HEPTODE
MINIATURE TYPE

COATED UNIPOTENTIAL CATHODE

HEATER
3.15 VOLTS  0.6 AMP.
AC OR DC
ANY MOUNTING POSITION

GLASS BULB

THE 3BE6, A PENTAGRID CONVERTER USING THE 7 PIN MINIATURE CONSTRUCTION, IS DESIGNED FOR USE IN 600 MA. SERIES HEATER OPERATED SUPERHETERODYNE RECEIVERS. IT IS INTENDED FOR SERVICE AS A COMBINED OSCILLATOR AND MIXER. THERMAL CHARACTERISTICS OF THE HEATER ARE CONTROLLED SUCH THAT HEATER VOLTAGE SURGES DURING THE WARM-UP CYCLE ARE MINIMIZED PROVIDED IT IS USED WITH OTHER TYPES WHICH ARE SIMILARLY CONTROLLED. WITH THE EXCEPTION OF HEATER RATINGS, ITS CHARACTERISTICS ARE IDENTICAL TO TYPE 6BE6.

DIRECT INTERELECTRODE CAPACITANCES

<table>
<thead>
<tr>
<th>WITH A SHIELD</th>
<th>WITHOUT SHIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>G3 TO P MAX.</td>
<td>0.25 \mu f</td>
</tr>
<tr>
<td>G3 TO G2 MAX.</td>
<td>0.15 \mu f</td>
</tr>
<tr>
<td>H+K+G4+G5+G6+P</td>
<td>7.0 \mu f</td>
</tr>
<tr>
<td>G4 TO (H+K+G4+G5+G6+P)</td>
<td>5.5 \mu f</td>
</tr>
<tr>
<td>P TO (H+K+G4+G5+G6+P)</td>
<td>13 \mu f</td>
</tr>
<tr>
<td>G4 TO K+G5</td>
<td>3.0 \mu f</td>
</tr>
<tr>
<td>K TO (H+G4+G5+P)</td>
<td>20 \mu f</td>
</tr>
<tr>
<td>G4 TO P MAX.</td>
<td>0.05 \mu f</td>
</tr>
</tbody>
</table>

\*EXTERNAL SHIELD #315 CONNECTED TO PIN #2.

RATINGS
INTERPRETED ACCORDING TO DESIGN CENTER SYSTEM

HEATER VOLTAGE
3.15 VOLTS

MAXIMUM HEATER-CATHODE VOLTAGE:
HEATER NEGATIVE WITH RESPECT TO CATHODE
TOTAL DC AND PEAK
200 VOLTS
HEATER POSITIVE WITH RESPECT TO CATHODE
DC TOTAL DC AND PEAK
200 VOLTS
MAXIMUM PLATE VOLTAGE
300 VOLTS
MAXIMUM GRID #2 AND #4 VOLTAGE
100 VOLTS
MAXIMUM GRID #2 AND #4 SUPPLY VOLTAGE
300 VOLTS
MAXIMUM NEGATIVE DC GRID #3 VOLTAGE
-50 VOLTS
MAXIMUM POSITIVE DC GRID #3 VOLTAGE
0 VOLTS
MAXIMUM PLATE DISSIPATION
1.0 WATT
MAXIMUM GRIDS #2 AND #4 DISSIPATION
1.0 WATT
MAXIMUM CATHODE CURRENT
14 MA.

HEATER WARM-UP TIME (APPROX.)*
11.0 SECONDS

*HEATER WARM-UP TIME IS DEFINED AS THE TIME REQUIRED FOR THE VOLTAGE ACROSS THE HEATER TO REACH 80% OF ITS RATED VOLTAGE AFTER APPLYING 4 TIMES RATED HEATER VOLTAGE TO A CIRCUIT CONSISTING OF THE TUBE HEATER IN SERIES WITH A RESISTANCE OF VALUE 3 TIMES THE NOMINAL HEATER OPERATING RESISTANCE.

CONTINUED ON FOLLOWING PAGE.

TUNG-SOL ELECTRIC INC.  ELECTRON TUBE DIVISION  BLOOMFIELD, NEW JERSEY, U.S.A.  SEPTEMBER 1, 1954  PLATE #940
## TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

**CONVERTER SERVICE – SEPARATE EXCITATION**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>heater voltage</td>
<td>3.15</td>
<td>3.15</td>
<td>volts</td>
</tr>
<tr>
<td>heater current</td>
<td>0.6</td>
<td>0.6</td>
<td>amp.</td>
</tr>
<tr>
<td>plate voltage</td>
<td>100</td>
<td>250</td>
<td>volts</td>
</tr>
<tr>
<td>grid #3 voltage</td>
<td>-1.5</td>
<td>-1.5</td>
<td>volts</td>
</tr>
<tr>
<td>grids #2 and #4 voltage</td>
<td>100</td>
<td>100</td>
<td>volts</td>
</tr>
<tr>
<td>grid #1 voltage (oscillator grid) RMS</td>
<td>10</td>
<td>10</td>
<td>volts</td>
</tr>
<tr>
<td>grid #1 resistance (oscillator grid)</td>
<td>20 000</td>
<td>20 000</td>
<td>ohms</td>
</tr>
<tr>
<td>plate resistance (approx.)</td>
<td>0.4</td>
<td>1.0</td>
<td>megohms</td>
</tr>
<tr>
<td>grid #1 current (oscillator grid)</td>
<td>0.5</td>
<td>0.5</td>
<td>ma.</td>
</tr>
<tr>
<td>conversion transconductance</td>
<td>455</td>
<td>475</td>
<td>μmhos</td>
</tr>
<tr>
<td>plate current</td>
<td>2.6</td>
<td>2.9</td>
<td>ma.</td>
</tr>
<tr>
<td>grids #2 and #4 current</td>
<td>7.0</td>
<td>6.8</td>
<td>ma.</td>
</tr>
<tr>
<td>cathode current</td>
<td>10.1</td>
<td>10.2</td>
<td>ma.</td>
</tr>
<tr>
<td>grid #3 voltage for $g_C = 10 \mu$mhos (approx.)</td>
<td>-50</td>
<td>-30</td>
<td>volts</td>
</tr>
<tr>
<td>grid #3 voltage for $g_C = 100 \mu$mhos (approx.)</td>
<td>-5</td>
<td>-6</td>
<td>volts</td>
</tr>
</tbody>
</table>

*Characteristics shown are obtained in the standard rma conversion conductance test set which uses separate excitation. The characteristics under these conditions correspond very closely with those obtained in a self-excited oscillatory circuit operating with zero bias.*

## OSCILLATOR CHARACTERISTICS

**NOT OSCILLATING**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>grid #3 voltage</td>
<td>0</td>
<td>volts</td>
</tr>
<tr>
<td>grid #1 voltage (oscillator grid)</td>
<td>0</td>
<td>volts</td>
</tr>
<tr>
<td>grids #2 and #4 connected to plate</td>
<td>100</td>
<td>volts</td>
</tr>
<tr>
<td>transconductance between grid #1 and grids #2 and #4 connected to plate</td>
<td>7 250</td>
<td>μmhos</td>
</tr>
<tr>
<td>amplification factor between grid #1 and grids #2 and #4 connected to plate</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>cathode current</td>
<td>25</td>
<td>ma.</td>
</tr>
<tr>
<td>grid #1 voltage (approx.) for $I_B = 10 \mu$A</td>
<td>-11</td>
<td>volts</td>
</tr>
</tbody>
</table>

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**PLATE #3941 SEPTEMBER 1, 1954 TUNG-SOL ELECTRIC INC. ELECTRON TUBE DIVISION BLOOMFIELD, NEW JERSEY, U.S.A.**
$E_f = 3.15$ Volts
$E_b = 250$ Volts
$E_{E2} & E_{E4} = 100$ Volts
$R_g = 20000$ Ohms

Oscillator Voltage Adjusted to give Grid #1 Current of 0.5 Ma.

TRANSCONDUCTANCE ($g_m$) - MICROMOS
3BE6

SELF-EXCITATION

\( E_f = 3.15 \text{ Volts} \)
\( E_b = 250 \text{ Volts} \)
\( E_{c2} \& E_{c4} = 100 \text{ Volts} \)
\( E_{c3} = -1 \text{ Volt} \)
\( R_g = 20000 \text{ Ohms} \)

\( P = \) Percentage Ratio of
\( E_k \) to \( E_k + E_g \) where

\( E_k = \) Voltage across
Oscillator-coil
Section between
Ground & Cathode.
\( E_g = \) Oscillator Voltage
between Cathode and
Grid.

- \( g_c \) for values of \( E_k \)
- \( g_c \) for values percent \( P \)
3BE6

SELF-EXCITATION

\( E_f = 3.15 \text{ Volts} \)
\( E_b = 250 \text{ Volts} \)
\( E_{c2} \& E_{c4} = 100 \text{ Volts} \)
\( E_{c3} = 0 \text{ Volts} \)
\( R_{g1} = 20000 \text{ Ohms} \)
\( I_{c1} = 0.5 \text{ Ma.} \)

Conversion Gain =
1F Output Volts
RF Input Volts to G3

RESONANT LOAD IMPEDANCE - MEGOHMS

Recommended Min.
\( I_{c4} = 0.16 \text{ Ma.} \)

3BE6

SEPARATE EXCITATION

\( E_f = 3.15 \text{ Volts} \)
\( E_b = 250 \text{ Volts} \)
\( E_{c2} \& 4 = 100 \text{ Volts} \)
\( E_{c3} = -1.5 \text{ Volts} \)
\( R_{g1} = 20000 \text{ Ohms} \)

Grid #1 Current Varied by Adjustment of Oscillator Voltage

CONVERSION TRANSCONDUCTANCE \( (g_c) \) - MICROMOS

CATHODE \( (I_c) \) MILLIAMPERES

GRID #1 \( (I_{c1}) \) MILLIAMPERES