



REFLEX KLYSTRON

DATA SHEET

oscillator

VA-6310

V-260

8.5 - 10.0 kmc

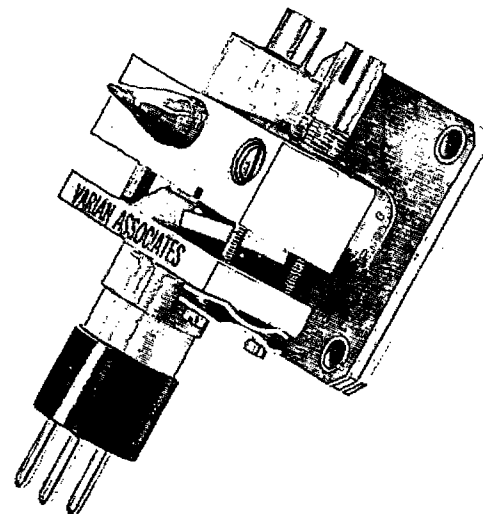
125 mw

APPLICATION

The VA-6310/V-260 is intended for radar application particularly under rugged service conditions. It will operate from conventional power supplies and with conventional crystal mixers, greatly increasing the ruggedness and reliability of any radar system to which it may be applied. It will produce adequate power output and electronic tuning range with resonator voltage as low as 200 volts.

FEATURES

Low microphonics . . . Negligible barometric frequency coefficient . . . Matched load operation without matching sections . . . Waveguide output . . . Linear reflector voltage tracking . . . Rapid warm-up . . . Removable inserts in flange holes simplify insulation when required.



GENERAL CHARACTERISTICS

Frequency Range 8.5 to 10 kmc
Heater Voltage 6.3 v
Heater Current 1.2 amp

MAXIMUM RATINGS

Resonator Voltage 350 v
Resonator Current 42 ma
Reflector Voltage 0 to -1000 v

MECHANICAL CHARACTERISTICS

Cathode Oxide coated, unipotential
Maximum Dimensions $3\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{8}$ in.
Weight 6 oz
Output Connector Bolts to UG-39/U flange
or UG-40A/U choke for
1 x $\frac{1}{2}$ x 0.050 in. waveguide
Base Pee-wee, 3-pin (A3-1)
Top Cap Miniature (C1-4)
Mounting Position Any
Cooling Convection¹
Tuner Single screw tuner²
Tuning Torque (starting) <50 in.-oz
Shock Withstands up to 250 G³
Microphonics Less than 500 kc⁴

AVERAGE ELECTRICAL CHARACTERISTICS

Resonator Voltage	200	300	300	v
Mode	6 $\frac{3}{4}$	5 $\frac{3}{4}$	4 $\frac{3}{4}$	
Frequency	9.3	9.3	9.3	kmc
Resonator Current	17	28	28	ma
Reflector Voltage	-120	-160	-250	v
Power Output (load VSWR<1.1)	20	70	125	mw
Electronic Tuning Range ⁵	30	48	35	mc
Modulation Sensitivity	2.5	1.5	1.1	mc/v
Warm-up Time ⁶	15	15	15	sec
Temperature Coefficient	-60	-60	-60	kc/°C

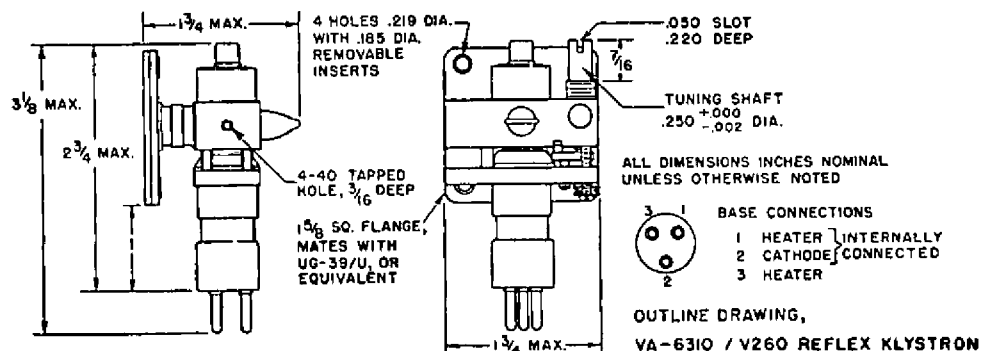
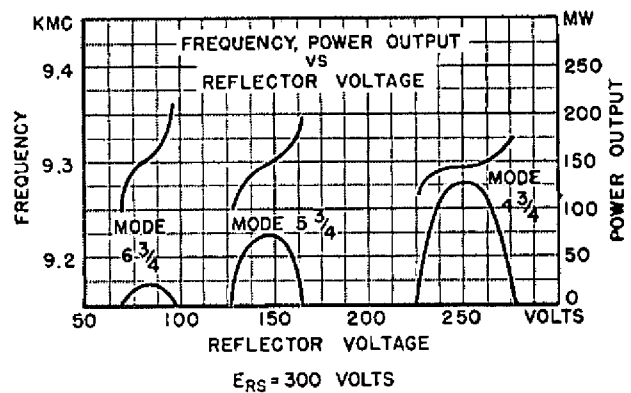
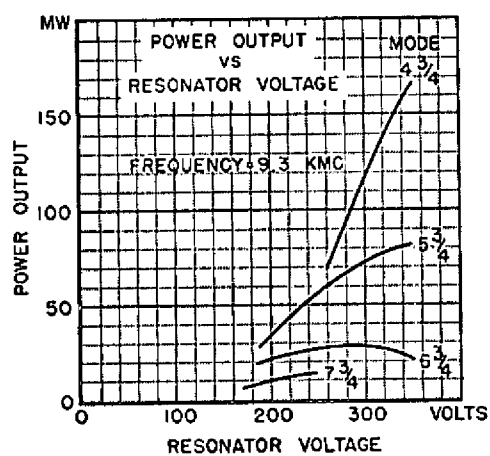
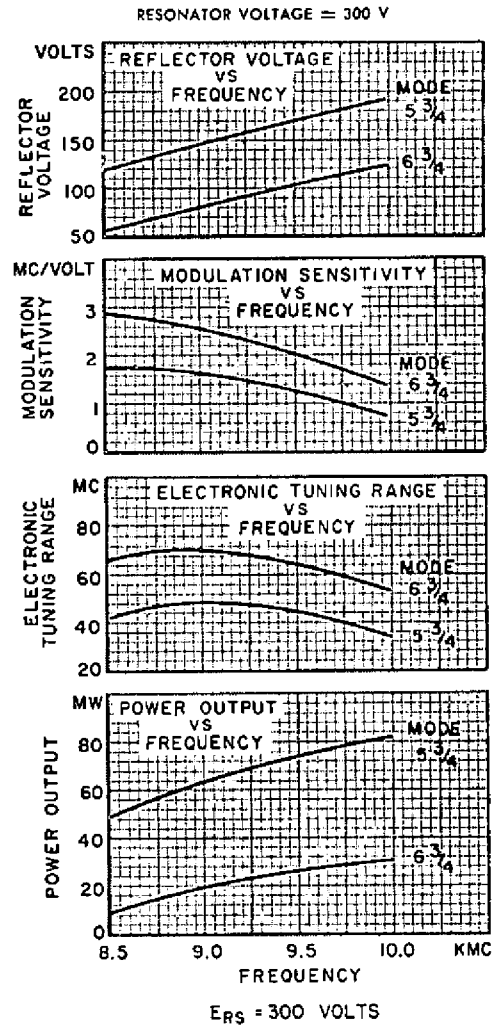
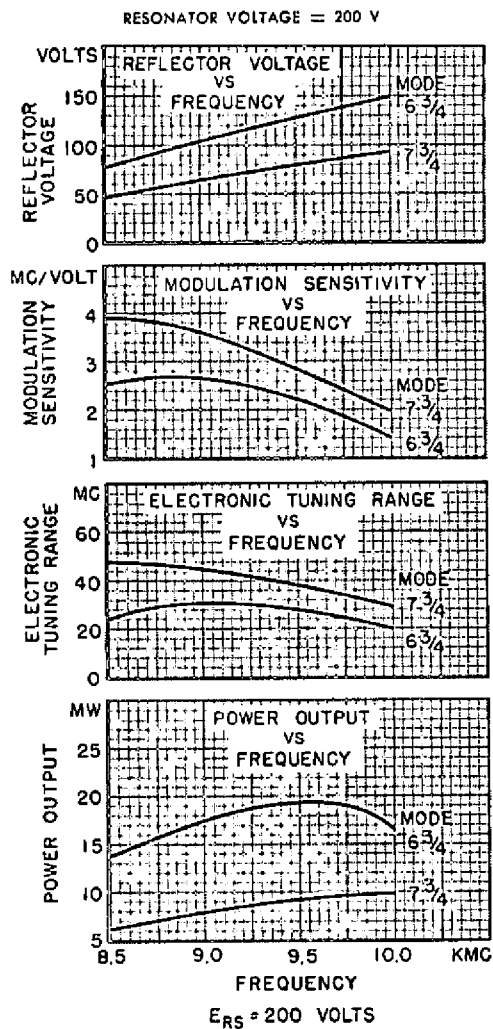
Operation over the published frequency range on the 5 $\frac{3}{4}$ mode at a resonator potential of 300 volts will provide at least 25 milliwatts power output (VSWR<1.1) and 30 mc Electronic Tuning Range.

NOTES:

1. Forced-air cooling required above 10 watts resonator power input.
2. Approximately 2 turns to cover frequency range. Positive mechanical stops are provided.
3. A 200 G shock of 10 milliseconds duration produces a permanent frequency change of the order of 2 mc.
4. At resonant peaks, a 5 G audio-frequency vibration may produce frequency modulation of as much as 2 mc.
5. Between half-power points.
6. Before oscillation begins.

Additional operation and application information available upon request.

ALL CURVES ARE TYPICAL DATA



SPECIFICATION
 TYPE VA-6310/V-260 REFLEX KLYSTRON

Description: Klystron, Integral Cavity, Tuner, Waveguide Output

					Tuner Plate	Altitude
Ratings:	Ef	Ers	Er	Ik	Temp.	Feet
Absolute	V	Vdc	Vdc	mAdc	°C	
Maximum:	6.3 ± 10%	350	0 to -1000	42	200	10,000

Test Cond: 6.3 300 -55 to -225 -- Notes 1 & 2

Dimensions: As per outline **Cathode: Coated Unipotential

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>
3.1	Qualification Approval:	Required for JAN markings		
4.5	Holding Period:	t=168 hours		
4.9.5.1	*Torque:			
4.9.18	*Carton Drop:	(d) Package Group 1 Carton Size N		
4.9.19	**Vibration(1):	Power Output(1) 10G; F=50 to 1000 cps t=5 min.		
4.9.19	Vibration(2):	10G; F=60; t=120 Note 4	Ir: 0	10 uAdc
4.9.20.5	**Shock:	Power Output(1); G=200		
4.10.8	*Heater Current:		If: 1.08	1.32 A
4.10.6.7.1	/Total Reflector Current:	Notes 5 & 6	Ir: --	3 uAdc
4.10.1.1	/Emission:	Ef=5.7; Note 6 Δ Ik/Ik:	--	-15 %
4.10.4.6	Cathode Current:	Er(Mode 5)/max Po F=10,000 ± .3% Mc	Ik: 20	32 mAdc
4.10.7.3.2	Tunable Frequency:		F: 8,500	10,000 Mc

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>
4.15.1	Power Output (1):	Er(Mode 5)/max Po F=8500 $\pm$.3% Mc	Po: 25	-- mW
4.15.1	Power Output (2):	Er(Mode 5)/max Po F=10,000 $\pm$.3% Mc	Po: 25	-- mW
4.15.1	**Power Output (3):	Er(Mode 5)/max Po F=8500 to 10,000 Mc	Po: 25	-- mW
4.10.5.4	Reflector Voltage (1):	Power Output (1)	Er: -85	-135 Vdc
4.10.5.4	*Reflector Voltage (2):	Power Output (2)	Er: -160	-225 Vdc
4.15.3	*Electronic Tuning Range:	Mode 5; 50% max Po; F=8500 to 10,000 Mc; Note 6	ΔF : 30	--- Mc
4.15.5	**Temperature Compensation:	Power Output (1) TA=20° to 60°C F=9300 $\pm$.3% Mc	Coeff: 0.0	-.20 Mc/°C
---	**Frequency Modulation	Power Output (2); Ef=5.7 to 7.0 Vdc	ΔF : ---	.1 Mc
4.11	Life Test:	Group C Power Output (1)	t: 500	---- hrs
4.11.4	Life Test End Point:	Power Output (1) Reflector Current t=5min	$\Delta Po/Po$: 0 Ir: ----	-20 % 10 uAdc

References are to paragraphs in "Military Specifications for Electron Tubes MIL-E-1B".

Note 1: All oscillation tests except vibration test shall be made with the tube rigidly connected to a UG39/U flange on appropriate RG52/U waveguide equipment and the load VSWR for the tube shall be less than 1.1. Forced air cooling is required for power inputs above 10 watts.

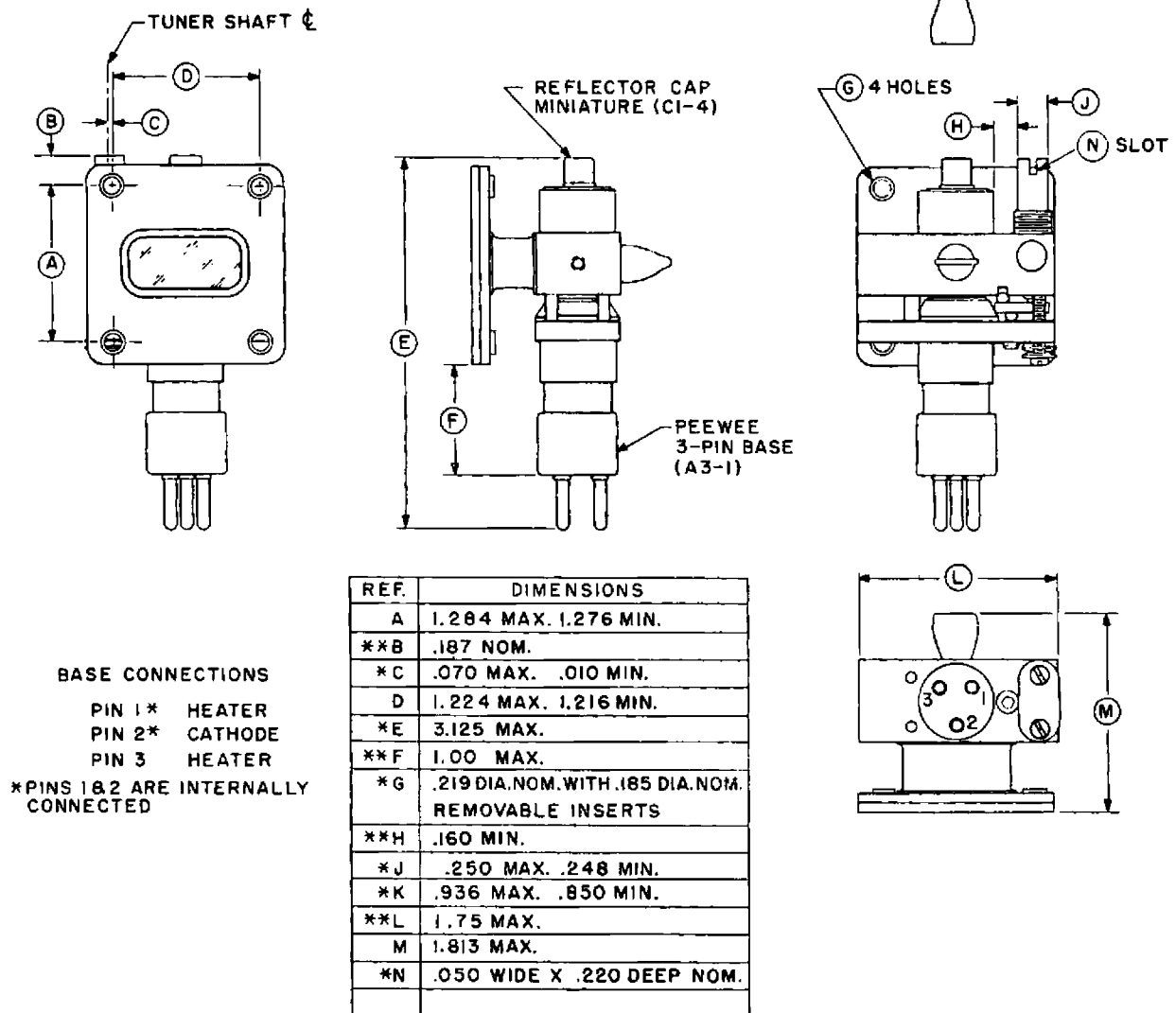
Note 2: The temperature of the base and cap should not exceed 120°C.

Note 3: The reflector current shall be recorded with a Brush Model BL202 recorder or equivalent. There shall be no reflector current bursts greater than the limit shown

Note 4: After two minutes with all voltages applied, total reflector current shall not exceed the specified limits.

Note 5: The tube shall not be oscillating during the test.

Note 6: The power output shall have no discontinuities between half-power points for either direction of reflector voltage change.



NOTE: Eyelet-type inserts in the flange mounting holes are 0.219 O.D. , 0.185 I.D. , nominal, and are easily removable from rear of flange. With inserts in place, the mounting holes provide clearance for #8 screws. With inserts removed, the mounting holes permit use of insulating bushings where d-c isolation between tube flange and waveguide system is desired.

SPECIFICATION DRAWING, VA-6310/V-260 REFLEX KLYSTRON

Dwg. 260B
 5-8-53



REFLEX KLYSTRON

DATA SHEET

oscillator

VA-6311

V-261

8.5 - 10.0 kMc

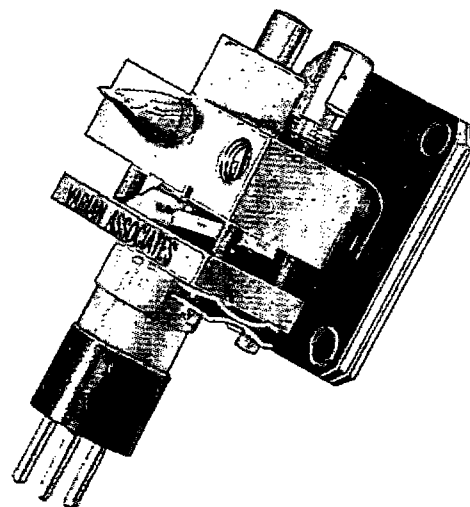
125 mW

APPLICATION

The VA-6311/V-261 is intended for radar application particularly under rugged service conditions. It will operate from conventional power supplies and with conventional crystal mixers, greatly increasing the ruggedness and reliability of any radar system to which it may be applied. It will produce adequate power output and electronic tuning range with resonator voltage as low as 200 volts.

FEATURES

Low microphonics . . . Negligible barometric frequency coefficient . . . Matched load operation without matching sections . . . Waveguide output . . . Linear reflector voltage tracking . . . Rapid warm-up . . . Removable inserts in flange holes simplify insulation when required.



GENERAL CHARACTERISTICS

Frequency Range 8.5 to 10 kMc
Heater Voltage 6.3 volts
Heater Current 1.2 A

MECHANICAL CHARACTERISTICS

Cathode Oxide coated, unipotential
Maximum Dimensions $3\frac{1}{4} \times 1\frac{1}{4} \times 1\frac{1}{4}$ in.
Weight 6 oz
Output Connector Bolts to UG-39/U flange
or UG-40A/U choke for
1 x 0.50 x 0.050 in. waveguide
Base Pec-wee, 3-pin (A3-1)
Top Cap Miniature (C1-4)
Mounting Position Any
Cooling Convection¹
Tuner Single screw tuner²
Tuning Torque (starting) <60 in.-oz
Shock Withstands up to 250 G³
Microphonics Less than 500 kc⁴

NOTES:

1. Forced-air cooling required above 10 watts resonator power input.
2. Approximately 2 turns to cover frequency range. Positive mechanical stops are provided.
3. A 200 G shock of 10 milliseconds duration produces a permanent frequency change of the order of 2 Mc.
4. At resonant peaks a 10 G audio-frequency vibration may produce frequency modulation of as much as 4 Mc.
5. Between half-power points.
6. Before oscillation begins.

MAXIMUM RATINGS

Resonator Voltage 350 volts
Resonator Current 42 mA
Reflector Voltage 0 to -1000 volts

ELECTRICAL CHARACTERISTICS

Operation between 8500 and 10,000 Mc, matched load,
Ef = 6.3 volts

Resonator Voltage = 300 volts Mode = 5%

	Min.	Avg.	Max.	
Resonator Current	20	28	32	mA
Reflector Voltage	-85	---	-225	volts
Power Output	25	70	---	mW
Electronic Tuning Range ⁵	30	40	---	Mc
Modulation Sensitivity	---	1.5	---	Mc/V
Temperature Coefficient	0	-60	-200	kc/°C
Warm-Up Time ⁶	---	15	---	sec

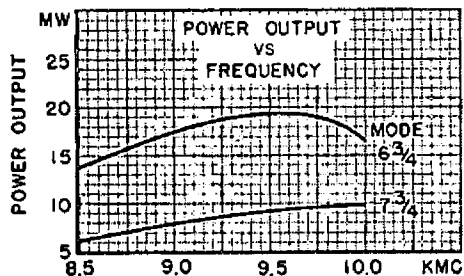
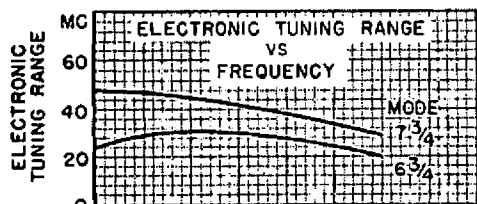
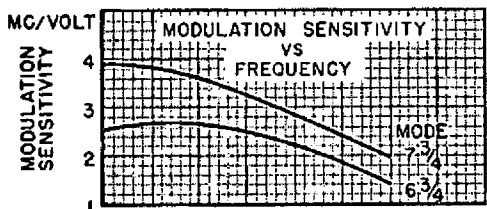
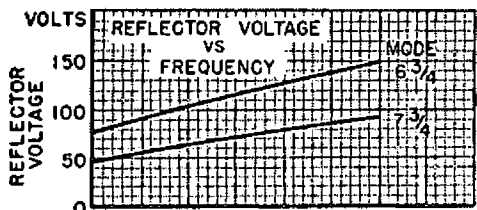
Additional operation and application information available upon request.

ALL CURVES ARE TYPICAL DATA

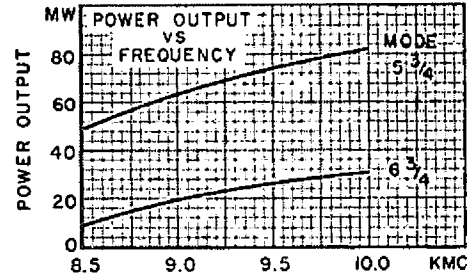
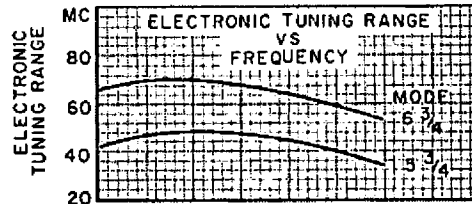
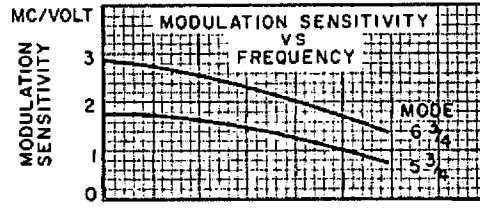
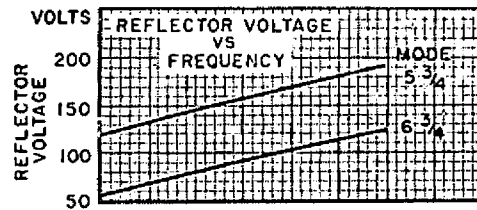
RESONATOR VOLTAGE = 200 V

VSWR < 1.1

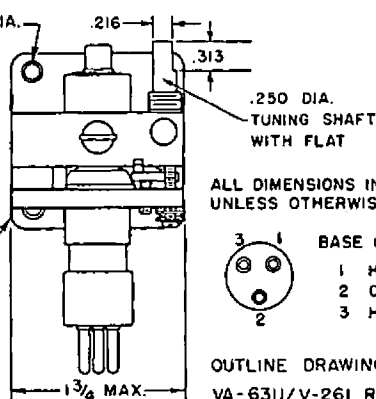
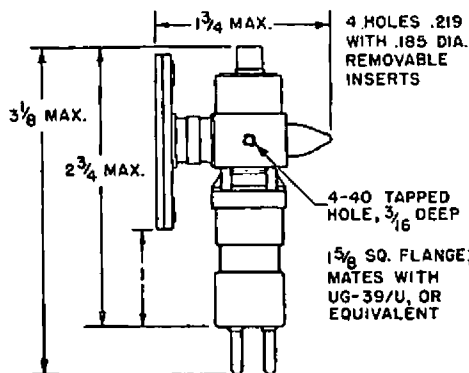
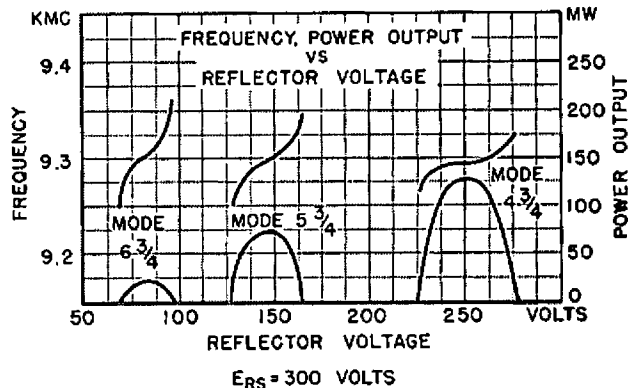
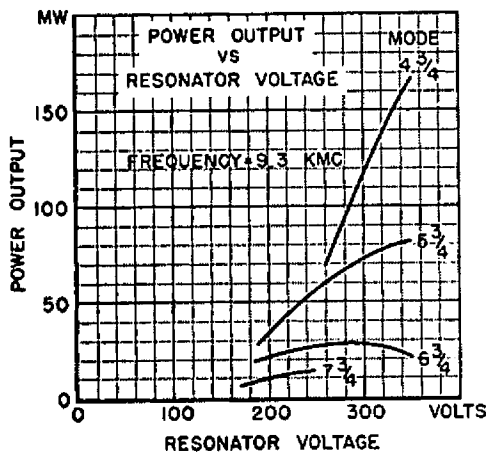
RESONATOR VOLTAGE = 300 V



$E_{RS} = 200$ VOLTS



$E_{RS} = 300$ VOLTS



ALL DIMENSIONS INCHES NOMINAL UNLESS OTHERWISE NOTED



BASE CONNECTIONS

- 1 HEATER } INTERNALLY CONNECTED
- 2 CATHODE }
- 3 HEATER }

OUTLINE DRAWING

VA-6311/V-261 REFLEX KLYSTRON

SPECIFICATION

TYPE VA-6311/V-261 REFLEX KLYSTRON

Description: Klystron, Integral Cavity, Tuner, Waveguide Output

Ratings:	Ef	Ers	Er	Ik	Tuner Plate Temp
Absolute	V	Vdc	Vdc	mAdc	°C
Maximum:	6.3 ± 10%	350	0 to -1000	42	200
Test Cond:	6.3	300	-55 to -225	--	--
Dimensions:	As per outline				
	**Cathode: Coated Unipotential				

Ref.	Test	Conditions	Min	Max.
3.1	Qualification Approval:	Required for JAN markings		
4.5	Holding Period:	t=168 hours		
4.9.5.1	*Torque:			
4.9.18	*Carton Drop:			
4.9.19	**Vibration(1):	Power Output(1) 10G; F=50 to 1000 cps		
4.9.19	Vibration(2):	10 G; f=60; t=120 Note 2	Ir: 0	10 uAdc
4.9.19	*Shock:	Power Output(1); G=200		
4.10.8	*Heater Current:		If: 1.08	1.32 A
4.10.6.7.1	/Total Reflector Current:	Notes 3 & 4	Ir: --	3 uAdc
4.10.1.1	/Emission:	Ef=5.7; Note 4	Δ Ik/Ik: --	-15 %
4.10.4.6	Cathode Current:	Er(Mode 5)/max Po F=10,000 ± .3% Mc	Ik: 20	32 mAdc
4.10.7.3.2	Tunable Frequency:		F: 8,500	10,000 Mc
4.15.1	Power Output(1):	Er(Mode 5)/max Po F=8500 ± .3% Mc	Po: 25	-- mW
4.15.1	Power Output(2):	Er(Mode 5)/max Po F=10,000 ± .3% Mc	Po: 25	-- mW

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>	
4.10.5.4	Reflector Voltage(1):	Power Output(1)	Er: -85	-135	Vdc
4.10.5.4	*Reflector Voltage(2):	Power Output(2)	Er: -160	-225	Vdc
4.15.3	*Electronic Tuning Range:	Mode 5; 50% max Po F=8500 to 10,000 Mc Note 5	ΔF : 30	---	Mc
4.15.5	**Temperature Compensation:	Power Output(1) T = -10 to +40°C	Coeff: ---	.20	Mc/°C
---	**Residual Frequency Modulation:	Power Output(2) Ef=5.7 to 7.0 Vdc	ΔF : ---	.1	Mc
4.11	Life Test:	Power Output(1)	t: 500	---	hrs
4.11.4	Life Test End Point:		$\Delta P_o/P_o$: 0	-20	%

References are to paragraphs in "Military Specifications for Electron Tubes MIL-E-1B".

Note 1: All oscillation tests except vibration test shall be made with the tube rigidly connected to a UG39/U flange or appropriate RG52/U waveguide equipment and the load VSWR for the tube shall be less than 1.1. Forced air cooling is required for power inputs above 10 watts. Temperature of base and cap should not exceed 120°C.

Note 2: The reflector current shall be recorded with a Brush Model BL202 recorder or equivalent. There shall be no reflector current bursts greater than the limit shown.

Note 3: After two minutes with all voltages applied, total reflector current shall not exceed the specified limits.

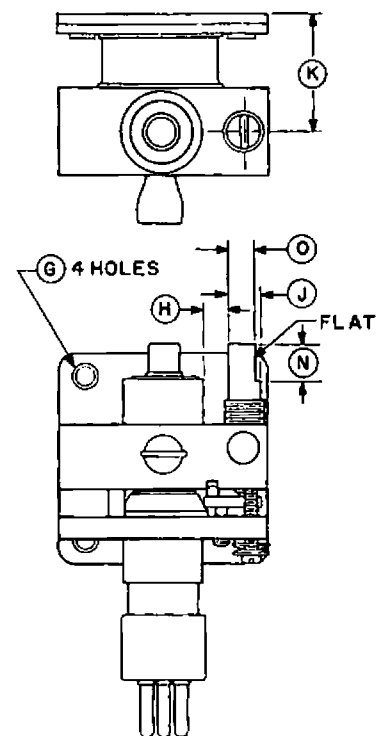
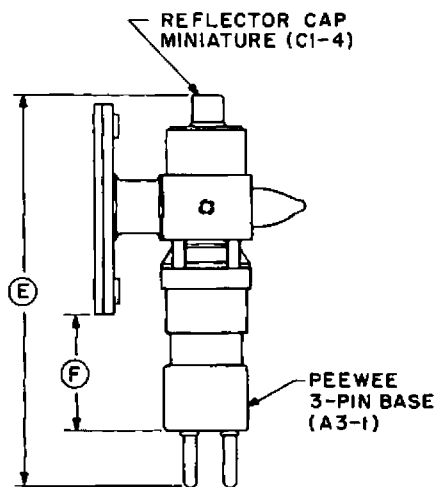
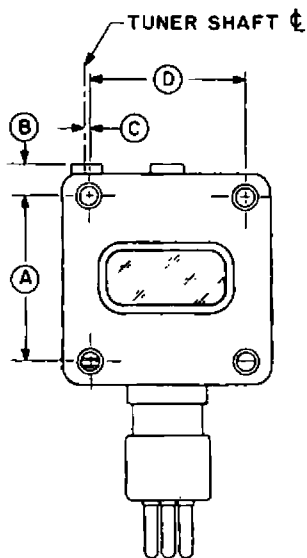
Note 4: The tube shall not be oscillating during the test.

Note 5: The power output shall have no discontinuities between half-power points for either direction of reflector voltage change.

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>	
--	**Mechanical Tuning Rate:	Test Cond; F=8500 to 10,000 Mc $\Delta F/\Delta \text{tuner degrees}$	1.8	3	Mc/o
4.11	Life Test:	Group C; Test Cond.	t: 500	--	hrs
4.11.4	Life Test End Point:	Test Cond; Reflector Current; t=5 min	$\Delta P_o/P_o$: 0	-20	%
			Ir: —	10	uAdc

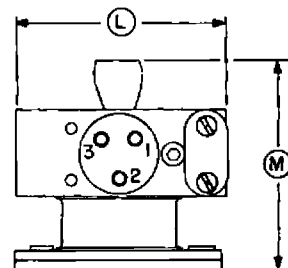
References are to paragraphs in "Military Specifications for Electron Tubes MIL-E-1B".

- Note 1: All oscillation tests except vibration test shall be made with the tube rigidly connected to a UG39/U flange on appropriate RG52/U waveguide equipment and the load VSWR for the tube shall be less than 1.1. Forced air cooling is required for power inputs above 10 watts.
- Note 2: The reflector current shall be recorded with a Brush Model BL202 recorder or equivalent. There shall be no reflector current bursts greater than the limit shown.
- Note 3: The tube shall be given 5 shocks in each of 3 planes. The frequency shift, after shock in any one plane, shall not exceed the value specified.
- Note 4: After two minutes with all voltages applied, total reflector current shall not exceed the specified limits.
- Note 5: The tube shall not be oscillating during the test.
- Note 6: Superimposing sufficient 60 cycle ac voltage on the direct reflector voltage to suppress oscillations on the ends of the sweep, the mode curve shall be observed on an oscilloscope whose amplifier has minimum bandpass of 0.1 Mc. The ratio of power output at the point of maximum hysteresis to maximum power output shall not exceed the value specified.
- Note 7: The frequency shall be stabilized at a pressure of 70 mm of Hg. The pressure shall be increased to 760 mm of Hg and the frequency at 760 mm of Hg read within the time specified. The resulting frequency change shall not exceed the limit specified.
- Note 8: Superimposing sufficient 60 cycle ac voltage on the direct reflector voltage to suppress oscillations on the ends of the sweep, the mode curve shall be observed on an oscilloscope whose amplifier has minimum bandpass of 0.1 Mc. With a standing wave introducer inserted, there shall be no discontinuities at the maximum power point for any phase of the standing wave. If the center of the mode is distorted, a wavemeter pip should not disappear for any interval of the mode center as the wavemeter is tuned to check for a frequency discontinuity.



BASE CONNECTIONS
 PIN 1* HEATER
 PIN 2* CATHODE
 PIN 3 HEATER
 *PINS 1 & 2 ARE INTERNALLY
 CONNECTED

REF.	DIMENSIONS
A	1.284 MAX. 1.276 MIN.
**B	.187 NOM.
*C	.070 MAX. .010 MIN.
D	1.224 MAX. 1.216 MIN.
*E	3.125 MAX.
**F	1.00 MAX.
*G	.219 DIA. NOM. WITH .185 DIA. NOM. REMOVABLE INSERTS
**H	.160 MIN.
*J	.250 MAX. .248 MIN.
*K	.936 MAX. .850 MIN.
**L	1.75 MAX.
M	1.813 MAX.
*N	.313 NOM.
*O	.216 NOM.



NOTE: Eyelet-type inserts in the flange mounting holes are 0.219 O.D., 0.185 I.D., nominal, and are easily removable from rear of flange. With inserts in place, the mounting holes provide clearance for #8 screws. With inserts removed, the mounting holes permit use of insulating bushings where d-c isolation between tube flange and waveguide system is desired.

SPECIFICATION DRAWING VA-6311/V-261 REFLEX KLYSTRON

DWG. 2618
 6-17-53



REFLEX KLYSTRON

DATA SHEET

oscillator

VA-6312*

8.5 - 10.0 kMc

APPLICATION

The VA-6312 is intended for radar application particularly under rugged service conditions. It will operate from conventional power supplies and with conventional crystal mixers, greatly increasing the ruggedness and reliability of any radar system to which it may be applied. It will produce adequate power output and electronic tuning range with resonator voltage as low as 200 volts.

FEATURES

Low microphonics . . . Negligible barometric frequency coefficient . . . Matched load operation without matching sections . . . Waveguide output . . . Linear reflector voltage tracking . . . Rapid warm-up . . . Removable inserts in flange holes simplify insulation when required . . . Molded leads and base permitting high altitude operation without pressurization.

GENERAL CHARACTERISTICS

Frequency Range 8.5 to 10 kMc
Heater Voltage 6.3 volts
Heater Current 1.2 A

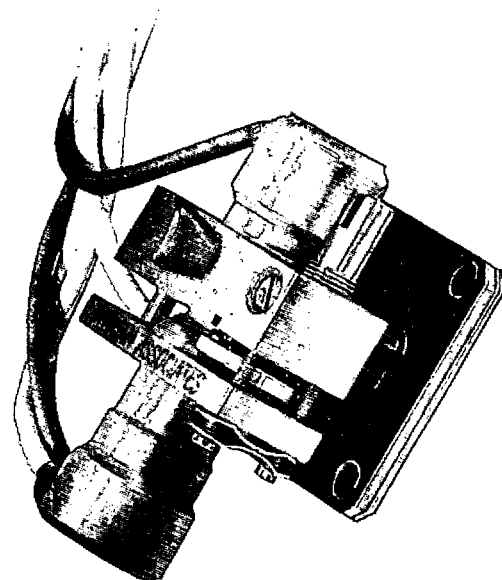
MECHANICAL CHARACTERISTICS

Cathode Oxide coated, unipotential
Maximum Dimensions 3 x 1½ x 1¼ in.
Weight 7 oz
Output Connector Bolts to UG-39/U flange
or UG-40A/U choke for
1 x 0.50 x 0.050 in. waveguide
Base Molded, flexible leads,
18 inches long
Mounting Position Any
Cooling Convection¹
Tuner Single screw tuner²

NOTES:

1. Forced-air cooling required above 10 watts resonator power input.
2. Approximately 2 turns to cover frequency range. Positive mechanical stops are provided.
3. Between half-power points.
4. Before oscillation begins.

* Formerly designated VA-6312/V-270



MAXIMUM RATINGS

Resonator Voltage 350 volts
Resonator Current 42 mA
Reflector Voltage 0 to -1000 volts

ELECTRICAL CHARACTERISTICS

Operation between 8500 and 10,000 Mc, matched load,
Ef = 6.3 volts

	Mode 5½		
	Min.	Avg.	Max.
Resonator Voltage = 300 volts			
Resonator Current	20	28	32 mA
Reflector Voltage (at 9.3 kMc)	-160		volts
Power Output	25	70	mW
Electronic Tuning Range ³	30	40	Mc
Modulation Sensitivity	1.5		Mc/V
Temperature Coefficient	0	-60	-200 kc/°C
Shock, 200G, ΔF	2	5	Mc
Vibration, 10G, 50 to 600			
Cycles, FM (p-p)		.5	4 Mc
Tuner Torque	2	4	in-lbs
Mechanical Tuning Rate	1.8	2.0	3 Mc/°
Warm-Up Time ⁴	15		sec

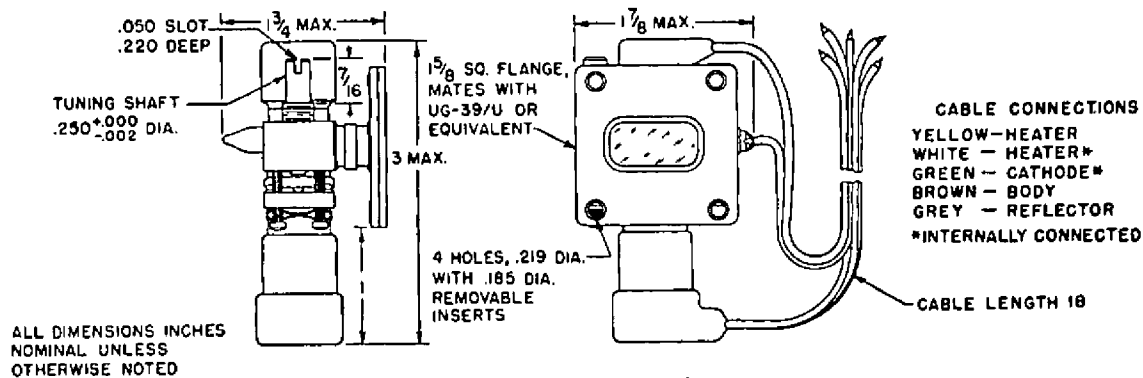
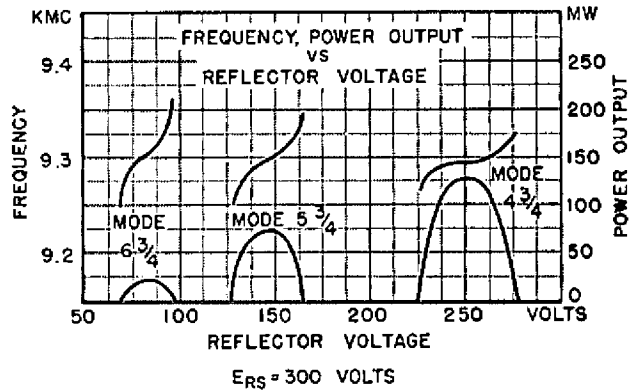
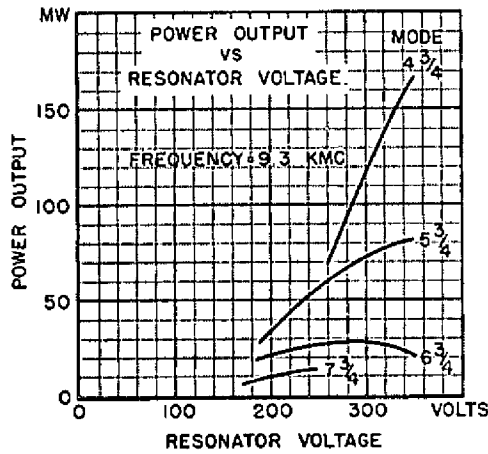
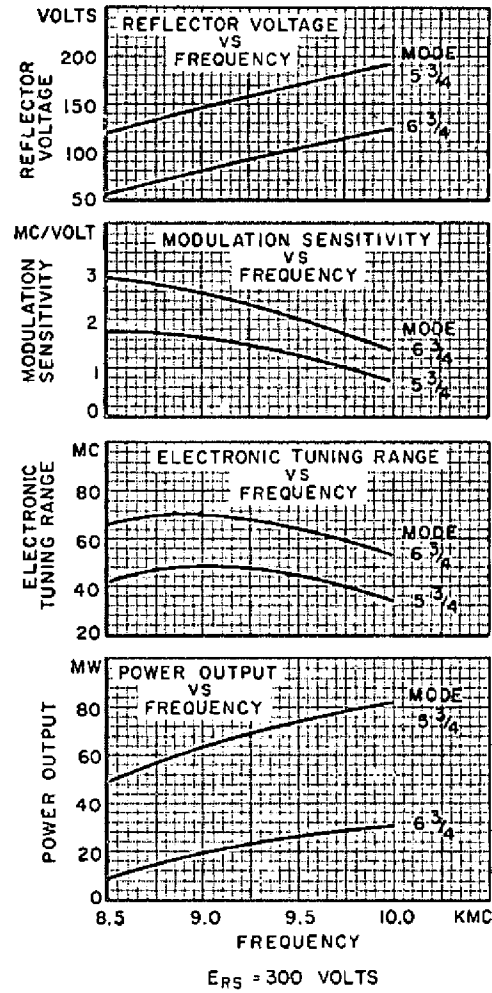
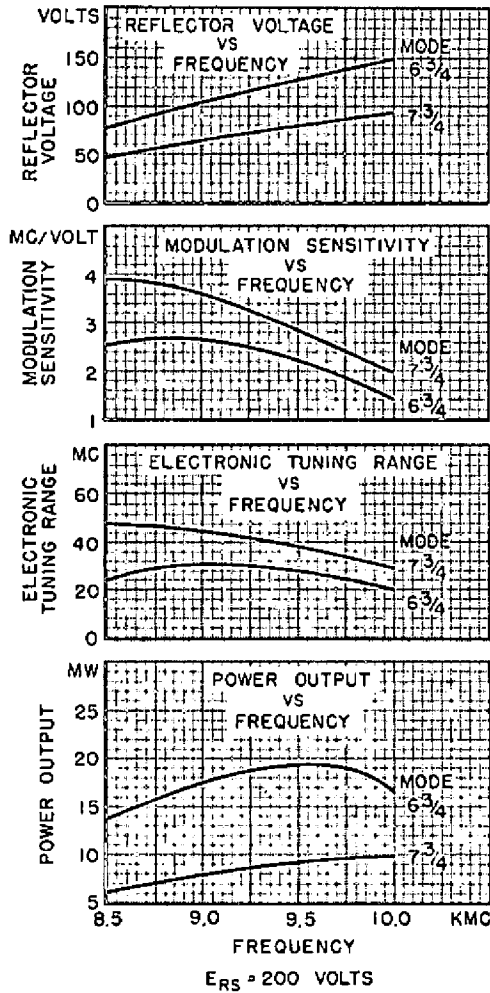
Additional operation and application information available upon request.

ALL CURVES ARE TYPICAL DATA

RESONATOR VOLTAGE = 200 V

VSWR < 1.1

RESONATOR VOLTAGE = 300 V



OUTLINE DRAWING
VA-6312 REFLEX KLYSTRON

DWG. 270A
REV. 3-11-2

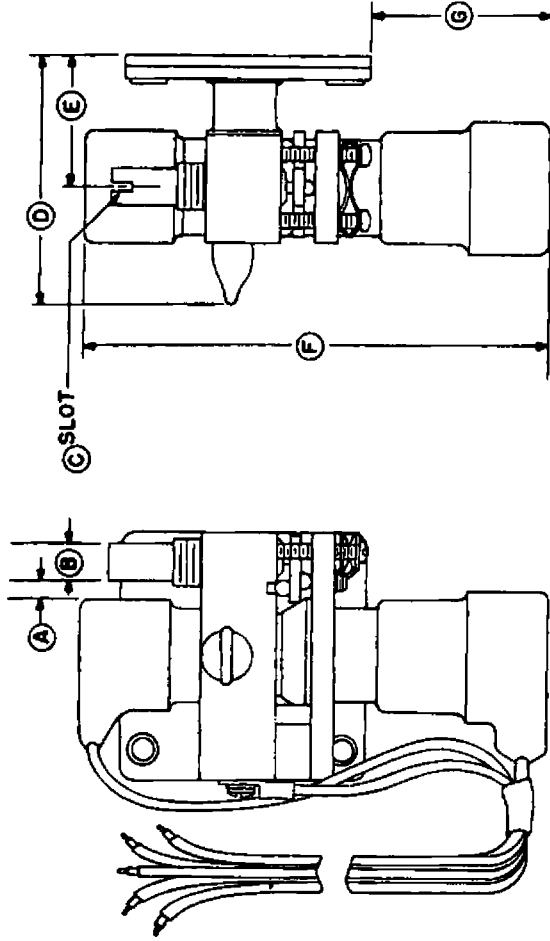
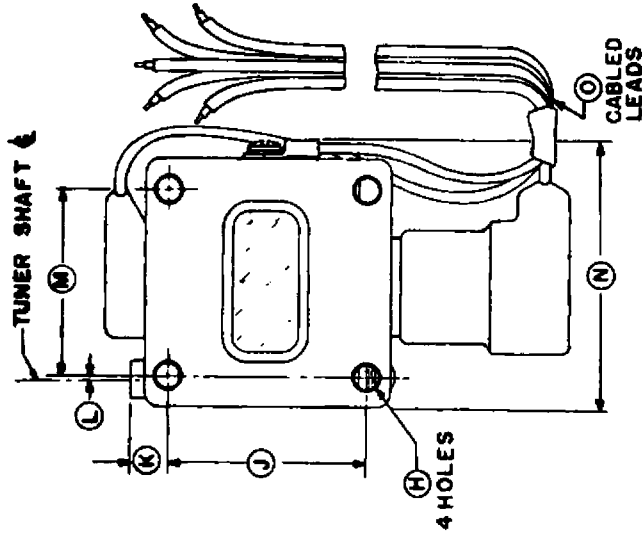
SPECIFICATION
 TYPE VA-6312/V-270 REFLEX KLYSTRON

Description: Klystron, Integral Cavity, Tuner, Waveguide Output

Ratings:	Ef	Ers	Er	Irs	F	Alt.	Tuner Plate Temp.
Absolute	v	Vdc	Vdc	mAdc	Mc	ft	°C
Maximum:	6.3 ± 10%	350	0 to -1000	42	--	No Limit	200
Test Cond:	6.3	300	-55 to -225	--	9300±.3%	--	Note 1.
**Base: Molded; color coded leads				**Cathode: Coated Unipotential			

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>
3.1	Qualification Approval:	Required for JAN markings		
4.5	Holding Period:	t=168 hours		
4.9.7	**Moisture-Vaporproof Pack:			
4.9.18	*Carton Drop:	(d)Package Group 1 Carton Size N		
4.9.2	*Dimensions:	See Outline Drawing		
4.9.19	**Vibration(1):	Test Cond; Er(Mode 5)/max Po; G=10; F=50 to 600 cps; t=5 min Δ F (p-p):	--	4 Mc
4.9.19	Vibration(2):	Test Cond; G=10; F=60; t=2 min; Note 2	Ir: 0	10 uAdc
--	**Shock:	Test Cond; Er(Mode 5)/max Po; G=200; Shock dura- tion=0.001 sec; Note 3	Δ F: --	5 Mc
4.10.8	*Heater Current:	Test Cond.	If: 1.08	1.32 A
4.10.6.7.1	∕Total Reflector Current:	Test Cond; Notes 4 & 5	Ir: --	3 uAdc
4.10.1.1	∕Emission:	Test Cond; Ef=5.7 v; Note 5 Δ Ik/Ik:	--	-15 %
--	Resonator Current:	Test Cond; Er(Mode 5)/max Po	Irs: 20	32 mAdc
2/24/54			Page 1	

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>
4.10.7.3.2	Mechanical Tuning Range:	Test Cond; Er(Mode 5)/max Po	F: 8500	10,000 Mc
4.15.1	Power Output(1):	Test Cond; Er(Mode 5)/max Po	Po: 25	-- mW
4.15.1	*Power Output(2):	Test Cond; Er(Mode 5)/max Po; F=8500 $\pm$.3% Mc; F=10,000 $\pm$.3% Mc	Po: 25	-- mW
4.15.1	**Power Output(3):	Test Cond; Er(Mode 5)/max Po; F=8500 through 10,000 Mc	Po: 25	-- mW
4.10.5.4	Reflector Voltage(1):	Test Cond; Er(Mode 5)/max Po	Er: -110	-195 Vdc
4.10.5.4	*Reflector Voltage(2):	Test Cond; Er(Mode 5)/max Po F=8500 $\pm$.3% Mc F=10,000 $\pm$.3% Mc	Er: -85 Er: -160	-135 Vdc -225 Vdc
4.15.3	*Electronic Tuning Range(1):	Test Cond; Er(Mode 5)/50% max Po	ΔF : 30	-- Mc
4.15.3	**Electronic Tuning Range(2):	Test Cond; Er(Mode 5)/50% max Po; F=8500 to 10,000 Mc	ΔF : 30	-- Mc
4.15.7	*Hysteresis:	Test Cond; Er(Mode 5)/max Po Note 6	ratio: --	0.5
4.15.5	**Temperature Coefficient:	Test Cond; Er(Mode 5)/max Po; TA=20°C to 60°C	Coeff: 0.0	-.20 Mc/°C
--	**Frequency Modulation:	Test Cond; Er(Mode 5)/max Po; Ef=5.7 to 7.0 Vdc	ΔF : --	.1 Mc
--	**Low Pressure:	Test Cond; Er(Mode 5)/max Po; t=10. sec; Note 7	ΔF : --	2 Mc
4.15.1.1	Frequency Pulling:	Test Cond; Er(Mode 5)/max Po; δ = 8db min; Note 8		
--	**Heater Voltage Coefficient:	Test Cond; Er=5.7 to 7.0 V	$\Delta F/\Delta Ef$: --	6 Mc/v



REF.	DIMENSIONS
**A	.125 NOM.
*B	.250 MAX. .248 MIN.
*C	.050 WIDE X .220 DEEP NOM.
D	1.75 MAX.
*E	.936 MAX. .850 MIN.
*F	3.000 MAX.
**G	1.00 MAX.
*H	.219 DIA. NOM. WITH .185 DIA. NOM. REMOVABLE INSERTS
J	1.284 MAX. 1.276 MIN.
**K	.260 MAX.
*L	.070 MAX. .010 MIN.
M	1.224 MAX. 1.216 MIN.
**N	1.875 MAX.
*O	18 NOM.

CABLE CONNECTIONS

YELLOW - HEATER
 WHITE - HEATER INTERNALLY
 GREEN - CATHODE CONNECTED
 GREY - REFLECTOR
 BROWN - BODY

NOTE: Eyelet-type inserts in the flange mounting holes are 0.219 O.D., 0.185 I.D., nominal, and are easily removable from rear of flange. With inserts in place, the mounting holes provide clearance for #8 screws. With inserts removed, the mounting holes permit use of insulating bushings where d-c isolation between tube flange and waveguide system is desired.

SPECIFICATION DRAWING VA-6312/V-270 REFLEX KLYSTRON

Dwg. 270C
 9-30-54



REFLEX KLYSTRON

DATA SHEET

oscillator

VA-6313*

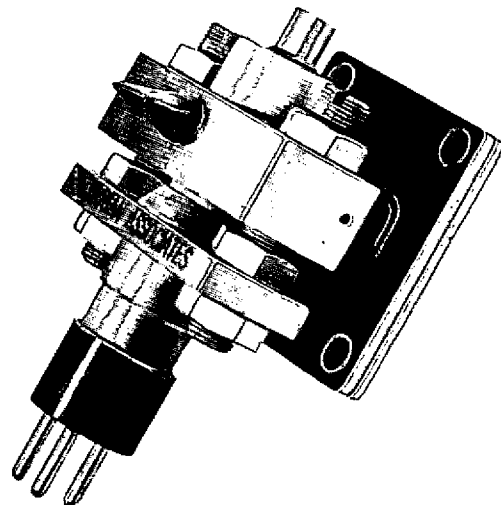
8.5 - 10.5 kMc

APPLICATION

The VA-6313 is intended for radar application particularly under rugged service conditions. It will operate from conventional power supplies and with conventional crystal mixers, greatly increasing the ruggedness and reliability of any radar system to which it may be applied. It will operate at much lower resonator voltages than most local oscillator klystrons, producing adequate power output and electronic tuning range with resonator voltage as low as 150 volts.

FEATURES

Extremely rugged construction . . . Low microphonics . . . Lock-nut tuning . . . Matched load operation without matching sections . . . Waveguide output . . . Rapid warm-up . . . Negligible barometric frequency coefficient.



GENERAL CHARACTERISTICS

Frequency Range 8.5 to 10.5 kMc
Heater Voltage 6.3 volts
Heater Current 1.2 A

MECHANICAL CHARACTERISTICS

Cathode Oxide coated, unipotential
Maximum Dimensions $3\frac{1}{8} \times 1\frac{13}{16} \times 1\frac{1}{4}$ in.
Weight 6 oz
Output Connector Bolts to UG-39/U flange
or UG-40A/U choke for
1 x 0.50 x 0.050 in. waveguide
Base Pee-wee, 3-pin (A3-1)
Top Cap Miniature (C1-4)
Mounting Position Any
Cooling Convection¹
Tuner Lock-nut²
Shock Withstands up to 250 G
Microphonics Less than 50 kc³

MAXIMUM RATINGS

Resonator Voltage 385 volts
Resonator Current 74 mA
Reflector Voltage 0 to -1000 volts

ELECTRICAL CHARACTERISTICS

Operation between 8500 and 10,500 Mc, Matched Load,
Ef = 6.3 volts

Resonator Voltage = 350 volts Mode 4½

	Min.	Avg.	Max.	
Resonator Current	52	60		mA
Reflector Voltage (at 9.3 kMc)	-150			volts
Power Output	50	120		mW
Electronic Tuning Range ⁴	40	65		Mc
Modulation Sensitivity	1.0			Mc/V
Temperature Coefficient	-200	-60	+200	kc/°C
Warm-Up Time ⁵	15			sec

NOTES:

1. Forced-air cooling required above 10 watts resonator power input.
2. Stops provided on low-frequency end.
3. At resonant peaks, a 10 G audio-frequency vibration may produce frequency modulation of as much as 2 Mc.
4. Between half-power points.
5. Before oscillation begins.

* Formerly designated VA-6313/V-280

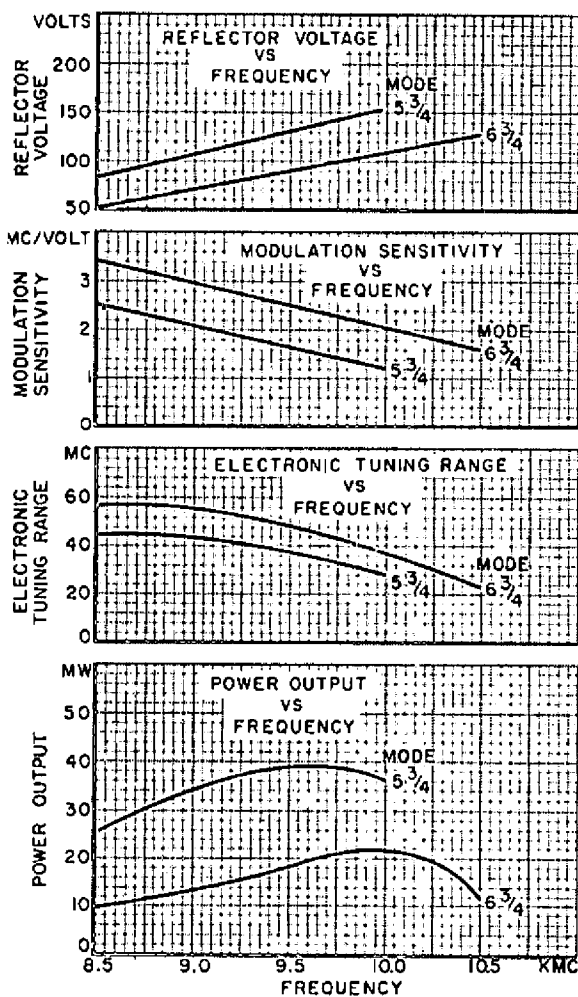
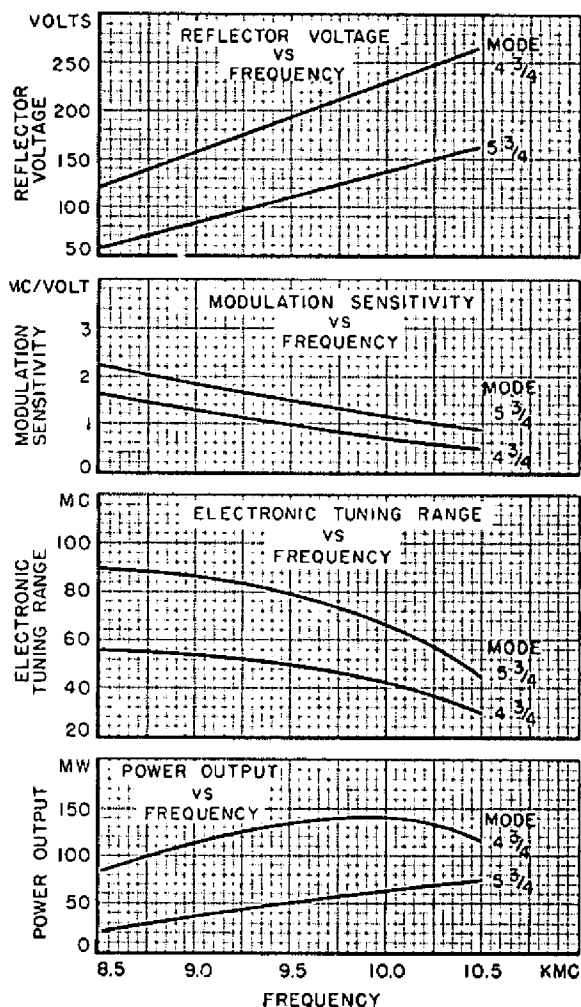
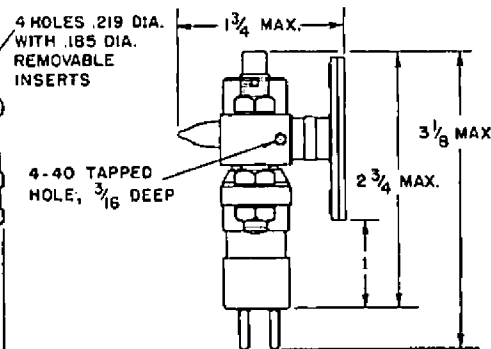
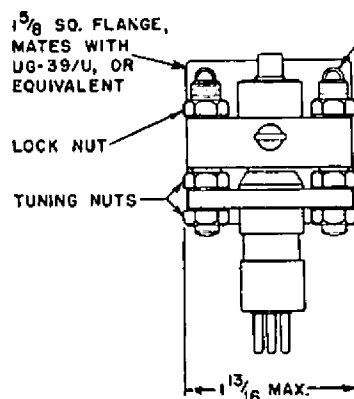
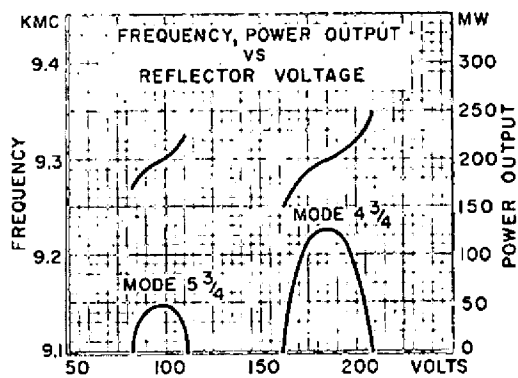
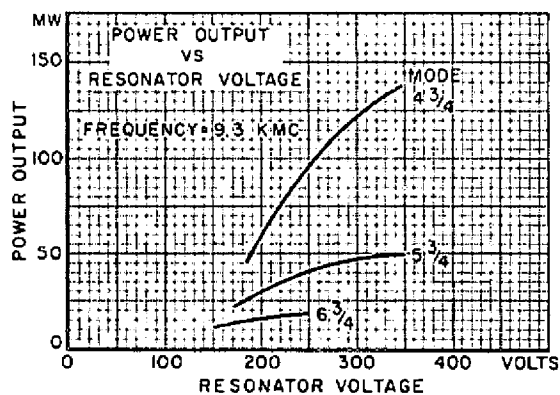
Additional operation and application information available upon request.

ALL CURVES ARE TYPICAL DATA

RESONATOR VOLTAGE = 200 V

LOAD VSWR > 1.1

RESONATOR VOLTAGE = 300 V

 $E_{RS} = 200$ VOLTS $E_{RS} = 300$ VOLTS

BASE CONNECTIONS

- 1* HEATER
- 2* CATHODE
- 3 HEATER

*PINS 1 & 2 INTERNALLY CONNECTED

ALL DIMENSIONS INCHES NOMINAL UNLESS OTHERWISE NOTED

OUTLINE DRAWING
VA-6313 REFLEX KLYSTRON



SPECIFICATION

TYPE VA-6313/V-280 REFLEX KLYSTRON
VA-6314/V-290

Description: Klystron, Integral Cavity, Tuner, Waveguide Output

Ratings:	Ef	Ers	Er	Ik	Tuner Plate Temp	Altitude Feet	Altitude Feet
Absolute V	Vdc	Vdc	mAdc	oC	VA-6313/V-280	VA-6314/V-290	
Maximum: 6.3+ 10%	385	0 to -1000	74	200	10,000	No Limit	

Test Cond: 6.3 350 -50 to -300 Notes 1 & 2

Dimensions: As per outline **Cathode: Coated Unipotential

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN markings		
4.5	Holding Period:	t=168 hours		
4.9.5.1	*Torque:	Note 3		
4.9.18	*Carton Drop:	(d)Package Group 1 Carton Size N		
4.9.19	**Vibration(1):	Power Output (3) 10G; F=50 to 1000 cps t=5 min.		
4.9.19	Vibration(2):	Ers=200 Vdc; 10G; F=60 t=120; Note 4	Ir: 0	10 uAdc
4.9.20.5	**Shock:	Power Output(3) G=200		
4.10.8	*Heater Current:		If: 1.08	1.32 A
4.10.6.7.1	Total Reflector Current:	Notes 5 & 6	Ir: ---	3 uAdc
4.10.1.1	Emission:	Ef=5.7; Note 6	Δ Ik/Ik: ---	-15 %
4.10.4.6	Cathode Current:	Er(Mode 4)/max Po F=10,000 + .3% Mc	Ik: ---	60 mAdc
4.10.7.3.2	Tunable Frequency:		F; 8500	10,500 Mc
4.15.1	Power Output(1):	Er(Mode 4)/max Po F=8500 + .3%	Po: 50	--- mW

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>
4.15.1	Power Output(2):	Er(Mode 4)/max Po F=10,000 $\pm$.3% Mc	Po: 100	--- mW
4.15.1	*Power Output(3):	Ers=200 Vdc; Er (Mode 6)/max Po; F=9300 $\pm$.3% Mc	Po: 8	--- mW.
4.10.5.4	Reflector Voltage(1):	Power Output(1)	Er: -85	-145 Vdc
4.10.5.4	Reflector Voltage(2):	Power Output(2)	Er: -170	-255 Vdc
4.10.5.4	*Reflector Voltage(3):	Power Output(3)	Er: -40	-110 Vdc
4.15.3	*Electronic Tuning Range(1):	Mode 4; 50% max Po F=8500 to 10,000 Mc Note 7	ΔF : 40	--- Mc
4.15.3	*Electronic Tuning Range(2):	Mode 6; 50% max Po F=9300; Ers=200 v Note 7	ΔF : 35	--- Mc
---	*Modulation Sensitivity:	Power Output(3) $\Delta F = \pm 2.5$ Mc max	Coeff: 2.0	4.0 Mc/V
4.15.5	**Temperature Compensation:	Power Output(3) TA = -10 to +40°C	Coeff: ---	.20 Mc/°C
---	**Frequency Modulation:	Power Output (2) Er=5.7 to 7.0 Vdc	ΔF : ---	.1 Mc
4.11	Life Test:	Group C Power Output(3)	t: 500	--- hrs
4.11.4	Life Test End Point:	Power Output(1) Reflector Current t=5 min.	$\Delta Po/Po$: 0 Ir: ---	-20 % 10 uAde

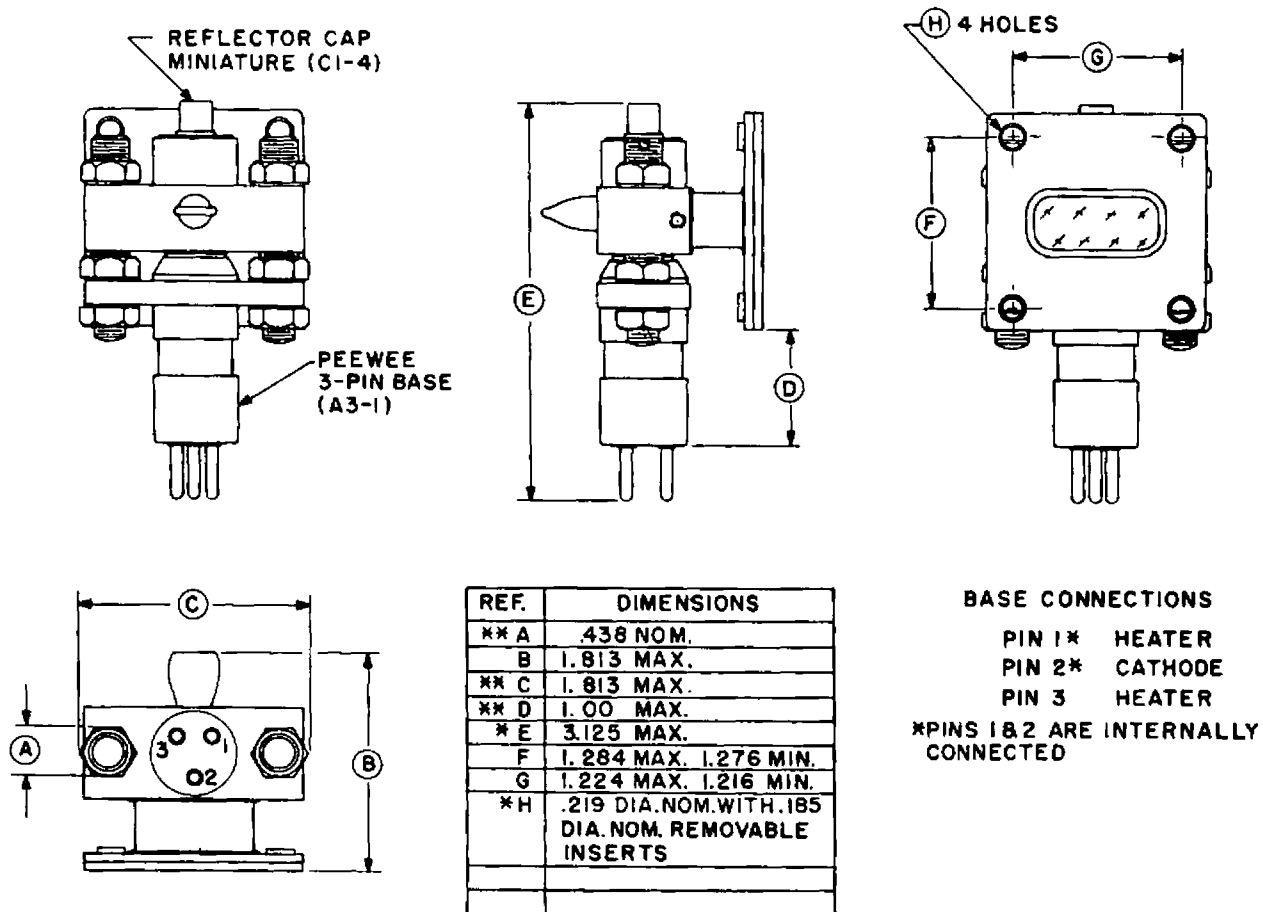
References are to paragraphs in "Military Specifications for Electron Tubes MIL-E-18".

Note 1: All oscillation tests except vibration test shall be made with the tube rigidly connected to a UG39/U flange on appropriate RG52/U waveguide equipment and the load VSWR for the tube shall be less than 1.1. Forced air cooling is required for power inputs above 10 watts.

Note 2: Temperature of base and cap of VA-6313/V-280 should not exceed 120°C.

Note 3: Not applicable to VA-6314/V-290.

- Note 4: The reflector current shall be recorded with a Brush Model BL202 recorder or equivalent. There shall be no reflector current bursts greater than the limits shown.
- Note 5: After two minutes with all voltages applied, total reflector current shall not exceed the specified limits.
- Note 6: The tube shall not be oscillating during the test.
- Note 7: The power output shall have no discontinuities between half-power points for either direction of reflector voltage change.



NOTE: Eyelet-type inserts in the flange mounting holes are 0.219 O.D. , 0.185 I.D. , nominal, and are easily removable from rear of flange. With inserts in place, the mounting holes provide clearance for #8 screws. With inserts removed, the mounting holes permit use of insulating bushings where d-c isolation between tube flange and waveguide system is desired.

SPECIFICATION DRAWING, VA-6313/V-280 REFLEX KLYSTRON

Dwg. 280B
4-20-53



REFLEX KLYSTRON

oscillator
VA-6314*
8.5 - 10.5 kmc

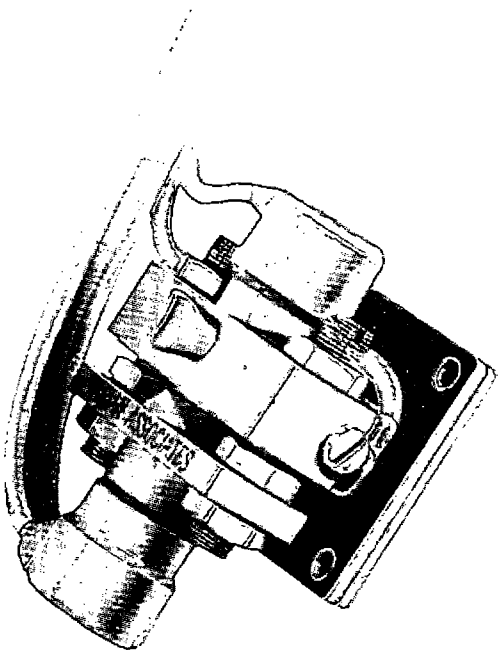
DATA SHEET

APPLICATION

The VA-6314 is intended for radar application particularly under rugged service conditions. It will operate from conventional power supplies and with conventional crystal mixers, greatly increasing the ruggedness and reliability of any radar system to which it may be applied. It will operate at much lower resonator voltages than most local oscillator-klystrons, producing adequate power output and electronic tuning range with resonator voltage as low as 150 volts.

FEATURES

Extremely rugged construction . . . Low microphonics . . . Lock-nut tuning . . . Matched load operation without matching sections . . . Waveguide output . . . Rapid warm-up . . . Negligible barometric frequency coefficient . . . Removable inserts in flange holes simplify insulation when required . . . Molded leads and base permitting high altitude operation without pressurization.



GENERAL CHARACTERISTICS

Frequency Range 8.5 to 10.5 kMc
Heater Voltage 6.3 volts
Heater Current 1.2 A

MAXIMUM RATINGS

Resonator Voltage 385 volts
Resonator Current 74 Ma
Reflector Voltage 0 to -1000 volts

MECHANICAL CHARACTERISTICS

Cathode Oxide coated, unipotential
Maximum Dimensions 3 x 1-15/16 x 1-3/4 in.
Weight 7 oz
Output Connector Bolts to UG-39/U flange
or UG-40A/U choke for
1 x 0.5 x 0.050 in. waveguide
Base Molded, flexible leads, 18 inches long
Mounting position Any
Cooling Convection¹
Shock Withstands up to 250 G
Tuner Lock-nut²
Microphonics Less than 500 kc³

ELECTRICAL CHARACTERISTICS

Operation between 8500 and 10,500 Mc, Matched Load, Ef=6.3 volts

Resonator Voltage 350 volts	Mode 4 3/4		
	Min.	Avg.	Max.
Resonator Current		52	60
Reflector Voltage	-150		
(at 9.3 kMc)			
Power Output	50	120	
Electronic Tuning Range ⁴	40	65	
Modulation Sensitivity	1.0		
Temperature Coefficient	-200	-60	+200
Warm-Up Time ⁵		15	

NOTES:

- 1. Forced-air cooling required above 10 watts resonator power input.
- 2. Stops provided on low-frequency end.
- 3. At resonant peaks, a 10 G audio-frequency vibration may produce frequency modulation of as much as 2 Mc.
- 4. Between half-power points.
- 5. Before oscillation begins.

* Formerly designated VA-6314/V-290

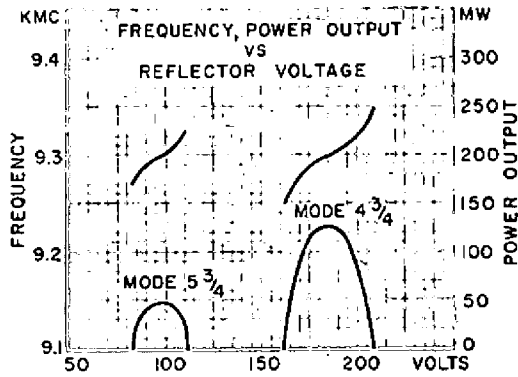
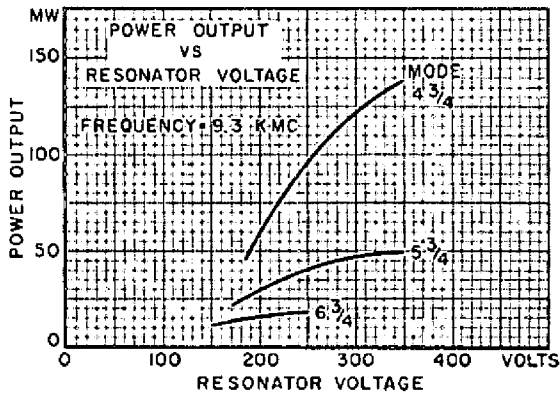
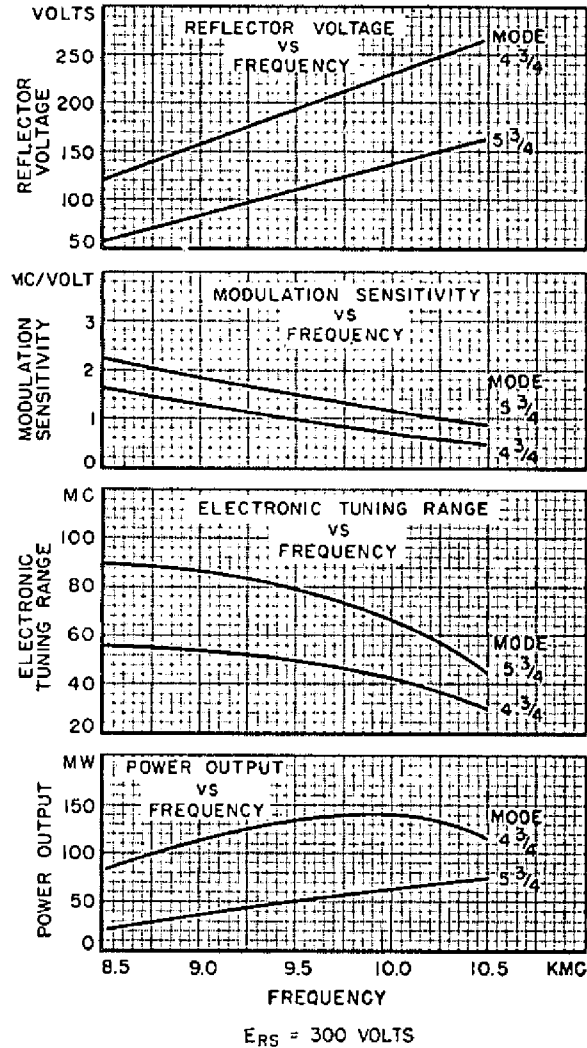
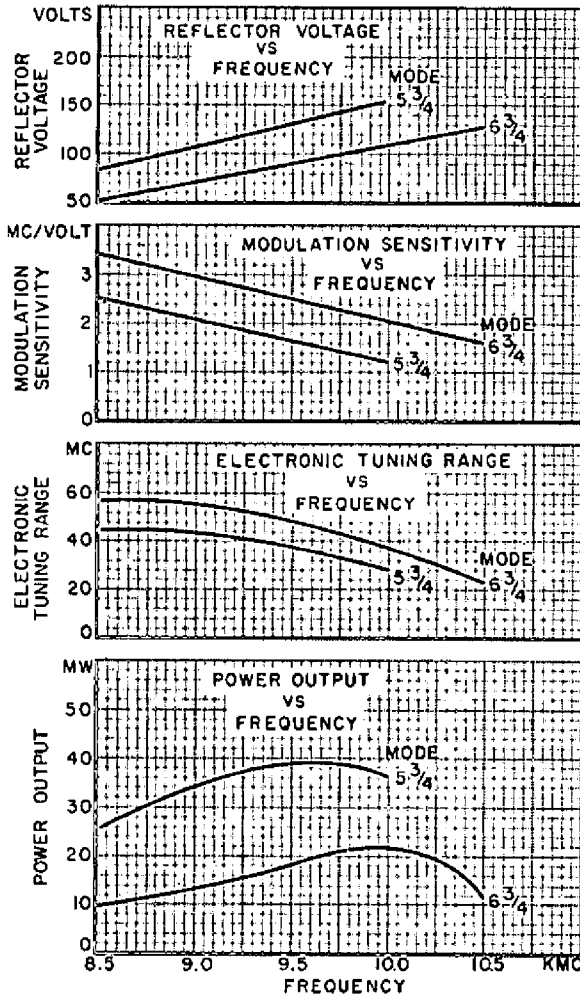
Additional operation and application information available upon request.

ALL CURVES ARE TYPICAL DATA

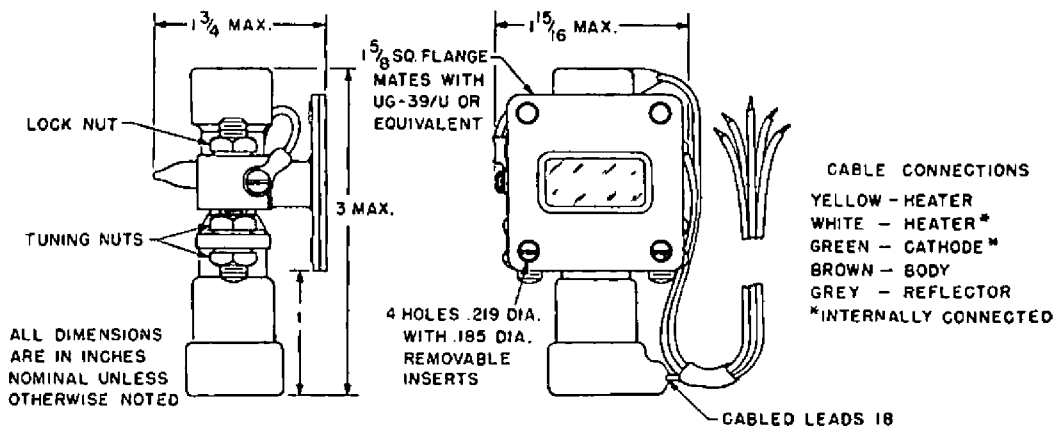
RESONATOR VOLTAGE = 200 V

LOAD VSWR > 1.1

RESONATOR VOLTAGE = 300 V



OUTLINE DRAWING
VA-6314
REFLEX KLYSTRON





SPECIFICATION

TYPE VA-6313/V-280 REFLEX KLYSTRON
VA-6314/V-290

Description: Klystron, Integral Cavity, Tuner, Waveguide Output

Ratings:	Ef	Ers	Er	Ik	Tuner Plate Temp	Altitude Feet	Altitude Feet
Absolute	V	Vdc	Vdc	mAdc	°C	VA-6313/V-280	VA-6314/V-290
Maximum:	6.3+ 10%	385	0 to -1000	74	200	10,000	No Limit

Test Cond: 6.3 350 -50 to -300 Notes 1 & 2

Dimensions: As per outline **Cathode: Coated Unipotential

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN markings		
4.5	Holding Period:	t=168 hours		
4.9.5.1	*Torque:	Note 3		
4.9.18	*Carton Drop:	(d)Package Group 1 Carton Size N		
4.9.19	**Vibration(1):	Power Output (3) 10G; F=50 to 1000 cps t=5 min.		
4.9.19	Vibration(2):	Ers=200 Vdc; 10G; F=60 t=120; Note 4	Ir: 0	10 uAdc
4.9.20.5	**Shock:	Power Output(3) G=200		
4.10.8	*Heater Current:		If: 1.08	1.32 A
4.10.6.7.1	Total Reflector Current:	Notes 5 & 6	Ir: ---	3 uAdc
4.10.1.1	Emission:	Ef=5.7; Note 6	Δ Ik/Ik: ---	-15 %
4.10.4.6	Cathode Current:	Er(Mode 4)/max Po F=10,000 + .3% Mc	Ik: ---	60 mAdc
4.10.7.3.2	Tunable Frequency:		F; 8500	10,500 Mc
4.15.1	Power Output(1):	Er(Mode 4)/max Po F=8500 + .3%	Po: 50	--- mW

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>
4.15.1	Power Output(2):	Er(Mode 4)/max Po F=10,000 $\pm$.3% Mc	Po: 100	--- mW
4.15.1	*Power Output(3):	Ers=200 Vdc; Er (Mode 6)/max Po; F=9300 $\pm$.3% Mc	Po: 8	--- mW.
4.10.5.4	Reflector Voltage(1):	Power Output(1)	Er: -85	-145 Vdc
4.10.5.4	Reflector Voltage(2):	Power Output(2)	Er: -170	-255 Vdc
4.10.5.4	*Reflector Voltage(3):	Power Output(3)	Er: -40	-110 Vdc
4.15.3	*Electronic Tuning Range(1):	Mode 4; 50% max Po F=8500 to 10,000 Mc Note 7	ΔF : 40	--- Mc
4.15.3	*Electronic Tuning Range(2):	Mode 6; 50% max Po F=9300; Ers=200 v Note 7	ΔF : 35	--- Mc
---	*Modulation Sensitivity:	Power Output(3) $\Delta F = \pm 2.5$ Mc max	Coeff: 2.0	4.0 Mc/V
4.15.5	**Temperature Compensation:	Power Output(3) TA = -10 to +40°C	Coeff: ---	.20 Mc/°C
---	**Frequency Modulation:	Power Output (2) Er=5.7 to 7.0 Vdc	ΔF : ---	.1 Mc
4.11	Life Test:	Group C Power Output(3)	t: 500	--- hrs
4.11.4	Life Test End Point:	Power Output(1) Reflector Current t=5 min.	$\Delta Po/Po$: 0 Ir: ---	-20 % 10 uAde

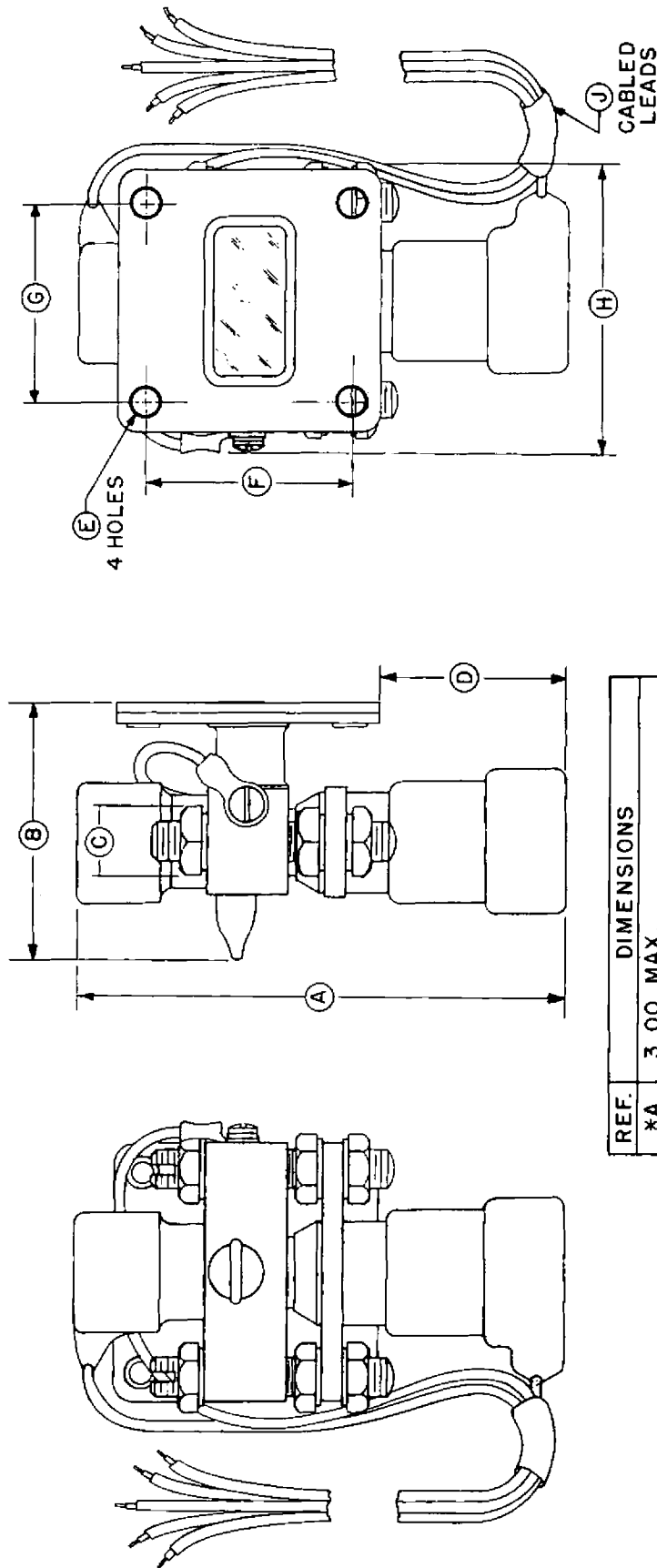
References are to paragraphs in "Military Specifications for Electron Tubes MIL-E-18".

Note 1: All oscillation tests except vibration test shall be made with the tube rigidly connected to a UG39/U flange on appropriate RG52/U waveguide equipment and the load VSWR for the tube shall be less than 1.1. Forced air cooling is required for power inputs above 10 watts.

Note 2: Temperature of base and cap of VA-6313/V-280 should not exceed 120°C.

Note 3: Not applicable to VA-6314/V-290.

- Note 4: The reflector current shall be recorded with a Brush Model BL202 recorder or equivalent. There shall be no reflector current bursts greater than the limits shown.
- Note 5: After two minutes with all voltages applied, total reflector current shall not exceed the specified limits.
- Note 6: The tube shall not be oscillating during the test.
- Note 7: The power output shall have no discontinuities between half-power points for either direction of reflector voltage change.



CABLE CONNECTIONS

YELLOW — HEATER
 WHITE — HEATER } INTERNALLY
 GREEN — CATHODE } CONNECTED
 GREY — REFLECTOR
 BROWN — BODY

REF.	DIMENSIONS
*A	3.00 MAX.
B	1.813 MAX.
**C	.438 NOM.
**D	1.00 MAX.
*E	.219 DIA. NOM. WITH .185 DIA. NOM. REMOVABLE INSERTS
F	1.284 MAX. 1.276 MIN.
G	1.224 MAX. 1.216 MIN.
**H	1.9 MAX.
*J	18 NOM.

NOTE: Eyelet-type inserts in the flange mounting holes are 0.219 O.D., 0.185 I.D., nominal, and are easily removable from rear of flange. With inserts in place, the mounting holes provide clearance for #8 screws. With inserts removed, the mounting holes permit use of insulating bushings where d-c isolation between tube flange and waveguide system is desired.

SPECIFICATION DRAWING VA-6314/V-290 REFLEX KLYSTRON



REFLEX KLYSTRON

TENTATIVE DATA SHEET

oscillator

VA-6315

V-153

8.5 - 10.0 kMc
140 mW

APPLICATION

The VA-6315/V-153 is designed for radar applications requiring reliability under rugged service conditions. It will operate from conventional power supplies and with conventional crystal mixers. It will operate at much lower resonator voltages than most local oscillator klystrons, producing adequate power output and electronic tuning range with resonator voltage as low as 150 volts.

FEATURES

Low microphonics . . . Waveguide output . . . Matched load operation without matching sections . . . Rapid warm-up . . . Negligible barometric frequency coefficient . . . Linear reflector voltage tracking . . . Molded leads and base permitting high altitude operation without pressurization.

GENERAL CHARACTERISTICS

MAXIMUM RATINGS

Frequency Range . . . 8.5 to 10.0 kMc	Resonator Voltage 385 volts
Heater Voltage 6.3 volts	Resonator Current 74 mA
Heater Current 1.2 A	Reflector Voltage . . 0 to -1000 volts

MECHANICAL CHARACTERISTICS

Cathode	Oxide coated, unipotential
Maximum Dimensions . . .	3-1/8 x 1-3/4 x 1-7/8 inches
Weight	6 ounces
Output Connector .	Bolts to UG-39/U flange or UG-40A/U choke for 1 x 0.50 x 0.050 inches waveguide
Base	Molded flexible leads 18 inches long
Mounting Position	Any
Cooling	Convection ¹
Tuner	Single Screw ²
Shock	Withstands up to 250 G
Microphonics	Less than 500 kc ³

from JETEC release #1495, July 11, 1955

VA-6315
V-153

TYPICAL OPERATION

Resonator Voltage	150	300	350	volts
Mode	6-3/4	5-3/4	4-3/4	
Frequency	9.3	9.3	9.3	kMc
Resonator Current	15	42	52	mA
Reflector Voltage	-90	-100	-150	volts
Power Output (VSWR < 1.1)	12	48	140	mW
Electronic tuning range ⁴	28	82	60	Mc
Modulation sensitivity	2.5	1.6	1.2	Mc/volts

NOTES:

1. Forced air cooling required above 10 watts resonator power input.
2. Approximately 2 turns to cover frequency range. Mechanical stops are provided.
3. At resonant peaks, a 10 G audio frequency vibration may produce frequency modulation of as much as 4.0 Mc.
4. Between half-power points.

For further information on electrical characteristics refer to the VA-6314/V-290 Data Sheet.

For further information on mechanical characteristics refer to the VA-6312/V-270 Data Sheet.



SPECIFICATION
TYPE VA-6315/V-153 REFLEX KLYSTRON

Description: Klystron, Integral Cavity, Tuner Waveguide Output

Ratings:	Ef	Ers	Er	Ik	F	Tuner Plate Temp.	Altitude
Absolute	V	Vdc	Vdc	mAdc	mc	°C	Feet
Maximum:	6.3 $\pm$ 10%	385	0 to -1000	74	8500 to 10000	200	No limit
Test Cond:	6.3	250	---	---	9300 $\pm$.3%	---	Note 1
Dimensions:	As per Outline		**Cathode: Coated Unipotential				

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>
3.1	Qualification Approval:	Required for JAN markings		
4.5	Holding Period:	t = 168 hours		
4.9.18	*Carton Drop:	(d) Package Group 1 Carton Size N		
---	**Vibration (1):	Power Output: 10G F=50 to 600 cps; t=5 min; Ef=6.3 v	Δ F: 0	4 Mc p-p
---	Vibration (2):	10G; F=60; f=120; Note 2	Ir: 0	10 uAdc
4.9.20.5	**Shock:	Power Output; G=200; Ef=6.3 v; Note 5	Δ F: 0	5 Mc
4.10.8	*Heater Current:		If: 1.08	1.32 A
4.10.6.7.1	Total Reflector Current:	Notes 3 & 4	Ir: ---	3 uAdc
4.10.1.1	Emission:	Ef=5.7; Note 4	Δ Ik/Ik ---	-15 %
4.10.4.6	Cathode Current:	Er(Mode 5)/max Po	Ik: ---	40 mAdc
4.15.1	Power Output (1):	Er(Mode 5)/max Po; Ef=5.7 v	Po: 30	--- mW
4.15.1	*Power Output (2):	Er(Mode 5)/max Po; F=8500 $\pm$.3% Mc	Po: 10	--- mW

10/21/53
Revised 11/25/53

<u>Ref:</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>
4.15.1	*Power Output (3):	Er(Mode 5)/max Po; F=10000 $\pm$.3% Mc	Po: 30	--- mW
4.15.1	*Power Output (4):	Er(Mode 4)/max Po; Ers=350 v; F=8500 $\pm$.3% Mc	Po: 50	--- mW
4.15.1	*Power Output (5):	Er(Mode 4)/max Po; Ers=350 v; F=10000 $\pm$.3% Mc	Po: 100	--- mW
---	*Reflector Voltage(1):	Electronic Tuning Range; Note 8	Er: -70	-127 Vdc
4.10.5.4	*Reflector Voltage(2):	Power Output(1)	Er: -50	-115 Vdc
4.10.5.4	*Reflector Voltage(3):	Power Output(2)	Er: -15	-90 Vdc
4.10.5.4	*Reflector Voltage(4):	Power Output(3)	Er: -70	-160 Vdc
4.10.5.4	*Reflector Voltage(5):	Power Output(4)	Er: -50	-145 Vdc
4.10.5.4	*Reflector Voltage(6)	Power Output(5)	Er: -140	-255 Vdc
4.15.3	*Electronic Tuning Range:	Mode 5; 50% max. Po; Note 6	F: 43	--- Mc
---	*Modulation Sensitivity:	Power Output(1) Ef=6.3 v. $\Delta F = \pm 2.5$ Mc max	Coeff: 1.5	3.0 Mc/v
4.16.5	**Pulling Factor:	Power Output (1); Ef=6.3 v	F: ---	12 Mc
---	**Sink Margin:	Power Output (1); VSWR=2.5; Note 9		
---	**Heater Voltage Coefficient:	Power Output (1); Ef=5.7 to 7.0 v	$\Delta F/\Delta Ef$: ---	6 Mc/v
4.15.5	**Temperature Compensation:	Power Output (1); Ef=6.3 v; TA=+ 20° to + 60°C	Coeff: -.1	.1 Mc/°C
---	**Low Pressure:	Power Output (1); Ef=6.3 v; t=10 sec; Note 7	ΔF : ---	2 Mc

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>	
---	**Residual Frequency Modulation:	Power Output (1); Ef=5.7 to 7.0 Vdc	ΔF : ---	.1	Mc
4.11	Life Test:	Group C	t: 500	---	hrs
4.11.4	Life Test End Point:	Power Output(1) Total Reflector Current; t=5 min	$\Delta P_o/P_o$: 0 Ir: ---	--20 10	% uA

References are to paragraphs in "Military Specifications for Electron Tubes MIL-E-1B".

Note 1: All oscillation tests except vibration test shall be made with the tube rigidly connected to a UG39/U flange on appropriate RG52/U waveguide equipment and the load VSWR for the tube shall be less than 1.1. Forced air cooling is required for power inputs above 10 watts.

Note 2: The reflector current shall be recorded with a Brush Model BL202 recorder or equivalent. There shall be no reflector current bursts greater than the limit shown.

Note 3: After two minutes with all voltages applied, total reflector current shall not exceed the specified limits.

Note 4: The tube shall not be oscillating during the test.

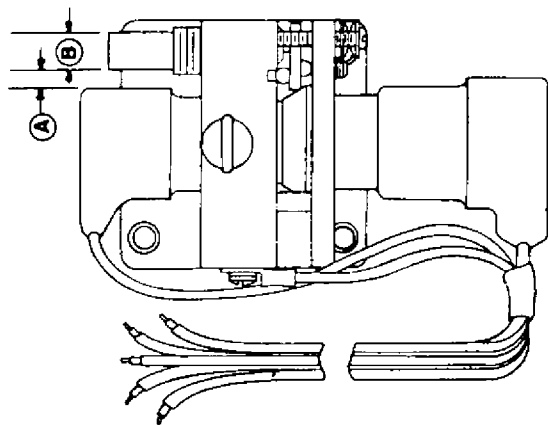
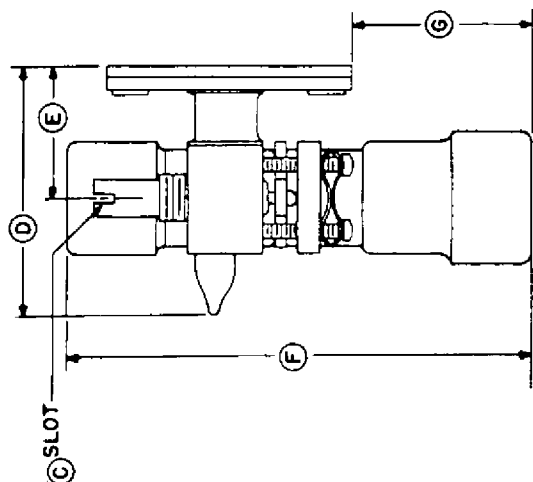
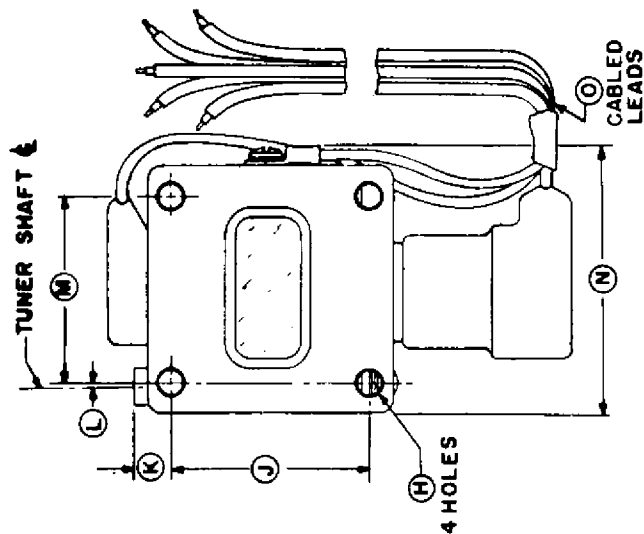
Note 5: The tube shall be given 5 shocks of 1 millisecond duration at specified accelerations in each of 3 planes. The frequency shift in any one plane shall not exceed the value specified after the 5 shocks.

Note 6: The power output shall have no discontinuities between half-power points for either direction of reflector voltage change.

Note 7: The frequency shall be stabilized at a pressure of 70 mm. of Hg. The pressure shall be increased to 760 mm. of Hg. in less than the time stated. The resulting frequency change shall not exceed the limit specified within the time specified.

Note 8: Reflector voltage shall be measured at the upper half-power point for this test.

Note 9: There shall be no discontinuity at the maximum power point for any phase of standing wave, when the magnitude of the standing wave is as specified.



CABLE CONNECTIONS

YELLOW - HEATER
 WHITE - HEATER } INTERNALLY
 GREEN - CATHODE } CONNECTED
 GREY - REFLECTOR
 BROWN - BODY

REF.	DIMENSIONS
**A	.125 NOM.
*B	.250 MAX. .248 MIN.
*C	.050 WIDE X .220 DEEP NOM.
D	1.75 MAX.
*E	.936 MAX. .850 MIN.
*F	3.000 MAX.
**G	1.00 MAX.
*H	219 DIA. NOM. WITH .185 DIA. NOM. REMOVABLE INSERTS
J	1.284 MAX. 1.276 MIN.
**K	.260 MAX.
*L	.070 MAX. .010 MIN.
M	1.224 MAX. 1.216 MIN.
**N	1.875 MAX.
*O	18 NOM.

NOTE: Eyelet-type inserts in the flange mounting holes are 0.219 O.D., 0.185 I.D., nominal, and are easily removable from rear of flange. With inserts in place, the mounting holes provide clearance for #8 screws. With inserts removed, the mounting holes permit use of insulating bushings where d-c isolation between tube flange and waveguide system is desired.

SPECIFICATION DRAWING VA-6315/V-153 REFLEX KLYSTRON



REFLEX KLYSTRON

DATA SHEET

Oscillator
V-151
6316
8.5 - 10.0
kMc

1495A

APPLICATION

Intended primarily for radar application, the V-151/6316 klystron's ruggedness and excellent electrical characteristics offer improved local oscillator reliability and performance in radar systems in which it is utilized.

FEATURES

Extremely rugged construction . . . Low microphonics . . . Matched load operation without matching sections . . . Negligible barometric frequency coefficient . . . Waveguide output . . . Removable flange inserts in flange holes simplify insulation when required . . . Rapid warm-up . . . Molded leads and base permitting high altitude operation without pressurization . . . High altitude connector for convenient installation.

GENERAL CHARACTERISTICS

Frequency Range 8.5 to 10.0 kMc
Heater Voltage 6.3 volts
Heater Current 1.2 A

MAXIMUM RATINGS

Resonator Voltage 350 volts
Resonator Current 52 mA
Reflector Voltage . . . 0 to -1000 volts

MECHANICAL CHARACTERISTICS

Cathode Oxide coated, unipotential
Maximum Dimensions 3 x 1-3/4 x 1-7/8 inches
Weight 7 ounces
Output Connection . . . Bolts to UG-39/U flange or UG-40A/U
choke for 1 x 0.50 x 0.050 in. waveguide
Base Molded flexible leads 7-inch leads
terminated in Viking Connector
Mounting Position Any
Cooling Convection¹
Tuner Lock-nut
Shock Withstands up to 250 G
Microphonics Less than 500 kc²

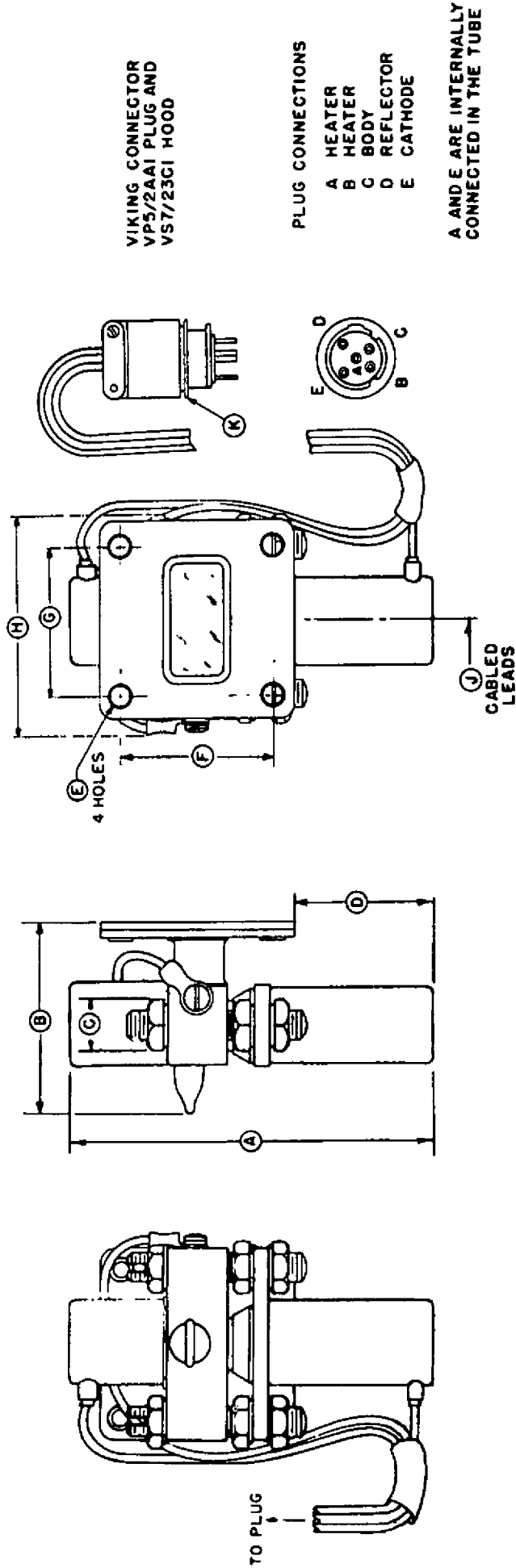
ELECTRICAL CHARACTERISTICS

Operation between 9000 and 9660 Mc, matched load
Ers = 200 volts, Ef = 6.3 Vac, Mode 6 3/4

	Min.	Avg.	Max.	
Resonator Current	-	20	23	mA
Reflector Voltage	-80	-	-160	volts
Power Output	15	25	-	mW
Electronic Tuning Range ³	20	45	-	Mc
Temperature Coefficient	-100	0	+100	kc/°C

- NOTES: 1. Forced air cooling required above 10 watts resonator power input.
2. At resonant peaks, a 10G audio-frequency vibration may produce frequency modulation of as much as 2.5 Mc.
3. Between half-power points.

Pub. 370 4.5M857 Litho U.S.A.



NOTE: Eyelet-type inserts in the flange mounting holes are 0.219 O. D., 0.185 I. D., nominal, and are easily removable from rear of flange. With inserts in place, the mounting holes provide clearance for 48 screws. With inserts removed, the mounting holes permit use of insulating bushings where d-c isolation between tube flange and waveguide system is desired.

REF.	DIMENSIONS
*A	3.00 MAX.
B	1.75 MAX.
*NC	.438 NOM.
*ND	1.00 MAX.
*E	.219 DIA. NOM. WITH .185 DIA. NOM. REMOVABLE INSERTS
F	1.284 MAX. 1.276 MIN.
G	1.224 MAX. 1.216 MIN.
*HH	1.9 MAX.
*JTK	7.0 NOM.

SPECIFICATION DRAWING V-151/6316 KLYSTRON



1495A

SPECIFICATION

TYPE V-151/6316 REFLEX KLYSTRON

Description: Klystron, Integral Cavity, Tuner, Waveguide Output

Ratings:	Ef	Ers	Er	Ik	Tuner Plate Temp	Altitude
Absolute	V	Vdc	Vdc	mAdc	°C	Feet
Maximum:	6.3 ± 10%	350	0 to -1000	42	200	No Limit
Test Cond:	6.3	200	-55 to -225	--	Notes 1 & 2	

Dimensions: As per Outline **Cathode: Coated Unipotential

Pack in sealed moisture resistant bag. If opaque bag is used, type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
4.5	Holding Period:	t=168 hours		
4.8	*Electrode Insulation:	300 Vdc, Tube Cold	Rh-rs: 2.0 Rk-rs:	Meg
4.9.18	*Carton Drop:	(d)Package Group 1 Carton Size N		
4.9.19	**Vibration(1):	Power Output(1) 10G; F=50 to 1000 cps t=5 min		
4.9.19	*Vibration(2):	10G; F=60; t=120 Note 3	Ir: 0	10 uAdc
4.9.20.5	**Shock:	Power Output(1) G=200		
4.10.8	*Heater Current:		If: 1.32	A
4.10.6.7.1	/Total Reflector Current:	Notes 4 & 5	Ir: --	3 uAdc
4.10.1.1	/Emission:	Ef=5.7; Note 5	△ Ik/Ik: --	-15 %
4.10.4.6	Cathode Current:	Er(Mode 6)/max Po F=9660 ± .3% Mc	Ik: --	23 uAdc
4.10.7.3.2	*Tunable Frequency:		F: 8500	10,000 Mc
4.15.1	Power Output(1):	Er(Mode 6)/max Po F=9000 ± .3% Mc	Po: 10	-- mW

Revised 8/5/57

Page 1 of 3

<u>Ref.</u>	<u>Test</u>	<u>Conditions</u>	<u>Min.</u>	<u>Max.</u>	
4.15.1	Power Output(2):	Er(Mode 6)/max Po F=9660 $\pm$.3% Mc	Po: 10	--	mW
4.15.1	**Power Output(3):	Er(Mode 5)/max Po F=8500 to 10,000 Mc Ers=300 Vdc	Po: 25	--	mW
4.10.5.4	Reflector Voltage(1):	Power Output(1)	Er: -80	-135	Vdc
4.10.5.4	*Reflector Voltage(2):	Power Output(2)	Er: -100	-160	Vdc
4.15.3	*Electronic Tuning Range:	Mode 6; 50% max Po F=9000 to 9660 Mc	Δ F: 20	--	Mc
4.15.5	**Temperature Compensation:	Power Output(1) TA=20 ^o to 60 ^o C F=9300 $\pm$.3%	Coeff: --	.1	Mc/ ^o C
--	**Frequency Modulation:	Power Output(2) Ef=5.7 to 7.0 Vdc	Δ F: --	.1	Mc
4.11	Life Tests:	Group C Power Output(1)	t: 500		hrs
4.11.4	Life Test End Point:	Power Output(1) Reflector Current t=5 min	Δ Po/Po: 0 Ir: --	-20 10	% uAdc

References are to paragraphs in "Military Specifications for Electron Tubes MIL-E-1C".

Note 1: All oscillation tests except vibration test shall be made with the tube rigidly connected to a UG-39/U flange on appropriate RG-52/U waveguide equipment and the load VSWR for the tube shall be less than 1.1. Forced air cooling is required for power inputs above 10 watts.

Note 2: The temperature of the insulation should not exceed 120^oC.

Note 3: The reflector current shall be recorded with a Brush Model BL202 recorder or equivalent. There shall be no reflector current bursts greater than the limit shown.

Note 4: After two minutes with all voltages applied, total reflector current shall not exceed the specified limits.

Note 5: The tube shall not be oscillating during the test.

JEDEC TYPE DESIGNATION REGISTRATION FORM

DOUBLE TR TUBE

November 29, 1962

Manufacturer's Designation: BL-625
JEDEC Designation: 6805
Manufacturer: Varian Associates, Bomac Division
Beverly, Massachusetts

GENERAL CHARACTERISTICS

The 6805 is a double broadband TR tube designed to operate in a system which makes use of each half of the tube in separate channels. The description "double" is used rather than "dual" to distinguish it from tubes designed for balanced duplexer operation used in conjunction with a pair of short-slot hybrid couplers. It is for use with RG52/U size waveguide. It is an integral cavity type with fixed tuned elements and has an operational band from 8490 to 9578 megacycles per second.

ELECTRICAL DATA (Note 1)

Operational Band	
VSWR - 1.9 (max)	8490 to 9578 Mc/seconds
VSWR - 1.4 (max)	8565 to 9487 Mc/seconds
Ignitor Ignition Time (max)	5 seconds
Ignitor Current (typical) at Ebb = -650 Vdc (Note 2)	150 μ Adc
Spike Leakage Energy (max)	0.3 ergs
F=9000 Mc; po = 40 kw; tp = 1.0 μ s;	
tp2=0.5 μ s; prr = 1000 pps; Ebb = -650Vdc	
Flat Leakage Power (max)	40 mw
For conditions - see Spike Leakage	
Insertion Loss (max) at F=9000 Mc and Ii = 0	0.7 db
Ignitor Interaction (max) at F=9000 Mc and Ii = 100 μ Adc	0.2 db
Recovery Time (max.) at 200 kw peak	10 μ s

ABSOLUTE MAXIMUM RATINGS

Transmitter Peak Power	200 kw
Transmitter Average Power	200 W
Ignitor Current	200 μ Adc

MECHANICAL DATA - GENERAL

Mounting Position	Any
Number of Electrodes	Two
Weight (approx)	8 ounces

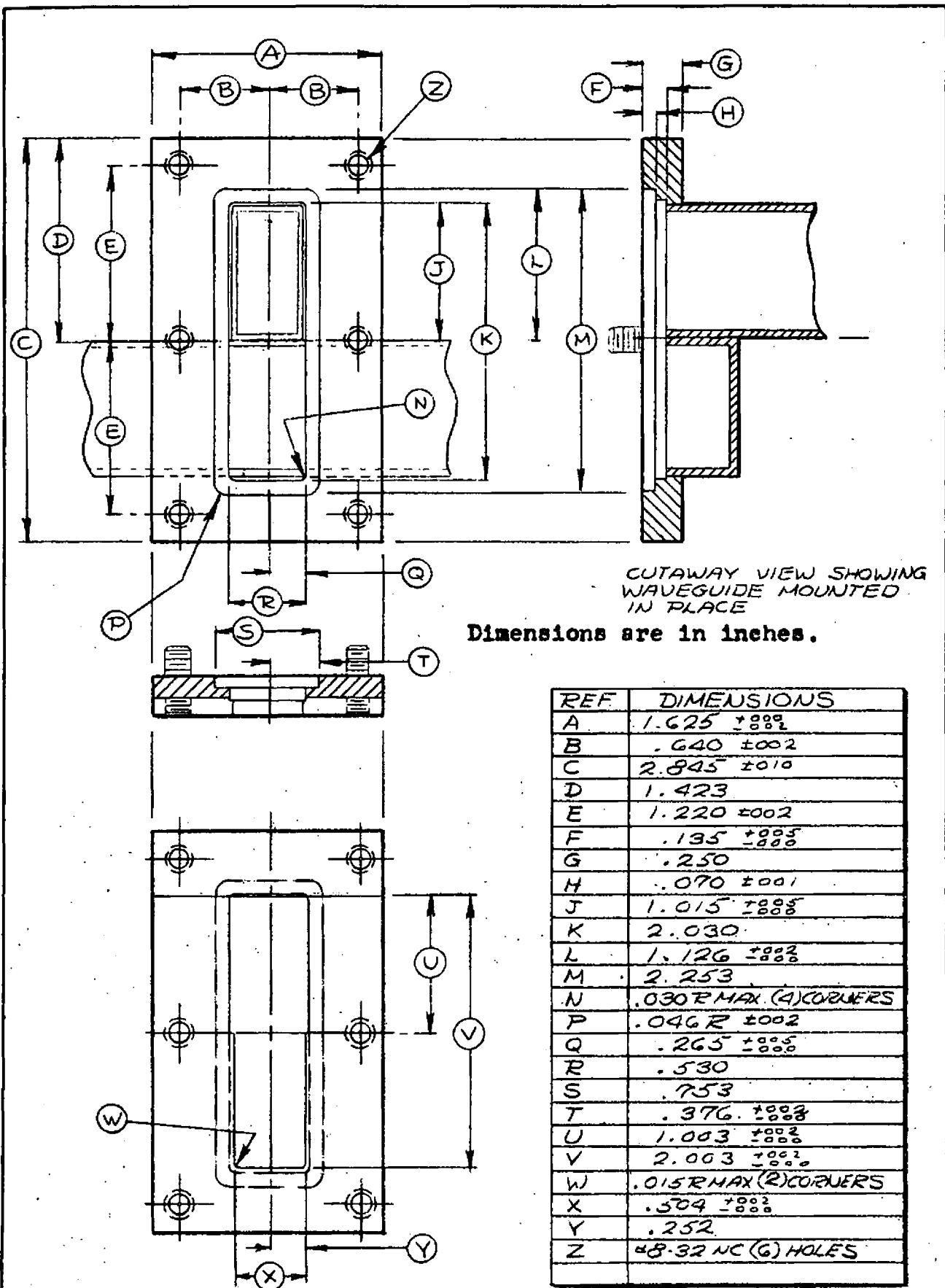
OUTLINE DRAWING

Outline as per attached drawing dated 7-6-56.

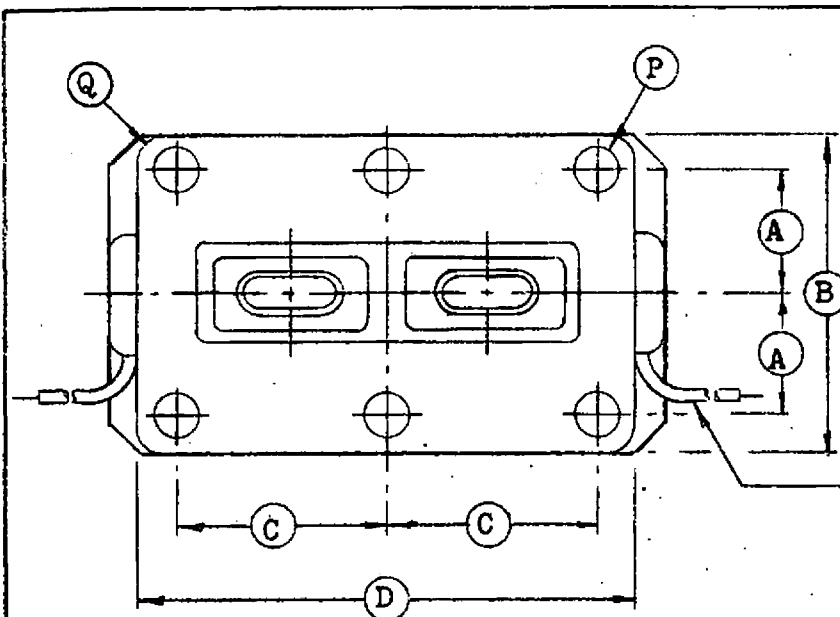
Tube Mounting per attached drawing dated 11-2-54.

Note 1: Each half of the tube is measured as a separate unit.

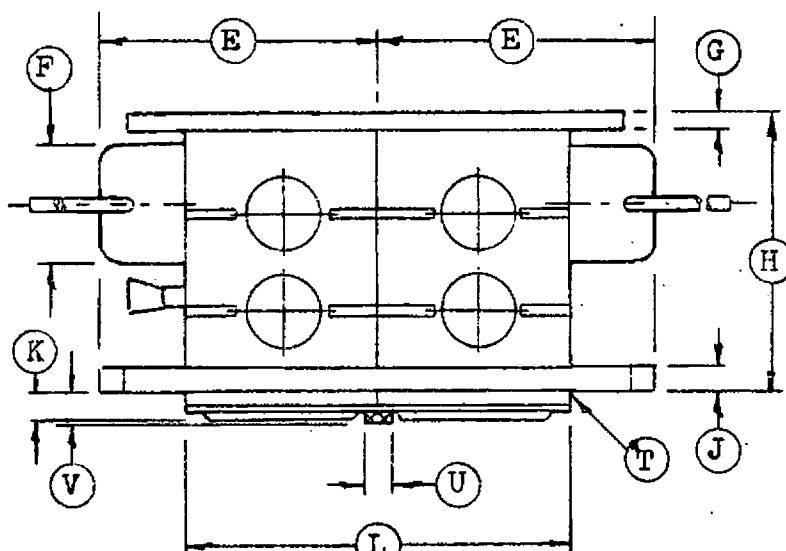
Note 2: A 2.7 megohm resistor is encapsulated at each ignitor.



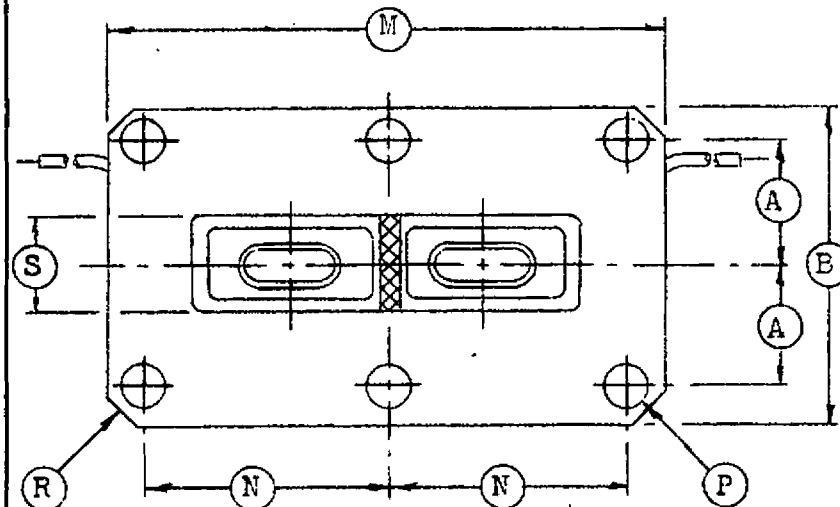
	SPECIFICATION SHEET	BOMAC LABORATORIES INC.
	<i>TUBE MOUNTING</i>	SALEM ROAD
GS-2E-1.10.30.07	6648/BL-615, 6805/BL-625	BEVERLY, MASSACHUSETTS
		<i>11-2-54</i> <i>E.D.</i>



Wire #24(AWG) 19 strand
teflon insulated wire
spec. Mil-W-16878A-
Type EE, 12" long



Ref.	Dimension
A*	0.640±.002
B**	1.625±.010
C*	1.085±.003
D**	2.575±.010
E*	1.500 Max.
F*	0.812 Max.
G**	0.083 Min.
H	1.438±.010
J**	0.125±.010
K	0.125
L	2.005
M**	2.845±.010
N*	1.220±.002
P	#17 (.173) Dr.
	6 Holes Ra. Flg.
Q**	1/8 Rad.
R**	0.125 x 45° Cham.
S	0.500
T	0.030 Rad. Max.
U	0.100±.010
V	0.140 Max.



SPECIFICATION SHEET

Outline

6805/BL-625

BOMAC LABORATORIES INC.
SALEM ROAD
BEVERLY, MASSACHUSETTS

7-6-56 clr



VARIAN
associates

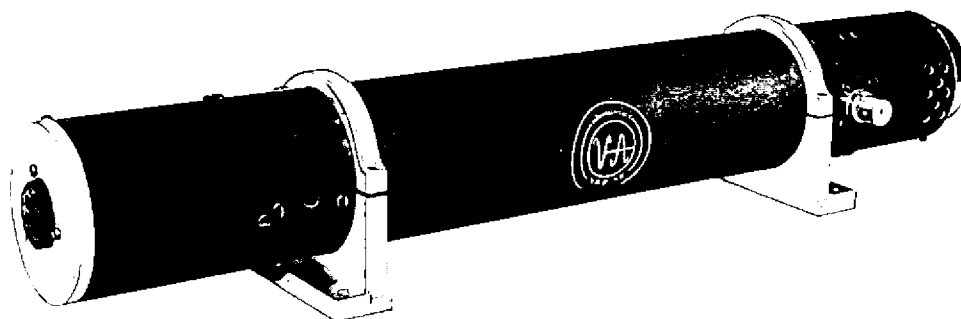
TRAVELING WAVE TUBE PULSE AMPLIFIER

DATA SHEET

VA-128/8232

2.7-3.6 Gc

7 kw peak



DESCRIPTION

The VA-128/8232 is a traveling wave pulse amplifier which delivers 7 to 9 kilowatts peak output between 2.7 and 3.6 gigacycles under saturation

conditions. It is a broadband driver for multi-megawatt amplifiers. The tube includes a control grid to permit low voltage beam switching.

FEATURES

Periodic Permanent Magnet Focusing—
needs no magnet power supply.

Broadband—High Power—
amplifies pulses within its 900-Mc bandwidth
without adjustment for change of frequency.

Control Grid—
permits low voltage beam pulsing.

Forced Air Cooled—
permits compact equipment design; no heat ex-
changer or interconnecting hoses required.

GENERAL CHARACTERISTICS¹

ELECTRICAL

Frequency Coverage	2.7 to 3.6 Gc
Beam Voltage	14.5 kVdc
Peak Beam Current	3.0 a
Heater Voltage	7.5 V
Heater Current, at 7.5 volts.....	2.0 A
Heater Warm-up Time, minimum.....	3 min
Capacitance, grid to all other electrodes..	25 pf
Focusing.....	Periodic Permanent Magnet

PHYSICAL

Dimensions	See Outline Drawing
Weight, approximate.....	15 lb
Mounting Position	Any
Connectors	See Outline Drawing
Cooling	Forced Air
Air Flow, minimum	15 cfm
Pressure Head, at 15 cfm.....	1.5" H ₂ O
Operating Ambient Temperature Range	-20 to +40°C

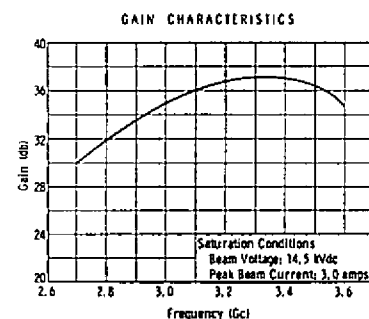
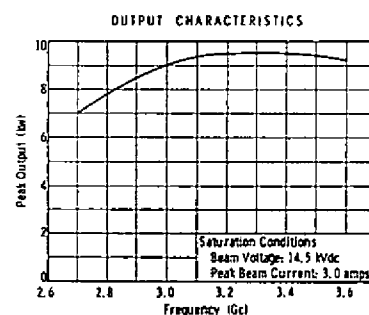
from JEDEC release #4258, May 13, 1963

OPERATING CONDITIONS AND RATINGS

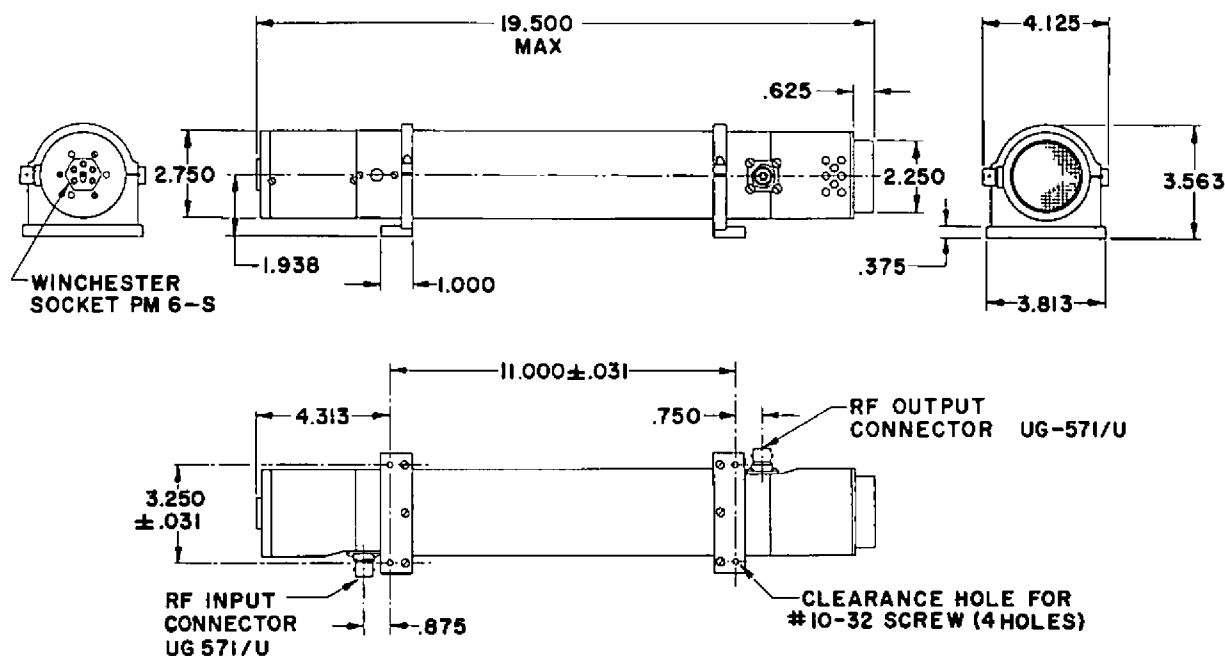
	Typical Operation ¹	Maximum Ratings ²	
Frequency Coverage.....	See Curve	- -	Gc
Peak Output, saturation.....	See Curve	- -	kw
Average Output, saturation.....	20	- -	W
Gain.....	See Curve	- -	db
Drive Power.....	- -	15	W
Beam Voltage.....	14.5	18	kVdc
Peak Beam Current.....	3.0	4.0	a
Grid Bias Voltage.....	-150	-300	Vdc
Peak Grid Voltage, above cathode.....	550	700	v
Duty Cycle.....	0.002	0.003	
Pulse Duration.....	10	15	μsec
Heater Voltage.....	7.5	8.0	V
Heater Current.....	2.0	- -	A
Heater Surge Current.....	- -	5.0	A
Load VSWR.....	1.2:1	2.0:1	

CHARACTERISTIC CURVES

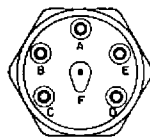
Typical performance values



OUTLINE DRAWING



DIMENSIONS ARE IN INCHES.



SOCKET CONNECTIONS	
A	CATHODE
B	NO CONNECTION
C	HEATER-CATHODE
D	HEATER
E	NO CONNECTION
F	GRID

NOTES:

1. Characteristics and operating values are based on performance tests. They may change as additional data are obtained.
2. 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 ratings will never be exceeded.

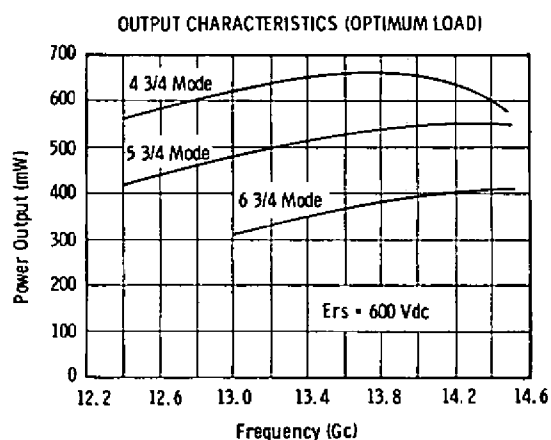
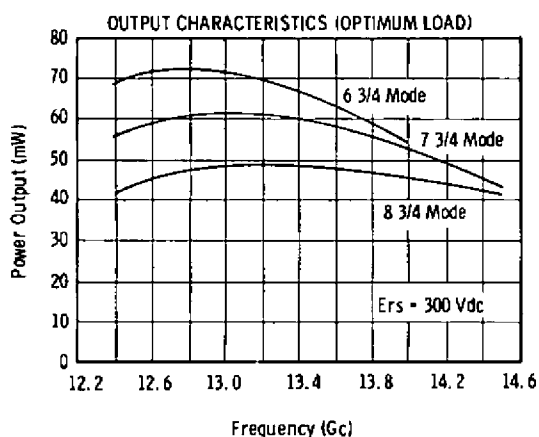
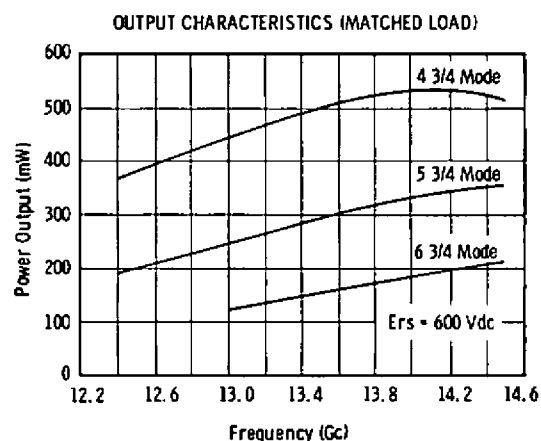
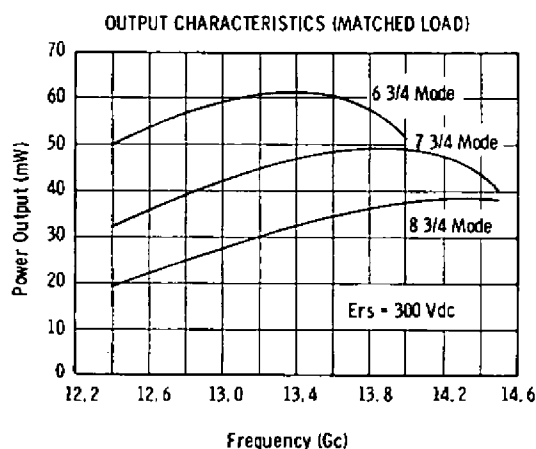
PALO ALTO TUBE DIVISION • 611 HANSEN WAY • PALO ALTO • CALIFORNIA

OPERATING CONDITIONS AND RATINGS

	Typical Operation ¹		Range Values for Equipment Design ⁸		Absolute Ratings ⁵		
Beam Voltage — 600 Vdc			Min	Max	Min	Max	
Frequency	12.4	14.5	12.4	14.5	--	--	Gc
Output Power, matched load	197	358	140	--	--	--	mW
Output Power, optimum load ⁶	420	552	--	--	--	--	mW
Beam Voltage	600	600	--	--	--	625	Vdc
Beam Current	62	62	--	66	--	--	mAdc
Electronic Tuning Range ⁷	78	65	50	--	--	--	Mc
Reflector Voltage	-179	-336	-140	-400	-20	-1000	Vdc
Beam Voltage — 300 Vdc							
Frequency	12.4	14.5	12.4	14.5	--	--	Gc
Output Power, matched load	32	40	20	--	--	--	mW
Output Power, optimum load ⁶	56	43	--	--	--	--	mW
Beam Voltage	300	300	--	--	--	625	Vdc
Beam Current	24	24	--	35	--	--	mAdc
Electronic Tuning Range ⁷	52	28	20	--	--	--	Mc
Reflector Voltage	-106	-193	-85	-220	-20	-1000	Vdc
Heater Voltage	6.3	6.3	--	--	5.7	7.0	V
Tuner Plate Temperature ⁹	--	--	--	--	--	160	°C

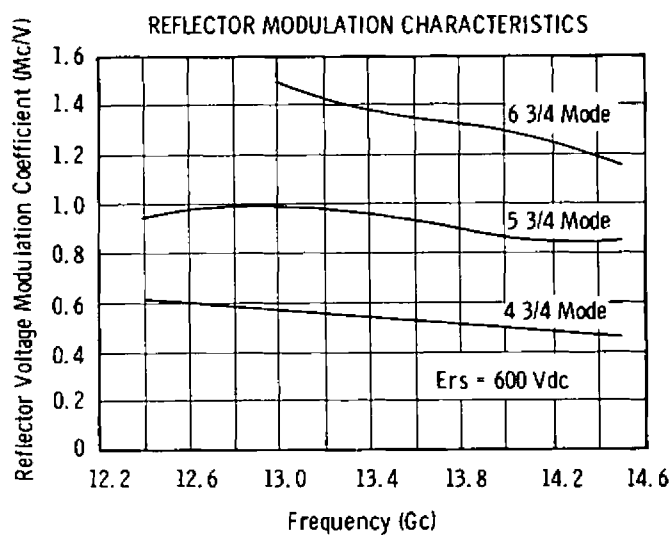
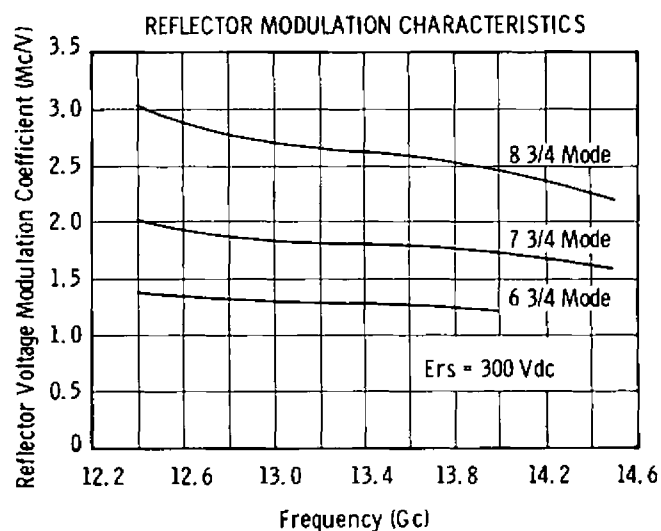
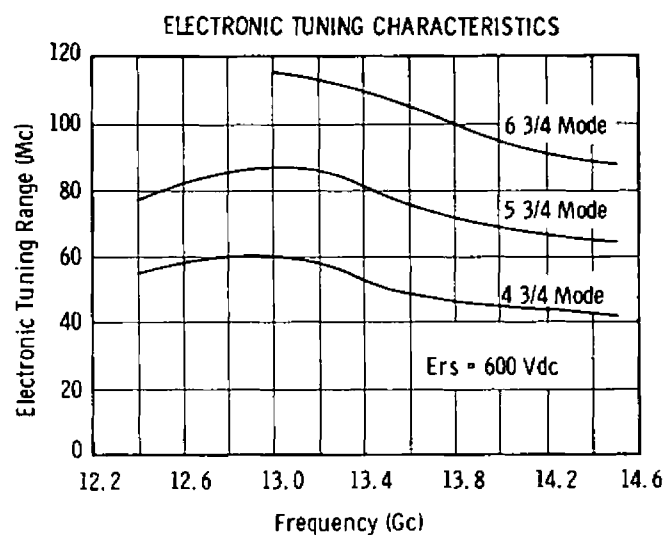
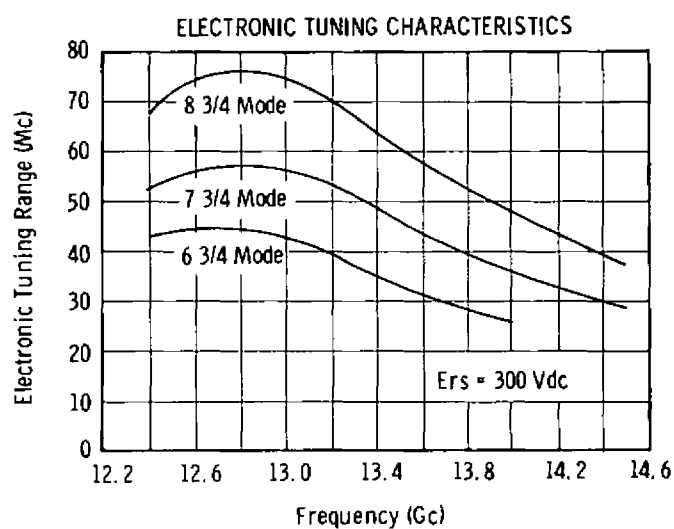
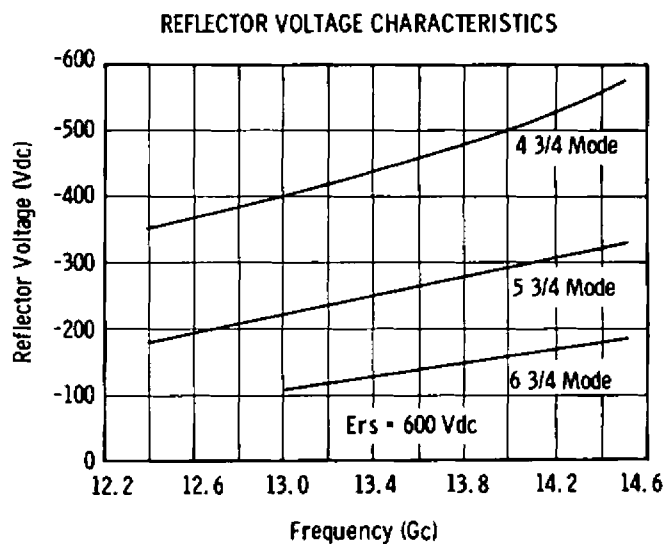
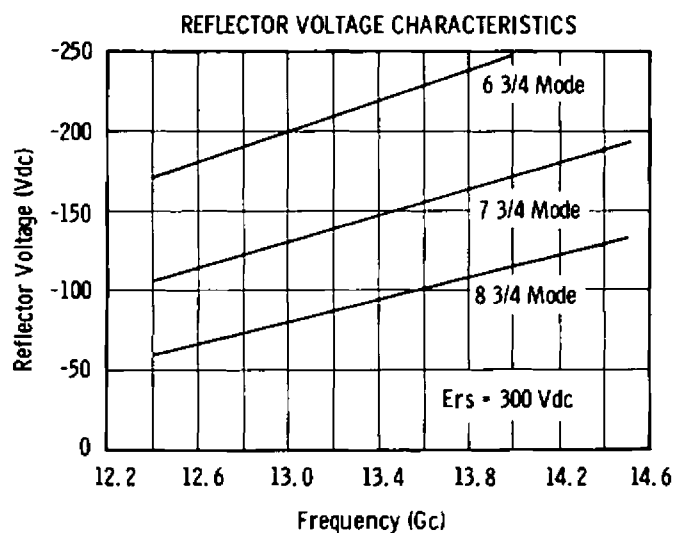
CHARACTERISTIC CURVES

Typical performance values

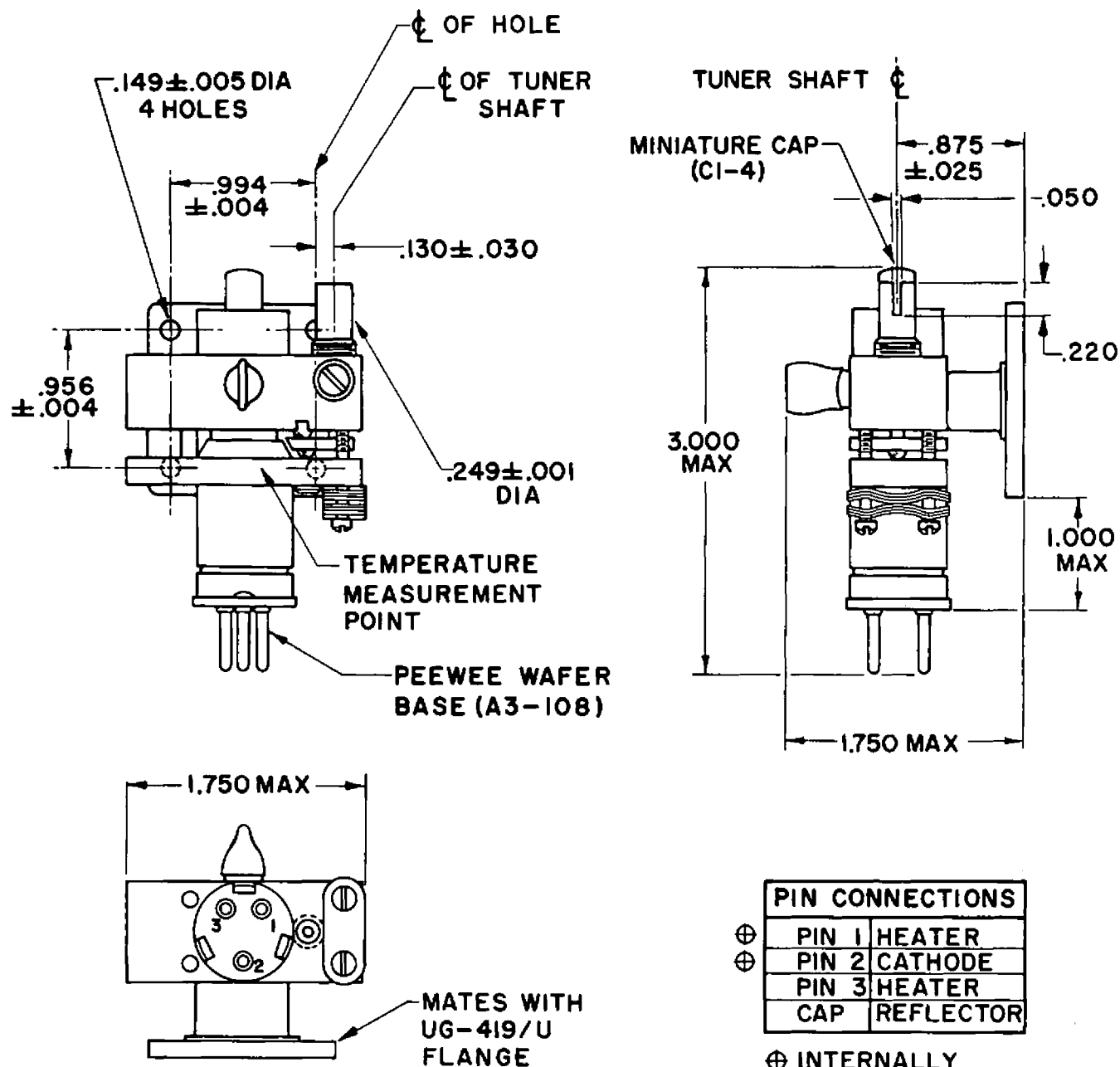


CHARACTERISTIC CURVES

Typical performance values



OUTLINE DRAWING



DIMENSIONS ARE IN INCHES.

NOTES:

1. Characteristics and operating values are based on performance tests. Test conditions and performance limits are given on the tube Specification sheet.
2. Reflector must always be negative with respect to the cathode by at least 20 volts.
3. Forced-air cooling of 1.1 lb/min is required when beam input power exceeds 10 watts.
4. Approximately $2\frac{1}{2}$ turns cover frequency range. Mechanical stops are provided.
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.

6. Load VSWR adjusted for maximum output power.

7. Measured between half-power points.

8. These values are acceptance limits for the beam voltages shown. Equipment design should allow for these variations.

9. Measured at the point indicated on the Outline Drawing.