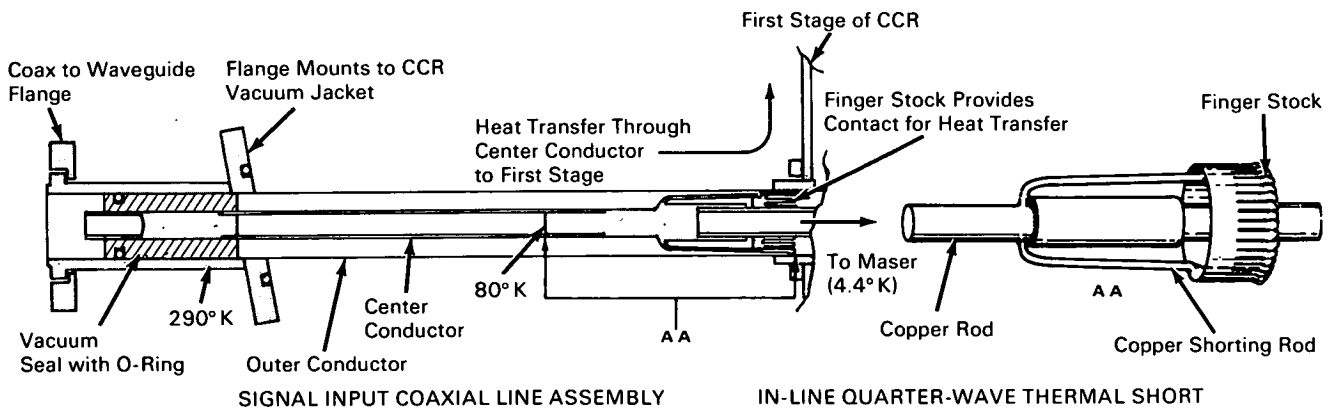


# NASA TECH BRIEF



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## Thermal Short Improves Sensitivity of Cryogenically Cooled Maser



An in-line, quarter-wave thermal short has been designed to cool the center conductor of the signal-input coaxial transmission line to a cryogenically cooled traveling wave maser. This device has two important advantages in that it reduces both the thermal noise contribution of the coaxial line and the heat leak through the center conductor to the maser at 4.4°K. The ambient insertion loss of the short is 0.011 dB. When cooled to 80°K, the device contributes less than 0.1°K to the maser noise temperature.

The first figure shows the thermal short installed in the transmission line and the manner in which heat is transferred through the center conductor into the closed-cycle refrigerator (CCR). Refrigeration at the first stage is sufficient to cool the center conductor from ambient temperature (290°K) to 80°K along a 4-inch length. The thermal short (second figure) which is inserted into the transmission line, is of such configuration that the heat from the inner conductor is conductively transferred (at the rate of 400 mw) through copper shorting rods to a finger stock contact to the outer conductor. The addition of the thermal short does not change the electrical characteristics of

the line, having little effect on the VSWR over a 25% bandwidth.

### Notes:

1. The entire center conductor can be removed (to replace the vacuum seal) in the field without disassembly of the refrigerator.
2. Additional technical details are contained in JPL Space Programs Summary No. 37-40, Vol. III, pages 90-93. Inquiries may also be directed to:

Technology Utilization Officer  
 NASA Pasadena Office  
 4800 Oak Grove Drive  
 Pasadena, California 91103  
 Reference: B68-10059

### Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546.

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 Category 01