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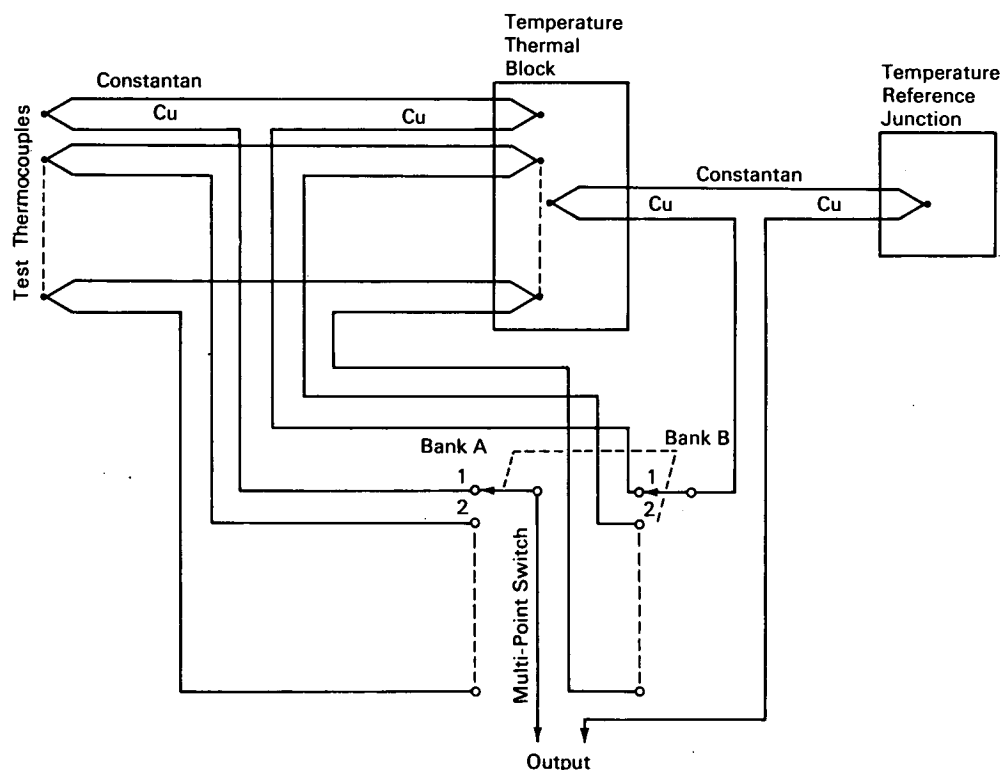
Brief 66-10260

# NASA TECH BRIEF



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## Multiple Temperatures Sampled Using Only One Reference Junction



### The problem:

To reduce the number of reference thermocouples, cabling, and cost of a multitemperature sampling system where the reference thermocouples are a distance from the test thermocouples. Previously, each test thermocouple required a separate reference junction, adding to the cost and complexity of the system.

### The solution:

An intermediate thermal junction block is placed between the test thermocouples and the reference junction permitting switching between a single reference and the test thermocouples.

### How it's done:

The constantan lead of each test thermocouple is connected to the constantan wire of an electrically

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insulated thermocouple in the intermediate thermal junction block. The copper leads of this pair of thermocouples are brought to banks A and B of the switch. The reference thermocouple is connected to a thermocouple on the intermediate thermal block and brought into the switch in a similar manner. In any one position of the switch, the test thermocouple, the reference thermocouple, and their corresponding thermocouples on the intermediate thermal junction block are connected in series. Since the intermediate thermocouples from the reference and test junctions are at the same temperature and are series connected, thereby producing equal but opposite voltages, their influence on the system cancels. The output then is the voltage difference between each test thermocouple and the reference thermocouple.

**Notes:**

1. The particular temperature of the intermediate thermal block is of no consequence so long as it is uniform and does not exceed the limitations of exposed materials.
2. Since all leads brought to the switch are copper, no additional error is introduced by the switching system.
3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Goddard Space Flight Center  
Greenbelt, Maryland 20771  
Reference: B66-10260

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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(GSFC-485)