Compactron
Dissimilar-Double-Triode Pentode

- VERTICAL OUTPUT PENTODE
- VERTICAL OSCILLATOR
- LOW HEATER POWER
- 140 VOLTS B+
- SYNC CLIPPER

The 31AL10 is a compactron containing a medium-mu triode, a high-mu triode, and a high-pervenance beam pentode. The pentode is intended for vertical output service in monochrome television receivers operating from 140 volts B+. The two triodes are intended for vertical oscillator and sync clipper functions.

GENERAL

ELECTRICAL
Cathode - Coated Unipotential
Heater Characteristics and Ratings
Heater Voltage, AC or DC* ......................... 31.5 Volts
Heater Current* .................................. 0.315 ± 0.02 Amperes
Heater Warm-up Time, average .................. 11 Seconds
Direct Inter-electrode Capacitances, approximate

Triode (Section 1)
Grid to Plate: (T1g to T1p) ....................... 3.0 pf
Input: T1g to (h + k + Pb.p.) ................. 3.2 pf
Output: T1p to (h + k + Pb.p.) .............. 0.4 pf

Triode (Section 2)
Grid to Plate: T2g to T2p) ....................... 3.7 pf
Input: T2g to (h + k + Pb.p.) ................. 2.0 pf
Output: T2p to (h + k + Pb.p.) .............. 0.6 pf

Pentode Section
Grid-Number 1 to Plate: (Pg1 to Pp) .......... 0.24 pf
Input: Pg1 to (h + k + Pg2 + Pb.p.) .......... 12 pf
Output: Pp to (h + k + Pg2 + Pb.p.) .......... 8.0 pf

MECHANICAL
Operating Position - Any
Envelope - T-9, Glass
Base - E12-70, Button 12-Pin
Outline Drawing - EIA 9-59
Maximum Diameter ............................. 1.188 Inches
Minimum Diameter ............................. 1.062 Inches
Maximum Over-all Length ..................... 2.625 Inches
Maximum Seated Height ....................... 2.250 Inches
Minimum Seated Height ....................... 2.000 Inches

MAXIMUM RATINGS

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

The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey tube 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 the characteristics of all other electron devices in the equipment.

PHYSICAL DIMENSIONS

| 1.188" MAX. | 1.062" MIN. |
| 2.625" MAX. | 2.250" MAX. | 2.000" MIN. |
| EIA 9-59 |

TERMINAL CONNECTIONS

Pin 1 - Heater
Pin 2 - Triode Plate (Section 2)
Pin 3 - Triode Grid (Section 2)
Pin 4 - Pentode Plate
Pin 5 - Pentode Grid Number 2 (Screen)
Pin 6 - Internal Connection - Do Not Use
Pin 7 - Triode Cathode (Section 2), Pentode Cathode, and Pentode Beam Plates
Pin 8 - Pentode Grid Number 1
Pin 9 - Triode Plate (Section 1)
Pin 10 - Triode Cathode (Section 1)
Pin 11 - Triode Grid (Section 1)
Pin 12 - Heater

BASING DIAGRAM

EIA 12HR
MAXIMUM RATINGS (Cont’d)

DESIGN-MAXIMUM VALUES

Pentode Section - Vertical-Deflection Amplifier Service

DC Plate Voltage ......................................................... 250 Volts
Peak Pulse Plate Voltage .............................................. 2000 Volts
Screen Voltage .......................................................... 200 Volts
Peak Negative Grid-Number 1 Voltage ............................... 150 Volts
Plate Dissipation .......................................................... 7.0 Watts
Screen Dissipation ......................................................... 1.8 Watts
Total DC Plate and Screen Current .................................... 70 Milliamperes
Total Peak Plate and Screen Current ................................. 245 Milliamperes

Heater-Cathode Voltage

Heater Positive with respect to Cathode
DC Component ........................................................... 100 Volts
Total DC and Peak ....................................................... 200 Volts

Heater Negative with respect to Cathode
Total DC and Peak ....................................................... 200 Volts

Grid-Number 1 Circuit Resistance
With Fixed Bias ............................................................ 1.0 Megohms

Triode (Section 1)

Plate Voltage ............................................................. 330 Volts
Positive DC Grid Voltage ................................................ 0 Volts
Plate Dissipation ............................................................ 1.25 Watts

Heater-Cathode Voltage

Heater Positive with respect to Cathode
DC Component ........................................................... 100 Volts
Total DC and Peak ....................................................... 200 Volts

Heater Negative with respect to Cathode
Total DC and Peak ....................................................... 200 Volts

Grid-Circuit Resistance
With Fixed Bias ............................................................ 0.5 Megohms

Triode (Section 2) - Vertical Oscillator Service

DC Plate Voltage ........................................................... 250 Volts
Peak Negative Grid Voltage ............................................. 400 Volts
Plate Dissipation ............................................................ 1.0 Watts
DC Plate Current .......................................................... 20 Milliamperes
Peak Plate Current ......................................................... 70 Milliamperes

Heater-Cathode Voltage

Heater Positive with respect to Cathode
DC Component ........................................................... 100 Volts
Total DC and Peak ....................................................... 200 Volts

Heater Negative with respect to Cathode
Total DC and Peak ....................................................... 200 Volts

Grid-Circuit Resistance
With Fixed Bias ............................................................ 1.0 Megohms

CHARACTERISTICS AND TYPICAL OPERATION

AVERAGE CHARACTERISTICS

Pentode Section
Plate Voltage ............................................................. 0.45 120 Volts
Screen Voltage .......................................................... 0.110 110 Volts
Grid-Number 1 Voltage ................................................. 0.0 8.0 Volts
Plate Resistance, approximate .............................. 1.1700 Ohms
Transconductance ......................................................... 0 7100 Microhms
Plate Current .............................................................. 0.122 46 Milliamperes
Screen Current ............................................................ 0.165 3.5 Milliamperes
Grid-Number 1 Voltage, approximate
Ib = 100 Microamperes .............................................. 0 -25 Volts

The tubes and arrangements disclosed herein may be covered by patents of General Electric Company or others. Neither the disclosure of any information herein nor the sale of tubes by General Electric Company conveys any license under patent claims covering combinations of tubes with other devices or elements, in the absence of an express written agreement to the contrary, General Electric Company assumes no liability for patent infringement arising out of any use of the tubes with other devices or elements by any purchaser of tubes or others.
CHARACTERISTICS AND TYPICAL OPERATION (Cont’d)

Triode (Section 1)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Voltage</td>
<td>150 Volts</td>
</tr>
<tr>
<td>Grid Voltage</td>
<td>-2.0 Volts</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>43 Ohms</td>
</tr>
<tr>
<td>Plate Resistance, approximate</td>
<td>11000 Ohms</td>
</tr>
<tr>
<td>Transconductance</td>
<td>3900 Micromhos</td>
</tr>
<tr>
<td>Plate Current</td>
<td>5.4 Milliamperes</td>
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<tr>
<td>Grid Voltage, approximate</td>
<td>-5.7 Volts</td>
</tr>
<tr>
<td>( I_b = 10 ) Microamperes</td>
<td></td>
</tr>
</tbody>
</table>

\[ I_b = 10 \text{ Microamperes} \]

Triode (Section 2)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Voltage</td>
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</tr>
<tr>
<td>Grid Voltage</td>
<td>-5.0 Volts</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>20 Ohms</td>
</tr>
<tr>
<td>Plate Resistance, approximate</td>
<td>8500 Micromhos</td>
</tr>
<tr>
<td>Transconductance</td>
<td>2350 Milliamperes</td>
</tr>
<tr>
<td>Plate Current</td>
<td>5.5 Milliamperes</td>
</tr>
<tr>
<td>Grid Voltage, approximate</td>
<td>-11 Volts</td>
</tr>
<tr>
<td>( I_b = 10 ) Microamperes</td>
<td></td>
</tr>
</tbody>
</table>

\[ I_b = 10 \text{ Microamperes} \]

NOTES

* Heater voltage for a bogey tube at \( I_f = 0.315 \) amperes.
* The equipment designer should design the equipment so that heater current is centered at the specified bogey value, with heater supply variations restricted to maintain heater current within the specified tolerance.
* The time required for the voltage across the heater to reach 80 percent of the bogey value after applying 4 times the bogey heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the bogey heater voltage divided by the bogey heater current.

\[ E_f = \text{RATED VALUE} \]
\[ E_c2 = 110 \text{ VOLTS} \]

AVERAGE PLATE CHARACTERISTICS

\[ E_f = \text{RATED VALUE} \]
\[ E_c2 = 110 \text{ VOLTS} \]

\[ I_b \text{ in Milliamperes} \]
\[ I_c \text{ in Milliamperes} \]

\[ E_f \text{ in Volts} \]

\[ E_c2 \text{ in Volts} \]

\[ I_f \text{ in Amperes} \]

\[ I_c \text{ in Amperes} \]

\[ I_b \text{ in Milliamperes} \]

\[ I_c \text{ in Milliamperes} \]

\[ E_f \text{ in Volts} \]

\[ E_c2 \text{ in Volts} \]

\[ I_f \text{ in Amperes} \]

\[ I_c \text{ in Amperes} \]

\[ I_b \text{ in Milliamperes} \]

\[ I_c \text{ in Milliamperes} \]

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\[ I_b \text{ in Milliamperes} \]

\[ I_c \text{ in Milliamperes} \]

\[ E_f \text{ in Volts} \]

\[ E_c2 \text{ in Volts} \]

\[ I_f \text{ in Amperes} \]

\[ I_c \text{ in Amperes} \]

\[ I_b \text{ in Milliamperes} \]

\[ I_c \text{ in Milliamperes} \]

\[ E_f \text{ in Volts} \]

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\[ I_c \text{ in Amperes} \]

\[ I_b \text{ in Milliamperes} \]

\[ I_c \text{ in Milliamperes} \]

\[ E_f \text{ in Volts} \]
AVERAGE PLATE CHARACTERISTICS

PENTODE SECTION

$E_f = \text{RATED VALUE}$
$Ec2 = 150 \text{ VOLTS}$

$E_f = \text{RATED VALUE}$
$Ec1 = 0 \text{ VOLTS}$

PLATE CURRENT ($I_p$) IN MILLIAMPERES

PLATE VOLTAGE IN VOLTS

SCREEN CURRENT ($I_s$) IN MILLIAMPERES

AVERAGE TRANSFER CHARACTERISTICS

PENTODE SECTION

$E_f = \text{RATED VALUE}$
$Eb = 120 \text{ VOLTS}$

GRID-VOLTAGE 1 VOLTAGE IN VOLTS

PLATE CURRENT IN MILLIAMPERES

$E_f = \text{RATED VALUE}$
$Ec2 = 150 \text{ VOLTS}$

$E_f = \text{RATED VALUE}$
$Ec1 = 0 \text{ VOLTS}$
AVERAGE TRANSFER CHARACTERISTICS
TRIODE SECTION 2

GRID VOLTAGE IN VOLTS

PLATE CURRENT IN MILLIAMPERES

AVERAGE CHARACTERISTICS
TRIODE SECTION 2

AMPLIFICATION FACTOR (β)

PLATE RESISTANCE (rP) IN OHMS

TRANSCONDUCTANCE (g_m) IN MICROHMS

PLATE CURRENT IN MILLIAMPERES

TUBE DEPARTMENT

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