

DESCRIPTION

VA-890A, VA-891A, and VA-892B are four-cavity, vapor-cooled klystrons for use as final amplifier tubes in both visual and aural sections of UHF-TV transmitters. When used in the visual socket, each tube will deliver peak-of-sync output of up to 32 kilowatts over its tunable range. These three klystrons cover the frequency range of 470 to 890 megahertz in three consecutive segments. Gain is at least 35 dB at peak-of-sync with very low drive power. The modulating anode enables each tube to operate also in the aural section of the transmitter at reduced output level using the same beam supply as the visual section. Each tube uses an electromagnet for focusing and is self-centering in its magnet. Installation is simplified by rollers on the tube body which engage tracks in the electromagnet.

FEATURES

High Power --

Up to 32 kW peak-of-sync visual output and 12 kW aural output for reliable, long-life performance.

High Gain --

Gain of at least 35 dB produces an output of 32 kW with less than 10 W of drive power.

Ample Bandwidth --

One-dB bandwidth is at least 7.5 MHz over the tuning range. Output power will not vary more than ± 1.0 dB over the range of -1.5 MHz to +6 MHz from the visual carrier frequency and over the power levels from white to black.

Vapor Cooling --

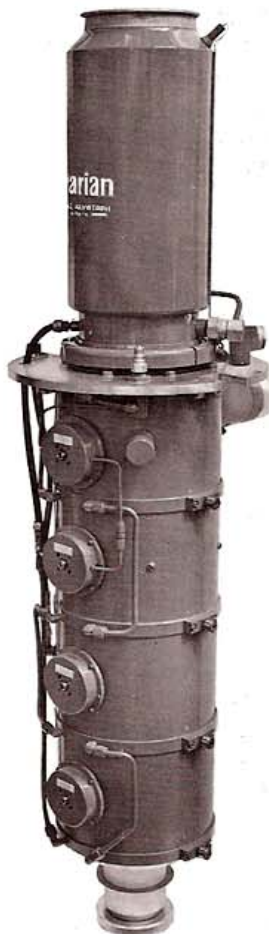
Reduces equipment size, noise, and cost; only 2 gal/min water flow required.

Modulating Anode --

Provides means for aural power control using the same beam power supply as the visual tube.

Simple Installation and Operation --

Each tube can be furnished factory tuned to a specified frequency if desired, but is tunable over its entire frequency range. The electromagnet operates from a single power supply. Installing the tube is made easy by rollers on the tube which mate with channels in the electromagnet.



VA-890A, VA-891A, VA-892B

GENERAL CHARACTERISTICS¹

ELECTRICAL

Frequency Range	470 to 890 MHz
VA-890A	470 to 566 MHz
VA-891A	566 to 698 MHz
VA-892B	698 to 890 MHz
Heater Voltage	6.0 ±0.5 V
Heater Current, at 6.0 V, typ	16.4 A
Heater Warm-up Time, min	5 min
Focusing	Electromagnet
Electromagnet Voltage, max	145 Vdc
Electromagnet Current, max	30 Adc

PHYSICAL

Dimensions	See Outline Drawing
Weight, approx	
VA-890A	270 lb
VA-1590B Electromagnet	350 lb
VA-891A	240 lb
VA-1591B Electromagnet	315 lb
VA-892B	187 lb
VA-1592B Electromagnet	170 lb
Mounting Position	Cathode Down
Cooling ²	
Tube	Water Vapor and Forced Air
Electromagnet	Water
Water Inlet Temperature, max	60 °C

OPERATING CONDITIONS AND RATINGS¹

	Typical Operation ³	Maximum Ratings ⁵
Frequency, visual, VA-890A	519	--- MHz
Output, saturated	35.5	--- kW
Output, peak-of-sync	32	--- kW
Drive Power, peak-of-sync	10	--- W
Gain, peak-of-sync ³	35	--- dB
Efficiency, saturated	37.5	--- %
Bandwidth, 1-dB	8	--- MHz
Beam Voltage	18.2	20.0 kVdc
Beam Current	5.1	6.1 Adc
Body Current	50	250 mAdc
Modulating Anode Voltage	18.2	20.0 kVdc
Modulating Anode Current	1.5	10 mAdc
Focusing Current	28	30 Adc
Load VSWR	< 1.1:1	1.5:1
Collector Temperature ⁴	105	245 °C

COOLING

Distilled water is the preferred coolant. Water purity should be maintained in accordance with the information contained in the Varian Application Engineering Bulletin AEB-31. In addition, at least 50 ft³/min of clean dry air should

be directed at the cathode. For additional information, contact the nearest Varian Sales Office or the Palo Alto Tube Division, Palo Alto, California.

Water Flow, minimum

Tube, body and collector in series	2 gal/min
Electromagnet	2 gal/min

Pressure Drop, at minimum flow, maximum

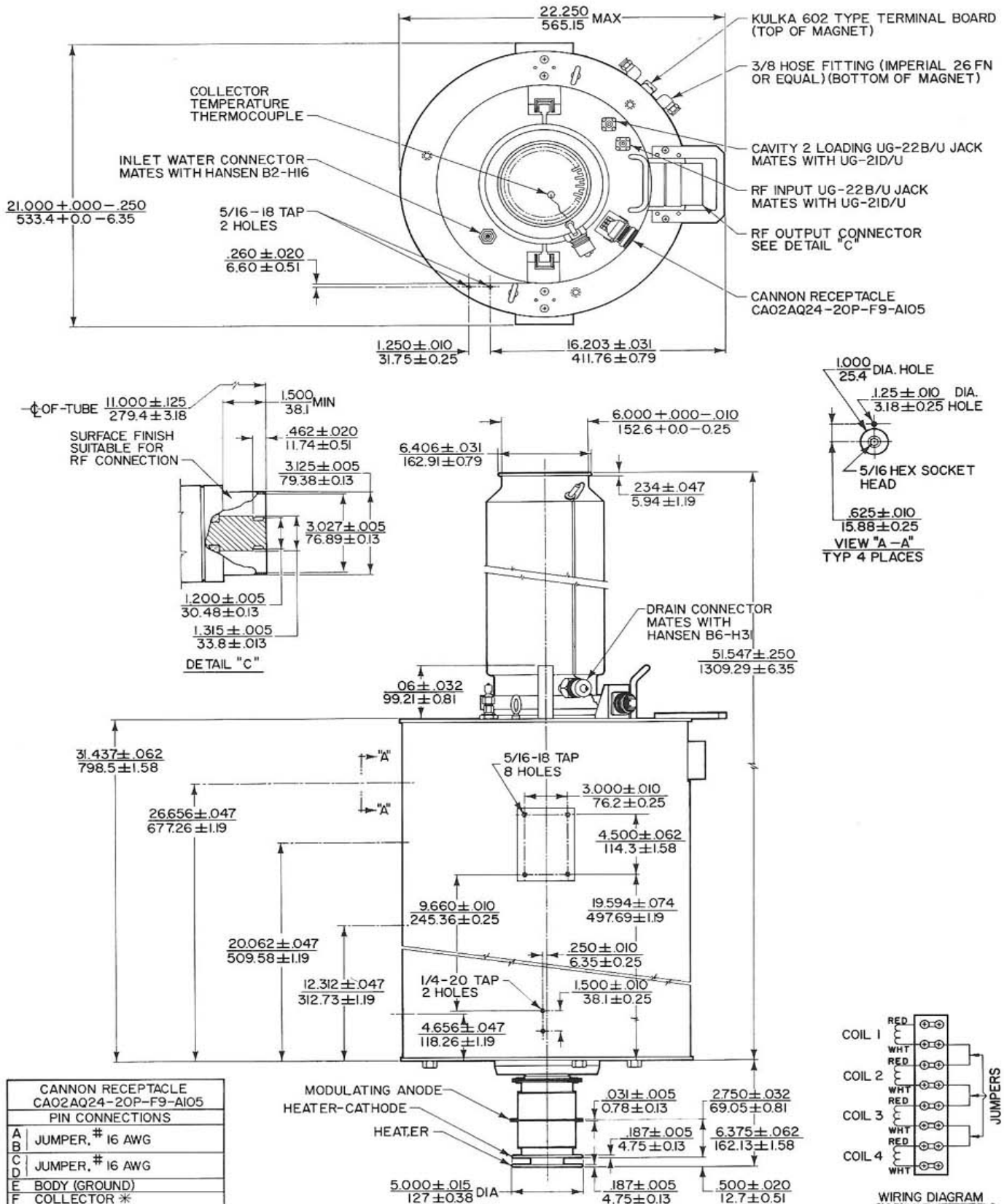
Tube	50 lbf/in ²
Electromagnet	35 lbf/in ²

NOTES:

1. Characteristic and operating values are based on performance tests. These figures may be changed without notice as a result of additional data or product refinement. Consult Varian before using this information for final equipment design.
2. For optimum performance, the water inlet temperature should be within 5°C of the coolest practical value.
3. Typical operation assumes a 91% peak-of-sync power ratio. Other ratios can be used depending upon the degree of linearity required.
4. The collector temperature is monitored by the chromel-alumel thermocouple attached to each tube at the point indicated on the outline drawing.
5. 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 not be possible. Equipment design should limit voltage and environmental variations so that the ratings will never be exceeded.

OUTLINE DRAWING

VA-890A Tube in VA-1590B Electromagnet



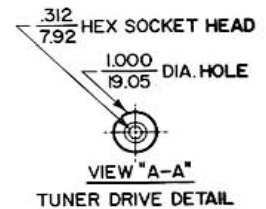
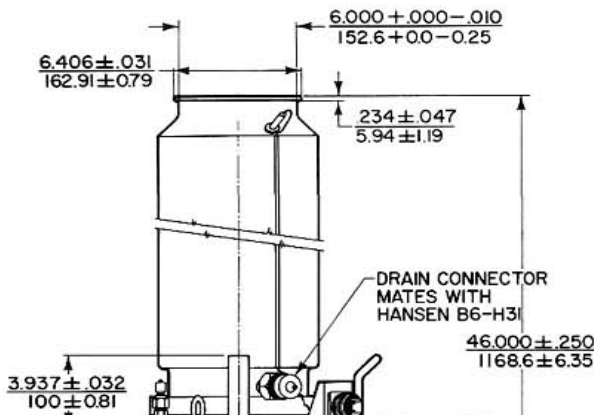
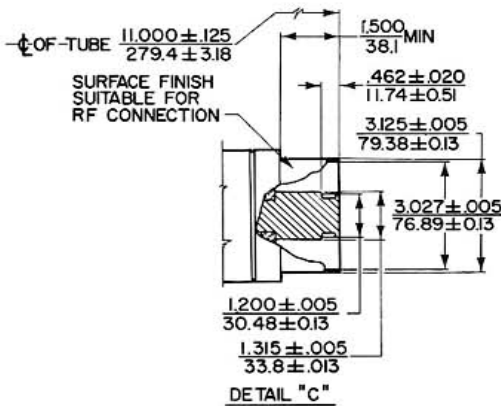
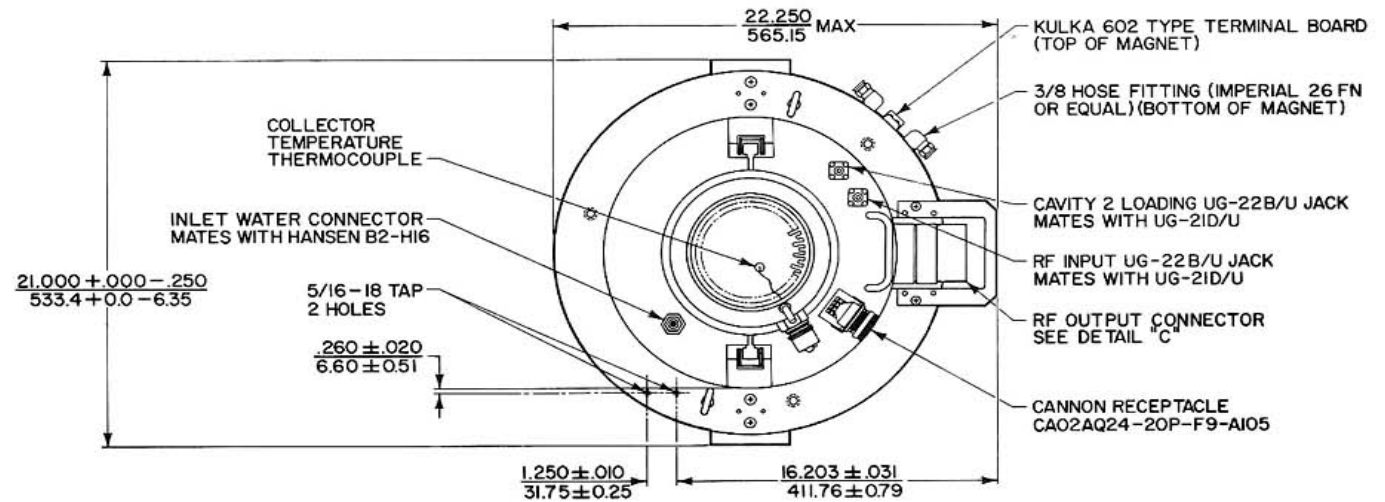
CANNON RECEPTACLE CA02AQ24-20P-F9-A105 PIN CONNECTIONS	
A	JUMPER, # 16 AWG
B	JUMPER, # 16 AWG
C	JUMPER, # 16 AWG
D	JUMPER, # 16 AWG
E	BODY (GROUND)
F	COLLECTOR *
G	COLLECTOR
H	CHROMEL THERMOCOUPLE
J	ALUMEL CONNECTIONS

* ALWAYS USE PINS F AND G IN PARALLEL



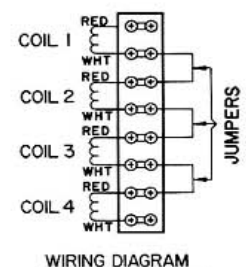
← $\frac{\text{inch}}{\text{mm}}$ →

OUTLINE DRAWING VA-891A Tube in VA-1591B Electromagnet



CANNON RECEPTACLE CAO2AQ24-20P-F9-A105 PIN CONNECTIONS	
A	JUMPER, # 16 AWG
B	JUMPER, # 16 AWG
C	JUMPER, # 16 AWG
D	JUMPER, # 16 AWG
E	BODY (GROUND)
F	COLLECTOR *
G	COLLECTOR
H	CHROMEL THERMOCOUPLE
J	ALUMEL CONNECTIONS

* ALWAYS USE PINS F AND G IN PARALLEL



inch
mm

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 energized. (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.

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.

