RCA TUBE Handbook HB-3



RECEIVING-TYPE INDUSTRIAL TUBE SECTION

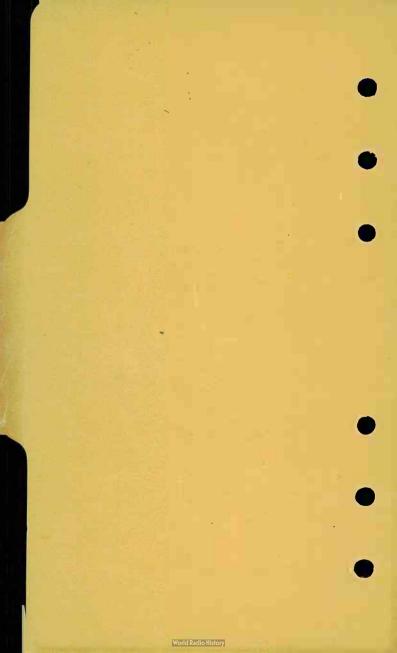
This Section contains data on "special red" tubes; premium tubes; tubes for computer and "on-off" control applications; lowmicrophonic amplifier tubes; and similar special types.

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

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SEPARATOR

World Radio History





RECEIVING-TYPE INDUSTRIAL TUBE CLASSIFICATION CHART

When choosing tube types, the equipment designer should refer to the RCA PREFERRED TYPES LIST and its companion list - TYPES NOT RECOMMENDED FOR NEW EQUIPMENT DESIGN both of which appear in the General Section.

Name	Prototype	TUBE TYP
Full-Wave Vacuum Rectifier High-Mu Twin Triode Medium-Mu Twin Triode Sharp-Cutoff Pentode	- 6SL7-GT 6SN7-GT 6SJ7	5690 5691 5692 5693†
PREMIUM TUBES		
Name	Prototype	TUBE TY
Sharp-Cutoff Pentode Medium-Mu Triode High-Mu Triode Twin Diode High-Mu Twin Triode Medium-Mu Twin Triode Sharp-Cutoff Pentode Voltage Regulator Voltage Regulator Voltage Regulator Nedium-Mu Twin Triode High-Mu Twin Triode Mame	6AK5 	5654 5719 5726 5751 5814-A 5840 6073 6074-A 6101 6201 7UBE TY
Medium-Mu Twin Triode Sharp-Cutoff Pentode Pentagrid Mixer Sharp-Cutoff Pentode Sharp-Cutoff Pentode	_ 6L7 6J7 _	12AY7 ^c 1609 1612† 1620† 5879 ^c
TUBES FOR COMPUTER & OTHER "O	N-OFF" CONTROL APPLI	CATIONS
Name	Use	TUBE TY
Pentagrid Amplifier Medium-Mu Twin Triode Medium-Wu Twin Triode Medium-Vu Twin Triode Power Pentode Medium-Mu Twin Triode	Gated Amplifier Frequency Divider Frequency Divider Frequency Divider Frequency Divider Frequency Divider	5915 5963 5964 5965 6197 6211
 Miniature type. For data on this type, see THIRATRON 	. IGNITRON, & GLON-DISCHARC	GE TUBE SECT.

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RECEIVING-TYPE INDUSTRIAL TUBE CLASSIFICATION CHART

TUBES HAVING 26.5-VOLT	HEATERS	
Name	Use	TUBE TYPE
Remote-Cutoff Pentode Twin Beam Power Tube Twin Diode Medium-Mu Triode Pentagrid Converter Low-Mu Twin Triode	Aircraft receivers where operating voltages are ob- tained from 12-cell stor- age batteries.	26A6 th 26A7–GT 26C6 th 26D6 th 6082

TUBES FOR SPECIAL APPLICATIONS

TOBES FOR SPECIAL AFFEIGATIONS		
Name	Features	TUBE TYPE
Power Pentode	Delivers 1.2 watts power output at 10 Mc in rf poweramplifierservice.	3A4 [□]
Medium-Mu Twin Triode	Delivers 2 watts power output at 40 Mc in push- pull class C service.	3A5 ^{Li}
Full-Wave Vacuum Rectifier	Useful at altitudes up to 40,000 feet.	5R4-GY
Sharp-Cutoff Pentode	Useful in gated- amplifier circuits, de- lay circuits, and gain- controlled amplifier circuits.	6AS6 ^{CI}
Low-Mu Twin Triode	Useful as regulator tube in dc power supolies, and in pro- jection-television boostor-scanning applications.	6AS7-G
Beam Power Tube	-	12A6†
Twin Power Pentode	_	12L8-GT
Twin Diode Medium-Mu Triode	Similar to ESR7 except for heater rating.	12SW7†
Medium-Mu Twin Triode	Similar to 6SN6-GT ex- ceot for heater rating.	12SX7-GT
Pentagrid Converter	Similar to 6SA7 except for heater rating.	12SY7†

D Miniature type. † Metal-shell type.

CHART 1

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RECEIVING-TYPE INDUSTRIAL TUBE CLASSIFICATION CHART

Name	Features	TUBE TYP
Power Pentode	Similar to 6F6. For applications reouiring continuity of service.	1621
Beam Power Tube	Similar to 6L6. For apolications requiring continuity of service.	1622
Electron-Ray Tube	Similar to 6E5 except for 12.6-volt heater. Useful as voltage indicator in aircraft equipment.	1629
Beam Power Tube	Similar to 6L6 except for 12.6-volt heater and dissipation ratings For applications critical as to uniform- ity of characteristics.	1631
Beam Power Tube	Similar to 25L6 except for 12.6-volt heater and dissipation ratings. For applications critical as to uniform- ity of characteristics.	1632
High-Mu Twin Triode	Similar to 12SC7. For applications critical as to matching of the two triode units.	1634
High-Mu Twin Triode	For audio-frequency amplifier applications.	1635
Beam Power Tube	For audio-frequency amplifier applications. Similar in electrical characteristics to the 6L6-G except for higher dissipation ratings.	5881
Lơw-Mu Twin Triode	Similar to GAS7-G but smaller. For applica- tions critical as to shock and vibration, and requiring reduced susceptibility to electrolysis.	6080

TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History

World Radio History

High-Mu Triode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 3FF5 is the same as the CFH5 except for the follo	wing items:
Heater Characteristics and Ratings (Design-Maximum	Values):
Current 0.450 ± 0).030 amp
Voltage (AC or DC) at heater	
amperes = 0.450	volts
Warm-up time (Average)	sec

3**GK**5

High-Mu Triode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

3GS8/3BU8

Sharp-Cutoff Twin Pentode

With Common Cathode, Grid No.1, and Grid No.2

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 3GS8/3BU8 is the same as the 4GS8/4BU8 except for the following stems:

Heater Characteristics and Ratings (Design-Maximum Values): Current. 0.600 ± 0.040 amp Valtage (AC or DC) at heater amperes = 0.600. 3.15 volts



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World Radio History

Sharp-Cutoff Pentode



With Heater Having Controlled Warm-Up Time

The 4AU6 is the same as the 6AU6 except for the following i	tems:
Heater Characteristics and Ratings (Design-Maximum Value	s):
Current 0.450 \pm 0.030	amp
Voltage (AC or DC) at heater amperes = 0.450	volts
Warm-up time (Average)	sec

4AV6

Twin Diode-High-Mu Triode

7-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 4 AV6 is the same as the 6 AV6 except for the following items: Heater Characteristics and Ratings (Design-Maximum Values): Current. 0.450 ± 0.030 amp Voltage (AC or DC) at heater amperes = 0.450. 4.2 volts Warm-up time (Average) 11 sec

4BC5

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 4BC5 is the same as the 6BC5 except for the j	following items:
Heater Characteristics and Ratings (Design-Cen Current	
Voltage (AC or DC) at heater amperes	
= 0.450	2 volts
Warm-up time (Average)	1 sec
Peak heater-cathode voltage:	
Heater negative with	
respect to cathode	0 max. volts
Heater positive with	0.9 . 1
respect to cathode 20	0ª max. volts

^a The dc component must not exceed 100 volts.



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Medium-Mu Twin Triode

With Semiremote-Cutoff Characteristic

9-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 4BC8 is the same as the 6BC8 except for the follows	ing items:
Heater Characteristics and Ratings (Design-Center Va	
Current 0.600 ± 0.0	040 amp
Voltage (AC or DC) at heater amperes	1.
= 0.600 4.2 Warm-up time (Average)	volts sec
Marin up (The (Average)	Sec

4**B**L8

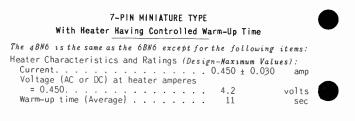
Medium-Mu Triode— Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

4**BN6**

Beam Tube



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Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 4AU6 is the same as the 6AU6 except for the	following	items:
Heater, for Unipotential Cathode:		
Voltage (AC or DC)		
Current		amp
Warm-up time (Average)	11	sec

4AV6

Twin Diode-High-Mu Triode

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 4AV6 is the same as the 6AV6 except for the following items: Heater, for Unipotential Cathode: Voltage (AC or DC). 4.2 volts 0.45 ± 6% Current . . . amp Warm-up time (Average). . . 11 sec

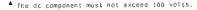
4BC5

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The $4BC5$ is the same as the $6BC5$ except for the following it	tems:
Heater, for Unipotential Cathode: Voltage (AC or DC)	volts
Current	amp
Warm-up time (Average)	sec
Heater negative with respect to cathode . 200 max. Heater positive with respect to cathode . 200ªmax.	





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Medium-Mu Twin Triode

With Semiremote-Cutoff Characteristic

9-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 4BC8 is the same as the 6BC8 except for t	he following items:
Heater, for Unipotential Cathodes:	
Voltage (AC or DC)	. 4.2 volts
Current	. 0.6 ± 6% amp
Warm-up time (Average)	. 11 sec

4**B**N6

Beam Tube

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

4BQ7-A

Current . . .

Medium-Mu Twin Triode

Warm-up time (Average). . . .

9-PIN MINIATURE TYPE For Equipment Having Series Heater-String Arrangement The 4BQ7-A is the same as the 6BQ7-A except for the following items: Heater, for Unipotential Cathodes: Voltage (AC or DC).....4.2 volts



	volts	
%	amp	
	sec	

 0.6 ± 6

11



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



Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BQ7A is the same as the 6BQ7A except for the following items:Heater Characteristics and Ratings (Design-Center Values):Current 0.600 ± 0.040 ampVoltage (AC or DC) at heatercurrent = 0.600 4.2 voltsWarm-up time (Average). 11

4BS8

Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

 The q8S8 is the same as the 6BS8 except for the following items:

 Heater Characteristics and Ratings (Design-Center Values):

 Current 0.600 ± 0.040 amp

 Voltage (AC or DC) at heater

 current = 0.600 4.5 volts

 Warm-up time (Average). 11 sec

4**B**U8

Sharp-Cutoff Twin Pentode

With Common Cathode, Grid No.1, & Grid No.2

9-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BU8 is the same as the 6BU8 except for the following	items:
Heater Characteristics and Ratings (Design-Maximum Valu	ies):
Current 0.450 ± 0.030	amp
Voltage (AC or DC) at heater	
current = 0.450 4.2	volts
Warm-up time (Average)	sec



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Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time The 4BZ6 is the same as the 6BZ6 except for the following items: Heater Characteristics and Ratings (Design-Maximum Values): 0.450 ± 0.030 amp

current = 0.450 4.2 volts Warm-up time (Average). 11 sec

4BZ7

Medium-Mu Twin Triode

9~PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4BZ7 is the same as the 6BZ7 except for the following items: Heater Characteristics and Ratings (Design-Center Values): 0.600 ± 0.040 amp current = 0.600 4.2 volts Warm-up time (Average). 11 sec

4CB6

Sharp-Cutott Pentode

7-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 4CB6 is the same as the 6CB6 except for the following items: Heater Characteristics and Ratings (Design-Center Values): 0.450 ± 0.030 amp current = 0.450 4.2 volts Warm-up time (Average). 11 sec Peak heater-cathode voltage: Heater negative with respect to cathode. 300^a max. volts Heater positive with

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^a The dc component must not exceed 200 volts. The dc component must not exceed 100 volts.

respect to cathode.

Electron Tube Division

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200^b max.



volts



Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 4BS% is the same as the 6BS8 except for the	following	items:
Heater, for Unipotential Cathodes:		
Voltage (AC or DC)	4.5	volts
Current		amp
Warm-up time (Average)	11	sec

4BU8

Sharp-Cutoff Twin Pentode

With Common Cathode, Grid No.1, & Grid No.2

9-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

4**B**Z6

Semiremote-Cutoff Pentode

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 4B26 is the same as the 6B26 except for the	following	items;
Heater, for Unipotential Cathode:		
Voltage (AC or DC)	4.2	volts
Current	0.45 ± 6%	amp
Warm-up time (Average)	11	sec



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Medium-Mu Twin Triode

4CB6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 4CB6 is the same as the 6CB6 except for the	following	items;
Heater, for Unipotential Cathode: Voltage (AC or DC) Current Warm-up time (Average)	0.45 ± 6%	volts amp sec
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode . Heater positive with respect to cathode .		volts volts

4CS6

Т н

Pentagrid Amplifier

The dc component must not exceed 200 volts.
 The dc component must not exceed 100 volts.





Pentagrid Amplifier

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4CS6 is the same as the 6CS6 except for the following items:Heater Characteristics and Ratings (Design-Center Values):Current 0.450 ± 0.030 ampVoltage (AC or DC) at heateramperes = 0.450 4.2 voltsWarm-up time (Average). 11 sec

4CY5

Sharp-Cutoff Tetrode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4CY5 is the same as the 6CY5 except for the following items: Heater Characteristics and Ratings (Design-Maximum Values): Current 0.300 ± 0.020 amp Voltage (AC or DC) at heater amperes = 0.300 4.5 volts Warm-up time (Average). . . . 11 sec

4**D**E6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 4DE6 is the same as the 6DE6 except for the following	g items:
Heater Characteristics and Ratings (Design-Naximum Va	lues):
Current 0.45C ± 0.030) amp
Voltage (AC or DC) at heater	
amperes = 0.450	volts
Warm-up time (Average) 11	sec



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4DT6

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4DT6 is the same as the 6DT6 except for t	he following items:
Heater Characteristics and Ratings (Design-	
Current 0	.450 ± 0.030 amp
Voltage (AC or DC) at heater	
amperes = 0.450	4.2 volts
Warm-up time (Average)	11 sec

4DT6A

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4DT6A is the same as the 6DT6A except for the following	items:
Heater Characteristics and Ratings (Design-Nazimum Val	
Current 0.450 ± 0.030 Voltage (AC or DC) at heater	amp
amperes = 0.450 4.2	volts
Warm-up time (Average)	sec

4EH7

Semiremote-Cutoff Pentode

9-PIN MINIATURE TYPE

 The 4EH7 is the same as the 6EH7 except for the following items:

 Heater Characteristics and Ratings (Design-Center Values):

 Current
 0.450 ± 0.030 amp

 Voltage (AC or DC) at heater

 amperes = 0.450
 4.4 volts

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Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

The 4EJ7 is the same as the 6EJ7 except for the following items: Heater Characteristics and Ratings (Design-Center Values): Current 0.450 \pm 0.030 amp Voltage (AC or DC) at heater amperes = 0.450 4.4 volts

4ES8

Variable-Mu Twin Triode

9-PIN MINIATURE TYPE With Heater Having Controlled Warm-Up Time

The 4ES8 is the same as the CES8 except for the following i	tems:
Heater Characteristics and Ratings (Design-Center Values	:):
Current 0.600 ± 0.040	amp
Voltage (AC or DC) at heater amperes	
= 0.600	volts
Warm-up time (Average)	sec



Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

With Heater Having Controlled Warm-Up Time

The 4EW6 is the same as the 6EW6 except for the following	
Heater Characteristics and Ratings (Design-Maximum Valu	ies):
Current 0.600 \pm 0.040	amp
Voltage (AC or DC) at heater amperes	
= 0.600 4.2	volts
Warm-up time (Average)	sec



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Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 4DT6 1	sthe same a	is the	6 <i>DT</i> 6	except	for th	ne following	items:
Voltage Current	AC or DC) time (Aver	· · ·	· ·		. 0	.45 ± 6%	volts amp sec

4DT6

Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 4DT6 is the same as the CDT6 except for the following	items:
Heater, for Unipotential Cathode:	
Voltage (AC or DC) 4.2	volts
Current 0.45 ± 6%	amp
Warm—up time (Average)	sec



Sharp-Cutoff Pentode

With Two Independent Control Grids

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The ADT6-A is the same as the 6DT6-A except for the following items: Heater, for Unipotential Cathode: 4.2 volts Voltage (AC or DC). 0.45 ± 6% amp Current . . .



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Warm-up time (Average). . . .

11

sec

4EW6

Sharp-Cutoff Pentode

7-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 4EW6 is the same as the 6EW6 except for the following items:

Heater, for Unipotential Cathode:

	(AC or DC								volts
Current		• • • •	•		•	•		0.6 ± 6%	атр
Warm-up	time (Ave	rage).		٠				11	sec





Medium-Mu Triode— Sharp-Cutoff Pentode

9-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 5CGB is the same as the items:	he 6CG8-A except	for the following						
Heater, for Unipotential Cathode:								
Voltage (AC or DC)		4.7 volts						
Current		0.6 ± 6% amp						



Medium-Mu Triode— Sharp-Cutoff Tetrode

9-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

5CM8

High-Mu Triode— Sharp-Cutoff Pentode



9-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement



RADIO CORPORATION OF AMERICA Electron Tube Division

Medium-Mu Triode-Sharp-Cutoff Tetrode

9-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 5CQ8 is the same as the 6CQ8 except for the following	items:
Heater, for Unipotential Cathodes:	
Voltage (AC or DC) 4.7	volts
Current 0.6 ± 6%	атр

5CZ5

Beam Power Tube

9-PIN MINIATURE TYPE

For Equipment Having Series Heater-String Arrangement

The 5C25 is the same as the 6C25 except for the following items: Heater, for Unipotential Cathode: Voltage (AC or DC). 4.7 volts Current . . 0.6 ± 6% amp

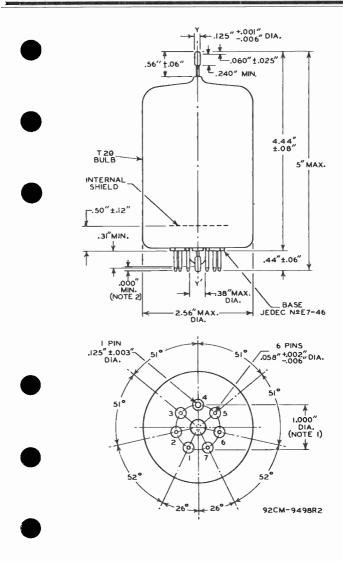
5EW6

Sharp-Cutoff Pentode							
7-PIN MINIATURE TYPE For Equipment Having Series Heater-String Arrangement							
The 5EW6 is the same as the 6EW6 except for the following Heater, for Unipotential Cathode:	items:						
Voltage (AC or DC)	volts amp sec						



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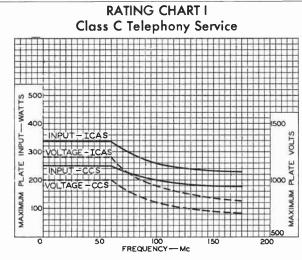
RADIO CORPORATION OF AMERICA Electron Tube Division DATA 4 5-62 THE REFERENCE AXIS Y-Y' is defined as the axis of the base Pin Gauge described in note i:

NOTE I: ANGULAR VARIATIONS BETWEEN PINS AND VARIATION IN PIN-CIRCLE DIAMETER ARE HELD TO TOLERANCES SUCH THAT PINS WILL ENTER TO A DISTANCE OF 0.375" A FLAT-PLATE BASE-PIN GAUGE HAVING SIX HOLES 0.0800" \pm 0.0005" AND ONE HOLE 0.1450" \pm 0.0005" ARRANGED ON A 1.0000" \pm 0.0005" DIAMETER CIRCLE AT SPECIFIED ANGLES WITH TOLERANCE OF \pm 5' FOR EACH ANGLE. GAUGE IS ALSO PROVIDED WITH A HOLE 0.500" \pm 0.010" CONCENTRIC WITH PIN CIRCLE WHOSE CENTER IS ON THE AXIS Y-Y'.

NOTE 2: EXHAUST TIP WILL NOT EXTEND BEYOND THE PLANE WHICH PASSES THROUGH THE ENDS OF THE THREE LONGEST PINS.

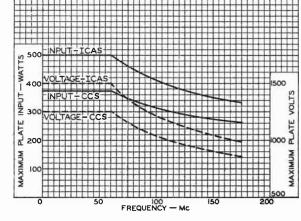






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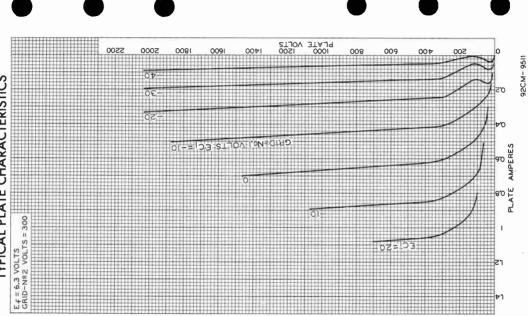


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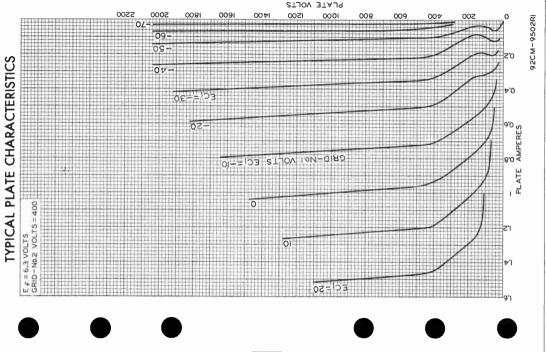


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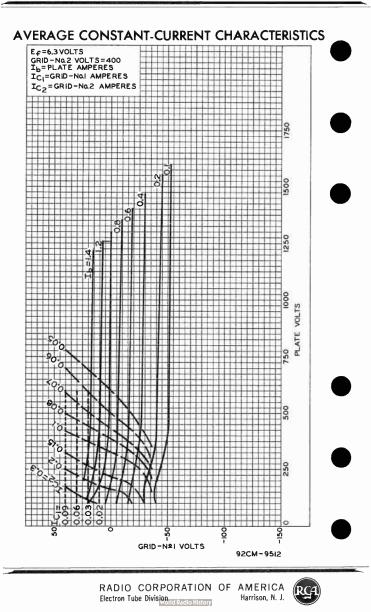
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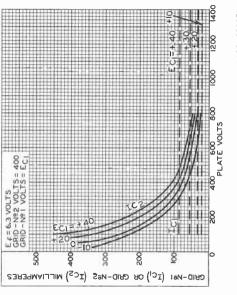
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92CS-9500RI



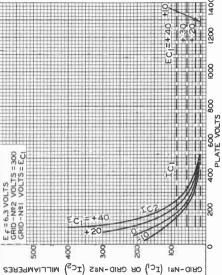










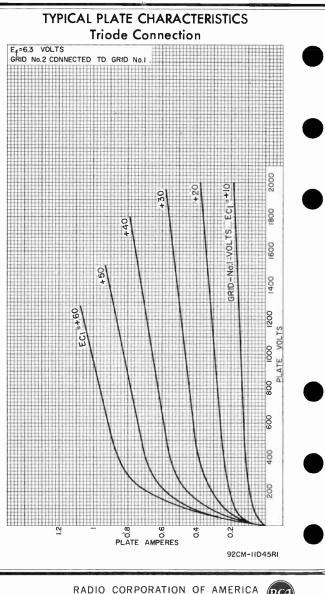




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E f = GRID GRID

7094

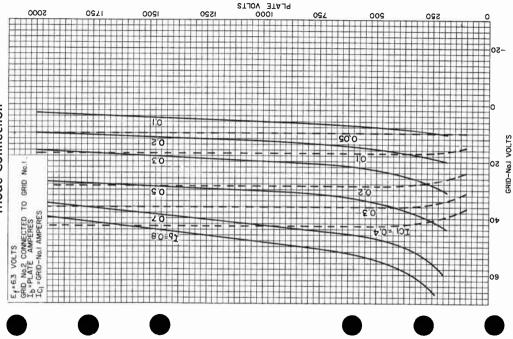


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ARACTERISTICS E Connection URRENT \overline{O} Triode CONSTANT TYPICAL

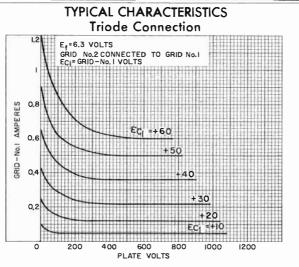


92CM-11047RI

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



forld Radio History



92CS-11046RI



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Medium-Mu Twin Triode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater Characteristics and Ratings (Design-Center Values): Voltage (AC or DC)
respect to cathode
Heiter positive with respect to cathode
Unrect Intererectione Capacitances." Unit No.i Unit No.2
Grid to plate \ldots \ldots 1.4 1.4 $\mu\mu f$
Grid to cathode, internal shield, and heater
Plate to cathode, internal
shield, and heater. 1.75 1.65 μμf Heater to cathode 2.6 2.7 μμf
Characteristics, Class Al Amplifier (Each Unit): ^b
Plate Supply Voltage 100 90 volts Grid Supply Voltage 9 0 volts Cathode Resistor 680 120 ohms Amplification Factor 33 - Transconductance 11500 µmhos Plate Current 15 12 ma
Mechanical:
Operating Position. Any Type of Cathodes. Coated Unipotential Maximum Overall Length. 2-3/16" Maximum Scated Length. 1-15/16" Length, Base Seat to Bulb lop (Excluding tip). 1-9/16" ± 3/32" Diameter. 0.750" to 0.875" Dimensional Outline See General Section Bulh.
Pin 1 - Plate of Unit No.2 Pin 2 - Grid of Unit No.2 Fin 3 - Cathode of Unit No.2 Pin 4 - Heater Pin 5 - Heater Unit No.1 Pin 7 - Grid of Unit No.1 Pin 7 - Grid of Unit No.1 Pin 7 - Grid of Unit No.1 Pin 8 - Cathode of Unit No.1 Pin 9 - Internal Shield



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

AMPLIFIER Class A								
Values are for Each Unit								
Maximum Ratings, Design-Center Values:								
PLATE VOLTAGE:								
With plate dissipation = 0.8 watt								
or greater	220 max.	volts						
With plate dissipation less than								
0.8 watt	250 max.	volts						
With plate ma. = 0	400 max.	volts						
With cathode ma. = 0	550 max.	volts						
GRID VOLTAGE:								
Negative-bias value	100 max.	volts						
Peak-negative value ^c	200 max.	volts						
CATHODE CURRENT:								
Peak ^c	100 max.	ma						
Average	20 max.	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.	°C						

Maximum Circuit Values:

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

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

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.

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



Twin Power Pentode

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-PuilRF-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 \pm 10% 6.3 \pm 10% volt. Current 0.3 0.6 am Transconductance (Each Unit) for dc plate volts = 150, dc grid-No.2 volts = 150, and dc plate ma. = 25 10500 μ mho Mu-Factor, Grid No.2 to Grid No.1 (Each Unit) for dc plate volts = 150, dc grid No.2 volts = 150, and dc plate ma. = 25 31 Direct Interelectrode Capacitances	p
	(Approx., Each Unit):* Grid No.1 to plate. 0.15 μμ Grid No.1 to cathode & grid No.3, grid No.2, and heater. 0.4 μμ Plate to cathode & grid Nc.3, grid No.2, and heater. 1.6 μμ	f
	Mechanical: Operating Position. Maximum Overall Length. Maximum Seated Length. Length, Base Seat to Bulb Top (Excluding tip). Diameter. Diameter. Diameter. Base Seat to Bulb Top (Excluding tip). Diameter. Diameter. Bulb. See General Section Bulb. Bulb. See General Section Bulb. Basing Designation for BOTTOM VIEW. Pin 1-Grid No.1 Operation Operation Pin 5-Heater	n 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
)	Pin 1-Grid No.1 of Unit No.2 Grid No.3 Pir. 3-Grid No.1 Pin 5-Heater Pin 5-Plate of Unit No.2 Pin 7-Grid No.2 Pin 7-Grid No.2 Pin 8-Plate of Pin 8-Plate of Pin 8-Plate of Pin 8-Plate of Pin 8-Plate of Pin 8-Plate of Pin 8-Plate of	



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

of Unit No.1

Pir 4 - Heater

DATA 1

Unit No.1

Pin 9-Heater Tap

√orld Radio History

PUSH-PULL RF POWER AMPLIFIER & OSCILLATOR — Class C and PUSH-PULL RF POWER AMPLIFIER — Class C FM Te	
Values are on a per-tube basis unless otherwise	specified
Maximum Ratings, Absolute-Haximum Values:	
Up to 500 Mc	
CCS* IC/	4 <i>5</i> • .
DC PLATE VOLTAGE	max. volts
DC_GRID-No.1 (CONTROL-GRID)	max. volts
VOLTAGE100 max100	
DC PLATE CURRENT 90 max. 100	max. ma
	max. ma
	max. ma
	max. watts
GRID-No.2 INPUT	max. watts
PLATE DISSIPATION 6 max. 7.5 PEAK HEATER-CATHODE VOLTAGE:	max. watts
Heater negative with	
	max. volts
	max. volts
	max. ^o C
Typical Operation:	
At 500 Mc	
DC Plate Voltage	volts
DC Grid-No.2 Voltage	volts
DC Grid-No.1 Voltage20 -20	volts
From grid resistor for	
each grid No.1 of 27000 27000 Peak-to-Peak RF	ohms
Grid-No.1 Voltage	volts
DC Plate Current	ma
DC Grid-No.2 Current	ma
DC Grid-No.1 Current 1.5 1.5	ma
Driver Power Output	
(Approx.) 1.2 1.2	watts
Useful Power Output (Approx.)	watts

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



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;

		U	\$ to	500 Mc		
		CCS	*	ICA	IS [†]	
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 CATHCDE CURRENT		80	max.	96	max.	ma
PLATE INPUT		8	max.	1C	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		4	max.	- 5	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
BULB TEMPERATURE (At hottest						
point on bulb surface)		225	max.	225	max.	oC

Typical Operation:

At	500 Mc	
DC Plate Voltage	180	volts
DC Grig-No.2 Voltage	180	volts
DC Grid-No.1 Voltage20	-20	volts
From grid resistor for		
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.)	1.2	watts
Useful Power Output		
(Approx.) [•]	5	watts

FREQUENCY TRIPLER --- Class C

Values are on a per-tube basis

Maximum Ratings, Absolute-Maximum Values:

					Up to 500 Nc
					CCS* ICAS
DC PLATE VOLTAGE.	٠				250 max. 250 max. volts



RADIO CORPORATION OF AMERICA **Electron Tube Division** World Radio History

Harrison, N. J.

	<i>ccs</i> *	ICAS		
DC GRID-No.2 (SCREEN-GRID)				_
VOLTAGE	200 max.	200 max.	volts	
VOLTAGE	-100 max.	-100 max.	volts	-
DC PLATE CURRENT.	60 max.	80 max.	ma	
DC GRID-No.1 CURRENT.	6 max.	8 max.	ma	
DC CATHODE CURRENT	70 max.	80 max.	ma	
PLATE INPUT	8 max.	10 max.	watts	_
GRID-No.2 INPUT	3 max.	3.5 max.	watts	
GRID-No.1 INPUT	0.2 max.		watt	
PLATE DISSIPATION	6 max.	7.5 max.	watts	-
respect to cathode Heater positive with	100 max.	100 max.	volts	
respect to cathode BULB TEMPERATURE (At hottest	100 max.	100 max.	voits	
point on bulb surface)	225 max.	225 max.	оС	
Typical Operation:	Up to 500) Mc		
DC Plate Voltage	180	200	volts	
DC Grid-No.2 Voltage (Approx.).	180	190	volts	
Through resistor of	1200	1200	ohms	
DC Grid-No.1 Voltage	-74	74	volts	
From grid resistor for				
each grid No.1 of Peak-to-Peak RF	82000	82000	ohms	
Grid-No.1 Voltage	165	165	volts	
DC Plate Current	40	46	ma	
DC Grid-No.2 Current	9.7	11	ma	
DC Grid-No.1 Current	1.8	1.8	ma	
Driver Power Output				
(Approx.)	1.1	1.1	watts	
(Approx.)•	1.8	2.2	watts	
A				

Without external shield.

Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the augio-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.

Electron Tube Oivision

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



Harrison, N. J.

The heater may be effectively bypassed by grounding one heater pin at the tube socket and bypassing the other heater pin to ground with a low inductance capacitor. If further 'solation 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 cathoderiead inductance.

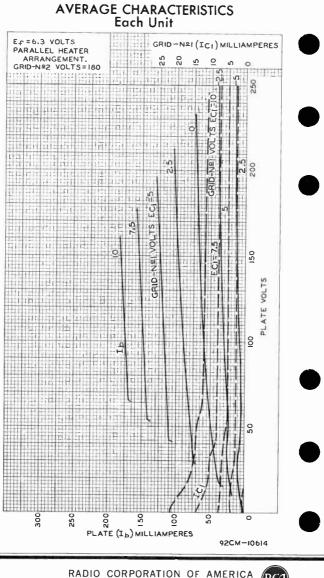
The *rf* impedance between grid No.2 and the cathode must be kept tow, usually by means of a suitable bypass capacitor. In telephony service when grid No.2 is modulated, a smaller bypass capacitor than is used for telegraphy service may be required in order to avoid excessive af bypassing. However, if 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. 0ATA 3 10-60

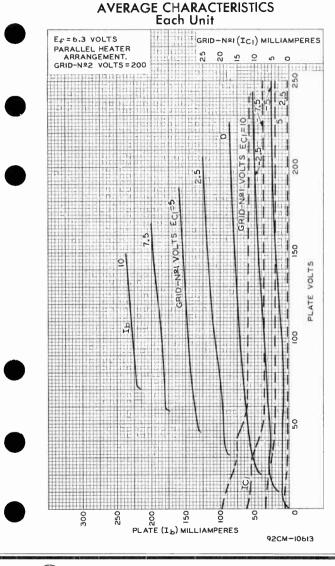
World Radio History



Electron Tube Division

Harrison, N. J.





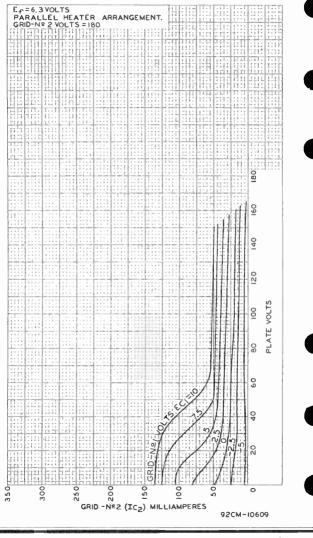
RADIO CORPORATION OF AMERICA

Harrison, N. J.

Electron Tube Division World Radio History

DATA 4 10-60



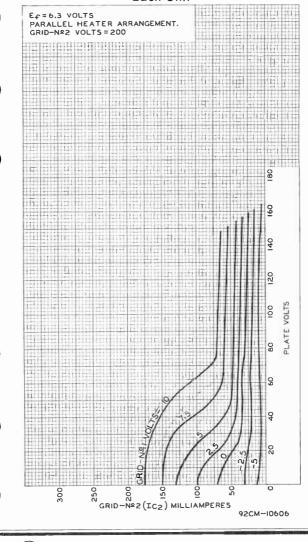


RADIO CORPORATION OF AMERICA Electron Tube Divisionorid Radio History

Harrison, N. J.



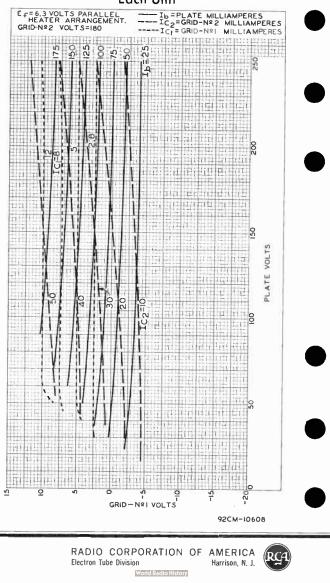
AVERAGE CHARACTERISTICS Each Unit



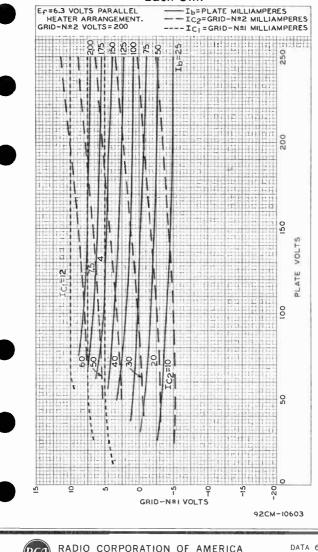


RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 5

AVERAGE CONSTANT-CURRENT CHARACTERISTICS Each Unit



AVERAGE CONSTANT-CURRENT CHARACTERISTICS Each Unit



Vorld Radio History

Electron Tube Division

DATA 6 10-60

Harrison, N. J.

World Radio History

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BEAM POWER TUBE

9-PIN MINIATURE TYPE

For high-fidelity audio-amplifier applications

GENERAL DATA

EI	ec	tr	ica	1:
----	----	----	-----	----

Heater, for Unipotential Cathode: Voltage. Ac or dc volt Voltage. 6.3 Ac or dc volt Current. 0.45 An or dc volt Direct Interelectrode Capacitances: Grid No.1 to plate An or dc volt Grid No.1 to plate 0.7 max. µµ Grid No.1 to cathode & grid No.3, grid No.2, and heater 8 µµ Plate to cathode & grid No.3, grid No.2, and heater 8.5 µµ	np. ⊥f ⊥f
Characteristics, Class A ₁ Amplifier: Plate Voltage	
Grid-No.1 (Control-Grid) Voltage15 volt Plate Resistance (Approx.)	ns
Plate Current. 46 m Grid-No.2 Current. 3.5 m Grid-No.1 Voltage (Approx.) for 6 1	na na
plate current of 100 μ a	ts
Mechanical:	
Operating Position Arr Maximum Overall Length 2-5/6 Maximum Seated Length 2-3/6 Length, Base Seat to Bulb Top (Excluding tip) 2" ± 3/32 Maximum Diameter 7/6 Dimensional Outline 5.6 Base 5.7 Base Small-Button Noval 9-Pin (JETEC No.E9-1) Basing Designation for BOTTOM VIEW 96	8" 8" 2" 8"
Pin 1 - Grid No.2 Pin 2 - No Connection Pin 3 - Grid No.1 Pin 4 - Heater Pin 5 - Heater Pin 5 - Heater Pin 6 - Grid No.1 Pin 7 - Grid No.3, Cathode Pin 8 - Grid No.2 Pin 9 - Plate	
PUSH-PULL AF POWER AMPLIFIER Class AB	
Maximum Ratings, Design-Center Values:	
PLATE VOLTAGE. 400 max. vol GRID-No.2 (SCREEN-GRID) VOLTAGE. 300 max. vol GRID-No.2 INPUT. 2 max. wat PLATE DISSIPATION. 12 max. wat	ts ts
°: See next page.	
8-57 ELECTRON TUBE DIVISION TENTATIVE DATA	1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History



BEAM POWER TUBE

EAK HEATER-CATHODE VOLTAGE :					
Heater negative with respect to cathode			200	max.	volts
Heater positive with respect to cathode			200	max.	volts
ULB TEMPFRATURE (At hottest point on bulb surface)					°C
ypical Operation with Fixed Bias:					
Values are for a	tu	ibes			
late Voltage		250 250	280	400 290	volts
rid-No.1 (Control-Grid) Voltage•. eak_AF_Grid-No.1-to-Grid-No.1		-15		-25	
Voltage		31 91	2 58	50 50	
axSignal Plate Current		10	5 106	107 2.5	
ero-Signal Grid-No.2 Current MaxSignal Grid-No.2 Current ffective Load Resistance (Plate		1		13.7	ma
to plate)		800			ohms
otal Harmonic Distortion JaxSignal Power Output		12.			
ypical Operation with Cathode Bias	:				
Values are for a	t i	ibes	5		
<pre>'late-Supply Voltage</pre>	nge	• • • •	300 300 230 48 80 96 6 14	310 310 270 55 77 92 5 14	volts volts volts wa ma ma ma
ffective Load Resistance (Plate to plate).			5500	6000	ohms
otal Harmonic Distortion			2	4	%
laxSignal Power Output		·	15	17	watts
laximum Circuit Values:					
Fid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation					megohm megohm
PUSH-PULL AF POWER AMPLIF	IER	_	Class	AB,	
Grid No.2 of each tube cor				on	
	- t 1	rans	former		
plate winding of output					
Aaximum Ratings, Design-Center Valu PLATE AND GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE			. 375	max.	volts
Maximum Ratings, <i>Design-Center Valu</i> PLATE AND GRID-No.2 (SCREEN-GRID)			. 375	max.	volts

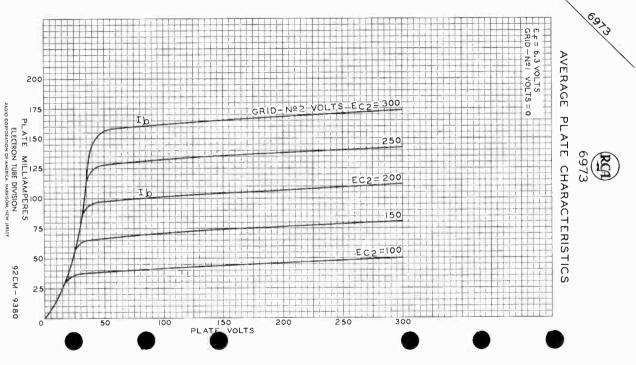
World Radio History

6913



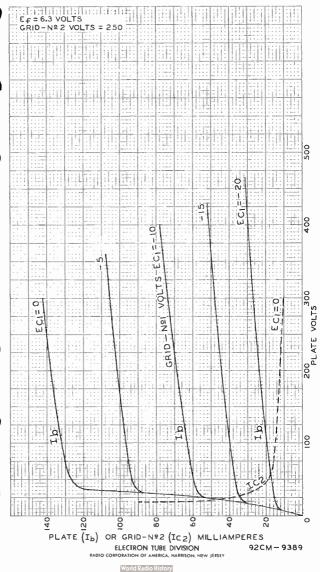
BEAM POWER TUBE

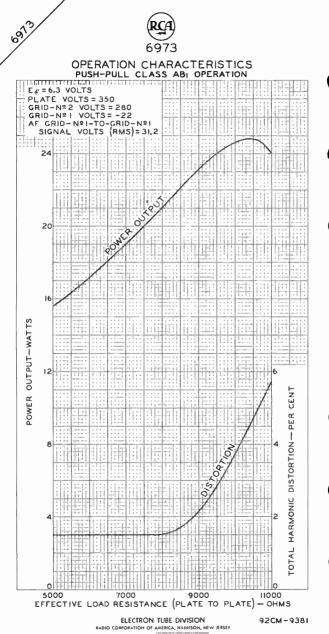
GRID-Nc.2 INPUT 1.75 max. watts PLATE DISSIPATION
respect to cathode 200 max. volts Heater positive with
respect to cathode 200 ^A max. volts BULB TEMPERATURE (At hottest point on bulb surface)
Typical Operation:
Values are for 2 tubes
Fixed Cathode Bias Bias
Plate-Supply Voltage
Peak AF Grid-No.1-to-Grid-No.1 Voltage. 67 62 volts Zero-Signal Cathode Current. 62 74 ma MaxSignal Cathode Current. 95 84 ma Effective Load Resistance (Plate 95 84 ma
to plate)
Maximum Circuit Values:
Grid-Nc.1-Circuit Resistance: For fixed-bias operation 0.5 max. megohm For cathode-bias operation 1 max. megohm
 Without external shield. The dc component must not exceed 100 volts. The type of input coupling network used should not introduce too much resistance in the grid-Nc.1 circuit. Transformer- or impedance- coupling devices are recommended.
Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center tap (8+) so as to apply 50 per cent of the plate signal voltageto grid No.2 of each output tube.
[#] Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center tap (8+) so as to supply 43 per cent of the plate signal voltage to grid Mo.2 of each output tube.





AVERAGE CHARACTERISTICS





World Radio History

604/7014

Full-Wave Gas and Mercury-Vapor Rectifier

GENERAL DATA

F I	ectr	iea	1	:	a

Filament, Coated:	
Voltage (AC)	2.5 volts
Current at 2.5 volts	11.5 ± 1.0 amp
Minimum heating time prior	•
to tube conduction.	15 sec
Typical Anode Starting Voltage	10 volts
	10 00103
Peak Tube Voltage Drop at	10 volts
anode amperes = 5	10 00115
Mechanical:	
Operating Position	rtical, base down
Maximum Overall Length	7-1/2"
Maximum Diameter	
Weight (Approx.).	
Bulb	
Socket.	r-lumbo 4-Contact
Base	Succer Jumbo 1-Pio
base	(JEDEC No.A4-81)
Basing Designation for BOTTOM VIEW	463
	n 3-Filament n 4-Anode No.1

Thermal:

Type of Cooling	ction
Above Ambient Temperature (Approx.):	00
No load	, Ç
Full load	°C

FULL-WAVE RECTIFIER^a

Maximum and Minimum Ratings, Absolute-Naximum Values:

For power-supply frequency of 60 cps

PEAK INVERSE ANODE VOLTAGE	900 max.,	volts
ANODE CURRENT (Each Anode):		
Peak	10 max.	amp
Average ^b	2.5 max.	amp
Fault	150 max.	атр
CONDENSED-MERCURY TEMPERATURE RANGE		
(Operating) ^c	0 to +90	°C
(operating)	0 10 10-	-

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

604/7014

- $\overset{a}{\cdot}$ with circuit returns to filament-transformer center-tap.
- b Averaged over any interval of 5 seconds maximum.
- For longest life, the operating congensed-mercury temperature range after warm-up should be kept between +10° and +90° C which corresponds approximately to +15° to +65° C ambient.

RADIO CORPORATION OF AMERICA Electron Tube Division History



Half-Wave Mercury-Vapor Rectifier

GENERAL DATA

Electrical:^a

Filament, Coated:Voltage (AC).Current at 2.5 volts.Minimum heating time priorto tube conduction.20 secTypical Anode Starting Voltage.Peak Tube Voltage Drop at anode amperes = 812 volts
Mechanical:
Operating Position Vertical, base down Maximum Overall Length
Basing Designation for BOTTOM VIEW
Pin 1-Filament Pin 2-Filament Pin 3-Filament
Thermal:
Type of Cooling
Temperature (Approx.)

HALF-WAVE RECTIFIER^a

Maximum and Minimum Ratings, Absolute-Nazimum Values:

For power-supply frequency of 60 cps	
PEAK INVERSE ANODE VOLTAGE 2000 m ANODE CURRENT:	nax. volts
Feak	
Average ^b	
Fault	nax. amp
CONDENSED-MERCURY TEMPERATURE RANGE (Operating)	+80 °C

 $^{\mathbf{a}}$ with circuit returns to filament-transformer center-tap. $^{\mathbf{b}}$ Averaged over any interval of 5 seconds maximum.



World Radio History

Half-Wave Gas and Mercury-Vapor Rectifier

GENERAL DATA

Electrical:^a

Filament, Coated: Voltage (AC) Current at 2.5 volts Minimum heating time prior to tube conduction Typical Anode Starting Voltage. Peak Tube Voltage Drop at anode a	18 ± 2 amp 60 sec 20 volts
Mechanical:	
Operating Position	9-1/2" 2-1/16" 6 oz

Pin 1-No Internal Connection Pin 2-Filament Pin 3-Filament



Pin 4 - No Internal Connection Cap - Anode

Thermal:

Type of Cooling	tion
tα Equilibrium Above Ambient Temperature (Approx.)	oC

HALF-WAVE RECTIFIER^a

Maximum and Minimum Ratings, Absolute-Maximum Values:

For power-supply frequency of 60 cps

for power suppry frequency of	00 0p0	
PEAK INVERSE ANODE VOLTAGE	. 1000) max. volts
ANODE CURRENT:		
Peak	. 77	7 max. amp
Average ^b	. 6.4	l max. amp
Fault	. 770) max. amp
CONDENSED-MERCURY TEMPERATURE		
RANGE (Operating) c	40 t	o +100 °C

635/7019

- ^a With circuit returns to filament-transformer center-tap.
- Averaged over any interval of 20 seconds maximum.
- C For longest life, the operating condensed-mercury temperature range after warm-up should be kept between +80° and +100° C which corresponds approximately to +10° to +70° C ambient.



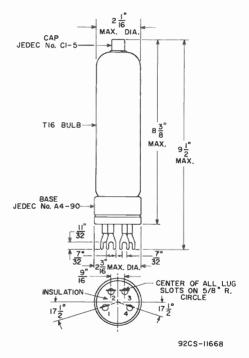


635L/7020

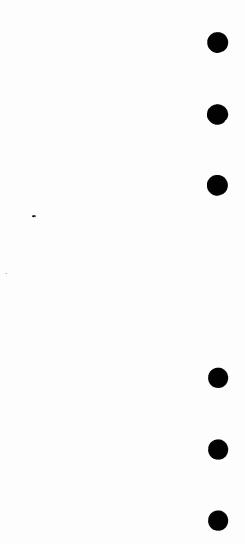
Half-Wave Gas and Mercury-Vapor Rectifier

The 635Li7020 is the same as the 635/7019 except for the following items:

Mechanical:







World Radio History



BEAM POWER TUBE

For high-fidelity audio-amplifier applications

GENERAL DATA

Electrical:

Electrical:	
Heater, for Unipotential Cathode: Voltage	
Grid No.1 to plate	μµf
grid No.2, and heater	μμf
grid No.2, and heater 7.5	μµf
Charaeteristics, Class A ₁ Amplifier:	
Grid-No.2 (Šcreen-Grid) Voltage 250 v Grid-No.1 (Control-Grid) Voltage14 v Plate Resistance (Approx.)	volts volts volts ohms umhos ma ma
Mechanical:	
Maximum Överall Length	1.06" 1.63" T12 3-Pin -191)
Pin 1 - Grid No.2 Pin 2 - Heater Pin 3 - Plate Pin 4 - Grid No.2 Pin 5 - Grid No.1 Pin 5 - Grid No.1 Pin 6 - Grid No.2 Pin 7 - Heater Pin 8 - Cathode, Grid No.1	
PUSH-PULL AF POWER AMPLIFIER - Class AB	
Maximum Ratings, Design-Center Values:	1
	volts volts
Peak	ma
DC 110 max. GR HD-No.2 INPUT 3.5 max. w	ma stte
	vatts vatts
°: See next page.	
7.59 TENTATIVE D	ATA 1
RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY	



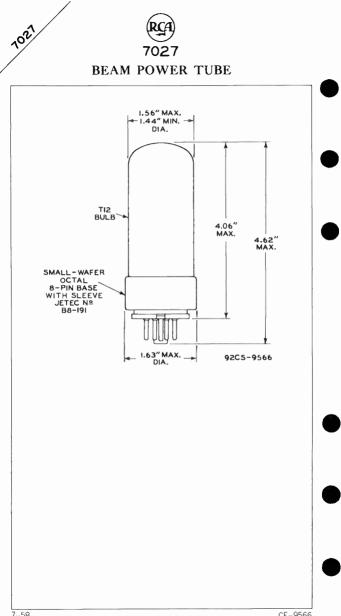
BEAM POWER TUBE

PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect t	o cathode		200 max.	volts
Heater nositive with respect t			2004 max.	
Typical Operation with Fixed Bi	as:			
Values are f				
Plate Voltage	330 330	400 300	450 350	volts volts
Voltage [•]	-24	-25	-30	volts
Voltage	48	50	60	volts
Zero-Signal Plate Current	122	102	95	ma
MaxSignal Plate Current	184 5.6	152 6	194 3.4	ma ma
Zero-Signal Grid-No.2 Current . MaxSignal Grid-No.2 Current .	18.5	17	19.2	ma ma
Effective Load Resistance (Plate to plate)		6600		ohms
Total Harmonic Distortion Max.—Signal Power Output	1 31.5	2 34	1.5 50	% watts
Typical Operation with Cathode				
Values are ;				
Plate-Supply Voltage			380 380	volts volts
Grid—No.2 Supply Voltage Cathode Resistor Peak AF Grid—No.1-to-Grid—No.1	200		180	ohms
Voltage	51	7	68.5	volts
Zero-Signal Plate Current			138	ma
MaxSignal Plate Current			170	ma
Zero-Signal Grid-No.2 Current . MaxSignal Grid-No.2 Current .			5.6 20	ma ma
Effective Load Resistance				
(Plate to plate)	6600	-	4500	ohms
Total Harmonic Distortion Max.—Signal Power Output	3		3.5 36	% 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
		- 014	ec AD.	
PUSH-PULL AF POWER AN Grid No.2 of each tub			•	
plate winding of a				
Maximum Ratings, Design-Center	Values:			
PLATE AND GRID-No.2 (SCREEN-GR SUPPLY VOLTAGE	ID)		450 max.	volts
O,≜,●: See next page.				
			TENTATIV	

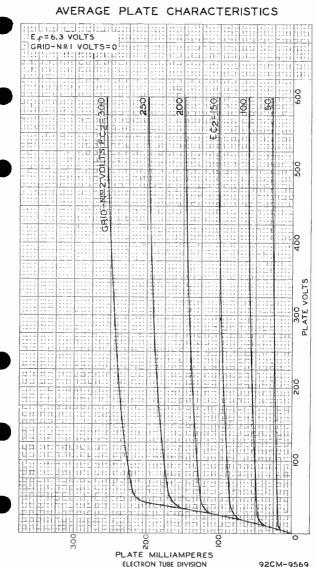


BEAM POWER TUBE

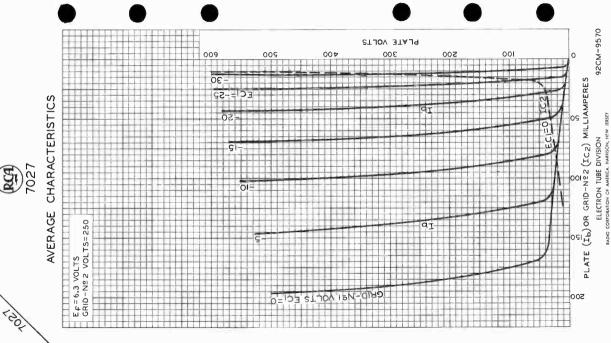
DC	00 max. 10 max. 3 max. 25 max. 20 max. 00 max.	ma ma watts watts volts volts
Typical Operation:		
Values are for 2 tubes		
Plate-Supply Voltage. Grid-No.2 Supply Voltage. Cathode Resistor. Peak AF Grid-No.1-to-Grid-No.1 Voltage. Zero-Signal Cathode Current. MaxSignal Cathode Current. Effective Load Resistance (Plate to plate) Total Harmonic Distortion. MaxSignal Power Output.	410 * 220 68 134 155 8000 1.6 24	volts volts ohms volts ma ohms % watts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance: For cathode-bias operation).5 max.	megohr
 Without external shield. The dc component must not exceed 100 volts. The type of input coupling network used should not resistance in the grid-No.1 circuit. Transformer- or oevices are recommended. Obtained from taps on the primary winding of the opter tap (The taps are located on each side of the center tap (U3 per cent of the plate signal voltage to grid No.2 or No.	impedance-	coupling



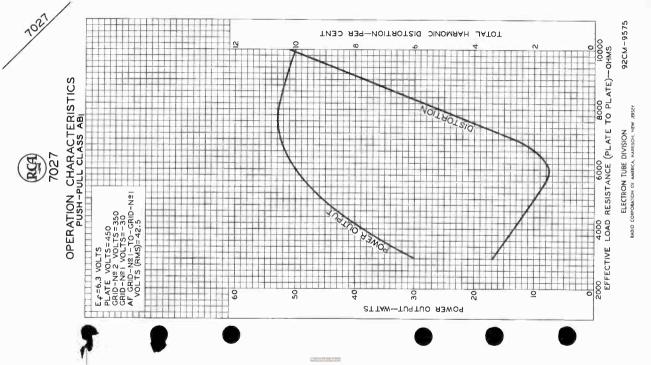


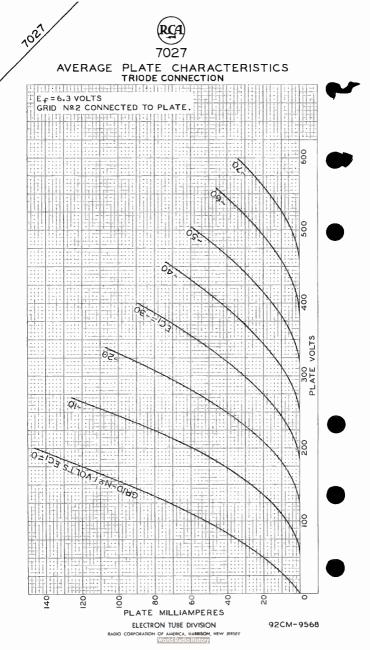


RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



World Radio History





Beam Power Tube

FORCED-AIR COOLED COAXIAL-ELECTRODE STRUCTURE 370 WATT

UNIPOTENTIAL CATHODE

COMPACT DESIGN

370 WATTS CW OUTPUT UP TO 150 Mc 140 WATTS CW OUTPUT AT 500 Mc INTEGRAL RADIATOR

For Use at Frequencies up to 500 Mc

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode: Voltage (AC or DC) ^a 6.0 ± 10% volts Current at heater volts = 6.0 2.6 amo Minimum heating time 30 sec Mu-Factor, Grid No.2 to Grid No.1, for grid-No.2 volts = 300 and
grid-No.2 ma. = 50 5 Direct Interelectrode Capacitances:
Grid No.1 to cathode, grid No.2, μμf
and heater \dots
and heater. \dots
Mechanical:
Operating Position
RADIATOR
Pin 1-Grid No.2 ^d Pin 2-Cathode Pin 3-Heater Pin 4-Cathode Pin 5-Do Not Use Pin 6-Cathode Pin 5-Do Not Use Pin 6-Cathode Pin 8-Cathode Base Index Plug- Grid No.1 Radiator - Plate Ring Terminal ^e - Grid No.2

Air Flow:

Through indicated air-system socket—This fitting directs the air over the base seals; past the grid-No.2 seal, glass envelope, and plate seal; and through the radiator to provide effective cooling with minimum air flow. When the tube is operated at maximum plate dissipation for each class of service, a minimum air flow of 5.6 cfm

- indicates a change.



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

7034/4X150A

through the system is required. The corresponding pressure drop is 0.45 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Without air-system socket—If an air-system socket is not used, it is essential that adequate cooling air be directed over the base seals, past the envelope, and through the radiator. Under these conditions and with the tube operating at maximum plate dissipation for each class of service, a minimum air flow of 5.3 cfm must pass through the radiator. The corresponding pressure drop is 0.28 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Plate Temperature (Measured on	base	end		
of plate surface at junction	with	fins)	 250 max.	oC
Temperature of Plate Seal			 200 max.	oC
Temperature of Base Seals and				
Grid-No.2 Seal			 175 max.	oC

AF POWER AMPLIFIER & MODULATOR - Class AB, f

Maximum CCS^g Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE			
DC GRID-No.2 (SCREEN-GRID) VOLTAGE			volts
MAXSIGNAL DC PLATE CURRENTh			ma
GRID-No.2 INPUT ¹			
PLATE DISSIPATION ^h	250	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode		max.	volts
Heater positive with respect to cathode	150	max.	volts
	200		*****

Typical CCS Operation:

Values are for 2 tubes

DC Plate Voltage DC Grid-No.2 Voltage DC Grid-No.1 (Control-	800 300	1000 300	1500 300	2000 300	volts volts
Grid) Voltage	-40	-43	-50	-50	volts
Grid-No.1 Voltage Zero-Signal DC Plate Current . MaxSignal DC Plate Current . Zero-Signal DC Grid-No.2	80 210 435	86 165 450	100 100 456	100 100 470	volts ma ma
Current	0	0	0	0	ma
Current	76	52	42	36	ma

RADIO CORPORATION OF AMERICA Electron Tube Division

Harrison, N. J.



Effective Load Res (Plate to plate) MaxSignal Driving		4400	4250	6570	8760	ohms
(Approx.)		0	0	0	0	watts
NaxSignal Power ((Approx.)		170	230	400	580	watts
Maximum Circuit Va	lues:					
Grid-Nø.1-Circuit I	Resistance	Per tu	ibe).	. 0.1	max.	megohm
AF POWER A	MPLIFIER &	MODULA	TOR —	Class	AB2j	
Maximum CCS ⁹ Ratin	gs, Absolute	-4axim	um Val	ues:		
DC PLATE VOLTAGE.				. 200	0 max.	volts
DC GRID-No.2 (SCRE	EN-GRID) VOL	TAGE .		. 40	0 max.	volts
MAX SIGNAL DC PLA	TE CURRENTh			. 25	0 max.	ma
GRID-No.2 INPUTh.				. 1	2 max.	
PLATE DISSIPATION ^h				. 25	o max.	
GRID-No.1 (CONTROL	-GRID) INPUT	ſ			2 max.	watts
PEAK HEATER-CATHOD						
Heater negative					0 max.	
Heater positive	with respect	t to ca	athode	. 15	ou max.	volts
Typical CCS Operat	ion:					
	Values are	for 2	tubes			
DC Plate Voltage.		800	1000	1500	2000	volts
DC Grid-No.2 Volta		300	300	300	300	volts
DC Grid-No.1 Volta		-40	-45	-50	-50	volts
Peak AF Grid-No.1-						
Gr•d-No.1 Voltag	e	90	- 98	106	106	volts
Zero-Signal DC Pla		21C	166	100	100	ma
MaxSignal DC Pla		500	493	500	500	ma
Zero-Signal DC Gri					-	
Current		0	0	0	0	ma
MaxSignal DC Gri		0.0	E O	10	0.0	
Current		80	58	46	36	ma
Effective Load Res		3140	3950	5970	8100	ohms
(Flate to plate) MaxSignal Drivin		5140	2820	2910	0100	OTHIS
(Approx.)		0.15	0.15	0.2	0.2	watt
MaxSignal Power		0.10	0.17	0.2	0.2	TTGL L
		215	270	440	630	watts
(1)221-2417		220		0	-/0	

RF POWER AMPLIFIER - Class B Television Service

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS⁹ Ratings, Ausolute-Maximum Values:





RADIO CORPORATION OF AMERICA **Electron Tube Division**

Harrison, N. J.

GRID-No.2 INPUT 12 max. GRID-No.1 INPUT 2 max. PLATE DISSIPATION 250 max. PEAK HEATER-CATHODE VOLTAGE: 150 max. Heater negative with respect to cathode. 150 max. Heater positive with respect to cathode. 150 max.	watts watts watts volts volts	(
Typical CCS Operation:		
With bandwidth of 5 Mc		
DC Plate Voltage. 750 1000 1250 DC Grid-No.2 Voltage. 300 300 300 DC Grid-No.1 Voltage: -60 -65 -70	volts volts volts	(
Synchronizing level	volts volts	
Synchronizing level	ma ma	(
Synchronizing level	ma ma	
Synchronizing level	ma ma	
Synchronizing level	watts watts	
Synchronizing level 135 200 250 Pedestal level 75 110 140	watts watts	

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Maximum Ratings, Absolute-Haximum Values:

	Up to CCS¶	150 Hc ICAS®	Up to 500 Nc CCS ⁹	
DC PLATE VOLTAGE DC GRID-No.2 (SCREEN-GRID)	2000 max.	2250 max.	1250 max. volts	
VOLTAGE	400 max.	400 max.	400 max. volts	
PLATE CURRENT	250 max.	280 max.	250 max. ma	
		12 max.	12 max. watts	
PLATE DISSIPATION . PEAK HEATER- CATHODE VOLTAGE: Heater negative with respect	250 max.	250 max.	300 max. watts	
to cathode Heater positive with respect	150 max.	150 max.	150 max. volts	
to cathode	150 max.	150 max.	150 max. volts 	

RADIO CORPORATION OF AMERICA Electron Tube Division

History

Harrison, N. J.



115 200 250 290 watts

Typical Class AB ₁ "Single-Tone	e" Ope	ration	up to	150 Mc:	n
System to the standard		CCS 9		ICAS ■	
DC Plate Voltage	1000	1500	1800	2000	volts
DC Grid-No.2 Voltage ^p	300	300	300	300	volts
DC Grid-No.1 (Control-	-				
Grid) Voltage	-50	-50	-50	-48	volts
Zero-Signal DC Plate Current.		50	50	60	ma
Zero-Signal DC Grid-No.2					
Current	0	0	0	0	ma
Effective RF Load Resistance.		3280	4140	4270	ohms
MaxSignal DC Plate Current.	225	225	225	250	ma
MaxSignal DC Grid-No.2					
Current	11	11	11	9	ma
MaxSignal Peak RF Grid-					
No.1 Voltage	50	50	50	48	volts
MaxSignal Driving Power				-	
(Apprcx.)	0	0	0	0	watts
MaxSignal Power Output					

Maximum Circuit Values (CCS or ICAS):

(Approx.)

Grid-No.1-Circuit	Res	ist	an	C€	ur	idei	r /	Any	r	Сог	nd i	it	ion:		
With fixed bias															
With cathode bi	as .												Not	recomm	ended

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

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

Maximum CCS^g Ratings, Absolute-Haximum Values:

DC PLATE VOLTAGE					150	Mc	150 500 1000	Mc	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	5							max.	vo)ts
VOLTAGE							-250	max.	volts
DC PLATE CURRENT							200	max.	ma
GRID-No.2 INPUT							10		watts
GRID-No.1 INPUT									
PLATE DISSIPATION		•			165	max.	165	max.	watts
PEAK HEATER-CATHODE VOLTAGE Heater negative with					. 5.0		. 50		
respect to cathode Heater positive with									
respect to cathode		•	•	•	150	max.	150	max.	volts
Typical CCS Operation:									
Uı	þ t	0	1	50	Mc				
DC Plate Voltage						1	200	1600	volts

DC Grid-No.2 Voltage (Modulated approx. 55%)¶.....250 250 volts ← Indicates a change.



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

DC Grid-No.1 Voltage ^r Peak AF Grid-No.2 Voltage 100% modulation) Peak RF Grid-No.1 Voltage DC Plate Current DC Grid-No.2 Current DC Grid-No.1 Current (Appr Driving Power (Approx.) Power Output (Approx.).	(F	· · · · · · · · · · · · · · · · · · ·	• • • •		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	-118 180 136 200 23 5 2 150	-118 200 136 200 23 5 3 230	volts volts volts ma ma wats watts	
	At	: 1	65		(c				(
DC Plate Voltage DC Grid-No.2 Voltage (Modulated approx. 55%)	•		•	•	400 250	600 250	250	1000 250	volts	
DC Grid-No.1 Voltage Peak AF Grid-No.2 Voltage	•	•	•	·	-90	-95	-100	-105	volts	
(For 100% modulation). Peak RF Grid-No.1 Voltage DC Plate Current DC Grid-No.2 Current DC Grid-No.1 Current (Appr Driving Power (Approx.). Power Output (Approx.).		: : :		• • • •	110 200	150 120 200 35 8 1 80	120 200 25	170 125 200 20 15 2 140	volts volts ma ma ma watts	
Maximum Circuit Values:										

RF POWER AMPLIFIER & OSCILLATOR -- Class C Telegraphy^s

and

RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS^g Ratings, Absolute-Maximum Values:

		150 to 500 Mc	
DC PLATE VOLTAGE	2000 max.	1250 max.	volts
VOLTAGE	300 max.	300 max.	volts
VOLTAGE			
DC PLATE CURRENT			ma watts
GRID-No.1 INPUT			
PEAK HEATER-CATHODE VOLTAGE:	200	200 11023	Harrs -
Heater negative with respect to cathode Heater positive with	150 max.	150 max.	volts
respect to cathode	150 max.	150 max.	volts
Typical CCS Operation:			
Up to 150	Mc		
DC Plate Voltage.	15	00 2000	volts

RADIO CORPORATION OF AMERICA

Harrison, N. J.



Electron Tube Division

DC Grid-No.1 Voltage. -86 -88 Peak RF Crid-No.1 Voltage 110 110 DC Flate Current. 250 250 DC Grid-No.2 Current. 24 24 DC Grid-No.1 Current (Approx.) 8 8 Driving Power (Approx.) 1.5 2.5 Power Output (Approx.) 260 370	volts volts ma ma watts watts
At 265 Hc	
DC Flate Voltage. 600 750 1000 1250 DC Grid-No.2 Voltage. 250 250 250 250 DC Grid-No.1 Voltage. -75 -80 -90 Peak RF Grid-No.1 Voltage. 91 96 95 106 DC Flate Current. 200 200 200 200 DC Grid-No.2 Current. 37 37 31 20 DC Grid-No.1 Current (Approx.) 11 11 11 11 Driving Fower (Approx.) 1 1 1.2 Power Output (Approx.) 85 110 150 195	volts volts volts volts ma ma watts watts
At 500 Mc with coaxial cavity	
DC Plate Voltage. 600 800 1000 1250 DC Grid-No.2 Voltage. 250 250 250 280 DC Grid-No.1 Voltage. -110 -110 -110 -115 DC Plate Current. 170 200 200 200 DC Grid-No.2 Current. 6 7 7 5 DC Grid-No.1 Current (Approx.) 6 10 10 10 Driver Power Output (Approx.) 15 20 25 30 Useful Power Output (Approx.) 50 95 120 140	volts volts volts ma ma wats watts
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance under Any Condition	ohms
 Because the cathode is subjected to considerable back bombard the frequency is increased with resultant increase in temperature voltage should be reduced depending on operating condition frequency to prevent overheating the cathode and resultant short a cylindrical shield JEDEK No.321 surrounding the grid-No.7 rimminal. Both shields are connected to ground. Available from E.F. Johnson Cc., waseca, Hinn. For use at lower frequencies. For use at lower frequencies. For use at lower frequencies. Subscript 1 indicates that grid-No.1 current does not flow dur part of the input cycle. Continuous Commercial Service. Averaged over any audio-frequency cycle of sine-wave form. Subscript 2 indicates that grid-No.1 current flows during sort of the input cycle. Averaged over any frame. The driver stage is required to supply tube losses and rf-closses. The driver stage should be designed to provide an of power above the indicated values to take care of variations values in the dracter states or yariations of any of the innet cycle. 	t life. ng ter- ing any me part excess in line in tube
ⁿ "Single-Tone" operation revers to that class of amplifier ; in which the grid-No.2 input consists of a monofrequency rf having constant amplitude. This signal is produced in a sideband suppressed-carrier system when a single audio frequi constant amplitude is applied to the input of the system.	ervice signal single- ency of



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

DATA 4 9-62

- Preferably obtained from a fixed supply.
- The dc grid-No.2 voltage must be modulated approximately 55% in phase with the plate modulation in order to obtain 100% modulation of the 7034/4X150A. The use of a series grid-No.2 resistor or reactor may not give satisfactory performance and is therefore not recommended.
- Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
- 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 1155 of the carrier conditions.

•	CHARACTERISTICS RANGE VALUES	FOR EQUI	PMENT	DESIGN	
		Note	∦ın.	Max.	
	Heater Current	1	2.3	2.9	amp
	Capacitances:				
	Grid No.1 to plate	2		0.05	μµf
	Grid No.1 to cathode, grid				
	No.2, and heater	2	14.5	17.0	μµf
	Plate to cathode, grid				
	No.2, and heater	2	4.0	4.8	μµ f
	Grid-No.1 Voltage	1,3.4,5	-32	-46	volts
	Grid-No.2 Current	1,3,4,5	-5	3	ma
	Power Output,	4,5,6	100	-	watts

Note 1. with 6.0 volts on heater.

With cylindrical shield JEDEC No.320 surrounding radiator: and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground. Note 2:

with dc plate volts = 1000, dcgrid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 milliamperes. Note 3: and grid-

- Note #: with forced-air cooling as specified under GENERAL DATA for Air-System Socket.
- Note 5: Heater voltage must be applied for at least 30 seconds before application of other voltages.
- With heater volts = 5.5, dc plate volts = 1000, dc grid-No.2 volts = 250, dc grid-No.1 volts = -90, maximum dc grid-No.1 millamperes = 20, grid-No.1 signal voltage adjusted to give dc plate current of 200 milliamperes, and a frequency of 475 Mc. Note 61

SPECIAL PERFORMANCE DATA

Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 6.6, no voltage on other elements, and specified forced-air cooling for Air-System Socket. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

Grid	No.I	and	Grid No.	2						10 min.	megohms
Grid	No.l	and	Cathode							IO min.	megohms
Grid	No.2	and	Cathode			•	•			10 min.	megohms

- Indicates a change.

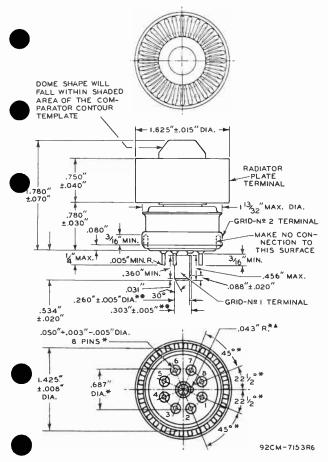




RADIO CORPORATION OF AMERICA Electron Tube Division Radio History







GRID-NO.I PLUG DIMENSIONS ARE MEASURED BY THE USE OF THE SERIES OF GAUGES SHOWN IN SKETCHES G_1 AND G_2 . IN THE FOLLOWING INSTRUCTIONS FOR THE USE OF THESE GAUGES, "GO" INDICATES THAT THE ENTIRE GRID-NO.I PLUG KEY WILL ENTER THE GAUGE; AND "NO-GO" INDICATES THAT THE GRID-NO.I PLUG KEY WILL NOT ENTER THE GAUGE MORE THAN I/16". INSTRUCTIONS FOR THE USE OF THE GAUGES FOLLOW:

▲, ●, *: See next page.

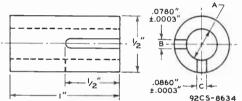


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GAUGES G1-1, G1-2, G1-3, AND G1-4:

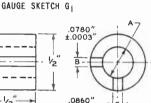
USING ONLY SLOT C, TRY THESE GAUGES IN NUMERICAL ORDER UNTIL ONE IS FOUND THAT WILL ACCEPT THE ENTIRE GRID-NO. I PLUG. USING THE FIRST GAUGE THUS FOUND, IT WILL NOT BE POSSIBLE TO INSERT THE GRID-NO.I PLUG IN SLOT B.

- GAUGES G2-1, G2-2, AND G3-3: THE GRID-NO. I PLUG WILL BE REJECTED BY GAUGES G2-1 AND G2-2, BUT WILL BE ACCEPTED BY GAUGE G2-3.
- * BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT THE ENTIRE LENGTH OF THE PINS WILL, WITHOUT UNDUE FORCE. PASS INTO AND DISENGAGE FROM THE FLAT-PLATE GAUGE SHOWN IN SKETCH G.



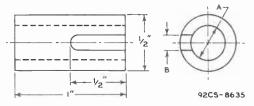
Gauge	Dimension A
G⊥⊸I	.2575" + .0000" 0005"
G ₁ -2	.2600" + .0000" DD05"
G ₁ -3	.2625" + .0000" 0005"
G1-4	.2650" + .0000" 0005"

Electron Tube Division



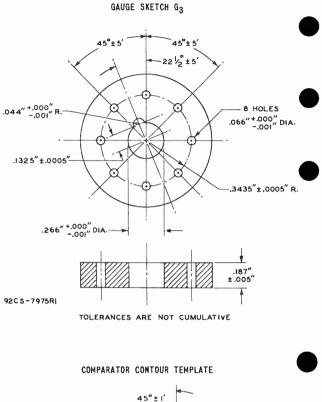


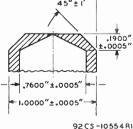
GAUGE SKETCH G2



Course	Dimension						
Gauge	A	В					
G ₂ -1	.2550" + .0000" ~ .0005"	.125"					
G ₂ -2	.2980" + .0000" 0005"	none					
G2-3	.3080" + .0000" 0005"	none					







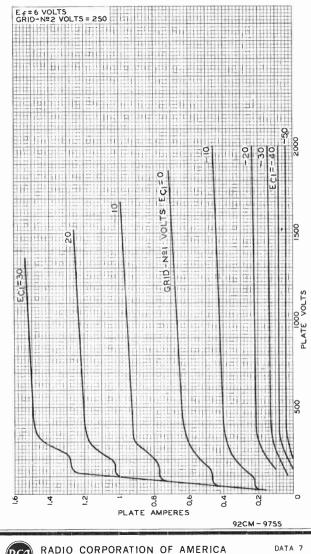
RADIO CORPORATION OF AMERICA Electron Tube Division Pradio History Harrison, N. J.



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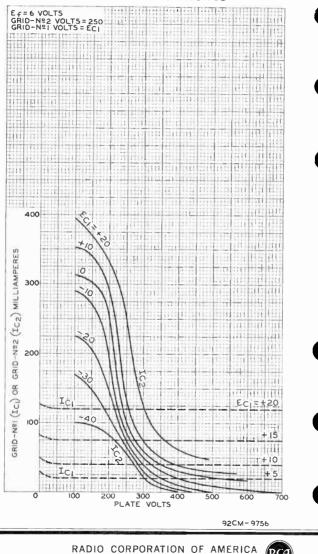
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TYPICAL PLATE CHARACTERISTICS



Electron Tube Division

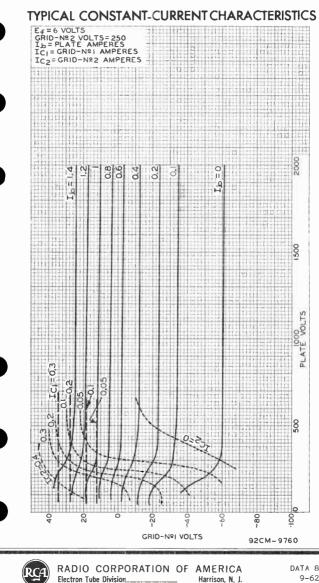
TYPICAL CHARACTERISTICS



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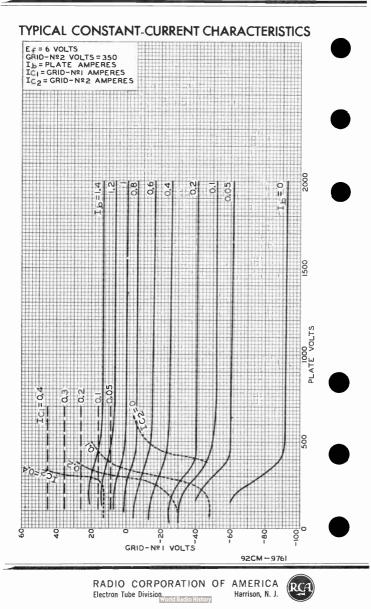
Harrison, N. J.

ld Radio History



orld Radio History

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Beam Power Tube

FORCED-AIR COOLED

COAXIAL-FLECTRODE STRUCTURE 370 WATTS CW OUTPUT UP TO 150 Mc 140 WATTS CW OUTPUT AT 500 Mc UNIPOTENTIAL CATHODE

INTEGRAL RADIATOR

amp

For Use at Frequencies up to 500 Mc

The 7035/4×150D is the same as the 7034/4×150A except for the following items:

Heater, for Unipotential Cathode: 26.5 ± 10% volts Voltage (AC or DC)^a Current at heater volts = 26.5. 0 58

Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS	RANGE	VALUES	FOR	EQUIPMENT	DESIGN
-----------------	-------	--------	-----	-----------	--------

	Note	Mın.	Max.	
Heater Current	1	0.50	0.62	amp
Direct Interelectrode				
Capacitances:	~		0.05	
Grid No.1 to plate	2	-	0.05	μµf
Grid No.1 to cathode, grid				
No.2, and heater	2	14.5	17.0	<i>μμ</i> f
Plate to cathode, grid				
No.2, and heater.	2	4.0	4.8	μµf
Grid-No.1 Voltage	1,3,4,5	-32	-46	volts
Grid-No.2 Current	1,3,4,5	-5	3	ma
Power Output	4,5,6	100	-	watts

Note 1: with 26.5 volts on heater.

COMPACT DESIGN

Note 2: with cylindrical shield having inside diameter of 1-13/16* com-pletely surrounding radiator, and insulated from the top and sides of it by a 1/16* thickness of insulating material; and with a cylindrical shield having inside diameter of 1.460* and length of 5/16* surrounding the grid-No.2 ring terminal and insulated from it. Both shields are connected to ground.

Note 3: With dc plate volts = 1000, dc grid-No.2 volts = 300. and grid-No.1 voltage adjusted to give plate current of 150 milliamperes. and grid-

Note 4: with forced-air cooling as specified under GENERAL DATA for Air-System Socket.

Note 5: Heater voltage must be applied for at least 30 seconds before application of other voltages.

Note 6: With heater volts = 24.5, dc plate volts = 1000, dc grid-No.2 volts = 250, dc grid-No.1 volts = -90, maximum dc grid-No.1 milliamperes = 20, grid-No.1 signal voltage adjusted to give dc plate current of 200 milliamperes, and a frequency of #75 Mc.

SPECIAL PERFORMANCE DATA

Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 29.1, no voltage on other elements,

- Indicates a change.



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7035/4X150D

and specified forced-air cooling for Air-System Socket. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

											megohms
Grid	No.1	and	cathode						10	min.	megohms
Grid	No.2	and	cathode						10	min.	megohms



RADIO CORPORATION OF AMERICA Electron Tube Division

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 3077/7054 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"





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World Radio History

Power Pentode

9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode: Voitage (AC or DC)	
Direct Interelectrode Capacitances (Approx.): ^a Grid No.1 to plate	F
grid No.2, and heater \ldots \ldots 10.8 $\mu\mu$ f Plate to cathode & grid No.3,	f
grid No.2, and heater $\dots \dots \dots$	
Characteristics, Class A ₁ Amplifier:	
Plate Voltage 250 volts Grid-No.2 Voltage 250 volts Grid-No.1 Voltage -7.3 volts Mu-Factor, Grid No.2 to Grid No.1 19.5 Plate Resistance (Approx.) 40000 ohms Transconductance. 11300 µmhos Plate Current 48 ma Grid-No.2 Current 5.5 ma	s s s a
Mechanical:	
Operating Position	"""" n2}
Pin 1 - Internal Con- nection- Do Not Use Pin 2 - Grid No.1 Pin 3 - Cathode, Grid No.3	

PUSH-PULL AF POWER AMPLIFIER --- Class AB1

Maximum Ratings, Design-Center Values:

PLATE VOLTAGE					400 max. volts
GRID-No.2 (SCREEN-GRID) VOLTAGE					300 max. volts
CATHODE CURRENT					65 max. ma
PLATE DISSIPATION					12 max. watts
ZERO-SIGNAL GRID-No.2 INPUT	٠	•	•	·	2 max. watts



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	MAXSIGNAL GRID-No.2 INPUT 4 max. PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. 100 max.	watts volts	
	Heater positive with respect to cathode 100 max.	volts	
	Typical Operation:		
	Values are for 2 tubes		
	Plate Voltage. 400 Grid-No.2 Voltage. 300 Grid-No.1 Voltage. -15 Peak AF Grid-No.1 Voltage. 14.8 Zero-Signal Plate Current. 15 MaxSignal Plate Current. 105 Zero-Signal Grid-No.2 Current. 1.6 MaxSignal Grid-No.2 Current. 25 Effective Load Resistance 25	volts volts volts ma ma ma	•
	(Plate to plate)	ohms % watts	
	Maximum Circuit Values:	Walls	•
	Grid-No.1-Circuit Resistance:		
	For fixed-bias operation 0.3 max.	megohm	
	PUSH-PULL AF POWER AMPLIFIER Class AB		
	Grid No.2 of each tube connected to tap		
	Grid No.2 of each tube connected to tap on plate winding of output transformer		
-	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.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. PLATE DISSIPATION. 12 max. ZERO-SIGNAL GRID-No.2 INPUT. MAXSIGNAL GRID-No.2 INPUT. 4 max. PEAK HEATER-CATHODE VOLTAGE:	volts ma watts watts watts	
-*	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. PLATE DISSIPATION. 12 max. ZERO-SIGNAL GRID-No.2 INPUT. MAXSIGNAL GRID-No.2 INPUT. PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. 100 max.	ma watts watts watts volts	
-	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	ma watts watts watts	
-	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	ma watts watts watts volts	•
	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	ma watts watts watts volts	•
	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 375 max. CATHODE CURRENT. 65 max. PLATE DISSIPATION. 12 max. ZERO-SIGNAL GRID-No.2 INPUT. 2 max. MAXSIGNAL GRID-No.2 INPUT. 4 max. PEAK HEATER-CATHODE VOLTAGE: 100 max. Heater negative with respect to cathode. 100 max. Heater positive with respect to cathode. 100 max. Ptate Supply Voltage 275 Grid-No.2 Supply Voltage 375	ma watts watts vatts volts volts	•
•	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 375 max. CATHODE CURRENT. 65 max. PLATE DISSIPATION. 12 max. ZERO-SIGNAL GRID-No.2 INPUT. 2 max. MAXSIGNAL GRID-No.2 INPUT. 4 max. PEAK HEATER-CATHODE VOLTAGE: 100 max. Heater negative with respect to cathode. 100 max. Heater positive with respect to cathode. 100 max. Grid-No.2 Supply Voltage. 375 Cathode Resistor 220 Peak AF Grid-No.1 Voltage. 17.7 Zero-Signal Cathode Current. 70	ma watts watts watts volts volts	•
•	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 375 max. CATHODE CURRENT. 65 max. PLATE DISSIPATION. 12 max. XERO-SIGNAL GRID-No.2 INPUT. 2 max. MAXSIGNAL GRID-No.2 INPUT. 4 max. PEAK HEATER-CATHODE VOLTAGE: 100 max. Heater negative with respect to cathode. 100 max. Heater positive with respect to cathode. 100 max. Typical Operation: Values are for 2 tubes Plate Supply Voltage 375 Grid-No.2 Supply Voltage 220 Peak AF Grid-No.1 Voltage. 17.7 Zero-Signal Cathode Current. 70	ma watts watts volts volts volts ohms volts ma	•

--- Indicates a change.

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Maximum Circuit Values:

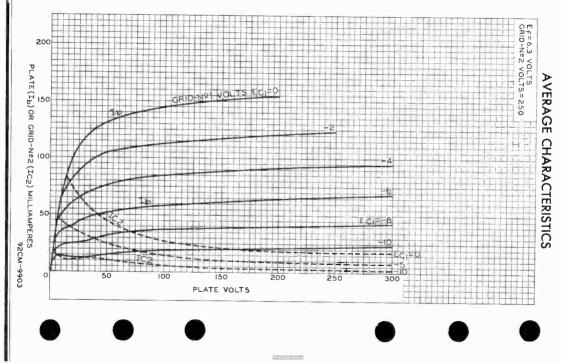


- a Without external shield.
- b Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center-tap (8+) so as to supply 43 per cent of the plate signal voltage to grid No.2 of each output tube.



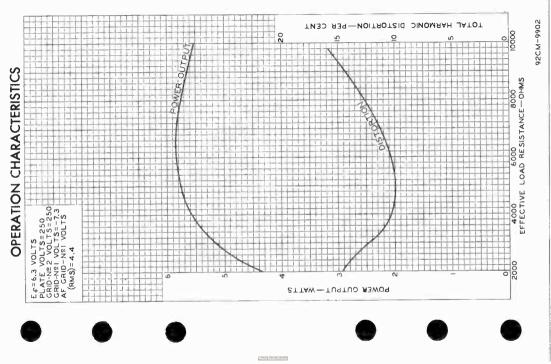






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CORPORATION

RADIO

Division

Tube

Electron 1

World Radio History

Beam Power Tube

FORCED-AIR COOLED

CERAMIC-METAL SEALS COAXIAL-ELECTRODE STRUCTURE COMPACT DESIGN 400 WATTS CW OUTPUT TO 175 Mc 250 WATTS CW OUTPUT AT 500 Mc INTEGRAL RADIATOR

For Use at Frequencies up to 500 Mc

The 7203 is unilaterally interchangeable with the 4X250B and bilaterally interchangeable with the 4CX250B.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC) ^a	6.0 ± 10%	volts
Current at heater volts = 6.0	2.6	amp
Minimum heating time	30	sec
Mu-Factor, Grid No.2 to Grid No.1.		
for grid-No.2 volts = 300 and		
grid-No.2 ma. = 50,	5.0	
Direct interelectrode Capacitances: ^b		
Grid No.1 to plate	0.03	<i>щ</i> f
Grid No.1 to cathode, grid No.2,		1.1
and heater	16.0	<i>1111</i> f
Plate to cathode, grid No.2,		
and heater	4.4	щıf
and nearen		اعتيمر

Mechanical:

Operating Position	Any
Maximum Överall Length	
Maximum Seated Length	1.91" -
Maximum Diameter	1.640"
Weight (Approx.)	
Radiator	
Socket Air-System	
	Air Chimney ^c ; or 124-110-1 ^d
	(Supplied with Air Chimney)
Base	Special 8-Pin



Pin 1 - Grid No.2^e Pin 2 - Cathode Pin 3 - Heater Pin 4 - Cathode Pin 5 - Do Not Use Pin 6 - Cathode Pin 7 - Heater



Pin 8-Cathode Base Index Plug-Grid No.1 Radiator - Plate Ring Terminal f -Grid No.2

Air Flow:

Through indicated air-system socket—This fitting directs the air over the base seals; past the grid-No.2 seal, envelope, and plate seal; and through the radiator to

-indicates a change.



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provide effective cooling with minimum air flow. When the tube is operated at maximum plate dissipation for each class of service, a minimum air flow of 3.8 cfm through the system is required. The corresponding pressure drop is approximately 0.3 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Without air-system socket—If an air-system socket is not used, it is essential that adequate cooling air be directed over the base seals, past the envelope, and through the radiator. Under these conditions and with the tube operating at maximum plate dissipation for each class of service, a minimum air flow of 3.6 cfm must pass through the radiator. The corresponding pressure drop is approximately 0.1 inch of water. These requirements are for operation at sea level and at an ambient temperature of 20° C. At higher altitudes and ambient temperatures, the air flow must be increased to maintain the respective seal temperatures and the plate temperature within maximum ratings.

Plate Temperature (Measured on base		
end of plate surface at junction		
with fins)	250 max.	°C
Temperature of Plate Seal, Grid-No.2		
Seal, and Base Seals	250 max.	oC

AF POWER AMPLIFIER & MODULATOR --- Class AB, 9

Maximum CCS^h Ratings, Absolute-Naximum Values:

DC PLATE VOLTAGE		2000	max.	volts
DC GRID-No.2 (SCREFN-GRID) VOLTAGE.		400	max.	volts
MAXSIGNAL DC PLATE CURRENT		250	max.	ma
GRID-No.2 INPUTJ		12	max.	watts
PLATE DISSIPATION ¹		250	max.	watts 🖉
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with				
respect to cathode		150	max.	volts
Heater positive with				
respect to cathode		150	max.	volts
Typical CCS Operation:				
Values are for a	z tubes			-
DC Plate Voltage	1000 1	500	2000	volts
	350	350	350	volts
DC Cuta No. 1 (Control stal)				

Voltage	-55	-55	55	volts
Voltage	94	94	94	volts
	166	166	166	ma
	500	500	500	ma

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Zero-Signal DC Grid-No.2							
Current	•	•		0	0	0	ma
MaxSignal DC Grid-No.2							
Current (Approx.)				10	8	8	ma
Effective Load Resistance	è						
(Plate to plate)				3300	6000	8700	ohmis
MaxSignal Driving Powe	-						
(Approx.)				0	0	0	watts
MaxSignal Power Output							
(Approx.)				220	400	590	watts
Maximum Circuit Values:							
Grid-No.1-Circuit Resista	ance		(Per	tube)	0.	1 max.	megohm

RF POWER AMPLIFIER --- Class B Television Service

Synchronizing-level conditions per tube unless otherwise specified

Maximum CCS^h Ratings, Absolute-Naximum Values:

	54 to 216 Mc
DC PLATE VOLTAGE	2000 max. volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max. volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max. volts
DC PLATE CURRENT (AVERAGE) ^k	250 max. ma
GRID-No.2 INPUT	12 max. watts
GRID-No.1 INPUT	2 max. watts
PLATE DISSIPATION	250 max. watts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode.	150 max. volts
Heater positive with respect to cathode.	150 max. volts

Typical CCS Operation:

With bandwidth of 5 Mc

DC Plate Voltage DC Grid-No.2 Voltage DC Grid-No.1 Voltage	1000	1500	2000	volts
	350	350	350	volts
	-60	-65	-70	volts
Synchronizing level	65	71	76	volts
Pedestal level	52	57	62	volts
Synchronizing level Pedestal level DC Grid-No.2 Current:	355	360	<u>3</u> 60	ma
	250	250	250	ma
Synchronizing level	27	29	29	ma
	4	0	0	ma
Synchronizing level	2	5	5	ma
Pedestal level	0	0	0	ma
Pedestal level.	0.4	1.2 0	1.2 0	watts watts
Synchronizing level Pedestal level	160	300	440	watts
	90	170	250	watts



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LINEAR RF POWER AMPLIFIER Single-Sideband Suppressed-Carrier Service

Maximum CCS^h Ratings, Absolute-Maximum Values:

	Up to 500 Mc
DC PLATE VOLTAGE	2000 max, volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	400 max. volts
MAXSIGNAL DC PLATE CURRENT	250 max. та
GRID-No.2 INPUT	12 max. watts
PLATE DISSIPATION	250 max. watts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode.	150 max. volts
Heater positive with respect to cathode.	150 max. volts

Typical CCS Class AB, "Single-Tone" Operation:"

At frequencies up to 175 Mc

DC Plate Voltage DC Grid-No.2 Voltage ⁿ DC Grid-No.1 (Control-grid)	• •	1000 350	1500 350	2000 350	volts volts	
Voltage	:	-55 83	-55 83	-55 83	volts ma	
Current Effective RF Load Resistance. MaxSignal DC Plate Current. MaxSignal DC Grid-No.2		0 1650 250	0 3000 250	0 4350 250	ma ohms ma	
Current	•	5	4	4	ma	
Voltage		47	47	47	volts	
MaxSignal Driving Power (Approx.)		0	0	0	watts	
(Approx.)		110	200	295	watts	

Maximum Circuit Values:

Grid-No.1-Circuit Resistance						
under any condition:						
For fixed-bias operation						25000 max. ohms
For cathode-bias operation.		٠	٠	•	•	 Not recommended

- Typical CCS Operation with "Two-Tone Modulation": P

		At	30 Mc		
DC Plate Voltage		000	1500	2000	volts
DC Grid-No.2 Voltage ⁿ		350	350	350	volts
DC Grid-No.1 Voltage ^q		-55	-55	-55	volts 🔍
Zero-Signal DC Plate Current.		83	83	83	ma
Effective RF Load Resistance.	. 10	550 🔅	3000	4350	ohms
DC Plate Current at Peak					
of Envelope	. :	250	250	250	ma
Average DC Plate Current	•	l 75	175	175	ma
DC Grid-No.2 Current at Peak					
of Envelope	•	30	30	30	ma

- Indicates a change,

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Average DC Grid-No.2 Current Average DC Grid-No.1 Current Peak-Envelope Driver Power	6 0	9.5 0	15 0	та та
(Approx.)	1	1	1	watt
Output-Circuit Efficiency (Approx.)	95	95	95	%
Distortion Products Level:" Third Order	29		30	db
Fifth Order	40	38	35	db
Average	55 110	100 200	147.5 295	watts watts

Maximum Circuit Values:

Grid-	No.1-Circuit	t Resista	nce	una	der	ā	any	1	cor	Id	iti	on:		
For	fixed-bias	operatio	n				•				25	000	max.	ohms
For	cathode-bia	as operat	ion.									Not	recomm	ended

PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony

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

Maximum CCS^f Ratings, Absoluie-Maximum Values:

	Up to 500 Mc	
DC PLATE VOLTAGE	1500 max. volts	;
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max. volts	į
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-250 max. volts	j
DC PLATE CURRENT	200 max. ma	t
GRID-No.2 INPUT	8 max. watts	
GRID-No.1 INPUT	2 max. watts	5
PLATE DISSIPATION	165 max. watts	;
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	150 max. volts	;
Heater positive with respect to cathode .	150 max. volts	į

Typical CCS Operation:

At frequencies up to 175 Mc

	DC Plate Voltage		500	1000	1500	volts
	DC Grid-No.2 Voltage (Modulated		000	1000	1000	10.10
	approx. 55%)*		250	250	250	volts
	DC Grid-No.1 Voltage"			-100	-100	volts
	Peak RF Grid-No.1 Voltage		113	113	113	volts
	DC Plate Current		200	200	200	та
J	DC Grid-No.2 Current		32	31	31	та
	DC Grid-No.1 Current (Approx.).		6	6	6	ma
	Driving Power (Approx.)1		0.7	0.7	0.7	watt
	Power Output (Approx.)		50	140	235	watts
	Maximum Circuit Values:					



Grid-No.1-Circuit Resistance under any condition 25000 max. ohms



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RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy

and

RF POWER AMPLIFIER - Class C FM Telephony

Maximum CCS^f Ratings, Absolute-Maximum Values:

	U‡ to 500 Mc	
DC PLATE VOLTAGE	2000 max. volts	
DC GRID-No.2 (SCREEN-GRID) VOLTAGE		
DC GRID-No.1 (CONTROL-GRID) VOLTAGE		
DC PLATE CURRENT	250 max. ma	
GRID-No.2 INPUT	12 max. watts	
GRID-No.1 INPUT	2 max. watts	
PLATE DISSIPATION	250 max. watts	
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode .	150 max. volts	
Heater positive with respect to cathode .	150 max. volts	

Typical CCS Operation:

At frequencies up to 175 Mc

DC Plate Voltage		1000	1500	2000	volts
DC Grid-No.2 Voltage		250	250	250	volts
DC Grid-No.1 Voltage		-90	-90	-90	volts
Peak RF Grid-No.1 Voltage		109	109	109	volts
DC Plate Current		250	250	250	ma
DC Grid-No.2 Current		45	36	30	ma
DC Grid-No.1 Current (Approx.).	12	12	11	11	ma
Driving Power (Approx.)	1	1	1	1	watt
Power Output (Approx.)	65	180	290	400	watts

At frequency of 500 Nc with coaxial cavity

DC Plate Voltage								2000	volts
DC Grid-No.2 Voltage.		•						300	volts
DC Grid-No.1 Voltage.								-90	volts
DC Plate Current								250	ma
DC Grid-No.2 Current.								10	ma
DC Grid-No.1 Current									ma
Driver Power Output (App	ro	х.)1.				18	watts
Useful Power Output (App	ro	х.).				250	watts

Maximum Circuit Values:

Grid-No.1-Circuit	Resi	stai	lce					
under any condit	tion				 		25000 max.	ohms

- Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.
- b With cylindrical shield JEDEC No.320 surrounding radiator; and with a cyli drical shield JLDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground. With
- ^C Available from Eitel-McCullough, Inc., San Bruno, California.
- đ Available from E. F. Johnson Co., Waseca. Minnesota.
- e For use at lower frequencies.
- f For use at higher frequencies.
- ^g Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.
- h Continuous Commercial Service.



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

- k Averaged over any frame.
- The driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, in components, in initial tube characteristics, and in tube voltage, in components, in characteristics during life.
- *Single-Tone* operation refers to that class of amplifier service in which the grid-No.2 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.
- n Preferably obtained from a fixed supply.
- Preteradiy obtained from a free suppry.
 P "Two-Tone Modulation" operation refers to that class of amplifier service in which the input consists of two equal monofrequency of signals having constant amplitude. These signals are produced in a single-sideband suppressed-carrier system when two equal-and-constant-amplitude audio frequencies are applied to the input of the system.
- 9 Obtained from a fixed supply.
- F Withput the use of feedback to enhance linerity.
- 8 Measured at load of output circuit having indicated efficiency.
- The dc grid-No.2 voltage must be modulated approximately 55% in phase with the plate modulation in order to obtain 100% modulation of the 7203. The use of a series grid-No.2 resistor or reactor may not give satisfactory performance and is therefore not recommended.
- U Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
- Key-down conditions per tube without amolitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 11% of the carrier Keyconditions.

	Note	Min.	Max.	
Heater Current	1	2.3	2.9	amp
Capacitances:				
Grid No.1 to plate	2	-	0.06	μμ f 🛨
Grid No.1 to cathode, grid No.2, and heater	2	14.2	17.2	6
Plate to cathode, grid No.2,	2	14.2	1/.2	μµf
	2	4.0	4.8	щuf
Grig-No.1 Voltage	1,3,4,5	-32	-46	volts
Grid-No.2 Current	1,3,4,5	-7	3	ma
Useful Power Output	4,5,6	225	-	watts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Note 1: With 6.0 volts on heater.

- with cylindrical shield JEOEC No.320 surrounding radiator; and with acylindrical shield JEOEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground. Note 2:
- With dc plate volts = 1000, dc grid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 ma. Note 3:
- With Forced-Air Cooling as specified under GENERAL DATA-Note 4: Air-System Socket.
- Heater-voltage must be applied for at least 30 seconds before application of other voltages. Note 5:
- With heater volts = 5.5, dc plate volts = 2000, dc grid-No.2 volts = 300, dc grid-No.1 volts = -90, dc grid-No.1 ma. = 25 maximum, grid-No.1 signal voltage adjustes to produce dc plate current of 250 ma., and coaxial-cavity amplifier-circuit operating frequency (Mc) = 475. Note 6:

- Indicates a change.



SPECIAL TESTS & PERFORMANCE DATA

Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 6.6, no voltage on other elements, and specified forced-air cooling for A_{1T} -System Socket. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

Grid No.I and grid No.2 10 min. megohms Grid No.I and cathode 10 min. megohms Grid No.2 and cathode 10 min. megohms

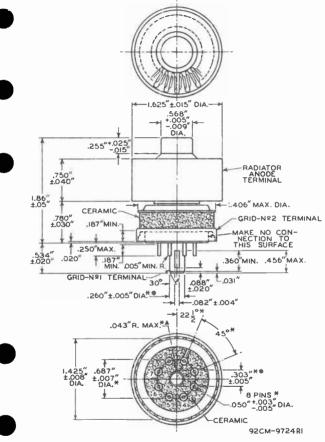
OPERATING CONSIDERATIONS

The socket for the 7203 should be of a type (such as is indicated in the tabulated data) which permits adequate aircooling of the tube. Although the base will fit a conventional lock-in socket, the latter does not permit adequate cooling and its use is therefore not recommended.

The plate connection is made by means of a metal band or spring contacts to the cylindrical surface of the radiator. It is essential that the contact areas bekept clean to minimize rf losses especially at the higher frequencies.



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GRID-NO.1-PLUG DIMENSIONS ARE MEASURED BY THE USE OF THE SERIES OF GAUGES SHOWN IN SKETCHES G₁ AND G₂. IN THE FOLLOWING INSTRUCTIONS FOR THE USE OF THESE GAUGES "GO" INDICATES THAT THE ENTIRE GRID-NO.1-PLUG KEY WILL ENTER TWE GAUGE; AND "NO-GO" INDICATES THAT THE GRID-NO.1-PLUG KEY WILL NOT ENTER THE GAUGE MORE THAN 1/16". INSTRUCTIONS FOR THE USE OF THE GAUGES FOLLOW:

▲,●, ": See next page.



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

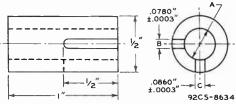
▲ GAUGES G₁-1, G₁-2, G₁-3, AND G₁-4:

USING ONLY SLOT C, TRY THESE GAUGES IN NUMERICAL ORDER UNTIL ONE IS FOUND THAT WILL ACCEPT THE ENTIRE GRID-No.I PLUG. USING THE FIRST GAUGE THUS FOUND, IT WILL NOT BE POSSIBLE TO INSERT THE GRID-No. | PLUG IN SLOT B.

GAUGES G2-1, G2-2, AND G2-3:

THE GRID-NO. | PLUG WILL BE REJECTED BY GAUGES G2-1 AND G2-2, BUT WILL BE ACCEPTED BY GAUGE G2-3.

* BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT THE ENTIRE LENGTH OF THE PINS WILL, WITHOUT UNDUE FORCE, PASS INTO AND DISENGAGE FROM THE FLAT-PLATE GAUGE SHOWN IN SKETCH G3.



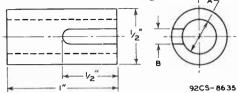
GAUGE SKETCH GI

Gauge	Dimension A
G ₁ -I	.2575" + .0000" 0005"
G ₁ -2	.2600" + .0000" 0005"
G ₁ -3	.2625" + .0000" 0005"
G ₁ -4	.2650" + .0000" 0005"

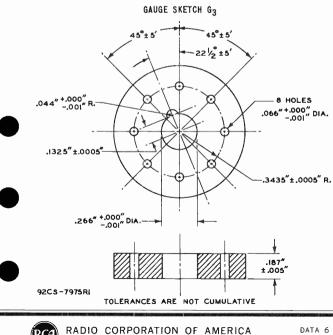


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GAUGE SKETCH G2



	Dimension	
Gauge	A	В
G2-1	.2550" + .0000" 0005"	.125"
G ₂ -2	.2980" + .0000" 0005"	none
G ₂ -3	.3080" + .0000" 0005"	none

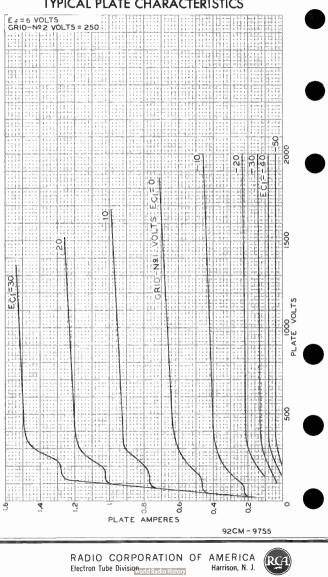


Electron Tube Division World Radio History

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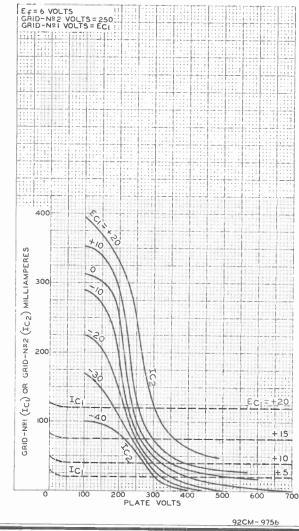
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TYPICAL PLATE CHARACTERISTICS



7203/4CX250B

TYPICAL CHARACTERISTICS

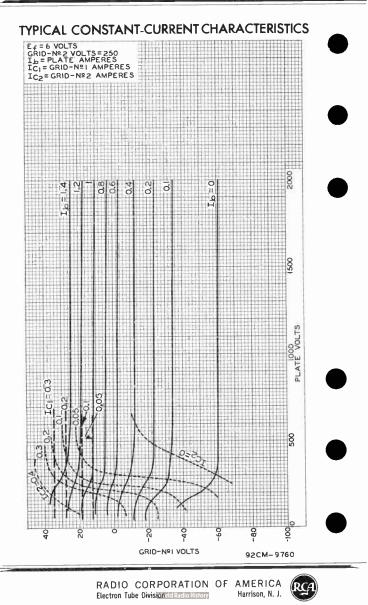


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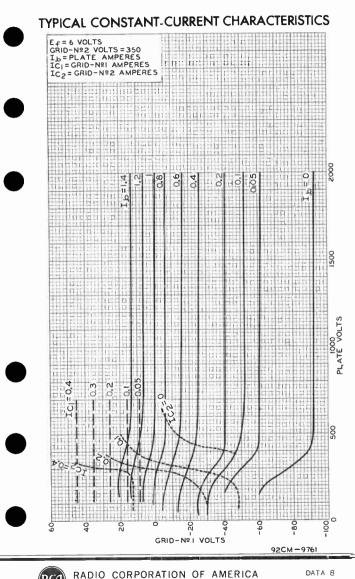
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DATA 7 9-62

7203/4CX250B



7203/4CX250B



Electron Tube Division World Radio History

Harrison, N. J.

9-62

Beam Power Tube

FORCED-AIR COOLED

CERAMIC-METAL SEALS 400 WATTS CW OUTPUT TO 175 MC COAXIAL-ELECTRODE STRUCTURE 250 WATTS CW OUTPUT AT 500 MC COMPACT DESIGN INTEGRAL RADIATOR

For Use at Frequencies up to 500 Mc

The 7201 is unilaterally interchangeable with the 4Å250F and \leftarrow bilaterally interchangeable with the 4CÅ250F.

The 7204 is the same as the 7203/4CX250B except for the following items:

Heater, for Unipotential Cathode:



Because the cathods is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Nın.	Max.	
Heater Current	1	0.50	0.62	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.06	μμ f 🖛
Grid No.1 to cathode, grid	<u>^</u>			6
	2	14.2	17.2	μμ f
Plate to cathode, grid	0			<i>c</i>
No.2, and heater		4.0	4.8	μμf
Grid-No.1 Voltage	1,3.4,5	-32	-46	volts
Grid-No.2 Current	1,3,4,5	-7	3	ma
Useful Power Output	4,5,6	225	-	watts



- Note 1: With 26.5 volts on heater.
- Note 2: With cylindrical shield JEDEC No.320 surrounding radiator; and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground.
- Note 3: With dc plate volts = 1000, dc grid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 ma.
- Note 4: With Forced-Air Cooling as specified under GENERAL DATA Air-System Socket.
- Note 5: Heater voltage must be applied for at least 30 seconds before application of other voltages.

Note 6: With heater volts = 78.3. dc plate volts = 2000, dc grid-No.2 volts = 300. dc grid-No.1 volts = -90, dc grid-No.1 ma. = 25 maximum, grid-No.1 signal voltage adjusted to produce dc plate current of 250 ma., ane coaxial-cavity amplifier-circuit operating frequency (Mc) = #75.

SPECIAL TESTS & PERFORMANCE DATA



Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following condi-

- Indicates a change.



RADIO CORPORATION OF AMERICA Electron Tube Division WorkElectron Tube Division

7204/4CX250F

tions; ac heater volts = 29.1, no voltage on other elements, and specified forced-air cooling for Air-System Socket. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

Grid	No.I	and	grid No	. 2		-		-		IO min.	megohms
Grid	No.l	and	cathode							IO min.	megohms
Grid	No.2	and	cathode	-			٠			IO min.	megohms





DATA I

9-62

Beam Power Tube

90 Watts CW Input (ICAS) up to 60 Mc 60 Watts CW Input (ICAS) up to 175 Mc For Use under Severe Shock and Vibration

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode: Voltage (AC or DC) Current at heater volts = 6.3 Transconductance, for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100 Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100 Direct Interelectrode Capacitances: Grid No.1 to plate Grid No.1 to plate Grid No.2 to cathode & grid No.3 & internal shield, grid No.3 internal shield, grid No.3 internal shield, grid No.3 internal shield, grid No.3 internal shield, grid No.2, base sleeve, and heater	. 6.3 ± 10% volts 1.25 amp . 7000 μmhos . 4.5 . 0.24 max. μμf . 13.0 μμf ← . 8.5 μμf
Mechanical:	
Operating Position	
Pin 1 - Cathode, Grid No.3, Internal Shield Pin 2 - Heater Pin 3 - Grid No.2 Pin 4 - Same as Pin 1 AA'=PLANE OF ELECTRODES	Pin 5-Grid No.1 Pin 6-Same as Pin 1 Pin 7-Heater Pin 8-Base Sleeve Cap-Plate
* See next page.	🗕 Indicates a change.

RADIO CORPORATION OF AMERICA

World Radio History

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Electron Tube Division

AF POWER AMPLIFIER & MODULATOR --- Class ABit

Maximum Ratings, Absolute-Maximum Values:

	ccs*	ICAS ••		
DC PLATE VOLTAGE DC GRID-No.2 (SCREEN-GRID)	600 max.	750 max.	volts	
VOLTAGE	250 max.	250 max.	volts	
CURRENT**	125 max.	135 max.	та	
MAXSIGNAL PLATE INPUT** MAXSIGNAL GRID-No.2	60 max.	85 max.	watts	
INPUT**	3 max.	3 max.	watts	
PLATE DISSIPATION** PEAK HEATER-CATHODE VOLTAGE: Heater negative with	20 max.	25 max.	watts	
respect to cathode Heater positive with	135 max.	135 max.	volts	-
respect to cathode BULB TEMPERATURE (At hottest	135 max.	135 max.	volts	
point on bulb surface)	220 max.	220 max.	°C	

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage		400	500	600	volts	
DC Grid-No.2 Voltage ⁴ DC Grid-No.1 (Control-Grid)		190	185	180	volts	
Voltage:						
With fixed-bias source		-40	-40	-45	volts	
Peak AF Grid-No.1-to-		40	40	-43	00113	
Grid-No.1 Voltage		80	80	90	volts	
Zero-Signal DC Plate Current .		63	57	26	ma	
MaxSignal DC Plate Current .		228	215	200	ma	
Zero-Signal DC Grid-No.2			= 10	200	116.4	
Current		2.5	2	1	ma	
MaxSignal DC Grid-No.2						
Current		25	25	23	ma 👝	
Effective Load Resistance						
(Plate to plate)	4	000	5500	7000	ohms	ļ
MaxSignal Driving						
Power (Approx.).		0	0	0	watts	
MaxSignal Power Output						
(Approx.)		55	70	82	watts	
Typical ICAS Push-Puil Operati	on:					

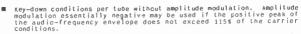
Values are for 2	tubes		
DC Plate Voltage DC Grid-No.2 Voltage ^A DC Grid-No.1 (Control-Grid) Voltage:	600 200	750 195	volts volts
From fixed-bias source	-50	-50	volts

*, 1, •, ••, **. A: See next page.

RADIO CORPORATION OF AMERICA Electron Tube Division

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ee obtained preferably from a seperate source, or from the plate supply voltage with avoltage divider, or through a series resistor. A series grid-Mo.2 resistor should be used only when the 7212 is used in a circuit which is not keyed. Grid-Mo.2 voltage must not exceed n00 volts under key-up conditions.

Ø Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, cr by combination methods.

CHARACTERISTICS RANGE	VALU	ES FOR	EQUI PMEN	IT DESIGN	
		Note	Min.	Max.	
Heater Current	• •	1	1.175	1.325	атр
Capacitances: Grid No.1 to plate Grid No.1 to cathode & grid No.3 & internal shield, grid No.2,		2	-	0.24	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, base sleeve,	• •	2	12.0	15.0	μμξ
and heater		2	7.3	9.5	μµf
Plate Current Grid-No.2 Current		2 3 3	46	94 5.5	ma ma
Heater 100 volts negative with respect to cathode Heater 100 volts positive		1	-	100	μа
with respect to cathode	• •	1	_	100	μa
Useful Power Output Mu-Factor, Grid No.1 to		1 4	47	-	watts
Grid No.2		5	3.6	5.4	+
Note 1: With 6.3 volts ac on he	ater.				

With 6.3 voits a

Note 2: without external shield.

Note 3: With 6.3 volts ac on heater, dc plate volts = 300, dc grid-No.2 volts = 200, and dc grid-No.1 volts = -33.

In a single-tube, self-excited oscillator circuit, and with 6.3 volts ac on heater, dc plate volts = 600, dc grid-No.2 volts = 180, grid-No.1 resistor (ohns) = 30,000 ± 10%, dc plate ma. = 100 to 112, dc grid-No.2 ma. = 23 maximum, dc grid-No.1 ma. = 2 to 2.5 and frequency (Mc) = 15. Note 4: and with 6.3

With 6.3 volts ac on heater, do 100, and grid-No.2 volts = 200. dc plate volts = 200, plate ma. = Note 5:

SPECIAL RATINGS & PERFORMANCE DATA

500-g 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 500 g. At the end of this test, tubes are required to meet the following limits:

- Indicates a change.



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

Useful RF Power Output.... 42 min. watts For conditions shown under Characteristics Range Values, Note 4.

Heater-Cathode

Leakage Current . . . See Characteristics Range Values The tubes must also meet the established limit for lowfrequency vibration (See below).

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 25 cycles per second for 32 hours in each of three positions. At the end of this test, tubes are required to meet the following limits:

Useful RF Power Output..... 42 min. watts For conditions shown under Characteristics Range Values, Note 4.

Heater-Cathode

Leakage Current . . . See Characteristics Range Values The tubes must also meet the established limit for lowfrequency vibration (See below).

Low-Frequency Vibration Performance:

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 = 250, grid-No.2 volts = 200, grid-No.1 voltage varied to give a plate current of 10 milliamperes, plate load resistor (ohms) = 2000, and vibrating frequency of 25 cycles per second with a fixed amplitude of 0.040 inch (total excursion 0.080 inch). The rms output voltage across the plate load resistor as a result of vibration of the tube must not exceed 500 millivolts.

Variable-Frequency Vibration Performance (1):

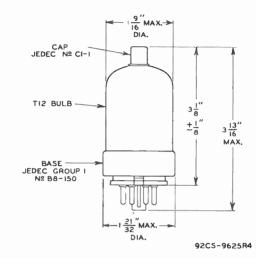
This test is performed on a sample lot of tubes from each production run. Tubes are vibrated in each of 3 positions through frequency range of from 10 to 50 cycles per second and back to 10 cycles per second. The tubes are vibrated under the same conditions as specified for Low-Frequency Vibration Performance. During the test, the tubes will not show an rms output voltage across the plate load resistor in excess of 500 millivolts. At the end of this test, the tubes will not show tap or permanent interelectrode shorts or defects that cause the tubes to be inoperable.

Variable-Frequency Vibration Performance (2):

This test is performed on a sample lot of tubes from each production run. Tubes are vibrated in each of 3 positions, perpendicular and parallel to major axis of the tube, and parallel to longitudinal axis of the tube, through the frequency range from 50 to 120 cycles per second at a fixed acceleration of 10 g under the same voltage, current and load conditions as specified for Low-Frequency Vibration Performance. During this test, the tubes will not show an rms output voltage across the plate load resistor in excess of 500 millivolts.



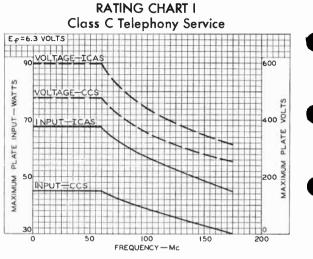
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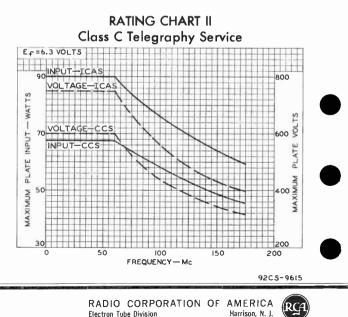


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DATA 6 9-62



9205-9614



Beam Power Tube

	CERAMIC-METAL SEALS UNITIZED-ELECTRODE DESIGN FORCED-AIR COOLED MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE
	Useful with Full Ratings at Frequencies up to 1215 Mc
_	GENERAL DATA
	Electrical:
	Heater, for Matrix-Type, Oxide- Coated, Unipotential Cathode: Voltage (AC or DC) ^a
	Current at heater volts = 5.5 17.3 amp -
	Minimum heating time at heater volts = 5.5
	for plate volts = 2500, grid-No.2 volts = 600, and plate ma. = 600 17 Direct Interelectrode Capacitances:
	Grid No.1 to plate ^b
	Grid No.1 to grid No.2 55 μμf Grid No.2 to plate 16 μμf
_	Mechanical: Operating Position
•	$G_1 - G_{rid-No.1-}$ Terminal Contact $G_2 - G_{rid-No.2-}$ Terminal $G_2 - G_{rid-No.2-}$ $G_2 -$
	Surface H-Heater- Terminal Contact Surface
	Thermal:
	Air F'ow:
-	Through radiator—Adequate air flow to limit the plate-seal temperature to 250° C should be delivered by a blower -Indicates a change.
	RADIO CORPORATION OF AMERICA DATA I Electron Tube Division

through the radiator before and during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator versus percentage of maximum rated plate dissipation for each class of service are shown in accompanying Typical-Cooling-Requirements curves. Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.

- To grid-No.2, grid-No.1, cathode, and heater seals-A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these seals so that its temperature does not exceed the specified maximum value of 250° C. An air flow of 10 cfm is usually adequate.
- Seal Temperature (Plate, grid No.2, 00

LINEAR RF POWER AMPLIFIER Single-Sideband Suppressed-Carrier Service

Maximum CCS^d Ratings, Absolute-Maximum Values:

	Up to 1215 Mc
DC PLATE VOLTAGE	2500 max. volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	1000 max. volts
MAXSIGNAL DC PLATE CURRENT	1 max. amp
MAXSIGNAL DC GRID-No.1 (CONTROL-GRID)	
CURRENT	0.2 max. amp
MAXSIGNAL PLATE INPUT	2500 max. watts
MAXSIGNAL GRID-No.2 INPUT	50 max. watts
PLATE DISSIPATION	1500 max. watts

Typical CCS Class AB, "Single-Tone" Operation:

						Up to	бо Мс	
DC Plate Volta	ge					2250	2500	volts
DC Grid-No.2 V	oltage ^f .					700	700	volts
DC Grid-No.1 V	oltage					-50	-50	volts
Zero-Signal DC	Plate Cur	rent.				0.2	0.2	amp
Zero-Signal DC	Grid-No.2	Curre	nt			0	0	amp
Effective RF L	oad Resist	ance.				1100	1100	ohms
MaxSignal DC	Plate Cur	rent.				0.9	1	amp
► MaxSignal DC	Grid-No.2	Curre	nt			0.045	0.045	amp
MaxSignal DC	Grid-No.1	Curre	nt			0	0	amp
MaxSignal Pe	ak RF Grid	-No.1	Volta	ge		50	50	volts
MaxSignal Dr	iving Powe	r (App	rox.)			0	0	watts
MaxSignal Po	wer Öutput	(Appr	ox.).			1000	1250	watts

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

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

Maximum CCS^d Ratings, Absolute-Maximum Values:

		Up to 1215 Mc
DC PLATE VOLTAGE		2000 max. volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGF.		1000 max. volts
		- Indicates a chânge







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



DC GRID-No.1 (CONTROL-GRID) VOLTAGE.			-300 n	nax. volts
DC PLATE CURRENT			0.85 m	nax. amp
DC GRID-No.1 CURRENT			C.2 n	nax. amp
PLATE INPUT.				nax. watts
GRID-No.2 INPUT				nax. watts
PLATE D'SSIPATION		•	1000 n	nax. watts

Typical CCS Operation:

In grid-drive circuit at 600 Mc

100 volts
i00 volts
-30 volts
83 amp
)15 amp
04 amp
55 watts
800 ^k watts
j

Maximum Circuit Values:

Grid-No.1-Circuit	Resistance under	
any condition		5000 max. ohms

RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphym and

RF POWER AMPLIFIER - Class C FM Telephony

Maximum CCS^d Ratings, Absolute-Maximum Values:

	Up to	1215 Nc
DC PLATE VOLTAGE	 . 2500) max. volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE .	 . 1000) max. volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE.) max. volts
DC PLATE CURRENT		l max. amp
DC GRID-No.1 CURRENT	 . 0.2	2 max. amp
PLATE INPUT	 . 2500) max. watts
GRID-No.2 INPUT	 . 50) max. watts
PLATE DISSIPATION	 . 1500) max. watts

Typical CCS Operation:

In grid-drive circuit at 600 Mc

DC Plate Voltage	2250 2500 volts
DC Grid-No.2 Voltage ⁿ	500 500 volts
DC Grid-No.1 Voltage ^P	. – 30 – 30 volts
DC Plate Current	
DC Grid-No.2 Current	0.02 0.02 amp
DC Grid-No.1 Current (Approx.)	
Driver Power Output (Approx.) j	
Useful Power Output (Approx.)	
	-

Maximum Circuit Values:

Grid	-No.1-Circu	uit	F	les	i:	sta	an	ce	u	nd	e٢					
any	condition.													5000*	max.	ohms



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- Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.
- b With external, flat, metal shield having diameter of 8" and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.
- c With external, With external, flat, meta} shield having diameter of 8" and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-Ko.1 terminal. Shield is located in plane of grid-Ko.1 terminal perpendicular to the tube axis. d
- Continuous Commercial Service.
- By the second sec
- f Preferably obtained from a fixed supply.
- g Obtained preferably from a separate source modulated along with the plate supply. h
- Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
- The driver stage is required to supply tube losses and rf-circuit losses. It should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteris-tics during life.
- ${f k}$ This value of useful power is measured in load of output circuit.
- If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.
- Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.
- n obtained preferably from a fixed supply, or from the plate-supply voltage with a voltage divider.
- ø Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

SPECIAL TESTS & PERFORMANCE DATA

Design samples of the 7213 have been subjected to the following tests without adverse effects.

Variable-Frequency Vibration Performance:

This test was performed (per MIL-E-IC⁹, paragraph 4.9.20.3) under the following conditions: heater volts = 5.5, platesupply volts = 450, grid-No.2 volts = 300, grid-No.1 voltage varied to give a plate current of 10 milliamperes, and plate load resistor (ohms) = 2000. The tubes were vibrated in each of 3 positions through frequency range from 10 to 50 to 10 cycles per second. The vibrating frequency had a fixed amplitude of 0.040 inch (total excursion of 0.080 inch). During the test, the tubes did not show an rms output voltage across the plate load resistor in excess of 500 millivolts. 🛥 At the end of this test, the tubes did not show tap or permanent interelectrode shorts or defects that would cause the tubes to be inoperable. The tubes exhibited no pronounced mechanical resonance during this test.

9 Willitary Specification, Electron Tubes and Crystal Rectifiers, 3 October 1955. - Indicates a change.



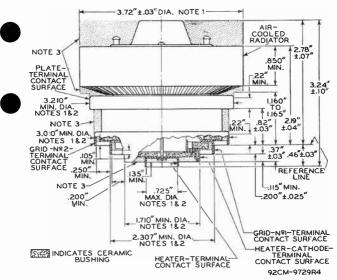


Electron Tube Division

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Fatigue Performance:

In this test (per MIL-E-IC, paragraph 4.9.20.6), the tubes were rigidly mounted and subjected to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours in each of three positions with heater volts = 5.5. At the end of this test, the tubes did not show permanent or temporary shorts or open circuits, and passed all electrical tests.



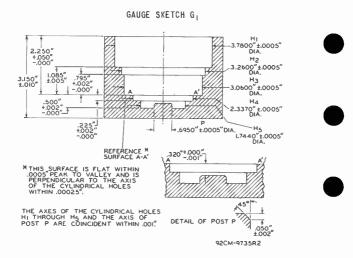
NOTE I: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-NO.2 TERMINAL, GRID-NO.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH GI. PROPER ENTRY OF THE TUBE IS OFTAINED WHEN THE GRID-NO.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A O.010"-THICKNESS GAUGE I/B" WIDE WILL NOT ENTER MORE THAN ://16" BETWEEN THE SHOULDER SURFACE AND THE GRID-NO.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-NO.2 TERMINAL ON SHOULDER A-A'.

NOTE 2: THE DIAMETER OF EACH TERMINALISHELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 3 I-63







Beam	Power	Tube
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	CERAMIC METAL SEALS UNITIZED-ELECTRODE DESIGN FORCED-AIR COOLED MATRIX-TYPE, OXIDE-COATED, For Pulsed RF Amplifier Ratings at Frequenci	Uหเ Ser	180 KW PEAK-F POTENTIAL CATH vice with Ful	AL RADIATOR PULSE POWER HODE 1
	GENERAL	DATA		
	Electrical:			+
	Heater, for Matrix-Type, Oxide- Coated, Unipotential Cathode:			
	Voitage (AC or DC) ^a		5.5 typica 6 max.	al volts volts
_	Current at heater volts = 5.5 .		17.3	amp
	Mirimum heating time at			
	<pre>Feater volts = 5.5 Mu-Factor. Grid-No.2 to Grid No.1</pre>		5	minutes
	tor plate volts = 2500, grid-No	. 2		
	volts = 600, and plate ma. = 60 Direct Interelectrode Capacitance	10 	19	
	Grid No.1 to plate ^b		0.17 max.	μµf
	Grid No.1 to cathode & heater . Plate to cathode & heater ^{b,c} .			μμf μμf
	Grid No.1 to grid No.2.			μμf
	Grid No. 2 to plate		16	μµf
	Grid No.2 to cathode & heater ^c .	• •	1.4 max.	μµf
	Mechanical:			A
	Operating Position Overall Length Greatest Diameter (See Dimensiona Weight (Approx.). Radia-or Termiral Connections (See Dimensi	l Ou	tline) 3. 	2 lbs
	G ₁ - Grid-No. 1-		Н,К-	Heater- &
	Terminal p Contact П			Cathode- Terminal
	Surface			Contact
	G ₂ - Srid-No. 2- Terminal		D	Surface Plate-
	Contact Contact	-	□c ₁	Terminal
	Surface			Contact
	H-Heater- Terminal	i,κ		Surface
	Contact Surface			
_				
			- Indica	ites a change.



Thermal:

Air Flow:

- Through radiator-Adequate air flow to limit the plate seal temperature to 250° C should be delivered by a blower through the radiator before and during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator versus percentage of maximum rated plate dissipation for each class of service are shown in accompanying Typical Cooling-Requirements curves. Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.
- To grid-No.2, grid-No.1, cathode, and heater seals A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these seals so that its temperature does not exceed the specified maximum value of 250° C. An air flow of 10 cfm is usually adequate.

Seal Tempera	ture (Plat	e, grid	No.2,			
grid No.1,	cathode,	and heat	ter).		250 max.	oC

GRID-PULSED RF AMPLIFIER

Maximum CCS^d Ratings, Absolute-Naximum Values:

For maximum "on" time e of 10 microseconds

.....

		U	p to 1	215 N	с
DC PLATE VOLTAGE			5000	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE.			1200	max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE					volts
DC PLATE CURRENT DURING PULSE			18	max.	amp
DC PLATE CURRENT.					amp
GRID-No.2 INPUT (Average)					watts
GRID-No.1 INPUT (Average)			30	max.	watts
PLATE DISSIPATION (Average)			1500	max.	watts

Typical Operation:

In class C cathode-drive circuit with rectangular-wave pulses at 1215 Nc and with duty factor f of 0.01

DC Plate Voltage	4500	volts
DC Grid-No.2 Voltage	1000	volts
DC Grid-No.1 Voltage	-80	volts
DC Plate Current during pulse	11	amp
DC Plate Current	0.11	amp
DC Grid-No.2 Current	0.005	amp
DC Grid-No.1 Current	0.01	amp
Driver Power Output at peak		
of pulse (Approx.) ^g	4.5	kw
Useful Power Output at peak		
of pulse (Approx.)	20	kw





PLATE- AND SCREEN-PULSED RF AMPLIFIER



Maximum CCS^d Ratings, Absolute-Naximum Values:

For maximum "on" time^e of 10 microseconds

		Ut	b to 1215 NC
	PEAK POSITIVE-PULSE PLATE VOLTAGE		10000 max. volts
	PEAK POSITIVE-PULSE GRID-No. 2		
	(SCREEN-GRID) VOLTAGE		1200 max. volts
	DC GFID-No.1 (CONTROL-GRID) VOLTAGE		
	DC PLATE CURRENT DURING PULSE		18 max. amp
,	DC PLATE CURRENT		0.2 max. amp
	GRID-No.2 INPUT (Average)		50 max. watts
	GRID-No.1 INPUT (Average)		30 max. watts
	PLATE DISSIPATION (Average)		
	÷		

Typical Operation:

In class C cathode-drive circuit with rectangular-wave pulses at 1215 Hc and with duty factor^f of 0.01

Peak Positive-Pulse Plate Voltage 9000 10000) volts
Peak Positive-Pulse Grid-No.2 Voltage 1000 1000) volts
DC Grid-No.1 Voltage) volts
DC Plate Current during pulse 16 18	3 amp
DC Plate Current 0.16 0.18	3 amp
DC Grid-No.2 Current 0.008 0.009) amp
DC Grid-No.1 Current 0.014 0.016	6 amp
Driver Power Output at peak	
of pulse (Approx.) ⁹ 10 1:	L kw
Useful Power Output at peak	
of pulse (Approx.)	i kw

- ^a Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.
- b With external, flat, metal shield having diameter of 8", and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.
- C With external, flat, metal shield having diameter of 8°, and center hole approximately 2-3/8° in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.
- d Continuous Commercial Service.
- e "On" time is defined as the sum of the durations of the individual pulses which occur during any 1000-microsecond interval.
- Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The yeak value is defined as the maximum value of a smooth Curve through the average of the fluctuations over the top portion of the pulse.
- [†] Duty factor for the 7214 is defined as the "on" time in microseconds divided by 1000 microseconds.
- 9 The driver stage is required to supply tube losses, rf-circuit losses, and in cathode-drive circuits, the rf power added to the plate input. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.





SPECIAL TESTS & PERFORMANCE DATA

Design samples of the 7214 have been subjected to the following tests without adverse effects.

Variable-Frequency Vibration Performance:

This test was performed (per MIL-E-ID^h, paragraph 4.9.20.3) under the following conditions: Heater voltage of 5.5 volts, plate supply voltage of 450 volts, grid-No.2 voltage of 300 volts, grid-No.1 voltage varied to give a plate current of 10 milliamperes, and plate load resistor of 2000 chms. The tubes were vibrated in each of 3 positions through frequency range from 10 to 50 cycles per second and back to 10 cycles per second. The vibrating frequency had a fixed amplitude of C.040 inch (total excursion of 0.040 inch). During the test, the tubes did not show an rms output voltage across the plate load resistor in excess of 500 millivolts.

At the end of this test, the tubes did not show tap or permanent interelectrode shorts or defects that would cause the tubes to be inoperable. The tubes exhibited no pronounced mechanical resonance during this test.

Fatigue Test:

In this test (per VIL-E-ID, paragraph 4.9.20.6), the tubes were rigidly mounted and subjected to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours in each of three positions with 5.5 volts applied to the heater. At the end of this test, the tubes did not show permanent or temporary shorts or open circuits, and passed all electrical tests.

OPERATING CONSIDERATIONS

The maximum seal temperature of 250° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made by the Tempil Corporation, 132 W. 22nd Street, New York II, New York in the form of liquid and stick.

The rated plate and grid-No.2 voltages of this tube are extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

^h 31 March 1958, Military Specification, Electron Tubes and Crystal Rectifiers.

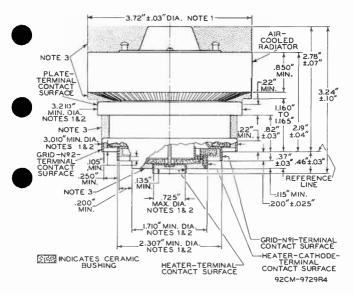
- Indicates a change.











NOTE I: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-NO.2 TERMINAL, GRID-NO.I TER-MINA\$, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREF OF BURRS, THE TURF WILL ENTER A GAUGE AS SHOWK IN SKETCH G1. PROPER ENTRY OF THE TURE IS OBTAINED WHEN THE GRID-NO.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A 0.010''-THICKNESS GAUGE I/8' WIDE WILL NOT ENTFR MORE THANI/16'' BETWEEN THE SHOULDER SURFACE AND THE GRID-NO.2 TER-MINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKINGMEASUREMENT OF SEATING OF GRID-NO.2 TERMINAL ON SHOULDERA-A'.

NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDI-CATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.



RADIO CORPORATION OF AMERICA Electron Tube Division

GAUGE SKETCH G H 3.7800" ±.0005" DIA. 2.250 H2 2600"±.0005" 1.085" ±.005" .795" +.002" Нз 3.150° 0" ±.0005" DIA. -.000 H4 .500″ +.002″ -2.3370" ±.0005" DIA. +.6950" ±.0005" DIA. H5 1.74 40"±.0005" DIA. .225 +.002 -.000 REFERENCE * .320"+.000" * THIS SURFACE IS FLAT WITHIN .0005" PEAK TO VALLEY AND IS PERPENDICULAR TO THE AXIS OF THE CYLINDRICAL HOLES WITHIN .00025". THE AXES OF THE CYLINDRICAL HOLES HI THROUGH H5 AND THE AXIS OF POST P ARE COINCIDENT WITHIN .001." DETAIL OF POST P ±.C

92CM-9735R2

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Beam Power Tube

For Pulse-Modulator Service under Severe Shock and Vibration

GENERAL DATA

Electrical:	
Heater, for Unipotential Cathode: Voltage (AC or DC) 6.3 ± 10% volts Current at heater volts = 6.3 1.25 amp Transconductance, for plate volts = 200, grid-No.2 volts = 200, and	
plate ma. = 100,	
volts = 200, and plate ma. = 100 4.5 Direct Interelectrode Capacitances: ^a	
Grid No.1 to plate 0.24 max. μμf Grid No.1 to cathode & grid No.3 & internal shield, grid No.2,	
base sleeve, and heater 13.0 μμf Plate to cathode & grid No.3 & internal shield, grid No.2,	
base sleeve, and heater 8.5 μμf	
Mechanica):	
Operating Position Any Maximum Overall Length 3-13/16" Seated Length 3-178" ± 1/8" Maximum Diameter 1-21/32" Weight (Approx.) 2 oz Bulb	
Basing Designation for BOTTOM VIEW	
MODULATOR — Rectangular-Wave Modulation	
Maximum and Minimum CCS ^b Ratings, Absolute-Naximum Values: For duty factor ^c between 0.001 and 1 and maxi- mum averaging time of 10,000 µsec in any interval	



Flootricals

DC GRID-No.2 SUPPLY VOLTAGE ^d 500 max. volts DC GRID-No.1 SUPPLY VOLTAGE ^d	
Chart I GRID-No.1 VOLTAGE: Instantaneous-negative value 400 max. volts Peak-positive value. 100 max. volts PEAK GRID-No.2 CURRENT See Rating Chart II PEAK GRID-No.1 CURRENT 0.75 max. amp PEAK GRID-No.1 CURRENT 0.5 max. amp PLATE INPUT 0.5 max. watts GRID-No.2 INPUT. 0.5 max. watts GRID-No.1 INPUT. 0.5 max. watts GRID-No.1 INPUT. 0.5 max. watts GRID-No.1 INPUT. 0.5 max. watts PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode 135 max. volts BULB TEMPERATURE (At hottest point on bulb surface) 220 max. °C	
Typical Operation:	
With rectangular-wave shapes in accompanying	
test circuit and with duty factorof 0.01DC Plate Supply Voltage3000voltsDC Grid-No.1 Supply Voltage300voltsDC Grid-No.1 Supply VoltagePeak-Positive Grid-No.1 Voltage65voltsPlate Current:	
Peak 1.5 amp Average 0.015 amp DC Grid-No.2 Current 0.004 amp DC Grid-No.1 Current 0.0025 amp Load Resistance (R_1), 100 watts, non-inductive 1500 ± 5% ohms Coupling Capacitor (C_3) 0.25 (5000 v dc) μ f	
Maximum Circuit Values:	1
Grid-No.1-Circuit Resistance 3000 max. ohms	
 a Without external shield. b Continuous Commercial Service. c Duty Pactor for the 7358 is defined as the "on" time in microseconds divided by 10.000 microseconds. "On" fine is defined as the sum of the durations of all the individual pulses which occur during any 10.000-microsecond interval. "Pulse Duration" is defined as the time interval between the two points on the pulse. The peak value is defined as the aximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse. For tube protection, it is essential that sufficient resistance be used in the olate suoply circuit. the ord-No.2 suoply circuit. and the 	(
^d For tube protection, it is essential that sufficient resistance be used in the plate supply circuit, the grid-No.2 supply circuit, and the grid-No.1 supply circuit so that the short-circuit current is limited to 0.5 ampere in each circuit.	(

Averaged over any interval not exceeding 10.000 microseconds. Care should be used in determining the plate dissipation. A calculated value based on rectangular pulses can be considerably in error when

Electron Tube Division



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the actual pulses have a finite rise and fall time. Plate dissipation should preferably be determined by measuring the bulb temperature under anouno preferanzy be determined by measuring the outo temperature Under actual operating conditions; then, with the tube in the same socket and under the same ambient-temperature conditions, apply to the tube sufficient dc input to obtain the same builb temperature. This value of dc input is a measure of the plate dissipation.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

		Note	Hin.	Max.	
	Heater Current	1	1.175	1.325	amp
	Grid No.1 to plate	2	-	0.24	µµ f
	& internal shield, grid No.2, base sleeve, and heater Plate to cathode & grid No.3 &	2	12.0	15.0	μμ f
)	internal shield, grid No.2, base sleeve, and heater Mu-Factor, Grid No.2 to	2	7.3	9.5	μµf
	Grid No.1		3.6	5.4	
	Plate Current		46		ma
	Grid-No.2 Current		0	5.5	ma
	Peak Plate Current	1,5	2.4	-	amp
	with respect to cathode Heater 100 volts positive	. 1	-	100	μa
	with respect to cathode	. 1	-	100	μa

Note 1: With 6.3 volts ac on heater.

Note :: Without external shield.

With dc plate volts = 200, dc grid-No.2 volts = 200, and dc grid-No.1 voltage adjusted to give dc plate current of 100 ma. Note 3:

with dc plate volts = 300, dc grid-No.2 volts = 200, and dc
grid-No.1 volts = -33. Note 4:

with the tube in the accompanying test circuit under the following conditions: rectangular-wave modulation (egg) applied to grid No.1; pulse duration of 1 microsecond approx.; pulse-repetition rate (approx. 3000 pps) adjusted to give dc plate current of 9 ma. minimum; dc plate supply volts = 5500; dc grid-No.2 supply volts = 500 applied simultaneously with the plate voltage; dc grid-No.1 supip volts = -300; peak-positive grid-No.1 swing of 100 volts; coupling (capacitor (f3) having value of 0.1 µf, 5000 volts (capacitor (f3) having value of 0.1 µf, 5000 volts (capacitor (f4) of 1000 \pm 5% ohms, 50 watts, non-inductive. Note 5:

SPECIAL TESTS & PERFORMANCE DATA

500-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 500 g. At the end of this test, tubes are required to meet the following limits:

Peak Plate Current . . . 2.4 min. amp . For conditions shown under Characteristics Range Values.

- Indicates a change.



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Heater-Cathode

Leakage Current. . . . See Characteristics Range Values The tubes must also meet the established limit for low-frequency vibration (See below).

Fatique Test:

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 25 cycles per second for 32 hours in each of three positions. At the end of this test, tubes are required to meet the following limits:

amo For conditions shown under Characteristics Range Values.

Heater-Cathode

Leakage Current. . . See Characteristics Range Values The tubes must also meet the established limit for lowfrequency vibration (See below).

Low-Frequency Vibration Performance:

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 = 250, grid-No.2 volts = 200, grid-No.1 voltage varied to give a plate current of 10 millamperes. plate load resistor (ohms) = 2000 and vibrating frequency of 25 cycles per second with a fixed amplitude of 0.040 inch (total excursion 0.080 inch). The rms output voltage across the plate load resistor as a result of vibration of the tube must not exceed 500 millivolts.

Variable-Frequency Vibration Performance (1):

This test is performed on a sample lot of tubes from each production run. Tubes are vibrated in each of 3 positions through frequency range of from 10 to 50 cycles per second and back to 10 cycles per second. The tubes are vibrated under the same conditions as specified for Low Frequency Vibration Performance. During the test, the tubes will not show an rms output voltage across the plate load resistor in excess of 500 millivolts. At the end of this test, the tubes will not show defects that cause the tubes to be inoperable.

Variable-Frequency Vibration Performance (2):

This test is performed on a sample lot of tubes from each production run. Tubes are vibrated in each of 3 positions, perpendicular and parallel to major axis of the tube, and parallel to longitudinal axis of the tube, through the frequency range from 50 to 120 cycles per second at a fixed acceleration of 10 g under the same voltage, current and load conditions as specified for Low Frequency Vibration Performance. During this test the tubes will not show an rms output voltage across the plate load resistor in excess of 500 millivolts.

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OPERATING CONSIDERATIONS

The bulb becomes hot during operation. To insure adequate cooling, therefore, it is essential that free circulation of air be provided around the 7358.

The *flate* snows no color when operated with maximum rated dissipation. Connection to the plate cap should be made with a f.exibie lead to prevent any strain on the seal of the cap.

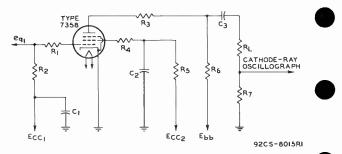
For sube protection, it is essential that sufficient resistance be used in the plate supply circuit, the grid-No.2 supply circuit, and the grid-No.1 supply circuit so that the short-circuit current is limited to 0.5 amperein each circuit.

The accompanying test circuit requires the use of damping resistors to suppress oscillations which may be caused by the rectangular-wave signal. These resistors should be non-inductive and they should be placed as close as possible to the socket terminals.



RADIO CORPORATION OF AMERICA Electron Tube Division DATA 3 9-62

TEST CIRCUIT FOR TYPE 7358



- C₁: 0.1 μf, 600 v dc.
- C2: 2 µf, 600 v dc.
- C3: For values, See Typical Operation and Characteristics Range Values (Note 5).
- R₁: 20 ohms, I watt, non-inductive.
- R,: 30,000 ohms, I watt.
- R₃: 10 ohms, 5 watts, non-inductive.
- R₄: 25 ohms, I watt, non-inductive.

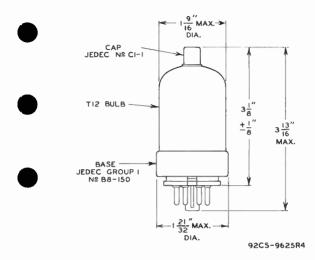
Ecc₁: Grid-No.I Supply Voltage. E_{cc2}: Grid No.2 Supply Voltage. E_{bb}: Plate Supply Voltage. eg₁: Rectangular-Wave

- Signal Voltage.
- R₅: 1000 ohms, I watt.
- R6: 10,000 ohms, 50 watts.
- R₇^o: 30 ± 1% ohms, 5 watts, non-inductive.
- R_L: For values, See Typical Operation and Characteristics Range Values (Note 5).

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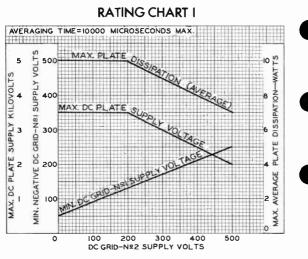




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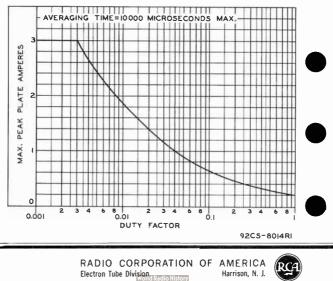
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DATA 4 9-62



92CS-8012R1

RATING CHART II



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

Electrica	1:		
Voltage Current	or Unipotential Cathode: (AC or DC)	6.3 ± 10% 0.35	volts amp
	.1 to all other electrodes		
	t plate	7.5	μµf
elect	0.1 to deflecting rode No.1	0.015	μµf
	rode No.2	0.015	μμf
	.1 to plate No.1	0.003	μμf
Grid No	1 to plate No.2	0.003	μµf
	lo.1 to all other electrodes		
	t deflecting electrode No.1	0.8	μµf
	lo.2 to all other electrodes	0.8	μµf
	ot deflecting electrode No.2 No.1 to plate No.2	0.8	μμι μμf
	ing electrode No.1 to all	0.)	pipe ,
	electrodes except plate No.1.	4.6	μµf
Deflect	ing electrode No.2 to all		
	electrodes except plate No.2.	4.6	μµf
	ing electrode No.1	4	uu f 🚽
	late No.1	4	μμι
	ate No.2	4	uu f 🚽
	ting electrode No.1 to		
	ecting electrode No.2	1.4	μµf
Characte	ristics, Class A, Amplifier:		
		150	volts
	.1 Supply Voltage	150	volts
Deflecti	ng-Electrode-No.1 Supply	150	VOICS
Voltage	2,	25	volts
	ng-Electrode-No.2 Supply		
Voltage		25	volts
	2 Supply Voltage	175	volts
Total Be	Resistor	150	ohms
curren	t plus plate-No.2 current)	8.5	ma -
	2 Current	2.1	ma -

-Indicates a Change.

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

DATA I 3-61

7360

Transconductance: Grid No.1 to both plates ← connected together. 5400 µmhos Deflecting electrode No.1 + 800 µmhos → to plate No.1 ^b . - 800 µmhos Deflecting electrode No.2 + to plate No.2 ^b . 11 volts	
Mechanical: Operating Position. Maximum Overall Length. Maximum Seated Length. Length, Base Seat to Bulb Top (Excluding tip). Uiameter. Oimensional Outline Bulb. See General Section Bulb. See Seat. Sase. Sasing Designation for BOTTOM VIEW.	
Pin 1-Cathode, Internal Shield Pin 2-Grid No.1 Pin 4-Heater Pin 5-Heater Pin 5-Heat	
BALANCED MODULATOR	
Maximum Ratings, Absolute-Naximum Values: PLATE-No.1 VOLTAGE. 300 max. volts PLATE-No.2 VOLTAGE. 300 max. volts DEFLECTING-ELECTRODE-No.1 VOLTAGE ±100 max. volts DEFLECTING-ELECTRODE-No.2 VOLTAGE ±100 max. volts GRID-No.2 (SCREEN-GRID) VOLTAGE 250 max. volts GRID-No.2 INPUT 0.5 max. watt	

PLATE-No.1 DISSIPATION. 1.5 max. watts PLATE-No.2 DISSIPATION. 1.5 max. watts PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. . 180 max. volts Heater positive with respect to cathode. 180^d max. volts

Typical Operation:

In accompanying balanced-modulator cir-			
cuit utilizing separate excitation ^e			
Plate Voltage (Each plate)	volts		
(Approx., each electrode)	volts volts	(

- Indicates a change.

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	Cathode Resistor	1200	ohms
	Electrode Voltagef	2.8	volts
,	Peak-to-Peak RF Grid-No.1 Voltage	10	volts
	Plate Current (Each plate)	1.5	ma
	Grid-No.2 Current	0.75	ma
	Plate-to-Plate Load Impedance		
	(Approx.)	5000	ohms
	Push-Pull, Peak-to-Peak Double-		
	Sideband Output Voltage	4	volts
,	Carrier Suppression ⁹	60	db ~
	Third-Order Distortion ⁹	-47	db
	Fourth-Order Distortion ⁹	-45	db
	Maximum Circuit Values:		
	Grid-No.1-Circuit Resistance:	0.5	and a second of
	For fixed-bias operation	0.5	- 5 -
,	For cathode-bias operation	2.2	max. megohms
	Deflecting-Electrode-Circuit		
	Resistance (Per deflecting	0.05	man and a second second
	electrode)	0.05	max. megohm

BALANCED MIXER

Maximum Ratings, Absolute-Naximum Values:

PLATE-No.1 VOLTAGE. PLATE-No.2 VOLTAGE. DEF_ECTING-ELECTRODE-No.1 VOLTAGE DEFLECTING-ELECTRODE-No.2 VOLTAGE GRID-No.2 (SCREEN-GRID) VOLTAGE GRID-No.2 (SCREEN-GRID) VOLTAGE GRID-NO.2 UPUT PLATE-No.1 DISSIPATION. PLATE-No.2 DISSIPATION.	· · · · · · · · · · · · · · · · · · ·	300 300 ±100 ±100 250 0.5 1.5 1.5	max. max. max. max. max. max. max. max.	volts volts volts volts volts watt watts watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode Heater positive with respect to cathode		180 1.80 ^d	max.	

Typical Operation:

In accompanying balanced-mixer circuit utilizing separate excitation^e

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

- Indicates a change.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 2 3-61

7360

Plate-to-Plate Load Impedance (Approx.)	ohms
	volts
Oscillator Rejection ⁹ 40	db
Third-Order Distortion ^g	db
Fourth-Order Distortion ^g	db
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance:	
For fixed-bias operation 0.5 max. ma	
	gohms 🕓
Deflecting-Electrode-Circuit Resistance (Per deflecting	
electrode)	egohm

a Without external shield.

- b Defined as the partial derivative of the plate current with respect to the difference between the deflecting-electrode voltages, evaluated about the point of equal plate currents.
- C Defined as the sum of (a) the absolute value of the difference between the deflecting-electrode voltages when the current to one plate is equal to 90% of the total beam current and (b) the absolute value of the difference between the deflecting-electrode voltages when the current to the same plate is equal to 10% of the total beam current. This sum, expressed in terms of signal voltage, corresponds to the peak-to-peak signal voltage that is required between the deflecting electrodes to produce peak-to-peak signal current at either plate equal to 80% of the total beam current.
- d The dc component must not exceed 100 volts.
- e Operation with self-excitation and cathode resistor of 300 ohms is similar to operation with separate excitation.
- [†] To either deflecting electrode. The other deflecting electrode is bypassed.
- ^g Referred to single-sideband output voltage.

OPERATING CONSIDERATIONS

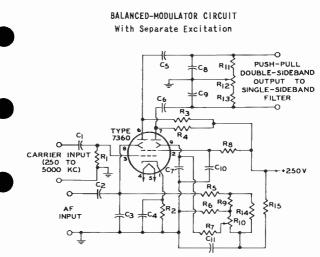
Deflecting-electrode-circuit resistance should be kept below 0.05 megohm to prevent nonlinear tube operation. The resistances of the two deflecting-electrode circuits should be approximately equal to minimize unbalance. The current drawn by each deflecting-electrode is in the order of 40 microamperes.

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

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

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





9205-10258

- C1: 0.001 µf C2: 0.22 µf C3: 0.001 µf C₁: 0.01 μf C₅ C₆: 0.0033 μt C₇: 0.1 μf C₈ C₉: Sufficient to resonate input of SSB filter C₁₀: 0.22 μf C,1: 0.47 µf R1: 0.47 megohm R2: 1200 ohms R , R : 68000 ohms R. : 47000 ohms
- R6: 12000 ohms
- R7: 47000 ohms
- R₈: 0.1 megohm
- R. : 2700 ohms
- R₁₀: Carrier-Balance Potentiometer, 5000 ohms
- R11: 2700 ohms
- R12: Quadrature-Balance
 - Potentiometer, 2500 ohms

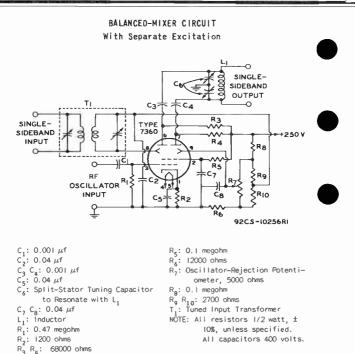
- $\begin{array}{c} {\sf R}_{13} \; {\sf R}_{14} \colon 2700 \; \text{ohms} \\ {\sf R}_{15} \colon 0.1 \; \text{megohm} \\ \text{NOTE: All resistors I/2 watt, } \pm \end{array}$ 10% unless specified. All capacitors 400 volts.

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World Radio History



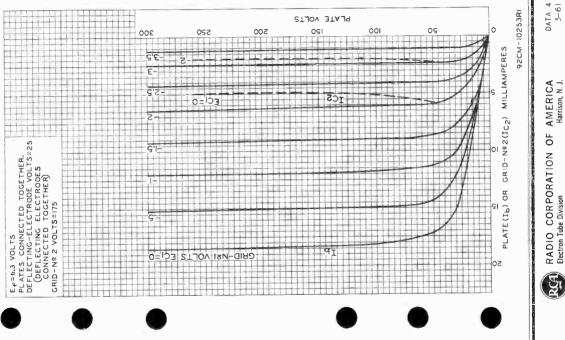
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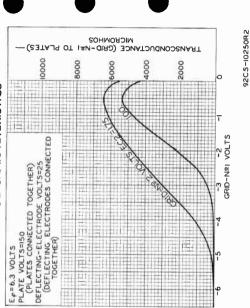
7360

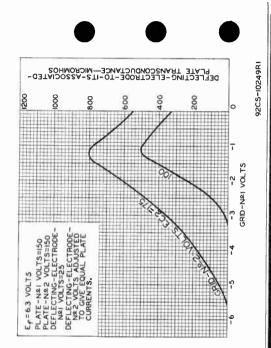




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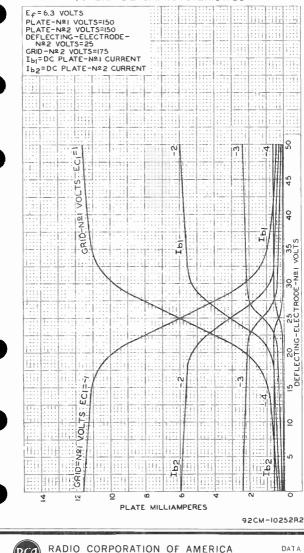
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CORPORATION

RADIO

Electron Tube Division

AVERAGE CHARACTERISTICS

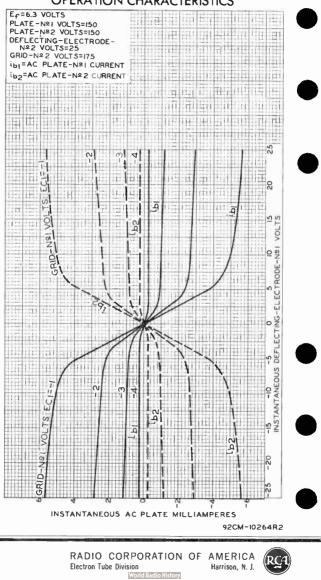


Harrison, N. J.

DATA 5 3-61

Electron Tube Division





Beam	Power	Tube
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	CERAMIC-METAL SEALS "ONE-PIECE" ELECTRODE DESIGN FORCED-AIR COOLED MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE For Use at Frequencies up to 2000 Mc under Severe Shock and Vibration
	GENERAL DATA Electrical:
•	Heater, for Matrix-Type, Oxide- Coated, Unipotential Cathode: Voltage (AC or DC) ^a 6.3 ± 10% volts Current at heater volts = 6.3 3.2 amp Minimum heating time 60 sec Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 250, grid-No.2 volts = 250, and plate ma. = 100 18
	Direct Interelectrode Capacitances: ^b Grid No.1 to plate
	Mechanical:
	Operating Position
	G ₁ -Grid-No.1- Terminal Contact Surface G ₂ -Grid-No.2- Terminal Contact Surface H - Heater- Terminal Contact Surface H - Plate- Terminal Contact Surface H - Plate- Contact Surface Surface Surface H - Heater- Terminal Contact Surface Surface Surface H - No.2- Terminal Contact Surface Surface Surface H - No.2- Terminal Contact Surface H - No.2- Terminal Contact Surface H - No.2- Terminal Contact Surface Surface H - No.2- Terminal Contact Surface Surface Surface H - No.2- Terminal Contact Surface Surface



RADIO CORPORATION OF AMERICA Electron Tube Division Air Flow:

- Through radiator—Adequate air flow to limit the plate-seal temperature to 250° C should be delivered by a blower through the radiator before and during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator without cowling and with cowling versus plate dissipation are shown in accompanying Typical-Cooling-Requirements curves. Plate power, grid-No.2 power, and air flow may be removed simultaneously.
- To grid-No.2, grid-No.1, cathode, and heater terminals—A sufficient quantity of air should be delivered to these terminals to prevent their temperature from exceeding the specified maximum value of 250° C.
- During standby operation—Cooling air is not normally required when only heater voltage is applied to the tube.
- Terminal Temperature (Plate, grid No.2,
- grid No.1, cathode, and heater) . . . 250 max.

AF POWER AMPLIFIER & MODULATOR - Class AB, d

Maximum CCS^e Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE	1000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE.	300 max.	volts
MAXSIGNAL DC PLATE CURRENT ^f	180 max.	ma
MAXSIGNAL PLATE INPUT ^f	180 max.	watts
MAXSIGNAL GRID-No.2 INPUT ⁴	4.5 max.	watts
PLATE DISSIPATION ^F	115 max.	watts

Typical CCS Operation:

Values are for 2 tubes

DC Plate Voltage	650 300	850 300	volts volts	
DC Grid-No.1 (Control-grid) Voltage:	-	-		
From fixed-bias source	-15	-15	volts	
Peak AF Grid-No.1-to-Grid-No.1 Voltage ^h .	30	30	volts	(
Zero-Signal DC Plate Current	80	80	ma	1
MaxSignal DC Plate Current	200	200	ma	
Zero-Signal DC Grid-No.2 Current	0	0	ma	
MaxSignal DC Grid-No.2 Current	20	20	ma	
Effective Load Resistance				
(Plate to plate)	4330	7000	ohms	
MaxSignal Driving Power (Approx.)	0	0	watts	1
MaxSignal Power Output (Approx.)	50	80	watts	1

Maximum Circuit Values:

Grid-No.1-Circuit Resistance			
under any condition: ^j			
For fixed-bias operation			30000 max. ohms
For cathode-bias operation.		٠	Not recommended





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

AF	POWER	AMPLIFIER	k	MODULATOR -	Class	AB,	k
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Maximum CCS^e Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE	1000	тах.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300	max.	volts
MAXSIGNAL DC PLATE CURRENT ^f	180	max.	ma
MAXSIGNAL DC GRID-No.1			
(CONTROL-GRID) CURRENT ^f			мa
MAXSIGNAL PLATE INPUT ^f	180	max.	watts
MAXSIGNAL GRID-No.2 INPUT ^f	4.5	max.	watts
PLATE DISSIPATION [†]	115	max.	watts

Typical CCS Operation:

Values are for 2 tubes

DC Flate Voltage DC Grid-No.2 Voltage ^g DC Grid-No.1 Voltage:	650 300	850 300	volts volts
From fixed-bias source	-15 46	-15 46	volts volts
Zero-Signal DC Plate Current	80	80	ma
MaxSignal DC Plate Current	355	355	ma
Zero-Signal DC Grid-No.2 Current	0	0	ma
MaxSignal DC Grid-No.2 Current	25	25	ma
MaxSignal DC Grid-No.1 Current	15	15	ma
Effective Load Resistance			
(Plate to plate)	2450	3960	ohms
MaxSignal Driving Power (Approx.) ¹	0.3	0.3	watt
MaxSignal Power Output (Approx.)	85	140	watts

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Maximum CCS^e Ratings, Absolute-Maximum Values:

	Up to 1215 Nc
DC PLATE VOLTAGE	1000 max. volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max. volts
MAXSIGNAL DC PLATE CURRENT	180 max. ma
MAXSIGNAL DC GRID-No.1	
(CONTROL-GRID) CURRENT	30 max. ma
MAXSIGNAL PLATE INPUT	180 max. watts
MAXSIGNAL GRID-No.2 INPUT	4.5 max. watts
PLATE DISSIPATION	1 1 5 max. watts

Typical CCS Class AB, "Single-Tone" Operation:"

							Up to	60 Mc	
D	Plate Voltag	e					650	850	volts
D	C Grid-No.2 Vo	ltage ^g .			•		300	300	volts
D	Corid-No.1 Vo	ltage					-15	-15	volts
Z	ero-Signal DC	Plate Cur	rent.				40	40	ma
	ero-Signal DC						0	0	ma
	fective RF Lo						2165	3500	ohms
	ixSignal DC						100	100	ma
M	axSignal DC	Grid-No.2	Curr	rent.			10	10	ma



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

Harrison, N. J.

Grid-No.1-Circuit Resistance under any condition:	nms ded
PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony Carrier conditions per tube for use with a maximum modulation factor of 1 Maximum CCS® Ratings, Absolute-Maximum Values:	
-	
	ts ma ma ts ts
At 400 Mc	
DC Plate Voltage. 400 700 vol DC Grid-No.2 Voltage ⁿ 200 250 vol DC Grid-No.1 Voltage ⁿ -20 -50 vol DC Grid-No.2 Current. 100 130 130	ts ts ma ma ts
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance under any condition	ims
RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy ^s and RF POWER AMPLIFIER — Class C FM Telephony	
Maximum CCS ^e Ratings, Absolute-Naximum Values:	
UP to 1215 Mc. DC PLATE VOLTAGE	ts
	······································

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

Beam	Power	Tube
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•	"ONE-PIECE" ELECTRODE DESIGN	WATTS CO IPOTEN up to 2	INTE WINPUT TIAL CA 2000 Mc	ODE STRI GRAL RAI UP TO I: Athode	DIATOR
	GENERAL DATA	1			
	Electrical:				
•	Heater, for Matrix-Type, Oxide- Coated, Unipotential Cathode: Voltage (AC or DC) ^a Current at heater volts = 6.3 Minimum heating time Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 250, grid-No.2 volts = 250, and plate ma. = 100.		6.3 ± 3.2 60	± 10%	volts amp - sec
	Direct Interelectrode Capacitances: ^b	• •	18		
	Grid No.1 to plate Grid No.1 to cathode & heater Plate to cathode & heater Grid No.1 to grid No.2 Grid No.2 to plate Grid No.2 to cathode & heater	· · · (0.065 n 14 0.019 n 19 4.5 1.3 n	nax.	μμι f μμι f μμι f μμι f μμι f μμι f
	Mechanical:				
•	Operating Position	utline) 	tegral	part of	2 oz f tube
•	G ₁ -Crid-No.1- Terminal Contact Surface G ₂ -Crid-No.2- Terminal Contact Surface H-Feater- Terminal Contact Surface	GI		- Heater Catho Termi Conta Surfa - Plate- Termi Conta Surfa	ode- inal act ace inal act
			+ Indl	cates a o	change.



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

	114 × 6 × 14	
MaxSignal DC Grid-No.1 Current	Upto60Nc 0 0 ma	
MaxSignal Peak RF Grid-No.1 Voltage .	0 0 ma 15 15 volts	
MaxSignal Driving Power (Approx.)	0 0 watts	
MaxSignal Power Output (Approx.)	25 40 watts	-
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance		
under any condition:		
For fixed-bias operation		
	Not recommended	
PLATE-MODULATED RF POWER AMPLIFIER -	Class C Telephony	
Carrier conditions per tube	for use	
with a maximum modulation fac		
Maximum CCS ^e Ratings, Absolute-Maximum Va	alues:	
	Up to 1215 Mc	
DC PLATE VOLTAGE	800 max. volts	
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max. volts	
DC GRID-No.1 (CONTROL-GRID) VOLTAGE DC PLATE CURRENT	-100 max. volts	
DC GRID-No.1 CURRENT.	150 max. ma 30 max. ma	
PLATE INPUT	120 max. watts	
GRID-No.2 INPUT	3 max. watts	
PLATE DISSIPATION	75 max. watts	
Typical CCS Operation:		
	At 400 Mc	
DC Plate Voltage.	400 700 volts	
DC Grid-No.2 Voltage ⁿ	200 250 volts -20 -50 volts	
DC Plate Current	100 130 ma	
DC Grid-No.2 Current	5 10 ma	
DC Grid-No.1 Current	5 10 ma	
Driver Power Output (Approx.) ⁴ Useful Power Output (Approx.)	2 3 watts 16 45 watts	
	16 45 watts	
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	30000 ^r max. ohms	
under any condition	30000' max. ohms	
RF POWER AMPLIFIER & OSCILLATOR - Cla	ass C Teleoraphy ^s	
and		
RF POWER AMPLIFIER Class C FM	lelephony	
Maximum CCS ^e Ratings, Absolute-Maximum Va	alues:	
	Up to 1215 Mc	
DC PLATE VOLTAGE	1000 max. volts	
DC GRID-No.2 (SCREEN-GRID) VOLTAGE.	300 max. volts -100 max. volts	
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-100 max. volts 180 max. ma	-
	200 mart 110	

RADIO CORPORATION OF AMERICA Electron Tube Division Montel Precion History

	AFI	POWER	AMPL	LIFIER	άM	ODULATOR	(— Class	AB2
Maximum	CCSe	Ratin	ıgs,	Absolu	ite-	Maximum	Values:	

DC PLATE VOLTAGE		1000	max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE.		300	max.	volts
MAXSIGNAL DC PLATE CURRENT f		180	max.	ma
MAXSIGNAL DC GRID-No.1				
(CONTROL-GRID) CURRENT ^f			max.	ma
MAXSIGNAL PLATE INPUT f			max.	watts
MAXSIGNAL GRID-No.2 INPUT ^f			max.	watts
PLATE DISSIPATION ^f	•	115	max.	watts

Typical CCS Operation:

Values are for 2 tubes

DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage ^g	300	300	volts
DC Grid-No.1 Voltage:	-	-	
From fixed-bias source	-15	-15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage.	46	46	volts
Zero-Signal DC Plate Current	80	80	ma
MaxSignal DC Plate Current	355	355	mó
	200	200	ma
Zero-Signal DC Grid-No.2 Current	0	0	ma
MaxSignal DC Grid-No.2 Current	25	25	ma
MaxSignal DC Grid-No.1 Current	15	15	ma
Effective Load Resistance			
(Plate to plate)	2450	3960	ohms
MaxSignal Driving Power (Approx.).	0.3	0.3	watt
MaxSignal Power Output (Approx.)	85	140	watts
make orginal remer output (Approx.).	00	140	natto

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Maximum CCS^e Ratings, Absolute-Maximum Values:

		Up to 1215 Nc
	DC PLATE VOLTAGE	. 1000 max. volts
,	DC GRID-No.2 (SCREEN-GRID) VOLTAGE.	. 300 max. volts
	MAXSIGNAL DC PLATE CURRENT	. 180 max. ma
	MAXSIGNAL DC GRID-No.1	
	(CONTROL-GRID) CURRENT.	
	MAXSIGNAL PLATE INPUT	
	MAXSIGNAL GRID-No.2 INPUT	
	PLATE DISSIPATION	. 115 max. watts
	' Typical CCS Class AB ₁ "Single-Tone" Ope	peration:"

	Up to	60 Nc	
DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage ^g	300	300	volts
DC Grid-No.1 Voltage	-15	-15	volts
Zero-Signal DC Plate Current	40	40	та
Zero-Signal DC Grid-No.2 Current	0	0	ma
Effective RF Load Resistance	2165	3500	ohms
MaxSignal DC Plate Current	100	100	ma
MaxSignal DC Grid-No.2 Current	10	10	ma



Air Flow:

- Through radiator—Adequate air flow to limit the plate-seal temperature to 250° C should be delivered by a blower through the radiator before and during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator without cowling and with cowling versus plate dissipation are shown in accompanying Typical-Cooling-Requirements curves. Plate power, grid-No.2 power, and air flow may be removed simultaneously.
- To grid-No.2, grid-No.1, cathode, and heater terminals—A sufficient quantity of air should be delivered to these terminals to prevent their temperature from exceeding the specified maximum value of 250° C.
- During standby operation—Cooling air is not normally required when only heater voltage is applied to the tube.
- Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater) ... 250 max. volts

AF POWER AMPLIFIER & MODULATOR -- Class AB, d

Maximum CCS^e Ratings, Absolute-Naximum Values:

DC PLATE VOLTAGE	1000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE.	300 max.	volts
MAXSIGNAL DC PLATE CURRENT ^f	180 max.	ma
MAXSIGNAL PLATE INPUT ^f	180 max.	watts
MAXSIGNAL GRID-No.2 INPUT [*]	4.5 max.	watts
PLATE DISSIPATION ⁶	115 max.	watts

Typical CCS Operation:

Values are for 2 tubes

DC Plate Voltage	650	850	volts	
DC Grid-No.2 Voltage ⁹	300	300	volts	
DC Grid-No.1 (Control-grid) Voltage:				_
From fixed-bias source	-15	-15	volts	
Peak AF Grid-No.1-to-Grid-No.1 Voltage ^h .	30	30	volts	
Zero-Signal DC Plate Current	80	80	ma	
MaxSignal DC Plate Current	200	200	ma	
Zero-Signal DC Grid-No.2 Current	0	0	ma	
MaxSignal DC Grid-No.2 Current	20	20	ma	
Effective Load Resistance				
(Plate to plate)	4330	7000	ohms	
MaxSignal Driving Power (Approx.)	0	0	watts	
MaxSignal Power Output (Approx.)	50	80	watts	$\mathbf{}$

Maximum Circuit Values:

Grid-No.1-Circuit Resistance							
under any condition: J							
For fixed-bias operation						30000 max.	ohms
For cathode-bias operation.	•	•	•	•	•	Not recomme	ended



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





DC GRID-No.1 CURRENT		30 max. ma 180 max. watts 4.5 max. watts 115 max. watts
Typical CCS Operation:	At 400 Nc	At 1215 Nc

DC Plate Voltage DC Grid-No.2 Voltage ^t DC Grid-No.1 Voltage ^u DC Plate Current DC Grid-No.2 Current DC Grid-No.1 Current Driver Power Output (Approx.) ^q .	400 200 -35 150 5 3	900 300 -30 170 1 10 3	900 300 -22 170 1 4 5	volts volts volts ma ma watts
Useful Power Output (Approx.).	23	80	40	watts

Maximum Circuit Values:

- a Secause the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.
- b Measured with special shield adapter.
- C For socket to be used with the 7457, consult manufacturers such as J-V-M Microwave Company, 9300 west 47th Street, Brookfleid, illinois; E.F. Johnson Company, Waseca, Minnesota; and Collins Radio Company, 855 35th Street Worth, Cedar Rapids, Iowa.
- d Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.
- e Continuous Commercial Service,
- f Averaged over any audio-frequency cycle of sine-wave form.
- 9 Preferably obtained from a fixed supply.
- h The driver stage should be capable of supplying the No.1 grids of the Class AB₁ stage with the specified driving voltage at low distortion.
- J The resistance introduced into the grid-No.1 circuit by the input coupling should be held to a low value. In no case should it exceed the specified maximum value. Transformer or impedance coupling devices are recommended.
- K Subscript 2 indicates that grid-wo.1 current flows during some part of the input cycle.
- Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the A82 stage. To mimize distortion, the effective resistance per grid-Mo.1 circuit of the A82 stage should be held at a low value. For this purpose, the use of transformer coupling is recommended.
- *Single-Tone* operation refers to that class of amplifier service in which the grid-to.l input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant ampl-tude is applied to the input of the system.
- n Obtained preferably from a separate source modulated along with the plate supply.
- P Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
- The driver stage is required to supply tube losses and rf-circuit losses. It should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics, and tube characteristics during life.
- If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.





- Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.
- ^t Obtained preferably from a fixed supply, or from the plate supply voltage with a voltage divider.
- ^U Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

+ Heater Current	Note 1	<i>Nin.</i> 2.90	<i>Max.</i> 3.55	amp	
Grid No.1 to plate Grid No.1 to cathode	2	-	0.065	μµrf	
& heater Plate to cathode & heater. Grid No.1 to grid No.2 Grid No.2 to plate Grid No.2 to cathode	2 2 2 2	11.8 17.3 [.] 4	15.2 0.019 21.9 5.1	μμι f μμι f μμι f μμι f	(
& heater Grid-No.1 Voltage Reverse Grid-No.1 Current Grid-No.2 Current Peak Emission Interelectrode Leakage	2 1,3 1,3 1,3 1,4	- -6 - -8 -	1.30 -18 -20 +2 400	μμf volts μa ma peak volts	
Resistance	5 6	1 80	-	megohm watts	

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

Note 2: Measured with special shield adapter.

Note 3: With dc plate volts = 1000, dc grid-No.2 volts = 300, and dc grid-No.1 voltage adjusted to give adc plate current of 115 ma.

- Note 4: For conditions with heater volts = 6.3; grid No.1, grid No.2, and plate lied together; and pulse-voltage source connected between plate and cathode. Pulse duration (microseconds) = 2, pulse-repetition frequency (pps) = 60, and duty factor of 0.0012. The voltage-pulse amplitude site adjusted until a peak cathode current of 10 amperes is obtained. After 1minute at this volue, the voltage-pulse amplitude will not exceed 400 volts (peak).
- Note 5: under conditions with lube at 200 lo 30° (or at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with a 200-volt Megger-lype ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.
- Note 6: In a single-tube, grid-driven coaxial-cavity class-C-amplifier circuit at 400 Mc and for conditions with 5,7 volts ac or dc on heater, dc plate volts = 1000, dc grid-Mro.2 volts = 300, grid-No.1 resistor adjustable between 1000 and 10,000 ohms, dc plate ma. = 180 maximum, dc grid-No.1 ma. = 20 maximum, and driver power output (watts) = 3.

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube



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



Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, New Jersey, on request.

50 g, li-Millisecond Shock Test;

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified long-duration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes are required to meet the limits for items 1, 3, 4, 7, and 8 under Characteristics Range Values for Equipment Design.

500 g. Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet the limits for items 1, 3, 4, 7, and 8 under Characteristics Range Values for Equipment Design.

5-to-2000 cps Variable Frequency and Cycling Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable frequency vibration. With heater volts = 6.3 ac or dc, dc plate supply volts = 300, dc grid-No.2 volts = 250, grid-No.1 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute cycle consisting of:

- a. 5-to-10 cps with fixed double amplitude of 0.080 inch ± 10%.
- b. 10-to-15 cps at fixed acceleration of 0.41 g \pm 10%.
- c. 15-to-75 cps with fixed double amplitude of 0.036 inch ± 10%.
- d. 75-to-2000 cps at fixed acceleration of 10 g ± 10%.

During the above vibration test, tubes will not show an rms output voltage in excess of 15 volts across the plate load resistor in the 5-to-2000 cycle range. At the end of this test, tubes are required to meet the limits for items 1, 3, 4, 7, and 8 under Characteristics Range Values for Equipment Design.

OPERATING CONSIDERATIONS

A suggested mounting arrangement for the 7457 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

During standby periods in intermittent operation, it is recommended that the heater voltage be maintained at normal operating value when the period is less than 15 minutes, and that it be reduced to 80 per cent of normal when the period is



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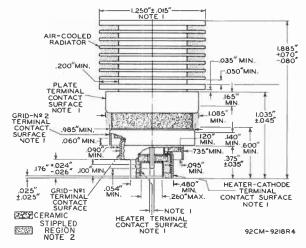


between 15 minutes and 2 hours. For longer periods, the heater voltage should be turned off.

The rated plate and grid-No.2 voltages of this tube are extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any highpotential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.





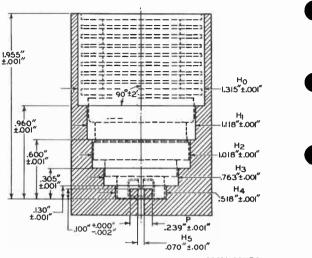


NOTE I: WITH THE CYLINDRICAL SURFACES OF THE PLATE TERMINAL, GRID-NO.2 TERMINAL, GRID-NO.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G₁. THE TUBE IS PROPERLY SEATED IN THE GAUGE WHEN A D.DID"-THICKNESS GAUGE I/B" WIDE WILL NOT ENTER BETWEEN THE HEATER-CATHODE TERMINAL AND THE BOTTOM SURFACE OF H₄. THE GAUGE IS PROVIDED WITH A SLOT TO PERMIT MAKING MEASUREMENT OF SEATING OF HEATER-CATHODE TERMINAL ON BOTTOM OF HOLE H₄.

NOTE 2: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.



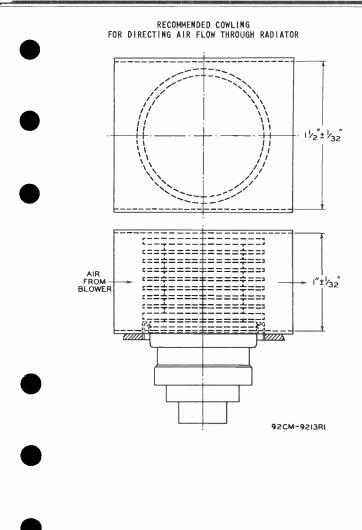
SKETCH GL



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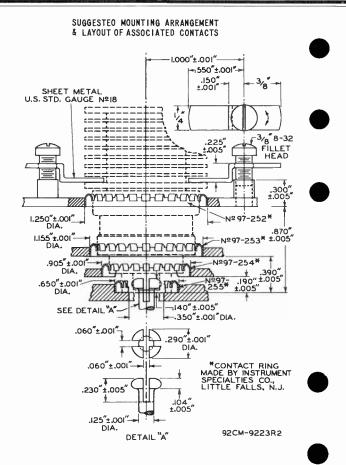
THE AXES OF THE CYLINDRICAL HOLES $\rm H_0$ THROUGH $\rm H_5$ AND THE AXES OF POST P ARE COINCIDENT WITHIN 0.001".







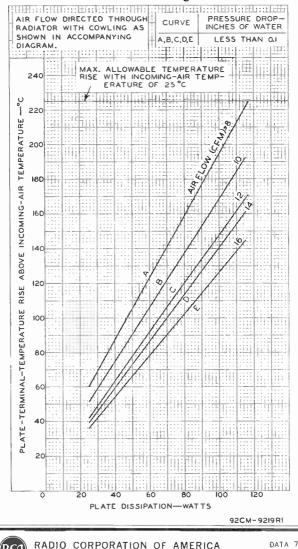
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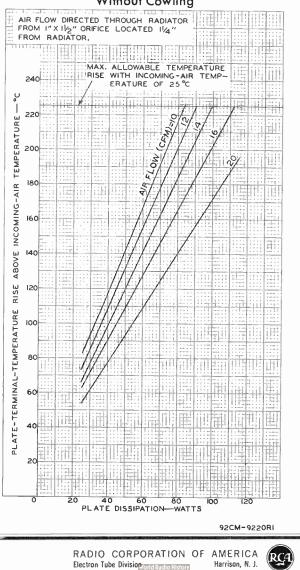


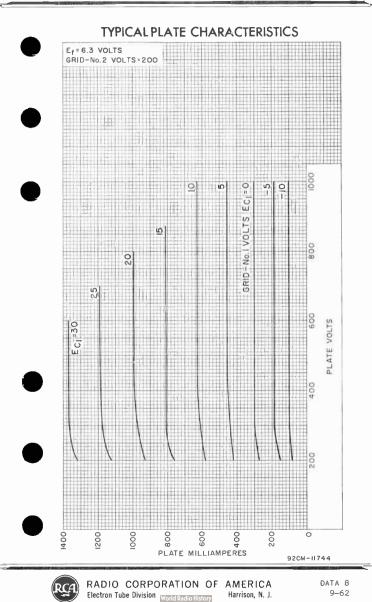


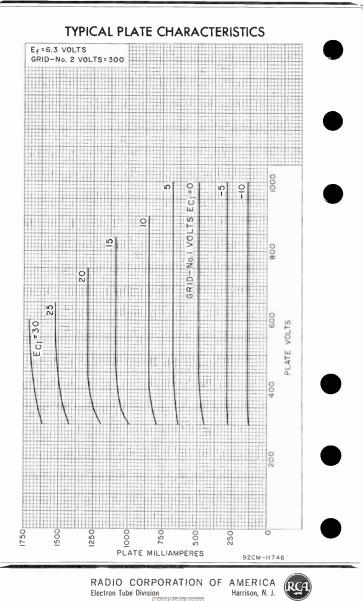
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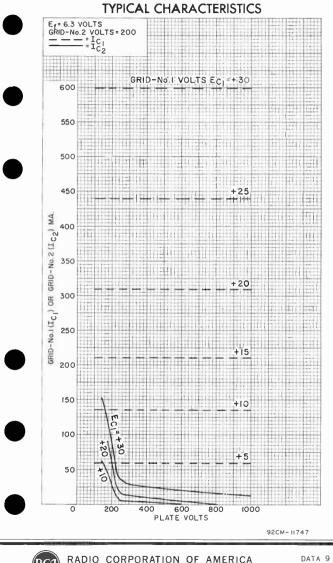
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TYPICAL COOLING REQUIREMENTS Without Cowling







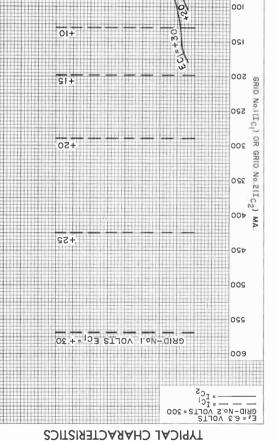


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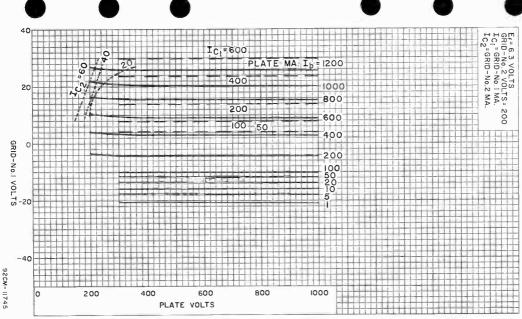
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7457

PLATE VOLTS

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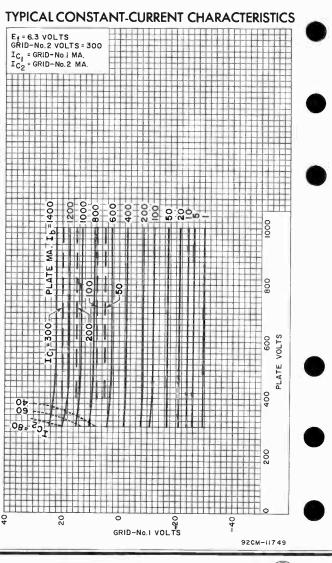




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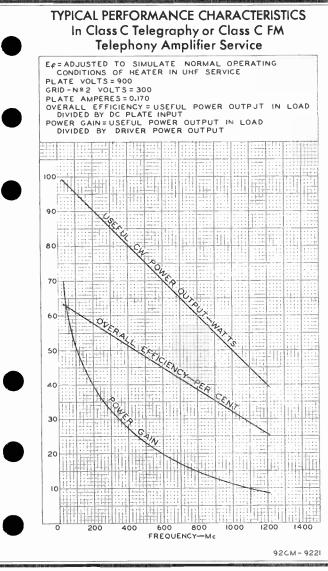
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World Radio History

High-Mu Triode

CERAMIC-METAL PENCIL TYPE

FAST WARM-UP TIME STURDY COAXIAL-ELECTRODE STRUCTURE

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

GENERAL DATA

delicine para
Electrical:
Heater, for Unipotential Cathode: Voltage (AC or DC)
<pre>(ohms) = 0, load resistor (onms) = 10, ard heater volts = 6.3 10 sec. Amplification Factor 80 Transconductance for dc plate ma. = 13, dc plate volts = 125, and cathode</pre>
resistor (ohms) = 50
Grid to plate2.4 $\mu\mu$ fGrid to cathode and heater4.4 $\mu\mu$ fPlate to cathode and heater0.04 $\mu\mu$ fHeater to cathode2.6 $\mu\mu$ fCathode to plate0.04 $\mu\mu$ fCathode to grid and heater7.0 $\mu\mu$ fPlate to grid and heater2.0 $\mu\mu$ f
Mechanical;
Operating Position
Heater-terminals connector Amerac ^b No.1018-88°, Grayhilld No.22-5, or equivalent
Socket for operation up to about 550 Mc (Including heater- terminals connector) Jettron ^e No.CD7010, or equivalent Cavities (Including heater-
terminals connector)J–V–M ^f No.D–7980 Series, Resdel ^g No.10 Series, or equivalent



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RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I 9-62 7552

Terminal Connections (See Dimensional Outline):

H-Heater K-Cathode



G-Grid P-Plate

RADIO-FREQUENCY AMPLIFIER --- Class A,

Maximum CCS^h Ratings, Absolute-Maximum Values:

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

and prequencies up to 1900	AC						
DC PLATE VOLTAGE,	250 max.	volts					
DC GRID VOLTAGE	-50 max.	volts					
DC PLATE CURRENT	25 max.	ma					
PLATE DISSIPATION	2.5 max.	watts					
PEAK HEATER-CATHODE VOLTAGE:							
Heater negative.with							
respect to cathode	50 max.	volts					
Heater positive with							
respect to cathode	50 max.						
PLATE-SEAL TEMPERATURE	225 max.	°C					

Typical CCS^h Operation in Cathode-Drive Circuit:

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

Maximum Circuit Values:

Grid-Circuit Resistance: For fixed-bias operation. Not recommended For cathode-bias operation. 0.25 max. megohm

^a Without external shield.

- b Amerac, Inc., Dunham Road, Beverly, Massachusetts.
- c For use with cavities.
- ^d Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.
- e Jettron Products, Inc., 56 Route 10, Hanover, N.J.
- f J-V-M Nicrowave 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 cavilies covers the range from 215 to 2325 Mc. https://www.avenue.covers.co
- ⁿ Continuous Commercial Service.

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	CI	ARACTERISTICS	RANGE	VALU	ES FOR	EQU I PMEI	NT DESI	GN 🗕
					Note	Min.	Max.	
	Direct	Current Interelectrode itances:		•••	1	0.205	0.245	amp
	Grid Plate	to plate to cathode to cathode	· · · · · ·	· · · ·	-	2.0 3.7 -	2.7 4.9 0.04	µµ2 f µ42 f µ42 f
	Heate	Cathode Leakage r negative with Dect to cathode	h	nt:	1,2	_	30	µа
	Heate	r positive with	h				30	,
I	Leakage	pect to cathod Resistance: grid to plate a		•••	1,3	-	20	μa
		node connected		ier.	1,4	100	-	megohms
		node connected		ner.	1,5	100	-	megohms
		Grid Current.		• •	1,6	-	0.3	μa
		n Voltage cation Factor.	• • •	•••	7 1,8	60	4 100	volts
		nductance			1,8	10000	17000	umhos
		urrent (1)			1,8	8.5	17.5	ma
		urrent (2)			1,9	-	50	μa
		urrent (3)			1,10	100		μa
	Power Ga		• • •	• •	1,11	13	-	db
	Ncise F			• •	1,11	-	7.5	db
		in Power Gain.	• • •	• •	11,12	-	-1	db
		in Noise Figure in Transconduc		· ·	11,12 11,12	-	0.5 15	db %
1	Note 1:	With 6.3 volts	ac or do	on h	eater,			
	Nole 2:	With 60 volts d with respect to	cathode	÷.				
_	Note 3:	With 60 volts d with respect to	cathode	· ·				
	Note 4:	With grid 100 v which are conne	cted to	ether				
	Note 5:	With plate 300 which are conne	cted tog	ether			-	
	Note 6: Note 7:	With dc plate volts, grid res	istor of	0.51	megohm.			
		With dc voltage adjusted to pro volts on heater						
	Note 8:	With dc plate si 50 ohms, and ca	thode by	pass	capacito	r of 1000	μf.	
	Note 9:	With dc plate -5 volts,						
	Note 10:	With dc plate ~2.5 volts.					-	•
· ·	Note 11:	With dc plate so of 50 ohms in a having a bandwin operating freque	upply vo i single dth of 5 ency of	ltage -tube ± 0. 550 ±	of 125 rf amp 5 Mc. si 10 Mc.	volts and lifier of gnal inpu	cathode the can t of -70	resistor lty type dbm, and
	Nole 12:	Reduce heater Noise Figure, a with 6.3 volts o	voltage nd Tran:	to 5. scondu	7 volts	. Chang values fro	e in Pow om those	er Gain, obtained

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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 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:

Variable-Frequency Vibration Performance:

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

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

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

Heater-Cathode Leakage Current. . . 60 max. 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-IO, paragraph 4.9.20.5) is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in three different positions to an impact acceleration of 500 g, 5 blows in each position.

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

- Heater-Cathode Leakage Current. . . 60 max. μa For conditions shown under Characteristics Range Values, Notes 1,3.
- Low-Frequency Vibration Output. . . 200 max. mv For conditions shown above under Low-Frequency Vibration Performance.

Change in Transconductance. -20 max. % From initial value for conditions shown under Characteristics Range Values, Notes 1.8.

Fatigue Vibration Test:

This test (similar to MIL-E-10, 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-10, 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 Ouration" curve shown in paragraph 4.7.7 of MIL-E-10, Amendment 5.

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

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 $15/16^{11}\pm 1/64^{11}$, 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 MIL-E-ID, paragraph 4.9.6.3) is performed on a sample lot of tubes every 90 days. Tubes are tested by first immersing in water, having a temperature of at least 97° C for at least 15 seconds, and then immersing immediately in water at not more than 5° C for 5 seconds. After drying for 48 hours at room temperature, the tubes will meet the following test limit:

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

Heater-Cycling Life Performance:

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

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

- Heater Current. 300 max. ma For conditions shown under Characteristics Range Values, Note 1.
- Heater-to-Cathode Leakage Current . 60 max. μ a 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:

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

100-Hour Survival Life Performance:

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



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to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *i-Hour Stability* Life Performance except that all voltages are cycled at the rate of 100 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:

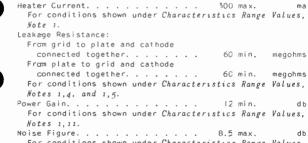
Heater Current. 300 max. ma For conditions shown under Characteristics Range Values, Note 1.

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° 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 fo'lowing limits:



Notes 1, 11, 12.

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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.

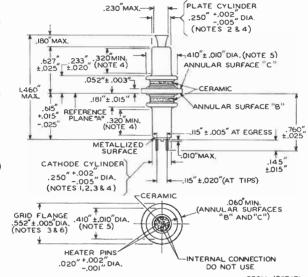
Noise Figure. 9.5 max. db For conditions shown under Characteristics Range Values, Notes 1,11.

OPERATING CONSIDERATIONS

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

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





92CM-10274RI

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

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

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

NOTE I: WITH ANNULAR SURFACE "B" RESTING ON REFERENCE PLAME "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".

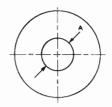
NOTE 4: THE DIAMETER ALONG THE 0.320" MINIMUM LENGTH IS MEASURED WITH "GO" AND "NO-GO" RING GAUGES $\rm G_1-I$ AND $\rm G_1-2$, RESPECTIVELY.

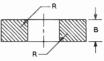
NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_2-1 AND G_2-2 , RESPECTIVELY.

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



GAUGES





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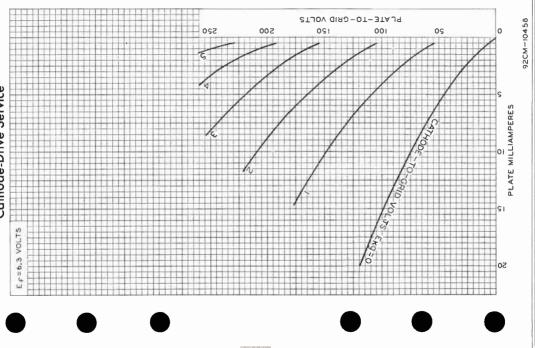
Gauge	Tune	Dimension								
Gauge	Туре	Diameter A	Thickness B	Radius R						
G _i -I	GO	0.25200"+0.00000" -0.00007"	0.320"+0.001" -0.000"	0.003" MAX.						
G ₁ -2	NO-GO	0.24500"+0.00007" -0.00000"	-	-						
G ₂ -1	GO	0.42000" ^{+0.00000} " -0.00007"	-	-						
G ₂ -2	NO-GO	0.40000"+0.00007" -0.00000"	-	-						
G ₃ – I	GO	0.55700"+0.00000" -0.00007"	-	-						
G ₃ -2	NO-GO	0.54700" ⁺ 0.00007" -0.00000"	-	-						



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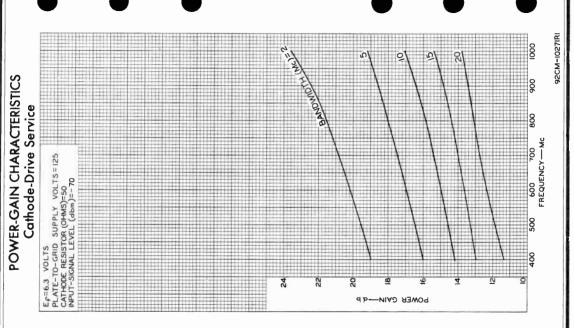
CORPORATION

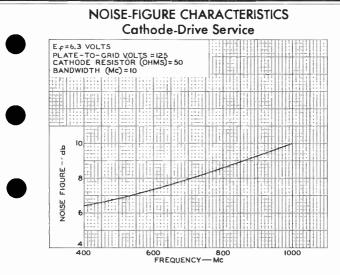
RADIO

Electron Tube Division

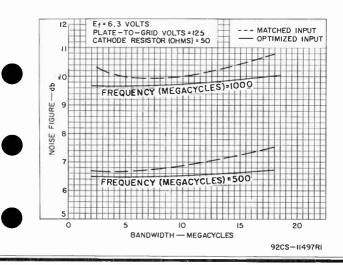


AMERICA Ч CORPORATION Electron Tube Division **RADIO**





⁹²CS-10270R3





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AMERICA Harrison, N. J. DATA 7 9-62

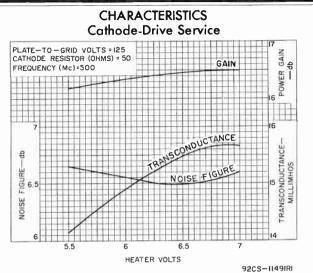
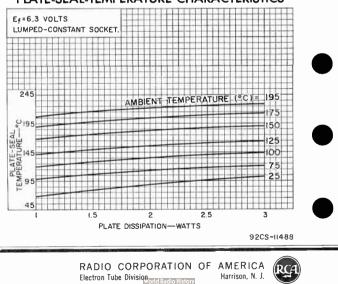


PLATE-SEAL-TEMPERATURE CHARACTERISTICS



High-Mu Triode

FAST WARM-UP TIME

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) Current at heater volts = 6.3 Cathode Warm-Up Time (Average) to reach 80% of operating plate current for dc plate-supply volts = 80, dc grid volts = 0, cathode resistor (ohms) = 0,	6.3 ± 10% volts 0.225 amp
load resistor (ohms) = 10, and heater volts = 6.3	10 sec 80
<pre>ma. = 12.5, dc plate volts = 125, and cathode resistor (ohms) = 50. Direct Interelectrode Capacitances:^a</pre>	13000 umhos
Grid to plate	2.4 μμf 4.4 μμf 0.03 max. μμf 2.6 μμf 0.03 max. μμf 2.4 μμf
Mechanical:	
Operating Position. Dimensions. Weight (Approx.). Sockets: Heater-terminals connector.	See Dimensional Outline
Heater-terminals connector	Grayhill ^d No.22-5, or equivalent
Socket for operation up to about 550 Mc (Including heater-terminals connector)	. Jettron ^e No.CD7010, or equivalent
Cavities (Including heater- terminals connector)	J-V-M ^f No.D-7980 Series, Resdel ^g No.10 Series, or equivalent



🔶 indicates a change.

RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 1 9-62

H-Heater

K-Cathode

Terminal Connections (See Dimensional Outline):



G-Grid P-Plate

RADIO-FREQUENCY AMPLIFIER - Class A

Maximum CCS^h Ratings, Absolute-Naximum Values:

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

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

Typical CCS^h Operation in Cathode-Drive Circuit:

DC Plate-to-Grid Voltage Cathode Resistor	At 550 Mc 125 50 -70 to -20 12.5	At 700 Hc 125 50 -70 to -20 12.5	volts ohms dbm ma
of 5 Mc	16.5 6.5	17 7	db db
		At 1100 Mc	
DC Plate-to-Grid Voltage		150	volts
Cathode Resistor		50	ohms
Input-Signal-Level Range		–70 to –20	dbm
DC Plate Current		14	ma
Power Gain for a bandwidth of:			
4 Mc		20	db
8 Mc		18	db
Noise Figure		11.5	db

Maximum Circuit Values:

Grid-Circuit Resistance: For fixed-bias operation. Not recommended For cathode-bias operation. 0.25 max. megohm

-+ Indicates a change.



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

- a Without external shield. b
- Amerac, Inc., Dunham Road, Beverly, Massachuselts.
- C For use with cavities.
- Grayhill, Inc., 561 Hillgrove Avenue, LeGrange, Illinois.
- Jeliron Products, inc., 56 Route 10, Hanover, N.J.
- J-V-M Microwave Co., 9300 W. 47th St., Brockfield, 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 RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.205	0.245	атр
Direct Interelectrode				
Capacitances:		0.4	2.0	<i>c</i>
Grid to plate	-	2.1	2.8	μµf
Plate to cathode	_	2.0	4.8 0.03	μµf
Heater-Cathode Leakage Current:	_		0.05	μμt
Heater negative with				
respect to cathode	1,2	-	30	щa
Heater positive with			/-	
respect to cathode.	1,3		30	µа
Leakage Resistance:				
From grid to plate and				
cathode connected together.	1,4	100	-	megohms
From plate to grid and				
cathode connected together.	1,5	100	-	megohms
Reverse Grid Current	1,6	-	0.3	μa
Emission Voltage	7	- E0	3 100	volts
Amplification Factor	1,8 1.8	10000	100	μ <i>m</i> hos
Plate Current (1)	1,8	8.5	16.5	µminus ma
Plate Current (2)	1.9	_	50	μa
Plate Current (3)	1,10	100	_	щa
Power Gain	1,11	14	_	db
Noise Figure	1,11	-	7	db
Change in Power Gain	11,12	-	-1	db
Change in Noise Figure		-	+0.5	db
Change in Transconductance	11,12	-	15	%

Note With 6.3 volls ac or dc on heater. 1.1 Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode. Note 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. With plate 300 volts negative with respect to grid and cathode Note 5: which are connected together. With dc plate voltage of 200 volts, dc grid voltage of-2 volts, grid resistor of 0.5 megohm. Nole 6:

-Indicates a change.



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

Note	7;	Wilh 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.
Nole	11:	With dc plate-supply voltage of 125 volts and cathode resistor of 50 ohms in a single-lube rf amplifier of the cavity type having a bandwidth of 5 \pm 0.5 Kc, signal input of -70 dbm, and operaling frequency of 550 \pm 10 Mc.
Nole	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, [9.1] 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 2.

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.









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

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

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

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

Shock Test:

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

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

Heater-Cathode Leakage Current. . . 60 max. μa For conditions shown under Characteristics Range Values, Notes 1.4.

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 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



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

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

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 μ sec is applied between the grid and cathode. Next, measurement of signal-output voltage is made 0.8 μ sec after the leading edge of a pulse. This value of signal-output voltage referred to the initial value will not show a change in excess of -5 db.

Heater-Cycling Life Performance:

This test Isimilar 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.



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





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

- 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-10, 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 pronerly 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:

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 unchang+d from the above values.

100-Hour Survival Life Performance:

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



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

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

500- and 1000-Hour Average Life Performance:

This test (similar to MIL-E-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° 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:

-	9			
Heater Current		300 max.	ma	
For conditions shown under	Characteris	tics Range	e Values,	
Note 1.				
Leakage Resistance:				
From grid to plate and				
cathode connected togethe	r	60 min.	megohms	
From plate to grid and				_
cathode connected togethe	r	60 min.	megohms	
For conditions shown under	Characteris	tics Range	e Values,	•
Notes 1,4 and 1,5.				
Power Gain				
For conditions shown under	Characteris	tics Range	e Values,	
Notes 1, 11.				
Noise Figure				_
For conditions shown under	Characteris	tics Range	e Values,	
Notes 1,11.				
Change in Power Gain				
For conditions shown under	Characteris	tics Range	e Values,	
Notes 1, 11, 12.				
At the end of 1000 hours, t	he tube will	not show	permanent	
shorts or open circuits and will	I be critic	ized for t	the total	
number of defects in the samp	le lot and	for the n	umber of	
tubes failing to meet the follo	wing limits:			
Heater Current		300 max.	ma	
For conditions shown under				

Note 1.

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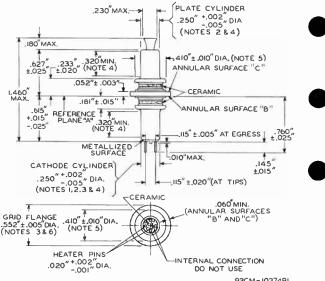
Noise Figure. 9.5 max. db For conditions shown under Characteristics Range Values, Nores 1,11.

OPERATING CONSIDERATIONS

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

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





92CM-10274RI

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

ANNULAR SURFACE "8" 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".

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

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

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

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

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

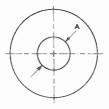
Electron Tube Division

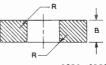


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GAUGES





92CS-10370

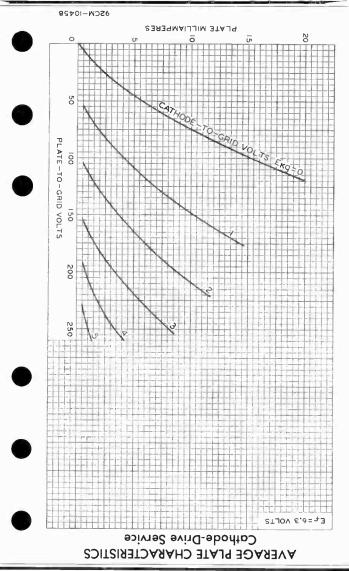
Gauge	Tues	Dimension							
Gauge	Туре	Diameter A	Thickness B	Radius R					
G1-1	GO	0.25200" <mark>+0.00000"</mark> -0.00007"	0.320" ^{+0.001"} -0.000"	0.003" MAX.					
G1-2	N0-G0	0.24500" ^{+0.00007"} -0.00000"	-	-					
G ₂ -1	GO	0.42000"-0.00000"	-	-					
G ₂ -2	NO-GO	0.40000" ^{+0.00007"} -0.00000"	-	-					
G ₃ -1	GC	0.55700" ^{+0.00000} " -0.00007"	-	-					
G ₃ -2	NO-GO	0.54700" ^{+0.00007"} _0.00000"		-					



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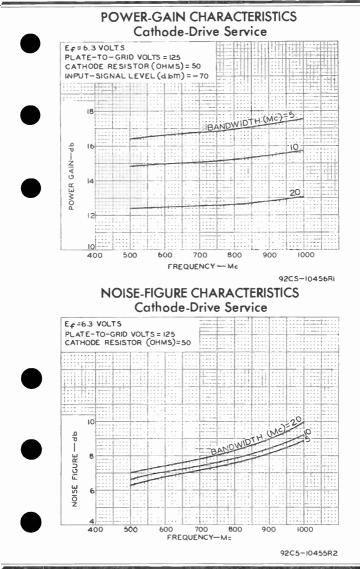




Electron Tube Division

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Harrison, N. J.

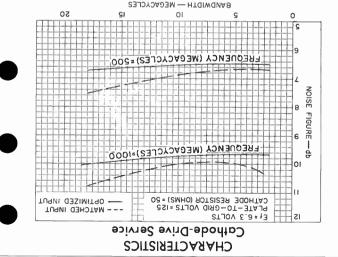




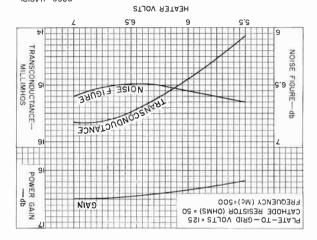
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Harrison, N. J.

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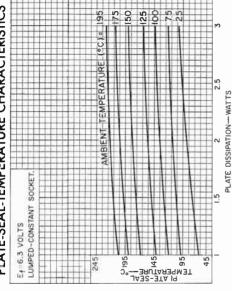
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CTERISTICS CHARA PLATE-SEAL-TEMPERATURE

World Radio History

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World Radio History

High-Mu Triode

CERAMIC-METAL PENCIL TYPE

FAST WARM-UP TIME STURDY COAXIAL-ELECTRODE STRUCTURE

For Use at Frequencies up to 5000 Mc in Cathode-Drive Circuits under Severe Shock and Vibration

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode: Voltage (AC or DC)	
heater volts = 6.3	
resistor (ohms) = 50 16000 μmhos	j.
Direct Interelectrode Capacitances: ^a Grid to plate	
Mechanical:	
Operating Position	2
Heazer-terminals connector Amerac ^b No.1018-88 ^c , Grayhill ^d No.22-5, or equivalent	
Socket for operation up to about	
550 Mc (Including heater- terminals connector) Jettron ^e No.CD7010, or equivalent	
Cavities (Including heater- terminals connector) Amerac No.1718 (for 4150 Mc), J-V-M ^f No.D-7980 Series, Resdel ^g No.10 Series, or equivalent	



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Terminal Connections (See Dimensional Outline):

H-Heater K-Cathode



G-Grid P-Plate

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

Maximum CCS^j Ratings, Absolute-Maximum Values:

At frequencies up to 5000 Mc and altitudes:

	Up to 80,000 feet	Between 80,000 and 100,000 feet	
DC PLATE VOLTAGE	250 max.	200 max.	volts
DC GRID VOLTAGE	-50 max.	-50 max.	volts
DC CATHODE CURRENT	25 max.	25 max.	ma
DC GRID CURRENT	6 ma×.	6 max.	ma
PLATE DISSIPATION	2.5 max.	2.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with			
respect to cathode	50 max.	50 max.	volts
Heater positive with			
respect to cathode	50 max.		volts
PLATE-SEAL TEMPERATURE	225 max.	225 max.	OC

Typical CCS^j Operation in Cathode-Drive Circuit:

As oscillator										
		At	At	At	At	At	At			
		500 Nc			3000 Мс					
DC Plate-to-Grid										
Voltage		205	203	151	125	200	200	volts		
DC Cathode-to-Grid										
Voltage		5	3	1	0.1	0.26	-	volts		
From a grid										
resistor of			600		500			ohms		
DC Cathode Current		21	24	24	20	23	25	ma		
DC Grid Current		5	5	4	0.2	2	-	ma		
Useful Power Output										
(Approx.)		1.6	1.3	0.5	0.15	0.1	0.03	watts		

--- Indicates a change.





As amplifier

						At 500 Mc	At 1000 Mc	
DC Plate-to-Grid Vol						204	185	volts
DC Cathode-to-Grid V	oltage.					4	10	volts
From a grid resist	or of .					800	2000	ohms
DC Cathode Current.						21	24	ma
DC Grid Current						5	5	ma
Driver Power Output						0.2	0.2	watt
Useful Power Output	(Approx.)	•	•	·	2.2	1.4	watts
Maximum Circuit Valu	es:							
Grid-Circuit Resista	nce					0.25	max.	megohm

FREQUENCY DOUBLER --- Class C

Maximum CCS^j Ratings, Absolute-Maximum Values:

At frequencies up to 2000 Nc and altitudes:

		Up to 80.000 feet	Between 80,000 and 100,000 feet						
DC PLATE VOLTAGE		250 max.	200 max.	volts					
DC GRID VOLTAGE		-50 max.	-50 max.	volts					
DC CATHODE CURRENT		22 max.	22 max.	ma					
DC GRID CURRENT		6 max.	6 max.	ma					
PLATE DISSIPATION		2.5 max.	2.5 max.	watts					
PEAK HEATER-CATHODE VOLTAGE:									
Heater negative with									
respect to cathode		50 max.	50 max.	volts					
Heater positive with									
respect to cathode		50 max.	50 max.	volts					
PLATE-SEAL TEMPERATURE		225 max.	225 max.	oC					

Typical CCS^j Operation in Cathode-Drive Circuit:

•	Up to 550 Mc	Up to 1000 Mc	
DC Plate-to-Grid Voltage DC Cathode-to-Grid Voltage From a grid resistor of . DC Catkode Current DC Grid Current Driver Power Output	193 207 18 7 3600 2300 20 18 5 3	$\begin{array}{cccc} 218 & 181 \\ 18 & 6 \\ 3600 & 2000 \\ 21 & 19 \\ 5 & 3 \end{array}$	volts voits ohms ma ma
(Approx.)	0.8 0.2	0.8 0.2	watt
(Approx.)	1.3 0.75	0.9 0.4	watts
Maximum Circuit Values: Grid-Circuit Resistance	••••	0.25 max.	megohm





-	FREQUENCY TR							
	Maximum CCS ^j Ratings, Absolut	e-Ma	ixii	num V	alues:			
	At frequencies up to	200	00 1	Vc an	d altı	tudes:		
		80		to ofee	80	letween ,000 and ,000 fee		
	DC PLATE VOLTAGE DC GRID VOLTAGE DC CATHODE CURRENT PLATE DISSIPATION PEAK HEATER-CATHODE VOLTAGF: Heater negative with	-	250 -50 20 6	max. max. max. max. max.	2	00 max. 50 max. 20 max. 6 n•x. .5 max.	volts volts ma ma	
	respect to cathode Heater positive with respect to cathode PLATE-SEAL TEMPERATURE		50	max. max. max.	!	50 max. 50 max. 25 max.	volts volts o _C	
	Typical CCS ^j Operation in Cat	hode	e-Di	rive	Circui	t:		
	Up to							
	DC Plate-to-Grid Voltage DC Cathode-to-Grid Voltage From a grid resistor of . DC Cathode Current DC Grid Current Driver Power Output (Approx.) Useful Power Output (Approx.)	•	· ·		202 27 9000 19 3 0.6 0.7	240 15 25000 13 0.6 0.2 0.4	volts volts ohms ma watt watt	
	Up to	100	00 1	Yc.				
	DC Plate-to-Grid Voltage DC Cathode-to-Grid Voltage. From a grid resistor of . DC Cathode Current. DC Grid Current. Driver Power Output (Approx.) Useful Power Output (Approx.)	•	· ·		205 30 10000 19 3 0.6 0.4	185 10 14000 12 0.7 0.2 0.15	volts volts ohms ma watt watt	
	Maximum Circuit Values:							
	Grid-Circuit Resistance				0.25	max.	megohm	
	^a without external shield. ^b Amerac, inc., Dunham Road, Beverl	ly.	Mass	achus	etts,			

Amerac, Inc., Dunham Road, Beverly. Massachusetts.

- C For use with cavities.
- d Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Hilinois.
- e Jettron Products, Inc., 56 Route 10, Hanover, N.J.
- f J-V-M Microwave Co., 9300 W. 47th St., Brookfield, Illinois. Indicated No. applies to a series of cavities covering range from 220 to 3500 Mc.
- 9 Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavilies covers the range from 215 to 2325 Mc.
- h Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio frequency envelope does not exceed 115 per cent of the carrier conditions.
- J Continuous Commercial Service.

-- indicates a change.



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СН	ARACTERISTICS	RANGE	VALUE	S FOR	EQUIPME	NT DESI	GN 🚽
				Note	Min.	Max.	
	urrent nterelectrode tances:			1	0.205	0.245	amp
Grid t	o plate o cathode to cathode		· ·	-	1.5 3.6 -	2.7 5.0 0.04	µµ f µµ f µµ f
Heater-C	athode Leakage negative with	e Curre	ent:				, ,
	ect to cathode positive with		•••	1,2	-	30	μа
Leakage	ect to cathode Resistance: rid to plate a		•••	1,3	-	30	μа
	ode connected late to grid a		er.	1,4	100		megohms
	ode connected		ner.	1,5	100	-	megohms
	Grid Current.		• •	1,6	-	0.3	μa
	Voltage			7	-	4	volts
Amplific	ation Factor.		• •	1,8	55	85	
Transcon	ductance			1,8	12500	19500	µmhos
	rrent (1)			1,8	9	19	ma
Plate Cu	rrent (2)			1,9	-	50	μa
Power Ou	tput			1,10	1.7	-	watts
Change i	n Power Outpu	t	•••	1,11		0.2	watt
Note 1:	With 6.3 volts	ac or de	c on he	ater.			
Note 2	With 60 volts of with respect to			ter and	cathode	, heater	negative
Note 3:	With 60 volts of with respect to	cathod	2.				
Note 4: Note 5:	With grid 100 v which are conne With plate 300	cted to	gether.				
Note 6:	which are conne With dc plate	cted to	géther.			-	
Note 7:	volts, grid res With dc voltage	istor o	ľ 0.5 m	egohm.			
	adjusted to pro volts on healer	duce a	cathod	e curren	t of 30	ma., and	with 5.5
Note 8:	With dc plate of 50 ohms, and	cathod	e bypas	s capac	itor of :	1000 µf.	
Note 9:	With dc plate volts.	-					-
Note 10:	In a single-tub a frequency of voltage of 250 grid voltage ad	approx. volts, justed i	550 ± 1 input- to prod	0 Mc, an signal uce a d	d with do power of c plate o	c plate t 0.2 wat current c	o cathode t, and dc f 20 ma,
Note 11:	Reduce heater value from tha exceed indicate	t obtai	ned wi	th 6.3	Change volts or	e in Pow i heater	er-Output will not



🖛 Indicates 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 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:

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 500 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 500 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 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 the test, the tubes will not show permanent sharts or open circuits and will meet the following test limit:



-Indicates a change.



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Shock Test:

This test (similar to MIL-L-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 50D 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 Cutput. . . 200 max. mv For conditions shown above under Low-Frequency Vibration Performance.

Channe 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 are required to 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 2D 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:

Ceramic-Seal-Fracture Test:

This test is performed on a sample lot of tubes every 90 day:. With cathode- and plate-cylinder-supports spaced 15/16" ± 1/64", and with the grid flange centered between these supports, the tubes will withstand the 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 MIL-E-ID, paragraph 4.9.6.3) is performed on a sample lot of tubes every 90 days. Tubes are tested by first immersing in water having a temperature of at least 97° C for at least 15 seconds and then immersing immediately in water at not more than 5° C for 5 seconds. After drying for 48 hours at room temperature, the tubes will meet the following test limit:

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

Heater-Cycling Life Performance:

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

At the end of this test, tubes will not show permanent shorts or open circuits and are required to 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 4.11.3.1a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions:

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

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

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







100-Hour Survival Life Performance:

This test (similar to MIL-E-ID, paragraph 4.11.3.1b) 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 *z*-Hour Stability Life Performance except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off.

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

- Transconductance. 9000 min. μ mhos For conditions shown under Characteristics Range Values, Notes 1, S.

500- and 1000-Hour Dynamic 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 high-quality rf performance. Each tube is life-tested as a class C amplifier in special cavity at 550 ± 10 Mc under the following conditions: Heater voltage of 6.3 volts; plate supply voltage of 250 volts; cathode resistor adjusted to give plate current of 25 ma.; and grid-circuit resistance adjusted to give grid current of 6 ma., heater positive with respect to cathode by 67.5 volts, and plate-seal temperature of 225° C. Heater voltage is cycled at a rate of 110 minutes off.

At the end of 500 hours, the tubes will not show permanent shorts or open circuits, and will be criticized for total number of tubes failing to pass the following limits:

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

Leakage Resistance:

From grid to plate and

- cathode connected together. . . 60 min. megohms From plate to grid and
- cathode connected together. . . 60 min. megohms For conditions shown under Characteristics Range Values. Notes 1,4, and 1,5.
- Power Output. 1.5 min. watts For conditions shown under Characteristics Range Values, Notes 1, 10.

At the end of 1000 hours, the tubes will not show permanent shorts or open circuits and will be criticized for total number of tubes failing to pass the following limits:



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watts For conditions shown under Characteristics Range Values, Notes 1, 10.

OPERATING CONSIDERATIONS

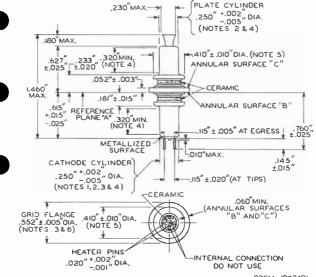
Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm, large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.

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 maximumrated values shown in the tabulated data.





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92CM-10274RI

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

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

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

NOTE I: WITH ANNULAR SURFACE "B" RESTING DN REFERENCE PLANE "A". THE AXIS DF THE CATHODE CYLINDER WILL BE WITEIN 2[°] DF A LINE PERPENDICULAR TD REFERENCE PLANE "A".

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

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

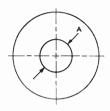
NOTE 4: THE DIAMETER ALONG THE 0.320" MINIMUM LENGTH IS MEASURED WITH "GO" AND "NO-GO" RING GAUGES $\rm G_1-I$ AND $\rm G_1\sim2$, RESPECTIVELY.

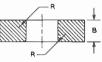
NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G_2-I AND G_2-2 , RESPECTIVELY.

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



GAUGES



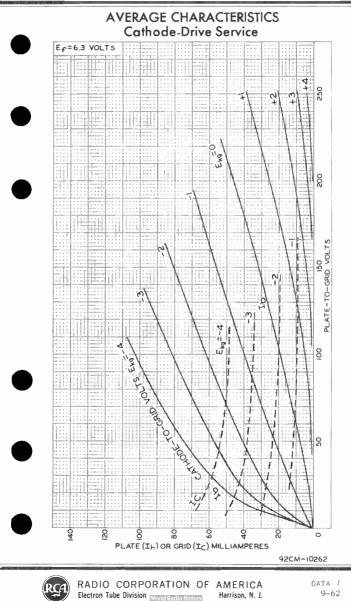


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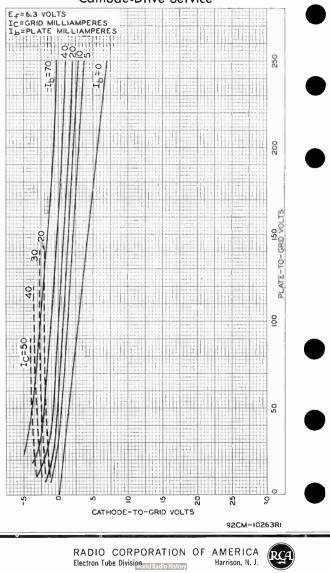
Gauge	Type	Dimension							
dauge	Туре	Diameter A	Thickness B	Radius R					
G 1 - I	GO	0.25200"+0.00000" -0.00007"	0.320"+0.001" -0.000"	0.003" MAX.					
G ₁ -2	NO-GO	0.24500" ^{+0.00007} " -0.00000"	-	-					
G₂-↓	GO	0.42000"+0.00000" -0.00007"	-	-					
G ₂ -2	NO-GO	0.40000" ^{+0.00007"} -0.00000"	-	-					
G ₃ -1	GO	0.55700" <mark>+0.00000"</mark> -0.00007"	-	-					
G ₃ -2	NO-GO	0.54700"+0.00007" -0.00000"	-	-					

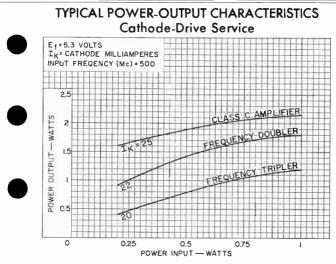


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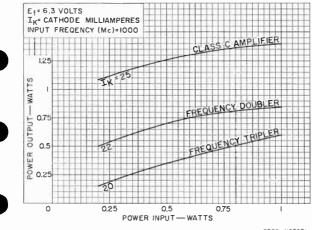


AVERAGE CONSTANT-CURRENT CHARACTERISTICS Cathode-Drive Service





92CS-11625RI



92CS~11626RI



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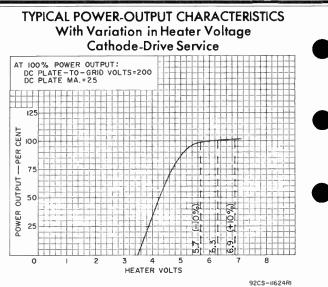
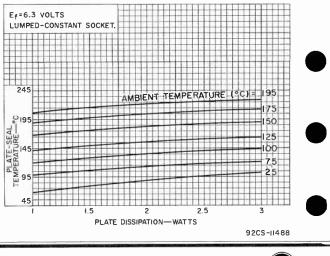


PLATE-SEAL-TEMPERATURE CHARACTERISTICS



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

amp

μµf

μµf

μuf

μµf

μµf

volts

volts

volts

ohms

megohm

ohms

ma

umhos

volts

Medium-Mu Triode

NUVISTOR TYPE For Industrial Applications

GENERAL DATA

Electrical: Heater, for Unipotential Cathode: Voltage (AC or DC) 6.3 ± 10% volts Current at 6.3 volts 0.14 Direct Interelectrode Capacitances (Approx.): Grid to plate. . . 2.2 4 Plate to cathode, shell, and heater. . . 1.4 Plate to cathode 0.2 Heater to cathode. 1.3 Characteristics, Class A, Amplifier: Plate Supply Voltage . . . 75 Plate Voltage. 26.5 40 Grid Supply Voltage. . . . 0 0 0 . Cathode Resistor _ 130 Amplification Factor 33 31 35 Grid-Circuit Resistance. . . . 0.5 0.5 _ Plate Resistance (Approx.) . . . 4400 2900 3200 Transconductance 7000 11000 11500 Plate Current. 2.8 6.8 10.5 Grid Voltage (Approx.) for plate $\mu a = 10....$ -6.5Mechanical: Envelope Metal Shell . . . Socket . . . Cinch Mfg. Corp. No.133 65 10 001, or equivalent Base Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65) Pin 1^A - Internal Con-

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



INDEX=LARGE LUG = PIN CUT OFF



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DATA I 8-60

INDUSTRIAL SERVICE

Maximum Ratings, Absolute-Naximum Values:

For operation at any altitude

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

Maximum Circuit Values:

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

Pin is cut off close to ceramic wafer.

• For operation at metal-shell temperatures up to 100° C.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Nin.	Max.		
Heater Current	1	0.132	0.148	amp	
Capacitances: Grid to plate Grid to cathode, shell, and	2	1.9	2.5	μµf	
heater	2	3.5	4.5	µµuf	
heater	2 2 2	1.1 1 0.14	1.6 1.6 0.26	µµւf µµւf µµւf	
Plate Current (1)	1,3 1,4	_ 9	12 50	ma μa	
Transconductance (1) Transconductance (2) Transconductance Change:	1,3 3,5	10000 9000	13000 -	µmhos µmhos	
Difference between Trans- conductance (1) and Trans- conductance (2), expressed					
in per cent of Transconduc- tance (1)	_	-	15	%	
Reverse Grid Current Amplification Factor Heater-Cathode Leakage Current:	1,6 1,3	26	0.3 38	μа	
Heater negative with respect to cathode Heater positive with	1,7	****	10	μa	
respect to cathode	1,7	-	10	μa	

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	Resistance: en grid and all other				
ele	ctrodes tied together en plate and all other	1,8	500	-	megohms
	ctrodes tied together	1,9	500	-	megohms
Note 1:	With 6.3 volts ac or dc on hea	ater.			
Note 2:	Measured in accordance with E	[A Standar	d RS-19	1-A.	
Note 3:	With dc plate supply volts = and cathode-bypass capacitor =			istor =	: 130 ohms,
Note 4:	With dc plate volts = 75, dc connected to ground.	grid vol	ts = -7	, and m	netal shell
Note 5:	With 5.7 volts ac or dc on hea	ater.			
Note 6:	With dc plate volts = 100, resistor = 0.5 megohm, and me	grid supp Lal shell	oly vol connect	ts = - ed to g	2.25, grid ground.
Note 7:	with 100 volts dc applied bet	ween heate	er and c	athode	
Note 8:	With grid 100 volts negative w tied together.	ith respec	t to all	other	electrodes
Note 9:	with plate 300 volts negative w tied together.	ith respec	t to all	other	electrodes

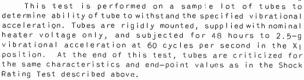
SPECIAL RATINGS & PERFORMANCE DATA

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 (fiyweight) Shock Machine and are subjected to 20 blows at a hammer angle of 60° (equivalent to 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.



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 10,000 cycles per second with a constant vibrational acceleration of 1 g. During the test, tube will not show an rms output voltage across the plate-



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load resistor in excess of: (1) 50 millivolts from 50 to 5000 cps, (2) 250 millivolts from 5000 to 7000 cps, and (3) 500 millivolts from 7000 to 10,000 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, Continuity, and Reverse Grid Current:

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*. See accompanying Shorts-Test Acceptance-Limits curve. Tubes are criticized for permanent or temporary shorts and open circuits, and also test is made for reverse grid current in excess of one microampere under the conditions specified in CHARACTERISTICS RANGE VALUES for reverse grid current.

Interelectrode Leakage:

These tests are performed on a sample lot of tubes from each production run under the following conditions: heater volts = 6.3, (1) plate = 300 volts negative with respect to all other electrodes tied together, and (2) grid = 100 volts negative with respect to all other electrodes tied together. Tubes are rejected if the leakage resistance between plate and all other electrodes under condition (1), or between grid and all other electrodes under condition (2), is less than 500 megohms.

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 two 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 O-hour value.

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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 plated issipation, and then subjected to the Intermittent Shorts 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).

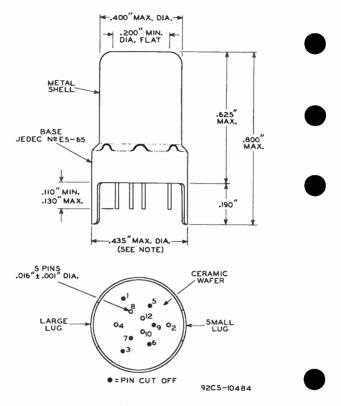
1000-Hour Life Performance:

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 intransconductance 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.

Specifications for tapper supplied on request.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. ÐATA 3 8-60



NOTE: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0. 190" LUG LENGTH.

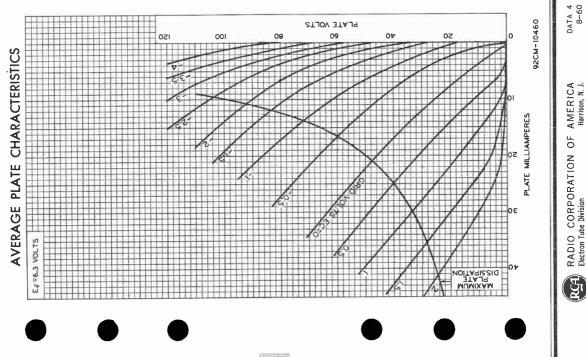


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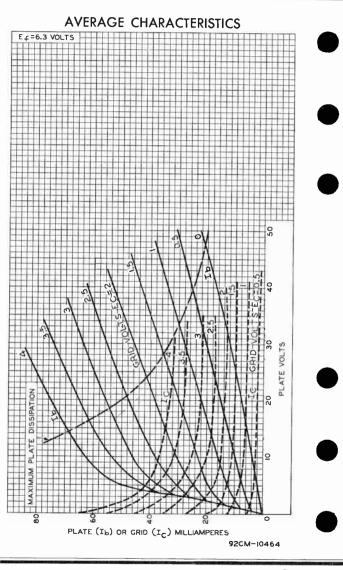
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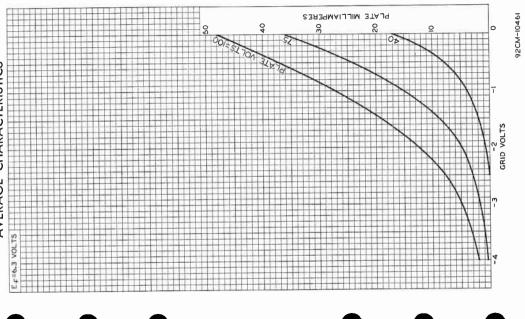
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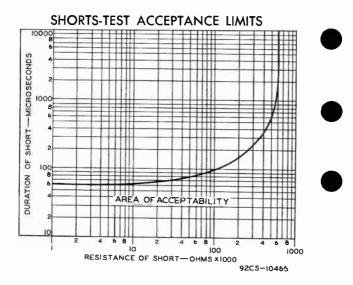
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	Beam Power Tube
	CERAMIC-METAL SEALS "ONE-PIECE" ELECTRODE DESIGN FORCED-AIR COOLED 9000-WATTS PEAK-PULSE INPUT UP TO 1215 MC MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE
	For Use at Frequencies up to 2000 Mc under S <u>evere Shock and V</u> ibration
	GENERAL DATA
	Electrical:
	Heater, for Matrix-Type, Oxide- Coated, Uniootential Cathode: Voltage (AC or DC) 6.3 \pm 10% volts Current at heater volts = 6.3 3.2 amp Minimum heating time 60 sec Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 1000, grid-No.2 volts = 500, and plate ma. = 115 18 Direct Interelectrode Capacitances: ^a Grid No.1 to plate 0.13 max. $\mu\mu f$ Plate to cathode & heater 0.19 max. $\mu\mu f$ Grid No.1 to grid No.2 20 $\mu\mu f$ Grid No.1 to plate 6.5 $\mu\mu f$ Grid No.2 to cathode & heater
	Mechanical:
	Operating Position
	For frequencies up to about 400 Mc
•	G ₁ -Grid-No.1- Terminal Contact Surface G ₂ -Grid-No.2- Terminal Contact Surface H - Heater- & Contact Surface H - Heater- & Contact Contact Contact Surface H - Heater- & Contact
	Surface Air Flow:
	Through radiator—Adequate air flow to limit the platetermi- nal temperature to 250° C should be delivered by a blower → Indicates a change.



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through the radiator before and during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator without cowling and with cowling versus plate dissipation are shown in accompanying Typical-Cooling-Requirements curves. Plate power, grid-No.2 power, and air flow may be removed simultaneously.

To Grid-No. 2. Grid-No. 1. Cathode, and Heater Terminals-A sufficient quantity of air should be delivered to these seals to prevent their temperature from exceeding the specified maximum value of 250° C.

During Standby Operation-Cooling air is not normally required when only heater voltage is applied to the tube. Terminal Temperature (Plate, grid No.2,

00 grid No.1, cathode, and heater) 250 max.

GRID-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS^c Ratings, Absolute-Naximum Values:

For maximum "on" timed of 10 microseconds

				Up to 1215 Mc
- DC PLATE VOLTAGE		•	•	. 2250 max. volts
PEAK POSITIVE PULSE-				
GRID-No.2 VOLTAGE		•	•	
DC GRID-No.1 VOLTAGE		•	•	 -200 max. volts
DC PLATE CURRENT DURING PULSE .			•	• 3000 max. ma
DC PLATE CURRENT.				 80 max.
GRID-No.2 INPUT (Average)		•	•	 4.5 max. watts
GRID-No.1 INPUT (Average)				 2 max. watts
PLATE DISSIPATION (Average)	• •	•	•	. 115 max. watts

Typical Operation:

In class-AB ₂ cathode-dr	i ve	e c	ir	c u	i t	with re	ctangula	r-	
wave pulses [°] at 1215 Mc	ano	l w	i th	d	ut	y factor	r' of o.	01	
DC Plate Voltage Peak Positive-Pulse	•	•••	•	•	•	1350	1500	volts	
Grid-No.2 Voltage						700	700	volts	
DC Grid-No.1 Voltage						0	0	volts	
DC Plate Current during pul	se					2700	3000	ma	
DC Plate Current	•				•	47	53	ma	
DC Grid-No.2 Current	•				•	1.6	2	ma	
DC Grid-No.1 Current	•					5	5	ma	
Driver Power Output at peak									
of pulse (Approx.) ⁹				•	•	390	460	watts	
Useful Power Output at peak of pulse (Approx.)		•••				1600 ^h	2300 ^h	watts	
Maximum Circuit Values:									

Grid-No.1-Circuit	. Resista	ance			
under any cond	ition		 	30000 max.	ohms

- Indicates a change.



RADIO CORPORATION OF AMERICA **Electron Tube Division** World Radio History

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PLATE-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS^c Ratings, Absolute-Maximum Values:

For maximum "on" timed of 10 microseconds

ÜÞ.	to	1215	MC

PEAK POSITIVE-PULSE PLATE VOLTAGE	3000 max.	volts
PEAK POSITIVE-PULSE GRID-No.2 VOLTAGE	750 max.	volts
DC GRID-No.1 VOLTAGE	-200 max.	volts
DC PLATE CURRENT DURING PULSE	3000 max.	ma
DC PLATE CURRENT	50 max.	та
GRID-No.2 INPUT (Average)	4.5 max.	watts
GRID-No.1 INPUT (Average)	2 max.	watts
PLATE DISSIPATION (Average)	115 max.	watts

Typical Operation:

· · · · · · · · · · · · · · · · · · ·								
In class AB $_{2}$ cathode-drive $^{\rm e}$ circuit with rectangular- wave pulses at 1215 Mc and with duty factor $^{\rm f}$ of 0.01								
Peak Positive-Pulse Plate Voltage Peak Positive-Pulse Grid-	2700	3000	volts					
No.2 Voltage	700	700	volts					
DC Grid-No.1 Voltage	0	0	volts					
DC Plate Current during pulse	2700	3000	ma					
DC Plate Current	32	35	ma					
DC Grid-No.2 Current	1	2	ma					
DC Grid-No.1 Current	9	8	ma					
Driver Power Output at peak of pulse (Approx.) ^g Useful Power Output at peak	350	450	watts					
of pulse (Approx.).	3700 ^h	4500 ^h	watts					

Maximum Circuit Values:

- ⁸ Measured with special shield adapter.
- b For socket to be used with the 7649 consult manufacturers such as J-V-M Nicrowave Company, 4631 Lawndale Avenue, Lyons, 111inois; E. F. Johnson, Waseca, Minnesota; and Collins Radio Company, 855 35th Street North, Cedar Rapids, Iowa.
- C Continous Commercial Service.
- down there is defined as the sum of the durations of all the individual pulses which occur during any 1000-microsecond interval. An increase in dc plate current during the pulse may be permissible at shorter "on" times, and a decrease is usually required at longer "on" times. Pulse dwration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the pase. The peak value is defined as the maximum value of asmooth curve through the average of the fluctuations over the top portion of the pulse.
- e Cathode is at dc ground potential.
- f Duty factor is defined as the ratio of "on" time to total elapsed time in any 1000-microsecond interval.
- g Driver power output includes circuit losses and feed-through power. It is actual power measured at input to the tube drive circuit. It will vary with frequency of operation and driver circuitry.
- h This value of useful power is measured in load of output circuit.





-	CHARACTERISTICS RANGE VALUES	FOR EQ	UIPMEN	T DESIGN	
		Note	Min.	Max.	
1. 2.	Heater Current	. 1	2.90	4.00	amp
	Grid No.1 to plate	2	-	0.13	μµf
	& heater. Plate to cathode & heater Grid No.1 to grid No.2. Grid No.2 to plate. Grid No.2 to cathode	. 2	11.8 - 17.3 5.8	15.2 0.019 21.9 6.8	µµ⊥f µµ⊥f µµ⊥f µµ⊥f
3. 4. 5. 6. 7. 8. 9.	& heater Grid-No.1 Voltage Reverse Grid-No.1 Current Grid-No.2 Current Peak Emission Voltage Interelectrode Leakage Resistance Power Output	1,3 1,7 1,7 1,3 1,4 5 1,6	-20 6 5 - 4500 -	1.3 -50 -18 -20 11 250 - -	μμf volts volts μa volts megohm watts volts
	2: Measured with special shield ada	pter. volts, d age adju n heater se-volta e durat pps, and adjuste . After l not ex	sted to ge sour ion is : duty fa d until 1 minu ceed 20	give a d to.1, grid ce connec 2 microse ctor is 0 a peak c te at this 0 volts	c plate d No.2, ted be- conds, .00012. :athode value, (peak).

Note 5: Under conditions with tube at 20° to 30°C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200volt Wegger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.

- Note 6: In a plate-and-screen-pulsed cathode-drive cavity at 1215 Mc and for conditions with 6.3 volts ac or dc on heater, peak plate voltage of 3000 volts, peak grid-No.2 voltage of 700 volts, driver power of 560 peak watts, and grid-No.1 voltage varied for peak plate current of 3 amperes. Pulse duration is 10 microseconds and duty factor is 0.01.
- Note 7: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 ma.
- Note 8: With dc plate voltage of 2250 volts, dc grid-No.2 voltage of 700 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma.

SPECIAL TESTS & PERFORMANCE DATA









50-g, II-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified longduration impact acceleration. Tubes are held rigid in six different positions in a Medium-impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes are required to meet the limits for items 1, 3, 5, 8, 9, and 10 under Characteristics Range Values for Equipment Design.

500~g, Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes are required to meet the limits for items 1, 3, 5, 8, 9, and 10 under Characteristics Range Values for Equipment Design.

5-to-2000 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute sweep consisting of:

- a. 5-to-10 cps with fixed double amplitude of 0.08 inch ± 10%.
- b. 10-to-15 cps at fixed acceleration of 0.41 g ± 10%.
- c. 15-to-75 cps with fixed double amplitude of 0.036 inch \pm 10%.
- d. 75-to-2000 cps at fixed acceleration of 10 g ± 10%.

Ouring the above vibration tests, tubes will not show an rms output voltage in excess of 15 volts across the plate load resistor in the 5-to-2000 cps range. At the end of this test, tubes are required to meet the limits for items 1, 3, 5, 8, 9, and 10 under Characteristics Range Values for Equipment Design.

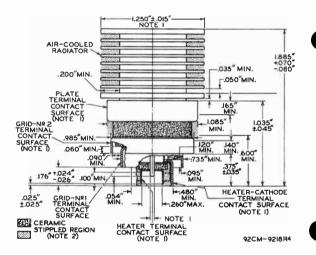
OPERATING CONSIDERATIONS

A suggested mounting arrangement for the 7649 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

During standby periods in intermittent operation, it is recommended that the heater voltage be maintained at normal operating value when the period is less than 15 minutes, and that it be reduced to 80 per cent of normal when the period is between 15 minutes and 2 hours. For longer periods, the heater voltage should be turned off.



RADIO CORPORATION OF AMERICA Electron Tube Division The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



NOTE I: WITH THE CYLINDRICAL SURFACES OF THE PLATE TERMINAL, GRID-NO.2 TERMINAL, GRID-NO.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G₁. THE TUBE IS PROPERLY SEATED IN THE GAUGE WHEN A 0.0ID"-THICKNESS GAUGE 1/8" WIDE WILL NOT ENTER BETWEEN THE HEATER-CATHODE TERMINAL AND THE BOTTOM SURFACE OF H₄. THE GAUGE IS PROVIDED WITH A SLOT TO PERMIT MAKING MEASUREMENT OF SEATING OF HEATER-CATHODE TERMINAL ON BOTTOM OF HOLE H₄.

NOTE 2: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.





Beam	Power	Tube
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	COAXIAL-ELECTRODE STRUCTURE INTEGRAL RADIATOR FORCED-AIR COOLED 9000-WATTS PEAK-PULSE INPUT UP TO 1215 MC MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE For Use at Frequencies up to 2000 Mc Under Severe Shock and Vibration
•	GENERAL DATA
H	Electrical: Heater, for Matrix-Type, Oxide- Coated, Unipotential Cathode: Voltage (AC or DC)
	for plate volts = 1000, grid-No.2 volts = 500, and plate ma. = 115 18 Direct Interelectrode Capacitances: Grid No.1 to olate 0.13 max. μμf Grid No.1 to cathode & heater 14 μμf Plate to cathode & heater 20 μμf Grid No.2 to grid No.2 20 μμf Grid No.2 to plate 6 μμf Grid No.2 to cathode & heater 13 max. μμf
	Hechanical:
U U V F S	Operating Position. Any Overall Length. 1.885" + 0.070" - 0.080" Greatest Diameter (See Dimensional Outline) 1.250" ± 0.015" Weight (Aoprox.) 2 oz Adiator. Integral part of tube Socket: For frequencies up to about 400 Mc. For use at higher frequencies. See Nounting Arrangement Terminal Connections (See Dimensional Outline):
•	G ₁ - Grid-No. 1- Terminal Contact Surface H - Heater- H, K - Heater- Cathode- Contact Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface Surface H - Heater- Terminal Contact Surface H - Heater- Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface
	Air Flow:
	Through radiator—Adequate air flow to limit the plate termi- nal temperature to 250°C should be delivered by a blower



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

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through the radiator before and during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator without cowling and with cowling versus plate dissipation are shown in accompanying Typical-Cooling-Requirements curves. Plate power, grid-No.2 power, and air flow may be removed simultaneously.

- To Grid-No.2, Grid-No.1, Cathode, and Heater Terminals-A sufficient quantity of air should be delivered to these seals to prevent their temperature from exceeding the specified maximum value of 250° C.
- During Standby Operation Cooling air is not normally required when only heater voltage is applied to the tube.
- Terminal Temperature (Plate, grid No.2, °C

GRID-AND-SCREEN-PUISED RE AMPLIEIER

Maximum CCS* Ratings, Absolute-Naximum Values:

For maximum "on" time of 10 microseconds

						ι	l¢ to 121	5 Mc
DC PLATE VOLTAGE	•	•	•	•	•	•	1500 ma	x. volts
PEAK POSITIVE PULSE- GRID-No.2 VOLTAGE							750	x. volts
DC GRID-No.1 VOLTAGE								
DC PLATE CURRENT DURING PULSE								
DC PLATE CURRENT	•						80 ma	x. ma
GRID-No.2 INPUT (Average)								
GRID-No.1 INPUT (Average)		•	•	•		•	2 ma	x. watts
PLATE DISSIPATION (Average) .	•	•		•			115 ma	x. watts

Typical Operation:

	In cl	lass-AB,	, ca	thod	de	-dr	10	e 🌢	с	iri	cu	١t	with r	ectangul	ar-
1	vave	pulses	at	121	5	Мc	an	d	ωı	th	a	lut	y fact	ortof o	. 01
DC P	late	Voltage	e										1350	1500	volts
		itive-Pu													
Gr	id-No	o.2 Volt	t age										700	700	volts
		Vo.1 Vo												0	volts
		Current												3000	ma
DC P	late	Current	t	• •				•		•	•	•	47	53	ma

DC Grid-No.2 Current		•		•		•	1.6	2	ma
DC Grid-No.1 Current							5	5	ma
Driver Power Output at peak									
of pulse (Approx.)*							390	460	watts
Useful Power Output at peak							-		
of pulse (Approx.)							1600 [®]	2300 [®]	watts
Maximum Circuit Values:									
Cold No. 1 Closuit Decisions									

Grid-No.1-Circuit Resistance under any condition 30000 max. ohms



RADIO CORPORATION OF AMERICA Electron Tube Division

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PLATE-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS* Ratings, Absolute-Naximum Values:

For maximum "on" time of 10 microseconds

Up	to 1215 MC	
PEAK POSITIVE-PULSE PLATE VOLTAGE	3000 max.	volts
PEAK POSITIVE-PULSE GRID-No.2 VOLTAGE	750 max.	volts
DC GRID-No.1 VOLTAGE	-200 max.	volts
DC PLATE CURRENT DURING PULSE	3000 max.	ma
DC PLATE CURRENT.	50 max.	ma
GRID-No.2 INPUT (Average)	4.5 max.	watts
GRID-No.1 INPUT (Average)	2.0 max.	watts
PLATE DISSIPATION (Average)	115 max.	watts

Typical Operation:

In class AB, cathode-drive circuit	with rec	tangula	r-
wave pulses at 1215 Hc and with dut	y factor	♦ of o.a	71
Peak Positive-Pulse Plate Voltage	2700	3000	volts
Peak Positive-Pulse Grid-			
No.2 Voltage	700	700	volts
DC Grid-No.1 Voltage	0	0	volts
DC Plate Current during pulse	2700	3000	ma
DC Plate Current	32	35	ma
DC Grid-No.2 Current	1	2	ma
DC Grid-No.1 Current	9	8	ma
Driver Power Output at peak			
of pulse (Approx.)#	350	450	watts
Useful Power Output at peak	-		
of pulse (Approx.)	3700 °	4500 [®]	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition . . . 30000 max. ohms

- Measured with special shield adapter.
- For socket to be used with the 7649 consult manufacturers such as J-V-M Nicrowave Company, 4631 Lawndale Avenue, Lyons, 111inois; E. F. Johnson, waseca, Minnesota; and Collins Radio Company, 855 35th Street North, Cedar Rapids, Iowa.
- * Continous Commercial Service.
- "Gm" time is defined as the sum of the durations of all the individual pulses which occur during any 1000-microsecond interval. An increase in dc plate current during the pulse may be permissible at shorter "on" times, and a decrease is usually required at longer "on" times. *Pulse* duration is defined as the time interval betwen the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The peak value is defined as the time maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.
- Cathode is at dc ground potential.
- Duty factor is defined as the ratio of "on" time to total elapsed time in any 1000-microsecond interval.
- Driver power output includes circuit losses and "eed-through power. It is actual power measured at input to the tube drive circuit. It will vary with frequency of operation and driver circuitry.
- This value of useful power is measured in load of output circuit.



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



CHARACTERISTICS RANGE VALUES FOR EQUIPMENT	CHARACTERISTICS	RANGE	VALUES	FOR	EOUIPMENT	DESIGN
--	-----------------	-------	--------	-----	-----------	--------

		Note	Min.	Max.	-
1. 2.	Heater Current Direct Interelectrode Capacitances:	1	2.90	4.00	amp
	Grid No.1 to plate Grid No.1 to cathode	2	-	0.13	μμf
	& heater	2	11.8	15.2	μμf
	Plate to cathode & heater	2	-	0.019	μμf
	Grid No.1 to grid No.2	2	17.3	21.9	μµf
	Grid No.2 to plate	2	5.3	6.3	μμ.f
	Grid No.2 to cathode				
	å heater	2	-	1.3	μμ. f
3.	Grid-No.1 Voltage	1.3	-20		
4.	Grid-No.1 Voltage	1.7	-6	-15	volts
5.	Reverse Grid-No.1 Current	1.7	_	-20	μa
6.	Grid-No.2 Current	1.3	-10	+5	ma 👝
7.	Peak Emission Voltage		-	200	volts
8.	Interelectrode Leakage				
	Resistance	5	1		megohm
9.	Power Output		4500	-	watts
	Grid-No.1 Cutoff Voltage		-	-100	volts

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

note 2: Measured with special shield adapter.

Note 3: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 700 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 ma.

- Note 4: For conditions with 6.3 volts on heater; grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.0012. The voltage-pulse amplitude is adjusted until a peak cathode current of 13 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed 200 volts (peak).
- Note 5: Under conditions with tube at 20⁰ to 30⁰ C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.
- Note 6: In a plate-and-screen-pulsed cathode-drive cavity at 1215 Mc and for conditions with 6.3 volts ac or dc on heater, peak plate voltage of 3000 volts, peak grid-No.2 voltage of 700 volts, driver power of 560 peak watts, and grid-No.1 voltage varied for peak plate current of 3 amperes. Pulse duration is 10 microseconds and duty factor is 0.01.
- Note 7: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 ma.
- Note 8: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 700 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma.

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, New Jersey, on request.



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



50-g, II-Millisecond Shock Test:



This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified longduration impact acceleration. Tubes are held rigid in six different positions in a Medium-impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes are required to meet the limits for items 1, 3, 5, 8, 9, and 10 under Characteristics Range Values for Equipment Design.

500-g, Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes are required to meet the limits for items I, 3, 5, 8, 9, and 10 under Characteristics Range Yalues for Equipment Design.

5-to-2000 cps Vibration Test:

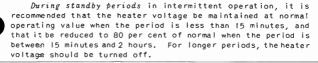
This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute sweep consisting of:

- a. 5-to-10 cps with fixed double amplitude of 0.08 inch \pm 10%.
- b. 10-to-15 cps at fixed acceleration of 0.41 g ± 10%.
- c. 15-to-75 cps with fixed double amplitude of 0.036 inch \pm 10%.
- d. 75-to-2000 cps at fixed acceleration of 10 g ± 10%.

During the above vibration tests, tubes will not show an rms putput voltage in excess of 15 volts across the plate load resistor in the 5-to-2000 cps range. At the end of this test, tubes are required to meet the limits for items 1, 3, 5, 8, 9, and 10 under Characteristics Range Values for Equipment Design.

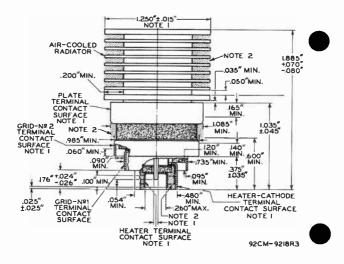
OPERATING CONSIDERATIONS

A suggested mounting arrangement for the 7649 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.





RADIO CORPORATION OF AMERICA Electron Tube Division The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



NOTE I: WITH THE CYLINDRICAL SURFACES OF THE PLATE TERMINAL, GRID-NO.2 TERMINAL, GRID-NO.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G_1 . THE TUBE IS PROPERLY SEATED IN THE GAUGE WHEN A D.DID"-THICKNESS GAUGE I/B" WIDE WILL NOT ENTER BETWEEN THE HEATER-CATHODE TERMINAL AND THE BOTTOM SURFACE OF H₄. THE GAUGE IS PROVIDED WITH A SLOT TO PERMIT MAKING MEASUREMENT OF SEATING OF HEATER-CATHODE TERMINAL ON BOTTOM OF HOLE H₄.

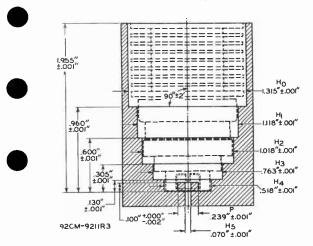
NOTE 2: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.



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

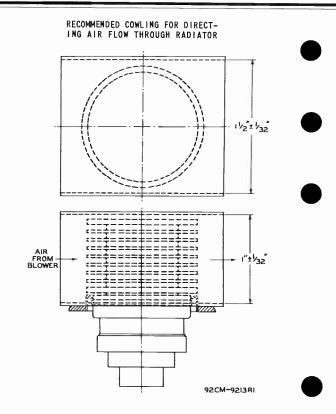


SKETCH G₁



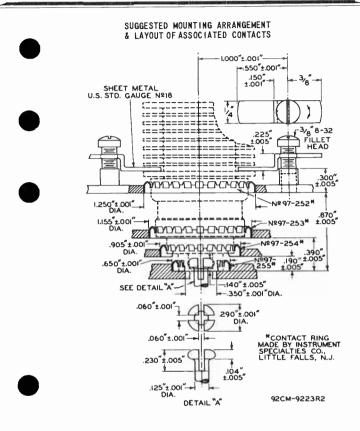
THE AXES OF THE CYLINDRICAL HOLES $\rm H_{O}$ THROUGH $\rm H_{5}$ AND THE AXES OF POST P ARE COINCIDENT WITHIN 0.001".





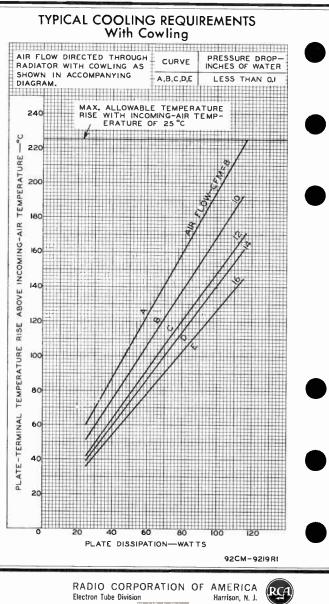
RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J.

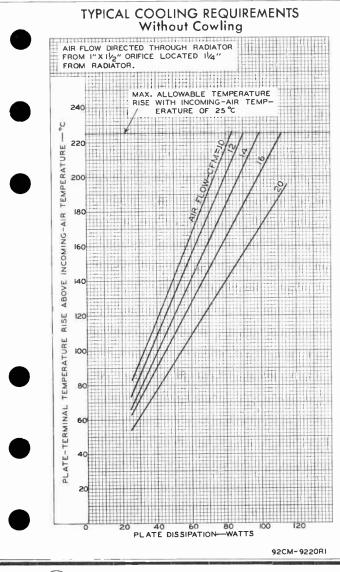






RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 5





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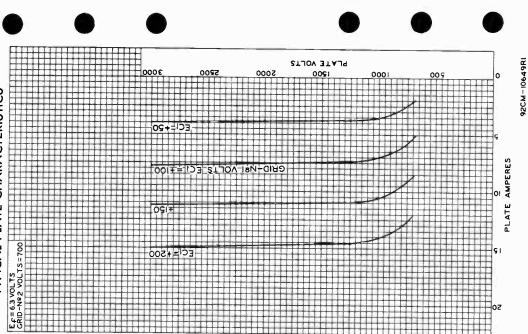
Harrison, N. J.

Electron Tube Division

DATA 6 1-61







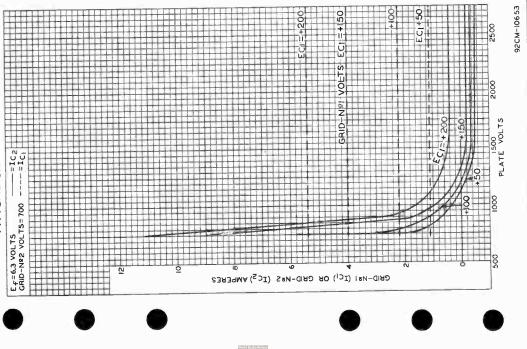
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CORPORATION

RADIO CORPC Electron Tube Division 7649





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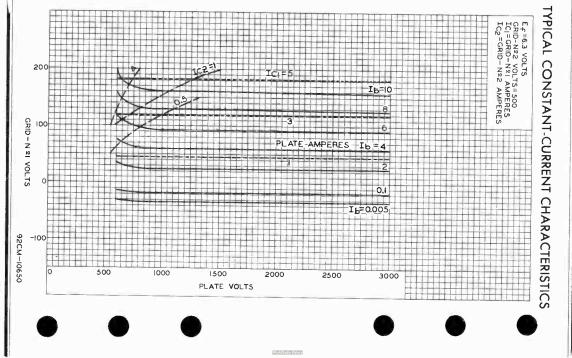
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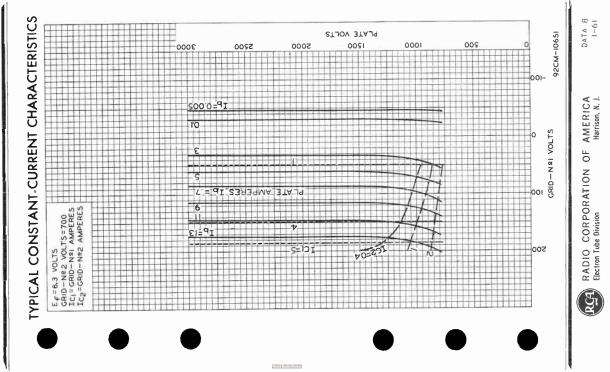
CORPORATION

RADIO CORPC Electron Tube Division





649



World Radio History

Beam	Power	Tube
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	CERAMIC-METAL SEALS "ONE-PIECE" ELECTRODE DESIGN FORCED-AIR COOLED FOR Use under Severe Shock and GENERAL DATA COAXIAL-ELECTRODE STRUCTURE INTEGRAL RADIATOR INTEGRAL RADIATOR INTEGRAL STRUCTURE INTEGRAL STRUCTURE INTEGRAL STRUCTURE INTEGRAL STRUCTURE INTEGRAL STRUCTURE INTEGRAL RADIATOR INTEGRAL STRUCTURE INTEGRAL STRUCTURE INTEGRAL RADIATOR INTEGRAL STRUCTURE INTEGRAL RADIATOR INTEGRAL STRUCTURE INTEGRAL RADIATOR INTEGRAL DATA
	Electrical: Heater, for Matrix-Type, 0xide-Coated, Unipotential Cathode: Voltage (AC or DC) [*] 6.3 ± 10% volts Current at heater volts = 6.3 7.85 amp Minimum heating time
•	Mechanical: Operating Position. Overall Length. Rediator. Meight (Approx.). Radiator. Contact Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface
	Air Flow:

Air flow may be removed simultaneously with all voltages. *Through radiator*—Adequate air flow to limit the platecore temperature to 250° C should be delivered by a blower through the radiator during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values

🖛 Indicates a change.



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I 9-62

of air flow directed through the radiator to maintain the plate core (See Dimensional Outline) at 250° C with an incoming air temperature of 25° C and with no restrictions at the plate-contact flange are:

Plate Dissipation	Air Flow	Static Pressure
(watts)	(cubic ft/min)	(inches of water)
100	2	0.04
300	4	0.14
600	11	0.66
700	16	0.96

To grid-No.2, grid-No.1, cathode, and heater terminals-A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these terminals so that no terminal temperature exceeds the specified maximum value of 250° C. An air flow of 2,5 cfm is usually adequate. Forced-air cooling of heater and cathode terminals is usually required during stand-by (heater only) operation. Plate-Core Temperature. 250 may 00

Terminal Temperature (Plate, Grid No.	2			
Grid No.1, Cathode, and Heater)			250 max.	00
Grid Ho.1, Cathode, and heaters		• •	ZJU Max.	- U

AF POWER AMPLIFIER & MODULATOR

Maximum CCS^c Ratings, Absolute-Naximum Values;

DC PLATE VOLTAGE							3000 max.	volts
DC GRID-No.2 VOLTAGE								
MAXSIGNAL DC PLATE CURRENT								
MAXSIGNAL GRID-No.1 CURRENT.								
MAXSIGNAL PLATE INPUT ^d								
MAXSIGNAL GRID-No.2 INPUT								
PLATE DISSIPATION ^d	•	•	•	•	•	•	600 max.	watts

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage DC Grid-No.2 Voltage [®] DC Grid-No.1 Voltage		3000 450		
from fixed-bias source Peak AF Grid-No.1-to-Grid-No.1 Voltage Zero-Signal DC Plate Current MaxSignal DC Grid-No.2 Current Effective Load Resistance (Plate to plate) MaxSignal Driving Power (Approx.) MaxSignal Prower Output (Approx.)	80 200 900 0 6 6 6000 0	-40 80 200 1000 0 5 6400 0 1600	volts volts ma ma ma ohms watts watts	

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition: ohms With cathode bias . . . Not recommended

RADIO CORPORATION OF AMERICA Electron Tube Division



LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Maximum CCS^c Ratings, Absolute-Maximum Values:

	Up to 1215 Mc
DC PLATE VOLTAGE	. 2500 max. volts
DC GRID-No.2 VOLTAGE	. 1200 max. volts
MAXSIGNAL DC PLATE CURRENT	
MAXSIGNAL DC GRID-No.1 CURRENT	
MAXSIGNAL PLATE INPUT	
MAXSIGNAL GRID-No.2 INPUT	. 25 max. watts
PLATE DISSIPATION	. 600 max. watts

Typical CCS "Single-Tone"^f Operation:

In grid-drive circuit at 30 Mc

DC Plate Voltage	2250	2500	volts
DC Grid-No.2 Voltage ^c	450	450	volts
DC Grid-No.1 Voltage ^c	37	37	volts
Zero-Signal DC Plate Current	160	160	ma
Zero-Signal DC Grid-No.2 Current	0	0	ma
Effective RF Load Resistance	2500	2700	ohms
MaxSignal DC Plate Current	450	500	ma
MaxSignal DC Grid-No.2 Current	4	4	ma
MaxSignal DC Grid-No.1 Current ⁹	0.05	0.05	ma
Output-Circuit Efficiency (Approx.)	90	90	%
MaxSignal Driver Power Outputh (Approx.).			watt
MaxSignal Useful Power Output (Approx.) .			

Typical CCS Operation with "Two-Tone Modulation"k

In grid-drive circuit at 30 Mc

DC Plate Voltage	2250	2500	volts
DC Grid-No.2 Voltage ^c	450	450	volts
DC Grid-No.1 Voltage ^c	-37	-37	volts
Zero-Signal DC Plate Current	160	160	ma
Effective RF Load Resistance	2500	2700	ohms
DC Plate Current at peak of envelope	450	500	та
Average DC Plate Current	315	350	та
DC Gr d-No.2 Current at peak of envelope	3	4	та
Average DC Grid-No.2 Current	1.8	2.5	та
Average DC Grid-No.1 Current	0.005	0.05	ma
Peak-Envelope Driver Power (Approx.)	1	1	watt
Output-Circuit Efficiency (Approx.)	90	90	%
Distortion Products Level:1			
Third Order	-31	-31	db
Fifth Order	-36	-36	db
Useful Power Output (Approx.):	-		
Average	290	340	watts
Peak Ĕnvelope	580j	6801	watts

Maximum Circuit Values:

Gr	id-N	lo.1−Ci	rcuit	Resist	ance	un	der	any	<i>(</i>)	cor	ndi	tion:		
	For	fixed-	bias	operat i	on.							15000	max.	ohms
	For	cathod	e-bia	s opera	ation						·	Not	recomm	nended
											-	⊢ Indica	tes a d	change.



World Radio History

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

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

Maximum CCS^c Ratings, Absolute-Maximum Values:

							U	p to 1215 Mc
DC PLATE VOLTAGE								2000 max. volts
DC GRID-No.2 VOLTAGE.								
DC GRID-No.1 VOLTAGE.								
DC PLATE CURRENT								
DC GRID-No.1 CURRENT.								
PLATE INPUT								
GRID-No.2 INPUT								
PLATE DISSIPATION	•	•	•	•	•	•	•	400 max. watts

Typical CCS Operation:

In cathode-drive circui	t at	4	oo Mc		
DC Plate Voltage			1800	2000	volts
DC Grid-No.2 Voltage ⁿ				400	volts
DC Grid-No.1 Voltage ^p	•		-45	-35	volts
DC Plate Current	•		450	500	ma
DC Grid-No.2 Current	•		6	8	ma
DC Grid-No.1 Current (Approx.)			15	12	ma
Output-Circuit Efficiency (Approx.) .				80	%
Driver Power Output (Approx.) 9			35		watts
Useful Power Output (Approx.)			500 ¹	6001	watts

Maximum Circuit Values:

RF POWER AMPLIFIER & OSCILLATOR -- Class C Telegraphy

and

RF POWER AMPLIFIER - Class C FM Telephony

Maximum CCS^c Ratings, Absolute-Maximum Values:

Up to 1215 Mc														
DC PLATE VOLTAGE												2500 max. volts		
DC GRID-No.2 VOLTAGE.												1200 max. volts		
DC GRID-No.1 VOLTAGE.												-250 max. volts		
DC PLATE CURRENT												500 max. ma		
DC GRID-No.1 CURRENT.														
PLATE INPUT				•			•			•		1250 max. watts 👝		
GRID-No.2 INPUT					•		•					25 max. watts		
PLATE DISSIPATION	٠		٠	·		·		•	•			700 max. watts		

Typical CCS Operation:

In cathode-drive^m circuit at 400 Mc

DC Plate Voltage												2250	2500	volts	
DC Grid-No.2 Voltage*															
DC Grid-No.1 Voltage.															
DC Plate Current															$\mathbf{}$
DC Grid-No.2 Current.	•	٠	·	٠	•	·	٠	٠	·	٠	•	7	8	ma	

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



Output-Circuit Efficiency (Approx.) 80 8 Driver Power Output (Approx.) 30 3	2 ma 30 % 35 watts 39 watts
In cathode-drive ^m circuit at 1215 Mc	
Output-Circuit Efficiency (Approx.) 7 Driver Power Output (Approx.)	0 volts 0 volts
Maximum Circuit Values:	
	commended
 Because the cathode is subjected to considerable back bombot the frequency is increased with resultant increase in temperiheater voltage should be reduced depending on operating cond frequency to prevent overheating the cathode and resultant simplement is build a subject of the special sheld adapter. Continuous Commercial Service. Averaged over any audio-frequency cycle of sine-wave form. Preferably obtained from a fixed supply. 	itions and hort life.
 Single-Tone operation refers to that class of amplifier sy which the grid-No.1 input consists of a monofrequency rf sig constant amplitude. This signal is produced in a single suppressed-carrier system when a single audio frequency of amplitude is applied to the input of the system. This value represents the approximate grid-No.1 current obt to initial electron velocities and contact-potential aff. 	tained due
^h Driver power output represents circuit losses and is act measured at the input to grid-No.1 circuit used. The tub	ual power
power is zero waits. J This value of useful power is measured in load of output k "Two-Tone-Modulation" operation refers to that class of	circuit. amplifier
* "Two-Tone-Modulation" operation refers to that class of service in which the input consists of two monofrequency r having equal peak amplitude.	'f signals
with maximum signal output used as a reference, and without feedback to enhance linearity.	the use of
Cathode is at dc ground potential.	1
plate supply.	
^P Obtained from grid-No.1 resistor or from a combination of resistor with either fixed supply or cathode resistor.	grid-No.1
9 Oriver power output includes circuit losses and feed-throu it is the actual power measured at input to drive circuit.	
r Key-down conditions per tube without amplitude modulation. modulation essentially negative may be used if the positive the audio-frequency envelope does not exceed 115 per ce carrier conditions.	Amplitude ve peak of nt of the
Obtained preferably from a fixed supply, or from the pla voltage with a voltage divider.	ite supply
-	



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History DATA 3 9-62

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.		
Heater Current	. 1	7.4	8.3	amp	
Capacitances:					
Grid No.1 to plate		-	0.11	μμ f	
Grid No.1 to cathode & heater .		26	32	µµ f	
Plate to cathode & heater		-	0.011	µµ f	
Grid No.1 to grid No.2		34	41	μμf	-
Grid No.2 to plate		4.3	6.3	μµt	
Grid No.2 to cathode & heater .		-	1.1	μµ	
Reverse Grid-No.1 Current		-	-50	μa	
Peak Emission Current		80	-	amp	
Interelectrode Leakage Resistance		8	-	megohms	
Grid-No.1 Cutoff Voltage	. 1,6	-	-87	volts	

- Note 1: With 6.3 volts ac or dc on heater.
- Note 2: Measured with special shield adapter.
- Note 3: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 240 ma.
- Nole 4: For conditions with 6.3 volts on heater: grid No.1, grid No.2 and plate tied together; and pulse-voltage source of 850 peak volts connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. Read peak emission current after 1 minute.
- Note 5: Under conditions with tube at 20⁰ to 30⁰ C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 8 megohms.
- Note 6: with dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma.

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N.J., on request.

50-g, ||-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified longduration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

500-g, Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different



- Indicates a change.







positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

5-to-2000 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms, the tube is vibrated along each of three mutually perpendicular axes over an 8-minute cycle consisting of:

- a. 5-to-10 cps with fixed double amplitude of 0.080 inch \pm 10%.
- b. IO-to-15 cps at fixed acceleration of 0.41 g ± 10%.
- c. I5-to-105 cps with fixed double amplitude of 0.036 inch \pm 10%.

d. 105-to-2000 cps at fixed acceleration of 20 g ± 10%.

At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

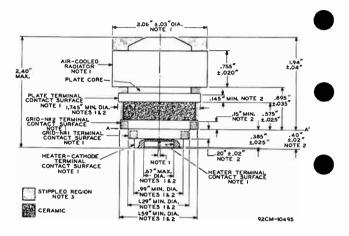
OPERATING CONSIDERATIONS

A suggested mounting arrangement for the 7650 is shown in the accompanying drawing along with alayout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any highpotential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



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



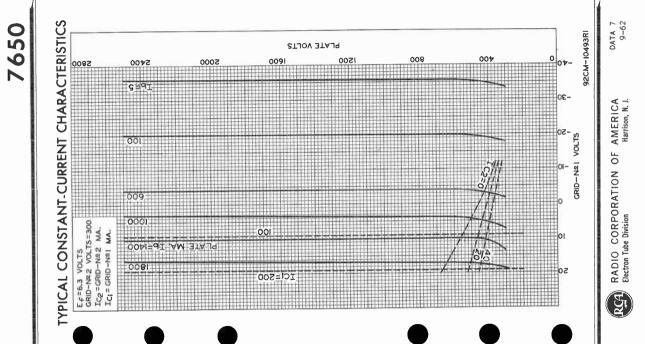
NOTE I: WITH THE CYLINDRICAL SURFACES DF THE RADIATOR BAND, PLATE TERMINAL, GRID-NO.2 TERMINAL, GRID-NO.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMODTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G₁. PROPER ENTRY OF THE TUBE IS OBTAINED WHEN THE GRID-NO.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A D.DID" THICKNESS GAUGE 1/8" WIDE WILL NOT ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE GRID-NO.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-NO.2 TERMINAL ON SHOULDER A-A'.

NOTE 2: THE DIAMETER OF EACH TERMINAL ISHELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

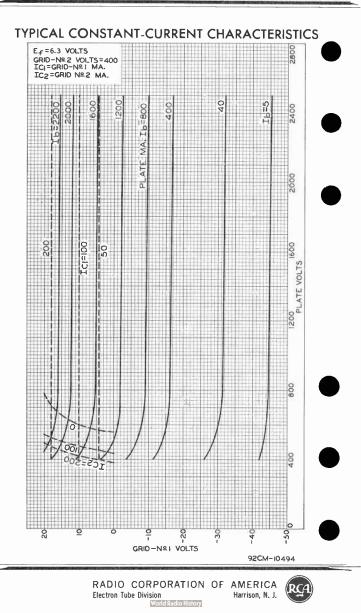
NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES. DIAMETERS OF STIPPLED AREAS ABOVE AIR-COOLED RADIATOR, PLATE-TERMINAL CONTACT SURFACE, AND GRID-NO.2-TERMINAL CONTACT SURFACE SHALL NOT BE GREATER THAN ITS ASSOCIATED DIAMETER.







World Radio Histor



Beam	Power	Tube
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CERAMIC-METAL SEALS COAXIAL-ELECTRODE STRUCTURE "ONE-PIECE" ELECTRODE DESIGN INTEGRAL RADIATOR 1250-WATTS CW INPUT UP TO 1215 Mc FORCED-AIR COOLED MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE For Use Under Severe Shock and Vibration

GENERAL DATA

	GENERAL PRIME		
Electrical:			
Heater, for Matrix-Type Unipotential Cathode:			
Voltage (AC or DC) ^A .			volts
Current at 6.3 volts		7.5	атр
Minimum heating time		120	sec
Mu-Factor, Grid No.2 to			
for plate volts = 225,		12	
volts = 225, and plate Direct Interelectrode Ca		13	
Grid No.1 to plate .		0.09 max.	f
Grid No.1 to cathode a		29	μμt μμf
Plate to cathode & hea		0.01 max.	μµ f
Grid No.1 to grid No.1		38	μμ1 μμ1
Grid No.2 to plate .		5.5	μμf
Grid No.2 to cathode a		0.8 max.	μμf
			papa .
Mechanical:			
Operating Position			Any
Overall Length		2.34" ± (0.06"
Greatest Diameter (See L	Dimensional Outline	1 2.06" ±	0.03"
Weight (Approx.) Radiator		3	/4 lb
Radiator		itegral part of	tube
Terminal Connections (Se	ee Dimensional Outl	1ne):	
G _I - Grid-No. 1-		H,K-Heater	- å
Terminal		Catho	
Contact	PI	Termi	
Surface	$\langle \perp \rangle$	Conta	
G ₂ - Grid-No. 2-	- h	Surfa	
(Crimina)		P - Plate-	
Contact	10/	Termi	nai

Surface H-Heater-Terminal Contact

Contact Surface

Air Flow:

Surface

Air flow may be removed simultaneously with all voltages.

H.K

Through radiator-Adequate air flow to limit the platecore temperature to 250° C should be delivered by a blower through the radiator during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator to maintain the plate core (See Dimensional Outline) at 250° C with an in-



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

coming air temperature of 25° C and with no restrictions at the plate-contact flange are:

Plate Dissipation	Air Flow	Static Pressure
(watts)	(cubic ft/min)	(inches of water)
100	2	0.04
300	4	0.14
600	11	0.66
700	16	0,96

riate oure remperator		• •	• •	-00 max.	0
Terminal Temperature	(Plate Grid No. 2				
Grid No.1, Cathode,	and Heater)			250 max.	20
dire north ownedd	and moundary i i i			100 marti	0

AF POWER AMPLIFIER & MODULATOR

Maximum CCS* Ratings, Absolute-Naximum Values:

DC PLATE VOLTAGE				3000 max.	volts
DC GRID-No.2 VOLTAGE					
MAXSIGNAL DC PLATE CURRENT					
MAXSIGNAL GRID-No.1 CURRENT.					
MAXSIGNAL PLATE INPUT.				1500 max.	watts
MAXSIGNAL GRID-No.2 INPUT.					watts
PLATE DISSIPATION.		٠		600 max.	watts

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage		•	2700 450	3000 450	volts volts	
DC Grid-No.1 Voltage from fixed-bias source Peak AF Grid-No.1-to-Grid-No.1	•	•	-40	-40	volts	(
Voltage , , , ,			80	80	volts	
Zero-Signal DC Plate Current			200	200	ma	
MaxSignal DC Plate Current			900	1000	ma	
Zero-Signal DC Grid-No.2 Current			0	0	ma	
MaxSignal DC Grid-No.2 Current			6	5	ma	
Effective Load Resistance						
(Plate to plate)			6000	6400	ohms	
MaxSignal Driving Power (Approx.)					watts	
MaxSignal Power Output (Approx.).					watts	

Maximum Circuit Values:

Grid-No	o. 1–Circu	lit.	Re	esi	st	ar	nce	εı	uno	der	- ;	any	/	со	nd	ition:		
	fixed b																max.	ohms
With	cathode	bia	as					٠	•	•	•	•	٠			Not	recomm	ended

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



World Radio History

LINEAR RF POWER AMPLIFIER Single-Sideband Suppressed-Carrier Service

Maximum CCS* Ratings, Absolute-Maximum Values:

		Up to 1215 Mc	
	DC PLATE VOLTAGE	2500 max. volts	
	DC GRID-No.2 VOLTAGE	1200 max. volts	
	MAXSIGNAL DC PLATE CURRENT	500 max. ma	
	MAXSIGNAL DC GRID-No.1 CURRENT	100 max. ma	
	MAXSIGNAL PLATE INPUT	1250 max. watts	
<u> </u>	MAXSIGNAL GRID-No.2 INPUT	25 max. watts	
	PLATE DISSIPATION	600 max. watts	

Typical CCS "Single-Tone"⁴ Operation:

In grid-drive circuit at 30 Ms

DC Plate Voltage	2250	2500	volts
DC Grid-No.2 Voltage [®]	450	450	volts
DC Grid-No.1 Voltage	-40	-40	volts
Zero-Signal DC Plate Current	90	100	ma
Zero-Signal DC Grid-No.2 Current	0	0	ma
Effective RF Load Resistance	2500	2700	ohms
MaxSignal DC Plate Current	450	500	ma
MaxSignal DC Grid-No.2 Current	3	3	ma
MaxSignal DC Grid-No.1 Current [®]	0.1	0.1	ma
Output-Čircuit Efficiency (Approx.)	.90	90	%
MaxSignal Driver Power Output®			
(Approx.)	4	4	watts
MaxSignal Useful Power Output			
(Approx.)	580*	680*	watts

Maximum Circuit Values:

Gı	rid−No).1-Ci	rcι	uit.	Re	es	i s 1	tar	nce	Э	und	der	 any	/	cor	nd i	tion:		
	₩ith	fixed	bi	ias													15000	max.	ohms
	With	cathoo	de	bia	as												Not	recom	nended

PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony

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

Maximum CCS* Ratings, Absolute-Maximum Values:

						Up to 1215 Mc
DC PLATE VOLTAGE						2000 max. volts
DC GRID-No.2 VOLTAGE.						1200 max. volts
DC GRID-No.1 VOLTAGE.			-			-250 max. volts
DC PLATE CURRENT						500 max. ma
DC GRID-No.1 CURRENT.						100 max. ma
PLATE INPUT						1000 max. watts
GRID-No.2 INPUT						17 max. watts
PLATE DISSIPATION				•		400 max. watts



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Typical CCS Operation:

In cathode-drive* circuit at 400 Mc

DC Plate Voltage	1800	2000	volts
DC Grid-No.2 Voltage	400	400	volts
DC Grid-No.1 Voltage [†]	-45	-35	volts
DC Plate Current	450	500	ma
DC Grid-No.2 Current	6	8	ma
DC Grid-No.1 Current (Approx.)	15	12	ma
Output-Circuit Efficiency (Approx.)	80	80	%
Driver Power Output (Approx.)‡	35	35	watts
Useful Power Output (Approx.)	500*	600*	watts

Maximum Circuit Values:

Grid-No.1-Circuit	Res	ist	ar	nce	e					
under any condi	tion								15000 max.	ohms

RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy§

and

RF POWER AMPLIFIER - Class C FM Telephony

Maximum CCS* Ratings, Absolute-Maximum Values:

					UP 10 1215 MC
DC PLATE VOLTAGE					
DC GRID-No.2 VOLTAGE.					
DC GRID-No.1 VOLTAGE.					
DC PLATE CURRENT					
DC GRID-No.1 CURRENT,		•			100 max. ma
PLATE INPUT					1250 max. watts
GRID-No.2 INPUT					25 max. watts
PLATE DISSIPATION					700 max. watts

Typical CCS Operation:

In cathode-drive* circuit at 400 Hc

DC Plate Voltage	2250	2500	volts
DC Grid-No.2 Voltage ^D	400	400	volts
DC Grid-No.1 Voltage	-45	-35	volts
DC Plate Current	450	500	ma
DC Grid-No.2 Current	7	8	ma
DC Grid-No.1 Current (Approx.)	10	12	ma
Output-Circuit Efficiency (Approx.) .	80	80	%
Driver Power Output (Approx.) ‡	30	35	watts
Useful Power Output (Approx.)	650*	800*	watts

In cathode-drive* circuit at 1215	i Mc
-----------------------------------	------

DC Plate Voltage	2500	volts
DC Grid-No.2 Voltage ^u	400	volts
DC Grid-No.1 Voltage	-50	volts
DC Plate Current	500	ma
DC Grid-No.2 Current	6	ma
DC Grid-No.1 Current (Approx.)	10	ma
Output-Circuit Efficiency (Approx.)	70	%
Driver Power Output (Approx.)‡	80	watts
Useful Power Output (Approx.)	375*	watts

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Harrison, N. J.

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Electron Tube Division Radio History

Maximum Circuit Values:



- Grid-No.1-Circuit Resistance under any condition:
- Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.
- Measured with special shield adapter.
- Continuous Commercial Service.
- Averaged over any audio-frequency cycle of sine-wave form.
- Preferably obtained from a fixed supply.
- *Single-Tone* operation refers to that class of amplifier service in which the grid-Mo.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.
- This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.
- Driver power output represents circuit losses and is actual power measured at the input to grid-No.1 circuit used. The tube driving power is zero walls.
- This value of useful power is measured in load of output circuit.
- * Cathode is at dc ground potential.
- $^{\bullet}$ Dbtained preferably from a separate source modulated along with the , plate supply.
- Dotained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
- Driver power output includes circuit losses and feed-through power. It is the actual power measured at input to drive circuit.
- Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.
- Obtained preferably from a fixed supply, or from the plate supply voltage with a voltage divider.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

						Note	Min.	Max.	
	Heater Current			•		1	6.9	8.3	amp
	Direct Interelectrode Capacitances:								
	Grid No.1 to plate	-		٠		2	-	0.09	$\mu\mu f$
	Grid No.1 to cathode & heater					2	26	32	µµf
	Plate to cathode	•	•	•	•	2		2	μμ '
	& heater					2	35	0.01	μµf
	Grid No.1 to grid No.2. Grid No.2 to plate					2	4.5	6.5	µµ f µµ f
	Grid No.2 to cathode					2		0.0	
	& heater					2 1,3	_	0.8 -50	μμf μa
	Peak Emission Voltage					1,4	-	850	volts
)	Interelectrode Leakage Resistance					5	8		megohms
	Grid-No.1 Cutoff Voltage.					1,6	-	-80	volts

World Radio History

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

Note 2: Measured with special shield adapter.

- With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 100 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 240 ma. Note 3:
- Note 4: For conditions with 6.3 volts on heater; grid No.1. grid No.2 For conditions with 6.3 volts on heater; grid No.1, grid No.2, and plate lied together; and pulse-voltage source connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 80 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed 850 volts (peak).
- Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 Note 5: The minimum megohm, will be 8 megohms.
- Note 6: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma.

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N.J., on request.

50-q, II-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified longduration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

500-g, Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

5-to-2000 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute sweep consisting of:

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- 5-to-10 cps with fixed double amplitude of 0.08 inch а. ± 10%.
- b. 10-to-15 cps at fixed acceleration of 0.4 g ± 10%.
- 15-to-105 cps with fixed double amplitude of 0.036 c. inch ± 10%.

105-to-2000 cps at fixed acceleration of 20 g ± 10%. d. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

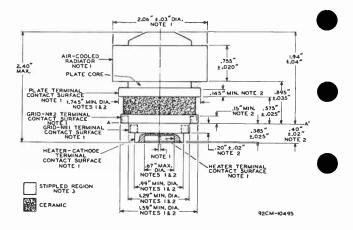
OPERATING CONSIDERATIONS

A suggested mounting arrangement for the 7650 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should behoused in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possible come in contact with anyhighpotential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



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NOTE I: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-NO.2 TERMINAL, GRID-NO.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G₁. PROPER FNTRY OF THE TUBE IS OBTAINED WHEN THE GRID-NO.2 TERMINAL IS SEATED ON THE SHOULDER A-A⁷. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A 0.010" THICKNESS GAUGE 1/8" WIDE WILL NOT ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE GRID-NO.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-NO.2 TERMINAL ON SHOULDER A-A⁷.

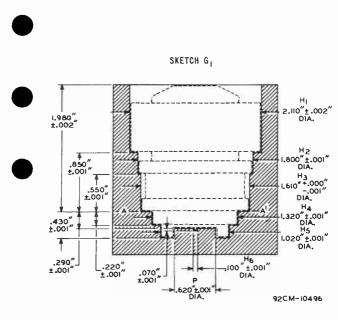
NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTOTHESE ANNULAR VOLUMES. DIAMETERS OF STIPPLED AREAS ABOVE AIR-COOLED RADIATOR, PLATE-TERMINAL CONTACT SURFACE, AND GRID-NO.2-TERMINAL CONTACT SURFACE SHALL NOT BE GREATER THAN ITS ASSOCIATED DIAMETER.





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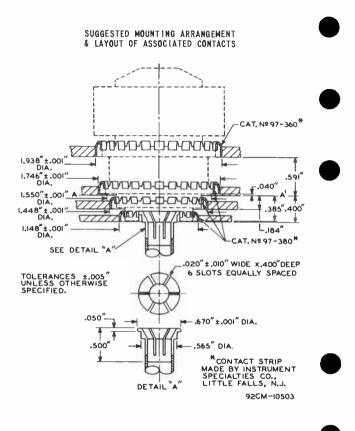


SURFACE A-A' IS FLAT WITHIN 0.0005" PEAK TO VALLEY AND IS PERPENDICULAR TO THE AXIS OF THE CYLINORICAL HOLES WITHIN 0.00025".

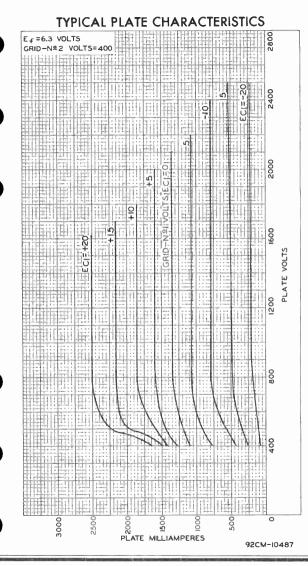
THE AXES OF THE CYLINORICAL HOLES H1 THROUGH H6 AND THE AXIS OF POST P ARE COINCIDENT WITHIN 0.001".



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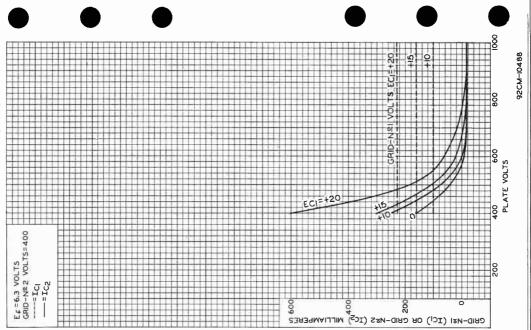


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7650

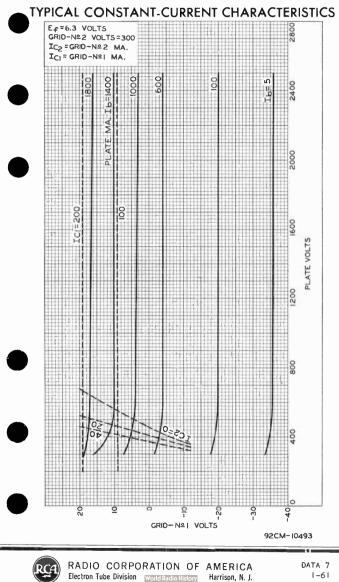
TYPICAL CHARACTERISTICS



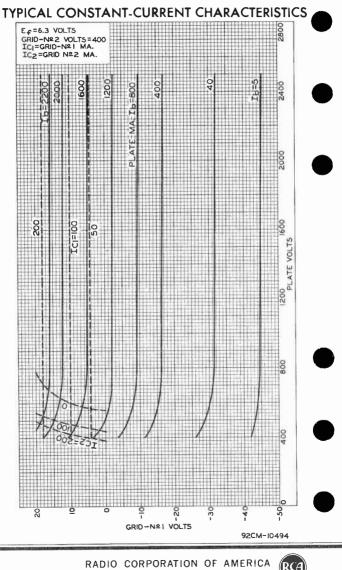
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Electron Tube DivisionId Radio History

Beam F	'ower	Tube
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CERAMIC-METAL SEALS "ONE-PIECE" ELECTRODE DESIGN FORCED-AIR COOLED MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE For Use under Severe Shock and Vibration
GENERAL DATA
Electrical: Heater, for Matrix-Type, Oxide- Coated, Unipotential Cathode: Voltage (AC or DC)
Grid No.2 to plate
Operating Position
GI-Grid-No.1- Terminal Contact Surface H-Heater- H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface H-Heater- Terminal Contact Surface
Air Flow:
Air flow may be removed simultaneously with all voltages. Through radiator—Adequate air flow to limit the plate-core temperature to 250°C should be delivered by a blower

temperature to 250° C should be delivered by a blower through the radiator during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator to maintain the



RADIO CORPORATION OF AMERICA **Electron Tube Division**

plate core (See Dimensional Outline) at 250° C with an incoming air temperature of 25° C and with no restrictions at the plate-contact flange are:

Plate Oissipation	Air Flow	Static Pressure
(watts)	(cubic ft/min)	(inches of water)
100	2	0.04
300	4	0.14
600	11	0.66

To Grid-No.2, Grid-No.1, Cathode, and Heater Terminals— A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these terminals so that no terminal temperature exceeds the specified maximum value of 250° C. An air flow of 2.5 cfm is usually adequate. Forced-air cooling of heater and cathode terminals is usually required during standby (heater only) operation.

Plate-Core Temperature	250 max. 00	2
Terminal Temperature (Plate, Grid I		
Grid No.1, Cathode, and Heater)	250 max. ⁰ (C

GRID-PULSED RF AMPLIFIER and GRID-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS^b Ratings, Absolute-Maximum Values:

For maximum "on" time c of 10 microseconds

			Üþ	to 1215 Mc	
- DC PLATE VOLTAGE					volts
DC GRID-No.2 VOLTAGE				1200 max.	volts
DC GRID-No.1 VOLTAGE					volts
DC PLATE CURRENT DURING PULSE				9 max.	amp
DC PLATE CURRENT				0.5 max.	атр
GRID-No.2 INPUT (Average)				25 max.	watts
GRID-No.1 INPUT (Average)				10 max.	watts
PLATE DISSIPATION (Average) .				600 max.	watts

Typical Operation:

In grid-pulsed cathode-drive ^d circuit	with rectangular-
wave pulse at 1215 Mc and with duty	factor ^e of 0.01
DC Plate Voltage	3600 4000 volts
➡Peak-Positive Grid-No.2 Voltage	800 1000 volts
DC Grid-No.1 Voltage	-100 -120 volts
DC Plate Current during pulse	8 9 amp
DC Plate Current	0.19 0.2 amp
DC Grid-No.2 Current	0.005 0.006 amp
DC Grid-No.1 Current	0.02 0.02 amp
Output-Circuit Efficiency (Approx.)	80 80 %
Driver Power Output at peak	
of pulse (Approx.) [†]	5.2 6.3 kw
Useful Power Output at peak	
of pulse (Approx.)	15 ^g 20 ^g kw

-Indicates a change.

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In grid-and-screen-pulsed cathode-drive^d circuit with rectangular-wave pulses at 1215 Nc with duty factor^e of 0.01

DC Plate Voltage		3600	4000	volts
Peak Positive-Pulse Grid-No.2 Voltage		800	1000	volts
DC Grid-No.1 Voltage		0	0	volts
DC Plate Current during pulse		8	9	amp
DC Plate Current		0.145	0.165	amp
DC Grid-No.2 Current		0.003	0.006	amp
DC Grid-No.1 Current			0.017	amp
Output-Circuit Efficiency (Approx.) .	•	80	80	%
Driver Power Output at peak cf pulse (Approx.) [†]		2.4	2.9	kw
Useful Power Output at peak of pulse (Approx.)		119	159	kw

PLATE-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS^b Ratings, Absolute-Maximum Values:

For maximum "on" time^c of 10 microseconds

Up to 1215 Mc	
PEAK POSITIVE-PULSE PLATE VOLTAGE 8000 max.	volts
PEAK POSITIVE-PULSE GRID-No.2 VOLTAGE 1200 max.	volts
DC GRID-No.1 VOLTAGE	volts
DC PLATE CURRENT DURING PULSE 9 max.	amp
DC PLATE CURRENT 0.12 max.	amp
GRID-No.2 INPUT (Average)	watts
GRID-No.1 INPUT (Average) 10 max.	watts
PLATE DISSIPATION (Average) 600 max.	watts

Typical Operation:

In cathode-drive^d circuit with rectangular-wave pulses at 1215 Mc and with duty factor^e of 0.01 0.1.

Peak Positive-Pulse					
Plate Voltage	7200	8000	7200	8000	volts
Peak Positive-Pulse					
Grid-No.2 Voltage	800	1000	800	1000	volts
DC Grid-No.1 Voltage	0	0	-75	80	volts
DC Plate Current					
during pulse	8	9	8	9	amp
DC Plate Current	0.09	0.1	0.09	0.1	amp
DC Grid-No.2 Current	0.003	0.008	0.003	0.004	amp
DC Grid-No.1 Current	0.015	0.016	0.019	0.02	amp
Output-Circuit					,
Efficiency (Approx.)	80	80	80	80	%
Driver Power Output at					
peak of pulse (Approx.) ^f .	1.8	2.2	4.5	5.3	kw
Useful Power Output at					
peak of pulse (Approx.).	229	289	309	399	kw

^a Measured with special shield adapter.

^b Continuous Commercial Service.

C "On" time is defined as the sum of the durations of all the individual pulses which occur during any 1000-microsecond interval. An increase in



dc plate current during the pulse may be permissible at shorter "on" times, and a decrease is usually required at longer "on" times.

Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

- d Cathode is at dc ground potential.
- e Duty factor is defined as the ratio of "on" time to total elapsed time in any 1000-microsecond interval.
- f Driver power output includes circuit losses and feed-through power It is actual power measured at input to tube drive circuit. It wil vary with frequency of operation and driver circuitry. it will
- 9 This value of useful power is measured in load of output circuit.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	6.9	8.3	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.13	μµ f
Grid No.1 to cathode & heater	2	26	32	μµf
Plate to cathode & heater	2	-	0.01	μµf
Grid No.1 to grid No.2	2	35	42	μµf
Grid No.2 to plate	2	5.5	7.5	μμf
Grid No.2 to cathode & heater	2	-	0.8	μµf
Reverse Grid-No.1 Current		_	-50	μa
Peak Emission Voltage	1,4	-	850	volts
Interelectrode Leakage Resistance .	5	8	-	megohms
Grid-No.1 Cutoff Voltage	1,6	-	-170	volts

- Note 1: With 6.3 volts ac or dc on heater.
- Note 2: Measured with special shield adapter.
- With dc plate voltage of 2500 volts, dc grid-No.2 voltage of #00 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 240 ma. Note 3:
- For conditions with 6.3 volts on heater; grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected be-tween plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude will not averaged 180 uples (pash-be orlange-pulse amplitude will not averaged 180 uples (pash-be orlangenouse pulse). Note 4: the voltage-pulse amplitude will not exceed 850 volts (peak).
- Under conditions with tube at 20° to 30° C for at least 30 Note 5: minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 8 megohms.
- With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and a dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma. Note 6:

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N. J., on request.



- Indicates a change.

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50-g, II-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified longduration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

500-g. Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

5-to-2000 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute cycle consisting of:

- a. 5-to-10 cps with fixed double amplitude of 0.08 inch \pm 10%.
- b. 10-to-15 cps at fixed acceleration of 0.41 g ± 10%.
- c. l5-to-105 cps with fixed double amplitude cf 0.036 inch \pm 10%.
- d. 105-to-2000 cps at fixed acceleration of 20 g ± 10%.

At the end of this test, tubes will not show permanent or temporary shorts or open circuits.



OPERATING CONSIDERATIONS

A suggested mounting arrangement for the 7651 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

🖛 Indicates a change.



RADIO CORPORATION OF AMERICA Electron Tube Division DIMENSIONAL OUTLINE, GAUGE DRAWING, and SUGGESTED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS shown under Type 7650 also apply to the 7651





Beam	Power	Tube
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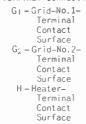
CERAMIC-METAL SEALS "OME-PIECE" ELECTRODE DESIGN FORCED-AIR COOLED MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE COAXIAL-ELECTRODE STRUCTURE INTEGRAL RADIATOR INTEGRA INTEGRAL RADIATOR INTEGRAL RADIATOR INTEGRAL

For Use Under Severe Shock and Vibration

GENERAL DATA

Electrical:	
Heater, for Matrix-Type, Oxide-	
Coated, Unipotential Cathode: Voltage (AC or DC) 6.3 ± 10%	volts
Current at 6.3 volts 7.5	amp
Mirimum heating time	sec
Mu—Factor, Grid Ňo.2 to Grid No.1	
for plate volts = 225, grid-No.2 volts = 225, and plate ma. = 100	
Direct Interelectrode Capacitances:	
Grid No.1 to plate 0.13 max.	µµuf
Grid No.1 to cathode & heater	<i>µ</i> µ_f
Plate to cathode & heater 0.01 max.	<i>µµ</i> f
Grid No.1 to grid No.2	<i>µµ</i> f
Grid No.2 to plate 6.5	<i>µµ</i> f
Grid No.2 to cathode & heater Q.8 max.	<i>щ</i> f

Mechanical:



P J J J K K H,K - Heater- & Cathode-Terminal Contact Surface P - Plate-Terminal Contact Surface

Air Flow:

Air flow may be removed simultaneously with all voltages. *Through radiator*—Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator to maintain the



RADIO CORPORATION OF AMERICA Electron Tube Division Credio History Harrison, N. J. plate core (See Dimensional Outline) at 250° C with an incoming air temperature of 25° C and with no restrictions at the plate-contact flange are:

Plate Dissipation (watts)	Air Flow {cubic ft/min}	Static Pressure (inches of water)
100	2	0.04
300	4	0.14
600	11	0.66

To Grid-No.2, Grid-No.1, Cathode, and Heater Terminals— A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these terminals so that no terminal temperature exceeds the specified maximum value of 250° C. An air flow of 2.5 cfm is usually adequate. Forced-air cooling of heater and cathode terminals is usually required during standby (heater only) operation.

Plate-Core Temperature		;
Terminal Temperature (Plate, Grid	3 No.2.	
Grid No.1, Cathode, and Heater)	і 250 max. ^о С	;

GRID-PULSED RF AMPLIFIER and GRID-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS® Ratings, Absolute-Naximum Values:

For maximum "on" time* of 10 microseconds

	Up to 1215 Nc
DC PLATE VOLTAGE	4000 max. volts
DC GRID-No.2 VOLTAGE	1200 max. volts
DC GRID-No.1 VOLTAGE	250 max. volts
DC PLATE CURRENT DURING PULSE	9 max. amp
DC PLATE CURRENT	0.5 max. amp
GRID-No.2 INPUT (Average)	25 max. watts
GRID-No.1 INPUT (Average)	10 max. watts
PLATE DISSIPATION (Average)	600 max. watts

Typical Operation:

In grid-pulsed cathode-drive circuit with rectangularwave pulse at 1215 Mc and with duty factor of 0.01 3600 4000 volts 800 1000 volts DC Grid-No.1 Voltage. -100-120 volts DC Plate Current during pulse . . . - 8 9 amp 0.19 0.2 amp DC Grid-No.2 Current. 0.005 0.006 amp 0.02 0.02 amp 80 80 × Driver Power Output at peak of pulse (Approx.). . . . 5.2 6.3 kw Useful Power Output at peak of pulse (Approx.). . . . 15* 20* kw

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Harrison, N. J.



Electron Tube Division World Radio History

In grid-and-screen-pulsed cathode-drive circuit with rectangular-wave pulses at 1215 Nc with duty factor of 0.01

)	DC Plate Voltage	800	4000 1000 0	volts volts volts
	DC Plate Current during pulse		9	amp
	DC Plate Current		0.165	amp
	DC Grid-No.2 Current	. 0.003	0.006	amp
	DC Grid-No.1 Current			amp
	Output-Circuit Efficiency (Approx.)	. 80	80	%
)	Driver Power Output at peak of pulse (Approx.)	. 2.4	2.9	kw
	of pulse (Approx.).	. 11 [‡]	15‡	kw

PLATE-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS® Ratings, Absolute-Naximum Values:

For maximum "on" time* of 10 microseconds

Up to 1215 Mc

PEAK POSITIVE-PULSE PLATE VOLTAGE	8000 max.	volts
PEAK POSITIVE-PULSE GRID-No.2 VOLTAGE	1200 max.	volts
DC GRID-No.1 VOLTAGE	–250 max.	volts
DC PLATE CURRENT DURING PULSE	9 max.	amp
DC PLATE CURRENT	0.12 max.	amp
GRID-No.2 INPUT (Average)	25 max.	watts
GRID-No.1 INPUT (Average)	10 max.	watts
PLATE DISSIPATION (Average)	600 max.	watts

Typical Operation:

In cathode-drive circuit with rectangular-wave pulses at 1215 Mc and with duty factor of 0.01

Peak Positive-Pulse Plate Voltage	7200	8000	7200	8000	volts
Peak Positive-Pulse Grid-No.2 Voltage DC Grid-No.1 Voltage	800 0	1000 0	800 -75	1000 80	volts volts
DC Plate Current during pulse DC Flate Current DC Grid-No.2 Current	8 0.09 0.003 0.015	9 0.1 0.008	8 0.09 0.003	9 0.1 0.004	amp amp amp
DC Grid-No.1 Current Output-Circuit Efficiency (Approx.)	80	0.016 80	0.019 80	0.02 80	amp %
Driver Power Output at peak of pulse (Approx.). Useful Power Output at	1.8	2.2	4.5	5.3	kw
peak of pulse (Approx.).	22*	28 [‡]	30 *	39 *	kw

Measured with special shield adapter.

Continuous Commercial Service.

* "On" time is defined as the sum of the durations of all the individual pulses which occur during any 1000-microsecond interval. An increase in



dc plate current during the pulse may be permissible at shorter "on" times, and a decrease is usually required at longer "on" times. times.

Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

- Cathode is at dc ground potential.
- Duty factor is defined as the ratio of "on" time to total elapsed time in any 1000-microsecond interval.
- Driver power output includes circuit losses and feed-through power It is actual power measured at input to tube drive circuit. It will lt will vary with frequency of operation and driver circuitry.
- This value of useful power is measured in load of output circuit.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Nin.	Nax.	
Heater Current	1	6.9	8.3	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.13	μµf
Grid No.1 to cathode & heater	2	26	32	μµf
Plate to cathode & heater	2	-	0.01	μµf
Grid No.1 to grid No.2		35	42	μµf
Grid No.2 to plate	2	5.5	7.5	μµf
Grid No.2 to cathode & heater	2	-	0.8	μµf
Reverse Grid-No.1 Current		-	-50	μa
Peak Emission Voltage		-	850	volts
Interelectrode Leakage Resistance .		8	_	megohms
Grid-No.1 Cutoff Voltage	1,6	-	-150	volts

- Note 1: With 6.3 volts ac or dc on heater.
- Measured with special shield adapter. Note 2:
- With dc plate voltage of 2500 volts, dc grid-No.2 voltage of #00 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 240 ma. Note 3:
- For conditions with 6.3 volts on heater; grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected be-tween plate and cathode. Pulse duration is 2 microseconds, Note 4: pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 80 amperesis obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed 850 volts (peak).
- Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two electrodes as measured with a 200-Note 5: wolt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 8 megohms.
- With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and a dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma. Note 6:

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N. J., on request.

Electron Tube Division

Harrison, N. J.

RADIO CORPORATION OF AMERICA World Radio History

50-g, 11-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified longduration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

500-g, Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

5-to-2000 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute sweep consisting of:

- a. 5-to-10 cps with fixed double amplitude of 0.08 inch \pm 10%.
- b. IO-to-15 cps at fixed acceleration of 0.41 g ± 10%.
- c. 15-to-105 cps with fixed double amplitude cf 0.036 inch \pm 10%.
- d. 105-to-2000 cps at fixed acceleration of 20 g ± 10%.

At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

OPERATING CONSIDERATIONS

A suggested mounting arrangement for the 7651 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

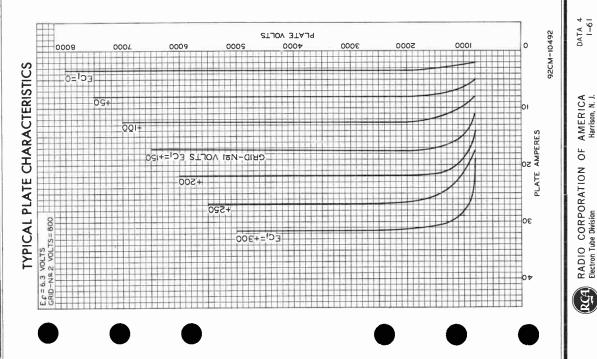
The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with ary high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



RADIO CORPORATION OF AMERICA Electron Tube Division World Partice Harrison, N. J. DIMENSIONAL OUTLINE, GAUGE DRAWING, and SUGGESTED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS shown under Type 7650 also apply to the 7651



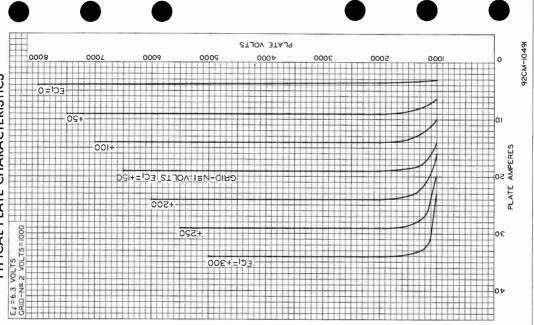
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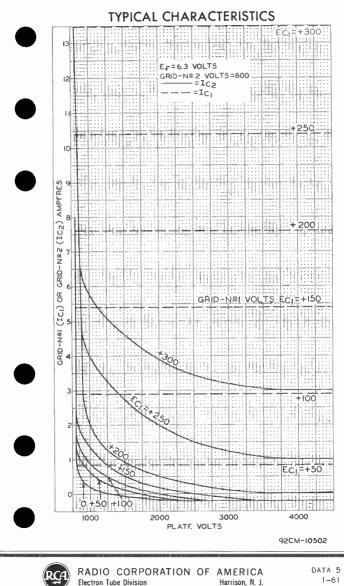


AMERICA Harrison, N. J.

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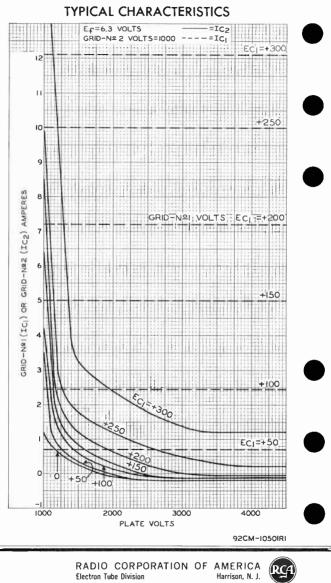
RADIO CORPORATION Electron Tube Division

7651



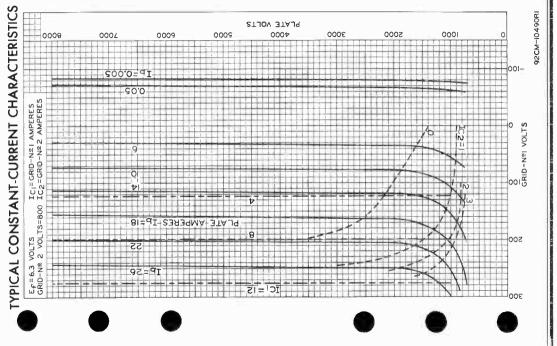
World Radio History

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7651



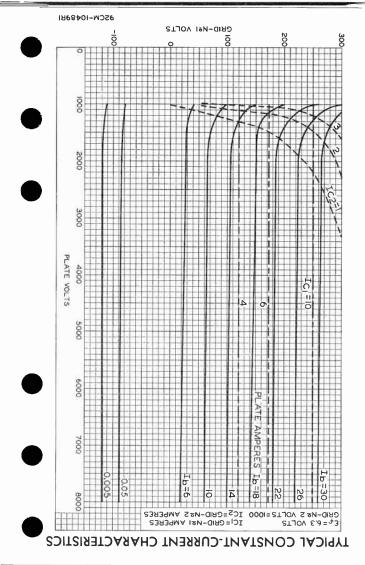
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Beam	Power	Tube
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	MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE For Use at Frequencies up to 2000
_	Mc under Severe Shock and Vibration GENERAL DATA
	GEMERAL DATA Electrical:
	Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode: Voltage (AC or DC)
	for plate volts = 250, grid-No.2 volts = 250, and plate ma. = 100
	Mechanical: Operating Position
	G ₁ -Grid-No.1- Terminal Contact Surface G ₂ -Grid-No.2- Terminal Contact Surface H - Heater- H - Heater- Terminal Contact Surface H - Heater- K - Heater- Contact Surface H - Heater- Contact Surface H - Heater- Surface H - Heater- H - Heater- H - Heater- Surface
	Thermal: Conduction-Cylinder Temperature

RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

DATA I 9-62

Cooling, Conduction:

The conduction cylinder must be thermally coupled to a constant-temperature device (heat sink—solid or liquid) to limit the conduction cylinder to the specified maximum value of 250° C. The plate, grid-No.2, grid-No.1, cathode, and heater terminals may also require coupling to the heat sink to limit their respective seal temperature to the specified maximum value of 250° C.

AF POWER AMPLIFIER & MODULATOR - Class AB

Maximum CCS Ratings, Absolute-Naximum Values:

DC PLATE VOLTAGE				1000	max.	volts
DC GRID-No.2 VOLTAGE						
MAXSIGNAL DC PLATE CURRENT						
MAXSIGNAL PLATE INPUT.						
MAXSIGNAL GRID-No.2 INPUT.					max.	watts
PLATE DISSIPATION.				÷		

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage		volts volts
DC Grid-No.1 Voltage from fixed-bias source15 Peak AF Grid-No.1-to-Grid-No.1	-15	volts
Voltage*	30	volts
Zero-Signal DC Plate Current 80	80	ma
MaxSignal DC Plate Current 200	200	ma
Zero-Signal DC Grid-No.2 Current 0	0	ma
MaxSignal DC Grid-No.2 Current 20	20	ma
Effective Load Resistance		
(Plate to plate)	7000	ohms
MaxSignal Driving Power (Approx.) . 0	0	watts
MaxSignal Power Output (Approx.) 50	80	watts

Maximum Circuit Values:

AF POWER AMPLIFIER & MODULATOR - Class AB2*

Maximum CCS⁴ Ratings, Absolute-Naximum Values:

DC PLATE VOLTAGE				1000 max.	volts
DC GRID-No.2 VOLTAGE				300 max.	volts
MAXSIGNAL DC PLATE CURRENT					
MAXSIGNAL DC GRID-No.1 CURRENT					
MAXSIGNAL PLATE INPUT.					
MAXSIGNAL GRID-No.2 INPUT		-	-		watts
PLATE DISSIPATION.				+	



Dri Use	ver Power Output (Approx.) [♦] 3 3 5 wat ful Power Output (Approx.) 23 80 40 wat
Max	imum Circuit Values:
	d-No.1-Circuit Resistance under ny condition
•	Because the cathode is subjected to considerable tack bombardment the frequency is increased with resultant increase in temperature, t heater voltage should be reduced depending on operating conditions frequency to prevent overheating the cathode and resultant short lif
٠	Measured with special shield adapter.
*	For socket to be used with the 7842, consult manufacturers such J-V-H Microwave Company, 9300 West #Tth Street, Brookfield, Illino E.F. Johnson Company, Waseca, Minnesota; Collins Radio Company, B 35th Street Worth, Cedar Rapids, lowa; and Jettron Products, Route Hanover, New Jersey.
•	Subscript 1 indicates that grid-No.1 current does not flow during a
4	part of the input cycle. Continuous Commercial Service.
٠	Averaged over any audio-frequency cycle of sine-wave form,
*	Maximum plate dissipation is a function of the maximum plate inpu efficiency of the class of service, and the effectiveness of t cooling system. See Cooling, Conduction under General Data, and a Cooling Considerations.
	Preferably obtained from a fixed supply.
#	The driver stage should be capable of supplying the No.1 grids of Class AB_1 stage with the specified driving voltage at low distortion
×	The resistance introduced into the grid-No.1 circuit by the inf coupling should be held to a low value. In no case should it exc the specified maximum value. Transformer- or impedance-coupli devices are recommended.
\$	Subscript 2 indicates that grid-No.1 current flows during some poof the input cycle.
†	Driver stage should be capable of supplying the specified driv power at low distortion to the No.1 grids of the AB ₂ stage minimize distortion, the effective resistance per grid-No.1 circl of the AB ₂ stage should be held at a low value. For this purpo- the use of transformer coupling is recommended.
ŧ	-Single-Tone* operation refers to that class of amplifier service which the grid-Ho.1 input consists of a monofrequency of signal hav constant amplitude. This signal is produced in a single-sideb suppressed-carrier system when a single audio frequency of const. amplitude is applied to the input of the system.
§	Obtained preferably from a separate source modulated along with plate supply.
Ð	Obtained from grid-No.1 resistor or from a combination of grid-N resistor with either fixed supply or cathode resistor.
0	The driver stage is required to supply tube losses and rf-circ losses. It should be designed to provide an excess of power ab the indicated values to take care of variations in line volta components, initial tube characteristics, and tube characterist during life.
Q	If this value is insufficient to provide adequate bias, the additio required bias must be supplied by a cathode resistor or fixed supp
**	Key-down conditions per tube without amplitude mcdulation. Amplit modulation essentially negative may be used if the positive peak the audio-frequency envelope does not exceed 115 per cent of carrier conditions.
	Obtained preferably from a fixed supply, or from the plate sup voltage with a voltage divider.
**	Obtained from fixed supply, by grid-No.1 resistor, by cathode resist or by combination methods.



CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Nin.	Nax.		
 Heater Current. Direct Interelectrode Capacitances: 	. 1	2.90	3.55	amp	
Grid No.1 to plate Grid No.1 to cathode	. 2	-	0.065	<i>щ</i> f	
& heater	. 2	11.8	15.2	<i>щ</i> гf	
å heater Grid No.1 to grid No.2 Grid No.2 to plate Grid No.2 to cathode	. 2	17.3 4	0.019 21.9 5.1	µµ⊥f µµ⊥f µµ⊥f	
& heater	· 1,3 · 1,3 · 1,3	- -6 - -8 -	1.3 -18 -20 2 400	μμf volts μa ma volts	
Resistance 8. Useful Power Output		1 80	-	megohm watts	

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

Note 2: Measured with special shield adapter.

Note 3: With dc voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 ma.

- Note 4: For conditions with 6.3 volts on heater; grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 10 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed 400 volts (peak).
- Note 5: under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.
- Note 6: In a single-tube, grid-driven, coaxial-cavity, class-c-amplifier circuit at 400 Mc and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 resistor adjustable between 1000 and 10.000 ohms, dc plate current of 180 ma. maximum, dc grid-No.1 current of 20 ma. maximum, and driver power output of 3 watts.

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N.J., on request.

50-g, II-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified long-

----Indicates a change.



RADIO CORPORATION OF AMERICA Electron Tube Division Light Conclusion







Beam Power Tube

CERAMIC-METAL SEALS "ONE-PIECE" ELECTRODE DESIGN INTEGRAL CONDUCTION CYLINDER CONDUCTION COOLED MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Use at Frequencies up to 2000 Mc Under Severe Shock and Vibration

GENERAL DATA

Electrical:

,	Electrical:	
	Heater, for Matrix-Type, Oxide-Coated,	
	Unipotential Cathode:	_
	Voltage (AC or DC) ¹	
	Minimum heating time	
	Mu-Factor, Grid No.2 to Grid No.1	Č
	for plate volts = 250, grid-No.2 volts	
	= 250, and plate ma. = 100	
	Direct Interelectrode Capacitances:	
	Grid No.1 to plate 0.065 max. μμ	
	Grid No.1 to cathode & heater 14 $\mu\mu$	
	Plate to cathode & heater 0.019 max. µµ Grid No.1 to grid No.2 19 µµ	
	Grid No.2 to plate 4.5 $\mu\mu$	
	Grid No.2 to cathode & heater 1.3 max. μμ	
	Mechanical:	
	Operating Position	y "
	Greatest Diameter (See Dimensional Outline)	
	Weight (Approx.)	z
	Socket:	
	For frequencies up to about 400 Mc	*
	For use at higher frequencies See Nounting Arrangemen	t
	Terminal Connections (See Dimensional Outline):	
	G ₁ -Grid-No.1- H,K-Heater- &	
	Terminal Cathode-	
	Contact Terminal	
	Surface Contact Ga - Grid-No. 2- Surface	
	G ₂ -Grid-No.2- Terminal P-Plate-	
	Contact Contact Terminal	
	Surface Contact	
,	H-Heater- Surface	
	Terminal H ^{EDC}	
	Contact	
	Surface	
	Thermal:	
	Conduction-Cylinder Temperature	С
	Seal Temperature (Plate, grid No.2.	
	grid No.1, cathode, and heater)	С
-		



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

World Radio History

Cooling, Conduction:

The conduction cylinder must be thermally coupled to a constant-temperature device (heat sink—solid or liquid) to limit the conduction cylinder to the specified maximum value of 250° C. The plate, grid-No.2, grid-No.1, cathode, and heater terminals may also require coupling to the heat sink to limit their respective seal temperature to the specified maximum value of 250° C.

AF POWER AMPLIFIER & MODULATOR --- Class AB

Maximum CCS Ratings, Absolute-Naximum Values:

DC PLATE VOLTAGE								1000 max.	volts
DC GRID-No.2 VOLTAGE								300 max.	volts
MAXSIGNAL DC PLATE CURRENT	•	٠		•		•	•	180 max.	ma
MAXSIGNAL PLATE INPUT.	٠	·	•					180 max.	watts
MAXSIGNAL GRID-No.2 INPUT PLATE DISSIPATION	•	٠	·	٠	٠	•	•	4.5 max.	watts
PLATE DISSIPATION.									

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage DC Grid-No.2 Voltage® DC Grid-No.1 Voltage from		650 300	850 300	volts volts
fixed-bias source	•	-15	-15	volts
Voltage#		30	30	volts
Zero-Signal DC Plate Current		80	80	ma
MaxSignal DC Plate Current		200	200	та
Zero-Signal DC Grid-No.2 Current		0	0	ma
MaxSignal DC Grid-No.2 Current		20	20	ma
Effective Load Resistance				
(Plate to plate)		4330 0 50	7000 0 80	ohms watts watts

Maximum Circuit Values:

AF POWER AMPLIFIER & MODULATOR --- Class AB2

Maximum CCS⁴ Ratings, Absolute-Naximum Values:

DC PLATE VOLTAGE				1000	max.	volts
DC GRID-No.2 VOLTAGE				300	max.	volts
MAXSIGNAL DC PLATE CURRENT				180	max.	ma
MAXSIGNAL DC GRID-No.1 CURRENT	۰.			30	max.	നമ
MAXSIGNAL PLATE INPUT				180	max.	watts
MAXSIGNAL GRID-No.2 INPUT				4.5	max.	watts
PLATE DISSIPATION				÷	i	

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



World Radio History

Typical CCS Push-Pull Operation:

Value	s are	for 2	tubes
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OC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage [®]	300	300	volts
DC Grid-No.1 Voltage from			
fixed-bias source	-15	-15	volts
Peak AF Grid-No.1-to-Grid-No.1			
Voltage	46	46	volts
Zero-Signal DC Plate Current	80	80	ma
MaxSignal DC Plate Current	355	355	ma
Zero-Signal DC Grid-No.2 Current	0	0	ma
MaxSignal DC Grid-No.2 Current	25	25	ma
MaxSignal DC Grid-No.1 Current	15	15	ma
Effective Load Resistance			
(Plate to plate)	2450	3960	ohms
MaxSignal Driving Power (Approx.)†.	0.3		watt
MaxSignal Power Output (Approx.)	85	140	watts

LINEAR RF POWER AMPLIFIER Single-Sideband Suppressed-Carrier Service

Maximum CCS⁴ Ratings, Absolute-Naximum Values:

	Up to 1215 Nc
DC PLATE VOLTAGE	1000 max. volts
DC GR1D-No.2 VOLTAGE	300 max. volts
MAXSIGNAL DC PLATE CURRENT	180 max. ma
MAXSIGNAL DC GRID-No.1 CURRENT	30 max. ma
MAXSIGNAL PLATE INPUT	180 max. watts
MAXSIGNAL GRID-No.2 INPUT	4.5 max. watts
PLATE DISSIPATION	+

Typical CCS Class AB₁ "Single-Tone" Operation:‡

	Up to (So Nc	
DC Plate Voltage	650	850	volts
DC Grio-No.2 Voltage®	300	300	volts
OC Grid-No.1 Voltage	-15	-15	volts
Zero-Signal DC Plate Current	40	40	ma
Zero-Signal DC Grid-No.2 Current	0	0	ma
Effective RF Load Resistance	2165	3500	ohms
MaxSignal DC Plate Current	100	100	ma
MaxSignal DC Grid-No.2 Current	10	10	ma
MaxSignal DC Grid-No.1 Current	0	0	ma
MaxSignal Peak RF Grid-No.1 Voltage .	15	15	volts
MaxSignal Driving Power (Approx.)	0	0	watts
MaxSignal Power Output (Approx.)	25	40	watts

Maximum Circuit Values:



RADIO CORPORATION OF AMERICA Electron Tube Division

PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony

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

Maximum CCS⁴ Ratings, Absolute-Maximum Values:

										UP to 1	215 MC	
DC PLATE VOLTAGE											max.	volts
DC GRID-No.2 VOLTAGE.								•		300	max.	volts
DC GRID-No.1 VOLTAGE.								٠		-100	max.	volts 👝
DC PLATE CURRENT											max.	ma
DC GRID-No.1 CURRENT.		•		•			•			30	max.	та 📃
PLATE INPUT											max.	watts
GRID-No.2 INPUT											max.	watts
PLATE DISSIPATION	•	٠	•	٠	·	٠	•	•	٠	÷		

Typical CCS Operation:

		At 400 Mc	
DC Plate Voltage		400 700	volts
DC Grid-No.2 Voltage§	• •	200 250	volts
DC Grid-No.1 Voltage ^D		-20 -50	volts
DC Plate Current		100 130	ma
DC Grid-No.2 Current		5 10	ma
DC Grid-No.1 Current		5 10	ma
Driver Power Output (Approx.).	• •	2 3	watts
Useful Power Output (Approx.)		16 45	watts

Maximum Circuit Values:

Grid-No.1-Circuit	Resistance under	
any condition .		30000 [♥] max. ohms

RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy

and

RF POWER AMPLIFIER --- Class C FM Telephony

Maximum CCS & Ratings, Absolute-Maximum Values:

		Up to 1215 Mc									
DC PLATE VOLTAGE		1000 max. volts									
DC GRID-No.2 VOLTAGE		300 max. volts									
DC GRID-No.1 VOLTAGE		-100 max. volts									
DC PLATE CURRENT		180 max. ma									
DC GRID-No.1 CURRENT		30 max. ma									
PLATE INPUT		180 max. watts									
GRID-No.2 INPUT		4.5 max. watts									
PLATE DISSIPATION											
Typical CCS Operation:											
	At 400 Nc										

	AL 400 AL	AL 1219 AC	
DC Plate Voltage	400 900	900	volts
DC Grid-No.2 Voltage••	200 300	300	volts
DC Grid-No.1 Voltage**	-35 -30	-22	volts 👝
DC Plate Current	150 170	170	ma
DC Grid-No.2 Current	5 1	1	ma
DC Grid-No.1 Current	3 10	4	ma

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Electron Tube Division Radio History

		iver Power Output (Approx.) ⁰ 3 3 5 watts eful Power Output (Approx.) 23 80 40 watts
	Max	kimum Circuit Values:
		id-No.1-Circuit Resistance under any condition
	•	Because the calhode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.
		Measured with special shield adapter.
-	*	For socket to be used with the 7842, consult manufacturers such as J-M-M Hicrowave Company, 9300 West With Street, Brookfield, Illinois E.F. Johnson Company, Waseca, Minnesota; Collins Radio Company, 855 35th Street Worth, Cedar Rapids, Iowa; and Jettron Products, Route 10, Hanover, New Jersey.
		Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.
		Continuous Commercial Service.
	 	Averaged over any audio-frequency cycle of sine-wave form.
•	-	Maximum plate dissipation is a function of the maximum plate input, efficiency of the class of service, and the effectiveness of the cooling system. See Cooling, Conduction under General Data, and also Cooling Considerations.
	•	Preferably obtained from a fixed supply.
	#	The driver stage should be capable of supplying the No.1 grids of the Class AB_1 stage with the specified driving voltage at low distortion.
	•	The resistance introduced into the grid-No.1 circuit by the input coupling should be held to a low value. In no case should it exceed the specified maximum value. Transformer- or impedance-coupling devices are recommended.
	¢	Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.
	t	or the input cycle. Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB stage. To minimize distortion, the effective resistance per grid=No.1 circuit of the AB stage should be held at a low value. For this purpose, the use of transformer coupling is recommended.
	‡	"Single-Tone" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude to the input of the system.
	Ş	Obtained preferably from a separate source modulated along with the plate supply.
	٥	Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
	٥	The driver stage is required to supply tube losses and rf-circuit losses. It should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics, and tube characteristics during life.
	Q	If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.
	**	Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.
	••	Obtained preferably from a fixed supply, or from the plate supply voltage with a voltage divider.
	**	Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

 Heater Current. Direct Interelectrode Capacitances: 	Note . 1	Min. 2.74	Max. 3.35	amp
Grid No.1 to plate Grid No.1 to cathode	. 2	-	0.065	μμf
& heater	. 2	11.8	15.2	μμ.f
& heater	. 2	17.3 4	0.019 21.9 5.1	µµ f µµ f µµ f
& heater	. 1,3 . 1,3 . 1,3	- -6 8 -	1.3 -15 -20 2 400	μμf volts ma volts
Resistance,		1 80	-	megohm watts

- Note 1: With 6.3 volts ac or dc on heater.
- Note 2: Measured with special shield adapter.

Note 3: With dc voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 ma.

- Note 4: For conditions with 6.3 volts on heater; grid No.1. grid No.2. and plate tied together; and pulse-voltage source connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltage-pulse amplitude isadjusted until a peak cathode current of 10 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed #00 volts (peak).
- Note 5: under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.
- In a single-tube, grid-driven, coaxial-cavity, class-C-ampli-fier circuit at u00 Mc and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-Mo.1 resistor adjustable between 1000 and 10,000 ohms, dc plate current of 180 ma. maximum, dc grid-Mo.1 current of 20 ma. maximum, and driver power output of 3 watts. Note 6: In a single-tube,

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N.J., on request.

50-g, ||-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified long-

Electron Tube Division World Radio History

RADIO CORPORATION OF AMERICA Harrison, N. J.



duration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes are required to meet the limits for items 1, 3, 4, 7, and 8 under Characteristics Range Values for Equipment Design.

500-g, Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes are required to meet the limits for items 1, 3, 4, 7, and 8 under Characteristics Range Values for Equipment Design.

5-to-2000 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage adjusted togive dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8minute sweep consisting of:

- a. 5-to-10 cps with fixed double amplitude of 0.080 inch \pm 10%.
- b. 10-to-15 cps at fixed acceleration of 0.41 g ± 10%.
- c, 15-to-75 cps with fixed double amplitude of 0.036 inch \pm 10%.
- d. 75-to-2000 cps at fixed acceleration of 10 g ± 10%.

During the above vibration tests, tubes will not show an rms output voltage in excess of 15 volts across the plate load resistor in the 5-to-2000 cycle range. At the end of this test, tubes are required to meet the limits for items 1, 3, 4, 7, and 8 under Characteristics Range Values for Equipment Design.

COOLING CONSIDERATIONS

The conduction-cooling system consists, in general, of a constant-temperature device (heat sink) and suitable heatflow path (coupling) between the heat sink and tube. Careful consideration should be given to the design of a heat-flow path through a coupling device having low electrical conductivity and high thermal conductivity.

The maximum plate dissipation may be calculated from the equation:

$$W = KA \frac{(T_2 - T_1)}{L}$$



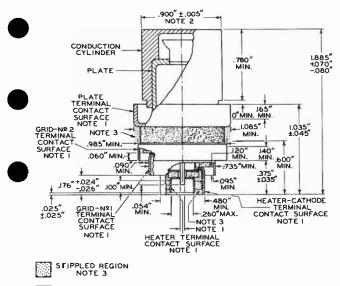
RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History Harrison, N. J. where:

W		maximum plate dissipation in watts
К	=	thermal conductivity♥♥ of the coupling material
A	=	area measured at right angles to the direction of the flow of heat in square inches
T_{2}, T_{1}	=	temperature in degrees Centigrade of planes or surfaces under consideration
L	=	length of heat path in inches through coupling

material to produce temperature gradient
Thermal conductivity is defined as the time rate of transfer of heat by conduction, through unit thickness, across unit area for unit difference of temperature. It is measured in watts per square inch for a thickness of one inch and a difference of temperature of 10 C.

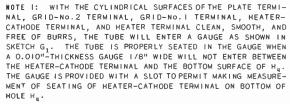








92CM-9218R4



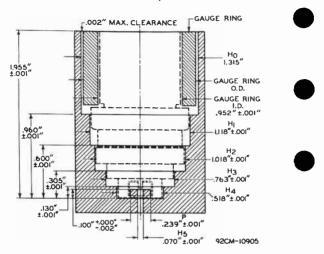
NOTE 2: WITH THE TUBE SEATED IN GAUGE AND WITH THE CONDUCTION CYLINDER CLEAN, SMOOTH, AND FREE OF BURRS, THE GAUGE RING WILL SLIP OVER CONDUCTION CYLINDER AS SHOWN IN SKETCH ${\bf G}_1.$

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.



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SKETCH G

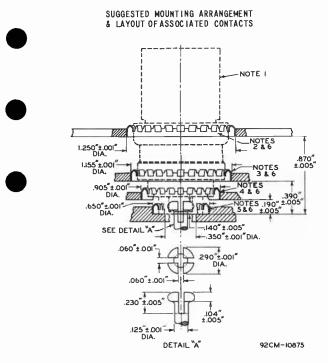


THE AXES OF THE CYLINORICAL HOLES $\rm H_1$ THROUGH $\rm H_5$ ANO THE AXIS OF POST P ARE COINCIDENT WITHIN 0.001".

THE AXES OF THE GAUGE-RING INSIDE DIAMETER AND GAUGE-RING OUTSIDE DIAMETER ARE COINCIDENT WITHIN 0.001".







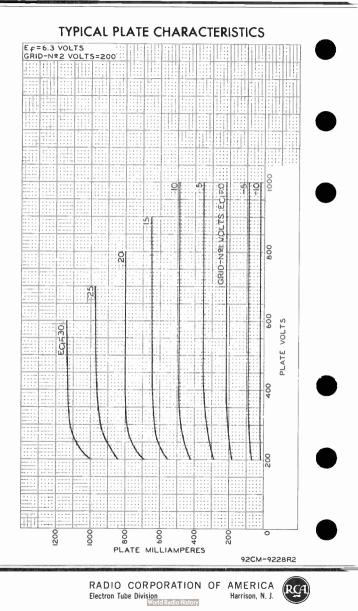
NOTE I: IF A CLAMP IS USED, IT MUST BE ADJUSTABLE IN A PLAME NORMAL TO THE MAJOR TUBE AXIS TO COMPENSATE FOR VARIATIONS IN CONCENTRICITY BETWEEN THE CONDUCTION CYLINOER AND THE CONTACT TERMINALS.

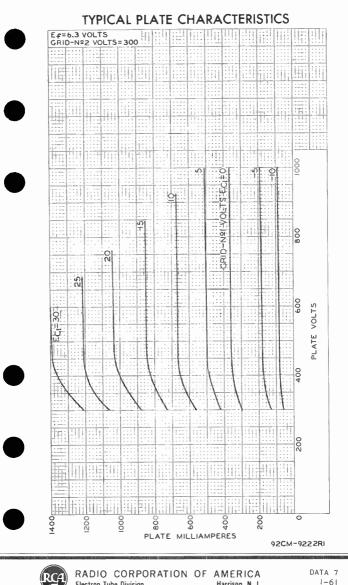
NOTE 2: CONTACT RING NO.97-252 OR FINGER STOCK NO.97-380. NOTE 3: CONTACT RING NO.97-253 OR FINGER STOCK NO.97-380. NOTE 4: CONTACT RING NO.97-254 OR FINGER STOCK NO.97-380. NOTE 5: CONTACT RING NO.97-255 OR FINGER STOCK NO.97-380. NOTE 6: THE SPECIFIED CONTACT RING OF PREFORMED FINGER STOCK ANO FINGER STOCK NO.97-380 PROVIDE ADEQUATE ELECTRICAL CONTACT, BUT THE FINGER STOCK NO.97-380 IS LESS SUSCEPTIBLE

TO BREAKAGE THAN THE SPECIFIED CONTACT RING. BOTH TYPES ARE MADE BY INSTRUMENTS SPECIALTIES COMPANY, LITTLE FALLS, NEW JERSEY.



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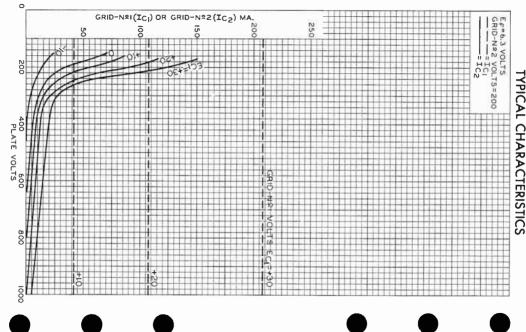


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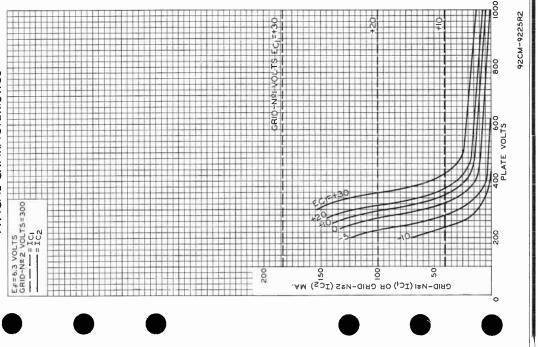
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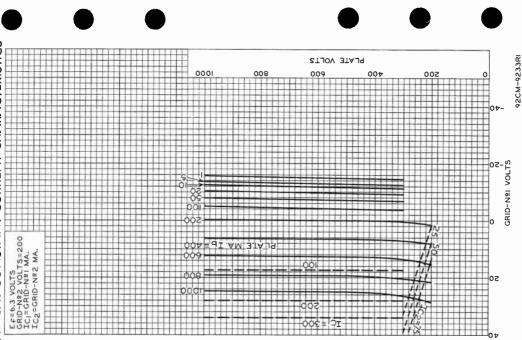
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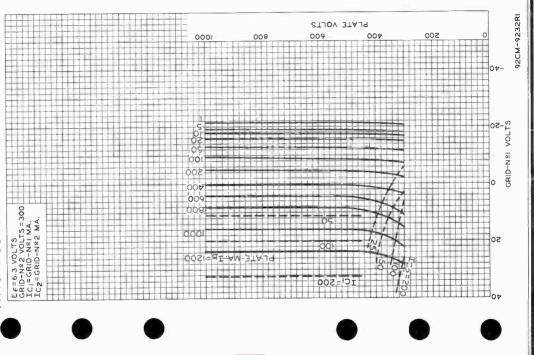
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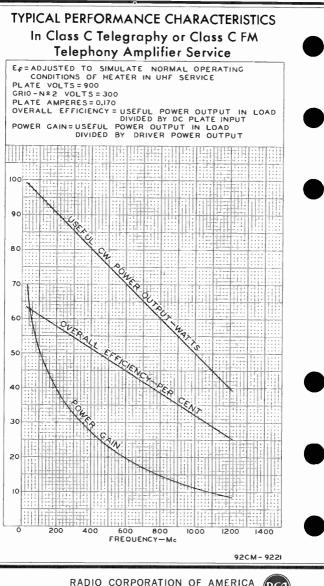
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Electron Tube Division World Radio History

Beam Power Tube

CERAMIC-METAL SEALS UNIPOTENTIAL CATHODE CONDUCTION COOLING

COAXIAL-ELECTRODE STRUCTURE INTEGRAL CONDUCTION CYLINDER 180 WATTS CW INPUT UP TO 1215 MC

For Use at Frequencies up to 2000 Mc

The 7843 is the same as the 7844 except for the following items:

He	ater, t	or U	In i po	oten	tia	1 (Jat	thode:				
	Voltage	(AC	or	DC)	а,						26.5 ± 10%	volts
	Current	at	heat	er	volt	ts	=	26.5.			0.52	amp

Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life,

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Hax.	
Heater Current	1	0.45	0.57	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.065	μμf
Grid No.1 to cathode & heater	2	11.8	15.2	μμf
Plate to cathode & heater	2	-	0.015	μμf
Grid No.1 to grid No.2	2	15.9	18.9	μμf 🖛
Grid No.2 to plate	2	4	5	μµf
Grid No.2 to cathode & heater	2	-	0.4	μμf
Grid-No.1 Voltage		-6.5	15	volts
Grid-No.1 Cutoff Voltage			-30	volts
Grid-No.1 Current	1,5	10	-	ma
Reverse Grid-No.1 Current	1,3	-	-20	μa
Grid-No.2 Current	1.3	-8	+2	ma
Peak Emission Voltage		-	400	volts
Interelectrode Leakage Resistance .	7	1	-	megohm
Useful Power Output	8	80	-	watts

- Note 1: With 26.5 volts ac or dc on heater.
- Note 2: Measured with special shield adapter.
- Note 3: With dc plate voltage of 1000 volts, dc grid—No.2 voltage of 300 volts, and dc grid—No.1 voltage adjusted to give a dc plate current of 115 ma.
- Note 4: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 1 ma.
- Nole 5: With plate and grid-No.2 floating and dc grid-No.1 voltage of +2 volts.
- Note 6: For conditions with: grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected between plate and calhode. Pulse duration is 2 microsecods, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltagepulse amplitude is adjusted until a peak cathode current of amperes is obtained. After 1 minute at this value, the voltagepulse amplitude with not exceed 400 volts (peak).
- Note 7: Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.

-Indicates a change.



RADIO CORPORATION OF AMERICA Electron Tube Division



Note 8: In a single-tube, grld-driven, coaxial-cavity class-C-amplifier circuit at 400 Mc and for conditions with 24 volts ac or dc on heater, dc plate voltage of 100 volts, dc grld-No.2 voltage of 300 volts, grid-No.1 resistor adjustable between 1000 and 10,000 ohms, dc plate current of 180 ma.maximum, dc grid-No.1 current of 20 ma. maximum, and driver power output of 3 watts.





Beam Power Tube

CERAMIC-METAL SEALS UNIPOTENTIAL CATHODE CONDUCTION COOLING

COAXIAL-ELECTRODE STRUCTURE INTEGRAL CONDUCTION CYLINDER 180 WATTS CW INPUT UP TO 1215 Mc

For Use at Frequencies up to 2000 Mc

The 7843 is the same as the 7844 except for the following items:

neater, for unipotentias	νaι	L L L L	JUG	÷ •				
Voltage (AC or DC)▲ .							26.5 ± 10%	volts
Current at 26.5 volts							0.52	amp

Because the cathode is subjected to considerable back bombardment as the "requency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Nin.	Nax.	
Heater Current	1	0.45	0.57	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2		0.065	μµuf
Grid No.1 to cathode&heater	2	11.8	15.2	<i>μ</i> μ.f
Piate to cathode & heater	2	-	0.015	<i>μ</i> μf
Gric No.1 to grid No.2	2	16.9	21	μµf
Gric No.2 to plate	2	4	5	μµf
Grid No.2 to cathode & heater	2	-	0.4	μµf
Grid-No.1 Voltage	1,3	-6.5	-15	volts
Grid-No.1 Cutoff Voltage	1,4	-	-30	volts
Grid-No.1 Current	1,5	10	-	ma
Reverse Grid-No.1 Current	1,3	-	-20	μa
Grid-No.2 Current	1,3	-8	+2	ma
Peak Emission Voltage			400	volts
Interelectrode Leakage Resistance .	7	1	-	megohm
Useful Power Output	8	80	-	watts

Note 1: With 26.5 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

- Note 3: With dc plate voltage of 1000 volts, dc grid—No.2 voltage of 300 volts, and dc grid—No.1 voltage adjusted to give a dc plate current of 115 ma.
- Mote 4 With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 1 ma.
- Note 5: With plate and grid-No.2 floating and dc grid-No.1 voltage of +2 volts.
- Note 6: For conditions with: grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltagepulse amplitude is adjusted until a peak cathode current of 10 amperes isobtained. After 1 minute at this value, the voltagepulse amplitude with a set 400 volts (peak).

Note 7: Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of i megohm, will be i megohm.



Note 8: In a single-tube, grid-driven, coaxial-cavity class-C-amplifier circuit at 400 Mc and for conditions with 24 volts ac or dc on heater, dc plate voltage of 100 volts, dc grid-No.2 voltage of 300 volts, grid-Ho.1 resistor adjustable between 1000 and 10,000 ohms, dc plate current of 180 ma.maximum, dc grid-Ho.1 current of 20 ma. maximum, and driver power output of 3 watts.



RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History

Beam Power Tube

CERAMIC-METAL SEALS UNIPOTENTIAL CATHODE CONDUCTION COOLED COAXIAL-ELECTRODE STRUCTURE INTEGRAL CONDUCTION CYLINDER 180 WATTS CW INPUT UP TO 1215 Mc

For Use at Frequencies up to 2000 Mc

GENERAL DATA

Electrical:

Lieuli (da).	
Heater, for Unipotential Cathode: Voitage (AC or DC) ⁴ 6.3 ±	10% volts
Current at heater volts = $6.3 \dots 2.1$	amp
Minimum heating time	sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 250, grid-No.2	
volts = 250 , and plate ma. = 100	
Direct Interelectrode Capacitances:	,
Grid No.1 to plate 0.065 ma Grid No.1 to cathode & heater	ıх. µµt µµf
Plate to cathode & heater 0.015 ma	
Grid No.1 to grid No.2	μμf -
Grid No.2 to plate 4.4	μµf
Grid No.2 to cathode & heater 0.4 ma	nx. μμf
Mechanical:	
Operating Position	'0" _ 0_080"
Greatest Diameter (See Dimensional Outline)	. 1.119"
Weight (Approx.).	
Socket:	*
For frequencies up to about 400 Mc	rrangement
Terminal Connections (See Dimensional Outline):	
	leater- å
Terminal p	Cathode-
	Terminal Contact
Surface G ₂ -Grid-No.2-	Surface
Terminal Garden P-F	Plate-
Contact	Terminal
Surface H-Heater-	Contact Surface
Terminal	ourrace
Contact	
Surface	
Thermal:	
	60 max. ^o C
Seal Temperature (Plate, Grid No.2, Grid No.1, Cathode, and Heater)	60 max. ^O C
Cooling, Conduction:	
The conduction cylinder must be thermally cou	
constant-temperature device (heat sink-solid	
to limit the conduction cylinder to the specifi	

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value of 250° C. The plate, grid-No.2, grid-No.1, cathode, and heater terminals may also require coupling to the heat sink to limit their respective seal temperature to the specified maximum value of 250° C.

AF POWER AMPLIFIER & MODULATOR - Class AB

Maximum CCS Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE				1000 max.	volts
DC GRID-No.2 VOLTAGE				300 max.	volts
MAXSIGNAL DC PLATE CURRENT					
MAXSIGNAL PLATE INPUT	•	•		180 max.	watts
MAXSIGNAL GRID-No.2 INPUT.				7_max.	watts
PLATE DISSIPATION [®]				•	

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage [®]		300	volts
DC Grid-No.1 Voltage from fixed-bias source.	-15	-15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage*	30	30	volts
Zero-Signal DC Plate Current	80	80	ma
MaxSignal DC Plate Current	200	200	та
Zero-Signal DC Grid-No.2 Current	0	0	та
MaxSignal DC Grid-No.2 Current	20	20	та
Effective Load Resistance (Plateto plate)	4330	7000	ohms
MaxSignal Driving Power (Approx.)	0	0	watts
MaxSignal Power Output (Approx.)	50	80	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	una	dei	- 6	any	/	cond	ition:'	*	
For fixed-bias operation							30000	max.	ohms
For cathode-bias operation.			•	•	•		Not	recomm	ended

AF POWER AMPLIFIER & MODULATOR - Class AB2*

Maximum CCS Ratings, Absolute-Maximum Values;

DC PLATE VOLTAGE	1000 max.	volts
DC GRID-No.2 VOLTAGE		
MAXSIGNAL DC PLATE CURRENT [®]		
MAXSIGNAL DC GRID-No.1 CURRENT		
MAXSIGNAL PLATE INPUT.	180 max.	watts
MAXSIGNAL GRID-No.2 INPUT	7 max.	watts
PLATE DISSIPATION ⁴	+	

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage	650	850	volts	
DC Grid-No.2 Voltage [®]				
DC Grid-No.1 Voltage from fixed-bias source.				
Peak AF Grid-No.1-to-Grid-No.1 Voltage			volts	
Zero-Signal DC Plate Current			ma	
MaxSignal DC Plate Current			ma	
Zero-Signal DC Grid-No.2 Current	0	0	та	

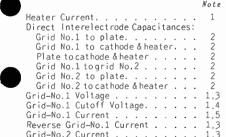
RADIO CORPORATION OF AMERICA Electron Tube Division Id Radio History

Harrison, N. J.



- Continuous Commercial Service.
- ٠ Averaged over any audio-frequency cycle of sine-wave form.
- Maximum plate dissipation is a function of the maximum plate input, efficiency of the class of service, and the effectiveness of the cooling system. See Cooling, Conduction under General Data, and also Cooling Considerations.
- æ Preferably obtained from a fixed supply. 4
- The driver stage should be capable of supplying the No.1 grids of the Class A81 stage with the specified driving voltage at low distortion.
- The resistance introduced into the grid-No.1 circuit by the input coupling should be held to a low value. In no case should it exceed the specified maximum value. Transformer- or impedance-coupling devices are recommended.
- Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.
- Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB₂ stage. To minimize distortion, the effective resistance per grid-No.1 circuit of the AB₂ stage should be held at a low value. For this purpose, the use of transformer coupling is recommended.
- İ "Single-Tone" operation refers to that class of amplifier service in which the grid-Mo.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system wher a single audio frequency of constant amplitude is applied to the input of the system.
- Obtained preferably from a separate source modulated along with the plate supply.
- Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
- The driver stage is required to supply tube losses and rf-circuit losses. It should be designed to provide an excess of power above the indicated values to take care of variations in line voltage. components, initial tube characteristics, and tube characteristics during life.
- If this value is insufficient to provide adequate blas, the additional required bias must be supplied by a cathode resistor or fixed supply.
- Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio frequency envelope does not exceed 115 per cent of the carrier conditions.
- Obtained preferably from a fixed supply, or from the plate supply voltage with a voltage divider.
- ** Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN



Electron Tube Division

Grid No.1 to plate	2	-	0.065	μμf
Grid No.1 to cathode & heater	2	11.8	15.2	μµf
Plate to cathode & heater	2	-	0.015	μµf
Grid No.1 togrid No.2	2	15.9	18.9	μμf +
Grid No.2 to plate	2	4	5	μµf
Grid No.2 to cathode & heater	2	-	0.4	μµf
Grid-No.1 Voltage	1,3	-6	-15	volts+
Grid-No.1 Cutoff Voltage	1.4	-	-30	volts
Grid-No.1 Current		10	_	ma
Reverse Grid-No.1 Current	1,3	-	-20	μa
Grid-No.2 Current	1,3	-8	+2	ma
Peak Emission Voltage	1,6	-	400	volts
Interelectrode Leakage Resistance.	7	1		megohm
Useful Power Output		80	-	watts
			licates a	change

Indicates a change.

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Harrison, N. J.

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Note	1:	With 6.3 volts ac or dc on heater.
Note	2:	Measured with special shield adapter.
Note	3:	With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-Ho.1 voltage adjusted to give a dc plate current of 115 ma.
Nole	4:	With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 1 ma.
Note	5:	With plate and grid-No.2 floating and dc grid-No.1 voltage of +2 volts.
Note		For conditions with: grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltage- pulse amplitude is adjusted until a peak cathode current of 10 amperes is obtained. After 1 minute at this value, the voltage- pulse amplitude will not exceed 400 volts (peak).
Note	7:	Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with

- No least 30 e minimum ured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.
- In a single-tube, grid-driven, coaxial-cavity class-C-amplifier circuit at 400 Mc and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 100 volts, dc grid-Mo.2 voltage of 300 volts, grid-No.1 resistor adjustable between 1000 and 10,000 ohms, dc plate current of 180 ma, maximum, dc grid-Ho.1 current of 20 ma, maximum, and driver power output of 3 watts. Note 8:

COOLING CONSIDERATIONS

The conduction-cooling system consists, in general, of a constant-temperature device (heat sink) and suitable heatflow path (coupling) between the heat sink and tube. Careful consideration should be given to the design of a heat-flow path through a coupling device having low electrical conductivity and high thermal conductivity.

The maximum plate dissipation may be calculated from the equation:

$$W = KA \frac{(T_2 + T_1)}{L}$$

where:

- W = maximum plate dissipation in watts
- = thermal conductivity 🚺 of the coupling material К
- A = area measured at right angles to the direction of the flow of heat in square inches
- T_2, T_1 = temperature in degrees Centigrade of planes or surfaces under consideration
 - L = length of heat path in inches through coupling material to produce temperature gradient
- Thermal conductivity is defined as the time rate of transfer of heat by conduction, through unit thickness, across unit area for unit difference of temperature. It is measured in watts per square inch for a thickness of one inch and a difference of temperature of 10 C.













Beam Power Tube

COAXIAL-ELECTRODE STRUCTURE INTEGRAL CONDUCTION CYLINDER 180 WATTS CW INPUT UP TO 1215 Mc

For Use at Frequencies up to 2000 Mc

CERAMIC-METAL SEALS

CONDUCTION COOLED

UNIPOTENTIAL CATHODE

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:6.3 ± 10% voltsVoltage (AC or DC)*
volts = 250, and plate ma. = 100
Grid No.1 to plate 0.065 max. μμf
Plate to cathode & heater 0.015 max. $\mu\mu f$
Grid No.1 to grid No.2 19 μμf Grid No.2 to plate 4.4 μμf
Grid No.2 to cathode & heater 0.4 max. $\mu\mu f$
Mechanical:
Operating Position
G, -Grid-No.1- H,K - Heater- &
Green Contact Contact Contact Green Contact Contact Contact Surface H - Heater- Terminal Contact Surface H - Heater- Terminal Contact Surface Contact Contact Contact Contact Contact Contact Surface

Thermal:

°C Conduction-Cylinder Temperature . . . 250 max. Seal Temperature (Plate, Grid No.2, Grid No.1, Cathode, and Heater) . 250 max. °C Cooling, Conduction: The conduction cylinder must be thermally coupled to a

constant-temperature device (heat sink-solid or liquid) to limit the conduction cylinder to the specified maximum



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value of 250° C. The plate, grid-No.2, grid-No.1, cathode, and heater terminals may also require coupling to the heat sink to limit their respective seal temperature to the specified maximum value of 250° C.

AF POWER AMPLIFIER & MODULATOR --- Class AB

Maximum CCS⁴ Ratings, Absolute-Haximum Values:

DC PLATE VOLTAGE								1000 max. v	olts
DC GRID-No.2 VOLTAGE. MAXSIGNAL DC PLATE CURRENT	·	•	•	•	·		•	300 max. v	/olts
MAXSIGNAL DC PLATE UNRENT	٠	٠	·	•	٠	٠	·	180 max.	ma
MAXSIGNAL PLATE INPUT MAXSIGNAL GRID-No.2 INPUT	·	•	·	•	•	·	•	180 max. v	vatts
PLATE DISSIPATION.	:	:	:	:	2	:	:	, max. ⊮	alls

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage [®]	300	300	
DC Grid-No.1 Voltage from fixed-bias source.	-15	-15	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage"	30	30	volts
Zero-Signal DC Plate Current	80	80	
MaxSignal DC Plate Current	200	200	
Zero-Signal DC Grid-No.2 Current	0	0	ma
MaxSignal DC Grid-No.2 Current	20	20	ma
Effective Load Resistance (Plate to plate)	4330	7000	ohms
MaxSignal Driving Power (Approx.)	0	0	watts
MaxSignal Power Output (Approx.)	50	80	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	und	der	- á	any	/	cond	ition:'	*	
For fixed-bias operation							30000	max.	ohms
For cathode-bias operation.		•	٠				Not	recomm	ended

AF POWER AMPLIFIER & MODULATOR - Class AB2*

Maximum CCS Ratings, Absolute-Hazimum Values:

DC PLATE VOLTAGE	1000 max.	volts
DC GRID-No.2 VOLTAGE	300 max.	volts
MAXSIGNAL DC PLATE CURRENT [®]	180 max.	ma
MAXSIGNAL DC GRID-No.1 CURRENT	30 max.	ma
MAXSIGNAL PLATE INPUT	180 max.	watts
MAXSIGNAL GRID-No.2 INPUT	7_max.	watts
PLATE DISSIPATION.	÷	

Typical CCS Push-Pull Operation:

Values are for 2 tubes

DC Plate Voltage. DC Grid-No.2 Voltage [®] . DC Grid-No.1 Voltage from fixed-bias source. Peak AF Grid-No.1-to-Grid-No.1 Voltage. Zero-Signal DC Plate Current. MaxSignal DC Plate Current. Zero-Signal DC Grid-No.2 Current.	300 -15 46 80 355	300 -15	ma	
Zero-Signal DC Grid-No.2 Current	0	0	ma	

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Max.-Signal DC Grid-No.2 Current. 25 25 ma Max.-Signal DC Grid-No.1 Current. . . . 15 15 ma Effective Load Resistance (Plate to plate) . . 2450 3960 ohms Max.-Signal Driving Power (Approx.)[†].... 0.3 0.3 watt Max.-Signal Power Output (Approx.). . . . 140 85 watts

LINEAR RE POWER AMPLIEIER

Single-Sideband Suppressed-Carrier Service

Maximum CCS⁴ Ratings, Absolute-Maximum Values:

Up to 1215 Mc

DC PLATE VOLTAGE		1000 max.	volts
DC GRID-No.2 VOLTAGE	•	300 max.	volts
MAXSIGNAL DC PLATE CURRENT		180 max.	ma
MAXSIGNAL DC GRID-No.1 CURRENT		30 max.	та
MAXSIGNAL PLATE INPUT		180 max.	watts
MAXSIGNAL GRID-No.2 INPUT	•	7 _* max.	watts
PLATE DISSIPATION	•		

Typical CCS Class AB; "Single-Tone" Operation:

	Up to	60 Mc	
DC Plate Voltage	650	850	volts
DC Grid-No.2 Voltage [®]		300	volts
DC Grid-No.1 Voltage	-15	-15	volts
Zero-Signal DC Plate Current	40	40	та
Zerc-Signal DC Grid-No.2 Current	0	0	та
Effective RF Load Resistance	2165	3500	ohms
MaxSignal DC Plate Current	100	100	ma
MaxSignal DC Grid-No.2 Current	10	10	та
MaxSignal DC Grid-No.1 Current	0	0	та
MaxSignal Peak RF Grid-No.1 Voltage		15	volts
MaxSignal Driving Power (Approx.)	0	0	watts
MaxSignal Power Output (Approx.)	25	40	watts

Maximum Circuit Values:

Gr	id-N	lo.1-Circuit	Resistance	uno	dei	- 6	а⊓у	/ (cor	١d	ition:		
- 1	For	fixed-bias	operation								30000	max.	ohms
1	For	cathode-bia	s operation.		•		•		•		Not	recomm	ended

PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony

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

Maximum CCS⁴ Ratings, Absolute-Maximum Values:

						Up to 1215 Nc	
DC PLATE VOLTAGE						800 max.	volts
DC GRID-No.2 VOLTAGE.						300 max.	volts
DC GRID-No.1 VOLTAGE.						-100 max.	volts
DC PLATE CURRENT							ma
DC GRID-No.1 CURRENT.							ma
PLATE INPUT							watts
GRID-No.2 INPUT						4.6 _e max.	watts
PLATE DISSIPATION					•	T	



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Typical CCS Operation:

Electron Tube Division World Radio History





- ÷ Continuous Commercial Service.
- ٠ Averaged over any audio-frequency cycle of sine-wave form.
- Maximum plate dissipation is a function of the maximum plate input, efficiency of the class of service, and the effectiveness of the cooling system. See Cooling, Conduction under General Data, and cooling system. See Cooli also Cooling Considerations.
 - Preferably obtained from a fixed supply.
 - # The driver stage should be capable of supplying the No.1 grids of the Class AB1 stage with the specified driving voltage at low distortion.
 - The resistance introduced into the grid-No.1 circuit by the input coupling should be held to a low value. In no case should it exceed the specified maximum value. Transformer- or impedance-coupling devices are recommended.
 - Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.
 - Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the A82 stage. To minimize distortion, the effective resistance per grid-Ho.1 circuit of the A82 stage should be held at a low value. For this purpose, the use of transformer coupling is recommended.
- t "Single-Tone" operation refers to that class of amplifier service in which the grid-Mo.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.
- §, Obtained preferably from a separate source modulated along with the plate supply.
- п Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
- 0 The driver stage is required to supply tube losses and rf-circuit losses. It should be designed to provide an excess of power above the indicated values to take care of variations in line voltage. components, initial tube characteristics, and tube characteristics during life. C
- If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.
- Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio frequency envelope does not exceed 115 per cent of the carrier conditions.
- Obtained preferably from a fixed supply, or from the plate supply voltage with a voltage divider.
- ** Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.



CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Hin.	Max.	
Heater Current	1	1.84	2.26	алр
Direct Interelectrode Capacitances:	0		0.005	
Grid No.1 to plate			0.065	μµf
Grid No.1 to cathode & heater		11.8	15.2	µµf
Plate to cathode & heater	2	-	0.015	μµuf
Grid No.1 togrid No.2	2	16.9	21	µµt
Grid No.2 to plate		4	5	щif
Grid No.2 to cathode & heater		-	0.4	μμf
Grid-No.1 Voltage		-6.5	-15	volts
Grid-No.1 Cutoff Voltage	1,4	-	-30	volts
Grid-No.1 Current	1,5	10	-	ma
Reverse Grid-No.1 Current		-	-20	μa
Grid-No.2 Current	1,3	-8	+2	ma
Peak Emission Voltage		-	400	volts
Interelectrode Leakage Resistance.	7	1	-	megohm
Useful Power Output		80	-	watts



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Nole	1:	With 6.3 volts ac or dc on heater.	
Note	2:	Measured with special shield adapter.	
Nole	3:	With dc plate vollage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 ma.)
Nole	4:	With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 1 ma.	
Note	5:	With plate and grid—No.2 floating and dc grid—No.1 voltage of *2 volts.	
Note	-	For conditions with: grid No.1, grid No.2, and plate tied logether; and pulse-voltage source connected between plate and calhode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60 pps, and duty factor is 0.00012. The voltage- pulse amplitude is adjusted until a peak cathode current of 10 amperes is obtained. After 1 minute at this value, the voltage- pulse amplitude will not exceed 400 volts (peak).	
Nole	7:	Under conditions with tube at 20 ⁰ to 30 ⁰ C for at least 30 minutes without any voltages applied to the tube. The minimum resistance between any two adjacent electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.	
Note		In a single-tube, grid-driven, coaxial-cavity class-C-amplifier circuit at 400 Mc and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 100 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 resistor adjustable between 1000 and 10.000 ohms, dc plate current of 180 ma. maximum, dc grid-No.1 current of 20 ma. maximum, and driver power output of 3 watts.)

COOLING CONSIDERATIONS

The conduction-cooling system consists, in general, of a constant-temperature device (heat sink) and suitable heatflow path (coupling) between the heat sink and tube. Careful consideration should be given to the design of a heat-flow path through a coupling device having low electrical conductivity and high thermal conductivity.

The maximum plate dissipation may be calculated from the equation:

$$W = KA \frac{(T_2 - T_1)}{L}$$

where:

W = maximum plate dissipation in watts

Electron Tube Division

- K = thermal conductivity ♥♥ of the coupling material
- A = area measured at right angles to the direction of the flow of heat in square inches
- ${\rm T_2, T_1} \simeq {\rm temperature}$ in degrees Centigrade of planes or surfaces under consideration
 - L = length of heat path in inches through coupling material to produce temperature gradient

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Radio History

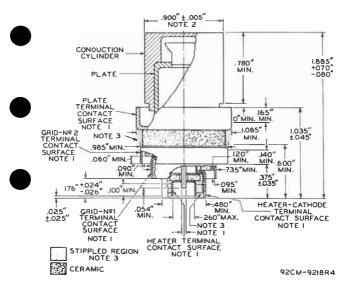
Thermal conductivity is defined as the time rate of transfer of heat by conduction, through unit thickness, across unit area for unit difference of temperature. It is measured in walts per square inch for a thickness of one inch and a difference of temperature of 1°C.



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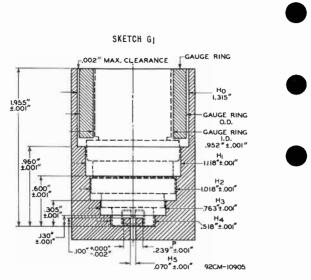
NOTE I: WITH THE CYLINDRICAL SURFACES OF THE PLATE TERMINAL, GRID-NO.2 TERMINAL, GRID-NO.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G₁. THE TUBE IS PROPERLY SEATED IN THE GAUGE WHEN A $O.010^{-1}$ -THICKNESS GAUGE I/B" WIDE WILL NOT ENTER BETWEEN THE HEATER-CATHODE TERMINAL AND THE BOTTOM SURFACE OF H₄. THE GAUGE IS PROVIDED WITH A SLOT TO PERMIT MAKING MEASUREMENT OF SEATING OF HEATER-CATHODE TERMINAL ON BOTTOM OF HOLE H₄.

NOTE 2: WITH THE TUBE SEATED IN GAUGE AND WITH THE CON-DUCTION CYLINDER CLEAN, SMOOTH, AND FREE OF BURRS, THE GAUGE RING WILL SLIP OVER CONDUCTION CYLINDER AS SHOWN IN SKETCH G.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.



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

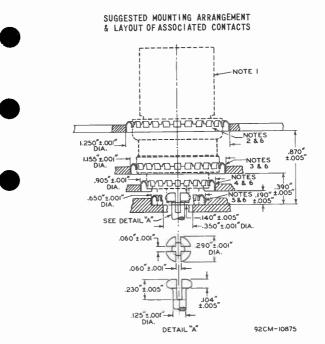


THE AXES OF THE CYLINDRICAL HOLES H1 THROUGH H5 AND THE AXIS OF POST P ARE COINCIDENT WITHIN O.DO!". THE AXES OF THE GAUGE-RING INSIDE DIAMETER AND GAUGE-RING

OUTSIDE DIAMETER ARE COINCIDENT WITHIN 0.001".



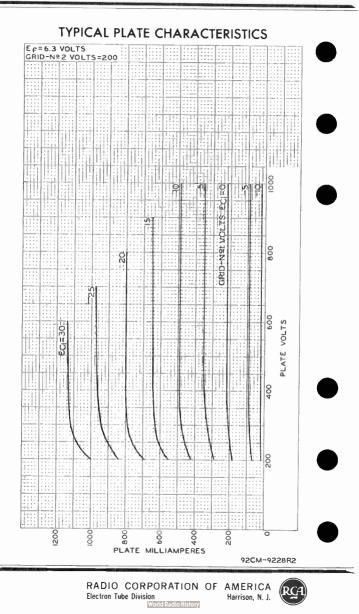




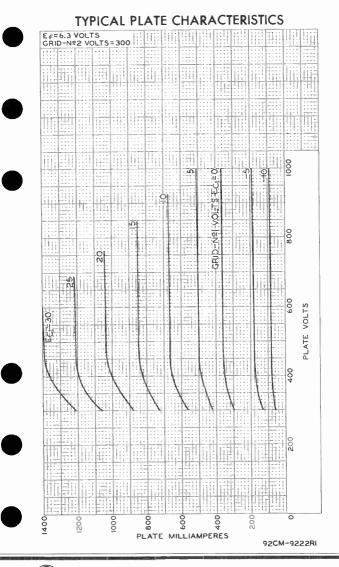
NOTE I: IF A CLAMP IS USED, IT MUST BE ADJUSTABLE IN A PLANE NORMAL TO THE MAJOR TUBE AXIS TO COMPENSATE FOR VAR'ATIONS IN CONCENTRICITY BETWEEN THE CONDUCTION CYLINDER AND THE CONTACT TERMINALS.

NOTE 2: CONTACT RING No.97-252 OR FINGER STOCK No.97-380. NOTE 3: CONTACT RING No.97-253 OR FINGER STOCK No.97-380. NOTE 4: CONTACT RING No.97-254 OR FINGER STOCK No.97-380. NOTE 5: CONTACT RING No.97-255 OR FINGER STOCK No.97-380. NOTE 6: THE SPECIFIED CONTACT RING OF PREFORMED FINGER STOCK AND FINGER STOCK No.97-380 PROVIDE ADEQUATE ELEC-TRICAL CONTACT, BUT THE FINGER STOCK No.97-380 IS LESS SUSCEPTIBLE TO BREAKAGE THAN THE SPECIFIED CONTACT RING. BOTH TYPES ARE MADE BY INSTRUMENTS SPECIALTIES COMPANY, LITTLE FALLS, NEW JERSEY.





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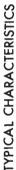
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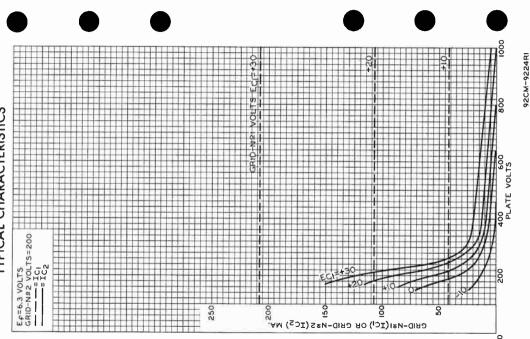
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Electron Tube Division

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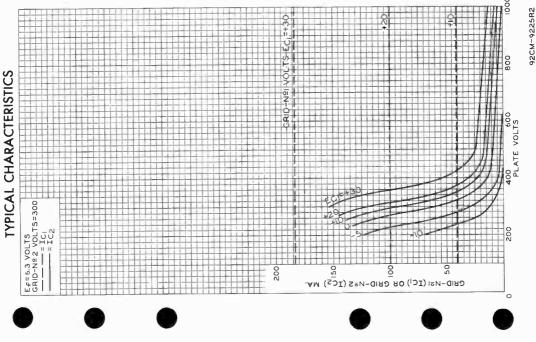




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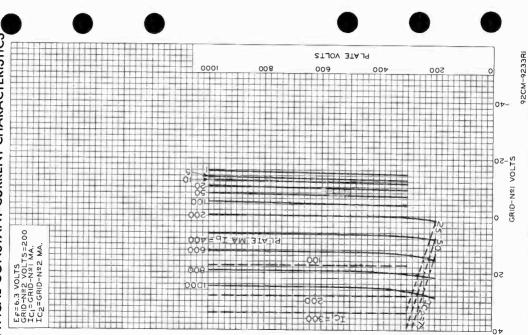
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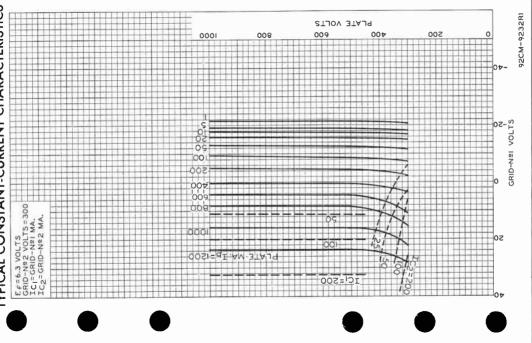
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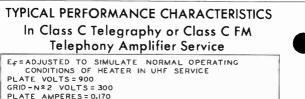
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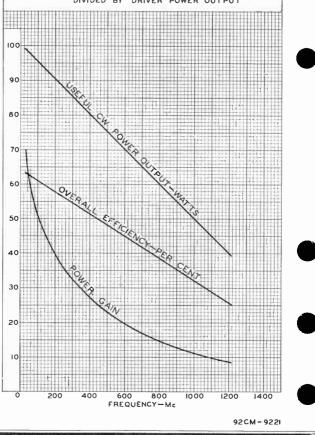
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POWER GAIN=USEFUL POWER OUTPUT IN LOAD DIVIDED BY DC PLATE INPUT POWER GAIN=USEFUL POWER OUTPUT IN LOAD DIVIDED BY DRIVER POWER OUTPUT



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Beam Power Tube

CERAMIC-METAL SEALS "ONE-PIECE" ELECTRODE DESIGN CONDUCTION COOLEL COAXIAL-ELECTRODE STRUCTURE

52.5-WATTS CW INPUT 27-WATTS CW OUTPUT AT 400 Mc I5-WATTS CW OUTPUT AT 1200 Mc 3.2-WATTS CW OUTPUT AT 3000 Mc

UNIPOTENTIAL CATHODE

^a Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Nin.	Max.	
Heater Current	1	0.88	1.1	amp 🔶
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.025	μµf
Grid No.1 to cathode & heater	2	8.5	10.3	µµf
Plate to cathode & heater	2		0.004	щuf
Grid No.1 to grid No.2	2	14	20.6	μμf
Grid No.2 to plate	2	2.1	2.5	щuf
Grid No.2 to cathode & heater	2		0.18	щuf
Grid-No.1 Voltage	1,3	-1	-10	volts
Grid-No.1 Cutoff Voltage	1,4	-	-25	volts
Grid-No.2 Current	1,3	-3	2	ma
Positive Grid-No.1 Voltage	1,5	0	14	volts
Transconductance	1,6	7500		µmhos

- Note 1: With 6.3 volts ac or dc on heater.
- Note 2: Measured with special shield adapter.
- Note 3: With dc plate voltage of 750 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.
- Note 4: With dc plate voltage of 750 volts, dc grid-Wo.2 voltage of 250 volts, and dc grid-Wo.1 voltage adjusted to give a dc plate current of 1 ma.
- Note 5: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage of -100 volts. Rectangular pulses, pulse duration of #500 to 5000 microseconds and pulserepetition frequency of 10 to 12 ops. The positive-pulse grid-No.1 voltage is adjusted to give a plate current of 300 ma. at leading edge of pulse.
- Note 6: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 150 volts, dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.



-Indicates a change.

High-Mu Triode

NUVISTOR TYPE

For Industrial Applications

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode: Voitage (AC or DC) Current at 6.3 volts Direct Interelectrode Capacitances (Approx.): Grid to plate Grid to cathode, shell, and heater	0.135 amp 0.9 μμε	
Plate to cathode, shell, and heater. Plate to cathode, shell, and heater. Plate to cathode Heater to cathode	4.2 $\mu\mu^{f}$ 1.7 $\mu\mu^{f}$ 0.22 $\mu\mu^{f}$ 1.3 $\mu\mu^{f}$	f
Characteristics, Class A, Amplifier:		
Plate Supply Voltage Grid Supply Voltage Cathode Resistor Amplification Factor Plate Resistance (Approx.) Transconductance Plate Current Grid Voltage (Approx.) for plate	110 volts 0 volts 150 ohms 64 6800 9400 μmhos 7 max	
$\mu a = 10 \dots \dots \dots \dots \dots \dots \dots \dots \dots $	-4 volts	5
Mechanical:		
Operating Position		
Basing Designation for BOTTOM VIEW	(JEDEC No.E5-65)	
Pin 1 ^a - Internal Con- nection- 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	RADEX = LARGE LUG	



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA I 3⊷6I

INDUSTRIAL SERVICE

Maximum Ratings, Absolute-Maximum Values:

For operation at any altitude

PLATE SUPPLY VOLTAGE	ts
PLATE VOLTAGE	ts
GRID VOLIAGE:	
Negative-bias value	ts
Peak-positive value	ts
GRID CURRENT	ma
PLATE CURRENT	ma
CATHODE CURRENT	ma
	tt
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode 100 max. vol	
Vol	
Heater positive with respect to cathode 100 max. vol	ts

Maximum Circuit Values:

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

^a Pin is cut off close to ceramic wafer.

 ${f b}$ For operation at metal-shell temperatures up to 150 $^{\rm O}$ C.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.		
Heater Current Direct Interelectrode Capacitances:	1	0.125	0.145	атр	
Grid to plate	2	0.8	1	μµf	
heater. Plate to cathode, shell, and	2	3.4	5	μµf	
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 -	μμ μμf μμf ma μanhos μomhos	•
conductance (2), expressed in per cent of Transconduc- tance (1)	1,6 1,3	- - 54	15 0.1 74	% µa	
Heater negative with respect to cathode Heater positive with	1,7	-	5	μa	
respect to cathode	1,7	-	5	μa	

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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 stell connected to ground.
- Note 7: With 100 volts dc applied between heater and cathode.
- Note 8: With grid 100 volts negative with respect to all other electrodes tied together.
- Note 9: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Impact Acceleration. 1000 max. g This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described below.

Fatigue Rating:

Vibrational Acceleration 2.5 max. g



This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted, supplied with normal heater voltage only, and subjected for 48 hours to 2.5y 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



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. 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 MIL-E-ID, Amendment 2, paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper⁶. 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 (I). A tube is rejected if its transconductance after two or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early-hour inoperatives. Tubes are operated for 100 hours at 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.









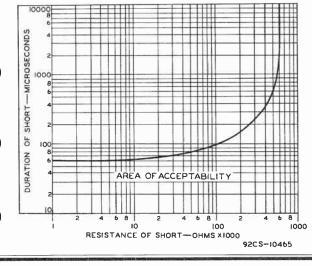
1000-Hour Conduction Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and 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 eurrent, 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 0-hours and cathode interface resistance greater than 25 ohms. Interface resistance is measured by Method B of ASTM specification F300-57T.

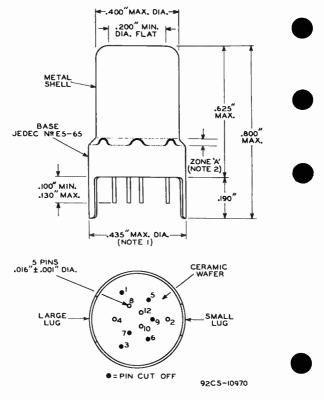
c Specifications for tapper supplied on request.



SHORTS-TEST ACCEPTANCE LIMITS



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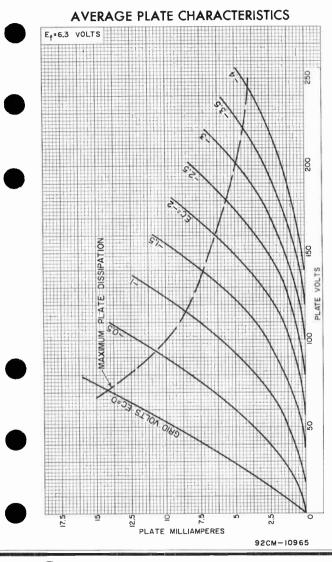


NOTE I: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

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



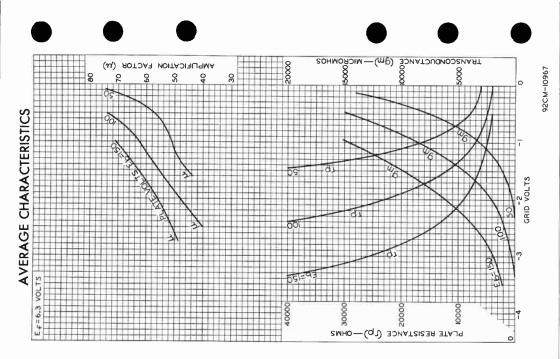






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CORPORATION

RADIO CORPC Electron Tube Division

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) ^a Current at heater volts = 13.5. Peak heater-cathode voltage (Each Heater negative with	0	Yaximum Va 13.5±1.5 .150	
respect to cathode Heater positive with		100 max.	volts
respect to cathode Direct Interelectrode Capacitances		100 max.	volts
	Without External Shield	With External Shield ^b	
Grid-Drive Operation:			
Grid to plate (Each unit) Grid to cathode and heater	1.6	1.6	<i>µµ</i> f
(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) Cathode to plate	0.2	0.18 ^d	µµf
(Unit No.2)	0.24	0.2 ^d	µµf
Cathode to grid and heater (Each unit) Plate to grid and heater	5	5 d	μµf
(Unit No.1)	1.9	2.7ª	µµf
Plate to grid and heater (Unit No.2)	1.8	2.7ď	µµf
Heater to cathode (Each unit) Plate to plate	2.8 0.24	2.8°	μμ.f μμ.f
Characteristics, Class A ₁ Amplifier	r (Each Uni	t):	
Heater Voltage	· · · · · ·	13.5 250 200 60 10900	volts volts ohms ohms
Transconductance	• • • • •	5500 10	µmhos ma
Grid Voltage (Approx.) for plate μ a	a = 10	-12	volts



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Mechanical:

Operating Position Any Type of Cathodes Coated Unipotential Maximum Seated Length. 1-15/16" . Length, Base Seat to Bulb Ton (Excluding tip). 1-9/16" ± 3/32" Bulb Small-Button Noval 9-Pin (JEDEC No.E9-1) Base

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 A

Values are for Each Unit

Maximum Ratings, Absolute-Maximum Values:

PLATE VOLTAGE			•	•	•	•	•	330	max.	volts
Negative-bias value								55		
										VOILS
Positive-bias value								0	max.	volts
PLATE DISSIPATION								2.75	max.	watts
BULB TEMPERATURE (At hot	te	st								
point on bulb surface)				•				180	max.	°C

Maximum Circuit Values:

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

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

 $^{
m c}$ With external shield JEDEC No.315 connected to ground.

With external shield JEDEC No.315 connected to grid of unit under test.

SPECIAL RATINGS AND PERFORMANCE DATA

Heater-Cycling:

Cycles of Intermittent Operation 1160 min. cycles This test is performed on a sample lot of tubes from each production run under the following conditions: Heater volts = 19.5 cycled one minute on and two minutes off; heater 135 volts negative with respect to cathode; all other elements



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

Low-Frequency Vibration Performance:

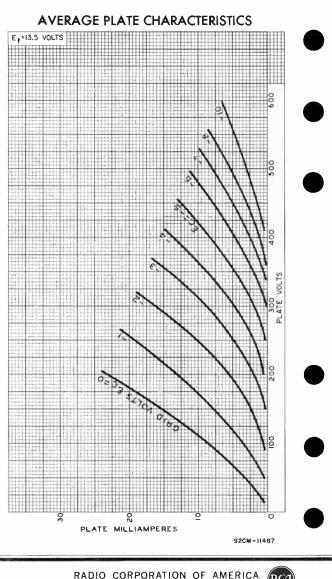
This test is performed on a sample lot of tubes from each production run under the following conditions: Units connected in parallel, heater volts = 13.5, plate-supply volts = 250, grid volts = -3, plate load resistor (ohms) = 2000, and vibrational acceleration = 2.5 g at 25 cps. In this test, the rms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

500-Hour Intermittent Life Performance:

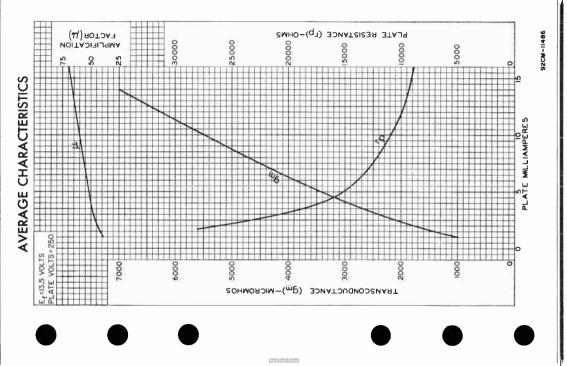
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: Heater volts = 15.0 and maximum-rated plate dissipation.



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World Radio History

Beam Power Tube

90 WATTS CW INPUT (ICAS) UP TO 60 Mc 60 WATTS CW INPUT (ICAS) UP TO 175 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode: Voltage (AC or DC) ^a	13.5 volt: 0.585 am 60 sea	р
200, grid-No.2 volts = 200, and plate ma. = 100	7000 <i>μ</i> πho:	5
for plate volts = 200, grid-No.2 volts = 200 and plate ma. = 100 Direct Interelectrode Capacitances: ^b	4.5	
Grid No.1 to plate	0.24 max. p	f
& internal shield, grid No.2, base sleeve, and heater Plate to cathode & grid No.3 & internal shield, grid No.2,	13.0 p	f
base sleeve, and heater	8.5 p	f
Mechanical:		
		" " z2}e)
Basing Designation for BOTTOM VIEW	70	Κ
Pin 1 - Cathode, Grid No.3, Internal Shield Pin 2 - Heater Pin 3 - Grid No.2 Pin 4 - Same as	Pin 5 - Grid No.1 Pin 6 - Same as Pin 1 Pin 7 - Heater Pin 8 - Base Sleeve P Cap - Plate	



Pin 1

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AF POWER AMPLIFIER & MODULATOR Class AB ₁ °	
Maximum Ratings, Absolute-Maximum Values:	
CCS ^d ICAS ^e	
DC PLATE VOLTAGE 600 max. 750 max. DC GRID-No.2 VOLTAGE 250 max. 250 max. MAXSIGNAL DC PLATE CURRENT 125 max. 135 max. MAXSIGNAL PLATE INPUT 60 max. 85 max.	volts volts ma watts
MAXSIGNAL GRID-No.2 INPUT [#] 3 max. 3 max.	watts
PLATE DISSIPATION ⁴ 20 max. 25 max. PEAK HEATER-CATHODE VOLTAGE: Heater negative with	watts
respect to cathode 135 max. 135 max. Heater positive with	volts
respect to cathode 135 max. 135 max. BULB TEMPERATURE (At hottest	volts
point on bulb surface) 220 max. 220 max.	°C
Typical CCS Push-Pull Operation:	
Values are for 2 tubes	
DC Plate Voltage 400 500 600 DC Grid-No.2 Voltage ⁹ 190 185 180 DC Grid-No.1 Voltage:	volts volts
With fixed-bias source40 -40 -45 Peak AF Grid-No.1-to-	volts
Grid-No.1 Voltage ^h 80 80 90	volts
Zero-Signal DC Plate Current 63 57 26	ma
MaxSignal DC Plate Current 228 215 200 Zero-Signal DC Grid-No.2 Current 2.5 2 1	ma
Zero-Signal DC Grid-No.2 Current . 2.5 2 1 MaxSignal DC Grid-No.2 Current . 25 25 23 Effective Load Resistance	ma ma
(Plate to plate) 4000 5500 7000 MaxSignal Driving	ohms
Power (Approx.)	watts watts
Typical ICAS Push-Pull Operation:	
Values are for 2 tubes	
DC Plate Voltage 600 750 DC Grid-No.2 Voltage ^g 200 195	volts volts
DC Grid-No.1 Voltage: From fixed-bias source	volts
Grid-No.1 Voltage ^h 100 100	volts
Zero-Signal DC Plate Current	ma ma
Zero-Signal DC Grid-No.2 Current	та
MaxSignal DC Grid-No.2 Current 27 26 Effective Load Resistance	ma
(Plate to plate)	ohms
MaxSignal Driving Power (Approx.) 0 0	watts
MaxSignal Power Output (Approx.) 95 120	watts

RADIO CORPORATION OF AMERICA Electron Tube Division



Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance
under any condition: J
With fixed bias 0.1 max. megohm
With cathode bias Not recommended

AF POWER AMPLIFIER & MODULATOR - Class AB1

Triode Connection-Grid	No.2	Connected	to .	Plate	
		CCS	IC.	4 <i>S</i>	
Maximum Ratings, Absolute-Maxim	num 1	Values:			
DC PLATE VOLTAGE	4	400 max.	400	max.	volts
MAXSIGNAL DC PLATE CURRENT		90 max.	- 90	max.	ma
MAXSIGNAL PLATE INPUT			35	max.	watts
PLATE DISSIPATION		20 max.	25	max.	watts
PEAK HEATER-CATHODE VOLTAGE:					
Hester negative with					
respect to cathode	1	135 max.	135	max.	volts
Heater positive with					
respect to cathode	1	135 max.	135	max.	volts
BUIR TEMPERATURE (At hottest					
point on bulb surface)	2	220 max.	220	max.	°C
Typical Push-Pull Operation:					

Values are for 2 tubes

				,
volts	400	400	250	DC Flate Voltage
volts	-100	-100	50	DC Grid-No.1 Voltage
				Peak AF Grid-No.1-to-
volts	200	200	100	Grid-No.1 Voltage [†]
ma	40	40	120	Zerc-Signal DC Plate Current
ma	100	100	125	MaxSignal DC Plate Current
				Effective Load Resistance
ohms	8000	8000	5000	(Flate-to-plate)
				Max.—Signal Driving
watts	0	0	0	Power (Approx.)
				MaxSignal Power
watts	22	22	10	Output (Approx.)

Maximum Circuit Values (CCS or ICAS):

Gric-No.1-Circuit Resistance			
under any condition:			
With fixed bias	 	0.1 max.	megohm
With cathode bias	 	0.5 max.	megohm

AF POWER AMPLIFIER & MODULATOR - Class AB2k

Maximum Ratings, Absolute-Maximum Values:

				CCS	ICAS	
DC PLATE VOLTAGE				600 max.	750 max.	volts
DC GRID-No.2 VOLTAGE.				250 max.	250 max.	volts



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	CCS	ICAS		
MAXSIGNAL DC PLATE CURRENT	125 max	. 135 max.	ma	_
MAXSIGNAL PLATE INPUT ⁴	62.5 max		watts	
MAXSIGNAL GRID-No.2 INPUT ^f	3 max		watts	
PLATE DISSIPATION [®] PEAK HEATER-CATHODE VOLTAGE:	20 max	. 25 max.	watts	
Heater negative with				
respect to cathode	135 max	. 135 max.	volts	
Heater positive with	290	290		
respect to cathode	135 max	. 135 max.	volts	
BULB TEMPERATURE (At hottest	000	000	00	
point on bulb surface)	220 max	. 220 max.	°C	
Typical CCS Push-Pull Operation:				
Values are for	2 tubes			
DC Plate Voltage	400	500 600	volts	_
DC'Grid-No.2 Voltage ^g	175	175 165	volts	
DC Grid-No.1 Voltage:			1.	
From fixed-bias source Peak AF Grid-No.1-to-	41	-44 -44	volts	
Grid-No.1 Voltage	. 95	102 97	volts	
Zero-Signal DC Plate Current		27 22	ma	
MaxSignal DC Plate Current	232	242 207	ma	
Zero-Signal DC Grid-No.2 Current.		0.7 0.6	ma	
MaxSignal DC Grid-No.2 Current.		18 17	ma	
MaxSignal DC Grid-No.1 Current. Effective Load Resistance	1.6	1.9 1.1	ma	
(Plate to plate)	3700	4600 6800	ohms	
MaxSignal Oriving Power (Approx.		0.3 0.2	watt	
MaxSignal Power Output (Approx.)	. 62	83 90	watts	
Typical ICAS Push-Pull Operation:				
Values are for	a tubaa			
	2 LUDES	COO 750	-14.	
DC Plate Voltage		600 750 190 165	volts volts	
DC Grid-No.1 Voltage:	• • • • •	190 105	00115	
From fixed-bias source		-48 -46	volts	
Peak AF Grid-No.1-to-Grid-No.1 Vol			volts	
Zero-Signal DC Plate Current		28 22	ma	
MaxSignal DC Plate Current.			ma	
Zero-Signal DC Grid-No.2 Current. MaxSignal DC Grid-No.2 Current.	••••		ma	
MaxSignal DC Grid-No.1 Current.	• • • • •		ma ma	
Effective Load Resistance (Plate to			ohms	
MaxSignal Driving Power (Approx.			watt	
MaxSignal Power Output (Approx.)			watts	
Maximum Circuit Values (CCS or ICA	5):			
Grid-No.1-Circuit Resistance:"	.,.			
With fixed bias		30000 max.	volts	
With fixed bias	 	· · · ·		

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RADIO CORPORATION OF AMERICA Harrison, N. J.



PLATE-MODULATED RF POWER AMPLIFIER --- Class C Telephony Carrier conditions per tube for use with a maximum modulation factor of 1 and at frequencies up to 60 Nc CCS ICAS Maximum Ratings, Absolute-Maximum Values: For maximum plate voltage and maximum plate input above 60 Mc. see Rating Chart I DC PLATE VOLTAGE. 600 max. 480 max. volts DC GRID-No.2 VOLTAGE. . . 250 max. 250 max. volts . . DC GRID-No.1 VOLTAGE. -150 max. -150 max. volts DC PLATE CURRENT. 117 max. 125 max. mа DC GRID-No.1 CURRENT. . . . 3.5 max. 4 max. ma PLATE INPUT 67.5 max. 45 max. watts GRID-No.2 INPUT 2 max. 2 max. watts PLATE DISSIPATION . . . 13.3 max. 16.7 max. watts PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. . . . 135 max. 135 max. volts Heater positive with respect to cathode. . . . volts 135 max. 135 max. BULB TEMPERATURE (At hottest point on bulb surface). . . . oc 220 max. 220 max. Typical Operation: DC Plate Voltage. . 400 475 600 volts DC Grid-No.2 Voltage^p. 150 135 150 volts From a series resistor of . . 33000 51000 56000 ohms DC Grid-No.1 Voltage". . . . -87 -77 -87 volts 27000 27000 27000 From a grid resistor of . . ohms Peak RF Grid-No.1 Voltage . . 107 95 107 volts DC Plate Current. 112 94 112 ma DC Grid-No.2 Current. . . . 7.8 7.8 6.4 ma DC Grid-No.1 Current (Approx.) 3.4 2.8 3.4 ma Driving Power (Approx.) . . . 0.4 0.3 0.4 watt Power Output (Approx.). . . 32 34 52 watts Maximum Circuit Values (CCS or ICAS): Grid-No.1-Circuit Resistance* 30000 max. ohms RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy and RF POWER AMPLIFIER - Class CFM Telephony CCS ICAS Maximum Ratings, Absolute-Maximum Values: At frequencies up to 60 Nc. For maximum plate voltage and maximum plate input above 60 Mc, see Rating Chart II. DC PLATE VOLTAGE. 600 max. 750 max. volts DC GRID-No.2 VOLTAGE. 250 max. 250 max. volts DC GRID-No.1 VOLTAGE. -150 max. -150 max. volts DC PLATE CURRENT. 140 max. 150 max. ma



RADIO CORPORATION OF AMERICA Electron Tube Division Harrison, N. J. DATA 3 1-63

DC GRID-No.1 CURRENT	CCS 3.5 max. 67.5 max. 3 max. 20 max. 135 max. 135 max. 220 max.	9 2 13 13	(CAS 4 max. 0 max. 3 max. 5 max. 5 max. 5 max. 0 max.	ma watts watts watts volts volts o _C	
As amplifier u	t to 60 4	lr.			
DC Plate Voltage 50 DC Grid-No.2 Voltage ^t 17 From a series resistor of	0 600 0 150 0 51000	600 180 43000 -71	750 160 56000 -62	volts volts ohms volts	
resistor of 2700	0 20000	24000	20000	ohms	
DC Grid-No.1 Current	4 73	430 91 150 10	470 79 120 11	ohms volts ma ma	
(Approx.)	2 0.2	2.8 0.3 66	3.1 0.2 70	ma watt watts	
As amplifier	at 175 Mc				
DC Plate Voltage DC Grid-No.2 Voltage ^t From a series resistor of DC Grid-No.1 Voltage ^u From a cathode resistor of Peak RF Grid-No.1 Voltage DC Plate Current DC Grid-No.2 Current (Approx.) Driving Power (Approx.) Power Output (Approx.)	320 180 13000 -51 27000 330 64 140 10 2 3 25	2 200 240 1	-54	volts ohms volts ohms volts ma ma watts watts	
Maximum Circuit Values (CCS or 1	CAS):				
Grid-No.1-Circuit Resistance [®] .		30000	max.	ohms	
 a Heater voltage fluctuations will cau 8032 is designed to meet the EIA Sta b with no external shield. C Subscript 1 indicates that grid-No.1 part of the input cycle. d Continuous Commercial Service. e Intermittent Commercial and Amateur 	current do				
			10.000.00		

RADIO CORPORATION OF AMERICA Harrison, N. J. World Radio History

Electron Tube Division



- f Averaged over any audio-frequency cycle or sine-wave form.
- g Obtained preferably from a separate source or from the plate voltage supply with a voltage divider.
- h The driver stage should be capable of supplying the No.1 grids of the class AB_1 stage with the specified driving voltage at low distortion.
- J The type of input coupling network used should not introduce too much resistance in the grid-Mo.1 circuit. Transformer or impedance coupling devices are recommended.
- k Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.
- Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the A82 stage.
- at 10% distortion to more site for the resistance per grid-No.1 circuit of the AB2 stage should be held at a law value. For this purpose the use of transformer coupling is recommended. In no case, however, should the total dc grid-No.1-circuit resistance exceed 30,000 omms when the 8032 is operated at maximum ratings. For operation at less then maximum ratings, the dc grid-No.1-circuit resistance may be as high as 100,000 ohms.
- ${\rm P}$ Obtained preferably from a separate source modulated with the plate sumply, or from the modulated plate supply through a series resistor.
- Obtained from grio-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathoce resistor.
- When grid No.1 is driven positive and the 8032 is operated at maximum ratings. The total dc grid-No.1-circuit resistance should not exceed the specified value of 30.000 ohms. If this value is insufficient to provide adequate blas, the additional required blas must be supplied by a cathode resistor or fixed supply. For operation at less than maximum ratings, the dc grid-No.1-circuit resistance may be as high as 100.000 ohms.
- as 100,000 onms. ¹ Obtained preferably from separate source, or from the plate-supply voltage with avoltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the 8032 is used in a circuit which is not keyed. Grid-No.2 voltage must not exceed 400 volts under key-up conditions.
- Ubtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

CHARACTERISTICS RANGE VALUES

	Note	Mın.	Nàx.	
Heater Current ,	1	0.550	0.620	amp
Direct Interelectrode Capacitances: Grid No.1 to plate	2	-	0.24	pf
No.3 & internal shield, grid Nc.2, base sleeve, and heater Plate to cathode & grid	2	12.0	15.0	pf
No.3 & internal shield, grid No.2, basesleeve, and heater	2	7.3		pf
Plate Current	n n	_46	94 5.5	та та
Grid-No.2 Current Dynamic Grid-No.2 Current	2 4	3	21	та
Usetul Power Output	4	47	-	watts
Note 1: With 13.5 volts ac on heater.				

Note 2: With no external shield.

With rated ac heater voltage, dc plate voltage of 300 volts, dc grid-No.2 voltage of 200 volts, and dc grid-No.1 voltage of Note 3: 33 volts.

In a single-tube, self-excited oscillator circuit, and with rated ac heater voltage, dc plate voltage of 600 volts, dc grid-No.2 voltage of 180 volts, grid-No.1 resistor of 30,000 ± 10 per cent ohms, dc plate current of 100 to 112 ma., dc grid-No.1 current of 2 to 2.5 ma., and frequency of 15 Mc. Note a:



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

OPERATING			SIBLE PERCENT E VOLTAGE & P			
FREQUENCY	TELEP	HONY	TELEGRAPHY			
Мс	NC Class C Plate-Modulate		Clas Unmodu			
	Voltage	Input	Voltage	Input		
60	100	100	100	100		
80	84	92	84	92		
125	65	78	65	78		
150	58	72	58	72		
160	56	70	56	70		
175	53	67	53	67		

MAXIMUM RATINGS vs OPERATING FREQUENCY

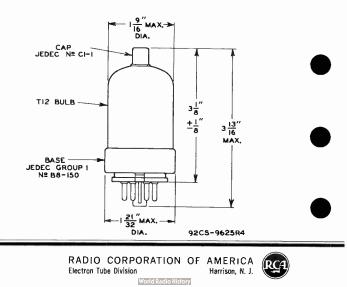
OPERATING CONSIDERATIONS

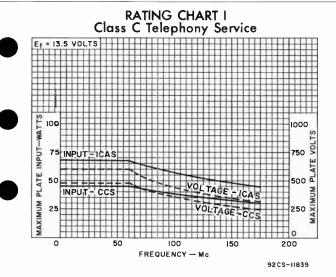
The maximum bulb temperature is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made by the Tempil Corporation, 132 West 22nd Street, New York II, New York.

To insure adequate cooling, it is essential that free circulation of air be provided around the tube. In most cases, no additional air is required.

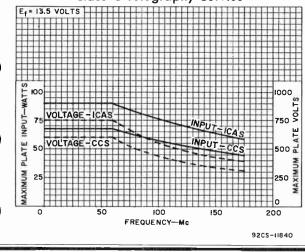
The plate shows no color when the 8032 is operated at full ratings under either CCS or ICAS conditions.

Connections to the plate should be made with a flexible lead to prevent any strain on the seal at the cap.





RATING CHART II Class C Telegraphy Service

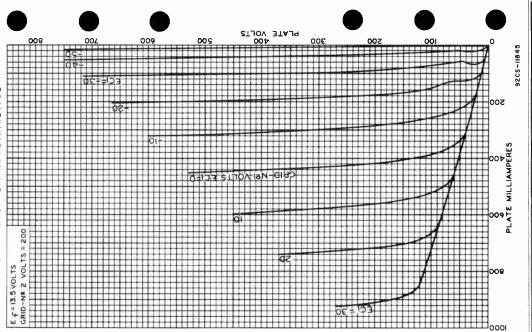




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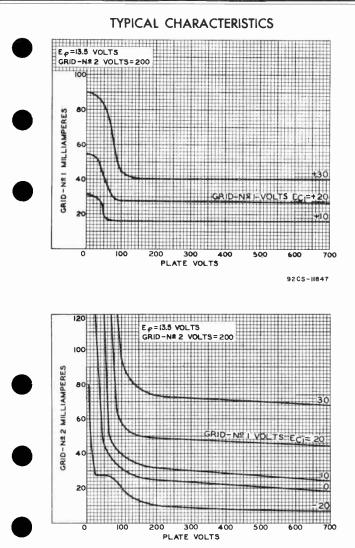


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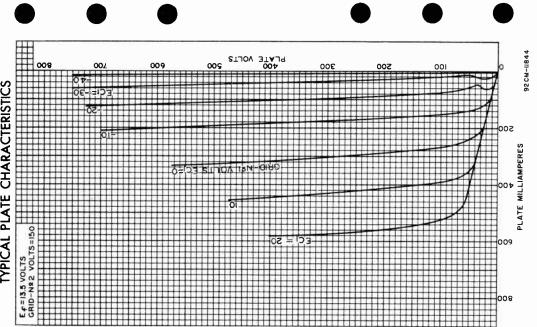
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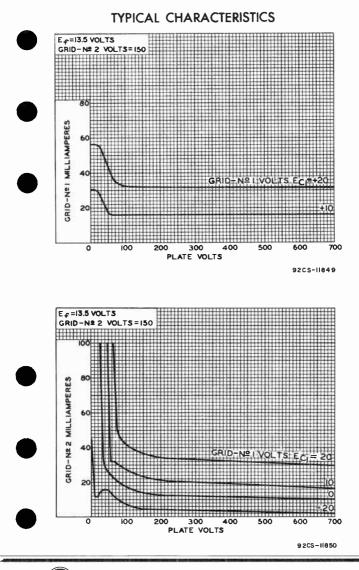
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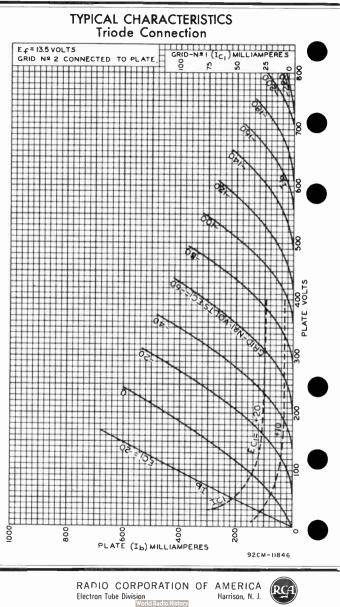
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DATA 7 1-63 

Medium-Mu Triode

NUVISTOR TYPE

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

GENERAL DATA

Electrical:

Heater Characteristics and Ratings (Absolute-Naximum Val Voltage (AC or DC)	
Grid to plate	μμf μμf μμf μμf μμf
Characteristics, Class & Amplifier:	
Plate Supply Voltage. 24 Grid Supply Voltage. 0 Cathode Resistor. 100 Amplification Factor. 11.5 Plate Resistance (Approx.) 1650 Transconductance. 7000 Plate Current 8.5 Grid Voltage (Approx.) for plate μa = 50. -5	volts volts ohms µmhos ma volts
Mechanical:	
Operating Position	ential 0.800" 0.625" 0.440" /15 oz 11 MT4 E5-65)
Pin 1ª - Do Not Use	

Pin	1ª	- Do Not Use	
Pin	2	– Plate	
Pin	3	-Same as Pin	1
Pin	2	-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	



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INDUSTRIAL SERVICE

Maximum Ratings, Absolute-Maximum Values:						
For operation at any altitude						
PLATE VOLTAGE	max. volts					
GRID VOLTAGE:						
Negative-bias value						
Peak-positive value						
GRID CURRENT	nax. Ma					
CATHODE CURRENT	max. ma					
PLATE DISSIPATION 0.45 m	max, watt					
Grid Supply Voltage 0 Grid Resistor	24 volts 0.7 volts - ohms 12.5 1560 ohms 8000 μmhos 10 ma					
Maximum Circuit Values: Grid-Circuit Resistance: ^b For fixed-bias operation						

Pin is cut off to ceramic wafer. а

b For operation at metal-shell temperatures up to $150^{\rm O}$ C. For temperatures above $150^{\rm O}$ C, see accompanying Rating Chart.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.		
Heater Current	. 1	0.125	0.145	amp	
Direct Interelectrode					
Capacitances:					
Grid to plate	. 2	1.8	2.4	μμ	_
Grid to cathode, shell,	2	2.4	A . C	5	
and heater	• 2	3.4	4.6	μµſ	
Plate to cathode, shell, and heater	. 2	1.4	2.0	μμſ	
Heater to cathode		1.4	1.7	μμ f	
Plate to cathode		0.26	0.42	μμf	
Plate Current (1)		6.5	10.5	ma	
Plate Current (2)		-	50	μa	-
Transconductance (1)		60D0	8000	µmhos .	
Transconductance (2)	. 3,5	5200	-	µmhos	•
Transconductance Change:					
Difference between trans-					
conductance (1) and trans-					
conductance (2), expressed in per cent of transcon-					
ductance (1)	_	_	15	%	
Reverse Grid Current.		_	0.05	μ <u>α</u>	
Amplification Factor.		9	14	pres	
	/	Ŷ			

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Harrison, N. J.



	Cathode Leaka <mark>ge Current:</mark> r negative with		
	pect to cathode	1	μa
	nect to cathode	1	µа
Leakage	Resistance:		
Betwee	en grid and all other		
	ctrodes tied together 1,8 1000		megohms
Betwe	en plate and all other		0
ele	ctrodes tied together 1,9 1000	-	megohms
	5		0
Note 1:	With 6.3 volts ac or dc on heater.		
Note 2:	Measured in accordance with FIA Standard RS-19	91-A.	
Note 3:	with dc plate supply volts = 20, cathode res and cathode-bypass capacitor = 1000 µf.	istor =	100 ohms,
Note 4:	with dc plate volts = 28, dc grid volts = -10 connected to around.	, and me	tal shell
Note 5:	with 5.7 volts ac or dc on heiter.		
Note 6:	with dc plate volts = 40, grid supply volts = = 1 megohm, and metal shell connected to group	−2, grid nd.	resistor
Note 7:	With 100 volts dc applied between heater and o	cathode.	
Note 8:	With grid 100 volts negative with respect to al tied together.) other e	lectrodes
Note 9:	With plate 100 volts regative with respect to all tied together.) other e	lectrodes

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:

Fatigue Rating:

Vibrational Acceleration. 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted, supplied with nominal heater voltage only, and subjected for 48 hours to 2.5-g vibrational acceleration at 60 cycles per second in the x_1 position. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described above.

Variable-Frequency Vibration Performance:

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



During operation, tube is vibrated in the X_1 position through the frequency range from 50 to 15,000 cycles per second under the following conditions: a sweep rate of one octave per 30 seconds from 50 to 3000 cps, a 7-second sweep from 3000 to 15,000 cps, and a constant vibrational acceleration of 4 g. During the test, tube must not show an output voltage across the plate-load resistor in excess of: (1) 20 rms millivolts from 50 to 3000 cps, (2) 50 peak millivolts from 3000 to 6000 cps, and (3) 500 peak millivolts from 6000 to 15,000 cps.

Low-Pressure Voltage-Breakdown Test:

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

Heater Cycling:

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

Shorts and Continuity:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-ID, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper^c. See accompanying *Shorts-Test Acceptance-Limits* curve. Tubes are criticized for permanent or tenoorary 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 CHARACTERISTICS RANGE VALUES for Transconductance III. A tube is rejected if its transconductance after 2 or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

100-Hour Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early-hour inoperatives. Tubes are operated for 100 hours at maximum-rated plate dissipation, and then subjected to the Shorts and Continuity Test previously described. Tubes must then show a transconductance of not less than 5000 micromhos under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1).

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1000-Hour Conduction Life Performance:

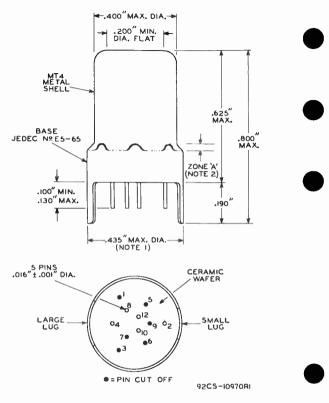
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test, tubes are operated for 1000 hours at maximum-rated plate dissipation^d,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

1000-Hour Standby Life Performance:

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

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



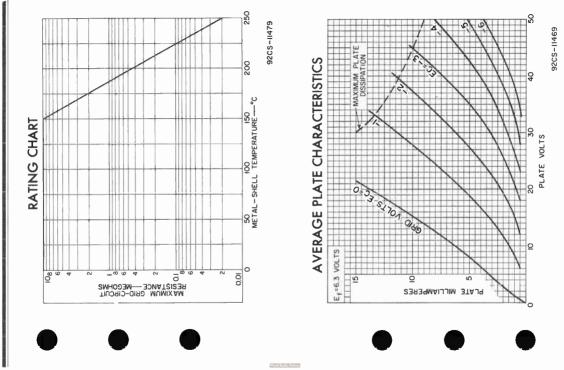


NOTE I: MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

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



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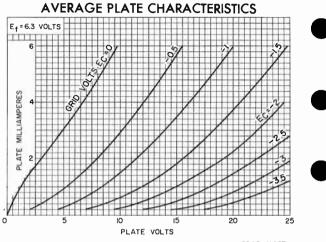


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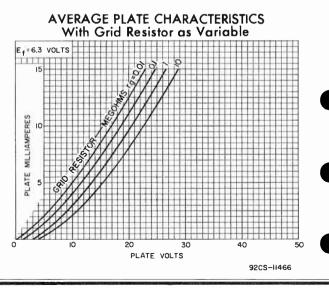
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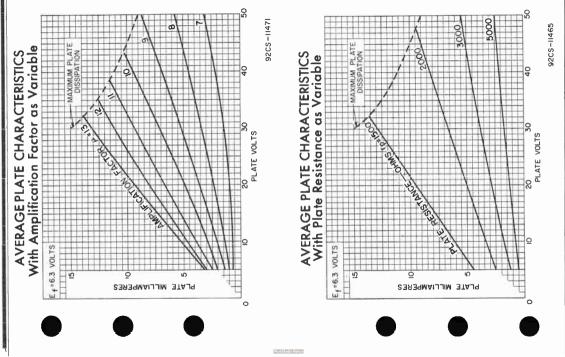
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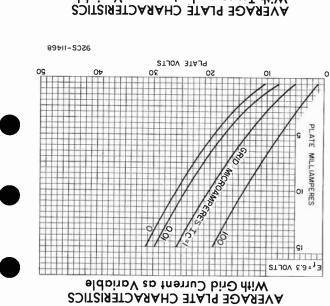
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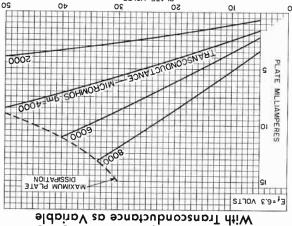
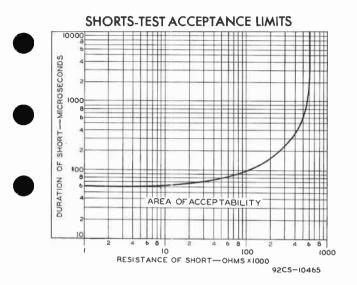


PLATE VOLTS

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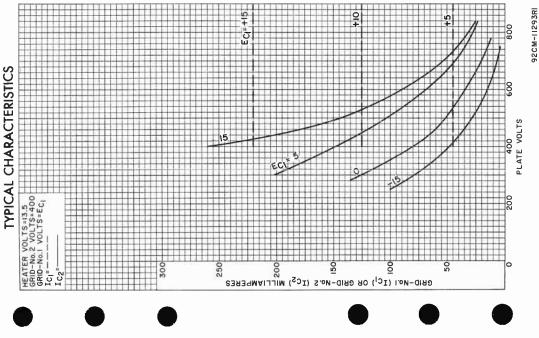


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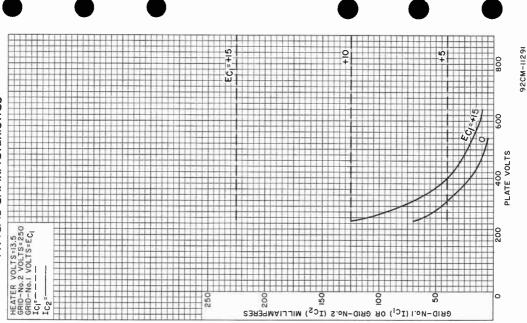
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OF

RADIO CORPORATION Electron Tube Division



Power Pentode

9-PIN MINIATURE TYPE

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

GENERAL DATA

Electrical:	
Heater Characteristics and Ratings (Absolute-Maximum Values): Voltage (AC or DC)* 13.5 ± 1.5 volts Current at heater volts = 13.5 0.275 amp Peak heater-cathode voltage: Heater negative with 120 max. volts Heater positive with respect to cathode	5
Direct Interelectrode Capac;tances (Approx.): ^b Grid No.1 to plate0.063 μμι Grid No.1 to all other electrodes	F
except plate	
Characteristics, Class A(Amplifier:	
Heater Voltage.13.5voltsPlate Supply Voltage.250voltsGrid No.3150Voltage Resistor.120ohmPlate Resistance (Approx.)0.1megohrTransconductance.11500 μ mhosPlate Current3.5Grid-No.2 Current3.5magGrid-No.1 Voltage (Approx.) for-10voltsvoltsVolts	555555
Mechanical: Operating Position. Any Type of Cathode Coated Unipotential Maximum Overall Length 2-3/16' Maximum Seated Length 1-15/16' Length, Base Seat to Bulb Top (Excluding tip) 1-9/16" ± 3/32' Diameter 0.750" to 0.875' Dimensional Outline See General Section	





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RADIO CORPORATION OF AMERICA Electron Tube Division

Harrison, N. J.

.Small-Button Noval 9-Pin (JEDEC No.E9-1)

Basing Designation for BOTTOM VIEW. . . 9GK

Pin 1 - Cathode Fin 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	ect to	cathode at	socket
GRID-No.1 (CONTROL-GRID) VOLTAGE:		TOO Max.	VUIUS
Negative-bias value		55 max.	
Positive-bias value			
GRID-No.2 INPUT			
PLATE DISSIPATION		5 max.	watts

Maximum Circuit Values:

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

RF POWER AMPLIFIER & OSCILLATOR --- Class C Telegraphyc

and

RF POWER AMPLIFIER - Class C FM Telephony

Maximum CCS^d Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE. DC GRID No.3 (SUPPRESSOR GRID)Connect to DC GRID-No.2 (SCRFFN-GRID) VOLTAGF. DC GRID-No.1 (CONTROL-GRID) VOLTAGF:	cathode at 175 max.	<i>socket</i> volts
Negative-bias value		
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		watts

Typical Operation:

At frequencies up to 40 Nc

Heater Voltage 13.5 13.5 13.5	volts
DC Plate Voltage) volts
Grid No.3	t socket
DC Grid-No.2 Voltage 115 145 175	volts
DC Grid-No.1 Voltage	volts
Peak RF Grid-No.1 Voltage 9 11 16	
DC Plate Current	та па
DC Grid-No.2 Current	, ma
DC Grid-No.1 Current (Approx.) 0.6 0.85 1	ma

RADIO CORPORATION OF AMERICA Electron Tube Division

Harrison, N. J.



Driving Power (Approx.)					10	12	15	mw
Power Cutput (Approx.).	·	·	•		1.5	2.7	4	watts



Maximum Circuit Values:

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

FREQUENCY MULTIPLIER

Maximum CCS^d Ratings, Absolute-Maximum Values:

Same as for RF POWER AMPLIFIER & OSCILLATOR

Typical Operation:

As douber up to do Mc

DC P	late Volta	age							200	250	300	volts
Grid	Nc.3					. C	on	nec	ted to	catho	de at	socket
DC C	rid-No.2	Voltage.							115	145	175	volts
DC G	rid-No.1	Voltage.							-16	-20	-25	volts
Peak	RF Grid-	No.1 Vol	tage						19	24	31	volts
	iate Curr								11	15	20	ma
DC G	rid-No.2	Current.							2	3	4	ma
DC C	ric-No.1	Current	(App	ro	x.)				0.3	0.45	0.6	та
	ing Power								5	9	13	mw
	ul Power								1.4			watts

Maximum Circuit Values:

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

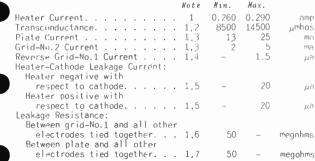
a The heater will take momentary excursions of 11.0 to 16.0 volts.

b without external shield.

Key-down conditions per tube without ampl tude modulation. Amplitude modul-tion essentially negative may be used if the positive peak of the audio-frequency envelope coes not exceed 115 per Cent of the carrier conditions.

d Continuous Commercial Service.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN





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Harrison, N. J.



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 (µt) = 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 (megonms) = 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 (μ 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.



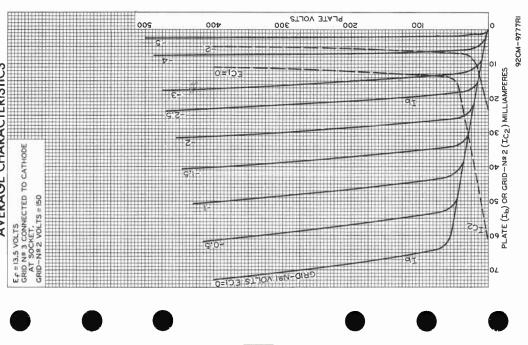












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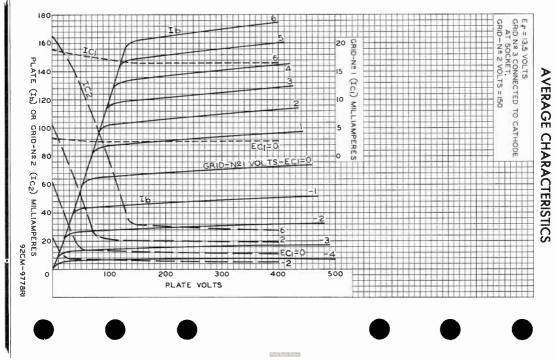
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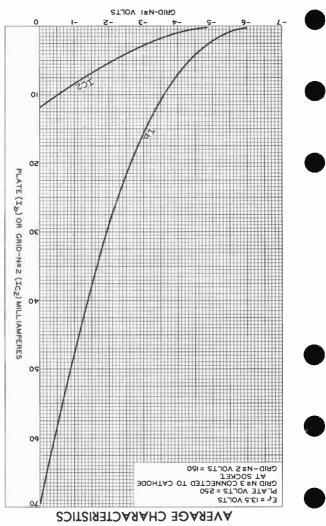


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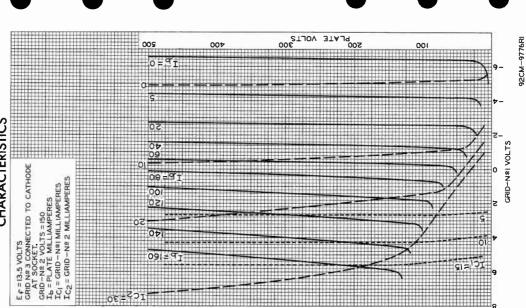


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URRENT AVERAGE CONSTANT-CI CHARACTERISTICS

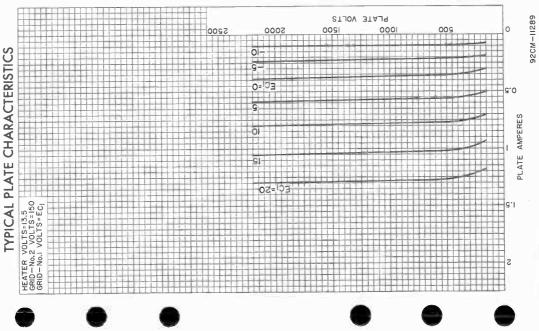


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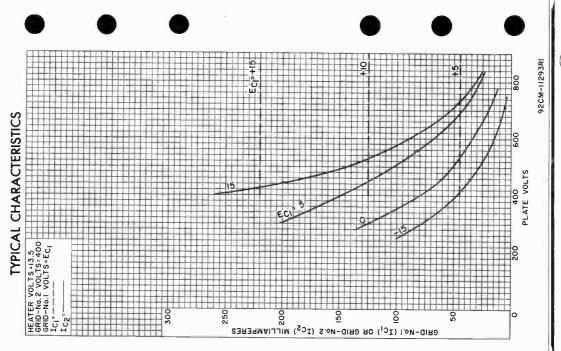
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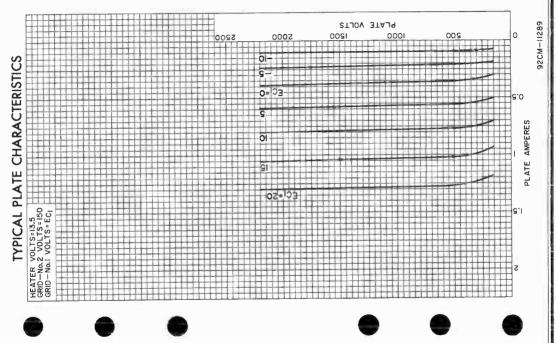
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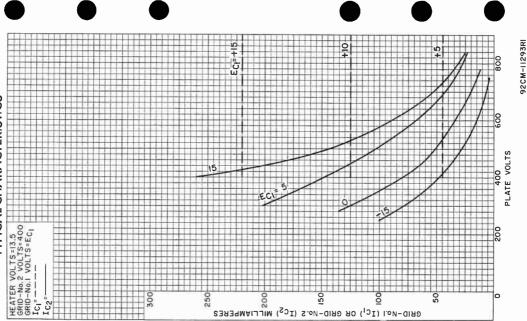
> AMERICA Harrison, N. J.

RADIO CORPORATION OF Electron Tube Division



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CERAMIC-METAL SEALS "ONE-PIECE" ELECTRODE DESIGN COAXIAL-ELECTRODE STRUCTURE INTEGRAL RADIATOR

2 MEGAWATT MAXIMUM PEAK POWER INPUT UP TO 500 Mc MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For use at Frequencies up to 500 Mc

GENERAL DATA

Electrical:

Heater. for Matrix-Type, Oxide-Coated, Unipotential Catlode^a

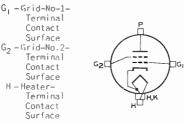
	T	y þ	100	11 4	aximum	
Voltage (AC or DC)		2	2		23	volts
Current at heater volts = 22				12.6	-	amp
Minimum heating time				5		minutes
Mu-Factor, Grid No.2 to Grid No.1						
<pre>for plate volts = 5000, grid-No.2</pre>						
volts = 1400, and plate ma. = 500				25		
Direct Interelectrode Canacitances:						
Grid No.1 to plate ^b				0.3	max.	pf
Grid No.1 to cathode & heater				100		рf
Plate to cathode & heater ^{b,c}				0.03	max.	pf
Grid No.1 to grid No.2				110		nf
Grid No.2 to plate				24		pf
Grid No.2 to cathode & heater ^c				1.5	×۶.۳	pf

Mechanical:

Operating Position	Any
Maximum Överall Length	7.24"
Maximum Diameter	5.56"
Weight (Approx.)	8.5 lbs
Radiator	Integral part of tube
Terminal Connections (See Dimensiona	l Outline):







H,K-Heater- & Cathode-Terminal Contact Surface P-Plate-Terminal Contact Sur face

Thermal:

A'r Elow:

Through radiator-Adequate air flow to limit the plate-core temperature to 250° C should be delivered by a blower through the radiator before and during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical



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values of air flow directed through the radiator versus plate dissipation are shown in accompanying Typical-Cooling-Requirements curve.

To Plate, Grid-No.2, Grid-No.1, Cathode, and Heater Terminals-A sufficient quantity of air should be allowed to flow past each of these terminals to prevent their temperature from exceeding the specified maximum value of 250° C.

Plate power, grid-No.2 power, heater power, and the forced-air flow may be removed simultaneously.

Terminal Temperatured (Plate, grid No.2,

grid No.1, cathode, and	heater)	 250 max.	°C (
Plate Core Temperature ^d			 250 max.	°C

PULSED RF AMPLIFIER

Maximum CCS^e Ratings, Absolute-Naximum Values:

For maximum "on" time^f of 10 microseconds in any 2000-microsecond interval and frequencies up to 500 Nc PEAK POSITIVE PULSE PLATE VOLTAGE⁴. . . . 25000 max. volts DC PLATE VOLTAGE⁹ 15000 max. volts POSITIVE-PULSE GRID-No.2 VOLTAGE: Peak. 2500 max. volts DC. . 2500 max. volts NEGATIVE-PULSE GRID-No.1 VOLTAGE: 500 max. Peak. volts DC. 500 max. volts . . . DC-PULSE PLATE CURRENT. . . 80 max. amos DC PLATE CURRENT. . . . 0.5 max. amp GRID-No.2 INPUT (Average) 150 max. watts GRID-No.1 INPUT (Average) 100 max. watts PLATE DISSIPATION (Average) 10000 max. watts

Maximum Circuit Values:

Grid-No.1-C	ircuit	Resist	anc	e				
under any	condit	ion .					2000 max.	ohms

^a See Operating Considerations.

- With external flat metal shield 8" diameter having center hole 4" diameter. Shield is located in plane of the grid-No.2 terminal, perpen-dicular to the tube axis, and is connected to grid No.2 and ground.
- C with external flat metal shield 8" diameter having center hole 3-3/8" diameter. Shield is located in plane of the grid-No.1 terminal, perpen-dicular to the tube axis, and is connected to grid No.1 and ground.
- See Operating Considerations and also Dimensional Outline for temperature-measurement points.
- e Continuous Commercial Service.
- Continuous commercial Service. "On" time is defined as the sum of the durations of all the individual oulses which occur during the interval, an increase in dc olste current during the pulse may be permissible at shorter "on" times. And a decrease is usually required at longer "on" times. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. Peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse. Duty factor is defined as the ratio of "on" time to total elapsed time in any interval.
- g Pressurization may be required when the tube is used at high altitudes and plate voltages near the maximum rating to prevent flash-over at the tube seals.

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Electron Tube Division



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CHARACTERISTICS RANGE VALUES

	Note	Nin.	Nax.	
Heater Current	1	11.7	13.5	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.3	pf
Grid No.1 to cathode & heater		91	113	pf
Plate to cathode & heater	2.3	-	0.03	pf
Grid No.1 to grid No.2		99	121	pf
Grid No.2 to plate		21	26	pf
Grid No.2 to cathode & heater		-		pf
Grid-No.1 Voltage	1,4	-27	-61	volts
Grid-No.1 Cutoff Voltage	1,5	-	-95	volts

- Note 1: With 22 volts ac or dc on heater.
- Note 2: With external flat metal shield 8" diameter having center hole &" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2 and ground.
- Note 3: With external flat metal shield 8" diameter having center hole 3-3/8" diameter. Shield is located in plane of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1 and ground.
- Note 4: With dc plate voltage of 5000 volts, dc grid-No.2 voltage of 1500 volts, and dc grid-No.1 voltage adjusted to give a plate current of 500 ma.
- Nole 5: With dc plate voltage of 5000 volts, dc grid-No.2 voltage of 1500 volts, and dc grid-No.1 voltage adjusted to give a plate current of 20 ma,

OPERATING CONSIDERATIONS

Heater

The heater of the 8134 should be operated at constant voltage rather than constant current. The rated heater voltage of 22 volts should be applied for 5 minutes to allow the cathode to reach normal operating temperature before voltages are applied to the other electrodes. Good regulation of the heater voltage is in general economically advantageous from the viewpoint of tube life; in no case should the voltage fluctuations be more than 5%.

Temperature

The maximum terminal temperature of 250° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made in the form of liquid and stick by the Fempil Corporation, 132 West 22nd Street, New York II, N.Y.

Standby Operation

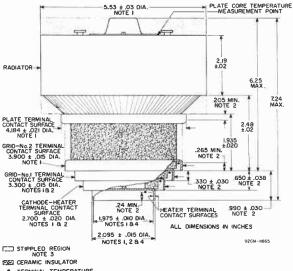
During long or frequent standby periods, the 8184 may be operated at decreased heater voltage to conserve life. It is recommended that the heater voltage be reduced to80% of normal during standby periods up to 2 hours. For longer periods, the heater voltage should be turned off.



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Precautions

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any highpotential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.



* TERMINAL TEMPERATURE MEASUREMENT POINT

NOTE I: SEE SKETCH GI FOR THE MAXIMUM DIAMETRICAL SPACE REQUIRED BY THE BIS4 BASED UPON THE DIAMETER AND ECCENTRI-CITY OF RADIATOR BAND AND OF EACH RING TERMINAL.

NOTE 2: THE DIAMETER OF THE TERMINAL IS HELD TO THE INDICATED VALUE ONLY OVER THE CONTACT SURFACE LENGTH. THE CONTACT SURFACE LENGTH OF THE HEATER, HEATER-CATHODE, AND GRID-NO.I TERMINALS EXTENDS FROM THE EDGE OF ITS TERMINAL TO THE PLANE COINCIDENT WITH THE EDGE OF THE ADJACENT LARGER TERMINAL.

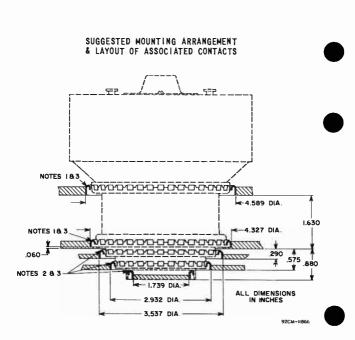
> RADIO CORPORATION OF AMERICA Electron Tube Division World Pacifol History Harrison, N. J.



NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR REGIONS. NOTE 4: THE HEATER TERMINAL IS DIMENSIONED FOR INSIDE DIAMETER AND OUTSIDE DIAMETER TO PROVIDE A CHOICE OF CONTACT MOUNTING; THE EXMENSIONS SHALL NOT BE CONSIDERED CONCURRENTLY. SKETCH G1 **OPENING FOR:** RADIATOR 5.625 PLATE TERMINAL GRID-No.2 TERMINAL 3.985 GRID-No.I TERMINAL 3,335 HEATER-CATHODE TERMINAL HEATER TERMINAL (INNER) ALL DIMENSIONS 1,935 IN INCHES HEATER TERMINAL (OUTER) -2.130 92CM-11869



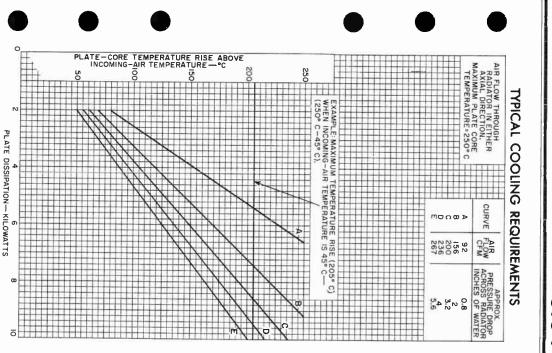
RADIO CORPORATION OF AMERICA Electron Tube Division World Radio History DATA 3 1-63



NOTE I: FINGER STOCK NO.97-310. NOTE 2: FINGER STOCK NO.97-139. NOTE 3: SPECIFIED FINGER STOCK IS MADE BY INSTRUMENT SPECIALITIES COMPANY, LITTLE FALLS, NEW JERSEY.







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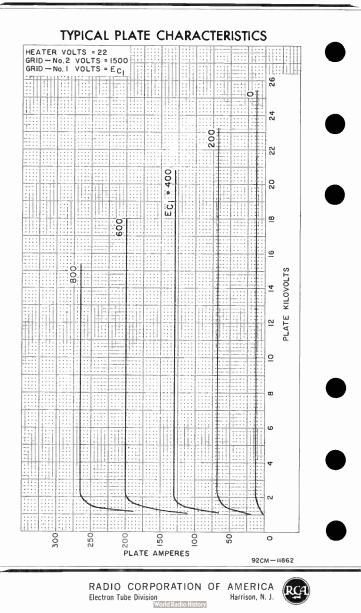
DISSIPATION

KILOWATTS

Tube

Division ORPO

92CM-11861



YPICAL

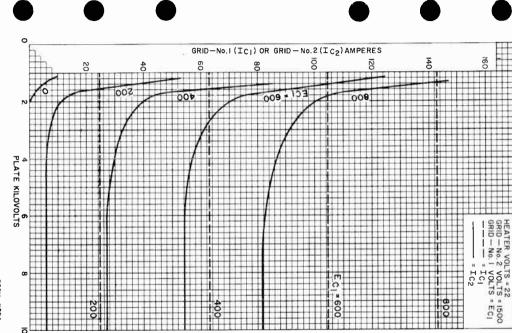
CHARACTERISTICS

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Tube





World Radio History

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DETECTOR AMPLIFIER PENTODE

MIDGET	TYPE
Heater Coated Unipoten	tial Cathode
Voltage 6.3	a-c or d-c volts
Current 0.15	amp.
Direct Interelectrode Capacitan	ces:
	max. µµf
Input 3.6	μµf
Output 3.0	μµf
Maximum Overall Length	1-13/16"
Maximum Seated Height	1-9/16"
Length from Base Seat to Bulb T	op
(excluding tip)	1-3/16" ± 3/32"
Maximum Diameter	3/4"
Bulb Base	T-5-1/2
Pin 1 – Grid	Miniature Button 7-Pin
Pin 2 - Cathode	Pin 5-Plate
Pin 3-Heater	Pin 6 - Screen
Pin 4 -Heater	D: 7 Grid No. 3
24CA	Shield
RCA Socket	Stock No. 9914 -
Mounting Position BOTTOM	
Maximum and Minimum Ratings	,,
Have man area Hereman Haveries	Are Design-center values
AMPLI	
Plate Voltage	250 max. volts
Screen Voltage	100 max. volts
Grid Voltage	-3 min. volts
Plate Dissipation	0.5 wart -
Screen Dissipation	0.1 watt 🖛
Typical Operation and Character	
Plate Voltage	90 250 volts
Screen Voltage	90 100 volts
Grid Voltage Plate Resistance	-3 -3 volts
Transconductance	1.0 <u>approx.megohm</u> 1100 1400 umhos
Plate Current	1.2 2.0 ma.
Screen Current	0.5 0.7 ma.
Typical Operation as Mixer in S	
Plate Voltage	100 250 volts
Screen Voltage	100 100 volts
Grid Voltage #	-5 -5 approx. volts
Conversion Transconductance	- 550 approx. µmhos
Shielding and $r-f$ by-passing of	
be required in order to preven	
provide the shortest possible c	
is operated at the ultra-high f	
can be accomplished by the use	
short leads placed close to the	
be advisable in some applicati	
of the by-pass condensers by r-	
sers in the return or supply	
■, ▲, • #: See next page.	*Temporary minimum length = $1-1/16^{\circ}$.
Indicates a change,	

OCT. 1, 1943



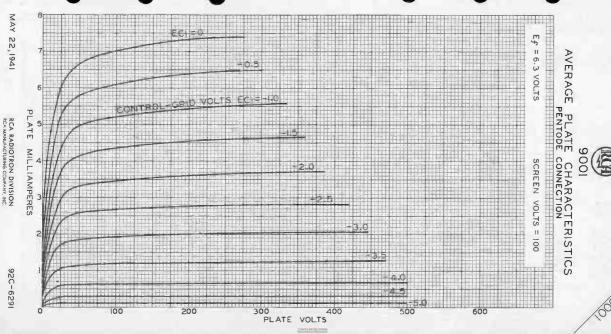
DETECTOR AMPLIFIER PENTODE

(continued from preceding page)

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

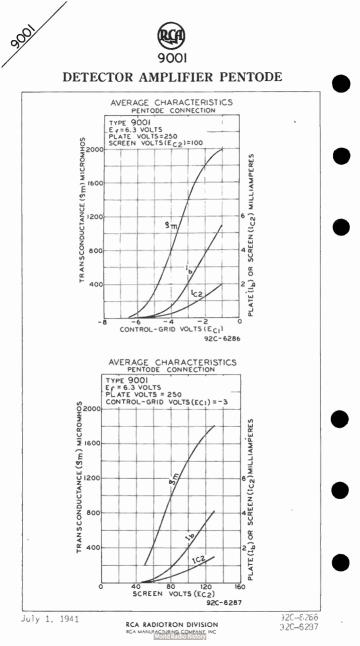
- The cathode of the 9001, when operated from a transformer, should preferably be connected to the heater circuit. In the case of d-c operation of the heater from a storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.
- Greater than 1.0 megohm, # The grid bias is minimum for an oscillator peak voltage of # volts. These values are optimum.
 - ▲ 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 be permitted to obstruct the sochet hole.

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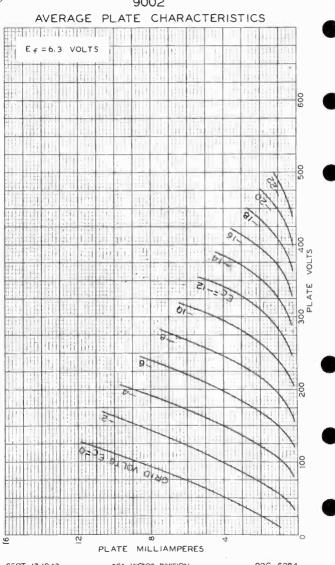
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			\mathbf{i}
DETECTOR, ADPLIFIER, OSCILLATOR MIDGET TYPE Heater Conted Unipotential Cathode Voltage 6.3 Current 0.15 Direct Interelectrode Capacitances: Grid to Plate 1.4 µµf Grid to Cathode 1.2 µµf Hate to Cathode 1.1 µµf Maximum Overall Length 1.1 1.9/16" Length from Base Seat to Bulb Top i excluding tip) 1-3/16" ±9/22" Haximum Diameter Pin 1 - Plate 7 Base M Niniture Button 7-Pin Pin 2 - Cathode Pin 3 - Cathode Pin 3 - Heater Pin 4 - Heater Pin 4 - Heater Plate Voltage MULIFIER 20 max. volts Plate Dissipation BOITOM VIEW Any Maximum Ratings Are Design-Center values Plate Voltage 10 135 180 250 volts Grid - 2.5 - 3.75 - 5 - 7 volts Plate Dissipation 25 180 250 volts Grid - 2.5 - 3.75 - 5 - 7 volts Plate Dissipation 1.2000 12500 11400 ohms Transcond. 1700 1300 02000 2200 µnhos Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode should be kept as low as possible. Ample ferrer Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode is nother designed for this base provides for the 9002, when operated from a transformer, should preferably be connected to the heater circuit. Is lied in either difference Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode is not be toold to be kept as low as possible. Ample for the 9002, when operated from a transformer, should preferably be connected to the should be kept as low as possible. A the center hole in sockets designed for this base may be manufactured with this exhaust-two be tip at the obster circuit is lied in either difference Ample and acthode should be kept as low as possible. Temporary minimum length = 1-1/16'. Maximum length = 1-1/16'.	R	CA)	90
DETECTOR, AMPLIFIER, OSCILLATOR MIDGET TYPE Heater Conted Unipotential Cathode Voltage 6.3 Current 0.15 Direct Interelectrode Capacitances: Grid to Plate 1.4 unif Grid to Cathode 1.2 unif Haximum Overall Length 1.1 1.19/16" Length from Base Seat to Bulb Top i excluding tip) 13/16" ± 2/32" Maximum Diameter Pin 1 - Plate 0.4thode Pin 2 - Cathode Pin 7 - Cathode Pin 3 - Heater Pin 4 - Heater Pin 4 - Heater Plate Voltage MultiFIER 200 max. volts Plate Dissipation BOITOM VIEW Any Maximum Ratings Are Design-Center values Plate Voltage MultiFIER 200 max. volts Plate Dissipation 1.6 max. watts Typical Operation and Characteristics - Class A, Amplifier: Plate Dissipation 2.5 2.5 2.5 Plate Res. 14700 13200 12500 11400 ohms Transcond. 1700 1900 2000 2200 unhosp Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode should be kept as low as possible. Ample for the 900, when operated from a transformer, should preferably be connected to the heater circuit. Is lied in either difference Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode is not bird the exhaust-two birds of the sole provides for the 9000 2000 2200 unhosp 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. Is lied in either difference Plate work and cathode should be kept as low as possible. A the center hole in sockets designed for this base may be manufactured with this exhaust-two be tip a the obset prestive to obstruct the socket hole. Temporary minimum length = 1-1/16'. OCT. 1, 1973 RCA VICTOR DVISION Maximum Content of meeting of the postability the stabe type, no material bersmitted to obstruct the socket hole. * Indicates a change.	90	92 102	1/2
Heater Coated Unipotential Cathode Voitage 6.3 a-C or d-C voits Current 0.15 amp. Direct Interelectrode Capacitances: amp. Grid to Plate 1.4 unif Maximum Overall Length 1-13/16" Hamilton (1-13/16") Maximum Overall Length 1-3/16" ± 2/32" * Maximum Diameter 3/4" -5-1/2 Bub T-5-1/2 Base * Muniature Button 7-Pin Pin 1 - Plate Pin 5 - Plate Pin 2 - Cathode Pin 5 - Plate Pin 6 - Grid Pin 3 - Heater Pin 7 - Cathode Pin 7 - Cathode Pin 4 - Heater Wound Ratings Are Design-Center values Any Mounting Position BOITOM VIEW Any Maximum Catings Are Design-Center values Any Plate Voltage 250 max. volts Plate Dissipation 1.6 max. watts Trypical Operation and Characteristics - Class A, Amplifier: Plate Oltage of 1.500 1100 000 2000 2200 unhos Plate Dissipation 1.6 max. watts Transcond. 1700 13200 12500 11400 ohms Transcond. 1700 13000 2000 2200 unhos	DETECTOR, AMPLII	FIER, OSCILL	
Voltage 6.3 a-c or d-c volts amp. Current 0.15 amp. Direct Interelectrode Capacitances: amp. Grid to Plate 1.4 upf Plate to Cathode 1.2 upf Plate to Cathode 1.1 upf Maximum Overall Length 1-3/16" 1-3/16" Maximum Diameter 3/4" 3/4" Bub 1-3/16" ± 3/32" * Maximum Diameter 3/4" -9/16" Base A Miniature Button 7-Pin Pin 1 - Plate Pin 5 - Plate Pin 2 - Cathode Pin 5 - Cathode Pin 3 - Heater Any Mounting Position BOITOM VIEW Mounting Position BOITOM VIEW Mounting Position AMPLIFIER Plate Oltage 250 volts Priate Dissipation 1.6 max. watts Transcond. 1700 130 180 250 Plate Res. 14700 13200 12500 1400 ohms Transcond. 1700 1300 2000 2200 pron breeterbly			
Grid to Plate 1.4 µµf Grid to Cathode 1.2 µµf Plate to Cathode 1.1 µµf Maximum Overall Length 1-3/16" 1-3/16" Maximum Overall Length 1-3/16" 1-3/16" Maximum Diameter 3/4" 3/4" Maximum Diameter 3/4" 1-3/16" Maximum Diameter 3/4" 3/4" Base A Miniature Button 7-Pin Pin 1 - Plate Pin 5 - Plate Pin 2 - Cathode Pin 5 - Plate Pin 4 - Heater Pin 7 - Cathode Pin 4 - Heater Any Mouting Position BOITOM VIEW Maximum Ratings Are Design-Center values Maximum Ratings Are Design-Center values Plate Dissipation 1.6 max. watts Typical Operation and Characteristics - Class A, Amplifier: Piate 90 135 180 250 volts Amp. Fact. 25 25 25 25 25 25 25 25 25 25 25 25 25 25 25 25 25 25 <	Voltage 6. Current 0.1	3 a-c 5	
Plate to Cathode 1.1 µµf Maximum Overall Length 1-3/16" 1-9/16" Maximum Diameter 3/4" -3/4" Maximum Diameter 3/4" -5.1/2 Base A Miniature Button 7-Pin Pin 1 - Plate Pin 5 - Plate Pin 5 - Plate Pin 2 - Cathode Pin 7 - Cathode Pin 7 - Cathode Pin 4 - Heater Stock No. 9914 Any Mounting Position BOITOM VIEW Any Maximum Ratings Are Design-Center values Any Plate Voltage 250 max. volts Plate Point 0 - Grid -2.5 - 3.75 - 5 - 7 volts Typical Operation and Characteristics - Class A, Amplifier: Plate Dissipation Transcond. 1700 13200 12500 11400 Plate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 902, when operated from a transformer, should preferably be connected to the heater circuit. In the case of dc operation of the heater of rowids is negative bitty the inter difference between heater and cathode should be kept as on as possible. Amplifier: Piate Cur. 2.5 3.5 4.5 6.3 ma. The cathode of the 902, when operated from a transformer, shou	Grid to Plate 1.	4	µµf
Maximum Overall Length 1-13/16" Maximum Seated Height 1-9/16" Length from Base Seat to Bulb Top 1-3/16" ± 2/32" Maximum Diameter 3/4" Bulb T-5-1/2 Base A Miniature Button 7-Pin Pin 1 - Plate Pin 5 - Plate Pin 2 - Cathode Pin 6 - Grid Pin 3 - Heater Pin 7 - Cathode RCA Socket Stock No. 9914 Mounting Position BOITOM VIEW Maximum Ratings Are Design-Center values AMPLIFIER 250 max. volts Plate Voltage 250 volts Provide for the 900 135 180 250 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 902, when operated from a transformer, should preferably be the cathode is not directly concil is tight in either directly or through bias resistors to the negative battery the minal. In circuits where the cathode is not directly concil is tight in either directly or through bias for the possibility that this tube type may be manufactured with the exhaust-tube tight at the base end. For this reason, it is recommended that in equipment employing this			
Length from Base Seat to Bulb Top lexcluding tip) Maximum Diameter Base A Pin 1 - Plate Pin 2 - Cathode Pin 3 - Heater Pin 4 - Heater RCA Socket Mounting Position BOITOM VIEW Maximum Ratings Are Design-Center Values <u>AMPLIFIER</u> Plate Voltage Plate Voltage Plate Obsration and Characteristics - Class A, Amplifier: Plate Obsration and Characteristics - Class A, Amplifier: Plate 00 135 180 250 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 dc operation of the heat- er from a storage battery. the cathode circuit is tide in either directly or through bias fresistors to the negative battery terminal. In circuits where the cathode is not directly connected for this base my be manufactured with the exhaust-tube tip at 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 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 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 persitied to obstruct the socket hole. * Temporary minimum length = 1-1/16*. OCT. 1, 1943 RCA VICTOR DIVISION MATA	Maximum Overall Length	-	1–13/16"
Build T-5-1/2 Base A Miniature Button 7-Pin Pin 1 - Plate Pin 5 - Plate Pin 3 - Heater Pin 6 - Grid Pin 4 - Heater Pin 7 - Cathode Pin 4 - Heater Pin 7 - Cathode Wounting Position BOITOM VIEW Mounting Position BOITOM VIEW Maximum Ratings Are Design-Center values AMPLIFIER 250 max. volts Plate Voltage AMPLIFIER Plate Operation and Characteristics - Class A, Amplifier: Piate 30 135 Grid -2.5 Amp. Fact. 25 Plate Res. 14700 13200 12500 Plate Cur. 2.5 Bootage 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 circuit is the stow as possible. After center hole in sockets designed for this base provides for the bossibility that this tube type and that is equipared with the		ор	
Base A Pin 1 - Plate Pin 2 - Cathode Pin 3 - Heater Pin 4 - Heater RCA Socket Mounting Position Mounting Position Mount	Maximum Diameter	1	-3/16" <u>+</u> 3/32" + 3/4"
Pin 2 - Cathode Pin 3 - Heater Pin 4 - Heater RCA Socket Mounting Position BOITOM VIEW Maximum Ratings Are Design-Center values AMPLIFIER Plate Voltage Plate Voltage Plate Voltage Plate Voltage Plate Operation and Characteristics - Class A, Amplifier: Plate 0 135 180 250 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- er from a storage battery, the cathode circuit is tied in either directly or through Dias 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 socket designed for this base provides for the possibility that this tube type, no material be permitted to obstruct the socket hole. Temporary minimum length = 1-1/16*. OCT. 1, 1943 RCA VICTOR DIVISION DATA	Base A	Miniature	
Pin 3 - Heater Pin 4 - Heater PCA Socket Mounting Position Maximum Ratings Are Design-Center values Maximum Ratings Are Design-Center values AmpLifier Plate Voltage Plate Voltage Plate Sissipation Typical Operation and Characteristics - Class A, Amplifier: Plate 00 135 180 250 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 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. 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 egythemit employing this tube type, no material be permitted to obstruct the socket hole. * Temporary minimum length = 1-1/16*. OCT. 1, 1943 RCA VICTOR DIVISION MATA MANNENDE CONFORMENTOR DATA			
Mounting Position BOITOM VIEW Any Maximum Ratings Are Design-Center values AMPLIFIER 250 max. volts Plate Voltage 250 max. volts Typical Operation and Characteristics - Class A, Amplifier: Piate 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 heat- 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. Afte center hole in sockets designed for this base provides for the possibility that this tube type, no material be permitted to obstruct the socket hole. Temporary minimum length = 1-1/16*. OCT. 1, 1943 RCA VICTOR DIVISION DATA	Pin 3-Heater		
Maximum Ratings Are Design-Center values AMPLIFIER Plate Voltage Plate Dissipation Typical Operation and Characteristics - Class A, Amplifier: Plate 90 135 180 250 volts Grid -2.5 -3.75 -5 -7 volts Arp. Fact. 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 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. Afthe center hole in sockets designed for this base provides for the foostful 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*. OCT. 1, 1943 RCA VICTOR DIVISION DATA	RCA Socket		
Plate Voltage 250 max. volts Plate Dissipation 1.6 max. watts Typical Operation and Characteristics - Class A, Amplifier: Piate 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 (cruit. In the case of d-coperation of the heat- 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 should be kept as low as possible. After center hole in sockets designed for this base provides for the possibility that this tube type, no material be permitted to obstruct the socket hole. * Temporary minimum length = 1-1/16*. * Indicates a change. OCT. 1, 1943 RCA VICTOR DIVISION DATA		Design-Center value	es
Plate Dissipation 1.6 max. watts Typical Operation and Characteristics - Class A, Amplifier: Piate 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- er from a storage battery, the cathode circuit is tied dreation of the heat- 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 recommended that in equipment employing this tube type, no material be permitted to obstruct the socket hole. Temporary minimum length = 1-1/16*. OCT. 1, 1943 RCA VICTOR DIVISION DATA			50 max volte
 Piate 90 135 180 250 volts Grid -2.5 -3.75 -5 -7 volts Arp. 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- 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. 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 that in equipment eas reason, it is recommended that in equipment to obstruct the socket hole. Temporary minimum length = 1-1/16*. OCT. 1, 1943 RCA VICTOR DIVISION DATA 	Plate Dissipation	1.	.6 max. watts _
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 (cruit. 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 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 permitted to obstruct the socket hole. Temporary minimum length = 1-1/16*. OCT. 1, 1943 RCA VICTOR DIVISION DATA	Typical Operation and Character Plate 90 135	istics - Class A ₁ 180 2	
Plate Res. 14700 13200 12500, 11400 ohms Transcond. 1700 1900 2000 2200 mmhos 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- 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. 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 permitted to obstruct the socket hole. * Temporary minimum length = 1-1/16*. OCT. 1, 1943 RCA VICTOR DIVISION DATA RCA VICTOR DIVISION DATA	Grid -2.5 -3.75	-5 -	-7 volts
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 third storage battery, the cathode circuit is tied in either directly or the cathode should be kept as low as possible. A fhe 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 permitted to obstruct the socket hole. Temporary minimum length = 1-1/16*. OCT. 1, 1943 RCA VICTOR DIVISION DATA	Plate Res. 14700 13200	12500, 114	00 ohms
 The center hole in sockets designed for this base provides for the possibility that this tube type may be many factured 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*. OCT. 1, 1943 RCA VICTOR DIVISION DATA RADIO COMPONITION OF AMERICA, MARRISON, NEW JERSEY 	Plate Cur. 2.5 3.5	4.5 6	.3 ma.
Temporary minimum length = 1-1/16*. → Indicates a change. OCT. 1, 1943 RCA VICTOR DIVISION DATA RADIO CORPORATION OF ARERICA, MARISON, NEW JERSEY	The cathode of the 9002, when operate be connected to the heater circuit. If er from a storage battery, the cathod through bias resistors to the negati the cathode is not directly connected between heater and cathode should be a	ed from a transformer, : h the case of d-c operat le circuit is tied in e: ve battery terminal. to the heater, the pote kept as low as possible.	should preferably tion of the heat- ither directly or In circuits where ential difference
Temporary minimum length = 1-1/16°. → Indicates a change. OCT. 1, 1943 RCA VICTOR DIVISION DATA RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY	The center hole in sock provides for the possi	ets designed for this bility that this tube	base type
Temporary minimum length = 1-1/16°. → Indicates a change. OCT. 1, 1943 RCA VICTOR DIVISION DATA RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY	the base end. For this that in equipment emp	in ine exhaust-tude t reason, it is recomm loying this tube two	ended e, no
OCT. 1, 1943 RCA VICTOR DIVISION DATA RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY	<pre>material be permitted to *Temporary minimum length = 1-1/16*.</pre>	obstruct the socket	hole.
OCT. 1, 1943 RCA VICTOR DIVISION DATA RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY			
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SEPT. 17, 1943

9002

RCA VICTOR DIVISION BADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY World Radio History

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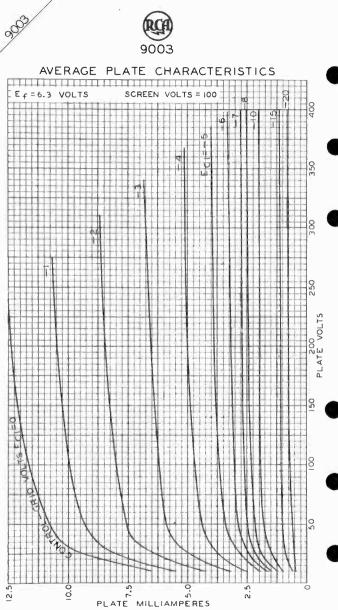


SUPER-CONTROL R-F AMPLIFIER PENTODE

Heater Coated Unipotential Cat	thode					
Voltage 6.3	a-c or d-c	volts				
Current 0.15		amp.				
Direct Interelectrode Capacitances:						
Grid to Plate 0.01 max.		μµf				
Input 3.4		μµf				
Output 3.0		μµf				
Maximum Overall Length	1-13/1					
Maximum Seated Height	1-9/1	6"				
Length from Base Seat to Buib Top		*				
(excluding tip)	1-3/16" ± 3					
Maximum Diameter	3/4"					
Bulb	T-5-1					
Base [*]	Miniature Button	7-Pin				
Pin 1-Grid	Pin 5-Plate	e				
Pin 2-Cathode @	Pin 6 - Scree	en				
Pin 3-Heater 0 20	Catho Grid	de, No 3				
Pin 4 - Heater	PIN /- j inter	nal hield				
RCA Socket	Stock No	9914				
Mounting Position BOTTOM VIEW		Any				
Maximum and Minimum Ratings Are De	esign-Center Valu					
AMPLIFIER						
Plate Voltage	250 max.	volts				
Screen Voltage	100 max.	volts				
Grid Voltage	-3 min.	volts				
Plate Dissipation	1.7 max.	watts				
Screen Dissipation	0.3 max.	watt				
Typical Operation and Characteristics -	- Class A, Amplij	ier:				
Plate Voltage	250	volts				
Screen Voltage	100	volts				
Grid Voltage	-3	volts				
Plate Resistance	0.7 approx.	megohm				
Transconductance	1800	unhos				
Grid Bias for		·				
Transcond, of 15 µmhos Grid Bias for	-35	volts				
Transcond. of 2 µmhos	-45	volts				
Plate Current	6.7	ma.				
Screen Current	2.7	ma.				
Typical Operation as Mixer in Superhete	erodyne Circuit:					
Plate Voltage 100	250	volts				
Screen Voltage 100	100	volts				
Grid Voltage # -10	-10 approx.					
Conversion Transconductance -	600 approx.					
# The grid bias is minimum for an oscillator These values are optimum.		volts.				
The center nole in sockets designed for the possibility that this tube type may i the exhaust-tube tip at the base end. Po recommended that in equipment employing the socket	its case provides for be manufactured with or this reason, it is its tube type, no ma- i hole.					
Shielding Considerations & Heater-Co for the 9003 are the same as for	athode Connection Type 9001.	15				
Indicates a change. *Temporary minimum length = 1-1/16".						
i increares a changes lemporary						

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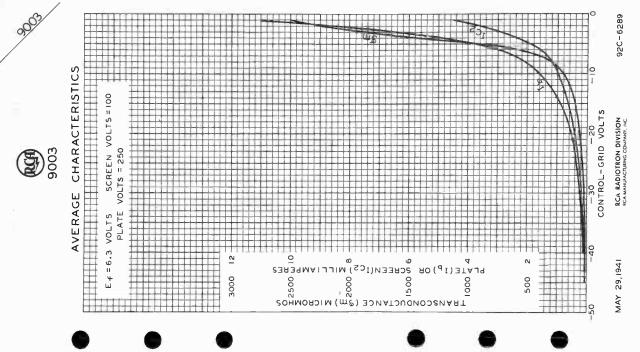




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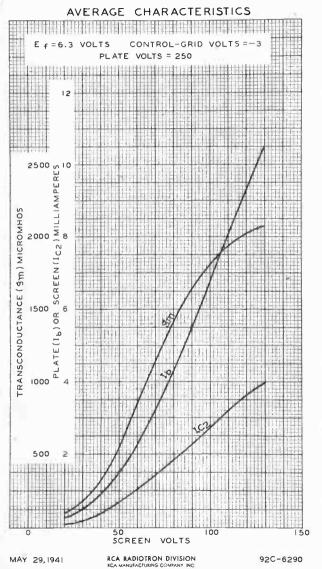






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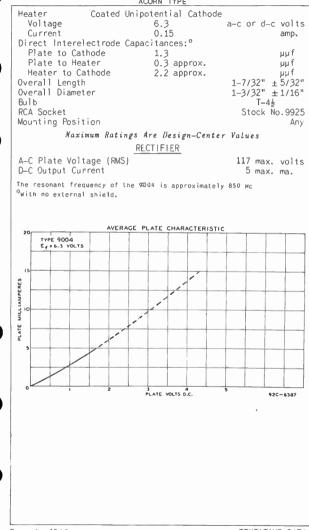






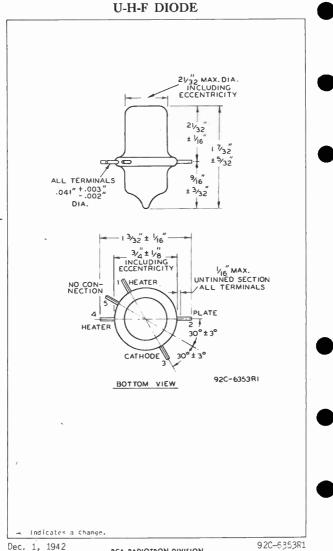
900+

U-H-F DIODE





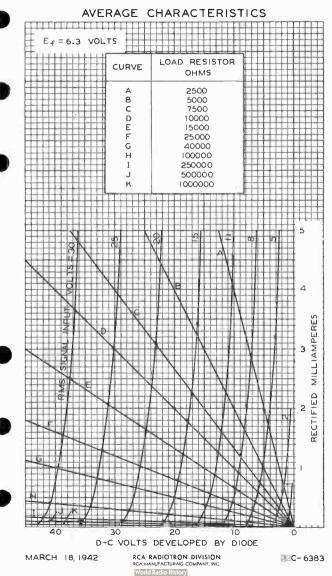




RCA RADIOTRON DIVISION RCA MANUFACTURING COMPANY INC World Radio History

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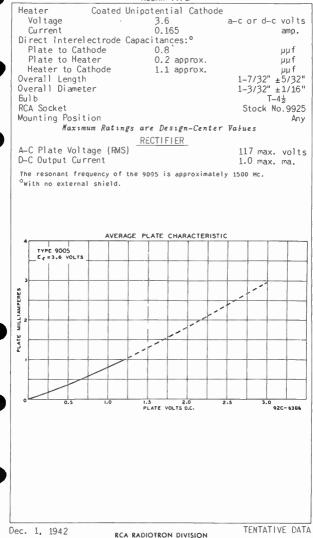


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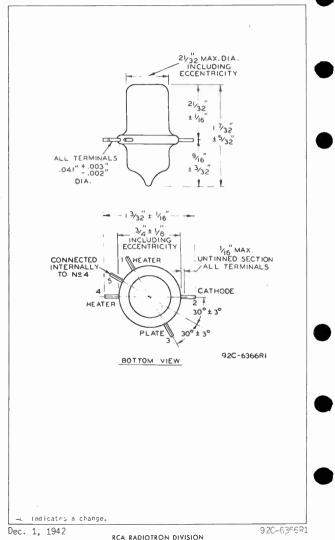


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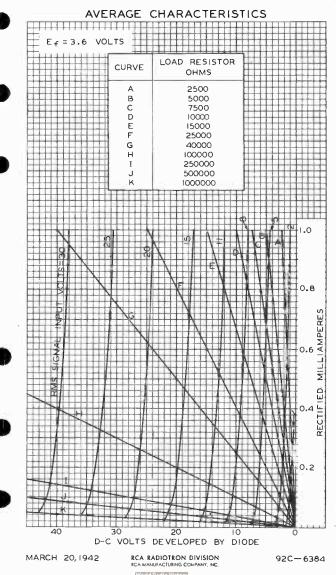


U-H-F DIODE



RCA MANUFACTURING COMPANY INC



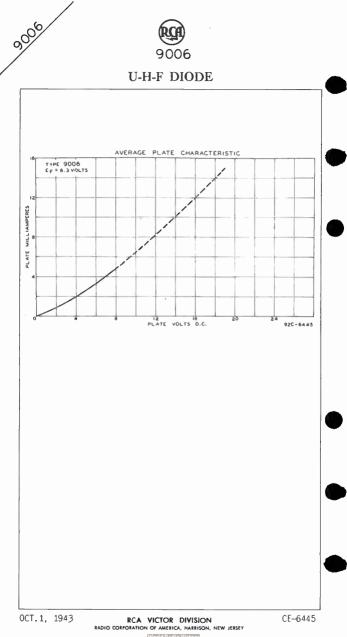


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U-H-F DIODE

WIDGET TYPE	
Heater Unipotential Cathode	
Voltage 6.3	a-c or d-c volt
Current 0.15	amp.
Direct Interelectrode Capacitances:	
Plate to Cathode 1.4	μμ f μμ f
Plate to Heater 0.2 Cathode to Heater 2.2	μμ μμ f
Maximum Overall Length	1-13/16"
Maximum Seated Height	1-9/16"
Length from Base Seat to Bulb Top	,
(excluding tip)	1-3/16 ± 3/32"
Maximum Diameter	3/4"
Bulb	T-5-1/2
	ature Sutton 7-Pin
	15-Plate
	n E - No Connection
Pin 3 - Heater Pin Pin 4 - Heater Pin	1 7 – Cathode
RCA Socket	Stock No. 9914
Mounting Position BOTTOM VIEW (68H)	Any
Maximum Ratings Are Design-Center	,
han man haven to booth other	1000400
RECTIFIER	
Peak Inverse Plate Voltage	750 max. volt
Peak Plate Current	15 max. ma.
L-C Output Current	5 max. ma.
D-C Heater-Cathode Potential Typical Operation as Rectifier:	100 max. volt
A-C Plate Supply Voltage (RMS)	270 volt
Min. Total Effective Plate-Supply Impedance	
D-C Output Current	5 ma.
∎ With no external shield.	
The resonant frequency of the good is 700 m	a da cuel a cladd rowl
provides for the possibility that this	tube type
may be manufacturea with the exhaust-tub the base end, for this reason, it is re-	e tip at connended
The center hole in sockets designed for provides for the possibility that this may be manufactured with the exhaust-tub the base end. For this reason, it is re- that in equipment employing this tube material be permitted to obstruct the soc	type, no
*Temporary minimum length = 1-1/16".	REL AGLE.
remporary minimum length = 1-1/15".	
OCT. 1, 1943 RCA VICTOR DIVISION	DAT



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