Temperature Monitoring System

Open Source all the way!

Jim Owens
System components

- Serial temperature sensor kit
- pyserial Python serial port extension
- tsl.py temperature data logger
- rrdtool logging and graphing application
- Linux-Apache-PHP
- cron daemon
- PHP scripts for recording and reporting temperature data
Serial Temperature Monitor
Temperature Monitor

Features

• Provides real-time data via the serial port
• Supports up to four sensors (DS18S20)
• Accuracy within +/- 0.5 degrees Celsius
• Configurable for Fahrenheit or Celsius
• No external power required
• Sensor placement up to 200m from board
Microcontroller: PIC12C509

- High-Performance RISC CPU
- 33 single word instructions
- All instructions are single cycle (1µs) except for program branches
- Operating speed: DC - 4MHz clock input
- 1024 Byte EPROM Program Memo
- 41 Byte RAM Data Memory
- Internal 4MHz RC Oscillator with programmable calibration
- In-circuit serial programming
Parts List

- Preprogrammed PIC 12C509 microcontroller chip
- 1N4003 diode
- 78L05 voltage regulator
- 100uF electrolytic capacitor
- \( n+1 \) 10uF tantalum capacitors 10V
- \( n \) DS1820 sensors
- \( n \) 2.2k pull-up resistors
- Printed circuit board
- Female 9-pin or 25-pin D connector

*Where \( n \) is the number of temperature sensors*
Circuit Schematic

Serial Temperature Sensor
Rev G 10th April 2001
james.cameron@real-time.com
nestor--rootds1820
Encapsulates access to the serial port

- Class-based interface on all supported platforms
- Access to the port settings using Python 2.2
- Use port numbering or string
- Support for different bytesizes, stopbits, parity and flow control with RTS/CTS and/or Xon/Xoff
- Works with or without receive timeout
- File-like API with "read" and "write"
- 100% pure Python. POSIX uses only standard modules
tsl.py

- Simple and straightforward; uses pyserial
- Logs temps, by sensor, from given serial port to given path
- Ideally, run by init process
- Source code: tsl.py
rrdtool

- Implements a round-robin database
- Creates sophisticated graphs “on the fly”
- Very well documented
- Provides bindings for Perl, Python, Ruby, etc.
- Supported by large development community

Homepage: rrdtool
System functions

- tsl.py reads, stores data in tsl.n files (minicom)
- On minute, cron script stores current temps in rrd database, per sensor
- Every 5 minutes, cron script creates new graphs (1, 12, 24 hrs), per sensor
- PHP script displays current temps and graphs, by “room”
Web sites

Temperature Sensor Project
pyserial Overview page
tsl Python source
rrdtool Homepage
Questions?