NUVISTOR TYPE
Heater Designed to Operate from Battery Supplies
Used in Sonobuoy and Other Expendable Equipment

Electrical:
Heater Characteristics and Ratings:
Voltage (DC) . . . . Tubes will be supplied with the heater
designed to operate within ±10% of any specified center
heater voltage between 6.0 and 8.5 volts to meet specific
battery-supply requirements in sonobuoy and other expend-
able equipment.
Input . . . . . . . . . . . . . . . . . . . . . . 1.1 watts
Peak heater-cathode voltage:
Heater negative with respect to cathode. 100 max. volts
Heater positive with respect to cathode. 100 max. volts
Direct Interelectrode Capacitances:
Grid No.1 to plate . . . . . . . . . . . . . . . . . . . . 0.015 max. pf
Grid No.1 to cathode, grid No.2, shell,
and heater . . . . . . . . . . . . . . . . . . . . . . . . 7.0 pf
Plate to cathode, grid No.2, shell,
and heater . . . . . . . . . . . . . . . . . . . . . . . . 1.4 pf
Heater to cathode . . . . . . . . . . . . . . . . . . . . 1.4 pf

Characteristics, Class A1 Amplifier:
Heater Voltage . . . . . . . . . . . . . . . . . . . . Specified center value
Plate Supply Voltage . . . . . . . . . . . . . . . . . . . . . . . . . 100 volts
Grid-No.2 Supply Voltage . . . . . . . . . . . . . . . . . . . . . 50 volts
Grid No.1 . . . . Connected to negative end of cathode resistor
Cathode Resistor . . . . . . . . . . . . . . . . . . . . . . . . . . . . 68 ohms
Transconductance . . . . . . . . . . . . . . . . . . . . . . . . . 11000 μhmhos
Plate Current . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 11 ma
Grid-No.2 Current . . . . . . . . . . . . . . . . . . . . . . . . . . 2.9 ma
Grid-No.1 Voltage (Approx.) for plate μa = 10 . . . . . . . . . . . . . -7 volts

Mechanical:
Operating Position . . . . . . . . . . . . . . . . . . . . . . . . . . Any
Type of Cathode . . . . . . . . . . . . . . . . . . . . . . . . . . Coated Unipotential
Maximum Overall Length . . . . . . . . . . . . . . . . . . . . . . . . 1.050"
Seated Length . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0.790" to 0.840"
Maximum Diameter . . . . . . . . . . . . . . . . . . . . . . . . . . 0.440"
Weight (Approx.) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2.4 grams
Envelope . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Metal Shell MT4 with Ceramic insulator
Socket and Connector . . . . . . . . . . . . . . . . . . . . . . . . See Socket & Connector Information
for RCA Nuvistor Tubes at front of this Section
Cap . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Skirted Miniature (JEDEC No.C1-44)
Base . . . Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)
**AMPLIFIER — Class A**

**Maximum Ratings, Absolute-Maximum Values:**

For operation at any altitude

- Plate Supply Voltage: 300 max. volts
- Plate Voltage: 250 max. volts
- Grid-No.2 (Screen-Grid) Supply Voltage: 300 max. volts
- Grid-No.2 Voltage: 100 max. volts
- Grid-No.1 (Control-Grid) Voltage:
  - Negative-bias value: 55 max. volts
  - Positive-bias value: 0 max. volts
- Cathode Current: 25 max. ma
- Grid-No.2 Input: 0.2 max. watt
- Plate Dissipation: 1.6 max. watts

**Maximum Circuit Values:**

- Grid-No.1-Circuit Resistance: 0.5 max. megohm
- For fixed-bias operation: 1 max. megohm

**COMBINED RF OSCILLATOR and FREQUENCY DOUBLER — Class C**

**Maximum Ratings, Absolute-Maximum Values:**

For operation at any altitude

- Plate Supply Voltage: 300 max. volts
- Plate Voltage: 250 max. volts
- Grid-No.2 (Screen-Grid) Supply Voltage: 300 max. volts
- Grid-No.2 Voltage: 100 max. volts
- Grid-No.1 (Control-Grid) Voltage:
  - Negative-bias value: 55 max. volts
  - Peak-positive value: 3 max. volts
- Cathode Current: 25 max. ma
- Grid-No.1 Current: 3 max. ma
- Grid-No.2 Input: 0.5 max. watt
- Plate Dissipation: 1.6 max. watts
- Metal-Shell Temperature (Measured in Zone "A" as shown on Dimensional Outline): 150 max. °C
Typical Operation:

- **Heater Voltage**: Specified center value 80 volts, 150 volts
- **Plate Supply Voltage**: 80 volts, 150 volts
- **Grid-No.2 Supply Voltage**: 12000 ohms
- **Grid-No.2 Resistor**: 27000 ohms, 10000 ohms
- **Grid-No.1 Resistor**: 7.5 ma, 10 ma
- **Plate Current**: 6 ma, 6 ma
- **Grid-No.2 Current**: 260 mw, 650 mw
- **Useful Power Output at 80 Mc**: 0.05 max. megohm

Maximum Circuit Values:

- **Grid-No.1-Circuit Resistance**: 0.05 max. megohm

Notes:

- a: Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.
- b: For operation at metal-shell temperature of 150°F measured in zone "A" as shown on Dimentional Outline. For operation at other metal-shell temperatures, see Grid-No.1-Circuit-Resistance Rating Chart.
- c: Cathode, grid No.1, and grid No.2 are operated as a 40-Mc, Colpitts-type, electron-coupled oscillator with grid No.2 functioning as the "plate" of the oscillator, and the plate circuit tuned to 80 Mc.
- d: Measured at load.

### CHARACTERISTICS RANGE VALUES

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<th>Note</th>
<th>Min.</th>
<th>Max.</th>
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<td>Heater Current</td>
<td>0.95</td>
<td>1.05</td>
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Direct Interelectrode Capacitances:

- Grid No.1 to plate: 2 pf
- Grid No.1 to cathode, grid No.2, shell, and heater: 6.0 pf
- Plate to cathode, grid No.2, shell, and heater: 1.2 pf, 1.6 pf
- Heater to cathode: 1.1 pf, 1.7 pf
- Plate Current (1): 9 ma, 13 ma
- Plate Current (2): 50 µa
- Grid-No.2 Current: 4 ma
- Transconductance (1): 9000 µmhos, 13000 µmhos

Useful Power Output (1): 0.550 watt
Useful Power Output (2): 0.500 watt
Reverse Grid-No.1 Current: 0.3 µa
AC Emission: 15 ma

Leakage Current:

- Heater negative with respect to cathode: 10 µa
- Heater positive with respect to cathode: 10 µa
Leakage Resistance:

Between grid No.1 and all other electrodes tied together........... 1.10 5000 – megohms
Between grid No.2 and all other electrodes tied together........... 1.11 5000 – megohms
Between plate and all other electrodes tied together............... 1.12 10000 – megohms

Note 1: With dc heater volts = specified center value, εᵣ(ctr).
Note 2: Measured in accordance with EIA Standard RS-191-A.
Note 3: With dc plate supply volts = 100, dc grid-No.2 supply volts = 50, grid No.1 and metal shell connected to negative end of cathode resistor, cathode resistor (ohms) = 68, and cathode-bypass capacitor (µF) = 1000.
Note 4: With dc plate supply volts = 100, dc grid-No.2 volts = 50, dc grid-No.1 volts = -7, and metal shell connected to ground.
Note 5: Measured at load in 40-Mc oscillator-90-Mc doubler circuit with dc plate supply volts = 150, dc grid-No.2 supply volts = 150, grid-No.2 resistor (ohms) = 12000, and grid-No.1 resistor (ohms) = 10000.
Note 6: With dc heater volts = 0.9 specified center value.
Note 7: With dc plate supply volts = 125, dc grid-No.2 supply volts = 60, dc grid-No.1 supply volts = -1.5, grid-No.1-circuit resistance (megohms) ≤ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.
Note 8: With dc plate supply volts = 100, dc grid-No.2 supply volts = 50, dc grid-No.1 supply volts = -6.5, rms 60-cps ac grid-No.1 signal volts = 7.5, dc grid-No.1-circuit resistance (ohms) ≤ 2, plate- and grid-No.1-voltage supplies each bypassed with capacitor (µF) = 500, and metal shell connected to ground. "Ac Emission" is measured as the dc component of current in the plate circuit.
Note 9: With dc heater-cathode volts = 100.
Note 10: With grid No.1 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.
Note 11: With grid No.2 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.
Note 12: With plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

SPECIAL TESTS

Short-Duration Shock (I):
Peak Impact Acceleration ....... 1000 g

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four different positions (X₁, X₂, Y₁, and Y₂) in a Navy-Type High-Impact (Flyweight) Shock Machine and, with tube-electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Continuity and Shorts, Useful Power Output (I), Reverse Grid-No.1 Current, and Heater-Cathode Leakage Current.
Long-Duration Shock (2):
Peak Impact Acceleration . . . . . . . . 50 g

This test is performed, using a half-sine-wave, 11-milli-
second, mechanical shock pulse, on a sample lot of tubes from
each production run to determine the ability of the tube to
withstand the specified Peak Impact Acceleration. Tubes are
held rigid in each of two positions in three mutually per-
pendicular axes on a free-fall table. The longitudinal axis
of the tube is coincident with one of the three axes. The
table is dropped a total of 18 times to a horizontal surface
from a height sufficient to produce the specified Peak Impact
Acceleration. The material of the horizontal surface is such
that the duration of the half-sine-wave shock pulse is 11
milliseconds. No tube-electrode voltages are applied during
this test.

At the end of this test, tubes are criticized for Continu-
ity and Shorts, Useful Power Output (1), Reverse Grid-No.1
Current, and Heater-Cathode Leakage Current.

Sweep-Frequency Fatigue Vibration:

This test is performed on a sample lot of tubes from each
production run to determine the ability of the tube to with-
stand the Sweep-Frequency Fatigue Vibration specified below.
Tubes are held rigid and operated with dc heater-cathode volts
= 100. During operation, the tube is vibrated through the
frequency range from 5 to 500 cps and back to 5 cps. One such
vibration sweep cycle takes approximately 15 minutes. This
cycle is repeated for a period of 3 hours along each of three
mutually perpendicular axes for a total of 9 hours. The
longitudinal axis of the tube is coincident with one of the
three axes. The vibrations are applied as follows:

a. The vibration from 5 to 50 cps is applied with a con-
stant peak amplitude of 0.040 inch (0.080 inch peak-to-
peak)
b. The vibration from 50 to 500 cps is applied with a con-
stant acceleration of 10 g.
c. The vibration from 500 to 50 cps and then to 5 cps fol-
 lows the same procedure, but in reverse.

At the end of this test, tubes are criticized for Continu-
ity and Shorts, Useful Power Output (1), Reverse Grid-No.1
Current, and Heater-Cathode Leakage Current.

Low-Pressure Voltage Breakdown:

This test is performed on a sample lot of tubes from each
production run to determine the ability of the tube to with-
stand high-altitude (low-air-pressure) conditions. Tubes are
operated with 250 volts rms (60-cycle, ac) applied between
plate and all other electrodes and metal shell connected to-
gether. Tubes must not break down or show evidence of corona
when subjected to an air pressure (8.0 ± 0.5 mm Hg) corres-
ponding to an altitude of 100,000 feet.
Continuity and Shorts:

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyatron-Type Shorts Test described in MIL-E-1D, Amendment 5, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied upon request). The areas of acceptance and rejection for this test are shown in the accompanying Shorts-Test Acceptance-Limits graph. In this test, tubes are criticized for permanent or temporary shorts and open circuits.

Reliability Life (20 Hours):

This test is performed on a sample size (minimum of 80 tubes/lot for a 5-lot sampling plan or a minimum of 400 tubes for a single-lot sampling plan) designed to assure a process average AFR (Acceptable Failure Rate) of 0.5 per cent for Inoperatives and 2.1 per cent for Total Defectives and a process average RFR (Rejectable Failure Rate) of 2.0 per cent for Inoperatives and 4.7 per cent for Total Defectives.

During this test, tubes are operated at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Useful Power Output (2), Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.200 watt.

Heater-Cycling Life (100 Hours):

Intermittent Operation . . . . . . . . . 2000 cycles

This test is performed on a sample lot of tubes from each production run with heater volts = 1.35x specified center value cycled 1 minute ON and 2 minutes OFF, dc heater-cathode volts = -100, all other tube electrodes and metal shell connected to ground.

At the end of this test, tubes are criticized for Heater-Cathode Leakage Current, Open Heaters, Open Cathode Circuits, and Heater-Cathode Shorts.

Combined Oscillator-Doubler Life (100 Hours):

This test is performed on a sample lot of tubes from each production run.

During this test, tubes are operated as a combined oscillator and frequency doubler at maximum-rated plate dissipation.

At the end of this test, tubes are criticized for Useful Power Output (2), Reverse Grid-No.1 Current, Inoperatives, and Total Defectives. A tube is considered Inoperative if Useful Power Output (2) is less than 0.200 watt.
**NOTE 1:** MAXIMUM OUTSIDE DIAMETER OF 0.440" IS PERMITTED ALONG 0.190" LUG LENGTH.

**NOTE 2:** METAL-SHELL TEMPERATURE SHOULD BE MEASURED IN ZONE "A".