



5U4-GB

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FULL-WAVE VACUUM RECTIFIER

GENERAL DATA

Electrical:

Filament, Coated:

Voltage 5 ac volts
 Current 3 amp

Mechanical:

Mounting Position Vertical, base up or down, or
 Horizontal with pins 2 and 4 in vertical plane

Maximum Overall Length 4-3/4"

Maximum Seated Length 4-3/16"

Maximum Diameter 1-23/32"

Bulb T-12

Base Flared Medium-Shell Octal 5-Pin
 with External Barriers (JETEC No.B5-127)

or Short Medium-Shell Octal 5-Pin

with External Barriers (JETEC No.B5-121)

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:

PEAK INVERSE PLATE VOLTAGE 1550 max. volts

PEAK PLATE CURRENT PER PLATE 1 max. amp

AC PLATE SUPPLY VOLTAGE (RMS) PER PLATE . . See Rating Chart I

DC OUTPUT CURRENT PER PLATE See Rating Chart I

HOT-SWITCHING TRANSIENT PLATE

CURRENT PER PLATE See Operating Considerations

Typical Operation with Capacitor-Input to Filter:

AC Plate-to-Plate Supply

Voltage (RMS) 600 900 1100 volts

Filter-Input Capacitor[▲] 40 40 40 μ f

Total Effective Plate-Supply

Impedance Per Plate 21 67 97 ohms

DC Output Voltage at Input

to Filter (Approx.):

At full-load current of 300 ma . 290 - - volts

275 ma . - 460 - volts

162 ma . - - 630 volts

[▲] When capacitance values higher than 40 μ f are used, the effective plate-supply impedance should be increased so that the maximum rating for peak plate current is not exceeded.



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DC Output Voltage at Input

to Filter (Approx.):

At half-load current of 150 ma .	335	-	-	volts
137.5 ma .	-	520	-	volts
81 ma .	-	-	680	volts

Voltage Regulation (Approx.):

Half-load to full-load current .	45	60	50	volts
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Typical Operation with Choke-Input to Filter:

AC Plate-to-Plate Supply

Voltage (RMS)	900	1100	volts
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Filter-Input Choke	10	10	henries
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DC Output Voltage at

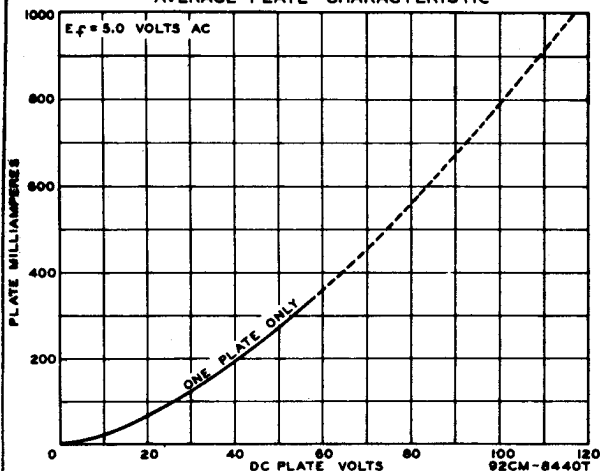
Input to Filter (Approx.):

At full-load current of 348 ma	340	-	volts
275 ma	-	440	volts
At half-load current of 174 ma	355	-	volts
137.5 ma	-	455	volts

Voltage Regulation (Approx.):

Half-load to full-load current	15	15	volts
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AVERAGE PLATE CHARACTERISTIC



OPERATING CONSIDERATIONS

Even occasional *hot-switching* with capacitor-input circuits permits the flow of plate current having magnitudes which can adversely affect tube life and reliability. If



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capacitor-input circuits are to be used, it is essential that the tube be protected against the possible adverse effects of hot-switching. The tube can be protected by circuits, designed to incorporate sufficient plate-supply resistance, as determined from Rating Chart III, to limit the maximum peak current value per plate to 4.6 amperes during the initial cycles of hot-switching operation. For applications in which hot-switching is required, choke-input circuits are recommended. Such circuits limit the hot-switching current to a value no higher than that of the peak plate current.

RATING CHARTS AND OPERATION CHARACTERISTICS

Rating Chart I represents graphically the relationships between maximum ac voltage input and maximum dc output current derived from the fundamental ratings for conditions of capacitor-input and choke-input filters. This graphical presentation gives the equipment designer considerable latitude in choice of operating conditions.

Rating Chart II represents graphically the relationship between maximum rectification efficiency and maximum dc output current per plate for conditions of capacitor-input to filter.

A choice of operating values of dc output current per plate and rectification efficiency should be made such that they fall within the area of permissible operation to insure that the maximum peak plate current will not be exceeded. If the operating values chosen fall outside the permissible operating area, a different choice of parameters should be made. For a given value of ac voltage input and dc output current, it is possible to reduce the rectification efficiency by either increasing the plate-supply resistance per plate or by using a smaller value of input filter capacitor.

Rating Chart III represents graphically the relationships between minimum plate-supply resistance per plate and maximum ac plate-supply voltage per plate under no-load conditions of capacitor-input filter when occasional hot-switching is employed.

If occasional hot-switching is required with capacitor-input circuits, it is important to protect the tube and the circuits against the flow of plate currents having magnitude in excess of the maximum permissible hot-switching current of 4.6 amperes. To limit the hot-switching current, adequate series plate-supply resistance per plate is necessary. The minimum value of this resistance may be determined from Rating Chart III. If the transformer windings do not provide this minimum value of resistance, then additional dc series resistance is required. The value of this dc resistance, R_A , may be determined from the relationship shown in the legend for Rating Chart III.



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If appreciable series inductance is present in the plate supply, a value of series plate-supply resistance smaller than that indicated by the curve may be employed provided it is experimentally determined that the combined effect of inductance and plate-supply resistance used are adequate to limit the hot-switching current to the indicated maximum value.

The *Operation Characteristics for Full-Wave Circuit with Capacitor-Input to Filter* show the usual typical operating curves for a full-wave rectifier with capacitor-input filter. In addition, they show by means of the boundary line "AED" the limiting current and voltage relationships presented in Rating Chart I. A choice of operating values to the left of the boundary line should be made such that the operation of the tube at these values will insure that the maximum ratings will not be exceeded.

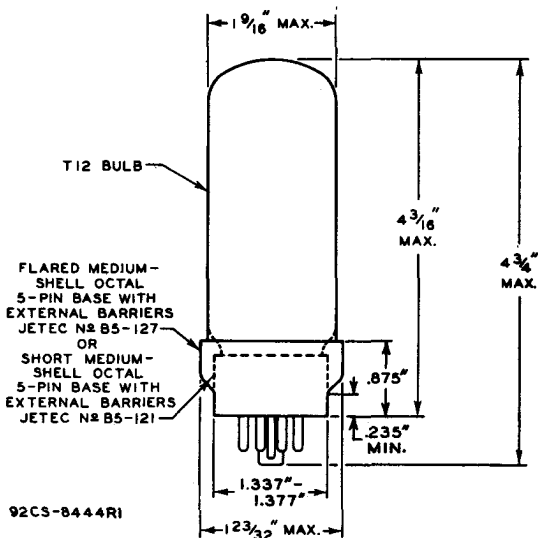
The *Operation Characteristics for Full-Wave Circuit with Choke-Input to Filter* show the usual typical operating curves for a full-wave rectifier with choke-input filter. They not only show by means of boundary line "ABC" the limiting current and voltage relationships presented in Rating Chart I, but also give information as to the effect of various sizes of chokes on regulation. The solid-line curves show the dc voltage outputs which would be obtained if the filter chokes had infinite inductance. The long-dash lines radiating from the zero position are boundary lines for various sizes of chokes as indicated. The intersection of one of these lines with a solid-line curve indicates the point on the curve at which the choke no longer behaves as though it had infinite inductance. To the left of the choke boundary line, the regulation curves depart from the solid-line curves as shown by the representative short-dash regulation curves. It will be noted that regulation improves with an increase in value of choke inductance, but for cost reasons, the value of inductance is usually held to the smallest value which will give the desired regulation over the operating current range. It is also to be noted that at the lower load currents, higher values of inductance are required to maintain good regulation. A choice of operating values to the left of the boundary line "ABC" should be made such that operation of the tube at these values will insure that the maximum ratings are not exceeded.



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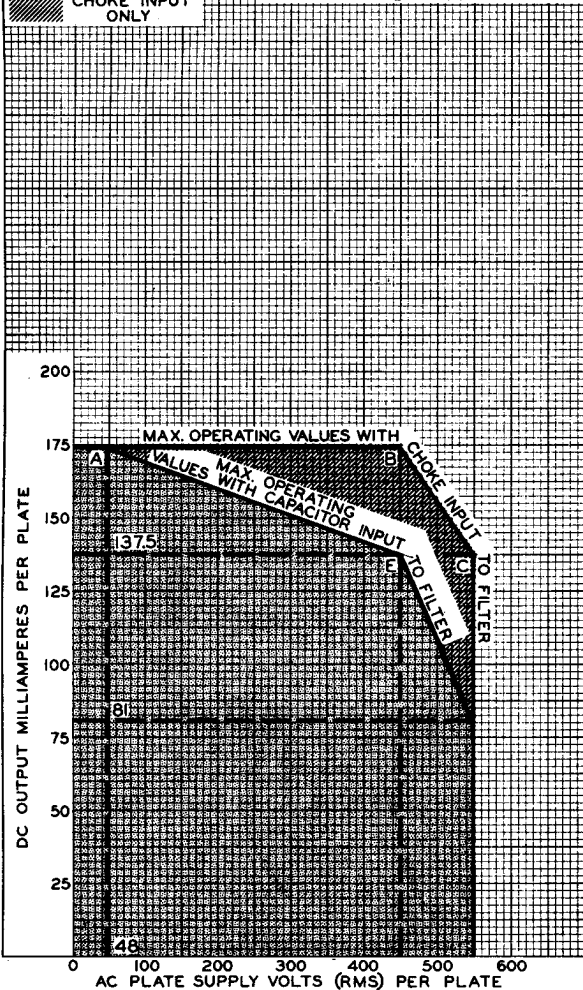
FULL-WAVE VACUUM RECTIFIER





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RATING CHART I

 $E_f = 5.0$ VOLTS ACCAPACITOR OR
CHOKE INPUTCHOKE INPUT
ONLYFOR SUITABLE CHOKE VALUES,
SEE CURVE"OPERATION CHARACTERISTICS"
WITH CHOKE INPUT TO FILTER

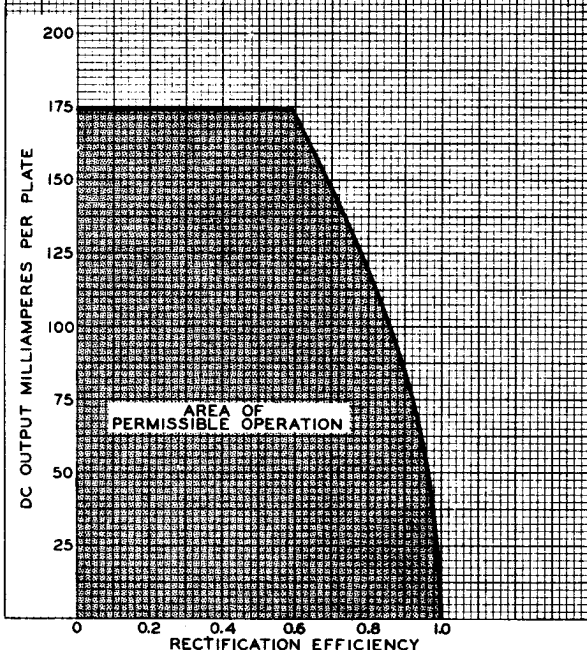


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RATING CHART II
CAPACITOR INPUT TO FILTER $E_f = 5.0$ VOLTS AC

MAX. PEAK PLATE CURRENT PER PLATE = 1 AMP.

RECTIFICATION EFFICIENCY = $\frac{\bar{E}}{\sqrt{2} E_s}$ WHERE $\bar{E}$ = DC OUTPUT VOLTS AT INPUT TO FILTER E_s = AC PLATE SUPPLY VOLTS (RMS) PER PLATE



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RATING CHART III CAPACITOR INPUT TO FILTER

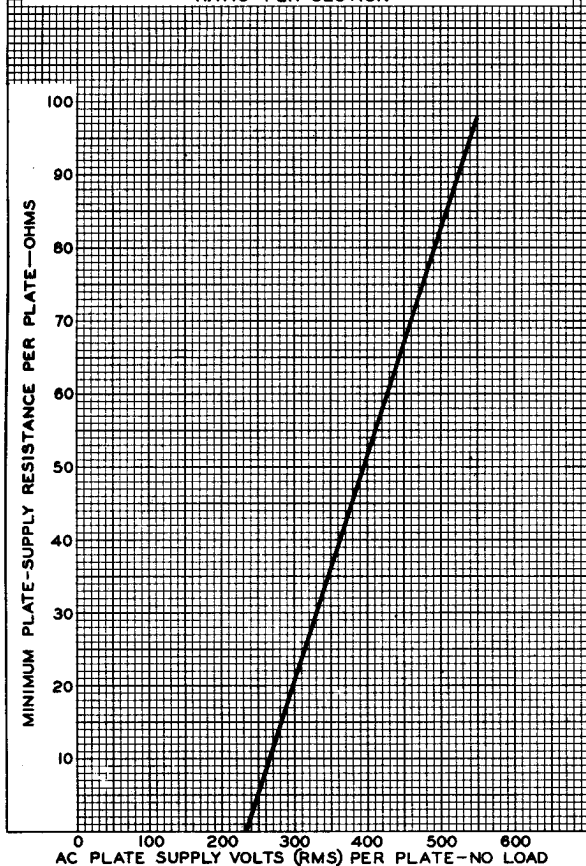
$E_f = 5.0$ VOLTS AC MAX. HOT-SWITCHING CUR. = 4.6 AMP.
 PLATE-SUPPLY RESISTANCE PER PLATE = $R_{SEC} + N^2 R_{PRI} + R_A$

WHERE R_{SEC} = DC RESISTANCE OF TRANSFORMER
 SECONDARY PER SECTION

R_{PRI} = DC RESISTANCE OF TRANSFORMER
 PRIMARY

R_A = DC RESISTANCE OF ADDED SERIES
 RESISTANCE PER PLATE

N = TRANSFORMER VOLTAGE STEP-UP
 RATIO PER SECTION





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OPERATION CHARACTERISTICS FULL-WAVE CIRCUIT, CAPACITOR INPUT TO FILTER

 $E_f = 5.0$ VOLTS AC

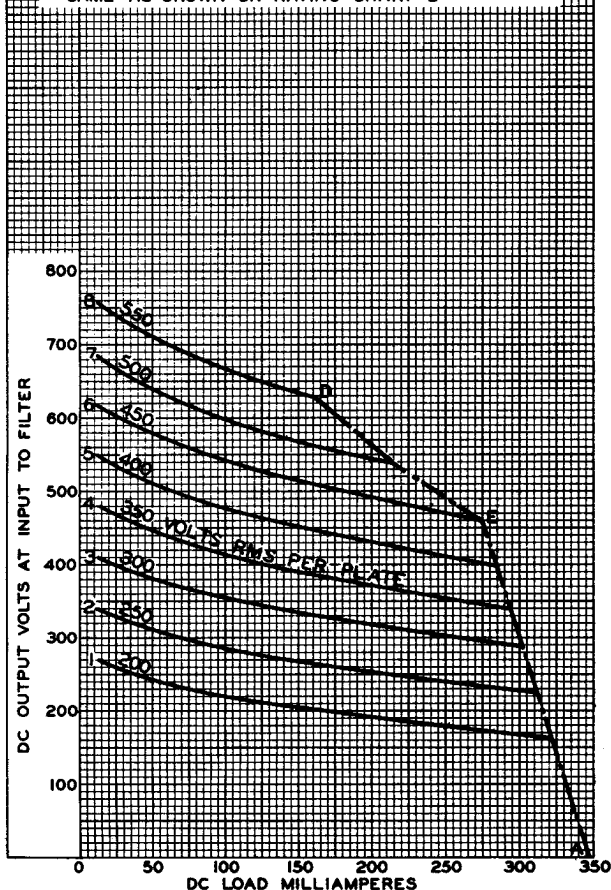
SUPPLY FREQUENCY = 60 CPS

CAPACITOR (C) INPUT TO FILTER: 40 μ f

TOTAL EFFECTIVE PLATE-SUPPLY IMPEDANCE

PER PLATE	CURVE	1	2	3	4	5	6	7	8
	OHMS	11	11	20	36	52	67	82	97

CURRENT-AND VOLTAGE BOUNDARY LINE 'DEA' IS THE SAME AS SHOWN ON RATING CHART I



OCT. 1, 1954

TUBE DIVISION

92CM-8446

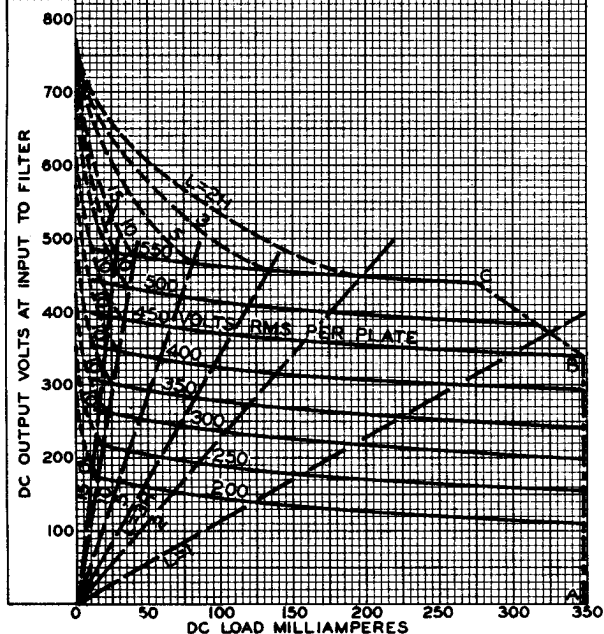
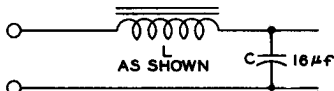
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY



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OPERATION CHARACTERISTICS FULL-WAVE CIRCUIT, CHOKE INPUT TO FILTER

$E_f = 5.0$ VOLTS AC SUPPLY FREQUENCY = 60 CPS
 SOLID-LINE CURVES = CHOKES OF INFINITE INDUCTANCE
 LONG-DASH LINES = BOUNDARY LINES FOR CHOKE SIZES AS SHOWN
 SHORT-DASH CURVES = REGULATION CURVES FOR REPRESENTATIVE CHOKE SIZES
 CURRENT-AND-VOLTAGE BOUNDARY LINE 'CBA' IS THE SAME AS SHOWN ON RATING CHART I



Full-Wave Vacuum Rectifier

GENERAL DATA

Electrical:

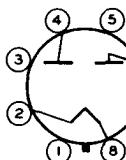
Filament, Coated:

Voltage (AC or DC) 5 volts
Current 3 amp

Mechanical:

Operating Position. Vertical, base down or up, or
Horizontal with pins 1 and 4 in vertical plane
Maximum Overall Length. 4-5/8"
Maximum Seated Length 4-1/16"
Diameter. 1.438" to 1.562"
Bulb. T12
Base. Short Medium-Shell Octal 5-Pin
with External Barriers, Style B, Arrangement 1
(JEDEC Group 1, No.B5-121), or
Short Medium-Shell Octal 8-Pin
with External Barriers, Style B (JEDEC Group 1, No.B8-118)
Basing Designation for BOTTOM VIEW. 5T

Pin 1 - No Connection
Pin 2 - Filament
Pin 3^a - No Connection



Pin 4 - Plate No.2
Pin 5 - Same as Pin 3
Pin 6 - Plate No.1
Pin 7 - Same as Pin 3
Pin 8 - Filament

FULL-WAVE RECTIFIER

Maximum Ratings, Design-Center Values:

For power-supply frequencies of 25 to 1000 cps

PEAK INVERSE PLATE VOLTAGE. 1550 max. volts
AC PLATE SUPPLY VOLTAGE PER PLATE
(RMS, without load) See Rating Chart I
STEADY-STATE PEAK PLATE CURRENT
PER PLATE (See Rating Chart II) 1 max. amp
TRANSIENT PEAK PLATE CURRENT
PER PLATE (See Rating Chart III). 4.6 max. amp
DC OUTPUT CURRENT See Rating Chart I

Typical Operation:

*With capacitor- With choke-
input filter input filter*

AC Plate-to-Plate
Supply Voltage
(RMS, without load) 600 900 1100 volts
Filter-Input Capacitor^b 40 40 - μ f
Filter-Input Choke. - - 10 henrys

← Indicates a change.



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Total Effective Plate

Supply Impedance				
Per Plate	21	67	-	ohms
DC Output Voltage at				
input to filter	290	460	420	volts
DC Output Current	300	275	275	ma

→ Characteristics:

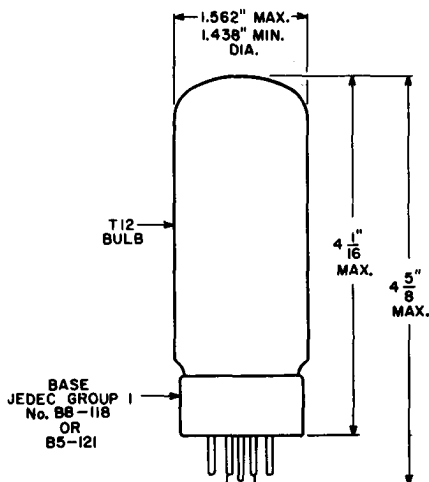
Tube Voltage Drop for
plate ma. (Per plate) =

225	44	volts
275	50	volts
300	54	volts

^a On the 5-pin base, pins 3, 5, and 7 are omitted.

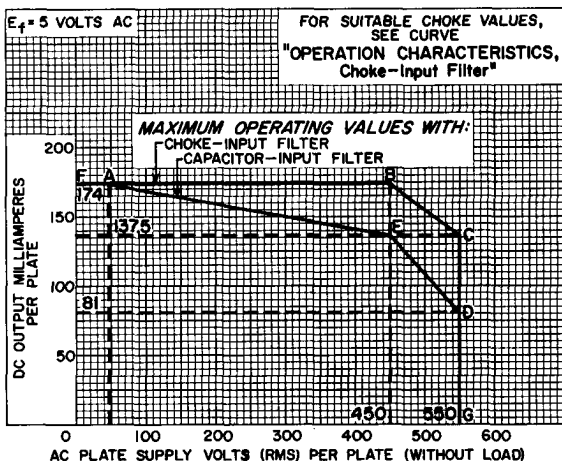
^b Values of capacitance greater than 40 μ f may be used, provided the plate supply impedance is increased to prevent exceeding the maximum peak-plate-current rating.

→ Indicates a change.

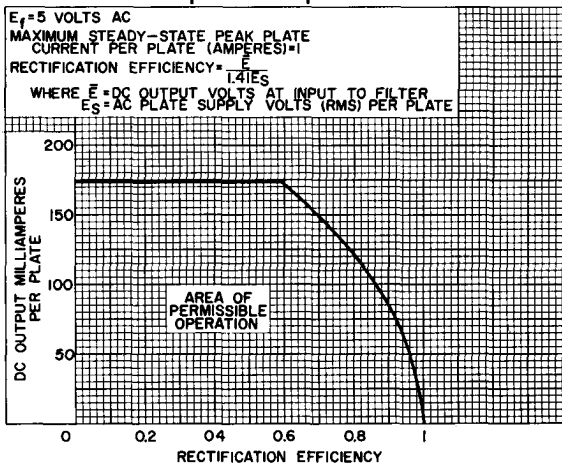


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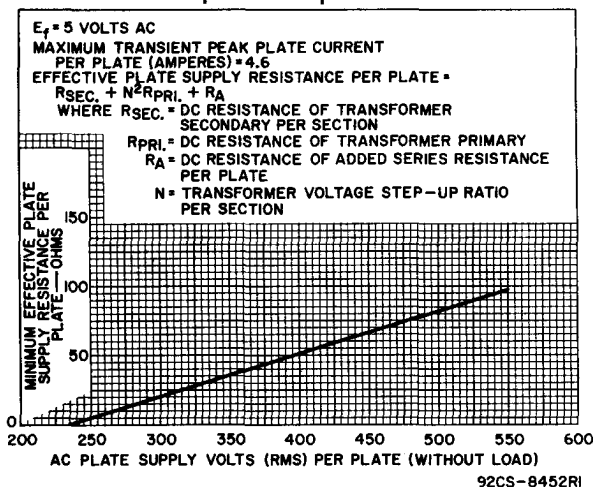
RATING CHART I



RATING CHART II Capacitor-Input Filter



RATING CHART III Capacitor-Input Filter



OPERATION CHARACTERISTICS Full-Wave Circuit, Capacitor-Input Filter

$E_f = 5$ VOLTS AC

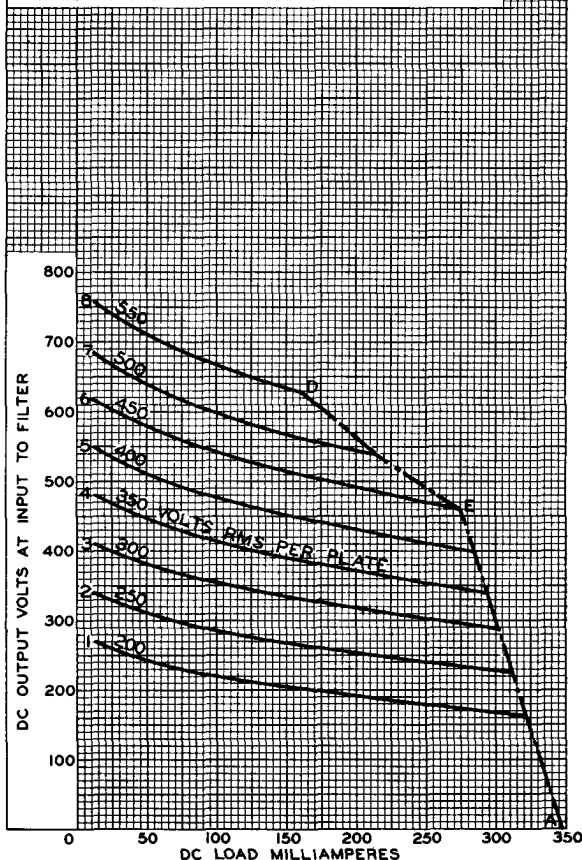
SUPPLY FREQUENCY (CPS) = 60

CAPACITOR (C) INPUT TO FILTER: (μf) = 40

TOTAL EFFECTIVE PLATE SUPPLY IMPEDANCE

PER PLATE	CURVE	1	2	3	4	5	6	7	8
	OHMS	11	11	20	36	52	67	82	97

CURRENT- AND VOLTAGE-BOUNDARY LINE 'DEA' IS THE SAME AS SHOWN ON RATING CHART 1



92CM-8446R1



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

DATA 3
7-61

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OPERATION CHARACTERISTICS Full-Wave Circuit, Choke-Input Filter

$E_f = 5$ VOLTS AC
 SUPPLY FREQUENCY (CPS) = 60
 SOLID LINE CURVES = CHOKES OF INFINITE INDUCTANCE
 LONG-DASH LINES = BOUNDARY LINES FOR CHOKE SIZES AS SHOWN
 SHORT-DASH CURVES = REGULATION CURVES FOR REPRESENTATIVE CHOKE SIZES
 CURRENT- AND VOLTAGE-BOUNDARY LINE 'CBA' IS THE SAME AS SHOWN ON RATING CHART I

