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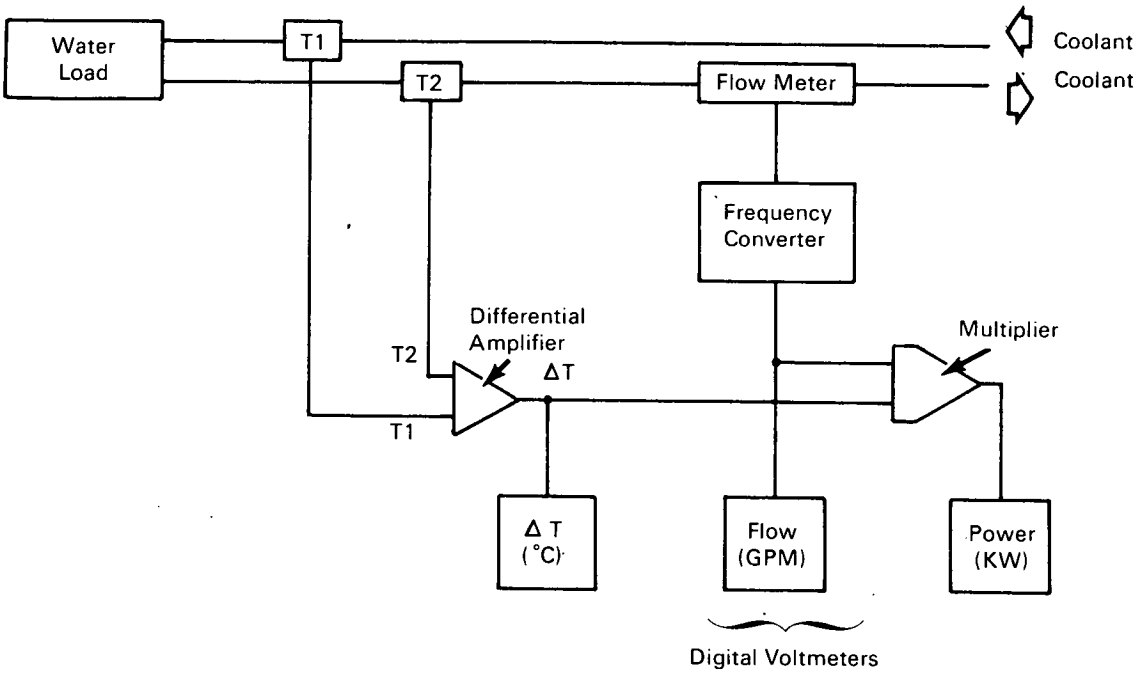
NASA TECH BRIEF

Automatic Calorimetry System Monitors RF Power



An automatic calorimetry system has been designed to monitor the average power dissipated in a high-power (450 kw) rf transmitter. A coolant (e.g., water) circulating in a jacket surrounding the transmitter circuitry absorbs the heat equivalent of the rf power. The system employs sensors to measure the change in temperature and the flow rate of the coolant and a multiplier to compute, in accordance with a standard formula, the power dissipated in the rf load (represented by an equivalent water load in the block diagram).

Temperature sensors T1 and T2 are connected in the coolant input and output lines, respectively, near the water load. The differential amplifier accepts the analog voltage inputs from the temperature sensors and provides a voltage output proportional to the temperature difference, which is displayed on a digital voltmeter. The coolant flow rate measured by a turbine flowmeter connected in the coolant line is converted to a proportional voltage by the frequency converter. This voltage is displayed as coolant flow in gallons per minute on a second digital voltmeter. The multiplier receives the voltage outputs and provides an analog voltage proportional to the product of the temperature difference, $\triangle T$, and flow rate, F. A third digital voltmeter displays the output of the multiplier in kilowatts of average power dissipation, P. The relationship of these quantities is given by the

(continued overleaf)

expression $\triangle T = \frac{P}{264kF}$, where k is a constant dependent on the coolant used (k=1 for water).

The frequency converter using integrated circuitry was specially developed to replace an expensive, bulky commercial unit.

Note:

No further documentation is available. Inquiries may be directed to:

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Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, non-exclusive 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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