate Current (3)	1,11	5	-	μa
With heater volts = 6.3 3 4500 6500 $\mu$ mhos Change with heater volts = 5.7 3 - 15 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 1000 hours with heater volts = 6.3 3 - 25 % Change at end of 500 hours from heater volts = 6.3 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours		Transconductance:				
Change with heater volts = 5.7		With heater volts = 6.3	3	4500	6500	µmhos
= 5.7 $3$ - 15 % Change at end of 500 hours with heater volts = 6.3 3 - 20 % Change at end of 1000 hours with heater volts = 6.3 . 3 - 25 % Change at end of 500 hours from heater volts = 6.3 . 3 - 25 % Change at end of 500 hours from heater volts = 5.7 . 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode		Change with heater volts				
Change at end of 500 hours with heater volts = 6.3 . 3 - 20 % Change at end of 1000 hours with heater volts = 6.3 . 3 - 25 % Change at end of 500 hours from heater volts = 6.3 . 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current at end of 500 hours 1,5 - 0.3 µa Reverse Grid Current at end of 1000 hours		= 5. /	3	-	15	%
<pre>with neater volts = 6.3 3 - 20 % Change at end of 1000 hours with heater volts = 6.3 . 3 - 25 % Change at end of 500 hours from heater volts = 6.3 to heater volts = 5.7 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,5 - 0.3 µa Reverse Grid Current at end of 1000 hours 1,5 - 0.3 µa Grid Emission Current 6.7 - 0.5 µa Heater negative with respect to cathode 1,8 - 7 µa Heater negative with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode</pre>		Change at end of 500 hours	-		~~~	~
Change at end of 1000 hours with heater volts = $6.3 \cdot . 3 - 25$ % Change at end of 500 hours from heater volts = $6.3$ to heater volts = $5.7 \cdot . 3 - 15$ % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average $1.3 - 15$ % Reverse Grid Current at end of 500 hours $1.5 - 0.3$ µa Reverse Grid Current at end of 1000 hours $6.7 - 0.5$ µa Heater negative with respect to cathode $1.8 - 7$ µa Heater positive with respect to cathode $1.8 - 7$ µa Heater positive with respect to cathode $1.8 - 7$ µa Heater positive with respect to cathode $1.8 - 7$ µa		with heater volts = 6.3	3	-	20	%
with neater volts = 6.3 3 - 25 % Change at end of 500 hours from heater volts = 6.3 to heater volts = 5.7 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours		Change at end of 1000 hours	0		05	~
Change at end of 500 hours from heater volts = 6.3 to heater volts = 5.7 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 6.7 - 0.5 $\mu$ a Heater cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a		with heater volts = 6.3	3	-	25	%
Trom heater volts = 6.3 to heater volts = 5.7 3 - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Grid Emission Current 6,7 - 0.5 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a		Change at end of 500 hours				
to heater volts = 5.7 $3$ - 15 % Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current. 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 6,7 - 0.5 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a		from heater volts = 6.3	0		45	~
Transconductance Change: Difference between average transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average $\dots \dots \dots 1,3 - 15$ % Reverse Grid Current $\dots \dots 1,5 - 0.3$ µa Reverse Grid Current at end of 500 hours $\dots \dots \dots 1,5 - 0.3$ µa Reverse Grid Current at end of 1000 hours $\dots \dots \dots 1,5 - 0.3$ µa Grid Emission Current $\dots 6,7 - 0.5$ µa Heater-Cathode Leakage Current: Heater negative with respect to cathode. $\dots 1,8 - 7$ µa Heater negative with respect to cathode. $\dots 1,8 - 7$ µa Heater negative with respect to cathode. $\dots 1,8 - 7$ µa Heater positive with respect to cathode. $\dots 1,8 - 7$ µa Heater positive with respect to cathode. $\dots 1,8 - 7$ µa		to heater volts = 5./	3	-	15	%
transconductance initially and average transconductance after 500 hours expressed as a percentage of the initial average $\dots \dots 1,3 - 15$ % Reverse Grid Current $\dots 1,5 - 0.3$ µa Reverse Grid Current at end of 500 hours $\dots \dots 1,5 - 0.3$ µa Reverse Grid Current at end of 1000 hours $\dots \dots 1,5 - 0.3$ µa Grid Emission Current $\dots 6.7 - 0.5$ µa Heater cathode Leakage Current: Heater negative with respect to cathode. $\dots 1,8 - 7$ µa Heater negative with respect to cathode. $\dots 1,8 - 7$ µa Heater negative with respect to cathode. $\dots 1,8 - 7$ µa Heater negative with respect to cathode. $\dots 1,8 - 7$ µa Heater negative with respect to cathode. $\dots 1,8 - 7$ µa Heater positive with respect to cathode. $\dots 1,8 - 7$ µa		Transconductance Change:				
and average transconductance after 500 hours expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 6,7 - 0.5 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a		Difference between average				
after soon hours expressed as a percentage of the initial average $\dots \dots 1,3 - 15$ % Reverse Grid Current $\dots 1,5 - 0.3$ $\mu a$ Reverse Grid Current at end of 500 hours $\dots \dots 1,5 - 0.3$ $\mu a$ Reverse Grid Current at end of 1000 hours $\dots \dots 1,5 - 0.3$ $\mu a$ Grid Emission Current $\dots 6,7 - 0.5$ $\mu a$ Heater-Cathode Leakage Current: Heater negative with respect to cathode $\dots 1,8 - 7$ $\mu a$ Heater negative with respect to cathode $\dots 1,8 - 7$ $\mu a$ Heater negative with respect to cathode $\dots 1,8 - 7$ $\mu a$ Heater negative with respect to cathode $\dots 1,8 - 7$ $\mu a$ Heater positive with respect to cathode $\dots 1,8 - 7$ $\mu a$ Heater positive with respect to cathode $\dots 1,8 - 7$ $\mu a$		and average transconductance				
as a percentage of the initial average 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Grid Emission Current 6,7 - 0.5 $\mu$ a Heater -Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode		after 500 hours expressed				
initial average 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Grid Emission Current 6,7 - 0.5 $\mu$ a Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater costive with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a		arter 500 nours expressed				
Initial addrage1,21,2 $\mu$ aReverse Grid Current at end of 500 hours.1,50.3 $\mu$ aReverse Grid Current at end of 1000 hours.1,50.3 $\mu$ aReverse Grid Current at end of 1000 hours.1,50.3 $\mu$ aGrid Emission Current .6,70.3 $\mu$ aHeater-Cathode Leakage Current: Heater positive with respect to cathode.1,87 $\mu$ aHeater-Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode.1,87 $\mu$ aHeater positive with respect to cathode.1,87 $\mu$ aHeater positive with respect to cathode.1,87 $\mu$ aHeater positive with respect to cathode.1,87 $\mu$ a		initial average	13	-	15	0%
Reverse Grid Current at end of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Grid Emission Current 6,7 - 0.5 $\mu$ a Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode		Reverse Grid Current	1 5	-	03	112
of 500 hours 1,5 - 0.3 $\mu$ a Reverse Grid Current at end of 1000 hours 1,5 - 0.3 $\mu$ a Grid Emission Current 6,7 - 0.5 $\mu$ a Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater negative with respect to cathode		Reverse Grid Current at end	1,0		0.7	pice
Reverse Grid Current at end1,50.3 $\mu a$ of 1000 hours1,50.3 $\mu a$ Grid Emission Current6,70.5 $\mu a$ Heater-Cathode Leakage Current: $heater$ negative with $heater$ negative withrespect to cathode1,87Heater positive with $\mu a$ respect to cathode $heater$ Heater positive with $heater$ respect to cathode $heater$ Heater negative with $\mu a$ respect to cathode $heater$ $\mu a$ $\mu a$ Heater positive with $\mu a$ $\mu a$ $\mu a$ $\mu a$ $\mu a$		of 500 hours	1 5	_	03	112
of 1000 hours $\dots \dots 1,5$ - 0.3 $\mu a$ Grid Emission Current $\dots 6,7$ - 0.5 $\mu a$ Heater-Cathode Leakage Current: Heater positive with respect to cathode. $\dots 1,8$ - 7 $\mu a$ Heater Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode. $\dots 1,8$ - 7 $\mu a$ Heater negative with respect to cathode. $\dots 1,8$ - 7 $\mu a$ Heater negative with respect to cathode. $\dots 1,8$ - 7 $\mu a$		Reverse Grid Current at end	1,0		0./	pro
Grid Emission Current $\dots$ $1,3$ $ 0.5$ $\mu$ a Heater-Cathode Leakage Current: Heater positive with respect to cathode. $\dots$ $1,8$ $ 7$ $\mu$ a Heater positive with respect to cathode. $\dots$ $1,8$ $ 7$ $\mu$ a Heater-Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode. $\dots$ $1,8$ $ 7$ $\mu$ a Heater positive with respect to cathode. $\dots$ $1,8$ $ 7$ $\mu$ a		of 1000 hours	1 5	-	03	113
Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa Heater-Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa		Grid Emission Current	6,7	-	0.5	112
Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a Heater-Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode 1,8 - 7 $\mu$ a Heater positive with respect to cathode 1,8 - 7 $\mu$ a		Heater-Cathode Leakage Current:	0,7		0.0	pice
respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa Heater-Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode 1,8 - 7 µa Heater positive with respect to cathode 1,8 - 7 µa	1	Heater negative with				
Heater positive with respect to cathode $1.8 - 7$ $\mu a$ Heater-Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode $1.8 - 7$ $\mu a$ Heater positive with respect to cathode $1.8 - 7$ $\mu a$		respect to cathode	1.8	-	7	μa
respect to cathode 1,8 - 7 $\mu a$ Heater-Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode 1,8 - 7 $\mu a$ Heater positive with respect to cathode 1,8 - 7 $\mu a$		Heater positive with				
Heater-Cathode Leakage Current at end of 500 hours: Heater negative with respect to cathode 1,8 - 7 μa Heater positive with respect to cathode 1,8 - 7 μa		respect to cathode	1,8	-	7	μa
at end of 500 hours: Heater negative with respect to cathode 1,8 - 7 μa Heater positive with respect to cathode 1,8 - 7 μa		Heater-Cathode Leakage Current				
Heater negative with respect to cathode 1.8 - 7 μa Heater positive with respect to cathode 1.8 - 7 μa		at end of 500 hours:				
respect to cathode 1,8 - 7 μa Heater positive with respect to cathode 1,8 - 7 μa		Heater negative with			-	
Heater positive with respect to cathode 1,8 - 7 μa	1	respect to cathode	1,8	-	7	μa
respect to cathode 1,8 - / µa		Heater positive with	1.0		7	
		respect to cathode	1,8	-	1	μa



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	Note	Min.	Max.		
Heater-Cathode Leakage Current at end of 1000 Hours: Heater ponative with					Ċ
respect to cathode Heater positive with	1,8	-	7	μa	
respect to cathode	1,8	-	7	μa	
Leakage Resistance: Between grid and all other					
electrodes tied together. Between plate and all other	1,9	100		megohms	
electrodes tied together.	1,10	100	-	megohms	
end of 500 hours: Between grid and all other					
electrodes tied together. Between plate and all other	1,9	50	-	megohms	
electrodes tied together.	1,10	50	-	megohms	C

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

Note 2: With no external shield.

- Note 3: With dc plate supply voltage of 150 volts, cathode resistor of 240 ohms, and cathode bypass capacitor of 1000 μf. Each unit is tested separately. Electrodes of units not under test are grounded.
- Note 4: With dc plate voltage of 150 volts, plate load resistance of 0.25 megohm, and dc grid voltage of -10 volts. Each unit is tested separately. Electrodes of unit not under test are grounded.
- Note 5: With dc plate supply voltage of 150 volts, grid resistor of 0.5 megohm, cathode resistor of 240 ohms, and cathode bypass capacitor of 1000 µf. Each unit istested separately. Electrodes of unit under test are grounded.

Note 6: With 7.5 volts ac or dc on heater.

Note 7: With dc plate voltage of 150 volts, grid resistor of 0.5 megohm, and dc grid voltage of -10 volts. Each unit is tested separately. Electrodes of unit not under test are grounded.

- Note 8: With 100 volts dc between heater and cathode.
- Note 9: With grid 100 volts negative with respect to all other electrodes tied together.
- Note 10: With plate 300 volts negative with respect to all other electrodes tied together.

Note 11: With dc plate voltage of 150 volts and dc grid voltage of -4 volts.

#### SPECIAL TESTS & PERFORMANCE DATA

#### 600-g Shock Test:

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in four different positions to an impact acceleration of 600 g. At the end of this test, tubes will not show permanent or temporary shorts, or open circuits, and are required to meet established limits for low frequency vibration, heater cathode leakage current, transconductance, and reverse grid current.

#### Fatigue Test:

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and are subjected to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours in each of three positions. At the end of this test,



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tubes will not show permanent or temporary shorts, or open circuits, and are required to meet established limits for low frequency vibration, heatercathode leakage current, transconductance, and reverse grid current.

#### Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: Plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 tied to grid of unit No.2, ac heater volts = 6.3, plate supply volts = 150, dc grid volts = -3, plate load resistor (ohms) = 2000 and vibrational acceleration = 10 g at 40 cycles per second. The rms output voltage across the plate load resistor as aresult of vibration of the tube must not exceed 130 millivolts.

#### Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. Tubes will withstand a minimum of 2000 cycles of intermittent operation under the following conditions: ac heater voltage of 7.5 volts cycled one minute on, one minute off, with heater at a potential of +135 volts with respect to cathode, all other elements disconnected. At the end of this test, tubes will not show open heaters, open cathodes, heatercathode shorts or excessive heater-cathode leakage.

#### Audio-Frequency Noise and Microphony Performance:

This test is performed on a sample lot of tubes from each production run, under the following conditions: Plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 to plate of unit No.2, ac heater volts = 6.3, cathode resistor (ohms) = 240, plate supply volts = 250, and plate load resistor (ohms) = 10,000. The output voltage must be less than 200 mv ac when the tube is tapped.

#### Shorts and Continuity Test (Thyratron-Type Detector Circuit):

This test, in addition to a 100% factory test, is performed on a sample lot of tubes from each production run. A tube is considered inoperative if either unit shows a permanent or temporary short or open circuit or avalue of reverse grid current in excess of I microampere under the conditions specified in the *Characteristics Range Values* for reverse grid current.

#### Grid-Pulse Emission Test:

This test is performed on a sample lot of tubes from each production run, under the following conditions: a cheater volts = 6.3, plate volts = 150, grid driven 30 volts positive, from a cutoff bias of -30 volts dc, with a 10 microsecond pulse at a pulse repetition rate of 1000 pulsesper second. Tubes must meet a minimum peak current value of 270 milliamperes.

#### AC Emission Test:

This test is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 5.0, plate volts = 100, and grid volts (rms) = 5.0. Tubes must meet a limit dc plate current of 11 milliamperes.



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#### 2- and 20-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run, under the following conditions: ac heater volts = 6.3, plate supply volts = 150, cathode resistor each unit (ohms) = 240, grid resistor each unit (megohm) = 0.5, dc heater to cathode voltage of 135 volts (heater positive with respect to cathode), and room temperature. The value of transconductance measured at the end of two and twenty hours, must be within 10 per cent of the initial reading.

#### 100-hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. The conditions are the same as for the two and twenty hour Stability Life Performance except that the heater is switched off once every two hours and the tube cools with electrode potentials applied. A tube is considered inoperative at the end of 100 hours total heater-on time if it shows a permanent short, open circuit, or a value of reverse grid current in excess of I microampere measured under the conditions specified in Characteristics Range Values for reverse grid current. Tube must also meet minimum gm limit.

#### 500-hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. The conditions for life test are as given above for the two and twenty hour Stability Life Performance Test except that the bulb temperature is maintained at 165° C. At the end of 500 hours total heater-on time tubes must not show any shorts or open circuits and must pass the established 500 hours limits of heater current, reverse grid current, heater cathode leakage current, transconductance changes and leakage resistance shown under Characteristics Range Values.

#### 1000-hour Intermittent Life Performance:

This test is performed on a minimum of one production run per month under the same condition as the 500 hour Intermittent Life Performance. At the end of 1000 hours total heater-on time, tubes must not show permanent or temporary shorts or open circuits and must pass the established 1000-hour limits for heater current, transconductance change, reverse grid current and heater cathode leakage current shown under the Characteristics Range Values.










# BEAM POWER TUBE

SREALING TYPE 9-PIN MINIATURE TYPE For af or rf power-amplifier applications at frequencies up to 160 Mc

## GENERAL DATA

E	lectr	ical	:
_			

Volta	ae.					6.3				ac	or	dc	volts
Curre	nt					0.35							amp

	Without External Shield	With External Shield <sup>0</sup>	
Grid No.1 to plate	0.11 max.	0.08 max.	μµf
Grid No.1 to cathode & grid No.3, grid No.2, and heater.	6.4	6.5	μµf
Plate to cathode & grid No.3, grid No.2, and heater.	4	8.5	μµf

## Mechanical:

Operat	in	q P	osi	ti	on									•											. Ar	۱y
Maximu	m (	Öve	ral	1	Ler	ngt	h																2	-3	/16	;"
Maximu	m :	Sea	tec	L	end	ith							÷										1-	15	/16	3"
Lenath		Bas	e S	Sea	tť	o E	Bul	b	То	p	(E)	kc1	uc	dir	ng	t	ip)	).		1-9	31:	16	' ±	: 3	132	2"
Diamet	er																		0	. 75	50		to	0.	875	5"
Dimens	io	nal	01	ut1	ine													See	0	Fer	ier	ral	S	ec	tic	n
Bulb .																								Τ6	-1	12
Base .							Sm	al	11-	-B	utt	tor	1 1	Vov	va	1 9	9-F	Pir	1	(JE	ED	EC	No	.E	9-	1)
Basi	ng	De	sic	na	tic	n	fo	r	B	T	TON	N N	118	EW											. 9	ЭĠ

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



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

## AUDIO-FREQUENCY POWER AMPLIFIER - Class A,

4-59	ELECTRON	TUBE	DIV	ISIC	N		TENT	ATIVE	DATA 1
<sup>O</sup> : See next page.									
Grid-No.2 Voltage							250		volts
Plate Voltage							250		volts
Typical Operation and	d Charact	eris	tic	s:					
Heater positive wi	th respec	t to	ca	the	ode	э.	100	max.	volts
Heater negative wi	th respec	t to	ca	the	ode	э.	100	max.	volts
PEAK HEATER-CATHODE	/OLTAGE:								
PLATE DISSIPATION							8.25	max.	watts
GRID-No.2 INPUT							3.3	max.	watts
GRID-No.2 (SCREEN-GR	D) VOLTA	GE.					275	max.	volts
PLATE VOLTAGE							275	max.	volts



# BEAM POWER TUBE

Grid-No.1 (Control-Grid) Voltage12.5voltsPeak AF Grid-No.1 Voltage.12.5voltsZero-Signal Plate Current.27maZero-Signal Grid-No.2 Current.3maPlate Resistance (Approx.).45000ohmsTransconductance.3100µmhosLoad Resistance.9000ohmsMaxSignal Power Output.2.7watts	C
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance: For fixed-bias operation0.1 max. megohm For cathode-bias operation0.5 max. megohm	C
RADIO-FREQUENCY POWER AMPLIFIER - Class C	
Maximum Ratings, Absolute Values:	
PLATE VOLTAGE       275 max. volts         GRID-No.2 (SCREEN-GRID) VOLTAGE       275 max. volts         GRID-No.1 (CONTROL-GRID) VOLTAGE       -165 max. volts         PLATE CURRENT       44 max. ma         GRID-No.2 CURRENT       16.5 max. ma         GRID-No.1 CURRENT       3.3 max. ma         PLATE INPUT       11 max. watts         GRID-No.2 INPUT       3.3 max. watts         PLATE DISSIPATION       8.25 max. watts         PEAK HEATER-CATHODE VOLTAGE:       100 max. volts         Heater positive with respect to cathode.       100 max. volts	
Typical Operation:	
At frequencies up to 160 Mc	
Plate Voltage         250         250         volts           Grid-No.2 Voltage         180         250         volts           Grid-No.1 Voltage         -30         -50         volts           From grid-No.1 resistor of         15000         25000         ohms           Peak RF Grid-No.1 Voltage         50         75         volts           Plate Current          30         40         ma           Grid-No.2 Current (Approx.)         6.5         10.5         ma           Grid-No.1 Current (Approx.)         2         2         ma           RF Grid-No.1 Driving Power	0
(Approx.)         0.1         0.15         watt           Power Output (Approx.)         5         6.5         watts           Useful Power Output at 125 Mc         -         5.25         watts	
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance 50000 max. ohms	0
<sup>O</sup> With external shield JEDEC No.315 connected to cathode & grid No.3.	

ELECTRON TUBE DIVISION TENTATIVE DATA 1



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## BEAM POWER TUBE

### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

This test is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in four different positions to an impact acceleration of 450 g.

### Fatigue Rating:

This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected to 2.5 g vibrational acceleration at a fixed frequency of 25 cycles per second for 100 hours in each of three positions.

#### Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. Tubes will withstand a minimum of 2000 cycles of intermittent operation under the following conditions: heater volts = 7.5 cycled one minute on and one minute off, heater 100 volts positive with respect to cathode, and all other elements connected to ground.





# MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

## GENERAL DATA

Electrical:					
Heater, for Unipotent	tial Catho	odes:	Paralle	1	
Voltage		12.6	6.3 0.9	ac or	dc volts
Direct Interelectrode	e Capacita	ances (	Approx.)	:0	ц <i>ш</i>
Grid to cathode and Plate to cathode a	d heater	(Each u	nit)	. 4	1 μμ
Unit No.1				. 0.6	δ μμ
Heater to cathode	(Each uni	t)		. 0	5 µµ 7 µµ
Grid to grid				. 0.025	δ μμ
Plate to plate		· · ·	• • • •	. 0.75	ο μμ
Characteristics, Cla	ss A <sub>1</sub> Amp	lifier	(Each Un	it):	
Plate Voltage		1:	20 18	0 250	) volt
Grid Voltage Amplification Eactor		-	-2 - 18 1	7 -12.3	o volt
Plate Resistance (App	prox.)	15	50 200	0 3000	) O ohm
Transconductance		115	00 850	0 5400	) µmho
Grid Voltage (Approx		-	20 2	> 1	2 11
plate $\mu a = 100$ .			-9 -1	4 -19	9 volt
Mechanical:					
Operating Position. Maximum Overall Leng Maximum Seated Lengt	 th h		· · · · ·		An . 2-3/16 1-15/16
Length, Base Seat to Diameter Dimensional Outline	Bulb lop • • • • • •	(Exclud	ing tip) •••• ••• Se	. 1-9716 0.750" e Genera	to 0.875 <i>l Sectio</i>
Base	.Small-Bu for BOTT	tton No OM VIEW	val 9-Pi	n (JEDEC	No.E9-1
Pin 1-Plate of Unit No.2		$\sim$	Pi	n 6-Cat Un	hode of it No.1
Pin 2-Grid of Unit No.2	a)	5	Pi	n 7-Gri	d of it No.1
Pin 3-Cathode of Unit No.2	3		ン Pi	in 8-Hea Mi	ter d-Tap
Pins 4 &8 - Heater	of ex	N	e) Pi	in 9-Pla Un	te of it No.1
Pins 5&8-Heater Unit N	of 0.1	0			



# MEDIUM-MU TWIN TRIODE

AMPLIFIER — Class A<sub>1</sub> Values are for Each Unit

## Maximum Ratings, Absolute Values:

5081

PLATE VOLTAGE.													330	max.	volts
GRID CURRENT .													6.6	max.	ma
PLATE DISSIPAT	ION:														1.1
Either plate													4.2	max.	watts
Both plates	(Bot	hι	init	S	ope	era	at	in	a)				7.5	max.	watts
PEAK HEATER-CA	THOD	EV	OLT	AG	E:										
Heater negat	ive	wit	h r	es	pe	ct	t	0 0	cat	the	ode	2.	100	max.	volts
Heater posit	ive	wit	h r	es	pe	ct	t	0 0	cat	the	ode	э.	100	max.	volts
BULB TEMPERATU	RE (	At	hot	te	st	p	oi	nt							
on bulb surf	ace)									•			220	max.	°C
Maximum Circui	t Va	lue	s:												

Grid-Circuit Resistance. . . . . . . . . . 1 max. megohm

<sup>O</sup> Without external shield.

TENTATIVE DATA



SPLCIMO



Intended for critical industrial applications where 10,000-hour life, extreme uniformity, rigid construction, and exceptional stability are paramount. Within its ratings, the 5691 may be used to replace its receiving-tube counterpart, type 6SL7-GT, where heater transformer will carry increased current.

	GENER	AL DA	ATA			
Electrical:						
Heater, for Unipotential Voltage Current Direct Interelectrode Ca	Catho . ( pacito	odes: 6.3 ± 0.6 ances	5%* 	ac	or dc	volt: . am
Triode No.1: Grid to Plate Grid to Cathode Plate to Cathode	::		<u>Min</u> 3.1 1.9 1.8	$     \frac{Av.}{3.6}     2.4     2.3 $	Max. 4.1 2.9 2.8	нн нн нн
Triode No.2: Grid to Plate Grid to Cathode Plate to Cathode	 		3.1	3.6 2.7 2.6	4.1 3.2 3.1	руд Гурд Гурд
Plate of Triode No.1 t Plate of Triode No.2	•		0.27	0.32	0.37	щ
* May deviate ±10% from rate less than 2% of the operat O With no external shield.	d valu ing tir	e prov me.	ided suc	h deviati	on occu	rs fo
Mechanical:						
Mounting Position Maximum Overall Length . Maximum Seated Length . Maximum Diameter Bulb Base	· · · · · · · · · · ·	   	•••• •••• •••• rt Inte	ermediate	2- 2- 1- e-Shell	An -7/8 5/16 9/32 T- Octa
Basing Designation for	BOTT	OM VI	EW	· · · · ·	- нуgros	88
Pin 1-Grid of Triode No.2 Pin 2-Plate of Triode No.2 Pin 3-Cathode of Triode No.2 Pin 4-Grid of Triode No.1				Pin 5 - P Pin 6 - Ca Pin 7 - Ha Pin 8 - Ha	late of Triode N athode o Triode N eater eater	0.1 f 0.1



# HIGH-MU TWIN TRIODE

INDUSTRIAL	SERVICE	tio ambli	fiors	
Values applications such as	s ac ana au	+	11075	
Maximum Patinga Abaaluta Valuas	euch uni	L		
maximum katings, Absolute values	•	07	-	1.
DC PLATE VULTAGE		. 21	o max.	volts
GRID VOLTAGE:		• 22	J max.	VOILS
Negative bias range	1° min	. to 100	) max.	volts
Negative peak value		. 200	) max.	volts
DC GRID CURRENT.		•	2 max.	ma
DC CATHODE CURRENT		. 10	) max.	ma
PLATE DISSIPATION		•	l max.	wat
PEAK HEATER-CATHODE VOLTAGE:		1.00		1.
Heater negative with respect to	cathode.	. 100	) max.	volts
Heater positive with respect to	cathode.	. 100	max.	volts
AMBIENI TEMPERATURE RANGE		00	10 +90	) -(
For resistance-coupled amplifier appas low as 0.5 volt.	plications,	the negat	ive bias	s may b
Aavimum Circuit Value (for any o	nerating	conditi		
aximum cricult value (lor any o	perating	conurci	5117.	
arid-Circuit Resistance		• •	2 max.m	egohm
haracteristics and Range Values	:			
Heater Volts, 6.3; Plate Vo	lts, 250; G	rid Volts	, -2	
	Min.	Av.	Mar.	
Lotter Connect	0 55	0.0	0.05	
leater Cathede Current with	0.00	0.0	0.05	am
heater cathode voltage of				
+ 100 volts	-	-	5	uam
Plate Current	1 7	23	29	main
)ifference in Plate Current	4.7	2.)	2.0	TIR
between triode units	-	_	0.9	ma
Plate Current for grid volt-			,0.0	
age of -5.5 volts	-	-	15	μamr,
Reverse Grid Current	-	- 1-1-	0.2	<i>µ</i> amp
Amplification Factor	60	70	80	
Plate Resistance	-	44000	-	ohms
ransconductance	1300	1600	1900	µmhos
voical Operation as Resistance-	Coupled A	molifier	(Fach	Init
			(	
See RESISTANCE-COUPLED AMPLIF	IER CHART	NO.7 at	front	of
Receiving 140	e Section			

5691

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



MAR. 15, 1948











# MEDIUM-MU TWIN TRIODE

Intended for critical industrial applications where 10,000-hour life, extreme uniformity, rigid construction, and exceptional stability are paramount. Within its ratings, the 5692 may be used to replace its receiving-tube counterpart, type 6SN7-GT.

	Rent - Arrest - Arrest - Arrest		des sette anne des second
	GENERAL DATA		
Electrical:			
Heater, for Unipotentia Voltage Current Direct Interelectrode C	1 Cathodes: • 6.3 ± 5%* • 0.6 • • apacitances: <sup>0</sup>	ac	or dc volt: amj
Triode No.1: Grid to Plate Grid to Cathode Plate to Cathode .		n.         Av.           .0         3.5           .8         2.3           .0         2.5	<u>Мах.</u> 4.0 µµ 2.8 µµ 3.0 µµ
Triode No.2: Grid to Plate Grid to Cathode Plate to Cathode .	· · · · · · 2 · · · · · · 2 · · · · · 2 2	.8 3.3 .1 2.6 .2 2.7	3.8 µµ 3.1 µµ 3.2 µµ
Plate of Triode No.1 Plate of Triode No.	to 20.	27 0.32	0.37 <i>щ</i>
* Heater voltage may devia ation occurs for less th O with no external shield.	te ± 10\$ from rated an 2\$ of the operati	value, provid ng time.	ed such devi
Mounting Position Maximum Overall Length Maximum Diameter Bulb Basing Designation for Pin 1 - Grid of Triode No.2 Pin 2 - Plate of Triode No.2 Pin 3 - Cathode of Triode No.2 Pin 4 - Grid of Triode No.1	Short In or BOTTOM VIEW .	termediate- 8-Pin, Non- Pin 5- Pla Tr Pin 6-Cat Tr Pin 7- Hea Pin 8- Hea	An. 2-7/8 2-5/16 1-9/32 Shell Octa Hygroscopi 88 te of idde No.1 hode of idde No.1 ter ter
(c	ontinued on next pag	e)	
MAP 15 1948		TE	NTATIVE DA



## MEDIUM-MU TWIN TRIODE

Including applications such as dc amplifiers, audio amplifiers.
and relaxation oscillators. Values are for each unit
laximum Ratings, Absolute Values:
C PLATE VOLTAGE
Negative bias range 1º min. to 100 max. volts Negative peak value 200 max. volts XC GRID CURRENT 2 max. ma XC CATHODE CURRENT
Heater negative with respect to cathode.       100 max. volts         Heater positive with respect to cathode.       100 max. volts         AMBIENT TEMPERATURE RANGE.       -55 to +90 °C
For resistance-coupled amplifier applications, the negative bias may be as low as 0.5 volt.
Maximum Circuit Value (for any operating condition):
Grid-Circuit Resistance 2 max.megohms
haracteristics and Range Values: Heater Tolts, 6.3; Plate Tolts, 250; Grid Tolts, -9
leater Current 0.55 0.6 0.65 amp leater-Cathode Current with beater-cathode voltage of
$\pm$ 100 volts 5 $\mu$ amp Plate Current 4.8 6.5 8.2 ma Difference in Plate Current
between triode units – – 2.0 ma Plate Current for grid volt-
age of -24 volts 15 μamp Reverse Grid Current 0.2 μamp Implification Factor 18 20 22 Plate Resistance 9100 - ohms
ransconductance
ypical Operation as Kesistance-Coupled Amplifier (Each Unit) See RESISTANCE-COUPLED AMPLIFIER CHART No.13 at front of Receiving Tube Section.
OUTLINE DIMENSIONS for the 5692 are the same as those shown for type 5691

MAR. 15, 1948

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TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY









# SHARP-CUTOFF PENTODE

Intended for critical industrial applications where 10,000-hour life, extreme uniformity, rigid construction, and exceptional stability are paramount. Within its ratings, the 5693 may be used to replace its receiving-tube counterpart, type 6SJ7.

2	T MI	ED/	1	DA.	TA
u	EN	ERA	۱L	UA	IA.

# Electrical:

MAR. 15, 1948 TUBE DEPARTMENT	TENTATIVE DATA
See next page.	
DC GRID-No.2 (SCREEN) VOLTAGE▲ DC GRID-No.2-SUPPLY VOLTAGE	125 max. volts 330 max. volts
Negative bias value	-100 max. volts
DC PLATE VOLTAGE	300 max. volts 330 max. volts
Maximum Ratings, Absolute Values:	
Includes applications such as dc and resistan	ce-coupled amplifiers
	A+
Pin 1- Shell Pin 2- Heater Pin 3- Grid No.3 Pin 4- Grid No.1 () () (8)	Pin 5- Cathode Pin 6-Grid No.2 Pin 7-Heater Pin 8-Plate
Mounting Position	Any 2-5/8" 1-31/32" ± 3/32" 
With shell connected to cathode.	
* May deviate ± 10% from rated value provided su less than 2% of the operating time.	uch deviation occurs for
Grid to Plate	<u>ли.</u> – 0.005 µµf 5.3 5.8 µµf 6.2 6.8 µµf
Heater, for Unipotential Cathode: Voltage	ac or dc volts amp



## SHARP-CUTOFF PENTODE

GRID-No.1 (CONTROL-GRID) VOLTAGE:		P
Negative bias range1" min. to	o -50 max. volts	
Negative peak value	-50 max. volts	
DC CATHODE CURRENT	10 max. ma	
PLATE DISSIPATION	2 max. watts	
GRID-NO.2 DISSIPATION	0.3 max. watt	
PEAK HEATER-CATHODE VOLTAGE:		h
Heater negative with respect to cathode.	100 max. volts	13
Heater positive with respect to cathode.	100 max. volts	
AMBIENT TEMPERATURE RANGE	-55 to +90 °C	

### Maximum Circuit Value:

5697

See curve on a following page giving maximum values of the grid-No.1 resistor.

#### Characteristics and Range Values:

Heater volts, 6.3; Plate Volts, 250; Grid-No.3 Volts, 0; Grid-No.2 Volts, 100; Grid-No.1 Volts, -3.

	Min.	Av.	Max.	
Heater Current	0.275	0.300	0.325	amp
Heater-Cathode Current with heater-cathode voltage				
of ± 100 volts	-	-	5	µamp
Plate Current	2.3	3.0	3.7	ma
Plate Current for grid-No.1				
voltage of -7.5 volts	2	30	80	μamp
Plate Current for grid-No.3				
voltage of -70 volts	150	450	750	µamp
Grid-No.2 Current	0.60	0.85	1.10	ma
Reverse Grid-No.1 Current	-	-	0.1	µamp
Plate Resistance	1.0	-		megohm
Transconductance	1400	1650	1900	umhos

Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART No. 20 at front of Receiving Tube Section.

The 5693 may be operated at a grid-No.2 voltage as high as the rated grid-No.2 supply voltage when the grid-No.2 dissipation rating is not exceeded for any signal condition and when a resistor is used in series with grid-No.2 and its supply voltage.

For resistance-coupled amplifier applications, the grid-No.1 negative bias may be as low as -0.5 volt.

TENTATIVE DATA







## OPERATION CHARACTERISTICS

Ef=	6.3 VOLTS	PLATE VOLTS = 3	GRID-Nº 3 VOLTS = 0
CURVE	GRID-Nº2 RESISTOR	GRID-Nº 2 SUPPLY VOLTS	THESE CURVES ARE BASED ON THE FOLLOWING VALUES:
I	O MEG.	100	$\Delta I_{K} = 300 \mu AMP, \Delta I_{g_{1}} = 0.1 \mu AMP$
2	0.25 MEG.	300	EXPRESSING THESE VALUES
3	0.5 MEG.	300	AIK 300
4	0.75 MEG.	300	$\frac{1}{\Delta Ig} = 0.1 \text{ OR } 3000$

FOR THOSE APPLICATIONS PERMITTING OTHER VALUES OF  $\Delta I_{K}$ , A NEW RATIO OF  $\Delta I_{K}/\Delta I_{g_{1}}$  CAN BE CALCULATED. THE VALUES OF R<sub>g\_{1}</sub> AS READ FROM THE CURVE MUST BE MULTIPLIED BY A FACTOR WHICH IS THE QUOTIENT OF THE NEW RATIO DIVIDED BY THE OLD RATIO. FOR EXAMPLE, IF THE NEW RATIO IS 6000 THE MULTIPLYING FAC-TOR IS 6000/3000, OR 2, AND VALUES OF R<sub>g\_1</sub> AS READ FROM THE CURVE ARE THEREFORE MULTIPLIED BY 2.

NOTE: TRANSCONDUCTANCE CURVES WERE OBTAINED WITH GRID-Nº2 RESISTOR AND CATHODE RESISTOR SUITABLY BYPASSED.







## AVERAGE CHARACTERISTICS PENTODE CONNECTION











## **MEDIUM-MU TRIODE**

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT	DESIGN*
Note Min.	Max.
Heater Current 1 0.138 Grid-to-Plate Capacitance 2 1.1 Input Capacitance 2 1.6 Output Capacitance 2 0.5 Amplification Factor 1,3 23 Plate Current 1,3 6.0 Plate Current 1,4 - Transconductance	0.162 amp 1.8 μμf 2.8 μμf 0.9 μμf 31 11.0 ma 100 μamp 6800 μmhos - μmhos ±0.4 μamp
respect to cathode 1,7 -	7.0 μamp
Heater positive with respect to cathode 1,7 – Leakage Resistance: Between Grid and All	7.0 μamp
Other Electrodes Tied 1,8 100 Between Plate and All	– megohms
Other Electrodes Tied 1,9 100 Useful Power Output 1,10 600	– megohms – mw
Each tube is stabilized before characteristics testin operation for at least us hours at room temperature and values equivalent to life test conditions. Note 1: With 6.3 volts ac or dc on heater. Note 2: With external shield.	g by continuous with dissipation
Note 3: With dc plate supply voltage of 100 volts, carr 150 onms, and cathode bypass capacitor of 1000 m Note 4: With dc plate voltage of 100 volts, and dc gri	icrofarads. d voltage of -7
Note 5: With 5.5 volts ac or dc on heater. Note 6: With dc plate supply voltage of 100 volts, cath	node resistor of
Note 7: With 100 volts dc between heater and cathode.	
Note 8: With grid 100 volts negative with respect to all tied together.	other electrodes
Note 9: With plate 300 volts negative with respect to trodes tied together.	all other elec-
aria resistor and feedback optimized to give use at a plate current of 20 ma, and frequency of 50	ful power output 0 Mc.
SPECIAL RATINGS & PERFORMANCE DATA	
Shock Rating:	
Impact Acceleration 450 Tubes are held rigid in three different po Navy Type, High Impact (flyweight) Shock Mac subjected to 450 g impact acceleration.	max. g sitions in a hine and are

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TENTATIVE DATA 2



## MEDIUM-MU TRIODE

## Fatigue Rating:

5718

Vibrational Acceleration . . . . 2.5 max. g Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.

### Uniform Acceleration Rating . . . . 1000 max.

Tubes are subjected in each of three positions to a gradually applied uniform acceleration up to 1000 g.

#### High-Frequency Vibration Performance:

RMS Output Voltage . . . . . . . . . . . . 60 max. mv Under the following conditions: A 100-volt plate and grid-No.2 voltage supply having an impedance not exceeding that of a 40- $\mu$ f capacitor, plate load resistance of 10000 ohms, grid-No.1 resistor of 0.1 megohm, cathode resistor of 150 ohms, cathode bypass capacitor of 1000  $\mu$ f, and vibrational acceleration of 15 g at 40 cps.

#### Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . 2500 max. cycles Under the following conditions: With heater voltage of 7.0 volts cycled 1 minute on and 4 minutes off, heatercathode voltage of 140 volts (rms), and plate, grid-No.2, and grid-No.1 voltage = 0 volts.

#### Average Life Performance:

The average life performance based on a 500-hour test at 175°C ambient temperature is not less than 450 hours. This life test is made on sample lot of tubes with heater voltage of 6.3 volts; plate supply voltage of 100 volts; grid-No.2 supply voltage of 100 volts; dc heater-cathode voltage (heater positive with respect to cathode) of 200 volts; cathode resistor of 150 ohms; and grid-No.1 resistor of 1 megohm.

The 500-hour end-point limits for the 5840 with heater voltage of 6.3 volts, plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms bypassed by capacitor having a maximum reactance of 3 ohms, and dc heater-cathode voltage of 100 volts with heater either positive or negative with respect to cathode are: transconductance, 3250 micromhos minimum; heater-cathode leakage current, 20 microamperes maximum; and grid-No.1 current, +0.9 microampere maximum or -0.9 microampere maximum.

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TUBE DEPARTMENT

TENTATIVE DATA 2

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## **MEDIUM-MU TRIODE**

SUBMINIATURE TYPE

Intended for applications where dependable verformance under shock and vibration is paramount.

## GENERAL DATA

Electrical:

1	APRIL 1 1052	TENTATI	VE DATA 1
	DC PLATE VOLTAGE	165 ma	x. volts
1	Maximum Ratings, Absolute Values:		
	AMPLIFIER - Class A		
	Conn. O 🔞		
	Lead No.4 - No	No.8-	Anode
	Lead No.3 - Heater	NO. / - I	Conn.
1	Lead NO.2 - NO Conn.	No.7	lo
	Lead No.1-Grid Lead	NO.5-(	Jathode
	@ @	N- 5 (	
	Orientation and Diameter See Dim BOTTOM VIFW	ensional	Outline
	Length	1-1/2" 1	0 1-3/4"
1	Bulb		8
	Diameter	0.383'	± 0.017"
	(Excluding tip)	1.075'	± 0.060"
	Maximum Bulb Length		1-3/8"
	Operating Position		. Any
	Mechanical:		
	plate current of 10 µamp -7 -1	.1	volts
	Plate Current 8.5 13.	0	ma
	Transconductance 5800 650	00	µmhos
	Amplification Factor . 27 2 Plate Resistance 4650 415	27	ohme
	Cathode Resistor 150 18	80	ohms
	Unaracteristics, Ulass A <sub>1</sub> Amplitier:	50	volte
	Having inside diameter of 0.405" and connected to le here the second	ad No.5.	
1	Output 2.4 0.	7	μμt
J	Input 2.4 2.	2	μµ
	Grid to Plate 13 1	hield A	uuf
	With Exter- Without	Exter-	
	Current 0.150		amp
1	Voltage 6.3±5%	. ac or	dc volts
M	Heater, for Unipotential Cathode:		





# MEDIUM-MU TRIODE

PLATE DISSIPATION					3.3 max.	watts
PEAK HEATER-CATHODE VOLTAGE:						
to cathode					200 max.	volts
Heater positive with respect						
to cathode					200 max.	volts
BULB TEMPERATURE (At hottest point					050	00
on build surface) .	•	• •	٠	•	250 max.	00

#### Typical Operation as Resistance-Coupled Amplifier:

See RESISTANCE-COUPLED AMPLIFIER CHART at end of tabulated data for this type

#### Maximum Circuit Values:

Grid-Circuit Resistance:

For cathode-bias operation . . . . 1.2 max. megohms For fixed-bias operation . . . . Not recommended Cathode-Bias Resistance - An adequate value of cathode-bias resistor should be used to protect the tube in event of temporary failure of excitation and resultant loss in developed bias.

#### RF AMPLIFIER and OSCILLATOR - Class C

Operation with full input is permissible up to 1000 Mc.

#### Maximum Ratings, Absolute Values:

DC PLATE VOLTA	GE											165	max.	volts
DC GRID VOLTAC	GE.											-55	max.	volts
DC PLATE CURRE	NT											22	max.	ma
DC GRID CURREN	NT.											5.5	max.	ma
PLATE DISSIPAT	ION											3.3	max.	watts
PEAK HEATER-CA	THOD	EV	OL	TA(	GE :									
Heater negat	ive	wit	h i	res	spe	ec	t							
	to c	ath	ode	9			•					200	max.	volts
Heater posit	ive	wit	h	re	spe	ec	t							
	to c	ath	ode	9								200	max.	volts
BULB TEMPERATU	JRE (	At	ho	tte	est	t I	ро	in	t					
C	on bu	16	sui	rfa	ace	2)						250	max.	°C

## Maximum Circuit Values:

Grid-Circuit Resistance:

For cathode-bias operation . . . . 1.2 max. megohms For fixed-bias operation . . . . Not recommended Cathode-Bias Resistance - An adequate value of cathode-bias resistor should be used to protect the tube in event of temporary failure of excitation and resultant Toss in developed bias.



# MEDIUM-MU TRIODE

### OPERATING CONDITIONS AS RESISTANCE-COUPLED AMPLIFIER

Plate-Supply Voltage			10	00			voit
Plate Load Resistor	0.	047	0.	10	0.	27	me
Grid-No.I Resistor	0.10	0.27	0.27	0.47	0.27	0.47	me
Sig. Input Volt. (mms)	0.5	0.5	0.5	0.5	0.5	0.5	vol
Output Voltage (rms)	8.2	8.5	8.2	8.2	7.3	7.4	volt
Voltage Gain≜ Distortion	16.4	17.0	16.4 3.0	16.4	14.6 3.4	14.8	
Sig. Input Volt. (rms)*	0.59	0.70	0.67	0.81	0.75	0.86	vo
Output Voltage (rms)	9.7	11.75	11.0	13.1	11.0	12.7	volt
Distortion	4.5	16.8 4.7	16.4 4.1	4.6	14.6 5.0	14.8 5.0	

Plate-Supply Voltage		5	2	00			volts
Plate Load Resistor	0.0	047	0.	10	0.	27	meg
Grid-No.I Resistor <sup>0</sup> Cathode Resistor	0.10 820	0.27 1000	0.27 1800	0.47 2200	0.27 4700	0.47 5600	meg ohms
Sig. Input Volt. (rms)	1.0	1.0	1.0	1.0	1.0	1.0	volt
Output Voltage (rms)	19.0	19.5	18.6	18.1	16.2	16.2	volts
Voltage Gain≜	19.0	19.5	18.6	18.1	16.2	16.2	
Distortion	4.0	3.3	3.2	3.1	3.8	3.2	%
Sig. Input Volt. (rms)*	1.23	1.45	1.43	1.56	1.34	1.58	volts
Output Voltage (rms)	23.4	28.0	26.0	28.2	21.6	25.0	volts
Voltage Gain≜	19.0	19.3	18.2	18.1	16.1	15.8	
Distortion	5.0	5.0	4.9	5.0	5.1	5.1	%

<sup>O</sup> of following stage.

Ratio of signal output to signal input.

Maximum value to swing the grid of resistance-coupled amplifier tube to the point where its grid No.1 starts to draw current.

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

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY







# HIGH-MU TRIODE

SUBMINIATURE TYPE

Intended for applications where dependable performance

under shock and vibration is paramount.

	GENERAL DATA	
Electrical:		
Heater, for Unipotential Voltage Current Direct Interelectrode Ca Grid to Plate Input	Cathode: 6.3 ± 5% pacitances: With Exter- nal Shield <sup>o</sup> 1.9 2.2	ac or dc volts amp ut Exter- Shield 0.8 µµf 1.7 µµf 0.6 µµf
O Having inside diameter of c	.405" and connected to ca	thode.
Characteristics. Class A, Amp	lifier:	
Plate Supply Voltage . Cathode Resistor Amplification Factor . Plate Resistance Transconductance Plate Current Grid volts (Approx.) for plate current of 10 µamp	100 1500 70 41000 3 1700 0.73	150 volts 680 ohms 70 0500 ohms 2300 μmhos 1.85 ma -3.8 volts
Mechanical:		
Operating Position Maximum Bulb Length Length from Button Seal (Excluding tip) Diameter Bulb Leads, Flexible Length Orientation and Diamet	to Bulb Top er See Dim BOTTOM VIEW	Any 
Lead No.1-Grid	Lead	No.5-Cathode
Lead No.2 - No Conn. Lead No.3 - Heater Lead No.4 - No Conn.	Lead Lead	No.6 - Heater No.7 - No Conn. No.8 - Plate
AMP	LIFIER - Class A	
Maximum Ratings, Absolut	Values.	
PLATE VOLTAGE		165 max. volts
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HIGH-MU TRIODE

	the second se		
GRID VOLTAGE	• • • •	-55 max.	volts
PLATE DISSIPATION	0	.55 max.	watt
Heater negative with respect to cath	ode.	200 max.	volts
BULB TEMPERATURE (At hottest point	ode.	200 max.	vorts
on buib surface) .		250 max.	
Typical Operation as Resistance-Coupl	ed Amplif	ier:	
See RESISTANCE-COUPLED AMP at end of tabulated data f	LIFIER CH or this t	ART ype	
(aximum Circuit Values:			
Brid-Circuit Resistance: For cathode-bias operation For fixed-bias operation	1.2	max. r Not recór	megohms mmended
CHARACTERISTICS RANGE VALUES FOR	EQUIPMENT	T DESIGN	
Note	Min.	Max.	
leater Current 1	0.138	0.162	amp
arid-to-Plate Capacitance . 2	0.6	1.0	μμT
Nutput Capacitance 2	1.2	2.2	μμι
Amplification Factor	60	80	refe
Plate Current 1.3	0.5	0.9	ma
Plate Current 1.4	-	50	µamp
ransconductance 1,3	1400	2000	µmhos
Fransconductance 5.3	1300		µmhos
	1)00		amo
Grid Current 1,6	-	±0.3	µamp
Grid Current 1,6 Heater-Cathode Leakage Current;	-	±0.3	Mamp
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathodo	-	±0.3	µamp
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with	-	±0.3 7.0	μamp
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7	-	±0.3 7.0 7.0	μamp μamp
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Leakage Resistance:	-	±0.3 7.0 7.0	μamp μamp μamp
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Leakage Resistance: Between Grid and All	-	±0.3 7.0 7.0	µamp µamp
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Heater cathode	-	±0.3 7.0 7.0	μαπρ μamp μamp
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Leakage Resistance: Between Grid and All Other Electrodes Tied Together 1,8 Retween Plate and All	100	±0.3 7.0 7.0	ματηρ μamp μamp
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Heater Grid and All Other Electrodes Tied Other Flactrodes Tied	100	±0.3 7.0 7.0	μamp μamp μamp negohms
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Heater Grid and All Other Electrodes Tied Together 1,8 Between Plate and All Other Electrodes Tied Together 1,9		±0.3 7.0 7.0	μamp μamp μamp negohms
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Leakage Resistance: Between Grid and All Other Electrodes Tied Together 1,8 Between Plate and All Other Electrodes Tied Together 1,9	- - 100	±0.3 7.0 7.0 - r	μαπρ μamp μamp negohms
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Heater positive with respect to cathode	- - 100 stics test erature and	±0.3 7.0 7.0 - r - r ing by co	μamp μamp μamp negohms megohms ntinuous sipation
Grid Current 1,6 Heater-Cathode Leakage Current; Heater negative with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Heater positive with respect to cathode 1,7 Heater positive with respect to cathode	- - 100 stics test erature and	±0.3 7.0 7.0 - r	μamp μamp μamp negohms negohms ntinuous sipation
Grid Current	- - 100 100 stics test erature and	±0.3 7.0 7.0 – r ing by co	μamp μamp μamp negohms negohms ntinuous sipation

5719

TUBE DEPARTMENT



570

## HIGH-MU TRIODE

Note 4: With dc plate voltage of 100 volts, and dc grid voltage of -2.5 volts. Note 5: With 5.7 volts ac or dc on heater. Note 6: With plate supply voltage of 100 volts, cathode resistor of 1500 ohms, cathode bypass capacitor of 1000 microfarads and grid re-sistor of 0.1 megohm. Note 7: With 100 volts dc between heater and cathode. Note 8: With grid 100 volts negative with respect to all other electrodes tied together. Note 9: With plate 300 volts negative with respect to all other electrodes tied together. SPECIAL RATINGS & PERFORMANCE DATA Shock Rating: Impact Acceleration . . . . . . . . . . . . . . . . 450 max. Tubes are held rigid in three different positions in a Navy Type, High (Impact (flyweight) Shock Machine and are subjected to 450 g impact acceleration. Fatigue Rating: Vibrational Acceleration . . . . . . . . . . . . 2.5 max. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours. 1000 max. Uniform Acceleration Rating:. . . . . . . . . . . . Tubes are subjected in each of three positions to a gradually applied uniform acceleration up to 1000 g. Low-Frequency Vibration Performance: RMS Output Voltage ..... 25 max. mν Under the following conditions: A 150-volt plate voltage supply having an impedance not exceeding that of a 40 µf capacitor, plate load resistance of 10000 ohms, grid resistor of 0.1 megohm, cathode resistor of 1500 ohms, cathode bypass capacitor of 1000  $\mu$ f, and vibrational acceleration of 15 g at 40 cps. Heater-Cycling Life Performance: Cycles of Intermittent Operation ..... 2500 min. cycles Under the following conditions: With heater voltage of 7.0 volts cycled | minute on and 4 minutes off, heater-cathode voltage of 140 volts (rms), and plate and grid voltage = 0 volts. Average Life Performance: The average life performance based on a 500-hour test at 175<sup>0</sup>C ambient temperature is not less than 450 hours. This life test is made on sample lot of tubes with heater voltage of 6.3 volts; plate supply voltage of 100 volts; dc heater-cathode voltage (heater positive with respect to cathode) of 200 volts; cathode resistor of 1500 ohms; and grid resistor of | megohm. The 500-hour end-point limits for the 5719 with heater voltage of 6.3

The 500-hour end-point limits for the 5/19 with heater voltage of 5.5 volts, plate supply voltage of 100 volts, cathode resistor of 680 ohms bypassed by capacitor having a maximum reactance of 3 ohms, and dc heater-cathode voltage of 100 volts with heater either positive or negative with respect to cathode are: transconductance, 1000 micromhos minimum; heater-cathode leakage current, 20 microamperes maximum; and grid current, +0.9 microampere maximum or -0.9 microampere maximum.





#### OPERATING CONDITIONS AS RE-

42

1.8

0.26

10.7

41.2

4.9

#### Cathode-Bias

39.5

2.4

0.20

7.8

39

5.0

Plate Supply Voltage Plate Load Resistor

Grid Resistor<sup>0</sup>

Cathode Resistor

			10	00	
	0.1	0.1	0.27	0.27	0.47
	0.27	0.47	0.47	1.0	0.47
	2700	2700	5600	6800	10000
)	0.1	0.1	0.1	0.1	0.1
	3.7	3.9	4.1	4.2	3.95

41

2.1

0.20

8.1

40.5

4.3

39

2.1

0.20

7.7

38.5

4.5

Output Volts (mms) Gain Distortion Signal Input Volts (rms)\*

Signal Input Volts (rms.

Output Volts (rms) GainA Distortion

Zero-Bias

Plate-Supply Voltage			1	00	
Plate Load Resistor	0.1	0.1	0.27	0.27	0.47
Grid Resistor <sup>0</sup>	0.27	0.47	0.47	1.0	0.47
Signal Input Volts (rms)	0.1	0.1	0.1	0.1	0.1
Output Volts (rms)	3.8	4.0	4.3	4.55	4.2
Gain <sup>®</sup>	38	40	43	45.5	42
Distortion	2.2	2.0	1.9	1.6	2.1
Signal Input Volts (rms)*	0.2	0.21	0.22	0.26	0.2
Output Volts (rms)	7.25	7.9	8.95	11	7.9
Gain <sup>&amp;</sup>	36.2	37.6	40.6	42.4	39.5
Distortion	5.0	4.8	4.9	4.8	4.8

37

2.4

0.20

7.3

36.5

5.0

Hote 1: Coupling capacitors should be selected to give desired frequency response. Cathode resistor should be adequately bypassed. O of following stage.



510

## HIGH-MU TRIODE

#### SISTANCE-COUPLED AMPLIFIER

#### Operation

volts			00	20			
megohm	0.47	0.47	0.27	0.27	0.1	0.1	0.47
megohm	1.0	0.47	1.0	0.47	0.47	0.27	1.0
ohms	6800	5600	3900	3300	1800	1500	10000
volt	0.1	0.1	0.1	0.1	0.1	0.1	0.1
volts	5.0	4.8	5.0	4.9	4.6	4.4	4.3
	50	48	50	49	46	44	43
per cent	0.7	0.9	0.7	0.9	0.7	0.7	1.7
volt	0.64	0.49	0.59	0.50	0.61	0.51	0.25
volts	31.6	23.2	29	24.2	27	22	10.7
	49.4	47.3	49.2	48.4	44.3	43.1	42.8
per cent	5.0	5.0	4.5	4.5	5.0	3.9	4.5

#### Operation

volts			00	20		1	
megohm	0.47	0.47	0.27	0.27	0.1	0.1	0.47
megohm	1.0	0.47	1.0	0.47	0.47	0.27	1.0
volt	0.1	0.1	0.1	0.1	0.1	0.1	0.1
volts	5.4.	5.2	5.4	5.35	4.9	4.7	4.55
	54	52	54	53.5	49	47	45.5
per cent	0.7	0.9	0.7	0.8	0.4	0.4	1.6
volt	0.63	0.5	0.65	0.54	0.63	0.59	0.27
volts	30.5	23.5	31.5	25.8	27.7	25	11.3
	48.4	47	48.5	47.7	43.9	42.4	41.8
per cent	4.8	5.0	5.0	4.9	5.0	4.9	5.0

\* Maximum value to swing the grid of resistance-coupled amplifier tube to the point where its grid starts to draw current.

Ratio of signal output to signal input.



EADIO CORPORATION OF AMERICA, HARRISON, NEW JEISEY



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PREMIUM

## SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount. This "premium" type is similar to the 6AS6.

## GENERAL DATA

#### Electrical:

4-57	N		TENT	ATIVE	DATA :
<sup>O</sup> With external shield JETEC No.316 connec	ted t	o cat	hode.		
LATE VULIAGE	• •	•	200	max.	vorts
Maximum Ratings, Absolute Values:			200	may	vol+
AMPLIFIER - C1	ass /	4			
Ű					
Pin 3 - Heater	$\overline{\mathcal{O}}$	٢	'in /-	Grid	NO.3
Internal 1	Γ	P	in 6-	Grid	No.2
Pin 1-Grid No.1 Pin 2-Cathode.	6	P	'in 4 - 'in 5 -	Plate	r
(4)_(5)				Unite	
Basing Designation for BOTTOM VIE	W	· ·	•••	· · · ·	. 7CM
Bulb	turo	7_Pi	n ( IF	TEC No	F7_1
Dimensional Outline	• •	. Se	e Geni	eral S	ection
Maximum Diameter					3/4"
Waximum Sealed Length	dina	tip)	1-	1/8" ±	3/32'
Maximum Overall Length	• •	•••	•••	• •	1 - 3/4'
Mounting Position					. Any
Mechanical:					
Grid-No.2 Current			3.5		ma
Plate Current			5.2		ma
Grid No.1 to plate	• •	•	3200		µmhos
Transconductance:					
Grid-No.1 (Control-Grid) Voltage.	11		-2		volts
Grid-No.3 (Suppressor-Grid) Voltage	• •		120		volts
Plate Voltage		•	120		volts
Characteristics, Class A <sub>1</sub> Amplifier	:				
Grid No.1 to grid No.3	• •	•	0.15	max.	$\mu\mu^{\dagger}$
grid No.3, grid No.2, and heate	r		3		μµt
Plate to cathode & internal shiel	d.	•	2.5		μμ
Grid No.1 to cathode & internal s	hield	ł,	2.0		
Grid No.1 to plate			0.02	max.	μμ
Current 0.1/5 .	o <b>` '</b>	• •	• • •	• • •	. amp
Voltage 6.3 ±	10%		ac	or dc	volts
leater, Pure lungsten, for Unipoten	tial	Cath	ode:		

5 25

## SHARP-CUTOFF PENTODE

								1
GRID-No.3 (SUPPRESSOR-GR	ID VO	LTAGE	):					
Positive bias value					30	) max.	volts	
Negative bias value.					55	ā max.	volts	
GRID-No 2 (SCREEN-GRID)	VOL TA	GE			159	max	volts	
CRID-No 1 (CONTROL-CRID)	VOLT	ACE .	÷.,		200	- 100474 •		÷ ،
Desitive bies velue	VULI	AGL.			(	)	walta	
Fositive bias value	• •		•	• • •	C.C.	max.	VOILS	
Negative bias value	• •		•		50	max.	VOITS	6
GRID-No.3 CURRENT					0.2	max.	ma	
CATHODE CURRENT					20	) max.	ma	
GRID-No.2 INPUT.					0.55	5 max.	watt	
PLATE DISSIPATION					1.6	max	watts	
DEAK HEATED CATHODE VOLT	ACE .	• • •		••••	1.00	indx.	Marco	
TEAR HEATEN-CATHODE VOET	AGL.	1 1	1		1.00		14-	
Heater negative with r	espec	τιο	cat	node.	100	, max.	VOILS	
Heater positive with r	espec	t to	cat	node.	. 100	) max.	volts	- 24
BULB TEMPERATURE (At hot	test	point	2				1	
on bulb surface)					165	max.	°C	
Maximum Circuit Values:								
Grid No 1 Circuit Posist	2000				0	may	magaahm	
GITU-NO.I-CITCUIL RESISE	ance		•	• • •	0	L IIIax.	megonin	
CHARACTERISTICS RAD		LUES	FOR	FOI	IPMENT	DESIG		
CHARACTER ISTICS RAT		LULU	1 01	LŲU	THEN	DESTU	·	
Values are Initio	al, Un	nless	Oth	erwi	se Spec	ified		
		N	ote	h	lin.	Max.		
		1			100	1000		
Heater Current		•	1		160	190	ma	
Direct Interelectrode								
Capacitances:								
Grid No.1 to cathode &								
internal chield aris	No 2							
niternar sineru, gric	1110.9	,	0		0.5	4 5	c	
grid No.2, and heate	r		Z		3.5	4.0	μμτ	
Plate to cathode & in-								
ternal shield. arid	No.3.							
orid No.2, and heate	r		2		2.6	3.4	μuf	
Plate Current (1)			12		2.5	9	ma	6
Plata Current (2)		•			2.0	200	ind	
Plate Current (2)	• •	•	1 5		- E	200	μα	
Flate Current (5)	• •	•	1,0		5		μa	
Plate Current (4)		•	1,6		-	200	μa	
Plate Current (5)		. 1	1,7		5	-	μa	1
Grid-No.2 Current			1.3		1.5	5.5	ma	
Transconductance (1). Gr	id							
No 1 to Plate	, a		1 2	-	500	1500	umbos	1
Transport to Hate	• •	•	1,/	2	.000	4000	pannos	
Fransconductance (1), at					000	1500	1	1
DUU hours	• •	•	1,3	2	200	4500	µmhos	
Transconductance (2), Gr	id							
No.1 to Plate			1.8		700	1700	µmhos	
Transconductance (3)			-,.			_, _ 3		
Grid No 3 to Plate			1 9		400	1150	umhoe	
Transconductance Change	• •		10		+00	15	anitos	
in ansconductance change.	• •	•	TO		-	TO	76	6
<ul> <li>Each tube is stabilized be operation for at least 45 ho values equivalent to life t</li> </ul>	fore cours at	harac room	teri temp	stics beratu	testing ure and wi	by cor th dis:	ntinuous sipation	
Notes 1 to 10: See next page								
E7					TEN		DATA 1	
1-0/					IEN	IALIVE	DATA 1	

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5725



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## SHARP-CUTOFF PENTODE

1				Note	Min.	Max.	
	Transconductance Change						
	at 500 hours		•	10	-	15	%
	Reverse Grid Current	•		1,11	-	0.1	μa
	Reverse Grid Current			1 11	0	0.1	
	Grid Emission Current	•	•	12	0	0.1	μa
2	Heater-Cathode Leakage	•	•	TZ	_	T	μα
- 3	Current:						
	Heater 100 volts negative						
	with respect to cathode			1	-	10	μa
	Heater 100 volts positive						
. 1	with respect to cathode	•	•	1	-	10	μa
	Heater-Cathode Leakage						
	Heator 100 volte pogative						
	with respect to cathode			1	-	10	112
	Heater 100 volts positive	•	•	-		10	pici
	with respect to cathode			1		10	μa
	Leakage Resistance:						Sec.
	Between grid No.1 and all						
	other electrodes tied						
	together	•	•	1,13	100	-	megohms
	Between grid No.3 and all						
	together			1 1 1	100		maaahma
	Between plate and all	•	•	1,14	100		megonins
	other electrodes tied						
	together			1,15	100	-	megohms
	Leakage Resistance at						
	500 hours:						
	Between grid No.1 and all						
N	together			1 12	50		magaahma
2	Between grid No 3 and all	*	•	1,1)	50	_	niegonins
	other electrodes tied						
	together.			1.14	50	-	meachms
	Between plate and all						
	other electrodes tied						
	together	8	8	1,15	50	-	megohms
	Note 1: With 6.3 volts ac or do	on	hea	ater			
	Note 2: With external shield JE	EC	NO	.316 con	nected to	cathode	
	Note 3: With plate volts = 120,	gr	id-	No.3 vo	lts = 0,	grid-No.	2 volts =
	120, and grid-No.1 volts	; =	-2.	NO 2 VO	1tc = _10	arid	0 2 401+0
	= 120, and grid-No.1 vol	lts	= .	-3.	11510	, griu-r	IO.2 VOILS
	Note 5: With plate volts = 120,	g	rid.	-No.3 VO	its = -6	, grid−N	o.2 volts
	Note 6: With plate volts = $120$ .	ar	id-	-2. No.3 vo	lts = 0.	arid-No.	2 volts =
	120, and grid-No.1 volts	=	-8	•		9110 101	2 10110
	Note 7: With plate volts = 120, 120, and grid-No.1 volts	gr =	id-	No.3 VO	lts = 0,	grid-No.	2 volts =
			2				
J	Notes 6 to 15: See next page.						
	4-0/		50.0	CION		ENIALLY	IL DALA Z

TUBE DIVISION



## SHARP-CUTOFF PENTODE

Note 8:	With plate volts = 120, grid-No.3 volts = -5, grid-No.2 volts = 120, and grid-No.1 volts = -2.
Note 9:	With plate volts = 120, grid-No.3 volts = $-3$ , grid-No.2 volts = 120, and grid-No.1 volts = $-2$ .
Note 10:	With 5.7 volts ac or dc on heater, plate volts = 120, grid-No.3 volts = 0, grid-No.2 volts = 120, and grid-No.1 volts = $-2$ .
Note 11:	With plate volts = 120, grid-No.3 volts = 0, grid-No.2 volts = 120, grid-No.1 volts = -2, and grid-No.1-circuit resistance (megohms) = 0.1.
Note 12:	With 7.5 volts ac or dc on heater, plate volts = 120, grid-No.3 volts = 0, grid-No.2 volts = 120, grid-No.1 volts = -10, and grid-No.1-circuit resistance (megohms) = 0.1.
Note 13:	With grid-No.1 volts = -100, and all other electrodes connected to ground.
Note 14:	With grid-No.3 volts = -100, and all other electrodes connected to ground.
Note 15:	With plate volts = -300, and all other electrodes connected to ground.

#### SPECIAL RATINGS AND PERFORMANCE DATA

#### Shock Rating:

5125

#### Fatigue Rating:

Vibrational Acceleration . . . . . . . . 2.5 max. g This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for reverse grid current, low-frequency vibration, heater-cathode leakage current, and transconductance.

#### Low-Frequency Vibration Performance:



## SHARP-CUTOFF PENTODE

#### Heater-Cycling Life Performance:

Cycles of Intermittent Operation. . . 2000 min. cycles Under the following conditions: heater voltage of 7.5 volts cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other electrodes connected to ground.

#### Audio-Frequency Noise and Microphonic Performance:

#### Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of I microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

#### I-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are checked for transconductance under conditions of maximum rated plate dissipation. At the end of I hour, the value of transconductance is read. The variation in transconductance from the O-hour reading will not exceed 10 per cent.

#### 100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions of maximum rated plate dissipation to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative it it shows a permanent or temporary short or open circuit, a value of reverse grid current in excess of I microampere, or a transconductance (I) value of less than 2200 micromhos under the conditions specified in CHARACTERISTICS RANGE VALUES.



### SHARP-CUTOFF PENTODE

#### 500-Hour Intermittent Life Performance:

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This test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: heater voltage of 6.3 volts ac or dc, plate-supply volts = 180, grid-No.3 supply volts = 0, grid-No.2 supply volts = 125, grid-No.1 volts = 0, grid-No. I-circuit resistance (megohms) = 0.1, cathode resistor (ohms) = 130, heater 135 volts positive with respect to cathode, and bulb temperature  $(^{\circ}C) = 165$ . At the end of 500 hours, tubes will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass the established initial limits for heater current, reverse grid current and heater-cathode leakage current, and 500-hour limits for transconductance (1), transconductance change, and leakage resistance as shown under CHARACTERISTICS RANGE VALUES.

Curves shown under Type 6AS6 also apply to the 5725

TENTATIVE DATA 3





## TWIN DIODE

MINIATURE TYPE

Intended for applications where dependable perform-

ance under shock and vibration is paramount.

The 5726 is a "premium" version

of the GALSW.

GENERAL DATA

00	••	100	1.
CC	LI.	ica	1.

	Heater, for Unipotential Cathodes:	
	Voltage 6.3±10%	ac or dc volts
I	Current 0.3	amp
ł	Resonant Frequency (Each unit, approx.)	. 700 Mc
1	Direct Interelectrode Capacitances	•
1	(With external shield JETEC No.316)	:
ł	Unit No.1:	
Į	Plate to Cathode + External Shield,	
	Heater, and Internal Shield	• 3.2 μμf
	Cathode to Plate + External Shield,	
	Heater, and Internal Shield	. 3.9 <i>µµ</i> f
	Unit No.2:	
	Plate to Cathode + External Shield,	
	Heater, and Internal Shield	· 3.2 μμ†
	Cathode to Plate + External Shield,	
	Heater, and Internal Shield	· 3.9 μμt
	Plate of Unit No.1 to Plate of Unit No.2"	0.026 max. 144
	Mechanical:	
	Neunting Desition	٨٥٠
	Mounting Position	••••••• Any 1. 2/4"
	Maximum Overall Length	· · · · · · · 1-2/4
	Maximum Seated Length	in) 1_1/0" + 3/32"
	Length, base seat to build top (Excluding t	10) 1-1/0 1 J/J2 2//"
	Bulb	T-5-1/2
	Base	Pin (JETEC No. F7-1)
	BOTTOM VIEW	
	Pin 1 - Cathode of	in 5-Cathode of
	Digde Unit 45	Diode Unit
	No 1	No.2
	Pin 2 - Plate of	Pin 6 - Internal
J	Diode Unit	Shield
	No.2	Pin 7 - Plate of
	Pin 3-Heater	Diode Unit
	Pin 4 - Heater	No.1
	HALF-WAVE RECTIFIER	
	Maximum Ratings, Absolute Values:	
	PEAK INVERSE PLATE VOLTAGE	. 360 max. volts
	PEAK PLATE CURRENT PER PLATE	. 60 max. ma
	<ul> <li>With external and internal shield connected to g</li> </ul>	round.
	SEPT. 1. 1952	TENTATIVE DATA 1
	TUBE DEPARTMENT	IERSEY



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## **TWIN DIODE**

Cycles of Intermitt At a heater volta CHARACTERISTICS Heater Current Direct Interelectrode Capacitances (With shield JETEC No.316 Unit No.1: Plate to Cathode+ Shield, Heater, and Shield Unit No.2: Plate to Cathode+ Shield, Heater, and Shield Cathode to Plate+ Shield, Heater, and Shield Cathode to Plate+ Shield, Heater, and Shield Cathode to Plate+ Shield, Heater, and Shield	external bill external bill external dinternal external dinternal external dinternal external dinternal	tion: volts . LUES FOR Note 1	200 EQUIPMEN <i>Nin</i> . 0.275 2.4 2.8 2.4 2.8	00 min. <b>T DESIGN</b> <i>Max.</i> 0.325 4.0 4.4 4.0 4.4	cycles amp µµf µµf µµf µµf µµf
Cycles of Intermitt At a heater volta CHARACTERISTICS Direct Interelectrode Capacitances (With shield JETEC No.316 Unit No.1: Plate to Cathode 4 Shield, Heater, and Shield, Heater, and	ent Operat ge of 7.5 8 RANGE VA external b: External d Internal c: External d Internal d Internal d Internal d Internal	tion: volts . <i>LUES FOR</i> <i>Note</i> 1	200 EQUIPMEN Min. 0.275 2.4 2.8 2.4	00 min. <b>T DESIG</b> <i>Nax.</i> 0.325 4.0 4.4 4.0	cycles amp μμf μμf μμf
Cycles of Intermitt At a heater volta CHARACTERISTICS Heater Current Direct Interelectrode Capacitances (With shield JETEC No.316 Unit No.1: Plate to Cathode+ Shield, Heater, and Shield, Heater, and Shield Unit No.2: Plate to Cathode+ Shield, Heater, and Shield, Heater, and Shield, Heater, and Shield, Heater, and	ent Operat ge of 7.5 8 RANGE VA external ): External d Internal External d Internal External d Internal	tion: volts . LUES FOR Note 1	200 EQUIPMEN Min. 0.275 2.4 2.8 2.4	00 min. <b>T DESIGN</b> <i>Max.</i> 0.325 4.0 4.4 4.4	cycles amp µµf µµf µµf
Cycles of Intermitt At a heater volta CHARACTERISTICS Heater Current Direct Interelectrode Capacitances (With shield JETEC No.316 Unit No.1: Plate to Cathode + Shield, Heater, and Shield, Heater, and Shield, Heater, and Shield, Heater, and Shield Unit No.2: Plate to Cathode +	ent Operat ge of 7.5 8 RANGE VA external ): External d Internal d Internal e External	tion: volts . LUES FOR Note 1	200 EQUIPMEN Min. 0.275 2.4 2.8	00 min. <b>T DESIG</b> <i>Max.</i> 0.325 4.0 4.4	cycles amp µµf µµf
Cycles of Intermitt At a heater volta CHARACTERISTICS Heater Current Direct Interelectrode Capacitances (With shield JETEC No.316 Unit No.1: Plate to Cathode 4 Shield, Heater, and Shield, Heater, and Shield, Heater, and Shield, Heater, and Shield, Heater, and Shield	ent Operat ge of 7.5 8 RANGE VA external ): External d Internal d Internal	tion: volts . LUES FOR Note 1	200 EQUIPMEN Min. 0.275 2.4 2.8	00 min. <b>T DESIGN</b> <i>Max.</i> 0.325 4.0 4.4	cycles amp µµf µµf
Cycles of Intermitt At a heater volta CHARACTERISTICS Heater Current Direct Interelectrode Capacitances (With shield JETEC No.316 Unit No.1: Plate to Cathode 4 Shield, Heater, and Shield, Heater, and Shield, Heater, and	ent Operat ge of 7.5 8 RANGE VA external ): External d Internal External d Internal	volts . LUES FOR Note 1	200 EQUIPMEN Min. 0.275 2.4	00 min. <b>T DESIGN</b> <i>Max.</i> 0.325 4.0	cycles amp μμf
Cycles of Intermitt At a heater volta CHARACTERISTICS Heater Current Direct Interelectrode Capacitances (With shield JETEC No.316 Unit No.1: Plate to Cathode+ Shield, Heater, and Shield	ent Operat ge of 7.5 8 RANGE VA external ): External d Internal	volts . LUES FOR Note 1	200 EQUIPMEN Min. 0.275	00 min. T DESIGN Max. 0.325	amp
Cycles of Intermitt At a heater volta CHARACTERISTICS Heater Current Direct Interelectrode Capacitances (With shield JETEC No.316 Unit No.1: Plate to Cathode 4	ent Operat ge of 7.5 8 RANGE VA external ): + External	volts . LUES FOR Note 1	200 EQUIPMEN Min. 0.275	00 min. T DESIGN Max. 0.325	amp
Cycles of Intermitt At a heater volta CHARACTERISTICS Heater Current Direct Interelectrode Capacitances (With shield JETEC No.316	ent Operat ge of 7.5 8 RANGE VA external ):	volts . LUES FOR Note 1	200 EQUIPMEN Min. 0.275	00 min. T DESIGN Max. 0.325	cycles amp
Cycles of Intermitt At a heater volta CHARACTERISTICS Heater Current Direct Interelectrode	ge of 7.5 RANGE VA	volts . LUES FOR Note 1	200 EQUIPMEN Min. 0.275	DO min. T DESIGN Nax. 0.325	cycles amp
Cycles of Intermitt At a heater volta CHARACTERISTICS	ge of 7.5	volts . LUES FOR Note	EQUIPMEN	DO min. T DESIGN Nax.	cycles
Cycles of Intermitt At a heater volta CHARACTERISTICS	ge of 7.5 RANGE VA	volts . LUES FOR	200	00 min. T DESIGN	cycles
Cycles of Intermitt At a heater volta	ge of 7.5	tion: volts .	200	)0 min.	cycles
	- + A				
This test is made as 1-A for Electron Tube	indicated s for type	in the J e 5726/6A	AN Speci L5W.	fication	ns JAN
Heater Cycling Life T	e≈t:				
Section F6b (9f) Vi Vibrational Accel	bration Te eration .	est:	2	.5 max.	9 9
follows: Section F6b (9e) Sh	ock Test:		7	00	
These tests are made JAN 1-A for Electron	as indica Tubes, N	ated in t Way 1946	he JAN S under t	pecifica he sect	tions: ion as
Shock and Vibration T	ests:				
DC Output Current Per	Plate .		· · 3	9	sma (
Minimum Total Effecti	ve Plate-S	Supply	1	1/	voits
AC Plate-Supply Volta	ige		4	17	un lto
The two units ma	y be used	separate	ly or in	paralle	L
Typical Operation:					
Heater positive wit	h respect	to catho to catho	de 3	60 max. 60 max.	volts
Heater negative wit	OLTAGE:		• •	10 max.	ma
PEAK HEATER-CATHODE V Heater negative wit			· · 3	50 max.	ma
For duration of 0.2 DC OUTPUT CURRENT PER PEAK HEATER-CATHODE V Heater negative wit	second ma	aximum .	0		

TUBE DEPARTMENT



orie

## **TWIN DIODE**

	Note	Min.	Max.	
Plate of Unit No.1 to Plate of Unit No.2	2 1,3	- 40	0.026	μμ1 ma
Note 1: With 6.3 volts ac on heater. Note 2: With external and internal ship Note 3: With dc plate voltage = 10 volts electrodes of poposite unit arc	eld conne s. Each u	cted to g nit tested	round. i separately	wit



(





## MECHANO-ELECTRONIC TRANSDUCER

TRIODE TYPE

#### GENERAL DATA

#### Electrical:

H

eater,	for	-	Un	ip	ot	en	ti	al	Ca	athode:									
Voltag	e.									6.3				a	0	or	d	С	volts
Curren	t.									0.15									amp

#### Mechanical:

Lead 4 - Heater

Lead 5-Grid

Lead 6 - Heater



Lead 7-Cathode, Internal Shield

SLA

Shell - Plate

#### Maximum Ratings, Design-Center Values:

DC PLATE-SUPPLY VOLTAGE	max volts
DC PLATE CURRENT 5	max ma
PLATE DISSIPATION 0.4	max watt
Heater negative with	
Heater positive with 90	max volts
respect to cathode 90	max volts
Typical Operation:	
DC Plate-Supply Voltage	volts
DC Grid Voltage 0	volts
Amplification Factor	
Plate Resistance /2000	· · · · onms
Transconductance 2/5	micromhos
DC Plate Current 1.5	ma
Load Resistance	· · · · ohms
Deflection Sensitivity	. volts/degree
[2300	. volts/radian
Moment of Inertia	
of Plate 3.4	milligram cm-
Rotational Compliance 10.0013 x 10	radian/dyne cm
of Diaphragm J ( 0.075	degree/gram cm
For plate shaft in undeflected position.	
Average change in voltage across 75000-ohm plate-loa	d resistor when the
The plane of deflection of the plate shaft must co	ncide with the plane

through terminal Po.5 and the axis of the tube. Based on external plate-shaft length of 1/8\* and the center of the diaphragm as pivot.

NOV. 15, 1948

#### TUBE DEPARTMENT

TENTATIVE DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



## MECHANO-ELECTRONIC TRANSDUCER

#### OPERATING PRINCIPLES

The plate shaft extends through the center of a thin metal diaphragm. Angular displacement of the plate shaft changes the distance between the fixed grid and the plate and results in a change in the plate current. The plane of deflection of the plate shaft coincides with the plane through terminal No.5 and the axis of the tube.

The part of the plate shaft within the tube has a minimum free cantilever resonance of 12000 cycles per second permitting, with suitable mechanical coupling to the external end of the plate shaft, measurements of vibration up to 12000 cycles per second.

#### OPERATING NOTES

The 5734 may be mounted by means of a supporting clamp which should firmly grip the metal shell of the tube within the designated clamping space indicated on the Outline Drawing. It is essential, however, that the pressure exerted on the shell by the clamp be held to a minimum to prevent possible fracture of the seals.

Under no circumstances should the plate shaft be displaced from its normal position by more than 0.5 degree. A larger displacement of the plate shaft will distort the flexible diaphragm and may damage the tube electrodes.

A non-corrosive flux must be used in soldering the actuating stylus to the plate shaft. Unless this precaution is observed, the plate shaft and the diaphragm will be damaged.

NOV. 15, 1948

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY TENTATIVE DATA



## MECHANO-ELECTRONIC TRANSDUCER



NOTE I: TUBE SUPPORTING CLAMP ON METAL SHELL MUST BE WITHIN THIS SPACE, AND SHOULD BE FASTENED ONLY TIGHT ENOUGH TO INSURE GOOD CONTACT FOR THE PLATE CONNECTION.

NOTE 2: THE PLANE OF DEFLECTION OF THE PLATE SHAFT WILL COINCIDE WITH THE PLANE THROUGH TERMINAL LEAD NO.5 AND THE AXIS OF THE TUBE.

92CS-7036

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NOV. 15, 1948

CE-7036



AUG.13,1948

92CM-7055





AUG. 17, 1948

92CM-7057

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



# PREATING TYPE PENTAGRID CONVERTER

7-PIN MINIATURE TYPE

For use as a combined mixer and oscillator tube particularly in mobile and aircraft communications receivers in which dependability is paramount. This "premium" type is similar to the 6BE6.

#### GENERAL DATA

#### Electrical:

Heater for Uninetential Cathoda:									
Voltage 6.3	1					ac	ar c	to v	olts
Current.	:				:	uc .			. amp
Direct Interelectrode Capacitances:	.0		• •		•	• •	• •	•	• amp
Grid No.3 to all other elec-									
trodes (RF input)						7.	1		μµf
Plate to all other electrodes									
(Mixer input)						7.6	5		μµf
Grid No.1 to all other elec-									
trodes (Oscillator input)						5.5	ō		μµf
Grid No.3 to plate		•	• •			0.	3 ma	i×.	μµf
Grid No.3 to grid No.1	•	• •	• •			().13	s ma	a×.	μµt
Grid No.1 to cathode & grid No.5	•	•	• •			-	3		μμt
Cathode & grid No.5 to all other						4.1			c
electrodes except grid No.1	•	• •	• •			1:	C		μμΤ
Mechanical:									
Operating Position									. Any
Maximum Överall Length								2-	1/8"
Maximum Seated Length								1-	7/8"
Length, Base Seat to Bulb Top									
(Excluding tip)		•				1-1	/2"	± 3	/32"
Diameter	•	•	• •	•	0	650	" to	0.	750"
Dimensional Outline	•	• •	•	See	G	ener	ral	Sec	tion
Bulb	•	• •			• ;			15	-1/2
Base Small-Button Minia	atu	re	1-	Pir	n (	JEDI	EC N	lo.E	/-1)
Basing Designation for BUITOM VIE	_W	• •	• •	•	•	• •	• •	•	. /CH
A 5									
Pin 1-Grid No.1				Pir	n 5	- P	late	2	
Pin 2 - Cathode, 3/	6	)		Pir	1 6	- G	rid	No.	2,
Grid No.5						(	Gric	No	.4
Pin 3-Heater	X7	)		Pir	17	- G	rid	No.	3
Pin 4-Heater	-								1
$\odot$									
CONVERTE	R								

Maximum Ratings, Absolute Values:		
PLATE VOLTAGE	330 ma	x. volts
Negative-bias value	55 ma	x. volts
Positive-bias value	0 ma	x. volts
SUPPLY VOLTAGE	330 ma	x. volts
<sup>O</sup> : See next page.	44,193	the faith of

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TENTATIVE DATA 1

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



## PENTAGRID CONVERTER

GRIDS-No.2 & No.4 VOLTAGE	. volts
TOTAL CATHODE CURRENT	. ma
GRIDS-No. 2 & No. 4 INPUT.	watts
PLATE DISSIPATION 1.1 max	watts
PEAK HEATER_CATHODE VOLTAGE	
Hester pozative with respect	
Teater negative with respect 100 may	volto
Hester essitive with respect	· voits
te cothede 100 max	volts
DUL D TEMPEDATURE (At bettest point	
an hulb surface) 165 may	00
Characteristics:	
With Separate Excitation*	
Plate Voltage	volts
Grids-No.2 & No.4 Voltage 100 100	volts
Grid-No.3 Voltage	volts
RMS Grid-No.1 (Öscillator-grid)	
Voltage	volts
Grid-No.1 Resistor	ohms
Plate Resistance (Approx.) 0.4 1	megohm
Conversion Transconductance 455 475	µmhos
Plate Current 2.6 2.6	ma
Grids-No.2 & No.4 Current 7.5 7.5	ma
Grid-No.1 Current 0.5 0.5	ma
Total Cathode Current 10.6 10.6	ma
Grid-No.3 Voltage (Approx.) for	1.4.1
conversion transconductance of:	
10 μmhos30 -30	volts
100 μmhos6 -6 -6	volts
Oscillator Characteristics (Not Oscillating):	199
Plate & Gride No. 2 & No. 4 Voltage 100	volts
Crid No 2 Voltage	volts
Grid-No.1 Voltage	volts
Amplification Eactor § 22.5	
Oscillator Transconductances	umbos
Cathode Current.	ma
Grid-No.1 Voltage (Approx.) for	
plate $\mu a_{\star} = 10 \dots -11$	volts
0 Without outgraph chield	
* The characteristics shown with separate excitation correst	ond very
closely with those obtained in a self-excited oscillator circ ating with zero bias.	uit oper-
With grids No.2 & No.4 connected to plate.	
9 Between grid No.1 and grids No.2 & No.4 connected to plate.	
SPECIAL RATINGS & PERFORMANCE DATA	1
Shock Pating	
Impact Accoloration 450 may	
This test is performed in a Navy-Type High-Impac	et (fly-
into cose is performed in a navy-type, high-impac	

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5750

ELECTRON TUBE DIVISION TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5750

## PENTAGRID CONVERTER

weight) Shock Machine.

#### Fatigue Rating:

Vibrational Acceleration . . . . . . . 2.5 max. g This test is performed for a period of 100 hours minimum at a frequency of 25 cycles per second.

#### Heater-Cycling Life Performance:

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

> CURVES shown under Type 6BE6 in the Receiving-Tube Section also apply to the 5750







## HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

Intended for applications where dependable performance under shock and ubration is paramount.

under Snock	and biblation is p	an amount c
	GENERAL DATA	
Electrical:		
Heater, for Unipotentia Heater Arrangement Voltage (AC or DC) . Current	l Cathodes: Series 12.6 ± 10% 0.175	Parallel 6.3 ± 10% volts 0.35 amp
Characteristics. Class	A, Amplifier:	
Plate Voltage Grid Voltage Amplification Factor . Plate Resistance Transconductance Plate Current	100 1 70 58000 1 70 58000 1200 0.9	250 volts -3 volts 70 58000 ohms 1200 μmhos 1.0 ma
Mechanical:		
Mounting Position Maximum Overall Length Maximum Seated Length Length, Base Seat to Bu Maximum Diameter Bulb Sm	lb Top (Excluding tip all-Button Noval 9- BOTTOM VIEW	Any 2-3/16" 1-15/16" 1-9/16" ± 3/32" 7/8" T-6-1/2 Pin (JETEC No.E9-1)
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 - Heater Mid-Tap
AM	PLIFIER - Class A	
Value	es are for each uni	t
Maximum Ratings, Absolu	te Values:	
PLATE VOLTAGE GRID VOLTAGE: Negative bias value Positive bias value PLATE DISSIPATION PEAK HEATER-CATHODE VOL	TAGE:	330 max. volts 55 max. volts 0 max. volts 0.8 max. watt
Heater negative with Heater positive with	respect to cathode respect to cathode	100 max. volts 100 max. volts

OCT. 1, 1953

TUBE DEPARTMENT

BULB TEMPERATURE (At hottest point on

bulb surface)

165 max.

oC



## HIGH-MU TWIN TRIODE

CHARACTERISTICS RANGE VALUE	S FOR	EQUIPMENT	DESIGN*	
	Note	Min.	Max.	
Heater Current	1 1,2 1,2 1,3 1,2 1,4	0.160 55 0.4 - 900 -	0.190 85 1.8 10.5 1600 0.4	amp ma μamp μmhos μamp
to cathode	1,5	-	10	μamp
to cathode	1,5	-	10	µamp
Between Grid and All Other Electrodes Tied Together Between Plate and All Other	1,6	500	~ m	egohms
Electrodes Tied Together	1,7	500	- m	egohms
* Each tube is stabilized before char operation for at least 45 hours at r tion values equivalent to life test	acterist room ter conditio	tics testin mperature an ons.	nd with d	tinuous issipa-
Note 1: With 12.6 volts ac or dc on hea	iter (sei	ries connec	ted).	
Note 2: With dc plate voltage of 250 volts. Each unit is tested se under test are grounded.	volts paratel	and dc gri y. Electro	d voltag des of u	nit not
Note 3: With dc plate voltage of 250 vo megohm, and dc grid voltage of separately. Electrodes of unit	olts, pl -10.5 v t not un	ate load re olts. Each der test an	esistance n unit is re ground	of 0.1 tested ed.
Note 4: With dc plate voltage of 250 vo and dc grid voltage of -3 volts Electrodes of unit not under te	olts, gr . Each st are g	id resistor unit is te grounded.	r of 1.0 sted sepa	megohm, rately.
Note 5: With 100 volts dc between heate	r and ca	athode, and	units co	nnected
Note 6: With grid 100 volts negative wi tied together.	th respe	ect to all	other ele	ctrodes
Note 7: With plate 300 volts negative trodes tied together.	with r	espect to	all other	r elec-
SPECIAL RATINGS & PE	ERFORMA	NCE DATA		
Shock Rating:				
Impact Acceleration Tubes are held rigid in thrk Navy Type, High Impact (flywe subjected to 600 g impact acc	ee dif eight) elerat	60 ferent po Shock Mac ion.	0 max. sitions chine ar	g in a nd are
Fatigue Rating:				
Vibrational Acceleration Tubes are rigidly mounted and	 d subie	2.	5 max. each of	g

Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.

OCT. 1, 1953

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TENTATIVE DATA 1

TUBE DEPARTMENT



## HIGH-MU TWIN TRIODE

#### Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . . . . . . . 100 max. mv Under the following conditions and with units connected in parallel; heater voltage of 12.6 volts (series connected), dc plate voltage of 250 volts, dc grid voltage of -3 volts, plate load resistance of 2000 ohms, and vibrational acceleration of 2.5 g at 25 cycles per second.

#### Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . 2000 min. cycles Under the following conditions and with parallel heater arrangement: heater voltage of 7.5 volts cycled one minute on and one minute off, heater 100 volts positive with respect to cathode, and plate and grid voltage = 0 volts.









#### -A

## PREASURA PREASURA MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount. The 5814-A, a "premium" version of the 12AU7, supersedes type 5814.

#### GENERAL DATA

#### Electrical: Heater, for Unipotential Cathodes: Heater arrangement Series Parallel . 12.6 ± 10% 6.3 ± 10% ac or dc volts Voltage . . . . . . Current . . . . . 0.175 0.35 amp Direct Interelectrode Capacitances (Approx.):° Unit No. 1 Unit No. 2 1.5 μμf Grid to plate . . . . . . 1.5 Grid to cathode and heater. . 1.6 1.6 μµf Plate to cathode and heater . 0.5 0.4 μµf Characteristics, Class A, Amplifier (Each Unit): Plate Voltage . . . . . . . 100 250 volts Grid Voltage. . . . . . . . 0 -8.5 volts 19.5 17 Amplification Factor. . . . 6250 7700 Plate Resistance (Approx.). . . ohms 3100 Transconductance. . . . . . . 2200 *u*mhos 11.8 10.5 ma plate current of 10 µamp. . . -22 volts Mechanical: Mounting Position . . . . . . . . Any Maximum Overall Length. . . . . . . . . 2-3/16' 1-15/16" Maximum Seated Length . . Length, Base Seat to Bulb Top (Excluding tip) 1-9/16" ± 3/32' Maximum Diameter. . . . . . . . . 7/8' . . . . . . Dimensional Outline . See General Section . . . T-6-1/2 Bulb. . . . Base. . Basing Designation for BOTTOM VIEW. . . . 9A Pin 1-Plate of Pin 6-Plate of Unit No.2 Unit No.1 Pin 2-Grid of Pin 7-Grid of Unit No.2 Unit No.1 Pin 3-Cathode of Pin 8-Cathode of Unit No.2 Unit No.1 Pin 9-Heater Pins 4 & 9 - Heater of (2) Unit No.2 Mid-Tap Pins 5 & 9 - Heater of Unit No.1 AMPLIFIER - Class A. Values are for Each Unit Maximum Ratings, Absolute Values: 330 max. volts PLATE VOLTAGE . . . . . . . . . . . <sup>O</sup> Without external shield. 12 - 56TENTATIVE DATA 1 TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA

## 5814-A

5814-1

## MEDIUM-MU TWIN TRIODE

, Notes 1	to 6: Se	e next p	age.				1.11.00	11.25	11
									and Dat in the
1 De pa	5								v 30.438
initial	average	e			10.03	1,5	$1.0 \pm 8 \frac{h}{h} \rightarrow 8$	15	TEAR TO BOOK
nours, e	ae of t	the							
and aver	age aft	er 500			- 72				
tance (2	) init	ially,							
average	transco	onduc-							
Differen	ce bet	ween							1-12
ranscondu	ctance	Change		1.		0,0	2200		μιποσ
ranscordu	s	(3)	·X		-	1,5	2250	2100	umbos
ranscondu	ctance	(2) at				1 5	2000	2700	umba
ranscondu	ctance	(2)			•	1,5	2500	3700	µmhos
ranscondu	ctance	(1)			2	1,3	1750	2650	µmhos
late Curr	ent (2)	)				1,4	- 0H	20	µamp
Between	Units .					1,3	- 1	3.5	ma
late-Curr	ent Di	fference	e	•		1,)	0.0	14.5	a na na
Mplificat	ont (1		•	1	o <b>f</b> 141	1 2	6.5	14 5	ma
heater	(Unit	No.2).	• •	•	•	12	0.2	U.6	μμ†
Plate to	cathoo	le and					0.0	0.0	
heater	(Unit	No.1).				2	0.3	0.7	μµf
Plate to	cathoo	de and					1.10	2.00	Property i
heater	cathode	anu				2	1.25	1.95	μµf
Grid to	cathod.	· · · ·	• •	•	·	2	1.2	1.0	μμι
Capacita	nces:					2	1 0	1 0	ins dool
irect Int	erelect	trode							1.1.1
eater Cur	rent					1	0.160	0.190	amp
						Note	Min.	Max.	
		unless	Uti	101	wise	speci	, iea		
	Values	are for	O+	cn	Uni	t ana	are Inti	ial,	1.925
UTAN	Welver		E		Ileri	+ and	are Init	ial	881 - B
CHAR	ACTERIS	TICS RA	NGE	V	ALUE	S FOR	EOUIPMEN	T DESIG	•
									v
For cath	ode-bia	as opera	atic	n.			. 1.(	) max.	megohm
For fixe	d-bias	operat	ion.				. 0.25	o max.	megohm
Grid-Circu	it Res	istance	:						1.00
Aaximum Ci	rcuit	Values:							1000
	at en	d of ta	ould	ite	a aa	ita for	r this t	ype	
	See R.	ESISTAN	CE-0	200	PLEL	AMPLI	FIER CH	ART	1.000
ypical up	eration	as Res		an		ouprec			
	oration	an Por	ict	20	0.0	ounles	Amplif	er.	
on bulb	surface	e)					. 165	max.	oC
ULB TEMPE	RATURE	(At hot	ttes	t	poin	t			1110912
neater p	ositive	withre	espe	ct	to	cathod	e. 100	) max.	volts
llester			- SUE	C 1	TO	Cathoo	e. 100	max.	VOITSI
Heater n	Poat ive	with re	AUL			a a the d	- 100		1.4-
EAK HEATE Heater n	R-CATHO	DE VOLT	TAGE	:			. 100		



SBIRIA

## MEDIUM-MU TWIN TRIODE

						N	ote	Min.	Max.	
	Reverse ( Grid Emis	Grid Current ssion Curren	 nt.				1,7 8,9	Ξ	0.5 1.5	μamp μamp
	Leakage	Current:								
	Heater	negative w	th							
	respe Heater	positive w	de. th	• •	•	. 1	,10	-	10	μamp
	respe	ect to cathe	ode.		2	. 1	,10	-	10	μamp
	Leakage F Betweer	Resistance: n grid and a	a11							4
-	otner tied	together	5			. 1	11	1 2	500	meachms
	Between	plate and	all				-,		000	
	other	electrodes	5							2094 U.S. 2010
	tied	together .	• •			. 1	1,12	-	500	megohms
	Leakage F	Resistance a	at							
	Botwood	urs:	11							
	other	r electrode	211							
	tied	together .				. 1	1.11	-	250	megohms
	Between	n plate and	all							5
	other	r electrode:	S						050	
	tied	together .	• •			•	1,12	-	250	megonms
	Note 1:	With 12.6 vol	ts ac	or d	c on	heate	r (ser	ies com	nnection	)
	Note 2:	Without extents to ground.	nal s	hield	and	with	unit r	ot unde	er test	connected
	Note 3:	With dc plate tested separa	volts ately.	= 25 Uni	0, an t no	nd dc unde	grid v r test	connec	-8.5.	Each unit ground.
	Note 4:	ohms) = 0.5, rately. Unit	and d and d	lc gr under	id vo tes	= 250 lts = t conn	-30. ected	Each u to grou	init tes und.	ted sepa-
	Note 5:	With dc plat tested separa	e vol: ately.	ts = Uni	100, t no	and d unde	ic gri r test	d volts connec	= 0.	Each unit ground.
	Note 6:	With 11.0 vo	lts ac	or d	c on	heate	r (ser	ies co	nnection	1).
	Note 7:	With dc plat = 0.5, and d Unit not und	e vol c grid er tes	ts = volt t cor	250, s = inect	grid- -8.5. ed to	Each ground	unit t unit t	stance ested se	eparately.
	Note 8:	With 15.0 vo	lts ac	or d	c on	heate	er (sei	ries co	nnection	n).
	Note 9:	With dc plat = 0.5, and d Unit not und	e vol c gric er tes	ts = d vol	250, ts = nect	grid- -30. ed to	-circu Each ground	it resi unit te 1.	stance ested se	(megohms) eparately.
	Note 10:	with 100 vol- in parallel.	ts dc	betwe	en h	eatera	and cat	thode ar	dunits	connected
	Note 11:	With grid 10 trodes tied	00 vol toget	ts ne her.	gati	ve wit	th res	pect to	all ot	her elec-
	Note 12:	With plate 3 trodes tied	100 vo togeti	lts n ner.	egat	ive wi	th res	spect t	o all o	ther elec-
	• Each tu operati values	ube is stabil on for at leas equivalent to	ized t t 45 H life	befor nours test	e ch at r cond	aracte oom te itions	eristi empera s.	cs test ture and	ing by I with d	continuous issipation
	1-12/201									
										-

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TUBE DIVISION

TENTATIVE DATA 2


5814-A

MEDIUM-MU TWIN TRIODE

### SPECIAL RATINGS & PERFORMANCE DATA

### Shock Rating:

5814-1

Impact Acceleration. . . . . . . . . . . . . . . . 600 max. g This test is performed on a sample lot of tubes from each production run in a Navy Type, High-Impact (flyweight) Shock Machine. Tubes are held rigid in four different positions and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for vibrational acceleration, heater-cathode leakage current, and transconductance.

### Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for impact acceleration, heater-cathode leakage current, and transconductance (1).

### Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . . . . . . . . 100 max. mv This test is performed on a sample lot of tubes from each production run under the following conditions: plate of unit No.1 tied to plate of unit No.2, grid of unit No. 1 tied togrid of unit No.2, heater volts = 12.6, dc plate volts = 250, dc grid volts = -8.5, plate load resistance (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cycles per second.

### Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . 2000 min. cycles Under the following conditions and with the heaters of unit No.1 and unit No.2 connected in parallel: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and plate and grid volts = 0.

### Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage . . . . . . . . . . 100 max. mv This test is performed on a sample lot of tubes from each production run under the following conditions: plate of unit No.1 tied to plate of unit No.2, grid of unit No.1 tied to grid of unit No.2, dc heater volts = 12.6, platesupply volts = 300, cathode resistor (ohms) = 1500 common to both units, and plate load resistance (ohms) = 50,000.

TENTATIVE DATA 2

TUBE DIVISION



SOIR

# MEDIUM-MU TWIN TRIODE

### Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.0 microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

#### I-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. With both units operating, each unit is checked for variation in transconductance (1) under conditions of maximum rated plate dissipation. At the end of I hour, the value of transconductance is read. The variation in transconductance from the O-hour reading will not exceed 10 per cent.

### 100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run under the conditions of maximum rated plate dissipation to insure a low percentage of early inoperatives. At the end of 100 hours a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or avalue of reverse grid current in excess of 1.0 microampere under the conditions specified in CHARACTERISTICS RANGE VALUES for reverse grid current.

#### 500-Hour Average Life Performance:

This 500-hour test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. With both units operating, each unit is life tested separately at room temperature under the following conditions: heater volts = 12.6 ac or dc (series connection), plate volts = 250, grid volts = -8.5, grid-circuit resistance (megohms) = 0.5, heater 135 volts positive with respect to cathode, and bulb temperature  $(^{\circ}C) = 165$ . At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass the established initial limits for heater current, reverse grid current, heater-cathode leakage current, and 500-hour limits for transconductance (2), transconductance change, and leakage resistance are shown under CHARACTERISTICS RANGE VALUES.

TENTATIVE DATA 3



5814-A

# MEDIUM-MU TWIN TRIODE

OPERATING CONDITIO	NS AS RESI (Each U	STANCE-CO nit)	UPLED AMPL	IFIER
Plate-Supply Voltage		90		volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain▲	0.24 3400 16 12	0.51 9400 19 12	1 22000 20 12	megohm ohms volts
Plate-Supply Voltage		180		volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain <sup>A</sup>	0.24 2800 32 13	0.51 8400 37 13	1 20000 42 13	megohm ohms volts
Plate-Supply Voltage		300		volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain▲	0.24 2600 44 14	0.51 7000 52 13	1 18000 58 13	megohm ohms volts

▲ At 2 volts (rms) output.

5814-4

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







TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY 92CM-9097







# SHARP-CUTOFF PENTODE

SUBMINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode: Voltage 6.3±5% ac or dc Current 0.150 ac Direct Interelectrode Capacitances: With Exter- nal Shield <sup>o</sup> Mithout Exter-	volts , amp
Grid No.1 to Plate     0.015 max.     0.03 max.       Input	µµµf µµµf µµµf
<sup>0</sup> Having inside diameter of 0.405" and connected to cathode.	
Characteristics, Class A <sub>l</sub> Amplifier:	
Plate Supply Voltage   100     Grid-No.2 Supply Voltage   100     Cathode Resistor   150     Plate Resistance   260000     Transconductance   5000     Plate Current   7.5     Grid-No.2 Current   2.4     Grid-No.1 Volts (Approx.) for plate	volts volts ohms ohms µmhos ma ma
current of 10 $\mu$ amp9	volts
Mechanical:	
Operating Position Maximum Bulb Length Length from Button Seal to Bulb Top (Excluding tip) Diameter Bulb Leads, Flexible Length Length Length Diameter Length Length Length Length Diameter Length Diameter Length Diameter Diamet	. Any 1-3/8" 0.060" 0.017" . T-3 . 8 1-3/4" utline section
Lead No.1-Grid No.1 Lead No.2-Cathode, Grid No.3 Lead No.3-Heater Lead No.4-Cathode, Grid No.3 Unit No.4 - Cathode, Grid No.3	r No.2 de, No.3
AMPLIFIER - Class A	
Maximum Ratings, Absolute Values:     DC PLATE VOLTAGE   165 max.     GRID-No.2 (SCREEN) VOLTAGE   155 max.	volts volts
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TUBE DEPARTMENT

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



5840

# SHARP-CUTOFF PENTODE

<b></b>	and the second second second				7
GRID-No.1 (CONTROL-GRID	) VOLTAGE:				
Negative bias value .			55 max	. volts	1
PLATE DISSIPATION			1.1 max	. watts	1
GRID-No.2 INPUT			0.55 max	. watt	
DC CATHODE CURRENT			16 5 max	ma	
DE AL HEATED CATHODE VOI	TACE .		10.5 max	• 11161	
PEAK HEATER-CATHODE VOI	TAGE:				
Heater negative with	respect		-	1.	6
to cathoo	ie		200 max	. VOITS	
Heater positive with	respect				1
to cathoo	ie		200 max	. volts	
BULB TEMPERATURE (At ho	ottest point	t		0.0	
on bulb s	surface) .		250 max	. <sup>o</sup> C	
Typical Operation as Re	sistance_Co		ifier		
Typical operation as Re	oro cance -oc	aprea Ampr			
See RESISTA	NCE-COUPLED	AMPLIFIER	CHART		
at end of t	abulated da	ta for this	type		
Maximum Circuit Valuas					
Maximum Circuit Values:					
Grid-No.1-Circuit Resis	tance:				
For cathode-bias oper	ation		L.2 max.	megohms	
For fixed-bias operat	ion		Not reco	ommended	
CHARACTERISTICS RA	NGE VALUES	FOR EQUIPM	ENT DESIG	N*	
	Note	Win.	Max.		
Usatan Current	1	0 120	0 100		
Meater Current	•• 1	0.138	0.102	amp	
Grid-No. 1-to-Plate	0		0.045	c	
Capacitance .	2	-	0.015	μμτ	
Input Capacitance	•• 2	3.5	4.9	μμτ	
Output Capacitance	•• 2	2.9	3.9	μμτ	
Plate Current	1,3	5.5	9.5	ma	
Plate Current	1,4	-	50	$\mu$ amp	
Transconductance	1,3	4100	5900	µmhos	
Transconductance	5,3	3750	-	µmhos	
Grid-No.1 Current	1,6		±0.3	μamp	-
Grid-No.2 Current	1,3	0.5	3.5	ma	
Plate Resistance	1,7	0.175		megohm	
Heater-Cathode Leakage					
Curr	ent:				
Heater negative with					1
respect to cathode	1,8	-	7.0	$\mu amp$	
Heater positive with					-
respect to cathode	1,8	-	7.0	$\mu$ amp	
Leakage Resistance:					
Between Grid No.1 and					
All Other Electrode	S				
Tied Together	1.9	100	-	megohms	
Between Plate and All		_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			1
Other Electrodes					
Tied Together	1 10	100	-	magahma	
rieu rogerier	• • 1,10	100	_	negonins	
*					
see next page.					
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TUBE DEPARTMENT



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# SHARP-CUTOFF PENTODE

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

- Note 2: With external shield having inside diameter of 0.405" and connected to cathode.
- Note 3: With plate supply voltage of 100 volts, grid—No.2 supply volt age of 100 volts, cathode resistor of 150 ohms, and cathode bypass capacitor of 1000 microfarads.

Note 4: With dc plate voltage of 100 volts, dc grid-No.2 voltage of 100 volts, and dc grid-No.1 voltage of -9 volts.

- Note 5: With 5.7 volts ac or dc on heater.
- Note 6: With plate supply voltage of 100 volts, grid-Mo.2 supply voltage of 100 volts, cathode resistor of 150 ohms, cathode bypass capacitor of 1000 microfarads, and grid-No.1 resistor of 0.1 megohm.
- Note 7: With plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms bypassed by capacitor having a maximum reactance of 3 ohms.

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

- Note 9: With grid No.1 100 volts negative with respect to all other electrodes tied together.
- Note 10: With plate 300 volts negative with respect to all other electrodes tied together.
- \* Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

### SPECIAL RATINGS & PERFORMANCE DATA

### Shock Rating:

### Fatigue Rating:

Vibrational Acceleration . . . 2.5 max. g Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.

Uniform Acceleration Rating . . . . 1000 max.

Tubes are subjected in each of three positions to a gradually applied uniform acceleration up to 1000 g.

### Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . . . . . . . . . . . . 60 max. mv Under the following conditions: A 100-volt plate and grid-No.2 voltage supply having an impedance not exceeding that of a 40- $\mu$ f capacitor, plate load resistance of 10000 ohms, grid-No.1 resistor of 0.1 megohm, cathode resistor of 150 ohms, cathode bypass capacitor of 1000  $\mu$ f, and vibrational acceleration of 15 g at 40 cps.

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### SHARP-CUTOFF PENTODE

### Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . 2500 min. cycles Under the following conditions: With heater voltage of 7.0 volts cycled 1 minute on and 4 minutes off, heatercathode voltage of 140 volts (rms), and plate, grid-No.2, and grid-No.1 voltage = 0 volts.

### Average Life Performance:

5840

The average life performance based on a 500-hour test at 175°C ambient temperature is not less than 450 hours. This life test is made on sample lot of tubes with heater voltage of 6.3 volts; plate supply voltage of 100 volts; grid-No.2 supply voltage of 100 volts; dc heater-cathode voltage (heater positive with respect to cathode) of 200 volts; cathode resistor of 150 ohms; and grid-No.1 resistor of 1 megohm.

The 500-hour end-point limits for the 5840 with heater voltage of 6.3 volts, plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms bypassed by capacitor having a maximum reactance of 3 ohms, and dc heater-cathode voltage of 100 volts with heater either positive or negative with respect to cathode are: transconductance, 3250 micromhos minimum; heater-cathode leakage current, 20 microamperes maximum or -0.9 micro-ampere maximum.



# SHARP-CUTOFF PENTODE

### OPERATING CONDITIONS AS RESISTANCE-COUPLED AMPLIFIER

Plate-Supply Voltage			10	00			volts
Plate Load Resistor Grid-No.2 Resistor	0.10	0.10	0.27 0.68	0.27 0.68	0.47	0.47	meg meg
Grid-No.1 Resistor <sup>0</sup> Cathode Resistor	0.27 820	0.47 820	0.47 2200	1.0 2200	0.47 3300	1.0 3300	meg ohms
Sig. Input Volt. (rms) Output Voltage (rms) Voltage Gain <sup>A</sup>	0.1 8.2 82	0.1 9.0 90	0.1 9.5 95	0.1 11.8 118	0.1 9.2 92	0.1	volt volts
Sig. Input Volt. (rms)*	0.23	0.22	0.15	0.16	0.12	0.14	volt
Voltage Gain <sup>A</sup> Distortion	4.9	85 4.8	91 4.7	106	92	114	%
Plate-Supply Voltage			11	50			volts
Plate Load Resistor Grid-No.2 Resistor Grid-No.1 Resistor <sup>O</sup> Cathode Resistor	0.10 0.27 0.27 560	0.10 0.27 0.47 560	0.27 0.82 0.47 1500	0.27 0.82 1.0 1500	0.47 1.5 0.47 2200	0.47 1.5 1.0 2200	meg meg ohms
Sig. Input Volts.(rms) Output Voltage (rms) Voltage Gain <sup>®</sup> Distortion	0.1 11.5 115 1.5	0.1 12.5 125 2.2	0.1 13.2 132 2.4	0.1 15.5 155 2.4	0.1 13 130 3.7	0.1 16.7 167 3.0	volt volts
Sig. Input Volt.(rms)* Output Voltage (rms) Voltage Gain≜	0.20 21.7 109	0.18 21.7 120	0.16 20.5 128	0.16 24 150	0.11 14 127	0.14 22.2 159	volt volts

O of following stage.

Ratio of signal output to signal input.

\* Maximum value to swing the grid of resistance-coupled amplifier tube to the point where its grid No.1 starts to draw current.

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







# 5842/417A

# Medium-Mu Triode

### 9-PIN MINIATURE TYPE

#### GENERAL DATA

### Electrical:

Heater Characteristics and Katings (A	losolute-Maxi	mum values):
Voltage (AC or DC)	6.3	± 0.6 volts
Current at heater volts = 6.3	0.300	amp
Peak heater-cathode voltage:		
Heater negative with		
respect to cathode	55	max. volts
Heater positive with		
respect to cathode	55	max. volts
Direct Interelectrode Capacitances (A	Approx.): <sup>a</sup>	
Plate to cathode and heater	0.55	μμf
Cathode to grid and heater	9	μμf
Plate to grid and heater	1.8	μµf
Characteristics Class A. Amplifier'		

### Plate Supply Voltage

Plate Supply Voltage	Э.							130	120	VOITS
Grid Voltage <sup>b</sup>								9		volts
Cathode Resistor								360	60	ohms
Amplification Factor	r.							43	43	
Plate Resistance (Ap	opr	0>	(.)					1600	1700	ohms
Transconductance								27000	25000	µmhos
Plate Current								27	25	ma

### Mechanical:

Pin 1 - Plate Pin 2 - No Internal Connection Pin 3 - Heater Pin 4 - Grid



Pin 5-Grid Pin 6-Cathode Pin 7-Grid Pin 8-Grid Pin 9-Heater

### AMPLIFIER - Class A

Maximum Katings,	A	103	501	u	te-	- M (	ıx	2 70 1	um	VC	211	ue:	s :				
PLATE VOLTAGE .															200	max.	volts
CATHODE CURRENT															38	max.	ma



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 3-62

# 5842/417A

<sup>a</sup> Without external shield.

**b** Measured with respect to the negative end of the cathode resistor.



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

5847/404A

# Sharp-Cutoff Pentode

### 9-PIN MINIATURE TYPE

### GENERAL DATA

### Electrical:

Heater Characteristics and Rati Voltage (AC or DC) Current at heater volts = 6.3 Peak heater-cathode voltage:	ngs (Absolu	te-Maximum Va 6.3 ± 0.6 0.300	lues): volts amp
Heater negative with respect to cathode Heater positive with		55 max.	volts
respect to cathode		55 max.	volts
	Without External Shield	With External Shield <sup>a</sup>	
Grid No.1 to plate Grid No.1 to cathode & grid No.3 & internal shield orid No.2 and	0.05 max.	0.04 max.	μµf
heater	7	7.1	μµf
Characteristics, Class A. Ampli	fier:		paper
Plate Supply Voltage. Grid-No.2 Supply Voltage. Grid-No.1 Voltage Cathode Resistor. Transconductance. Plate Current Grid-No.2 Current	150 150 - 110 12500 13 4.5	b 160 8.5 600 12500 13 4.5	volts volts volts ohms µmhos ma
Mechanical: Operating Position Type of Cathode Maximum Overall Length Maximum Seated Length Length, Base Seat to Bulb Top (Exc Diameter	luding tip)	Coated Unipot	. Any ential 1-3/4" 1-1/2" ± 3/32" 0.875"
Bulb.		See General 3	T6-1/2



# 5847/404A

Base	Small-Button Noval	9-Pin (JEDEC No.E9-1)	
Basing Designation	for BOTTOM VIEW		
Pin 1-Grid No.1	5	Pin 5-No Internal	1
Pin 2-No Internal	(4) (6)	Connection	
Connection		Pin 6-Plate	
Pin 3-Heater		Pin 7-No Internal	
Pin 4 – Cathode,		Connection	
Grid No.3,	(2)	Pin 8–Grid No.2	
Internal		Pin 9-Heater	

9

### AMPLIFIER - Class A

 $(\mathbf{1})$ 

Maximum Ratings, Absolute-Maximum Values:

PLATE VOLTAGE								÷			200	max.	volts	
GRID-No.2 (SCREEN-	-GF	211	D)	VC	DL	TAC	ĞΕ				165	max.	volts	
CATHODE CURRENT .											40	max.	ma	
GRID-No.2 INPUT .											0.85	max.	watt	
PLATE DISSIPATION					÷						3.3	max.	watts	

### Maximum Circuit Values:

Shield

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

**a** With external shield JEDEC No.315 connected to cathode.

b Operating conditions to minimize gain variations due to supply-voltage fluctuations.



# Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Audio-Amplifier Applications Critical as to Microphonism, Leakage Noise, and Hum

### GENERAL DATA

### Electrical:

Heater, for Unipotential Cathode: Voltage (AC or DC)Current at 6.3 volts	6.3 ± 10% volt 0.15 am	s
Pentode Connection: Grid No.1 to plate ( Grid No.1 to cathode, grid No.3.	0.11 max. μμ	f
grid No.2, heater, and pins 2 and 6. Plate to cathode, grid No.3.	2.7 μμ	f
grid No.2, heater, and pins 2 and 6.	2.4 μμ	f
Triode Connection: <sup>b</sup> Grid No.1 to plate	1.4 μμ 1.4 μμ 0.85 μμ	f

### Characteristics, Class A<sub>1</sub> Amplifier:

			Tri	iode	Pentode	
			Conne	ction <sup>D</sup>	Connectio	o n
Plate Voltage			100	250	250	volts
Grid No.3			-	-	Connected	to cathode
						at socket
Grid-No.2 Voltage			-	-	100	volts
Grid-No.1 Voltage			-3	-8	-3	volts
Amplification Factor.			21	21	_	
Plate Resistance						
(Approx.)			0.017	0.0137	2	megohms
Transconductance			1240	1530	1000	umhos
Plate Current			2.2	5.5	1.8	ma
Grid-No.2 Current			_	-	0.4	ma
Grid-No.1 Voltage					1997 B	d
(Approx.) for plate						
$\mu a = 10$	ŝ	÷	-	-	-8	volts
,		,			0	10100

### Mechanical:

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



-Indicates a change.

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I 3-61

Basing Designation for BOTTOM VIEW. . . . . . . . . . . . . 9AD

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



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

AMPLIFIER - Class A

- Maximum Ratings, Design-Maximum Values: Triode Pentode Connection<sup>b</sup> Connection volts PLATE VOLTAGE. . 275 max. 330 max. GRID No.3 (SUPPRESSOR GRID). Connect to cathode ----at socket GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE . . . . . . 330 max. volts GRID-No.2 VOLTAGE. . . . . . See Grid-No.2 Input Rating Chart at front of Receiving Tube Section GRID-No.1 (CONTROL-GRID) VOLTAGE: Negative-bias value. . . . 55 max. 55 max. volts Positive-bias value. . . . 0 max. 0 max. volts GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts . . . . . 0.25 max. watt For grid-No.2 voltages between 165 and 330 volts. . . . . . . See Grid-No.2 Input Rating Chart at front of Receiving Tube Section PLATE DISSIPATION. . . . . 1.7 max. 1.25 max. watts PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode . . . 100 max. 100 max. volts Heater positive with respect to cathode . . . 100 max. 100 max. volts Typical Operation as Resistance-Coupled Amplifier: See RESISTANCE-COUPLED-AMPLIFIER CHARTS No. 26 & No. 27 at front of this Section Maximum Circuit Values:

		Triode Connection <sup>b</sup>	Pentode Connection	
Grid-No.1-Circuit	Resistance	2.2 max.	2.2 max.	megohms

a Without external shield.
b Grid No.3 and grid No.2 connected to plate.

-Indicates a change.

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



### OPERATING CONSIDERATIONS

It is recommended that pins 2 and 6 be grounded in all applications. Grounding of these pins will effectively shield grid No.l and plate from heater and help to reduce hum level when an ac heater supply is used.



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← Indicates a change.

DATA 2 3-61



Electron Tube Division

Harrison, N. J.





<sup>92</sup>CS-11053



# AVERAGE PLATE CHARACTERISTICS Triode Connection





BEAM POWER TUBE

For audio-frequency power amplifier applications

### GENERAL DATA

# Electrical:

Heater, for Unipotential Cathode: Voltage 6.3ac or dc volts Current 0.9
Mechanical:
Mounting Position . Any Maximum Overall Length. 3-15/32" Maximum Beated Length . 2-29/32" Maximum Diameter
Pin 1 - No Connec- tion Pin 2 - Heater Pin 3 - Plate Pin 4 - Grid No.2 Pin 5 - Grid No.1 Pin 7 - Heater Pin 8 - Cathode, Grid No.3
AF POWER AMPLIFIER - Class A
Maximum Ratings, Design-Center Values:
PLATE VOLTAGE 400 max. volts GRID-No.2 (SCREEN-GRID) VOLTAGE 400 max. volts

GI	RID-No.2	2 (SCREEN-	-GRID	) VO	LTAGE					400	max.	volts
GI	RID-No.2	2 INPUT .								3	max.	watts
PI	LATE DIS	SIPATION								23	max.	watts
P	EAK HEAT	FER-CATHO	DE VO	LTAG	Ε:							
	Heater	negative	with	res	pect	to	Ca	ath	ode	200	max.	volts
	Heater	positive	with	res	pect	to	Cá	ath	ode	200	max.	volts

### Typical Operation and Characteristics:

the state provide the contract respective re				
Plate Voltage	250	300	350	volts
Grid-No.2 Voltage	250	200	250	volts.
Grid-No.1 (Control-Grid)				
Voltage	-14	-12.5	-18	volts
Peak AF Grid-No.1 Voltage	14	12.5	18	volts
Zero-Signal Plate Current	75	48	53	ma
MaxSignal Plate Current	80	55	65	ma
Zero-Signal Grid-No.2 Current .	4.3	2.5	2.5	ma
MaxSignal Grid-No.2 Current .	7.6	4.7	8.5	ma
Plate Resistance (Approx.)	30000	35000	48000	ohms
Transconductance	6100	5300	5200	µmhos
Load Resistance	2500	4500	4200	ohms
Total Harmonic Distortion	10	11	13	%
MaxSignal Power Output	6.7	6.5	11.3	watts
and the second sec				

2-57

TUBE DIVISION

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



# BEAM POWER TUBE

Maximum Circuit Values:		
Grid-No. 1-Circuit Resistance:		
For fixed-bias operation	0.1 max	meanhm
For cathode-bias operation	0.5 max	megohm
for cathode-bras operation	0.0 max.	megorim
AF POWER AMPLIFIER - Class /	A <sub>1</sub>	
Triode Connection - Grid No.2 Connecte	ed to Plate	
Maximum Ratings, Design-Center Values:		
PLATE VOLTAGE	400 max.	volts
PLATE DISSIPATION	26 max.	watts
Heater negative with respect to cathode.	200 max.	volts
Heater positive with respect to cathode.	200 max.	volts
Typical Operation and Characteristics:		
Plate Voltage	300	volts
Grid-No.1 (Control-Grid) Voltage18	-20	volts
Peak AF Grid-No.1 Voltage	20	volts
Zero-Signal Plate Current 52	78	ma
Max _Signal Plate Current	85	ma
Amplification Eactor		ind
Erangeneductance 5250		umbos
Previolation Augustance	4000	phillios
	4000	onins
Iotal Harmonic Distortion	0.0	<i>%</i>
MaxSignal Power Output 1.4	1.0	Walls
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm
PUSH-PULL AF POWER AMPLIFIER - C-	ass Ai	
Maximum Ratings. Design-Center Values:		
PLATE VOLTAGE	400 max	volts
CPID_No 2 (SCREEN_CRID) VOLTACE	400 may	volte
PID No 2 INPIT	3 may	watte
DIATE DISSIDATION	23 may	watte
DEAL DISSIFATION	2) max.	warts
TEAN REALER-GAINOUE VULIAGE.	200 may	volto
neater negative with respect to cathode.	200 max.	volta
meater positive with respect to cathode.	ZUU Max.	voits
Typical Operation:		
Unless otherwise specified, values are	for 2 tube	S
Plate Voltage	270	volts
Grid-No.2 Voltage	270	volts
Grid-No.1 (Control-Grid) Voltage16	-17.5	volts
Peak AF Grid-No.1-to-Grid-No.1		
Voltage	35	volts
F 7	TENTATIVE	DATA
-5/	IENIALIVE	. DATA 1

TUBE DIVISION



# BEAM POWER TUBE

Zero-Signal Plate Current 120 MaxSignal Plate Current 140 Zero-Signal Grid-No.2 Current. 10 MaxSignal Grid-No.2 Current. 16 Plate Resistance (Approx	134 155 11 17	ma ma ma
tube)	23500 5700	ohms µmhos
(Plate to plate)	5000 2 17.5	ohms % watts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation	0.1 max. 0.5 max.	megohm megohm
PUSH-PULL AF POWER AMPLIFIER - C1	ass AB <sub>1</sub>	
Maximum Ratings, Design-Center Values:		
PLATE VOLTAGE. GRID-No.2 (SCREEN-GRID) VOLTAGE. GRID-No.2 INPUT. PLATE DISSIPATION. PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	400 max. 400 max. 3 max. 23 max. 200 max. 200 max.	volts volts watts watts volts volts
Typical Operation:		
Values are for 2 tubes		
Plate Voltage	360 270 -22.5	volts volts volts
Voltage. 45 Zero-Signal Plate Current. 88 MaxSignal Plate Current. 132 Zero-Signal Grid-No.2 Current. 5 MaxSignal Grid-No.2 Current. 15	45 88 140 5 11	vorts ma ma ma
(Plate to plate)	3800 2 18	ohms g watts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance: <sup>†</sup> For fixed-bias operation For cathode-bias operation	0.1 max. 0.5 max.	megohn megohn
†: See next page.		
2_57	TENTATIVE	DATA

TUBE DIVISION



BEAM POWER TUB	E	
PUSH-PULL AF POWER AMPLIFIER - C	lass AB	
Triode Connection - Grid No.2 Connect	ted to Plate	
Maximum Ratings, Design-Center Values:		
PLATE VOLTAGE PLATE DISSIPATION PEAK HEATER-CATHODE VOLTAGE:	400 max. 26 max.	volts watts
Heater negative with respect to cathode . Heater positive with respect to cathode .	200 max. 200 max.	volts volts
Typical Operation:		
Values are for 2 tubes		
Plate Voltage Grid-No.1 (Control-Grid) Voltage Peak AF Grid-No.1-to-Grid-No.1 Voltage Zero-Signal Plate Current MaxSignal Plate Current Effective Load Resistance	400 -45 90 65 130	volts volts volts ma
(Plate to plate) otal Harmonic Distortion MaxSignal Power Output	4000 4.4 13.3	ohms % watts
Grid-No.1-Circuit Resistance:† For fixed-bias operation For cathode-bias operation	0.1 max. 0.5 max.	megohm megohm
PUSH-PULL AF POWER AMPLIFIER - C1	ass AB <sub>2</sub>	
laximum Ratings, Design-Center Values:		
PLATE VOLTAGE	400 max. 400 max. 3 max. 23 max. 200 max. 200 max.	volts volts watts watts volts volts
ypical Operation:		1
Values are for 2 tubes	220	
'late Voltage	360 270 -22.5	volts volts volts
Voltage	72 88	volts ma
The type of input coupling used should not introduce in the grid-No.1 circuit. Transformer- or impeda are recommended.	e too much res nce-coupling o	istance devices
: See next page.		



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# **BEAM POWER TUBE**







### PENTAGRID AMPLIFIER

FOR "ON-OFF" CONTROL APPLICATIONS INVOLVING LONG PERIODS OF OPERATION UNDER CUTOFF CONDITIONS

### GENERAL DATA

Electrical:

Heater, for Unipotential Cathode: Voltage. . . . 6.3 ± 10% . . . . ac or dc volts 0.3 Current. . . . amp Microphonism . . . Not Tested Direct Interelectrode Capacitances (Approx.):0 Grid No.1 to Plate . . . 0.08 max. μµf Grid No.3 to Plate . . . 0.35 max. μµf . Grid No.1 to Grid No.3. 0.15 max. muf Grid No.1 to All Other Electrodes and Heater. 5.4 μµf Grid No.3 to All Other Electrodes and Heater. 6.9 muf Plate to All Other Electrodes and Heater. 7.6 Huf • With no external shield. Characteristics, Class A Amplifier: Plate Voltage. . . . 67.5 67.5 volts Grids-No.2 and No.4 Voltage. . . . 67.5 67.5 volts Grid-No.3 Voltage. . . 0 -4 volts Grid-No.1 Voltage. . . 0 0 volts Grid-No.1-to-Plate Transconductance. umhos Grid-No.3-to-Plate Transconductance. 1100 #mhos Mechanical: Mounting Position. . . Any Maximum Overall Length . 2-1/8" . . . . . 1-7/8" Maximum Seated Length. . . Length; Base Seat to Bulb Top (Excluding tip). 1-1/2" ± 3/32" Maximum Diameter . . . . . . . . 3/4" T-5-1/2 Bulb . . . . . . . Small-Button Miniature 7-Pin Base . . . . . . Basing Designation for BOTTOM VIEW . . 7CH Pin 1-Grid No.1 Pin 5 - Plate Pin 2-Cathode. 6 Pin 6-Grid No.2. Grid No.4 Grid No.5 Pin 7-Grid No.3 Pin 3-Heater Pin 4 - Heater GATED AMPLIFIER IN COMPUTER SERVICE & "ON-OFF" CONTROL SERVICE Maximum Ratings, Absolute Values: PLATE VOLTAGE. . . . . . . . 250 max. volts TENTATIVE DATA 1 SEPT. 1, 1950 TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

RCA 5915

# PENTAGRID AMPLIFIER

	TAGE		See	Curve
GRIDS-No.2 and No.4 SUP	PPLY VOLTA	GE	250 max.	volts
Negative bias value.			100 max.	volts
Positive bias value.			0 max.	volts
Peak negative value.			200 max.	volts
Peak positive value.	••••	• • • • • •	90 max.	volts
Negative bias value.			100 max.	volts
Positive bias value.			0 max.	volts
Peak negative value.	1.2.2.1.2		200 max.	volts
Peak positive value:	Limited i	n any applic	ation by the	e peak
	cathodec	current and th	egrid-No.1	input
PLATE DISSIPATION			1 max.	watt
GRID-No.3 INPUT			0.5 max.	watt
GRIDS-No.2 and No.4 INF	PUT		1 max.	watt
GRID-No.1 INPUT			0.5 max.	watt
DC CATHODE CURRENT			20 max.	ma
PEAK CATHODE CURRENT . PEAK HEATER-CATHODE VOL	TAGE		70 max.	ma
Heater negative with	respect t	o cathode.	90 max.	volts
Heater positive with	respect t	o cathode.	90 max.	volts
BULB TEMPERATURE (At ho	ottest poi	nt on	o o marte	
bu	lb surface		120 max.	°C
Typical Operation:				
	CUTO CONDI	FF TION	ZERO-BIAS CONDITION	
G	CUTO CONDI condi	FF TION Grid-No.3	ZERO-BIAS CONDITION	
G	CUTO CONDI Control Control	FF TION Grid-No.3 Control	ZERO-BIAS CONDITION	
G Plate-Supply Voltage	CUTO CONDI Frid-No.1 Control 150	FF TION Grid-No.3 Control 150	ZERO-BIAS CONDITION 150	volts
G Plate-Supply Voltage Grid-No.3 Supply	CUTO CONDI Frid-No.1 Control 150	FF TION Grid-No.3 Control 150	ZERO-BIAS CONDITION 150	volts
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4	CUTO CONDI Crid-No. 1 Control 150 0	FF TION Grid-No.3 Control 150 -10	ZERO-BIAS CONDITION 150 0	volts volts
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Grid-No.1 Supply	CUTO CONDI Frid-No. 1 Control 150 0 75	FF TION Grid-No.3 Control 150 -10 75	2ERO-BIAS CONDITION 150 0 75	volts volts volts
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Grid-No.1 Supply Voltage	CUTO CONDI Grid-No.1 Control 150 0 75 -10	FF TION Grid-No.3 Control 150 -10 75 0	2ERO-BIAS CONDITION 150 0 75 0	volts volts volts volts
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Grid-No.1 Supply Voltage Plate-Circuit Resistance	CUTO CONDI Frid-No.1 Control 150 0 75 -10 20000	FF TION Grid-No.3 Control 150 -10 75 0 20000	2ERO-BIAS CONDITION 150 0 75 0 20000	volts volts volts volts ohms
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Grid-No.1 Supply Voltage Plate-Circuit Resistance Grid-No.3-Circuit Resistance	CUTO CONDI Frid-No.1 Control 150 0 75 -10 20000 47000	FF TION Grid-No.3 Control 150 -10 75 0 20000 47000	ZERO-BIAS CONDITION 150 0 75 0 20000 47000	volts volts volts volts ohms ohms
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Grid-No.1 Supply Voltage Plate-Circuit Resistance Grids-No.2 & No.4	CUTO CONDI Frid-No.1 Control 150 0 75 -10 20000 47000	FF TION Grid-No.3 Control 150 -10 75 0 20000 47000	2ERO-BIAS CONDITION 150 0 75 0 20000 47000	volts volts volts volts ohms ohms
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Plate-Circuit Resistance Grid-No.3-Circuit Grids-No.2 & No.4 Series Resistor Grid-No.1-Circuit	CUTO CONDI rid-No.1 Control 150 0 75 -10 20000 47000 470	FF TION Grid-No.3 Control 150 -10 75 0 20000 47000 470	2ERO-BIAS CONDITION 150 0 75 0 20000 47000 470	volts volts volts volts ohms ohms ohms
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Grid-No.1 Supply Voltage Plate-Circuit Resistance Grid-No.3-Circuit Resistance Grids-No.2 & No.4 Series Resistor Grid-No.1-Circuit Resistance	CUTO CONDI rid-No.1 Control 150 0 75 -10 20000 47000 4700 47000	FF TION Grid-No.3 Control 150 -10 75 0 20000 47000 4700 4700	ZERO-BIAS CONDITION 150 0 75 0 20000 47000 4700 4700	volts volts volts volts ohms ohms ohms
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Grid-No.1 Supply Voltage Plate-Circuit Resistance Grid-No.3-Circuit Grids-No.2 & No.4 Series Resistor Grid-No.1-Circuit Resistance Plate Current	CUTO CONDI Frid-No.1 Control 150 0 75 -10 20000 47000 47000 0	FF TION Grid-No.3 Control 150 -10 75 0 20000 47000 47000 0	2ERO-BIAS CONDITION 150 0 75 0 20000 47000 4700 4700 5.8	volts volts volts volts ohms ohms ohms ohms ma
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Grid-No.1 Supply Voltage Plate-Circuit Resistance Grid-No.3-Circuit Grid-No.3-Circuit Resistance Grid-No.1-Circuit Resistance Grid-No.1-Circuit Crids-No.2 & No.4 Series Resistor Grid-No.1-Circuit Content Circuit	CUTO CONDI Frid-No.1 Control 150 0 75 -10 20000 47000 47000 47000 0	FF TION Grid-No.3 Control 150 -10 75 0 20000 47000 47000 47000 0	2ERO-BIAS CONDITION 150 0 75 0 20000 47000 4700 4700 4700 5.8	volts volts volts volts ohms ohms ohms ma
G Plate-Supply Voltage Grid-No.3 Supply Voltage Grids-No.2 & No.4 Supply Voltage Grid-No.1 Supply Voltage Plate-Circuit Resistance Grid-No.3-Circuit Grids-No.2 & No.4 Series Resistor Grid-No.1-Circuit Resistance Grids-No.2 & No.4 Current	CUTO CONDI Frid-No.1 Control 150 0 75 -10 20000 47000 47000 47000 0 0	FF TION Grid-No.3 Control 150 -10 75 0 20000 4700 47000 4700 0 14	2ERO-BIAS CONDITION 150 0 75 0 20000 47000 47000 4700 47000 5.8 9	volts volts volts ohms ohms ohms ma ma

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# PENTAGRID AMPLIFIER

Grid-N	o.1 or Gr	id-No.3-Ci	rcuit Res	sistance	:	
For	fixed-bia cathode-b	s operation	on		0.5	max. meg
	R	ANGE VALUE	ES FOR EQU	UIPMENT	DESIGN	
Cutoff	Conditio	n	Note	Min	ı. <i>M</i>	ax.
Plat	e Current	الملبو والودي	1a and 1b		(	.2
Zero-B	lias Condi	tion				
Plat	e Current		2	5.0	) 6	5.5
			antid ward			
Note 1a	on heate 0, grids = +10, pl resistal (ohms) =	No.2 & No. No.2 & No. Late-circuit nce (ohms) = 470, and g	rid No.1 pply volts supply volts resistance 47000, gr	as contro = 150, g plts = 75, e (ohms) = rids-No.2 ircuit re:	rid-No.3 , grid-No. 20000, gri & No.4 se sistance (	de: 0.3 Vo supply volt 1 supply vo d-No.3 circ eries resis ohms) = 470
Note 1b	: For cond same as and grid	for Note 1 d-No.1 suppl	grid No.3 a except th y volts = (	as contro hat grid- D.	l electrod No.3 suppl	e: values y volts =
Note 2:	For cond 150, gr volts = (ohms) grids-N No. 1-cil	ditions with ids-No.2 an 0, grid No.1 = 20000, gr lo.2 and No. rcuit resist	6.3 volts d No.4 supply vo id-No.3-ci 4 series r ance (ohms	on heate ply volts lts = 0, rcuit res resistor ) = 47000	er, plate- = 75, gri plate-circ istance (c (ohms) = 4	supply volt d-No.3 sup uit resista hms) = 470 470, and gr
		11/2011			1.00	



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY






## MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE For "on-off" control applications involving long periods of operation under cutoff conditions

### GENERAL DATA

Electrical:

Heater, Pure Tungsten, for Unipotential	Cathodes:
Heater arrangment Series Para Voltage 12.6 ± 10% 6.3 Current 0.15 0.3	± 10% ac or dc volts amo
Microphonism. Direct Interelectrode Capacitances (App	Not Tested
Grid to plate 1.5 Grid to cathode and heater 1.9 Plate to cathode and heater . 0.5	1.5 μμf 1.5 μμf 1.9 μμf
Grid of unit No.1 to grid of unit No.2 (	0.1 max. μμf
Characteristics, Class A <sub>1</sub> Amplifier (Ea	ch Unit):
Plate Voltage Grid Voltage Amplification Factor Plate Resistance (Approx.) Transconductance. Plate Current	67.5 volts 0 volts 21 6600 ohms 3200 µmhos 8.5 ma
Mechanical:	
Mounting Position Maximum Overall Length. Length, Base Seat to Bulb Top (Excludin Maximum Diameter. Dimensional Outline Bulb. Base. Base. Basing Designation for BOTTOM VIEW.	
Pin 1-Plate of Unit No.2	Pin 6-Plate of Unit No.1
Pin 2-Grid of	Pin 7-Grid of Unit No.1
Pin 3-Cathode of	Pin 8-Cathode of Unit No.1
Pins 4 & 9 - Heater of Unit No.2	Pin 9-Heater Mid-Tap
Pins 5&9-Heater of Unit No.1	
<sup>O</sup> without external shield.	
	-Indicates a change.
SEPT. 1, 1955 TUBE DIVISION	DATA



#### FREQUENCY DIVIDER IN COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE

Values are for Each Unit

#### Maximum Ratings, Absolute Values:

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PLATE VOLTAGE		250	max. volts
GRID VOLTAGE:			
Negative bias value		100	max. volts
Positive bias value		0	max. volts
Peak negative value		. 200	max. volts
PLATE DISSIPATION		2.5	max. watts
GRID INPUT		0.5	max. watt
CATHODE CURRENT:			
Peak		100	max. ma
DC		. 20	max. ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect	to cathode.	90	max. volts
Heater positive with respect	to cathode.	90	max. volts
BULE TEMPERATURE (At hottest p	oint		
on bulb surface)		120	max. <sup>o</sup> C

#### Typical Operation as Frequency Halfer:

				Cutoff Condition	Zero-Bias Condition	
Plate-Supply Voltage				150	150	volts
Grid Voltage				-15	0	volts
Plate-Circuit Resistance				20000	20000	ohms
Grid-Circuit Resistance.				47000	47000	ohms
Plate Current	•	•	•	0	5.1	ma

#### Maximum Circuit Values:

Grid-Circuit Resistance:							
For fixed-bias operation .					0.5	max.	megohm
For cathode-bias operation	•	•			1.0	max.	megohm

### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Cutoff Condition				
Plate Current	. 1	-	50	μamp
Current Between Units		-	50	μamp
Zero-Bias Condition				
Plate Current	. 2	4.6	5.4	ma
Difference in Plate Current Between Units		-	0.8	ma
Note 1: For conditions with 12.6 v 150, grid-supply volts = -1 20000, and grid-circuit res	olts on h 15, plate- istance (	neater, plat -circuit res onms) = 470	e-supply sistance ( 00.	volts = ohms) =
Note 2: Conditions are same as f volts = 0.	or Note	1 except t	hat grid-	-supply
		🗕 i n	dicates a	change.

SEPT. 1, 1955

#### TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA







FOR "ON-OFF" CONTROL APPLICATIONS INVOLVING LONG PERIODS OF OPERATION UNDER CUTOFF CONDITIONS

Cathode	:			
. 6.3	± 10%		. ac or	dc volts
. 0.45				amp
			No	t Tested
pacitanc	es (Ap	prox.)	:0	
			1.3	µµ t
Heater .			2.1	μμ
Heater.			0.4	141
nit No.2			0.4 max	<. μμ1
ifier (Ead	ch Unit,	with		
both	n units	operati	ng):	
			100	volts
			50	ohms
			39	
			6500	ohms
		• •	6000	µmho:
		• •	9.5	ma
BOTTOM	small VIEW	tip). -Butto Pin Pin	n Miniatu 5-Grid c Trioc 6-Grid c Trioc	. Any 2-1/8' 1-7/8' 1-7/8' 1-7/8' T-5-1/2 ure 7-Pir . 78' of de No.1 of de No.2
axx	10	Pin	7 - Cathoo	de
2				
VIDER IN	COMPIL	TER SE	RVICE	
DEF" CONT	ROL SI	RVICE	NTIOL .	
e are fo	r agel	unit		
s are jo	reach	unil		
e Values	:			
			250 ma:	x. volt
	Cathode 6.3 pacitanc pacitanc Heater Heater nit No.2 ifier (Eau both both BOTTOM O Cathode	Cathode: 6.3 ± 10% 0.45  pacitances (App  Heater Heater ifier (Each Unit, both units  both Units   both Units   both Units   both Units   both Units      both Units   	Cathode: 6.3 ± 10% pacitances (Approx.) Heater Heater ifier (Each Unit, with both units operati  b Top (Excluding tip).  Small-Butto BOTTOM VIEW Pin Pin Pin VIDER IN COMPUTER SE DFF" COMTROL SERVICE s are for each unit e Values:	Cathode: 6.3 ± 10% ac or 0.45 No pacitances (Approx.):0 1.3 Heater 2.1 Heater 2.1 Heater 0.4 max ifier (Each Unit, with both units operating): 100 50 500 6500 6000 9.5 6500 9.5 6000 9.5

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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RCA 5964

# MEDIUM-MU TWIN TRIODE

	· · · · · · · · · · · · · · · · · · ·	
GRID VOLTAGE:		1.00
Negative bias value	100	max. volts
Positive bias value	0	max. volts
Peak negative value	200	max. volts
PLATE DISSIPATION	1.5	max. watts
GRID INPUT	0.1	max. watt
DC CATHODE CURRENT	15	max. ma
PEAK CATHODE CURRENT	/5	max. ma
Heater possible with respect of	o cathoda 00	may volte
Heater positive with respect	o cathode. 90	max. volts
BULB TEMPERATURE (At hottest po	nt on	
bulb surface)	150	max. <sup>o</sup> C
Typical Operation as Frequency	alfer (Fach Unit)	
Typical operation as frequency i	Cutoff Zana	Pian
	Condition Condi	tion
Plate-Supply Voltage	150	150 volts
Plate-Circuit Resistance	20000 200	00 ohms
Frid-Supply Voltage	-10	0 volts
Grid-Circuit Resistance	47000 470	00 ohms
Plate Current	0	5 ma
laximum Circuit Values:		
Grid-Circuit Resistance:		
For fixed-bias operation For cathode-bias operation	0.5 ma	ax. megohm ax. megohm
		N. I A
RANGE VALUES FOR E	UIPMENT DESIGN	
Cutoff Condition Not	Min. N	ax.
Plate Current (Each Unit). 1 Difference in Plate	- 0	).2 ma
Current Between Units	- 0	.2 ma
Zero-Bias Condition		
Plate Current (Each Unit). 2	4.3 5	.7 ma
Difference in Plate		
Current Between Units	- 1	4 ma
lote 1: For conditions with 6.3 vol 150, plate-circuit resistance	s on heater, plate-s (ohms) = 20000, grid	upply volts = -supply volts
= -10, and grid-circuit resis	ance (ohms) = 47000.	arid supply
volts = 0.	Note 1 except that	grid-suppry
No. 1	i filologija	
with both units operating, the dc 30 milliamperes, and the peak cat	ode current should n	ot exceed 150
milliamperes.		
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		1.6,17
		a

SEPT. 1, .1950

5964

TUBE DEPARTMENT

TENTATIVE DATA







### MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For "on-off" control applications involving long periods of operation under cutoff conditions.

### GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes:	
Heater arrangement Series Parallel	
Voltage (AC or DC) 12.6±5% 6.3±5% vo	lts
Current	amp
Direct Interelectrode Capacitances (Approx.):	
Grid to cathode and heater (Each unit) 3.8	μμι f
Plate to cathode and heater (Lach unit) . 9.8	unf
Plate to cathode and heater (Unit No.2). 0.38	щf
Plate of unit No.1 to plate of	
unit No.2 0.5	µµf
Characteristics, Class A, Amplifier (Each Unit):	
Plate Supply Voltage 150 vo	lts
Cathode-Bias Resistor	hms
Amplification Factor 47	
Plate Resistance	hms
[ransconductance	hos
Plate Current	ma
Grid Voltage (Approx.) for plate	lte
	113
Mechanical:	
Mounting Position	Any
Maximum Overall Length	16"
Maximum Sealed Length	10
(Excluding tip) $\cdot \cdot \cdot$	32"
Maximum Diameter	/8"
Bulb	1/2
Base Small-Button Noval 9-Pin (JETEC No.ES	-1)
Basing Designation for BOTTOM VIEW	9A
Pin 1 – Plate of Pin 6 – Plate of	
Unit No.2 (4) (6) Unit No.	1
Pin 2-Grid of Pin 7-Grid of	
Unit No.2 Unit No.	1
Pin 3- Cathode of Pin 8- Cathode of	1
Pin 4 9 Heater of Pin 9 - Heater	T
Unit No.2 Mid-Tap	
Pin 5.9 - Heater of	
Unit No.1	
* Without external shield.	
a de la companya de l	
JUNE 14, 1954 TUBE DIVISION TENTATIVE DA	TA 1



#### FREQUENCY DIVIDER IN COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE

Values are for Each Unit

#### Maximum Ratings, Absolute Values:

5965

PLATE VOLTAGE	•	330 max.	volts
Negative bias value		150 max.	volts
PLATE DISS PATION		2.4 max.	watts
Total for both units		4.4 max.	watts
DC CATHODE CURRENT		16.5 max.	ma
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode		200#max.	volts
Heater positive with respect to cathode		200#max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)		165 max.	°C

#### Typical Operation in Computer Service:

	Cutoff Condition	Conduction Condition	3
Plate Supply Voltage	150 7200	150 7200	volts ohms
 Plate Current	÷.,	10.5	ma
grid current of 140 μamp Grid Voltage (Approx.) for	-	less than	1 volt
plate current of 150 µamp Difference in Grid Voltage	-5.5	-	volts
Between Units (For plate	1.5		volte

#### Maximum Circuit Values:

Grid-Circuit Resistance:							
For fixed-bias operation .					0.1	max.	megohm
For cathode-bias operation			×.		0.5	max.	megohm

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current Amplification Factor(Each Unit Grid Voltage for plate current	. 1 ) 1,2	0.207 39	0.243 55	amp
of 150 µamp (Each Unit) Difference in Grid Voltage Between Units (For plate	. 1,3	1.	-7.5	volts
current of 150 $\mu$ amp per unit Plate Current 1 (Each Unit) .	) _	- 6	1.5 10.4	volts ma
# The dc component must not exceed 1	.00 volts.			

TUBE DIVISION



### MEDIUM-MU TWIN TRIODE

	Note	Min.	Max.	
Plate Current 2 (Each Unit)	1,4	9.75		ma
Reverse Grid Current (Each Unit) Heater-Cathode Leakage Current: Heater negative with respect	1,5	-	1	µamp
to cathode	1,6		20	$\mu amp$
to cathode	1,6 1,2	- 5100	20 7900	$\mu amp \ \mu mhos$

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

Note 2: With plate supply voltage of 150 volts and cathode resistor for each cathode of 220 ohms adequately bypassed for a signal frequency of 60 cps. Each unit tested separately. Unit not under test biased to cutoff.

#### Note 3: With plate supply voltage of 150 volts, grid supply voltage adjusted to give dc plate current of 150 microamperes, and plate load resistor of 7200 ohms. Each unit tested separately. Unit not under test blased to cutoff.

Note 4: With plate supply voltage of 150 volts, grid supply voltage adjusted to give dc grid current of 140 microamperes, and plate load resistor of 7200 ohms. Each unit tested separately. Unit not under test biased to cutoff.

Note 5: With plate supply voltage of 150 volts, cathode resistor for each cathode of 220 ohms, and grid-circuit resistance of 0.5 megohm. Each unit tested separately. Unit not under test biased to cutoff.

wote 6: With 100 volts dc between heater and cathode and units connected in parallel.

JUNE 14, 1954









# PREALUNA T MEDIUM-MU TWIN TRIODE

SUBMINIATURE TYPE

Intended for applications at altitudes up to 60,000 feetwhere dependable performance under shock and vibration is paramount

#### GENERAL DATA

#### Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes: Voltage. . . . . . . . . 6.3 . . . . . ac or dc volts 0.3 Current. . . . . . . . . .amp Direct Interelectrode Capacitances: Without With External External Shield Shield<sup>0</sup> Grid to plate (Each unit). . 1.5 1.4 μµf Grid to cathode and heater (Each unit). . . . . 2.4 2.1 μµf Plate to cathode and heater (Unit No.1). . . . . 0.28 1.3 μµf Plate to cathode and heater (Unit No.2). . . . 1.4 0.32 μµf Grid to grid . . 0.013 max. 0.011 max. μµf Plate to plate . 0.52 max. 0.33 max. μµf

#### Characteristics, Class A<sub>1</sub> Amplifier (Each Unit):

Plate-Supply Voltage	100	volts
Cathode Resistor	150	ohms
Amplification Factor	35	
Plate Resistance (Approx.)	6500	ohms
Transconductance	5400	µmhos
Plate Current	6.5	ma
Grid Voltage (Approx.) for		
plate current of 10 $\mu$ a	-6.5	volts
Mechanical:		

Operating Position . . . . Any Maximum Length (Excluding flexible leads). . . 1-3/8" Length, Bulb Seat to Bulb Top (Excluding tip). 1.075" ± 0.060" Diameter . . 0.366" to 0.400" Dimensional Outline. .See General Section T3 Bulb . . Leads, Flexible. 8 Length . 1-1/2" to 1-3/4" . . . . . . . Orientation and diameter . . See Dimensional Outline .



<sup>O</sup>: See next page.

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

TENTATIVE DATA 1



# MEDIUM-MU TWIN TRIODE

AM	PLIFIC		SS A		
Valu	ies are	for Eac	h Unit		
Maximum Ratings, Absol	ute Va	lues:			
For Operation	at Alt	itudes u	p to 60,	000 Feet	
PLATE VOLTAGE				165 max.	volts
Positive bias value.				0 max.	volts
Negative bias value.				55 max.	volts
PLATE CURRENT				22 max.	ma
GRID CURRENT				5.5 max.	ma
PLATE DISSIPATION				1.1 max.	watts
PEAK HEATER-CATHODE VO	LIAGE:		thede	200	welte
Heater negative with	respe	ct to ca	thode	200 max.	volts
ALLE TEMPERATURE (A+ h	ottest	noint	indue	200 max.	VOTES
on bulb surface)				220 max.	°C
laximum Circuit Values	:				
rid-Circuit Resistanc	e:				
For cathode-bias ope	ration			1.1 max.	megohms
With external shield h	aving i	nside dia	meter of	0.405" conr	ected to
cathode of unit under to	551.				
CHARACTERISTICS	RANGE	VALUES F	OR EQUIP	MENT DESIG	in .
CHARACTERISTICS Values are for Each U	RANGE Init (0	VALUES F ther uni	OR EQUIP t connec	MENT DESIG	N und)
CHARACTERISTICS Values are for Each U and are Initio	RANGE Init (O al, Unl	VALUES F ther uni cess Othe	OR EQUIP t connec erwise In	MENT DESIG ted to gro adicated	iN ound)
CHARACTERISTICS Values are for Each U and are Initio	RANGE Init (0 21, Unl	VALUES F ther uni ess Othe Note	OR EQUIP t connec erwise In Min.	MENT DESIG ted to gro dicated Max.	N ound)
CHARACTERISTICS Values are for Each U and are Initio	RANGE Init (O al, Unl	VALUES F ther uni ess Othe Note 1	OR EQUIP t connec erwise In Min. 0.28	MENT DESIG ted to gro dicated Max. 0.32	amp
CHARACTERISTICS Values are for Each U and are Initio leater Current leater Current at	RANGE Unit (O al, Unl	VALUES F ther uni ess Othe Note 1	OR EQUIP t connec erwise In Min. 0.28	MENT DESIG ted to gro dicated Max. 0.32	iN ound) amp
CHARACTERISTICS Values are for Each U and are Initio Heater Current Heater Current at 500 hours	RANGE Unit (O al, Unl	VALUES F ther uni ess Othe Note 1 1	OR EQUIP t connec erwise In Min. 0.28 0.276	MENT DESIG ted to gro dicated Max. 0.32 0.328	iN nund) amp amp
CHARACTERISTICS Values are for Each U and are Initio Heater Current Heater Current at 500 hours	RANGE Unit (O al, Unl	VALUES F ther uni ess Othe Note 1 1	OR EQUIP t connec erwise In Min. 0.28 0.276	MENT DESIG ted to gro dicated Max. 0.32 0.328	iN ound) amp amp
CHARACTERISTICS Values are for Each U and are Initio Heater Current Heater Current at 500 hours Direct Interelectrode Capacitances: Crid to clato	RANGE Unit (O al, Unl	VALUES F ther uni ess Othe Note 1 1	OR EQUIP t connec erwise In Min. 0.28 0.276	MENT DESIG ted to gro dicated Max. 0.32 0.328	n ound) amp amp
CHARACTERISTICS Values are for Each U and are Inition Heater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and	RANGE Unit (O al, Unl	VALUES F ther uni tess Othe Note 1 1 2	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2	MENT DESIG ted to gro dicated Max. 0.32 0.328 1.8	n bund) amp amp µµf
CHARACTERISTICS Values are for Each U and are Inition Heater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater	RANGE Init (O al, Unl	VALUES F ther uni tess Othe Note 1 1 2 2	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8	MENT DESIG ted to gro ddicated Max. 0.32 0.328 1.8 3	n nund) amp amp µµf µµf
CHARACTERISTICS Values are for Each U and are Initio Heater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater Plate to cathode and	RANGE Unit (O al, Unl	VALUES F ther uni ess Othe Note 1 1 2 2	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8	MENT DESIG ted to gro dicated Max. 0.32 0.328 1.8 3	iN ound) amp amp μμt
CHARACTERISTICS Values are for Each U and are Initio Heater Current Heater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater (Unit No.1)	RANGE Init (0 21, Unl	VALUES F ther uni ess Othe 1 1 2 2 2	OR EQUIP t connec prwise In Min. 0.28 0.276 1.2 1.8 0.2	MENT DESIG ted to gro dicated Max. 0.32 0.328 1.8 3 0.36	iN pund) amp μμf μμf
CHARACTERISTICS Values are for Each U and are Initio Heater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater Plate to cathode and heater (Unit No.1) Plate to cathode and	RANGE Init (0 21, Unl	VALUES F ther uni ess Othe 1 1 2 2 2	OR EQUIP t connec prwise In Min. 0.28 0.276 1.2 1.8 0.2	MENT DESIG ted to gro dicated Max. 0.32 0.328 1.8 3 0.36	iN nund) amp עער עער
CHARACTERISTICS Values are for Each U and are Initio Heater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater Plate to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2)	RANGE Unit (0 21, Unl	VALUES F ther uni cess Othe 1 1 2 2 2 2 2 2	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22	MENT DESIG ted to gro wdicated Max. 0.32 0.328 1.8 3 0.36 0.42	iN nund) amp μμf μμf μμf
CHARACTERISTICS Values are for Each U and are Inition leater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater Plate to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to grid	RANGE Init (O zl, Unl 	VALUES F ther unitess Othe Note 1 1 2 2 2 2 2 3	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22	MENT DESIG ted to ground Max. 0.32 0.328 1.8 3 0.36 0.42 0.013	iN ound) amp μμf μμf μμf μμf
CHARACTERISTICS Values are for Each U and are Inition leater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to grid Plate to plate	RANGE	VALUES F ther uni ess Othe 1 1 2 2 2 2 2 3 3	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22	MENT DESIG ted to gro dicated Max. 0.32 0.328 1.8 3 0.36 0.42 0.013 0.52	iN amp amp μμf μμf μμf μμf μμf
CHARACTERISTICS Values are for Each U and are Initio Heater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater Plate to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to plate Plate to plate Plate to plate	RANGE '' init (0 al, Unl	VALUES F ther uni ess Othe Note 1 1 2 2 2 2 2 2 2 3 3 1,4	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22 - - .30	MENT DESIG dicated Max. 0.32 0.328 1.8 3 0.36 0.42 0.013 0.52 40 0.62	iN amp amp μμι μμι μμι μμι
CHARACTERISTICS Values are for Each U and are Initio Heater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to grid Plate to plate Plate to plate Plate current (1).	RANGE Init (O al, Unl	VALUES F ther uni ess Othe 1 1 2 2 2 2 3 3 1,4 1,4 1,4	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22 - - 30 4.5	MENT DESIG ted to gro wdicated Max. 0.32 0.328 1.8 3 0.36 0.42 0.013 0.52 40 8.5	in ound) amp amp μμt μμt μμt μμt μμt μμt
CHARACTERISTICS Values are for Each U and are Initia teater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to grid Plate to plate Plate to plate Plate to plate Plate to plate Plate current (1) Plate-Current Different	RANGE init (O al, Unl	VALUES F ther unitess Other Note 1 1 2 2 2 3 3 1,4 1,4 1,4	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22 - 30 4.5	MENT DESIG ted to group dicated Max. 0.32 0.328 1.8 3 0.36 0.42 0.013 0.52 40 8.5 1.6	iN amp amp μμf μμf μμf μμf μμf μμτ
CHARACTERISTICS Values are for Each U and are Inition Heater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Plate to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to grid Plate to plate Plate current (1) Plate-Current Differen Between Units Plate (2)	RANGE Init (O al, Unl	VALUES F ther uni ess Othe 1 1 2 2 2 2 2 3 3 1,4 1,4 1,4 1,5	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22 - 30 4.5	MENT DESIG ted to gro dicated Max. 0.32 0.328 1.8 3 0.36 0.42 0.013 0.52 40 8.5 1.6 100	iN amp amp μμt μμt μμt μμt ma ma
CHARACTERISTICS Values are for Each U and are Initio leater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater Plate to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to grid Plate to plate mplification Factor late Current 11 late-Current 11 etween Units late Current (2)	RANGE Init (O al, Unl	VALUES F ther uni ess Othe 1 1 2 2 2 2 2 2 3 3 1,4 1,4 1,4 1,4 1,4	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 1.8 0.2 0.22 - 30 4.5 -	MENT DESIG ted to gro ddicated Max. 0.32 0.328 1.8 3 0.36 0.42 0.013 0.52 40 8.5 1.6 100 6350	iN amp amp μμι μμι μμι ma ma μα μα
CHARACTERISTICS Values are for Each U and are Initio leater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to grid Plate to plate . Plate to plate . Plate current [1] 'late-Current Differen Between Units 'late Current (2). 'ransconductance (1) .	RANGE Init (O al, Unl	VALUES F ther uni ess Othe 1 1 2 2 2 2 3 3 1,4 1,4 1,4 1,4 1,4 1,4	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22 - 30 4.5 - 4450	MENT DESIG ted to group dicated Max. 0.32 0.328 1.8 3 0.36 0.42 0.013 0.52 40 8.5 1.6 100 6350	in ound) amp amp μμf μμf μμf μμf μμf μμf μamhos
CHARACTERISTICS Values are for Each U and are Inition leater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to grid Plate to plate mplification Factor . 'late Current (1) 'late-Current Differen Between Units. 'late Current (2) 'ransconductance (1)	RANGE Vinit (O al, Unl	VALUES F ther uni ess Othe 1 1 2 2 2 2 3 3 1,4 1,4 1,4 1,5 1,4	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22 - 30 4.5 - 4450	MENT DESIG ted to gro dicated Max. 0.32 0.328 1.8 3 0.36 0.42 0.013 0.52 40 8.5 1.6 100 6350	in ound) amp amp μμf μμf μμf μμf μμf μμf μμf μμf μαthos
CHARACTERISTICS Values are for Each U and are Inition leater Current at 500 hours Direct Interelectrode Capacitances: Grid to plate Grid to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.1) Plate to cathode and heater (Unit No.2) Grid to grid Plate to plate mplification Factor 'late Current (1) 'late Current 10 ficer Between Units 'late Current (2) 'ransconductance (1)	RANGE Init (O al, Unl	VALUES F ther unitess Other Note 1 1 2 2 2 2 3 3 1,4 1,4 1,4 1,4	OR EQUIP t connec erwise In Min. 0.28 0.276 1.2 1.8 0.2 0.22 2 30 4.5 - 4450	MENT DESIG ted to ground dicated Max. 0.32 0.328 1.8 3 0.36 0.42 0.013 0.52 40 8.5 1.6 100 6350	in ound) amp μμf μμf μμf μμf μμf μμf μμf μμf α α α α

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



# MEDIUM-MU TWIN TRIODE

	Max.	Min.	Note		
				nce (1) Change:	Transco
	45			voltage	With
9	15	-	4	o 5.7 voits	real
7	25	-	1,4	at our nours .	Indiv
7	15	-	1,4	500 hours	Averag
				SUU nours:	w:+
a	15		4	er vorlage	rodu
7	10 2	-	1 6	Current	ovorso
μα	0.)	-	1,0	Current at	everse
ua	0.9	-	1.6		500 h
ца	-0.5	-	7	Current	rid Em
,				e Leakage	eater-(
					Currer
				volts negative	Heater
μa	5	-	1	ect to cathode.	with
				volts positive	Heater
μα	5	-	1	ect to cathode.	with
				e Leakage	eater-(
				500 hours:	Currer
				volts negative	Heater
μa	10	-	1	ect to cathode.	with
				volts positive	Heater
μa	10	-	1	ect to cathode.	with
				tance:	eakage
				d and all	Betwee
magahma		100	1 2 0	ctrodes tred	tone
megonins	-	100	1,2,0	to and all	Botwoo
				ctrodes tied	othe
meanhme		100	139	ctroues treu	toge
negonina		100	1,2,0	tance at	eakane
				canoo ac	500 hc
				d and all	Betwee
				ctrodes tied	othe
meanhms	-	50	138		toge
mogorimo		00	-,/,0	te and all	Betwee
				ctrodes tied	othe
megohms	-	50	1,3,9		toga
0			hostor	a velte es es de es	
			neater.	t external shield	ote 1:
			to around	electrodes connected	lote 3:
esistor of	athode r	volts, ca	age of 100	c plate-supply volta	ote 4:
00 μf.	or of 10	s capacit	stor bypas	ms, and cathode-resi	
6.5 volts.	tage of -	grid vol	volts and	plate voltage of 100	Note 5:
esistor of	athode r	volts, ca phm.	age of 150 r of 1 meg	c plate-supply volta ms, and grid resisto	Note 6:
voltage of sistor of	grid re	volts, do lts, and	age of 7.5 of -7.5 vo	c or dc heater volta olts, grid voltage	lote 7:
			volts.	rid voltage of -100	Note 8:
			300 volts.	c plate voltage of -	Note 9:



#### SPECIAL RATINGS AND PERFORMANCE DATA

#### Shock Rating:

6021

#### Fatigue Ratings:

Vibrational Acceleration . . . . . 2.5 max. g This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 gvibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

#### Variable-Frequency Vibration Performance:

This test is performed on a sample lot from each production run. Tubes are vibrated over the frequency range of 5 to 50 cps at a total excursion of 0.08" for 3 minutes. At the end of this test, tubes are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

#### Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . . . . . . . . . . . 50 max. mv This test is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 100 volts, cathode resistor of 150 ohms, plate load resistor of 10000 ohms and vibrational acceleration of 15 g at 40 cps.

#### Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . 2000 min. cycles Under the following conditions: Heater voltage of 7.0 volts cycled one minute on and four minutes off, heater 140 volts rms with respect to both cathodes tied together.

#### Audio-Frequency Noise and Microphonic Performance:



# MEDIUM-MU TWIN TRIODE

megohm, plate load resistor of 0.01 megohm, and cathodebypass capacitor of 1000  $\mu$ f. Units are connected in parallel. The output voltage of atube, when tapped, will not cause a reading on avu meter greater than that produced when a calibrating signal of 65 millivolts rms is applied to the plates of the tube.

#### Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test atube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.0 microampere under the conditions specified in the Characteristics Range Values for reverse grid current.

#### I-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Conditions of life testing are specified under 500-Hour Intermittent Life Performance, except test run at room temperature. Tubes are initially read for transconductance (1). At the end of I hour, the value of transconductance (1) is read. The variation in transconductance (1) from the 0-hour reading will not exceed 15 per cent under the conditions specified in Characteristics Range Values.

#### 100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Conditions of life testing are specified under 500-Hour Intermittent Life Performance, except test run at room temperature. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, reverse grid current in excess of 1.0 microampere, or a transconductance (1) of less than 4000 micromhos under the conditions specified in Characteristics Range Values.

#### 500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 100 volts, heater-cathode voltage of 200 volts (heater positive with respect to cathode), cathode resistor of 150 ohms, grid resistor of 1 megohm and bulb temperature of  $220^\circ$  C. At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of



defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, individual, average, and 5.7-heater-voltage transconductance change, reverse grid current and heatercathode leakage current shown under Characteristics Range Values.

#### OPERATING CONSIDERATIONS

The heater supply should be well regulated because life and reliability of the 6021 are adversely affected by departures from the 6.3-volt value. The extent to which life is affected is a function of the amount of these departures and their durations.

The *flexible leads* of the 6021 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation may crack the glass seals of the leads and damage the tube.

6021









9-PIN MINIATURE TYPE

For use in industrial and military applications critical as to microphonics and in which dependability is paramount. Characteristics are similar to those of the 12AY7.

### GENERAL DATA

### Electrical.

Ē	
	Heater, for Unipotential Cathodes:         Heater arrangement       Series       Parallel         Voltage.       12.6       6.3       ac or dc volts         Current.       0.175       0.35      amp         Direct Interelectrode Capacitances (Approx.): <sup>O</sup> Grid to plate (Each unit).       1.4       μμf         Grid to plate (Each unit).       1.5       μμf         Plate to cathode and heater:       0.5       μμf         Unit No.1.       0.38       μμf
	Characteristics, Class A, Amplifier (Each Unit):
	Plate Voltage.       250       volts         Grid Voltage.       -4       volts         Amplification Factor       44         Plate Resistance (Approx.)       25000       ohms         Transconductance       1750       µmhos         Plate Current.       3       ma         Grid Voltage (Approx.)       8       10.       -8
	Mechanical:
	Operating Position
	Pin 1 - Plate of Unit No.2 Pin 2 - Grid of Unit No.2 Pin 3 - Cathode of Unit No.2 Pins 4 & 9 - Heater of Unit No.2 Pins 5 & 9 - Heater of Unit No.1 Pins 5 & 9 - Heater of Unit No.1 Pins 5 & 9 - Heater of Unit No.1 Pins 5 & 9 - Heater of Unit No.1
	• Without external shield.

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

TENTATIVE DATA 1





with respect to cathode, and all other elements connected to ground.

so12



# MEDIUM-MU TWIN TRIODE

#### OPERATING CONDITIONS AS RESISTANCE-COUPLED AMPLIFIER (Each Unit)

### With Effective Source Impedance of 200 ohms (Approx.)

Plate-Supply Voltage	0.1	90	0.51	volts
Plate Load Resistor	0.1	0.24	0.51	megonn
Grid Resistor (UI	0.24	0.51	1	
Cathada Pasiatar	0.24	0.51	10000	megonn
Dathode Resistor	2100	4800	10000	onms
Peak Output voltage	14	16	10	volts
Voltage Gain-	25	21	27	
Plate-Supply Voltage	1	180	1	volts
Plate Load Resistor	0.1	0.24	0.51	megohr
Grid Resistor (Of				
following stage)	0.24	0.51	1	megohm
Cathode Resistor	1500	3100	7200	ohms
Peak Output Voltage	34	35	35	volts
Voltage Gain	28	28	29	
Plate-Supply Voltage	T	300		volts
Plate Load Resistor	0.1	0.24	0.51	megohr
Grid Resistor (Of				0
following stage)	0.24	0.51	1	megohr
Cathode Resistor	1300	2700	6000	ohms
Peak Output Voltage	64	64	64	volts
Voltage Gain▲	29	31	31	
With Effortive Source			Noroha /An	
WITH Effective Source	ce Impedant	ce of U.I	Megonim (Ap	prox.)
Plate-Supply Voltage	ce impedan	90	Megonim (Ap	volts
Plate-Supply Voltage Plate Load Resistor		90 0.24	0.51	volts megohm
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of		90 0.24	0.51	volts megohm
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage)	0.1	90 0.24 0.51	0.51	volts megohm megohm
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor	0.1 0.24 3000	90 0.24 0.51 6200	0.51 1 12000	volts megohm megohm ohms
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage	0.1 0.24 3000 17	90 0.24 0.51 6200 18	0.51 1 12000 20	volts megohm megohm ohms volts
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain <sup>A</sup>	0.1 0.24 3000 17 23	90 0.24 0.51 6200 18 25	0.51 1 12000 20 26	volts megohm megohm ohms volts
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain Plate-Supply Voltage	0.1 0.24 3000 17 23	90 0.24 0.51 6200 18 25	0.51 1 12000 20 26	volts megohm ohms volts volts
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain Plate-Supply Voltage Plate Load Resistor	0.1 0.24 3000 17 23	90 0.24 0.51 6200 18 25 180 0.24	0.51 1 12000 20 26 0.51	volts megohm ohms volts volts megohm
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of	0.1 0.24 3000 17 23	90 0.24 0.51 6200 18 25 180 0.24	0.51 1 12000 20 26 0.51	volts megohm ohms volts volts megohm
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain▲ Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage)	0.1 0.24 3000 17 23 0.1 0.24	90 0.24 0.51 6200 18 25 <b>180</b> 0.24 0.51	0.51 1 12000 20 26 0.51 1	volts megohm ohms volts volts megohm megohm
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor	0.1 0.24 3000 17 23 0.1 0.24	90 0.24 0.51 6200 18 25 180 0.24 0.51 4100	0.51 1 12000 20 26 0.51 1 8100	volts megohm ohms volts volts megohm ohms
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage	0.1 0.24 3000 17 23 0.1 0.24 1900 38	90 0.24 0.51 6200 18 25 180 0.24 0.51 4100 41	0.51 1 12000 20 26 0.51 1 8100 44	volts megohm ohms volts volts megohm megohm ohms volts
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Valtage CaipA	0.1 0.24 3000 17 23 0.1 0.24 1900 38 27	90 0.24 0.51 6200 18 25 180 0.24 0.51 4100 41 29	0.51 1 12000 20 26 0.51 1 8100 44 20	vol megol ohr vol wol megol ohr vol
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain▲ Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain▲	0.1 0.24 3000 17 23 0.1 0.24 1900 38 27	90 0.24 0.51 6200 18 25 180 0.24 0.51 4100 41 28	0.51 1 12000 20 26 0.51 1 8100 44 29	volt megohr ohm volt volt megohr ohm volt
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain <sup>A</sup> Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain <sup>A</sup>	0.1 0.24 3000 17 23 0.1 0.24 1900 38 27	90 0.24 0.51 6200 18 25 180 0.24 0.51 4100 41 28	0.51 1 12000 20 26 0.51 1 8100 44 29	volts megohn ohms volts volts megohn ohms volts
Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain Plate-Supply Voltage Plate Load Resistor Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain At 2 volts (rms) output.	0.1 0.24 3000 17 23 0.1 0.24 1900 38 27	90 0.24 0.51 6200 18 25 180 0.24 0.51 4100 41 28	0.51 1 12000 20 26 0.51 1 8100 44 29	volts megohn ohms volts volts megohn megohn ohms volts

ELECTRON TUBE DIVISION

TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



Plate-Supply Voltage		300		volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain▲	0.24 1600 68 28	0.51 3400 72 30	1 6700 76 30	megohm ohms volts

At 2 volts (rms) output. Note: Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

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ELECTRON TUBE DIVISION

TENTATIVE DATA 2



# LOW-MU TWIN POWER TRIODE

### GENERAL DATA

	Heater, for Unipotential Cathodes: Voltage 6.3 ± 10% ac or dc volts Current 2.5 amp Direct Interelectrode Capacitances (Approx.):	+
	(Lach Unit, without external shield)         Grid to Plate       8         Input       6         Output       2.2         Heater to Cathode:	
)	Triode Unit No.1         6.5         μμf           Triode Unit No.2         6         μμf           Grid of Unit No.1 to Grid of Unit No.2         0.5         μμf           Plate of Unit No.1         μμf         μf	
	to Plate of Unit No.2 2 $\mu\mu$ f	
	Characteristics, Amplifier Class A <sub>l</sub> (Each Unit): Plate-Supply Voltage	
	Amplification Factor         2           Plate Resistance         280         ohms           Transconductance         7000         μmhos           Plate Current         125         ma	
	Mechanical:	
	Mounting Position Any Maximum Overall Length	+ + +
	Basing Designation for BOTTOM VIEW	
	Unit No.2 Pin 2 - Plate of Unit No.2 Unit No.2 Unit No.1 Of Dial of Unit No.1	
1	Pin 3-Cathode of Unit No.2 Pin 4-Grid of	
	Unit No.1	
	DC AMPLIFIER Values are for Each Unit	
	Maximum Ratings, Absolute Values:	
)	PLATE VOLTAGE       250 max. volts         PLATE CURRENT       125 max. ma         PLATE DISSIPATION       13 max. watts         PEAK HEATER-CATHODE VOLTAGE:       300 max. volts         Heater negative with respect to cathode.       300 max. volts	
	← Indicates a change	
	AUG. 1, 1953 TUBE DEPARTMENT DATA 1	



# LOW-MU TWIN POWER TRIODE

BULB TEMPERATURE <sup>⊕</sup>	. 200	max.	°C
Maximum Circuit Values:			
<pre>irid-Circuit Resistance: For cathode-bias operation For fixed-bias operation<sup>0</sup> For combined fixed and cathode-bias operation*</pre>	. 1.0 ma . 0.1 ma	ax. ax.	megohm megohm megohm
BOOSTER SCANNING SERVI	CE		
Values are for Each Un	i t		
Maximum Ratings. Absolute Values:			
For operation in a 525-line, 30-f	frame syst	em▲	
PEAK NEGATIVE-PULSE PLATE VOLTAGE PEAK NEGATIVE-PULSE GRID VOLTAGE C PLATE CURRENT PLATE DISSIPATION. PEAK HEATER-CATHODE VOLTAGE: Heater pegative with respect to cathode	· 3000 · 2300 · 125 · 13	max. max. max. max.	volts volts watts volts
Heater positive with respect to cathode BULB TEMPERATURE®	e. 300 . 200	max. max.	volts
Maximum Circuit Values (For maximum rated	d conditi	ons):	
For cathode-bias operation For fixed-bias operation	• 1.0 ma • not	recon	megohm mended
For cathode-bias operation For fixed-bias operation	1.0 ma not	necon DESIGN	mego <b>hm</b> mended
Grid-Circuit Kesistance: For cathode-bias operation For fixed-bias operation CHARACTERISTICS RANGE VALUES FOR EQ Note	. 1.0 ma . not QUIPMENT I Min. 2 26	DESIGN	megohm mended
Grid-Circuit Kesistance: For cathode-bias operation For fixed-bias operation CHARACTERISTICS RANGE VALUES FOR E( Note Heater Current 1 Amplification Factor (Fact Unit) 1 2	. 1.0 ma not QUIPMENT I Min. 2.26	DESIGN Max. 2.74	megohm mended I
Grid-Circuit Kesistance: For cathode-bias operation For fixed-bias operation CHARACTERISTICS RANGE VALUES FOR EQ Note Heater Current 1 Amplification Factor (Each Unit) 1,2 Plate Current (Each Unit) 1,2 Transcroductance	. 1.0 ma not QUIPMENT I Min. 2.26 1.4 100	AX. recom Max. 2.74 2.6 150	megohm mended I amp ma
Grid-Circuit Kesistance: For cathode-bias operation For fixed-bias operation CHARACTERISTICS RANGE VALUES FOR E( Note teater Current 1 Amplification Factor (Each Unit) 1,2 Plate Current (Each Unit) 1,2 Transconductance (Each Unit) 1,2 Severse Crid Current	. 1.0 mm not QUIPMENT I Min. 2.26 1.4 100 5800	DESIGN Max. 2.74 2.6 150 8200	megohm mended amp ma µmhos
Grid-Circuit Kesistance: For cathode-bias operation For fixed-bias operation CHARACTERISTICS RANGE VALUES FOR EQ Note Heater Current 1 Amplification Factor (Each Unit) 1,2 Plate Current (Each Unit) 1,2 Transconductance (Each Unit) 1,2 Reverse Grid Current (Units in Parallel) 1,3	. 1.0 mat not QUIPMENT I Nin. 2.26 1.4 100 5800	AX. recom Max. 2.74 2.6 150 8200 4	megohm imended amp ma μαmhos μαmp
Grid-Circuit Kesistance: For cathode-bias operation For fixed-bias operation CHARACTERISTICS RANGE VALUES FOR EQ Note Heater Current 1 Amplification Factor (Each Unit) 1,2 Plate Current (Each Unit) 1,2 Transconductance (Each Unit) 1,2 Reverse Grid Current (Units in Parallel) 1,3 Note 1: With 6,3 volts ac or dc on heater. Note 2: With plate-supply voltage of 135 volts, c of 250 ohms in each cathode (both triode	. 1.0 mm . not QUIPMENT I Min. 2.26 1.4 100 5800 - and cathode units oper	DESIGN Max. 2.74 2.6 150 8200 4 -bias ating)	megohm imended amp ma μαmhos μamp resistor
Grid-Circuit Kesistance: For cathode-bias operation For fixed-bias operation CHARACTERISTICS RANGE VALUES FOR EQ Note Heater Current 1 Amplification Factor (Each Unit) 1,2 Plate Current (Each Unit) 1,2 Transconductance (Each Unit) 1,2 Reverse Grid Current (Units in Parallel) 1,3 Note 1: With 6,3 volts ac or dc on heater. Note 2: With plate-supply voltage of 135 volts, a of 250 ohms in each cathode bias resistor of (both triode units operating).	. 1.0 mm . not QUIPMENT I Min. 2.26 1.4 100 5800 - and cathode units oper grid resist '250 ohms i	DESIGN Max. 2.74 2.6 150 8200 4 -bias ating) or of n each	megohm imended amp ma μmhos μamp resistor i megohm cathode
Grid-Circuit Kesistance: For cathode-bias operation For fixed-bias operation CHARACTERISTICS RANGE VALUES FOR EG Note Heater Current 1 Amplification Factor (Each Unit) 1,2 Plate Current (Each Unit) 1,2 Plate Current (Each Unit) 1,2 Transconductance (Each Unit) 1,2 Reverse Grid Current (Units in Parallel) 1,3 Note 1: With 6.3 volts ac or dc on heater. Note 2: With plate-supply voltage of 135 volts, of of 250 ohms in each cathode (both tride Note 3: With plate-supply voltage of 135 volts, of in each grid and cathode -bias resistor of (both tride units operating). At hottest point on bulb surface. When fixed bias is used, the plate circuit shi- resistance to provide a minimum drop of 15 volta- ating conditions.	. 1.0 mm . not QUIPMENT I Min. 2.26 1.4 100 5800 - and cathode units oper grid resist 250 ohms i ould contai ts dc at th	AX. recom DESIGN Max. 2.74 2.66 150 8200 4 -bias ating) or of n each n a pr	megohm mended amp ma μmhos μamp resistor i megohm cathode otective al oper-
Grid-Circuit Kesistance: For cathode-bias operation For fixed-bias operation CHARACTERISTICS RANGE VALUES FOR EG Note Heater Current 1 Amplification Factor (Each Unit) 1,2 Plate Current (Each Unit) 1,2 Plate Current (Each Unit) 1,2 Transconductance (Each Unit) 1,2 Reverse Grid Current (Units in Parallel) 1,3 Note 1: With 6,3 volts ac or dc on heater. Note 2: With plate-supply voltage of 135 volts, of of 250 ohms in each cathode (both tride (ote 3: With plate-supply voltage of 135 volts, of in each grid and cathode -bias resistor of (both tride units operating). At hottest point on bulb surface. When fixed bias is used, the plate circuit shi- resistance to provide a minimum drop of 15 volta- ating conditions.	. 1.0 mm . not QUIPMENT I Min. 2.26 1.4 100 5800 - and cathode units oper grid resist 250 ohms i ould contai ts dc at th →Indi	AX. recom DESIGN Max. 2.74 2.66 150 8200 4 -bias ating) or of n each n a pr e norm	megohm mended amp ma μmhos μamp resistor 1 megohm cathode otective al oper- a change

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



### LOW-MU TWIN POWER TRIODE

when combined fixed- and cathode-bias is used, the cathode-bias portion should have a minimum value of 7.5 volts dc at the normal operating conditions. As described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission. The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. Operation of this tube is not recommended with a damper pulse between heater and cathode. SPECIAL RATINGS & PERFORMANCE DATA Shock Rating: Impact Acceleration . . . 450 max. Tubes are held rigid in four different positions in a Navy Type, High Impact (flyweight) Shock Machine and are subjected to 450 g impact acceleration. Fatigue Rating: Vibrational Acceleration . . . . 2.5 max. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours. Low-Frequency Vibration Performance: RMS Output Voltage ..... 200 max. mv Under the following conditions and with units connected in parallel: Heater voltage of 6.3 volts, plate voltage supply of 135 volts, dc grid voltage of -7 volts, plate load resistance of 2000 ohms, and vibrational acceleration of 2.5 g at 25 cycles per second. 1 % MAX. 4 16 TI2 BULB MAX. 31/2 MAX. LARGE - WAFER OCTAL 8-PIN BASE WITH SLEEVE JETEC NºB8-98 92CS-7717R2 ← Indicates a change DATA 2 AUG. 1. 1953 TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY





# LOW-MU TWIN POWER TRIODE

### GENERAL DATA

)	Heater, for Unipotential Cathodes: Voltage	+
	Characteristics. Amplifier Class A, (Each Unit):	
	Plate-Supply Voltage       135       volts         Cathode-Bias Resistor       250       ohms         Amplification Factor       2       Plate Resistance       280         Plate Resistance       7000       µmhos         Plate Current       125       ma	
	Mechanical:	
	Mounting Position Any Maximum Overall Length 4-1/16" Maximum Seated Length 3-1/2" Maximum Diameter 1-23/32" Bulb Large-Wafer Octal 8-Pin with Sleeve and External Barriers (JETEC No.88-98) Basing Designation for BOTTOM VIEW 8BD Pin 1-Grid of Pin 5-Plate	4 4 4
	Unit No.2 Pin 2 - Plate of Unit No.2 Pin 3 - Cathode of Unit No.2 Pin 3 - Cathode of Unit No.2 Pin 4 - Grid of Unit No.2 Unit No.2 Pin 6 - Cathode of Unit No.1 Pin 6 - Cathode of Unit No.1 Pin 7 - Heater Pin 8 - Heater	
	Unit No.1	
	DC AMPLIFIER	
	values are jor back Unit	
	PLATE VOLTAGE	
A	UG. 1, 1953 TUBE DEPARTMENT DATA 1	1
	RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY	



# LOW-MU TWIN POWER TRIODE

	BULB TEMPERATURE <sup>⊕</sup> 200 max. <sup>O</sup> C	
	Maximum Circuit Values:	
	Grid-Circuit Resistance: For cathode-bias operation 1.0 max. megohm For fixed-bias operation <sup>9</sup> 0.1 max. megohm For combined fixed- and	
	cathode-bias operation <sup>®</sup> 0.1 max. megohm	
>	CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN	
	Note Min. Max.	
	Heater Current 1 0.55 0.65 amp Amplification Factor	
	(Each Unit) 1,2 1.4 2.6 Plate Current (Each Unit) , 1,2 100 150 ma	
	Transconductance (Each Unit) 1,2 5800 8200 μmhos	
	Reverse Grid Current (Units in Parallel), 1,3 - 4 μαmp	
	wate to With 26 E walte as or do on heater	
	Note 1: With plate-supply voltage of 135 volts, and cathode-bias resistor of 250 ohms in each cathode (both triode units operating).	
and a second sec	Note 3: With plate-supply voltage of 135 volts, grid resistor of 1 megohm in each grid and cathode-bias resistor of 250 ohms in each cathode (both triode units operating).	
	♥ At hottest point on bulb surface.	
	<sup>D</sup> When fixed bias is used, the plate circuit should contain a protective resistance to provide a minimum drop of 15 volts dc at the normal oper- ating conditions.	
	* When combined fixed- and cathode-bias is used, the cathode-bias portion should have a minimum value of 7.5 volts dc at the normal operating con- ditions.	
*	SPECIAL RATINGS & PERFORMANCE DATA	
	Shock Rating:	
	Impact Acceleration	
	Fatigue Rating:	
	Vibrational Acceleration 2.5 max. g Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours.	
	Low-Frequency Vibration Performance:	
Contraction of the local division of the loc	RMS Output Voltage 200 max. mv Under the following conditions and with units connected in parallel: Heater voltage of 26.5 volts, plate voltage	
	-> Indicates a change	

AUG. 1, 1953

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TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY DATA 1



### LOW-MU TWIN POWER TRIODE

supply of 135 volts, dc grid voltage of -7 volts, plate load resistance of 2000 ohms, and vibrational acceleration of 2.5 g at 25 cycles per second.

> Outline Drawing and Average Plate Characteristics Curve for the 6082 are the same as shown for Type 6080

6082







#### MINIATURE TYPE

Intended for applications at altitudes up to 55000 feet and where dependable performance under shock and vibration is paramount.

### GENERAL DATA

Electrical:
Heater, for Unipotential Cathode: Voltage 6.3 ± 10% ac or dc volts Current 0.45 Direct Interelectrode Capacitances (Each Unit, approx.)*:
Grid to Plate         1.5
Characteristics Class & Amplifiant
Plate Supply Voltage
Mechanical:
Mounting Position
Pin 1 - Plate of Unit No.2 Pin 2 - Plate of Unit No.1 Pin 3 - Heater Pin 4 - Heater Pin 4 - Heater
AMPLIFIER - Class A
Values are for each unit
Maximum Ratings, Absolute Values: For Pressures Down to 55°±5 mm of Hg**
PLATE VOLTAGE
<ul> <li>With no external shield.</li> <li>** Corresponds to altitude of about 55000 feet.</li> <li>§ Value is common to both units operating at the specified conditions.</li> </ul>

OCT. 1, 1953

TUBE DEPARTMENT

TENTATIVE DATA 1

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## MEDIUM-MU TWIN TRIODE

PLATE DISSIPATION	0.8	5 max.	watt
PEAK HEATER-CATHODE VOLTAGE:	da 10	0	volto
Heater positive with respect to catho	de. 18	0 max.	volts
BULB TEMPERATURE (At hottest point on		_	00
bulb surface)	16	b max.	00
Maximum Circuit Values (For maximum rat	ed condit	ions):	
Grid-Circuit Resistance:			
For fixed-bias operation	No	t recom	mended
For cathode-bras operation	• • 0.5	max.	megorini
CHARACTERISTICS RANGE VALUES FOR	FOULPMENT	DESIGN	
Note	Min.	Max.	
Heater Current 1	0.420	0.480	amp
Grid-to-Plate Capacitance			
(Each Unit)	1.2	1.8	μμt
(Each Unit)	1.4	2.8	μμf
Plate-to-Cathode Capacitance			
(Unit No.1) 2	0.25	0.65	$\mu\mu^{\dagger}$
(Unit No.2)	0.25	0.55	μμf
Heater-to-Cathode Capacitance . 2	4.0	8.0	Huf
Amplification Factor 1.3	28	48	
Plate Current (1) 1,4	6.5	11.5	ma
$\begin{array}{c} \text{Plate Current (2)} \\ \text{Plate Current (2)} \\ 1.7 \end{array}$	- 5	200	µamp µamp
Transconductance (1)	4500	7500	umbos
Transconductance (2)	4000	-	µmhos
Reverse Grid Current (1) 1,8	-	0.5	µamp
Reverse Grid Current (2) 9,10	-	1.0	μamp
Heater-Cathode Leakage Current:			
Heater negative with		10	uamo
Heater positive with		10	peamp
respect to cathode 1,11	-	10	µamp
Leakage Resistance Per Unit:			
Between Grid and All Other	4		
Electrodes Tied Together 1,12	100	— m	egohms
Electrodes Tied Together 1.13	100	— m	eaohms
Note 1. With 6.3 volts ac or dc on heater.			
Note 2: With no external shield.			
Note 3: With plate supply voltage of 100 volts	, cathode-b	ias resi	stor of
50 ohms common to both units, and a c 1000 $\mu$ f. Each unit tested separately ating.	athode bypa and with b	ss capac oth unit	itor of s oper-
Note 4: With plate supply voltage of 100 volts of 50 ohms common to both units. Each with both units operating.	s and cathod unit tested	e-bias r separat	esistor ely and
with both units operating.			

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## MEDIUM-MU TWIN TRIODE

Note 5: With dc plate voltage of 250 volts, and dc grid voltage of -14.5 volts. Each unit tested separately and with both units operating.
Note 6: With 5.7 volts ac or dc on heater.
Note 7: With plate supply voltage of 250 volts and dc grid voltage of -10.5 volts. Each unit tested separately and with both units operating.
Pote 8: With plate supply voltage of 250 volts, grid-circuit resistance of 1.0 mgohm common to both units, and cathode-bias resistor of 500 ohms common to both units. Plate of unit No.2; grid of unit No.1 tied to plate of 1 meghm common to both units, and cathode-bias resistor of 500 ohms common to both units, and cathode-bias resistor of 500 ohms common to both units. Plate of unit No.2; with plate supply voltage of 100 volts, grid-circuit resistance of 1 meghm common to both units and cathode-bias resistor of 50 ohms common to both units. Plate of unit No.2; tied to plate of unit No.2; grid of unit No.1 tied to grid of unit No.2; the did of unit No.1 tied to grid of unit No.2; the did units 0.1 tied to grid of unit No.2; the did units 0.1 tied to grid of unit No.2;
Note 11: With 100 volts dc between heater and cathode.
Note 12: With grid 100 volts negative with respect to all other electrodes tied together.
Note 13: With plate 300 volts negative with respect to all other electrodes tied together.

### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

Impact Acceleration . . . . . . . . . 500 max. g This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-Impact (flyweight) Shock Machine and are subjected to 20 blows at a hammer angle of 30° (equivalent to the specified maximum impact acceleration). At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for vibration, heater-cathode leakage current, and transconductance.

### Fatigue Rating:

Vibrational Acceleration . . . t . . 2.5 max. g This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for fatigue, heatercathode leakage current, and transconductance.

### Low-Frequency Vibration Performance:

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### MEDIUM-MU TWIN TRIODE

generation of audio noise as determined by the measured rms output voltage. Plate of unit No.l tied to plate of unit No.2 and grid of unit No.l tied to grid of unit No.2; dc plate voltage of 250 volts, dc grid voltage of -8 volts, plate load resistance of 20000 ohms, and vibrational acceleration of 2.5 g at 25 cps.

### Audio-Frequency Noise and Microphonic Performance:

RMS Output Voltage . . . . . . . . 70 max. millivolts This test is performed on a sample lot of tubes from each production run to determine susceptibility of tube to movement of its elements when tapped and consequent generation af audio noise as determined by the measured rms output voltage. Plate of unit No.1 tied to plate of uni No.2, grid of unit No.1 tied to grid of unit No.2, plate supply voltage of 100 volts, grid-circuit resistance of 0.1 megohm common to both units, cathode-bias resistor of 50 ohms common to both units, and plate load resistance of 10000 ohms.

### Glass Strain Test:

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This test is performed on a sample lot of tubes from each production run to check for tubes which may have been improperly processed. Tubes are completely submerged in boiling water  $(97^{\circ}C \ to \ 100^{\circ}C)$  for a period of 15 seconds and then immediately submerged in ice water  $(0^{\circ}C \ to \ 3^{\circ}C)$ . Tubes will withstand this treatment without loss of vacuum.

### Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of I.O microampere under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current (1).

### I-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. With both units operating, each unit is checked for variation in transconductance under conditions of maximum rated plate dissipation. At the end of I hour, the value of transconductance of each unit is read. The variation in transconductance from the O-hour reading will not exceed 12 per cent.

### 100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions of maximum rated plate dissipation to insure a low percentage of early inopera-

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## MEDIUM-MU TWIN TRIODE

tives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.0 microampere under the conditions specified in CHARACTERISTICS RANGE VALUES for reverse grid current (1).

#### 500-Hour Average Life Performance:

This 500-hour test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. With both units operating, each unit is life tested separately at room temperature under the following conditions: heater voltage of 6.3 volts ac or dc, plate supply voltage of 100 volts, dc heater-cathode voltage (heater positive with respect to cathode) of 180 volts, and cathode bias resistor (common to both units) of 50 ohms. At the end of 500 hours, the tubes will not show permanent shorts or open circuits and will be criticized for the totalnumber of defects in the sample lot and for the number of tubes failing to pass the established limits of heater current, transconductance with 6.3 volts acordc on heater, transconductance with 5.7 volts ac or dc on heater, plate current (1), reverse grid current (2), heater-cathode leakage current, and leakage resistance per unit.

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# MEDIUM-MU TWIN TRIODE

SUBMINIATURE TYPE

Intended for applications at altitudes up to 60,000 feet where dependable performance under shock and vibration is paramount

### GENERAL DATA

### Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes: Voltage 6.3
WithoutWithoutWith ExternalGrid to plate (Each unit) $1.5$ $1.4$ $\mu\mu$ fGrid to cathode and heater $1.9 - 2.1$ $\mu\mu$ fPlate to cathode and heater $0.28$ $1.3$ $\mu\mu$ fPlate to cathode and heater $0.28$ $1.4$ $\mu\mu$ fControl to the cathode and heater $0.28$ $1.4$ $\mu\mu$ fControl to the cathode and heater $0.32$ $1.4$ $\mu\mu$ fControl to the cathode and heater $0.32$ $1.4$ $\mu\mu$ fControl to the cathode and heater $0.32$ $1.4$ $\mu\mu$ fControl to the cathode and heater $0.32$ $1.4$ $\mu\mu$ fControl to the cathode and heater $0.32$ $0.32$ $1.4$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Control to the cathode and heater $0.32$ $0.32$ $0.32$ Co
of unit No.2 0.011 max. 0.01 max. μμf Plate of unit No.1 to plate of unit No.2 0.5 max. 0.3 max. μμf
Characteristics, Class A, Amplifier (Each Unit):         Plate-Supply Voltage.       100       volts         Cathode Resistor.       220       ohms         Amplification Factor.       20       plate Resistance (Approx.).       4000       ohms         Transconductance.       5000       µmhos       plate Current       8.5       ma         Grid Voltage (Approx.)       6r plate current       9       volts
Mechanical: Operating Position
*: See next Page.

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# MEDIUM-MU TWIN TRIODE

Plate of unit No.1 to plate of unit No.2 2 - 0.5 $\mu\mu^4$ Amplification Factor 1,3 17 23 Plate Current (1) 1,3 6 11 ma Plate-Current Difference Between Units 1,3 - 2 ma Plate Current (2) 1,4 - 100 $\mu^2$ Transconductance: With heater volts = 6.3 3 4100 5900 $\mu$ mhos Individual change from 0 to 500 hours 1,3 - 20 % Individual change at end of 500-hour life test with heater voltage reduced to 5.7 volts 3 - 15 % Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current 6,7 - 0.5 $\mu^2$ Heater negative with respect to cathode 1,8 - 5 $\mu^2$ Heater negative with respect to cathode 1,8 - 5 $\mu^2$ Heater negative with respect to cathode	2.		Note	Min.	Max.	
unit No.2		Plate of unit No.1 to plate of				
Amplification Factor 1,3 17 23 Plate Current (1) 1,3 6 11 ma Plate-Current Difference Between Units 1,3 - 2 ma Plate Current (2) 1,4 - 100 $\mu$ a Transconductance: With heater volts = 6.3 3 4100 5900 $\mu$ mhos Individual change from 0 to 500 hours 1,3 - 20 % Individual change at end of 500-hour life test with heater voltage reduced to 5.7 volts 3 - 15 % Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 $\mu$ a Grid-Emission Current 1,8 - 5 $\mu$ a Heater regative with respect to cathode 1,8 - 5 $\mu$ a Heater positive with respect to cathode 1,8 - 10 $\mu$ a Heater negative with respect to cathode 1,8 - 10 $\mu$ a Heater positive with respect to cathode 1,8 - 10 $\mu$ a Heater positive with respect to cathode 1,8 - 10 $\mu$ a Heater obsitive with respect to cathode 1,8 - 10 $\mu$ a Heater obsitive with respect to cathode		unit No.2	2	-	0.5	μµf
Plate Current (1) 1,3611maxPlate-Current DifferenceBetween Units 1,3-2maxPlate Current (2) 1,4-100 $\mu^{ab}$ Transconductance:With heater volts = 6.3 341005900 $\mu$ mhosIndividual change from0to 500 hours 1,3-20 $\mu^{ab}$ 0to 500 hours 1,3-20 $\mu^{ab}$ with heater voltagereduced to 5.7 volts 3-15 $\mu^{ab}$ verses disconductance initially, and average after 500-hours, expressed as a percentage $\mu^{ab}$ Current:Heater negative with respect to cathode 1,8-0.3 $\mu^{ab}$ Heater positive with respect to cathode		Amplification Factor	1,3	17	23	
Plate-Current Difference Between Units 1,3 - 2 ma Plate Current (2) 1,4 - 100 $\mu$ a Transconductance: With heater volts = 6.3 3 4100 5900 $\mu$ mhos Individual change from 0 to 500 hours 1,3 - 20 % individual change at end of 500-hour life test with heater voltage reduced to 5.7 volts 3 - 15 % Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 $\mu$ a Grid-Emission Current		Plate Current (1)	1,3	6	11	ma
Between Units       1,3       -       2       mm         Plate Current (2)       1,4       -       100       µa         Transconductance:       With heater volts = 6.3       3       4100       5900       µmhos         Individual change from       0       to 500 hours.       1,3       -       20       %         Individual change at end       of 500-hour life test       .		Plate-Current Difference				
<pre>Plate Current (2) 1,4 - 100</pre>		Between Units	1,3	-	2	ma
Transconductance:With heater volts = 6.3 3 4100 5900 µmhosIndividual change from0 to 500 hours 1,3 - 20 %Individual change at endof 500-hour life testwith heater voltagereduced to 5.7 volts 3 - 15 %Difference between averagetransconductance initially,and average after 500-hours,expressed as a percentageof the initial average 1,3 - 15 %Reverse Grid Current 1,5 - 0.3 µaGrid-Emission Current	2	Plate Current (2)	1,4	-	100	μa
With heater volts = 6.3 3 4100 5900 µmhos Individual change from 0 to 500 hours 1,3 - 20 % Individual change at end of 500-hour life test with heater voltage reduced to 5.7 volts 3 - 15 % Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current 6,70.5 µaa Grid-Emission Current 6,70.5 µaa Grid-Emission Current 6,70.5 µaa Heater negative with respect to cathode 1,8 - 5 µaa Heater positive with respect to cathode 1,8 - 5 µaa Heater positive with respect to cathode 1,8 - 10 µaa Heater negative with respect to cathode 1,8 - 10 µaa Heater positive with respect to cathode		Transconductance:				
Individual change from 0 to 500 hours 1,3 - 20 % Individual change at end of 500-hour life test with heater voltage reduced to 5.7 volts 3 - 15 % Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average. 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 µa Grid-Emission Current 6,70.5 µa Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 5 µa Heater positive with respect to cathode 1,8 - 5 µa Heater negative with respect to cathode 1,8 - 10 µa Heater negative with respect to cathode		With heater volts = 6.3	3	4100	5900	µmhos
0 to 500 hours.       1,3       -       20       92         Individual change at end of 500-hour life test with heater voltage reduced to 5.7 volts.       3       -       15       92         Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average.       1,3       -       15       92         Reverse Grid Current.       1,5       -       0.3       µaa         Grid-Emission Current       1,5       -       0.3       µaa         Heater-Cathode Leakage       -       -       -       0.5       µaa         Current:       Heater positive with respect to cathode.       1,8       -       5       µaa         Heater positive with respect to cathode.       1,8       -       10       µaa         Heater negative with respect to cathode.       1,8       -       10       µaa         Heater positive with respect to cathode.       1,8       -       10       µaa         Leakage Resistance: Grid to all other electrodes tied together       1,10       100       -       megohms         Plate to all other electrodes tied together       1,10       100       -       megohms         Plate to all other electrodes tied together       1,10       50       -		Individual change from				
<pre>Individual change at end of 500-hour life test with heater voltage reduced to 5.7 volts 3 - 15 % Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 µaa Grid-Emission Current 1,5 - 0.3 µaa Grid-Emission Current 6,70.5 µaa Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 5 µaa Heater positive with respect to cathode 1,8 - 5 µaa Heater cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1,8 - 10 µaa Heater positive with respect to cathode 1,8 - 10 µaa Heater positive with respect to cathode 1,8 - 10 µaa Heater positive with respect to cathode 1,9 100 - megohms Plate to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 5</pre>		0 to 500 hours	1,3	-	20	%
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Difference between average transconductance initially, and average after 500-hours, expressed as a percentage of the initial average. 1,3 - 15 % Reverse Grid Current. 1,5 - 0.3 µa Grid-Emission Current 6,70.5 µa Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 5 µa Heater positive with respect to cathode 1,8 - 5 µa Heater positive with respect to cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode		reduced to 5.7 volts	3	-	15	%
<pre>transconductance initially, and average after 500-hours, expressed as a percentage of the initial average. 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 µa Grid-Emission Current 6,70.5 µa Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 5 µa Heater positive with respect to cathode 1,8 - 5 µa Heater cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,9 100 - megohms Plate to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together</pre>		Difference between average				
and average after 500-hours, expressed as a percentage of the initial average. 1,3 - 15 % Reverse Grid Current. 1,5 - 0.3 µa Grid-Emission Current . 6,70.5 µa Heater-Cathode Leakage Current: Heater negative with respect to cathode. 1,8 - 5 µa Heater positive with respect to cathode. 1,8 - 5 µa Heater-Cathode Leakage Current at 500 hours: Heater negative with respect to cathode. 1,8 - 10 µa Heater positive with respect to cathode 1,9 100 - megohms Plate to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Note 1: With 6.3 volts ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µf) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		transconductance initially,				
<pre>expressed as a percentage of the initial average. 1,3 - 15 % Reverse Grid Current 1,5 - 0.3 µa Grid-Emission Current 6,70.5 µa Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 5 µa Heater positive with respect to cathode 1,8 - 5 µa Heater-Cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Note 1: With 6.3 volts ac or ac on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-supply volts = 100, cathode resistor (ohms) = 220, act acthode-base capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2</pre>		and average after 500-hours,				
of the initial average 1,3 - 15 9 Reverse Grid Current 1,5 - 0.3 µa Grid-Emission Current 6,70.5 µa Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 5 µa Heater positive with respect to cathode 1,8 - 5 µa Heater cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode		expressed as a percentage				
Reverse Grid Current.       1,5       -       0.3       µa         Grid-Emission Current.       6,7       -       -0.5       µa         Heater-Cathode Leakage       Current:             Heater negative with       respect to cathode.       1,8       -       5       µa         Heater positive with       respect to cathode.       1,8       -       5       µa         Heater positive with       respect to cathode.       1,8       -       5       µa         Heater positive with       respect to cathode.       1,8       -       5       µa         Heater negative with respect       to cathode.       1,8       -       10       µa         Heater positive with respect       1,8       -       10       µa         Heater positive with respect       1,8       -       10       µa         Leakage Resistance:       Grid to all other electrodes       1,9       100       -       megohms         Plate to all other electrodes       1,10       100       -       megohms         Plate to all other electrodes       1,10       50       -       megohms         Plate to all other electrodes       1,10       50		of the initial average	1,3	-	15	%
<pre>Grid-Emission Current 6,70.5 µa Heater-Cathode Leakage Current: Heater negative with respect to cathode 1,8 - 5 µa Heater positive with respect to cathode 1,8 - 5 µa Heater-Cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,10 100 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Note 1: With 6.3 volts ac or ac on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µf) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2</pre>		Reverse Grid Current	1,5	-	0.3	μa
<pre>Heater-Cathode Leakage Current: Heater negative with respect to cathode 1.8 - 5 µa Heater positive with respect to cathode 1.8 - 5 µa Heater-Cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1.8 - 10 µa Heater positive with respect to cathode 1.8 - 10 µa Heater positive with respect to cathode 1.8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1.9 100 - megohms Plate to all other electrodes tied together 1.9 100 - megohms Plate to all other electrodes tied together 1.9 50 - megohms Plate to all other electrodes tied together 1.9 50 - megohms Note 1: With 6.3 volts ac or ac on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypes capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIV</pre>		Grid-Emission Current	6,7	-	-0.5	μa
Current: Heater negative with respect to cathode 1,8 - 5 µa Heater positive with respect to cathode 1,8 - 5 µa Heater positive with respect to cathode 1,8 - 10 µa Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,10 100 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Note 1: With 6.3 volts ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		Heater-Cathode Leakage				
<pre>Heater negative with respect to cathode 1.8 - 5 µa Heater positive with respect to cathode 1.8 - 5 µa Heater-Cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1.8 - 10 µa Heater positive with respect to cathode 1.8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1.9 100 - megohms Plate to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Note 1: With 6.3 volts ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. TENTATIVE DATA 2 4-58 TENTATIVE DATA 2 10 10 10 10 10 10 10 10 10 10 10 10 10 1</pre>		Current:				
<pre>respect to cathode 1,8 - 5 µa Heater positive with respect to cathode 1,8 - 5 µa Heater-Cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Note 1: With 6.3 volts ac or ac on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-byps capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2 TENTATIVE DATA 2</pre>		Heater negative with				
<pre>Heater positive with respect to cathode 1,8 - 5 µa Heater-Cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,10 100 - megohms Leakage Resistance at 500 hours: Grid to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Note 1: With 6.3 volts ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. TENTATIVE DATA 2 4-58 TENTATIVE DATA 2 10 µa Heater positive with respect test positive with page. TENTATIVE DATA 2 10 µa Heater positive with respect TENTATIVE DATA 2 10 µa Heater positive with page. Herricon with positive positive positive positive test positive with page. Herricon with positive positive test positive positive test positive t</pre>		respect to cathode	1,8	-	5	μa
respect to cathode 1,8 - 5 µa Heater-Cathode Leakage Current at 500 hours: Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,10 100 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,9 50 - megohms Note 1: With 6.3 volts ac or ac on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µf) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		Heater positive with				
<pre>Heater-Cathode Leakage Current at 500 hours: Heater negative with respect to cathode</pre>		respect to cathode	1,8	-	5	μa
Current at 500 hours: Heater negative with respect to cathode		Heater-Cathode Leakage				
Heater negative with respect to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,10 100 - megohms Leakage Resistance at 500 hours: Grid to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together		Current at 500 hours:				
<pre>to cathode 1,8 - 10 µa Heater positive with respect to cathode 1,8 - 10 µa Leakage Resistance: Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,10 100 - megohms Leakage Resistance at 500 hours: Grid to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,10 50 - megohms Note 1: With 6.3 volts ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2</pre>		Heater negative with respect				
Heater positive with respect to cathode		to cathode	1,8	-	10	μa
<pre>to cathode</pre>		Heater positive with respect				
Leakage Resistance: Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,10 100 - megohms Leakage Resistance at 500 hours: Grid to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,10 50 - megohms Plate to all other electrodes tied together 1,10 50 - megohms Note 1: With 6.3 volts ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µf) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		to cathode	1,8	-	10	μa
Grid to all other electrodes tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,10 100 - megohms Leakage Resistance at 500 hours: Grid to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,10 50 - megohms Note 1: With 6.3 volts 'ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor ( <i>L</i> ) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58		Leakage Resistance:				
<pre>tied together 1,9 100 - megohms Plate to all other electrodes tied together 1,10 100 - megohms Grid to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,10 50 - megohms Note 1: With 6.3 volts ac or ac on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µf) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. TENTATIVE DATA 2 </pre>		Grid to all other electrodes				
Plate to all other electrodes tied together		tied together	1,9	100	-	megohms
<pre>tied together 1,10 100 - megohms Leakage Resistance at 500 hours: Grid to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,10 50 - megohms Note 1: With 6.3 volts ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. TENTATIVE DATA 2</pre>		Plate to all other electrodes				
Leakage Resistance at 500 hours: Grid to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,10 50 - megohms Note 1: With 6.3 volts 'ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor ( <i>ut</i> ) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		tied together	1,10	100	-	megohms
Grid to all other electrodes tied together 1,9 50 - megohms Plate to all other electrodes tied together 1,10 50 - megohms Note 1: With 6.3 volts ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		Leakage Resistance at 500 hours:				
<ul> <li>tied together 1,9 50 - megohms</li> <li>Plate to all other electrodes</li> <li>tied together</li></ul>	1	Grid to all other electrodes				
Plate to all other electrodes tied together		tied together	1,9	50	-	megohms
<ul> <li>tied together 1,10 50 - megohms</li> <li>Note 1: With 6.3 volts 'ac or dc on heater.</li> <li>Note 2: Without external shield.</li> <li>Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (<i>ut</i>) = 1000. Each unit tested separately. Unit not under test connected to ground.</li> <li>Notes 4 to 10: See next page.</li> <li>4-58 TENTATIVE DATA 2010</li> </ul>		Plate to all other electrodes				
Note 1: With 6.3 volts ac or dc on heater. Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		tied together	1,10	50	-	megohms
Note 2: Without external shield. Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor ( <i>µ</i> f) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		Note 1. with 6 3 volts be or do on her	ter			
Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 220, and cathode-bypass capacitor ( <i>u</i> f) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		Note 2: Without external shield.				
and cathode-Dypass capacitor (µt) = 1000. Each unit tested separately. Unit not under test connected to ground. Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		Note 3: with plate-supply volts = 100	. catho	de resis	tor (ohn	(s) = 220.
Notes 4 to 10: See next page.	1	and cathode-bypass capacitor	(µf) =	1000.	Each un	it tested
Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2		separately. Unit not under te	est conn	ected to	ground.	
Notes 4 to 10: See next page. 4-58 TENTATIVE DATA 2						
4-58 TENTATIVE DATA 2		Notes 4 to 10: See next page.				
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### MEDIUM-MU TWIN TRIODE

Nute	4:	With plate volts = 100 and grid volts = -9. Each unit tested separately. Unit not under test connected to ground.
Note	5:	with plate volts = 100, grid resistor (megohms) = 1, and cathode resistor (ohms) = 200. Each unit tested separately. Unit not under test connected to ground.
Note	6:	With 7.5 volts dc on heater.
Note	7:	With plate volts = 100, grid resistor (megohms) = 1, and grid volts = -9. Preheated prior to testing for 5 minutes at heater volts = 7.5 ac or dc, plate volts = 100, grid resistor (megohms) = 1, and cathode resistor (ohms) = 220.
Note	8:	With 100 volts between heater and cathode. Each unit tested separately. Unit not under test connected to ground.
Note	9:	With grid 100 volts negative with respect to all other electrodes tied together.
Note	10:	With plate 300 volts negative with respect to all other electrodes tied together.

### SPECIAL RATINGS AND PERFORMANCE DATA

Values are for Each Unit, Unless Otherwise Specified

#### Shock Rating:

6111

### Fatigue Rating:

Vibrational Acceleration . . . . . . 2.5 max. g This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

#### Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . . . . . . 100 max. mv This test is performed on a sample lot of tubes from each production run under the following conditions: Heater.volts = 6.3, plate-supply volts = 100, cathode resistor (ohms) = 220, cathode-bypass capacitor ( $\mu$ f) = 1000, plate load resistor (ohms) = 10,000, and vibrational acceleration of 15 g at 40 cps.

### Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . . 2000 min. cycles Under the following conditions: Heater volts = 7 cycled one minute on and four minutes off, heater 140 volts

TENTATIVE DATA 2

ELECTRON TUBE DIVISION

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## MEDIUM-MU TWIN TRIODE

rms with respect to cathode, and all other elements connected to ground. At the end of this test, tubes will not show heater-cathode shorts or open circuits.

Audio-Frequency Noise and Microphonic Performance:

### Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of I microampere under the conditions specified in the CHARACTER-ISTICS RANGE VALUES for reverse grid current.

### I-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Life-test conditions are the same as those specified under 500-Hour Intermittent Life Performance, except that the test run at room temperature. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

### 100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life test conditions are the same as those specified under 500-Hour Intermittent Life Performance, except that the test run at room temperature. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit or a value of reverse grid current in excess of I microampere under the conditions specified in CHARACTERISTICS RANGE VALUES.

### 500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater volts = 6.3, plate-supply volts = 100, heater-cathode volts = 200 (heater positive with



## MEDIUM-MU TWIN TRIODE

respect to cathodel, cathode resistor (ohms) = 220, grid resistor (megohms) = 1, and bulb temperature ( $^{\circ}$ C) = 220. At the end of 500 hours, tube will not show permanent shorts or open circuits, and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, individual transconductance change, transconductance change with heater volts = 5.7, and 500-hour limits for reverse grid current, heater-cathode leakage current, leakage resistance, and the difference in transconductance between the initial value and average value shown under CHARACTERISTICS RANGE VALUES.

### OPERATING CONSIDERATIONS

The *heater supply* should be well regulated because life and reliability of the 6111 are adversely affected by departures from the 6.3-volt value. The extent to which life is affected is a function of the amount of these departures and their durations.

The *flexible leads* of the GIII are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation will crack the glass seals of the leads and damage the tube.

DATA

6111









## SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount. This "premium" type is similar to the 6AU6

### GENERAL DATA

### Electrical:

Heater, for Unipotential Cathode:			
Voltage 6.3 ± 10%		ac or d	c volts
Direct Interelectrode Capacitances <sup>0</sup>			amp
Grid No.1 to plate Grid No.1 to cathode, grid No.3 &	. 0.00	035 max.	μµf
and heater Plate to cathode, grid No.3 & internal shield, grid No.2.	•	6	μµf
and heater		5	μµf
Characteristics, Class A, Amplifier:			
Plate-Supply Voltage	. 100	250	volts
Grid No.3 (Suppressor Grid)		•	1.
Grid-No.2 (Screen-Grid) Supply Voltage	. 100	150	volts
Plate Resistance (Approx.)	. 150	1	meanhm
Transconductance	. 3900	5200	umbos
Plate Current	. 5	10.6	ma
Grid-No.2 Current	. 2.1	4.3	ma
Grid-No.1 (Control-Grid) Voltage (Approx.) for plate current of 10 μa	4.2	-6.5	volts
Mechanical:			π.
Operating Position Maximum Overall Length Maximum Seated Length. Length, Base Seat to Bulb Top (Excludin Maximum Diameter Dimensional Outline. Bulb Base Basing Designation for BOTTOM VIEW.	g tip). .See ( 7-Pin	1-1/2" General (JETEC N	Any 2-1/8" 1-7/8" ± 3/32" .3/4" Section T5-1/2 0.E7-1) .7BK
Pin 1-Grid No.1 Pin 2-Grid No.3, Internal Shield Pin 3-Heater	Pin Pin Pin Pin	4 - Heat 5 - Plat 6 - Grid 7 - Cath	er e No.2 ode
AMPLIFIER - Class	Α,		
Maximum Ratings. Absolute Values:			
PLATÉ VOLTAGE.	3	330 max.	volts
°,♦: See next page.			
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# SHARP-CUTOFF PENTODE

	and the second second second			
SRID-No.3 (SUPPRESSOR-GRID) VO	OLTAGE.		0 max	volts
SRID-No.1 (CONTROL-GRID) VOLTA	GE		165 max	. voits
Positive bias value			0 max.	volts
ARID-No.2 INPUT			0.7 max.	. watt
PLATE DISSIPATION.			3.3 max.	. watts
Heater pagative with respect	t to cat	hodo	100 may	volte
Heater nositive with respec	t to cat	hode.	100 max.	volts
BULB TEMPERATURE (At hottest	point			
on bulb surface)			165 max.	°C
Typical Operation as Resistand	ce-Couple	ed Ampli	fier:	
See RESISTANCE-COU	IPLED AMP	PLIFIER	CHART	
at end of tabulate	d data f	or this	type	
faximum Circuit Values:				
rid-No.1-Circuit Resistance:			0.05	
For fixed-bias operation			0.25 max.	megohm
Tor cathode-bras operation .			v.J max.	megonin
Without external shield.				
Connected to cathode at socket.				20
		FOULDW	ENT DEGLO	
CHARACTERISTICS PANGE VA	MULES FOR	FUILIPM	ENI DESIG	N I
UNARAUTERIGITUG RANGE VA		LYUTTA		
Values are Initial, Un	less Oth	erwise S	Specified	
Values are Initial, Un	less Oth Note	erwise S Min.	Specified Max.	
Values are Initial, United to the current	less Oth Note 1	erwise S Min. 0.275	Specified Max. 0.325	amp
Values are Initial, Unitiate Current	less Oth Note 1	erwise \$ Min. 0.275	Specified Max. 0.325	amp
Values are Initial, Unitiate Current	less Othe Note 1	erwise S Min. 0.275	Specified Max. 0.325 0.0035	amp μμf
Values are Initial, University of the second	less Oth Note 1	erwise S Min. 0.275 -	Specified Max. 0.325 0.0035	amp μμf
Values are Initial, University of the second	less Oth Note 1	erwise S Min. 0.275 -	Specified Max. 0.325 0.0035	amp μμf
Values are Initial, University of Nance Values are Initial, University of the compactances: Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth Note 1 2	erwise S Min. 0.275 - 4.8	Specified Max. 0.325 0.0035	атр <i>µµ</i> f <i>µµ</i> f
Values are Initial, University of NAME VA Values are Initial, University of Capacitances: Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth Note 1 2	erwise S Min. 0.275 - 4.8	Specified Max. 0.325 0.0035 7.2	атр <i>µµ</i> f <i>µµ</i> f
Values are Initial, University of NAME VALUES are Initial, University of the second se	less Oth Note 1 2	erwise S Min. 0.275 - 4.8	Specified Max. 0.325 0.0035 7.2	атр <i>µµ</i> f <i>µµ</i> f
Values are Initial, University of NAMEL VA Values are Initial, University of Capacitances: Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth Note 1 2	erwise S Min. 0.275 - 4.8	Specified Max. 0.325 0.0035 7.2	атр µµf µµf
Values are Initial, University of NAME Values are Initial, University of the second se	Less Oth. Note 1 2 2 2 1,3	erwise S Min. 0.275 - 4.8 3.9 8	Specified Max. 0.325 0.0035 7.2 5.9 13.5	amp μμιf μμιf μμιf ma
Values are Initial, University of NAME Values are Initial, University of Name Values are Initial, University of No.1 to plate Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth. Note 1 2 2 2 1,3 1,4	erwise S Min. 0.275 - 4.8 3.9 8	Specified Max. 0.325 0.0035 7.2 5.9 13.5 35	amp μμf μμf μμf ma μa
Values are Initial, University of NAME Values are Initial, University of Name Values are Initial, University of No.1 to plate	less Oth. Note 1 2 2 2 1,3 1,4 1,3	erwise S Min. 0.275 - 4.8 3.9 8 - 2.6	Specified Max. 0.325 0.0035 7.2 5.9 13.5 35 6	amp μμf μμf μμf ma ma
Values are Initial, University of NAME Values are Initial, University of Name Values are Initial, University of No.1 to plate Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth Note 1 2 2 1,3 1,4 1,3	erwise S Min. 0.275 - 4.8 3.9 8 - 2.6	Specified Max. 0.325 0.0035 7.2 5.9 13.5 35 6	amp μμf μμf ma μa ma
Values are Initial, University of Nance Values are Initial, University of No.1 to plate Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth Note 1 2 2 1,3 1,4 1,3	erwise S Min. 0.275 - 4.8 3.9 8 - 2.6 4150	Specified Max. 0.325 0.0035 7.2 5.9 13.5 6 6 6250	amp μμιf μμf ma μa ma μambos
Values are Initial, University of NAME Values are Initial, University of No.1 to plate Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth Note 1 2 2 1,3 1,4 1,3 1,4 1,3 3	erwise S Min. 0.275 - 4.8 3.9 8 2.6 4150 3900	Specified Max. 0.325 0.0035 7.2 5.9 13.5 35 6 6 6250 -	amp μμf μμf ma μa ma μmhos μmhos
Values are Initial, University of NAME Values are Initial, University of No.1 to plate Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth Note 1 2 2 1,3 1,4 1,3 3 3	erwise S Min. 0.275 - 4.8 3.9 8 - 2.6 4150 3900	Specified Max. 0.325 0.0035 7.2 5.9 13.5 35 6 6250 -	amp μμf μμf ma μa ma μmhos μmhos
Values are Initial, University of NAME Values are Initial, University of Capacitances: Grid No.1 to plate Grid No.1 to plate Grid No.1 to cathode, grid No.2, and heater	less Oth Note 1 2 1,3 1,4 1,3 3 3 3 3	erwise S Min. 0.275 - 4.8 3.9 8 - 2.6 4150 3900 3600	5pecified Max. 0.325 0.0035 7.2 5.9 13.5 35 6 6250 - 6250	amp μμf μμf ma μa ma μmhos μmhos
Values are Initial, University of NAMEL VA Values are Initial, University of Capacitances: Grid No.1 to plate Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth Note 1 2 1,3 1,4 1,3 3 3 3 3	erwise S Min. 0.275 - 4.8 3.9 8 - 2.6 4150 3900 3600	Specified Max. 0.325 0.0035 7.2 5.9 13.5 35 6 6250 - 6250	amp μμf μμf ma μa ma μmhos μmhos
Values are Initial, University of NAMEL VA Values are Initial, University of Capacitances: Grid No.1 to plate Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater	less Oth Note 1 2 1,3 1,4 1,3 3 3 3 3	erwise S Min. 0.275 - 4.8 3.9 8 - 2.6 4150 3900 3600	Specified Max. 0.325 0.0035 7.2 5.9 13.5 35 6 6250 - 6250	amp μμf μμf ma μa ma μmhos μmhos

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# SHARP-CUTOFF PENTODE

	61 <sup>×</sup>	Note	Min.	Max.		
	Difference between average transconductance initially, and average after 500 hours, expressed as a percentage					
D	of the initial average Reverse Grid-No.1 Current Reverse Grid-No.1 Current at	1,3 1,5	-	17 1		% µа
	500 hours Grid-No.1-Emission Current Heater-Cathode Leakage	1,5 6	-	_1 _2		μа µа
	Current: Heater 100 volts negative with respect to cathode Heater 100 volts positive	1	_	10		μa
	With respect to cathode Heater-Cathode Leakage Current at 500 hours:	1	-	10		μa
	Heater 100 volts negative with respect to cathode Heater 100 volts positive	1	-	10		μa
	with respect to cathode Leakage Resistance: Grid No.1 to all other	1	-	10		μa
	electrodes . Plate to all other electrodes . Leakage Resistance at 500 hours: Grid No.1 to all other	1,7 1,8	100 100	1	mego mego	hms hms
	electrodes	1,7 1,8	50 50	-	mego mego	hms hms
D	Note 1: With 6.3 volts ac or dc on heate Note 2: Without external shield. Note 3: With plate-supply voltage of 250 of 150 volts, cathode resists	r. volts, g r of 68	rid-No. ohms,	2 supp catho	ly volt de-byp	age ass
	Note 4: With plate voltage of 250 volts, grid-No.1 voltage of -9 volts, pl. and grid No.3 tied to cathode.	grid-No ate load	.2 volt resist	age of or of 0	150 vol 1 mego	ts, bhm,
	Note 5: With plate voltage of 250 volts, grid-No.2 voltage of 150 volts, and grid-No.1 resistor of 0.25 m	grid-N grid-Nc egohm.	0.3 vol .1 voli	tage of tage of	f 0 vol -1 vo	ts, lt,
	Note 6: With 7.5 volts ac or dc on heate grid-No.3 voltage of 0 volts, g grid-No.1 voltage of -10 volts, megohm.	r, plate rid-No.2 and grid	volta volta d-No.1	ge of : ge of 1 resisto	250 vol .50 vol or of 0	ts, ts, .25
	Note 7: With grid No.1 100 volts negat electrodes tied together. Note 8: With plate 300 volts negative with tied together.	ive with respect	to all	ct to other e	all ot electro	her
D						
L						

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TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



### SHARP-CUTOFF PENTODE

### SPECIAL RATINGS AND PERFORMANCE DATA

### Shock Rating:

6130

### Fatigue Rating:

Vibrational Acceleration . . . . . 2.5 max. g This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, reverse grid-No.1 current, and transconductance.

### Low-Frequency Vibration Performance:

RMS Output Voltage . . . . . . . . . . . . . . . . 300 max. mv This test is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 250 volts, grid No.3 tied to cathode, grid-No.2 supply voltage of 150 volts, cathode resistor of 68 ohms, cathode-bypass capacitor of 1000 μf, plate load resistor of 2000 ohms and vibrational acceleration of 2.5 g at 25 cps.

### Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . 2000 min. cycles Under the following conditions: Heater voltage of 7.5 volts cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground.

### Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid-No.I current in excess of I.O microampere under the conditions specified in the Characteristics Range Values for reverse grid-No.I current.

ELECTRON TUBE DIVISION

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## SHARP-CUTOFF PENTODE

### I-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are checked for transconductance under conditions specified under 500-Hour Intermittent Life Performance. At the end of I hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

### 100-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions specified under 500-Hour Intermittent Life Performance to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit or a value of reverse grid-No.1 current in excess of 1.0 microampere under the conditions specified in Characteristics Range Values.

### 500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 300 volts, grid No.3 tied to cathode, grid-No.2 supply voltage of 150 volts, heatercathode voltage of 135 volts (heater positive with respect to cathode), cathode resistor of 80 ohms and grid-No.I resistor of 0.5 megohm. At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, and 500 hour limits for reverse grid-No.1 current, heater-cathode leakage current, leakage resistance, transconductance range, and the difference in transconductance between the initial value and average value shown under Characteristics Range Values.

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# SHARP-CUTOFF PENTODE

OPERATING CONDITION	S AS RESIS	TANCE-COU	PLED AMPLI	FIER
Plate-Supply Voltage		90	0.17	volts
Plate Load Resistor Grid-No.2 Resistor Grid-No.1 Resistor	0.1	0.22	0.47	megohm
(Of following stage) Cathode Resistor	0.22 2100	0.47 3200	1 6500	megohm ohms
Peak Output Voltage® Voltage Gain®	32 72	32 99	32 126	volts
Plate-Supply Voltage		180		volts
Plate Load Resistor Grid-No.2 Resistor	0.1	0.22 0.43	0.47	megohm megohm
Grid-No.1 Resistor (Of following stage) Cathode Resistor	0.22	0.47	1 3400	megohm
Peak Output Voltage® Voltage Gain®	82 116	67 171	65 232	volts
Plate-Supply Voltage		300		volts
Plate Load Resistor Grid-No.2 Resistor	0.1	0.22	0.47	megohm megohm
(Of following stage) Cathode Resistor	0.22	0.47	1 1900	megohm ohms
Peak Output Voltage" Voltage Gain	103	230	318	volts
• Obtained across grid-No.1 condition where the signal the resistance-coupled amp starts to draw current. • At 5 volts (RMS) output. Note: Coupling capacitors s	resistor o level is au lifier tube should be se	f following dequate to s to the poin lected to g	stage and swing the gr nt where its ive desired	is for the id-No.1 of grid-No.1 frequency
response. Cathode a bypassed.	nd grid-No.:	2 resistors	should be	adequately
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ELECTRON TUBE DIVISION

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6130



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6613







RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6614







### GENERAL DATA

### Electrical:

### Mechanical:

H-Heater Leads P-Plate Terminal (Adjacent to pinch-off)



K-Cathode Terminal (Adjacent to heater leads)

### PULSE-DETECTION and PULSE-POWER-MEASURING SERVICE\*

#### Maximum Ratings, Absolute Values:

PEAK IN	VER	SE PL	ATE	VOL	TAG	Ε.								1000	max.	volts
PEAK PU	LSE	PLAT	EVC	DLTA	GE.									150	max.	volts
PEAK PU	LSE	PLAT	E CL	JRRE	NT.									1	max.	amp
DC PLAT	EC	URREN	Τ											1	max.	ma
PEAK HE	ATE	R-CAT	HODE	E VO	LTA	GE	:									
Heate	r n	egati	ve v	vith	re	sp	ec'	t	to	Ca	ath	100	de	90	max.	volts
Heate	r p	ositi	ve v	vith	re	sp	ec	t	to	Cá	ath	100	de	90	max.	volts
SEAL TE	MPE	RATUR	E (F	Plat	e c	r	ca	th	ode	e)				175	max.	°C

### HALF-WAVE RECTIFIER

#### Maximum Ratings, Absolute Values:

PEAK	INVER	RSE	PLATE	V	OLT	AGE	Ξ.								375	max.	volts
PEAK	PLATE	CL	RRENT										:		50	max.	ma
HOT-	SWITCH	ING	TRAN	SI	ENT	PI	LAT	ΓE	CL	JRF	REI	NT:	•				
Fo	r dura	atic	n of	0.	2 s	eco	ond	d i	max	kir	nur	n.			250	max.	ma
DC C	UTPUT	CUR	RENT												5.5	max.	ma

,▲,●: See next page.

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ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY DATA 1

RCA) 6173

# UHF DIODE

PEAK HEATER-CATHODE VOLTAGE:

Heater	negative	with	respect	to	cathode	90	max.	volts
Heater	positive	with	respect	to	cathode	90	max.	volts
SEAL TEM	PERATURE	(Plate	e or cath	node	e)	175	max.	°C

<sup>O</sup> Without external shield.

6173

- In this class of service, the heater should be allowed to warm up for a minimum of 60 seconds before plate voltage is applied in order to allow the cathode to reach normal operating temperature and to be able to supply the high peak plate currents encountered in this class of service.
- A minimum plate-load impedance (including the source impedance) of 300 ohms is required to limit the hot-switching transient plate current and thereby prevent damage to the tube when the plate voltage is applied.

### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.127	0.143	amp
Plate to cathode	2	0.8	1.4	μµf
Tube Voltage Drop	1,3	-	15	volts

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

Note 2: Without external shield.

Note 3: With peak plate current of 50 milliamperes provided by an applied dc voltage. Tube drop is measured by a voltmeter connected between plate and cathode.

#### OPERATING CONSIDERATIONS

Connections to the cathode terminal and the plate terminal should be made by flexible spring contacts only. The connectors must make firm, large-surface contact, yet must be sufficiently flexible so that no part of the tube is subjected to strain. Unless this recommendation is observed, the glass-to-metal seals may be damaged.

The *heater leads* should not be soldered to the circuit elements. The heat of the soldering operation may crack the glass seals of the heater leads and damage the tube.

The accompanying *Pulse Rating Chart* represents graphically the relationships between pulse duration, pulse-repetition rate, and peak-pulse plate current. This Chart gives the equipment designer a wide choice of operating parameters within the tube's ratings.

Dotted boundary line "ABC" is the locus of the maximum peak-pulse-plate-current values for various pulse durations. In most applications, two of the three parameters shown in the Pulse Rating Chart are known. Knowing any two parameters, the equipment designer can select from the Chart the maximum allowable value of the third parameter. For example, if an application requires a 1-microsecond pulse and a pulserepetition rate of 1000 pulses per second, the maximum allowable peak-pulse plate current is 1 ampere. Since the pulserepetition rate of 1000 is a maximum value for a pulse duration

- Indicates a change.

DATA 1

RCA) 6173 UHF DIODE 613



RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



## UHF DIODE

PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with respect to cathode		90	max.	volts
Heater positive with respect to cathode		90	max.	volts
SEAL TEMPERATURE (Plate or Cathode)		175	max.	oC

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.123	0.143	amp
Plate-to-Cathode Capacitance		0.8	1.4	μμt
Tube Voltage Drop	1,2		15	volts

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

6173

Note 2: With peak plate current of 50 milliamperes provided by an applied dc voltage. Tubedrop is measured by a voltmeter connected between plate and cathode.

### INSTALLATION CONSIDERATIONS

Connections to the cathode cylinder and plate cylinder should be made by flexible spring contacts only. The connectors must make firm, large-surface contact, yet must be sufficiently flexible so that no part of the tube is subjected to strain. Unless this recommendation is observed, the glass-to-metal seals may be damaged.

The *heater* leads of the 6173 fit the Cinch Socket No.54A16325. They should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater leads and damage the tube.

JULY 1, 1952

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



# UHF DIODE

of I microsecond, it follows that any pulse-repetition rate up to 1000 may be used under these conditions. If a longer pulse duration is required, e.g., 1.5 microseconds, and the same pulse-repetition rate of 1000 is required, the maximum allowable peak-pulse plate current is 0.67 ampere.

In applications where groups of pulses are employed, the equipment designer can total the pulse duration of the individual pulses in any one group and then treat the pulse duration of the group as a single wide pulse.



NOTE I: THE MAXIMUM ECCENTRICITY OF THE CATHODE TERMINAL WITH RESPECT TO THE PLATE TERMINAL IS 0.008". ECCENTRICITY IS MEASURED BY CHUCKING THE PLATE TERMINAL 0.050" TO 0.100" FROM THE GLASS MID-SECTION, ROTATING THE TUBE, AND MEASURING ONE-HALF THE TOTAL TRAVEL DISTANCE OF THE CATHODE TERMINAL AT A POINT 0.080" FROM THE FREE END OF THE CATHODE TERMINAL.

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DATA 2









610-

# **POWER PENTODE**

FOR "ON-OFF" CONTROL APPLICATIONS INVOLVING LONG PERIODS OF OPERATION UNDER CUTOFF CONDITIONS

### GENERAL DATA

## Electrical:

Voltage	c volts amp μμf μμf μμf				
characteristics, class a Amplifier:					
Heater Voltage       6.3         Plate Voltage       250         Grid No.3       Connected to Cathode at         Grid-No.2 Voltage       150         Grid-No.1 Voltage       -3         Mu-Factor, Grid No.2 to Grid No.1       22         Plate Resistance       90000         Transconductance       11000         Plate Current       7         Maximum Plate Current       7	volts volts Socket volts volts ohms µmhos ma ma				
voltage of -12 volts 100	µamp.				
Mechanical: Mounting Position Vertical; Horizontal operation per-	mitted if cal plane				
Maximum Overall Length Maximum Seated Length Length, Base Seat to Bulb Top (Excluding tip) 2" Maximum Diameter Bulb Base	2-5/8" 2-3/8" ± 3/32" • 7/8" T-6-1/2 o.E9-1)				
Pin 1: Cathode Pin 2: Grid No.1 Pin 3: Grid No.2 Pin 4: Heater Pin 5: Heater Pin 5: Heater	lo.3, Shield lo.2 lo.1				
FREQUENCY DIVIDER IN COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE					
Maximum Ratings, Absolute Values:					
PLATE VOLTAGE	volts volts				

MARCH 1, 1954

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



# **POWER PENTODE**

					1.000
CDID No. 2 (SODEENI) VOLTAGE		20	0		
GRID-NU.2 (SCREEN) VOLTAGE		•••• 23	ou max.	VOILS	
GRID-NO.I (CONTROL-GRID) VOLTAG	L	• • • -5	ou max.	volts	
PLATE DISSIPATION		7.	5 max.	watts	
GRID-No.2 INPUT		2.	5 max.	watts	
CATHODE CURRENT			0 max	ma	
PEAK HEATER_CATHODE VOLTACE		••••	No max.	ma	100
Heater pogative with recease	ta aatha		0.		
Heater negative with respect	to cathe	ode . 18	su max.	Volts	-
Heater positive with respect	to cathe	ode . 18	so max.	volts	
BULB TEMPERATURE (At hottest po	int				
on bulb surface	)	20	)0 max.	OC	
Maximum Circuit Values:					
Grid-No.1-Circuit Resistance:					1
For fixed-bias operation		0 1	mav	meachm	
For catheda bias operation		0.1	max.	magahm	-
For cathode-bias operation		0.5	max.	megorim	
CHARACTERISTICS RANGE VALL		COLUDIENT	DECIO	.	
CHARACTERISTICS RANGE VALU	JES FOR	EQUIPMENT	DESIGN		
	Note	Min.	Max.		
Heater Current	1	0.61	0.69	amp	
Mu-ractor, Grid No.2	1 0	10	25		
to Grid No.1	1,2	19	20		
Plate Current (1)	1,3	26	46	ma	
Plate Current (2)	1,4	20	40	ma	
Plate Current (3)	1.5		100	<i>µ</i> amp	
Grid-No.2 Current	1 4	5	9	ma	
Reverse Grid-No.1 Current	1 6	_	2	uamp	
Heater Cathoda Lookage Current:	1,0		4	picamp	
Heater-Gathoue Leakage Guillent.				1.0.2.10	
Heater negative with respect			10		
to cathode	1,/		40	μamp	
Heater positive with respect					
to cathode	1.7	-	40	μamp	
Transconductance	1 4	9000	13000	umhos	
	1,4	0000	2/000	1	
Note 1: With 6.3 volts ac or dc on hea	iter.				
Note 2: With grid No.3 tied to cathod	de, grid	NO.2 TIED	to plate	nd arid-	
No.1 voltage of -3 volts.	··· z voitu	JC 01 100 1	ores, a	ia gria	
Note 3: With plate voltage of 50 volt No.2 voltage of 100 volts, and	s, grid M grid-No.	No.3 tied t 1 voltage	o catho of 0 vol	de, grid ts.	
Note 4: With plate voltage of 250 vol	ts, grid	No.3 connec	cted to	cathode,	
grid-No.2 voltage of 150 volts,	and grid	i-No.1 volt	age of -	3 volts.	
grid-No.2 voltage of 150 volts,	and grid	-No.1 volt	age of -1	2 volts.	
Note 6: With plate voltage of 250 volt grid-No.2 voltage of 150 volt volts, and grid-No.1 resistor	ts, grid ts, grid— of 0.25 π	No.3 connec No.1 suppl negohm.	y voltag	pe of -3	
Note 7: With 90 volts dc between heate	r and cat	hode.			
DC component must not exceed 90 volt	s.				
				1	-
The second s					

6197










# HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

Intended for applications where dependable performance under shock and vibration is paramount, and for "on-off" control applications involving long periods of operation

of the 12AT7, may be used at	frequencies i	up to 300	Mc.
GENERAL	DATA		
lectrical:			
eater, Pure Tungsten, for Unipot Heater arrangement Series	ential Cathoo Parallel	les:	
Voltage 12.6 ± 109 Current 0.15	6.3 ± 10% 0.3	ac or dc	volts amp
Grid-Drive Operation:	Without	With	
office operations	External Shield	External Shield*	
Grid to plate (Each unit) Grid to cathode and	1.6	1.6	μµf
heater (Each unit) Plate to cathode and	2.5	2.5	μµf
heater (Unit No.1) Plate to cathode and	0.45	1.2	μμf
heater (Unit No.2)	0.38	1.3	μµf
(Each unit)	2.8	2.8	<i>µµ</i> f <i>µ</i> µf
Cathode-Drive Operation:	Without External Shield	With External Shield®	
Plate to cathode (Unit No.1)	0.2	0.18	μµf
(Unit No.2)	0.24	0.2	μµf
heater (Each unit)	5	5	μµf
(Unit No.1)	1.9	2.7	μµf
(Unit No.2)	1.8	2.7	μµf
haracteristics, Class A <sub>1</sub> Amplif	ier (Each Uni	t):	
late-Supply Voltage	100	250	volts

1ts Cathode Resistor . 270 200 ohms 57 60 Amplification Factor 5 14300 10900 ohms Plate Resistance (Approx. 4000 5500 umhos Transconductance 3.3 10 ma Plate Current. . . . Grid Voltage (Approx.) for plate current of 10 µamp -5 -12 volts

•: See next page.

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E Н

TENTATIVE DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



Mechanical: Mounting Position . . . . Anv Maximum Overall Length. . . . . . . 2-3/16' Maximum Seated Length . . . 1-15/16" Length, Base Seat to Bulb Top (Excluding tip) 1-9/16" ± 3/32" Maximum Diameter. . . . . . . . 7/8" . . . Dimensional Outline . . See General Section Bulb. . . . T-6-1/2 Basing Designation for BOTTOM VIEW. . . . . . 9A Pin 1 - Plate of Pin 6 - Plate of Unit No.2 Unit No.1 Pin 2 - Grid of Pin 7 - Grid of Unit No.2 Unit No.1 Pin 3 - Cathode of Pin 8 - Cathode of Unit No.2 Unit No.1 Pins 4 & 9 - Heater of Pin 9 - Heater Unit No.2 Mid-Tap Pins 5 & 9 - Heater of Unit No.1 AMPLIFIER - Class A. Values are for Each Unit Maximum Ratings, Absolute Values: PLATE VOLTAGE . . . . . . . . . . . 330 max. volts GRID VOLTAGE: Negative bias value . . . . volts 55 max. Positive bias value . . . . 0 max. volts PLATE DISSIPATION . . watts 2.75 max. PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode . 100 max. volts volts Heater positive with respect to cathode . 100 max. BULB TEMPERATURE (At hottest point OC. 180 max. Maximum Circuit Values: Grid-Circuit Resistance: For fixed-bias operation. . 0.25 max. megohm For cathode-bias operation. . 1.0 max. megohm Typical Operation as Resistance-Coupled Amplifier: See RESISTANCE-COUPLED AMPLIFIER CHART at end of tabulated data for this type With external shield JETEC No.315 connected to cathode of unit under test. With external shield JETEC No.315 connected to grid of unit under test.

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6201

TENTATIVE DATA 1



620,

# HIGH-MU TWIN TRIODE

# CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN.

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

		Note	Min	Mar	
		1000	0. 100	0.400	_
leater Current Direct Interelectrode	•	1	0.138	0.162	amp
Grid to plate		2	1.3	1.9	µµ
heater		2	2	3	μµf
heater (Unit No.1) .		2	0.2	0.7	μµf
heater (Unit No.2) .		2	0.16	0.6	$\mu\mu$ f
Heater to cathode	•	2	2.1	2.0	μμ
Plate to plate		17	0.15	0.33	μμι
Mate Current (1)		1,4	50	14	ma
Plate_Current Difference	•	1,4	1	14	IIId
Between Units		1.4	-	3.2	ma
Plate Current (2)		1.5	-	100	μamp
Fransconductance (1)		1.4	4500	6500	µmhos
ransconductance (1) at					
500 Hours		1,4	3800	6500	µmhos
ransconductance (2)		3,6	4100	-	µmhos
ransconductance Change:					
Difference between					
tance (1) initially					
and average after 500					
hours expressed as a					
percentage of the					
initial average		1.4	-	15	9
Reverse Grid Current		1.7		0.7	μamp
Grid Emission Current .		8.9	-	1.5	μam
Heater-Cathode					
Leakage Current:					
Heater negative with					
respect to cathode.		1,10	-	10	$\mu$ amp
Heater positive with		1 10		10	
respect to cathode.	• •	1,10	_	10	μαιη
Between grid and all					
other electrodes					
tied together		1.11	100		megohms
Each tube is stabilized by operation for at least 45 he values equivalent to life	efore ours test	e charac at room f conditio	teristics te temperature a ons.	sting by nd with d	continous issipation
lotes 1 to 11; See next page.					

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



		10.0	1.18		-	19	Note	Min.	Max.	
Lea	kag	e Resi	istand	e:						
E	letw	een pl	ate a	and al	1					
	oti	her≁el ed tog	ectro	des			1,12	100	-	megohms
Lea 5	ikagi 100 H	e Resi Hours:	stanc	e at						0
E	etwe	een gr	id ar	nd all						
	oth	her el	ectro	des						
D	tie	ed tog	gether	· · ·	1	•	1,11	50	-	megohms
D	oth	her el	ectro	inu ai	1					
	tie	ed too	ether				1.12	50	-	meaohms
										Jerme
Note	1:	With	12.6 VC	olts ac	or	dc or	heate	r (series c	onnection	).
Note	2:	ground	ut exte 1.	ernals	hiel	d and	withun	it not unde	r test co	innected to
Note	3:	Withou	ut exte	ernal s	hie	1d.				
Note	4:	With d and c separa	c plate athode ately.	-suppl bypas Unit	y v ss c not	olts = apaci	250, itor of test	cathode res $1000 \ \mu f.$	istor (oh Each ur o ground.	ms) = 200, nit tested
Note	5:	With ohms) rate	dc pla = 0.1	te-sup and	ply dc g	volts prid v	s = 250 olts =	, plate loa -20. Each	d resist unit te	ance (meg- sted sepa-
ote	6;	With	11.0 vc	lts ac	or	dc or	heate	r (series c	onnection	).
lote	7:	With c ohms) capac under	itor o test	e-supp catho f 1000 connec	ly de μf. ted	volts resis Eac to gr	= 250, tor (of th unit ound.	grid-circu ms) = 200, tested sep	it resist and cath arately.	ance (meg- ode bypass Unit not
Note	8:	with 1	15.0 VC	lts ac	or	dc on	heate	r (series c	onnection	).
Note	9:	With 0.5,	dc pla and dc	te vol: grid	ts = vol	250, ts =	grid-	circuit res Each unit	istance tested se	(megohms) = eparately.
lote	10:	With 1 ted in	LOO VOI paral	ts dc lel.	bet	ween	heater	and cathode	e and uni	ts connec-
Note	11:	with g	grid 1 tied	00 vol togeth	ts i er.	negati	ive wit	h respect	to all of	ther elec-
Note	12:	with p trodes	tied	togeth	er.	negat	ive wi	th respect	to all o	ther elec-
										6 ×
			SPEC	IAL R	ATI	NGS 8	PERF	ORMANCE D	ATA	
Shoo	k R	ating	:							sanders of
Ir	npac	t Acc	elera	tion.					600 ma	x. a
	Thi	s tes	tis	perfoi	rme	d on	a sam	ole lot of	ftubes	from each
	pro	ducti	on ru	in in	al	Navy	Type,	High-Im	pact (f	lyweight)
	Sho	ck Ma	chine	e. Tu	be	s are	e held	rigid in	n four d	different
	pos	ition	s and	are	sub	jecte	ed to	20 blows	at the	specified
	max	imum	impac	t acc	el	erati	ion.	At the en	nd of ti	his test,
	cir	cuits	and	are	v pe	i red	to m	et establ	ished 1	imits for
	vib	ratio	nal ac scond	cceler	at	ion,	heater	-cathode	leakage	current,
E a t		Dot:								
rati	gue	Rati	ig:							

Vibrational Acceleration . . . . . . 2.5 max. g This test is performed on a sample lot of tubes from each

TENTATIVE DATA 2

6201



production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for impact acceleration, heater-cathode leakage current, and transconductance.

### Low-Frequency Vibration Performance:

RMS Output Voltage. . . . . . . . . . . 100 max. mv This test is performed on a sample lot of tubes from each production run under the following conditions: plate of unit No.1 tied to plate of unit No.2, grid of unit No. I tied to grid of unit No.2, heater volts = 12.6, dc plate volts = 250, dc grid volts = -3, plate load resistance (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cycles per second.

### Heater-Cycling Life Performance:

Cycles of Intermittent Operation. . . . 2000 min. cycles Under the following conditions and with the heaters of unit No.1 and unit No.2 connected in parallel: heater volts = 7.5 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and plate and grid volts = 0.

### Audio-Frequency Noise and Microphonic Performance:

#### Shorts and Continuity Test:

This test is performed on a sample lot of tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.4 microamperes under the conditions specified in the CHARACTERISTICS RANGE VALUES for reverse grid current.

#### I-Hour Stability Life Performance:

This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. With both units operating, each unit is checked for variation in transconductance under conditions of maximum rated plate dissipation. At the end of I hour, the value of transconductance is read. The variation in transconductance from the O-hour reading will not exceed 10 per cent.



### 100-Hour Life Performance:

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This test is performed on a sample lot of tubes from each production run under the conditions of maximum rated plate dissipation to insure a low percentage of early inoperatives. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or avalue of reverse grid current in excess of 1.4 microamperes under the conditions specified in CHARACTERISTICS RANGE VALUES for reverse grid current.

#### 500-Hour Average Life Performance:

This 500-hour test is made on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. With both units operating, each unit is life tested separately at room temperature under the following conditions: heater volts = 12.6 ac or dc (series connection), plate-supply volts = 250, cathode resistor (ohms) = 200, grid-circuit resistance (megohms) = 0.5, heater 135 volts positive with respect to cathode, and bulb temperature  $(^{\circ}C) = 180$ . At the end of 500 hours, tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass the established initial limits for heater current, reverse grid current, heater-cathode leakage current, and 500-hour limits for transconductance (1), transconductance change, and leakage resistance as shown under CHARACTERISTICS RANGE VALUES.

TENTATIVE DATA 3



# HIGH-MU TWIN TRIODE

# OPERATING CONSIDERATIONS AS RESISTANCE-COUPLED AMPLIFIER (Each Unit)

Dista Sussily Valtara		90		unl+n
Plate Load Resistor	0.1	0.24	.0.51	megohm
Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain▲	0.24 2400 13 27	0.51 5300 15 28	1 11000 16 28	megohm ohms volts
Plate-Supply Voltage	T	180		volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain <sup>▲</sup>	0.24 1400 28 33	0.51 3600 31 33	1 7100 33 32	megohm ohms volts
Plate-Supply Voltage		300		volts
Plate Load Resistor	0.1	0.24	0.51	megohm
Grid Resistor (Of following stage) Cathode Resistor Peak Output Voltage Voltage Gain <sup>A</sup>	0.24 1200 47 33	0.51 2900 52 34	1 6400 55 34	megohm ohms volts

At 2 volts (rms) output.

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







TUBE DIVISION







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# MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE For "on-off" control applications involving long periods of operation under cutoff conditions

## GENERAL DATA

## Electrical:

Heater, Pure Tungsten, fo Heater arrangement Voltage Current Direct Interelectrode Ca	or Unipotential Cathodes: Series Parallel 12.6±5% 6.3±5% ac or do 0.15 0.3 pacitances: <sup>0</sup> Unit No.1 Unit No.2	e volts amp
Grid to plate Grid to cathode and hea Plate to cathode and hea Heater to cathode Plate of unit No.1 to plate of unit No.2	2.22 2.22   ater 2.90 2.90   ater 0.54 0.46    3.25 3.25	$ \begin{array}{c} \mu\mu f\\ \end{array} +$
Grid of unit No.1 to grid of unit No.2		μμf
Characteristics. Class A	Amplifier (Each Unit);	
Plate-Supply Voltage Cathode Resistor Amplification Factor Plate Resistance (Approx Transconductance Plate Current Grid Voltage (Approx.) fi of 150 volts and plate	100 470 27 .)	volts ohms µmhos ma volts •
Mechanical:		
Mounting Position or Horizontal Maximum Overall Length . Maximum Seated Length . Length, Base Seat to Bull Maximum Diameter Dimensional Outline Bulb Base Basing Designation for Pin 1 - Plate of Unit No.2 Pin 2 - Grid Unit No.2 Pin 3 - Cathode of Unit No.2 Pins 4 & 9 - Heater of Unit No.2 Pins 5 & 9 - Heater of Unit No.1 o Without external shield.	Vertical, base up or With pins 1 and 5 in vertical Do Top (Excluding tip) 1-9/16" 	- down, +   plane 2-3/16"  -5/16" ± 3/32" . 7/8" Section F-6-1/2 0.E9-1) . 9A of No.1 of No.1 of No.1 rap
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# MEDIUM-MU TWIN TRIODE

#### FREQUENCY DIVIDER IN COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE Values are for Each Unit Maximum Ratings. Absolute Values: PLATE VOLTAGE . . . . 200 max. volts GRID VOLTAGE: 100 max. volts Negative bias value . Positive bias value 1 max. volt . DC POSITIVE GRID CURRENT. 2 max. ma DC CATHODE CURRENT. . 16 max. ma . . PLATE DISSIPATION . . 1 max. watt PEAK HEATER-CATHODE VOLTAGE: volts Heater negative with respect to cathode . 180 max. Heater positive with respect to cathode . 180<sup>4</sup>max. volts BULB TEMPERATURE (At hottest point 00 on bulb surface). . . . 120 max. . . . . . Maximum Circuit Values: Grid-Circuit Resistance: For fixed-bias operation. . 0.1 max. megohm For cathode-bias operation. . 0.5 max. megohm CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN Min. Note Max. 1 0.138 0.162 Heater Current. amp 1,2 5.5 Plate Current (Each unit) 4.8 ma 1,3 3.6 5.6 Plate Current (Each unit) ma 100 Plate Current (Each unit) 1,2,4 uamp 4500 Transconductance. . . 1,2,3 umhos Reverse Grid Current (Units in parallel). . . 1.5 µamp Leakage Resistance (Eachunit): Between grid and all other 100 electrodes. . . . 1,6 megohms Between plate and all other electrodes. . . 1.7 100 megohms Heater-Cathode Leakage Current: Heater negative with respect to cathode. . . . 1,8 uamp Heater positive with respect to cathode. . . . 1,8 uamp Difference in Grid Voltage Between Units . . . . . 1.2.9 volt volt Contact Potential . . . 1.10 Amplification Factor (Each unit). . 1.2 31 Note 1: With 12.6 volts ac or dc on heater (series arrangement). The dc component must not exceed 90 volts. Indicates a change.

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TUBE DIVISION

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# MEDIUM-MU TWIN TRIODE

Note 2: With plate-supply volts = 150, plate-circuit resistance (ohms) = 20,000, and grid-circuit resistance (ohms) = 47,000. Each unit tested separately. Unit not under test connected to ground.

Note 3: With plate-supply volts = 100, cathode resistor (ohms) = 470, and cathode bypass capacitor of 1000 µf, Each unit tested separately. Unit not under test connected to ground.

- Note 4: With grid volts = -10.
- Note 5: With plate-supply volts = 150, cathode resistor (ohms) = 470, and grid-circuit resistance (megohm) = 0.5.
- Note 6: With grid 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.
- Note 8: With 100 volts dc between heater and cathode and units connected in parallel.
- Note 9: With grid voltage adjusted for plate current of 100 #amp.

Note 10: With plate volts = 100, grid current (µamp) = 0.1, and gridcircuit resistance (megohm) = 0.1. Each unit tested separately. Unit not under test connected to ground.

### SPECIAL RATINGS & PERFORMANCE DATA

#### Heater-Cycling Life Performance:

Cycles of Intermittent Operation. . . . 2000 min. cycles For conditions: Series heater arrangement, heater volts = 17, cycled | minute on and 4 minutes off, heater positive with respect to cathode by +100 volts dc, plate volts = 0, and grid volts = 0.

- Indicates a change.

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# AVERAGE PLATE CHARACTERISTICS





6336A

# Low-Mu Twin Triode

For Use as a Series-Regulator Tube in Regulated DC Power Supplies

## GENERAL DATA

### Electrical:

Heater Characteristics and Ratings (Absolute-Maximum Va	lues):
Voltage (AC or DC) 6.3 ± 0.6	volts
Current at heater volts = 6.3 5.000	amp
Peak heater-cathode voltage (Each Unit):	
Heater negative with	
respect to cathode	volts
Hostor positive with	10100
recept to cathodo 300 may	volte
Cothode Warm Up Time (Minimum) 20	VUILS
Calhode Warne-up Thile (Mithinuni)	Sec
Original and the second containers.	£
	μμι
Grid to cathode (Each Unit) 10.7	μμι
Plate to cathode (Each Unit)	μμτ
Heater to cathode (Each Unit)	μμι
Plate to plate 0.6	μμΤ
Characteristics Class &. Amplifier (Fach Unit):	
	1.1
Plate Supply Voltage	voits
Cathode Resistor	onms
Amplification Factor	
Plate Resistance (Approx.)	ohms
Transconductance	µmhos
Transconductance	µmhos
Transconductance	µmhos
Transconductance	µmhos up, or
Transconductance	µmhos up, or plane ential
Transconductance	µmhos up, or plane ential 4 750"
Transconductance	µmhos up, or plane ential 4.750" 4 188"
Transconductance	μmhos up, or plane ential 4.750" 4.188" 2.070"





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### SERIES-REGULATOR SERVICE

Values are for Each Unit

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

For operation at altitudes up to 60,000 feet<sup>a</sup>

PLATE VOLTAGE	max. volts
GRID VOLTAGE:	
Negative-bias value	max. volts
Positive-bias value 0	max. volts
PLATE CURRENT	max. ma
PLATE DISSIPATION	max. watts
BULB TEMPERATURE (At hottest point on	
bulb surface)	max. <sup>o</sup> C

#### Maximum Circuit Values:

Grid-Circuit Resistance:<sup>b</sup> For fixed-bias operation . . . . . . 0.2 max. megohm For cathode-bias operation . . . . . 0.5 max. megohm

a Cooling must be provided to keep bulb temperature within ratings at altitudes above 10,000 feet.

<sup>b</sup> Minimum resistance per cathode should be 27 ohms or that resistance necessary to provide 10 per cent of the grid bias voltage, whichever is greater.

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

#### Note Min.

Max.

Heater Current	1	4.75	5.25	amp
Amplification Factor (Each Unit)	 1,2	2	3.4	
Plate Current (Each Unit)	 1,2	165	200	ma
Plate Current (Each Unit)	 1.3	0	10	ma
Transconductance (Each Unit)	1,2	11000	16000	µmhos

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

Note 2: With plate supply voltage of 190 volts, grid resistor of 500 ohms (each grid), and cathode resistor of 200 ohms (each cathode), both triode units operating.

Note 3: With plate voltage of 200 volts, and a grid-No.1 voltage of -100 volts (both triode units operating).

#### SPECIAL RATINGS AND PERFORMANCE DATA

#### Shock Rating:

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#### Variable-Frequency-Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, plate supply voltage of 190 volts, grid resistor of 500 ohms in each grid, cathode resistor of 200 ohms in each cathode (both units operating), and a plate load resistance of 2000 ohms per unit. During operation, tubes are vibrated through the frequency range from 10 to 50 cycles per second with a constant vibrational acceleration of 10 g. During the test, tubes will not show an rms output voltage across the plate load resistor in excess of 200 millivolts.

#### 1000-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater voltage of 6.3 volts, plate supply voltage of 190 volts, grid resistor of 500 ohms in each grid, and cathode resistor of 200 ohms in each cathode (both units operating).

At the end of 1000 hours, tubes will be considered inoperative if they do not have a minimum plate current per unit of 150 milliamperes, a minimum transconductance per unit of 9000 micromhos, a maximum heater-to-cathode leakage current (both units) of 100 microamperes, and a maximum reverse grid current (both units) of 8 microamperes.

### OPERATING CONSIDERATIONS

Operating conditions for the 6336A should be selected to assure that there is always some voltage drop across the tube. In addition, bias voltage provided by the drop across the plate load resistor of the amplifier tube should not be less than 5 volts to allow for variations in the characteristics of individual 6336A's. Agrid resistor of approximately 1000 ohms should be used to prevent parasitic oscillations.



RADIO CORPORATION OF AMERICA **Electron Tube Division** 

Harrison, N. J.

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# MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE

For "on-off" control applications involving long periods of operation under cutoff conditions

## GENERAL DATA

# Electrical:

Heater, Pure Tungsten, for Unipotential Cathodes:	
Voltage $12.6 \pm 5\%$ 6.3 $\pm 5\%$ ac or	dc volts
Current 0.3 0.6	amp
Grid to plate (Fach unit)	unt
Grid to cathode and heater (Each unit) . 3.6	μµf
Plate to cathode and heater (Each unit) . 0.6	μµf
Heater to cathode (Each unit) 4.6	μµf
Grid to grid	х. µµт
Plate to plate I ma	х. µµ
Characteristics, Class A, Amplifier (Each Unit):	
Plate Voltage 150	volts
Grid Voltage	volts
Amplification Factor	
Plate Resistance (Approx.)	onms
Plate Current 11	µmnos ma
Grid Voltage (Approx ) for plate voltage	
of 150 volts and plate current of 100 $\mu a$ 11 Grid Voltson (Approx.) for plate valtage	volts
of 200 volts and plate current of 1 ma12	volts
Mechanical:	
Operating Position Any, but for the utmost in tube should be Vertical with base up or Horizontal with pins 6 and 9 in vertic Maximum Overall Length. Length, Base Seat to Bulb Top (Excluding tip) 2" Maximum Diameter . Dimensional Outline. Babe	service, down, or al plane 2-5/8" .2-3/8" ± 3/32" .7/8" <i>Section</i> .T6-1/2 No.E9-1) 9CZ e of t No.1 ode of t No.1 of t No.1 er -Tap
<sup>O</sup> Without external shield.	
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# MEDIUM-MU TWIN TRIODE

COMPUTER S	ERVICE and "(	ON-OFF"	CONTROL S	SERVICE	
Unless Otherwi	se Specified	, Values	are for	Each Un	it
Maximum Ratings, A	bsolute Value	es:			
DC PLATE VOLTAGE . PEAK POSITIVE-PULS DC GRID VOLTAGE:	E PLATE VOLT	AGE*	· · 3: · · 10	30 max. 00 max.	volts volts
Negative bias va Positive bias va	lue	••••	•••	80 max. 4 max.	volts
PEAK POSITIVE-PULS DC GRID CURRENT	E GRID VOLTAG	GE*	••• 4	14 max. .5 max.	volts
PEAK GRID CURRENT* DC CATHODE CURRENT	· · · · · · ·	::::	1	10 max. 45 max.	ma ma
PLAK CAIHODE CURRE PLATE DISSIPATION: Either plate	NI"		•• 3	ou max. 4 max.	ma watts
Both plates (Both PEAK HEATER-CATHODI	h units opera E VOLTAGE:	ating) .	•••	7 max.	watts
Heater positive N BULB TEMPERATURE ()	with respect At hottest po	to catho oint	de . 22	20 <sup>4</sup> max.	volts
on bulb surface)			12	20 max.	°C
Maximum Circuit Va	lues:				
For fixed-bias of For cathode-bias	tance: peration operation .		· · 0.	1 max. 5 max.	megohm megohm
CHARACTERIST	ICS RANGE VAL	UES FOR	EQUIPMEN	IT DESIG	N
Unless Otherwis	se Specified,	Values	are for	Each Un	i t
		Note	Min.	Max.	
Heater Current Plate Current (1). Plate Current (2). Plate Current (3). Fransconductance . Amplification Facto	· · · · · · · · · · · · · · · · · · ·	1 1,2 1,3 1,4 1,2 1,2	0.275 6 - 3200 15	0.325 16 1 100 6000 21	amp ma ma μa μmhos
in parallel) leater-Cathode Leak	age Cur-	1,5	-	2.5	μα
Heater negative w respect to cath	vith node	1,6	-	15	μa
respect to cath	node	1,6	-	15	μa
<sup>6</sup> Under the following 0.08 microsecond; pu 0.08.	conditions: lsé-repetition	rectangul rate, 1 >	ar pulse; 106 pps;	pulse du and duty	factor,
The dc component mus	t not exceed 1	10 volts.			
lotes 1 to 6: See next	page.				
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# MEDIUM-MU TWIN TRIODE

2		Note	Min.	Max.	
	Grid-Voltage Difference Between Units	1,7	-	2.5	volts
	Between grid and all other electrodes tied				
	together	1,8	100	-	megohms
	other electrodes tied together	1,9	100	_	megohms
	Note 1: With 12.6 volts ac or dc on heat	er (ser	ies arr	angement	).
	Note 2: With plate volts = 150 and grid separately. Unit not under test	volts connec	= -5. ted to	Each un ground.	it tested
)	Note 3: With plate volts = 200 and grid separately. Unit not under test	volts = connec	-15. ted to	Each un ground.	it tested
	Note 4: With plate volts = 150 and grid separately. Unit not under test	volts = connec	-15. ted to	Each un ground.	it tested
	Note 5: With plate volts = 180, grid vo sistance (megohms) = 0.1.	lts = -	5, and	grid-ci	rcuit re-
	Note 6: With 100 volts dc between heater	and ca	thode.		
	Note 7: With plate volts = 200 and gr current of 1 milliampere.	id volt	age ad	justed	for plate
	Note 8: With grid 100 volts negative w trodes tied together.	ith res	pect to	all ot	her elec-
	Note 9: With plate 300 volts negative w trodes tied together.	ith res	pect to	o all ot	her elec-

## SPECIAL RATINGS & PERFORMANCE DATA

### Heater-Cycling Life Performance:

Cycles of Intermittent Operation . . . 2000 min. cycles Under the following conditions: heater volts = 7.5 cycled one minute on and four minutes off, heater 180 volts positive with respect to cathode, and all other elements connected to ground.

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TENTATIVE DATA 2







RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

# **Beam Power Tube**

### GENERAL DATA

Electrical:

	Heater Characteristics and Katings (Design-	Center Value	s):
	Voltage (AC or DC)	$6.3 \pm 0.6$	volts
	Current at heater volts = 6.3	1.600	amp
	Peak heater-cathode voltage:		
	Heater negative with		
ľ	respect to cathode	300ª max.	volts
	Heater positive with		
	respect to cathode	200 <sup>b</sup> max.	volts
	Direct Interelectrode Capacitances (Approx.	): <sup>c</sup>	
	Grid No.1 to plate	0.85	μµf
	Grid No.1 to cathode & grid No.3,		
	grid No.2, base sleeve, and heater	14.0	μµt
ſ	Plate to cathode & grid No.3, grid	10.0	ć
	No.2, base sleeve, and heater	12.0	μμt

Characteristics, Class A<sub>1</sub> Amplifier:

	Triode Connection <sup>d</sup>	
	Plate Voltage 250 450 400   Grid-No.2 Voltage 250 450 225   Grid-No.1 Voltage -14 -46 -16.5   Amplification Factor 8 7.5 -	volts volts volts
	Plate Resistance (Approx.). 12000 27000   Transconductance. 11000 9000   Plate Current. 140 150 87   Grid-No.2 Current. 12 4 4   Grid-No.1 Voltage (Approx.) 12 5 5	ohms μmhos ma ma
	for plate ma. = 14035	volts
	Operating Position. Type of Cathode Coated Unipote Maximum Overall Length	. Any ential 4-3/4" -3/16" -1/16" .ST16 oup 1, B8-86) 7S
)	Pin 1 - Base Sleeve Pin 2 - Heater Pin 3 - Plate Pin 4 - Grid No.2 Pin 5 - Grid No.1 Pin 6 - No Inte Connec Pin 7 - Heater Pin 8 - Cathode Grid No.1	rnal tion , o.3

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A	AF	POWER	AMPLIF	IER	-	Class	A	
	D		0	17 1				

Maximum Ratings, Design-Cente	er.	Va	ll	ies	s :					
PLATE VOLTAGE							600	) max.	volts	6
GRID-No.2 (SCREEN-GRID) VOLTA	AGI FA(	E. GF:	·	•	•	•	400	) max.	volts	
Negative-bias value							300	) max.	volts	
Positive-bias value							(	) max.	volts	
CATHODE CURRENT							175	5 max.	ma	
GRID-No.2 INPUT							E	6 max.	watts	
PLATE DISSIPATION							35	i max.	watts	6
BULB TEMPERATURE (At hottest	p	oir	nt							
on bulb surface)			•				250	) max.	oC	
Typical Operation and Charact	tei	ris	ti	c	5:					
Plate Voltage							250	400	volts	
Grid-No.2 Voltage							250	225	volts	
Grid-No.1 Voltage							-14	-16.5	volts	6
Peak AF Grid-No.1 Voltage							14	16.5	volts	
Zero-Signal Plate Current							140	87	ma	
MaxSignal Plate Current					•		150	105	ma	
Zero-Signal Grid-No.2 Current	ί.						12	4	ma	
MaxSignal Grid-No.2 Current	ί.						28	18	ma	
Plate Resistance (Approx.) .			•				12000	27000	ohms	
Transconductance							11000	9000	µmhos	
Load Resistance			•	•	•		1500	3000	ohms	
Total Harmonic Distortion			•	•			7	13.5	%	
MaxSignal Power Output							12.5	20	watts	

### Maximum Circuit Values:

Grid-No.1-Circuit Resistance:					
For fixed-bias operation .				0.05 max.	megohm
For cathode-bias operation	•	•		0.25 max.	megohm

# PUSH-PULL AF POWER AMPLIFIER - Class A

# Maximum Ratings, Design-Center Values:

Same as for AF POWER AMPLIFIER - Class A1

## Typical Operation and Characteristics:

Values are for 2 tubes

	Fix Bio	ed 25	Cathode Bias		
Plate Supply Voltage	400	600	400	volts	-
Grid-No.2 Supply Voltage	275	300	300	volts	
Grid-No.1 Voltage	-23	-31	-	volts	-
Cathode Resistor	-	-	140	ohms	
Peak AF Grid-No.1-to-Grid-No.1					
Voltage	46	62	53	volts	
Zero-Signal Plate Current	180	115	166	ma	
MaxSignal Plate Current	270	273	190	ma	
Zero-Signal Grid-No.2 Current	9	4	7.5	ma	
MaxSignal Grid-No.2 Current	44	41	39	ma	$\smile$
Effective Load Resistance (Plate					
to plate)	3500	5000	4500	ohms	

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Total Harmonic Distortion 3 MaxSignal Power Output 55		2.5 100	4 41	% watts
Maximum Circuit Yalues: Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation		0.05	max. max.	megohm megohm
PUSH-PULL AF POWER AMPLIFIER Triode Connection		Class	A I	
Maximum Ratings, Design-Center Values:				
PLATE VOLTAGE	· · ·	495 440 330 0 192.5 6.6	max. max. max. max. max. max. max.	volts volts volts volts ma watts watts
BULB TEMPERATURE (At hottest point on bulb surface)		250	max.	°C
Typical Operation and Characteristics:				
Values are for 2 tu	bes			
Plate Voltage. Grid No.1 Voltage. Peak AF Grid-No.1-to-Grid-No.1-Voltage Zero-Signal Plate Current. MaxSignal Plate Current. Effective Load Resistance (Plate to plate). Total Harmonic Distortion.	· · · · · · · · · · · · · · · · · · ·	450 -46 92 150 220 4000 2.5		volts volts volts ma ma
MaxSignal Power Output		28		watts

### Maximum Circuit Values:

Grid-	No.1-Circuit Resistance:						
For	fixed-bias operation .		÷			0.05 max	<. megohm
For	cathode-bias operation					0.25 max	<. megohm



a The dc component must not exceed 300 volts.

**b** The dc component must not exceed 100 volts

- C Without external shield.
- d Grid No.2 connected to plate.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 2 5-62





# 6660/6BA6

# **REMOTE-CUTOFF PENTODE**

7-PIN MINIATURE TYPE

For use in mobile communications equipment

## GENERAL DATA

### Electrical:

Heater, for Unipotential Cathode: Voltage. . . . . . . . 6.3 ± 20%\* ac or dc volts Current at 6.3 volts . . 0.3 . amp Direct Interelectrode Capacitances:

	Without External Shield	With External Shield <sup>0</sup>	
Grid No.1 to plate Grid No.1 to cathode, grid	0.0035 max.	0.0035 max.	μµf
prid No.2, and heater Plate to cathode, grid No.3	5.5	5.5	μµf
No.2, and heater	5	5.5	μµf

#### Characteristics, Class A, Amplifier:

Heater Voltage								6.3	6.3		volts
Plate Supply Voltage								100	250		volts
Grid No.3			. C	on	ne	ct	ed	to co	athode	at	socket
Grid-No.2 Supply Voltage.			2					100	100		volts
Cathode Resistor			8	8				68	68		ohms
Plate Resistance (Approx.	).							0.25	1		megohm
Transconductance								4300	4400		µmhos
Plate Current			•					10.8	11		ma
Grid-No.2 Current		•						4.4	4.2		ma
Grid-No.1 Voltage (Approx transconductance = 40 μ	(.) ∡mhc	fc s	or					-20	-20		volts
Mechanical:											
Operating Position				•		•	•			•	Any
Maximum Overall Length.						•					1_7/0"
Maximum Sealed Length	- <u>*</u>		1.		;	÷.,	Ċ.,				1-1/0
Length, Base Seat to Built	0 10	р	(1	XC	:11	Ia I	ng	tip)	1-1/	2	± 3/32
Diameter	•			٠	•	•		ч. н. I	0.650"	το	0.750"
Dimensional Outline			8		٠	•	•	. See	Gener	al	Section
Bulb	e - 10										.15-1/2

Base. . . . . Small-Button Miniature 7-Pin (JEDEC No. E7-1) Basing Designation for BOTTOM VIEW. . .

Pin 1-Grid No.1 Pin 2-Grid No.3 Internal Shield Pin 3-Heater



Pin 4-Heater Pin 5-Plate Pin 6-Grid No.2 Pin 7-Cathode

DATA

7BK

6660


6660/6BA6

## **REMOTE-CUTOFF PENTODE**

#### AMPLIFIER - Class A

Maximum Ratings, Design-Maximum Values:	
PLATE VOLTAGE	volts
GRID-NO.2 (SUREEN-GRID) SUPPLY	
VULIAGE	VOILS
GRID-NO.2 VULIAGE See Grid-No.2 Input Rating	Chart
at front of Receiving Tube S	ection
VOLTAGE:	
Negative-bias value	volts
Positive-bias value	volts
GRID-No.2 INPUT	
For grid-No 2 voltages up	
to 165 volte	watt
10 105 VOILS	watt
For grid-No.2 voltages be-	
tween 165 and 330 volts. See Grid-No.2 Input Rating	Chart
at front of Receiving Tube S	ection
PLATE DISSIPATION	watts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to	
cathode	volts
Heater positive with respect to	
cathode	volts
* When the heater is operated from storage-battery-with-charger or similar supplies, the normal battery-voltage fluctuation ma much as 35 per cent or more. Although such variation in heater	supply y be as voltage

or similar supples, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

<sup>0</sup> With external shield JEDEC No.316 connected to cathode.

#### 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 = 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:



## 6661/6BH6

### SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

For use in mobile communications equipment

#### GENERAL DATA

#### Electrical:

Heater, for Unipotential Cathode: Voltage. . . . . . 6.3 ± 20%\* . . . .ac or dc volts Current at 6.3 volts . 0.15 . . . . . . . . . . . . amp Direct Interelectrode Capacitances:

	Without External Shield	With External Shield <sup>0</sup>
Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield.	0.0035 max.	0.0035 max. μμf
grid No.2, and heater Plate to cathode, grid No.3 & internal shield, grid	5.4	5.4 <i>μ</i> μf
No. 2, and heater	4.4	4.4 μμf
Characteristics, Class A, Ampli	fier:	
Heater Voltage		. 6.3 volts
Grid No.3	Connected to	cathode at socket
Grid-No. 2 Supply Voltage		. 150 volts
Cathode Resistor		. 100 ohms
Plate Resistance (Approx.)		. 1.4 megohms
Transconductance		. 4600 µmhos
Plate Current		. 7.4 ma
Grid-No.2 Current		. 2.6 ma
for plate μa = 10		7.7 volts
Mechanical:		
Operating Position		Any
Maximum Överall Length		2-1/8"
Maximum Seated Length		1-7/8"
Length, Base Seat to Bulb Top (	Excluding tip	) $1-1/2" \pm 3/32"$

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



Pin 6-Grid No.2 Pin 7-Grid No.3, Internal Shield

6<sub>661</sub>



6661/6BH6

#### SHARP-CUTOFF PENTODE

#### AMPLIFIER - Class A

Maximum Ratings, Design-Maximum Values: PLATE VOLTAGE. . . . .... 330 max. volts GRID-No.2 (SCREEN-GRID) SUPPLY .... 330 max. volts VOLTAGE. . GRID-No. 2 VOLTAGE. . . . . . See Grid-No. 2 Input Rating Chart at front of Receiving Tube Section GRID-No.1 (CONTROL-GRID) VOL TAGE: Negative-bias value. . . . . . . . . 55 max. volts Positive-bias value. . . 0 max. volts . . . . GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts . . . . . 0.55 max. watt . . . . . . . For grid-No.2 voltages between 165 and 330 volts. . . . . . . . . . See Grid-No.2 Input Rating Chart at front of Receiving Tube Section PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. . 100 max. volts Heater positive with respect to cathode. . 100 max. volts

\* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as muchas 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

<sup>0</sup> With external shield JEDEC No.316 connected to cathode.

#### 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 = 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:



## 6662/6BJ6 REMOTE-CUTOFF PENTODE

7-PIN MINIATURE TYPE

For use in mobile communications equipment

#### GENERAL DATA

#### Electrical:

Shield	Dirrera
Grid No.1 to plate 0.0035 max. 0. Grid No.1 to cathode, grid	0035 max. μμf
grid No.2, and heater 4.5 Plate to cathode, grid No.3 & internal shield orid	4.5 <i>μμ</i> f
No.2, and heater 5.5	5.5 <i>µµ</i> t

#### Characteristics, Class A, Amplifier:

Heater Voltage										6.3	6.3		volts
Plate Supply Voltage.										100	250		volts
Grid No.3						Cor	nne	eci	ted	to ca	thode	at s	ocket
Grid-No.2 Supply Volt	ag	e.								100	100		volts
Cathode Resistor										80	80		ohms
Plate Resistance (App	ro	x.	).							0.25	1.3	me	egohms
Transconductance										3650	3600		µmhos
Plate Current										9	9.2		ma
Grid-No. 2 Current										3.5	3.3		ma
Grid-No.1 Voltage (An	pr	ox	.)	f	or								
transconductance =	10	μ	mh	os						-20	-20		volts

#### Mechanical:

Operating Position. . . Any 2-1/8" Maximum Overall Length. 1-7/8" Maximum Seated Length . Length, Base Seat to Bulb Top (Excluding tip) 1-1/2" ± 3/32" 0.650" to 0.750" Diameter. . . . . . Dimensional Outline . See General Section Bulb. . . . . . Small-Button Miniature 7-Pin (JEDEC No. E7-1) Base. . . . . . Basing Designation for BOTTOM VIEW. 7CM

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



Pin 6-Grid No.2 Pin 7-Grid No.3 Internal Shield

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DATA

RCA 6662/6BJ6

## **REMOTE-CUTOFF PENTODE**

#### AMPLIFIER - Class AI

Maximum Ratings, Design-Maximum Values:	
PLATE VOLTAGE	volts
VOLTAGE	volts
GRID-No.2 VOLTAGE See Grid-No.2 Input Rating (	Chart
at front of Receiving Tube Sec	ction
GRID-No.1 (CONTROL-GRID) VOLTAGE:	
Negative-bias value	volts
Positive-bias value 0 max.	volts
GRID-No.2 INPUT:	
For grid-No.2 voltages up	
to 165 volts 0.65 max.	watt
For grid-No.2 voltages be-	
tween 165 and 330 volts. See Grid-No.2 Input Rating (	Chart
at front of Receiving Tube Sec	ction
PLATE DISSIPATION	watts
Heater negative with respect	
to cathode 100 max.	volts
Heater positive with respect	1.
to cathode 100 max.	volts

- \* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.
- <sup>0</sup> With external shield JEDEC No.316 connected to cathode.

#### 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 = 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:



7-PIN MINIATURE TYPE

For use in mobile communications equipment

#### GENERAL DATA

Electrical:

Heater, for Unipotential Cathodes: Voltage. . . . . . . 6.3 ± 20%\* . . . ac or dc volts Current at 6.3 volts. . 0.3 . . . . . . . . . . amp Direct Interelectrode Capacitances:

	Without External Shield	With External Shield <sup>0</sup>	
Plate to cathode, internal shield, and heater (Each unit)	2.5	3.2	μµf
unit)	3.4	3.6	µµf
Plate of unit No:1 to plate of unit No.2	0.068 max.	0.026 max.	щuf

#### Mechanical:

Operating Position. . . Any Maximum Overall Length. . . . 1-3/4" 1-1/2" Maximum Seated Length . . . Length, Base Seat to Bulb Top (Excluding tip). . 1-1/8" ± 3/32" Diameter. . . . . . 0.650" to 0.750" . Dimensional Outline . See General Section Bulb. . . . .T5-1/2 .Small-Button Miniature 7-Pin (JEDEC No. E7-1) Base. . . Basing Designation for BOTTOM VIEW. . . . . . 6BT

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

Pin 5- Cathode of Unit No.2 Pin 6- Internal Shield Pin 7- Plate of Unit No.1

6663

#### RECTIFIER

Values are for Each Unit

Maximum Ratings, Design-Maximum Values:

PEAK INV	ERSE PLAT	E VOLT	AGE.								275	max.	volts
PEAK PLA	TE CURREN	Τ									60	max.	ma
PEAK PLA	TE CURREN	T (For	- pul	se	du	ira	ati	or	1				
of 0.1	second m	aximun	n)			e.				ε.	350	max.	ma
DC PLATE	CURRENT.										10	max.	ma
PEAK HEA	TER-CATHO	DE VOL	TAGE	:									
Heater	negative	with	resp	ect	t t	0	ca	th	100	ie	275	max.	volts
Heater	positive	with	resp	ect	t t	0	ca	tł	100	le	100	max.	volts

6663/6AL5

## **TWIN DIODE**

#### Characteristics:

600<sup>33</sup>

Heater	· Voltage									6.3	volts
Plate	Voltage									10	volts
Plate	Current	•								60	ma

\* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as muchas 35 per cert or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

<sup>0</sup> With external shield JEDEC No.316 connected to pin 6.

#### 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 = 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.

## High-Mu Triode

7-PIN MINIATURE TYPE

For Mobile-Communications Equipment

#### GENERAL DATA

#### Electrical:

Heater Characteristics and Ratings (Absolute-Maximum Values): Voltage (AC or DC)
respect to cathode
respect to cathode 100 max. volts
Direct Interelectrode Capacitances (Approx.): Without With External External Shield Shield <sup>b</sup>
Grid to plate 1.5 1.5 $\mu\mu$ f Grid to cathode and heater 2.2 2.2 $\mu\mu$ f Plate to cathode and heater 0.5 1.4 $\mu\mu$ f Cathode to plate 0.24 0.20° $\mu\mu$ f Cathode to grid and heater 5.0 5.2 <sup>d</sup> $\mu\mu$ f Plate to grid and heater 1.7 2.6 <sup>d</sup> $\mu\mu$ f Heater to cathode 2.9 2.9° $\mu\mu$ f
Characteristics, Class A <sub>1</sub> Amplifier:
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Mechanical:
Operating Position.       Any         Type of Cathode       Coated Unipotential         Maximum Overall Length       2-1/8"         Maximum Seated Length       1-7/8"         Length, Base Seat to Bulb Top (Excluding tip).       1-1/2" ± 3/32"         Diameter.       0.650" to 0.750"         Dimensional Outline       See General Section         Bulb.       T5-1/2         Base.       Small-Button Miniature 7-Pin (JEDEC No.E7-1)



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

DATA 5-62

# 6664/6AB4

Basing Designation for BOTTOM VIEW. . . . . . . . . . . . . 5CE

Pin 1 - Plate Pin 2 - No Internal Connection Pin 3 - Heater Pin 4 - Heater



Pin 5-No Internal Connection Pin 6-Grid Pin 7-Cathode

#### AMPLIFIER - Class Aj

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

2								330	max.	volts
								0.00		
								55	max.	volts
	÷					÷.		0	max.	volts
		ŝ			5	ł.		2.9	max.	watts
	· · ·	· · · · · · · · · · · · · · · · · · ·	 	* * * * * * *	* * * * * * * * *		· · · · · · · · · · ·			

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

- $^{\mbox{b}}$  with external shield JEDEC No.316 connected to cathode except as noted.
- <sup>C</sup> With external shield JEDEC No.316 connected to ground.

<sup>d</sup> with external shield JEDEC No.316 connected to grid.

#### 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:







## 6669/6AQ5-A BEAM POWER TUBE

7-PIN MINIATURE TYPE

For use in mobile communications equipment

#### GENERAL DATA

#### Electrical:

Heater, for Unipotential Cathode:		
Voltage 6.3 ± 20%* ac	or dc	volts
Current at 6.3 volts 0.45		. amp
Direct Interelectrode Capacitances (Approx.): <sup>0</sup>		
Grid No.1 to plate	0.4	μµf
Grid No.1 to cathode & grid No.3,		
grid No.2, and heater	8	μµf
Plate to cathode & grid No.3,		
grid No.2, and heater	8.5	μµf

#### Mechanical:

Operating Position. . Any 2-5/8" Maximum Överall Length. Maximum Seated Length . . 2-3/8" . . . 2" Length, Base Seat to Bulb Top (Excluding tip). ± 3/32" 0.650" to 0.750" Diameter. . . . Dimensional Outline See General Section Bulb. . . . . .T5-1/2 Base. . . . . . . . . Small-Button Miniature 7-Pin (JEDEC No.E7-1) Basing Designation for BOTTOM VIEW. 7BZ

Pin 1-Grid No.1 Pin 2- Cathode, Grid No.3 Pin 3-Heater



Pin 4-Heater Pin 5-Plate Pin 6-Grid No.2 Pin 7-Grid No.1

6<sub>669</sub>

#### AMPLIFIER - Class A.

Maximum Ratings, Design-Maximum Values:		
PLATE VOLTAGE	250 max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250 max.	volts
GRID-No.2 INPUT	2 max.	watts
PLATE DISSIPATION	12 max.	watts
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode. BULB TEMPERATURE (At hottest point	100 max.	volts
on bulb surface)	225 max.	°C
Typical Operation and Characteristics:		
Heater Voltage	6.3	volts
Plate Voltage	250	volts
Grid-No.2 Voltage	250	volts
Grid-No.1 (Control-grid) Voltage	-12.5	volts
Peak AF Grid-No.1 Voltage	12.5	volts

#### ELECTRON TUBE DIVISION

Peak AF Grid-No.1 Voltage . . .

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6669/6AQ5-A

BEAM POWER TUBE

Zero-Signal Plate Current	45 ma
MaxSignal Plate Current	47 ma
Zero-Signal Grid-No.2 Current	4.5 ma
MaxSignal Grid-No.2 Current	7 ma
Plate Resistance (Approx.)	52000 ohms
Transconductance	4100 μmhos
Load Resistance	5000 ohms
Total Harmonic Distortion	8 %
MaxSignal Power Output	4.5 watts
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance:	
For fixed-bias operation	0.1 max. megohm
For cathode-bias operation	0.5 max. megohm
	12-10 S (18)
AMPLIFIER - Class AB <sub>1</sub>	
Maximum Ratings, Design-Maximum Values:	
PLATE VOLTAGE	250 max. volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250 max. volts
GRID-No.2 INPUT	2 max. watts
PLATE DISSIPATION	12 max. watts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode.	100 max. volts
Heater positive with respect to cathode.	100 max. volts
BULB TEMPERATURE (At hottest point	0.0
on bulb surface)	225 max. °C
Typical Push-Pull Operation:	
Unless otherwise specified, values ar	e for 2 tubes
Heater Voltage	6.3 volts
Plate Voltage	250 volts
Grid-No.2 Voltage	250 volts
Grid-No.1 (Control-grid) Voltage	-15 volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	30 volts
Vax Signal Plate Current	70 ma
Zero-Signal Grid-No.2 Current	75 ma
MaxSignal Grid-No.2 Current	13 ma
Effective Load Resistance (Plate	
to plate)	10000 ohms
Total Harmonic Distortion	5 %
MaxSignal Power Output	10 watts
Maximum Circuit Values:	a second second second
Grid-No.1-Circuit Resistance:	
For fixed-bias operation	0.1 max. megohm
For cathode-bias operation	0.5 max. megohm
* When the heater is operated from storage-batte or similar supplies, the normal battery-voltage much as 35 per cent or more. Although such varia is permissible for short periods, reliability	ry-with-charger supply fluctuation may be as ation in heater voltage can be increased with

8-59

600°

## ELECTRON TUBE DIVISION

DATA 1



## BEAM POWER TUBE

Without external shield.

#### 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 = 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.

#### Power Output at Reduced Heater Voltage:

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6<sub>669</sub>



# 6676/6CB6A

## Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE For Mobi<u>le-Communications Eq</u>uipment

#### GENERAL DATA

#### Electrical:

Heater Characteristics and Rat Voltage (AC or DC) Current at heater volts = 6. Peak heater-cathode voltage:	tings (Absolute .30	-Maximum Values): 6.3ª volts 1.300 amp
Heater negative with respect to cathode		200 max. volts
respect to cathode Direct Interelectrode Capacita	ances:	200 <sup>b</sup> max. volts
	Without External Shield	With External Shield <sup>C</sup>
Grid No.1 to plate Grid No.1 to cathode, grid No.3 & internal shield	. 0.025 max.	0.015 max. μμf
grid No.2, and heater Plate to cathode, grid No.3 & internal shield grid	. 6.5	6.5 <i>μ</i> μf
No.2, and heater	. 2.0	3.0 <i>µµ</i> f
Characteristics, Class A <sub>1</sub> Amp Plate Supply Voltage Grid No.3 Grid-No.2 Supply Voltage Grid-No.1 Voltage Cathode Resistor Plate Resistance (Approx.) . Transconductance Plate Current Grid-No.2 Current Grid-No.1 Voltage (Approx.) f plate $\mu a = 20$	Connected to	125 125 volts <i>cathode at socket</i> 125 125 volts -3 - volts - 56 ohms - 0.28 megohm - 8000 µmhos 2.8 13 ma 3.7 ma 6.5 volts
Mechanical: Operating Position Type of Cathode Maximum Overall Length Maximum Seated Length Length, Base Seat to Bulb Top (E Diameter Dimensional Outline Bulb	xcluding tip).	Dated Unipotential 2-1/8" 1-7/8" 1-1/2" ± 3/32" 0.650" to 0.750" ee General Section 



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 5-62

# 6676/6CB6A

Basing Designation for BOTTOM VIEW. . . . . . . . . . . . 7CM

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



Pin 6-Grid No.2 Pin 7-Grid No.3 Internal Shield

#### AMPLIFIER - Class A

Maximum Ratings, Absolute-Maximum Values:

PLATE VOLTAGE . . . 330 max. volts . . . . . . GRID No.3 (SUPPRESSOR GRID) . . . Connect to cathode at socket GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE. . . 330 max. volts GRID-No.2 VOLTAGE . . . .See Grid-No.2 Input Rating Chart at front of Receiving Tube Section GRID-No.1 (CONTROL-GRID) VOLTAGE: Positive-bias value . . 0 max. volts GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts . . . 0.55 max. watt For grid-No.2 voltages between 165 and 330 volts .See Grid-No.2 Input Rating Chart at front of Receiving Tube Section PLATE DISSIPATION . . . . . . . . . . . . . . . . 2.3 max. watts

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

**b** The dc component must not exceed 100 volts.

c With external shield JEDEC No.316 connected to cathode.

#### 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:







## 6677/6CL6 POWER PENTODE

9-PIN MINIATURE TYPE For use in mobile communications equipment

#### GENERAL DATA

#### Electrical:

Heater, for Unipotential Cathode: 6.3 ± 20%\* . . . . ac or dc volts Voltage. . . . . . . . . Current at 6.3 volts . . 0.65 . amp Direct Interelectrode Capacitances:<sup>0</sup> μµf Grid No.1 to plate . . . . . 0.12 max. Grid No.1 to cathode, grid No.3 & internal shield, grid No.2, and heater. . . . 11 μµf Plate to cathode, grid No.3 & internal shield, grid No.2, and heater. . . . 5.5 μµf

#### Mechanical:

Operating Position . . . . . . . Anv . . 2-5/8" Maximum Overall Length . . . . . . . 2-3/8" Maximum Seated Length. . . Length, Base Seat to Bulb Top (Excluding tip) . . . 2" ± 3/32" ..... to 0.875" to 0.875" Diameter . . . . . Dimensional Outline. . . . . . . . . . . . See General Section Bulb . . . . . . . . . T6-1/2  $\boldsymbol{v}_{1} = \boldsymbol{v}_{2} = \boldsymbol{v}_{1} = \boldsymbol{v}_{2}$ Base . . . . . . . . . Small-Button Noval 9-Pin (JEDEC No.E9-1) Basing Designation for BOTTOM VIEW . . . . . . . .98V

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



Pin 7-Grid No.3, Internal Shield Pin 8-Grid No.2 Pin 9-Grid No.1

ده

#### AMPLIFIER - Class A

Maximum Ratings, Design-Maximum Values:

PLATE VOLTAGE. . . . . . . . . . 330 max. volts GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE. . . . 0 max. volts GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE . . . 330 max. volts . See Grid-No. 2 Input Rating Chart GRID-No. 2 VOLTAGE. . . at front of Receiving Tube Section GRID-No.1 (CONTROL-GRID) VOLTAGE: Negative-bias value. . . . . . . . . . 50 max. volts 0 max. volts Positive-bias value. . . . . . . . GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts . . 2 max. watts For grid-No.2 voltages between 165 and 330 volts. . . . . . . . See Grid-No.2 Input Rating Chart at front of Receiving Tube Section 6677/6CL6

### **POWER PENTODE**

PLATE DISSI PEAK HEATER-	PATION	DE VO	 DLTA	GE	:	•	•	•	•	•	•		8.5	nax.	watts
Heater neg	gative	WITT	re	sp	ec	τ	10	Ca	au	100	le	•	100 1	nax.	VOILS
Heater pos	sitive	with	n re	sp	ec	t	to	Cá	atl	100	de		100 r	nax.	volts
BULB TEMPER	ATURE	(At F	ott	es	tı	po	in	t d	on						
bulb surfa	ace).					•				x	•	•	210 r	nax.	°C
Typical Open	ration	and	Cha	ra	ct	er	is	tio	CS						
Heater Volta	age			2	2			2	÷				6.3		volts
Plate Volta	1e			-			100						250		volts
Grid No 3		• •	e e	-	•		C			tor	1	t o	cathody	at	sochet
Grid No. 2 V	oltano.			÷.	•		007					00	150		volts
	litaye				•	•	•	•			•		100		volto
Grid-No.1 VC	Itage		• •	•	٠	•			•	8	•	•	-2		VUILS
Peak AF Grid	1-No.1	Volt	age										3		VOILS
Zero-Signal	Plate	Curr	rent			10							30		ma
MaxSignal	Plate	Curr	rent										31		ma
Zero-Signal	Grid-I	Vo. 2	Cur	re	nt								7		ma
Max Signal	Crid	10.2	Cur	ro	n+								7 2		ma
MaxSiynai	un iu-i	10.2	Cur	10	nυ	•					1		0 15		ma
Plate Resis	tance	(Appr	οx.	1.									0.15		megonm
Transconduct	tance.										•		11000		µmhos
load Resista	ance .												7500		ohms
Total Harmon	nic Di	stort	ion									2	8		96
May Signal	Power	Outr	nut					÷.		÷.	Ċ.	0	28		watts
maxSignal	rower	out	ul.		•			•	•		٠	•	2.0		mallo

#### Maximum Circuit Values:

6017

Grid-No.1-Circuit Resistance: For fixed-bias operation.....0.1 max. megohm For cathode-bias operation.....0.5 max. megohm

\* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

° Without external shield.

#### 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 = 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:



### 6678/6U8-A MEDIUM-MU TRIODE-SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment

#### GENERAL DATA

#### Electrical:

Heater, for Unipotential Cathodes: Voltage. . . . . . . 6.3 ± 20%\* ac or dc volts Current at 6.3 volts . . 0.45 . amp Direct Interelectrode Capacitances: Without With External External Shield Shieldo

Triode Unit:			
Grid to plate	1.8	1.8	μµf
Grid to cathode and heater	2.5	2.5	<i>щ</i> гf
heater	0.4	1	μµf
Pentode Unit: Grid No.1 to plate Grid No.1 to cathode & grid No.2 & internal	0.01 max.	0.006 max.	μµf
shield, grid No.2, and heater	5	5	μµf
No.3 & internal shield, grid No.2, and heater.	2.6	3.5	μµf
(Fach unit)	3	3.	uuf

#### Characteristics, Class A, Amplifier:

#### With heater voltage of 6.3 volts

		Triode Unit	Pentode Unit	
Plate Supply Voltage	ų,	150	250	volts
Grid-No.2 (Screen-grid) Supply Voltage Cathode Resistor	ł	- 56	110 68	volts ohms
Amplification Factor	Ŷ	40	-	1
Transconductance	÷	5000 8500	400000 5200	ohms µmhos
Plate Current	÷	18	10	ma
Grid-No.1 Voltage (Approx.)		_	2.5	IIIa
for plate $\mu a = 10 \dots$		-12	-10	volts
Mechanical:				
Operating Position Maximum Overall Length Maximum Seated Length		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · 2	. Any 2-3/16" -15/16"
Length, Base Seat to Bulb To	D	(Excluding t	ip), 1-9/16"	+ 3/32"

8-59

Diameter. .

ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY DATA 1

0.750" to 0.875"

6<sub>628</sub>





### MEDIUM-MU TRIODE – SHARP-CUTOFF PENTODE

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 = 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:

Triode Unit:

Pentode Unit:

6<sub>6}0</sub>





## 6679/12AT7

## HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment

#### GENERAL DATA

Electrical:			
Heater, for Unipotential Cathodes: Heater arrangement Series Voltage 12.6 ± 20%*	Parallel 6.3 ± 20%*	ac or dc	volts
At 12.6 volts 0.15 At 6.3 volts Direct Interelectrode Capacitances	0.3 (Approx.): Without	With	amp amp
	Shield	Shield <sup>0</sup>	
Grid-Drive Operation:			
Grid to plate (Each unit) Grid to cathode and heater	1.5	1.5	μµf
(Each unit) Plate to cathode and heater:	2.2	2.2	μµf
Unit No.1	0.5 0.4	1.2	μμ f μμ f
Cathode-Drive Operation: Plate to cathode (Each unit) .	0.2	0.2	μµf
Cathode to grid and heater (Each unit)	4.6	4.6	μµf
(Each unit)	1.8 2.4	2.6 2.4	μμf μμf
Characteristics, Class A <sub>1</sub> Amplifie	er (Each Uni	t):	
Heater Voltage: For series connection Plate Supply Voltage Cathode Resistor Amplification Factor Plate Resistance (Approx.) Transconductance	ua = 10 .	12.6 6.3 250 60 10900 5500 10 -12	volts volts ohms µmhos volts
Mechanical:			
Operating Position	uding tip). 	1-9/16" 0.750" to General S	Any 2-3/16" 15/16" ± 3/32" 0.875" Section T6-1/2 0.E9-1)

6079 6679/12AT7 HIGH-MU TWIN TRIODE Basing Designation for BOTTOM VIEW . 94 Pin 6 - Plate of Pin 1-Plate of Unit No.2 Unit No.1 Pin 2-Grid of Pin 7-Grid of Unit No.2 Unit No.1 Pin 3-Cathode of Pin 8-Cathode of Unit No.2 Unit No.1 Pins 4 & 9 - Heater of Pin 9-Heater Unit No.2 Mid-Tap Pins 5 & 9 - Heater of Unit No.1 AMPLIFIER - Class A Values are for Each Unit Maximum Ratings, Design-Maximum Values: PLATE VOLTAGE. . . . . 330 max. volts GRID VOLTAGE: Negative-bias value. . . . 55 max. volts Positive-bias value. . . . 0 max. volts PLATE DISSIPATION. . 2.8 max. watts PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode . 100 max. volts Heater positive with respect to cathode . . 100 max. volts When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.  $^{\circ}$  With external shield JEDEC No.315 connected to heater except as noted. • With external shield JEDEC No.315 connected to ground. SPECIAL RATINGS & PERFORMANCE DATA Heater-Cycling Life Performance: This test is performed on a sample lot of tubes from each

Inis 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 = 15 (Series connection) 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:



## 6680/12AU7-A

MEDIUM-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment

GENERAL DA	AT		
Electrical:			
Heater, for Unipotential Cathodes: Heater arrangement Series Voltage	Parallel 6.3 ± 20%*	ac or do	: volts
Current: At 12.6 volts 0.15 At 6.3 volts – Direct Interelectrode Capacitances	0.3 (Approx.): Without External Shield	With External Shield <sup>0</sup>	amp amp
Grid to plate (Each unit) Grid to cathode and beater	1.5	1.5	μµf
(Each unit)	1.6	1.8	μµf
Unit No.1	0.4 0.32	2 2	<i>µµf</i> µµf
Characteristics, Class A <sub>1</sub> Amplifie	r (Each Uni	t):	
Heater Voltage: For series connection For parallel connection Plate Voltage Grid Voltage Amplification Factor Plate Resistance (Approx.) Transconductance Plate Current Grid Voltage (Approx.) for plate $\mu$ as	12.6 6.3 100 20 20 6500 3100 11.8 = 10	12.6 6.3 250 -8.5 17 7700 2200 10.5 -24	volts volts volts volts µmhos ma volts
Mechanical:			
Operating Position	luding tip) See Noval 9-Pin EWPin Pin 7 Pin	1. 1-9/16" 0.750" to General (JEDEC N 6 - Plate Unit 7 - Grid Unit 8 - Catho Unit	. Any 2-3/16" -15/16' ± 3/32" 0.875' Section T6-1/2 of No.1 of No.1 de of No.1

Pin 9-Heater Mid-Tap

8-59

Pins 4 & 9 - Heater of

Pins 5 & 9 - Heater of Unit No.1

Unit No.2

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

6680

. . 9A



## 6680/12AU7-A

## MEDIUM-MU TWIN TRIODE

#### AMPLIFIER --- Class A

Values are for Each Unit

Maximum Ratings, Design-Maximum Values:

PLATE VOLTAGE	330	max.	volts
Positive-bias value	0	max.	volts
PLATE DISSIPATION	3	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect	000		
to cathode	200	max.	volts
Heater positive with respect	2004		
	200-	max.	VOILS

#### Maximum Circuit Values:

6000

Grid-Circuit Resistance:

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

\* When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

<sup>O</sup> With external shield JEDEC No.315 connected to cathode of unit under test.

The dc component must not exceed 100 volts.

#### 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 = 15 (Series connection) 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:



## 6681/12AX7

## HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment

#### GENERAL DATA

E	lectrical:			
Н	eater, for Unipotential Cathodes: Heater arrangement Series Voltage 12.6 ± 20%*	Parallel 6.3 ± 20%*	ac or dc	volts
	At 12.6 volts 0.15	-		amp
	At 6.3 volts –	0.3		amp
	rect interefectrode Capacitances	(Approx.): Without External Shield	With External Shield <sup>0</sup>	
	Grid to plate (Each unit) Grid to cathode and heater	1.7	1.7	μµf
	(Each unit)	1.6	1.8	μµf
	Unit No.1	0.46	1.9	μµf
	Unit No.2	0.34	1.9	μμ†
C	haracteristics, Class A <sub>1</sub> Amplifie	r (Each Uni	it):	
FOAFTF	eater Voltage: For series connection For parallel connection late Voltage mplification Factor late Resistance (Approx.) ransconductance late Current	12.6 	$ \begin{array}{r} 12.6\\ 6.3\\ 250\\ -2\\ 100\\ 0.0625\\ 1600\\ 1.2\\ \end{array} $	volts volts volts volts megohm µmhos ma
A	lechanical:			
	perating Position	uding tip) 	1	Any 2-3/16" 15/16" ± 3/32" 0.875" Section T6-1/2 .E9-1) 9A of No.1 of No.1 De Mo.1 Fap

RCA 6681/12AX7

#### HIGH-MU TWIN TRIODE

#### AMPLIFIER - Class A

Values are for Each Unit

Maximum Ratings, Design-Maximum Values:

6681

	330	max.	volts
Negative-bias value	55	max.	volts
Positive-bias value	0	max.	volts
PLATE DISSIPATION	1.1	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect			
to cathode	200	max.	volts
Heater positive with respect			
to cathode	200	max.	volts

When the heater is operated from storage-battery-with-charger supply or similar supplies, the normal battery-voltage fluctuation may be as much as 35 per cent or more. Although such variation in heater voltage is permissible for short periods, reliability can be increased with improved supply-voltage regulation.

With external shield JEDEC No.315 connected to cathode of unit under test.
 The dc component must not exceed 100 volts.

#### 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 = 15 (Series connection) 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.

DATA



688,

## **TWIN DIODE**

7-PIN MINIATURE TYPE

For switching applications in electronic computers

#### GENERAL DATA

### Electrical:

	4-57 TUBE DIVISION TENTATIVE DATA
	T: See next page.
	<sup>O</sup> Without external shield.
	Note 1: With 6.3 volts ac or dc on heater.
ł	Heater Current
	Note Min. Max.
	CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN
	BULB TEMPERATURE (At hottest point on bulb surface)
	PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. 150 max. volts Heater positive with respect to cathode. 150 max. volts
	IPEAK INVERSE PLATE VOLTAGE
	Maximum Ratings, Absolute Values:
	Values are for Each Unit
	SWITCHING SERVICE
	Pin 1 - Cathode of Unit No.1 Pin 2 - Plate of Unit No.2 Pin 3 - Heater Pin 4 - Heater
	Maximum Base Seat to Bulb Top (Excluding tip) 1" ± 3/32" Maximum Diameter
	Mechanical: Mounting Position
	heater 2.2 μμf Cathode to plate, internal shield, and heater 3.5 μμf Heater to cathode 2.1 μμf
	Direct Interelectrode Capacitances (Each unit, approx.): <sup>o</sup> Plate to cathode 1.4 $\mu\mu$ f Plate to cathode, internal shield, and
	Heater, Pure Tungsten, for Unipotential Cathodes:

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



## TWIN DIODE

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1.5
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TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



## TWIN DIODE



TUBE DIVISION



## Medium-Mu Twin Triode

#### 9-PIN MINIATURE TYPE

#### GENERAL DATA

#### Electrical:

	Heater Characteristics and Ratings (Design-Center Values)	:
	Voltage (AC or DC) 6.3 ± 0.6	/olts
	Current at heater volts = 6.3 0.300	amp
	Peak heater-cathode voltage (Each unit):	
	Heater negative with	
	respect to cathode 60 max	olts
	Hester ereitive with	10100
	Heater positive with	
	respect to cathode	VOILS
	Direct Interelectrode Capacitances:"	
	Unit No 1 Unit No 2	
	0011 0011 0011 0012	
	Grid to plate 1.4 1.4	μμ†
	Grid to cathode, internal	
	shield and heater. 3.1 3.1	uuf
	Plate to cathode internal	1.1
	chield and heater 1 75 1 65	f
		μμi
	Heater to cathode 2.0 2.7	μμι
	Characteristics Class AL Amplifier (Fach Unit); b	
		1.
	Plate Supply Voltage	VOITS
	Grid Supply Voltage	VOITS
	Cathode Resistor	ohms
	Amplification Factor	
	Transconductance	µmhos
	Plate Current 15 12	ma
	Mechanical:	
	Otime Desition	100
		· Ally
	Type of Cathodes Coated Unipole	ntial
	Maximum Overall Length	3/16"
6	Maximum Seated Length 1-1	5/16"
	Length, Base Seat to Bulb Top (Excluding tip) 1–9/16" ±	3/32"
	Diameter 0.750" to 0	.875"
	Dimensional Outline See General Se	ction
	Bulb	6-1/2
	Base	E9-1)
	Basing Designation for BOTTOM VIEW.	. 9AJ
	Pin 1 – Plate of $(5)$ Pin 6 – Plate of	f
	Unit No.2 4 6 Unit N	0.1
	Pin 2-Grid of Pin 7-Grid of	
	Unit No.2 (3) U(7) Unit N	0.1
	Pin 3 - Cathode of Pin 8 - Cathode	of
		0 1
	Die 4 Wester	1.1
	Pin 9 - Interna	0
1	Pin 5-Heater O Shield	



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 5-62

AMPLIFIER - Class A	
Values are for Each Unit	
Maximum Ratings, Design-Center Values:	
PLATE VOLTAGE:	
With plate dissipation = 0.8 watt	
or greater	volts
With plate dissipation less than	
0.8 watt	volts
With plate ma. = 0	volts
With cathode ma. = 0	volts
GRID VOLTAGE:	
Negative-bias value 100 max.	volts
Peak-negative value <sup>c</sup>	volts
CATHODE CURRENT:	
Peak <sup>c</sup>	ma
Average	ma
GRID INPUT 0.03 max.	watt
PLATE DISSIPATION:	
Either plate 1.5 max.	watts
Both plates (Both units operating) 2 max.	watts
BULB TEMPERATURE (At hottest	
point on bulb surface) 170 max.	oC

#### Maximum Circuit Values:

a Without external shield.

b Operation under conditions listed in left-hand column is recommended because of the small spread in characteristics.

c Pulse duration (microseconds) = 200 max., duty factor = 0.10 max.

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

Impact Acceleration . . . . . . . . . . . . . . . . 500 max. g This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (Flyweight) Shock Machine and are subjected to 5 blows at a hammer angle of 30°.

#### 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 and are subjected for 32 hours to 2.5-g vibrational acceleration at 50 cycles per second in each of three directions.



g

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

Tw	/in	Po	wer	Pe	ente	ode

9-PIN MINIATURE TYPE

INTERNALLY NEUTRALIZED FOR PUSH-PULL AMPLIFIER SERVICE 14 WATTS CW INPUT (ICAS) UP TO 500 Mc

For Communications Equipment Operating at Frequencies up to 500 Mc as a Push-Pull RF-Power-Amplifier or as a Frequency-Multiplier Tube

#### GENERAL DATA

#### Electrical:

Heater, for Unipotential Cathode:	
Heater arrangement Series	Parallel
Voltage (AC or DC) 12.6 ± 10%	6.3 ± 10% volts
Current 0.3	0.6 amp
Transconductance (Each Unit)	
for dc plate volts = 150, dc	
grid-No.2 volts = 150, and	
dc plate ma. = 25 10	)500 μmhos
Mu-Factor, Grid No.2 to Grid	
No.1 (Each Unit) for dc plate	
volts = 150. dc arid No.2 volts	
= 150, and dc plate ma. = 25,	31
Direct Interelectrode Capacitances	
(Approx Each Unit) · A	
Grid No 1 to plate	).15 uuf
Grid No.1 to cathode & grid	,.10 mm
No 3 grid No 2 and heater	6.4 <i>mu</i> f
Plate to cathode & grid No 3	μμ.
arid No 2 and heater	1.6 <i>mi</i> f
grid Ho.2, and heater	1.0 pp.
Mechanical:	
o	Α

Operating Position	Any
Maximum Överall Length	
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding	tip) 2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	. See General Section
Bulb	
Base Small-Button Noval	9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9HL
Pin 1 - Grid No.1	Pin 5-Heater
of Unit No.2	Pin 6-Plate of
Pin 2 - Cathode,	Unit No.2
Grid No.3	Pin 7-Grid No.2
Pin 3-Grid No.1	Pin 8-Plate of
of Unit No.1	Unit No.1
Pin 4 - Heater	Pin 9-Heater lap



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I 10-60

PUSH-PULL RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy®											
PUSH-PULL RF POWER AMPLIFIER - Class C FM Telephony											
Values are on a per-ti	ube b	as	is	1	inless	oth	erwise	spect	fied	$\bigcirc$	
Maximum Ratings, Absolut	te-Ma	xi	m14	m	Value	s:					
nakinam natinge, neseta					l	lb to	500 M	2			
					CC	c*	IC	150			
DC PLATE VOLTAGE DC GRID-No.2 (SCREEN-GR				•	250	max.	250	max.	volts		
VOLTAGE DC GRID-No.1 (CONTROL-GI	RID)	•		•	200	max.	200	max.	volts	0	
VOLTAGE	• •	•	·		-100	max.	-100	max.	volts		
DC PLATE CURRENT	• •	٠	•		90	max.	100	max.	ma		
DC GRID-No.1 CURRENT.	• •	•	•		6	max.	8	max.	ma		
DC CATHODE CURRENT	• •	•	•		100	max.	120	max.	ma		
PLATE INPUT	• •	٠	•		12	max.	14	max.	watts		
GRID-No.2 INPUL	• •		•		3	max.	3.5	max.	watts		
GRID-No.1 INPUT	• •	•	•		0.2	max.	0.24	max.	watt		
PLATE DISSIPATION					6	max.	1.5	max.	watts		
PEAK HEATER-CATHODE VOL	TAGE:										
Heater negative with respect to cathode.					100	max.	100	max.	volts		
respect to cathode.					100	max.	100	max.	volts		
BULB TEMPERATURE (At hot point on bulb surface)	ttest )				225	max.	225	max.	°C		
Typical Operation:											
					At	500	Mc				
DC Plate Voltage					180		200		volts		
DC Grid-No.2 Voltage					180		200		volts		
DC Grid-No.1 Voltage From grid resistor for	 r	•	•		-20		-20		volts		
each grid No.1 of .				2	27000		27000		ohms		
Peak-to-Peak RF											
Grid-No.1 Voltage					50		50		volts		
DC Plate Current					55		60		ma		
DC Grid-No.2 Current			•		12.5		14		ma		
DC Grid-No.1 Current	• •	•	•		1.5		1.5		ma		
(Approx.)			•		1.2		1.2		watts		
(Approx.).		•			5		6		watts		



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. PLATE-MODULATED PUSH-PULL RF POWER AMPLIFIER - Class C Telephony

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

Values are on a per-tube basis

Maximum Ratings, Absolute-Maximum Values:

			L	lp to	500 MC		
			CC	S*	ICA	15	
DC PLATE VOLTAGE			200	max.	200	max.	volts
VOLTAGE		•	200	max.	200	max.	volts
VOLTAGE			-100	max.	-100	max.	volts
DC PLATE CURRENT			64	max.	80	max.	ma
DC GRID-No.1 CURRENT			6	max.	8	max.	ma
DC CATHODE CURRENT			80	max.	96	max.	ma
PLATE INPUT			8	max.	10	max.	watts
GRID-No.2 INPUT			2	max.	2.3	max.	watts
GRID-No.1 INPUT			0.2	max.	0.24	max.	watt
PLATE DISSIPATION	6	•	4	max.	5	max.	watts
respect to cathode Heater positive with			100	max.	100	max.	volts
respect to cathode BULB TEMPERATURE (At hottest	•		100	max.	100	max.	volts
point on bulb surface)		•	225	max.	225	max.	oC

#### Typical Operation:

			AL	500 MC	
DC Plate Voltage			180	180	volts
DC Grid-No.2 Voltage			180	180	volts
DC Grid-No.1 Voltage			-20	-20	volts
From grid resistor fo	r				
each grid No.1 of .			68000	27000	ohms
Peak-to-Peak RF					
Grid-No.1 Voltage			45	50	volts
DC Plate Current			40	55	ma
DC Grid-No.2 Current			9.5	12.5	ma
DC Grid-No.1 Current			0.6	1.5	ma
Driver Power Output					
(Approx.)			1	1.2	watts
Useful Power Output					
(Approx.)●			3.5	5	watts

1+ 000 Ho

#### FREQUENCY TRIPLER - Class C

Values are on a per-tube basis

Maximum Ratings, Absolute-Maximum Values:

			Up to		
			ccs*	ICAS	
DC PLATE VOLTAGE.	 		250 max.	250 max.	volts



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 2
	ccs*	ICAS♥		
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	200 max.	200 max.	volts	C
VOLTAGE DC PLATE CURRENT. DC GRID-No.1 CURRENT. DC CATHODE CURRENT. PLATE INPUT. GRID-No.2 INPUT. GRID-No.1 INPUT. PLATE DISSIPATION PEAK HEATER-CATHODE VOLTAGE: Heater pegative with	-100 max. 60 max. 70 max. 8 max. 3 max. 0.2 max. 6 max.	-100 max. 80 max. 80 max. 10 max. 3.5 max. 0.24 max. 7.5 max.	volts ma ma watts watts watts watt	0
respect to cathode Heater positive with	100 max.	100 max.	volts	
respect to cathode BULB TEMPERATURE (At hottest point on bulb surface)	100 max. 225 max.	100 max. 225 max.	voits °C	0
Typical Operation:	110 to 500	o Mc		
DC Plate Voltage DC Grid-No.2 Voltage (Approx.). Through resistor of DC Grid-No.1 Voltage From arid resistor for	180 180 1200 -74	200 190 1200 -74	volts volts ohms volts	
each grid No.1 of	82000	82000	ohms	
Grid-No.1 Voltage DC Plate Current DC Grid-No.2 Current DC Grid-No.1 Current	165 40 9.7 1.8	165 46 11 1.8	volts ma ma	
(Approx.)	1.1	1.1	watts	
(Approx.).	1.8	2.2	watts	

Without external shield.

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.

Continuous Commercial Service.

Intermittent Commercial and Amateur Service.

This value of useful power is measured at load of output circuit.

#### OPERATING CONSIDERATIONS

Shielding of the 6939 in "straight-through" rf-amplifier service may be required for stable operation. 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 4 and 5 and the space between pins 1 and 9, is generally adequate for this purpose.

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



The heater may be effectively by¢assed by grounding one heater pin at the tube socket and bypassing the other heater pin to ground with a low inductance capacitor. If further isolation of the ungrounded heater pin is required a suitable rf choke followed by another low inductance bypass capacitor, is recommended.

The *cathode* of the 6939 should be grounded by means of the shortest possible connection to reduce the effect of cathode-lead inductance.

The rf impedance between grid No.2 and the cathode must be kept low, usually by means of a suitable bypass capacitor. In telephony service when grid No.2 is modulated, a smaller bypass capacitor than is used for telegraphy service may be required in order to avoid excessive af bypassing. However, if the capacitance value is too small, rf feedback may occur between plate and grid No.1, depending on the circuit layout, operating frequency, and power gain of the stage. AF bypassing difficulties can usually be eliminated if the grid-No.2 bypass capacitor is replaced by a series-resonant circuit which is tuned to resonate at the operating frequency. This circuit presents a high impedance to audio frequencies but a very low impedance to its resonant frequency.

To prevent generation of parasitic oscillations, it is recommended that a 100-ohm resistor be connected in series with grid No.2 as close to the socket as possible.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 3 10-60









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





RADIO CORPORATION OF AMERICA Harrison, N. J.

**Electron Tube Division** 

DATA 5 10-60



# AVERAGE CONSTANT-CURRENT CHARACTERISTICS



**Electron Tube Division** 

AMERICA Harrison, N. J. DATA 6





### BEAM POWER TUBE

9-PIN MINIATURE TYPE

For high-jidelity audio-amplifier applications

#### GENERAL DATA

### Electrical:

Heat Vo Cu Dire Gr Gr P1	er, fo ltage. rrent. ct Int id No. id No. grid N ate to grid N	r Unip erelec 1 to p 1 to c o.2, a catho o.2, an	otentia  trode ( late . athode nd hea de & gi d heate	al Ca Capac & gr ter. rid No	thode 6.3 0.45 itanc id No 0.3,	: es: .3,		•••••	• •	•	•••	ac  0.7 8 3.5	or max	dc 	vol a 4 4	ts mp μf μf
Char	acteri	stics,	Class	A A	mplif	ier	:									
Plat Grid Plat Tran Plat Grid Grid	e Volt -No.2 -No.1 e Resi scondu e Curr -No.2 H-No.1 ate cu	age (Scree (Contr stance ctance ent Curren Voltag rrent	n-Grid ol-Grid (Appro t e (App of 100	) Vol d) Vo ox.)  rox.) <i>µ</i> a.	tage ltage for	•					73 4	250 250 -15 000 800 46 3.5			vol vol oł µmh	ts ts ims ios ma ts
Mech	anical	1														
Oper Maxi Maxi Leng Maxi Dime Bulb Base Base	rating mum Ov imum Se oth, Ba mum Di ensiona o asing [	Positi erall ated L se Sea ameter 1 Outl  Designa	on Length ength. it to B ine. S tion f	ulb T  mall- or BC	op (I Butto	xc on VI	1 ud Nov EW			ti .s .−F	p). ee 2in	 Gene (JE1	2" ral	± Se No	2-5, 2-3, 3/3 7, 2 c t 1 16-1 E9-	Any (8" (8" (8" (8" (8" (8" (8" (1/2) (-1) ) (9)))
Pi Pi Pi Pi	in 1–0 in 2–N in 3–0 in 4–H in 5–H	irid No lo Conr irid No leater leater	0.2 nection 0.1	() 3( 2)	HIILA					F F F	Pin Pin Pin	6 – ( 7 – ( 8 – ( 9 – F	Gric Gric Cat Gric Plat	No hoo e	5.1 5.3 de 5.2	1.12
		PUSH-	PULL A	F POW	EK AN	1PL	111	EK		- C	las	S AB	1			
PLAT GRIE GRIE PLAT	imum Ra TE VOLT D-No.2 D-No.2 TE DISS ee next	AGE. (SCREE INPUT. SIPATIO	Desig	n-Cen )) VOL	ter TAGE	Val  	ue.	s:		• • •		400 300 2 12	ma) ma) ma) ma)	<. <. <.	vo vo wa wa	lts lts tts

8-57

ELECTRON TUBE DIVISION

TENTATIVE DATA 1



### BEAM POWER TUBE

	- No.
PEAK HEATER-CATHODE VOLTAGE:	
respect to cathode 200 max. volts	
respect to cathode	
BULB TEMPERATURE (At hottest point on bulb surface)	
Typical Operation with Fixed Bias'	
Values are for 2 tubes	
Plate Voltage	
Grid-No.2 Voltage	
[Grid-No.1 (Control-Grid) Voltage• –15 –22 –25 volts Peak AE Crid No.1 to Crid No.1	
Voltage	
Zero-Signal Plate Current 92 58 50 ma	
MaxSignal Plate Current 105 106 107 ma	
MaxSignal Grid-No.2 Current 16 14 13.7 ma	
Effective Load Resistance (Plate	
to plate)	
MaxSignal Power Output 12.5 20 24 watts	
Typical Operation with Cathode Bias:	
Values are for 2 tubes	
Plate-Supply Voltage	
Grid-No.2 Supply Voltage	
Cathode Resistor	
Zero-Signal Plate Current 80 77 ma	
MaxSignal Plate Current 96 92 ma	
Zero-Signal Grid-No.2 Current	
Effective Load Resistance (Plate	
to plate)	
Max.—Signal Power Output	
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance:	
For fixed-bias operation 0.5 max. megohm	
For cathode-bias operation I max. megonm	
PUSH-PULL AF POWER AMPLIFIER - Class AB	
Grid No.2 of each tube connected to tap on	
Maximum Ratings. Design-Center Values:	6
PLATE AND GRID-No.2 (SCREEN-GRID)	
SUPPLY VOLTAGE	
°,▲,●: See next page.	
8-57 ELECTRON TUBE DIVISION TENTATIVE DATA 1	



### BEAM POWER TUBE

GRID-No.2 INPUT 1.75 max. watts
PLATE DISSIPATION
Typical Operation: Values are for a tubes
Fixed Cathode Bias Bias
Plate-Supply Voltage
Voltage 67 62 volts Zero-Signal Cathode Current
to plate)
Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation 0.5 max. megohm For cathode-bias operation 1 max. megohm
<ul> <li>Without external shield.</li> <li>The dc component must not exceed 100 volts.</li> <li>The type of input coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer- or impedance-coupling devices are recommended.</li> </ul>
Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center tap (B+) so as to apply 50 per cent of the plate signal voltage to grid No.2 of each output tube.
The taps are located on each side of the center tap (B+) so as to supply H3 per cent of the plate signal voltage to grid No.2 of each output tube.

ELECTRON TUBE DIVISION

TENTATIVE DAJA 2









# BEAM POWER TUBE

For high-fidelity audio-amplifier applications

### GENERAL DATA

lectrical:							
Heater, for Unipotentia	1 Cathode	:					
Voltage	6.3				ac	or dc	volts
Current	0.9						. amp
rect Interelectrode C	apacitanc	es:0		n 900			ites consider
Grid No.1 to plate					1.	.5	uuf
Grid No.1 to cathode	& arid No	3					
grid No.2 and heat	er					10	nuf
Plate to cathode & gr	id No.3.						P-P-
grid No.2, and heate	r				7.	.5	μµf
baraatariation Alaan	A Amplif	10.00					
lata Valtara	AL AMPTIT	ier;			25	50	volto
rid_No 2 (Screen Grid)	Voltace	•••		•	24	50	volte
rid-No.1 (Control-Grid	1) Voltage	• • •	• •	1	-	14	volte
late Resistance (Appro	x.).			2	2250	00	ohms
ransconductance					600	00	µmhos
late Current						72	ma
rid-No.2 Current				1		5	ma
lechanical:							
perating Position							Anu
perating Position		•••	• •	• •	· · ·	• • •	. Ally
aximum Sosted Longth		• •	• •	• •		• • •	4.02
aximum Diameter		• •	• •	• •		••••	1.63"
	1111		1.1			111	. T12
ase		1.00	. Sr	nall	-Wafer	Octal	8-Pir
		with	Sle	eve	(JETE	C No.B	8-191)
Basing Designation fo	or BOTTOM	VIEW					. 8HY
	4	5				o • • •	4
Pin 1-Grid No.2	an	Ne	2	F	(in 6 - 1	Grid N	0.1
Pin 2 Plate	9	1/r		t t	10 /-	Cathod	~
Pin 4 Crid No 2	a	Th	6	P	111 0 -1	Grid	No 3
Pin 5-Grid No.1	adr	D				arid	10.7
	0	8					
PUSH-PULL AF	POWER AMP	LIFI	ER	- 0	lass A	BI	
Maximum Ratings, Design	n-Center V	alue	s:				
PLATE VOLTAGE					450	max.	volts
GRID-No.2 (SCREEN-GRID	) VOLTAGE			•	400	max.	volts
CATHODE CURRENT:					105		
Peak		• •	• •	•	400	max.	ma
DC		• •	• •	•	110 2 F	max.	ma
ADIO NO ALIDUT				•	3.0	max.	watts
GRID-No.2 INPUT	• • • • •					moht.	1110 7 -
GRID-No.2 INPUT PLATE DISSIPATION		• •	• •	•	25	max.	watts
GRID-No.2 INPUT PLATE DISSIPATION		•••	• •	•	20	max.	watts
GRID-No.2 INPUT PLATE DISSIPATION	• • • • • •	•••	• •	•	25	max.	watts



# BEAM POWER TUBE

PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	200 max.	volts
Heater positive with respect to cathode.	200- max.	VOILS
ypical Operation with Fixed Bias:		
Values are for 2 tubes		1.1
Plate Voltage	00 450 00 350	volts volts
Voltage $-24$ $-24$ $-2$	-30	volts
Voltage 48 5 Zero-Signal Plate Current 122 10 MaxSignal Plate Current	60 60 02 95 52 194 6 3.4 7 19.2	volts ma ma ma
(Plate to plate)	00 6000 2 1.5 34 50	ohms % watts
Typical Operation with Cathode Bias:		a kuta
Values are for 2 tubes		Teller (g
Plate-Supply Voltage	380 380 180	volts volts ohms
Voltage       57         Zero-Signal Plate Current       112         MaxSignal Plate Current       128         Zero-Signal Grid-No.2 Current       7         MaxSignal Grid-No.2 Current       16         Effective Load Resistance       6600         (Plate to plate)       6600         Total Harmonic Distortion       2         Max-Signal Prove Output       32	68.5 138 170 5.6 20 4500 3.5 36	volts ma ma ma ohms % watts
		nacco
Grid-No.1-Circuit Yalues: Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation	0.1 max. 0.5 max.	megohm megohm
		14
PUSH-PULL AF POWER AMPLIFIER - C	lass AB <sub>1</sub>	no. all
Grid No.2 of each tube connected t plate winding of output transf	o tap on ormer	den of
Maximum Ratings, Design-Center Values:		1011 273
PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	450 max.	volts
°,▲,●: See next page.		



## BEAM POWER TUBE

CATTIOUL	CURRENT:								
Peak.				• • •			400	max.	
DC				• •	• •		110	max.	
GRID-No.	2 INPUT						3	max.	wat
PLATE DI PEAK HEA	SSIPATIO TER-CATH	N		11	• •	•	25	max.	wat
Heater	negativ	e with re	spect	to cat	thode		200	max.	vol
Heater	positiv	e with re	spect	to cat	thode		200	max.	vol
Typical	Operatio	n:							
		Value	s are	for 2	tub	es			
Plate-Su	ipply Vol	tage	• •		• •	•	4	10	vol
Grid-No.	2 Supply	voltage.	• • •		• •		_	*	vol
Cathode	Resistor				• •		4	20	oh
Peak AF	Grid-No.	1-to-Grid	-No.1	Volta	age.			68	VO
Zero-Sig	nal Cath	iode Curre	ent.		• •		1	.34	
MaxSig	nal Cath	iode Curre	ent		: •	-	1	.55	
Effectiv	re Load k	esistance	e (Pla	te to j	plate	e)	80	000	oh
lotal Ha	armonic L	)istortion	1		• •		1		
MaxSig	gnal Powe	er Output.			• •			24	wat
Maximum	Circuit	Values:							
C. L I	1 0:	Paraco.							
Grid-No.	thede bi	t Kesista	ince:-				0 5	mali	
FOT Ca	illiode-bi	as operat	Ton.		• •	•	0.0	max.	mego
O Without	external	shield.							
▲ The dc	component	must not e	xceed 1	00 vol	te				
			10000		60.				
• The typ resista	e of inpu ince in the	t coupling grid-No.1	networ circuit	k used . Tra	shou nsfor	ld not mer- c	intr impe	oduce edance	too mu -coupl
<ul> <li>The typ resista devices</li> <li>* Obtains</li> </ul>	nce in the are record	t coupling grid-No.1 mmended.	networ circuit	k used . Tra	shou nsfor	ld not mer- c	intr r impe	oduce edance	too mu -coupl
<ul> <li>The typ resista devices</li> <li>Obtaine The tap 43 per</li> </ul>	be of inpu ince in the are record and from ta sare location cent of the	t coupling grid-No.1 mmended. ps on the ted on each e plate sign	networ circuit primary side c nal volt	k used . Tra wind of the tage to	shou nsfor ing o cente grie	ld not mer- c f the er tap d No.2	intr ir impe outpu (B+) of eac	t trar so as	too mu -coupl nsforme to app put tub
<ul> <li>The typ resista devices</li> <li>* Obtaine The tap 43 per</li> </ul>	be of inpu ince in the are record d from ta sare locat cent of the	t coupling grid-No.1 mmended. ps on the ted on each e plate sig	networ circuit primary side c nal volt	k used Tra wind of the age to	shou nsfor ing o cente grid	ld not mer- c f the er tap 1 No.2	outpu (B+) of eac	oduce edance t trar so as ch out	too mu -coupl nsforme to app put tub
<ul> <li>The typ resista devices</li> <li>* Obtaine The tap 43 per</li> </ul>	be of inpu ince in the are record ed from ta ssare loca cent of the	t coupling grid-No.1 mmended. ps on the ted on each e plate sign	networ circuit primary side c nal volt	k used . Tra windi of the age to	shou nsfor ing o cente grid	ld not mer- c f the er tap d No.2	outpu (B+) of eac	t trar so as	too mu -coupl nsforme to app put tub
<ul> <li>The typ resista devices</li> <li>Obtaine The tap 43 per</li> </ul>	be of inpu ince in the s are record ed from ta s are loca cent of the	t coupling grid—No.1 mmended. .ps on the ted on each e plate sign	networ circuit primary side c nal volt	k used Tra wind of the tage to	shou nsfor ing o cente grid	ld not mer- c f the er tap j No.2	intr rimpe outpu (B+) of ead	t trar so as	too mu -coupl nsforme to app put tub
<ul> <li>The typ resista devices</li> <li>Obtaine The tap 43 per</li> </ul>	be of inpu ince in the s are record ed from ta s are loca cent of the	t coupling grid-No.1 mmended. .ps on the ted on each e plate sig	networ circuit primary side c nal volt	k used . Tra wind of the cage to	shou nsfor ing o cente grid	ld not mer- c f the er tap d No.2	intr rimpe outpu (B+) of ead	oduce edance t trar so as ch out	too mu -coupl nsforme to app put tub
<ul> <li>The typ resista devices</li> <li>Obtaine The tap 43 per</li> </ul>	be of inpu nce in the are recor ed from ta sare loca cent of the	t coupling grid-No.1 mmended. ps on the ted on each e platesig	networ circuit primary side c nal volt	k used Tra wind of the age to	shou nsfor ing o cento grid	ld not mer- c f the er tap d No.2	outpu (B+) of eac	oduce edance t trar so as ch out	too mu -coupl nsforme to app put tub
<ul> <li>The typ resista devices</li> <li>Obtaine The tap 43 per</li> </ul>	be of inpu nce in the are recor ed from ta os are loca cent of the	t coupling grid-No.1 mmended. ps on the ted on each e plate sig	networ circuit primary side c nal volt	k used Tra wind of the age to	shou nsfor ing o cente grid	ld not mer- c f the er tap i No.2	outpu (B+) of eac	oduce edance t trar so as ch out	too mu -coupl hsforme to app put tub
<ul> <li>The typ resista devices</li> <li>Obtaine The tap 43 per</li> </ul>	be of inpu nnce in the s are recor- ed from ta s are local cent of the	t coupling grid-No.1 mmended. ps on the ted on each e plate sig	networ circuit primary side c nal volt	k used . Tra wind i of the cage to	shou nsfor ing o cente grid	ld not mer- c f the er tap d No.2	intr rimpe outpu (B+) of ead	oduce edance t trar so as ch out	too mu -coupl nsforme to app put tub
<ul> <li>The typ resista devices</li> <li>* Obtaine The tap 43 per</li> </ul>	be of inpu nnce in the s are record d from ta s are local cent of the	t coupling grid-No.1 .ps on the ted on each e plate sig	primary side c hal volt	k used . Tra wind i of the cage to	shou nsfor ing o cente grid	ld not mer- c f the er tap d No.2	intr r impe outpu (B+) of eac	oduce edance t trar so as ch out	too mu -coupl nsforme to app put tub
<ul> <li>The typ resistant devices</li> <li>Obtaine The tap 43 per</li> </ul>	be of inpu nnce in the s are recor- ed from ta s are loca cent of the	t coupling grid-No.1 mmended. ps on the ted on each e plate sig	primary side c hal volt	k used . Tra wind of the age to	shou nsfor ing o cento grid	ld not mer- c f the er tap d No.2	intr r impe outpu (B+) of ead	oduce edance t trar so as ch out	too mu -coupl nsforme to app put tut
<ul> <li>The typ resistance</li> <li>* Obtaine The tap #3 per</li> </ul>	be of inpu nce in the s are recor ed from ta s are loca cent of the	t coupling grid-No.1 mmended. nps on the ted on eact e plate sign	networ circuit side c hal volt	k used . Tra wind of the age to	shou nsfor ing o cento grid	ld not mer- c f the er tap g No.2	intr r impe outpu (B+) of ead	oduce edance t trar so as ch out	too mu -coupl nsforme to app put tut
<ul> <li>The typ resistance devices</li> <li>Obtains</li> <li>The tag</li> <li>43 per</li> </ul>	be of inpu nee in the a re record d from ta s are locat s are locat c ent of the	t coupling grid-No.1 mmended. nps on the ted on eact e plate sign	networ circuit primary side c al volt	k used . Tra . wind: of the .age to	shou nsfor ing o cento grid	ld not mer- c f the er tap j No.2	: intr r impe outpu (B+) of ead	oduce edance t tran so as ch out	too mu -coupl asforme to app put tub
<ul> <li>The typ resist devices</li> <li>Obtaint The tag 43 per</li> </ul>	be of inpu nce in the a re record d from ta sare loca cent of the	t coupling grid-No.1 mmended. ps on the ted on each e plate sign	networ circuit primary side c nal volt	k used . Tra , wind of the age to	shou nsfor ing o centr grid	ld not mer- c f the er tap 1 No.2	: intr r impe outpu (B+) of ead	oduce edance t tran so as ch out	too mu -coupl isforme to app put tut
<ul> <li>The typ resist devices</li> <li>Obtaine The tag #3 per</li> </ul>	be of inpu are record d from ta sare location to the same same same cent of the	t coupling grid-No.1 mmended. ps on the ted on eact ted on eact e plate sign	networ circuit primary side c nal volt	k used Tra wind of the age to	shou nsfor ing o cent grid	ld not mer- c f the er tap 1 No.2	intr rimpe (B+) of ead	oduce edance t trar so as ch out	too mu -coupl isforme to app put tut
<ul> <li>The typ resist devices</li> <li>Obtains</li> <li>The tag 43 per</li> </ul>	te of inpu are record d from ta sare location to the sare location cent of the	t coupling grid-No.1 mmended. nps on the ted on eact e plate sign	networ circuit primary side c nal volt	k used . Tra , wind of the age to	shou nsfor ing o cent grid	ld not mer- c f the er tap g No.2	i intrimpé outpu (B+) of eac	oduce edance t tran so as ch out	too mu -coupl asformen to app put tub
<ul> <li>The typ resistance devices</li> <li>Obtains</li> <li>* Obtains</li> <li>* Obtains</li></ul>	Ne of inpunce in the are record and control of the second	t coupling grid-No.1 mmended. nps on the ted on each e plate sig	networ circuit primary side c hal volt	k used . Tra , wind of the cage to	shou nsfor ing o centu o grid	ld noi mer- c f the er tap j No.2	intr rimpe (B+) of eac	oduce edance t trar so as ch out	too mu -coupl isformen to app put tub
<ul> <li>The typ resist devices</li> <li>Obtaine The tag #3 per</li> </ul>	te of inpu are record d from ta sare loca d from ta sare loca cent of th	t coupling grid-No.1 mmended. ps on the ted on eact e plate sign	networ circuit primary side c al volt	k used . Tra , wind of the .age to	shou nsfor ing o centu o grid	ld noi mer- c f the er tap i No.2	intr rimpe (B+) of eac	roduce dance t trar so as ch out	too mu -coupl asforme to app put tub
<ul> <li>The typ resist devices</li> <li>Obtaine The tag 43 per</li> </ul>	te of inpu are record dfrom ta sare loca dfrom ta sare loca cent of the	t coupling grid-No.1 mmended. nps on the ted on eact e plate sig	networ circuit primary side c al volt	k used	shound nsfor cent. grid	ld nol mer- c f the r tap i No.2	: intrimpe output (B+) of eac	roduce dance t trar so as ch out	too mu -coupl isforme to app put tul
<ul> <li>The typ resistance devices</li> <li>Obtains</li> <li>The tag 43 per</li> </ul>	he of inpunce in the are record af from ta is are local cent of the	t coupling grid-No.1 mended. nps on the ted on eact e plate sign	networ circuit primary side c hal volt	k used . Tra v windi of the age to	shound nsfor centro grid	ld nol mer- c f the r tap r tap	: intrimpe output (B+) of eac	roduce dance- t trans so as h out;	too mu -coupl asforme to app put tut
<ul> <li>The typ resist devices</li> <li>Obtaine The tag 43 per</li> </ul>	e of inpu nce in the a re record d from ta sare loca cent of the	t coupling grid-No.1 mmended. ps on the ted on each e plate sign	networ circuit side c nalvolt	k used . Tra . wind f the the to	shounsfor ing o cent grid	ld nol mer- c f the r tap r tap i No.2	: intrimpe output (B+) of ead	roduce dance t trar so as c as c as	too mu -coupl isforme to app ut tut











## Medium-Mu Twin Triode

#### 9-PIN MINIATURE TYPE

For Computer and other "On-Off" Control Applications Involving Long Periods of Operation under Cutoff Conditions

#### GENERAL DATA

#### Electrical:

leater, for Unipotential Cathodes:	
Heater arrangement Series Parallel	
Voltage (AC or DC) 12.6 ± 5% 6.3 ± 5% v	olts
Current 0.45 0.9	amp
)irect Interelectrode Capacitances (Approx.): <sup>a</sup>	
Grid to plate (Each unit) 6	μμf
Grid to cathode and heater (Each unit) 4.8	μμf
Plate to cathode and heater	
(Unit No.1) 0.65	μμf
Plate to cathode and heater	
(Unit No.2) 0.55	μµf
Grid to grid 0.1	μµf
Plate to plate 1.4	μµf
Heater to cathode (Each unit) 6	μµf

#### Characteristics (Each Unit):

Plate Voltage														90	120	volts
Grid Voltage.														b	-2	volts
Amplification	Fa	ac	to	r.										-	21	
Plate Resista	nce	e	(A)	op	ro	х.	).							-	1750	ohms
Transconducta	nce	e.												-	12000	µmhos
Plate Current														47	36	ma
Grid Current.														250	-	μa
Grid Voltage	(Ar	pp	ro;	κ.	)	fo	r	p1.	ate	e	vo	lt	S			
= 150 and p	lat	te	μà	a :	= 1	20	0.							-	-11	volts

#### Mechanical:

Indicates a change.



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Basing Designation for BOTTOM VIEW		
Pin 1 - Plate of	Pin 6 - Cathode of	2
Pin 2-Grid of	Pin 7-Grid of	
Unit No.2 3	Unit No.1 Pin 8-Heater	
Unit No.2	Mid-Tap	
Pins 4 & 8 - Heater of Unit No.2	Pin 9-Plate of Unit No.1	
Pins 5&8-Heater of		6

#### COMPUTER SERVICE and "ON-OFF" CONTROL SERVICE

Unless Otherwise Specified, Values are for Each Unit

Maximum Ratings, Absolute-Maximum Values:

PLATE VOLTAGE:			
Average	300	max.	volts
Peak positive-pulse <sup>c</sup>	600	max.	volts
GRID VOLTAGE:			
DC negative	100	max.	volts
DC positive	1	may	volt
	200	max.	volte
Peak negative-puise	200	max.	VUILS
Peak positive-pulse"	30	max.	VOITS
GRID CURRENT:			
Average	5	max.	ma
Peak <sup>c</sup>	200	max.	ma
CATHODE CURRENT:			
Average	50	max.	ma
Peak <sup>c</sup>	400	max.	ma
PLATE DISSIPATION:			
Either plate	4 5	max.	watts
Poth plates (Poth units operating)	.0	max.	watte
DOLIT PTALES (DOLIT UNITES OPERALING)	0	max.	Walls
PEAK HEATER-CATHODE VOLTAGE:	000		11-
Heater negative with respect to cathode.	200	max.	volts
Heater positive with respect to cathode.	200ª	max.	volts
BULB TEMPERATURE (At hottest point			
on bulb surface)	160	max.	oC

#### Maximum Circuit Values:

Grid-Circuit Resistance:						
For fixed-bias operation .				0.1	max.	megohm
For cathode-bias operation				0.5	max.	megohm

a Without external shield.

b Adjusted for indicated grid current.

C Under the following conditions: rectangular pulse; pulse duration, 10 microseconds; pulse-repetition rate, 1 x 103 pps; and duty factor, 0.010 ± 0.001. The rise time shall be less than 1 microsecond, fall time less than 2 microseconds, overshoot less than 5 per cent and droop less than 10 per cent.



d The dc component must not exceed 100 volts.

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#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Unless Otherwise Specified, Values are for Each Unit

									Note	Min.	Max.	
Heater Current									1	0.41	0.49	amp
Plate Current (1)									1,2	26	45	ma
Plate Current (2)									1,3	34	60	ma 🕳
Plate Current (3)									1,4	-	200	μa
Reverse Grid Curr	ent.								1,2	-	-1.5	μa
Heater-Cathode Le	akag	e (	Cu	rre	ent	t:						
Heater negative respect to ca Heater positive	wit thod wit	h e. h	•			•			1,5	-	30	μa
respect to ca	thod	e.							1,5	-	30	μa
Leakage Resistance Between plate a	e: nd a	11	0	the	er							
electrodes ti	ed t	oge	et	hei	r.			•	1,6	50	-	megohms
electrodes ti	ed t	oge	etl	he	r.				1,7	50	-	megohms
Note 1: With heater	volt	s =	1	2.1	5 a	C I	or	dc	(Seri	es arra	ngement)	

With plate volts = 120 and grid volts = -2. Each unit tested separately. Unit not under test connected to ground. Note 2:

With plate volts = 90 and grid voltage adjusted for grid  $\mu a$  = 250. Each unit tested separately. Unit not under test connected Note 3: to ground.

Note 4: With plate volts = 150 and grid volts = -14. Each unit tested separately. Unit not under test connected to ground.

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

Note 6: With plate volts = -500.

Note 7: With grid volts = -300.

#### 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 = 15 (Series heater arrangement) cycled one minute on and four minutes off, heater 180 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.

#### Cathode-Interface-Resistance Life Test:

A sample lot of tubes from each production run is life tested at heater volts = 12.6 (Series heater arrangement) and with zero cathode current. At the end of 1000 hours, tubes will not show a cathode-interface resistance in excess of 25 ohms when measured in accordance with Method B, the Complementary Network Method, of ASTM Standard F 300-57T at heater volts = 11.4, plate volts = 75, plate current adjusted to 6.5 milliamperes, and 50-kc, square-wave signal voltage of 0.2 volt.





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Electron Tube Division

Harrison, N. J.





**Electron Tube Division** 

Harrison, N. J.



# **Power Pentode**

#### 9-PIN MINIATURE TYPE

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

The 7054 is the same as the 8077/7054 except for the following items:

#### Mechanical:

 Maximum Overall Length.
 2-5/8"

 Maximum Seated Length.
 2-3/8"

 Length, Base Seat to Bulb Top (Excluding tip).
 2" ± 3/32"







### **TWIN DIODE**

#### 7-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. Useful as a detector in AM and FM receivers, as a full-wave rectifier in power supplies having low dc requirements, and in speech-clipper applications.

	GENERAL DATA
)	Electrical:
	Heater, for Unipotential Cathodes: Voltage range
	Direct Interelectrode Capacitances (Approx.): <sup>0</sup>
)	and heater (Each unit) 3.2 μμf Cathode to plate, internal shield,
	and heater (Each unit) 3.6 μμf Plate of unit No.1 to plate of
	unit No.20.026 μμf Mechanical
	Operating Position
)	Pin 1 - Cathode of Unit No.1 Pin 2 - Plate of Unit No.2 Pin 3 - Heater Pin 4 - Heater Pin 4 - Heater Pin 4 - Heater Pin 5 - Cathode of Unit No.2 Pin 5 - Cathode of Unit No.2 Pin 6 - Internal Shield Pin 7 - Plate of Unit No.1
	RECTIFIER
)	Maximum Ratings, Absolute Values: PEAK INVERSE PLATE VOLTAGE

PEAK PLATE CURRENT PER PLATE . . . 60 max. ma DC OUTPUT CURRENT PER PLATE. . 10 max. ma PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. . 120 max. volts Heater positive with respect to cathode. . volts 120 max. Typical Operation: The two units may be used separately or in parallel Heater Voltage . . volts . . 13.5

<sup>O</sup>: See next page.

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ELECTRON TUBE DIVISION

TENTATIVE DATA



### TWIN DIODE

AC Plate Voltage Minimum Total Ef Impedance per DC Output Curren	per Plate (RMS fective Plate-S Plate t per Plate	upply	· · 117 · · 300 · · 9		ohms ma
O With external sh test.	ield JETEC No.316	connected	to cathod	e of unit	under
CHARACTERI	STICS RANGE VAL	UES FOR E	QUIPMENT	DESIGN	
Heater Current. Plate Current pe Heater-Cathode I (Each unit):	er Plate Leakage Current	Note 1.1,2	Min. 0.143 ( 15	∦ax. ).167 _	amp ma
Heater negative respect to of Heater positive respect to of Leakage Resistant Plate to all of	ve with cathode ve with cathode nce: other electrodes	. 1,3 . 1,3	-	5	µа µа
Note 1: With ac or Note 2: With plate connected Note 3: With 100 vo Note 4: With plate trodes of b	dc heater volts = volts = 5 and e to ground. lts dc between hea 300 volts negativ oth units tied tog	13.5. lectrodes ter and cat ve with res ether.	of unit t thode. spect to a	not under all other	• test elec-
SPE Heater-Cycling L	CIAL RATINGS & ife Performance	PERFORMAN	CE DATA		
This test is production run operation is a volts = 17 cyc	performed on a 1. A minimum o pplied under the led one minute	sample lo of 2000 cy e followin on and fou	ot of tu veles of g condit ir minute	bes from intermi ions: f s off, f	n each ttent heater 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.

#### 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 current.

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ELECTRON TUBE DIVISION

TENTATIVE DATA



92CS-9774

ELECTRON TUBE DIVISION





### SHARP-CUTOFF PENTODE

7-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. Useful as if or rf amplifier at frequencies up to 45 Mc.

GENERAL DATA
Electrical:
Heater, for Unipotential Cathode: Voltage range 12 to 15 ac or dc volts Current (Approx.) at 13.5 volts 0.15
Without With
External External
Shield Shield <sup>0</sup>
Grid No.1 to plate 0.02 max. 0.01 max. μμf Grid No.1 to all other
electrodes except plate 6.5 6.5 μμf Plate to all other electrodes
except grid No.1 2 3 μμ/f
Characteristics, Class A, Amplifier:
Heater Voltage       13.5       volts         Plate-Supply Voltage       200       volts         Grid No.3 (Suppressor Grid)       Connected to cathode at socket         Grid-No.2 (Screen-Grid) Supply Voltage       150       volts         Cathode Resistor       180       ohms         Plate Resistance (Approx.)       0.6       megohm         Transconductance       9.5       ma         Grid-No.2 Current       2.8       ma         Grid-No.1 (Control-Grid) Voltage (Approx.)       2.8       ma
for plate $\mu a = 100 \dots -7$ volts
Operating Position
Pin 1-Grid No.1 Pin 2-Cathode Pin 3-Heater Pin 4-Heater Pin 5-Plate Pin 5-Plate Pin 6-Grid No.2 Pin 7-Grid No.3, Internal Shield

<sup>O</sup> With external shield JETEC No.316 connected to cathode.

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ELECTRON TUBE DIVISION

TENTATIVE DATA 1


# SHARP-CUTOFF PENTODE

### AMPLIFIER - Class A

Maximum Ratings, Absolute Values:

1050

GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts. 0.5 max. watt For grid-No.2 voltages between 165 volts and 330 volts. . . See Grid-No.2 Input Rating Chart

Heater positive with respect to cathode. 120 max. volts

### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

1		Note	Min.	Max.	
Heater C	urrent	1	0.138	0.164	amp
Transcon	ductance	1,2	5000	7400	µmhos
Plate Cu	rrent	1,3	6.5	12.5	ma
Grid-No.	2 Current	1,3	1.6	4	ma
Reverse	Grid-No.1 Current	1,4	-	-1	μa
Heater-C	athode Leakage Current:				
Heater	negative with				
resp	ect to cathode	1,5		20	μa
Heater	positive with			~~~	
resp	ect to cathode	1,5	-	20	μa
Leakage	Resistance:				
Betwee	n grid-No.1 and all				
otne	r electrodes tied	1 6	50		magaahma
Rotwoo	n plate and all other	1,0	50		megonins
elec	trodes tied together	1 7	50	_	megohms
Cicc	crodes cred together	±,,,	00		negerine
Note 1:	With ac or dc heater volts = 1	13.5.			
Note 2:	With dc plate-supply volts =	200, gr	id-No.2 s	supply vo	olts = 150,
	grid No.3 connected to cath (ohms) = 180, and cathode-bypa	ode at ass capa	socket, acitor (µ	f) = 1000	resistor 0.
Note 3:	With dc plate-supply volts = 2 grid No.3 connected to cathod	200, gri e at so	d-No.2 s cket, and	upply vo d cathode	lts = 150, e resistor
	(ohms) = 180.				
Note 4:	With dc plate volts = 200, g connected to cathode at socket	grid-No t, and g	.2 volts grid-No.1	= 150, volts =	grid No.3 -1.5.
Note 5:	With 100 volts dc between heat	ter and	cathode.		
Note 6:	With grid-No.1 100 volts neg electrodes tied together.	gative v	with res:	pect to	all other
Note 7:	With plate 300 volts negative trodes tied together.	e with r	respect t	o all ot	her elec-
					1

ELECTRON TUBE DIVISION



## SHARP-CUTOFF PENTODE

## SPECIAL TESTS & 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 = 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-supply volts = 200, grid No.3 connected to cathode, grid-No.2 volts = 150, grid-No.1 volts = -2, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 gat 25 cps. In this test, the rms output voltage must not exceed 250 millivolts.

### 500-Hour Intermittent Life Performance:

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









# MEDIUM-MU TWIN TRIODE

#### 9-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. Useful as an rf amplifier in directcoupled cathode-drive circuits at frequencies up to 200 Mc.

## GENERAL DATA

Electrical:			
Heater, for Unipotential Cathodes: Voltage range 12 to 15 Current (Approx.) at		ac or dc	volts
13.5 volts 0.18 Direct Interelectrode Capacitances: <sup>0</sup>	* * * *	• • • •	amp
U	nit No.1	Unit No.	2
Grid to plate	1.2	1.2	μµf
and heater	2.6	-	μμf
shield and heater	1 2	-	nuf
Plate to cathode	0.12	0.12	pipe i
Cathede te bester	2.6	0.12	pppi
	2.0	2.1	μμι
and heater	-	5	μµf
Plate to grid, internal shield,			
Plate of unit No.1 to plate of	-	2.2	μμ†
unit No.2	0.01	max.	μµf
Plate of unit No.2 to plate and			
grid of unit No.1	0.024	max.	μµf
Characteristics, Class A <sub>l</sub> Amplifier (	Each Unit	):	
Heater Voltage	1	3.5	volts
Plate-Supply Voltage		150	volts
Cathode Resistor		220	ohms
Amplification Eactor	1 11	36	011110
Plate Resistance (Approx.)		300	ohme
Transconductance		800	umbos
Plate Current	• • •	10	ma

## Mechanical:

Operating Position							8										. A	ny
Maximum Overall Length .																2-3	3/1	6"
Waximum Seated Length															1-	-15	5/1	6"
Length, Base Seat to Bulb	T	op	(1	X	= 1	ud	ing	1	ti	p)	. 1	1-9	91	16	п ;	± 3	3/3	2"
Diameter											0.	. 7	50		to	0	.87	5"
Dimensional Outline										See	(	Ger	1e	ra	l :	Sec	ti	on
Bulb																Te	5-1	12

<sup>O</sup> With external shield JETEC No.315 connected to pin 9.

Grid Voltage (Approx.) for plate  $\mu a = 10$ .

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TENTATIVE DATA 1

volts



# MEDIUM-MU TWIN TRIODE

Base. . . . . . . . .Small-Button Noval 9-Pin (JETEC No.E9-1) Basing Designation for BOTTOM VIEW. . . . . . 9AJ

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



1051



Pin 6 - Plate of Unit No.1 Pin 7-Grid of Unit No.1 Pin 8-Cathode of Unit No.1 Pin 9-Internal Shield

## AMPLIFIER - Class A,

Values are for Each Unit

## Maximum Ratings, Absolute Values:

PLATE VO	LTAGE .													275	max.	volts
PLATE DI	SSIPATI	ON	x x	÷			5.			÷.	•		ā.	2.2	max.	watts
PEAK HEA	TER-CAT	HOD	DE VO	DL	TA(	GE :										
Heater	negati	ve	with	n I	res	spe	ect	1	to	Ca	ath	100	le	150	max.	volts
Heater	positi	ve	with	n I	res	spe	ect	1	to	Ca	ath	100	le	150	max.	volts

## Maximum Circuit Values:

Grid-Circuit Res	sistance						÷,		$\mathbf{\hat{k}}_{i}$			0.5	max.	megohm
------------------	----------	--	--	--	--	--	----	--	------------------------	--	--	-----	------	--------

## CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Values are	for	Each	Unit	Unless	Otherwise	Specified
------------	-----	------	------	--------	-----------	-----------

Note	Min.	Max.	
1	0.165	0.195	amp
			1
2	2.05	3.15	μμf
0			
2	4.1	5.9	μμτ
0	4 0	0 5	c
2	1.9	2.5	μμτ
1,3	26	46	
1,4	7	13	ma
1,3	5800	7800	µmhos
1,5	1000	-2	μa
4 0		20	
1,6	-	20	μa
4 0		00	
1,6	-	20	μa
	Note 1 2 2 1,3 1,4 1,3 1,5 1,6 1,6	Note Min. 1 0.165 2 2.05 2 4.1 2 1.9 1,3 26 1,4 7 1,3 5800 1,5 - 1,6 - 1,6 - 1,6 -	Note Min. Max.   1 0.165 0.195   2 2.05 3.15   2 4.1 5.9   2 1.9 2.5   1,3 26 46   1,4 7 13   1,3 5800 7800   1,5 - -2   1,6 - 20

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TENTATIVE DATA 1 RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



## MEDIUM-MU TWIN TRIODE

			Note	Min.	Max.	
Leaka Be	age twee elec	Resistance: en grid and all other strodes of both units				
Be	tied	d together en plate and all other	1,7	50		megohms
	tie	d together	1,8	50	-	megohms
Note	1:	With ac or dc heater volts =	13.5.			
Note	2:	With external shield JETEC No	.315 C	onnected	to pin 9	•
Note	3:	With dc plate-supply volts = 2 and cathode-bypass capacito separately. Electrodes of un ground.	150, ca or (μf) nit not	thode re = 1000 under t	sistor (o . Each u est are c	hms) = 220, unit tested connected to
Note	4:	With dc plate-supply volts = 220. Each unit tested separatest are connected to ground	150, a ately.	nd catho Electro	de resist desofuni	or (ohms) = t not under
Note	5:	With dc plate-supply volts = : and grid resistor (megohms) : with cathode and grid resiste	250, ca = 0.5. prs com	thode re Units a mon to b	sistor (c re testec oth units	hms) = 250, Lin parallel 5.
Note	6:	With 150 volts dc between he	ater an	d cathod	e.	
Note	7:	With grid 100 volts negative of both units tied together.	with re	spect to	all other	electrodes
Note	8:	With plate 300 volts negative of both units tied together.	with re	spect to	all other	electrodes

## 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 = 17 cycled one minute on and four minutes off, heater 180 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: units connected in parallel, heater volts = 13.5, plate-supply volts = 250, grid volts = -8, 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.

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# HIGH-MU TWIN TRIODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. Useful in phase-inverter, resistancecoupled-amplifier, and low-frequency-oscillator applications.

## GENERAL DATA

## Electrical:

Heater, Volta Curre 13. Direct	for Unipotent age range ent (Approx.) a .5 volts Interelectrode	tial Cathoo 12 t at 0.1 e Capacitan	des: o 15 . L55 . nces: <sup>o</sup> .	· · ·	. ac or 	dc volts amp
Grid Grid Plate	to plate to cathode and e to cathode ar	d heater . nd heater.	Un  	it No.1 1.7 1.6 0.46	Unit N 1. 1.6 0.3	0.2 7 μμf 5 μμf 4 μμf
Charac	teristics, Clas	ss A, Ampl	ifier (E	ach Uni	t):	
Heater Plate Grid Vo Amplif Plate Transco Plate Grid Vo µa =	Voltage /oltage ication Factor Resistance (App onductance Current oltage (Approx 10	prox.) .) for pla			13.5 250 -2 100 61000 1650 1.25 -5	volts volts volts ohms μmhos ma volts
Markan					0	
Operat Maximum Length (Exc Diamet Dimens Bulb. Base. Basi	ing Position . n Overall Leng n Seated Length Juding tip) . er ional Outline.  ng Designation	th Bulb Top Small-But for BOTTO	ton Nova	See al 9-Pir	1-9/16' 0.750" t <i>General</i>	Any 2-3/16" 1-15/16" ± 3/32" o 0.875" Section . T6-1/2 No.E9-1) 9EP
Pin Pin Pin Pin Pin	1 - Plate of Unit No.2 2 - Grid of Unit No.2 3 - Cathode of Unit No.2 4 - Heater 5 - Heater 6 - Plate of Unit No.1			Pin 7 Pin 8 Pin 9	- Grid of Unit N - Cathode Unit N - Interna Connec Do Not	do.1 e of do.1 dl tion
<sup>O</sup> : See	next page.					
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# HIGH-MU TWIN TRIODE

AMPL	IF.	IER	-	CI	ass	A	i
------	-----	-----	---	----	-----	---	---

Values are for Each Unit

Maximum Ratings, Absolute Values:

1058

PLATE VOLTAGE	2		÷		•	•	•	ž	ž	÷	330	max.	volts
GRID VULIAGE.											0	mov	volte
Positive-blas value	•			•							U	max.	VUILS
Negative-bias value											55	max.	volts
PLATE DISSIPATION								3	×.	÷	1	max.	watt
PEAK HEATER-CATHODE VO	DL	TA(	GE :										
Heater negative with	1	re	spe	ec	t t	0	ca	th	bd	е.	120	max.	volts
Heater positive with	1.1	re:	spe	ec	t t	0	ca	th	bc	е.	120	max.	volts

## Typical Operation as Resistance-Coupled Amplifier (Each Unit):

See RESISTANCE-COUPLED AMPLIFIER CHART No. 25 at front of Receiving Tube Section

## Maximum Circuit Values:

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

<sup>O</sup> Without external shield.

### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Values are for Each Unit Unless Otherwise Specified

	No	te	Min.	Max.	
Heater Current	• 1	1	0.143	0.167	amp
Ampinitication Factor	· ⊥	, 4	00	1 75	ma
	· 1	, 4	1260	2100	umbool
Pransconductance	· 1	, ८	1300	2100	μinios
Reverse Grid Current (Iotal-	1	2		4	
potnunits)	• 1	,2	-	-1	μa
Heater-Cathode Leakage Current:					
Heater negative with	1	4		20	
Heater and the with	• 1	, 4	-	20	μa
Heater positive with	1	4		20	
respect to cathode	8 - 14	, 4		20	μα
Leakage Resistance.					
between grid and all other					
electrodes of both units	1	c	FO		magaahma
tied together	• +	, Э	50	_	megonins
Between plate and all other					
electrodes of both units	4	C	50		
tied together	. 1	,6	50	-	megonms
Note 1: With ac or dc heater volts =	13.5				
Note 2: With dc plate volts = 250, a	nd d	lc gri	d volts	= -2.	Each unit
tested separately. Electriconnected to ground.	odes	of	unit not	under	test are
Note 3: With dc plate volts = 250, g to both units, and dc grid in parallel.	grid d vo	resis lts	stor (me = -2. l	gohms) = Jnits ar	1 common e tested
		ISION	Т	ENTATIV	E DATA 1



# HIGH-MU TWIN TRIODE

Note 4: With 100 volts dc between heater and cathode.

Note 5: With grid 100 volts negative with respect to all other electrodes of both units tied together.

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

## SPECIAL RATINGS & PERFORMANCE DATA

#### Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 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: units connected in parallel, heater volts = 13.5, plate-supply volts = 250, grid volts = -2, 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.









# MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

9-PIN MINIATURE TYPE

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

## GENERAL DATA

	GENERAL DA			
	Electrical:			
	Heater, for Unipotential Cathodes:			
	Voltage range 12 to 15	j	. ac or d	c volts
	Current (Approx.) at			
	Direct Interelectrode Canacitances:			amp
		Without	With	
		External	Externa	l
2	Triada Units	Shield	Shield	
	Grid to plate	1.7	1.7	uuf
	Grid to cathode and heater .	2.7	2.7	μµf
	Plate to cathode and			
	heater	0.4	1	μµf
	Pentode Unit:	0.01	0.000	
	Grid No.1 to all other	0.01 max.	0.006 ma:	×. μμι
	electrodes except plate	5	5	щf
	Plate to all other			151-5
	electrodes except	0.5	2.4	c
	grid No.1	2.5	3.4	μμ† f
	neater to cathode (Each ant).	2	2	μμ
	Characteristics, Class A, Amplifier	•:		
		Triode	Pentode	
	Heater Voltage	13.5	13.5	volts
	Plate-Supply Voltage	150	250	volts
	[Grid-No.2 (Screen-Grid)		110	
	Cathode Resistor	56	68	ohms
	Amplification Factor	40	-	onno
	Plate Resistance (Approx.)	4700	400000	ohms
	Plate Current	8500	5200	µmhos
	Grid-No.2 Current.	- 10	3.5	ma
	Grid-No.1 Voltage (Approx.) for			
	plate µa = 10	-12	-10	volts
	Mechanical:			
	Operating Position			Any
8	Maximum Overall Length	• • • • •		2-3/16"
	length. Base Seat to Bulb Top (Exclu	ding tip)		-13/16" + 3/32"
	Diameter	· · · · · ·	0.750" to	0.875"
	Dimensional Outline	See	e General .	Section
	O, See next page.			

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ELECTRON TUBE DIVISION



# MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

CHARACTERISTICS RANGE VALUE	ES FOR	EQUIPME	NT DESI	GN
	Note	Min.	Max.	
Heater Current	1 1,2 1,3 1,4 1,5 1,5	0.179 6800 12.7 3900 7.5 2.2	0.211 10200 23.3 6500 12.5 4.8	amp μmhos ma μmhos ma ma
(Total—both units) Heater-Cathode Leakage Current (Each unit):	1,6	-	-1.5	μα
Heater negative with respect to cathode Heater positive with	1,7	-	5	μa
respect to cathode Leakage Resistance (Each unit): Between grid No.1 and all other electrodes of both	1,7	-	5	μα
units tied together Between plate and all other electrodes of both units	1,8	50	-	megohms
tied together	1,9	50	-	megohms
Note 1: With ac or dc heater volts = Note 2: With dc plate-supply volts = 56, and cathode-bypass capaci	13.5. = 150; tor (µf)	cathode ) = 1000.	resistor	(ohms) =
Note 3: With dc plate-supply volts = 56.	150, and	d cathode	resisto	r (ohms) =
Note 4: With dc plate-supply volts = cathode resistor (ohms) = 6 $(\mu f)$ = 1000.	250, gr 8, and	id-No.2 s cathode-	upply vo -bypass	lts = 110, capacitor
Note 5: With dc plate-supply volts = and cathode resistor (ohms) =	250, gr 68.	id-No.2 s	upply vo	lts = 110,
Note 6: With triode dc plate volts = grid-No.2 volts = 110, grid- and grid-No.1 resistor (megoh	150, pe No.1 vo ms) = 0	ntode dc olts = -1 5 for ea	plate vo .5 on bo ch unit.	lts = 250, oth units,
Note 7: With 50 volts dc between heat	er and o	cathode.		
Note 8: With grid No.1 100 volts ne electrodes of both units tied	gative togeth	with res er.	pect to	all other
Note 9: With plate 300 volts negative w of both units tied together.	ith res	pect to al	1 other	electrodes

## 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 = 17 cycled one minuteon 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.

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ELECTRON TUBE DIVISION

TENTATIVE DATA 2

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2050



## MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

#### Low-Frequency Vibration Performance:

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

Triode Unit:

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Heater volts = 13.5, plate-supply volts = 150, grid volts = -1.5, 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.

Pentode Unit:

Heater volts = 13.5, plate-supply volts = 250, grid-No.2 volts = 110, grid-No.1 volts = -1.5, 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 250 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.





RATION OF AMERICA, HARRISON, NEW JERS







## MEDIUM-MU TRIODE-POWER PENTODE

9-PIN MINIATURE TYPE

For use in mobile communications equipment operating from 6-cell storage-battery systems. The pentode unit is useful in class-C-amplifier and frequency-multiplier applications at frequencies up to 40 Mc. The triode unit is useful as a reactance modulator.

	GENERAL DAT	A		
Electrical:				
Heater, for Unipotent Voltage range Current (Approx.)	tial Cathodes: 12 to 15 at		. ac or dc	volts
Direct Interelectrod	e Capacitances: <sup>c</sup>	· · · ·		• • cump
Triode Unit: Grid to plate			2.2	μµf
Plate to cathode	and heater and heater		0.22	μμτ μμf
Pentode Unit: Grid No.1 to pla	te	. • (	.044	μµf
electrodes exc Plate to all oth	ept plate er electrodes		7.1	μμf
except grid No	.1`		2.5	μµf f
Pentode grid No.1	to triode plate.	. (	).022 max.	μμſ
Pentode plate to t	riode plate		0.16 max.	μμf
Characteristics, Cla	ss A <sub>l</sub> Amplifier:	:		
	1	Criode Unit	Pentode Unit	
Heater Voltage Plate-Supply Voltage Grid-No 2 (Screen-Gr	 	13.5 150	13.5 200	volts volts
Supply Voltage Cathode Resistor		150 40	125 82	volts ohms
Plate Resistance (Ap Transconductance	prox.)	8200 4900	150000 7000	ohms µmhos
Plate Current Grid-No.2 Current Grid-No.1 Voltage (A		- 9	15 3.4	ma ma
for plate $\mu a = 100$		-6.5	-8	volts
Mechanical:				
Operating Position Maximum Overall Leng Maximum Seated Lengt Length, Base Seat to B Diameter	th h. ulb Top (Exclud	ing tip).	1-9/16" : 0.750" to	Any 2-3/16" -15/16" ± 3/32" 0.875"
Bulb	• • • • • • • •		General S	T6-1/2
11-00	ELECTRON TURE DI	VISION	IENIALIVE	UATA 1





# MEDIUM-MU TRIODE-POWER PENTODE

## RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy<sup>®</sup> and

RF POWER AMPLIFIER - Class C FM Telephony

Pentode Unit

Maximum CCS® Ratings, Absolute Values:

	DC PLATE VOLTAGE DC GRID-No.2 (SCREEN-GRID) VOLTAGE DC GRID-No.1 (CONTROL-GRID) VOLTAGE:	300 150	max. max.	volts volts
ľ	Negative-bias value	50	max.	volts
	Positive-bias value	0	max.	volts
Ir	C PLATE CURRENT	20	max.	ma
	C GRID-No 2 CURRENT	7	max.	ma
ł	C GRID-No.1 CURRENT	3	max.	ma
10	RID-No 2 INPUT	0.8	max.	watt
li	PLATE DISSIDATION	2 75	max.	watte
	PEAK HEATER_CATHODE VOLTAGE	2.10	max.	walls
ľ	Heater negative with respect to cathode	120	may	volte
	Heater nositive with respect to cathode.	120	max.	volte
	neater positive which respect to cathode.	120	max.	VUILS
	Typical Operation:			1.0
	At frequencies up to 40	Mc		
ł	Heater Voltage	13.5	13.5	volts
1	DC Plate Voltage	250	300	volts
1	C Grid-No 2 Voltage 85	105	125	volts
1	C Grid-No 1 Voltage -7	-9	-11	volts
	C Plate Current 11	15	20	ma
li	C Grid-No 2 Current 3.2	4 5	6	ma
li	C Grid-No 1 Current (Approx) 0.9	1 2	1 6	ma
1	(Approx.)	15	25	mw
	Power Output	2.1	3.5	watts
	Any imum Circuit Values:		1.0	
ľ	Maximum circuit values.			
1	Grid-No.1-Circuit Resistance	0.1	max.	megohm
	<sup>D</sup> Without external shield.			
	Key-down conditions per tube without amplitud modulation essentially negative maybe used if audio-frequency envelope does not exceed 115% o	e modulati the positi f the carri	on. A ve pea er cor	mplitude ak of the aditions.
	Continuous Commercial Service.			

## CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

· 725	Note	Min.	Max.	
Heater Current	1	0.26	0.3	amp
(Triode unit)	1,2	32 3800	48	umbos
Plate Current (Triode unit)	1,3	6.5	11.5	ma
(ransconductance (Pentode unit).	1,4	5200	8800	µmnos

ELECTRON TUBE DIVISION

TENTATIVE DATA 2



## MEDIUM-MU TRIODE-POWER PENTODE

	Note	Min.	Max.	
Plate Current (Pentode unit)	1,5	11.2	22.8	ma
Grid-No.2 Current		19 14 15 113 EX		
(Pentode unit)	1,5	2.2	4.6	ma
Direct Interelectrode				
Crid No 1 to plate				
(Pentode unit)	6	0 035	0.053	uuf
Reverse Grid-No.1 Current	0	0.0/0	0.007	1010
(Total-both units)	1,7	-	-2	μa
Heater-Cathode Leakage Current				
(Each unit):				
Heater negative with	1 0		20	
Heater positive with	1,0		20	μα
respect to cathode	18		30	ща
leakage Resistance (Each unit):	1,0		10	
Between grid No.1 and all				
other electrodes of both				
units tied together	1,9	50		megohms
Between plate and all				
other electrodes of both	1 10	EO		manahma
units tied together	1,10	50	_	megorims
Note 1: With ac or dc heater volts =	13.5.			
Note 2: With dc plate-supply volts 150, and cathode-bypass capa	= 150, citor ()	cathode uf) = 100	resistor	(ohms) =
Note 3: With dc plate-supply volts = 150.	150, a	nd cathoo	le resist	or (ohms) =
Note 4: With dc plate-supply volts 125, cathode resistor (ohms) $(\mu f) = 1000.$	= 200, = 82, a	grid-No nd cathod	.2 suppl le—bypass	y volts = capacitor
Note 5: With dc plate-supply volts	= 200,	grid-No	.2 suppl	y volts =
Note 6: Without external shield.				1.1.1.1.1.1.1
Note 7: With pentode dc plate-supp	ly volt	s = 150,	grid-No	.2 supply
volts = 180, pentode cathor grid-No.1 resistor (megohms) = 180, triode cathode resis resistor (megohms) = 0.5.	de resis = 1, t stor (of	stor (ohm riode do nms) = 75	ns) = 120 plate-su 5, and tr	pply volts iode grid
Note 8: With 100 volts dc between he	eater an	d cathode		
Note 9: With grid No.1 100 volts ne electrodes of both units tie	egative ed toget	with res her.	spect to	all other
Note 10: With plate 300 volts nega electrodes of both units tie	ative w ed toget	ith resp her.	ect to	all other
SPECIAL RATINGS & F	PERFORM	ANCE DA	TA	

### 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 = 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.

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ELECTRON TUBE DIVISION



# MEDIUM-MU TRIODE-POWER PENTODE

#### Low-Frequency Vibration Performance:

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

Triode Unit:

Heater volts = 13.5, plate-supply volts = 150, grid volts = -1.5, 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.

Pentode Unit:

Heater volts = 13.5, plate-supply volts = 200, grid-No.2 volts = 125, grid-No.1 volts = -2, 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 250 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 eqidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate dissipation and grid-No.2 input.
















### 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     Current (Approx.) at     13.5 volts.   0.21     Direct Interelectrode Capacitances: <sup>0</sup> Grid No.1 to plate   0.7 max. μμ     Grid No.1 to all other electrodes     except plate   8     Plate to all other electrodes     except grid No.1     except grid No.1
Mechanical:
Operating Position
Pin 1-Grid No.2 Pin 2-No Connec- tion Pin 3-Grid No.1 Pin 4-Heater Pin 5-Heater Pin 5-Heater Pin 5-Heater Pin 5-Grid No.2 Pin 6-Grid No 1 Pin 7-Cathode, Grid No.2 Pin 8-Grid No.2 Pin 9-Plate
AMPLIFIER - Class A
Maximum Ratings Absolute Values
PLATE VOLTAGE   345 max.   volt     GRID-No.2 (SCREEN-GRID) VOLTAGE   310 max.   volt     GRID-No.2 INPUT   2 max.   watt     PLATE DISSIPATION   9 max.   watt     PEAK HEATER-CATHODE VOLTAGE:   120 max.   volt     Heater negative with respect to cathode   120 max.   volt
Typical Operation and Characteristics:
Heater Voltage
Without external shield.
ELECTRON TUBE DIVISION



### BEAM POWER TUBE

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     MaxSignal Grid-No.2 Current   7.5   ma     Plate Resistance (Approx.)   60000   ohms     Transconductance   4200   µmhos     Load Resistance   5000   ohms     Total Harmonic Distortion   7   %     MaxSignal Power Output   3   watts	
Maximum Circuit Values: Grid-No.1-Circuit Resistance:	
For tilxed-blas operation	
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN	
Note Min. Max.	
Heater Current.   1   0.19   0.23   amp     Transconductance.   1,2   3100   5800   μmhos     Plate Current.   1,2   26   45   ma     Grid-No.2 Current.   1,2   -   6.5   ma     Reverse Grid-No.1 Current.   1,3   -   -   μa     Power Output   14   2.4   -   water	
Heater-Cathode Leakage Current: Heater negative with	
respect to cathode 1,5 – 50 μa Heater positive with	
respect to cathode 1,5 – 50 μa Leakage Resistance: Between grid No.1 and all other	
electrodes tied together 1,6 50 - megohms Between plate and all other	
electrodes tied together 1,7 50 - megohms	
Note 1: With ac or dc heater volts = 13.5.	
Note 2: With dc plate volts = 200, grid-No.2 volts = 200, grid-No.1 volts = -10, and grid No.3 connected to cathode.	
Note 3: With grid-No.1 resistor (megohms) = 0.1.	6
Note 5: With 100 volts dc between heater and cathode.	
Note 6: With grid No.1 100 volts negative with respect to all other electrodes tied together.	
Note 7: With plate 300 volts negative with respect to all other electrodes tied together.	
SPECIAL RATINGS & PERFORMANCE DATA	1
Heater-Cycling Life Performance:	

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

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ELECTRON TUBE DIVISION



### BEAM POWER TUBE

operation is applied under the following conditions: heater volts = 17 cycled one minuteon 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.







RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY





### **Power Pentode**

### 9-PIN MINIATURE TYPE

### GENERAL DATA

### Electrical:

Heater, for Unipotential Cathode:	
Voltage (AC or DC) 6.3	volts
Current 0.76	amp
Direct Interelectrode Capacitances (Approx.):a	
Grid No.1 to plate 0.5	μµt
Grid No.1 to cathode & grid No.3, grid No.2, and heater 10.8	μµf
grid No.2, and heater 6.5	μµf
Grid No.1 to heater 0.25	$\mu\mu^{\dagger}$
Characteristics, Class A, Amplifier:	
Plate Voltage	volts
Grid-No.2 Voltage	volts
Grid-No.1 Voltage	volts
My Eactor Grid No 2 to Grid No 1 195	

sistance	(	Ap	p	ro	х.	).			ġ.	÷	÷	•			÷		40000	ohms
ductance									8	x	÷				x		11300	µmhos
rrent .				÷	×.					÷.	÷	•			8	8	48	ma
2 Curren	t	•		8	ŝ				•					•			5.5	ma
	sistance ductance rrent . 2 Curren	sistance ( ductance. rrent 2 Current	sistance (Ap ductance rrent 2 Current .	sistance (App ductance rrent 2 Current	sistance (Appro ductance rrent 2 Current	sistance (Approx. ductance rrent 2 Current	sistance (Approx.). ductance rrent 2 Current	sistance (Approx.) ductance rrent 2 Current	sistance (Approx.) ductance rrent 2 Current	sistance (Approx.) ductance rrent	sistance (Approx.) ductance rrent	sistance (Approx.) ductance rrent	sistance (Approx.)	sistance (Approx.).   40000     ductance.   11300     rrent   48     2 Current   5.5				

### Mechanical:

Operatir	g Pc	sit	ic	n.		2							ġ.				2	×.		4				Any
Maximum	Över	ral	1 1	eng	gtł	۱.			÷			•	•			÷						3-	-1	/16"
Maximum	Seat	ted	Le	engt	th																1	2-:	13	/16"
Length,	Base	e Si	ea	t to	Bu	Jł	T	op	(1	Exc	211	bL	in	g	ti	p)		2-	-7,	16	5"	±	3	/32"
Diameter	r																	0.	750	)"	t	0 1	0.1	875"
Dimensio	onal	Ou	t1	ine	÷.					2	ŝ,			۰.		S	ee	Ge	ne	ra	l	Se	c	tion
Bulb					÷																		T6-	-1/2
Base						Sma	11	1-6	Bu	tte	on	No	VC	al	9	-P	in	(.	JE	DEC	3	No	. E	9-1)
Basin	g De:	sig	na	tio	n :	fo	r	BO	T	OM	٧	IEN	Ν.											9CV

Pin 1- Internal Connection-Do Not Use Pin 2-Grid No.1 Pin 3- Cathode, Grid No.3



Pin 4-Heater Pin 5-Heater Pin 6-Same as Pin 1 Pin 7-Plate Pin 8-Same as Pin 1 Pin 9-Grid No.2

### PUSH-PULL AF POWER AMPLIFIER - Class AB

Maximum Ratings, Design-Center Values:

PLATE VOLTAGE			•	2		400 max. volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	5	•				300 max. volts
CATHODE CURRENT			•			65 max. ma
PLATE DISSIPATION		•		÷	8	12 max. watts
ZERO-SIGNAL GRID-No.2 INPUT		•	•	÷		2 max. watts



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MAX.—SIGNAL GRID—No.2 INPUT 4 max. watts PEAK HEATER—CATHODE VOLTAGE: Heater negative with respect to cathode 100 max. volts Heater positive with respect to cathode 100 max. volts	
Heater positive with respect to cathode 100 max. volts	
the second	
Typical Operation:	
Values are for 2 tubes	
Plate Voltage.   400   volts     Grid-No.2 Voltage.   300   volts     Grid-No.1 Voltage.   -15   volts     Peak AF Grid-No.1 Voltage.   14.8   volts     Zero-Signal Plate Current.   15   ma     MaxSignal Plate Current.   105   ma     Zero-Signal Grid-No.2 Current.   1.6   ma     MaxSignal Grid-No.2 Current.   25   ma     Effective Load Resistance   5   ma	
(Plate to plate) 8000 ohms	
Total Harmonic Distortion	
max.—Signal Power Output	
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance: For fixed-bias operation 0.3 max. megohm	
Grid-No.1-Circuit Resistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB:	
Grid-No.1-Circuit Resistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB <sub>1</sub> Grid No.2 of each tube connected to tab	
Grid-No.1-Circuit Resistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB <sub>1</sub> Grid No.2 of each tube connected to tap on plate winding of output transformer	
Grid-No.1-Circuit Resistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB <sub>1</sub> Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values:	
Grid-No.1-Circuit Resistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB <sub>1</sub> Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID)	
Grid-No.1-Circuit Resistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB <sub>1</sub> Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
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Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB <sub>1</sub> Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
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Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance: For fixed-bias operation 0.3 max. megohm PUSH-PULL AF POWER AMPLIFIER — Class AB1 Grid No.2 of each tube connected to tap on plate winding of output transformer Maximum Ratings, Design-Center Values: PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	
Grid-No.1-Circuit Kesistance:     For fixed-bias operation     For fixed-bias operation     PUSH-PULL AF POWER AMPLIFIER     Grid No.2 of each tube connected to tap on plate winding of output transformer     Maximum Ratings, Design-Center Values:     PLATE AND GRID-No.2 (SCREEN-GRID)     SUPPLY VOLTAGE     PLATE DISSIPATION     12 max.     watts     ZERO-SIGNAL GRID-No.2 INPUT.     2 max.     Watts     PEAK HEATER-CATHODE VOLTAGE:     Heater negative with respect to cathode.     100 max.   volts     Typical Operation:     Values are for 2 tubes     Plate Supply Voltage     Plate Supply Voltage     Cathode Resistor     Actioned Resistor     Actioned Resistor     Amax     Values are for 2 tubes     Plate Supply Voltage     MaxSignal Cathode Current     Amax     Values     Supplate to plate)     Optime     Optime     Optime     Values     Voltage     Values     Values <td></td>	
Grid-No.1-Circuit Kesistance:     For fixed-bias operation     For fixed-bias operation     PUSH-PULL AF POWER AMPLIFIER     Grid No.2 of each tube connected to tap on plate winding of output transformer     Maximum Ratings, Design-Center Values:     PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE     SUPPLY VOLTAGE     CATHODE CURRENT     65 max.     ma     PLATE DISSIPATION.     12 max.     watts     ZERO-SIGNAL GRID-No.2 INPUT.     2 max.     Watts     PEAK HEATER-CATHODE VOLTAGE:     Heater negative with respect to cathode.     100 max.   volts     Typical Operation:     Values are for 2 tubes     Plate Supply Voltage.     Pate Supply Voltage.     Cathode Resistor     Cathode Resistor     2 carbode Resistor     Peak AF Grid-No.1 Voltage.     Peak AF Grid-No.1 Voltage.     Peak AF Grid-No.1 Voltage.     Peak AF Grid-No.1 Voltage.     Plate to plate)     Plate to plate)     Pate to plate)     Pate to plate)     MaxSignal Cathode Curr	

-Indicates a change.



### Maximum Circuit Values:

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

- **a** Without external shield.
- b Obtained from taps on the primary winding of the putput transformer. The taps are located on each side of the center-tap (B+) so as to supply 43 per cent of the plate signal voltage to grid No.2 of each output tube.



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Electron Tube Division

Harrison, N. J.







## **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

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	$6.3 \pm 10\%$	volts
Current	0.35	amp
Direct Interelectrode Capacitances		P
(Approx ).a		
Grid No 1 to all other electrodes		
avenut plata	7 5	f
Chid No 1 to deflocting	1.5	μμι
alastrade No. 1	0.015	f
Crid No.1 to deflecting	0.015	pipe 1
Grid NO.1 to deflecting	0.015	f
	0.015	μμi
Grid-No.1 to plate No.1	0.003	μμi
Grid No.1 to plate No.2	0.003	μμτ
Plate No.1 to all other electrodes		<i>c</i>
except deflecting electrode No.1	0.8	μμt
Plate No.2 to all other electrodes		
except deflecting electrode No.2	0.8	μµf
Plate No.1 to plate No.2	0.3	μµf
Deflecting electrode No.1 to all		
other electrodes except plate No.1.	4.6	μµf
Deflecting electrode No.2 to all		
other electrodes except plate No.2.	4.6	μµf
Deflecting electrode No.1		
to plate No.1	4	μµf-
Deflecting electrode No.2		
to plate No.2	4	μµf-
Deflecting electrode No.1 to		
deflecting electrode No.2	1.4	μµf
Characteristics, Class A <sub>1</sub> Amplifier:		
Plate-No.1 Supply Voltage	150	volts
Plate-No.2 Supply Voltage	150	volts
Deflecting-Electrode-No.1 Supply		
Voltage	25	volts
Deflecting-Electrode-No.2 Supply		
Voltage	25	volts
Grid-No.2 Supply Voltage	175	volts
Cathode Resistor	150	ohms
Total Beam Current (Plate-No.1		
current plus plate-No.2 current)	8.5	ma-
Grid-No.2 Current	2.1	ma.

- Indicates a change.

Electrical:

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Transconductance: Grid No.1 to both plates connected together	0
Length, Base Seat to Bulb lop (Excluding tip) 2" ± 3/32" Diameter 0.750" to 0.8750" Dimensional Outline	0
Pin 1 - Cathode, Internal Shield Pin 2 - Grid No.2 Pin 3 - Grid No.1 Pin 4 - Heater Pin 5 - Heater BALANCED MODULATOR Pin 1 - Plate No.2 Pin 7 - Plate No.1 Pin 8 - Deflecting Electrode No.2 Pin 9 - Deflecting Electrode No.1	
Maximum Patings Abastute Konigur 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. watt	0
PLATE-No.2 DISSIPATION 1.5 max. watts PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	C
Typical Operation:	10
In accompanying balanced-modulator cir-	
cuit utilizing separate excitation <sup>e</sup>	
Plate Voltage (Each plate) 150 volts	
(Approx., each electrode)	
-Indicates a change	



	Cathode Resistor			1200	ohms	
)	Electrode Voltagef Peak-to-Peak RF Grid-No.1 Voltage Plate Current (Each plate)	:	•	2.8 10 1.5	volts volts ma	
	Grid-No.2 Current			0.75	ma	
	Plate-to-Plate Load Impedance (Approx.)			5000	ohms	
Ń	Sideband Output Voltage			4	volts	
7	Carrier Suppression <sup>9</sup>	•		60	db 🗲	
	Fourth Order Distortion <sup>9</sup>	•	•	-47	db	
	Fourth-order Distortions	•	•	-40	UD.	
	Maximum Circuit Values:					
)	Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation Deflecting-Electrode-Circuit Resistance (Per deflecting		•	0.5 2.2	max. megohm max. megohms	
	electrode)			0.05	max. megohm	

### BALANCED MIXER

### Maximum Ratings, Absolute-Maximum Values:

	PLATE-No.1 VOLTAGE.   300     PLATE-No.2 VOLTAGE.   300     DEFLECTING-ELECTRODE-No.1 VOLTAGE.   ±100     DEFLECTING-ELECTRODE-No.2 VOLTAGE.   ±100     GRID-No.2 (SCREEN-GRID) VOLTAGE.   250     GRID-No.2 INPUT.   0.5     PLATE-No.1 DISSIPATION.   1.5     PLATE-No.2 DISSIPATION.   1.5     PLATE-No.2 DISSIPATION.   1.5     PLATE-No.2 DISSIPATION.   1.5     PLATE recathode.   1.80     Heater negative with   180     respect to cathode.   180	max. max. max. max. max. max. max.	volts volts volts volts volts watt watts watts volts volts
	Typical Operation:		
	In accompanying balanced-mixer cir- cuit utilizing separate excitation <sup>®</sup>		
i	Plate Voltage (Each plate) 150		volts
	(Approx., each electrode)		volts volts ohms
)	Peak-to-Peak RF Grid-No.1 Voltage   8     Peak-to-Peak RF Grid-No.1 Voltage   10     Plate Current (Each plate).   1.5     Grid-No.2 Current   0.75		volts volts ma ma



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Plate-to-Plate Load Impedance (Approx.)	ohms	
Sideband Output Voltage 40 Oscillator Rejection <sup>9</sup>	volts db db db	
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance: For fixed-bias operation 0.5 may For cathode-bias operation 2.2 may	x. megohm x. megohms	
Deflecting-Electrode-Circuit Resistance (Per deflecting electrode) 0.05 max	x. megohm	

<sup>a</sup> Without external shield.

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

- C Defined as the sum of (a) the absolute value of the difference beiween 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 plate value of signal voltage that is required between the flecting electrodes to produce peak-to-peak signal current at either plate equal to 80% of the total beam current.
- <sup>a</sup> The dc component must not exceed 100 volts.
- e Operation with self-excitation and cathode resistor of 300 ohms is similar to operation with separate excitation.
- To either deflecting electrode. The other deflecting electrode is bypassed.
- 9 Referred to single-sideband output voltage.

### OPERATING CONSIDERATIONS

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

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

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



### BALANCED-MODULATOR CIRCUIT With Separate Excitation



92CS-10258

- $\begin{array}{l} C_1:\ 0.001\ \mu\text{f}\\ C_2:\ 0.22\ \mu\text{f}\\ C_3:\ 0.001\ \mu\text{f}\\ C_5:\ C_2:\ 0.0033\ \mu\text{f}\\ C_7:\ 0.1\ \mu\text{f}\\ C_7:\ 0.1\ \mu\text{f}\\ C_8:\ C_9:\ 0.033\ \mu\text{f}\\ C_7:\ 0.1\ \mu\text{f}\\ C_1:\ 0.47\ \mu\text{f}\\ C_1:\ 0.47\ \mu\text{f}\\ R_1:\ 0.47\ \mu\text{gohm}\\ R_2:\ 1200\ ohms\\ R_3:\ R_4:\ 42000\ ohms\\ R_5:\ 47000\ ohms\\ \end{array}$
- R<sub>6</sub>: 12000 ohms R<sub>7</sub>: 47000 ohms R<sub>9</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 NOTE: All resistors 1/2 watt, ± 10% unless specified. All capacitors 400 volts.

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- C<sub>1</sub>: 0.001 μf C<sub>2</sub>: 0.004 μf C<sub>3</sub> C<sub>4</sub>: 0.001 μf C<sub>5</sub>: 0.04 μf C<sub>6</sub>: Split-Stator Tuning Capacitor to Resonate with L<sub>1</sub> C<sub>7</sub> C<sub>8</sub>: 0.04 μf L<sub>1</sub>: Inductor R<sub>1</sub>: 0.47 mgohm R<sub>2</sub>: 1200 ohms R<sub>3</sub> R<sub>4</sub>: 68000 ohms
- R<sub>5</sub>: 0.1 megohm R<sub>6</sub>: 12000 ohms R<sub>7</sub>: Oscillator-Rejection Potentiometer, 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 watt, ± 10%, unless specified. All capacitors 400 volts.

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Electron Tube Division

Harrison, N. J.



### **Beam Power Tube**

9-PIN MINIATURE TYPE

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

### GENERAL DATA

### Electrical:

Heater Characteristics and Ratings:			
Voltage range	12	to 15	volts
Current at heater volts = 13.5	0.360		amp
Peak heater-cathode voltage:			
Heater negative with			
respect to cathode	100	max.	volts
Heater positive with			
respect to cathode	100	max.	volts
Direct Interelectrode Capacitances: <sup>0</sup>			
Grid No.1 to plate	0.15	max.	pf
Grid No.1 to cathode, grid No.3,			
grid No.2, and heater	10.0		pt
Plate to cathode, grid No.3,			
grid No.2, and heater	5.5		pi
al a la			

### Characteristics, Class A<sub>1</sub> Amplifier:

Heater Vol	tage											•		13.5		volts
Plate Volt	tage													250		volts
Grid No.3									. (	201	nne	ect	ted	to cathode	at	socket
Grid-No.2	Volt	age												250		volts
Grid-No.1	Volt	age												-18		volts
Mu-Factor,	Gri	d No	0.2	2 .	to	Gr	ric	1	No.	1				8.7		
Transcondu	ictan	ice.												5300		µmhos
Plate Curr	rent													40		ma
Grid-No.2	Curr	rent									•			3		ma

### Mechanical:

Operating Position. . . . . . . . Any Type of Cathode . . . . . . . . Coated Unipotential . . 2-5/8" Maximum Overall Length. . . . . 2-3/8" Maximum Seated Length . . . . . . . . . Length, Base Seat to Bulb Top (Excluding tip) . 2" ± 3/32" 0.750" to 0.875" Diameter. . . . . . . . . Dimensional Outline See General Section . . T6-1/2 Bulb. . . . . . . Basing Designation for BOTTOM VIEW. . . . . . . 9LK

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



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



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA I 9-63

### AF POWER AMPLIFIER & MODULATOR - Class AB

Maximum CCS<sup>®</sup> Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE						375	max.	volts	
GRID No.3 (SUPPRESSOR GRID)						0	max.	volts	
DC GRID-No.2 (SCREEN-GRID) '	VOL	TAG	Ε.			300	max.	volts	
MAX SIGNAL DC PLATE CURREN	T <sup>IN</sup> .					70	max.	ma	1
MAXSIGNAL PLATE INPUT						21	max.	watts	
MAXSIGNAL GRID-No.2 INPUT	۰.					2	max.	watts	
PLATE DISSIPATION						10	max.	watts	

### Typical CCS Push-Pull Operation:

Values are for 2 tubes

Heater Voltage	volt	S
DC Plate Voltage	volt	S
Grid No.3 Connected to cathode	at socke	t
DC Grid-No.2 Voltage§	volt	S
DC Grid-No.1 Voltage§	volt	S
Peak AF Grid-No.1-to-Grid-No.1 Voltage 40	volt	S
Zero-Signal DC Plate Current 40	m	а
MaxSignal DC Plate Current	m	а
Zero-Signal DC Grid-No.2 Current	m	а
MaxSignal DC Grid-No.2 Current	m	а
Effective Load Resistance (Plate to plate). 5000	ohm	S
MaxSignal Driving Power 0	watt	s
Total Harmonic Distortion 5	1	%
MaxSignal Power Output (Approx.) 20.5	watt	S

### Maximum Circuit Values:

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

### RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy†

RF POWER AMPLIFIER - Class C FM Telephony

Maximum Ratings, Absolute-Maximum Values:

	Ut to 175 Mc								
			CO	cs•	ICA	4S ••			
DC PLATE VOLTAGE			375	max.	375	max.	volts		
GRID No.3 (SUPPRESSOR GRID)			0	max.	0	max.	volts		
DC GRID-No.2 (SCREEN-GRID)								6	
VOLTAGE	•	•	300	max.	300	max.	volts	-	
DC GRID-No.1 (CONTROL-GRID)									
VOLTAGE		$\sim$	-125	max.	-125	max.	volts		
DC PLATE CURRENT			70	max.	80	max.	ma		
DC GRID-No.2 CURRENT	•		15	max.	15	max.	ma		
DC GRID-No.1 CURRENT			5	max.	5	max.	ma		
PLATE INPUT			21	max.	24	max.	watts	6	
GRID-No.2 INPUT			- 2	max.	2	max.	watts	6	
PLATE DISSIPATION	•	•	10	max.	12	max.	watts		
					- Ind	icates	a change.		

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ICAS

Typical Operation:

As amplifier at 175 Mc CCS

Heater Voltage						13.5	13.5	13.5	volts
DC Plate Voltage			•			250	300	300	volts
Grid No.3				.(	Con	nected	to cath	ode at	socket
DC Grid-No.2 Voltage	·					200	200	250	volts
DC Grid-No.1 Voltage <sup>∉</sup>	⊕					-40	-42	-55	volts
Peak RF Grid-No. 1 Vol	tage					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	(App	ro	×.	).		1.5	2.1	1.6	ma
Driver Power Output (	Appr	ox	.)			1	1	1.5	watts
Useful Power Output (	Appr	ox	.)	*.		6.5	8.5	10	watts

### Maximum Circuit Values:

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

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

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

Maximum Ratings, Absolute-Maximum Values:

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

### Typical Operation:

At 175 Mc

Heater Voltage						13.5	13.5	volts
DC Plate Voltage						250	250	volts
Grid No.3					.0	Connected	to cathode a	at socket
DC Grid-No.2 Voltage*						250	250	volts
DC Grid-No.1 Voltage*						-70	-75	volts
From a grid-No.1								
resistor of						33000	33000	ohms
RF Grid-No.1 Voltage.						75	80	volts
DC Plate Current						60	70	ma
DC Grid-No.2 Current.						2.5	3	ma
DC Grid-No.1 Current	(A	qq	ro	Χ.	).	2.1	2.3	ma
Driving Power (Approx.	.)					1	1	watt
Useful Power Output*.						6.5	7.5	watts

- Indicates a change.

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Maximum Circuit	alues:				
Grid-No.1-Circui	t Resistance.	. (	).1 max.	0.1 max.	megohm
	FREQUENCY	MULTI	PLIER		

CCS

ICAS

Maximum Ratings, Absolute-Maximum Values:

			CO	CS .	I	CAS		
DC PLATE VOLTAGE GRID No. 3 (SUPPRESSOR GRID) DC GRID-No. 2 (SCREEN-GRID)	•		375 0	max. max.	375 0	max. max.	volts volts	
VOLTAGE		•	300	max.	300	max.	volts	
VOLTAGE		÷	-125	max.	-125	max.	volts	
DC PLATE CURRENT			50	max.	60	max.	ma	
DC GRID-No.2 CURRENT			15	max.	15	max.	ma	
DC GRID-No.1 CURRENT			5	max.	5	max.	ma	C
PLATE INPUT			13	max.	15	max.	watts	
GRID-No.2 INPUT			2	max.	2	max.	watts	
PLATE DISSIPATION		•	10	max.	12	max.	watts	

### Typical Operation:

	1	15	ac	uo	Le	T.	10 175 MC				
Heater Voltage							13.5		13.5		volts
DC Plate Voltage			•				250		250		volts
Grid No.3							Connected	to	cathode	at	socket
DC Grid-No.2 Voltag	ge.					÷	200		250		volts

- Indicates a change.



	C	HARACTER	ISTICS	RANGE	VALU	JES FOR	EQUIPME	NT DESI	GN -
$\frown$		κ.				Note	Min.	Max.	
	Heater Direct	Current. Interele	ctrode	• • •	• •	1	0.205	0.245	amp
-	Grid Grid Plate Heater-	to plate to cathc to cathc cathcde	de ode	• • • • • • • • • • • • • • • • • • •	 	-	2.0 3.7 -	2.7 4.9 0.04	μμf μμf μμf
0	Heate	er negati spect to	ve with cathod	e	• •	1,2	-	30	μa
	res	spect to Resista	cathod	e		1,3	-	30	μa
	From cat From	grid to thode cor plate to	plate nected grid	and toget and	her.	1,4	100		megohms
	cat Reverse Emissic Amplifi	hode cor e Grid Cu on Voltag	inected irrent. ie	toget	her. · ·	1,5 1,6 7	100	- 0.3 4 100	mégohms µa volts
	Transco Plate ( Plate (	Current (	1) 2)	· · · ·	· · · · · · · · · · · · · · · · · · ·	1,8 1,8 1,9	10000	17000 17.5 50	μmhos ma μa
	Plate C Power C Noise F Change	Gain Figure in Power	3) Gain.		:::	1,10 1,11 1,11 11,12	100 13 -	- 7.5 -1	μa db db
	Change Change	in Noise in Trans	Figur	e. tance.	•••	11,12	-	0.5	db %
	Note 1:	With 6.	3 volts	ac or d	c on	heater.			
	Note 2:	With 60 with re	volts o spect to	dc betwe cathod	een h e.	eater an	d_cathode	e, heater	negative
	Note 3:	With 60 with re:	volts o spect to	cathod	een h	eater an	d cathode	e, heater	positive
	Note 4:	With gr which a	id 100 v re conne	olts ne cted to	gativ gethe	e with r r.	espect to	plate an	nd cathode
	Note 5:	which a	ate 300 re conne	volts n cted to	egati gethe	ve with r.	respect t	o grid an	nd cathode
	Note 6:	With do volts,	plate grid res	voltage istor o	e of f 0.5	200 vol megohm.	ts, dc gi	rid volt	age of −2
	Note 7:	With dc adjuste volts or	voltage d to pro n heater	on gri duce a	d and cathc	plate w de curre	hich are ent of 30	connected ma., and	d together d with 5.5
	Note 8:	With dc 50 ohms	plate s	upply v thode b	oltag	e of 125 capacit	volts, c	athode re	esistor of
	Note 9:	With do -5 volt	plate	voltage	e of	125 vol	ts and do	s grid v	oltage of
	Note 10:	With do -2.5 vo	plate Its.	voltage	e of	125 vol	ts and d	c grid v	oltage of
	Note 11:	With dc of 50 o having a operatio	plate s hms in a bandwi ng frequ	upply v a singl dth of ency of	oltag e-tub 5 ± 0 550	e of 125 e rf am .5 Mc, s ± 10 Mc.	volts an plifier o ignal inp	d cathod f the ca ut of -71	e resistor vity type D dbm, and
	Note 12:	Reduce Noise F with 6.	heater igure, a 3 volts	voltage Ind Tran on heat	to scond scond er wi	5.7 volt luctance 11 not e	s. Chan values f xceed ind	ge in Po rom those icated va	wer Gain, e obtained alues.
							-	ndicates	a change.



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### SPECIAL TESTS & PERFORMANCE DATA

### Low-Pressure Voltage-Breakdown Test:

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

#### Low-Frequency Vibration Performance:

This test (similar to MIL-E-ID, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and plate load resistor of 10,000 ohms. The tubes are vibrated in aplane 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 Current. . . . . . . . . . . . . . 300 max. ma For conditions shown under *Characteristics Range Values*, *Note* 1.

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

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### Shock Test:

This test (similar to MIL-E-ID, paragraph 4,9.20.5) is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in three different positions to an impact acceleration of 500 g, 5 blows in each position.

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

- Heater Current. . . . . . . . . . . . . . . 300 max. ma For conditions shown under *Characteristics Range Values*, *Note* 1.
- Heater-Cathode Leakage Current. . . 60 max. μa For conditions shown under Characteristics Range Values, Notes 1,3.
- Low-Frequency Vibration Output. . . 200 max. mv For conditions shown above under Low-Frequency Vibration Performance.

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

### Fatigue Vibration Test:

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

### Shorts and Continuity Test:

This test (similar to MIL-E-ID, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the gridterminal 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  $15/16^{+}\pm1/64^{+}$ , 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.



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upon the grid flange without causing fracture of the ceramic insulation.

### Seal Strain Test:

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

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

#### Heater-Cycling Life Performance:

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

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

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

#### 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:

### 100-Hour Survival Life Performance:

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











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

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

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

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

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

This test (similar to MIL-E-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 guard against epidemic failures of tubes to meet any of the characteristics indicated below.

Each tube is life tested under the following conditions: Heater voltage of 6.3 volts; plate-supply voltage of 215 volts; cathode resistor of 150 ohms; heater positive with respect to cathode by 67.5 volts; and plate-seal temperature of  $225^{\circ}$  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

connec	cted t	ogethe	r		$\sim -\infty$		60 min.	megohms
From pla	ate to	grid	and ca	thode	9			
connec	cted t	ogethe	r		с с.	2	60 min.	megohms

For conditions shown under Characteristics Range Values, Notes 1,4, and 1,5.

Noise Figure. . . . . . . . . . . 8.5 max. db For conditions shown under Characteristics Range Values, Notes 1,11.

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

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

Noise Figure. . . . . . . . . . . 9.5 max. db For conditions shown under Characteristics Range Values, Notes 1,11.

#### OPERATING CONSIDERATIONS

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

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







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

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

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

NOTE I: WITH ANNULAR SURFACE "B" RESTING ON REFERENCE PLANE "A". THE AXIS OF THE CATHODE CYLINDER WILL BE WITHIN  $2^\circ$  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  $\rm G_1-I$  AND  $\rm G_1-2$ , RESPECTIVELY.

NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G<sub>2</sub>-1 AND G<sub>2</sub>-2, RESPECTIVELY.

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








92CS-10370

0	T		Dimension											
Gauge	Type	Diameter A	Thickness B	Radius R										
G <sub>1</sub> -I	GO	0.25200" <sup>+0.00000"</sup> -0.00007"	0.320"+0.001" -0.000"	0.003" MAX.										
G <sub>1</sub> -2	NO-GO	0.24500"+0.00007" -0.00000"	-	-										
G <sub>2</sub> -1	GO	0.42000"+0.00000" -0.00007"	-	-										
G <sub>2</sub> -2	NO-GO	0.40000"+0.00007" -0.00000"	-	-										
G <sub>3</sub> -1	GO	0.55700"+0.00000" -0.00007"	-	-										
G <sub>3</sub> -2	NO-GO	0.54700"+0.00007"	-											













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BANDWIDTH - MEGACYCLES

15

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20

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HEATER VOLTS

92CS-11491RI





Electron Tube Division

Harrison, N. J.



# 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)	:s np
	load resistor (ohms) = 0, load resistor (ohms) = 10, and heater volts = 6.3 10 se Amplification Factor 80 Transconductance for dc plate ma_ = 12.5 dc plate volts = 125	90
	and cathode resistor (ohms) = 50 13000 $\mu$ mhc	)S
	Grid to plate	⊥f ⊥f ⊥f ⊥f ⊥f ⊥f
	Mechanical:	
	Operating Position An Dimensions See Dimensional Outlin Weight (Approx.) 0.3 c Sockets: Heater-terminals connector	ny 1e DZ c
	Grayhill <sup>a</sup> No.22-5 or equivaler	, 5, nt
1	Socket for operation up to about 550 Mc (Including heater-terminals connector) Jettron <sup>e</sup> No.CD7010 or equivaler	D, nt
	Cavities (Including heater- terminals connector)J-V-M <sup>f</sup> No.D-7980 Series Resdel <sup>g</sup> No.10 Series or equivaler	s, s, nt



- Indicates a change.

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Terminal Connections (See Dimensional Outline):

H – Heater K – Cathode



G-Grid P-Plate

# RADIO-FREQUENCY AMPLIFIER - Class A

Maximum CCS<sup>h</sup> Ratings, Absolute-Maximum Values:

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

00 76 00	0	10	. 4	40	110	 0.0	14	r	00	1 900 1	1.0		
DC PLATE VOLTAGE.										25	50	max.	volts
DC GRID VOLTAGE .					-					-5	50	max.	volts
DC PLATE CURRENT.		χ.				2				2	25	max.	ma
PLATE DISSIPATION		2	÷							2.	.5	max.	watts
PEAK HEATER-CATHOD	DE	VC	)L	TA(	GE :								
Heater negative	W	ith	1										
respect to cat	the	ode	Э.							Ę	50	max.	volts
Heater positive	W	itł	٦										
respect to cat	the	ode	2.							Ę	50	max.	volts
PLATE-SEAL TEMPERA	ATI	IRE					÷.			22	25	max.	°C

## Typical CCS<sup>h</sup> Operation in Cathode-Drive Circuit:

	At 550 Mc	At 700 Mc	
DC Plate-to-Grid Voltage Cathode Resistor Input-Signal-Level Range	125 50 -70 to -20	125 50 -70 to -20	volts ohms dbm
DC Plate Current	12.5	12.5	ma
of 5 Mc	16.5	17	db
Noise Figure	0.0	At 1100 Mc	UD
DC Plata to Crid Valtage		150	volts
Cathode Resistor.		50	ohms
Input-Signal-Level Range		-70 to -20	dbm
DC Plate Current		14	ma
4 Mc		20	db
8 Mc	* * 	18 11.5	db db
Notbe riguie			0.0

# Maximum Circuit Values:

Grid-Circuit Resistance: For fixed-bias operation. . . . . . . . Not recommended For cathode-bias operation. . . . . 0.25 max. megohm

→ Indicates a change.





a without external shield.

- b Amerac, Inc., Dunham Road, Beverly, Massachusetts.
- C For use with cavities.
- d Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.
- e Jettron Products, Inc., 56 Route 10, Hanover, N.J.
- J\_MM 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.
- 9 Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavities covers the range from 215 up to 2325 Mc.
- h Continuous Commercial Service.

CHARACTERISTICS RA	ANGE VALUES	FOR E	OUIPMENT	DESIGN
--------------------	-------------	-------	----------	--------

	Note	Min.	Max.	
Heater Current	1	0.205	0.245	amp
Capacitances: Grid to plate	-	2.1 3.8 -	2.8 4.8 0.03	μμf μμf μμf
respect to cathode	1,2		30	μa
respect to cathode Leakage Resistance:	1,3	-	30	μa
From grid to plate and cathode connected together. From plate to grid and	1,4	100	-	megohms
cathode connected together. Reverse Grid Current	1,5 1,6 7 1,8 1,8 1,9 1,10 1,11 1,11 1,12 11,12 11,12	100 - 60 10000 8.5 - 100 14 - -	- 0.3 3 100 16000 16.5 50 - 7 -1 +0.5 15	megohms μa volts μmhos ma μa db db db db db

1: With 6.3 volts ac or dc on heater.

- Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode. Note 3: With 60 volts dc between heater and cathode, heater positive
- with respect to cathode.
- Note 4: With grid 100 volts negative with respect to plate and cathode which are connected together.
- Note 5: With plate 300 volts negative with respect to grid and cathode which are connected together.

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

-Indicates a change.



Note

Note	7:	With dc voltage on grid and plate which are connected together adjusted to produce a cathode current of 30 ma., and with 5.5 volts on heater.
Note	8:	With dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1000 $\mu f.$
Note	9:	With dc plate voltage of 125 volts and dc grid voltage of -5 volts.
Note	10:	With dc plate voltage of 125 volts and dc grid voltage of $-2.5$ volts.
Note	11:	With dc plate-supply voltage of 125 volts and cathode resistor of 50 ohms in a single-tube rf amplifier of the cavity type having a bandwidth of 5 $\pm$ 0.5 Mc, signal input of -70 dbm, and operating frequency of 550 $\pm$ 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 4.9.19.1) 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 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

-Indicates a change.









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

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

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

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

Heater-Cathode Leakage Current. . . 60 max.  $\mu$ a For conditions shown under Characteristics Range Values, Notes 1,3.



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

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

- Heater Current. . . . . . . . . . . . . . . 300 max. ma For conditions shown under *Characteristics Range Values*, *Note 1*.
- Heater-Cathode Leakage Current. . . 60 max. μa For conditions shown under Characteristics Range Values, Notes 1.4.

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 @cceleration 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"  $\pm$  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  $97^{\circ}$  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.

#### Grid Blackout:

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

Signal-output voltage is measured under conditions with heater voltage of 6.3 volts, dc plate-supply voltage of 200 volts, plate load resistor of 10.000 ohms, grid resistor of 15 ohms, and a sine-wave voltage having a frequency of 100 kc and a peak-to-peak value of 0.1 volt applied between the grid and cathode. Then, in addition to the above conditions, a pulse signal with repetition rate of 2000 pps, peak-to-peak voltage of 5 volts, and pulse duration of 0.25 µsec is applied between the grid and cathode. Next, measurement of signal-output voltage is made 0.8 µsec after the leading edge of a pulse. This value of signal-output voltage referred to the initial value will not show a change in excess of -5 db.

#### Heater-Cycling Life Performance:

This test (similar to MIL-E-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

- Heater-to-Cathode Leakage Current. 60 max. µa For conditions shown under Characteristics Range Values, Notes 1, 9.
- 0

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 limit:

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

### 44-Hour Grid-Emission Life Performance:

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

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

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

#### 100-Hour Survival Life Performance:

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



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

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

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

This test (similar to MIL-E-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:

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  $225^{\circ}$  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	ma 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,	1
Notes 1,4 and 1,5.		
Power Gain	db	
For conditions shown under Characteristics Range	Values,	
Notes 1, 11.		
Noise Figure 8 max.	db	
For conditions shown under Characteristics Range	Values,	
Notes 1, 11.		ų
Change in Power Gain	db	
For conditions shown under Characteristics Kange	Values,	
Notes 1, 11, 12.		
At the end of 1000 hours, the tube will not show p	ermanent	
horts or open circuits and will be criticized for the	ne total	
umber of defects in the sample lot and for the nu	mber of	
ubes failing to meet the following limits:		į



Noise Figure. . . . . . . . . . . 9,5 max. db For conditions shown under *Characteristics Range Values*, *Notes* 1, 11.

#### OPERATING CONSIDERATIONS

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

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



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

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

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

NOTE 1: WITH ANNULAR SURFACE "B" RESTING ON REFERENCE PLANE "A". THE AXIS OF THE CATHODE CYLINDER WILL BE WITHIN 2° 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  $\rm G_1^{-1}$  AND  $\rm G_1^{-2},$  RESPECTIVELY.

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

NOTE 6: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G<sub>2</sub>-1 AND G<sub>2</sub>-2, RESPECTIVELY.



GAUGES





92CS-10370

Gouro	Tuna		Dimension												
dauge	туре	Diameter A	Thickness B	Radius R											
G <sub>1</sub> -1	GO	0.25200" <sup>+0.00000"</sup> -0.00007"	0.320"+0.001" -0.000"	0.003" MAX.											
G <sub>1</sub> -2	NO-GO	0.24500" <sup>+0.00007"</sup> -0.00000"	-	-											
G <sub>2</sub> -1	GO	0.42000" <mark>-0.00000"</mark>	-	-											
G <sub>2</sub> -2	NO-GO	0.40000"+0.00007" -0.00000"	-	-											
G <sub>3</sub> -1	GO	+0.00000" -0.00007"	-	-											
G <sub>3</sub> -2	NO-GO	0.54700"+0.00007" -0.00000"	-	-											



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Electron Tube Division

Harrison, N. J.









9205-1149/RI





92CS-11488





# **Beam Power Tube**

For Use in Communications Equipment at Frequencies Up to 175 Mc. 9-PIN MINIATURE TYPE

# Electrical:

Heater Characteristics and Ratings: Voltage (AC or DC)	volts amp
Heater negative with respect 100 max.	volts
to cathode	volts
Grid No.1 to plate	pf
grid No.2, and heater	pf
Plate to cathode, grid No.3, grid No.2, and heater 5.5	pf

## Characteristics, Class A, Amplifier:

Plate Vol	tage						•									250		volts
Grid No.3										0	201	ine	c	tec	l to	cathode	at	socket
Grid-No.2	Volt	tag	je													250		volts
Grid-No.1	Volt	tag	je													-18		volts
Mu-Factor	, Gr	id	No	. 2	t	0	Gr	-ic	ł	No.	1					8.7		
Transcond	ucta	nce	2.													5300		µmhos
Plate Cur	rent															40		ma
Grid-No.2	Curi	rer	nt													3		ma

# Mechanical:

Operating Position						Any
Type of Cathode					. Coate	ed Unipotential
Maximum Overall Length.						2-5/8"
Maximum Seated Length .						2-3/8"
Length, Base Seat to Bul	b To	op (1	Excl	uding	tip) .	••• 2" <u>+</u> 3/32"
Diameter					0.	.750" to 0.875"
Dimensional Outline					See G	eneral Section
Bulb						T6-1/2
Base Sma	a]]_	Butt	on N	oval	9-Pin	(JEDEC No.E9-1)
Basing Designation for	- B0	TTOM	VIE	W		9LK

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



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



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 1 9-63

# AF POWER AMPLIFIER & MODULATOR - Class AB

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

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

## Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage							. 300	volts
Grid No.3		Con	nec	ted	to	С	athode at	socket
DC Grid-No.2 Voltage							. 250	volts
DC Grid-No.1 Voltage <sup>9</sup>							21	volts
Peak AF Grid-No.1-to-Grid-No	.1	Vol	tag	е.			. 40	volts
Zero-Signal DC Plate Current							. 40	ma
MaxSignal DC Plate Current						•	. 125	ma
Zero-Signal DC Grid-No.2 Cur	ren	t.					. 2	ma
MaxSignal DC Grid-No.2 Cur	ren	it .					. 14	ma
Effective Load Resistance (P	lat	e ti	ор	late	e)		. 5000	ohms
MaxSignal Driving Power							. 0	watts
Total Harmonic Distortion							. 5	%
MaxSignal Power Output (Ap	pro	×.)					. 20.5	watts

#### Maximum Circuit Values:

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

# RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy<sup>†</sup> and

RF POWER AMPLIFIER - Class C FM Telephony

Maximum Ratings, Absolute-Maximum Values:

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

- Indicates a change.

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



# Typical Operation:

AS umptifie	1 40	1/2 1			
		(	CCS	ICAS	
DC Plate Voltage		250	300	300	volts
Grid No.3	Conne	cted	to cath	ode at	socket
DC Grid-No.2 Voltage <sup>DD</sup>		200	200	250	volts
DC Grid-No.1 Voltage <sup>⊕⊕</sup>		-40	-42	-55	volts
Peak RF Grid-No.1 Voltage		47	52	62	volts
DC Plate Current		60	70	80	ma
DC Grid-No.2 Current		3.7	3.7	5.1	ma
DC Grid-No.1 Current (Approx.)		1.5	2.1	1.6	ma
Driver Power Output (Approx.)		1	1	1.5	watts
Useful Power Output (Approx.).		6.5	8.5	10	watis

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# Maximum Circuit Values:

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

# PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony

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

Maximum Ratings, Absolute-Maximum Values:

			Up to 175 Mc										
				CO	CS	IC	CAS						
DC PLATE VOLTAGE				300	max.	300	max.	volts					
GRID No.3 (SUPPRESSOR GRID) DC GRID-No.2 (SCREEN-GRID)	÷	×	÷	0	max.	0	max.	volts					
VOLTAGE	•		•	300	max.	300	max.	volts					
VOLTAGE				-125	max.	-125	max.	volts					
DC PLATE CURRENT				60	max.	70	max.	ma					
DC GRID-No.2 CURRENT		ž,		10	max.	10	max.	ma					
DC GRID-No.1 CURRENT		8	8	5	max.	5	max.	ma					
PLATE INPUT				15	max.	17.5	max.	watts					
GRID-No.2 INPUT				1.4	max.	1.4	max.	watts					
PLATE DISSIPATION				7	max.	8	max.	watts					

## Typical Operation:

At	175 MC	
DC Plate Voltage	250 volts	
Grid No.3 Connected	to cathode at socket	
DC Grid-No.2 Voltage	250 volts	
DC Grid-No.1 Voltage*70	-75 volts	
From a grid-No.2 resistor of	33000 ohms	
RF Grid-No.1 Voltage	80 volts	
DC Plate Current 60	70 ma	
DC Grid-No.2 Current 2.5	3 ma	
DC Grid-No.1 Current (Approx.) . 2.1	2.3 ma	
Driving Power (Approx.) 🔺 . 1	1 watt	
Useful Power Output* 6.5	7.5 watts	
	🛥 Indicates a change.	

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

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## Maximum Circuit Values:

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

# FREQUENCY MULTIPLIER

Maximum Ratings, Absolute-Maximum Values:

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

# Typical Operation:

	AS	a	00	01	er	ι	0 175 MC			
DC Plate Voltage							• 250		250	volts
Grid No.3						Co	onnected	to	cathode at	socket
DC Grid-No.2 Voltage							. 200		250	volts
DC Grid-No.1 Voltage	••						· -53		-66	volts
From a grid-No.1 resistor of							53000		44000	ohms

- Indicates a change.





# **BEAM POWER TUBE**

	Peak RE Grid-No 1			
	Voltage DC Plate Current DC Grid-No.2 Current DC Grid-No.1 Current	60 50 2.6	74 60 3.5	volts ma ma
	(Approx.).	0 1	1.5	watt
	Useful Power Output*	0.4	4 5	watts
		at the Me	4.0	nacco
	As iripler	200	250	volte
	Grid No. 3	Connected to	200 cathode at	sochet
_	DC Grid-No.2 Voltage	200	250	volts
	DC Grid-No.1 Voltage⊕⊕	-90	-120	volts
	From a grid-No.1			
	resistor of 5 Peak RF Grid-No.1	50000	70000	ohms
	Voltage	105	130	volts
	DC Plate Current	50	60	ma
	DC Grid-No.2 Current	2	2.9	ma
	(Approx.)	1.85	1.7	ma
	Driving Power (Approx.)**	0.4	0.6	watt
	Useful Power Output*	1.4	2.3	watts
	Maximum Circuit Values:			
	Grid-No.1-Circuit			
	Resistance	0.1 max.	0.1 max.	megonm
	Without external shield.	lo 1 current de	es not flow du	ring any
	part of the input cycle.			
	Averaged over any audio-frequency	cycle of sine	-wave form.	
	S Obtained preferably from a fixed	supply.		
	T Key-down conditions per tube with modulation essentially negative of the audio-frequency envelope conditions.	mout amplitude may be used i does not exce	modulation. An f the positive ed 115% of the	peak of carrier
	•• Intermittent Commercial and Amate	eur Service.		
	Obtained preferably from a separ supply with a voltage divider. If be adjustable to obtain the des	ate source or faseries resis sired operatio	from the plate- stor is used, in g plate current	-voltage t should t after
	⊕⊕ initial tuning adjustments are co	ompleted.	mbination of a	rid-No. 1
	resistor with either fixed supply	or cathode re	esistor.	10-001
	Driver stage is required to supp The driver stage should be desi above the indicated values to take components, initial tube charac during life.	gned to provi care of varia teristics, and	de an excess d ations in line d tube characte	voltage, eristics
-	Measured at load.			
	Obtained preferably from a separ plate supply, or from the modul resistor. It is recommended tha tain the desired operating plate ments are made.	ate source mo ated plate su t this resisto current after	dulated along w pply through a or be adjustable initial tuning	with the series to ob- adjust-

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

DATA 3

1558



# BEAM POWER TUBE

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

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

							Note	Min.	Max.	
Heater Current							1	0.745	0.855	amp
Transconductance							1,2	4200	6400	µmhos.
Plate Current							1,2	30	50	ma
Plate Current							1,3		50	μa
Grid-No.2 Current .							1,2		7.5	ma
Reverse Grid-No.1 C	ur	rer	nt				1,4		2	μa
Heater-Cathode Leak Heater negative w	ag it	e ( h	Cu	rre	en	t:				
respect to cath Heater positive w	od	e. h	•	•	•	•	1,5		20	μa
respect to cath	od	e.					1.5		20	μa
Leakage Resistance:										
Between grid-No.1 other electrode	a s	nd tie	a ed	11						
together Between plate and	·a	11	•	•	•	•	1,6	100	-	megohms
together		•	•				1,7	100		megohms

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

Note 2: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of -18 volts. Note 3: With plate voltage of 250 volts, grid No.3 connected to cathode, grid-No.2 voltage of 250 volts, and grid-No.1 voltage of -48 volts.

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

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

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

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

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# 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 Rati	ngs:	
Voltage (AC or DC)		6.3 ± 0.6 volts
Current at heater volts = 6.3		0.135 amp
Peak heater-cathode voltage:		
Heater negative with respec	t to cathode.	100 max. volts
Heater positive with respec	t to cathode.	100 max. volts
Direct Interelectrode Capacitan	ces (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									Co	a	tec	ł	Un	ipo	tent	tial
Maximum Overall Length.															0.8	800"
Maximum Seated Length .															0.6	625"
Maximum Diameter															0.4	440"
Weight (Approx.)						•								1.	9 g	rams
Envelope											Me	et	al	Sh	elľ	MT4
Socket	¢	See	5	Sar	· b a	+	Re	C	2 22 2	101	. + .		T.	a fo	rma	tion

for RCA Nuvistor Tubes at front of this Section Base. . . Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65) 







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

# Characteristics, Class A, Amplifier:

Plate Supply Voltage. . . 75 volts Plate Voltage . . . 26.5 40 ---volts -Indicates a change.



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Grid Supply Voltage.							0	0	0	volts
Cathode Resistor							-	-	100	ohms
Amplification Factor							31	35	35	
Grid Resistor							0.5	0.5	-	megohm
Plate Resistance (Ap	pr	ox.	.)				4400	3000	3000	ohms
Transconductance							7000	11500	11500	µmhos
Plate Current							2.8	7.5	10.5	ma
Grid Voltage (Approx.	) 1	for	pl	at	te					
$\mu a = 10 \dots$					•	•	-	-	-7	volts

# INDUSTRIAL SERVICE

### Maximum Ratings, Absolute-Maximum Values:

For operation at any altitude

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

#### Maximum Circuit Values:

Grid-Circuit Resistance: <sup>b</sup>								
For fixed-bias operation .			•		•		0.5	megohm
For cathode-bias operation	•	•		•	•		1	megohm

<sup>a</sup> Pin is cut off close to ceramic wafer.

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

## CHARACTERISTICS RANGE VALUES

Heater Current	Note 1	<i>Min.</i> 0.125	<i>Max.</i> 0.145	amp	
Grid to plate Input: G to (K,S,H) Output: P to (K,S,H) Heater to cathode Cathode to plate	2 2 2 2 2	1.8 3.8 1.4 1.1 0.20	2.6 4.6 1.8 1.7 0.32 12 5	pf pf pf pf ma	(
Plate Current (1) Transconductance (1) Transconductance (2)	1,4 1,3 3,5	10000 9000	12.0 50 13000	μa μmhos μmhos	(
Transconductance Change: Difference between Trans- conductance (1) and Trans- conductance (2), expressed in per cent of Transconductance (1) Reverse Grid Current Amplification Factor	_ 1,6 1,3		15 0.1 42	% µa	(

- Indicates a change.

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Heater-	Cathode Leakage Current: r negative with	
res Heate	pect to cathode 1,7 – 5	μa
res	pect to cathode 1,7 - 5	μa
Leakage Retwe	Resistance:	
ele	ctrodes tied together 1,8 1000 - meg	ohms
ele	strodes tied together 1,9 1000 - meg	ohms
Note 1:	With 6.3 volts ac or dc on heater.	
Note 2:	Measured in accordance with EIA Standard RS-191-A.	
Note 3:	With dc plate supply volts = 75, dc grid supply volts = 0, ca resistor = 100 ohms, cathode-bypass capacitor = 1000 µf, and shell connected to ground.	nthode - metal
Note 4:	With dc plate volts = 75, dc grid volts = -7, and metal connected to ground.	shell
Note 5:	With 5.7 volts ac or dc on heater.	
Note 6:	With dc plate volts = 80, grid supply volts = $-1.2$ , grid res = 0.5 megohm, and metal shell connected to ground.	istor
Note 7:	With 100 volts dc applied between heater and cathode.	
Note 8:	With grid 100 volts negative with respect to all other electied together, and metal shell connected to ground.	rodes 🛥
Note 9:	With plate 300 volts negative with respect to all other elect tied together, and metal shell connected to ground.	rodes 🗲

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

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

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in four different positions  $(X_1, X_2, Y_1, Y_2)$  in a Navy Type, High-impact (flyweight) Shock Machine, and with tube electrodes applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

#### Fatigue Rating:

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

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified Peak Vibrational Acceleration. Tubes are rigidly mounted, supplied with center heater voltage only, and subjected for 48 hours to 2.5-g Peak Vibrational Acceleration at 60 cycles per second in the 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:

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.  $\leftarrow$  Indicates a change.



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

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

Post-Impact and Post-Fatigue Vibration Limits:

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

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

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 rms volts applied between plate and all other electrodes and metal shell connected together and will not break down or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100,000 feet ( $8.0\pm0.5$  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<sup>C</sup>. 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 (1). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

#### Survival-Rate Life (100 hours):

This test is performed on a sample lot of tubes from each production run to assure aminimum 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

<sup>C</sup> Specification for tapper supplied on request.

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

#### Intermittent Conduction Life (1000 hours):

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

Tubes are criticized at 500 and 1000 hours for Inoperatives, d reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, a tube is rejected if its Transconductance (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 (1) of individual tubes from the O-hour values, and for cathode interface resistance greater than 25 ohms. Interface resistance is measured by Method B of ASTM specification F300-61T.

 $\boldsymbol{d}$  An inoperative is defined as a tube having a discontinuity, permanent short, or air leak.



### SHORTS-TEST ACCEPTANCE LIMITS



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DATA 5 2-65



92CS-1046IRI





## Sharp-Cutoff Tetrode

NUVISTOR TYPE For Industrial Applications

#### GENERAL DATA

#### Electrical:

leater 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
)irect Interelectrode Capacitances:
Grid No.1 to plate 0.015 may of
Grid No.1 to prate arid No.2
chall and heater 7.0 of
Dista to antibudo perid No 2
Plate to cathode, grid No.2,
shell, and heater 1.4 pt
Heater to cathode 1.4 pt
About the Alexandre Annual Street
naracteristics, class aj amplitier:
Plate Supply Voltage
Grid-No.2 Supply Voltage 50 volts
Cathode Resistor
Plate Resistance (Approx.) 0.2 megohm
Fransconductance 10600 µmhos
Plate Current
Grid-No.2 Current
Grid-No.1 Voltage (Approx.)
for plate $ua = 10$
Mechanical:
Departing Position
Tues of Cathoda
Type of Cathode Coated Unipotential
Maximum Overall Length
Maximum Seated Length
Maximum Diameter
Neight (Approx.)
Envelope Metal Shell MT4 and Ceramic Cylinder
Cap
Socket Cinch Mtg. Corp. No. 133 65 10 001, or equivalent
Base
(JEDEC No. E5-65)

- Indicates a change.



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



INDUSTRIAL SERVICE

Maximum Ratings, Absolute-Maximum Values:

For operation at any altitude

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

#### Maximum Circuit Values:

Grid-Circuit Resistance: <sup>b</sup>								
For fixed-bias operation	2	÷				0.5	max.	megohm
For cathode-bias operation.		·	÷		÷	1	max.	megohm

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

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.		
Heater Current	1	0.140	0.160	amp	
Direct Interelectrode Capacitances:					6
Grid No.1 to plate	2	-	0.015	pf	
Grid No.1 to cathode, grid No.2,	-				
shell, and heater	2	6.0	8.0	pt	
shall and bostor	2	1 2	16	of	
Heater to cathede	2	1 1	1 7	pi	
neater to cathode	2	1.1	1.7	pr	
Plate Current (1)	1,3	8.5	11.5	ma	
Plate Current (2)	1,4	-	50	μa	
Grid-No.2 Current	1,3		3.6	ma	-
Transconductance (1)	1,3	9000	12000	µmhos	
		15		a any services and	

-- Indicates a change.



Transc Transc Diff duct	on er an	ductance (2)3,5 & ductance Change: ence between Transcon- ce (1) and Transcon- ce (2) expressed in	8000	-	µmhos
per	ce	nt of Transconductance (1)	-	.20	%
Revers	se	Grid Current 1,6	-	0.1	μa
Heater	C	athode Leakage Current:			
Heat	er	negative with			
re	esp	ect to cathode 1,8	-	5	μa
Heat	er	positive with			
re	esp	ect to cathode 1,8	-	5	μa
Leakag	je	Resistance:			
Betw	vee	n grid No.2 and all other			
el	ec	trodes tied together 1,7	500		megohms
Betw	vee	n grid No.1 and all other			
el	ec	trodes tied together 1,9	500	-	megohms
Betw	vee	n plate and all other	500		
el	ec	trodes tied together 1,10	500	-	megohms
Note 1		With 6 3 volts ac or dc on heater			
Note 2		Measured in accordance with FLA Standar	d RS-191	- 4	
Note 3	3:	With dc plate supply volts = 125, prid-	No.2 SUD	ply vo	1ts = 50.
Note y		cathode resistor = 68 ohms, and cathor 1000 $\mu$ f.	de-bypa	ss cap	acitor =
Note 4	4:	With dc plate volts = 125, dc grid-No.2 v volts = $-6$ , and metal shell connected t	olts = 5 o ground	0, dc	grid-No.1
Note 5	5:	With 5.7 volts ac or dc on heater.			
Note 6	5:	With dc plate volts = 200, dc grid-No. No.1 supply volts = -1.6, grid-No.1 r and metal shell connected to ground.	volts esistor	= 70, = 0.5	dc grid- i megohm,
Note 7	7:	With grid No.2 100 volts negative wit electrodes tied together.	h respec	t to a	all other
Note 8	в:	With 100 volts dc applied between heate	r and ca	thode.	
Note 9	9:	With grid No.1 100 volts negative wit electrodes tied together.	h respec	t to a	all other

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

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

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

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.



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#### Fatigue Rating:

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

#### Variable-Frequency Vibration Performance:

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

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

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

#### Heater Cycling:

Cycles of Intermittent Operation. . . . . 2000 min. cycles This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100 volts negative with respect to cathode; grid No.1, grid No.2, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters and heater-cathode shorts.

#### Shorts and Continuity:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-ID, Ammendent 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper<sup>6</sup>. 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 maximumrated 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 (1). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

#### 100-Hour Life Performance:

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

#### 1000-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation, and then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the O-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.

<sup>C</sup> Specifications for tapper supplied on request.



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NOTE I: 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.















DATA 5 5-61



# 7717/6CY5

### Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

For Mobile-Communications Equipment

#### GENERAL DATA

#### Electrical:

Heater Characteristics and Ratings (Design-Me	aximum Values):
Voltage (AC or DC)	6.3 +1.2 volts
Current at heater volts = 6.3 0 Peak heater-cathode voltage: Heater negative with	.200 amp
respect to cathode	100 max. volts
respect to cathode	100 <sup>a</sup> max. volts
Grid No.1 to plate	0.03 max. μμf
grid No.2, and heater	4.4 μμf
grid No.2. and heater	2.74 μμf
9	-12-20
Characteristics, Class A <sub>1</sub> Amplifier:	
Plate Voltage	125 volts
Grid-No.2 Voltage	80 volts
Grid-No.1 Voltage	-1 volt
Plate Resistance (Approx.) C	.125 megohm
Transconductance	8000 μmhos
Plate Current	10 ma
Grid-No.2 Current	1.4 ma
transconductance ( $\mu$ mhos) = 100	-5 volts
Mechanical:	
Operating Position.	Any
Type of Cathode	ated Unipotential
Maximum Overall Length.	2-1/8"
Maximum Seated Length	1-7/8"
Length Base Seat to Bulb Top (Excluding tip).	. 1-1/2" + 3/32"
Diameter	0.650" to 0.750"
Dimensional Outline	e General Section
Bulb	
Base	n (JEDEC No.E7-1)
Basing Designation for BOTTOM VIEW	7EW
(4) (5)	
Pin 1-Grid No.1	Pin 5 - Plate
Pin 2-Cathode, (3)	Sin 6-Grid No.2
Internal	'in /-Cathode,
Shield	Internal
Pin 3-Heater (2)(1/7)	Shield
Pin 4 - Heater	



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#### AMPLIFIER - Class A

#### Maximum Ratings, Design-Maximum Values:

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

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

#### Electrical:

Heater Characteristics and Katings (Design-Maximum Valu	es):
Voltage (AC or DC)	volts
Current at heater volts = 14.0 0.150	amp
Peak heater-cathode voltage (Each unit):	
Heater pogative with	
recepcet to esthedo 200 max	volte
Herter excitive with	VUILS
neater positive with	ualta
respect to cathode	VOILS
Direct Interelectrode Capacitances: •	
Triode Unit:	
Grid to plate 1.8	μµf
Grid to cathode and heater 1.6	unt
Plate to cathode and heater 0.24	unt
	poper,
Diode Units:	c.
Diode-No.1 plate to triode grid 0.09 max.	μμt
Diode-No.2 plate to triode grid 0.0/ max.	µµt
Either diode cathode to all other	
tube electrodes 6.5	μµf
Diode plate to cathode and heater	
(Each unit)	μµf
Characteristics, Class A <sub>1</sub> Amplifier (Triode Unit):	
Plate Voltage	volts
Grid Voltage -3	volts
Amplification Factor 72	10100
Plate Resistance (Approx.) 72000	ohms
Trace Resistance (Approx./	umbos
	µ111103
Plate Current 0.7	IIIa
Mechanical:	
	٨
Operating Position	. Any
Type of Cathodes Coated Unipot	ential
Maximum Overall Length	-3/16"
Maximum Seated Length	15/16"
Length. Base Seat to Bulb Top (Excluding tip) 1-9/16" ±	3/32"
Diameter 0.750" to	0.875"
Dimensional Outline See General S	ection
Bulb	T6-1/2
Rosa Small Rutton Noval 9 Pin ( IEDEC No	FQ_1)



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# 7724/14GT8

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



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

#### TRIODE UNIT - AMPLIFIER - Class AI

#### Maximum Ratings, Design-Maximum Values:

PLATE VOLTAGE							330	max.	volts
GRID VOLTAGE:									
Positive-bias val	ue.						0	max.	volts
PLATE DISSIPATION.							1.1	max.	watts

#### DIODE UNITS - Two

Values are for Each Unit

#### Maximum Ratings, Design-Maximum Values: PLATE CURRENT. . . . . . . . . . . 5 max. ma

#### Characteristics, Instantaneous Value:

Plate	Current	for	plate	volts	=	5.		,	18	ma

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Heater-Cycling:

Cycles of Intermittent Operation . . . . 2000 min. cycles This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 18.9 cycled one minute on and one minute off, heater 135 volts positive with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

#### Transconductance at Reduced Heater Voltage (Triode Unit):

900 umhos With heater volts = 10.8, plate volts = 250, and grid volts = -3.

For satisfactory operation, it is recommended that the heater be operated within the voltage range of 12.0 to 15.0 volts. **b** The dc component must not exceed 100 volts.

C Without external shield.



RADIO CORPORATION OF AMERICA **Flectron Tube Division** 

Harrison, N. J.

## High-Mu Triode

#### NUVISTOR TYPE

For Industrial Applications

#### GENERAL DATA

#### Electrical:

Heater, for Unipotential Cathode: Voltage (AC or DC)	
Characteristics, Class A1 Amplifier:Plate Supply Voltage.0Grid Supply Voltage.0Cathode Resistor.150Amplification Factor.64Plate Resistance (Approx.)6800ohms9400µmhosPlate Current.7Grid Voltage (Approx.) for plateµa = 10-4voltage	
Mechanical:     Operating Position.	v · · · zltn)
Basing Designation for BOTTOM VIEW	Ş

Pin	5	-	Same	as	Pin	1	
Pin	6	-	Same	as	Pin	1	
Pin	7	-	Same	as	Pin	1	
Pin	8	-	Catho	ode			
Pin	9	_	Same	as	Pin	1	
Pin	10		Heate	er			
Pin	12	-	Heate	er			



INDEX = LARGE LUG

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

DATA I 3-61

#### INDUSTRIAL SERVICE

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

For operation at any altitude

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

#### Maximum Circuit Values:

Grid-Circuit Resistance: <sup>b</sup>						
For fixed-bias operation				0.5	max.	megohm
For cathode-bias operation.				1	max.	megohm

<sup>a</sup> Pin is cut off close to ceramic wafer.

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

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.		
Heater Current	1	0.125	0.145	amp	
Direct Interelectrode					
Grid to plate	2	0.8	1	μµf	
heater	2	3.4	5	µµuf	
heater	2 2 1,3 1,4 1,3 3,5	1.3 1 0.16 5.5 7900 6900	2.1 1.6 0.28 8.8 50 10900	μμf μμf μμf ma μa μmhos μmhos	0
in per cent of Transconduc- tance (1)	1,6 1,3	- 54	15 0.1 74	% µa	•
Heater negative with respect to cathode	1,7	-	5	μa	0
respect to cathode	1,7	-	5	μa	



Leakage Resistance:

Between grid and all other

electrodes tied together . . . 1,8 1000 - megohms Between plate and all other

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

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

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

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

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

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

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

- Note 7: With 100 volts dc applied between heater and cathode.
- Note 8: With grid 100 volts negative with respect to all other electrodes tied together.

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

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:

Impact Acceleration. . . . . . . . . . . 1000 max. g This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

#### Fatigue Rating:

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

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 endof this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

#### Variable-Frequency Vibration Performance:

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



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q

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

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

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

#### Heater Cycling:

Cycles of Intermittent Operation . . . . 2000 min. cycles This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100 volts negative with respect to cathode; grid, plate, and metal shell connected to ground. At the end of this test, tubes are tested for open heaters, heater-cathode shorts, and 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 MlL=E-10, Amendment 2, paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper<sup>6</sup>. 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 maximumrated 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 (1). A tube is rejected if its transconductance after two or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

#### 100-Hour Life Performance:

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











#### 1000-Hour Conduction Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and quard 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 O-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent at 500 hours, and 20 per cent at 1000 hours.

#### 1000-Hour Standby Life Performance:

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

C Specifications for tapper supplied on request.





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NOTE I: 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.









## High-Mu Twin Triode

9-PIN MINIATURE TYPE

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

#### GENERAL DATA

#### Electrical:

)	Heater Characteristics and Ratings Voltage (AC or DC) <sup>a</sup> Current at heater volts = 13.5. Peak heater-cathode voltage (Eac	(Absolute-, 0 h unit):	Yaximum Va 13.5±1.5 .150	<i>lues):</i> volts amp
	Heater negative with respect to cathode Heater positive with		100 max.	volts
)	Direct Interelectrode Capacitances	(Approx.):	100 max.	volts
		Without External Shield	With External Shield <sup>b</sup>	
	Grid-Drive Operation:			
	Grid to plate (Each unit)	1.6	1.6	μµf
	(Each unit)	2.5	2.5	μµf
	(Unit No.1)	0.45	1.2	μµf
	(Unit No.2)	0.38	1.3	μµf
	Cathode-Drive Operation:			
	Cathode to plate (Unit No.1)	0.2	0.18 <sup>d</sup>	μµf
	(Unit No.2)	0.24	0.2 <sup>d</sup>	μµf
)	(Each unit).	5	5 <b>d</b>	μµf
	Plate to grid and heater (Unit No.1)	1.9	2.7 <sup>d</sup>	μµf
	(Unit No.2)	1.8	2.7 <sup>d</sup>	μµf
)	Heater to cathode (Each unit) Plate to plate	2.8 0.24	2.8°	µµf µµf
	Characteristics, Class A <sub>1</sub> Amplifie	r (Each Uni	t):	
	Heater Voltage		13.5 250 200 60	volts volts ohms
	Plate Resistance (Approx.) Transconductance		10900 5500 10	ohms µmhos ma
	Grid Voltage (Approx.) for plate µ	a = 10	-12	volts

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#### Mechanical:

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

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



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

#### AMPLIFIER - Class Ai

Values are for Each Unit

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

PLATE VOLTAGE						÷.		330	max.	volts
GRID VOLTAGE:										
Negative-bias value.								55	max.	volts
Positive-bias value.								0	max.	volts
PLATE DISSIPATION								2.75	max.	watts
BULB TEMPERATURE (At ho	ott	tes	st							
point on bulb surface	e)							180	max.	°C

#### Maximum Circuit Values:

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

**a** Heater will withstand momentary excursions from 11.0 to 16.0 volts. ь With external shield JEDEC No.315 connected to cathode of unit under test except as noted.

<sup>c</sup> with external shield JEDEC No.315 connected to ground.

d With external shield JEDEC No.315 connected to grid of unit under test.

#### SPECIAL RATINGS AND PERFORMANCE DATA

#### Heater-Cycling:

Cycles of Intermittent Operation . . . . 1160 min. cycles This test is performed on a sample lot of tubes from each production run under the following conditions: Heater volts = 19.5 cycled one minute on and two minutes off; heater 135 volts negative with respect to cathode; all other elements

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

#### Low-Frequency Vibration Performance:

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

#### 500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: Heater volts = 15.0 and maximum-rated plate dissipation.



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### **Beam Power Tube**

9-PIN MINIATURE TYPE Quick-Heating-Filament Type for Mobile-Communications Equipment

#### GENERAL DATA

#### Electrical:

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

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

	Current	at 6	.3 vol	ts .		$\sim 5$			8				0.65	amp
	Heating	time											Less than 1	second
D	irect In	terel	ectroc	le Ca	pac	ita	nce	es:	a					
	Grid No	.1 to	plate								8	÷	0.14 max.	pf
	Grid No	.1 to	filan	nent,	gr	id	No.	3,						
	and a	rid N	0.2							υ.		e.	8.5	pf
	Plate t	o fil	ament.	qri	d N	0.3	,							
	and a	rid N	0.2.										5.5	pf
	0													

#### Characteristics, Class A, Amplifier:

Plate Voltage									•				200		volts
Grid No.3				a - 4				Co	nn	ес	te	d	to pin	ı at	socket
Grid-No.2 Voltage.									•				185		volts
Grid-No.1 Voltage.													-6		volts
Mu-Factor, Grid No.	2	tc	0	Grid	1 1	VO.	. 1		•	2		÷	11.5		
Transconductance .	÷.		•	8.18		0		•				×.	6700		µmhos
Plate Current	e.												36		ma
Grid-No.2 Current.		×.							×				2.5		ma

#### Mechanical:



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PLATE MODULATED RF POWER AMPLIFIER - Class C Telephony

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

Maximum ICAS<sup>c</sup> Ratings, Absolute-Maximum Values:

									U	p to	175 M	С	
DC PLATE VOLTAGE				÷						250	max.		volts
GRID No.3			×.	÷	ł.	÷	.(	207	nnect	to	bin 1	at	socket
DC GRID-No.2 VOLTAGE.				÷						250	max.		volts
DC GRID-No.1 VOLTAGE.										-125	max.		volts
DC PLATE CURRENT			× 1							60	max.		ma
DC GRID-No.2 CURRENT.				8	×					10	max.		ma
DC GRID-No.1 CURRENT.				÷.			1.0			5	max.		ma
PLATE INPUT										15	max.		watts
GRID-No.2 INPUT										1.4	max.		watts
PLATE DISSIPATION			2.1	ς.	2	2				7	max.		watts
BULB TEMPERATURE (At	ho	tte	est	E.									
point on bulb surfa	ce	).			i.	÷	×			225	max.		oC

#### Typical ICAS<sup>c</sup> Operation:<sup>d</sup>

	At 175 Mc	
DC Plate Voltage	250	volts
Grid No.3 Connected	to pin 1 at	socket
DC Grid-No.2 Voltagej	250	volts
DC Grid-No.1 Voltage <sup>f</sup> from a grid-No.1		
resistor of 33,000 ohms	-70	volts
Peak RF Grid-No.1 Voltage	75	volts
DC Plate Current	60	ma
DC Grid-No.2 Current	2.5	ma
DC Grid-No.1 Current (Approx.)	2.1	ma
Driving Power <sup>g</sup> (Approx.)	1	watt
Useful Power Output <sup>h</sup> (Approx.)	6.5	w ts
Maximum Circuit Values:		

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

#### FREQUENCY MULTIPLIER

Maximum ICAS<sup>c</sup> Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE					5	x.	×.		300	max.		volts
GRID No.3						.0	on	inect	to 1	bin 1	at	socket
DC GRID-No.2 SUPPLY VOL	TA	GE							300	max.		volts
DC GRID-No.2 VOLTAGE						2			250	max.		volts
DC GRID-No.1 VOLTAGE									-125	max.		volts
DC PLATE CURRENT									50	max.		ma
DC GRID-No.2 CURRENT		÷.	÷			3	x.		10	max.		ma
DC GRID-No.1 CURRENT		2		•			×	×	5	max.		ma
PLATE INPUT									15	max.		watts
GRID-No.2 INPUT									1.5	max.		watts
PLATE DISSIPATION									10	max.		watts
BUILD TEMPERATURE (At ho	ot t	est	ŧ.									
point on bulb surface	).			ŝ,					225	max.		oC



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### Typical ICAS<sup>c</sup> Operation:

As doubler to 175 Mc

Grid No.3. DC Grid-No. DC Grid-No. resistor Peak RF Gri DC Plate Cu DC Grid-No. DC Grid-No. Driving Powe Useful Powe	2 Voltage 1 Voltage of 53,000 d-No.1 Vo rrent . 2 Current 1 Current er <sup>9</sup> (Appr r Outputj	e f from ohms. ltage. (Appro ox.) (Appro	a gri	Conn d-No.	ectec 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	300 n 1 at 215 -80 87 50 3.4 1.5 0.5 3.5	volts socket volts volts volts ma ma watt watts	
		As trif	ler t	0 175	Mc				
DC Plate Vo Grid No.3. DC Grid-No. DC Grid-No. resistor	ltage 2 Voltage 1 Voltage of:	e. g from	· · · · · · · a gri	Conn d-No.	 ected 	250 topi 180	250 n 1 at 225	volts socket volts	
50,000 60,000 Peak RF Gri DC Plate Cu DC Grid-No. DC Grid-No. Driving Pow Useful Powe	ohms ohms d-No.1 Vo rrent . 2 Current 1 Current er <sup>g</sup> (Appr r Output <sup>h</sup>	ltage. (Appro ox.) (Appro	) )	• • •	· · · ·	-90 105 40 2.5 1.8 0.4 1.4	-108 118 50 3.4 1.8 0.6 2	volts volts volts ma ma watt watts	
Maximum Cir	cuit Valu	es:							
Grid-No.1-C	ircuit Re	sistand	е			0.1	max.	meaohm	
a Without ext	ernal shiel	d.			ituda	modulat	ion. Ar	nplitude	
<ul> <li>key-down comodulation audio-frequenced from the second seco</li></ul>	nditions pe essentially lency envel- t Commercia 5 at rf gro referably f avoltage d le to permi al tuning a om a grid-N d either fi 1 resistor	er tube negativ ope does al and An bund. rom a se ivider. it obtai djustmer o.1 res xed supp and fix	without ye may b not e nateur If a ning th its are istor, oly or red sup	sources sources sources comple or fro cathod ply ha	if ti 115 p e. e. ired c eted. om a co le res as the	from the stor is operatin ombinati istor. advanta	of the of the used, i g plate on of g The com	voltage t should current rid-No.1 pination not only	
<ul> <li>key-down comodulation audio-frequence conditions.</li> <li>c Intermitten d Pins 4 and</li> <li>e Obtained pry with be adjustab after initi</li> <li>f Obtained fr resistor an of grid-No. protecting minimizing</li> </ul>	nditions pe essentially lency envel- t Commercia 5 at rf gro referably f avoltage d le to permi al tuning a om a grid-N- d either fi 1 resistor the tube fr distortion	ar tube r negativ ope does and An bund. rom a se ivider. it obtai djustmer o.1 resi xed supp and fix om damag by bias-	without re may b nateur parate If a ning th its are istor, oly or sed sup ge throo- supply	source source service service service service comple or fro cathod ply ha ugh lo comple	tif ti 115 p ce. ce or s resis ired c ted. om a c le res as the ensat in ensat in	he posit er cent stor is operatin ombinati istor. advanta excitat	of the of the used, i g plate on of g The com age of r ion but	k of the carrier -voltage t should current rid-No.1 bination not only also of	
<ul> <li>b Key-down comodulation addio-frequencies</li> <li>c Intermitten</li> <li>d Pins 4 and</li> <li>e Obtained prive</li> <li>e Adjustaba after initi</li> <li>f Obtained friende</li> <li>f Obtained friende</li> <li>g of grid-No.</li> <li>protecting</li> <li>g Driving pow</li> <li>at input</li> </ul>	nditions pe essentially ency envel- t Commercia 5 at rf gro referably f avoltage d le to permi al tuning a om a grid-W d either fi 1 resistor the tube fr distortion er includes	ar tube negative ope does (1 and An bound. rom a sec ivider. it obtai xed supp and fix om damag by bias- circuit id circu	without ve may b not e nateur lf a ning th istor, oly or supply c losse it.	sources sources sources services or fro cathod ply ha ugh lo comple s and	tift 115 p te. ce or s resis ired c ted. om a co le res as the oss of insation is the	from the stor is operatin ombinati istor. advanta excitat on. e actual	of the of the used, i g plate on of g The coml age of r ion but	<pre>k of the carrier -voltage t should current rid-No.1 pination not only also of measured</pre>	
<ul> <li>b Key-down comodulation audio-frequencies</li> <li>c Intermitten</li> <li>d pins u and</li> <li>e Obtained prissuand</li> <li>d btained prissuand</li> <li>f Obtained friende</li> <li>f Obtained friende</li> <li>g Driving pow at the input</li> <li>h Measured at</li> </ul>	nditions pe essentially tency envel- t Commercia 5 at rf gro referably f avoltage d le to permi al tuning a om a grid-W d either fi d either fi d istortion er includes t to the gr load.	er tube negativ ope does negativ ope does nound. rom a se livider. it obtai djustmer o.1 res xed supp and fix om damag by bias- circuit id circu	without ve may b not e nateur eparate If a ning th istor, Dly or supply completions istor,	source source source service or froc cathod ply ha ugh lo comple s and	i if ti 115 p e. ce or i red c ired c ted. om a c le res as the oss of ensation is the	from the stor is operatin ombinati istor. advants excitat on. e actual	of the a plate- used, i g plate on of g The com age of r ion but	<pre>k of the carrier -voltage t should current rid-No.1 pination iot only also of measured</pre>	
<ul> <li>b Key-down comodulation audio-frequant of the second lines.</li> <li>c Intermitten d pins 4 and</li> <li>e Obtained prive values after initian of grid-No. protecting minimizing</li> <li>g Driving pow at the input h Measured at jobtained priving pow at the suppresistor.</li> <li>obtaining adjustments</li> </ul>	nditions pp essentially ency envel- t Commercia 5 at rf gro referably f avoltage d le to permi al tuning a om a grid-N d either fi 1 resistor the tube fr distortion er includes t to the gr load. eferably fr ly, or fro lt is recomm the desirec are made.	er tube : negative ope does al and An bund. rom a se it obtai djustmer on te se sed supp and fix om damag by bias- circuit id circu om a se; n the m iended th i operat	without we may be nateur parate If a ning th ths are istor, object hroo supply those boxes boxe	source source servic servic series or fro cathod ply ha ugh lo comple s and source at con	ce or s resisting ined ce ted. om a cc ted. om a cc ted. om a cc ted. is the s s the s s the s to r is the s to r is the s constant is the constant is the s constant is the constant is the constant is the constant is the constant	he posit er cent from the stor is speratin ombinati istor. advantz excitat on. e actual ulated a pply th be adjus after	of the of the used, i g plate on of g The comm age of r ion but power r along w rough a table to initial	<pre>k of the carrier -voltage t should current rid-No.1 bination not only also of measured ith the series o permit tuning</pre>	

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



#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

										Note	Min.	Max.	
Filament Current.										1	0.59	0.71	amp
Transconductance.										1,2	5700		µmhos
Plate Current										1,2	27	52	ma
Plate Current										1,3	-	75	μa
Grid-No.2 Current										1,2	-	5	ma
Reverse Grid-No.1	C	ur	rer	nt						1,4	-	1	μa
Leakage Resistance	e:												
Between grid No	.1	a	nd	a	11								
other electro	de	S	tie	ed	t	pg	et	he	r.	1,5	100	-	megohms
Between plate a	nd	a	11	0	the	er							
electrodes ti	ed	t	oge	etl	he	r.				1,6	100	-	megohms
													-

Note 1: With 6.3 volts dc on filament.

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

Note 3: With dc plate volts = 200, grid No.3 connected to pin 1 at socket, dc grid-No.2 volts = 185, and dc grid-No.1 volts = -36. Note 4: With dc plate volts = 215, grid No.3 connected to pin 1 at socket, dc grid-No.2 volts = 215, and dc grid-No.1 resistor = 0.1 megohm.

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

Note 6: With plate300 volts negative with respect to all other electrodes tied together.

#### OPERATING CONSIDERATIONS

The socket connections to fins q 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.



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### AVERAGE PLATE CHARACTERISTICS



Electron Tube Division

Harrison, N. J.





**Electron Tube Division** 

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92CS-11383



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

### Medium-Mu Triode

NUVISTOR TYPE

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

#### GENERAL DATA

#### Electrical:

Heater Characteristics and Ratings: Voltage (AC or DC)	S
Current at heater volts = 6.3 0.135 amp Peak heater-cathode voltage:	D
Heater negative with respect to cathode . 100 max. volts Heater positive with respect to cathode . 100 max. volts	S
Direct Interelectrode Capacitances (Approx.): Grid to plate	f f f
Characteristics, Class A; Amplifier:	1
Plate Supply Voltage.       24       volts         Grid.       Connected to negative end of cathode resistor         Cathode Resistor.       100       ohm         Amplification Factor.       11.5         Plate Resistance (Approx.)       1530       ohm         Transconductance.       7500       µmhor         Plate Current       8.7       m         Grid Voltage (Approx.) for plate μa = 50.       -5       volts	s s s s a s
Mechanical:	
Operating Position./Ang Type of CathodeCoated Unipotentia Maximum Overall LengthCoated Unipotentia Maximum Seated LengthO.6205 Maximum DiameterO.4400 Weight (Approx.)	y 1 ""
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-	,
5; or equivalent. Flange Mounting — Cinch Mfg. Co., No.133 65 10 003, or equivalent. Printed Board (Stand-off) —	
Cinch Mfg. Co., No.133 65 10 041, or equivalent.	

Indicates a change.



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Pin 1<sup>a</sup> - Do Not Use Pin 2 - Plate Pin 3 -Same as Pin 1 Pin 4 - Grid Pin 5 - Same as Pin 1 Pin 6 - Same as Pin 1 Pin 7 -Same as Pin 1 Pin 8 - Cathode Pin 9 - Same as Pin 1 Pin 10 - Heater Pin 12 - Heater



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

#### INDUSTRIAL SERVICE

Maximum Ratings, Absolute-Maximum Values:

For operation at any altitude

PLATE VOLTAGE .						 141	÷		50	max.	volts
GRID VOLTAGE:											
Negative-bias	V	alı	ue						 55	max.	volts
Peak-positive	V	alı	Je	÷		×.			2	max.	volts
GRID CURRENT									2	max.	ma
CATHODE CURRENT							×1		15	max.	ma
PLATE DISSIPATI	ON								0.45	max.	watt

#### - Typical Operation:

Plate Supply Voltage				5			12	24	volts
Grid Supply Voltage								0.7	volt
Grid Resistor							33000	-	ohms
Amplification Factor	ς.			÷			12	12	
Plate Resistance (Ap	pro	х.	).				1500	1500	ohms
Transconductance							8000	8000	umhos
Plate Current							5.5	9.5	ma

#### Maximum Circuit Values:

Grid-Circuit Resistance:<sup>b</sup> For fixed-bias operation. . . . . . . 10 max. megohms For cathode-bias operation. . . . . . . 10 max. megohms

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

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

#### CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
Heater Current	 1	0.125	0.145	amp
Direct Interelectrode				
Grid to plate	 2	1.8	2.4 dicates a	pf change.

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						Note	Min.	Max.	
	Grid and Plate	to cathode, : heater to cathode.	shell, 			2	3.4	4.6	pf
	and Heate Plate Plate C	heater r to cathode to cathode. urrent (1) .	· · · · · · · · · · · · · · · · · · ·	· ·	•	2 2 2 1,3	1.4 1.1 0.26 6.7	2.0 1.7 0.42 10.7	pf pf pf ma
	Plate Cu Transcou Transcou Transcou	urrent (2) . nductance (1 nductance (2 nductance Cha	) ) ange:	  	•	1,4 1,3 3,5	6500 5700	50 8500 –	μa μmhos μmhos
	Diffe conduc conduc in pe	rence between ctance (1) an ctance (2), e r cent of tra	n trans- nd trans- expressed anscon-						
	ducta	nce (1)		• •	•	1 6	-	15	%
	Amplifi	cation Facto	l r		:	1.3	9	14	μа
	Heater- Heate	Cathode Leak r negative w	age Curre ith	ent:					
	res	pect to cath	ode		•	1,7	-	5	μa
	res	pect to cath	ode			1,7	-	5	μa
	Leakage Betwe	Resistance: en grid and	all other	-					
	Betwe	ctrodes tied	together	· ·	•	1,8	1000	-	megohms
	ele	ctrodes tied	together	· ·	·	1,9	1000	-	megohms
	Note 1:	With 6.3 volts	s ac or dc	on h	eat	er.			
	Note 2:	Measured in ac	ccordance w	vith	EIA	Standa	rd RS-19	1-A.	
	Note 3:	With dc plate and cathode-by	supply vo ypass capac	itor	= 2	4, cath 1000 μf	ode resi •	stor = :	100 ohms,
	Note 4:	With dc plate connected to g	volts = 2 ground.	4, dc	g	rid vol	ts = -10,	and me	tal shell
	Note 5:	With 5.7 volts	s ac or dc	on h	eat	er.			
í	Note 6:	With dc plate = 1 megohm, ar	volts = 40 nd metal sh	), gr nell	id con	supply	volts = to ground	-2, grid d.	resistor
	Note 7:	With 100 volts	s dc applie	ed be	twe	en heat	er and c	athode.	
	Note 8:	With grid 100 v tied together.	volts negat	tive	wit	h respe	ct to all	other e	lectrodes
	Note 9:	With plate 100 tied together.	volts nega	ative	wi	th respe	ct to all	other e	lectrodes

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Shock Rating:



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current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency 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 nominal heater voltage only, and subjected for 48 hours to 2.5-g vibrational acceleration at 60 cycles per second in the  $X_1$  position. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

#### Variable-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in the  $X_1$  position through the frequency range from 50 to 15,000 cycles per second under the following conditions: a sweep rate of one octave per 30 seconds from 50 to 3000 cps, a 7-second sweep from 3000 to 15,000 cps, and a constant vibrational acceleration of 4 g. During the test, tube must not show an output voltage across the plate-load resistor in excess of: (1) 20 rms millivolts from 50 to 3000 cps, (2) 50 peak millivolts from 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-1D, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper<sup>C</sup>. See accompanying *Shorts-Test Acceptance-Limits* curve. Tubes are criticized for permanent or temporary shorts and open circuits.







a



#### 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 maximumrated plate dissipation. After 2 hours of operation and again after 20 hours of operation, tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 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  $\mu$ mhos under the  $\star$ 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>d</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 O-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent at 500 hours, and 20 per cent at 1000 hours.

#### 1000-Hour Standby Life Performance:

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

<sup>c</sup> Specifications for tapper supplied on request. d At metal-shell temperature of 150° C.

- Indicates a change.



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DIMENSIONS IN INCHES





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



9205-12161

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

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

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92CS-11479RI





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92CS-11467





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92CS-11471R1

### AVERAGE PLATE CHARACTERISTICS With Plate Resistance as Variable





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92CS-11468



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### 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							Eh	6.3	۷
Heater Current at Eh = 6.3	3 1	1.					Ih	135	mA
Direct Interelectrode Ca	pad	cit	tai	nce	es				
Input: K to (G, S, H).							ci	6.0	pF
Output: P to (G, S, H)							Co	1.3	pF
Cathode to plate							Ckp	0.046 max	pF
Heater to cathode							Chk	1.4	pF

#### CLASS AL AMPLIFIER

For Following Characteristics see Conditions

Amplification Factor					• µ	70	
Plate Resistance (Approx.) .					. r <sub>p</sub>	5600	Ω
Transconductance					• 9m	12400	$\mu$ mho
DC Plate Current					- Ib	10	mA
Cutoff DC Grid Voltage for 1b=	= 10	Οp	Α.		· Ec(co)	-5	V
Con	dit	tio	ns		. ,		
Heater Voltage					. Eh	6.3	۷
Plate Supply Voltage					- Ebb	110	V
Grid Supply Voltage					. Ecc	0	۷
Cathode Resistor			-		. R <sub>k</sub>	47	Ω
ABSOLUTE-M	AX	MU	М	RA	TINGS		
For operation	a	t d	iny	a	ltitude		
Plate Supply Voltage					Epp	330	V
DC Plate Voltage					Eb	150	V
Grid Voltage							
DC positive value			-		Ec	0	۷
DC negative value					Ec	-55	۷
Peak Heater-Cathode Voltage.			•		ehkm	±100	۷
Heater Voltage, AC or DC	•			•	Eh 5.7	to 6.9	
Average Cathode Current	•	•			'k(av)	15	mA
Plate Dissipation	•	•		•	Pb	1.5	W
MAXIMUM C	IR	CUI	Т	٧A	LUES		
Grid-Circuit Resistance <sup>a</sup>							
For fixed-bias operation .	•			•	Rg(ckt)	0.5	MΩ
For cathode-bias operation					Ra(ckt)	1	MΩ



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For cathode-bias operation . . . . Rg(ckt)

DATA 1

#### MECHANICAL CHARACTERISTICS

Operating Position . . . . . . . Anv . . . . . . . Type of Cathode. . . . . .Coated Unipotential . . Maximum Overall Length (1m). 0.985 in . Maximum Seated Length (1sm). 0.780 in Maximum Diameter (dm). . 0.440 in Weight (Approx.) . . . 2.2 g Dimensional Outline. JEDEC No. 4-6 Envelope . . . . JEDEC MT4 Base . . . Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-79)

BASING DIAGRAM (Bottom View)

Pin 2 - Cathode Pin 4 - Cathode Pin 7b\_Do Not Use Pin 8 - Cathode Pin10 - Heater Metal Shell-Grid Top Cap - Plate



INDEX = LARGE LUG • = SHORT PIN-IC

12CT

#### TYPICAL OPERATION

#### As Cathode-Drive RF Amplifier

Frequency		×.	1	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.				lb(av)	10	10	10	mA
Bandwidth				-	6	12	12	MHz
Power Gain				-	16.5	12.5	10.5	dB
Noise Factor <sup>C</sup>			٠	NF	6.5	9.5	12.2	dB

For operation at metal-shell temperature of 150  $^{\circ}$ C. For operation at other metal-shell temperatures, see Grid-Ofrcuit Resistance Ohart. Metal-shell temperature are measured in zone "An (See Dimensional)

 $\boldsymbol{b}$  Pin 7 is of such a length such that its end does not touch the socket insertion plane.

<sup>C</sup> Argon noise source. Input is tuned for optimum value.



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DATA I

#### INITIAL CHARACTERISTICS LIMITS

		Note	Min	Max	
Heater Current	Ih	1	0.125	0.145	Α
Capacitances Cathode to plate	ckp	2	-	0.046	pF
and heater	ci	2	5	7	рF
and heater Heater to cathode Plate Current (1) Transconductance (1) Reverse Grid Current Amplification Factor	со Chk IIb 2Ib Igm 2gm -Ic	2 1,3 1,4 1,3 3,5 1,6	1.1 1.1 7.8 _ 10000 8700 _ 54	1.5 1.7 13.2 50 14800 - 0.1 86	pF pF mA μMho μmho μA
Heater-Cathode Leakage Current	Ihk	1,7	а х <b>—</b> с	±5	$\mu \mathbf{A}$
Between grid and all other electrodes tied together. Between plate and all other	r <sub>g</sub> -all	1,8	5000	-	ΜΩ
electrodes tied together.	r <sub>p</sub> -all	1,9	10000	-	$\mathbf{M}\Omega$

#### Note I: With $E_f = 6.3$ V.

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

Note 3: With  $E_{bb}$  = 110 V,  $R_k$  = 47  $\Omega$ ,  $C_k$  = 1000  $\mu$ F.

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

Note 5: With  $E_f = 5.7$  V.

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

Note 7: With  $E_{hk} = \pm 100$  V.

Note 8: With  $E_{p}$ -all = -100 V. Note 9: With  $E_{p}$ -all = -300 V.

#### SPECIAL RATINGS & PERFORMANCE DATA Shock Rating

#### 

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.





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#### 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 RANCE 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 6000 to 15,000 c/s.

#### Low-Pressure Voltage-Breakdown Test

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

#### Heater Cycling

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

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100volts 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 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<sup>d</sup>. See accompanying Shorts-Test Acceptance-Limits curve. Tubes are criticized for permanent or temporary shorts and open circuits.

#### 1000-Hour Conduction Life Performance

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation and with a metal-shell temperature of 150  $^{\circ}$ C; then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent of 500 hours, and 20 per cent at 1000 hours.

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#### Interelectrode Leakage

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

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

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

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

<sup>d</sup> Specification for tapper will be supplied on request.



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Grid-Circuit-Resistance Chart



Electronic Components and Devices

Harrison, N. J.

### **Power Pentode**

#### 9-PIN MINIATURE TYPE

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

#### GENERAL DATA

#### Electrical:

Heater Characteristics and Ratings (Absolute-Maxi	imum Values):
Voltage (AC or DC) <sup>a</sup>	± 1.5 volts
Current at heater volts = 13.5 0.275	amp
Peak heater-cathode voltage:	
Heater negative with	
respect to cathode	max. volts
Heater positive with	
respect to cathode	max. volts
Direct Interelectrode Capacitances (Approx.):b	
Grid No.1 to plate 0.063	μµf
Grid No.1 to all other electrodes	
except plate	μµf
Plate to all other electrodes	
except grid No.1	μµf

#### Characteristics, Class A; Amplifier:

Heater Voltage	volts
Plate Supply Voltage	volts
Grid No.3 Connected to cathode	at socket
Grid No.2 Supply Voltage	volts
Cathode Resistor	ohms
Plate Resistance (Approx.) 0.1	megohm
Transconductance	µmhos
Plate Current	ma
Grid-No.2 Current	ma
Grid-No.1 Voltage (Approx.) for	
plate μa = 20	volts

#### Mechanical:

 Operating Position.
 Any

 Type of Cathode
 Coated Unipotential

 Maximum Overall Length.
 Coated Unipotential

 Maximum Seated Length.
 1-15/16"

 Length, Base Seat to Bulb Top (Excluding tip)
 1-9/16" ± 3/32"

 Diameter.
 0.750" to 0.875"

 Dimensional Outline
 See General Section

 Bulb.
 T6-1/2

 Base.
 Small-Button Noval 9-Pin (JEDEC No.E9-1)



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



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

#### AF POWER AMPLIFIER - Class AI

Maximum Ratings, Absolute-Maximum Values:

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

#### Maximum Circuit Values:

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

#### RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy<sup>c</sup>

and

RF POWER AMPLIFIER - Class C FM Telephony

Maximum CCS<sup>d</sup> Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE												300	max.	volts
DC GRID No.3 (SUPPRES	SOF	8 (	GR	D)		.(	on	ne	ect	1	0	catho	de at	socket
DC GRID-No.2 (SCREEN-	GRI	D)	1	101	TA	AGE						175	max.	volts
DC GRID-No.1 (CONTROL	-GF	RIE	))	VC	)L1	FA(	GE :							
Negative-bias value												50	max.	volts
DC PLATE CURRENT												33	max.	ma
DC GRID-No.2 CURRENT.												5.5	max.	ma
DC GRID-No.1 CURRENT.					•							3	max.	ma
GRID-No.2 INPUT												1	max.	watt
PLATE DISSIPATION												5	max.	watts

#### Typical Operation:

#### At frequencies up to 40 Mc

Heater Voltage							13.5	13.5	13.5	volts	
DC Plate Voltage							200	250	300	volts	
Grid No.3				. C	on	ine	cted to	cath	ode at	socket	
DC Grid-No.2 Voltage							115	145	175	volts	
DC Grid-No.1 Voltage							-7	-9	-12	volts	
Peak RF Grid-No.1 Voltag	je						9	11	16	volts	6
DC Plate Current							14.5	20	26	ma	-
DC Grid-No.2 Current							3	4.1	5.5	·ma	
DC Grid-No.1 Current (Ap	pr	ox	.)				0.6	0.85	1	ma	

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

#### Maximum Circuit Values:

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

#### FREQUENCY MULTIPLIER

Maximum CCS<sup>d</sup> Ratings, Absolute-Maximum Values:

Same as for RF POWER AMPLIFIER & OSCILLATOR

#### Typical Operation:

As doubler up to 40 Mc

DC Plate Voltage						200	250	300	volts
Grid No.3			.(	Cor	ine	cted to	cath	ode at	socket
DC Grid-No.2 Voltage						115	145	175	volts
DC Grid-No.1 Voltage						-16	-20	-25	volts
Peak RF Grid-No.1 Voltage						19	24	31	volts
DC Plate Current						11	15	20	ma
DC Grid-No.2 Current		÷				2	3	4	ma
DC Grid-No.1 Current (App	ro	х.	).			0.3	0.45	0.6	ma
Driving Power (Approx.) .						5	9	13	mw
Useful Power Output (Appr	ox	.)				1.4	1.9	2.5	watts

#### Maximum Circuit Values:

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

<sup>a</sup> The heater will take momentary excursions of 11.0 to 16.0 volts.

b Without external shield.

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

d Continuous Commercial Service.

#### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

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

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Note	1:	With ac or dc heater volts = 13.5.
Note	2:	With dc-plate-supply volts = 250, grid-No.2 volts = 150, grid No.3 connected to cathode at socket, cathode resistor (ohms) = 120, and cathode-bypass capacitor ( $\mu$ H) = 1000.
Note	3:	With dc plate-supply volts = 250, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, and cathode resistor (ohms) = 120.
Note	4;	With dc plate-supply volts = 250, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, cathode resistor (ohms) = 120, and grid-No.1 resistor (megohms) = 1.
Note	5:	With 100 volts dc between heater and cathode.
Note	6:	With grid No.1 100 volts negative with respect to all other electrodes tied together.
Note	7:	With plate 300 volts negative with respect to all other elec- trodes tied together.

#### SPECIAL RATINGS & PERFORMANCE DATA

#### Heater-Cycling Life Performance:

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

#### Low-Frequency Vibration Performance:

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





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### AVERAGE CHARACTERISTICS



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





**Electron Tube Division** 

5-62

Harrison, N. J.


# Power Tetrode

#### NUVISTOR TYPE

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

## Electrical:

Heater Characteristics and Ratings:

Voltage (DC). . . . .Tubes will be supplied with the heater designed to operate within ±10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.

Input	1.1		watts
Peak heater-cathode voltage:			
Heater negative with respect to cathode.	100	max.	volts
Heater positive with respect to cathode.	100	max.	volts
Direct Interelectrode Capacitances:			
Grid No.1 to plate	0.015	max.	pf
Grid No.1 to cathode, grid No.2, shell.			
and heater	7.0		pf
Plate to cathode, grid No.2, shell.			
and heater	1.4		of
Heater to cathode	1.4		pf
			12 13

#### Characteristics, Class A<sub>1</sub> Amplifier:

Heater Voltage	8										Spe	ec	ified cen	ter value
Plate Supply Volta	ige												100	volts
Grid-No.2 Supply V	01	ta	ge										50	volts
Grid No.1	Co	nn	ec	ted	to	n	ega	at	ive	9	enc	C	fcathode	resistor
Cathode Resistor.	χ.					÷				ž.		÷	68	ohms
Transconductance.	x i				÷					×.			11000	µmhos
Plate Current													11	ma
Grid-No.2 Current							100			×			2.9	ma
Grid-No.1 Voltage	(A)	pp	ro	×.)	fo	bri	pla	ate	εμ	a	= 1	0	-7	volts

#### Mechanical:

Operating Position. . . . . . . . . . . Any Type of Cathode . . . . Coated Unipotential 2 . . . . Maximum Overall Length. . . . . . . . 1.050" . . . Seated Length . . . . . . . . . . . . 0.790" to 0.840" Maximum Diameter. . 0.440" . . Weight (Approx.). . . . . . . . 2.4 grams Envelope. . . . . . . . Metal Shell MT4 with Ceramic Insulator Socket and Connector . . . . See Socket & Connector Information for RCA Nuvistor Tubes at front of this Section Base. . . Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)



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Basing Designation for BOTTOM VIEW. . . .

Pin  $1^{a}$  - Do Not Use Pin 2 - Grid No.2 Pin  $3^{a}$  - Do Not Use Pin 4 - Grid No.1 Pin  $5^{a}$  - Do Not Use Pin  $6^{a}$  - Do Not Use Pin  $7^{a}$  - Do Not Use Pin  $9^{a}$  - Do Not Use Pin 10 - Heater Pin 12 - Heater Top Cap - Plate



12AS

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

#### AMPLIFIER - Class A

Maximum Ratings, Absolute-Maximum Values:

For operation at any altitude

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

#### Maximum Circuit Values:

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

#### COMBINED RF OSCILLATOR and FREQUENCY DOUBLER - Class C

Maximum Ratings, Absolute-Maximum Values:

For operation at any altitude

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



#### Typical Operation: c

Heater Voltage							.S	pecified	center	value
Plate Supply Voltage.								80	150	volts
Grid-No.2 Supply Volta	ige							80	150	volts
Grid-No.2 Resistor								-	12000	ohms
Grid-No.1 Resistor								27000	10000	ohms
Plate Current						•		7.5	10	ma
Grid-No.2 Current								6	6	ma
Useful Power Output at	8	30	Мс	d				260	650	mw

### Maximum Circuit Values:

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

- a 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<sup>0</sup> C measured in Zone "A" as shown on Dimensional Outline. For operation at other metal-shell temperatures, see Grid-No.1-Circuit-Resistance Rating Chart.
- C Cathode, grid No.1, and grid No.2 are operated as a 40-Mc, Colpitts-type, electron-coupled oscillator with grid No.2 functioning as the "plate" of the oscillator, and the plate circuit tuned to 80 Mc.
- d Measured at load.

CHARACTERISTICS RANGE VALUES

Note	Min.	Max.	
Heater Current 1	$0.95 \left[ \frac{1.1}{E_f(ctr)} \right]$	$1.05 \left[ \frac{1.1}{E_{f}(ctr)} \right]$	amp
Direct Interelectrode Capacitances: Grid No.1 to plate . 2 Grid No.1 to cathode,	-	0.015	pf
grid No.2, shell, and heater 2 Plate to cathode,	6.0	8.0	pf
grid No.2, shell, and heater 2 Heater to cathode . 2 Plate Current (1) 1,3 Plate Current (2) 1,4 Grid-No.2 Current 1,3 Transconductance (1) . 1,3 Transconductance,	1.2 1.1 9  9000	1.6 1.7 13 50 4 13000	pf pf ma μa ma μmhos
Grid No.1 to Grid No.2 1,3 Useful Power Output (1)1,5 Useful Power Output (2)5,6 Reverse Grid-No.1	2000 0.550 0.500		µmhos watt watt
Current	15	0.3	μa ma
Heater negative with respect to cathode 1,9	-	10	μa
respect to cathode 1,9	-	10	μa

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	Note	Min.	Max.	
Leakage Resistance: Between grid No 1 and all				
other electrodes tied	1 10	5000		
Between grid No.2 and all	. 1,10	5000	-	megonms
other electrodes tied	. 1.11	5000	-	meanhms
Between plate and all		0000		negoring
other electrodes tied together	. 1,12	10000	-	megohms
				0

Note 1: With dc heater volts = specified center value,  $E_{f}(ctr)$ .

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

- Note 3: With dc plate supply volts = 100, dc grid-No.2 supply volts = 50, grid No.1 and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 68, and cathodebypass capacitor (μf) = 1000.
- Note 4: With dc plate volts = 100, dc grid-No.2 volts = 50, dc grid-No.1 volts = -7, and metal shell connected to ground.
- Note 5: Measured at load in 40-Mc oscillator-80-Mc doubler circuit with dc plate supply volts = 150, dc grid-No.2 supply volts = 150, grid-No.2 resistor (ohms) = 12000, and grid-No.1 resistor (ohms) = 10000.
- Note 6: With dc heater volts = 0.9 specified center value.
- Note 7: With dc plate supply volts = 125, dc grid-No.2 supply volts = 60, dc grid-No.1 supply volts = -1.5, grid-No.1-circuit resistance (megohms) <u>i</u> (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.
- Note 8: With dc plate supply volts = 100, dc grid-No.2 supply volts = 50, dc grid-No.1 supply volts = -6.5, rms 60-cps ac grid-No.1 signal volts = 7.5, dc grid-No.1-crircuit resistance (ohms) ≤ 2, plate- and grid-No.1-voltage supplies each bypassed with capacitor (µt) ≥ 500, and metal shell connected to ground. \*AC Emission\* is measured as the dc component of current in the plate circuit.
- Note 9: With dc heater-cathode volts = 100.
- Note 10: With grid No.1 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.
- Note 11: With grid No.2 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.
- Note 12: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

#### SPECIAL TESTS

#### Short-Duration Shock (1):

Peak Impact Acceleration . . . . . 1000

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<sub>1</sub>, X<sub>2</sub>, Y<sub>1</sub>, and Y<sub>2</sub>) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

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



# Long-Duration Shock (2):

Peak Impact Acceleration . . . . .

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 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, Useful Power Output (1), Reverse Grid-No.1 Current, and Heater-Cathode Leakage Current.

#### Sweep-Frequency Fatigue Vibration:

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

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

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

#### Low-Pressure Voltage Breakdown:

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



y

#### 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):

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.I Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.200 watt.



cycles



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

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



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92CS-12173

# AVERAGE CHARACTERISTICS









RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 5









# 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
)irect Interelectrode Capacitances (Approx.):		
Grid to plate	2.2	pf
Grid to cathode, shell,		
and heater	4.2	pf
Plate to cathode, shell,		
and heater	1.6	pf
Plate to cathode	0.26	pf
Heater to cathode	1.4	pf

#### Characteristics, Class A, Amplifier:

Heater Voltage . . . . . . . . . . . Specified center value Plate Supply Voltage . . . . . . . . . . 75 volts Grid . . . . . . Connected to negative end of cathode resistor ohms Amplification Factor . . . . . 28 Plate Resistance (Approx.) . . . . . . 2200 ohms 12800 Transconductance . . . . . umhos Plate Current. . . . 15 ma Grid Voltage (Approx.) for plate  $\mu a = 10$ -8 volts

#### Mechanical:

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



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Basing Designation for BOTTOM VIEW. . . .

Pin 1ª - Do Not Use 2 - Plate Pin 3ª - Do Not Use Pin Pin 4 -Grid Pin 5ª-Do Not Use 6ª - Do Not Use Pin 7ª-Do Not Use Pin Pin 8 - Cathode Pin 9<sup>a</sup> - Do Not Use Pin 10 - Heater Pin 12 -Heater



INDEX=LARGE LUG ●= SHORT PIN: IC-DO NOT USE

#### RF AMPLIFIER or OSCILLATOR - Class C

Maximum Ratings, Absolute-Maximum Values:

For operation at any altitude

												Up to	175 Mc	
Plate Supply Volt	age	3.	÷	÷				÷	÷			300	max.	volts
Plate Voltage												250	max.	volts
Grid Voltage:														
Negative-bias v	alı	Je										55	max.	volts
Peak-positive v	alı	Je							2			4	max.	volts
Grid Current		2						x	÷			5	max.	ma
Cathode Current .				2						÷.		25	max.	ma
Plate Dissipation		2								÷		2	max.	watts
Metal-Shell Tempe	rat	tui	re											
(Measured in Zo	ne	"	711	as	S									
shown on Dimens	ior	al	0	Jut	tli	ne	2)		÷		•	150	max.	°C

### Typical Operation:

As cathode-drive rf amplifier

											At 175 Mc		
Heater Voltage		2				2	÷			Spec	ified cente	er value	1
Plate Supply Voltage.	÷			$\sim$		5					150	volts	
Grid Resistor	×					$\sim$	×			$\sim$	4700	ohms	
Driver Power Output.			•	٠	•	$\mathbf{r}$			•		250	mw	
Useful Power Output <sup>D</sup> .			•	·	•			·	•		1.6	watts	
		As	s (	050	ci.	110	ite	r					

								At 175 Mc		
Heater Voltage				i.	×.		Spec	cified center	value	6
Plate Supply Voltage				į.		ŝ		170	volts	-
Grid Resistor	÷				÷			4700	ohms	
Plate Input			•			÷		3	watts	
Useful Power Output <sup>b</sup>	·					÷		1.5	watts	
Maximum Circuit Values:										
Grid-Circuit Resistance		×.						0.05 max. r	negohm	





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# FREQUENCY DOUBLER - Class C

Maximum Ratings, Absolute-Maximum Values:

For operation at any altitude

										U	b to	175 Mc	
Plate Supply Voltage.		ş.		ŝ			i.	į.	ł.		300	max.	volts
Plate Voltage		÷	÷	÷	•			÷	÷		250	max.	volts
Grid Voltage:													
Negative-bias value						20.2					200	max.	volts
Peak-positive value					÷.			1		6	4	max.	volts
Grid Current			×.	×.	÷						5	max.	ma
Cathode Current			÷	1	÷			÷	÷	÷	22	max.	ma
Plate Dissipation			×	×.					÷	÷.	2	max.	watts
Metal-Shell Temperatu	ire												
(Measured in Zone "	'Α"	a	S										
shown on Dimensiona	l	Oui	tl	ine	2)					8	150	max.	oC

# Typical Operation:

								C	-00	10-100 MC	
Heater Voltage								Spe	eci	fied center	value
Plate Supply Voltage			,		ŝ	•		ŝ.	÷.	135	volts
Grid Resistor			×.				•	5		30000	ohms
Driver Power Output		•	e.						÷	150	mw
Useful Power Output <sup>®</sup>			5	·	٠		•		·	800	mw

# Maximum Circuit Values:

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

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

b Measured at load.

#### CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
Heater Current	1	$0.95 \left[ \frac{0.85}{E_{f}(ctr)} \right]$	1.05 $\frac{0.85}{E_{f}(ctr)}$	amp
Direct Interelectrode Capacitances: Grid to plate Grid to cathode	e 2	1.8	2.6	pf
shell, and heater	2	3.8	4.6	pf
Plate to cathode, shell, and heater Plate to cathode. Heater to cathode. Plate Current (1). Plate Current (2).	2 2 1,3 1,4	1.4 0.20 1.1 11	1.8 0.32 1.7 19 100	pf pf ma μa
Transconductance (1) Useful Power Output (2 Useful Power Output (2 Reverse Grid Current AC Emission Amplification Factor	1,3 1)1,5 2)5,6 1,7 1,8 1,3	11400 1.4 1.3  20 22	14200 / 	umhos vatts vatts μa ma



							1	Vote	Min.	Max.		
Heater	-C.	athode										
Leak	ag	e Current:										6
Heat	er	negative with								-		-
re	spe	ect to cathode.	•	•	•	• •		1,9		5	μa	
Heat	er	positive with						1 0		E		
re	spe	ect to cathode.	•	•	•	•		1,9		C	μa	
Leakag	eı	Resistance.										
Detw	eer	n grid and all										
+:	ne	relectrodes						1 10	5000		magaahma	6
Botw	eu	n plate and all	•		•	• •		1,10	0000	_	negonns	
ot	ho	r place and an										
ti	ed	together		a. 11				1.11	10000	-	meanhms	
	cu	cogether	•		•			-,	10000		negonno	
Note 1	:	With dc heater vo	lts	=	spe	cit	ied	cent	er value,	E <sub>f</sub> (cti	r).	
Note 2	:	Measured in accor	danc	ce	wit	h E	AIE	Stand	ard RS-19	1-A.		
Note 3	:	with dc plate sup ed to negative end = 100, and cathod	ply of e-by	ca pa	lts tho ss	de cap	75, res aci	istor tor (	and meta , cathode uf) = 100	il shell resist 10.	l connect- tor (ohms)	
Note 4	:	With dc plate vol connected to grou	ts : nd.	= 7	5,	dc	gr	id vol	ts = -9,	and me	tal shell	
Note 5	:	Measured at load i with dc plate sup and driver power	n 17 ply outp	vo vo	Mc, lts (m	ca =	150 iwa	de-dr , grid tts) :	ive, rf-a d resisto = 250.	umplifie or (ohms	er circuit s) = 2500,	
Note 6	:	With dc heater vo	lts	= (	0.9	sp	eci	fied	center va	lue.		
Note 7	:	With dc plate sup grid-circuit resi of the current m shell connected t	ply star ete o gr	vo nce r u rou	lt: (m ise nd.	s = nego d f	80, hms or	dc g ) ≟ 1 this	rid supp (the int measurem	ly volt ernal i ent),	s = -1.2, resistance and metal	
Note 8	:	With dc plate sup rms 60-cps ac grid (ohms) = 2, plat with capacitor (µ1 "AC Emission" is the plate circuit	ply sig e- mea ∙	vo gna and 500 asu	lts l y l g o, rec	s = rid and d a	40, s = -vo d me s th	dc g 8, dd ltage tal si ne dc	grid supp c grid-ci supplie hell conr componer	ly volt rcuit n s each nected t nt of c	s = -6.5, resistance bypassed o ground. urrent in	
Note 9	:	With dc heater-ca	thod	ie '	vol	ts	= 1	00.				
Note 10	:	With grid 100 volt tied together, an	s ne d me	ega	tiv 1 s	hel	ith 1 c	resper onnec	ct to all ted to gr	other e ound.	electrodes	
Note 11	:	With plate 300 vo	lts	ne	gat	tiv	e wi	th re	espect to	all ot	her elec-	

### 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<sub>1</sub>, X<sub>2</sub>, Y<sub>1</sub>, and Y<sub>2</sub>) in a Navy-Type High-Impact (Flyweight) Shock Machine and, withtube-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 . . . . .

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 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, Useful Power Output (1), Reverse Grid Current, and Heater-Cathode Leakage Current.

#### Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the Sweep-Frequency Fatigue Vibration specified below. Tubes are held rigid and operated with 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 g.
- c. The vibration from 500 to 50 cps and then to 5 cps follows the same procedure, but in reverse.

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

#### Low-Pressure Voltage Breakdown:

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

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.

#### Oscillator Life (100 Hours):

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

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

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





BOTTOM VIEW

Showing Arrangement of All II Base Pins



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



NOTE I: MAXIMUM OUTSIDE DIAMETER OF 0.440" 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. DATA 4







RADIO CORPORATION OF AMERICA Harrison, N. J. DATA 5 1-64





# Medium-Mu Triode

NUVISTOR TYPE

ALL-CERAMIC-AND-METAL CONSTRUCTION

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

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

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

# CHARACTERISTICS RANGE VALUES

							Notea	Min.	Max.	
Heater Current	x.	÷.					10	0.055	0.065	amp
Direct Interelectrode										
Capacitances:										
Grid to plate	÷		÷		•		2	2.0	2.8	pf
Input: G to (K,S,H)							2	4.0	4.8	pf
Heater to cathode .							2	1.4	2.0	pf
Transconductance (2).	2	×.	÷	•	•		11	9000	-	µmhos
Note 10: With 13.5	V	olt	ts	ac		or	dc on	heater.		

Note II: 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.





RADIO CORPORATION OF AMERICA Electronic Components and Devices

Harrison, N. J.



# High-Mu Triode

### NUVISTOR TYPE

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

# Electrical:

Heater Characteristics and Ratings:

Voltage (DC). . . .Tubes will be supplied with the heater designed to operate within  $\pm 10\%$  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.

watt		0.85									$\mathbf{x} \rightarrow \mathbf{x}$				Input	
								ge	ta	vol	ode	atho	er-c	heat	Peak	
								0		ith	e w	tive	nega	ter	Hea	
volts	max.	100								ode	ath	0 08	ct t	espe	1	
										ith.	e w	tive	posi	ter	Hea	
volts	max.	100			•					ode	ath	0 08	ct t	espe	r	
		<.):	orox	App	()	es	nc	ita	ac	Cap	ode	ctro	erele	Inte	rect	Di
pf		0.9									ν.		late	to p	Grid	1
										ell,	sh	de,	atho	to c	Grid	1
pf		4.2											ter	hea	and	
									,	hell	, s	ode,	cath	to	Plate	
pf		1.7								e 14	χ.		ter	hea	and	
pf		0.22										ode	cath	to	Plate	
pf		1.3									з.	hode	cat	r to	leate	

#### Characteristics, Class A, Amplifier:

Heater Voltage							Spe	ecified cent	ter value
Plate Supply Voltage						•		110	volts
Grid Connected to	0	ne	ga	ti	Ve	6	end	of.cathode	resistor
Cathode Resistor								150	ohms
Amplification Factor			x.					64	
Plate Resistance (Approx.) .			x.					6800	ohms
Transconductance								9400	µmhos
Plate Current								7	ma
Grid Voltage (Approx.) for a	[]	at	е	цa	1 =	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.)	1.9 grams
Envelope	Metal Shell MT4
Socket See	Socket & Connector Information
for RCA Nuvistor	Tubes at front of this Section
Base Medium Ceramic-Wafer	Twelvar 5-Pin (JEDEC No.E5-65)



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Basing Designation for BOTTOM VIEW. .

Pin 1ª - Do Not Use 2 - Plate Pin 3ª-Do Not Use Pin 4 -Grid 5ª-Do Not Use Pin 6ª-Do Not Use Pin 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-Maximum Values:

For operation at any altitude

						Rating 1	Rating 2 b	
Plate Supply Voltage.					8	300 max.	300 max.	volts
Plate Voltage					2	250 max.	250 max.	volts
Grid Voltage:								
Negative-bias value				ž.		55 max.	55 max.	volts
Positive-bias value				ł.	5	-	0 max.	volts
Peak-positive value					8	2 max.	-	volts
Cathode Current	•	٠	÷	÷	8	15 max.	2.5 max.	ma
Plate Dissipation			$\sim$	¥.		1 max.	0.2 max.	watt

#### Maximum Circuit Values:

Rating 1 Rating 2 b

Grid-Circuit i For fixed-b	ia	515	sta	and	ce						
operation				÷		×		0.5° max.	40	max.	megohms
For cathode- operation	-b	ia:	s •					1° max.	40	max.	megohms

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

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

For operation at metal-shell temperature of 150<sup>0</sup> C measured in Zone "A" as shown on *Dimensional Outline*. For operation at other metal-shell temperatures, see *Grid-Circuit-Resistance* Rating *Chart*.

#### CHARACTERISTICS RANGE VALUES

	Not	e Min.	Max		
Heater Current	1	$0.95 \left[ \frac{0.85}{F_{-}(atr)} \right]$	$1.05 \left[ \frac{0.85}{F_{\rm out} r_{\rm ot}} \right]$	amp	
Direct Interelectrode Capacitances:		[Lf(Ctr)]			
Grid to plate	2	0.8	1.0	pf	0
shell, and heater .	2	3.4	5.0	pf	



					Note	Min.	Max.	
	Plate to cat shell, and Plate to cat Heater to ca Plate Current Plate Current Transconductar Transconductar Reverse Grid ( Amplification Heater-Cathodd	hode, hode hode (1) (2) ce (1). current. Current.			2 2 1,3 1,4 1,3 3,5 1,3	1.3 0.16 1.0 5.5 7900 6700 - 54	2.1 0.28 1.6 8.8 50 10900 - 0.05 74	pf pf ma μmhos μmhos μa
	Leakage Curi Heater nega respect to	rent: tive with cathode			1,7	_	5	μa
)	Heater posit respect to Leakage Resist Between grid	cathode tance: d and all			1,7	-	5	μa
	other elec tied toge Between pla	ctrodes ther te and all	r n	• •	1,8	5000	-	megohms
	tied toge	ther		× ×	1,9	10000	-	megohms
	Note 1: With do Note 2: Measure Note 3: With do to nega = 150.	heater vol d in accord plate supp ative end o and cathode	ts = ance ly vc f cat	speci with lts = hode	ified ce ELA Sta 110, gr resist	enter value andard RS-: id and met or, cathoo c (uf) = 10	e, E <sub>f</sub> (ctr) 191-A. tal shell de resist	connected or (ohms)
	Note 4: With do	plate volt ed to groun	s =	110,	dc grid	volts = -	5, and me	tal shell
	Note 5: With do Note 6: With do grid-ci of the c connect	heater vol plate supp rcuit resis urrent mete ed to groun	ts = ly v stanc r use d.	0.9 s olts e (me ed fo	specifie = 150, gohms) <u>-</u> r this n	ed center v dc grid su ∠ 1 (the i neasuremen†	value. hpply volt nternal r t), and me	s = -1.7, esistance tal shell
	Note 7: With do	heater-cat	hode	volt	s = 100.			
	Note 8: With gr tied to	id 100 volts gether.	nega	ative	with re	espect to a	ll other e	electrodes
7	Note 9: With pl tied to	ate 300 volt gether.	s neg	gativ	e with re	espect to a	ll other e	electrodes

#### SPECIAL TESTS

#### Short-Duration Shock (1):

Peak Impact Acceleration . . . . .

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<sub>1</sub>, X<sub>2</sub>, Y<sub>1</sub>, and Y<sub>2</sub>) in a Navy-Type High-Impact (Flyweight) Shock Machine and, withtube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

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



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

# Long-Duration Shock (2):

Peak Impact Acceleration . . . . . 50

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

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

#### Low-Pressure Voltage Breakdown:

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

RCA

g

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. Inthis test, tubes are criticized for permanent or temporary shorts and open circuits.

## Reliability Life (20 Hours):

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

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

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

# Heater-Cycling Life (100 Hours):

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.

#### Intermittent Life (100 Hours):

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

During this test, tubes are operated at maximum rated plate dissipation ( $Rating \ 1 \longrightarrow 1$  watt).

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





DIMENSIONS IN INCHES

BOTTOM VIEW

Showing Arrangement of All II Base Pins



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



MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED NOTE I: 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.









# Medium-Mu Triode

#### NUVISTOR TYPE

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

#### Electrical:

Heater Characteristics and Ratings:

Voltage (DC)....Tubes will be supplied with the heater designed to operate within ± 10% of any specified center heater voltage between 6.0 and 8.5 volts to meet specific battery-supply requirements in sonobuoy and other expendable equipment.

watt		0.85			a be a			Input	Inpi
						voltage	hode	Peak heater-cath	Peal
					ect	th resp	ve wi	Heater negative	He
volts	max.	100					2 A	to cathode.	
					ect	th resp	ve wi	Heater positive	He
volts	max.	100						to cathode.	
		.):	rox	App	inces	Capacit	rode	rect Interelectro	irec
pf		2.1						Grid to plate .	Grid
pf		4.0			heater	1, and	, she	Grid to cathode,	Gri
pf		1.7		er.	heate	ell, and	ie. sh	Plate to cathode	Pla
pf		0.34					le	Plate to cathode	Pla
pf		1.4					de .	Heater to cathod	Hea

### Characteristics, Class A, Amplifier:

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

#### Mechanical:

Operating Position. . . . Anv Type of Cathode . . . . . Coated Unipotential Maximum Overall Length. . . . . . . . . . . . . 0.800" . . . . Maximum Seated Length . . 0.625" Maximum Diameter. . . . . . . . . . . 0.440" 1.9 grams . . . . . . . Metal Shell MT4 Envelope. See Socket & Connector Information Socket. . 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 . . . . .



. 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	2.								÷	55	max.	volts
Peak-positive value							i.	2		2	max.	volts
Grid Current										2	max.	ma
Cathode Current		5		2	2		÷.	÷	2	15	max.	ma
Plate Dissipation				÷.			÷.	4	2	0.45	max.	watt

#### Typical Operation:

Heater Voltage	2					iii			SI	pecified	center	value
Plate Supply Voltage										12	24	volts
Grid Voltage											-0.7	volt
Grid Resistor.		2				ų,				33000		ohms
Amplification Factor							2			12	12	
Plate Resistance (Ap	pr	ox.	)					×	×	1500	1500	ohms
Transconductance			÷							8000	8000	µmhos
Plate Current	12.1		×	×						5.5	9.5	ma

#### Maximum Circuit Values:

Grid-Circuit Resistance: <sup>b</sup>						
For fixed-bias operation .			÷		10 max.	megohms
For cathode-bias operation	e	•	8		10 max.	megohms

- a Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.
- For operation at metal-shell temperatures up to 150° C,measured in Zone "A" as shown on *Dimensional Outline*. For operation at metalshell temperatures above 150° C, see accompanying *Grid-Circuit-Re*sistance Rating Chart.





		UNAKA	LIER	ISTICS RANGE V	ALUES	
			Note	Min.	Max.	
	Heater	Current	1	$0.95 \left[ \frac{0.85}{E_{f}(ctr)} \right]$	$1.05\left[\frac{0.85}{E_{f}(ctr)}\right]$	amp
	Direct	Interelectrode			<u> </u>	
	Capac	itances:				
	Grid	to plate	2	1.8	2.4	pf
	Grid	to cathode,				Acres 1
	she	11, and heater	2	3.4	4.6	pf
	Plate	to cathode,				
	she	11, and heater	2	1.4	2.0	pf
	Plate	to cathode .	2	0.26	0.42	рf
	Heate	r to cathode.	2	1.1	1.7	pf
	Plate C	urrent (1)	1,3	6./	10.7	ma
	Plate C	urrent (2).	1,4	-	50	μa
	Transco	nductance (1)	1, 3	6500	8200	µmnos
7	Pavarco	Crid Current	2,0	5700	0.05	µmnos
	Amplifi	cation Eactor	1 2	- 0	14	μa
	Heater-	Cathode	1,7	0	1.4	
	Leaka	de Current:				
	Heate	r negative				
	wit	h respect to				
	cat	hode	1.7	_	5	ца
	Heate	r positive				1
	wit	h respect to				
	cat	hode	1,7	-	5	μa
	Leakage	Resistance:				
	Betwe	en grid and				
	all	other				
	ere	ectrodes tied	1 0	5000		maaabma
	Retwo	en plate and	1,0	3000	-	negonins
	all	other				
	ele	ectrodes tied				
	tog	gether	1,9	10000	-	megohms
	Note 1.	With de bostor v	olte	- spacified costs	r value E (etc)	
	Note 2.	Measured in acco	rdanci	e with FLA Standa	rd RS-191-A	
	Note 3:	With dc plate supp	ly vo	lts = 24. grid an	nd metal shell con	nected to
		negative end of c and cathode-bypa	aťhod ss ca	e resistor, catho pacitor $(\mu f) = 10$	de resistor (ohm 100.	s) = 100,
	Note 4:	with dc plate vo connected to grou	its = und.	24, dc grid vol	ts = -10, and me	tai shell
)	Note 5:	With dc heater v	olts	= 0.9 specified c	enter value.	
	Note 6:	With dc plate s grid circuit res of the current me connected to grou	upply istan ter u und.	volts = 40, dc ice (megohms) $\leq 1$ sed for this meas	grid supply vol (the internal re surement), and me	ts = -2, esistance tal shell
	Note 7:	With dc heater-c.	athod	e volts = 100.		

CHARACTERISTICS RANGE VALUES

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.



RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 2 1-64
#### SPECIAL TESTS

#### Short-Duration Shock (1):

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

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

#### Long-Duration Shock (2):

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

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 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. During operation, the tube is vibrated through the frequency range from 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. This cycle is repeated for a period of 3 hours along each of three mutually perpendicular axes for a total of 9 hours. The longtudinal axis of the tube is coincident with one of the three axes. The vibrations are applied as follows:

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

At the end of this test, tubes are criticized for Continuity



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

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 lot of tubes from each production run.

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

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



9205-10465RI







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".



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92CS-12165





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**Electronic Components and Devices** 

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Harrison, N. J.



92CS-12164





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



## High-Mu Triode

#### 7-PIN MINIATURE TYPE

FRAME-GRID CONSTRUCTION

"PREMIUM" VERSION OF 6J4

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

#### Electrical:

Heater Ratings and Characteristics:		
Voltage (AČ or DC)	$6.3 \pm 0.3$	volts
Current at heater volts = 6.3	0.400	amp
Peak heater-cathode voltage:		
Heater negative with respect to cathode.	100 max.	volts
Heater positive with respect to cathode.	100 max.	volts
Direct Interelectrode Capacitances: <sup>a</sup>		
Cathode to plate	0.2 max.	pf
Input (Cathode-drive operation):		
K to (G + IS. H) <sup>b</sup>	7.5	pf
Output (Cathode-drive operation):		
P to (G + IS, H) <sup>b</sup>	5.0 max.	pf
Grid and internal shield to plate	2.8	pf
Heater to cathode	2.8	pf

#### Mechanical:

Operating Position. . . . . . Any Coated Unipotential . . ÷ 2-1/8" Maximum Seated Length . . . 1-7/8" Length, Base Seat to Bulb Top (Excluding tip). . 1-1/2" ± 3/32" Diameter. . . . . 0.650" to 0.750" . . . . . . . . Dimensional Outline (JEDEC No.5-2). . See General Section Bulb. . . . . . . . . . . . . . . . . . T5-1/2 Basing Designation for BOTTOM VIEW. . . . . . 7BO

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



#### Characteristics, Class A, Amplifier:

Plate	SI	upp	1)	1	101	ta	age	е.			×.	•									150	volts
Grid.															C	oni	ne	ct	ed	to	negati	ve end
																		0	f	cat	hode re	sistor
Catho	de	Re	si	st	tor	•															100	ohms
Ampli	fic	cat	ic	n	Fa	act	to	r.			÷										52.5	
Plate	Re	esi	st	ar	nce	2	(Ap	ppi	ro)	Χ.	).	•			•	•	•	·	•	•	4800	ohms
Trans	CO	ndu	ict	ar	nce	2.	•	•	•	•		•	•	•		•		•		•	11000	$\mu$ mhos

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Plate Current	~
CLASS A1 AMPLIFIER	
Maximum Ratings, Absolute-Maximum Values:	
For operation at altitudes up to 80,000 feet and frequencies up to 500 Mc	
Plate Voltage	
Negative-bias value	
Cathode Current	
Plate Dissipation 2.5 watts	
Bulb Temperature (At hottest point on bulb surface) 120 °C	
Maximum Circuit Values:	

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

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

### CHARACTERISTICS RANGE VALUES

		Note	Min.	Max.		
Heater Current		1	0.375	0.425	amp	
Direct Interelectrode		0				
Capacitances		2		0.0	- 5	
Cathode to plate		3	-	0.2	pr	
operation):						
K to (G + IS. H)		4	5.5	9.5	pf	
Output (Cathode-drive						
operation):					-	
P to (G + IS, H)	• •	4	-	5.0	pt	6
Grid and Internal shield		З	2.3	3.3	of	
Heater to cathode		3	1.0	4.5	pf	
Plate Current (1)		1,5	9	18	ma	
Plate Current (2)		1,6	-	60	μa	
Transconductance (1)	• •	1,5	8800	13200	µmhos	
Iransconductance (2) for an						1
as a per cent of Trans-						-
conductance (1)		5.7	-	15	%	
Reverse Grid Current		1,8	0	0.5	μa	
Amplification Factor		1,5	40	65		
Heater-Cathode Leakage Current	•					
respect to cathode.		1.9	-	10	ща	0
Heater positive with		-,0			1000	
respect to cathode		1,9	-	10	μa	-

DATA I

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Harrison, N. J.

Leakage Resistance:

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

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

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

- Note 3: With external shield JEDEC No.316 connected to ground.
- Note 4: With external shield JEDEC No.316 connected to grid.
- Note 5: With dc plate-supply volts = 150, grid connected to negative end of cathode resistor, cathode resistor (ohms) = 100, and cathode-bypass capacitor (uf) = 1000.
- Note 6: With dc plate volts = 150 and dc grid volts = -15.
- Note 7: With ac or dc heater volts = 5.7.

Note 8: With dc plate supply volts = 175, grid-circuit resistance (megohms) = 0.25, and cathode resistor (ohms) = 150. Note 9: With dc heater-cathode volts = 100.

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

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

#### SPECIAL TESTS

#### High-Impact, Short-Duration Shock:

Peak	Impact	Accele	ration.					•		8	450	g
Durat	ion of	half-s	ine-wave	3								
mer	hanica	l-shock	nulse								1	msec

This test is performed on sample tubes from each production lot to determine the ability of the tubes to withstand the specified acceleration for a short time interval. Tubes are rigidly mounted in each of four different positions (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 (megonhms) = 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 Vibrati	ional	Acc	ce	lei	rat	ti	nc	÷.								5	g
Vibration Fr	requen	су														25	cps
Duration of	Test.	•	•	X	÷	•	٠	X	ž.	•	•	•	÷.	ŝ	٠	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  $Y_1$ ).



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Tubes are then criticized for changes in Transconductance (I), 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 Vibrati	ional A	ccele	erat	ion								10		g
Vibration Fr	requenc	у.				2						40		cps
RMS Voltage	across	pla <sup>.</sup>	te 1	oad	re	esi	st	toi	٢.	ž.		150	max.	mv

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

#### Variable-Frequency Vibration:

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

This test is performed periodically on sample tubes to determine if mechanical resonance is present at the specified acceleration over the specified frequency range. Tubes are rigidly mounted on a platform vibrating with simple harmonic motion over a frequency range of 50 to 500 cps and, with the tubes operating under the conditions specified in the CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate load resistor of 2000 ohms, are subjected to the specified acceleration in each of two different positions,  $\chi_1$  and  $\chi_2$ . The acceleration over the frequency range is within  $\pm 20$  percent 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.					2				80000				ft	
Air Pressure				s.					21	±	2	mm	Hg	
Ambient Temperature				÷					25	±	5		οč	
RMS Voltage between	pl	at	te											
base pin and adjad	er	nt	0	in	s.				500			vo	ts	

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  $25^{\circ} \pm 5^{\circ}$  C, while the tubes

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

#### Continuity and Shorts:

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

#### Heater-Cycling Life:

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

#### Stability Life (20 Hours):

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

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

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

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

This test is performed on sample tubes from each production lot to assure the high quality of individual tubes and to guard against epidemic failures due to excessive transconductance change in any of the characteristics specified below. After 500 hours of operation under the conditions specified for the Stability Life Test above and, in addition, with heater voltage cycled IIO minutes ON and IO minutes OFF, and bulb temperature =  $120^{\circ}$  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, are again criticized for all of the preceding defects with the exception of the change in Transconductance (2).



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# High-Mu Triode

#### ENVIRONMENTAL TESTS

Heater to cathode.

#### LIFE TESTS

1.0

Chk

pF

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

NUVISTOR TYPE

#### ELECTRICAL CHARACTERISTICS

#### Bogey Values

Heater Voltage, (DC or AC) Ef	6.3	٧
Heater Current at $E_f = 6.3 V \dots I_f$	100	mA
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	pF
Grid to cathode	2.6	pF
gr.		

#### CLASS AL AMPLIFIER

For Following Characteristics see Conditions

Amplification Factor $\mu$	127	
Plate Resistance (Approx.) rp	41	kΩ
Transconductance gm	3100	$\mu$ mho
DC Plate Current Ib	1.5	mA
Cutoff DC Grid Voltage for $I_b = 10 \ \mu A E_c(co)$	-1.7	V
Conditions		
Heater Voltage	6.3	V
Plate Supply Valtage	120	V

						Ef
-						- ·

Plate Supply Voltage		٠	٠	٠	٠				-bb	120	Y
Grid Supply Voltage.									Ecc	0	٧
Cathode Resistor									Rk	200	Ω
Metal Shell						C	on	nec	ted to	system	ground

#### ABSOLUTE MAXIMUM RATINGS

For operation as a Class-A1 Amplifier Tube at frequencies up to 200 kc/s

Plate Supply Voltage .									Ebb	330	٧
DC Plate Voltage									Eb	250	٧
Grid Voltage											
Peak positive value.									ecm	0	۷
DC positive value									Ec	0	٧
DC negative value									Ec	-55	۷
Peak Heater-Cathode Vol	ta	ige							ehkm	±100	٧
Heater Voltage, DC or A	C								Ef	5.7 to 6.9	٧
Instantaneous Voltage.									See Bred	akdown-Volta	ige
Between base pins and m	et	al		she	e1	1		(	Characte	eristics Cur	ve
Average Cathode Current									Ik(av)	2	mA
Plate Dissipation									Ph	0.3	W
Envelope Temperature <sup>C</sup> .			•						TE	150	°C

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MAXIMUM CIRCUIT VALUES								
Grid-Circuit Resistance     For fixed-bias operation     50     MΩ       For cathode-bias operation      Rg(ckt)     100     MΩ       MFCHANICAL CHARACTERISTICS	Ģ							
Operating Position								
Uperating Position	0							
P								
Pin $1^{\mathbf{b}}$ - Do Not Use Pin $2$ - Plate Pin $3^{\mathbf{b}}$ - Do Not Use Pin $4$ - Grid Pin $5^{\mathbf{b}}$ - Do Not Use Pin $6^{\mathbf{b}}$ - Do Not Use Pin $7^{\mathbf{b}}$ - Do Not Use Pin $8$ - Cathode Pin $9^{\mathbf{b}}$ - Do Not Use Pin $10$ - Heater Pin $11$ - Omitted Pin $12$ - Heater <b>INDEX=LARGE LUG</b> $\bullet$ = SHORT PIN—IC								
TYPICAL OPERATION								
In High-Input-Impedance, Cathode-Follower Circuit								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0							
Source resistance $(R_c) = 1$ GO R. 7 kO.								
Average Grid Current								
Average Plate Current Ib(av) 0.3 mA								
<ul> <li>a Designed to mate with Cinch Mfg. Co. Socket No. 133 65 92 025, 133 65 91 034, or equivalent.</li> <li>b Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.</li> </ul>	0							
"Measured on metal shell in Zone "A" (See Dimensional Outline).								
Measured on metal shell in Zone "A" (See Dimensional Outline).								



INITI	AL CHA	ARACTERI	STICS	LIMITS

										Note	Min	Max	
Heater	Cu	rrent			2				ν.	1	90	110	mA
Direct	In	terelectr	ode C	apa	cit	ar	ice	s					
Grid	to	nlate.								2	-	0.7	рF
Innu	+ .	G to IK	S H)	• •	1		÷.	<u>.</u>	•	2	3.0	3.8	n F
Outo		P to IK	S H		•	•	•	•	•	2	1 5	1 9	DE
Dlat	ut.	FLU (K,	3, 11		•	•	•	•	•	2	0 17	0 22	pr
Fial	eı	o cathout		• •	•		•	•	•	2	0.17	0.23	pr
Grid	to	cathode.		• •				•	•	2	2.2	3.0	PF
Heat	er	to cathod	e	• •		٠	•	•	•	2	0.8	1.2	p۲
Amplit	Ica	tion Fact	or .	• •			•	•		3	95	160	
Iransc	ond	uctance .		• •			•	•		3	2200	4000	μmho
Plate	Cur	rent		• •	•		٠	٠	•	3	0.7	2.3	mA
CUTOTT	PI	ate curre	ent.	• •		•	•	•	•	4		200	μA
AC VOI	tag	e Amplit	catio	n.		٠		٠	•	5	/		v
lotal	Gri	d Current			•		•	•	•	6	-	-0.05	μA
Heater	-Ca	thode Lea	akage	Cur	rer	٦t				/	-	±b	μA
Leakag	le R	esistance	•										
Betw	/een	gridand	allot	her						1.000	October 1		
ele	ectr	odes conr	nected	to	get	the	er	•		8	50	-	GΩ
Betw	/een	plate ar	nd all	ot	hei	r							
ele	ectr	odes conr	nected	to	ge	the	er			9	100	-	GΩ
Inoper	ati	ves								10		1	
Note	1:	With Er	= 6.3	V.									
Note	2:	Measured	with	nut	ex	te	rn	al	S	hield.			
Note	3:	With Er	= 6.3	V	Eh	h	=	12	20	V. Eac	= 0 V	. Ri =	200 Ω.
		$C_{1} = 100$	0 UF	met	al	D e	he	11	0	rounder	4.	, r.K	,
Note	4:	With Er	= 6.3	V.	EL	-	1	20	v	E. =	-1.7 V	metal	shell
		grounded	- 0.0	.,	20					, 20		,	
Note	5:	With Er	= 6.3	V	EL	L	_	12	20	V E	- 0 V	B <sub>a</sub> =	10 MΩ.
	• •	$C_{-}(\cdot, \cdot) =$	0 1 11	γ,	ri	d-	si	on	al	- SOULC	einter	nalimn	edance
		< 2500 0	$F_{-} = 0$	21	11	rm	c .	60	0	's sin	ewave)	B 0.	5 MQ
		C. (	- 0 5	UF		RM	S.	01	ta	ge comp	onent :	measured	d across
		c(out)	_ 0.0	to 1		ic	to	n 1	wit	the 51	MQ (mi)	n ) inn	ut im-
		une seri	es pra	re 1	63	13	00	T	w T I	una J I	ine (mit)	a., inp	ut Ill-

pedance vacuum-tube voltmeter. Note 6: With  $E_f = 6.3 V$ ,  $E_b = 200 V$ ,  $E_{cc} = -1 V$ ,  $R_g = 1 M\Omega$ , metal shell grounded.

Note 7: With  $E_f = 6.3 V$ ,  $E_{hk} = \pm 100 V$ .

Note 8: With  $E_f = 6.3 V$ ,  $E_{p-all} = -100 V$ , metal shell grounded. Note 9: With  $E_f = 6.3 V$ ,  $E_{p-all} = -300 V$ , metal shell grounded. Note 10: Tubes are criticized for Shorts, Discontinuities, and Air Leaks.

#### ENVIRONMENTAL TESTS

#### High-Impact, Short-Duration Shock

Peak Impact Acceleration	Wave	• •	•	1000	g
Mechanical-Shock Pulse				$\textbf{0.8} \pm \textbf{0.2}$	ms
Operating Conditions during Test $E_{f} = 6.3 \text{ V}, E_{bb} = 120 \text{ V}, E_{cc} = 0 \text{ V},$	$R_{k} = 200$	Ω,	Rg	= 1 MΩ, E	nk =
100 V.					

RCA

RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 2

$ \begin{array}{cccccc} & & & & & & & & & & & & & & & & $	Q
Tap and Permanent Shorts, and Discontinuities $\checkmark$	$\bigcirc$
Low-Impact, Long-Duration Shock	
Peak Impact Acceleration       50 g         Duration of Approximate Half-Sine-Wave       50 mechanical-Shock Pulse         Mechanical-Shock Pulse       11 ± 2 ms         Condition during Test       50 mechanical-Shock Pulse	
No tube-element voltages are applied. <b>Post-Shock Limits and Rejection Criteria</b> Same as those specified above for the High-Impact, Short-Du- ration Shock Test.	0
Sweep-Frequency-Vibration Fatigue	
Vibration-Frequency Range (Overall) 5 to 500 to 5 c/s Peak Displacement	
5 to 50 & 50 to 5 c/s 0.040 in Peak-to-peak value 0.080 in Peak Vibrational Acceleration 10 g	
Period of I Sweep Cycle (Approx.)	
Duration of Test (Overall) 9 h Along each of 3 mutually perpendicular axes. 3 h Operating Condition during Test	
Post-Sweep-Frequency-Vibration-Fatigue Limits	
Same as those specified above for the High-Impact-Short-Du- ration Shock Test.	0
Variable-Frequency Vibration	
Vibration-Frequency Range (Overall) 3 to 15 kc/s Peak Vibrational Acceleration I In Xi nosition	
$\begin{array}{llllllllllllllllllllllllllllllllllll$	0
ERpm over Vibration-Frequency Range of: 3 to 6 kc/s	



### LIFE TESTS

Heater Cycling

Duration of Test Operating Conditions Ef = 8.5 V cycled 1 continuously ON. Rejection Criteria Heater-Cathode Sho	s L mir orts,	nute , and	ON an Heate	d 2 mir	nutes Cathoo	••• OFF de Di	. 20 , E <sub>hk</sub> scont	000 c = -: .inui	ycles 180 V ties.
Intermittent Operation (2, 20, 100, 500, and 1000 Hours)									
Operating Conditions $E_f = 6.3 \text{ V cycled 110 minutes 0N and 10 minutes 0FF, } E_b = 120 \text{ V},$ $E_{cc} = -1 \text{ V}, E_{hk} = 100 \text{ V}, R_k = 0 \Omega, R_g = 1 \text{ M}\Omega, P_b = 0.3 \text{ W (approx.)},$ $T_E = 150^{\circ}\text{C min.}$ End Point Limits 4:12 and 201 100 1 500 1 1000 1 h									
	Min	Max	Min	Max	Min	Max	Min	Max	
g <sub>m</sub>		±10 - - -	2000	-0.05	1 1 1 1	- ±10 7 -0.1 ±10	1 1 1 1 1	- ±15 10 -0.1 ±10	μmho % % μΑ μΑ

#### DIMENSIONAL OUTLINE

JEDEC No.4-4



#### DIMENSIONS IN INCHES

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

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

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RADIO CORPORATION OF AMERICA Electronic Components and Devices Harrison, N. J. DATA 3 10-65



DATA 3

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Breakdown-Voltage Characteristic

92CS-13116R1



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

DATA 4

# High-Mu Triode

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

### ELECTRICAL CHARACTERISTICS - Bogey Values

Heater Voltage, dc or ac	E <sub>h</sub>	6.3	V
Heater Current at $E_h = 6.3 V$ .	Ih	340	mA
Direct Interelectrode Capacitan	ces:		
Without external shield			
Input: K to (G, S, H)	c <sub>i</sub>	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 characteristics, see Conditions below:

Amplification Factor	$\mu$	100	
Plate Resistance (Approx.)	r	6400	Ω
Transconductance	gm	18000	$\mu$ mho
DC Plate Current	Ib	15	mA
Cutoff DC Grid Voltage for $I_b = 10 \ \mu A$ Conditions	E <sub>c(co)</sub>	-5	v
Heater Voltage	Eh	6.3	v
Plate Supply Voltage	E <sub>bb</sub>	200	v
Grid Supply Voltage	E	0	v
Cathode Resistor	R	68	Ω

### MECHANICAL CHARACTERISTICS

R(B/Л

Drawing
0.985 in
0.780 in
0.440 in
tion MT4
on C1-46)

Electronic Components

DATA 1 5-69

Base <sup>a</sup> Medium	n-Cera (JE	amic-Wafer Twelvar 6-Pin EDEC Designation E6-93)	
Type of Cathode		Coated Unipotential	100
Operating Position		Any	
Cooling		Conduction	
		h	
MAXIMUM RATINGS - Absolute	-Maxin	num Values <sup>0</sup>	
For operation as a low-level cla oscillator, or frequency-multi to 1.2 GHz	iss-C iplier	rf-power-amplifier, tube at frequencies up	Q
		ICAS <sup>c</sup>	
Plate Supply Voltage (E <sub>bb</sub> )			
Up to 50,000 feet		1000 <sup>d</sup> V	
Above 50,000 feet See Brea	kdowr	n-Voltage Characteristics	
DC Plate Voltage	Eh	1000 V	$\mathbf{\nabla}$
Grid Voltage:	D		
Peak	e	30 V	
	C	(+0 V	
DC	Ec	3-100 V	
Peak Heater-Cathode Voltage	е.,	+100 V	
Heater Voltage do or ac	hk Fa	5.7 to 6.9 V	
Peak Cathode Current	-h i.	1000 mA	
	<sup>-</sup> k	See Pulse-Rating Chart	
Average Cathode Current	Ik	75 mA	
Plate Dissipation	Ph	6 <sup>e</sup> W	
Grid Dissipation	P	200 mW	
See	Grid-	Dissipation Rating Chart	
Envelope Temperature <sup>f</sup>	$T_{\rm E}$	200 °C	0
MAXIMUM CIRCUIT VALUES			
	-	ICAS	
Grid-Circuit Resistance:	Rg		
For fixed-bias or cathode- bias operation:		50 kΩ	100
See Grid-C	ircuit	-Resistance Rating Chart	$\mathbf{\mathbf{\nabla}}$
TYPICAL OPERATION - CCS <sup>9</sup>			
As cathode-drive rf power ample	ifier		
Frequency	f	1 GHz	
			-

Heater Voltage ..... Eh 6.3 v 206 DC Plate-to-Grid Voltage ... Ebg v  $\Pi$ BЛ

Electronic Components

DATA 1

	DC Cathode-to-Grid Voltage	Eka	5.8	V
	From grid resistor of	R	300	Ω
	Average Plate Current	Ib	50	mA
1	Average Grid Current	I	19	mA
	Driving Power (Approx.)	Pg	1.0	mW
	Useful Power Output (Approx.)	Po	5	W
	As cathode-drive frequency dou	ubler		
7	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.	Ekg	11	v
	From grid resistor of	Rg	1000	Ω
	Average Plate Current	Ib	38	mA
	Average Grid Current	I <sub>C</sub>	10.5	mA
	Driving Power (Approx.)	Pg	1	W
	Useful Power Output (Approx.).	Po	2	W

### TYPICAL OPERATION

As pulsed cathode-drive class-C amplifier

Output Frequency	f	1	1	GHz
DC Plate-to-Grid Voltage	Ebg	500	1000	v
DC Cathode-to-Grid Voltage	Ekg	16	20	v
Average Plate Current	ц	9	4.75	mA
Average Grid Current	Ic	5.5	1.4	mA
Duty Factor	-	2.5	1	%
Pulse Length	-	5	5	$\mu s$
Peak Driving Power	-	30	50	W
Average Driving Power	-	0.75	0.5	W
Peak Useful Power Output (Approx.)	-	105	240	w
Average Power Output	-	2.5	2.4	W
Plate Dissipation (Approx.)	-	2.4	2.7	W
Gain	-	5.4	6.8	dB

<sup>a</sup> See Socket and Connector Information.

<sup>b</sup> As defined in the current issue of EIA Standard RS-239.

<sup>c</sup> Intermittent Commercial and Amateur Service.

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

RBA Electronic Components

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mum permissible plate voltage is dependent on atmospheric pressure.

- e This rating applies when the plate-seal temperature is maintained below 200°C by means of an external heat sink such as the center conductor of a coaxial resonator. If no provision is made for additional heat removal, the maximum seal temperature of 200°C will not be exceeded with 4 watts of plate dissipation and a chassis temperature of 25°C.
- f Measured on metal shell in Zone "A" (See Dimensional Outline).
- <sup>9</sup> Continuous Commercial Service.

DIMENSIONAL OUTLINE - Dimensions in Inches (mm)



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

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

#### MODIFIED BOTTOM VIEW

With Element Connections Indicated and Short Pins Not Shown



Electronic Components

DATA 2

DATA 3

5-69



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

<b>TYPE 8808</b>	SOCKET	AND	CONNECTOR	INFORMATION

	S	DCKET	
Mounting	Body Material	Cinch Mfg. Co. <sup>▲</sup> No.	Cinch-Jones Sales-Division Distributor No.
Crimp	HALON	133 67 90 040§	5NS-4
	TOP-CAP	CONNECTOR	
For Distributed-Con- stant Circuit	Internation Therma-Li or equival	nal Electronic Res nk Retainer Part M ent	earch Corp <sup>⊕</sup> No.TXBE-032-031G,
For Lumped-Con- stant Circuit	Wakefield Engineering, Inc. Semiconductor Cooler Type NF207, or equivalent		Semiconductor valent

▲ 1026 South Homan Ave., Chicago, Illinois 60624.

TRADE MARK: Allied Chemical Corp., Morristown, N. J.

⊕ 135 West Magnolia Blvd., Burbank, Calif. 91502.

Electronic

Components

139 Foundry St., Wakefield, Mass. 01880.

<sup>3</sup> 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  $\mu {\rm s},$  whichever is greater.



Electronic Components

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DATA 3





# CW Klystron Amplifier

High Power Output Very High Gain Long Life, High Reliability Integral Cavity Construction Water/Vapor Cooled Electromagnet Focusing Easy to Install and Operate Modulating Anode – permits both visual and aural application with a single beam supply

#### Electrical

Frequency Range
Cathode Type Indirectly heated, tungsten dispenser cathode
Heater (dc or 50-60 Hz):
Voltage <sup>a</sup>
Current @ 6.0 V, typical 16.4 A
Surge current, maximum
Warm-up time, minimum
Focusing RCA-AJ2166 Electromagnet
Mechanical
Mounting Position Vertical, cathode down
Dimensions, Maximum:
Height
Width
Weight, Approximate:
Uncrated
Crated
Inlet Coolant Connector Mates with Hansen B2-H16
Outlet Coolant Connector Mates with Hansen LL3-H21
Steam Outlet
Electrical Connections
RF Input UG-22B/U jack mates with UG-21D/U plug
RF Output See Dimensional Outline
Collector <sup>b</sup> Pins F and G, Cannon Rec. <sup>c</sup> Thermocouple:
Chromel Rin H Cannon Rec. <sup>c</sup>
Alumel Pin J Cannon Rec. <sup>c</sup>
Body Pin E Cannon Rec. <sup>C</sup>

Electronic Components

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Modulating Anode	See Dimensional Outline
Heater-Cathode	See Dimensional Outline
Heater	See Dimensional Outline
Interlock #1 Pin	s A and B, Cannon Rec. <sup>c</sup>
Interlock #2 Pin	s C and D, Cannon Rec. <sup>C</sup>

### Thermal

Collector Temperature	145	max.	oC
Body Temperature	100	max.	oC
Electron Gun Insulator Temperature	250	max.	oC
Storage Temperature	-65	min.	°C

#### **Coolant Requirements**

Collector and Body			
Water flow (7.5 l/m)	2.0	min. gpm	١
Inlet water temperature	70	max. oc	
Electron Gun			
Forced air flow (24 I/s)	50	min. cfm	1
Water Pressure Differential for Typical Flow of 2.1 gpm (3.5 kg/cm <sup>2</sup> )	50	max. ps	i
Water Pressure at any Inlet (4.2 kg/cm <sup>2</sup> )	60	max. ps	i

Maximum Ratings,	Absolute-Maximum Values	
Beam Voltage, DC		20
Beam Current, DC		5.5
Body Current, DC		250
Modulating Anode	Voltage, DC	20
Load VSWR		1.5:

#### Typical Operation, UHF Television Service (Visual 471.25 MHz, Aural 475.75 MHz)

	Visual	Aural	
Collector Voltage, DC <sup>f</sup>	0	0	V
Body Voltage, DC	0	0	V
Beam Current, DC	4.7	2.4	A
Body Current, DC <sup>g</sup>	70	15	mA

RBA Electronic Components

DATA 1

kV

A

20 max.

max.

max. mA

max. kV

5.5

20

1.5:1.0

Modulating Anode Voltage, DC	0	-6	kV
Modulating Anode Current, DC	1.5	1.0	mA
Cathode Voltage, DC	-18	-18	kV
Focusing Current, DC (Typical with RCA-AJ2166 Electromagnet)	28	28	A
Load VSWR	1.1:1	1.1:1	-
Drive Power, for Visual Peak-of- Sync or Aural CW	10	1.1	W
Output, for Visual Peak-of-Sync or Aural CW	31	12	kW
Gain	35	40	dB
Efficiency	37	28	%

a Careful attention to maintaining the minimum value of filament voltage consistent with adequate emission will result in conserving the life of the tube.

- b Pins F and G must always be used in parallel.
- c Type CA22365-2729 Cannon Receptacle.
- d All water must be removed from the water course during storage.
- e Cooling air blower must be directed toward the electron gun and located within a distance of 24 inches.
- f A DC ammeter make the connection between the collector and ground.
- g The body is connected directly to ground. Body current is measured in the ground leg of the beam power supply.

### **General Information**

### Cooling

The electron gun is cooled by forced-air directed at the cathode-seal area. Air flow must be at least 50 cfm. (24.0 I/sec) The remainder of the tube is cooled by water/vapor system with water cooling the resonators and drift-tube sections and vapor cooling the collector.

The use of distilled water is essential. The liquid flow must start before application of any voltages and preferably should continue for five minutes after removal of voltages. Interlocking of the liquid flow through each of the cooled elements with the beam supply is recommended to prevent damage in case of cooling failure.

A steam exhaust sleeve must be provided for the top of the klystron boiler. A flexible, neoprene type is recommended. The sleeve is placed over the lip provided at the top of the boiler (see Dimensional Outline) and clamped securely in place for a water-tight connection.

### **Electrical Connections to Tube Terminals**

Connections to the Heater, Heater-Cathode and Modulating Anode Terminals (see Dimensional Outline) are made with preformed finger stock or knife blade type fuse clips. Care should be taken when making these connections not to place excessive stress on the ceramic-to-metal seals.

### **Protection Circuits**

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Note AN4206 for complete information on protection circuits required.

### **RF** Output Coaxial Adapter

The RF output coaxial adapter shown in the klystron Outline Drawing is shipped as a separate item within the tube crate. It must be screwed on after the tube is installed within the electromagnet.

### Installation and Operation

RCA reference publications required for the installation and operation of this device include the following:

Data Sheet – RCA-8824 Application Note AN4206 Application Guide 1CE-279A

These publications are available as a complete packet – request PWR-537, "Applications Information for the RCA-8824 Super-Power Klystron,"

### **Personnel Safety**

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals adequately shielded.

This device, in operation, may produce X-radiation which can constitute a health hazard. Shielding or other precautions may be required.

### Packaging

The klystron is shipped in a specially designed shipping crate featuring steel tracks for receiving the rollers on the tube sides. Unpacking instructions are attached to the crate.

### RCA AJ2166 Electromagnet

The RCA 8824 klystron is designed to be mounted in and its beam focused by the water-cooled, single-coil electromagnet, RCA-AJ2166. The exposed surfaces of the electromagnet are treated by painting or plating to resist corrosion.

	General Data
	Voltage, DC
	Current, DC
	Dimensions
	Weight (approx.) (158.7 kg)
_	Cooling:
	Water flow, minimum (3.8 l/m) 1 gpm
	Inlet temperature, maximum
	Maximum water pressure differ- ential for typical flow (3.5 kg/cm <sup>2</sup> ) 50 psig
	Maximum water pressure at any inlet

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#### **Operating Considerations**

Typical operating coil currents are noted under "Typical Operation" data section,

It is recommended that the coil coolant flow start before the application of any coil voltage and preferably continue for five minutes after the removal of voltages. Interlocking of the coolant flow with the klystron beam and modulatinganode voltages and coil voltages is highly recommended to prevent tube and coil damage in the event of inadequate coolant flow.

The use of a solid-state diode connected in parallel with the electromagnet is recommended to prevent excessive transient voltage build-up in the event of coil current interruptions. Connections should be made so the coil current will flow through the diode when the polarity of the normal coil voltage becomes reversed.

#### ELECTROMAGNET DIMENSIONAL OUTLINE

Components







Electronic

Components

R(B/A

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Electronic Components

#### KLYSTRON OUTLINE DIMENSIONS

A E C E F

Ref.	Inches	Millimeters
7	$50.83 \pm 0.25$	1290.0 ± 6.3
3	12.40 Max.	314.9 Max.
C Dia.	0.75 Ref.	19.05
D Dia.	$6.40 \pm 0.04$	162.56 ± 1.0
Ξ	$0.23 \pm 0.04$	5.84 ± 1.0
2	$11.00 \pm 0.12$	279.4 ± 3.0
3	1.51 ± 0.01	38.35 ± 0.25
4	$27.52 \pm 0.06$	699.0 ± 1.5
Dia.	7.50 Max.	190.5 Max.
K Dia.	$5.00 \pm 0.01$	127.00 ± 0.25
_	$0.69 \pm 0.05$	17.53 ± 1.2
Л Dia.	$5.00 \pm 0.03$	127.00 ± 0.76
J	$0.19\pm0.01$	4.82 ± 0.25
	$0.19 \pm 0.01$	4.82 ± 0.25
2	0.04	1.0
3	$2.79\pm0.05$	70.86 ± 1.2
5	$6.89 \pm 0.07$	175.0 ±± 1.7
Г	4.16 ± 0.03	105.66 ± 0.76
J	11.80 ± 0.04	299.72 ± 1.0
1	19.60 ± 0.05	497.8 ± 1.3
V	26.20 ±0.06	665.5 ± 1.5
<	$30.82 \pm 0.09$	782.8 ± 2.2
(	$0.50\pm0.02$	$12.70 \pm 0.5$
Z Dia.	15.00 Max.	381.0 Max.

#### Notes:

- 1. UG-22 B/U jack mates with UG-21 D/U
- 2. Channel tuning screws 5/16" hex socket head.
- 3. Tube rollers mate with RCA AJ2166 electromagnet.

RBA Electronic Components

#### DETAIL RF OUTPUT CONNECTOR



"ALWAYS USE PINS F AND G IN PARALLE!

More complete information covering the handling, installation, safety and operation of this type may be obtained through an RCA Field Representative or by writing RCA Super Power Tube Marketing, Lancaster, PA. 17604.

RBA Electronic Components

	CW Kly	stron Amplifier
	High Power Output	Easy to Install and Operate
	Very High Gain	Modulating Anode – permits
	Long Life, High Reliability	both visual and aural
	Integral Cavity Construction	application with
	Water/Vapor Cooled	a single beam supply
	Electromagnet Focusing	
	Electrical	
	Frequency Range	
	Cathode Type Indirectly he	eated, tungsten dispenser cathode
	Heater (dc or 50-60 Hz):	
	Voltage <sup>a</sup>	$6.0 \pm 0.5 \text{ V}$
	Current @ 6.0 V, typical	16.4 A
	Surge current, maximum	30.0 A
	Warm-up time, minimum	180 sec
	Focusing	RCA-AJ2167 Electromagnet
	Mechanical	
	Mounting Position	Vertical, cathode down
	Dimensions, Maximum:	(4040
	Width (excluding output conn	(1346 mm) 53 in (381.0 mm) 15.0 in
	Weight Approximate:	(381.0 mm/ 15.0 m
	Uncrated	(90.7 kg) 200 lbs
	Crated	(213.1 kg) 470 lbs
	Inlet Coolant Connector	Mates with Hansen B2-H16
	Outlet Coolant Connector	Mates with Hansen LL3-H21
	Steam Outlet	See Dimensional Outline
	Electrical Connections	
1	RF Input UG-22B/U	jack mates with UG-21D/U plug
	RF Output	See Dimensional Outline
	Thermocouple:	Pins F and G, Cannon Rec.
	Chromel	Pin H Cannon Bec C
	Alumel	Pin J Cannon Rec. <sup>C</sup>
	Body	Pin E Cannon Rec. <sup>C</sup>

RB/ Electronic Components



Modulating Anode	. See Dimensional Outline
Heater-Cathode	. See Dimensional Outline
Heater	. See Dimensional Outline
Interlock #1 !	Pins A and B, Cannon Rec. <sup>C</sup>
Interlock #2	Pins C and D, Cannon Rec. <sup>C</sup>

#### Thermal

Collector Temperature 145	max.	oC
Body Temperature 100	max.	oC
Electron Gun Insulator Temperature	max.	oC
Storage Temperature	min.	oC

#### **Coolant Requirements**

Collector and Body			
Water flow (7.5 l/m)	2.0	min.	gpm
Inlet water temperature	70	max.	oC
Electron Gun			
Forced air flow (24 I/s)	50	min.	cfm
Water Pressure Differential for Typical Flow of 2.1 gpm (3.5 kg/cm <sup>2</sup> )	50	max.	psi
Water Pressure at any Inlet (4.2 kg/cm <sup>2</sup> )	60	max.	psi

# Maximum Ratings, Absolute-Maximum Values Beam Voltage, DC 20 Beam Current, DC 5.5 Body Current, DC 250

Body Current, DC	250	max.	mA
Modulating Anode Voltage, DC	20	max.	kV
Load VSWR	1.5:1	1.0	

#### Typical Operation, UHF Television Service (Visual 627.25 MHz, Aural 631.75 MHz)

Electronic Components

Collector Voltage, DC <sup>f</sup>	0	0	V
Body Voltage, DC	0	0	V
Beam Current, DC	4.7	2.4	А
Body Current, DC <sup>g</sup>	70	15	mA

DATA 1

max. kV

max. A

Visual Aural

Modulating Anode Voltage, DC	0	-6	kV
Modulating Anode Current, DC	1.5	1.0	mA
Cathode Voltage, DC	-18	-18	kV
Focusing Current, DC (Typical with RCA-AJ2167 Electromagnet)	28	28	А
Load VSWR	1.1:1	1.1:1	-
Drive Power, for Visual Peak-of- Sync or Aural CW	10	1.1	W
Output, for Visual Peak-of-Sync or			
Aural CW	31	12	kW
Gain	35	40	dB
Efficiency	37	28	%

a Careful attention to maintaining the minimum value of filament voltage consistent with adequate emission will result in conserving the life of the tube.

- b Pins F and G must always be used in parallel.
- c Type CA22365-2729 Cannon Receptacle.
- d All water must be removed from the water course during storage.
- e Cooling air blower must be directed toward the electron gun and located within a distance of 24 inches.
- f A DC ammeter make the connection between the collector and ground.
- g The body is connected directly to ground. Body current is measured in the ground leg of the beam power supply.

#### GENERAL INFORMATION

#### Cooling

The electron gun is cooled by forced-air directed at the cathode-seal area. Air flow must be at least 50 cfm. (24.0 I/sec) The remainder of the tube is cooled by water/vapor system with water cooling the resonators and drift-tube sections and vapor cooling the collector.

The use of distilled water is essential. The liquid flow must start before application of any voltages and preferably should continue for five minutes after removal of voltages. Interlocking of the liquid flow through each of the cooled elements with the beam supply is recommended to prevent damage in case of cooling failure.



A steam exhaust sleeve must be provided for the top of the klystron boiler. A flexible, neoprene type is recommended. The sleeve is placed over the lip provided at the top of the boiler (see Dimensional Outline) and clamped securely in place for a water-tight connection.

#### **Electrical Connections to Tube Terminals**

Connections to the Heater, Heater-Cathode and Modulating Anode Terminals (see Dimensional Outline) are made with preformed finger stock or knife blade type fuse clips. Care should be taken when making these connections not to place excessive stress on the ceramic-to-metal seals.

#### **Protection Circuits**

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Note AN4206 for complete information on protection circuits required.

#### **RF** Output Coaxial Adapter

The RF output coaxial adapter shown in the klystron Outline Drawing is shipped as a separate item within the tube crate. It must be screwed on after the tube is installed within the electromagnet.

#### Installation and Operation

RCA reference publications required for the installation and operation of this device include the following:

Data Sheet – RCA-8825 Application Note AN4206 Application Guide 1CE-279A

These publications are available as a complete packet – request PWR-538, "Applications Information for the RCA-8825 Super-Power Klystron,"

#### Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals adequately shielded.

This device, in operation, may produce X-radiation which can constitute a health hazard. Shielding or other precautions may be required.

#### Packaging

The klystron is shipped in a specially designed shipping crate featuring steel tracks for receiving the rollers on the tube sides. Unpacking instructions are attached to the crate.

#### RCA AJ2167 Electromagnet

The RCA 8825 klystron is designed to be mounted in and its beam focused by the water-cooled, single-coil electromagnet, RCA-AJ2167. The exposed surfaces of the electromagnet are treated by painting or plating to resist corrosion.

#### General Data

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Voltage, DC 125 max. V
Current, DC
Dimensions Drawing
Neight (approx.) (158.7 kg)
Cooling:
Water flow, minimum (3.8 l/m) 1 gpm
Inlet temperature, maximum 70° C
Maximum water pressure differ- ential for typical flow (3.5 kg/cm <sup>2</sup> ) 50 psig
Maximum water pressure at any inlet

#### **Operating Considerations**

Typical operating coil currents are noted under "Typical Operation" data section.

It is recommended that the coil coolant flow start before the application of any coil voltage and preferably continue for five minutes after the removal of voltages. Interlocking of the coolant flow with the klystron beam and modulatinganode voltages and coil voltages is highly recommended to prevent tube and coil damage in the event of inadequate coolant flow.

The use of a solid-state diode connected in parallel with the electromagnet is recommended to prevent excessive transient voltage build-up in the event of coil current interruptions. Connections should be made so the coil current will flow through the diode when the polarity of the normal coil voltage becomes reversed.

#### ELECTROMAGNET DIMENSIONAL OUTLINE







Electronic Components

KLYSTRON OUTLINE DIMENSIONS

Ref.	Inches	Millimeters
A	45.77 ± 0.25	1162.6 ± 6.3
В	12.40 Max.	314.9 Max.
C Dia.	0.75 Ref.	19.05 Ref.
D Dia.	$6.40 \pm 0.04$	162.6 ± 1.0
E	0.23 ± 0.04	5.8 ± 1.0
F	11.00 ± 0.12	279.4 ± 3.0
G	1.51 ± 0.01	38.35 ± 0.25
H	21.97 ± 0.06	558.0 ± 1.5
J Dia.	7.50 Max.	190.5 Max.
K Dia.	$5.00 \pm 0.01$	127.00 ± 0.25
L	0.69 ± 0.05	17.53 ± 1.3
M Dia.	$5.00 \pm 0.03$	127.00 ± 0.76
N	$0.19 \pm 0.01$	$4.82 \pm 0.25$
Ρ	0.19 ± 0.01	4.82 ± 0.25
Q	0.04 Ref.	1.0 Ref.
R	$2.79 \pm 0.05$	70.86 ± 1.3
S	$6.89 \pm 0.07$	175.0 +± 1.7
Т	$3.45 \pm 0.03$	87.63 ± 0.76
U	$9.65 \pm 0.04$	245.1 ± 1.0
V	15.85 ± 0.05	402.6 ± 1.3
W	21.37 ±0.06	542.8 ± 1.5
х	25.26 ± 0.09	641.6 ± 2.2
Y	$0.50 \pm 0.02$	12.70 ± 0.5
Z Dia.	15.00 Max.	381.0 Max.

Notes:

1. UG-22 B/U jack mates with UG-21 D/U

2. Channel tuning screws 5/16" hex socket head.

3. Tube rollers mate with RCA AJ2167 electromagnet.

RBA Electronic Components

#### DETAIL RF OUTPUT CONNECTOR



ALWAYS USE PINS F AND G IN PARALLEL

More complete information covering the handling, installation, safety and operation of this type may be obtained through an RCA Field Representative or by writing RCA Super Power Tube Marketing, Lancaster, PA. 17604.



## DETECTOR AMPLIFIER PENTODE

2	MIDG	ET TIPE		
	Heater Coated Unipo	tential Catl	hode	1.0
	Voltage	6.3	a-c or d-	-c volts
	Current 0	.15		amp.
	Direct Interelectrode Capaci	tances:		
1	Grid to Plate 0	.01 max.		μµf
4	Input	3.6		µµf
	Output	3.0		цµf
1	Maximum Overall Length		1-13/1	L6"
	Maximum Seated Height		1-9/1	6"
	Length from Base Seat to Bul	b lop		*
	(excluding tip)		1-3/16"	± 3/ 32"
	Maximum Diameter		3/4 T 5 1	2
1	Bulb		I-J-1/	Z
1	Dase 1 Crid		Di- 5 DI	
	Pin 2 Cathada			ate
	Pin 3 Heater	× ×	rin o - Sc rca	at hode,
	Pin A Heater		Pin 7- 3 Gr	id No. 3,
	1 m 4 -nearer	the	Lu Lu	Shield
	PCA Sockat	L'	Stock	10 9911 -
	Mounting Position BOT	TOM VIEW	OLOCK	A04
	Wowing rosteron Bot	TOW VILW	ian Contor Val	Ally
	Maximum and Minimum Rail	ngs are Des	itgn=center vat	ues
	AM	<b>MPLIFIER</b>		1
	Plate Voltage		250 max.	volts
	Screen Voltage		100 max.	volts
1	Grid Voltage		-3 min.	volts
	Plate Dissipation		0.5	watt -
	Screen Dissipation		0.1	watt  -
	Typical Operation and Charac	teristics -	Class A1 Ampl	ifier:
	Plate Voltage	90	250	volts
	Screen Voltage	90	100	volts
N	Grid Voltage	-3	-3	VOITS
7	Plate Resistance	1.0	· approx	. megonm
	Iransconductance	1100	1400	µmnos
	Plate Current	1.2	2.0	ma.
	Screen Current	0.5	0.7	ma.
	Typical Operation as Mixer 1	n Superhete	rodyne Circuit	: walto
	Plate voltage	100	200	volts
	Grid Voltage	-5	-5 approx	volts
	Conversion Transconductance	e -	550 approx	. umbos
	Shielding and a f by tanging	of each r	f amolifior st	200 may
	Shielding and F-J by-passing	vont intere	tage coupling	age may
	provide the shortest possible	e circuit	returns when t	he tube
	is operated at the ultra-hig	h frequenci	es. B-f by-	passing
	can be accomplished by the	use of sma	II condensers	having
Ń	short leads placed close to	the tube te	rminals. It m	av also
	be advisable in some applic	ations to	supplement the	action
	of the by-pass condensers by	r-f chokes	close to the	conden-
	sers in the return or sup	oly leads f	or the grid,	screen,
	■, ▲, ● #: See next page.	*Tempora	ry minimum length =	1-1/16".
	- Indicates a change	. cpord	,	
	OCT 1 1042			DATA
	RCA VIC RADIO CORPORATION OF	AMERICA, HARRISON,	NEW JERSEY	UATA



#### DETECTOR AMPLIFIER PENTODE

#### (continued from preceding page)

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

- The cathode of the 9001, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater 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 was cathode as low as possible.
  Greater than 1.0 megohm.

9001

- # The grid bias is minimum for an oscillator peak voltage of 4 volts. Theseval-ues are optimum.
  - ▲ The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole.





RCA MANUFACTURING COMPANY, INC

92C-6287



DETECTOR, AMPLIFIER, OSCILLATOR MIDGET TYPE Heater Coated Unipotential Cathode Voltage 6.3 a-c or d-c volts Current 0.15 amp. Direct Interelectrode Capacitances: Grid to Cathode 1.2 unif Plate to Cathode 1.1 unif Maximum Overall Length 1-13/16" Length from Base Seat to Bulb Top (excluding tip) 1-3/16" ± 3/32" Maximum Diameter Bulb Base M Mounting Position BOTTOM VIEW Any Maximum Ratings Are Design-Center Values Plate Voltage 250 max. volts Plate Dissipation 1.6 max. watts Typical Operation and Characteristics - Class A, Amplifier: Plate Bes. 14700 13200 12500 11400 ohms Transcond. 1700 1900 2000 2200 unhos Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode is not directly chat this ube type mount is possibility that this ube type move a storage balary, the cathode circuit is tide in either directly or through bias resistors to the negative baltery that this ube type move based for this base move based for this base move based for this base move based for this base move based for this base for the possibility that this tube type move based for the possibility that this ube type move based for the possibility that this ube type move based for the possibility that this ube type move based for the possibility that this the type and the socket hole. * temporary minimum length = 1-1/16*.		9002	2		Ň
Heater Coated Unipotential Cathode Voltage 6.3 a-c or d-c volts Current 0.15 amp. Direct Interelectrode Capacitances: Grid to Plate 1.4 unif Plate to Cathode 1.2 unif Plate to Cathode 1.2 unif Plate to Cathode 1.1 unif Maximum Overall Length 1-13/16" Length from Base Seat to Bulb Top (excluding tip) 1-3/16" 2/32' Maximum Diameter 3/4" Bulb 1-Plate 7-5-1/2 Base A Miniature Button 7-Pir Pin 1 - Plate 7-5-1/2 Base A Miniature Button 7-Pir Pin 2 - Cathode 7-7 in Pin 5 - Plate Pin 2 - Cathode 9-7 in 6 - Grid 9- Pin 4 - Heater 7-5-1/2 Mounting Position BOTTOM VIEW Ang Maximum Ratings Are Design-Center Values Plate Voltage 250 max. volts Plate Dissipation 1.6 max. watts Typical Operation and Characteristics - Class 4, Amplifier: Typical Operation 25 180 250 volts Grid -2.5 -3.75 -5 -7 volts Amp. Fact. 25 25 25 Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater er from a storage battery, the cathode circuit is tide in either difference between heater and cathode Should be kept as how as possible. Arthe cathode of the 9002, when operated from a transformer, should preferably be connected to the heater directly commended to the heater, the potential difference between heater and cathode Should be kept as how as possible. Arthe center hole in sock beside signed for this base provides for the possibility that this tube type momended base for the possibile. Arthe center hole in sock besidened for this base provides for the possibility that this tube type momended base for the possibile. The center hole in sock beside signed for this base material befermitted to obstruct the socket hole. Temporary minimum length = 1-1/16*.	DETECTOR, A	MIDGET TY	ER, OS	CILLATO	R
<pre>Voltage 6.3 a-c or d-c volts Current 0.15 amp. Direct Interelectrode Capacitances: Grid to Plate 1.4 uuf Grid to Cathode 1.2 uuf Plate to Cathode 1.1 uuf Maximum Overall Length 1-13/16" Maximum Seated Height 1-3/16" ±3/32" Maximum Diameter Bub Bub Bub Base A Miniature Button 7-Pin Pin 1 - Plate Pin 2 - Cathode Pin 3 - Heater Pin 4 - Heater Plate Voltage Act business for this base Plate Voltage Act 25 25 25 Plate Operation and Characteristics - Class 4, Amplifier: Plate 0 135 180 250 volts Grid -2.5 -3.75 -5 -7 volts Amp. Fact. 25 2.5 2.5 25 Plate Res. 14700 13200 12500 11400 ohms Transcond. 1700 1900 2000 2200 unhos Plate Cur. 2.5 3.5 4.5 6.3 ma.</pre>	Heater Coate	d Unipotent	ial Catho	de	
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<pre>Maximum Overall Length III IIII IIIIIIIIIIIIIIIIIIIIIIIIIII</pre>	Plate to Cathode	1 1			μui
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<pre>(excluding tip)</pre>	Length from Base Seat	to Bulb Top			
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Pin 3 - Heater Pin 4 - Heater RCA Socket Mounting Position Maximum Ratings Are Design-Center Values Maximum Ratings Are Design-Center Values <u>AMPLIFIER</u> Plate Voltage Plate Voltage Plate Operation and Characteristics - Class A, Amplifier Plate 90 135 180 250 volts Grid -2.5 -3.75 -5 -7 volts Amp. Fact. 25 25 25 25 Plate Res. 14700 13200 12500 11400 ohms Transcond. 1700 1900 2000 2200 µmhos Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 9002, when operated from a transformer, should prefrably be connected to the heater circuit. In the case of d-c operation of the heater er from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible. The cathode is not directly connected to the shaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, is is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole. *Temporary minimum length = 1-1/16*.	Pin 2 - Cathode			Pin 6 - Gr	id
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RCA Socket       O       Stock No. 9914         Mounting Position       BOTTOM VIEW       Any         Maximum Ratings Are Design-Center Values       AMPLIFIER         Plate Voltage       250 max. volts         Plate Dissipation       1.6 max. watts         Typical Operation and Characteristics - Class A, Amplifier:       Plate         Plate 0       135       180       250         Grid       -2.5       -3.75       -5       -7       volts         Amp. Fact.       25       25       25       Plate Res.       14700       13200       12500       11400       ohms         Transcond.       1700       19200       2000       2200       µmhos         Plate Cur.       2.5       3.5       4.5       6.3       ma.         The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit.       In the case of d-c operation of the heater frough bias resistors to the negative battery terminal.       In circuits where the cathode circuit is tide in either directly con through bias resistors to the negative battery terminal.       In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.         The center hole in sockets designed for this tube type may be manyfactured with the exhaust-tube tip at the base end. For t	Pin 4-Heater	Sterz	0		
Mounting Position       BOTTOM VIEW       Any         Maximum Ratings Are Design-Center Values       AMPLIFIER         Plate Voltage       250 max. volts         Plate Dissipation       1.6 max. watts         Typical Operation and Characteristics - Class A. Amplifier:       Plate         Plate       90       135       180       250       volts         Grid       -2.5       -3.75       -5       -7       volts         Amp. Fact.       25       25       25       25         Plate Res.       14700       13200       12500       11400       ohms         Transcond.       1700       1900       2000       200       µmhos         Plate Cur.       2.5       3.5       4.5       6.3       ma.         The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit.       In the relative battery terminal.       In circuits where the cathode circuit is tied in either directly con through bias resistors to the negative battery terminal.       In circuits where the cathode directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.         The center hole in sockets designed for this base provides for the possibility that shis tube type may be manufactured with the exhaust-shue tip at the base end. For this reason, it is recommended that in equipment	RCA Socket	0		Stock !	lo. 991
Maximum Ratings Are Design-Center Values         AMPLIFIER         Plate Dissipation       1.6 max. watts         Typical Operation and Characteristics - Class A, Amplifier:         Plate       90       135       180       250       volts         Grid       -2.5       -3.75       -5       -7       volts         Amp. Fact.       25       25       25       Plate Res.       14700       13200       12500       11400       ohms         Transcond.       1700       1900       2000       2200       µmhos         Plate Cur.       2.5       3.5       4.5       6.3       ma.         The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater of the ogsite stors to the negative battery terminal. In circuits where the extander the potential difference between heater and cathode should be kept as low as possible.         Affect the cathode in sockets designed for this base provides for the possibility that this tube type may be manufactured with the extand the base the at the stander the potential difference that and the extand the stander the potention, the stander the lost.         The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the extand the the stander hole.         Temporary minimum length = 1-1/16*.       Temporary minimum length = 1-1/16*	Mounting Position	BOTTOM VI	EW		Any
AMPLIFIER250 max. voltsPlate Voltage250 max. voltsPlate Dissipation1.6 max. wattsTypical Operation and Characteristics - Class A, Amplifier:Plate90135180250Grid-2.5-3.75-5-7voltsAmp. Fact.252525Plate Res.1470013200125001400ohmsTranscond.1700190020002200µmhosPlate Cur.2.53.54.56.3ma.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 er from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal.the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.The center hole in sockets designed for this base 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 beformitted to obstruct the socket hole.Temporary minimum length = 1-1/16*.	Maximum Rati	ngs Are Des	ign-Center	r Values	
Plate Voltage       250 max. volts         Plate Dissipation       1.6 max. watts         Typical Operation and Characteristics - Class A, Amplifier:       Plate       90       135       180       250       volts         Grid       -2.5       -3.75       -5       -7       volts         Amp. Fact.       25       25       25       25         Plate Res.       14700       13200       12500       11400       ohms         Transcond.       1700       1900       2000       2200       µmhos         Plate Cur.       2.5       3.5       4.5       6.3       ma.         The cathode of the 9002, when operated from a transformer, should prefrably 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 should be kept as low as possible.         After center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this recommended that in equipment employing this tube type, no material be persitied to obstruct the socket hole.         Temporary minimum length = 1-1/16*.       *		AMPLIFIE	R		
<pre>Plate Dissipation 1.6 max. watts Typical Operation and Characteristics - Class A, Amplifier: Plate 90 135 180 250 volts Grid -2.5 -3.75 -5 -7 volts Amp. Fact. 25 25 25 25 Plate Res. 14700 13200 12500 11400 ohms Transcond. 1700 1900 2000 2200 µmhos Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heat r from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.     The center hole in sockets designed for this base     may be manufactured with the exhaust-tube tip at     the dise end. For this reason, it is recommended     that in equipment employing this tube type, no     material be persited to obstruct the socket hole.     Temporary minimum length = 1-1/16*. </pre>	Plate Voltage			250 ma>	. volts
<pre>Typical Operation and Characteristics - Class A, Amplifier: Plate 90 135 180 250 volts Grid -2.5 -3.75 -5 -7 volts Amp. Fact. 25 25 25 25 Plate Res. 14700 13200 12500 11400 ohms Transcond. 1700 1900 2000 2200 µmhos Plate Cur. 2.5 3.5 4.5 6.3 ma.</pre> 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 heat- er from a storage battery, the cathode circuit is tied in either directly or through blas resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible. The center hole in sockets designed for this base provides for the possibility that this tube type may be manyfactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material beperitted to obstruct the socket hole. Temporary minimum length = 1-1/16*.	Plate Dissipation			1.6 ma>	. watts
<pre>Grid -2.5 -3.75 -5 -7 volts Amp. Fact. 25 25 25 25 Plate Res. 14700 12200 12500 11400 ohms Transcond. 1700 1900 2000 2200 µmhos Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater er from a storage battery, the cathode circuit is tied in either directly con through blas 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.</pre>	Plato 00	Characteris	tics - Cla	iss A <sub>1</sub> Ampli	fier:
Amp. Fact. 25 25 25 25 Plate Res. 14700 13200 12500 11400 ohms Transcond. 1700 1900 2000 2200 µmhos Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible. The center hole in sockets designed for this base provides for the possibility that this tube type the base manufactor this reason, this tube type, no material be permitted to obstruct the socket hole. Temporary minimum length = 1-1/16*.	Grid -2.5	-3 75	-5	-7	volte
Plate Res. 14700 13200 12500 11400 ohms Transcond. 1700 1900 2000 2200 µmhos Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater er from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible. The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at that in equipment employing this tube type, no material be permitted to obstruct the socket hole. Temporary minimum length = 1-1/16*.	Amp. Fact. 25	25	25	25	
Transcond. 1700 1900 2000 2200 µmhos Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 9002, when operated from a transformer, should prefrably 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 The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be persited to obstruct the socket hole. Temporary minimum length = 1-1/16*.	Plate Res. 14700	13200	12500	11400	ohms
Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 9002, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible. The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be persited to obstruct the socket hole. Temporary minimum length = 1-1/16*.	Transcond. 1700	1900	2000	2200	µmhos
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 connected to the heater, the potential difference the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible. The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, st is recommended that in equipment employing this tube type, no material be persited to obstruct the socket hole. Temporary minimum length = 1-1/16*.	Plate Cur. 2.5	3.5	4.5	6.3	ma.
The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with the exhaust-tube tip at the base end. For this reason, it is recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole. *Temporary minimum length = 1-1/16*.	The cathode of the 9002, be connected to the heater er from a storage battery through bias resistors to the cathode is not directl between heater and cathode	when operated to circuit. In the the cathode co the negative y connected to should be kept	from a transf ne case of d- ircuit is ti battery term the heater, as low as p	ormer, should p c operation of ed in either d inal. In circu the potential o ossible.	the heat- rectly or its where lifference
Temporary minimum length = 1-1/16*.	The center ho provides for may be manu the base end that in eq material be per	ole in sockets the possibil factured with For this re sipment employ crmitted to ob	designed f ity that th the exhaust ason, it is ing this t struct the	or this base is tube type -tube tip at recommended ube type, no socket hole.	
	Temporary minimum length	= 1 - 1 / 16".			





### SUPER-CONTROL R-F AMPLIFIER PENTODE

Ζ.	MIDGET THE	27				
	Heater Coated Unipotential Cathode					
	Voltage 6.3 a-c or d-c volts					
	Current 0.15 amp.					
	Direct Interelectrode Capacitances:					
	Grid to Plate 0.01 max. µµf					
Ń	Input 3.4 μμf					
ŋ	Output 3.0 µµf					
	Maximum Overall Length 1-13/16"					
	Maximum Seated Height 1-9/16"					
	Length from Base Seat to Bulb Top					
	[excluding tip] 1-3/16" ± 3/ 32"	-				
	Maximum Diameter 3/4"					
	Bu1b T-5-1/2					
N	Base▲ Miniature Button 7–Pin					
1	Pin 1-Grid Pin 5-Plate					
	Pin 2 - Cathode @ Pin 6 - Screen					
	Pin 3-Heater 3 2 6 Cathode, Grid No. 3					
	Pin 4 - Heater Pin 7- { Internal "					
	L shield					
	RCA Socket O Stock No. 9914	ŀ				
	Mounting Position BOTTOM VIEW Any					
	Maximum and Minimum Ratings Are Design-Center Values					
	AMPLIFIER					
	Plate Voltage 250 max. volts					
	Screen Voltage 100 max. volts					
	Grid Voltage -3 min. volts					
	Plate Dissipation 1.7 max. watts	-				
	Screen Dissipation 0.3 max. watt	ŀ				
	Typical Operation and Characteristics - Class A1 Amplifier:					
	Plate Voltage 250 volts					
	Screen Voltage 100 volts					
	Grid Voltage -3 volts					
N	Plate Resistance U.7 approx.megonm					
1	Iransconductance 1800 µmnos					
	Grid Blas for					
	Iranscond. of 15 µmhos -30 voits					
	Grid Blas for					
	Iranscond. of 2 µmhos -45 volts					
	Plate current 0.7 ma.					
ų,	Screen Current 2.7 ma.					
ų	Typical Operation as Mixer in Superheterodyne Circuit:					
	Screen Voltage 100 200 Volta					
	Grid Voltage 10 10 Volts					
	Conversion Transconductance - 600 approx. voits					
	# The grid bias is minimum for an oscillator peak voltage of 9 volts.					
	inese values ale optimum.					
Ņ	The center hole in sockets designed for this base provides for the possibility that this tube type may be manufactured with					
	the exhaust-tube tip at the base end. For this reason, it is					
	terial be permitted to obstruct the socket hole.					
	Shielding Considerations & Heater-Cathode Connections					
	for the 9003 are the same as for Type 9001.					
	Indicates a change. Temporary minimum length = 1-1/16".					
	DCT. 1, 1943 RCA VICTOR DIVISION DATA					











## U-H-F DIODE



RCA MANUFACTURING COMPANY, INC.



**U-H-F DIODE** 











## U-H-F DIODE

Heater U	Inipotential Cath	node	
Voltage	6.3	a-c or d-	c volt
Current	0.15		amp.
Direct Interelectrode	Capacitances:		
Plate to Cathode	1.4		μµF
Plate to Heater	0.2		μµf
Cathode to Heater	2.2		uuf
Maximum Overall Lengt	h	1-	-13/16"
Maximum Seated Height			-9/16"
enoth from Base Seat	to Bulb Top		
(excluding tip)		1-3/16:	± 3/32"
Maximum Diameter			3/4"
Bulb		T	-5-1/2
Base▲		Miniature Butto	n 7-Pi
Pin 1-Plate	a 5	Pin 5-Plate	
Pin 2 - Cathode	3/200	Pin 6 - No Cor	nectio
Pin 3-Heater	ALT P	Pin 7 - Cathor	P
Pin 4 - Heater	atta to	i in / outroo	
PCA Socket	X	Stock N	0 001
tounting Position	POTTON VIEW 160		0. 331
Would the rosition	ing the Desi	Cantan Valuar	An
Maximum Kat	ings are Design-	-center values	
	RECTIFIER		
Peak Inverse Plate Vo	Itage	750 max	volt
Peak Plate Current	reage	15 max	ma
D-C Output Current		5 max	ma.
D-C Heater-Cathode Po	tential	100 max	volt
Typical Operation as	Rectifier.	100 1102	
A-C Plate Supply Vo	Itage (RMS)	270	volt
Min Total Effectiv	e Plate-Sunniv I	medance 100	ohms
D-C Output Current	c i late ouppij i	5	ma
b-c output current		0	IIICAS
<ul> <li>With no external shield</li> </ul>	j.		
The resonant frequenc	y of the good is	s 700 megacycles(c	(pprox)
A The center ho	le in sockets design	ned for this base	
provides for	the possibility the	at this tube type	
the base end.	For this reason,	it is recommended	
that in equ	ipment employing th	tis tube type, no	
*Tomososy minimum longth	- 1 1/16"	the SUCKET NOTE.	
remporary minimum renger	1 = 1 - 1/10.		



RCA VICTOR DIVISION

CE-6445

