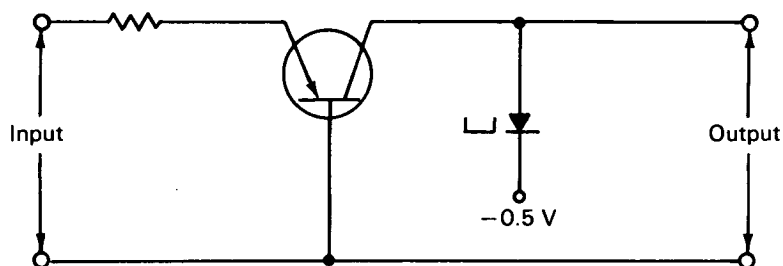


# NASA TECH BRIEF



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## Constant-Current Regulator Improves Tunnel Diode Threshold-Detector Performance



**The problem:** To design a tunnel diode threshold detector with maximum voltage output and overload protection. In conventional circuits, inputs just at threshold level result in outputs barely large enough to actuate a following stage. Also, as input voltage increases, voltage across and current through the tunnel diode increase. Currents several times as large as the tunnel diode peak current rating will alter its characteristics. These conditions result in marginal or unreliable operation.

**The solution:** A grounded-base transistor placed in the circuit and a bias voltage applied to the tunnel diode. The grounded-base transistor provides a constant current source and yields maximum output voltage for input threshold level. Biasing the tunnel diode limits the voltage across it, thus limiting the current through it to less than its maximum peak current rating.

**How it's done:** The load line for a grounded-base transistor configuration is horizontal; i.e., the collector current is constant with respect to any change

in collector-to-base voltage. The  $-0.5$  volt bias applied to the tunnel diode limits the voltage across the diode, thus limiting the current through the diode to less than the maximum peak current rating and preventing tunnel diode characteristic changes.

### Notes:

1. A diode placed between the base of the transistor and ground would act to compensate for temperature changes in the transistor emitter-to-base voltage.
2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Goddard Space Flight Center  
Greenbelt, Maryland, 20771  
Reference: B65-10282

**Patent status:** NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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Category 01