

PRELIMINARY TECHNICAL INFORMATION

These ratings represent those of current samples of this type. Refer to the Objective Technical Information sheet for design-objective ratings.

DEVELOPMENTAL
TYPE

ZM-3160
PTI-99
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ZM-3160

TRAVELING-WAVE TUBE

1 Milliwatt Power Output
30 db Gain

3700-4200 Megacycles
Less Than 7 db Noise Figure

Permanent Magnet

The ZM-3160 is a ruggedized, low-noise traveling-wave tube for use in the 3700-to-4200-megacycle frequency range. It has a noise figure of less than 7 decibels across the band with a power output of 1 milliwatt.

The tube is of metal-and-ceramic construction and is supplied as a completely packaged assembly which includes a permanent-magnet focusing structure, connectors and housing. The entire assembly weighs approximately 11.5 pounds.

The low noise, high gain, freedom from tuning adjustments, and rugged construction are important features for application in military systems. The device is particularly useful as the input tube for radar receivers, where its low noise and protection to the crystal mixer are decided advantages. Other applications include electronic countermeasures equipment, microwave relay systems and radiometry.

ELECTRICAL

Frequency	3700-4200	Megacycles
Heater		
Voltage	6.3	Volts
Current, nominal	0.4	Ampere
A heater-voltage regulation of ± 2 percent is recommended to realize optimum gain and noise figure.		
Focusing Method - Permanent Magnet		
Noise Figure *, maximum	7	Decibels
Small Signal Gain, minimum	30	Decibels
Saturation Power Output, nominal	1.0	Milliwatt
Collector Dissipation	1.0	Watt
Impedance, Coaxial	50	Ohms
Input, VSWR	Less than 2.5 to 1	
Output, VSWR	Less than 3.0 to 1	

MECHANICAL

Mounting Position - Any		
Connectors		
DC Socket - Winchester M10P-LSH-19 (or equivalent)		
RF Connectors, Coaxial		
Input - Type N, Female		
Output - Type N, Female		
Over-all Dimensions		
Length, approximate	9.25	Inches
Width, approximate	4.25	Inches
Height, approximate	4.25	Inches
Weight (Complete Assembly), approximate	11.5	Pounds

THERMAL

Cooling - Convection

TYPICAL OPERATING CONDITIONS**

Electrode - No. 1 (Grid) Voltage		-10 to 0	Volts
Electrode - No. 2 (Anode) Voltage		10 to 30	Volts
Electrode - No. 3 Voltage		25 to 100	Volts
Electrode - No. 4 Voltage		50 to 200	Volts
Helix			
Voltage		150 to 275	Volts
Current, maximum		50	Microamperes
Collector Voltage		400 to 600	Volts
Beam Current		200 to 600	Microamperes

ENVIRONMENTAL

Shock (energized)	50 G for 11 milliseconds on each of three mutually perpendicular axes.
Vibration (operating)	0.06 inches double amplitude from 5 to 70 cycles per second and 15 G from 70 to 2000 cycles per second with sweep over 5 to 2000 cycles per second for 100 minutes on each of three mutually perpendicular axes.
Humidity (non-operating)	MIL-E-5272C, Paragraph 4.4.1 (Procedure I); i.e., non-operating tube in 95 percent relative humidity atmosphere for 10 days with temperature cycled slowly from approximately 30 C to 71 C each day.
Acoustic noise (operating)	135 decibels, 25 to 12,000 cycles per second random noise.
Altitude (operating)	100,000 feet mean sea level.
Operating temperature, ambient	-60 to +100 C

* Over band with the same operating voltages that provide minimum gain variation.

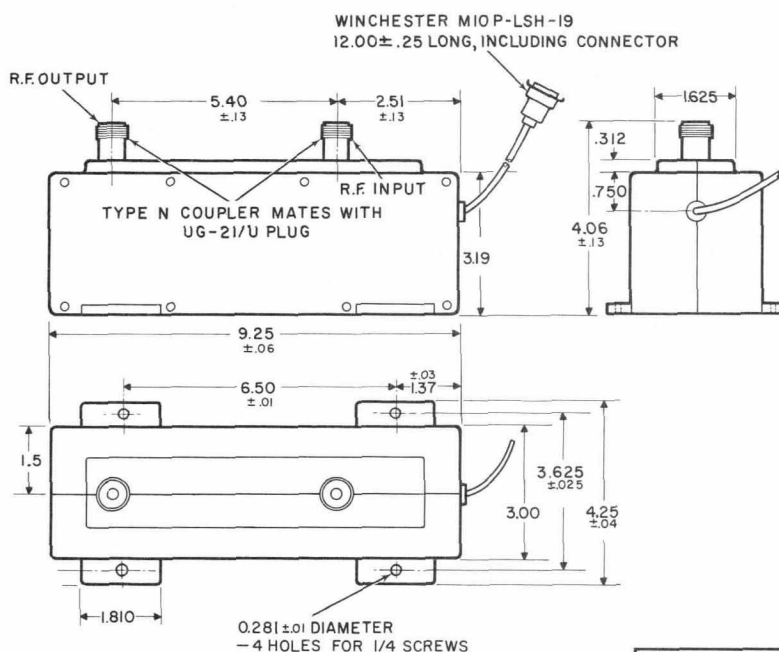
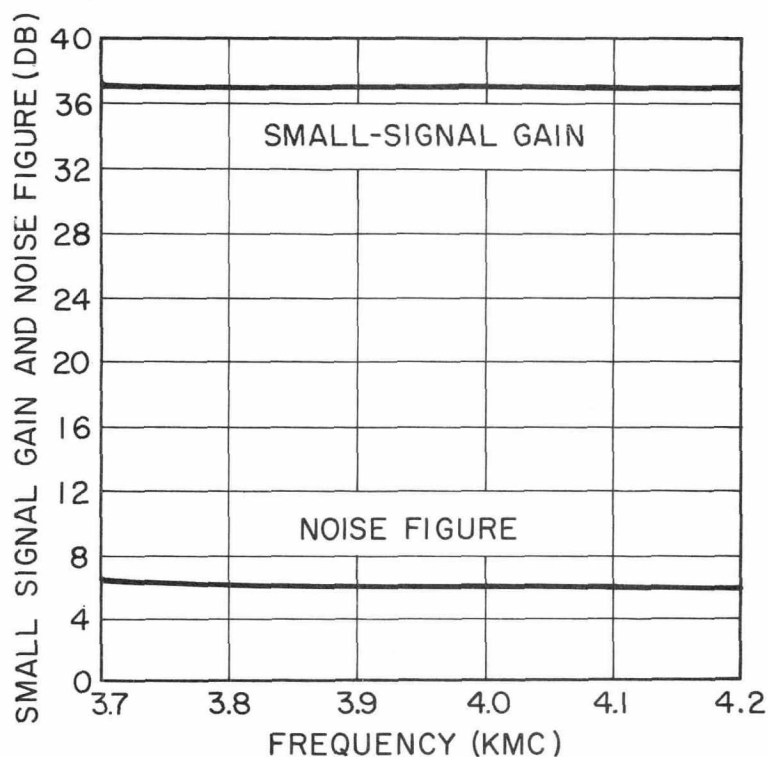
** All voltages may be isolated from ground; i.e., it is not necessary to operate the cathode, helix, collector, or any other electrode at ground potential. Voltages shown are measured with respect to cathode. For minimum noise and optimum gain characteristics, voltages should be adjusted within ranges specified by instructions accompanying each tube.

PERMANENT-MAGNET PRECAUTIONS

This tube uses a uniform-field permanent magnet as the focusing structure. A label on the tube specifies a nominal lower limit of two inches on magnetic-material proximity. It must be realized that strong external magnets or large amounts of magnetic material at this distance may permanently damage the tube. A small screw-driver will not, while a large a-c transformer or a large sheet of steel at this distance may cause damage by defocusing the tube.

In addition, a related caution is important and must be remembered whenever handling a uniform-field tube. The permanent magnets of these tubes cause a large attractive force between the tube and magnetic material. Unless one is always careful to hold the tube and/or magnetic objects near the tube firmly, the result is sudden direct contact. The magnetic object may cause tube damage due to violations of the minimum spacing requirement.

For small steel hand tools, a two-inch limit is sufficient. For large magnetic objects with magnetic fields of their own, the lower minimum distance should be determined accurately by testing. To accomplish this, the tube may be secured to a suitable three-foot-long dielectric support and the tube case grounded. With the tube operating and its helix current being measured, the tube may be moved slowly by the dielectric support toward the magnetic object. (CAUTION: Appropriate electrical safety procedures should be followed at all times.) The minimum distance for which there is no degradation in r-f performance is the point at which the helix current starts to increase. If a slight degradation in noise figure can be accepted, the helix current may be allowed to increase somewhat as long as it stays below its operating maximum.



ALL DIMENSIONS ARE IN INCHES AND
THOSE WITHOUT TOLERANCES ARE
APPROXIMATE.

PIN CONNECTIONS MIOP-LSH-19	
ELECTRODE	PIN
CATHODE	B
HEATER	D
NO. 1, GRID	C
NO. 2, ANODE	F
NO. 3, FOCUS	A
NO. 4, FOCUS	E
NO CONNECTION	J
NO CONNECTION	H
HELIX	K
COLLECTOR	L

