FEDERAL TELEPHONE AND RADIO COMPANY
A Division of International Telephone and Telegraph Corporation

TRAVELING WAVE TUBE REGISTRATION

Reservation No. 6868 Manufacturer's Designation: D-77

Reservation Date: January 25, 1956 Data Bureau Designation: 6868

General Characteristics

The 6868 all metal envelope traveling wave tube employing a helical type wave propagating structure is for power, intermediate-level, or low level amplifier operation in the 1700 to 4000 mc frequency range. The power output is approximately 10 watts and the tube is forced air cooled. It is designed for CW service. The matching circuit in 50 ohm coaxial line is used. The matching circuit is integral with the tube. A uniform magnetic field is used to control the electron beam.

Electrical Ratings, Absolute Values

Heater Voltage	6.3 (±10%) volts
Heater Current	2.5 amperes
Maximum Anode Voltage (Note 1)	1500 volts
Maximum Shell Current (Note 2)	5 milliamperes
Maximum Collector Voltage (Note 3)	1750 volts
Maximum Collector Dissipation (Note 4)	150 watts
Maximum Focussing Electrode Voltage (Note 5)	-250 volts

Electrical Information

Maximum Frequency	4000 mc
Minimum Frequency	1700 mc
Minimum Cold Transmission Loss	50 db

Mechanical Information

Type of Cathode	Oxide Impregnated Unipotential
Base, Small Shell Duodecal, 5 Pin, JETEC Designation	B5-57
Type of Envelope	Metal
Magnetic Field Strength (Nominal)	1000 gauss
Length of Magnetic Field	6.75 inches uniform
Mounting Position	Any
Weight (not including Magnet)	1 pound, 7 ounces
R-F Input and Output Impedance and Type Conductor	50 ohm coax with Type N Jack UG-23B/U
Type of Cooling	Forced Air
Glass Temperature	160°C max.
Cooling Air Required (Note 4)	20 cfm

from JETEC release #1786, Nov. 12, 1956

Typical Operation as Power Amplifier

Anode Voltage	1200 volts
Shell Current	3 milliamperes
Collector Voltage	1400 volts
Collector Current	70 milliamperes
Focussing Electrode Voltage	0 volts
Power Output (See Curve #1)	10 watts nominal
Gain (See Curve #1)	30 db nominal
Duty Cycle	
R-F	Variable to 1.0
Beam	1.0

Typical Operation as Linear Amplifier
(Input powers less than -10 dbm)

Anode Voltage	1150 volts
Shell Current	2.5 milliamperes
Collector Voltage	1400 volts
Collector Current	67 milliamperes
Focussing Electrode Voltage	0 volts
Gain (Curve #2)	35 db nominal
Noise Figure	30 db
Duty Cycle	
R-F	Variable to 1.0
Beam	1.0

Note 1: All voltages shown are with respect to cathode. Anode and helix are connected internally to the shell. The shell is normally operated at approximate ground potential and the d-c connection is made to the shell of the solenoid.

Note 2: The shell current is the difference between the cathode current and collector current. Since this current, in general, should be minimized, it is desirable to measure the current from shell to ground. It is recommended that overload protection be provided to remove high voltage if the shell current exceeds 5 milliamperes.

Note 3: It is generally desirable to operate the collector at 100 to 200 volts positive with respect to shell, and potential difference between collector and shell should be limited to 300 volts maximum.

Note 4: Forced air cooling of collector is required for average collector power in excess of 10 watts. As the collector power is increased, the air flow required increases. At the maximum collector power of 150 watts, a minimum air flow of 20 cfm through the cooling fins is required.

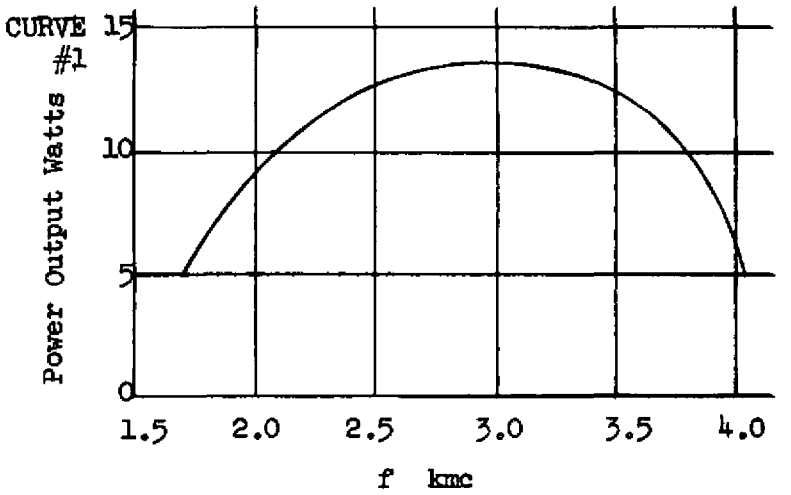
Note 5: This electrode is a remote cutoff grid, suitable for use as a gain control providing approximately 30 db control range but is not suitable for low level pulsing of the beam. It is recommended that, where feasible, provision should be made to operate the tube with small negative voltage on this electrode (-5 to -10 volts) as this permits operation of the tube at approximately optimum conditions with very low interception (shell current). It may also be operated fixed at cathode potential, if desired.

The data presented here is representative of operation of this type as an amplifier with maximum bandwidth and does not indicate the maximum performance obtainable under specific conditions, particularly narrower bandwidths.

Standard solenoids to operate this tube are available, and solenoids designed for particular applications can be supplied.

Additional information for specific applications can be obtained from the Vacuum Tube Engineering Department.

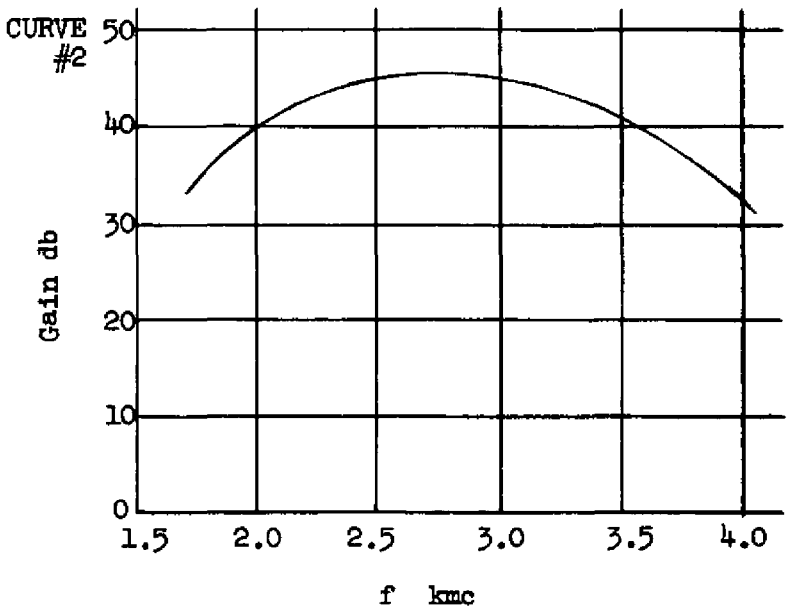
WARNING: Precautions must be taken to insure that high voltage is not applied in the absence of magnetic field otherwise the tube may be damaged.



Power Output vs. Frequency for
P_{in} = 1 milliwatt

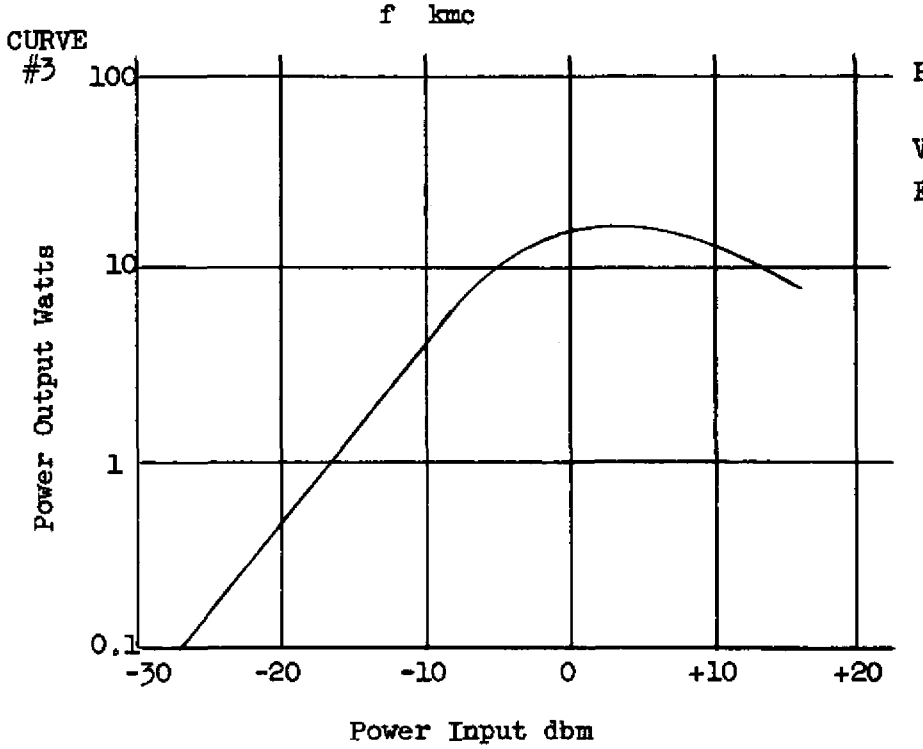
Voltage set for Max. P_{out} at f = 4.0 kmc,
P_{in} = 1 mw
(approximately 1200 volts)

Saturated Power Output is slightly higher.



Small Signal Gain vs. Frequency

Voltage set for Max. Gain at f = 4.0 kmc,
P_{in} = -20 dbm
(approximately 1150 volts)

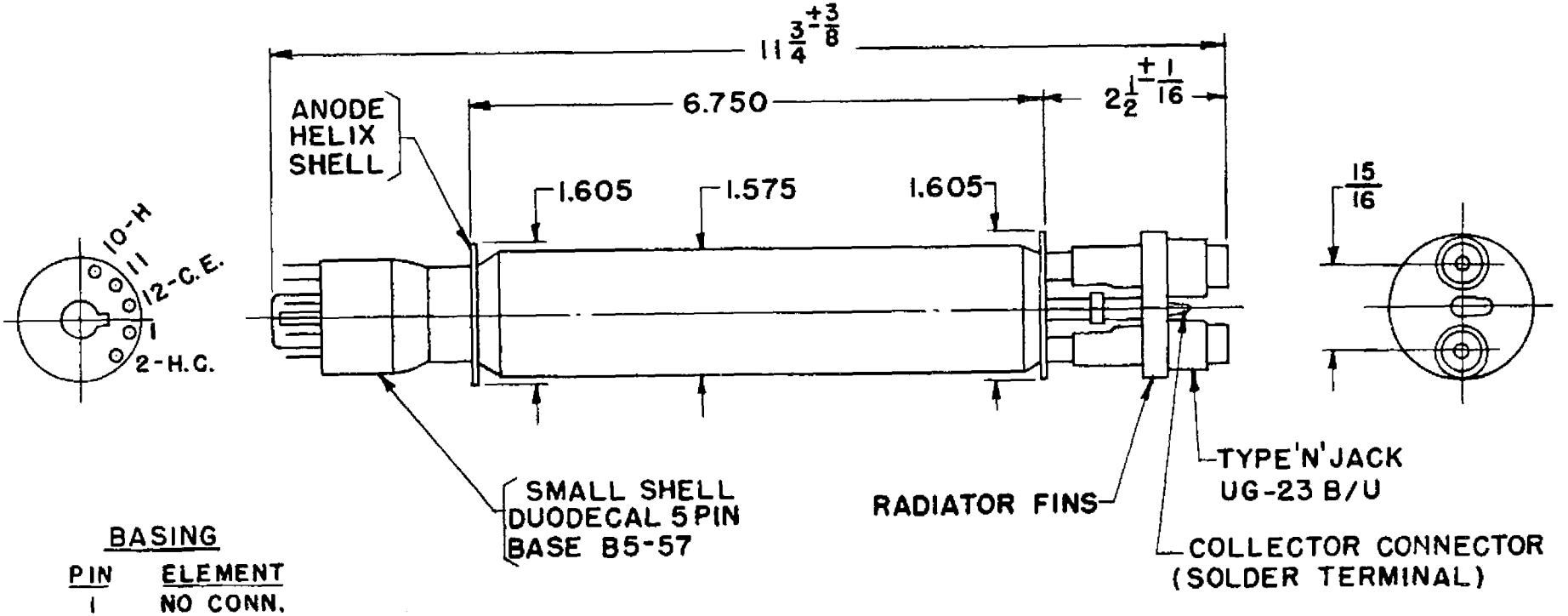


Power Output vs. Power Input

Voltage approximately 1200 volts
Frequency Midband

ALL CURVES SHOWN WITH MAGNETIC FIELD SET FOR MINIMUM SHELL CURRENT IN RANGE OF 750 TO 1000 GAUSS.

TYPICAL CHARACTERISTICS CURVES TWT 6868



BASING

PIN	ELEMENT
1	NO CONN.
2	HEATER-CATHODE
10	HEATER
11	NO CONN.
12	CONTROL ELECTRODE (FOCUSSING ELECTRODE)

TRAVELING WAVE TUBE TYPE F-6868