



varian
palo alto tube division

TECHNICAL DATA

4KM50000LA5

CW KLYSTRON AMPLIFIER

400-610 MHz
10 kW

DESCRIPTION

The 4KM50000LA5 is a four-cavity, externally-tuned klystron amplifier for use in shipboard, fixed-station, or van-mounted communication systems. The tube delivers an output of at least 10 kilowatts over its tunable frequency range of 400 to 610 megahertz. It includes an integral modulating anode which provides protection against internal arcs when connected through a resistor to the beam supply. The external cavities permit an unlimited number of tuning cycles without damaging the vacuum seals. The 4KM50000LA5 operates in conjunction with the H-206 R-F Circuit Assembly, which includes the focusing electromagnet, tunable cavities, load couplers for all four cavities, and an SK-110 Air System Socket.

MAXIMUM RATINGS¹

Beam Voltage	20 kVdc
Beam Current	2.5 Adc
Collector Dissipation	50 kW
Body Current, with drive	100 mAdc
Getter Current ²	50 Aac
Heater Surge Current	40 A
Focus Electrode Voltage	-500 Vdc
Reflected Power ³	500 W
Hydrostatic Pressure, tube	70 lbf/in ² g
Load VSWR	2:1



GENERAL CHARACTERISTICS^{4,5}

ELECTRICAL

Frequency Range	400-610 MHz
Heater Voltage	7.5 ± 0.4 V
Heater Current, typ	20 A
Heater Warm-up Time, min	5 min
Getter Voltage ²	2 Vac
Getter Current	36 Aac
Focusing	H-206 R-F Circuit Assembly

PHYSICAL

Dimensions	See Outline Drawings
Weight, approximate	
Tube	74 lbs
R-F Circuit Assembly	775 lbs
Mounting Position	Vertical, cathode up
Cooling	Liquid and Forced Air
Connectors	See Outline Drawings

TYPICAL OPERATING CONDITIONS ⁴

	Narrowband		Broadband
Frequency	400	610	400 MHz
Power Output	13.1	12.0	11.0 kW
Drive Power	0.05	0.05	0.5 W
Gain	54.2	53.8	43.4 dB
Bandwidth, 3-dB	0.3	0.5	3.0 MHz
Beam Voltage	17	17	17 kVdc
Beam Current	1.80	1.80	2.04 Adc
Body Current, with drive	90	80	75 mAdc
Cavity Loading			
Input Cavity	---	---	0.4 W
Second Cavity	---	---	13 W
Third Cavity	---	---	200 W
Focus Electrode Voltage	-201	-211	-100 Vdc
Focusing Current	2.0	2.0	2.6 Adc
Prefocus Coil Current	1.00	0.97	1.30 Adc
Load VSWR	1.05:1	1.05:1	1.05:1

H-206 R-F CIRCUIT ASSEMBLY

Prefocus Coil	
Voltage	0-50 V
Current	0-1.5 A
Body Coils and Collector Coil, in series	
Voltage	0-500 V
Current	0-2.75 A

COOLING

Cathode	Flow Rate	Pressure Drop
with SK-110 Air		
System socket ⁵	25 ft ³ /min	1 in-H ₂ O
Output Cavity ⁵	50 ft ³ /min	1.5 in-H ₂ O
Tube Body ⁷	1 gal/min	28 lbf/in ²
Tube Collector ⁷	25 gal/min	28 lbf/in ²

OPERATING HAZARDS

Read the following and take all necessary precautions to protect personnel. Safe operating conditions are the responsibility of the equipment designer and the user.

High Voltage. This tube operates at voltages which can be deadly. Equipment must be designed so personnel cannot come in contact with operating voltages. Enclose high-voltage circuits and terminals and provide fail-safe interlocking switch circuits to open the primary circuits of the power supply and to discharge high-voltage condensers whenever access is required.

Microwave Radiation. Exposure of the human body to microwave radiation in excess of 1 milliwatt per square centimeter is unsafe and can result in blindness or other injury. Personnel must be fully protected from the microwave energy which radiates from this device. All input and output r-f connections, waveguide flanges, and gaskets must be r-f leakproof and properly engaged. Never operate this device without a microwave-energy-absorbing load attached. Personnel must be prevented from looking into open waveguides or antennas while such a device is ener-

gized. (Ref. Proc. IRE, Vol. 49, No. 2, pp. 427-447, Feb. 1961).

X Rays. This device may produce X-ray radiation when energized. Operating personnel must be protected by appropriate shielding. Provide adequate X-ray shielding on all sides of this device, as well as the modulator and pulse transformer tanks. X-ray caution signs or labels must be permanently attached to equipment directing operating personnel never to operate this device without X-ray shielding in place.

Beryllium-Oxide Ceramics. This tube contains Beryllium-Oxide Ceramics. BERYLLIUM-OXIDE DUST AND FUMES ARE HIGHLY TOXIC AND BREATHING THEM CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH. Never perform any operation on the ceramic parts of this tube which might produce dust or fumes, such as grinding, grit blasting and acid cleaning.

Equipment must be designed to fully safeguard all personnel from these hazards. Labels and caution notices must be provided on equipment and in manuals clearly warning of those hazards which cannot be avoided.

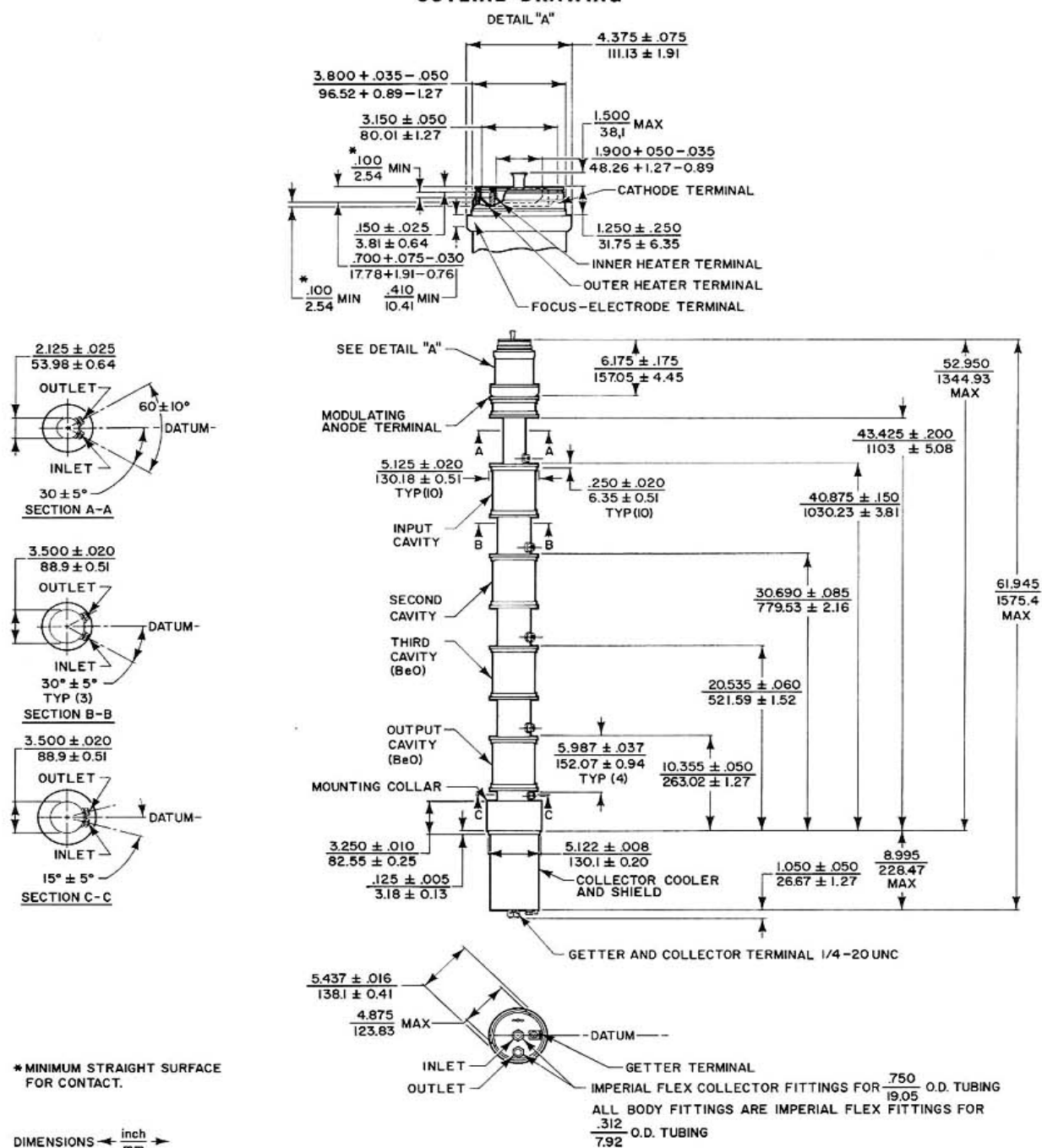
NOTES:

1. Ratings should not be exceeded under continuous or transient conditions. A single rating may be the limitation and simultaneous operation at more than one rating may damage the tube. Equipment design should limit voltage and environmental variations so that the ratings will never be exceeded.
2. Getter voltage must be applied whenever heater-voltage is applied.
3. Reflected power corresponds to a maximum load VSWR of 1.58:1 at 10 kilowatts output.
4. Characteristics and operating values are based on performance tests. These figures may change without

notice as a result of additional data or product refinement. Varian Associates should be consulted before using this information for equipment design.

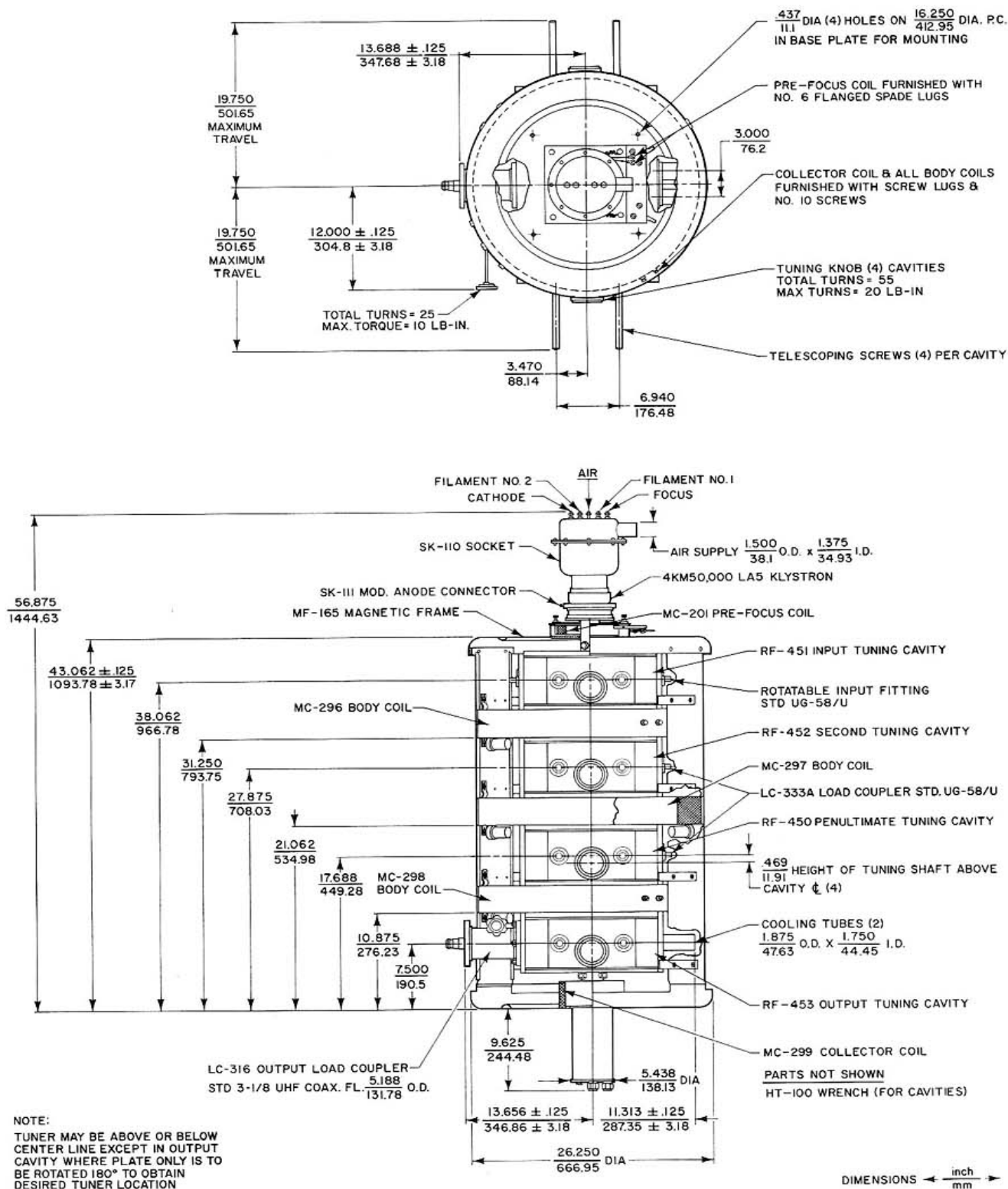
5. To protect against internal arc, a 10,000 ohm, 100-watt resistor should be connected between the modulating anode and the beam supply.
6. At sea level with a 20°C inlet air temperature.
7. Distilled water is the preferred coolant. Metals in the system should be close to copper in the galvanic series. Coolant should not be allowed to freeze in the tube. If antifreeze is required, consult the Palo Alto Tube Division, Palo Alto, California for recommendations.

OUTLINE DRAWING



4KM50000LA5

OUTLINE DRAWING



4KM50000LA5 IN H-206 RF ASSEMBLY