

GL-6942

TETRODE

ONE KILOWATT UHF TELEVISION OUTPUT

FORCED-AIR COOLED

UHF TETRODE

METAL AND CERAMIC

GROUNDING-GRID CIRCUITS

INTEGRAL RADIATOR

THORIATED TUNGSTEN CATHODE

# DESCRIPTION AND RATING

The GL-6942 is a four-electrode transmitting tube featuring a metal-and-ceramic envelope designed for use as a power amplifier or oscillator in grounded-grid circuits with both grids maintained at radio-frequency ground potential. The output circuit is connected between the anode and the screen grid. The anode is capable of dissipating one and one-half kilowatts. Cooling is accomplished by forced air with the radiator an integral part of the anode. The cathode is indirectly heated thoriated tungsten. Maximum ratings apply up to 900 megacycles.

When used as a Class B grounded-grid broad-band television amplifier this tube has a useful synchronizing peak-power output of one kilowatt at 900 megacycles; in narrow band Class C service the output is one kilowatt of continuous power as an amplifier or oscillator. Because of its ratings, the tube is also well adapted to use in dielectric-heating equipment.

High operating efficiency is assured because of the small size and close spacing of the tube electrodes, the ring-seal construction, and the low-loss factor due to the silver-plated external parts and the ceramic insulators. In addition, the grounded-grid construction eliminates the necessity for neutralization in a properly designed circuit. The small size of the GL-6942 permits compact mounting, and the ring-seal construction allows quick plug-in installation.

# TECHNICAL INFORMATION

## GENERAL

| Electrical                            | Minimum | Bogey | Maximum |         |
|---------------------------------------|---------|-------|---------|---------|
| Heater Voltage* . . . . .             | --      | 5.7   | 6.0     | Volts   |
| Heater Current at Bogey Voltage . . . | 21      | 23    | 24      | Amperes |
| Heater Starting Current . . . . .     | --      | --    | 36      | Amperes |
| Heater Cold Resistance . . . . .      | --      | 0.02  | --      | Ohms    |
| Cathode Heating Time . . . . .        | 1       | --    | --      | Minutes |

G E N E R A L   E L E C T R I C   C O M P A N Y

| Electrical (Cont'd)                                                                  | Minimum | Bogey | Maximum |                |
|--------------------------------------------------------------------------------------|---------|-------|---------|----------------|
| Amplification Factor, $G_2$ to $G_1$<br>$E_b=475$ Volts, $I_b=0.250$ Ampere. . . . . | 12      | 17    | 22      |                |
| Peak Cathode Current $I_c$ . . . . .                                                 | --      | --    | 3.0     | Amperes        |
| Direct Interelectrode Capacitances                                                   |         |       |         |                |
| Cathode - Plate $C_{cp}$ . . . . .                                                   | --      | --    | 0.04    | $\mu\text{pf}$ |
| Input, $G_2$ tied to $G_1$ . . . . .                                                 | 15.5    | 17.0  | 18.5    | $\mu\text{pf}$ |
| Output, $G_2$ tied to $G_1$ . . . . .                                                | 4.8     | 5.5   | 5.8     | $\mu\text{pf}$ |

## Mechanical

Mounting Position - Vertical

Air Flow ~~///~~

Through Radiator (See drawing for air duct form)

|                                                                                                                                                                                   |         |                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------------|
| Plate Dissipation. . . . .                                                                                                                                                        | 1.5     | Kilowatts                |
| Air Flow . . . . .                                                                                                                                                                | 60 Min  | Cubic Feet<br>per Minute |
| Static Pressure. . . . .                                                                                                                                                          | 1.5     | Inches Water             |
| Heater to Cathode Seals. . . . .                                                                                                                                                  | 12 Min  | Cubic Feet<br>per Minute |
| Screen-Grid to Control-Grid Seals. . . . .                                                                                                                                        | 6 Min   | Cubic Feet<br>per Minute |
| Anode to Screen-Grid Ceramic Insulator . . . . .                                                                                                                                  | 6 Min   | Cubic Feet<br>per Minute |
| Incoming Air Temperature . . . . .                                                                                                                                                | 45 Max  | C                        |
| Radiator Hub Temperature at Fin Adjacent to Anode Seal                                                                                                                            | 180 Max | C                        |
| Ceramic Temperature at Any Point . . . . .                                                                                                                                        | 200 Max | C                        |
| Net Weight . . . . .                                                                                                                                                              | 3.6     | Pounds                   |
| Forced-air cooling to be applied before and during the application<br>of any voltages. Forced-air cooling must be maintained for one minute<br>after the removal of all voltages. |         |                          |

## MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

Radio-Frequency Amplifier - Class B Television Service

Synchronizing-Level Conditions per Tube Unless Otherwise Specified

### Maximum Ratings, Absolute Values

|                                |          |           |
|--------------------------------|----------|-----------|
| DC Plate Voltage . . . . .     | 4000 Max | Volts     |
| DC Grid-No. 2 Voltage. . . . . | 600 Max  | Volts     |
| DC Plate Current . . . . .     | 0.7 Max  | Amperes   |
| Plate Input. . . . .           | 2.5 Max  | Kilowatts |
| Grid-No. 2 Input . . . . .     | 25 Max   | Watts     |
| Plate Dissipation. . . . .     | 1.5 Max  | Kilowatts |

### Typical Operation - Grounded-Grid Circuit up to 900 Megacycles

|                                                |      |       |
|------------------------------------------------|------|-------|
| Bandwidth 6 Megacycles, measured to 1 db point |      |       |
| DC Plate Voltage . . . . .                     | 3500 | Volts |
| DC Grid-No. 2 Voltage. . . . .                 | 500  | Volts |
| DC Grid-No. 1 Voltage. . . . .                 | -40  | Volts |
| Peak RF Plate Voltage                          |      |       |
| Synchronizing Level. . . . .                   | 2500 | Volts |
| Pedestal Level . . . . .                       | 1875 | Volts |

|                                        |       |         |
|----------------------------------------|-------|---------|
| Peak RF Driving Voltage                |       |         |
| Synchronizing Level. . . . .           | 110   | Volts   |
| Pedestal Level . . . . .               | 70    | Volts   |
| DC Plate Current                       |       |         |
| Synchronizing Level. . . . .           | 0.520 | Amperes |
| Pedestal Level . . . . .               | 0.360 | Amperes |
| DC Grid-No. 2, Pedestal Level. . . . . | 0.035 | Amperes |
| DC Grid-No. 1 Current                  |       |         |
| Synchronizing Level. . . . .           | 0.110 | Amperes |
| Pedestal Level . . . . .               | 0.035 | Amperes |
| Driving Power at Tube, approximate     |       |         |
| Synchronizing Level. . . . .           | 100   | Watts   |
| Pedestal Level . . . . .               | 25    | Watts   |
| Power Output, approximate              |       |         |
| Synchronizing Level $\phi$ . . . . .   | 1000  | Watts   |
| Pedestal Level $\phi$ . . . . .        | 560   | Watts   |

# PLATE-MODULATED RADIO-FREQUENCY POWER AMPLIFIER - CLASS C TELEPHONY

Carrier Conditions with a Maximum Modulation Factor of 1.0

## Maximum Ratings, Absolute Values

|                                |      |     |           |
|--------------------------------|------|-----|-----------|
| DC Plate Voltage . . . . .     | 3200 | Max | Volts     |
| DC Grid-No. 2 Voltage. . . . . | 600  | Max | Volts     |
| DC Grid-No. 1 Voltage. . . . . | -120 | Max | Volts     |
| DC Plate Current . . . . .     | 0.35 | Max | Amperes   |
| DC Grid-No. 1 Current. . . . . | 0.10 | Max | Amperes   |
| Plate Input. . . . .           | 1.12 | Max | Kilowatts |
| Grid-No. 2 Input . . . . .     | 10   | Max | Watts     |
| Plate Dissipation. . . . .     | 1200 | Max | Watts     |

## Typical Operation, Grounded-Grid Circuit up to 900 Megacycles

|                                              |       |         |
|----------------------------------------------|-------|---------|
| DC Plate Voltage . . . . .                   | 3000  | Volts   |
| DC Grid-No. 2 Voltage. . . . .               | 500   | Volts   |
| DC Grid-No. 1 Voltage. . . . .               | -100  | Volts   |
| Peak RF Plate Voltage. . . . .               | 2300  | Volts   |
| Peak RF Driving Voltage. . . . .             | 137   | Volts   |
| DC Plate Current . . . . .                   | 0.25  | Amperes |
| DC Grid-No. 2 Current. . . . .               | 0.01  | Amperes |
| DC Grid-No. 1 Current, approximate . . . . . | 0.047 | Amperes |
| Driving Power, approximate $\pi$ . . . . .   | 38    | Watts   |
| Power Output $\Delta$ . . . . .              | 565   | Watts   |

# RADIO-FREQUENCY POWER AMPLIFIER AND OSCILLATOR - CLASS C TELEGRAPHY

Key-Down Conditions per Tube without Amplitude Modulation  $\phi$

## Maximum Ratings, Absolute Values

|                                |      |     |           |
|--------------------------------|------|-----|-----------|
| DC Plate Voltage . . . . .     | 4000 | Max | Volts     |
| DC Grid-No. 2 Voltage. . . . . | 600  | Max | Volts     |
| DC Grid-No. 1 Voltage. . . . . | -150 | Max | Volts     |
| DC Plate Current . . . . .     | 0.7  | Max | Amperes   |
| DC Grid-No. 1 Current. . . . . | 0.10 | Max | Amperes   |
| Plate Input. . . . .           | 2.5  | Max | Kilowatts |
| Grid-No. 2 Input . . . . .     | 25   | Max | Watts     |
| Plate Dissipation. . . . .     | 1.5  | Max | Kilowatts |

Typical Operation - Grounded-Grid Circuit up to 900 Megacycles

|                                              |       |         |
|----------------------------------------------|-------|---------|
| DC Plate Voltage . . . . .                   | 3800  | Volts   |
| DC Grid-No. 2 Voltage . . . . .              | 500   | Volts   |
| DC Grid-No. 1 Voltage . . . . .              | -120  | Volts   |
| Peak RF Plate Voltage, approximate . . . . . | 2750  | Volts   |
| Peak RF Grid-No. 1 Voltage . . . . .         | 195   | Volts   |
| DC Plate Current . . . . .                   | 0.500 | Amperes |
| DC Grid-No. 2 Current . . . . .              | 0.022 | Amperes |
| DC Grid-No. 1 Current, approximate . . . . . | 0.075 | Amperes |
| Driving Power, approximate . . . . .         | 150   | Watts   |
| Power Output, approximate $\Delta$ . . . . . | 1200  | Watts   |

- \* The cathode of the GL-6942 because of transit-time effects which raise the temperature of the cathode, is subjected to considerable back bombardment in ultra-high-frequency service. The amount of heating due to bombardment is a function of the operating conditions and frequency, and must be compensated for by a reduction of the heater input to prevent overheating of the cathode with resulting short life. For long life, the GL-6942 should be put in operation with rated heater voltage. After the circuit has been adjusted for proper tube operation the heater voltage should be reduced to a value slightly above that at which circuit performance is affected. At a frequency of 900 megacycles and with typical operating conditions the heater voltage can be reduced to approximately 5.3 volts. At lower frequencies, the reduction will be less. Minor circuit readjustment may be necessary after this adjustment.
- / Represents maximum useable cathode current (plate current plus current to each grid) for any condition of operation.
- z Measured with a 6-inch diameter flat metal disk attached to the screen-grid ring. Control grid connected to the screen grid.
- § Output capacitance measured between anode and screen grid. Control grid connected directly to screen grid.
- /// The volume of cooling air indicated for the various seals is approximate only. Distribution of cooling air will vary with the cavity configuration about the tube. For most satisfactory operation the maximum temperature of any point on the tube shall be below 200 C.
- ◊ Useful power output including power transferred from driver stage.
- $\pi$  The carrier of the driver modulated 100 percent.
- ∅ Modulation essentially negative may be used if the positive peak of the envelope does not exceed 115 percent of the carrier conditions.
- $\Delta$  Total anode power output including power transferred from driver stage.

Technical drawing of a vacuum tube socket, showing a side view and a top view.

**FIG. 1 (Side View):**

- Overall height:  $8\frac{1}{4} \pm \frac{1}{4}$
- Top flange thickness:  $\frac{1}{8}$  MAX.
- Top flange outer diameter:  $3\frac{1}{2} \pm \frac{1}{64}$  DIA.
- Distance from top flange to anode terminal:  $2\frac{1}{8} \pm \frac{1}{8}$
- Anode terminal diameter:  $2.755 \pm .010$  DIA.
- Distance from anode terminal to screen-grid terminal:  $\frac{1}{8} \pm \frac{1}{16}$
- Screen-grid terminal diameter:  $3.250 \pm .010$  DIA.
- Distance from screen-grid terminal to control-grid terminal:  $\frac{1}{8}$  MIN.
- Control-grid terminal diameter:  $2.525 \pm .010$  DIA.
- Distance from control-grid terminal to cathode and filament return terminal:  $\frac{3}{4} \pm \frac{1}{16}$
- Cathode and filament return terminal diameter:  $1.532 \pm .010$  DIA.
- Distance from cathode and filament return terminal to filament terminal:  $\frac{7}{32} \pm \frac{1}{16}$
- Filament terminal diameter:  $.375 \pm .010$
- Distance from filament terminal to base:  $\frac{15}{32} \pm \frac{1}{16}$
- Base diameter:  $1.532 \pm .010$  DIA.
- Distance from base to bottom flange:  $\frac{1}{8}$  MIN.
- Bottom flange thickness:  $\frac{1}{8}$  MAX.
- Bottom flange outer diameter:  $2.50 \pm .008$  DIA. (NOTE 3)

**FIG. 2 (Top View):**

- Overall width:  $2\frac{3}{8}$  MAX.
- Handle diameter:  $\frac{5}{16}$  MAX.
- View at A: A-A

**NOTES:**

1. MAXIMUM ECCENTRICITY 0.010"
2. MAXIMUM ECCENTRICITY 0.015"
3. MAXIMUM ECCENTRICITY 0.030" WITH RESPECT TO CENTERLINE DETERMINED BY CENTERS OF ANODE TERMINAL AND CONTROL-GRID TERMINAL.

Diagram illustrating the top view of a mechanical part. The part consists of a cylindrical section on the left and a hemispherical section on the right. The cylindrical section has a diameter of  $2\frac{1}{2}$  inches. The hemispherical section has an internal diameter (I.D.) of  $5\frac{5}{16}$  inches and a 2-inch opening on the right side. An arrow labeled "AIR INPUT" points into the cylindrical section.

