



827-R

# 827-R

## BEAM POWER TUBE

FORCED-AIR COOLED

Useful with full input up to 110 Mc

### GENERAL DATA

#### Electrical:

Filament, Thoriated Tungsten:

Voltage. . . . . 7.5 ± 0.4 . . . ac or dc volts ←

Current at 7.5 volts . . . . . 25 . . . . . amp

Starting current: The filament current must never exceed 50 amperes, even momentarily

Cold resistance. . . . . 0.033 ohm

Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 2000, grid-No.2 volts = 1100, and plate ma. = 350. . . . . 16 ←

Direct Interelectrode Capacitances: ←

Grid No.1 to plate (With external shield)♦. . . . . 0.19 μmf ←

Grid No.1 to filament and grid No.2. . . . . 18.5 μmf

Plate to filament and grid No.2. . . . . 11 μmf ←

#### Mechanical:

Operating Position . . . . . Vertical, filament end up ←

Maximum Overall Length (Excluding flexible leads). . . . . 6-3/8"

Maximum Diameter . . . . . 4-11/16"

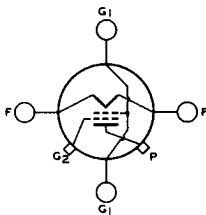
Weight (Approx.) . . . . . 4-1/2 lbs

Radiator . . . . . Integral part of tube

Terminal Connections (See Dimensional Outline):

TOP VIEW

G<sub>1</sub> - Grid No.1 (Ribbon leads identified by "G" on seal)  
G<sub>2</sub> - Grid No.2 (Header)



P - Plate (Radiator)  
F - Filament (Ribbon leads identified by "F" on seal)

#### Air Flow:

*Through Radiator*--The specified flow of incoming air at a maximum temperature of 45° C for various plate dissipations, as indicated in the following tabulation, should be delivered by a blower through the radiator before and during the application of any voltages. Filament power, plate power, and air flow may be removed simultaneously.

♦: See next page.

← Indicates a change.

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Percentage of maximum-rated plate dissipation for each class of service. . . . .	100	80	%
Minimum air flow. . . . .	65	45	cfm
Static pressure . . . . .	0.2	0.1	in. of water

To Header, Grid-No.1 Seals, and Filament Seals. . . . . 10 min. cfm

The specified air flow from a 1"-diameter nozzle should be directed into the header and onto the grid-No.1 seals and filament seals before and during the application of any voltages in order to limit the temperature of the filament and the grid-No.1 seals to their maximum value.

Incoming-Air Temperature. . . . .	45 max.	°C
Radiator Temperature (Measured on the core at end away from incoming air) . . . . .	150 max.	°C
Bulb Temperature (At hottest part). . . . .	150 max.	°C
Seal Temperature, Filament and Grid No.1 . . . . .	175 max.	°C

## RF POWER AMPLIFIER — Class B Telephony

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

## Maximum CCS\* Ratings, Absolute Values:

DC PLATE VOLTAGE. . . . .	3500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . . . .	1000 max.	volts
DC PLATE CURRENT. . . . .	400 max.	ma
PLATE INPUT . . . . .	1200 max.	watts
GRID-No.2 INPUT . . . . .	100 max.	watts
PLATE DISSIPATION . . . . .	800 max.	watts

## Typical Operation:

DC Plate Voltage. . . . .	3000	3500	volts
DC Grid-No.2 Voltage. . . . .	800	800	volts
DC Grid-No.1 (Control-Grid) Voltage <sup>†</sup> . . . . .	-75	-75	volts
Peak RF Grid-No.1 Voltage . . . . .	165	150	volts
DC Plate Current. . . . .	320	340	ma
DC Grid-No.2 Current. . . . .	10	12	ma
DC Grid-No.1 Current (Approx.). . . . .	30	25	ma
Driving Power (Approx.) <sup>‡</sup> . . . . .	50	38	watts
Power Output (Approx.). . . . .	350	400	watts

◆, ●, #, ■: See next page.



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## GRID-MODULATED RF POWER AMPLIFIER — Class C Telephony

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

Maximum CCS<sup>®</sup> Ratings, Absolute Values:

DC PLATE VOLTAGE . . . . .	3500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE . . .	1000 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE. . .	-500 max.	volts
DC PLATE CURRENT . . . . .	400 max.	ma
PLATE INPUT. . . . .	1200 max.	watts
GRID-No.2 INPUT. . . . .	100 max.	watts
PLATE DISSIPATION. . . . .	800 max.	watts

## Typical Operation:

DC Plate Voltage . . . . .	3000	3500	volts
DC Grid-No.2 Voltage . . . . .	800	800	volts
DC Grid-No.1 Voltage . . . . .	-300	-300	volts
Peak RF Grid-No.1 Voltage. . . . .	410	410	volts
Peak AF Grid-No.1 Voltage. . . . .	235	260	volts
DC Plate Current . . . . .	333	320	ma
DC Grid-No.2 Current . . . . .	15	13	ma
DC Grid-No.1 Current (Approx.) . . . .	45	40	ma
Driving Power (Approx.) <sup>♦</sup> . . . . .	82	74	watts
Power Output (Approx.) . . . . .	350	400	watts

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

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

Maximum CCS<sup>®</sup> Ratings, Absolute Values:

DC PLATE VOLTAGE . . . . .	3000 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE . . .	800 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE. . .	-500 max.	volts
DC PLATE CURRENT . . . . .	400 max.	ma
DC GRID-No.1 CURRENT . . . . .	125 max.	ma
PLATE INPUT. . . . .	1200 max.	watts
GRID-No.2 INPUT. . . . .	100 max.	watts
PLATE DISSIPATION. . . . .	550 max.	watts

## Typical Operation:

DC Plate Voltage . . . . .	2500	3000	volts
DC Grid-No.2 Voltage* . . . . .	700	750	volts
DC Grid-No.1 Voltage <sup>▲</sup> . . . . .	-350	-325	volts
Peak RF Grid-No.1 Voltage. . . . .	640	600	volts
DC Plate Current . . . . .	400	400	ma
DC Grid-No.2 Current . . . . .	140	125	ma
DC Grid-No.1 Current (Approx.) . . . .	125	125	ma
Driving Power (Approx.) . . . . .	72	68	watts
Power Output (Approx.) . . . . .	670	825	watts

♦, ●, #, ■, \*, ▲: See next page.

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## BEAM POWER TUBE

 RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy<sup>†</sup>  
 and  
 RF POWER AMPLIFIER — Class C FM Telephony

## Maximum CCS\* Ratings, Absolute Values:

DC PLATE VOLTAGE. . . . .	3500 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE. . . . .	1000 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE. . . . .	-500 max.	volts
DC PLATE CURRENT. . . . .	500 max.	ma
DC GRID-No.1 CURRENT. . . . .	150 max.	ma
PLATE INPUT. . . . .	1500 max.	watts
GRID-No.2 INPUT. . . . .	150 max.	watts
PLATE DISSIPATION. . . . .	800 max.	watts

## Typical Operation:

DC Plate Voltage. . . . .	3000	3500	volts
DC Grid-No.2 Voltage <sup>®</sup> . . . . .	900	700	volts
DC Grid-No.1 Voltage <sup>□</sup> . . . . .	-350	-300	volts
Peak RF Grid-No.1 Voltage. . . . .	590	520	volts
DC Plate Current. . . . .	500	428	ma
DC Grid-No.2 Current. . . . .	165	185	ma
DC Grid-No.1 Current (Approx.). . . . .	125	100	ma
Driving Power (Approx.). . . . .	66	50	watts
Power Output (Approx.). . . . .	1000	1050	watts

◆ With external, flat metal shield 10" by 12" having a 3-inch-diameter hole whose center is located on major axis 5" from one of the 10" sides. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

● Continuous Commercial Service.

\* Grid-No.1 voltage is given with respect to midpoint of filament operated on ac. If dc is used, each stated value of grid-No.1 voltage should be decreased by one-half the filament voltage and the circuit returns made to the negative end of the filament.

■ At crest of audio-frequency cycle with modulation factor of 1.

\* Obtained preferably from fixed supply modulated simultaneously with the plate voltage. Series voltage-dropping resistor connected to modulated plate-voltage supply may also be used.

▲ Obtained by grid-No.1 resistor or by 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 115% of the carrier conditions.

® Obtained preferably from fixed supply or voltage divider. Grid-No.2 voltage must not exceed twice the maximum grid-No.2-voltage rating under key-up conditions.

□ Obtained from fixed supply, cathode resistor, or grid-No.1 resistor. If a preceding stage is keyed, sufficient bias must be applied to maintain plate current at a low value under key-up conditions.

## CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Filament Current. . . . .	1	23.1	26.9	amp

→ Indicates a change.



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	Note	Min.	Max.	
Direct Interelectrode Capacitances:				
Grid No.1 to plate . . . . .	2	0.16	0.22	$\mu\text{mf}$
Grid No.1 to filament and grid No.2. . . . .	-	14.5	22.5	$\mu\text{mf}$
Plate to filament and grid No.2. . . . .	-	7.5	14.5	$\mu\text{mf}$
Mu-Factor, Grid No.2 to Grid No.1. . . . .	1,3	13.9	18.1	
Plate Current. . . . .	1,4	200	340	ma
Plate-Current Cutoff . . . . .	1,5	-55	-95	volts
Grid-No.2 Current. . . . .	1,4	-	23	ma
Power Output . . . . .	1,6	900	-	watts

- Note 1: With 7.5 volts ac on filament.
- Note 2: With external, flat metal shield 10" by 12" having a 3-inch diameter hole whose center is located on major axis 5" from one of the 10" sides. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.
- Note 3: With dc plate volts = 2000, dc grid-No.2 volts = 1100, and dc grid-No.1 voltage adjusted to give dc plate current of 350 ma.
- Note 4: With dc plate volts = 3000, dc grid-No.2 volts = 1000, and dc grid-No.1 volts = -20.
- Note 5: With dc plate volts = 3000, dc grid-No.2 volts = 1000, and dc grid-No.1 voltage adjusted to give dc plate current of 10 ma.
- Note 6: In self-excited oscillator circuit, and with dc plate volts = 3500, dc grid-No.2 volts = 900, dc plate ma. = 430, dc grid-No.1 ma. = 80 to 120, grid-No.1 resistor (ohms) = 5000, and frequency (Mc) = 8.

## OPERATING CONSIDERATIONS

The *mounting* for the 827-R requires a clamp support for the radiator (plate connection), a connector for the grid-No.2 terminal, a connector for the grid-No.1 leads tied together, and two connectors for the filament leads. The tube should be supported in a vertical position with the grid-No.1 and filament leads up. If the 827-R is subjected to considerable vibration in service, it is advisable to support the mounting by means of a spring suspension. The installation of all wires and connections must be made so that they will not be close to or touch the glass parts. This precaution is necessary to prevent almost certain puncture of the glass.

*Connections* to the grid-No.1 and filament leads must have some degree of flexibility in order not to put strain on the glass-to-metal seals. Particular caution must be exercised in making connection to the grid-No.2 terminal (header) in order to avoid placing strain on the seal between the header and the glass bulb. It is suggested that the connector for the grid-No.2 terminal consist of a flat yoke having spring contacts which will engage the inside and the outside of the rim of the header with firm but moderate pressure. Do not

← Indicates a change.

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use any form of clamp on the header as it will crack the glass-to-metal seal. The support for the yoke must not place any pressure on the seal. None of the connectors should be used to support circuits parts.

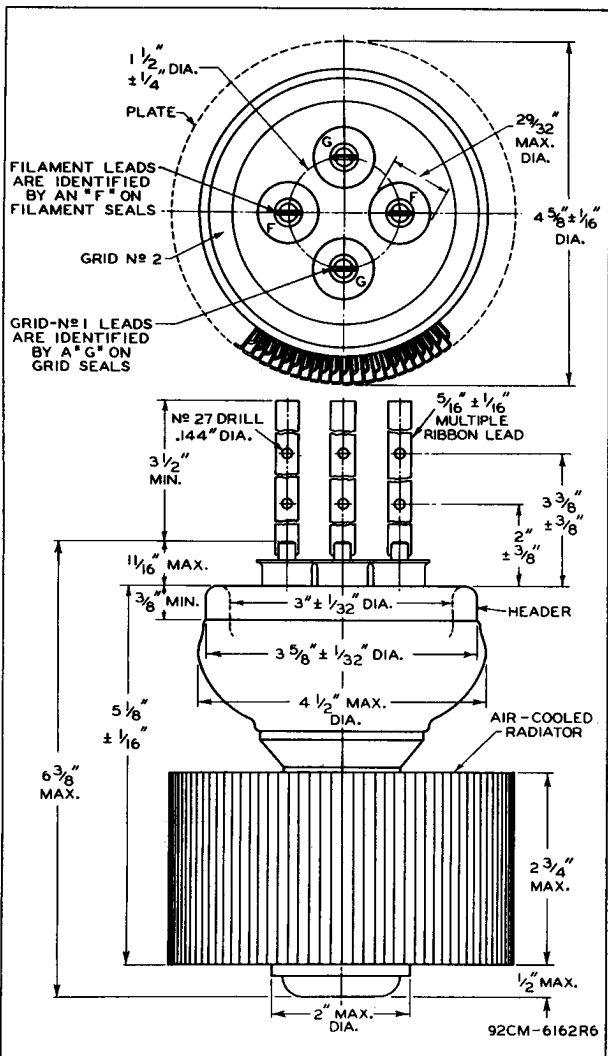
*Cooling* of the 827-R is accomplished by passing a stream of clean air through the radiator toward the filament end, and by directing another stream of air into the entrant metal header and around the grid-No.1 and filament seals. A suitable air filter is required in the air supply for the radiator.



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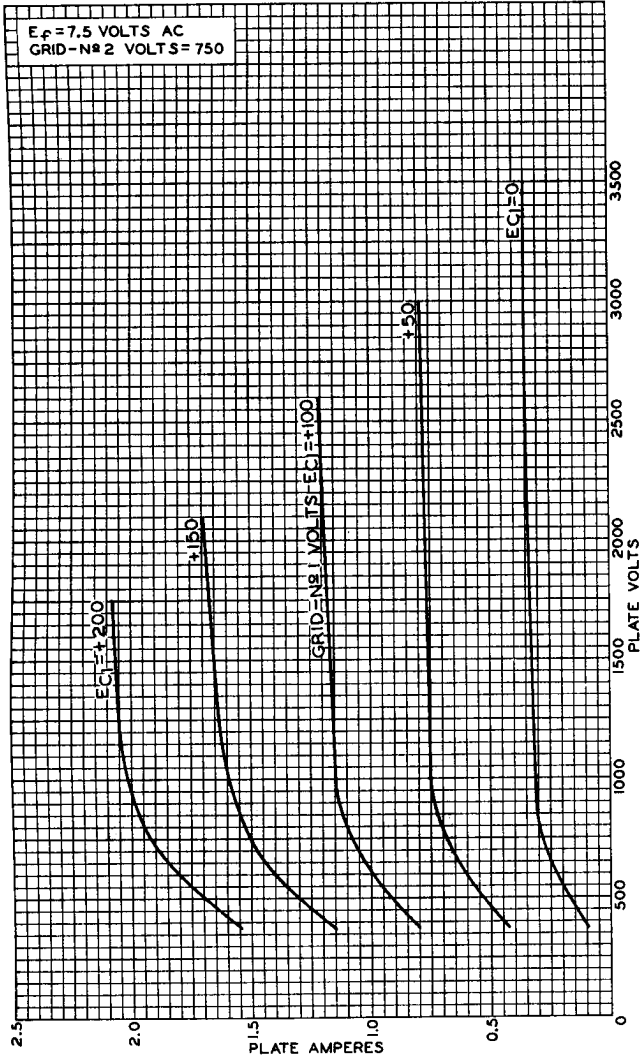


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# TYPICAL PLATE CHARACTERISTICS



ELECTRON TUBE DIVISION

92CM-6167RI

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

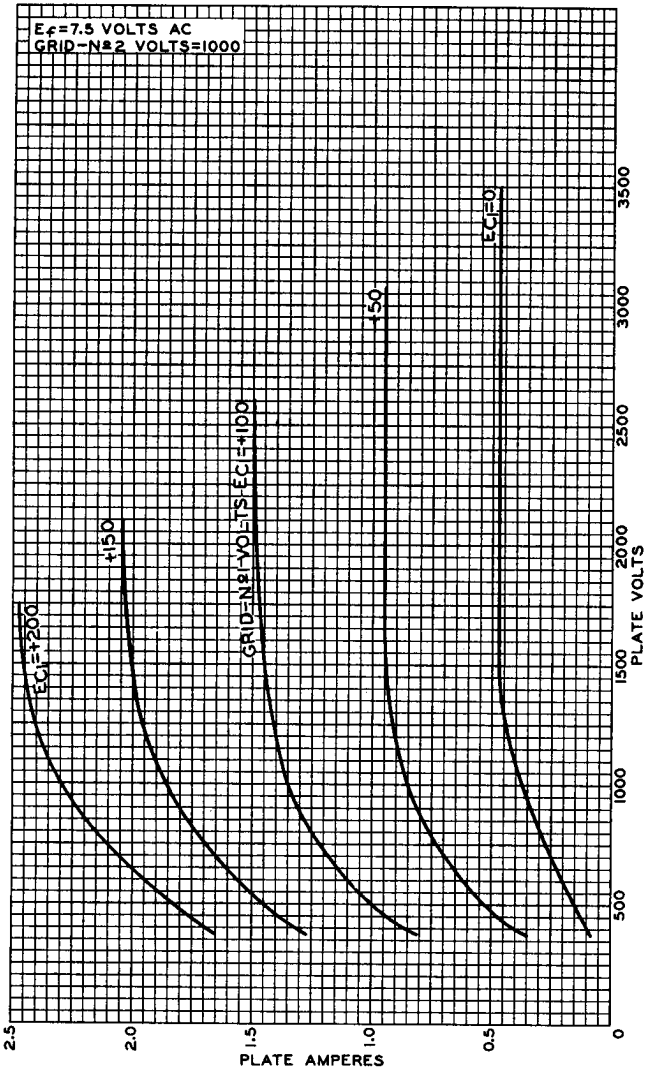




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# TYPICAL PLATE CHARACTERISTICS



ELECTRON TUBE DIVISION

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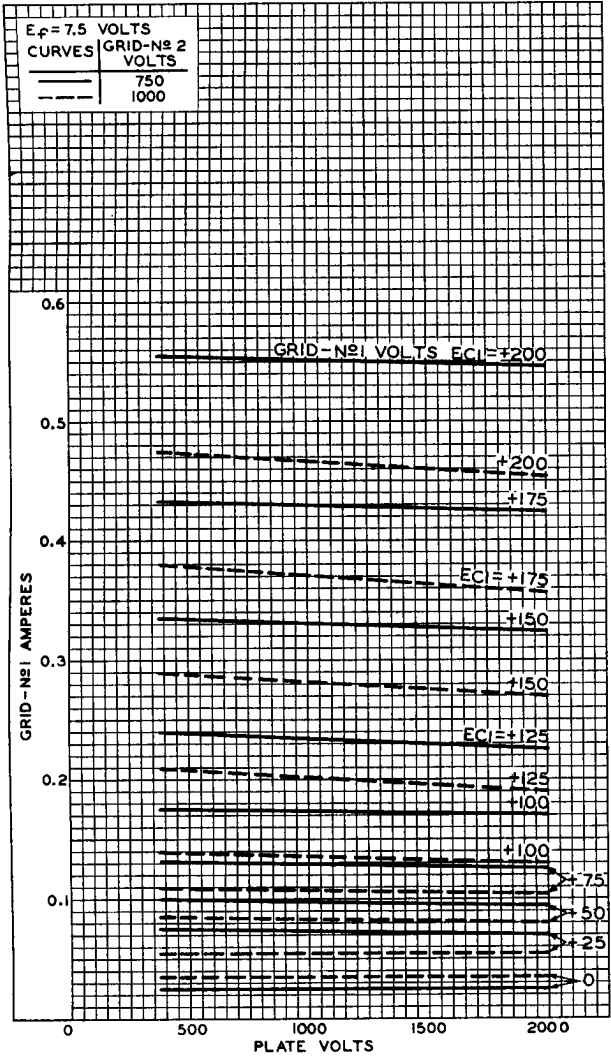
92CM-6166RI

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TYPICAL CHARACTERISTICS

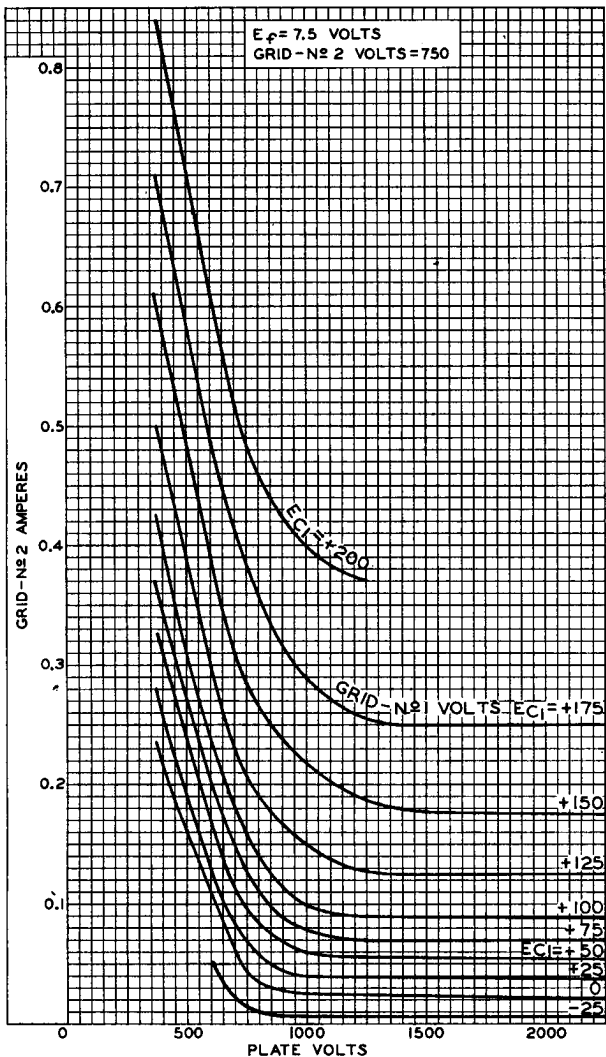




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### TYPICAL CHARACTERISTICS



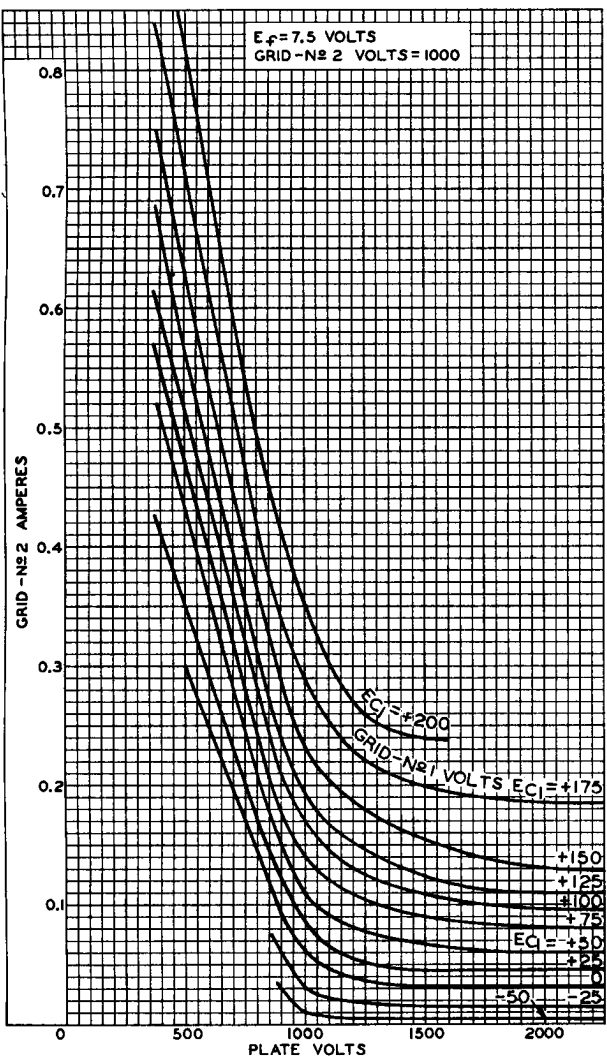
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### TYPICAL CHARACTERISTICS

$E_f = 7.5$  VOLTS  
GRID-№2 VOLTS = 1000



ELECTRON TUBE DIVISION

92CM-9556

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



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## TRANSMITTING TETRODE FORCED-AIR COOLED

Filament	Thoriated Tungsten	
Voltage	7.5	a-c or d-c volts
Current	25	amp.
Starting - The current must never exceed 50 amperes, even momentarily.		
Grid-Screen Mu-Factor	16	
Direct Interelectrode Capacitances:		
Grid-Plate (with external shielding)	0.18 max.	$\mu\text{f}$
Input	21	$\mu\text{f}$
Output	13	$\mu\text{f}$
Maximum Overall Length	5-15/16" ←	
Maximum Diameter	4-21/32"	
Radiator	Integral part of tube	
Cooling - vertical air flow of 100 cfm from plate to seal end required for max. plate dissipation rating and max. ambient temperature not more than 45°C. Also, flow of 10 cfm from 1"-diameter nozzle should be directed into header. Air flow must start before any voltages are applied.		

### MAXIMUM CCS RATINGS and TYPICAL OPERATING CONDITIONS

*CCS = Continuous Commercial Service*

#### R-F POWER AMPLIFIER - Class B Telephony

*Carrier conditions per tube for use with a max. modulation fact. of 1.0*

	<u>CCS</u>	
D-C Plate Voltage	3500 max.	volts
D-C Screen Voltage (Grid No.2)	1000 max.	volts
D-C Plate Current	400 max.	ma.
Plate Input	1200 max.	watts
Screen Input	100 max.	watts
Plate Dissipation	800 max.	watts
Radiator Temperature	150 max.	°C

#### Typical Operation:

D-C Plate Voltage	3000	3500	volts
D-C Screen Voltage	800	800	volts
D-C Grid Voltage (Grid No.1)*	-75	-75	volts
Peak R-F Grid Voltage	165	150	volts
D-C Plate Current	320	340	ma.
D-C Screen Current	10	12	ma.
D-C Grid Current	30	25 approx.	ma.
Driving Power •	50	38 approx.	watts
Power Output	350	400 approx.	watts

#### GRID-MODULATED R-F POWER AMPLIFIER - Class C Telephony

*Carrier conditions per tube for use with a max. modulation fact. of 1.0*

	<u>CCS</u>	
D-C Plate Voltage	3500 max.	volts
D-C Screen Voltage (Grid No.2)	1000 max.	volts
D-C Grid Voltage (Grid No.1)	-500 max.	volts
D-C Plate Current	400 max.	ma.
Plate Input	1200 max.	watts
Screen Input	100 max.	watts
Plate Dissipation	800 max.	watts
Radiator Temperature	150 max.	°C

#### Typical Operation:

D-C Plate Voltage	3000	3500	volts
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• See end of tabulation. ← Indicates a change. \*With a-c filament supply.

AUG. 15, 1944

RCA VICTOR DIVISION  
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DATA 1



## TRANSMITTING TETRODE

(continued from preceding page)

D-C Screen Voltage	800	800	volts
D-C Grid Voltage	-300	-300	volts
Peak R-F Grid Voltage	410	410	volts
Peak A-F Grid Voltage	235	260	volts
D-C Plate Current	333	320	ma.
D-C Screen Current	15	13	ma.
D-C Grid Current	45	40	approx. ma.
Driving Power •	82	74	approx. watts
Power Output	250	400	approx. watts

### PLATE-MODULATED R-F POWER AMPLIFIER - Class C Telephony

Carrier conditions per tube for use with a max. modulation fact. of 1.0

	<u>CCS</u>		
D-C Plate Voltage	3000	max.	volts
D-C Screen Voltage (Grid No.2)	800	max.	volts
D-C Grid Voltage (Grid No.1)	-500	max.	volts
D-C Plate Current	400	max.	ma.
D-C Grid Current	125	max.	ma.
Plate Input	1200	max.	watts
Screen Input	100	max.	watts
Plate Dissipation	550	max.	watts
Radiator Temperature	150	max.	°C

#### Typical Operation:

D-C Plate Voltage	2500	3000	volts
D-C Screen Voltage ◊	700	750	volts
	13000	18000	ohms
D-C Grid Voltage ▲	-350	-325	volts
	2800	2600	ohms
Peak R-F Grid Voltage	640	600	volts
D-C Plate Current	400	400	ma.
D-C Screen Current	140	125	ma.
D-C Grid Current	125	125	approx. ma.
Driving Power	72	68	approx. watts
Power Output	670	825	approx. watts

◊ obtained preferably from fixed supply modulated simultaneously with plate voltage. Series voltage-dropping resistor (13000, 18000 ohms) connected to modulated plate-voltage supply may also be used.

▲ obtained by grid resistor of value shown or by combination of grid resistor with either fixed supply or cathode resistor.

### R-F POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy

Key-down conditions per tube without modulation ##

	<u>CCS</u>		
D-C Plate Voltage	3500	max.	volts
D-C Screen Voltage (Grid No.2)	1000	max.	volts
D-C Grid Voltage (Grid No.1)	-500	max.	volts
D-C Plate Current	500	max.	ma.
D-C Grid Current	150	max.	ma.
Plate Input	1500	max.	watts
Screen Input	150	max.	watts
Plate Dissipation	800	max.	watts
Radiator Temperature	150	max.	°C

•, ##: see end of tabulation.



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## TRANSMITTING TETRODE

(continued from preceding page)

## Typical Operation:

D-C Plate Voltage	3000	3500	volts
D-C Screen Voltage §	900	700	volts
	12500	15100	ohms
	-350	-300	volts
D-C Grid Voltage □	560	570	ohms
	2800	3000	ohms
	590	520	volts
Peak R-F Grid Voltage	590	520	volts
D-C Plate Current	500	428	ma.
D-C Screen Current	165	185	ma.
D-C Grid Current	125	100	approx. ma.
Driving Power	66	50	approx. watts
Power Output	1000	1050	approx. watts

• At crest of audio-frequency cycle with modulation factor of 1.0.

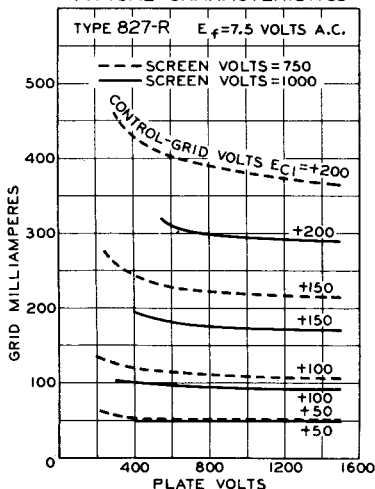
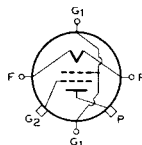
§ Obtained preferably from fixed supply or voltage divider. Screen voltage must not exceed twice the maximum screen-voltage rating under key-up conditions.

□ Obtained from fixed supply, cathode resistor (560, 570) or grid resistor (2800, 3000). If a preceding stage is keyed, sufficient fixed bias must be supplied to maintain plate current at a low value under key-up conditions.

■ Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

Data on operating frequencies for the 827-R are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.

## TYPICAL CHARACTERISTICS

TOP VIEW OF  
TERMINAL CONNECTIONS

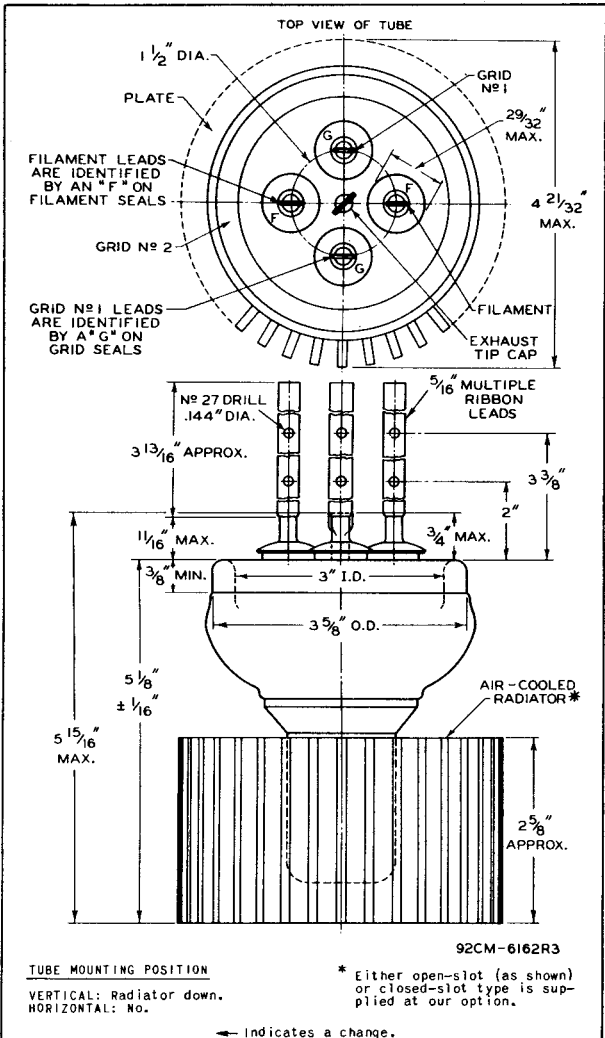
F - Filament  
G<sub>1</sub> - Grid No. 1  
G<sub>2</sub> - Grid No. 2  
P - Plate

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## TRANSMITTING TETRODE



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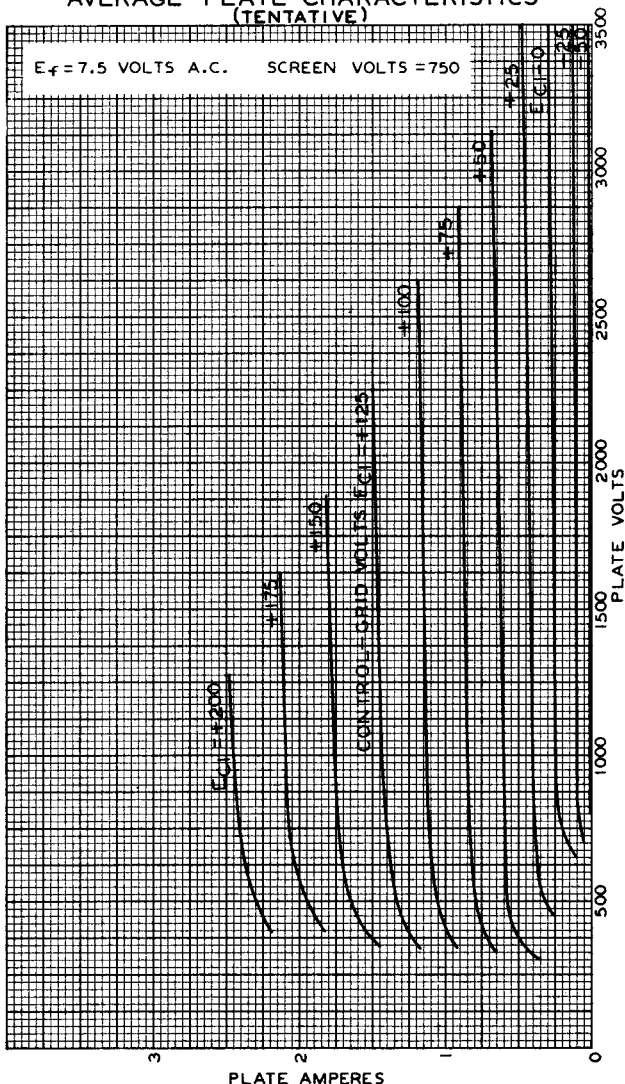
DATA 2





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# 827-R AVERAGE PLATE CHARACTERISTICS (TENTATIVE)



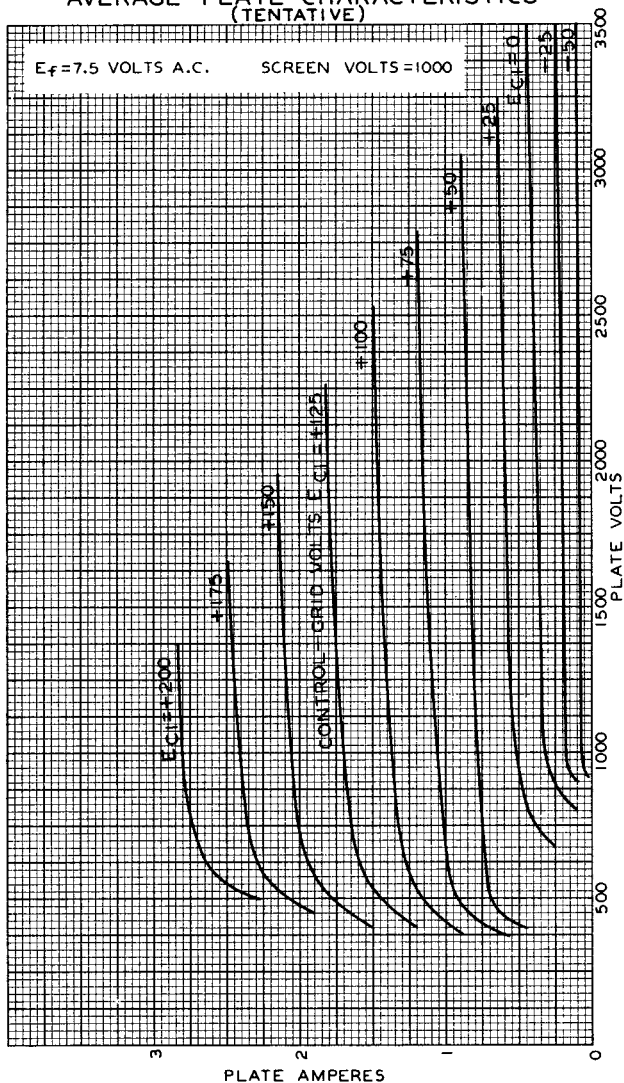
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## AVERAGE PLATE CHARACTERISTICS

(TENTATIVE)



JUNE 5, 1940

RCA RADOTRON DIVISION  
RCA MANUFACTURING COMPANY, INC.

92C-6166