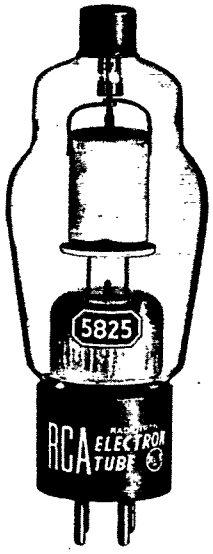
5825RCA Ø

5825

HALF-WAVE HIGH-VACUUM RECTIFIER

TENTATIVE DATA

RCA-5825 is a half-wave rectifier designed for use in high-voltage, low-current applications. Its features make it particularly suitable for use as a rectifier in compact, high-voltage, rf-operated equipment.



A single 5825 in a half-wave circuit is capable of supplying a maximum dc output voltage of about 27000 volts at the full rated output current of 2 milliamperes. In a voltage-doubler circuit, two 5825's will give about 54000 volts; and in a voltage-tripler circuit, three 5825's will deliver about 81000 volts.

An important feature of the 5825 is its low-wattage, thoriated-tungsten filament (2 watts) which may be operated either from a separate winding on the rf transformer or by utilizing a resonant transformer excited by the capacitance current through the tube. To permit use of the latter arrangement without circuit readjustment when replacing tubes, the plate-filament capacitance of the 5825 is held to close tolerances.

GENERAL DATA

Electrical:

Filament, Thoriated Tungsten:		
Voltage (AC)	1.6	volts
Current	1.25	amperes
Direct Interelectrode Capacitance:[o]		
Plate to Filament	2.2	μμf
Tube Voltage Drop at maximum peak plate current	1750	volts

Mechanical:

Mounting Position	Any
Overall Length	5-11/16" ± 5/32"
Seated Length	5-1/16" ± 5/32"
Maximum Diameter	2-1/16"
Bulb	ST-16
Cap	Medium
Base	Medium-Shell Small 4-Pin

HALF-WAVE RECTIFIER

Maximum Ratings, *Absolute Values:*

For supply frequencies up to 250 kc

PEAK INVERSE PLATE VOLTAGE	60000 max.	volts
PEAK PLATE CURRENT	40 max.	ma
AVERAGE PLATE CURRENT	2 max.	ma
HOT-SWITCHING TRANSIENT CURRENT for duration of 0.1 second maximum	100 max.	ma
PLATE DISSIPATION	3.5 max.	watts
BULB TEMPERATURE	80 max.	°C

Typical Operation at 70 kc in Half-Wave Circuit with Capacitor-Input to Filter:

AC Plate-Supply Voltage (RMS)	21200	volts
Filter-Input Capacitor	350	μμf
Effective Plate-Supply Impedance	120000	ohms
DC Output Current	2	ma
DC Output Voltage at Input to Filter (Approx.):		
At half-load current (1 ma)	28000	volts
At full-load current (2 ma)	26700	volts
Voltage Regulation (Approx.):		
Half-load to full-load current	1300	volts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Filament Current	1	1.15	1.35	amperes
Plate-Filament Capacitance	–	2.14	2.26	μμf

Note 1: With 1.6 volts dc on filament.

[o] With no external shield.

INSTALLATION and APPLICATION

The *base* pins of the 5825 fit the standard 4-contact socket. The socket may be installed to operate the tube in any position. The plate connection is made to the bulb cap.

The *internal shield* is connected within the tube to pin No.4 to which circuit returns should be made.

The *filament* is of the thoriated-tungsten type and is designed for operation at 1.6 volts. Under normal full-load conditions, the filament should be maintained at the rated voltage within ± 5 per cent.

When the filament is supplied from an rf power source which is at a high dc potential above ground, adjustment of the filament voltage by direct measurement is usually impractical. However, a simple method utilizing visual comparison of filament temperatures can be used for adjustment of filament power. The color temperature of the filament operating from an rf power source may be checked visually by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. A visual comparison of this color temperature with that obtained when the filament of another 5825 is operated from a dc or low-frequency ac supply of 1.6 volts, provides a convenient means for adjusting the amount of rf excitation to produce 1.6 volts (rms) at the filament terminals.

The filament must never under any condition of operation be allowed to reach a temperature higher than that caused by operating the filament on dc or low-frequency ac at a voltage of 1.68

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

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volts. Operation at higher temperatures will cause impaired performance of the tube. During circuit adjustment, however, it is permissible to allow the filament voltage to rise to 2 volts for the brief interval required to make the adjustment.

The technique for making the above comparison measurements on an accurate, reproducible basis is the same as that employed for RCA-1B3-GT/8016 (see Reference 1).

Severely overloading the 5825 may cause decreased filament emission. Filament activity can sometimes be restored by operating the filament at rated voltage for 10 minutes or more without voltage on the plate. This process may be accelerated by raising the filament voltage to 1.9 volts (not higher) for a few minutes.

The filament transformer or filament-excitation circuit must be adequately insulated to withstand the maximum peak inverse plate voltage encountered in the installation.

The *peak plate current* of the 5825 should be checked under actual operating conditions in each application to make certain that the maximum rating of 40 milliamperes is not exceeded. If facilities are not available for measuring peak current, the curve in Fig. 1 may be used for determining the peak current under pure sine-wave conditions. From the operating conditions, the

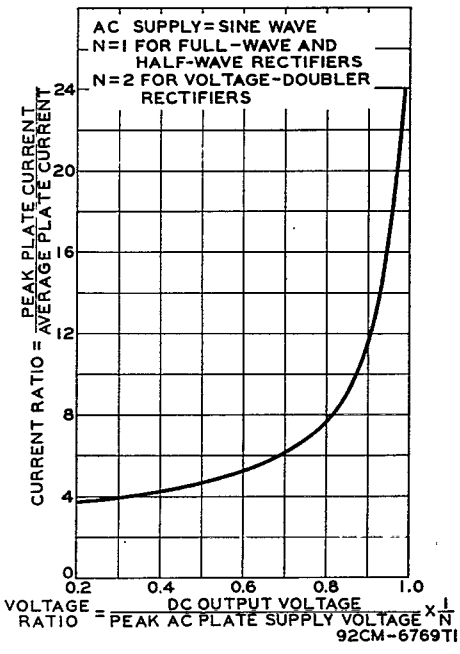


Fig. 1 - Curve for Determining Peak Current under Pure Sine-Wave Conditions.

rectification efficiency of the system (ratio of dc output voltage to the peak value of the ac plate-supply voltage) may be calculated and used to determine the corresponding ratio of peak-to-average current from the curve. From this current ratio, the approximate peak plate current may be calculated and it should not exceed 40 milliamperes on an absolute-rating basis.

The *average plate characteristic* of the 5825 is shown in Fig. 2.

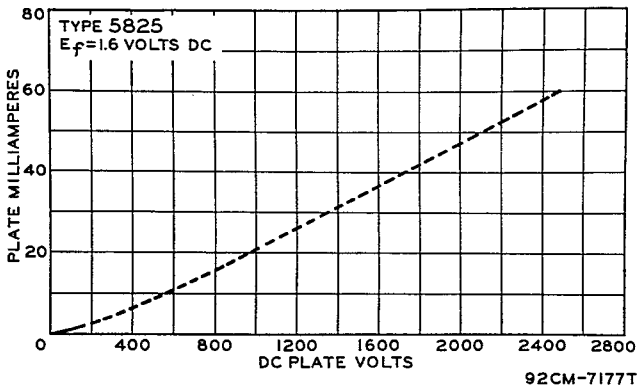


Fig. 2 - Average Plate Characteristic of Type 5825.

The *maximum ratings* shown for the 5825 are limiting values above which its serviceability may be impaired from the viewpoint of life and satisfactory performance. Therefore, in order not to exceed these absolute ratings, the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating by an amount such that the absolute values will never be exceeded under any usual conditions of supply-voltage variation, load variation, or manufacturing variation in the equipment itself.

Like other high-voltage devices, the 5825 requires that certain precautions be observed to minimize the possibility of failure due to dust, humidity, and corona.

Dust and Humidity Considerations. The high voltage applied to the 5825 increases the rate at which dust is precipitated on the surface of the tube. The rate of precipitation is further accelerated in the presence of corona. Such dust decreases the insulation of the bulb. The dust usually consists of fibrous materials and may contain soluble salts. The fibers absorb and retain moisture; the soluble salts provide electrical leakage paths that increase in conductivity as the humidity increases. Because a film of dust can nullify the insulating qualities of the glass bulb, the 5825 should be protected as much as possible from dust. It is recommended that the bulb be cleaned at intervals with a damp cloth.

Corona Considerations. A high-voltage system may be subject to corona, especially when the humidity is high, unless suitable precautions are taken. Corona, which is an electrical dis-

charge appearing on the surface of a conductor when the voltage gradient exceeds the breakdown value of air, causes deterioration of organic insulating materials, induces arc-over at points and sharp edges, and forms ozone, a gas which is deleterious to many insulating materials. Sharp points or other irregularities on any part of the high-voltage system may increase the possibility of corona and should be avoided. Instead, rounded contours and surfaces should be used.

In the design of 5825 equipment, sharp points or irregularities on surfaces around the tube must be avoided. It is recommended that high-voltage leads be kept at least 4 inches away from the tube and that the diameter of the leads be so chosen that corona does not occur.

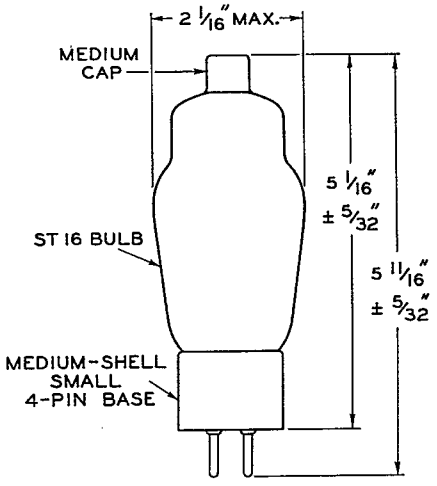
The high voltages at which the 5825 is operated are very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. In those circuits where the filament circuit is not grounded, the filament circuit operates at high dc potentials which can cause fatal shock. Extreme precautions must be taken when the filament voltage is determined. These precautions must include safeguards which definitely eliminate all hazards to personnel. Under any circumstances, all circuit parts which may be at high potentials should be enclosed and "interlock" switches should be used to break the primary circuit of the high-voltage power supply when access to the equipment is required.

Soft x-rays are produced when the 5825 is operated at a plate voltage above approximately 20000 volts. These rays can constitute a health hazard unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design (see References 2 and 3).

REFERENCES

1. *"Adjustment of Filament Voltage of RCA-1B3-GT by Observation of Filament Temperature,"* RCA Application Note AN-134.
2. *"X-ray Protection,"* National Bureau of Standards Handbook H20.
3. *"Safety Code for Industrial Use of X-rays,"* American Standards Association, ASA Code Z54.1 — 1946.

DIMENSIONAL OUTLINE



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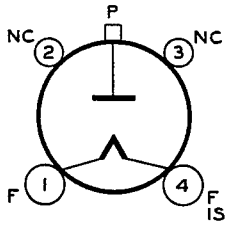
SOCKET CONNECTIONS

Bottom View



4P

PIN 1: FILAMENT
PIN 2: NO CONNECTION
PIN 3: NO CONNECTION
PIN 4: FILAMENT, INTERNAL SHIELD
CAP: PLATE