RCA-12DS7 is a multiunit tube of the 9-pin miniature type containing two diodes and a high-pervenance power tetrode of the space-charge-grid type in one envelope. It is intended for use in "hybrid" automobile receivers in which tube and transistor electrode voltages are obtained directly from the 12-volt storage battery. In such receivers, the diode units are used for signal detection and automatic volume control, while the tetrode unit serves as the driver for the transistorized audio output stage.

Because of its high pervenance, the tetrode unit can supply high space-charge grid current and high plate current with only 12.6 volts on the plate. These features, in addition to a high value of grid-No.2-to-plate transconductance (15000 microhmhos) and a low value of plate resistance of only 480 ohms, enable this tube to supply high input power at low distortion to the transistor in the power output stage of automobile receivers.

Space-charge-grid operation of the tetrode unit is accomplished by operating grid No.1 at a positive potential and utilizing grid No.2 as the control electrode.

## General Data

### Electrical

Heater, for Unipotential Cathode:

- **Voltage range** (AC or DC): 10.0 to 15.9 volts
- This voltage range is on an absolute basis. For longest life, it is recommended that the heater be operated within the voltage range of 11 to 14 volts.
- **Current (Approx.) at 12.6 volts**: 0.4 amp
- **Direct Interelectrode Capacitances (Without external shield):**
  - Grid No.2 to plate: 12.5 μF
  - Grid No.2 to grid No.1, heater, and cathode: 13 μF
  - Plate to grid No.1, heater, and cathode: 2 μF
- **Diode Units:**
  - Diode plate No.1 to diode cathode and heater: 0.5 μF
  - Diode plate No.2 to diode cathode and heater: 0.5 μF
  - Diode plate No.2 to diode plate No.2: 0.1 μF

### Characteristics, Class A Amplifier with 12.6 Volts on Heater:

- **Plate Voltage**: 12.6 volts
- **Grid-No.2 (Control-Grid) Voltage:**
  - Developed across a 2.7-megohm resistor: -0.5 volt
  - Developed across a 2.7-megohm resistor: 12.6 volts
- **Plate Resistance (Approx.)**: 480 ohms
- **Amplification Factor, grid No.2 to plate**: 7.2
- **Transconductance, grid No.2 to plate**: 15000 μhmhos
- **Plate Current**: 40 ma
- **Grid-No.1 Current**: 75 ma

### Mechanical:

- **Operating Position**: Any
- **Maximum Overall Length**: 2-5/8″
- **Maximum Seated Length**: 2-3/8″
- **Length, Base seat to Bulb Tip (Excluding tip)**: 2″ ± 3/32″
- **Diameter**: Minimum: 0.750″
  - Maximum: 0.875″
- **Bulb**: T-6-1/2
- **Base**: Small-Button Noval 9-pin (JEDEC No. E9-1)

### Tetrode Unit — Audio Driver Service

**Maximum Ratings, Design-Center Values Except as Noted:**

- **PLATE VOLTAGE**: 16 max. volts
- **GRID-No.2 (CONTROL-GRID) VOLTAGE**:
  - Negative bias value: -16 max. volts
- **GRID-No.1 (SPACE-CHANGE-GRID) VOLTAGE**
  - (Absolute Maximum): 16 max. volts
- **PEAK HEATER-CATHODE VOLTAGE**:
  - Heater negative with respect to cathode: 16 max. volts
  - Heater positive with respect to cathode: 16 max. volts

### Typical Operation:

- **With 12.6 volts on heater and grid-No.2 voltage obtained by a cathode resistor**
- **Plate Supply Voltage**: 12.6 volts
- **Plate Voltage**: Obtained from indicated plate supply through series 100-megohm having dc resistance of 150 ohms
- **Grid-No.1 Supply Voltage**: 12.6 volts
- **Grid-No.2 Supply Voltage**: 0 volts
- **Grid-No.2 Resistor**: 1.8 meghms
- **Cathode Resistor**: 18 ohms
- **Peak .4F Grid-No.2 Supply Voltage (Approx.)**:
  - From 3.3-megohm signal source: 2.85 volts
- **Plate Current**:
  - Zero Signal (Approx.): 23 ma
  - Maximum Signal: 13 ma
  - Grid-No.1 Current: 77 ma
  - Load Resistance: 1250 ohms
  - Total Harmonic Distortion: 8 per cent
  - Max.-Signal Power Output: 10 mw
Typical Operation:

With 12.6 volts on heater and grid-No.2 voltage obtained by grid-No.2 resistor
Plate Voltage. .................. 12.6 volts
Grid-No.1 Voltage. .............. 12.6 volts
Grid-No.2 Voltage:
Obtained by rectification through a 2.2-megohm resistor. ................ -2 volts
Peak A.F. Grid-No.2 Voltage (Approx.):
From 0.1-megohm signal source. ....... 2.5 volts
Plate Current:
Zero Signal (Approx.). ............ 40 ma
Maximum Signal. ... 8 ma
Grid-No.1 Current. ............... 75 ma
Load Resistance. ................. 800 ohms
Total Harmonic Distortion. ....... 10 per cent
Max.-Signal Power Output ........ 40 mw

Maximum Circuit Values:
Grid-No.2 Circuit Resistance ......... 10 max. megohms

DIODE UNITS -- Two
Values are for Each Unit
Maximum Ratings, Design-Center Values:
PLATE CURRENT. ................ 5 max. ma
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode .......... 16 max. volts
Heater positive with respect to cathode .......... 16 max. volts
Characteristics with 12.6 Volts on Heater:
Plate Current for plate volts = 10 ... 3 ma

OPERATING CONSIDERATIONS

The maximum ratings in the tabulated data, except the rating for grid-No.1 voltage, are established in accordance with the following definition of the Design-Center Rating System for rating electron devices.

Design-Center ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

The device manufacturer chooses those values to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation*, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

The equipment manufacturer should design so that initially no design-center value for the intended service is exceeded with a bogey device in equipment operating at the stated normal supply voltage.*

The maximum rating shown in the tabulated data for grid-No.1 voltage is established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron tubes.

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

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute maximum value for the intended service is exceeded with any device 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 device characteristics.

* For automotive equipment utilizing a 12-volt system, battery voltage range of 10.0 volts to 15.9 volts is accepted U.S.A. practice.

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA’s patent rights.
Fig. 1 - Average Plate Characteristics for Tetrode Unit of Type 12DS7.

Fig. 2 - Average Characteristics for Tetrode Unit of Type 12DS7.
DIMENSIONAL OUTLINE

APPLIES IN ZONE STARTING 0.375" FROM BASE SEAT.
MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED
BY RING GAUGE OF 7/16" I.D.

SOCKET CONNECTIONS
Bottom View

PIN 1 - PLATE OF DIODE UNIT NO. 2
PIN 2 - NO CONNECTION
PIN 3 - GRID NO. 1 OF TETRODE UNIT
PIN 4 - HEATER
PIN 5 - HEATER
PIN 6 - PLATE OF TETRODE UNIT
PIN 7 - GRID NO. 2 OF TETRODE UNIT
PIN 8 - CATHODE
PIN 9 - PLATE OF DIODE UNIT NO. 1