POWER TRIODE
WATER- & FORCED-AIR-COOLED

GENERAL DATA

Electrical:
Filament, Multistrand Tungsten:
Excitation ... Single Phase AC or DC
Voltage. ....... 19.5 ....... ac or dc volts
Current. ....... 415 ....... amp
Starting Current: The filament current must never exceed 750 amperes, even momentarily.
Cold Resistance. ....... 0.0042 ....... ohm
Amplification Factor ....... 36
Direct Interelectrode Capacitances (Approx.):
Grid to Plate. ....... 46 ....... \( \mu \text{f} \)
Grid to Filament. ....... 100 ....... \( \mu \text{f} \)
Plate to Filament. ....... 2.0 ....... \( \mu \text{f} \)

Mechanical:
Terminal Connections:
F - Filament
G - Grid-Flange
Terminal
P - Water-Cooled
Plate
Terminal

Mounting Position. ....... Vertical, Filament End Up
Maximum Overall Length ....... 24-1/2"
Maximum Diameter ....... 9-1/2"
Water Jacket ....... RCA MI - 19460
Gasket ....... RCA MI - 27001
Water Flow ....... 15 to 20 gpm

The water flow must start before the application of any voltages and must continue for at least 2 minutes after the removal of all voltages.

Air Flow:
To Filament Seals. ....... 10 min. cfm
The specified air flow directed by a nozzle of 1-1/4" diameter into the filament header is required before and during the application of any voltages to limit the temperature of the filament seals to the maximum value.
To Plate Seal and Bulb ....... 250 cfm
The specified air flow at a pressure of 1.3 inches of water must be directed at and distributed uniformly around the plate seal and bulb to limit the temperature of each to its maximum value at the hottest point.

Outlet Water Temperature ....... 70 max. \( ^\circ \text{C} \)
Bulb Temperature ....... 160 max. \( ^\circ \text{C} \)
Seal Temperature (Filament, grid, plate) ....... 165 max. \( ^\circ \text{C} \)

AF POWER AMPLIFIER & MODULATOR - Class B

Maximum CCS\textsuperscript{\textregistered} Ratings, Absolute Values:

DC PLATE VOLTAGE ....... 15000 max. volts
MAX.-SIGNAL DC PLATE CURRENT\textasteriskcentered ....... 6 max. amp
MAX.-SIGNAL PLATE INPUT\textasteriskcentered ....... 90 max. kw
PLATE DISSIPATION\textasteriskcentered ....... 40 max. kw
\textasteriskcentered See next page.

\textsuperscript{\textcopyright} Indicates a change.

OCTOBER 15, 1947 RADIALL CORPORATION OF AMERICA, HARRISON, NEW JERSEY

DATA 1
Typical Operation:

Unless otherwise specified, values are for 2 tubes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10200</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-220</td>
</tr>
<tr>
<td>Peak AF Grid-to-Grid Voltage</td>
<td>850</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>0.6</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>5.7</td>
</tr>
<tr>
<td>Effective Load Resistance (plate-to-plate)</td>
<td>3600</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>110</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>36</td>
</tr>
</tbody>
</table>

PLATE-MODULATED RF POWER AMPLIFIER-Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum CCS® Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>12500</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-2000</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>4</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>1.5</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>50</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>28</td>
</tr>
</tbody>
</table>

Typical Operation:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10200</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-1500</td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>1960</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3.1</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>0.75</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>1320</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>27.5</td>
</tr>
</tbody>
</table>

RF POWER AMPLIFIER & OSCILLATOR-Class C Telephony

Key-down conditions per tube without modulation

Maximum CCS® Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>17000</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-2000</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>9</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>1.5</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>150</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>40</td>
</tr>
</tbody>
</table>

Typical Operation:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>14000</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-1500</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>230</td>
</tr>
<tr>
<td></td>
<td>1800</td>
</tr>
</tbody>
</table>
Peak RF Grid Voltage . . . . . . . . . . . . . 2000  2200 volts
DC Plate Current . . . . . . . . . . . . . . . . . . 5.8  7.9 amp
DC Grid Current (Approx.). . . . . . . . . . . . . . . . . 0.83  0.9 amp
Driving Power (Approx.). . . . . . . . . . . . . . . . . 1500  1800 watts
Power Output (Approx.) . . . . . . . . . . . . . . . . . . . 61  100 kw

● Continuous Commercial Service.
* Averaged over any audio-frequency cycle of sine-wave form.
# The driving stage should have good regulation and should be capable of supplying considerably more than the specified driving power.
© Obtained by grid resistor (2000, 2100) or by partial self-bias methods.
 diarr Subject to wide variations as explained under TUBE RATINGS in General Section.
pp modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.
★ Obtained from cathode resistor (230, 180), or grid resistor (1800, 1780) or by partial self-bias methods.

Data on operating frequencies for the 9C21 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.
POWER TRIODE

SEE NOTE
4 FILAMENT POSTS
.676" ± .010" DIA.

12 H OLES
.177" DIA.
(No 16 DRILL)

GRID TERMINAL (SEE NOTE)

2 1/4" MAX.

7 1/8" MAX.
DIA.

PLATE

NOTE: FLEXIBLE CONNECTIONS ARE REQUIRED.
92CM-6438RI

FILAMENT CONNECTIONS

GRID TERMINAL

EXHAUST TUBE
CAP - MAKE NO CONNECTION

DC OR
1 PH AC

92CS-6519

OCTOBER 15, 1947
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-6438R1-6519
$E_f = 19.5$ VOLTS A.C.
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

$E_T = 19.5$ VOLTS A.C.
$I_C = GRID$ AMPERES
$I_D = PLATE$ AMPERES

DEC. 1, 1943
RCA VICTOR DIVISION
92GM-6462
Power Triode

WATER- AND FORCED-AIR COOLED

GENERAL DATA

Electrical:

Filament, Multistrand Tungsten:
Excitation ........................................ DC or Single Phase AC
Voltage (AC or DC) ................................. 19.5 volts
Current ............................................. 415 amp
Starting Current: The filament current should never exceed 750 amperes, even momentarily.
Cold Resistance .................................. 0.0042 ohm
Amplification Factor .............................. 40
Direct Interelectrode Capacitances (Approx.):
Grid to plate ....................................... 53 pf
Grid to filament .................................... 103 pf
Plate to filament .................................. 1.2 pf

Mechanical:

Operating Position ................................ Vertical, filament end up
Maximum Overall Length .......................... 24-1/2"
Maximum Diameter ................................. 9-1/2"
Weight (Approx.) .................................. 26 lbs
Terminal Diagram (See Dimensional Outline):

\[ \text{F-Filament} \quad \text{G-Grid} \quad \text{P-Plate} \]

Diametrically Opposite Terminals
MUST BE CONNECTED TOGETHER

Thermal:

Water Flow ........................................... 15 to 20 gpm
The water flow must start before the application of any voltages and must continue for at least 2 minutes after the removal of all voltages.

Air Flow:
To filament seals ................................... 10 min. cfm
The specified air flow directed by a nozzle of 1-1/4" diameter into the filament header is required before and during the application of any voltages to limit the temperature of the filament seals to the maximum value.
To plate seal and bulb .............................. 250 min. cfm
The specified air flow at a pressure of 1.3 inches of water must be directed at and distributed uniformly around the plate seal and bulb to limit the temperature of each to its maximum value at the hottest point.

\[ \rightarrow \text{Indicates a change.} \]
Outlet Water Temperature: 70 max. °C
Bulb Temperature: 180 max. °C
Seal Temperature (Filament, grid, plate): 165 max. °C

AF POWER AMPLIFIER & MODULATOR — Class B

Maximum CCS<sup>a</sup> Ratings, Absolute—Maximum Values:

- **DC PLATE VOLTAGE**: 15000 max. volts
- **MAX.-SIGNAL DC PLATE CURRENT<sup>b</sup>**: 6 max. amp
- **MAX.-SIGNAL PLATE INPUT<sup>b</sup>**: 90 max. kw
- **PLATE DISSIPATION<sup>b</sup>**: 40 max. kw

**Typical Operation:**

*Unless otherwise specified, values are for 2 tubes*

- **DC Plate Voltage**: 10200 14000 volts
- **DC Grid Voltage**: -220 -300 volts
- **Peak AF Grid-to-Grid Voltage**: 850 1050 volts
- **Zero-Signal DC Plate Current**: 0.6 0.6 amp
- **Max.-Signal DC Plate Current**: 5.7 7.1 amp
- **Effective Load Resistance**: (Plate to plate) 3600 4000 ohms
- **Max.-Signal Driving Power (Approx.)<sup>c</sup>**: 110 150 watts
- **Max.-Signal Power Output (Approx.)**: 36 61 kw

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

*Carrier conditions per tube for use with a maximum-modulation factor of 1*

Maximum CCS<sup>a</sup> Ratings, Absolute—Maximum Values:

- **DC PLATE VOLTAGE**: 12500 max. volts
- **DC GRID VOLTAGE**: -2000 max. volts
- **DC PLATE CURRENT**: 4 max. amp
- **DC GRID CURRENT**: 1.5 max. amp
- **PLATE INPUT**: 50 max. kw
- **PLATE DISSIPATION**: 28 max. kw

**Typical Operation:**

- **DC Plate Voltage**: 10200 12500 volts
- **DC Grid Voltage**: from a grid resistor of:
  - 2000 ohms: -1500 - volts
  - 2100 ohms: -1670 volts
- **Peak RF Grid Voltage**: 1960 2190 volts
- **DC Plate Current**: 3.1 3.5 amp
- **DC Grid Current (Approx.)<sup>e</sup>**: 0.75 0.79 amp
- **Driving Power (Approx.)<sup>e</sup>**: 1320 1570 watts
- **Power Output (Approx.)**: 27.5 38 kw

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy<sup>f</sup>

Maximum CCS<sup>a</sup> Ratings, Absolute—Maximum Values:

- **DC PLATE VOLTAGE**: 17000 max. volts
- **DC GRID VOLTAGE**: -2000 max. volts
- **DC PLATE CURRENT**: 9 max. amp
DC GRID CURRENT ................................ 1.5 max. amp
PLATE INPUT ...................................... 150 max. kw
PLATE DISSIPATION ................................ 40 max. kw

Typical Operation:
DC Plate Voltage .................................. 14000 17000 volts
DC Grid Voltage:
From a grid resistor of:
1800 ohms ........................................ -1500 - volts
1780 ohms .......................................... - -1600 volts
From a cathode resistor of:
230 ohms ........................................... -1500 - volts
180 ohms ........................................... - -1600 volts
Peak RF Grid Voltage ................................ 2000 2200 volts
DC Plate Current .................................. 5.8 7.9 amp
DC Grid Current (Approx.) ....................... 0.83 0.9 amp
Driving Power (Approx.) ......................... 1500 1800 watts
Power Output (Approx.) ......................... 61 100 kw

a Continuous Commercial Service.
b Averaged over any audio-frequency cycle of sine-wave form.
c The driving stage should have good regulation and should be capable of supplying considerably more than the specified driving power.
d Obtained from a fixed supply, grid resistor, or a combination of both.
e Subject to wide variations as explained under TUBE RATINGS in General Section.
f Key-down conditions per tube without modulation. 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.
g Obtained from a fixed supply, a cathode resistor, a grid resistor, or from a combination of a fixed supply and self-bias.

MAXIMUM RATINGS vs OPERATING FREQUENCY

<table>
<thead>
<tr>
<th>OPERATING FREQUENCY (Mc)</th>
<th>MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM-RATED PLATE VOLTAGE &amp; PLATE INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TELEPHONY</td>
</tr>
<tr>
<td></td>
<td>Class C Plate-Modulated</td>
</tr>
<tr>
<td>15</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>88</td>
</tr>
<tr>
<td>25</td>
<td>81</td>
</tr>
</tbody>
</table>

FILAMENT CONNECTIONS

GRID TERMINAL

EXHAUST TUBE, CAP-MAKE NO CONNECTION

92CS-6519

DATA 2
4-63
NOTE 1: FLEXIBLE CONNECTIONS ARE REQUIRED.

NOTE 2: FILAMENT-TERMINAL POSITIONS ARE HELD TO TOLERANCES SUCH THAT ENTIRE LENGTH OF TERMINALS WILL, WITHOUT UNDUE FORCE, PASS INTO AND DISENGAGE FROM FLAT-PLATE GAUGE HAVING A THICKNESS OF 1/8" AND FOUR HOLES WITH DIAMETERS OF 0.801" ± 0.001" ARRANGED AT ANGLES OF 90° ± 10' ON A CIRCLE HAVING DIAMETER OF 3.125" ± 0.001". GAUGE IS ALSO PROVIDED WITH A HOLE HAVING DIAMETER OF 1.250" ± 0.010" CONCENTRIC WITH THE FILAMENT-TERMINAL CIRCLE.