

4659, 4660

C Band Klystrons

5.0 Kilowatts Pulsed Power Output
High Efficiency — High Power Gain
Compact — Sturdy
Gang-Tuned Cavities
Air Cooled

ELECTRICAL

Cathode Indirectly-Heated Tungsten Dispenser Cathode
 Filament

Voltage 6.5 ± 0.5 V
 Current (at 6.5 V) 7.6 A
 Current (maximum) 8.2 A
 Warm-Up Time 180 s

MECHANICAL

Mounting Position Any
 Length (maximum) (393 mm) 15.5 in
 Width (maximum) (267 mm) 10.5 in
 Weight (approx.)
 Uncrated (17.2 kg) 38 lb
 In commercial pack (18.1 kg) 40 lb
 In military pack (22.5 kg) 50 lb

THERMAL

Collector Temperature (maximum) 260 °C
 Body Temperature (maximum) 150 °C
 Tuner Fin Temperature (maximum) 150 °C

Electron Gun Temperature

 Insulation (maximum) 250 °C
 Storage (minimum) -65 °C

Cooling: Forced air flow across the collector, body and tuner is required.

Typical air-flow requirements
 (20° C at sea level pressure)

	Min. Air Flow		Max. Press Drop	
	lbs/min.	kg/min.	in H ₂ O	cm H ₂ O
Collector . .	7.5	3.4	2.0	5.1
Body and Tuner	0.85	0.38	0.75	1.9



**Electronic
Components**

DATA 1
2-71

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Typical Rating as a Pulsed RF Amplifier

MAXIMUM RATINGS, *Absolute-Maximum Values:*

Pulsed Beam Voltage	14.0 max.	kV
Pulsed Beam Current	1.6 max.	A
Pulse Width	500	μ sec
Duty	0.2	%

TYPICAL PULSED OPERATION

Frequency	4.7	GHz
Pulsed Beam Voltage	12.0	kV
Pulsed Beam Current	1.4	A
Pulsed Power Output*	5.0	kW
Power Gain	50.0	dB
Efficiency	30.0	%
Pulse Width	5.0	μ sec
Duty	0.2	%

* A waveguide transformer was used to optimize the power output at the stated frequency

GENERAL INFORMATION

Installation and Operation

No installation or operation should be attempted prior to consulting the Installation and Operating instructions shipped with each tube or available upon request from Super Power Tube Marketing, RCA Lancaster, PA 17604.

RCA reference publications helpful for installation and operation include the following:

Data Sheet — RCA 4659, RCA 4660

Application Note — AN 4213

Application Guide — 1CE-279

These publications are available as complete packets—Request PWR-544, "Application Information for the RCA 4569 Klystron."

Request PWR-545, "Application Information for the RCA 4660 Klystron."

Personnel Safety

The high voltages and microwave radiations from these devices can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals shielded.

These devices, in operation, may produce X-Radiation which can constitute a health hazard. Shielding or other precautions may be required.

Packaging

Two types of packaging are available with these tubes; Commercial Pack and Military Pack. The customer specifies the desired type.

The Commercial Pack is made of nesting, cardboard cartons with the inner carton shock-mounted. The Military Pack complies with MIL-S-4473C for air shipment. It uses an hermetically-sealed, metal container which protects the tube and serves to shield the surrounding area from stray magnetic fields set up by the klystron focusing magnet.

During shipment, the tube is enclosed in a polyethylene bag to prevent dust and other particles from collecting in the waveguide or tuning systems. It is recommended that the tube be stored in the bag and in the shipping container when not in use. Dust or other unwanted particles in the waveguide can cause arcing during operation and subsequent tube destruction.

Cooling

Air ducts must be provided to connect to the top of the collector and the tuner cooling duct. See the Outline Drawing.

Mounting

Four holes are provided in the gun end of the focusing magnet for mounting purposes. Only non-magnetic studs should be used.

Thermocouple

A thermocouple, mounted on the collector, provides a signal which will indicate excessive collector temperature. This output can be used to operate protective circuitry.

Tuning

Tuning is accomplished by a single knob which gang tunes all four cavities simultaneously. The second, third and output cavities may be individually trimmed for optimizing the tube performance at any frequency within the tube operating band. See Outline Drawing.

Protection Circuits

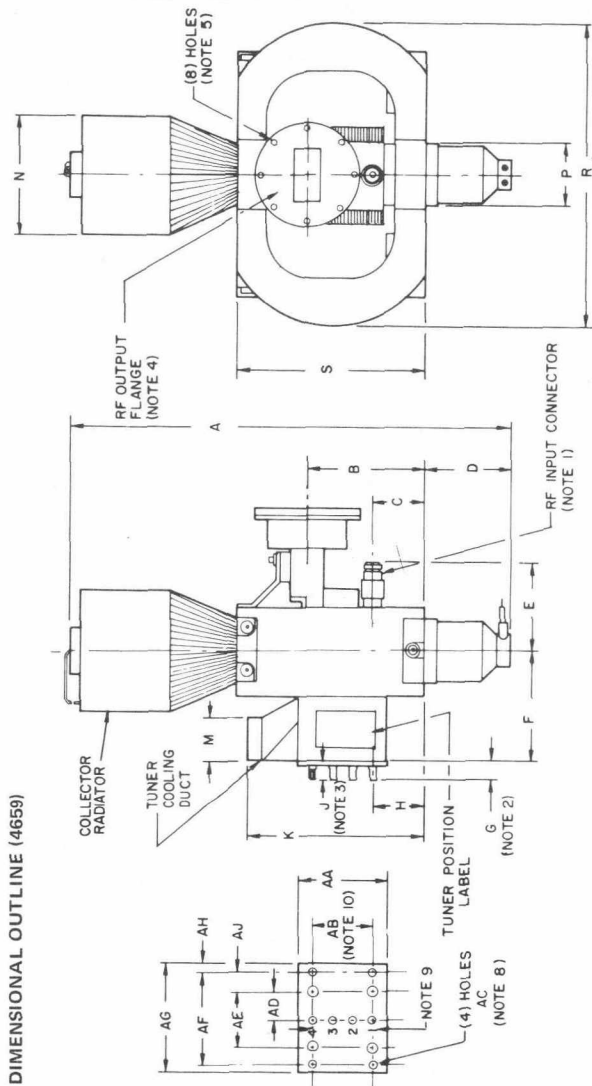
Protection circuits serve a three fold purpose: safety of personnel, protection of the tube, and protection of the circuits. Consult "Application Guide" 1CE-279 for complete information on protection circuits.

NOTES FOR OUTLINE DRAWINGS (BOTH TYPES)

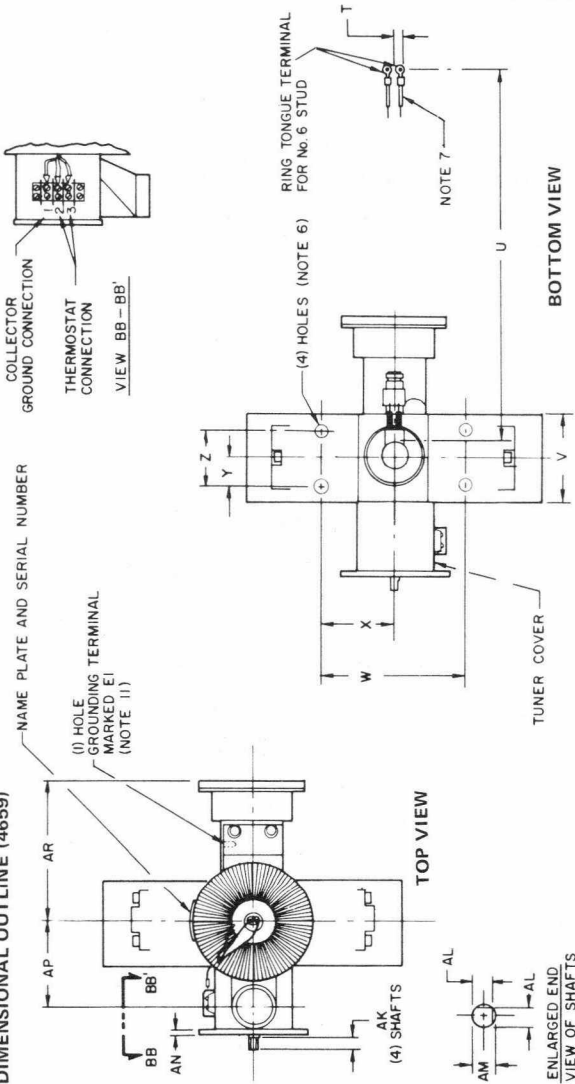
1. Mates with Type "N" Connector UG-21 B/U or equivalent.
2. Dimension applies to Shaft No.1 only.
3. Dimension applies to Shafts No.'s 2, 3, and 4 only.
4. Mates with UG-149 A/U or equivalent.
5. Holes 10-32 UNF-2B equally spaced on $3.250'' \pm .032''$ ($82.6 \pm .8$ mm) dia. circle.
6. Holes $0.437'' \pm .062''$ (11.1 ± 1.6 mm) thru (One side only).
7. High-Voltage Lead Designation
Heater Lead — Yellow
Heater-Cathode Lead — White
8. Thru-holes checked with gauge.
9. Three spaces between shafts are $0.70'' \pm .03''$ ($17.8 \pm .8$ mm) and add to $2.100''$ (53.34 mm). Shafts are numbered as shown.
10. Tolerance for this dimension applies to location of four $0.201''$ (5.11 mm) holes.
11. Hole #6-32 UNC-2B, $0.25''$ (6.35 mm) minimum depth.

TABULATED DIMENSIONS FOR THE OUTLINE DRAWING (4659)

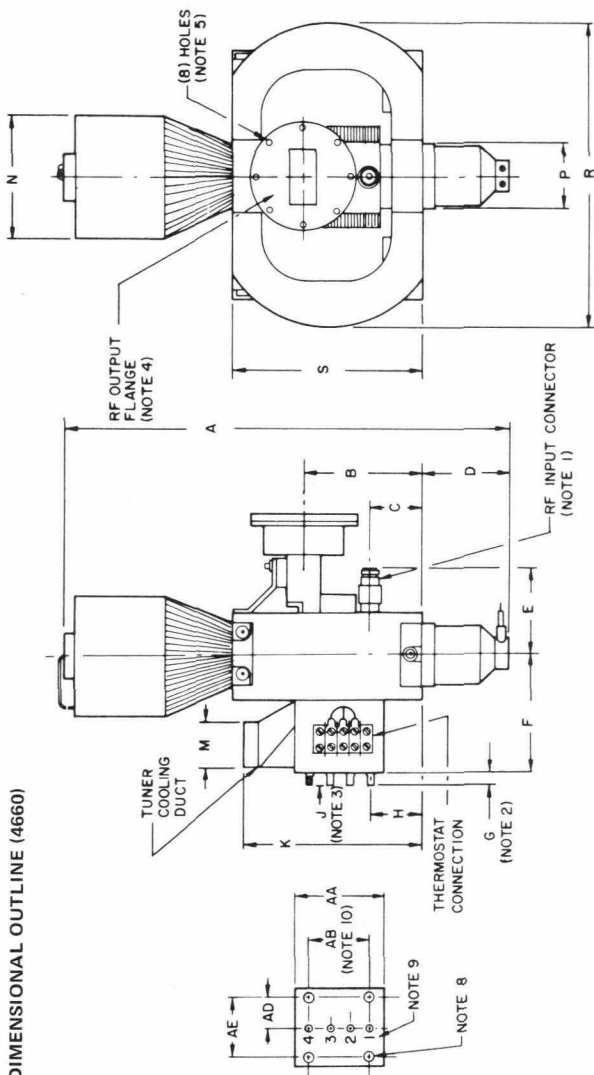
Dimension Reference	Specified Values Inches	Millimeters
A	15.5 max.	393.7 max.
B	$4.06 \pm .12$	103.1 ± 3.0
C	$1.80 \pm .12$	45.7 ± 3.0
D	3.5 max.	88.9 max.
E	$3.00 \pm .06$	76.2 ± 1.5
F	$3.80 \pm .12$	96.5 ± 3.0
G	$0.68 \pm .05$	17.3 ± 1.3
H	$1.80 \pm .09$	45.7 ± 2.3
J	$0.68^{+.15}_{.10}$	$17.3^{+3.8}_{-2.5}$
K	6.25 max.	158.8 max.
M	$1.50 \pm .03$	$38.1 \pm .8$
N Dia.	$4.12 \pm .03$	$101.6 \pm .8$
P Dia.	$2.130 \pm .015$	$54.10 \pm .38$
R	10.5 max.	266.7 max.
S	$6.5 \pm .5$	165 ± 13.0
T Dia.	$0.250 \pm .015$	$6.35 \pm .38$
U	$13.50 \pm .25$	343.0 ± 6.0
V	3.25 max.	82.55 max.
W	$5.00 \pm .06$	127.0 ± 1.5
X	$2.50 \pm .06$	63.5 ± 1.5
Y	$1.00 \pm .06$	25.4 ± 1.5
Z	$2.00 \pm .06$	50.8 ± 1.5
AA	$3.00 \pm .06$	76.2 ± 1.5
AB	$2.10 \pm .02$	$53.34 \pm .51$
AC	$0.201 \pm .010$	$5.11 \pm .25$
AD	$1.00 \pm .03$	$25.4 \pm .8$
AE	$2.00 \pm .03$	$50.8 \pm .8$
AF	$3.25 \pm .02$	$82.55 \pm .51$
AG	$3.75 \pm .03$	$95.3 \pm .8$
AH	$0.25 \pm .03$	$6.4 \pm .8$
AJ	$0.62 \pm .03$	$15.8 \pm .8$
AK	$0.440 \pm .010$	$11.18 \pm .25$
AL	$0.230 \pm .005$	$5.84 \pm .13$
AM Dia.	$0.249 \pm .002$	$6.325 \pm .051$
AN	$0.125 \pm .030$	$3.2 \pm .8$
AP	$3.00 \pm .06$	76.2 ± 1.5
AR	$4.75 \pm .12$	120.6 ± 3.0



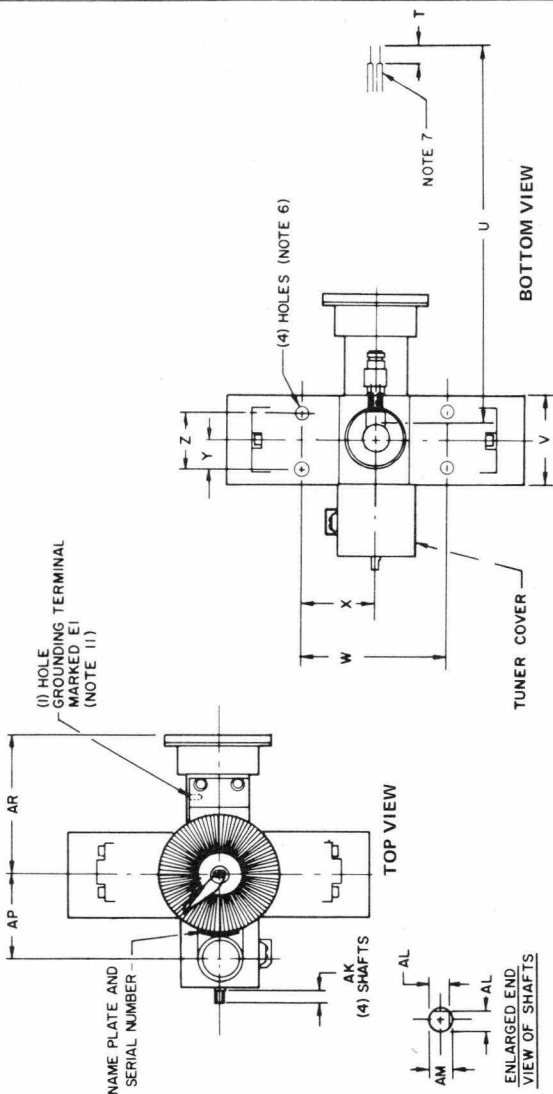
DIMENSIONAL OUTLINE (4659)



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C	$1.80 \pm .12$	45.7 ± 3.0
D	3.5 max.	88.9 max.
E	$3.00 \pm .06$	76.2 ± 1.5
F	$3.80 \pm .12$	96.5 ± 3.0
G	$0.68 \pm .05$	17.3 ± 1.3
H	$1.80 \pm .09$	45.7 ± 2.3
J	$0.68 \begin{smallmatrix} + .15 \\ - .10 \end{smallmatrix}$	$17.3 \begin{smallmatrix} + 3.8 \\ - 2.5 \end{smallmatrix}$
K	6.25 max.	158.8 max.
M	$1.50 \pm .03$	$38.1 \pm .8$
N Dia.	$4.12 \pm .03$	$101.6 \pm .8$
P Dia.	$2.130 \pm .015$	$54.10 \pm .38$
R	10.5 max.	266.7 max.
S	$6.5 \pm .5$	165 ± 13.0
T	$0.50 \pm .12$	12.7 ± 3.0
U	$15.00 \pm .25$	381.0 ± 6.0
V	3.25 max.	82.55 max.
W	$5.00 \pm .06$	127.0 ± 1.5
X	$2.50 \pm .06$	63.5 ± 1.5
Y	$1.00 \pm .06$	25.4 ± 1.5
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