System monitors multiple temperatures, controls fan speed

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The block diagram in Figure 1 represents a complete remote-temperature-sensing and fan-control system. The system uses an Analog Devices temperature-monitor and fan-control ASIC and a PIC16C84 µC from Microchip Technology. The ADM1022 allows you to measure the local temperature and two remote temperatures within a system. An on-chip, 8-bit DAC controls the speed of a cooling fan in response to the measured temperature. This circuit can form the basis of a central-heating/air-conditioning system with minimal component count and cost. The ADM1022 uses TDM (thermal-diode-modeling) techniques to accurately sense temperature. The use of readily available transistors, such as the 2N3904, eases temperature monitoring. The temperature-sensing elements remotely connect to the ADM1022, using a shielded twisted-pair cable. Zone A represents ambient temperature; the internal bandgap temperature sensor in the ADM1022 measures this temperature. Writing to the on-chip DAC controls the speed of the cooling fan.

Figure 2 shows a complete schematic of the system. The heart of the unit is the PIC16C84 µC. The I²C software-based communication system uses "bit-banging" of two of the pins. A 16-character--y-four-line LCD displays all measured values. The µC reads the temperature data from the ADM1022 via the I²C bus. Zone A represents the ambient temperature. Zones B and C represent temperatures at a distance from the system and use shielded twisted-pair cable. If any temperature goes outside the programmed limits, the over/undertemperature-detection LED lights up. In the schematic, the ADM1022 drives a 12V fan. You can substitute other fans or actuators by providing suitable drive circuitry. The three-state ADD pin can be high, low, or floating. Thus, as many as three ADM1022s can connect to one µC, allowing you to easily expand the system to monitor nine temperature zones.