

E. F. Johnson
Viking I Transmitter
Tube Characteristics

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TECHNICAL INFORMATION

BEAM POWER AMPLIFIER OSCILLATOR

Excellence in Electronics

The Raytheon RK4D32 and RK4D22 tubes are beam type aligned grid power amplifiers. Each has a unipotential oxide-coated cathode, a hard glass nonex bulb, and a glass base with short tungsten leads. The type RK4D32 has a heater designed to operate from a 6.3 volt supply, while the type RK4D22 has a center-tapped heater providing for operation from either a 12.6 volt or 25.2 volt supply. The two types are identical with the exception of the heater voltages, and heater base pin connections. Mechanically both types have been ruggedized to withstand the shock and vibration encountered in mobile and aircraft applications.

A single tube may be operated as a "Class C" RF amplifier up to 60 megacycles without neutralization and without reducing the plate input power ratings. With a 600 volt plate supply and 1.25 watts grid driving power, single tube will produce 100 watts power output.

Two tubes may be used in a push-pull audio amplifier circuit under "Class AB₂" conditions to produce 125 watts output.

The tube may also be used as an oscillator, frequency multiplier or plate modulated RF amplifier.

MECHANICAL DATA

ENVELOPE: Hard Glass

BASE: Medium Molded Flare Septor 7-Pin. Will Fit Standard Johnson #247 Socket or similar type

TERMINAL CONNECTIONS: (Largest Diameter Pin is Pin #4)

Pin 1 Heater	Pin 5 Cathode, Internal Shield,
Pin 2 Grid #2	Deflector
Pin 3 Heater Center Tap	Pin 6 Grid #1
Pin 4 Cathode, Internal Shield,	Pin 7 Heater
Deflector	

MOUNTING POSITION: Any

COOLING: Freely Circulating Air

ELECTRICAL DATA

DIRECT INTERELECTRODE CAPACITANCE: (Without External Shield) (μfds)

Grid #1 to Plate	0.40
Input	30
Output	16
Screen-Cathode Capacitance (including internal screen by-pass condenser)	40 approx.

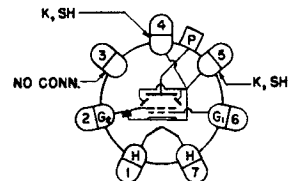
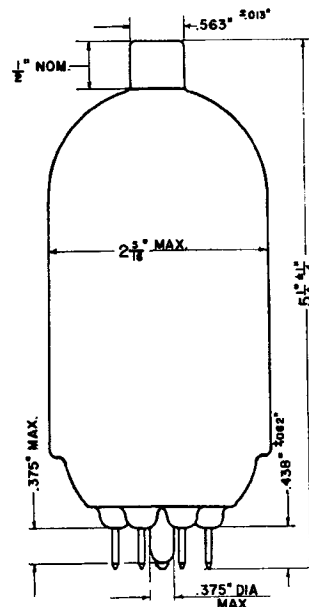
FILAMENT RATINGS:

	SERIES	PARALLEL
TYPE RK4D22		
Heater Voltage	25.2	12.6 volts
Heater Current	0.8	1.6 amperes
TYPE RK4D32		
Heater Voltage		6.3 volts
Heater Current		3.75 amperes

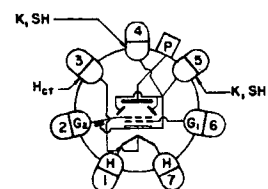
R-F POWER AMPLIFIER OR OSCILLATOR-CLASS C-MAXIMUM C.C.S. RATINGS

	Telephony Φ Plate and Screen Modulation	Telegraphy or Frequency Modulation Telephony
DC Plate Voltage	600	600 volts
DC Grid Voltage	-200	-200 volts
DC Screen Voltage	350	350 volts
DC Plate Current	300	300 ma

TYPE RK-4D22- RK-4D32



BOTTOM VIEW OF SOCKET
TYPE RK-4D32



BOTTOM VIEW OF SOCKET
TYPE RK-4D22

Tentative Data

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BEAM POWER AMPLIFIER OSCILLATOR

ELECTRICAL DATA (Cont'd)

R - F POWER AMPLIFIER OR OSCILLATOR - CLASS C - MAXIMUM C.C.S. RATINGS

	Telephony ♦ Plate and Screen Modulation	Telephony or Frequency Modulation Telephony
DC Grid Current	15	15 ma
DC Screen Current	30	35 ma
Plate Input Watts	150	200 watts
Plate Dissipation	35	50 watts
Screen Dissipation	10	14 watts
Grid Dissipation	0.75	0.75 watts
Highest Frequency for Maximum Ratings	60	60 Megacycles

R - F POWER AMPLIFIER OR OSCILLATOR - CLASS C - TYPICAL OPERATION

	Telephony ♦ Plate and Screen Modulation	Telephony or Frequency Modulation Telephony
DC Plate Voltage	550	600 volts
DC Screen Voltage	----	300 volts
Series Screen Resistor	15,000	---- ohms
DC Grid Voltage	-100	-100 volts
DC Plate Current	175	215 ma
DC Screen Current	17	30 ma
DC Control Grid Current	6.0	10.0 ma
R - F Grid Driving Power (approx.)	0.6	1.25 watts
Carrier Power Output (approx.)	70	90 watts

A - F POWER AMPLIFIER - CLASS AB₁ - CLASS AB₂ - TYPICAL OPERATION •

	Class AB ₁	Class AB ₂
DC Plate Voltage	600	600 volts
DC Grid Voltage	-37.5	-25 volts
DC Screen Voltage	350	250 volts
Peak A - F Input Voltage (grid to grid)	74	70 volts
DC Plate Current (zero signal)	100	100 ma
DC Plate Current (max. signal)	350	365 ma
DC Screen Current (max. signal)	46	26 ma
Effective Load Resistance (plate to plate)	3,000	3,000 ohms
Maximum Signal Driving Power (approx.)	0	0.45 watts
Maximum Signal Power Output (approx.)	112	125 watts
Maximum Plate Dissipation (per tube - approx.)	49	47 watts
Maximum Screen Dissipation (per tube - approx.)	8	3 watts

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

• Unless other wise specified, values are for two tubes.

⊕ Pin #3 for RK4D32 has no connection.

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BEAM POWER AMPLIFIER OSCILLATOR

OPERATING NOTES

HEATER

The heater voltage, under all possible conditions of line voltage, should be within 10 % of the rated value. A minimum heating time of 2 minutes should be allowed before application of screen or plate voltages. The heater supply should be connected to the cathode where possible, but in no case should the voltage between heater and cathode exceed 100 volts.

R-F AMPLIFIER

EXCITATION

The Class C operation curves on the following pages show operating data against D.C. Grid Driving Current for 100 volts of fixed bias. In general, higher efficiencies cannot be achieved by increasing the D.C. bias above this value. Higher screen grid currents are produced by an increase in bias, therefore care should be taken to insure that screen grid dissipation ratings are not exceeded because of too much grid bias or excessive grid excitation current. It should be noted that on some of the Class C operation curves the maximum screen grid current rating is exceeded at the higher values of grid driving current.

BIAS

In Class C operation the usual forms of fixed bias, cathode resistor bias, or grid leak bias can be used. To prevent damage to the tube by a failure of excitation signal, grid leak bias alone should not be used. Circuit design should be such that at least 40 volts bias is provided in the event of signal failure. For C. W. Operation where the exciter or oscillator stages are keyed, a fixed bias voltage of at least 75 volts should be used.

SHIELDING

The input and output stages must be completely shielded to avoid regeneration or oscillation. This may be accomplished by mounting the tube base below the chassis level, with the disc shield (located near the bottom of the elements in the tube) level with the chassis. The tube may be mounted through a 23/8" diameter hole in the chassis. This arrangement permits isolation of input and output circuits by locating each on opposite sides of the chassis.

SCREEN VOLTAGE SUPPLY

The screen voltage may be obtained from a fixed voltage supply or through a series resistor from the plate supply. When a fixed voltage is used, care should be taken when making tuning adjustments to prevent excessive screen grid current. The screen should be adequately bypassed to cathode at R-F frequencies in addition to the internal tube condenser. For plate and screen modulation, the series screen resistor should be connected to the plate side of the modulation transformer. The R-F bypass condenser on the screen should not be large enough to produce attenuation or phase shift of the screen modulation voltage through this series screen resistor.

PLATE CIRCUIT

Because this tube is a relatively low voltage-high power type, the ratio of D.C. plate voltage to D.C. plate current is lower than will be found in most other tube types. This condition requires a lower L/C ratio for optimum Q: i.e., a higher value of tank capacitance than is required by many other transmitting tube types. For typical operating conditions, the tank capacitance (including plate and wiring capacitances) should be approximately 4 μf per meter

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BEAM POWER AMPLIFIER OSCILLATOR

of wavelength. It should be noted that the Class C operation curves on the following pages were taken with the load coupling adjusted to produce maximum output with an average tube operating at the conditions indicated. Closer coupling will not increase the power output, but will increase the plate current and reduce efficiency. In general, looser coupling will produce slightly higher efficiencies than the values shown, with lower plate current and power output values. In adjusting the load in an R-F amplifier, the coupling should be less than the values indicated so that for a given set of operating conditions, the plate current will be slightly less than the values shown on the graphs and the screen current slightly higher. As suggested under the notes on "Screen Voltage Supply", the load coupling and plate current should not be low enough to cause excessive screen current with a fixed screen supply voltage.

PLATE TEMPERATURE

At the maximum plate dissipation rating of 50

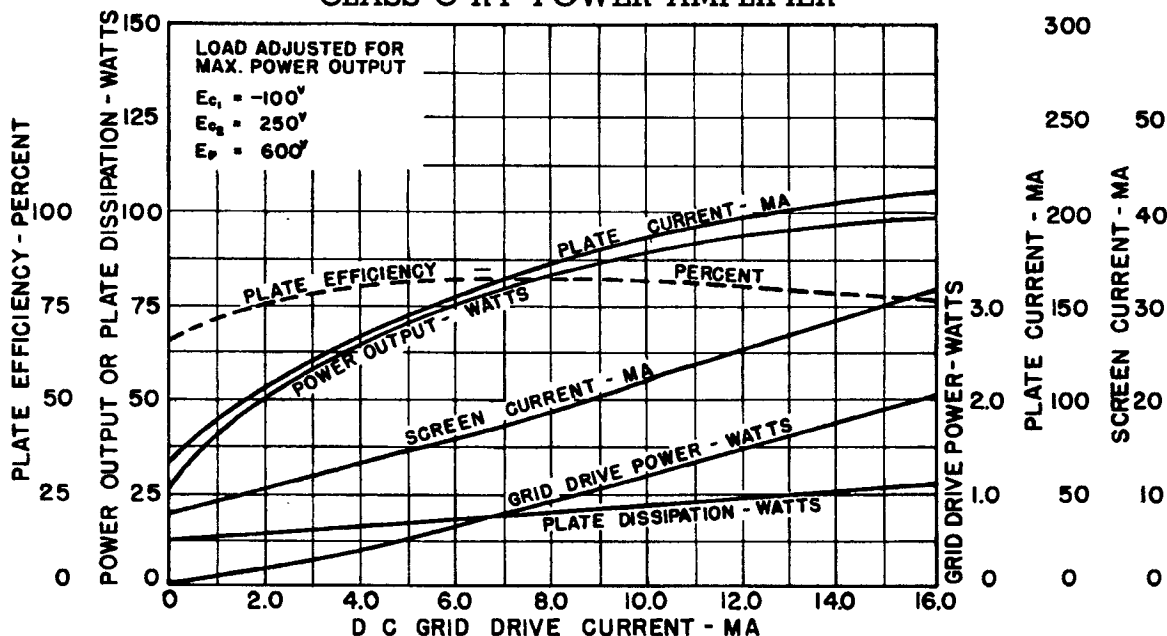
watts no color is visible on any portion of the plate. For this reason the plate dissipation should be determined on the basis of plate input and power output measurements. Under no circumstances is the tube to be operated so that it shows plate color.

A-F AMPLIFIER

In push-pull audio service, two tubes may be operated in Class AB₁ or Class AB₂ service. For greatest efficiency, the tubes are best operated with a screen voltage of 250 volts in Class AB₂. Grid current flows during the most positive signal swing in this class of operation, and a fixed source of bias voltage with good regulation is necessary. Where driving power is not available, these tubes may be operated in Class AB₁. The values given to this type of operation are determined on the basis that no grid current flows at any time. The value of D.C. grid leak resistance should not exceed 25,000 ohms.

AVERAGE CHARACTERISTICS

CLASS C R-F POWER AMPLIFIER



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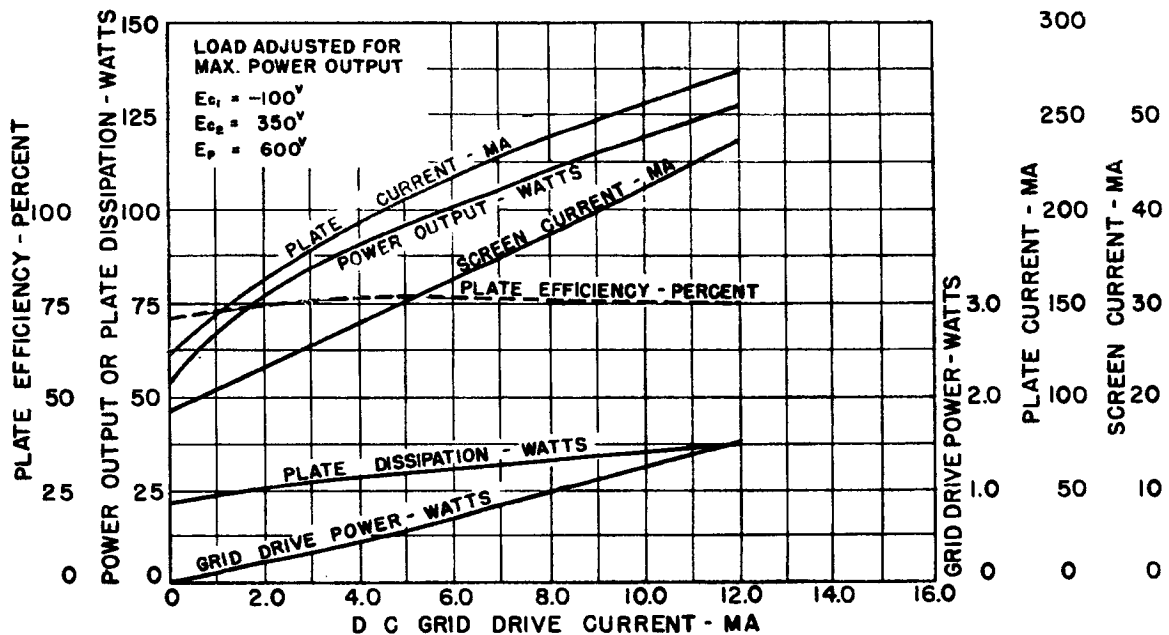
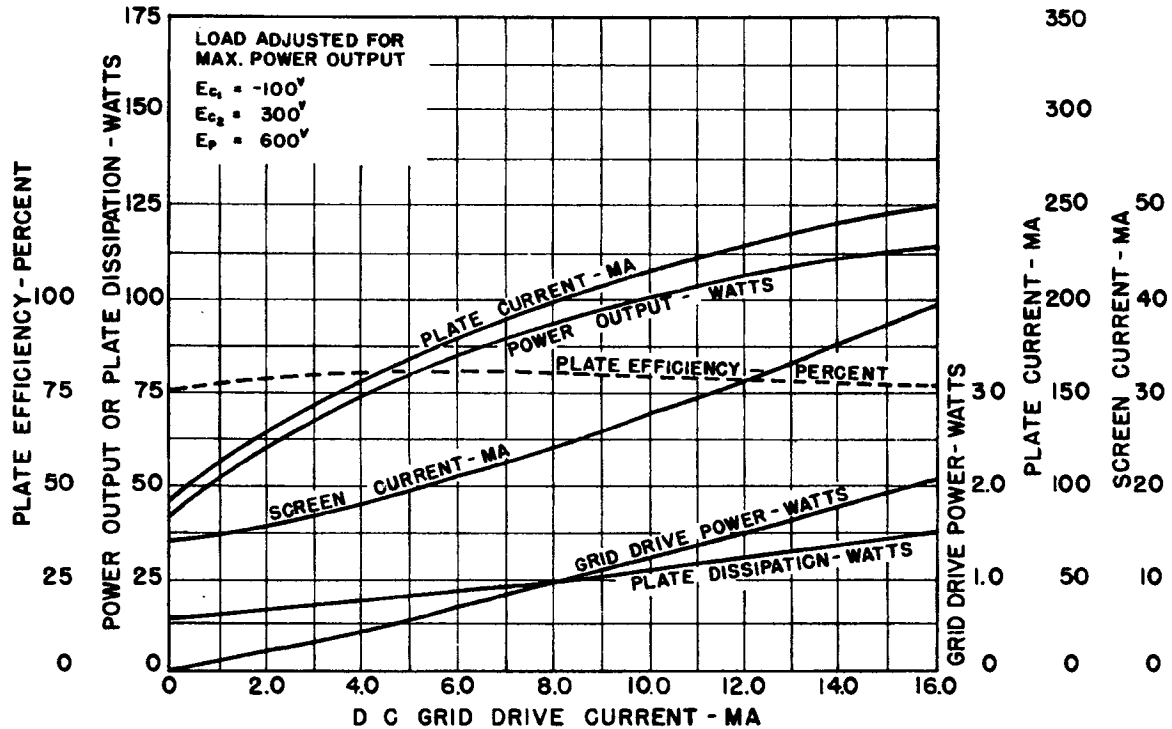
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TYPE RK4D22
RK4D32

BEAM POWER AMPLIFIER OSCILLATOR

AVERAGE CHARACTERISTICS
CLASS C R-F POWER AMPLIFIER



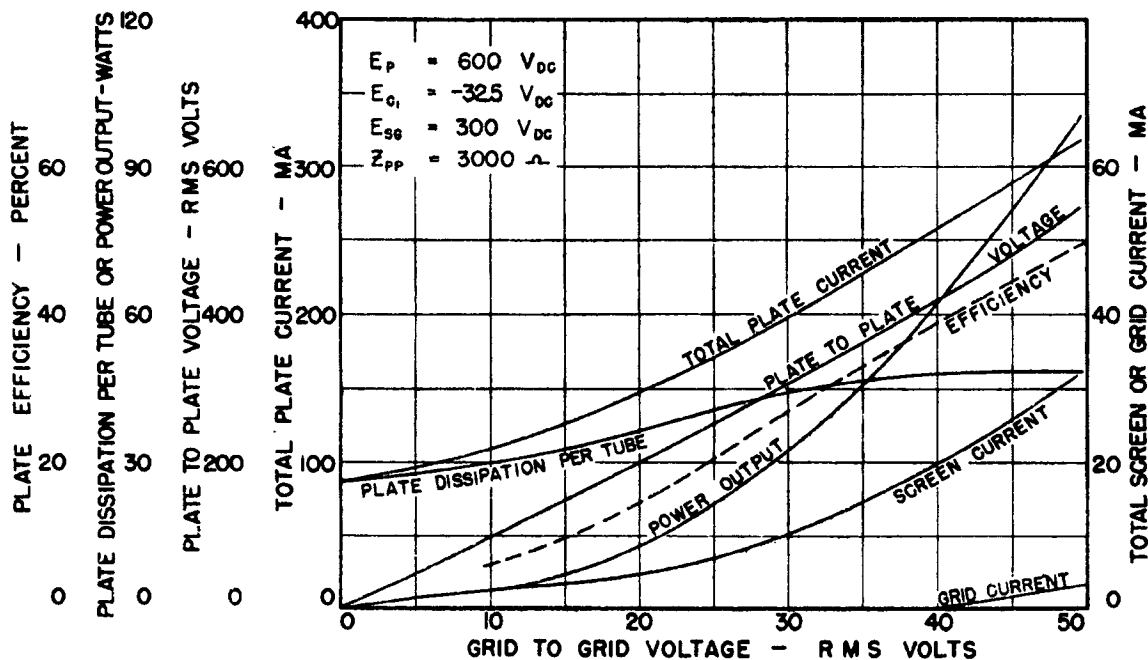
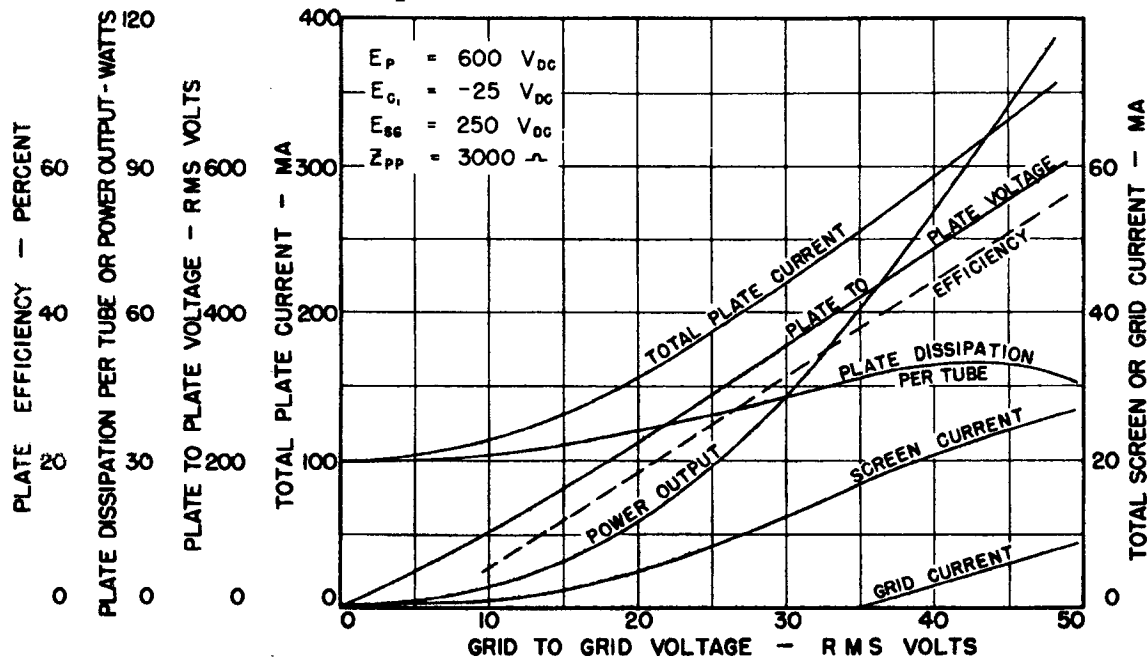
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BEAM POWER AMPLIFIER OSCILLATOR

AVERAGE CHARACTERISTICS
CLASS AB₂ PUSH PULL AUDIO AMPLIFIER



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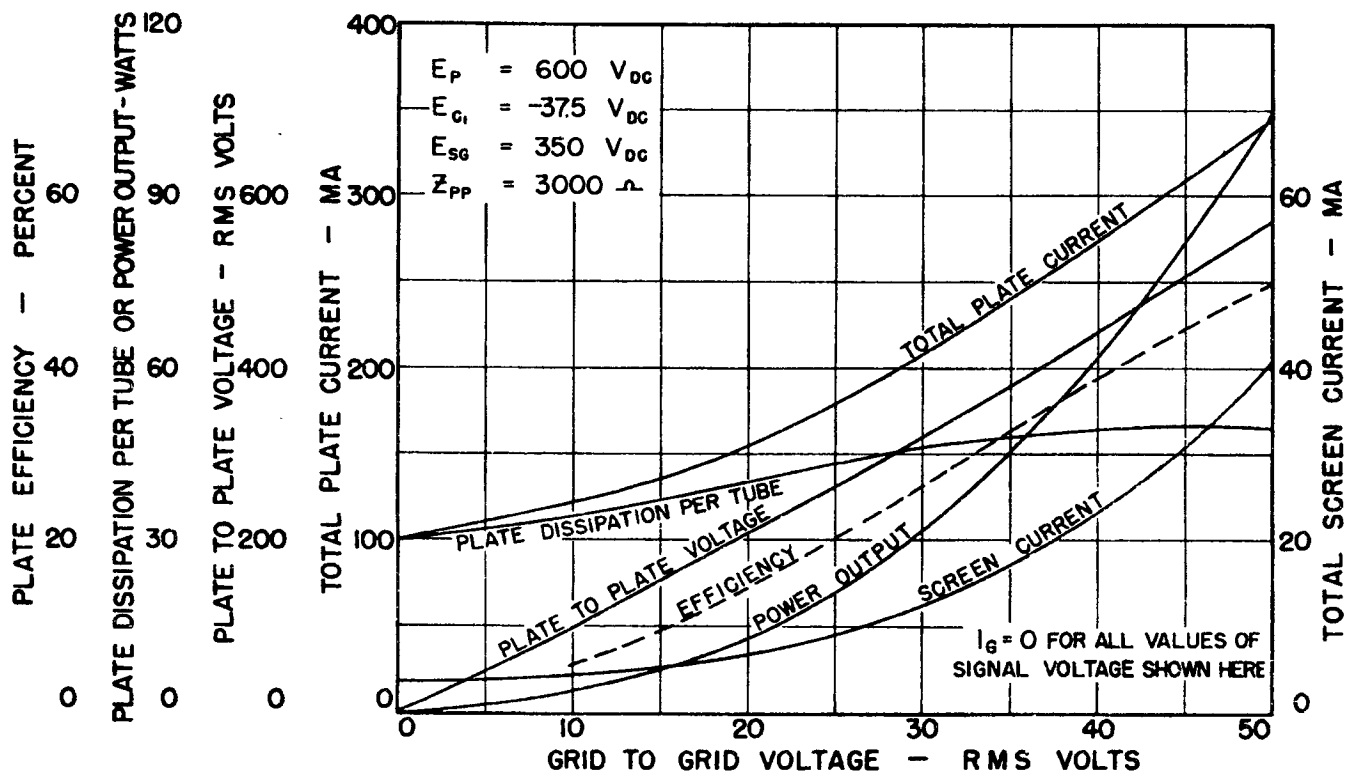
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TYPE RK4D22
RK4D32

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AVERAGE CHARACTERISTICS



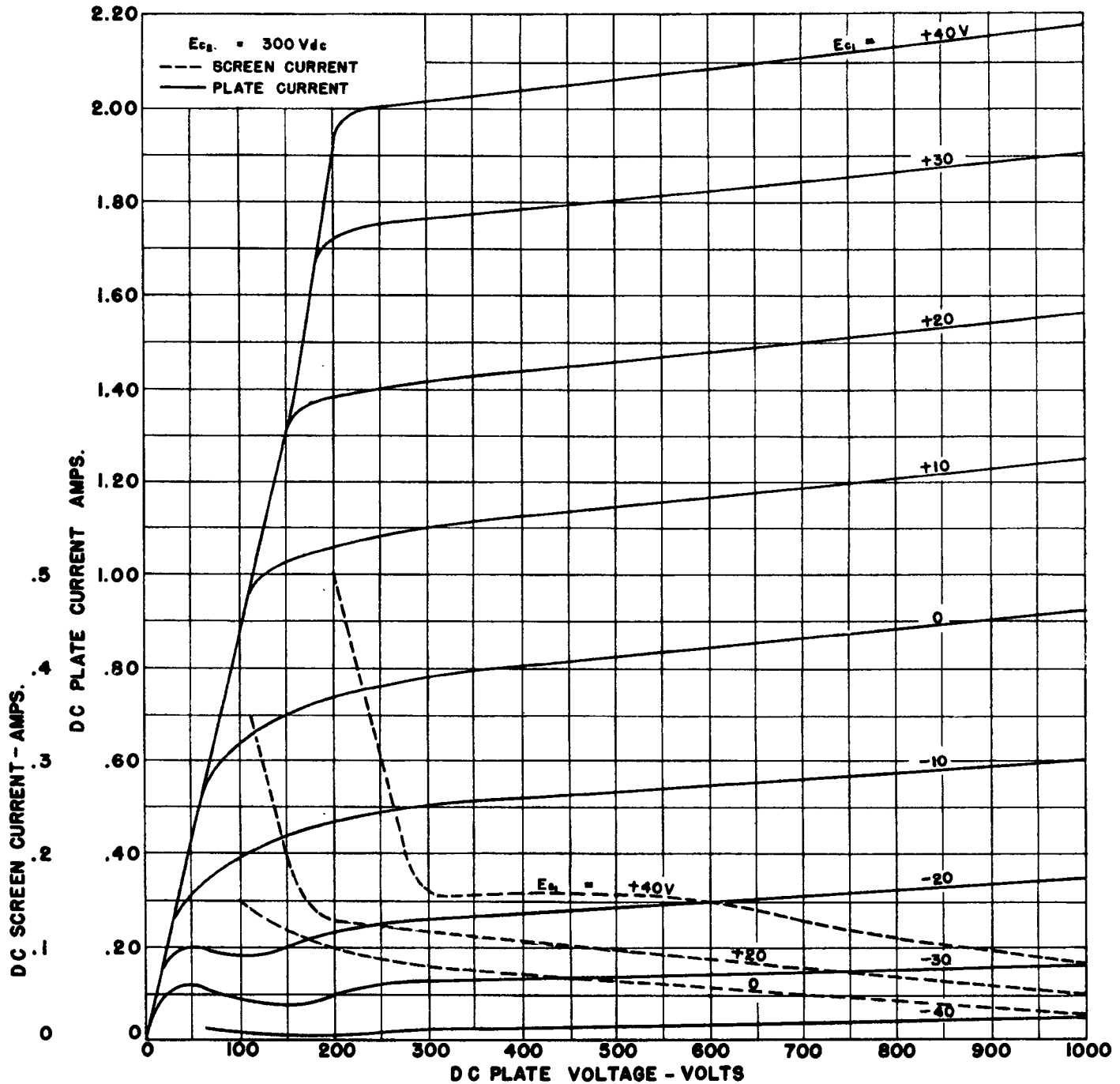
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BEAM POWER AMPLIFIER OSCILLATOR

AVERAGE PLATE CHARACTERISTICS



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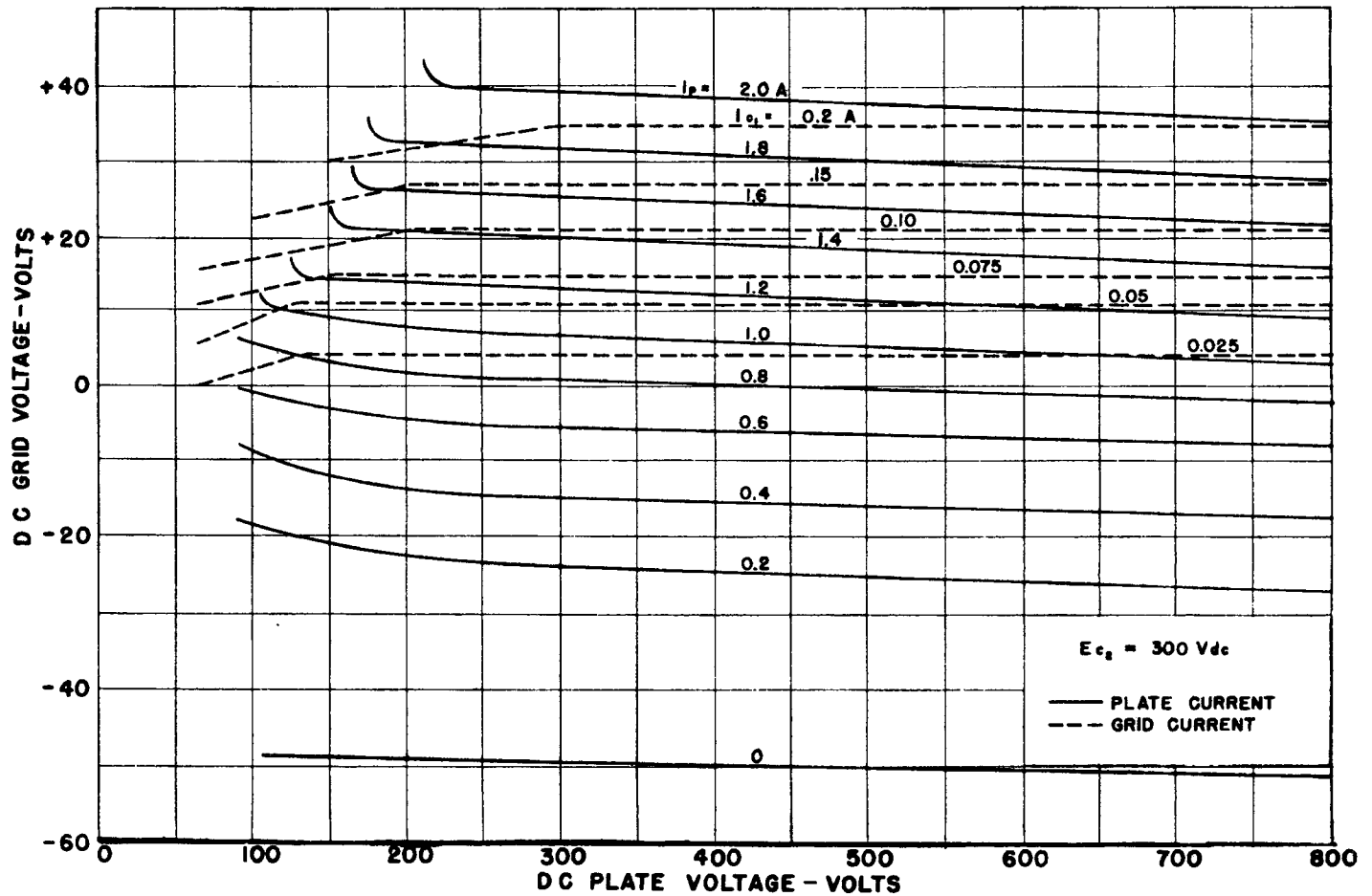
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TYPE RK4D22
RK4D32

BEAM POWER AMPLIFIER OSCILLATOR

CONSTANT CURRENT CHARACTERISTICS



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RAYTHEON MANUFACTURING COMPANY



5R4-GY

FULL-WAVE VACUUM RECTIFIER

5R4-GY

GENERAL DATA

Electrical:

Filament, Coated:*

Voltage 5 ac or dc volts

Current 2 amp

Mechanical:

Mounting Position. Vertical, or Horizontal with pins
1 and 4 in vertical plane

Maximum Overall Length 5-5/16"

Maximum Seated Length 4-3/4"

Maximum Diameter 2-1/16"

Bulb ST-16

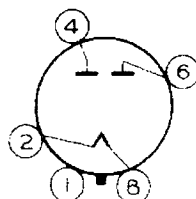
Base Medium-Shell Octal 5-Pin, Micanol

Basing Designation for BOTTOM VIEW G-5T

Pin 1 - No Connection

Pin 2 - Filament

Pin 4 - Plate No.2



Pin 6 - Plate No.1

Pin 8 - Filament

FULL-WAVE RECTIFIER

Maximum Ratings, Design-Center Values:

	For Altitudes up to 40000 ft.		For Altitudes up to 20000 ft.
PEAK INVERSE PLATE VOLT. (No Load)	2100 max.	2400 max.	2800 max. volts
PEAK PLATE CURRENT PER PLATE . . .	650 max.	650 max.	650 max. ma
DC OUTPUT CURRENT:			
With capacitor input to filter	250 max.	175 max.	150 max. ma
With choke input to filter . . .	250 max.	250 max. ^o	175 max. [•] ma

Typical Operation with Capacitor-Input Filter:

	For Altitudes up to 40000 ft.		For Altitudes up to 20000 ft.
AC Plate-to-Plate Supply Voltage (RMS):			
Full Load . . .	1400 . .	1500 . .	1800 . . volts
No Load. . . .	1500 . .	1700 . .	2000 . . volts
Filter Input			
Capacitor. . .	4 . .	4 . .	4 . . μ f

* See curve for conditions necessitating delay in application of plate voltage until filament has reached operating temperature.

^o, [•]: See next page.

← Indicates a change.

SEPT. 30, 1948

TUBE DEPARTMENT

DATA

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5R4-GY



5R4-GY

FULL-WAVE VACUUM RECTIFIER

	<u>For Altitudes up to 40000 ft.</u>		<u>For Altitudes up to 20000 ft.</u>	
Total Effect. Plate-Supply Impedance per Plate [▲] . . .	125	500	575	ohms
DC Output Current . . .	250	150	150	ma
DC Output Volt. at Input to Filter:				
At Half Load . . .	790*	900*	1060*	volts
At Full Load . . .	700*	810*	950*	volts
Voltage Regulation, Half-Load to Full-Load Current . . .	90*	90*	110*	volts

→ Typical Operation with Choke-Input Filter:

	<u>For Altitudes up to 40000 ft.</u>	<u>For Altitudes up to 20000 ft.</u>
AC Plate-to-Plate Supply Voltage (RMS):		
Full Load	1500	1900 . . volts
No Load	1700	2000 . . volts
Filter Input Choke	5	10 . . henries
DC Output Current	250	175 . . ma
DC Output Voltage at Input to Filter:		
At Half Load	590*	810* . . volts
At Full Load	550*	750* . . volts
Voltage Regulation, Half-Load to Full-Load Current	40*	60* . . volts

○ For choke not less than 5 henries.

● For choke not less than 10 henries.

▲ Indicated values for conditions shown will limit peak plate current to max. rated value. When a filter-input capacitor larger than $\frac{1}{2}$ μ f is used, it may be necessary to use more plate-supply impedance than the value shown to limit the peak plate current to the rated value.

* values are approximate.

→ indicates a change.

SEPT. 30, 1948

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA

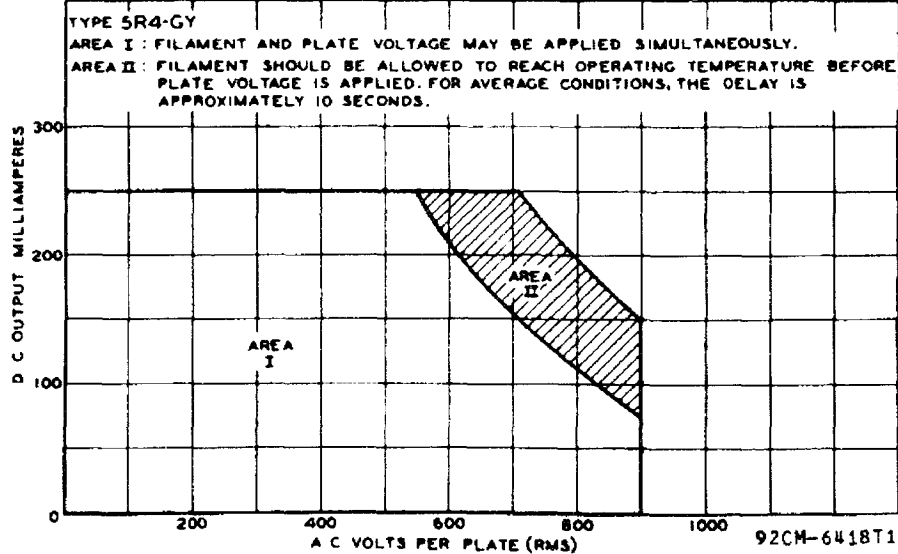


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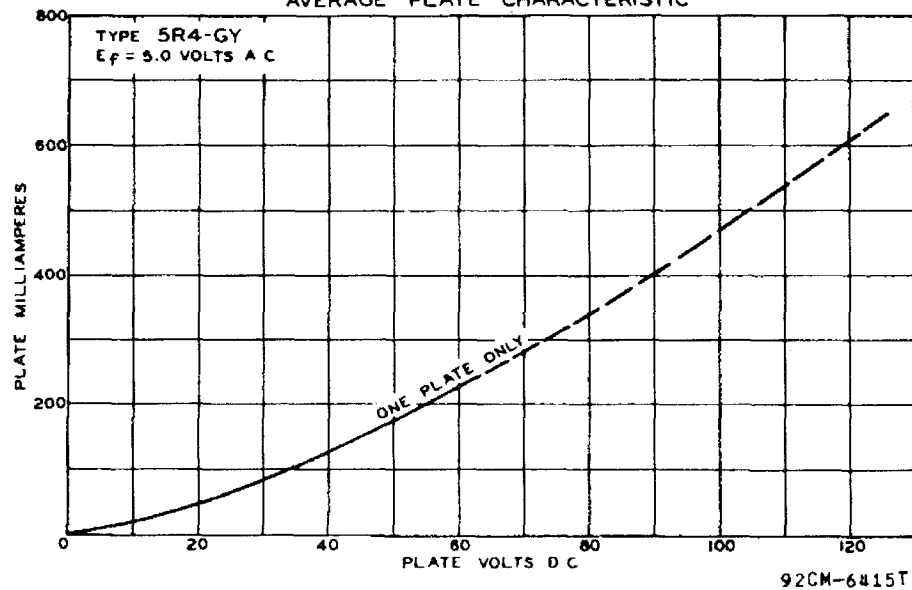
FULL-WAVE VACUUM RECTIFIER

5R4-GY

OPERATION CHARACTERISTICS
WITH CAPACITOR INPUT TO FILTER



AVERAGE PLATE CHARACTERISTIC



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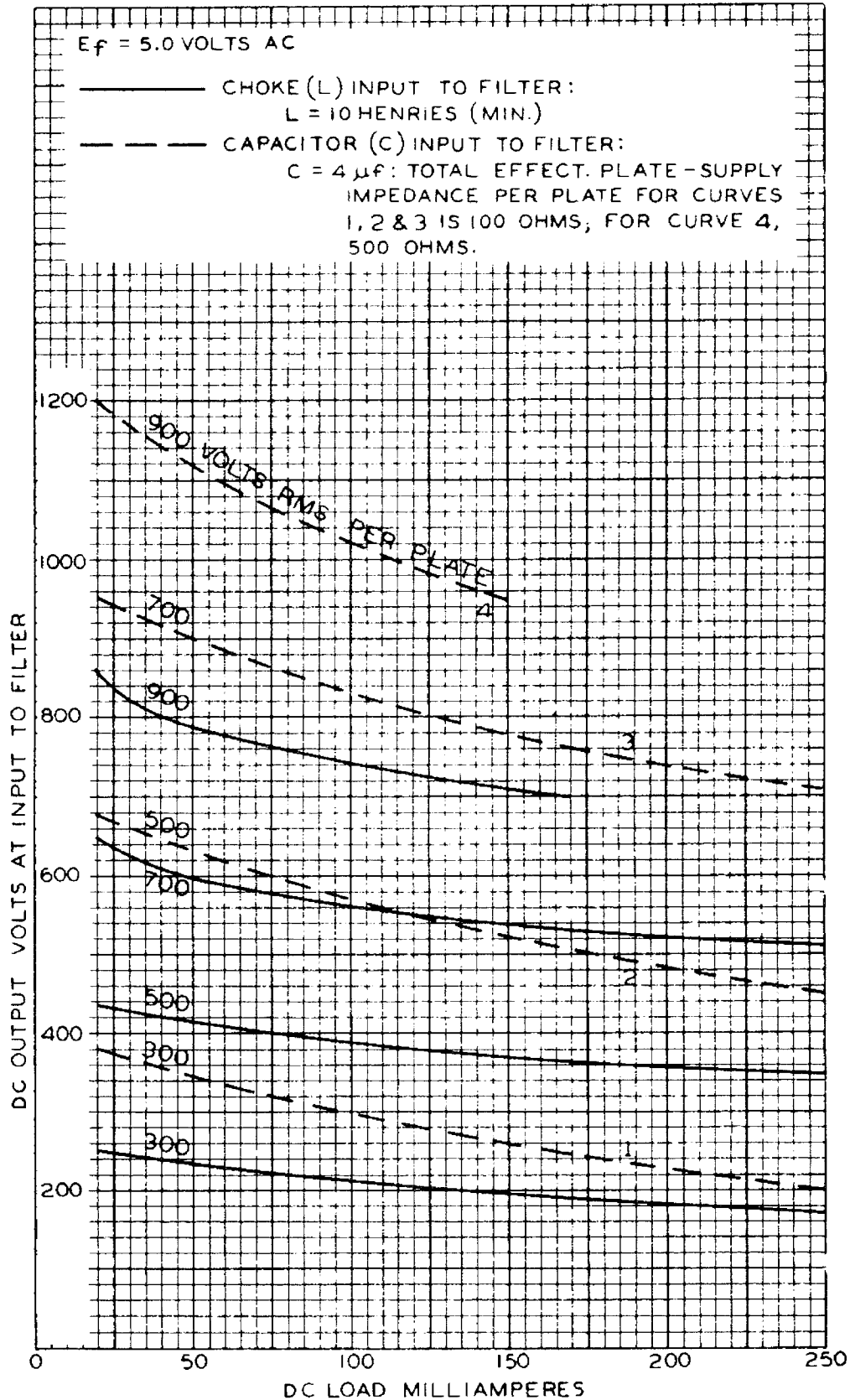
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5R4-GY



5R4-GY

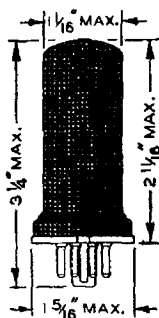
OPERATION CHARACTERISTICS



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TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

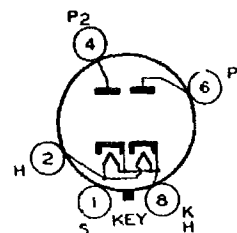
92CM-6416R2



RCA-5Z4

FULL-WAVE RECTIFIER

The 5Z4 is a full-wave high-vacuum rectifying tube of the All-Metal type intended for use in d-c power-supply devices which operate from the a-c supply line.



CHARACTERISTICS

HEATER VOLTAGE (A. C.).....	5.0	Volts
HEATER CURRENT	2.0	Amperes
A-C PLATE VOLTAGE PER PLATE.....	400 max.	Volts
PEAK INVERSE VOLTAGE.....	1100 max.	Volts
D-C OUTPUT CURRENT.....	125 max.	Milliamperes
BASE	Small Wafer Octal 5-Pin	

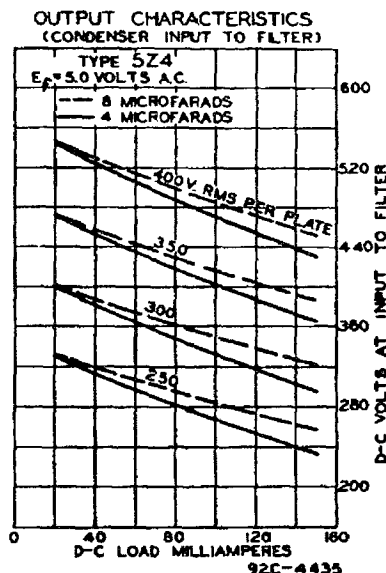
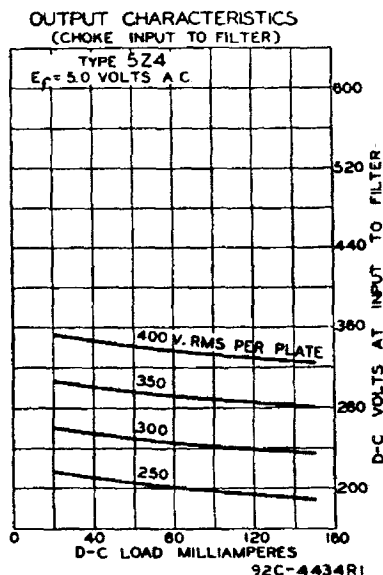
INSTALLATION AND APPLICATION

The base pins of the 5Z4 fit the standard octal socket which should be installed to hold the tube in any position. Provision should be made for adequate ventilation to prevent overheating.

The heater of the 5Z4 is designed to operate from the a-c line through a step-down transformer. The voltage applied to the heater should be the rated value of 5.0 volts under operating conditions and average line voltage.

As a full-wave rectifier, the 5Z4 may be operated with condenser-input or choke-input filter under conditions not to exceed the ratings given under CHARACTERISTICS.

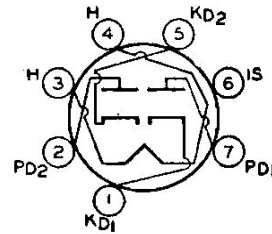
As a half-wave rectifier, two 5Z4's may be operated in a full-wave circuit with reasonable serviceability to deliver more d-c output current than can be obtained from one tube. For this use, the plates of each 5Z4 are tied together at the socket. The allowable voltage and load conditions per tube are the same as for full-wave service.



6AL5

TWIN DIODE

Miniature, high-perveance type used as detector in FM and television circuits. It is especially useful as a ratio detector in ac-operated FM receivers. Each diode section can be used



independently of the other, or the two sections can be combined in parallel or full-wave arrangement. Resonant frequency of each unit is approximately 700 megacycles per second. Outline 9, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position.

HEATER VOLTAGE (AC/DC)	6.3	volts
HEATER CURRENT	0.3	ampere
DIRECT INTERELECTRODE CAPACITANCES:		
Plate No. 1 to Cathode No. 1, Heater, and Internal Shield	2.5	μf
Plate No. 2 to Cathode No. 2, Heater, and Internal Shield	2.5	μf
Cathode No. 1 to Plate No. 1, Heater, and Internal Shield	3.4	μf
Cathode No. 2 to Plate No. 2, Heater, and Internal Shield	3.4	μf
Plate No. 1 to Plate No. 2	0.068 max	μf

Maximum Ratings:

HALF-WAVE RECTIFIER

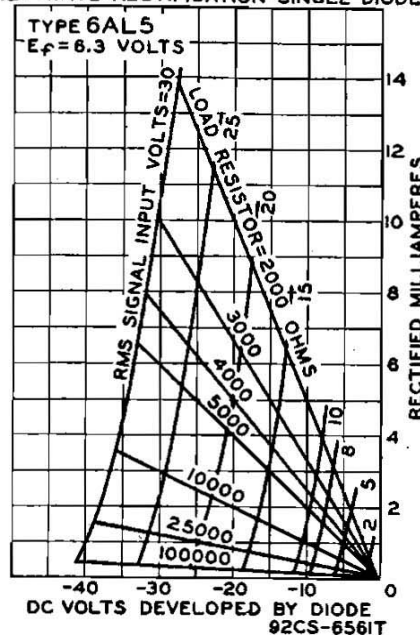
PEAK INVERSE PLATE VOLTAGE	330 max	volts
PEAK PLATE CURRENT (Per Plate)	54 max	ma
DC OUTPUT CURRENT (Per Plate)	9 max	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	330 max	volts
Heater positive with respect to cathode	330 max	volts

Typical Operation:

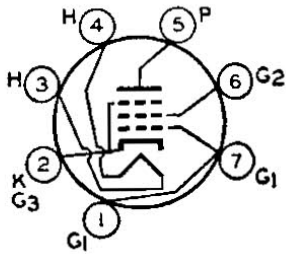
AC Plate Voltage per Plate (rms)	117	volts
Min. Total Effective Plate-Supply Impedance	300	ohms
DC Output Current per Plate	9	ma

Technical Data

AVERAGE CHARACTERISTICS
HALF-WAVE RECTIFICATION-SINGLE DIODE



^



BEAM POWER TUBE

Miniature types used as output amplifiers primarily in automobile receivers and in ac-operated receivers and, triode-connected, as vertical deflection amplifiers in television receivers.

6AQ5

6AQ5-A

Type 6AQ5-A has a controlled heater warm-up time for use in television receivers employing series-connected heater strings. Outline 13, OUTLINES SECTION. Tubes require miniature seven-contact socket and may be mounted in any position. Within their maximum ratings, the performance of these types is equivalent to that of larger types 6V6 and 6V6-GT. For typical circuits employing type 6AQ5-A, both singly and in push-pull, refer to CIRCUITS SECTION. Type 6AQ5 is a DISCONTINUED type listed for reference only.

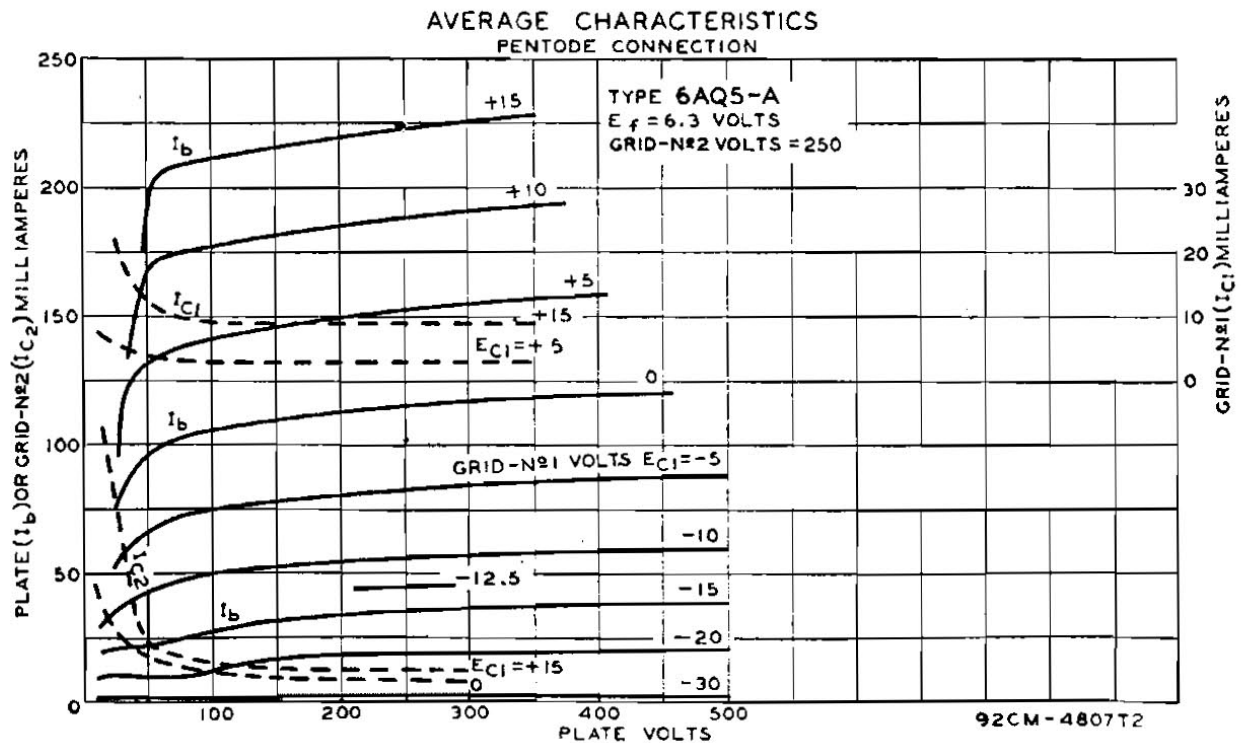
HEATER VOLTAGE (AC/DC)	6.3	volts
HEATER CURRENT	0.45	ampere
HEATER WARM-UP TIME (Average) for 6AQ5-A	11	seconds
DIRECT INTERELECTRODE CAPACITANCES (Approx.):		
Grid No.1 to Plate	0.35	μf
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	8.3	μf
Plate to Cathode, Heater, Grid No.2, and Grid No.3	8.2	μf
AMPLIFICATION FACTOR*	9.5	
PLATE RESISTANCE (Approx.)*	1970	ohms
TRANSCONDUCTANCE*	4800	μmhos

* Grid No.2 connected to plate; plate and grid-No.2 volts, 250; grid-No.1 volts, -12.5; plate ma., 49.5.

Maximum Ratings:

CLASS A₁ AMPLIFIER

PLATE VOLTAGE	250 max	volts
GRID-NO.2 (SCREEN-GRID) VOLTAGE	250 max	volts



RCA Receiving Tube Manual

PLATE DISSIPATION.....	12 max	watts
GRID-NO.2 INPUT.....	2 max	watts
PEAK HEATER-CATHODE VOLTAGE:	6AQ5	6AQ5-A
Heater negative with respect to cathode.....	90 max	200 max
Heater positive with respect to cathode.....	90 max	200 max

■ The dc component must not exceed 100 volts.

Typical Operation:

Same as for type 6V6-GT within the limitations of the maximum ratings.

Maximum Circuit Values:

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

VERTICAL DEFLECTION AMPLIFIER (Triode Connection)[°]

Maximum Ratings: For operation in a 525-line, 30-frame system

DC PLATE VOLTAGE.....	250 max	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE† (Absolute Maximum).....	1100 max	volts
PEAK NEGATIVE-PULSE GRID-NO.1 (CONTROL-GRID) VOLTAGE.....	-250 max	volts
PEAK CATHODE CURRENT.....	105 max	ma
AVERAGE CATHODE CURRENT.....	35 max	ma
PLATE DISSIPATION.....	9 max	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.....	200 max	volts
Heater positive with respect to cathode.....	200 max	volts

Maximum Circuit Value:

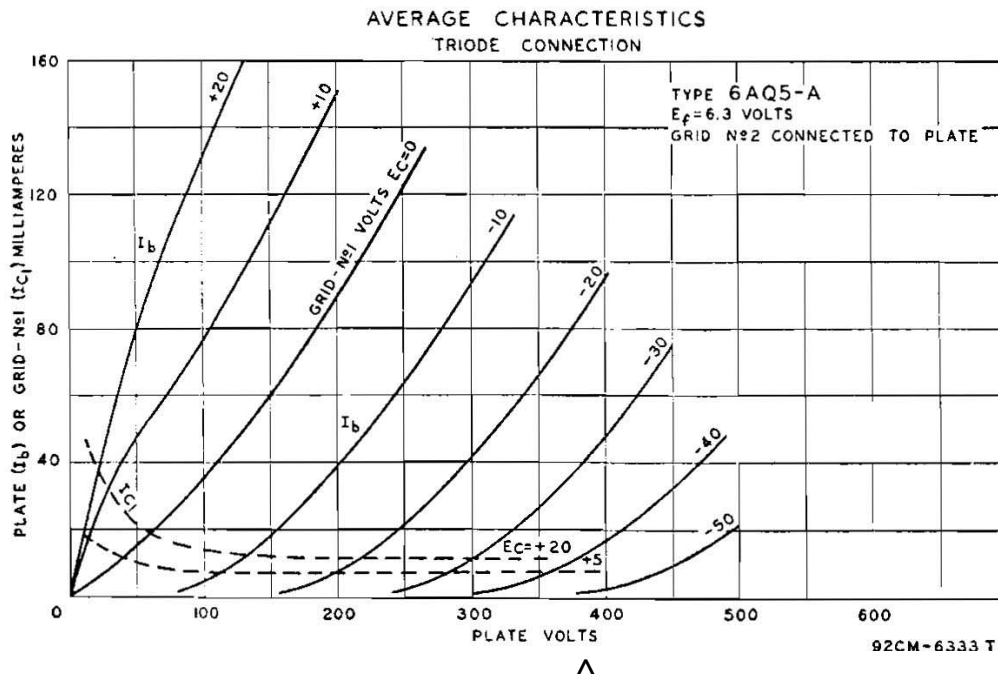
Grid-No.1-Circuit Resistance:		
For cathode-bias operation.....	2.2 max	megohms

[°] Grid No.2 connected to plate.

† The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

▲ Under no circumstances should this absolute value be exceeded.

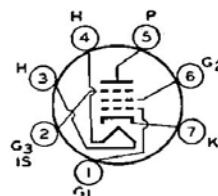
■ The dc component must not exceed 100 volts.



6AU6

SHARP-CUTOFF PENTODE

Miniature type used in compact radio equipment as an rf amplifier especially in high-frequency, wide-band applications. It is also used as a limiter tube in FM equipment. Outline 11,



OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. For a discussion of limiters, refer to ELECTRON TUBE APPLICATIONS SECTION. For typical operation as resistance-coupled amplifier, refer to Chart 6, RESISTANCE-COUPLED AMPLIFIER SECTION.

HEATER VOLTAGE (AC/DC).....	6.3	volts
HEATER CURRENT.....	0.3	ampere
DIRECT INTERELECTRODE CAPACITANCES:		
Grid No.1 to Plate.....	0.0035 max	μ uf
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield.....	5.5	μ uf
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield....	5.0	μ uf

Technical Data

CLASS A₁ AMPLIFIER

Maximum Ratings:

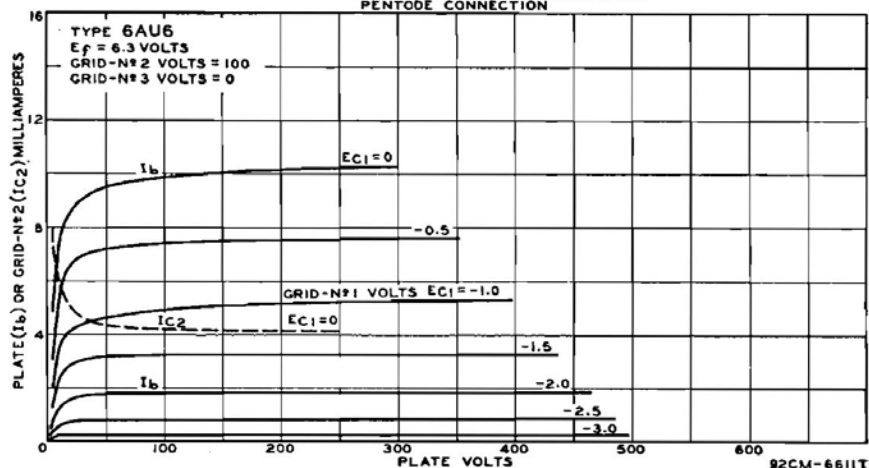
	Triode† Connection	Pentode Connection	
PLATE VOLTAGE.....	250 max	300 max	volts
GRID-NO.2 (SCREEN-GRID) VOLTAGE.....	—	See curve page 69	
GRID-NO.2 SUPPLY VOLTAGE.....	—	300 max	volts
PLATE DISSIPATION.....	3.2 max	3 max	watts
GRID-NO.2 INPUT:			
For grid-No.2 voltages up to 150 volts.....		0.65 max	watt
For grid-No.2 voltages between 150 and 300 volts.....		See curve page 69	
GRID-NO.1 (CONTROL-GRID) VOLTAGE:			
Negative bias value.....	-50 max	-50 max	volts
Positive bias value.....	0 max	0 max	volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.....	180 max	180 max	volts
Heater positive with respect to cathode.....	100 max	100 max	volts

Characteristics:

	Triode† Connection	Pentode Connection	
Plate Supply Voltage.....	250	100 250	volts
Grid No.3 (Suppressor Grid).....	—	Connected to cathode at socket	
Grid-No.2 Supply Voltage.....	—	100 125 150	volts
Cathode-Bias Resistor.....	330	150 100 68	ohms
Amplification Factor.....	36	—	
Plate Resistance (Approx.).....	0.0075	0.5 1.5 1.0	megohms
Transconductance.....	4800	3900 4500 5200	μ mhos
Grid-No.1 Voltage for plate current of 10 μ a.....	—	-4.2 -5.5 -6.5	volts
Plate Current.....	12.2	5.0 7.6 10.6	ma
Grid-No. 2 Current.....	—	2.1 3.0 4.3	ma

† Grid No. 2 and grid No. 3 tied to plate.

AVERAGE PLATE CHARACTERISTICS PENTODE CONNECTION





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BEAM POWER TUBE*Useful at Frequencies up to 125 Mc***GENERAL DATA****Electrical:**

Heater, for Unipotential Cathode:

Voltage. 6.3 ± 0.6 ac or dc volts
 Current. 0.9 amp

Transconductance (Approx.)

for plate volts = 250,
 grid-No.2 volts = 250,
 grid-No.1 volts = -14 6000 μ hos

Mu-Factor, Grid No.2 to

Grid No.1 for plate volts =
 250, grid-No.2 volts = 250,
 and grid-No.1 volts = -20 8

Direct Interelectrode Capacitances:

Grid No.1 to plate⁰ 0.2 max. μ f

Grid No.1 to cathode &
 grid No.3, grid No.2,
 and heater 12 μ f

Plate to cathode & grid
 No.3, grid No.2,
 and heater 7 μ f

Mechanical:

Mounting Position. Any

Maximum Overall Length 5-3/4"

Seated Length. 4-31/32" \pm 5/32"

Maximum Diameter 2-1/16"

Weight (Approx.) 3 oz

Bulb ST-16

Cap. Small (JETEC No.C1-1)

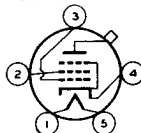
Base Medium-Micanol-Shell Small 5-Pin (JETEC No.A5-11)

Basing Designation for BOTTOM VIEW 5AW

Pin 1-Heater

Pin 2-Grid No.2

Pin 3-Grid No.1



Pin 4-Cathode,

Grid No.3

Pin 5-Heater

Cap-Plate

AF POWER AMPLIFIER & MODULATOR - Class AB₁*Triode Connection--Grid No.2 Connected to Plate***Maximum Ratings, Absolute Values:**

	CCS*	ICAS**	
DC PLATE VOLTAGE	400 max.	400 max.	volts
MAX.-SIGNAL DC PLATE CURRENT*.	125 max.	125 max.	ma
MAX.-SIGNAL DC PLATE PLUS GRID-No.2 INPUT*	50 max.	50 max.	watts
PLATE DISSIPATION PLUS GRID-No.2 INPUT*	25 max.	30 max.	watts

⁰ With external shield JETEC No.312.

♦, •, •, •: See next page.

←Indicates a change.

NOV. 5, 1954

TUBE DIVISION

DATA 1

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



BEAM POWER TUBE

	CCS [•]	ICAS ^{••}	
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts

	CCS [•]	ICAS ^{••}	
Typical Operation: [•]			
<i>Values are for 2 tubes</i>			
DC Plate Voltage	400	400	volts
DC Grid-No.1 (Control-Grid) Voltage	-45	-45	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage ^{••}	90	90	volts
→ Zero-Signal DC Plate Current	64	64	ma
Max.-Signal DC Plate Current	140	140	ma
Effective Load Resistance (Plate to Plate)	3000	3000	ohms
Max.-Signal Driving Power (Approx.)	0	0	watts
Max.-Signal Power Output (Approx.)	15	15	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance: ^{••}			
With fixed bias		0.1 max.	megohm
With cathode bias		0.5 max.	megohm

AF POWER AMPLIFIER & MODULATOR - Class AB₁ ♦

Maximum Ratings, Absolute Values:

	CCS [•]	ICAS ^{••}	
DC PLATE VOLTAGE	600 max.	750 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	300 max.	300 max.	volts
MAX.-SIGNAL DC PLATE CURRENT*.	120 max.	120 max.	ma
MAX.-SIGNAL DC PLATE INPUT*.	60 max.	90 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT*.	3.5 max.	3.5 max.	watts
PLATE DISSIPATION*.	25 max.	30 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	135 max.	135 max.	volts
Heater positive with respect to cathode	135 max.	135 max.	volts

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

• In class AB₁ service, the normal design limitation is the requirement that grid-No.1 current should not flow. For this reason, the typical operating values shown for both CCS and ICAS conditions are the same.

•• 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.

•, ••, *, ••: See next page.

→ Indicates a change.



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BEAM POWER TUBE

Typical Operation:	CCS*			ICAS**	
Values are for 2 tubes					
DC Plate Voltage	400	500	600	750	volts
DC Grid-No.2 Voltage** .	300	300	300	300	volts
DC Grid-No.1 (Control- Grid) Voltage:					
From fixed-bias source	-30	-32	-34	-35	volts
Peak AF Grid-No.1-to-					
Grid-No.1 Voltage. . .	60	64	68	70	volts
Zero-Signal DC					
Plate Current.	56	44	36	30	ma
Max.-Signal DC					
Plate Current.	143	141	139	139	ma
Zero-Signal DC					
Grid-No.2 Current. . .	2	1	0.6	0.5	ma
Max.-Signal DC					
Grid-No.2 Current. . .	16	15	15	16	ma
Effective Load Resistance (Plate to plate) . . .	6800	8200	10000	12000	ohms
Max.-Signal Driving Power (Approx.)	0	0	0	0*	watts
Max.-Signal Power Output (Approx.) . . .	36	46	56	72	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance:°°

With fixed bias. 0.1 max. megohms

With cathode bias. Not recommended

AF POWER AMPLIFIER & MODULATOR - Class AB₂#

Maximum Ratings, Absolute Values:

	CCS*	ICAS**
DC PLATE VOLTAGE	600 max.	750 max. volts
DC GRID-No.2 (SCREEN) VOLTAGE.	300 max.	300 max. volts
MAX.-SIGNAL DC PLATE CURRENT*.	120 max.	120 max. ma
MAX.-SIGNAL PLATE INPUT* . . .	60 max.	90 max. watts
MAX.-SIGNAL GRID-No.2 INPUT* .	3.5 max.	3.5 max. watts
PLATE DISSIPATION*	25 max.	30 max. watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	135 max.	135 max. volts
Heater positive with respect to cathode	135 max.	135 max. volts

* Subscript 2 indicates that the grid-no.1 current flows during some part of the input cycle.

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

•, °°, **, °°: See next page.

← Indicates a change.



BEAM POWER TUBE

Typical Operation:	CCS*			ICAS**	
	Values are for 2 tubes				
DC Plate Voltage	400	500	600	750	volts
DC Grid-No.2 Voltage** .	300	300	300	300	volts
DC Grid-No.1 (Control-Grid) Voltage:					
From fixed-bias source	-28	-30	-32	-35	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage. . .	80	86	90	96	volts
Zero-Signal DC Plate Current.	72	60	48	30	ma
Max.-Signal DC Plate Current.	240	240	200	240	ma
Zero-Signal DC Grid-No.2 Current. . .	2	0.9	0.7	0.5	ma
Max.-Signal DC Grid-No.2 Current. . .	20	20	18	20	ma
Effective Load Resistance (Plate to plate) . . .	3700	4600	6900	7300	ohms
Max.-Signal Driving Power (Approx.)♦♦. . .	0.2	0.2	0.1	0.2	watt
Max.-Signal Power Output (Approx.)▲. . .	55	75	80	120	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance:°°

With fixed bias. 30000 max. ohms

With cathode bias. Not recommended

RF POWER AMPLIFIER-Class B Telephony

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

Maximum Ratings, Absolute Values:

	CCS*	ICAS**
DC PLATE VOLTAGE	600 max.	750 max. volts
DC GRID-No.2 (SCREEN) VOLTAGE .	300 max.	300 max. volts
DC PLATE CURRENT	80 max.	90 max. ma
PLATE INPUT.	37.5 max.	45 max. watts
GRID-No.2 INPUT.	2.5 max.	2.5 max. watts

** Preferably obtained from a separate source, or from the plate-voltage supply with a voltage divider.

°° Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the class AB₂ stage. The effective resistance per grid-No.1 circuit of the class AB₂ stage should be kept below 500 ohms and the effective impedance should not exceed 700 ohms at the highest response frequency.

▲ With zero-impedance driver and perfect regulation, plate-circuit distortion does not exceed 2%. In practice, the regulation of the plate-voltage, grid-No.2 voltage, and grid-No.1 voltage should not be greater than 5%, 5%, and 3%, respectively.

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BEAM POWER TUBE

	CCS*			ICAS**	
PLATE DISSIPATION.	25	max.		30	max. watts
PEAK HEATER-CATHODE VOLTAGE:					
Heater negative with respect to cathode	135	max.		135	max. volts
Heater positive with respect to cathode	135	max.		135	max. volts
Typical Operation:					
DC Plate Voltage	400	500	600	750	volts
DC Grid-No.2 Voltage . .	300	300	300	300	volts
DC Grid-No.1 (Control-Grid) Voltage	-40	-40	-40	-40	volts
Peak RF Grid-No.1 Voltage	40	38	36	35	volts
DC Plate Current	75	70	62.5	60	ma
DC Grid-No.2 Current . .	5	4	4	3	ma
DC Grid-No.1 Current (Approx.)	0	0	0	0	ma
Driving Power (Approx.) [□]	0.4	0.3	0.2	0.2	watt
Power Output (Approx.)	9	11	12.5	15	watts

Maximum Circuit Values (CCS or ICAS):Grid-No.1-Circuit Resistance^{○○} 30000 max. ohms**PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony**

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

Maximum Ratings, Absolute Values:

	CCS*	ICAS**
DC PLATE VOLTAGE	475 max.	600 max. volts
DC GRID-No.2 (SCREEN) VOLTAGE.	300 max.	300 max. volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE.	-200 max.	-200 max. volts
DC PLATE CURRENT	83 max.	100 max. ma
DC GRID-No.1 CURRENT	5 max.	5 max. ma
PLATE INPUT.	40 max.	60 max. watts
GRID-No.2 INPUT.	2.5 max.	2.5 max. watts
PLATE DISSIPATION.	16.5 max.	25 max. watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	135 max.	135 max. volts
Heater positive with respect to cathode	135 max.	135 max. volts

▲ Use of a fixed supply or bypassed cathode resistor is recommended.

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

○○ The type of input coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer- or impedance-coupling devices are recommended.

•, ••: See next page.

← Indicates a change.



BEAM POWER TUBE

Typical Operation:	CCS*			ICAS**	
DC Plate Voltage . . .	325	400	475	600	volts
DC Grid-No.2 Voltage ^{▲▲}	250	250	250	300	volts
From a series resistor of . . .	12500	25000	28000	37500	ohms
DC Grid-No.1 Voltage ^{††}	-75	-75	-85	-85	volts
From a grid-No.1 resistor of . . .	21400	21400	21200	21200	ohms
Peak RF Grid-No.1 Voltage	95	95	108	107	volts
DC Plate Current . . .	80	80	83	100	ma
DC Grid-No.2 Current .	6	6	8	8	ma
DC Grid-No.1 Current (Approx.)	3.5	3.5	4	4	ma
Driving Power (Approx.)	0.3	0.3	0.4	0.4	watt
Power Output (Approx.)	17	22	28	44	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance*. 30000 max. ohms

RF POWER AMPLIFIER & OSCILLATOR-Class C Telephony[■] and RF POWER AMPLIFIER-Class C FM Telephony

Maximum Ratings, Absolute Values:

	CCS*	ICAS**
DC PLATE VOLTAGE	600 max.	750 max. volts
DC GRID-No.2 (SCREEN) VOLTAGE.	300 max.	300 max. volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-200 max.	-200 max. volts
DC PLATE CURRENT	100 max.	100 max. ma
DC GRID-No.1 CURRENT	5 max.	5 max. ma
PLATE INPUT.	60 max.	75 max. watts
GRID-No.2 INPUT.	3.5 max.	3.5 max. watts
PLATE DISSIPATION.	25 max.	30 max. watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	135 max.	135 max. volts
Heater positive with respect to cathode	135 max.	135 max. volts

^{▲▲} Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor as indicated.

^{††} Obtained from a grid-No.1 resistor as indicated, 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 115% of the carrier conditions.



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BEAM POWER TUBE

Typical Operation:		CCS*			ICAS**	
DC Plate Voltage . . .		400	500	600	750	volts
DC Grid-No.2 Voltage [■]		250	250	250	250	volts
From a series resistor of . . .		19000	31000	44000	62000	ohms
DC Grid-No.1 Voltage [□]		-45	-45	-45	-45	volts
From a grid-No.1 resistor of . . .		11200	11200	11200	11200	ohms
From a cathode resistor of . . .		400	400	400	400	ohms
Peak RF Grid-No.1 Voltage		65	65	65	65	volts
DC Plate Current . . .		100	100	100	100	ma
DC Grid-No.2 Current .		8	8	8	8	ma
DC Grid-No.1 Current (Approx.)		4	4	4	4	ma
Driving Power (Approx.)		0.3	0.3	0.3	0.3	watt
Power Output (Approx.)		25	32	40	54	watts

Maximum Circuit Values (CCS or ICAS):

Grid-No.1-Circuit Resistance [•]	30000 max.	ohms
---	------------	------

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.81	0.99	amp
Direct Interelectrode Capacitances:				
Grid No.1 to plate	2	-	0.2	μ f
Grid No.1 to cathode & grid No.3, grid No.2, and heater	-	10	14	μ f
Plate to cathode & grid No.3, grid No.2, and heater	-	5.3	8.7	μ f
Plate Current (1)	1,3	24	48	ma
Plate Current (2)	1,4	-	0.5	ma
Grid-No.2 Current	1,3	-	4	ma
Power Output	1,5	33	-	watts

Note 1: Heater voltage = 6.3 volts.

Note 2: With external shield JETEC No.312.

Note 3: With dc plate voltage of 600 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage of -29 volts.

Note 4: With dc plate voltage of 600 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage of -100 volts.

Note 5: With dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, dc plate current of 100 ma. max., grid-No.1 current of 5 to 7 ma., grid-No.1 resistor of 10000 ohms \pm 10%, and a frequency of 15 Mc.

•, ••, •••, ■, □: See next page.

←Indicates a change.

**BEAM POWER TUBE**

- Continuous Commercial Service.
- Intermittent Commercial & Amateur Service.
- When grid No.1 is driven positive, the total dc grid-No.1-circuit resistance should not exceed 30000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.
- Obtained from a separate source, from the plate-voltage supply with a voltage divider, or through a series resistor as indicated. A series grid-No.2 resistor should be employed only when the 807 is used in a circuit which is not keyed. Grid-No.2 voltage must not exceed 400 volts under key-up conditions.
- Obtained from fixed supply, by grid-No.1 resistor as indicated, by cathode resistor as indicated, or by combination methods.

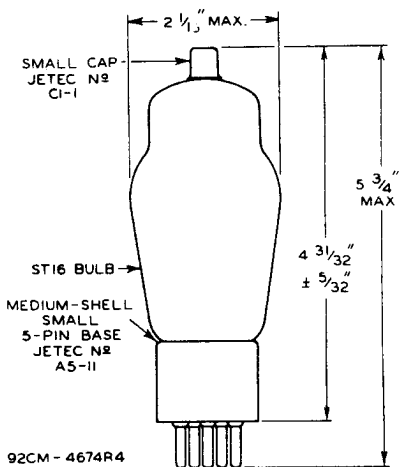
Data on Operating Frequencies for the 807 are given
on the sheet TRANS. TUBE RATINGS vs FREQUENCY.



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BEAM POWER TUBE

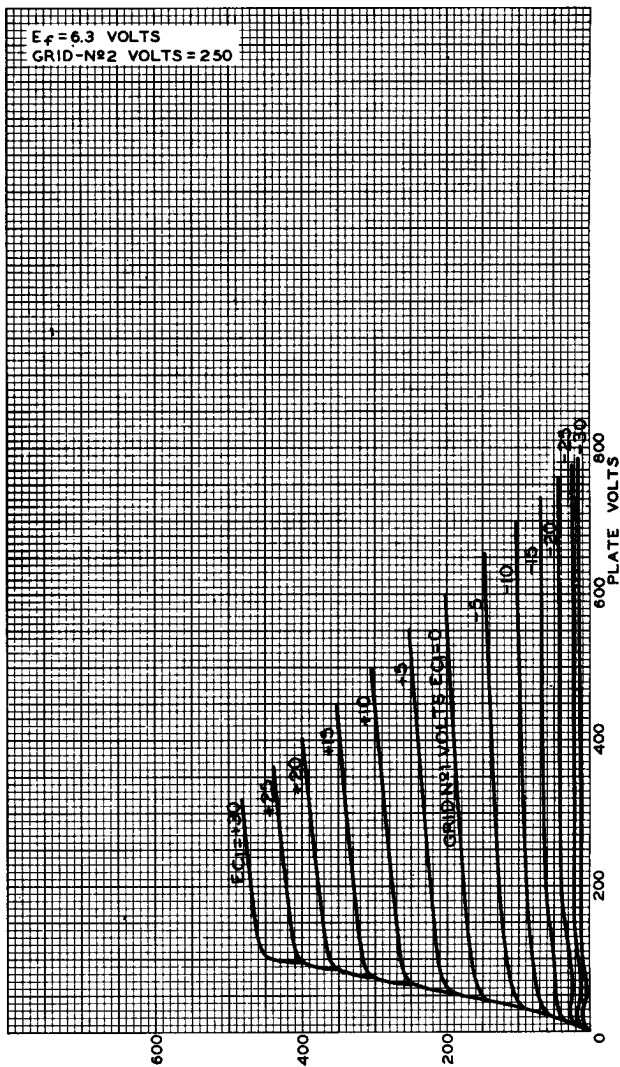


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AVERAGE PLATE CHARACTERISTICS



APR. 7, 1953

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

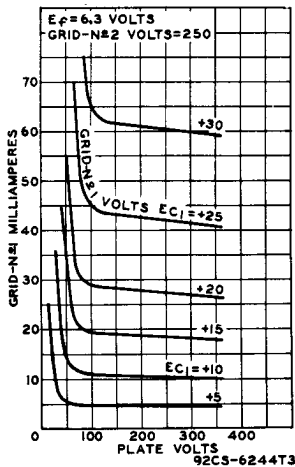
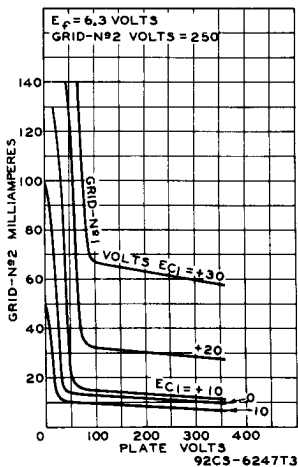
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AVERAGE CHARACTERISTICS

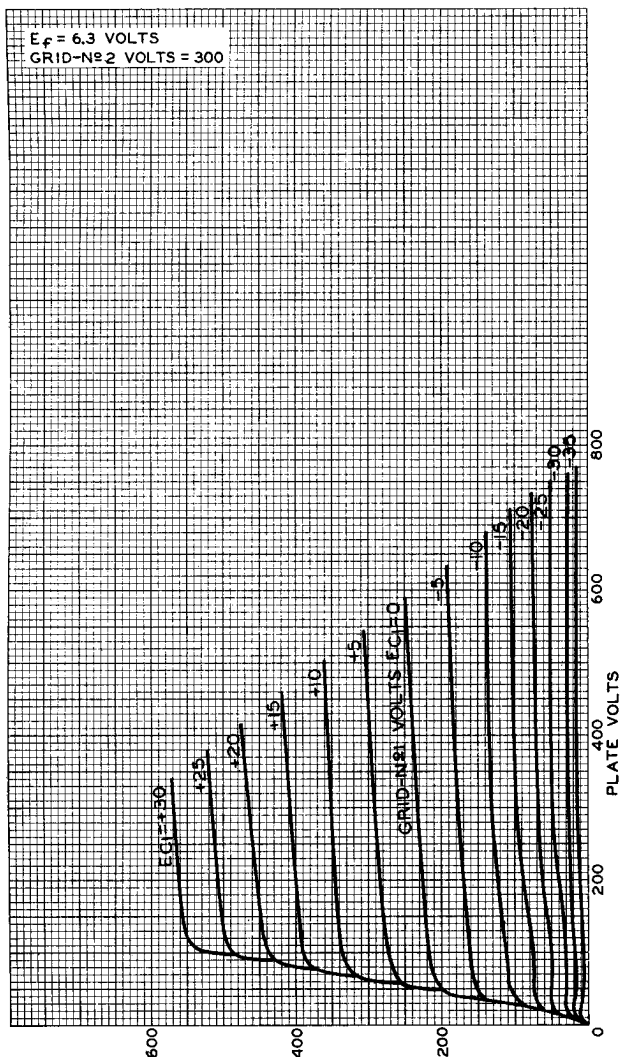


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AVERAGE PLATE CHARACTERISTICS

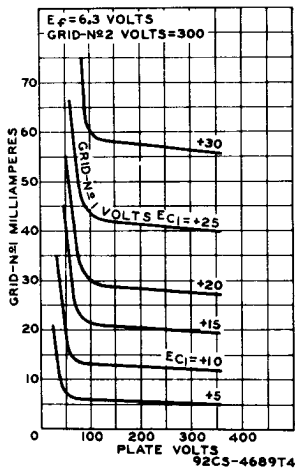
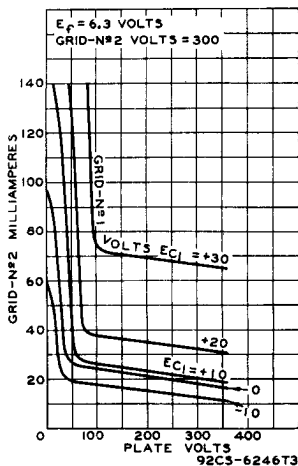




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AVERAGE CHARACTERISTICS



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AVERAGE CHARACTERISTICS TRIODE CONNECTION

 $E_f = 6.3$ VOLTS
GRID N^o2 CONNECTED TO PLATE.GRID-N^o1 (I_{C1}) MILLIAMPERES

80

60

40

20

0

500

400

300

200

100

0

PLATE VOLTS

400

300

200

100

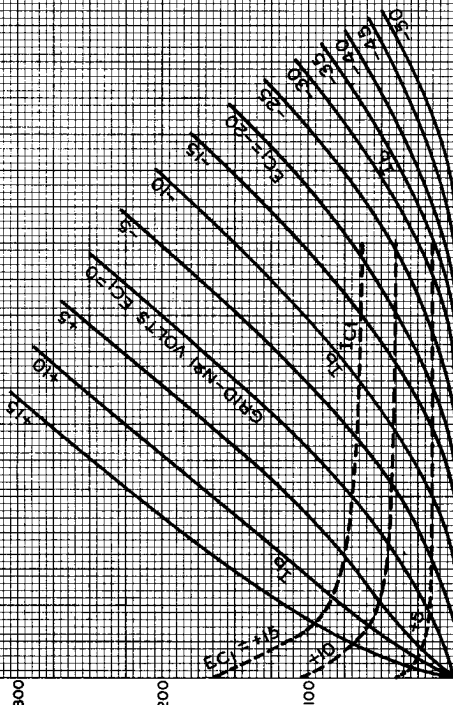
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PLATE (I_b) MILLIAMPERES

ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7116R1



TV-7 Tube Checker Settings

Tube Type	Filament Voltage	Settings	Settings	Bias	Shunt	Load	Press Button	Minimum Reading	Remarks
5R4 (5AS4)	5.0 "	JS0 "	6000 4000	0 "	39 36	A "	7 "	40 "	H.V. Rectifier (V8, V9) "
5Z4	5.0 "	JS0 "	6000 4000	0 0	64 "	A "	7 "	40 "	L.V. Rectifier (V10) "
6AL5	6.3 "	ET1 "	7010 2050	0 "	70 "	A "	2 "	40 "	Bias Rectifier (V11) "
6AQ5	6.3	ET1	5620	21	--	C	3	46	R.F. Driver (V5)
6AU6	6.3	ET1	5672	16	--	B	3	58	Speech Amplifier (V1) A.F. Driver (V2) Crystal Oscillator (V6)
807	6.3	FR3	0240	33	--	C	3	48	Modulator (V3, V4) Connect cap to Plate Jack