

DIYBIO Manchester & HACMan - PCR Thermocycler Project

DIYBIO Manchester and HACMan have teamed up to make a PCR Thermocycler for DIYBIO's nefarious DNA experiments!! PCR stands for Polymerase Chain Reaction and a Thermocycler is a device that cycles heat! In order to multiply DNA strands samples need to be heated to 95 degrees C, then cooled to 58 degrees C and then reheated to 78 degrees C. There are commercial PCR machines available but they are expensive! We think we can do better!! We are looking at realizing an arduino controlled Thermocycler with 4 modules (three heating sections and one cooling section) which automatically performs the heat cycling required on 16 DNA samples. The samples will be provided in test tubes or eppendorfs??

The device, once realised might look something like the attached diagram:

[File:DIYBIO_PCR_Diagram.pdf](#)

For the control electronics an arduino Mega 2560 might be appropriate running on 5 Volts with a high current 12V 100W supply for the heater plate(s). The T0220 resistor can be controlled by a PWM fed N-type FET transistor. The control loop for the temperature cycle would be a feedback system based upon 0.5 second sampling of two 10k N-type thermistors; one mounted on the AI heating plate and the other on or near the sample carrier. The temperature of each plate can be displayed on a 16x2 LCD display. The unit will be controlled locally via push buttons and pre-stored temperature cycles or via a control program on a USB connected computer.

Useful Part Numbers:

Farnell - 9566961 - VISHAY SFERNICE - LTO030F2R200JTE3 - RESISTOR, 30W 2R2 5%

Farnell - 1848688 - ARDUINO - A000047 - BOARD, ARDUINO, MEGA2560

Farnell - 1672366 - AVX - ND03N00103K- - THERMISTOR, NTC, 10K, 3.5MM

Farnell - 1813384 - INTERNATIONAL RECTIFIER - AU1RF1010Z - MOSFET, N CH, 55V, 94A, TO220AB

Useful Websites:

<http://www.scq.ubc.ca/diy-pcr-notes-appendum-shooting-the-breeze-whatever/>

http://learn.genetics.utah.edu/content/labs/extraction/howto/DNA_Extraction.pdf

<http://www.synbio.org.uk/hardware/diy-lab-equipment.html>

<http://www.instructables.com/id/Coffee-Cup-PCR-Thermocycler-costing-under-350/?ALLSTEPS>

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