5U4-GB

FULL-WAVE VACUUM RECTIFIER

GENERAL DATA

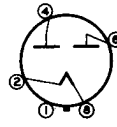
Electrical:

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	μf
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 uf are used, the effective plate-supply impedance should be increased so that the maximum rating for peak plate current is not exceeded.

5U4-GB

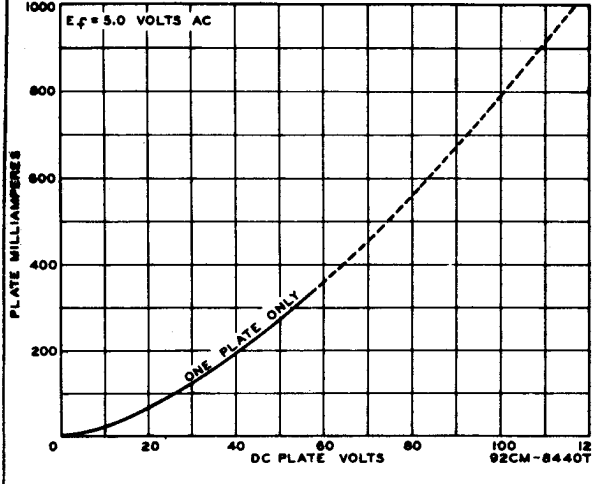
FULL-WAVE VACUUM RECTIFIER

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

Typical Operation with Choke-Input to Filter:

AC Plate-to-Plate Supply Voltage (RMS)	900	1100	volts
Filter-Input Choke	10	10	henries
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

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

5U4-GB

FULL-WAVE VACUUM RECTIFIER

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.

5U4-GB
FULL-WAVE VACUUM RECTIFIER

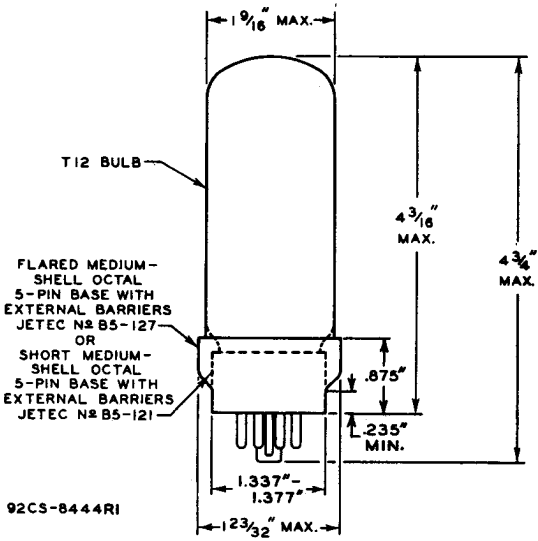
If appreciable series inductance is present in the plate supply, a value of series plate-supply resistance smaller than that indicated by the curve may be employed provided it is experimentally determined that the combined effect of inductance and plate-supply resistance used are adequate to limit the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

5U4-GB

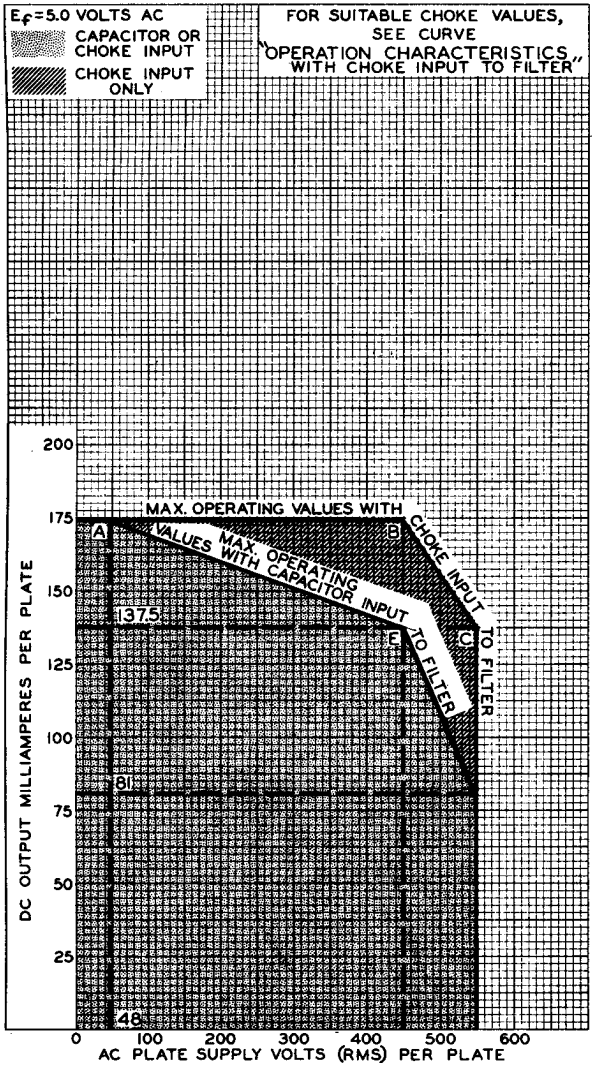
FULL-WAVE VACUUM RECTIFIER



RCA

5U4-GB

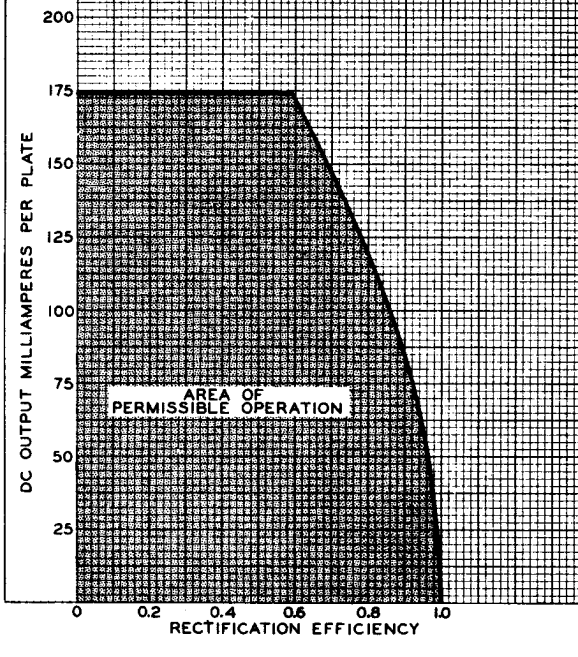
RATING CHART I



5U4-GB

RATING CHART II
CAPACITOR INPUT TO FILTER

E_f = 5.0 VOLTS AC
MAX. PEAK PLATE CURRENT PER PLATE = 1 AMP.
RECTIFICATION EFFICIENCY = $\frac{\overline{E}}{\sqrt{2}\,E_S}$
WHERE $\overline{E}$ = DC OUTPUT VOLTS AT INPUT TO FILTER
E_S = AC PLATE SUPPLY VOLTS (RMS) PER PLATE



RCA

5U4-GB

RATING CHART III
CAPACITOR INPUT TO FILTER

E_f=5.0 VOLTS AC MAX. HOT-SWITCHING CUR.=4.6 AMP.

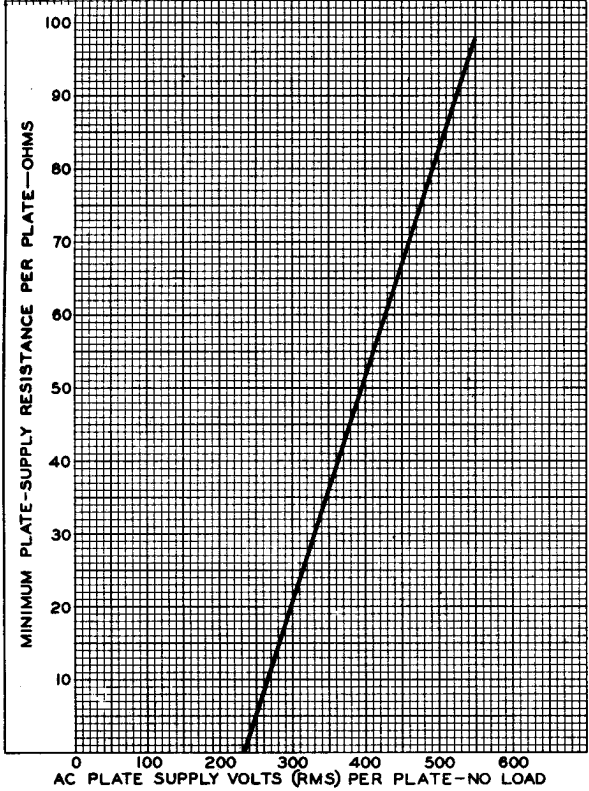
PLATE-SUPPLY RESISTANCE PER PLATE=$R_{SEC.}+N^2 R_{PRI.}+R_A$

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



RCA

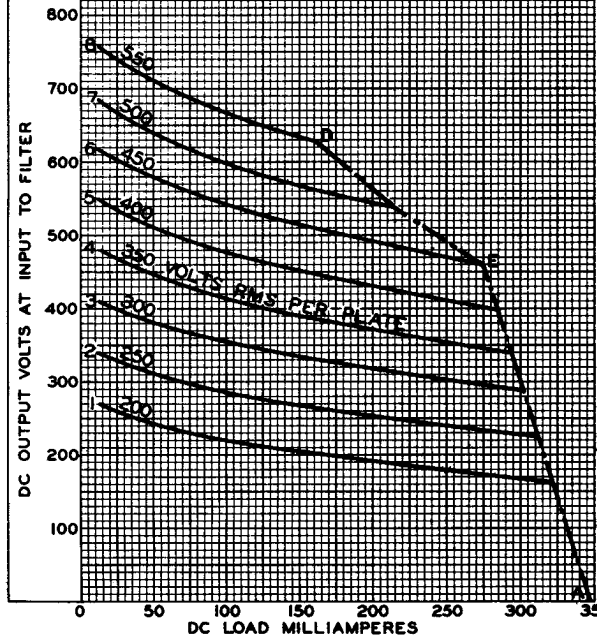
5U4-GB

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 μf
TOTAL EFFECTIVE PLATE-SUPPLY IMPEDANCE

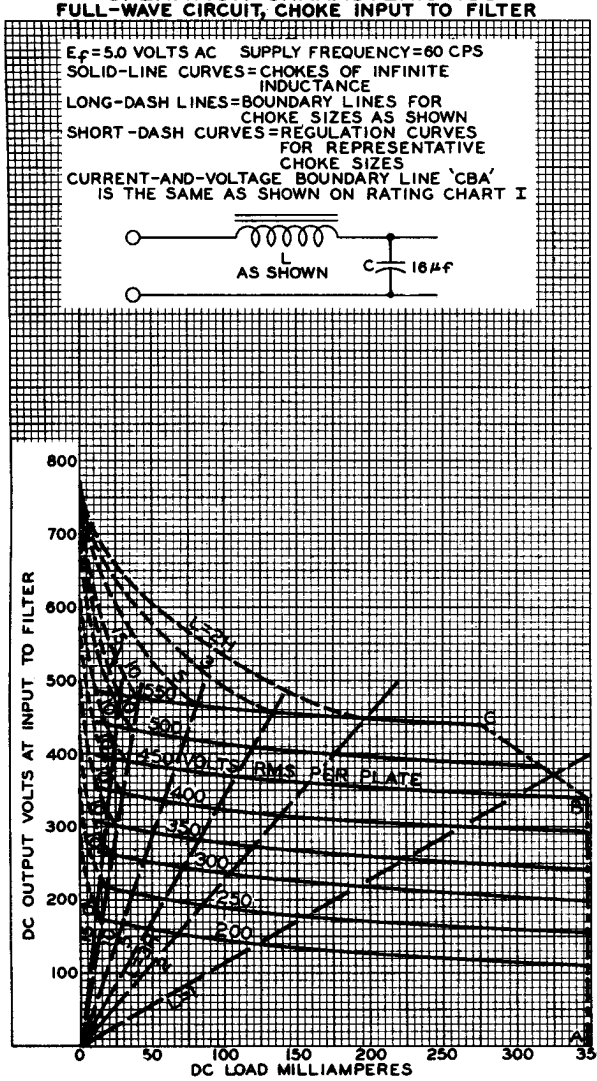
PER PLATE	CURVE	1	2	3	4	5	6	7	8
	OHMS	11	11	20	36	52	67	82	97

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



5U4-GB

OPERATION CHARACTERISTICS
FULL-WAVE CIRCUIT, CHOKE INPUT TO FILTER



Full-Wave Vacuum Rectifier

GENERAL DATA

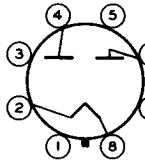
Electrical:

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-input filter		*With choke-input filter*	
AC Plate-to-Plate Supply Voltage (RMS, without load) . .	600	900	1100	volts
Filter-Input Capacitor[b] .	40	40	–	μf
Filter-Input Choke. . . .	–	–	10	henrys

◄ Indicates a change.

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:

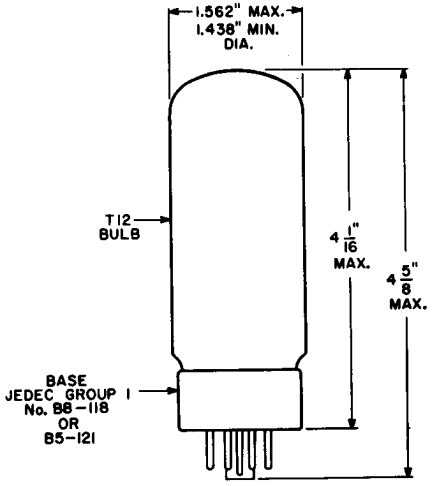
Tube Voltage Drop for plate ma. (Per plate) =

225	44	volts
275	50	volts
300	54	volts

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

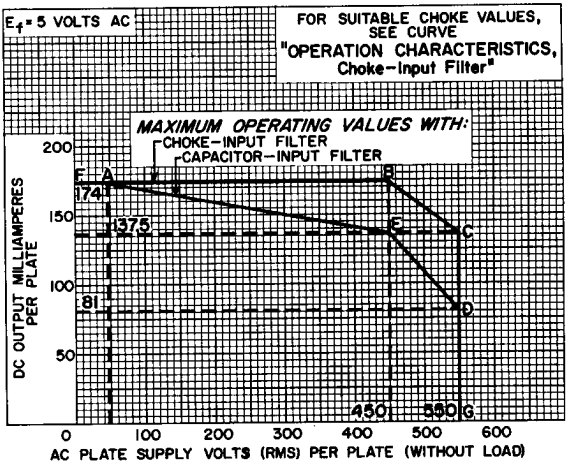
[b] Values of capacitance greater than 40 μf may be used, provided the plate supply impedance is increased to prevent exceeding the maximum peak-plate-current rating.

→ Indicates a change.



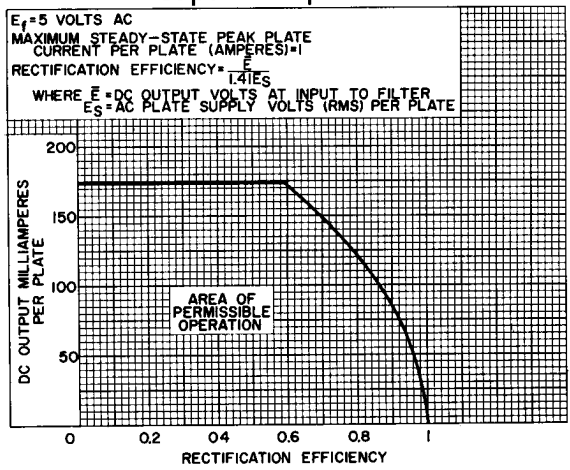
92CS-8444R2

RATING CHART I



92CS-8450RI

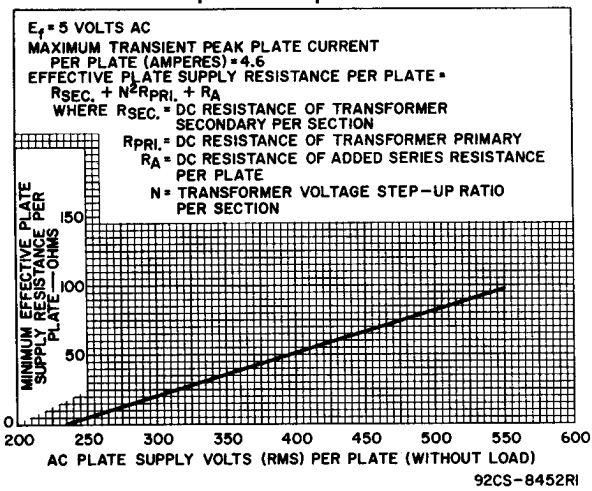
RATING CHART II
Capacitor-Input Filter



92CS-8451RI

5U4GB

RATING CHART III
Capacitor-Input Filter



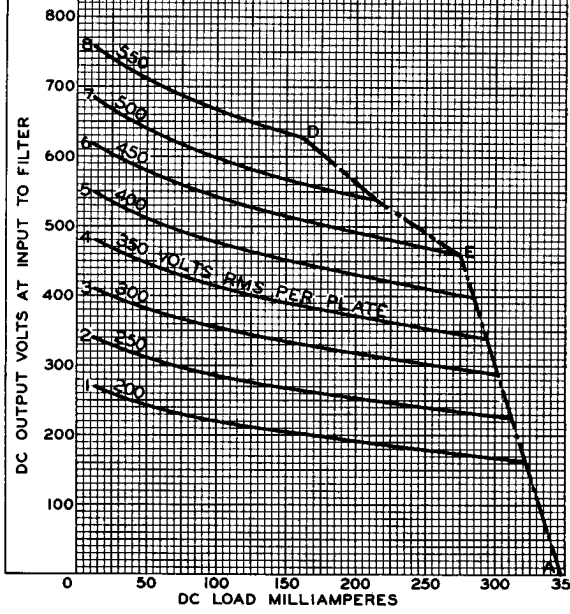
92CS-8452RI

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 I

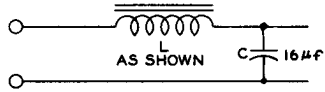


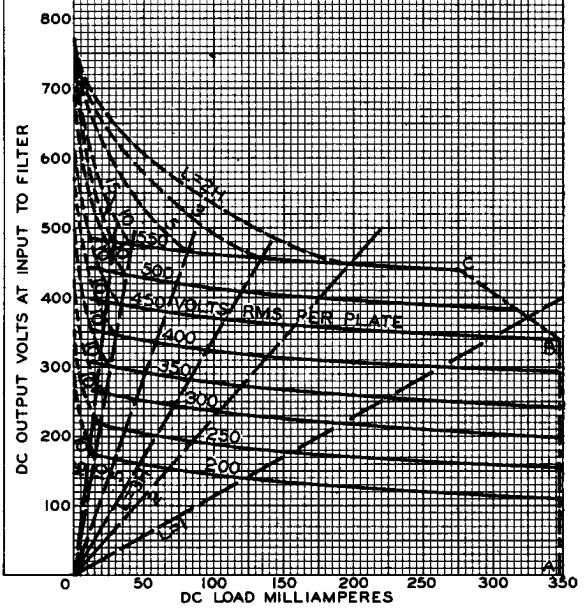
92CM-8446RI

5U4GB

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=BOUNDRY 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





92CM-8447RI