RCA nuvistor

General-Purpose Industrial Medium-Mu Triode

7586

■ Low-voltage operation ■ Low heater drain ■ Very high transconductance at low plate current ■ Exceptional uniformity of characteristics from tube to tube ■ Operation at full ratings at all altitudes ■ Rigorously controlled and tested ■ All-metal-and-ceramic construction ■ High resistance to shock and vibration ■ Only 8/10 inch long; less than 1/2 inch in diameter; weighs 1/15 oz.

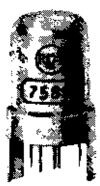
RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

Printed in U.S.A.

RCA-7586

MEDIUM-MU TRIODE

Nuvistor Type for Industrial Applications



Actual Size

RCA-7586 is a medium-mu general-purpose nuvistor triode of the heater-cathode type designed for use in a wide variety of applications in industrial equipment where compactness, low-drain low-voltage operation, exceptional uniformity of characteristics from tube to tube, and ability to withstand mechanical shock and vibration are primary design requirements. It is capable of providing high gain with low noise in amplifier service, and excellent stability as an oscillator, over a wide range of frequencies.

General Features

The 7586 has a metal envelope provided with two peripheral lugs of unequal width for indexing, is only 8/10" long, less than 1/2" in diameter, and weighs approximately 1/15 ounce (1.9 grams). It features (1) a very rugged structure of unique design, (2) a 6.3-volt low-wattage heater, and a specially designed cathode made of passive material to assure very low interface resistance and leakage, (3) very high transconductance at low plate voltage and current (11500 micromhos at 75 volts and 10.5 milliamperes), (4) very high input impedance, (5) high perveance, and (6) ability to operate at any altitude at full ratings.

Structural Features

A major feature of the 7586 is its all-ceramic-and-metal construction utilizing a light-weight, cantilever-supported cylindrical electrode structure. This unique type of electrode structure, inherent in the nuvistor design, uses only strong metals and ceramics to provide a structure of extreme ruggedness. All connections are brazed at very high temperatures in a hydrogen atmosphere to eliminate the structural strain and element distortion often caused by welding. The tube is also exhausted and sealed at very high temperatures to eliminate the gases and impurities which are generally present in electron devices processed at low temperatures.

The structure of the 7586 nuvistor triode also permits automatic assembly using parts made to extremely small tolerances, thus assuring exceptional uniformity of characteristics from tube to tube.

Special Tests and Controls

The 7586 is rigidly controlled during manufacture, and is subjected to rigorous tests for intermittent shorts and interelectrode leakage; for early-hour, 100-hour, and 1000-hour conduction life performance; for resistance to impact shock, low-frequency vibration, variable-frequency vibration, low-pressure breakdown, 1000-hour standby-life performance, and heater cycling.

These special controls and tests, together with high transconductance at low plate currents and voltages, small power requirements, ability to operate at full ratings at any altitude, and extremely small size, make the 7586 nuvistor triode exceptionally desirable for critical industrial applications--for example, in communications equipment, control and instrumentation equipment, medical electronic equipment, TV cameras, and test and measurement instruments.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (ac or dc)	6.3 ± 10%	volts
Current at 6.3 volts	0.135	amp
Direct Interelectrode Capacitances:		
Grid to plate	2.2	μμf
Grid to cathode, heater, & shell	4.2	μμf
Plate to cathode, heater, & shell	1.6	μμf
Heater to cathode	1.4	μμf
Plate to cathode	0.26	μμf

Characteristics, Class A_1 Amplifier:

Plate-Supply Voltage	-	-	75	volts
Plate Voltage	26.5	40	-	volts
Grid-Supply Voltage	0	0	0	volts
Cathode Resistor	-	-	100	ohms
Grid-Circuit Resistance	0.5	0.5	-	megohm
Amplification Factor	31	35	35	
Plate Resistance (Approx.)	4400	3200	3000	ohms
Transconductance	7000	11000	11500	μmhos
Plate Current	2.8	6.8	10.5	ma
Grid Voltage (Approx.) for plate current = 10 μa	-	-	-7.0	volts

Mechanical:

Operating Position	Any
Maximum Over-all Length	0.8"
Maximum Seated Height	0.625"
Maximum Diameter	0.440"
Envelope	Metal Shell
Base	Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)
Socket	Cinch Mfg. Co. No.133 65 10 001, or Equivalent

INDUSTRIAL SERVICE

Maximum Ratings, *Absolute-Maximum Values:*

For Operation at Any Altitude

PLATE SUPPLY VOLTAGE	330 max.	volts
PLATE VOLTAGE	110 max.	volts
GRID VOLTAGE:		
Negative-bias value	55 max.	volts
Peak positive value	4 max.	volts
PLATE DISSIPATION	1 max.	watt
GRID CURRENT	2 max.	ma
CATHODE CURRENT	15 max.	ma
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Maximum Circuit Values:

Grid-Circuit Resistance*:		
For fixed-bias operation	0.5 max.	megohm
For cathode-bias operation	1 max.	megohm

* For Operation at Metal-Shell Temperatures up to 150° C (See *Dimensional Outline* on Page 9).

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current	1	0.125	0.145	amp
Direct Interelectrode Capacitances:				
Grid to plate	2	1.8	2.6	μμf
Grid to cathode, heater, & shell	2	3.8	4.6	μμf
Plate to cathode, heater, & shell	2	1.4	1.8	μμf
Heater to cathode	2	1.1	1.7	μμf
Plate to cathode	2	0.2	0.32	μμf
Plate Current (1)	1,3	9.0	12.5	ma
Plate Current (2)	1,4	-	50	μa
Transconductance (1)	1,3	10000	13000	μmhos
Transconductance (2)	3,5	9000	-	μmhos
Transconductance Change:				
Difference between Transconductance (1) and Transconductance (2), expressed in per cent of Transconductance (1)	-	-	15	%
Reverse Grid Current	1,6	-	0.1	μa
Amplification Factor	1,3	28	40	
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,7	-	5	μa
Heater positive with respect to cathode	1,7	-	5	μa
Leakage Resistance:				
Between grid and all other electrodes tied together	1,8	1000	-	megohms
Between plate and all other electrodes tied together	1,9	1000	-	megohms

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured in accordance with EIA Standard RS-191-A.

Note 3: With dc plate volts = 75, cathode resistor = 100 ohms, and cathode-bypass capacitor = 1000 μf.

Note 4: With dc plate volts = 75, dc grid volts = -7, and metal shell grounded.

Note 5: With 5.7 volts ac or dc on heater.

Note 6: With dc plate volts = 80, grid supply volts = -1.2, grid resistor = 0.5 megohm, and metal shell grounded.

Note 7: With 100 volts dc applied between heater and cathode.

Note 8: With grid 100 volts negative with respect to all other electrodes tied together.

Note 9: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS AND PERFORMANCE DATA

Shock Rating:

Impact Acceleration . . . . 1000 max. g

This test is performed on a sample lot of tubes from each production run to determine ability of tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a Navy Type, High-impact (flyweight) Shock Machine and are subjected to 20 blows at the specified maximum impact acceleration. At the end of this test, tubes are criticized for change in transconductance, reverse grid current, and heater-cathode leakage current, and are then subjected to the Variable-Frequency Vibration Test described later.

Fatigue Rating:

Vibrational Acceleration. . . . . 2.5 max. g

This test is performed on a sample lot of tubes to determine ability of tube to withstand the specified vibrational acceleration. Tubes are rigidly mounted, supplied with nominal heater voltage only, and subjected for 48 hours to 2.5 g vibrational acceleration at 60 cycles per second in the X_1 position. At the end of this test, tubes are criticized for the same characteristics and end-point values as in the Shock Rating Test described previously.

Variable-Frequency-Vibration Performance:

FREQUENCY RANGE (cps)	MAX. PERMISSIBLE RMS OUTPUT VOLTAGE (millivolts)
50 to 6000	25
6000 to 15000	500

This test is performed on a sample lot of tubes from each production run. The tube is operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1) with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in the X_1 position through the frequency range from 50 to 15000 cycles per second under the following conditions: a sweep rate of one octave per 30 seconds from 50 to 3000 cps and a 7-second sweep from 3000 to 15000 cps, with a constant vibrational acceleration of 1 g. During the test, tube will not show an rms output voltage across the plate-load resistor in excess of the value shown in the adjoining chart for the specified frequency range.

Low-Pressure Voltage-Breakdown Test:

This test is performed on a sample lot of tubes from each production run. In this test tubes are operated with 240 rms volts applied between plate and all other electrodes and will not break down or show evidence of corona when subjected to air pressures equivalent to altitudes of up to 100000 feet.

Heater Cycling

Cycles of Intermittent Operation. . . . . 2000 min. cycles

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 7.5 cycled one minute on and two minutes off; heater 100 volts negative with respect to cathode; grid, plate, and metal shell connected to ground. At the end of this test tubes are tested for open heaters and heater-cathode shorts.

Intermittent Shorts

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyratron-Type Shorts Test described in MIL-E-ID, Amendment 2, Par. 4.7.7, except that tapping is done by hand with a soft rubber tapper*. The Acceptance Curve for this test is shown in Fig.4. In this test tubes are criticized for permanent or temporary shorts and open circuits.

Early-Hour Stability Life Performance

This test is performed on a sample lot of tubes from each production run to insure that tubes are properly stabilized. In this test tubes are operated for 20 hours at maximum rated plate dissipation. After two hours of operation and again after 20 hours of operation tubes are checked for transconductance under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1). A tube is rejected if its transconductance after two or 20 hours of operation has changed more than 10 per cent from the 0-hour value.

100-Hour Life Performance

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early-hour inoperatives. Tubes are operated for 100 hours at maximum rated plate dissipation, and then subjected to the Intermittent Shorts Test previously described. Tubes must then show a transconductance of not less than 8300 micromhos under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance (1).

1000-Hour Conduction Life Performance

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and guard against epidemic failures due to excessive changes in any of the characteristics indicated below. In this test tubes are operated for 1000 hours at maximum rated plate dissipation,● and then criticized for inoperatives, reverse grid current, heater-cathode leakage current, and leakage resistance. In addition, the average change in transconductance of the lot from the 0-hour value for Transconductance (1) specified in CHARACTERISTICS RANGE VALUES, must not exceed 15 per cent at 500 hours, and 20 per cent at 1000 hours.

1000-Hour Standby Life Performance

This test is performed on a sample lot of tubes from each production run. The tubes are operated for 1000 hours with only heater voltage applied. The

* Specifications for this tapper will be supplied on request.

● At a shell temperature of 150° C.

tubes are then criticized for interelectrode leakage, reverse grid current, change in transconductance of individual tubes from the zero-hour values and for cathode interface resistance greater than 25 ohms. Interface resistance is measured by Method B of ASTM specification F300-57T.

OPERATING CONSIDERATIONS

The *base-pins* of the 7856 fit the Cinch Mfg. Co. socket No. 133 6510 001 or equivalent. The socket may be mounted to hold the tube in any position.

The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

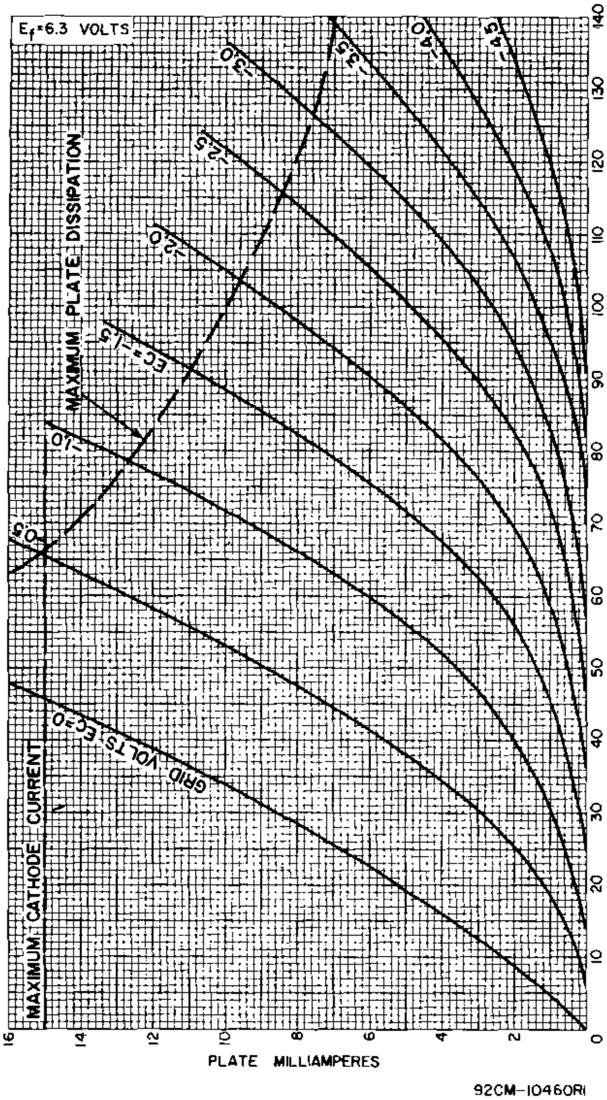


Fig.1 - Average Plate Characteristics for Type 7586.

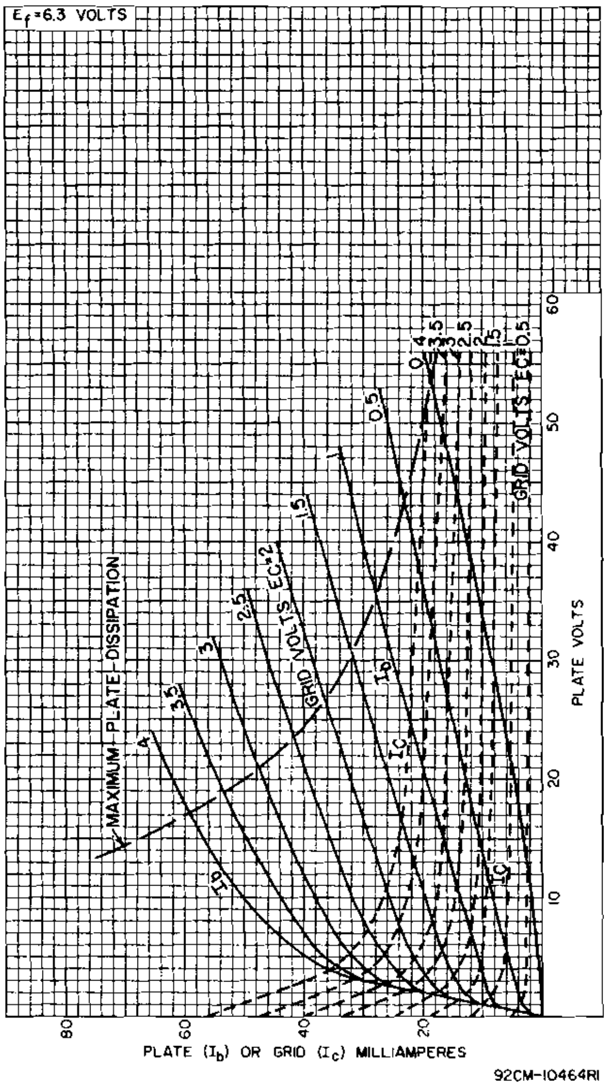


Fig.2 - Average Characteristics for Type 7586.

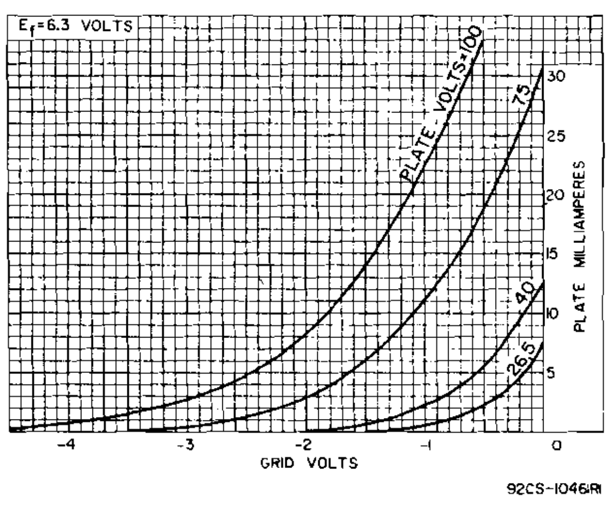


Fig.3 - Average Characteristics for Type 7586.

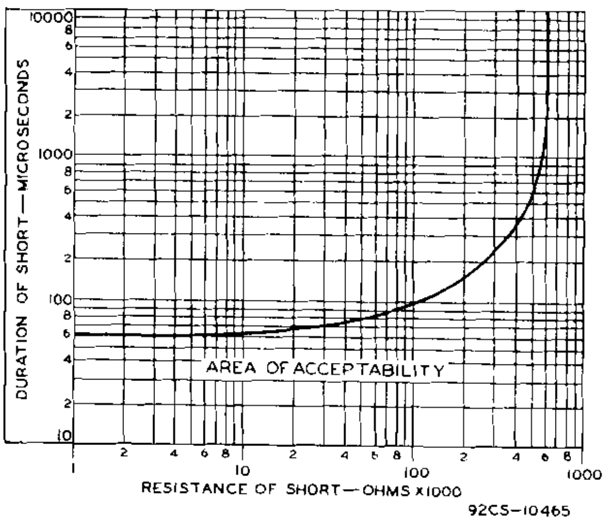


Fig.4 - Thyratron-Type Shorts Test for Type 7586.

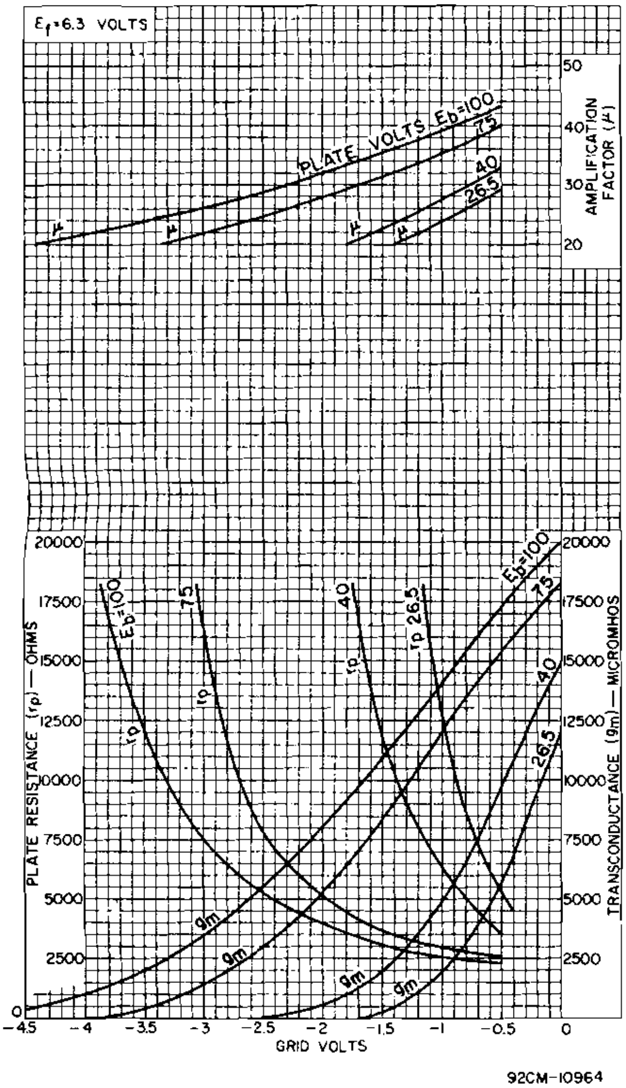
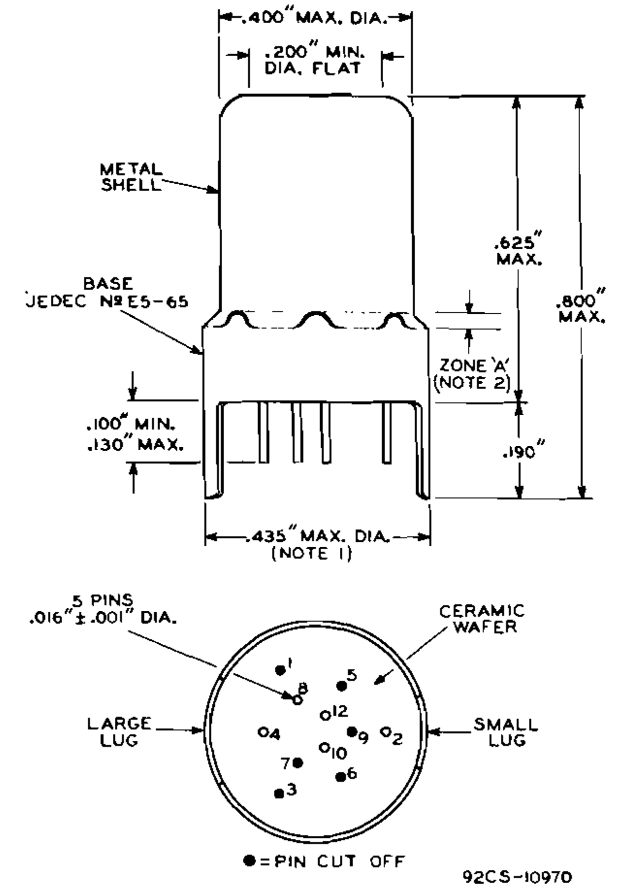


Fig.5 - Average Characteristics for Type 7586.

DIMENSIONAL OUTLINE

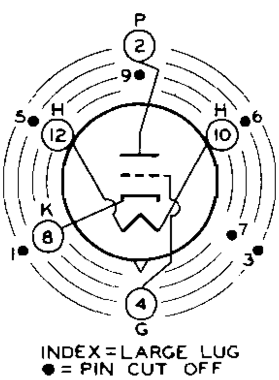


Note 1: Maximum O.D. of 0.440" is permitted along 0.190" lug length.

Note 2: Shell temperature should be measured in the zone 'A' indicated by broken lines.

BASING DIAGRAM (Bottom View)

Pin 1: ▲
Pin 2: Plate
Pin 3: ▲
Pin 4: Grid
Pin 5: ▲
Pin 6: ▲

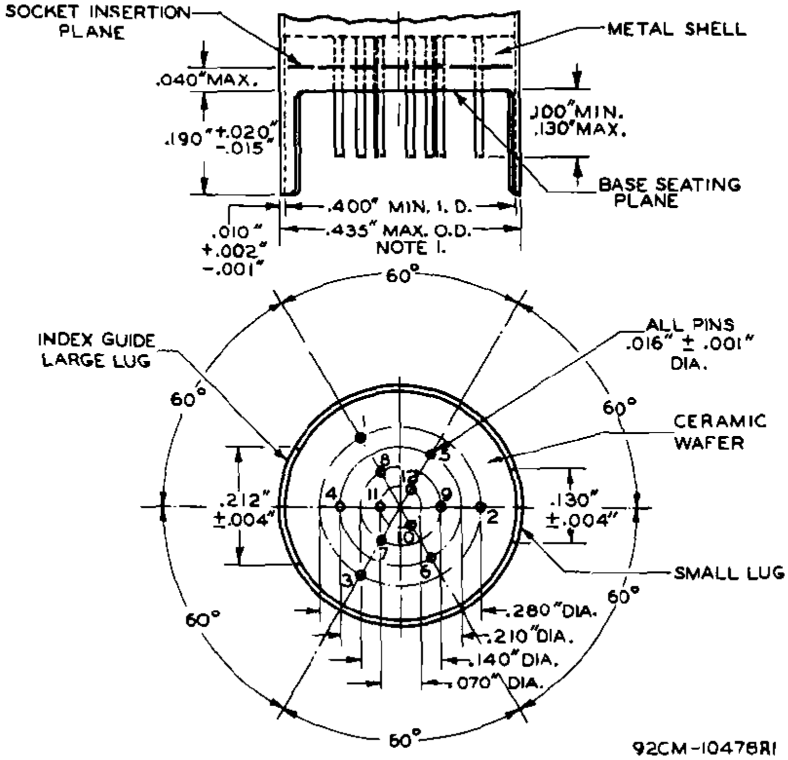


12AQ

Pin 7: ▲
Pin 8: Cathode
Pin 9: ▲
Pin 10: Heater
Pin 11: Omitted
Pin 12: Heater

▲ Pin has internal connection and is cut off close to ceramic wafer--Do Not Use.

MEDIUM CERAMIC-WAFER TWELVAR BASE



JEDEC NO.	NAME	PINS
E12-64	12-Pin Base	1,2,3,4,5,6,7,8,9,10,11,12
E5-65	5-Pin Base	2,4,8,10,12, (Note 2)

Note 1: Maximum O.D. of 0.440" is permitted along the 0.190" lug length.

Note 2: Pins 1,3,5,6,7, and 9 are cut off to a length such that their ends do not touch the socket insertion plane. Pin 11 is omitted.

PIN-ALIGNMENT GAUGE

Base-pin positions and lug positions shall be held to tolerances such that entire length of pins and lugs will without undue force pass into and disengage from flat-plate gauge having thickness of 0.25" and twelve holes of 0.0350" ± 0.0005" diameter located on four concentric circles as follows: three holes located on 0.2800" ± 0.0005", three holes located on 0.2100" ± 0.0005", three holes located on 0.1400" ± 0.0005", three holes located on 0.0700" ± 0.0005" diameter circles at specified angles with a tolerance of ± 0.08° for each angle. In addition, gauge provides for two curved slots with chordal lengths of 0.2270" ± 0.0005" and 0.1450" ± 0.0005" located on 0.4200" ± 0.0005" diameter circle concentric with pin circles at 180° ± 0.08° and having a width of 0.0230" ± 0.0005".

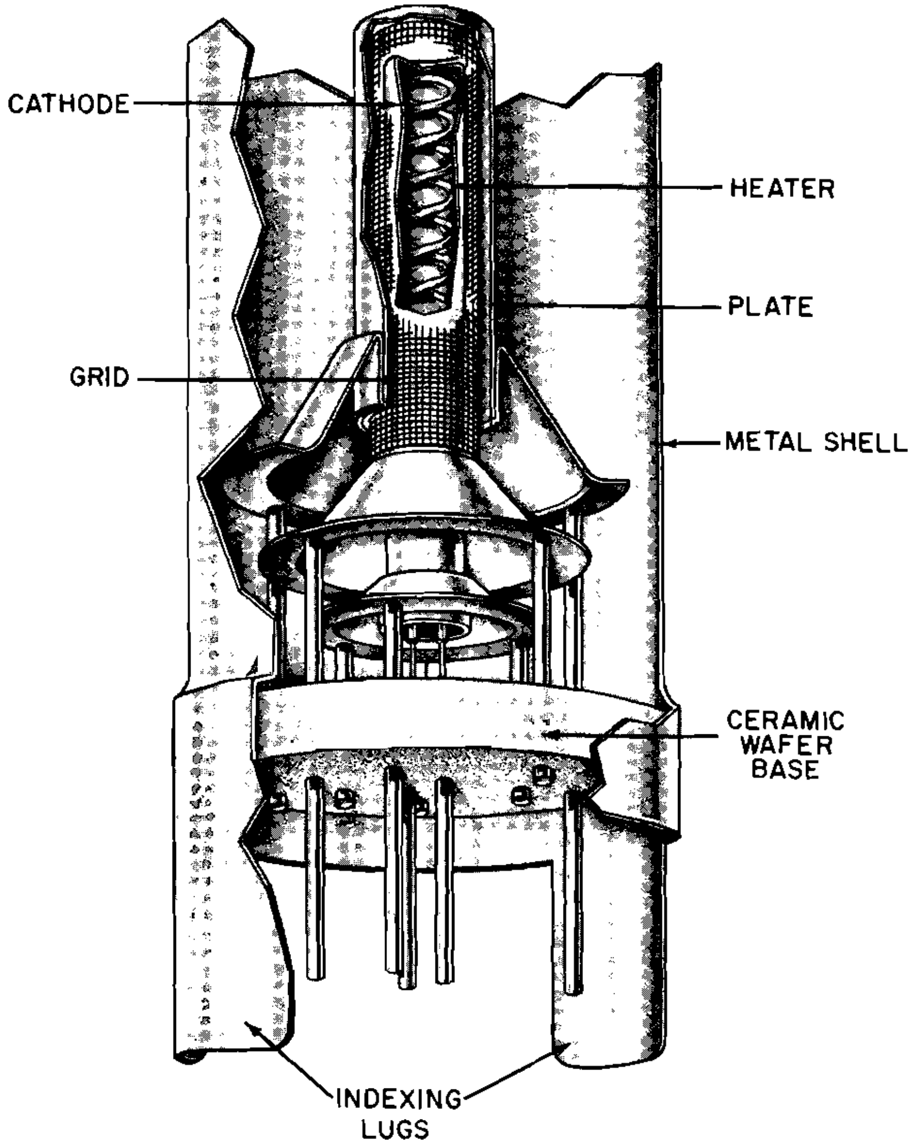


Fig.6 - Illustration of a nuvistor triode showing cylindrical electrodes and tripod-like supports.

RCA