

**LOW NOISE
TRAVELLING WAVE TUBE****Service Type CV5362****ABRIDGED DATA**

Low noise travelling wave tube for use in the input stage of radar and other microwave receivers, and in i.f. amplifier service. The tube is contained in a metal canister and is fitted with coaxial input and output connectors. A separate focusing solenoid is required.

Frequency range	2.7 to 3.5	GHz
Saturation output power	1.0	mW
Noise factor	6.5	db
Low level gain	25	db
Recommended solenoid		N4004

GENERAL**Electrical**

Cathode	indirectly heated, oxide coated
Heater voltage	5.0 V
Heater current	0.5 A
Heater starting current (peak)	4.0 A max
Cathode heating time (minimum)	1.0 min

Mechanical

Overall length	19.375 inches (492.1mm) max
Overall diameter	1.380 inches (35.1mm) max
Net weight	1.75 pounds (800g) approx
R.F. connections	50Ω coaxial plug connectors type 'N' U.S. military no. UG-1185/U
Base	international octal
Collector connection	4mm socket
Mounting position	any
Cooling	natural

MAXIMUM AND MINIMUM RATINGS (Absolute values) (see note 1)

No individual rating to be exceeded

	Min	Max	
Collector voltage	—	500	V
Collector current	—	500	μ A
Helix voltage	—	500	V
Helix current (see note 2)	—	5.0	μ A
Grid 4 voltage	—	500	V
Grid 4 dissipation	—	0.1	W
Grid 3 voltage	—	300	V
Grid 3 dissipation	—	0.1	W
Grid 2 voltage	—	75	V
Grid 2 dissipation	—	0.1	W
Grid 1 voltage	—	20	V
Grid 1 dissipation	—	0.1	W
Heater voltage	—	5.25	V
Magnetic field (see note 3)	40	—	mT
	400	—	gauss
Peak input power	—	100	W
Mean input power	—	0.4	W
Canister temperature (at hottest point)	—	175	$^{\circ}$ C

TYPICAL OPERATION (at 3.1GHz)**Operational Conditions (see note 1)**

Collector voltage (see note 4)	400	V
Collector current	150	μ A
Helix voltage (see notes 5 and 6)	375	V
Grid 4 voltage (see note 6)	200	V
Grid 3 voltage (see note 6)	40	V
Grid 2 voltage (see note 7)	20	V approx
Grid 1 voltage	0	V
Magnetic field (see notes 8 and 9)	52.5	mT
	525	gauss

Typical Performance

Helix current (see note 6)	0.5	μA
Grid 4 current	less than 1.0	μA
Grid 3 current	less than 1.0	μA
Grid 2 current	less than 1.0	μA
Grid 1 current	less than 1.0	μA
Cold insertion loss	80	db
Gain	25	db
Noise factor (see note 6)	6.5	db
Output power (saturated)	1.0	mW

RANGE OF CHARACTERISTICS FOR EQUIPMENT DESIGN (Over the frequency range 2.7 to 3.5GHz)

Recommended Applied Conditions (see note 1)

Heater voltage (see note 10)	5.0	V
Collector voltage (see note 4)	400	V
Collector current	150	μA
Helix voltage (see notes 5 and 6)	350 to 390	V
Grid 4 voltage (see note 6)	160 to 275	V
Grid 3 voltage (see note 6)	20 to 50	V
Grid 2 voltage (see note 7)	0 to 30	V
Grid 1 voltage	0	V
Magnetic field (see notes 8 and 9)	52.5 525	mT gauss

Range of Characteristics (with recommended applied conditions)

	Min	Max	
Heater current	—	0.85	A
Helix current	—	5.0	μA
Grid 4 current	—	10	μA
Grid 3 current	—	10	μA
Grid 2 current	—	10	μA
Grid 1 current	—	10	μA
Gain	20	—	db
Noise factor	—	7.0	db
Output power (saturated)	0.25	—	mW
Tube input v.s.w.r. (see note 11)	—	1.7:1	
Tube output v.s.w.r. (see note 11)	—	2.0:1	

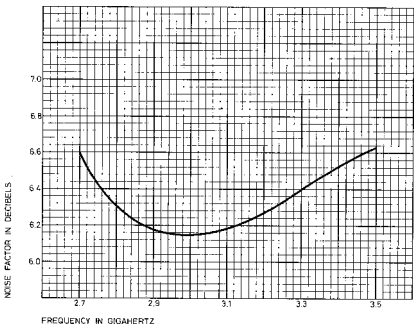
NOTES

1. All voltages apart from the heater voltage are with respect to the cathode. It may sometimes be convenient to earth the collector and maintain the cathode at a negative potential.
2. During alignment in the magnetic focusing field this maximum value of helix current may be exceeded for short periods, but must never exceed $25\mu\text{A}$.
3. This minimum value of magnetic field strength will focus the electron beam but the optimum noise figure will not be obtained.
4. It is necessary to maintain the collector positive with respect to the helix. Fluctuations in collector voltage should be less than $\pm 10\%$.
5. The helix voltage should be set to the optimum value for the frequency of operation and stabilized to within $\pm 5\%$.
6. In order to operate the tube at the lowest noise factor it is necessary to adjust the electrode voltages as follows. First align the travelling wave tube in the focusing solenoid for minimum helix current. Then with the tube connected in its circuit, apply a signal or noise input and adjust the helix voltage to give maximum output. This value of helix voltage simultaneously produces optimum gain and minimum noise factor. Next, with no input signal, vary grid 3 and grid 4 voltages alternately until the receiver output reaches a minimum. The voltages reached in this way are those which will operate the 6861 at the lowest noise factor for the particular frequency to which the equipment is tuned. For wide band operation these adjustments should be carried out at the centre frequency. If the focusing field changes, it will be necessary to repeat the above adjustments. Grid 3 and grid 4 voltages should be stabilized to within $\pm 5\%$.
7. Grid 2 voltage is adjusted to give $150\mu\text{A}$ collector current and should be stabilized to within $\pm 5\%$.
8. Care must be taken to avoid distortion of the magnetic field by metal parts in the vicinity of the tube. Unless otherwise specified, non-magnetic material should be used for such parts.
9. The measurements are made with the magnetic field adjusted to 52.5mT (525 gauss) $\pm 5\%$. Provision must be made for aligning the

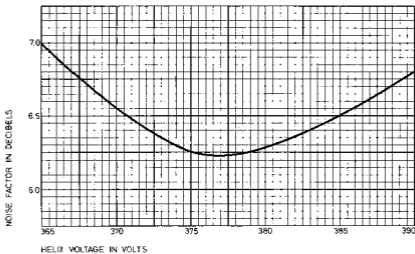
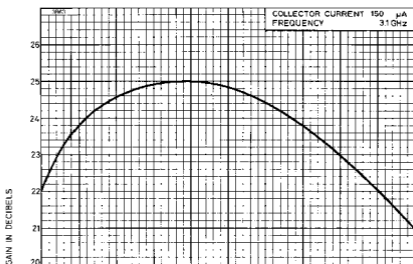
tube in the solenoid. An adjustment of ± 0.100 inch (± 2.54 mm) about the axis should be sufficient. Care should be taken when winding the solenoid to ensure that the mechanical and magnetic axes are the same. The use of the EEV lightweight solenoid type N4004 is recommended.

10. Tolerance $\pm 5\%$.
11. The input and output matching transformers are contained within the canister of the tube. They are adjusted during manufacture for optimum performance over the frequency range and further adjustments are neither possible nor necessary.

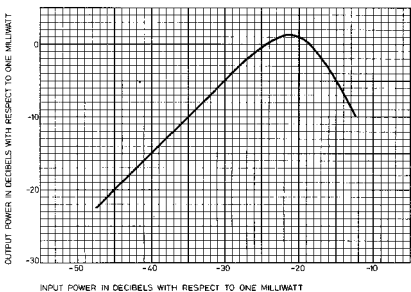
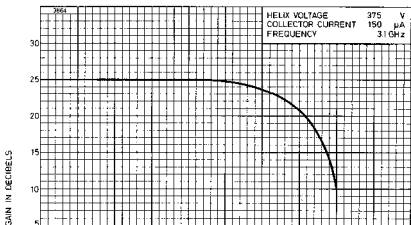
TYPICAL PERFORMANCE CHARACTERISTICS



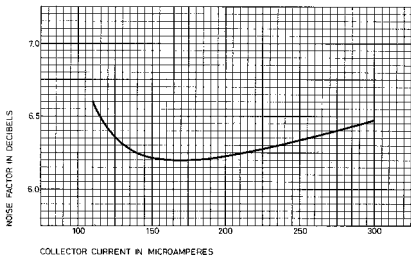
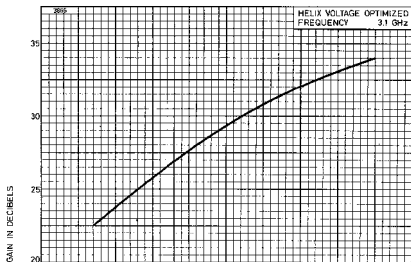
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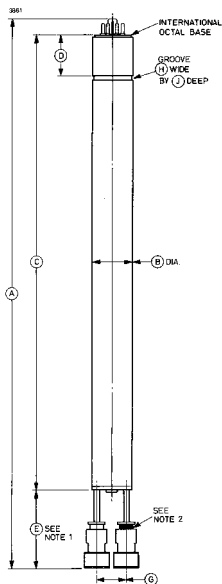
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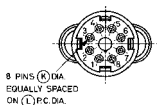
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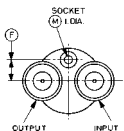
OUTLINE



Enlarged View on Base



Enlarged View on Connectors



Outline Dimensions (All dimensions without limits are nominal)

Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	19.375 max	492.1 max	G	1.000 ± 0.125	25.40 ± 3.18
B	1.380 max	35.05 max	H	0.145	3.68
C	15.843 ± 0.032	402.4 ± 0.81	J	0.042	1.07
D	1.428 ± 0.015	36.27 ± 0.38	K	0.093 ± 0.003	2.362 ± 0.076
E	2.750 ± 0.250	69.85 ± 6.35	L	0.687	17.45
F	0.400 ± 0.005	10.16 ± 0.13	M	0.158	4.00

Millimetre dimensions have been derived from inches except dimension M.

Connections

Pin	Element
1	Grid 1
2	No connection
3	Helix
4	Grid 4
5	Grid 3
6	Grid 2
7	Heater
8	Heater, cathode
Socket	Collector

Outline Notes

1. The two connectors will not necessarily be at the same level but both will be within the maximum dimension.
2. Coaxial plug connectors 50 Ω type N. The input connector is indicated by a black band.