

# Traveling-Wave Tube

Frequency Range 8 to 12 GHz

Integral Periodic-Permanent-Magnet Type

## ELECTRICAL

Heater, for Unipotential Cathode:

Voltage (ac or dc) . . . . .	6.3 ± 5%	V
Current at 6.3 volts . . . . .	0.7	A
Starting Current . . . . .	Must never exceed 4 amperes, even momentarily	
Minimum Cathode Heating Time . . . .	3	minutes
Frequency Range . . . . .	8 to 12	GHz
Cold Insertion Loss . . . . .	60	dB
Input VSWR . . . . .	2.5:1 max.	
Output VSWR . . . . .	2.0:1 max.	
Gain, Small Signal (at 0.1 W output) 8.0 to 12 GHz . .	34 min.	dB

## MECHANICAL

Operating Position . . . . . Any

Maximum Dimensions:

Overall Length . . . . .	15 max. in
Height . . . . .	3.25 max. in
Width . . . . .	2.20 max. in
Shell Diameter . . . . .	1.75 in

Connectors:

RF Input . . . . .	Type TNC Plug
RF Output . . . . .	Special Flange Coupling
Terminal Leads . . . . .	See <i>Dimensional Outline</i>

Weight (Approx.) . . . . . 6.0 lb

## RF POWER AMPLIFIER

Maximum Ratings, Absolute-Maximum Values

DC Collector Voltage . . . . .	3000 max. V
DC Helix Voltage . . . . .	2950 max. V
DC Grid-No.2 Voltage . . . . .	2000 max. V
DC Collector Current . . . . .	15 max. mA
DC Helix Current . . . . .	2.5 max. mA
DC Grid-No.2 Current . . . . .	0.1 max. mA
RF Power Input . . . . .	1 max. mW



# 4041

## Typical Operation at 10 GHz

DC Collector Voltage	3000	V
DC Helix Voltage	2800	V
DC Grid-No.2 Voltage	1800	V
DC Collector Current	12	mA
DC Helix Current	0.5	mA
DC Grid-No.2 Current	0	mA
Input VSWR	2.0:1	
Output VSWR	1.5:1	
RF Power Input	1 to 10	mW
Saturated Power Output	1.5	W

## CHARACTERISTICS RANGE VALUES

	Note	Min.	Max.	
Heater Current	1	0.5	1.1	A
DC Collector Voltage	2,3	2600	3000	V
DC Helix Voltage	2,3	2600	2950	V
DC Grid-No.2 Voltage	3	1600	2000	V
DC Collector Current	3	8	15	mA
DC Helix Current	3	0.1	2.5	mA
DC Grid-No.2 Current	—	0	0.1	mA

**Note 1:** With heater voltage of 6.3 volts.

**Note 2:** Normally the tube is operated with the helix voltage equal to the collector voltage.

**Note 3:** Specific operating value is supplied with each tube.

## OPERATING CONSIDERATIONS

The magnetic field required to focus the electron beam in the 4041 is supplied by integral periodic permanent magnets. Although the periodic-magnet structure is difficult to demagnetize, and has little stray field, care should be taken to prevent the presence of any appreciable external transverse magnetic field which might cause defocusing of the electron beam within the tube. Magnetic material should be kept at least eight inches away from the tube.

Impedance match between the 4041 rf power output and the load should have a voltage standing wave ratio (VSWR) no greater than 4:1. With VSWR's in excess of

4:1, oscillations may occur causing permanent damage to the tube. Tubes should not be operated without a termination.

Conduction cooling on the tube is necessary whenever collector current is flowing. Failure to observe this precaution may result in permanent damage to the tube.

The power supply should incorporate a helix-current overload protective device to prevent damage to the tube in the event of loss of collector voltage. Such a condition would cause the entire electron beam current to flow to the helix and thereby overheat that electrode. If it is desired to remove all voltages by a single control, the time-constant values of the power supply should be chosen so that the grid No.2 voltage decays faster than all other voltages (except the heater voltage).

*Mounting.* The 4041 may be mounted in any position by means of clamps around the specified areas shown on the *Dimensional Outline*.

*Electrical connections* are made to the 4041 by means of the six leads. These color-coded, flexible, insulated leads are identified on the *Dimensional Outline*. The rf input is made to a type TNC male plug on the tube, the rf output is by means of a flange coupling and a transition piece (see *Dimensional Outline*). The collector is connected to the capsule and is normally grounded.

The rated values for collector voltage, helix voltage, and grid-No.2 voltage are high enough to be dangerous to the user. Care should be taken during adjustment of circuits, especially when exposed circuit parts are at a high dc potential.

#### **Starting Procedure**

Voltages should be applied to the 4041 in the following sequence: Apply the rated heater voltage and allow tube to warm-up for 3 minutes minimum. Then apply the collector voltage as specified on the tube label. Next, apply the helix voltage as specified on

the tube label. Finally, increase the grid-No.2 voltage in a few milliseconds to obtain the collector current specified on the tube label. The three power supplies can be controlled by one switch provided there is a sufficient delay in application of the grid-No.2 voltage to allow the collector and helix voltages to stabilize first.

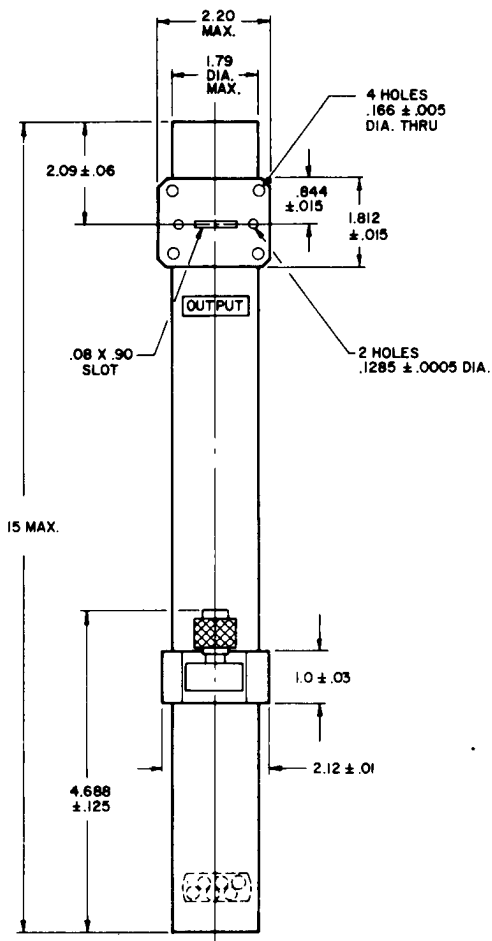
### Turn-Off Procedure

To turn off the tube, remove the electrode voltages in the following sequence: First reduce the grid-No.2 voltage, then remove the helix voltage, collector voltage, and heater voltage in that order. The three power supplies can be controlled by one switch provided the grid-No.2 voltage decays faster than the collector and helix voltages.

### FLEXIBLE LEAD COLOR CODE (See Dimensional Outline)

<b>Yellow:</b>	Heater-Cathode
<b>Brown:</b>	Heater
<b>Green:</b>	Grid No. 1
<b>Black:</b>	Collector (Ground)
<b>Orange:</b>	Helix
<b>Blue:</b>	Grid No. 2 (Anode)

## DIMENSIONAL OUTLINE (Front View)



DIMENSIONS IN INCHES