SYLVANIA ROCKET TUBES are planar-electrode, disc-seal triodes which operate efficiently and can be used in simplified circuits at frequencies up to the 3300 mc. region. As oscillators and amplifiers these types may be used as integral parts of tuned cavities and, because of their low internal lead inductance, are well adapted to lumped-constant circuits in the 500-mc. region.

Three design features of this group of tubes are of major importance to simplified, efficient operation at ultra-high frequencies:

1) The stretched, parallel-wire grid construction results in stable, uniform operation because this type of planar grid does not buckle.

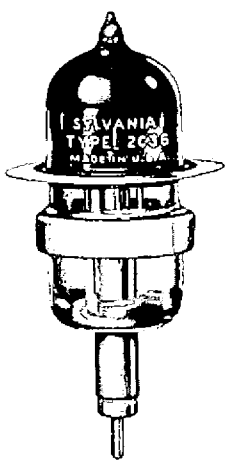
2) The unique cathode design minimizes mechanical and electrical discontinuities in the cathode structure.

3) The disc-seal type of construction satisfies the requirements for low lead inductance, and the variety of disc-shapes now available allows the use of these types in several kinds of mechanical tuners.

Optimized tube design permits *broad band* operation. Frequency ratios of about 4 to 1 (250 mc. to 1000 mc.) for continuous tuning can be obtained up to 1000 mc. with no deadspots throughout the range. Ratios of about 3 to 1 can likewise be obtained up to 3300 mc.

Since the tuning operation for these types is simpler and covers a greater continuous range than that of many other types of uhf tubes, the SYLVANIA planar triodes may be used to advantage in a wide variety of applications in electronics, communications, radar, and navigation. Some types are designed for c.w. and others for pulsed operation.

DESCRIPTION OF TYPES

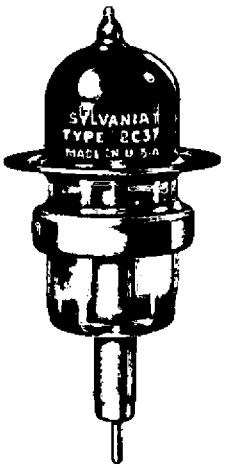


TYPE 2C36

This type was designed for use as a pulse-modulated oscillator at frequencies up to 1200 mc. The 2C36 has a built-in internal feedback circuit between cathode and anode and fits into a concentric-line circuit similar to that shown for the 2C37 in Fig. 8. A small amount of adjustable, external feedback is generally necessary in order to obtain optimum power output at any given frequency. A feedback probe between the output and input lines may be used as indicated in the drawing. With plate-pulse modulation the grid may be operated at zero bias, eliminating the necessity of insulating the cathode from the grid in the input-line plunger. Ratings and characteristics are listed in Table I.

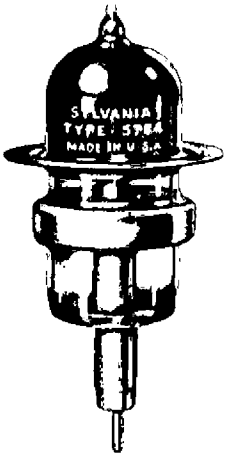
from RMA release #728, Jan. 15, 1949

TYPE 2C37



This type was designed primarily for use as a c.w. oscillator at frequencies up to 3300 mc. It can also be used for amplifier and frequency-multiplier applications.

The 2C37 is similar in appearance to the 2C36, but has no internal feedback. Ratings and characteristics are given in Table II, characteristic curves in Figs. 5 and 6.



TYPE 5764

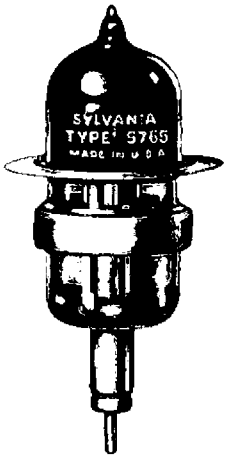
This type was designed for use as a pulse-modulated oscillator at frequencies up to 3300 mc.

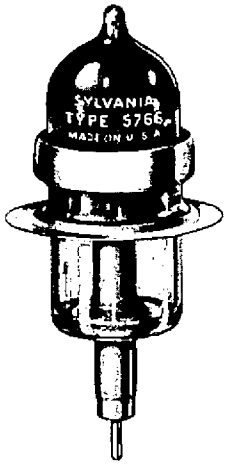
The 5764 is identical with the 2C37 except for special cathode design and processing that makes it suitable for pulsed operation. Previously, it was termed experimental type SB846B. A typical circuit for pulse-modulated operation is the half-wave re-entrant-cavity circuit shown in Fig. 9. Typical frequency drift characteristics caused by variations in heater voltage, plate voltage, and duty cycle in this circuit appear in Fig. 7. Ratings and characteristics are given in Table III.

TYPE 5765

This type was designed for use as a c.w. oscillator without external feedback in the range from 900-2900 mc.

The 5765 is similar to the 2C37 except for a specially designed built-in feedback similar to that of the 2C36 and requires no feedback in the external circuit over the specified frequency range. Ratings and characteristics are given in Table IV.

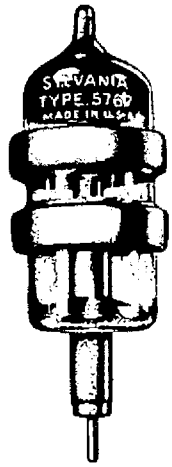




TYPE 5766

This type was designed primarily for use as a c.w. oscillator at frequencies up to 3300 mc.

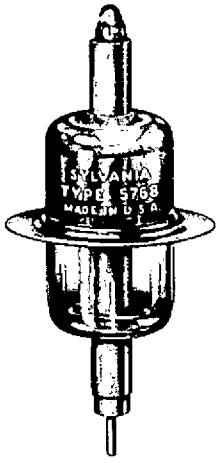
The 5766 is identical with the 2C37 except that the plate disc is folded and the grid disc is flat. This allows the tube to be used in cavity shapes different from those used with the 2C37. Ratings and characteristics are given in Table II. This tube was previously termed experimental type SB846D.



TYPE 5767

This type was designed for use as a c.w. oscillator at frequencies up to 3300 mc.

The 5767 is identical with the 2C37 except that both discs are folded. This construction is particularly adapted to applications in lumped-constant circuits or butterfly circuits. Ratings and characteristics are given in Table II. This type was previously termed experimental type SB846H.



TYPE 5768

This type was designed for use as an amplifier at frequencies up to 3000 mc.

The cylindrical anode design of the 5768 lends itself to use in high-impedance output cavities. Ratings and optimum characteristics are given in Table V.

In order to cover a 3 to 1 frequency range a considerable sacrifice in gain must be made in certain portions of the band, especially the low end. A cavity properly designed for any given fixed frequency between 1000 mc and 3000 mc will thus have a considerably higher gain than that shown in Table V.

For all of the above tubes, the area of contact with the anode disc (or anode rod, in the case of type 5768) should be sufficiently large to allow adequate cooling so that 5.0 watts can be dissipated without exceeding the maximum allowable temperature for the glass-to-metal seal.

CHARACTERISTICS AND RATINGS

TABLE I
Type 2C36
Ultra-High-Frequency Oscillator
Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage (A.C. or D.C.)	6.3 volts
Heater current	0.4 amperes
Maximum plate dissipation	5.0 watts
Maximum seal temperature	175 degrees C.
Maximum plate voltage (pulsed)	1500 volts
Maximum operating frequency	1200 megacycles
Direct Interelectrode Capacitances (average)	
Grid-plate	2.40 micromicrofarads
Grid-cathode	1.40 micromicrofarads
Plate-cathode	0.36 micromicrofarads

TUBE CHARACTERISTICS

Transconductance (E_b = 180 volts D.C., R_k = 400 ohms)	4500 micromhos
Amplification factor " " " " " "	25
Plate current " " " " " "	11.5 milliamperes

TYPICAL OPERATING CONDITIONS

ULTRA-HIGH-FREQUENCY OSCILLATOR - PLATE PULSE MODULATED

Plate voltage (peak)	1000 volts
Plate current (peak)	0.9 amperes
Grid voltage	0.0 volts
Pulse repetition frequency	2000 pulses per second
Pulse width	2.0 microseconds
Frequency of operation	1000 megacycles
Power output (peak)	200 watts

MECHANICAL SPECIFICATIONS

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

TABLE II

Types 2C37, 5766, 5767

Ultra-High-Frequency, General-Purpose Triodes

Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage (A.C. or D.C.)	6.3 volts
Heater current	0.4 amperes
Maximum plate voltage	350 volts D.C.
Maximum plate dissipation	5.0 watts
Maximum seal temperature	175 degrees C.
Maximum operating frequency	3300 megacycles
Direct Interelectrode Capacitances (Average)	
Grid-plate	1.85 micromicrofarads
Grid-cathode	1.40 micromicrofarads
Plate-cathode	0.02 micromicrofarads

TUBE CHARACTERISTICS

Heater voltage	6.3 volts
Heater current	0.4 amperes
Plate voltage	180 volts D.C.
Cathode bias resistor	400 ohms
Plate current	11.5 milliamperes D.C.
Transconductance	4500 micromhos
Amplification factor	25
Grid voltage for I_b = 10 microamperes D.C.	-13.0 volts D.C.

TYPICAL OPERATING CONDITIONS

ULTRA-HIGH-FREQUENCY OSCILLATOR - CONTINUOUS WAVE

Plate voltage	150 volts D.C.
Plate current	15 milliamperes D.C.
Grid resistor	3000 ohms
Developed grid voltage (approximate)	-11.0 volts D.C.
Frequency	1000 megacycles
Power output	0.5 watts

ULTRA-HIGH-FREQUENCY OSCILLATOR - CONTINUOUS WAVE

Heater voltage	6.3 volts
Plate voltage	150.0 volts
Cathode resistor	100 ohms*
Grid resistor	100 ohms
Plate current	25 milliamperes
Frequency	3300 megacycles
Power Output	100 milliwatts

**Cathode resistor variable*

MECHANICAL SPECIFICATIONS

TYPES 2C37, 5766

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

TYPE 5767

Maximum over-all length	2.38 inches
Maximum over-all diameter	0.75 inches

TABLE III
Type 5764
Ultra-High-Frequency Oscillator for Pulse Operation
Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage (A.C. or D.C.)	6.3	volts
Heater current	0.4	amperes
Maximum plate dissipation (continuous)	5.0	watts
Maximum seal temperature	175	degrees C.
Maximum plate voltage (pulsed)	1500	volts
Maximum operating frequency	3300	megacycles
Direct Interelectrode Capacitances (Average)		
Grid-plate	1.85	micromicrofarads
Grid-cathode	1.40	micromicrofarads
Plate-cathode	0.02	micromicrofarads

TUBE CHARACTERISTICS

(E_b = 180 volts D.C., R_k = 400 ohms)

Transconductance	4500 micromhos
Amplification Factor	25
Plate Current	11.5 milliamperes

TYPICAL OPERATING CONDITIONS

Heater voltage	6.3	volts
Heater current	0.4	amperes
Plate voltage (peak)	1000	volts
Plate current (peak)	1.3	amperes
Grid voltage	0.0	volts
Pulse repetition frequency	2000	pulses per second
Pulse width	1.0	microsecond
Frequency of operation	3300	megacycles
Power output (peak)	200	watts

MECHANICAL SPECIFICATIONS

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

TABLE IV
Type 5765
Ultra-High-Frequency Oscillator for C.W. Operation
Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage (A.C. or D.C.)	6.3 volts
Heater current	0.4 amperes
Maximum plate voltage	350 volts D.C.
Maximum plate dissipation	5.0 watts
Maximum seal temperature	175 degrees C.
Maximum operating frequency	2900 megacycles
Direct Interelectrode Capacitances (average)	
Grid-plate	2.10 micromicrofarads
Grid-cathode	1.30 micromicrofarads
Plate-cathode	0.03 micromicrofarads

TUBE CHARACTERISTICS

Heater voltage	6.3 volts
Heater current	0.4 amperes
Plate voltage	180 volts D.C.
Cathode bias resistor	400 ohms
Plate current	11.5 milliamperes D.C.
Transconductance	4500 micromhos
Amplification factor	25
Grid voltage for I_b = 10 microamperes D.C.	-13.0 volts D.C.

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS *(tentative)*

ULTRA-HIGH-FREQUENCY OSCILLATOR - CONTINUOUS WAVE-TUNABLE, BROAD BAND

Plate voltage	180 volts
Plate current	25 milliamperes
Grid resistor	10,000 ohms*
Frequency band	900 to 2900 megacycles
Power output (average over band)	175 milliwatts
Power output (at 1900 megacycles)	225 milliwatts

**Grid resistor variable*

MECHANICAL SPECIFICATIONS

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

Cavity information will be furnished upon request.

TABLE V
Type 5768
Ultra-High-Frequency Amplifier for C.W. Operation
Ratings and Characteristics

ELECTRICAL RATINGS

Heater voltage	6.3 volts
Heater current	0.4 amperes
Maximum plate voltage	350 volts
Maximum plate dissipation	5.0 watts
Maximum seal temperature	175 degrees C.
Maximum operating frequency	3000 megacycles
Direct Interelectrode Capacitances (average)	
Grid-plate	1.30 micromicrofarads
Grid-cathode	1.25 micromicrofarads
Plate-cathode	.01 micromicrofarads

TUBE CHARACTERISTICS

Heater voltage	6.3 volts
Heater current	0.4 amperes
Plate voltage	180 volts D.C.
Cathode bias resistor	400 ohms
Plate current	4 milliamperes
Transconductance	4500 micromhos
Amplification factor	85

TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS (*tentative*)

ULTRA-HIGH-FREQUENCY AMPLIFIER - CONTINUOUS WAVE-TUNABLE, BROAD BAND

Plate voltage	250 volts
Fixed bias voltage	-1 volt
Plate current	9.3 milliamperes
Frequency band	1000 to 3000 megacycles
Power gain (average over band)	7 decibels
Power gain (at 3000 megacycles)	3 decibels

MECHANICAL SPECIFICATIONS

Maximum over-all length	2.38 inches
Maximum over-all diameter	1.01 inches

OUTLINE DRAWINGS

TYPES 2C36, 2C37, 5764, 5765

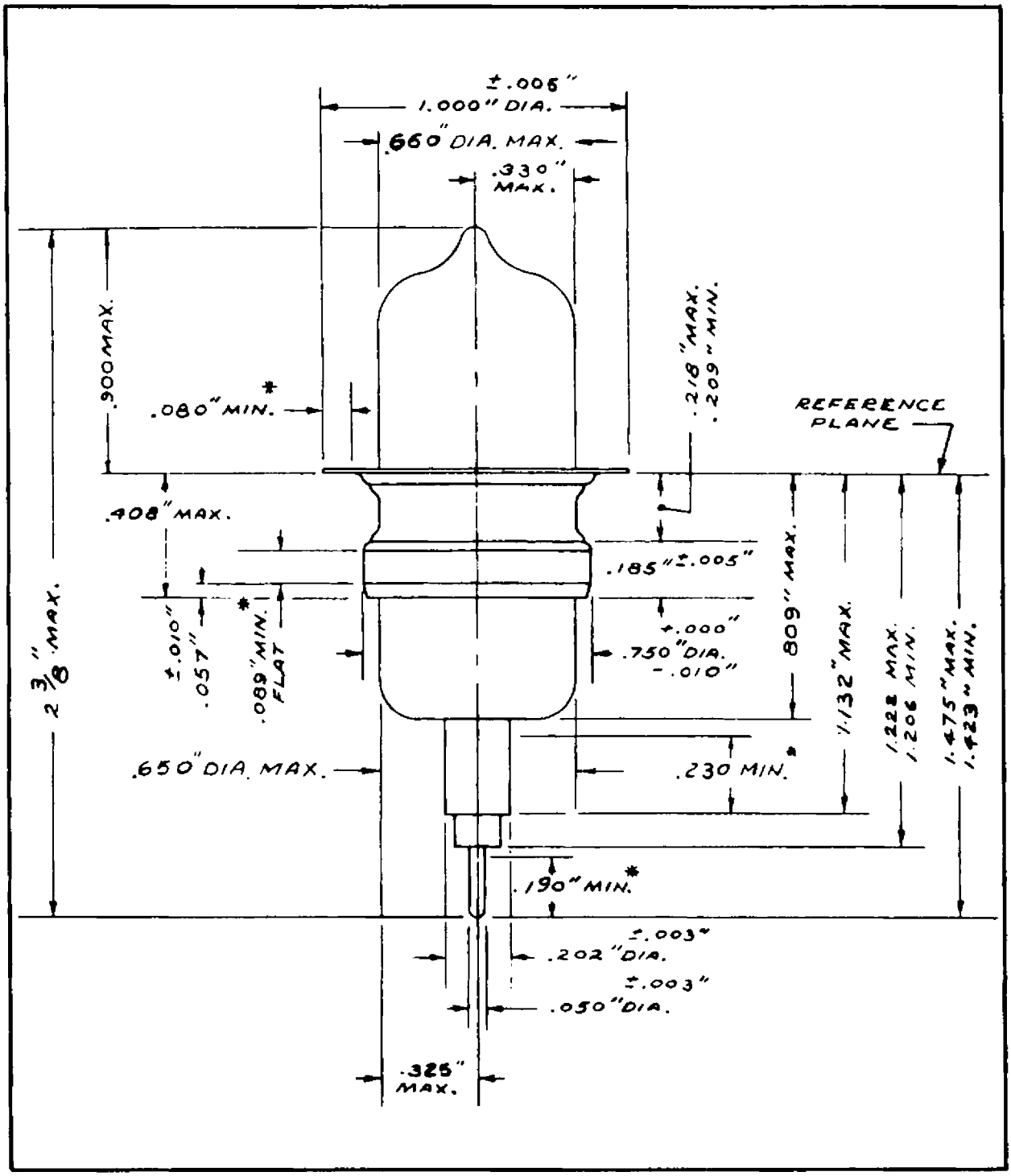


Fig. 1 Outline drawing showing the dimensions that are necessary for designing cavities. The dimensions are for the 2C36, 2C37, 5764, and 5765.

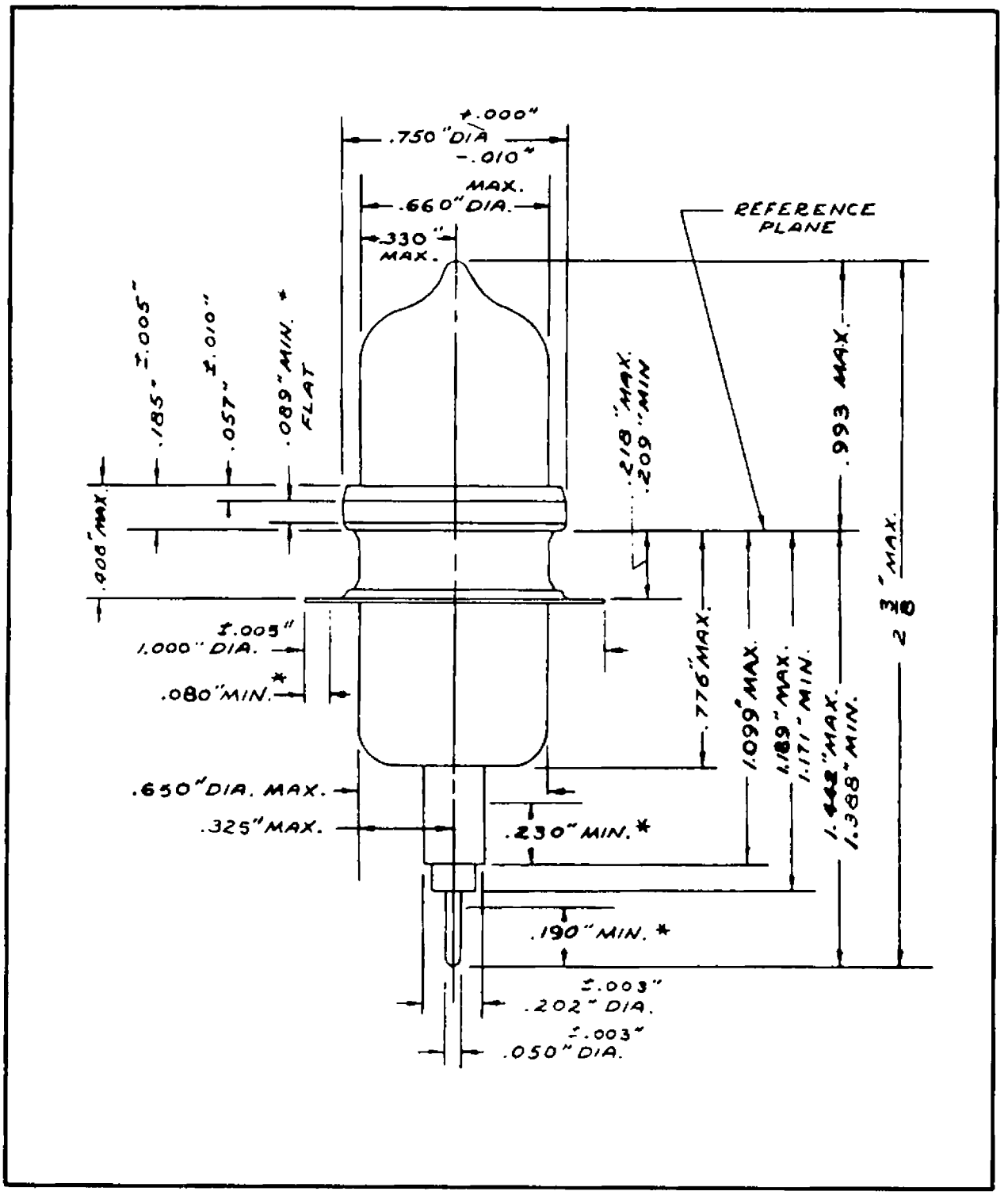


Fig. 2 Outline Drawing of the 5766.

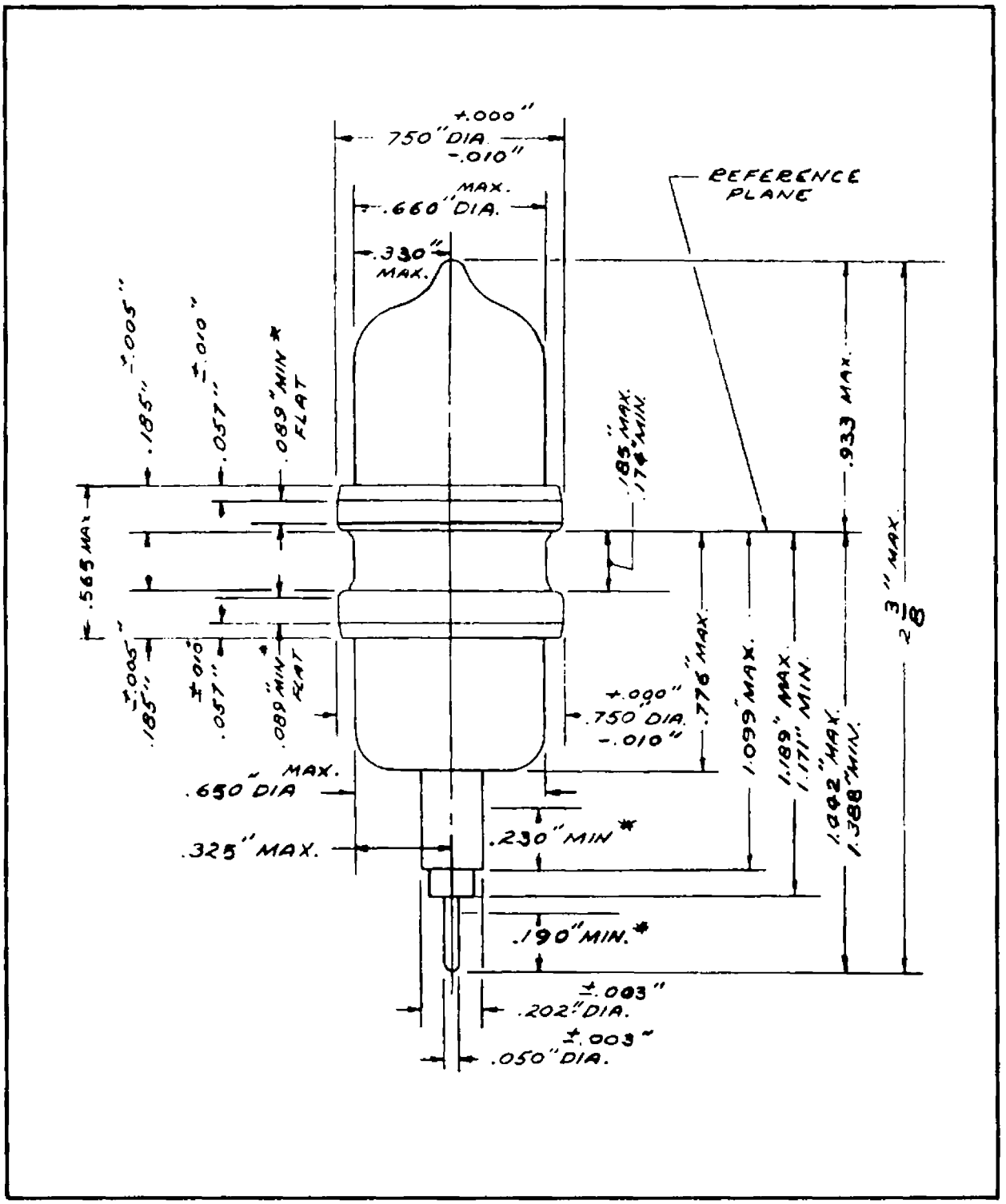


Fig. 3 Outline Drawing of the 5767.

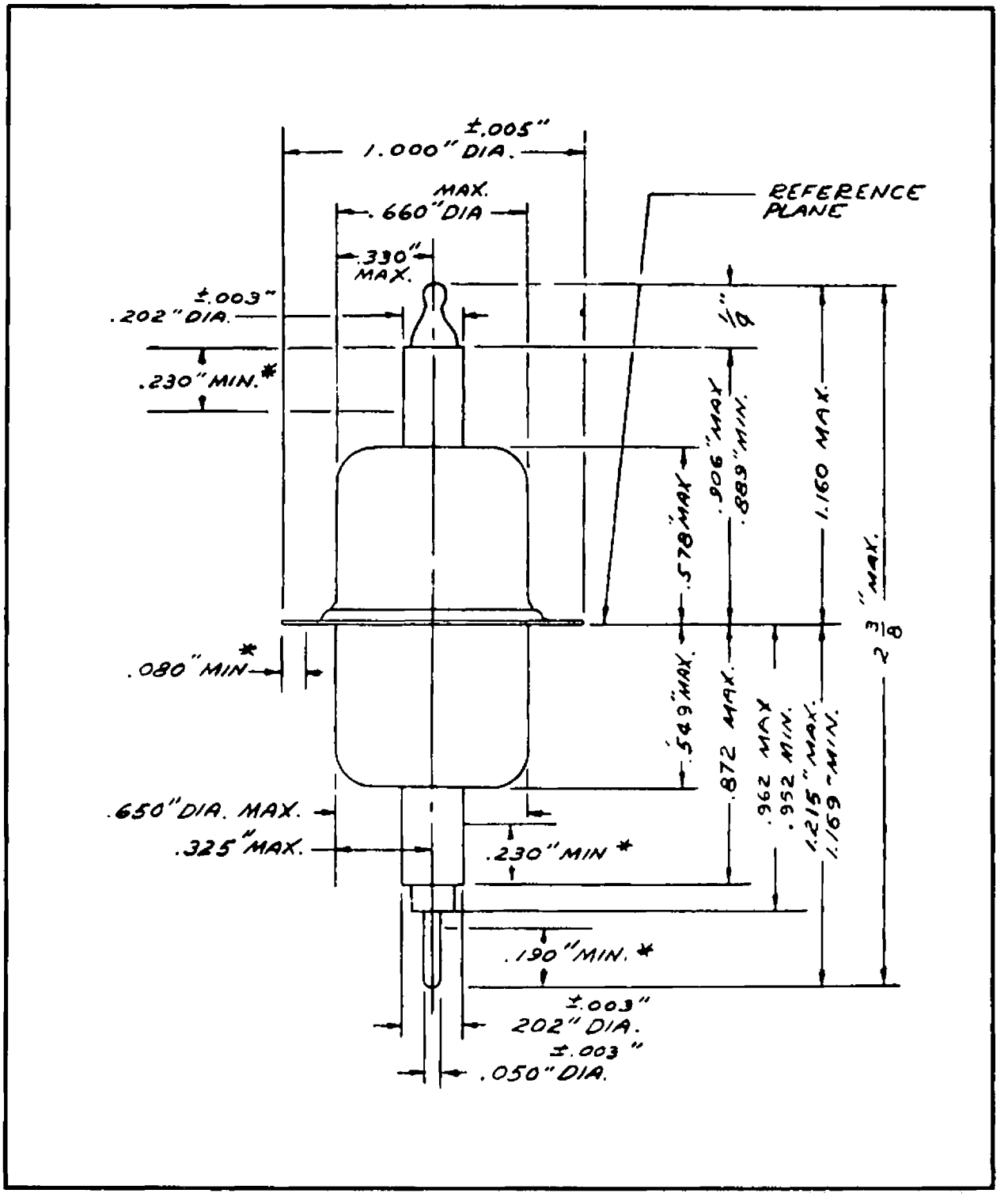


Fig. 4 Outline Drawing of the 5768.

CHARACTERISTIC CURVES

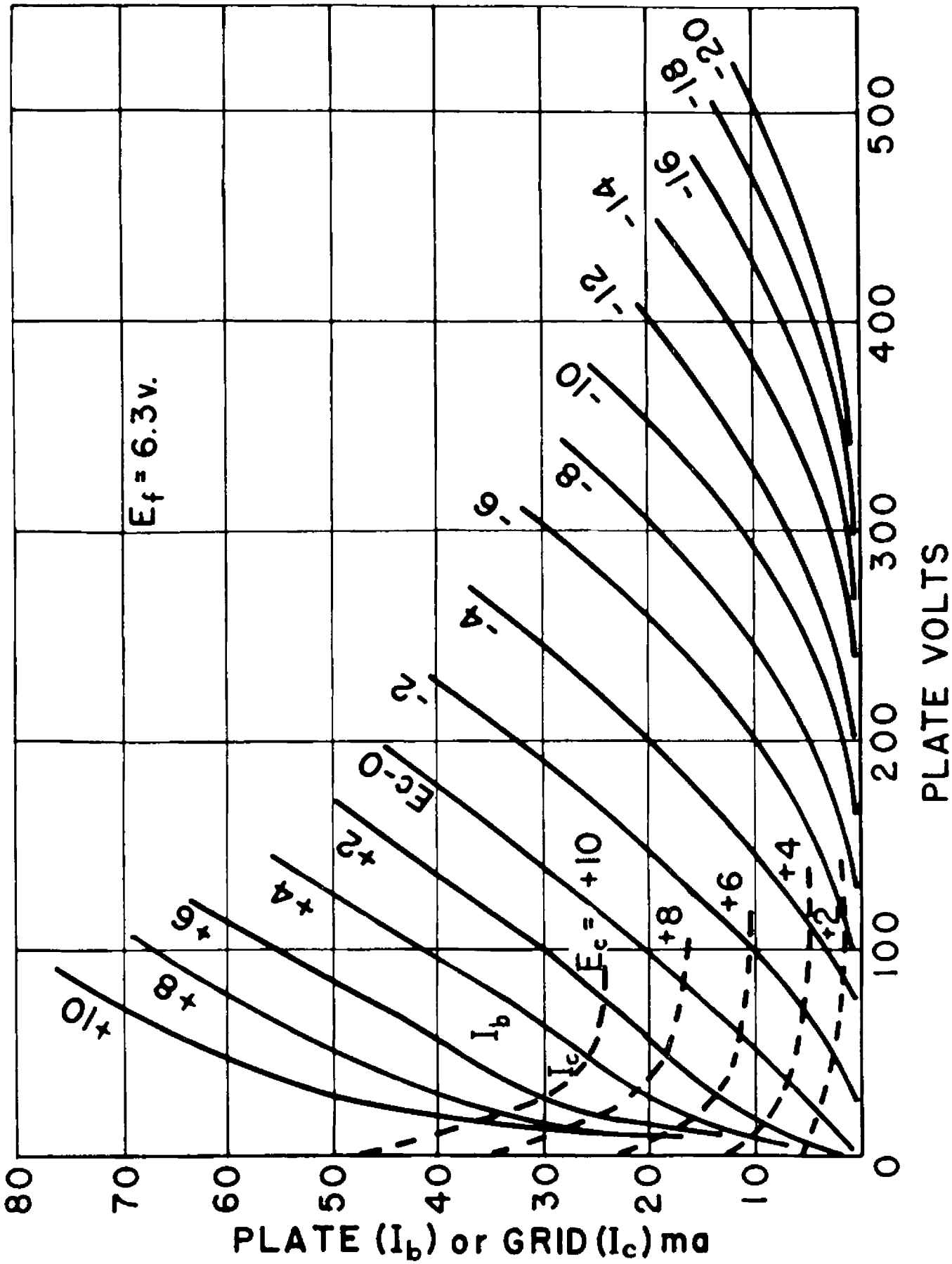


Fig. 5 SYLVANIA Type 2C37 Plate Characteristics.

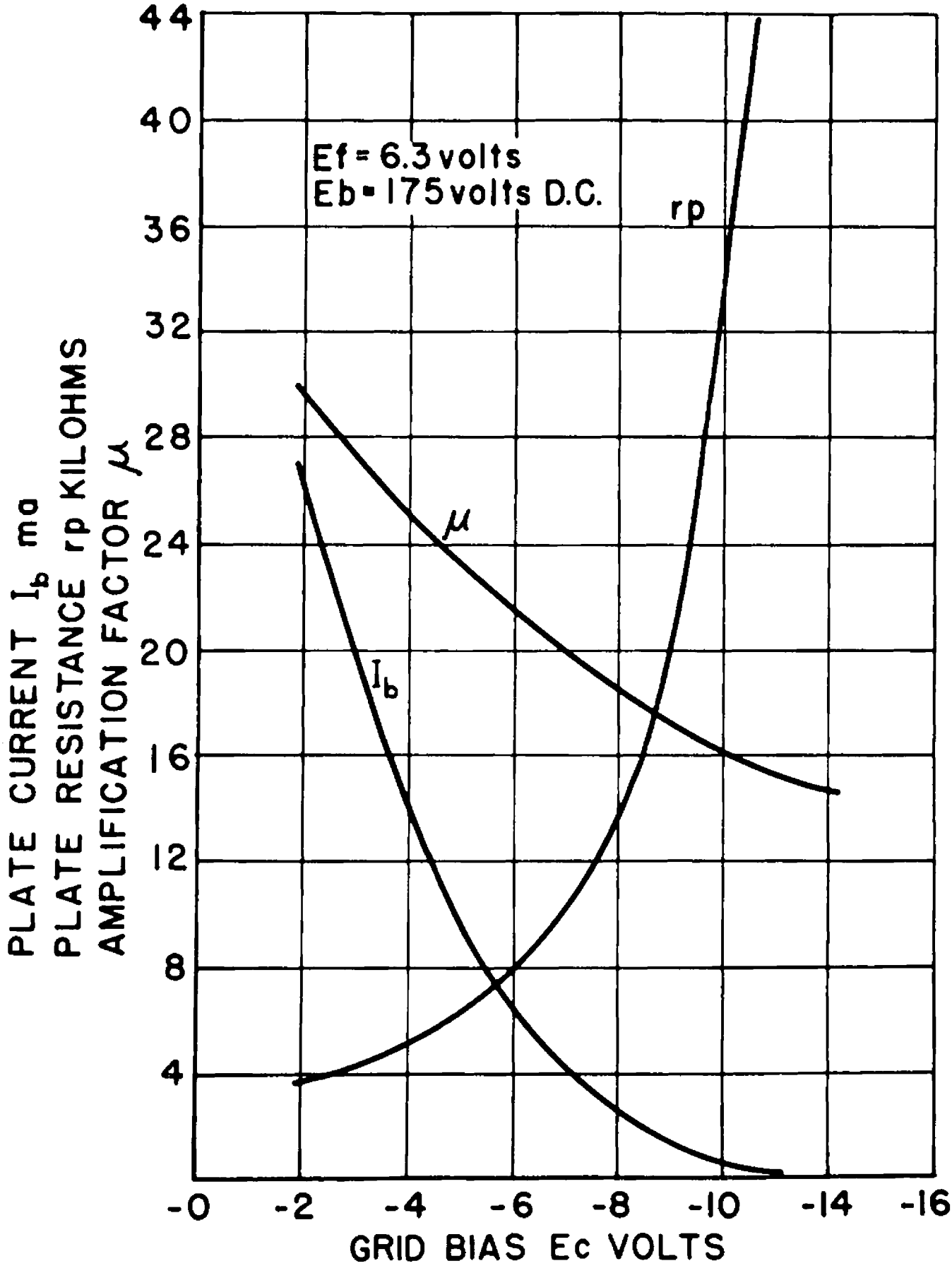
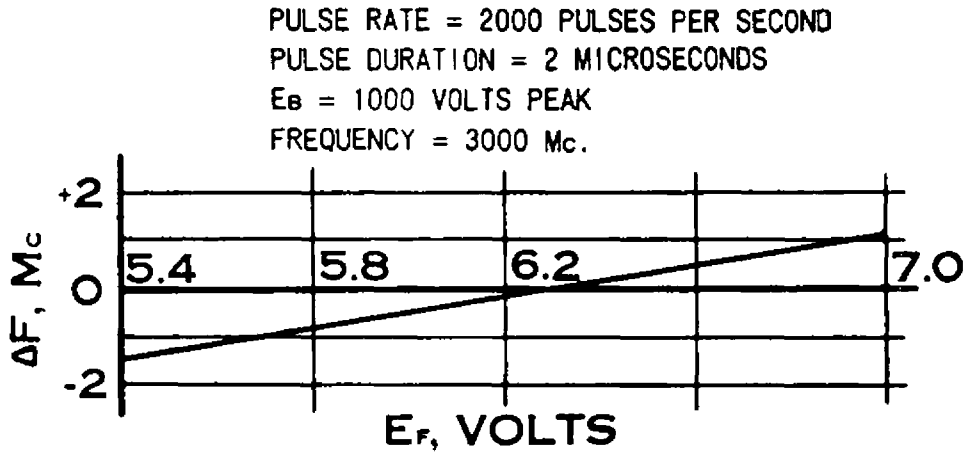
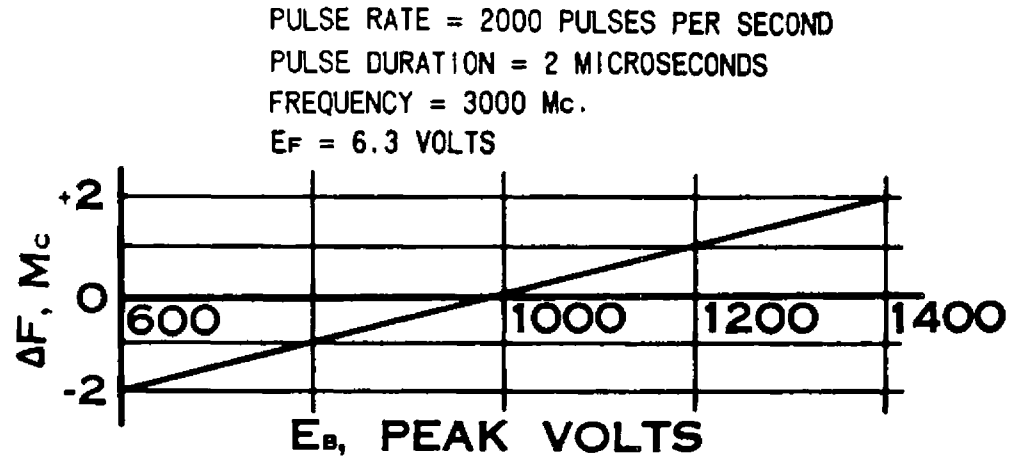


Fig. 6 SYLVANIA Type 2C37 Transfer Characteristics.

Typical Frequency Drift Characteristics, Pulse-Modulated Oscillator





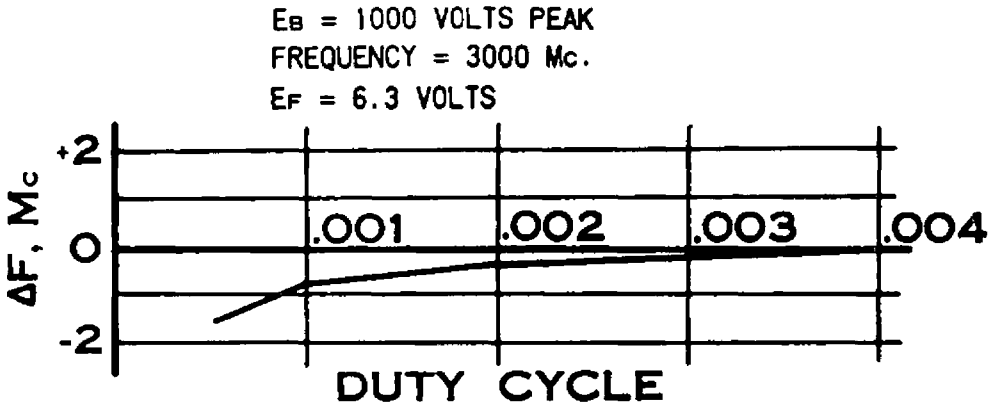


Fig. 7. At 3000 megacycles center frequency, the frequency drift in changing the heater voltages from 5.4 to 7.0 is in the order of 2 megacycles per volt. Likewise, the drift in changing the peak plate voltage from 600 to 1400 is approximately one-half megacycle per 100 volts. The total drift in changing the duty cycle from 0.0005 to 0.004 is in the order of 2 megacycles.

APPLICATIONS

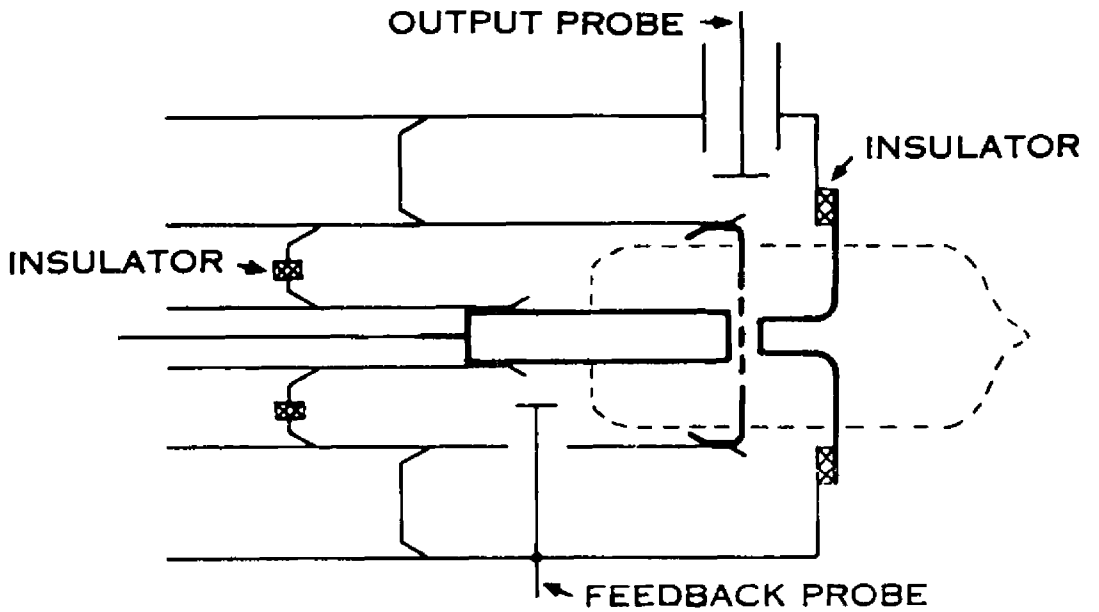


Fig. 8. A type 2C37 in a typical quarter-wave concentric-line circuit. An external probe provides the external feedback necessary for oscillation. If the tube is used as an amplifier, the feedback probe may be removed and a loop or probe connected to the input line.

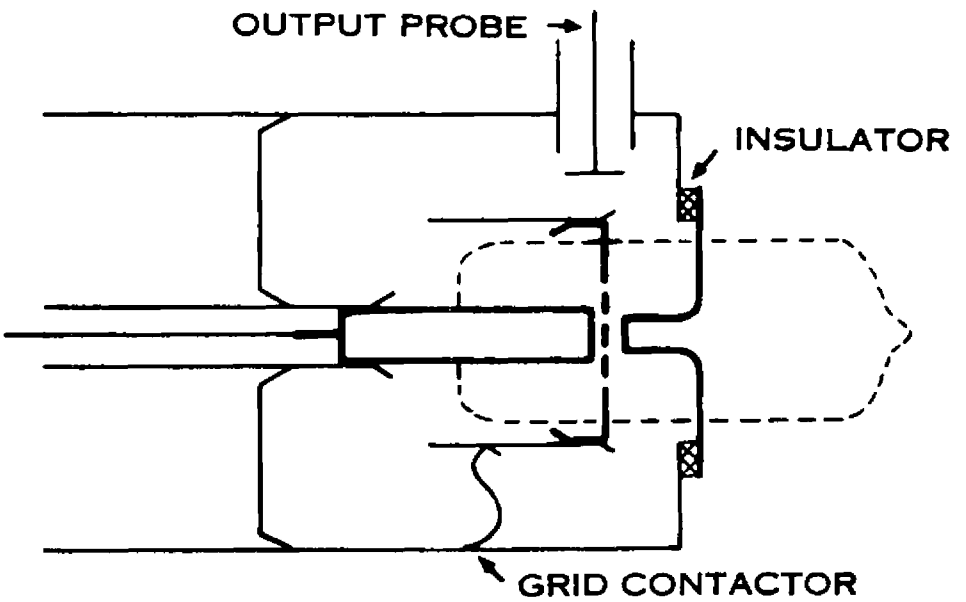


Fig. 9. A type 5764 is shown in this circuit in which the length of cylinder on the grid forming a half-wave transmission line determines the frequency of operation. Direct current contact to the grid is made through a spring clip from the wall of the cavity, and it may be insulated from the cavity with a capacitance by-pass. For plate-pulse modulation the grid is operated at D.C. ground potential so that no insulation is necessary. Tuning the plunger optimizes power output with very little effect on frequency. Feedback is accomplished by the open-ended grid cylinder, allowing currents to flow from the output circuit to the input circuit. Power is coupled by means of a probe or loop as usual.