Power Pentode

9-PIN MINIATURE TYPE

For Mobile-Communications Equipment Operating from 6-Cell Storage-Battery Systems. Useful as a Class-C RF-Power-Amplifier, Oscillator, and Frequency-Multiplier Tube up to 40 Mc, and as a Modulator and AF-Power-Amplifier Tube.

GENERAL DATA

Electrical:

Heater Characteristics and Ratings (Absolute-Maximum Values):

Voltage (AC or DC)a .................. 13.5 ± 1.5 volts
Current at heater volts = 13.5. .................. 0.275 amp
Peak heater-cathode voltage:
Heater negative with respect to cathode. .................. 120 max. volts
Heater positive with respect to cathode. .................. 120 max. volts

Direct Interelectrode Capacitances (Approx.):b

Grid No.1 to plate. .................. 0.063 μf
Grid No.1 to all other electrodes except plate. .............. 10.2 μf
Plate to all other electrodes except grid No.1. .............. 3.5 μf

Characteristics, Class A1 Amplifier:

Heater Voltage. .................. 13.5 volts
Plate Supply Voltage. .................. 250 volts
Grid No.3 .................. Connected to cathode at socket
Grid No.2 Supply Voltage. .................. 150 volts
Cathode Resistor. .................. 120 ohms
Plate Resistance (Approx.) .................. 0.1 megohm
Transconductance. .................. 11500 μhos
Plate Current .................. 19 ma
Grid-No.2 Current .................. 3.5 ma
Grid-No.1 Voltage (Approx.) for plate μa = 20 .................. −10 volts

Mechanical:

Operating Position .................. Any
Type of Cathode .................. Coated Unipotential
Maximum Overall Length .................. 2-3/16"  
Maximum Seated Length .................. 1-15/16"  
Length, Base Seat to Bulb Top (Excluding tip) .................. 1-9/16" ± 3/32"
Diameter. .................. 0.750" to 0.875"
Dimensional Outline .................. See General Section
Bulb. .................. Small-Button Noval 9-Pin (JEDEC No.E9-1)

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Basing Designation for BOTTOM VIEW: 9GK

Pin 1—Cathode
Pin 2—Grid No.1
Pin 3—Grid No.3, Internal Shield
Pin 4—Heater
Pin 5—Heater
Pin 6—No Internal Connection
Pin 7—Plate
Pin 8—Grid No.2
Pin 9—Grid No.3, Internal Shield

AF POWER AMPLIFIER — Class A1

Maximum Ratings, Absolute-Maximum Values:

PLATE VOLTAGE ........................................ 330 max. volts
GRID No.3 (SUPPRESSOR GRID) Connect to cathode at socket
GRID-No.2 (SCREEN-GRID) VOLTAGE .................. 180 max. volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:
  Negative-bias value .................................. 55 max. volts
  Positive-bias value .................................. 0 max. volts
GRID-No.2 INPUT ....................................... 1 max. watt
PLATE DISSIPATION ................................... 5 max. watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:
  For fixed-bias operation: 0.1 max. megohm
  For cathode-bias operation: 0.25 max. megohm

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraph

and

RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCSd Ratings, Absolute-Maximum Values:

DC PLATE VOLTAGE ..................................... 300 max. volts
DC GRID No.3 (SUPPRESSOR GRID) Connect to cathode at socket
DC GRID-No.2 (SCREEN-GRID) VOLTAGE ............... 175 max. volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE:
  Negative-bias value .................................. 50 max. volts
  DC PLATE CURRENT .................................. 33 max. ma
  DC GRID-No.2 CURRENT ............................... 5.5 max. ma
  DC GRID-No.1 CURRENT ............................... 3 max. ma
  GRID-No.2 INPUT ...................................... 1 max. watt
  PLATE DISSIPATION .................................. 5 max. watts

Typical Operation:

At frequencies up to 40 Mc

Heater Voltage ........................................ 13.5 13.5 13.5 volts
DC Plate Voltage ...................................... 200 250 300 volts
Grid No.3 Connect to cathode at socket
DC Grid-No.2 Voltage .................................. 115 145 175 volts
DC Grid-No.1 Voltage .................................. -7 -9 -12 volts
Peak RF Grid-No.1 Voltage ............................. 9 11 16 volts
DC Plate Current ...................................... 14.5 20 26 ma
DC Grid-No.2 Current .................................. 3 4.1 5.5 ma
DC Grid-No.1 Current (Approx.) ....................... 0.6 0.85 1 ma

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Driving Power (Approx.) ........  10  12  15  mw
Power Output (Approx.) .......  1.5  2.7  4  watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance ........  0.1 max.  megohm

FREQUENCY MULTIPLIER

Maximum CCS\(^d\) Ratings, Absolute-Maximum Values:
Same as for RF POWER AMPLIFIER & OSCILLATOR

Typical Operation:
As doubler up to 40 Mc

DC Plate Voltage ..................  200  250  300  volts
Grid No.3 .................. Connected to cathode at socket
DC Grid-No.2 Voltage ...........  115  145  175  volts
DC Grid-No.1 Voltage ........... -16  -20  -25  volts
Peak RF Grid-No.1 Voltage ......  19  24  31  volts
DC Plate Current ..............  11  15  20  ma
DC Grid-No.2 Current ...........  2  3  4  ma
DC Grid-No.1 Current (Approx.)...  0.3  0.45  0.6  ma
Driving Power (Approx.) .......  5  9  13  mw
Useful Power Output (Approx.) ...  1.4  1.9  2.5  watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance ........  0.1 max.  megohm

\(^a\) The heater will take momentary excursions of 11.0 to 16.0 volts.
\(^b\) Without external shield.
\(^c\) Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.
\(^d\) Continuous Commercial Service.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.260</td>
<td>0.290</td>
</tr>
<tr>
<td>Transconductance</td>
<td>1,2</td>
<td>8500</td>
<td>14500</td>
</tr>
<tr>
<td>Plate Current</td>
<td>1,3</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>Grid-No.2 Current</td>
<td>1,3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Reverse Grid-No.1 Current</td>
<td>1,4</td>
<td>–</td>
<td>1.5</td>
</tr>
<tr>
<td>Heater-Cathode Leakage Current:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>1,5</td>
<td>–</td>
<td>20</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>1,5</td>
<td>–</td>
<td>20</td>
</tr>
<tr>
<td>Leakage Resistance:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between grid-No.1 and all other electrodes tied together</td>
<td>1,6</td>
<td>50</td>
<td>–</td>
</tr>
<tr>
<td>Between plate and all other electrodes tied together</td>
<td>1,7</td>
<td>50</td>
<td>–</td>
</tr>
</tbody>
</table>

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DATA 2
5-62
Note 1: With ac or dc heater volts = 13.5.

Note 2: With dc-plate-supply volts = 250, grid-No.2 volts = 150, grid No.3 connected to cathode at socket, cathode resistor (ohms) = 120, and cathode-bypass capacitor (µf) = 1000.

Note 3: With dc plate-supply volts = 250, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, and cathode resistor (ohms) = 120.

Note 4: With dc plate-supply volts = 250, grid-No.2 supply volts = 150, grid No.3 connected to cathode at socket, cathode resistor (ohms) = 120, and grid-No.1 resistor (megohms) = 1.

Note 5: With 100 volts dc between heater and cathode.

Note 6: With grid No.1 100 volts negative with respect to all other electrodes tied together.

Note 7: With plate 300 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Heater-Cycling Life Performance:

This test is performed on a sample lot of tubes from each production run. A minimum of 2000 cycles of intermittent operation is applied under the following conditions: heater volts = 19.5 cycled one minute on and two minutes off, heater 135 volts negative with respect to cathode, and all other elements connected to ground. At the end of this test, tubes are checked for heater-cathode shorts and open circuits.

Low-Frequency Vibration Performance:

This test is performed on a sample lot of tubes from each production run under the following conditions: heater volts = 13.5, plate-supply volts = 250, grid No.3 connected to cathode, grid-No.2 supply volts = 150, cathode resistor (ohms) = 120, cathode-bypass capacitor (µf) = 1000, plate load resistor (ohms) = 2000, and vibrational acceleration of 2.5 g at 25 cps. In this test, the rms output voltage must not exceed 150 millivolts.

500-Hour Intermittent Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures. Life testing is conducted under the following conditions: heater volts = 15 and maximum-rated plate dissipation and grid-No.2 input.
AVERAGE CHARACTERISTICS

$E_C = 13.5$ VOLTS
GRID NO. 3 CONNECTED TO CATHODE AT SOCKET.
GRID—NO. 2 VOLTS = 150

PLATE (I_b) OR GRID—NO. 2 (I_c2) MILLIAMPERES

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DATA 3
5–62
AVerage Characteristics

$E_f = 13.5$ Volts
Grid No. 3 connected to cathode at socket.
Grid No. 2 Volts = 150

[Graph showing characteristics with axes for plate current ($I_B$), grid current 1 ($I_{C1}$), and grid current 2 ($I_{C2}$) vs. plate voltage.]
AVERAGE CHARACTERISTICS

$E_f = 13.5$ VOLTS
PLATE VOLTS = 250
GRID N°3 CONNECTED TO CATHODE
AT SOCKET.
GRID-N°2 VOLTS = 150

GRID-N°1 VOLTS

PLATE ($I_b$) OR GRID-N°2 ($I_{C2}$) MILLIAMPERES

92CM-9775RI
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

$E_F = 13.5$ VOLTS
GRID N° 3 CONNECTED TO CATHODE AT SOCKET.
GRID−N° 2 VOLTS = 150
$I_b = PLATE MILLIAMPERES$
$I_{C1} = GRID−N° 1 MILLIAMPERES$
$I_{C2} = GRID−N° 2 MILLIAMPERES$