

ELECTRONIC TUBE REFERENCE

10AL11

Power - Beam (NOT sweep) electronic tube

CONSOLIDATED TECHNICAL DATA  
2 SECTIONS  
CONSTRUCTION  
BEAMPOWER-PENTODE

Duodecar combination tube for television receivers, integrating a beam-power audio output section with a dual-control pentode used for FM detection and signal processing.

GENERAL CHARACTERISTICS

|                     |                   |                      |               |
|---------------------|-------------------|----------------------|---------------|
| BASE DESIGNATION    | 12BU              | BASE PINS            | 12            |
| NOMINAL HEATER      | 9.8 V / 600 mA    | PARALLEL HEATER      | – / –         |
| HEATING             | Indirect          | SERIES OPERATION     | Not specified |
| CATHODE ARRANGEMENT | Separate cathodes | SECTION CONSTRUCTION | Dissimilar    |

12BU - TERMINAL PINOUT

| TERMINAL | SECTION | ELEMENT              | STATUS    |
|----------|---------|----------------------|-----------|
| PIN1     | –       | H – Heater           | CONNECTED |
| PIN2     | B       | K – Cathode          | CONNECTED |
| PIN3     | B       | G1 – Control Grid    | CONNECTED |
| PIN4     | B       | G3 – Suppressor Grid | CONNECTED |
| PIN5     | –       | IS – Internal Screen | CONNECTED |
| PIN6     | B       | P – Plate (Anode)    | CONNECTED |
| PIN7     | B       | G2 – Screen Grid     | CONNECTED |
| PIN8     | A       | G1 – Control Grid    | CONNECTED |
| PIN9     | A       | G3 – Suppressor Grid | CONNECTED |
| PIN9     | A       | K – Cathode          | CONNECTED |
| PIN10    | A       | G2 – Screen Grid     | CONNECTED |
| PIN11    | A       | P – Plate (Anode)    | CONNECTED |
| PIN12    | –       | H – Heater           | CONNECTED |

## SECTION RATINGS

| SECTION1 Pentode                                                             |                 |
|------------------------------------------------------------------------------|-----------------|
| PLATE RESISTANCE                                                             | 150000 $\Omega$ |
| TRANSCONDUCTANCE                                                             | 0.001 S         |
| MAXIMUM PLATE VOLTAGE                                                        | 330 V           |
| MAXIMUM SCREEN VOLTAGE                                                       | 330 V           |
| MAXIMUM PLATE DISSIPATION                                                    | 1.7 W           |
| MAXIMUM SCREEN DISSIPATION                                                   | 1.1 W           |
| <i>Section 1 power pentode for audio-frequency output amplifier service.</i> |                 |

| SECTION2 Beam Power                                                                                                     |                 |
|-------------------------------------------------------------------------------------------------------------------------|-----------------|
| PLATE RESISTANCE                                                                                                        | 100000 $\Omega$ |
| TRANSCONDUCTANCE                                                                                                        | 0.0065 S        |
| MAXIMUM PLATE VOLTAGE                                                                                                   | 275 V           |
| MAXIMUM SCREEN VOLTAGE                                                                                                  | 275 V           |
| MAXIMUM PLATE DISSIPATION                                                                                               | 10 W            |
| MAXIMUM SCREEN DISSIPATION                                                                                              | 2 W             |
| <i>Section 2 sharp-cutoff dual-control pentode for FM detector service; grid-3 control data retained as parameters.</i> |                 |

## 10AL11 — Dissimilar Double Pentode Compactron

The **10AL11** is a multi-unit vacuum tube of the compactron design, combining two dissimilar pentode sections within a single T-9 glass envelope. It features a sharp-cutoff, dual-control pentode (Section 2) and a high-power pentode (Section 1). This device is primarily designed for television receiver applications, where the dual-control pentode serves as an FM detector and the power pentode operates as an audio-frequency output amplifier.

### Construction, Heater, and Pinout

The 10AL11 is constructed in a T-9 glass bulb with a 12-pin button duodecar base (E12-70 outline, JEDEC 9-58). The tube features coated unipotential cathodes and can be operated in any mounting position.

The heater is designed for series-string or parallel operation with a nominal voltage of **9.8 V** and a current of **0.6 A** (600 mA), with a controlled warm-up time of **11 seconds**. The heater current limits are specified at  $600 \pm 40$  mA. The heater-to-cathode voltage ratings are:

- **Heater positive with respect to cathode:** 100 V maximum DC component, 200 V maximum total DC and peak.
- **Heater negative with respect to cathode:** 200 V maximum total DC and peak.

The JEDEC 12BU basing diagram defines the pin connections as follows:

- **Pin 1:** Heater (H)
- **Pin 2:** Cathode, Section 2 (2K)
- **Pin 3:** Grid No. 1, Section 2 (2G1)
- **Pin 4:** Grid No. 3, Section 2 (2G3)
- **Pin 5:** Internal Shield (IS)
- **Pin 6:** Plate, Section 2 (2P)
- **Pin 7:** Grid No. 2, Section 2 (2G2)
- **Pin 8:** Grid No. 1, Section 1 (1G1)
- **Pin 9:** Cathode and Grid No. 3, Section 1 (1K, 1G3)
- **Pin 10:** Grid No. 2, Section 1 (1G2)
- **Pin 11:** Plate, Section 1 (1P)
- **Pin 12:** Heater (H)

## Section 1: Beam Power Unit (Power Pentode)

Section 1 is a power pentode designed for Class A1 audio amplification. It is capable of delivering moderate power output with low distortion when driven by typical audio-frequency signals.

### Maximum Ratings (Design-Maximum Values)

- **Plate Voltage:** 275 V
- **Grid No. 2 (Screen-Grid) Voltage:** 275 V
- **Plate Dissipation:** 10 W
- **Grid No. 2 Input:** 2 W

### Typical Operation (Class A1 Amplifier)

At a typical operating point, the power pentode exhibits the following characteristics:

- **Plate Voltage:** 250 V
- **Grid No. 2 Voltage:** 250 V
- **Grid No. 1 (Control-Grid) Voltage:** -8 V
- **Peak AF Grid No. 1 Voltage:** 8 V
- **Zero-Signal Plate Current:** 35 mA
- **Maximum-Signal Plate Current:** 39 mA
- **Zero-Signal Grid No. 2 Current:** 2.5 mA
- **Maximum-Signal Grid No. 2 Current:** 7 mA
- **Plate Resistance (Approx.):** 0.1 MΩ

- **Transconductance:** 6500  $\mu\text{mhos}$
- **Load Resistance:** 5000  $\Omega$
- **Total Harmonic Distortion:** 10%
- **Maximum-Signal Power Output:** 4.2 W

## Maximum Circuit Values

- **Grid No. 1 Circuit Resistance (Fixed Bias):** 0.25 M $\Omega$
- **Grid No. 1 Circuit Resistance (Cathode Bias):** 0.5 M $\Omega$

## Section 2: Pentode Unit (Dual-Control Pentode)

Section 2 is a sharp-cutoff, dual-control pentode designed for FM detector service. It features independent control grids (Grid No. 1 and Grid No. 3) that allow dual-signal modulation or gated detection.

## Maximum Ratings (Design-Maximum Values)

- **Plate Voltage:** 330 V
- **Grid No. 3 (Suppressor-Grid) Voltage:** 28 V
- **Grid No. 2 Supply Voltage:** 330 V
- **Grid No. 1 Voltage (Positive DC):** 0 V
- **Plate Dissipation:** 1.7 W
- **Grid No. 2 Input:**
  - For Grid No. 2 voltages up to 165 V: 1.1 W
  - For Grid No. 2 voltages between 165 V and 330 V: Must be limited in accordance with the Grid No. 2 rating chart (decreasing to 0 W at 330 V).

## Characteristics and Typical Operation (Class A1)

- **Plate Supply Voltage:** 150 V
- **Grid No. 3 Voltage:** 0 V
- **Grid No. 2 Supply Voltage:** 100 V
- **Cathode-Bias Resistor:** 560  $\Omega$
- **Plate Resistance (Approx.):** 0.15 M $\Omega$
- **Grid No. 1 to Plate Transconductance:** 1000  $\mu\text{mhos}$
- **Grid No. 3 to Plate Transconductance:** 400  $\mu\text{mhos}$
- **Plate Current:** 1.3 mA
- **Grid No. 2 Current:** 2.1 mA
- **Grid No. 1 Voltage (Approx.) for Plate Current of 30  $\mu\text{A}$ :** -4.5 V
- **Grid No. 3 Voltage (Approx.) for Plate Current of 50  $\mu\text{A}$ :** -4.5 V

# Interelectrode Capacitances

The direct interelectrode capacitances of the 10AL11 are specified separately for each section, along with the capacitive coupling between the two plates.

| Parameter                                                                           | Value    |
|-------------------------------------------------------------------------------------|----------|
| <b>Section 1 (Beam Power Unit)</b>                                                  |          |
| Grid No. 1 to Plate                                                                 | 0.26 pF  |
| Input: Grid No. 1 to (Cathode + Heater + Grid No. 2 + Grid No. 3 + Internal Shield) | 11 pF    |
| Output: Plate to (Cathode + Heater + Grid No. 2 + Grid No. 3 + Internal Shield)     | 12 pF    |
| <b>Section 2 (Pentode Unit)</b>                                                     |          |
| Grid No. 1 to Plate                                                                 | 0.034 pF |
| Grid No. 3 to Plate                                                                 | 3.2 pF   |
| Grid No. 1 to All except Plate                                                      | 6.5 pF   |
| Grid No. 3 to All                                                                   | 7.5 pF   |
| Grid No. 1 to Grid No. 3                                                            | 0.24 pF  |
| <b>Inter-Section</b>                                                                |          |
| Pentode Plate to Beam Power Plate (1P to 2P)                                        | 0.12 pF  |

## Related Designations

The **10AL11** belongs to a family of identical compactrons that differ only in their heater configurations:

- **6AL11**: Designed for a 6.3 V, 0.9 A heater supply.
- **12AL11**: Designed for a 12.6 V, 0.45 A heater supply with an 11-second warm-up time.

All other physical dimensions, pinouts, capacitances, and electrical ratings remain identical across these three designations.

## Technical Summary

The **10AL11** is a versatile duodecar-based compactron containing a high-power pentode and a dual-control sharp-cutoff pentode. By integrating these two distinct functions into a single T-9 envelope, it simplifies the design of FM detection and audio output stages in television receivers. Operating with a 9.8 V, 0.6 A heater, the device provides robust performance, offering up to 4.2 W of audio output from Section 1 and precise dual-control detection capabilities from Section 2.



## SOURCE OPERATING CONDITIONS

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# 1961 Tung Sol

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

1961 TUNG SOL

## Section 1 · Pentode

| CHARACTERISTIC         |                 |                  |
|------------------------|-----------------|------------------|
| PARAMETER              | PUBLISHED VALUE | CONDITION / NOTE |
| Grid1Transconductance  | 1000 $\mu$ S    | Section1         |
| Grid3 Transconductance | 400 $\mu$ S     | Section1         |

1961 TUNG SOL

## Section 2 · Beam Power

| OTHER        |                 |                      |
|--------------|-----------------|----------------------|
| PARAMETER    | PUBLISHED VALUE | CONDITION / NOTE     |
| Power Output | 4.7 W           | AudioFrequencyOutput |



## SOURCE OPERATING CONDITIONS

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# 1966 Tung Sol Electronic Tubes 2 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

## Section 1 · Pentode

| OTHER                        |                 |                  |
|------------------------------|-----------------|------------------|
| PARAMETER                    | PUBLISHED VALUE | CONDITION / NOTE |
| Plate voltage                | 250 V           | Section1;ClassA1 |
| Grid 2 voltage               | 250 V           | Section1;ClassA1 |
| Grid 1 voltage               | -8 V            | Section1;ClassA1 |
| Zero-signal plate current    | 35 mA           | Section1;ClassA1 |
| Maximum-signal plate current | 39 mA           | Section1;ClassA1 |

| PARAMETER                     | PUBLISHED VALUE | CONDITION / NOTE |
|-------------------------------|-----------------|------------------|
| Zero-signal grid 2 current    | 2.5 mA          | Section1;ClassA1 |
| Maximum-signal grid 2 current | 7 mA            | Section1;ClassA1 |
| Load resistance               | 5000 ohm        | Section1;ClassA1 |
| Maximum-signal power output   | 4.2 W           | Section1;ClassA1 |

| CHARACTERISTIC            |                 |                  |
|---------------------------|-----------------|------------------|
| PARAMETER                 | PUBLISHED VALUE | CONDITION / NOTE |
| Total harmonic distortion | 10 percent      | Section1;ClassA1 |

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

## Section 2 · Beam Power

| CHARACTERISTIC                                    |                 |                  |
|---------------------------------------------------|-----------------|------------------|
| PARAMETER                                         | PUBLISHED VALUE | CONDITION / NOTE |
| Plate voltage                                     | 150 V           | Section2         |
| Grid 2 voltage                                    | 100 V           | Section2         |
| Grid 3 voltage                                    | 0 V             | Section2         |
| Cathode bias resistor                             | 560 ohm         | Section2         |
| Plate current                                     | 1.3 mA          | Section2         |
| Grid 2 current                                    | 2.1 mA          | Section2         |
| Grid 3 transconductance                           | 400 $\mu$ S     | Section2         |
| Grid 1 cutoff voltage at 30 $\mu$ A plate current | -4.5 V          | Section2         |
| Grid 3 cutoff voltage at 50 $\mu$ A plate current | -4.5 V          | Section2         |
| Heater warm-up time                               | 11 s            | WholeTube        |



SOURCE DATA APPENDIX

### SOURCE OPERATING CONDITIONS

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# 1975 RCA RC30

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

1975 RCA RC30

## Section 2 · Beam Power

| CHARACTERISTIC                       |                    |                                            |
|--------------------------------------|--------------------|--------------------------------------------|
| PARAMETER                            | PUBLISHED VALUE    | CONDITION / NOTE                           |
| Peak Inverse Plate Voltage           | <b>330 volts</b>   | Published value from supplied target entry |
| Peak Plate Current (Per Plate)       | <b>54 mA</b>       | Published value from supplied target entry |
| AC Plate Voltage per Plate (rms)     | <b>117 volts</b>   | Published value from supplied target entry |
| Average Output Current per Plate     | <b>9 mA</b>        | Published value from supplied target entry |
| Heater Voltage (ac/dc)               | <b>12.6 volts</b>  | Published value from supplied target entry |
| Heater Current                       | <b>0.45 ampere</b> | Published value from supplied target entry |
| Heater Warm-up Time (Average)        | <b>11 seconds</b>  | Published value from supplied target entry |
| Plate Voltage                        | <b>275 volts</b>   | Published value from supplied target entry |
| Grid-No                              | <b>275 volts</b>   | Published value from supplied target entry |
| Plate Dissipation                    | <b>10 watts</b>    | Published value from supplied target entry |
| Grid-No                              | <b>2 watts</b>     | Published value from supplied target entry |
| Plate Voltage                        | <b>250 volts</b>   | Published value from supplied target entry |
| Grid-No                              | <b>250 volts</b>   | Published value from supplied target entry |
| Grid-No.1 (Control-Grid) Voltage     | <b>-8 volts</b>    | Published value from supplied target entry |
| Peak AF Grid-No.1 Voltage            | <b>8 volts</b>     | Published value from supplied target entry |
| Zero-Signal Plate Current            | <b>35 mA</b>       | Published value from supplied target entry |
| Zero-Signal Grid-No                  | <b>2.5 mA</b>      | Published value from supplied target entry |
| Plate Resistance (Approx.)           | <b>0.1 megohm</b>  | Published value from supplied target entry |
| Transconductance                     | <b>6500</b>        | Published value from supplied target entry |
| Load Resistance                      | <b>5000 ohms</b>   | Published value from supplied target entry |
| Plate Supply Voltage                 | <b>150 volts</b>   | Published value from supplied target entry |
| Grid-No                              | <b>0 volts</b>     | Published value from supplied target entry |
| Grid-No                              | <b>100 volts</b>   | Published value from supplied target entry |
| Plate Resistance (Approx.)           | <b>0.15 megohm</b> | Published value from supplied target entry |
| Transconductance, Grid No.1 to Plate | <b>1000</b>        | Published value from supplied target entry |
| Transconductance Grid No             | <b>400</b>         | Published value from supplied target entry |

| PARAMETER                                                | PUBLISHED VALUE  | CONDITION / NOTE                           |
|----------------------------------------------------------|------------------|--------------------------------------------|
| Plate Current                                            | <b>1.3 mA</b>    | Published value from supplied target entry |
| Grid-No                                                  | <b>2.1 mA</b>    | Published value from supplied target entry |
| Grid-No                                                  | <b>50</b>        | Published value from supplied target entry |
| Plate Voltage                                            | <b>330 volts</b> | Published value from supplied target entry |
| Grid-No                                                  | <b>28 volts</b>  | Published value from supplied target entry |
| Grid-No                                                  | <b>330 volts</b> | Published value from supplied target entry |
| Grid-No                                                  | <b>300</b>       | Published value from supplied target entry |
| Grid-No.1 (Control-Grid)<br>Voltage, Positive-bias value | <b>0 volts</b>   | Published value from supplied target entry |
| Plate Dissipation                                        | <b>-7 watts</b>  | Published value from supplied target entry |
| Grid-No                                                  | <b>2</b>         | Published value from supplied target entry |
| For grid-No                                              | <b>1.1 volts</b> | Published value from supplied target entry |
| For grid-No                                              | <b>300 volts</b> | Published value from supplied target entry |

| CAPACITANCE                          |                 |                                            |
|--------------------------------------|-----------------|--------------------------------------------|
| PARAMETER                            | PUBLISHED VALUE | CONDITION / NOTE                           |
| Plate to Cathode, Heater,<br>Grid No | <b>3</b>        | Published value from supplied target entry |
| Pentode Plate to Beam Power<br>Plate | <b>0.12 pF</b>  | Published value from supplied target entry |

| OTHER                        |                 |                                            |
|------------------------------|-----------------|--------------------------------------------|
| PARAMETER                    | PUBLISHED VALUE | CONDITION / NOTE                           |
| Maximum-Signal Plate Current | <b>39 mA</b>    | Published value from supplied target entry |
| Maximum-Signal Grid-No       | <b>7 mA</b>     | Published value from supplied target entry |
| Maximum-Signal Power Output  | <b>-2 watts</b> | Published value from supplied target entry |

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