



## ELECTRONIC TUBE REFERENCE

# 1B5

Voltage - Triode (with diode, heptode or hexode) electronic tube

CONSOLIDATED TECHNICAL  
DATA

**3 SECTIONS**

CONSTRUCTION

**DIODE-DIODE-TRIODE**

Directly heated double-diode triode for detector, AVC, and audio voltage-amplifier service in battery receivers. Two diodes provide signal and control-voltage rectification while the triode supplies subsequent audio gain.

## GENERAL CHARACTERISTICS

|                     |                |                      |               |
|---------------------|----------------|----------------------|---------------|
| BASE DESIGNATION    | 6M             | BASE PINS            | 6             |
| NOMINAL HEATER      | 2 V / 60 mA    | PARALLEL HEATER      | – / –         |
| HEATING             | Direct         | SERIES OPERATION     | Not specified |
| CATHODE ARRANGEMENT | Common cathode | SECTION CONSTRUCTION | Dissimilar    |

## SECTION RATINGS

### SECTION1 Diode

|                         |       |
|-------------------------|-------|
| MAXIMUM PLATE VOLTAGE   | 135 V |
| MAXIMUM CATHODE CURRENT | 1 mA  |

*Detector/AVC diode section 1; source publishes no separate fixed electrical ratings for the diode.*

### SECTION2 Diode

|                         |       |
|-------------------------|-------|
| MAXIMUM PLATE VOLTAGE   | 135 V |
| MAXIMUM CATHODE CURRENT | 1 mA  |

*Detector/AVC diode section 2; source publishes no separate fixed electrical ratings for the diode.*

|                                                 |                |
|-------------------------------------------------|----------------|
| <b>SECTION3</b> Triode                          |                |
| <b>PLATE RESISTANCE</b>                         | 35000 $\Omega$ |
| <b>TRANSCONDUCTANCE</b>                         | 0.000575 S     |
| <b>AMPLIFICATION FACTOR</b>                     | 20             |
| <b>MAXIMUM PLATE VOLTAGE</b>                    | 135 V          |
| <b>MAXIMUM CATHODE CURRENT</b>                  | 5 mA           |
| <i>Triode section Class A1 characteristics.</i> |                |

## 1B5 — Duplex-Diode Triode Vacuum Tube

The **1B5** (also designated as **1B5/25-S**, **1B5/25S**, and originally introduced as the **25S**) is a duplex-diode triode vacuum tube designed for battery-operated radio receivers. It combines two independent diodes and a single medium-mu triode within a single envelope, sharing a common filament. The tube is primarily intended to function as a combined detector, automatic volume control (AVC) rectifier, and audio-frequency (LF) amplifier.

The 1B5 belongs to the 2-volt filament series. In terms of application, it is similar to the Type [6R7](#), and its octal-based equivalent is the [1H6G](#).

### Mechanical Specifications and Filament Ratings

The 1B5 is constructed with a coated filament designed for direct-current (DC) operation. The physical envelope is an ST-12 glass bulb.

The physical dimensions of the ST-12 envelope are:

- **Maximum Diameter:** 1-9/16 inches
- **Maximum Overall Length:** 4-3/16 inches
- **Maximum Seated Height:** 3-9/16 inches

The tube is designed to be mounted vertically with the base down. Horizontal operation is also permitted, provided that pins 2 and 5 are aligned in a horizontal plane.

The filament ratings are:

- **Filament Voltage (DC):** 2.0 V
- **Filament Current:** 0.06 A

The filament operation and shielding requirements are comparable to those of the type [1A6](#).

### Pinout and Base Configurations

The 1B5 utilizes a small 6-pin base (also referred to as the 6M base connection). The documented pin connections for this base configuration vary across historical specifications. Two distinct pinout

arrangements are recorded:

## Configuration A

- **Pin 1:** Filament Positive (F+)
- **Pin 2:** Triode Plate (PT)
- **Pin 3:** Diode Plate 2 (PC2)
- **Pin 4:** Diode Plate 1 (PD1)
- **Pin 5:** Triode Grid (GT)
- **Pin 6:** Filament Negative (F-)

## Configuration B

- **Pin 1:** Diode Plate 1 (P1)
- **Pin 2:** Filament (F)
- **Pin 3:** Control Grid (G)
- **Pin 4:** Diode Plate 2 (P2)
- **Pin 5:** Filament (F)
- **Pin 6:** Triode Plate (P)

## Electrical Characteristics and Class A1 Operation

The triode section of the 1B5 is designed for Class A1 voltage amplification. The direct interelectrode capacitances of the triode section, measured without an external shield, are:

- **Grid-to-Plate:** 3.6  $\mu\text{F}$
- **Input (Grid-to-Filament):** 1.6  $\mu\text{F}$
- **Output (Plate-to-Filament):** 1.9  $\mu\text{F}$

Under typical Class A1 operating conditions, the triode section exhibits the following characteristics:

- **Maximum Plate Voltage:** 135 V
- **Control Grid Voltage:** -3.0 V
- **Plate Current:** 0.8 mA
- **Plate Resistance ( $r_p$ ):** 35,000 Ohms
- **Transconductance ( $g_m$ ):** 575  $\mu\text{mhos}$
- **Amplification Factor ( $\mu$ ):** 20

## Diode Construction and AVC Applications

The diode section consists of two independent diode plates positioned below the triode section. These diode plates are cylindrical, with each plate surrounding one end of the filament. Because the filament is directly heated by a 2.0 V DC source, a 2-volt potential difference exists between the filament sections associated with the two diodes. Diode Plate 1 is located at the negative end of the filament, while Diode

Plate 2 is located at the positive end. For detection, Diode Plate 1 is recommended to avoid signal delay. Diode operation curves can be referenced from the type [6B7](#).

The physical separation and potential difference across the filament allow for several distinct automatic volume control (AVC) and detection configurations:

- **Non-Delayed AVC:** Only the diode plate at the negative end of the filament (Diode Plate 1) is used. The plate return is connected directly to the negative pole of the filament.
- **Delayed AVC:** The diode surrounding the positive end of the filament (Diode Plate 2) is utilized for detection, with its plate return connected to the positive pole of the filament. The other diode (Diode Plate 1) is used for AVC, with its return connected to the negative pole of the bias voltage.
- **Highly Delayed AVC:** The diode at the negative end of the filament is used for detection, with its return connected to the negative low-voltage filament terminal. The diode at the positive end of the filament provides the AVC voltage, with its return connected to the negative pole of the bias voltage. This configuration provides the AVC diode with an additional bias that is 2 volts higher than the applied bias voltage due to the filament potential drop.

In typical receiver circuits, the triode section is coupled to the diode detector via an ordinary coupling capacitor, and the triode grid is connected to the bias voltage through a 1-megohm grid leak resistor.

## Qualitative Curve Analysis

The published characteristic curves for the 1B5 triode section illustrate standard triode behavior under various operating conditions:

- **Plate Characteristics ( $I_b$  vs.  $E_b$ ):** Plotted for grid voltages ( $E_c$ ) from 0 V to -15.0 V in -1.5 V steps. At  $E_c = 0$  V, the plate current reaches approximately 1.0 mA at a plate voltage of 100 V, and up to 1.5 mA at approximately 120 V. The curves shift uniformly to the right as the negative grid bias increases.
- **Triode Characteristics vs. Plate Current ( $I_b$ ):** At a constant filament voltage of 2.0 V DC and a plate voltage of 135 V, the triode parameters behave as follows over a plate current range of 0.1 mA to 1.2 mA:
  - **Amplification Factor ( $\mu$ ):** Remains nearly flat and constant at approximately 20 across the entire plate current range.
  - **Plate Resistance ( $r_p$ ):** Decreases non-linearly and sharply from approximately 110 k $\Omega$  at 0.1 mA down to approximately 30 k $\Omega$  at 1.2 mA.
  - **Transconductance ( $g_m$ ):** Increases non-linearly from approximately 180-200  $\mu$ mhos at 0.1 mA up to approximately 650-675  $\mu$ mhos at 1.2 mA.

## Technical Summary

The **1B5** is a 2-volt filamentary duplex-diode triode designed for battery-operated receivers. It integrates two independent diodes and a medium-mu triode (with an amplification factor of 20) sharing a single filament. Operating at a maximum plate voltage of 135 V, the triode section provides audio amplification, while the dual-diode structure allows for flexible detection and non-delayed, delayed, or highly delayed AVC configurations. Housed in an ST-12 glass bulb with a small 6-pin base, the 1B5 offers a compact, multi-functional solution for low-power, battery-driven radio designs.

## SOURCE OPERATING CONDITIONS

# 1937 Raytheon Radio Receiving Tubes

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

## 1937 RAYTHEON RADIO RECEIVING TUBES

## Section 2 · Diode

| OTHER                           |                 |                             |
|---------------------------------|-----------------|-----------------------------|
| PARAMETER                       | PUBLISHED VALUE | CONDITION / NOTE            |
| Number of identical diode units | 2 count         | IdenticalSectionsCompressed |

## 1937 RAYTHEON RADIO RECEIVING TUBES

## Section 3 · Triode

| OTHER         |                 |                  |
|---------------|-----------------|------------------|
| PARAMETER     | PUBLISHED VALUE | CONDITION / NOTE |
| Plate voltage | 135 V           | ClassA           |
| Grid bias     | -3 V            | ClassA           |
| Plate current | 0.8 mA          | ClassA           |

| CAPACITANCE               |                 |                  |
|---------------------------|-----------------|------------------|
| PARAMETER                 | PUBLISHED VALUE | CONDITION / NOTE |
| Grid-to-plate capacitance | 3.8 pF          | TriodeSection    |
| Input capacitance         | 2 pF            | TriodeSection    |
| Output capacitance        | 3 pF            | TriodeSection    |

## 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 · Diode

| OTHER                   |                 |                  |
|-------------------------|-----------------|------------------|
| PARAMETER               | PUBLISHED VALUE | CONDITION / NOTE |
| HeaterVoltageNominal    | 2 V             | Nominal          |
| HeaterCurrentNominal    | 60 mA           | Nominal          |
| Maximum Plate Voltage   | 135 V           | —                |
| Maximum Cathode Current | 1 mA            | —                |

1940 RCA

Section 3 · Triode

| OTHER                   |                 |                  |
|-------------------------|-----------------|------------------|
| PARAMETER               | PUBLISHED VALUE | CONDITION / NOTE |
| HeaterVoltageNominal    | 2 V             | Nominal          |
| HeaterCurrentNominal    | 60 mA           | Nominal          |
| Maximum Plate Voltage   | 135 V           | —                |
| Maximum Cathode Current | 5 mA            | —                |

| CHARACTERISTIC       |                 |                  |
|----------------------|-----------------|------------------|
| PARAMETER            | PUBLISHED VALUE | CONDITION / NOTE |
| Transconductance     | 575 $\mu$ S     | Typical          |
| Amplification Factor | 20              | Typical          |
| Plate Resistance     | 31500 ohm       | Typical          |



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

SOURCE PDF

1950 Sylvania

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

1950 SYLVANIA

Section 3 · Triode

| CHARACTERISTIC                                |                 |                                        |
|-----------------------------------------------|-----------------|----------------------------------------|
| PARAMETER                                     | PUBLISHED VALUE | CONDITION / NOTE                       |
| Tension filament (CC) ...<br>... .. 2,0 Volts | 2 V             | Tension filament (CC) ... .. 2,0 Volts |

| PARAMETER                                                                    | PUBLISHED VALUE | CONDITION / NOTE                                                          |
|------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------|
| Courant filament ... .. v<br>cor o e e e 0,06 ampère                         | 60 mA           | Courant filament ... .. v cor o e e e 0,06 ampère                         |
| Tension filament ... .. .<br>e 2,0 Volts                                     | 2 V             | Tension filament ... .. e 2,0 Volts                                       |
| Courant plaque ... ..<br>... .. o .. 0,8 ma                                  | 0.8 ma          | Courant plaque ... .. o .. 0,8 ma                                         |
| Résistance interne ... ..<br>... .. 35,000<br>ohms                           | 35 ohms         | Résistance interne ... .. 35,000<br>ohms                                  |
| son retour s'effectuant au<br>pôle négatif de la tension<br>de polarisation. | 1 A             | son retour s'effectuant au pôle négatif de la<br>tension de polarisation. |

| OTHER                                         |                 |                                            |
|-----------------------------------------------|-----------------|--------------------------------------------|
| PARAMETER                                     | PUBLISHED VALUE | CONDITION / NOTE                           |
| Tension plaque ... ..<br>0 L L 135 Volts max. | 135 V           | Tension plaque ... .. 0 L L 135 Volts max. |



## SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

# 195X General Electric Essential Characteristics

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

## 195X GENERAL ELECTRIC ESSENTIAL CHARACTERISTICS

### Section 3 · Triode

| CAPACITANCE               |                 |                  |
|---------------------------|-----------------|------------------|
| PARAMETER                 | PUBLISHED VALUE | CONDITION / NOTE |
| Input capacitance         | 1.6 pF          | Section1         |
| Output capacitance        | 1.9 pF          | Section1         |
| Grid-to-plate capacitance | 3.6 pF          | Section1         |

| OTHER                |                 |                  |
|----------------------|-----------------|------------------|
| PARAMETER            | PUBLISHED VALUE | CONDITION / NOTE |
| Plate voltage        | 135 V           | ClassA           |
| Control-grid voltage | -3 V            | ClassA           |

| PARAMETER     | PUBLISHED VALUE | CONDITION / NOTE |
|---------------|-----------------|------------------|
| Plate current | 0.8 mA          | ClassA           |

| CHARACTERISTIC       |                   |                  |
|----------------------|-------------------|------------------|
| PARAMETER            | PUBLISHED VALUE   | CONDITION / NOTE |
| Plate resistance     | 35000 $\Omega$    | ClassA           |
| Transconductance     | 575 $\mu\text{S}$ | ClassA           |
| Amplification factor | 20                | ClassA           |


SOURCE DATA APPENDIX

## SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

# 1961 Tung Sol

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

1961 TUNG SOL

## Section 3 · Triode

| OTHER                |                 |                  |
|----------------------|-----------------|------------------|
| PARAMETER            | PUBLISHED VALUE | CONDITION / NOTE |
| Filament Voltage     | 2 V             | Nominal          |
| Filament Current     | 60 mA           | Nominal          |
| Control Grid Voltage | -3 V            | ClassA1          |
| Plate Current        | 0.8 mA          | ClassA1          |

| CAPACITANCE               |                 |                  |
|---------------------------|-----------------|------------------|
| PARAMETER                 | PUBLISHED VALUE | CONDITION / NOTE |
| Grid To Plate Capacitance | 3.6 pF          | —                |
| Input Capacitance         | 1.6 pF          | —                |
| Output Capacitance        | 1.9 pF          | —                |

| CHARACTERISTIC       |                   |                  |
|----------------------|-------------------|------------------|
| PARAMETER            | PUBLISHED VALUE   | CONDITION / NOTE |
| Plate Resistance     | 35000 ohm         | ClassA1          |
| Transconductance     | 575 $\mu\text{S}$ | ClassA1          |
| Amplification Factor | 20                | ClassA1          |

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