



ELECTRONIC TUBE REFERENCE

159

Power - Triode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

TRIODE

High-power three-electrode transmitting triode for Class B/C RF power amplification, Class C oscillator operation, and Class B modulator service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	10 V / 9.6 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Triode	
TRANSCONDUCTANCE	0.0065 S
AMPLIFICATION FACTOR	20
MAXIMUM PLATE VOLTAGE	2000 V
MAXIMUM PLATE DISSIPATION	250 W
Representative electrical section; promoted values mapped from published ratings and characteristics where applicable.	

159 — Three-Electrode Transmitting Triode

The **GL-159** is a three-electrode transmitting triode designed for use as a Class B and Class C radio-frequency power amplifier, a Class C oscillator, or a Class B modulator. It features a heavy-duty filamentary cathode and is capable of operating at full ratings at frequencies up to 15 megacycles, and at reduced ratings up to 35 megacycles.

Physical Construction and Base Connections

The GL-159 is a large-envelope, convection-cooled transmitting tube. It is designed to be mounted either vertically (with the base up or down) or horizontally, provided that the filament is oriented in a vertical plane to prevent sagging and internal short circuits.

Physical Dimensions

- **Maximum Diameter:** 3-13/16 inches
- **Overall Height:** 11-1/4 inches $\pm$ 1/4 inch
- **Seated Height (base shoulder to top of cap):** 10-1/4 inches $\pm$ 3/16 inch
- **Anode Terminal:** Located at the top of the bulb, featuring a cap with a diameter of 0.800 inches $\pm$ 0.007 inches and a minimum straight side of 0.750 inches.
- **Net Weight:** Approximately 1 pound
- **Shipping Weight:** Approximately 3 pounds
- **Maximum Ambient Temperature:** 60 degrees Centigrade

Base and Pinout

The tube utilizes a **Super Jumbo 4-Pin Base (A4-18)**. The pin connections, viewed from the bottom of the base, are as follows:

Pin Number	Connection
1	Grid Terminal
2	Filament Terminal
3	Filament Terminal
4	No Connection (NC)

The plane of the internal electrodes is oriented at a 45-degree angle relative to the pin layout.

Electrical and Filament Characteristics

The GL-159 features a robust filamentary cathode designed for AC or DC operation. Under typical operating conditions, the average electrical characteristics are measured with a plate voltage of 2000 V, a plate current of 100 mA, and a filament voltage of 10 V AC:

Parameter	Value
Filament Voltage	10 V
Filament Current	9.6 A
Grid Voltage	-80 V

Parameter	Value
Amplification Factor	20
Grid-Plate Transconductance	6500 micromhos

Direct Interelectrode Capacitances

- **Grid-to-Plate:** 17.6 pF
- **Input:** 11 pF
- **Output:** 5 pF

Maximum Ratings and Operating Conditions

The GL-159 can be operated under several distinct classes of service. The maximum ratings and typical operating points vary significantly depending on the application.

Class B Audio-Frequency Power Amplifier (Two Tubes)

In modulator or audio-frequency amplifier service, two GL-159 tubes are typically operated in a push-pull configuration.

Parameter	Typical Operation (1500 V)	Typical Operation (2000 V)	Maximum Ratings
D-c plate voltage	1500 V	2000 V	2000 V
Max. signal d-c plate current (per tube)	—	—	400 mA
D-c max. signal plate input (per tube)	—	—	750 W
Plate dissipation (per tube)	—	—	250 W
D-c grid voltage	-73 V	-100 V	—
Peak a-f grid input voltage	370 V	400 V	—
Zero signal plate current	0.030 A	0.030 A	—
Max. signal plate current (two tubes)	0.720 A	0.660 A	—
Max. driving power (approx.)	5 W	4 W	—

Parameter	Typical Operation (1500 V)	Typical Operation (2000 V)	Maximum Ratings
Effective load (plate-to-plate)	4400 ohms	6880 ohms	—
Max. signal plate power output (approx.)	720 W	900 W	—

Class B Radio-Frequency Power Amplifier

This service is intended for carrier conditions per tube with a maximum modulation factor of 1.0.

Parameter	Typical Operation (1500 V)	Typical Operation (2000 V)	Maximum Ratings
D-c plate voltage	1500 V	2000 V	2000 V
D-c grid voltage	-65 V	-90 V	—
D-c plate current	0.240 A	0.190 A	0.300 A
Plate input	—	—	400 W
Plate dissipation	—	—	250 W
Peak r-f grid input voltage	200 V	200 V	—
Driving power output (approx.)	3.5 W	2.5 W	—
Plate power output (approx.)	120 W	130 W	—

Class C Radio-Frequency Power Amplifier and Oscillator (Plate-Modulated)

For carrier conditions per tube with a maximum modulation factor of 1.0.

Parameter	Typical Operation (1250 V)	Typical Operation (1500 V)	Typical Operation (1500 V, High Current)	Maximum Ratings
D-c plate voltage	1250 V	1500 V	1500 V	1500 V
D-c grid voltage	-200 V	-240 V	-240 V	-400 V

Parameter	Typical Operation (1250 V)	Typical Operation (1500 V)	Typical Operation (1500 V, High Current)	Maximum Ratings
D-c plate current	0.360 A	0.360 A	0.400 A	0.400 A
Plate input	—	—	—	600 W
Plate dissipation	—	—	—	150 W
Peak r-f grid input voltage	350 V	390 V	400 V	—
Driving power	7 W	7 W	9 W	—
Plate power output	330 W	400 W	450 W	—

Class C Radio-Frequency Power Amplifier and Oscillator (Unmodulated)

For key-down conditions per tube without modulation.

Parameter	Typical Operation (1500 V)	Typical Operation (2000 V)	Typical Operation (2000 V, High Current)	Maximum Ratings
D-c plate voltage	1500 V	2000 V	2000 V	2000 V
D-c grid voltage	-150 V	-200 V	-200 V	-400 V
D-c plate current	0.360 A	0.360 A	0.400 A	0.400 A
D-c grid current (approx.)	0.014 A	0.014 A	0.017 A	0.100 A
Plate input	—	—	—	800 W
Plate dissipation	—	—	—	250 W
Peak r-f grid input voltage (approx.)	295 V	340 V	350 V	—
Driving power (approx.)	4 W	5 W	6 W	—

Parameter	Typical Operation (1500 V)	Typical Operation (2000 V)	Typical Operation (2000 V, High Current)	Maximum Ratings
Plate power output (approx.)	400 W	560 W	620 W	—

High-Frequency Operation and Derating

The GL-159 is rated for operation at full maximum ratings up to a frequency of 15 megacycles. When operating at higher frequencies, the maximum plate voltage and plate power input must be reduced to protect the tube from excessive dielectric heating and thermal stress. The other maximum ratings remain unchanged.

The following table outlines the maximum allowable percentages of rated plate voltage and plate input up to 35 megacycles:

Frequency	15 MHz	25 MHz	35 MHz
Class B	100%	85%	74%
Class C (Plate-Modulated)	100%	75%	50%
Class C (Unmodulated)	100%	75%	50%

At these elevated frequencies, special attention must be given to providing adequate ventilation of the glass bulb to maintain the ambient temperature below the maximum limit of 60 degrees Centigrade.

Characteristic Curves and Interpretation

The published characteristics of the GL-159 include plate-grid transfer curves and average plate curves, both evaluated with a filament voltage of 10 V AC.

- **Plate-Grid Transfer Characteristics:** These curves plot grid current in milliamperes against plate voltage in volts for positive grid potentials (ranging up to +160 V). They show that grid current rises sharply at lower plate voltages, peaking before declining as plate voltage increases. This behavior is critical for calculating driving power and grid dissipation in Class C and Class B operations.
- **Average Plate Characteristics:** These curves plot plate current in amperes against plate voltage in volts for grid voltages ranging from +160 V down to -120 V. The curves illustrate the triode's high power-handling capability, showing linear plate current increases with plate voltage at positive grid biases, which is essential for high-efficiency Class C amplifier and oscillator design.

Technical Summary

The **GL-159** is a high-power, convection-cooled transmitting triode featuring a 10 V, 9.6 A filamentary cathode, an amplification factor of 20, and a transconductance of 6500 micromhos. Housed in a large glass envelope with a Super Jumbo 4-pin base and a top-cap anode terminal, it is capable of delivering up to 620 watts of RF power output in unmodulated Class C telegraphy or 900 watts of audio power in a push-pull Class B modulator configuration. It supports full ratings up to 15 MHz and can be operated up to 35 MHz with appropriate voltage and input power derating and adequate bulb ventilation.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1950 General Electric Transmitting Types

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1950 GENERAL ELECTRIC TRANSMITTING TYPES

Section 1 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum signal plate input per tube	750 W	ClassB Audio
Maximum signal plate power output	900 W	ClassB Audio PushPull

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