Temperature Controller for the ARC

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Capabilities

Temperature Sensor Inputs:
• 2x Hi-resolution (5mK RMS noise) 4-wire channels.
• 2x Lo-resolution (10mK RMS noise) 4-wire channels.
• Variable bandwidth single-pole digital filtering of all temperature sensor data.

Compatible sensor types:
• Standard Pt100.
• Lakeshore DT870.
• Low-cost 1N4148 diode.

Auxiliary Analogue Inputs:
• 1x 12-bit input, range 0-10V.
• 1x Pressure sensor input (MKS 970 or Pfeiffer PKR251 compatible).

Servo outputs:
• 2x 9W independent P-I servo loops.
• Linear output for low-noise.
• Tunable P-I and maximum slope constants.
• Programmable alarm and "servo-killed" temperature thresholds.
• Automatic shutdown in case of overload or cable faults.
• Telemetry on heater voltage/current/power.

Hardware Capabilities User Interface

4-layer ARC compatible PCB.
Board mounted in ARC chassis.

Main GUI

A: Power Servo A
B: Power Servo B
C: Power regulation
D: 32MHz Microcontroller
E: External EEPROM with sensor calibration curves.
F: Current, voltage and power sensing
G: 8-bit GPIO
H: 2-channel analogue input
I: 2x open-drain digital outputs
J: 16-bit ADC
K: 10ppm voltage reference
L: Temperature sensor preamps and current sources
M: External LCD interface
N: Sensor/heater/digital-i/o connector
O: External power input.

Performance

Transient response for various servo parameter settings

Slope control response

Long-term stability

User Interface

The board can be controlled using the ARC SDK and the OWL GUI. It can also be used independently with a USB interface and Python GUI. Servo loops can be freely configured and the telemetry read back.

Low-cost temperature sensor

1N4148 Diode Calibration

Manufacturing panel

Sensor with leads attached

System schematic

Current sources for sensors (10µA/1mA)

Two open-drain 300mA drivers - hardware timed for control of shutter and calibration LEDs.

9W Power amplifiers Servo A

Servo B

12-bit ADC input

12-bit ADC input

SPI bus

PC bus

Two uncommitted analogue inputs, 12-bit, 0-10V

8-bit GPIO

Optional LCD interface

External power (5V-15V)

16-bit ADC

9W Power amplifiers

Servo A

Serbo B

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