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USB

Micro Controller

Super caps

Slip Ring

Power

IO

IO

Ground

Switch

Power

Charge

R-Pi Base board

Daughter board

EL Panels

Bubble Sensor

Centrifuge Motor

Stepper Motor

Cameras

2xSolenoid Valve

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| **Component Name** | **Source** | **Required Electronics to run** |
| Supercapacitor (PC10-270) | http://www.maxwell.com/products/ultracapacitors/docs/hq\_pc10\_ds\_08122013.pdf | Charger Board (eg LT3625 dual capacitor charger) included on microcontroller |
| Microcontroller | To be designed | Must be able to handle simple IO requests both to and from Nanoracks AND the Raspberry Pi |
| R-Pi Base Board | To be designed | Includes latest R-Pi module (http://www.raspberrypi.org/raspberry-pi-compute-module-new-product/), DDR2 SODIMM connector, and board |
| Daughter Board |  | - |
| EL Panels |  | High Frequency inverter |
| Centrifuge Motor | http://www.maxonmotor.co.uk/maxon/view/product/motor/dcmotor/remax/remax13/268346 | Controlled via attached sensor (http://www.maxonmotor.co.uk/medias/sys\_master/8813575700510/14-312-EN.pdf) |
| Stepper Motor (35DBM102U) | http://www.farnell.com/datasheets/526510.pdf | Requires microstepping control (eg http://www.ti.com/lit/an/slva443/slva443.pdf). Requires a 5V to 12Vtransformer (runs on 12V). |
| 2xSolenoid Valve (LHLA0531111H) | http://www.theleeco.com/electro-fluidic-systems/solenoid-valves/lhl/soft-tube-ported-style.cfm | Latching Control Driver (http://www.theleeco.com/engineering/electrical-engineering/lee-solenoid-valve-drive-circuit-schematics.cfm#Latching\_Valve\_Driver\_Schematic) |
| 2x Cameras | http://www.farnell.com/datasheets/1730389.pdf | Normal R-Pi Control |
| Bubble Sensor (A230) | http://www.smdsensors.com/Products/Customer-Files/Products/A230\_Ultrasonic\_Bubble\_Detector\_R3.pdf |  |

**Additional information**

* 12 Supercaps in total. 2 supercapacitors in series (provides 5V), 6 lots of those in parallel. These need to be charged (hence the need for a charger board)
* The supercapacitors receive charging via the charger board included in the microcontroller.
* The microcontroller controls a switch which allows power to be transferred from the supercapacitors to the raspberry pi inside the cylinder.
* The microcontroller must be capable of accepting and transferring basic IO commands between Nanoracks and the Raspberry Pi.
* The R-Pi base board (and if needed, daughterboard) handle the control of all other components inside the cylinder, as indicated by the block diagram.
* The various dependencies of each individual component have been noted if anything particularly special is required.