



ELECTRONIC TUBE REFERENCE

1636

Specialized - Uncategorized electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

OTHER

RCA ultra-high-frequency electron-beam tube using dynode bombardment, developed for operation around 400–600 MHz. Available source material does not establish a narrower standardized functional category.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	— / —	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Other*No fixed ratings recorded.**Source-derived section; promoted fields populated where applicable.***1636 — U-H-F Beam-Deflection Mixer**

The **1636** is a specialized vacuum tube designed primarily as a mixer for operation at ultra-high frequencies (UHF) from 400 to 600 megacycles. It operates on the principle of deflection control of an electron beam rather than conventional grid-control methods. By utilizing a pair of deflecting electrodes positioned outside the main electron stream, the tube achieves extremely low input-circuit loading and minimized coupling between the input and output circuits. Additionally, the 1636 incorporates a single stage of secondary-emission multiplication (a dynode) to increase its overall transconductance, providing a several-fold improvement in gain and a superior signal-to-noise ratio compared to conventional UHF tubes of its era.

Internal Construction and Operating Principles

The 1636 features a unique internal structure designed to form, focus, deflect, and multiply an electron beam. The electrode arrangement consists of:

- **Cathode and Cathode Shield (Grid No. 1):** These elements generate and initially shape the electron stream.
- **First and Second Apertures (Grids No. 2 and 3):** These electrodes accelerate and form the electrons into a well-defined, rectangular beam.
- **Deflecting Electrodes (DJ1 and DJ2):** Located on either side of the beam path, these electrodes are used to focus, center, and deflect the beam. Because they do not intercept the electron stream, they require very little power, which minimizes input-circuit loading at ultra-high frequencies.
- **Third Aperture and Barrier (Grid No. 4):** This electrode features a rectangular opening divided lengthwise by a central barrier, forming two narrow apertures.
- **Dynode:** A secondary-emission multiplier plate located immediately behind Grid No. 4.

Grids No. 2, 3, and 4 are operated at a common positive voltage and are constructed as a single physical assembly known as the **grid-anode**.

In the quiescent (no-signal) state, when the electron beam is properly focused and centered, the central barrier of Grid No. 4 is aligned with the apertures of Grids No. 2 and 3, effectively blocking the beam from reaching the dynode. When a signal or local oscillator voltage is applied to the deflecting electrodes, the beam is swept to either side of the barrier, passing through the narrow apertures of Grid No. 4 to bombard the dynode.

Upon bombardment, the dynode releases secondary electrons. Because the dynode is operated at a lower positive potential than the grid-anode, these secondary electrons are attracted back to the grid-anode assembly. The resulting output current of the tube is obtained from the dynode and grid-anode circuit. If the beam is deflected too far to either side, it is cut off by the outer limits of the Grid No. 4 apertures, resulting in a double-peaked output current characteristic curve.

Physical Specifications and Installation

The 1636 is housed in a T-10-1/2 glass bulb and utilizes a Medium Shell Octal 8-pin base. It features three external cap terminals to accommodate high-frequency connections and minimize lead inductance: one cap at the top of the bulb for the dynode, and two caps on the side of the bulb for the deflecting electrodes (DJ1 and DJ2).

Physical Dimensions

- **Overall Length:** 4-11/16 inches $\pm$ 1/8 inch
- **Maximum Seated Height:** 4-1/4 inches
- **Bulb Radius:** 1-1/8 inches $\pm$ 1/16 inch

Base Pin Connections (Bottom View)

The octal base connections are assigned as follows:

- **Pin 1:** Internal Connection (Do not use)
- **Pin 2:** Grid-Anode (Grids No. 2, 3, 4)
- **Pin 3:** Internal Connection (Do not use)
- **Pin 4:** Cathode Shield (Grid No. 1)
- **Pin 5:** Grid-Anode (Grids No. 2, 3, 4)
- **Pin 6:** Grid-Anode (Grids No. 2, 3, 4)
- **Pin 7:** Heater
- **Pin 8:** Heater and Cathode

Installation Guidelines

The tube can be mounted and operated in any physical position. Because of the delicate glass-to-metal seals of the terminal caps, specific installation precautions must be observed:

- **Flexible Leads:** All connections to the top and side caps must use highly flexible lead wires to prevent mechanical strain on the glass seals during thermal expansion.
- **No Soldering:** Connections must never be soldered directly to the cap terminals, as the intense heat can crack the glass seals. Instead, spring-loaded clamps should be attached to the lead wires and slipped gently onto the terminals.
- **No Component Support:** The terminal caps must never be used to mechanically support other circuit components.
- **Heater Voltage:** The heater is designed for a nominal 6.3 V (AC or DC) supply and must be maintained within $\pm 10\%$ of this rated value under all operating conditions.

Electrical Ratings and Typical Operating Conditions

The maximum ratings and typical operating parameters for the 1636 are established as design-center values:

Maximum Ratings

- **Grid-Anode (Grids No. 2, 3, 4) Voltage:** 300 max. Volts
- **Dynode Voltage:** 250 max. Volts
- **Deflecting Electrode Voltage (Focusing):** 150 max. Volts
- **Grid-Anode Dissipation:** 3 max. Watts

Typical Operating Conditions

- **Heater Voltage:** 6.3 V
- **Heater Current:** 0.3 A
- **Grid-Anode Voltage:** 300 V
- **Dynode Voltage:** 240 V
- **Deflecting Electrode Focusing Voltage:** 140 V (must be adjustable by ± 15 V for beam focusing)
- **Deflecting Electrode Centering Voltage:** -5 to +5 V (measured with respect to the focusing voltage)

- **Cathode Shield (Grid No. 1) Voltage:** 0 V (a 1000-ohm cathode self-biasing resistor is recommended to place the shield at ground potential)
- **Deflecting Electrode Voltage (for fundamental oscillator operation):** 1 max. Volt peak-to-peak

Direct Interelectrode Capacitances

- **Each Deflecting Electrode to Grid-Anode:** 1 μF
- **Deflecting Electrode DJ1 to Deflecting Electrode DJ2:** 1 max. μF
- **Dynode to Grid-Anode:** 1.4 μF

Note on Operation: To prevent damage to the secondary-emitting surface of the dynode, the electron beam should not be allowed to remain stationary on the dynode longer than is necessary to perform circuit adjustments.

Mixer Application and Alignment Procedure

The 1636 is highly flexible and can operate as a mixer on the fundamental frequency of the local oscillator, or on its second or third harmonics. Operation on the fundamental frequency is highly recommended because it yields the best signal-to-noise ratio.

Alignment and Tuning Steps

1. **Initial Voltage Setup:** Apply the typical operating voltages to the grid-anode and dynode.
2. **Beam Focusing and Centering:** Without applying any RF signals, adjust the deflecting-electrode focusing and centering voltages simultaneously. The goal is to obtain the lowest possible minimum quiescent dynode current. This indicates that the electron beam is sharply focused and centered directly on the Grid No. 4 barrier, preventing electrons from reaching the dynode. If the beam is poorly focused or distorted by external magnetic fields, the quiescent current will be high, and the characteristic curve will deform.
3. **Signal Tuning:** Apply an RF signal (typically in the order of 20 millivolts) to the deflecting electrodes without the local oscillator running. Tune the input circuit for maximum step-up, which is indicated by a peak in the output current.
4. **Local Oscillator Coupling:** Couple the local oscillator to the input circuit. Adjust the oscillator's frequency and amplitude until the resulting dynode current is between 10% and 20% of the maximum instantaneous dynode current (the peak current on the characteristic curve).
5. **Final Optimization:** Perform a final adjustment of the focusing and centering voltages to achieve the best overall gain.

Harmonic Operation

- **Second-Harmonic Operation:** Requires the beam centering voltage to be adjusted to the point of maximum slope on the output current characteristic curve. The local oscillator excitation must be increased compared to fundamental operation.
- **Third-Harmonic Operation:** Uses the same centering adjustment as fundamental operation, but requires twice the local oscillator excitation.

- *Performance Trade-off:* Both second- and third-harmonic operations result in slightly lower gain and a significantly poorer signal-to-noise ratio than fundamental operation.

Noise Performance

When operated on the local oscillator fundamental in its designed frequency range of 400 to 600 megacycles, a receiver using the 1636 in its first stage exhibits an equivalent noise voltage of approximately 13 dB above the thermal noise of a dummy antenna. This represents an approximate 3 dB improvement in signal-to-noise performance over contemporary commercial UHF tubes.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1940 RCA

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1940 RCA

Section 1 · Other

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
RCA	1636	RCA-1636 Is a mixer tube designed primarily * Centering voltage is given with respect to deflecting-
400 to 600 megacycles. t employs a new princi~ *x 1000~ohm cathode re	1000 ohm	400 to 600 megacycles. t employs a new princi~ *x 1000~ohm cathode resistor is recommended.
ple in that the operation of the tube depends on ## Must be adjustable to	15 V	ple in that the operation of the tube depends on ## Must be adjustable to +15 volts in order to focus the
HEATER VOLTAGE (A.C. or D.C.)	6.3 V	HEATER VOLTAGE (A.C. or D.C.) 6.3 Volts FIRST
HEATER CURRENT	300 mA	HEATER CURRENT 0.3 Ampere APERTURE THIRD
GRID-ANODE (Grids No0	300 V	GRID-ANODE (Grids No0.2,3,4) VOLTAGE 300 max. Volts
DYNODE VOLTAGE	4	DYNODE VOLTAGE 250 max. Volis located just past the Grid No.4 sothat it inter—
DEFLECTING ELECTRODE VOLTAGE (Focusing)	150 V	DEFLECTING ELECTRODE VOLTAGE (Focusing) 150 max. Volts cepts the electron beam when the beam is deflected
GRID—ANODE DISSIPATION	3 W	GRID—ANODE DISSIPATION 3 max. Watts
Grid-Anode Voltage	300 V	Grid-Anode Voltage 300 Volts the dynode is operated at a lower voltage with
Dynode Voltage	240 V	Dynode Voltage 240 Volts
Voltage	140 V	Voltage 140 Volts ondary electrons from the dynode are attracted
voltage TM	1636 V	voltage TM -5 to+5 Volts to the grid—-anode. The output of the 1636 ap-

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode Shield (Grid No	0 V	Cathode Shield (Grid No.1) 0 Volts pears in the dynode, grid—anode circuit.
mental Frequency	1 V	mental Frequency 1 max. Volt# rier which divides a rectangular opening in the
bardment of the dynode by the electron beam. When cathode. A self-biasing resistor of {	0 ohm	bardment of the dynode by the electron beam. When cathode. A self-biasing resistor of {000 ohms
of	20	of 20 millivolts and without the local osciilator increasing the signal input coupling stightly
75-OHM INPUT SHIELDED LINE	75 ohm	75-OHM INPUT SHIELDED LINE
of the designed (	3 MHz	of the designed (400 to 600 mc). This isabout 3 dbbetter
IS	2	IS 2545 AS MEASURED TIPS OF DJ) & DJp= 2°

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
of Grid No	4	of Grid No.4. The output current characteristic adjustable positive voltage (for focusing), should

TUBE TINKER

An independent reference for electronic tubes, vacuum tubes, and their source documents.

Catalog

Tube types

Full books

Blog

Feedback & corrections

© 2026 Tube Tinker