Nabsys, Inc.
60 Clifford Street
Providence, RI 02903
401.276.9100
401.276.9122 (fax)
www.nabsys.com

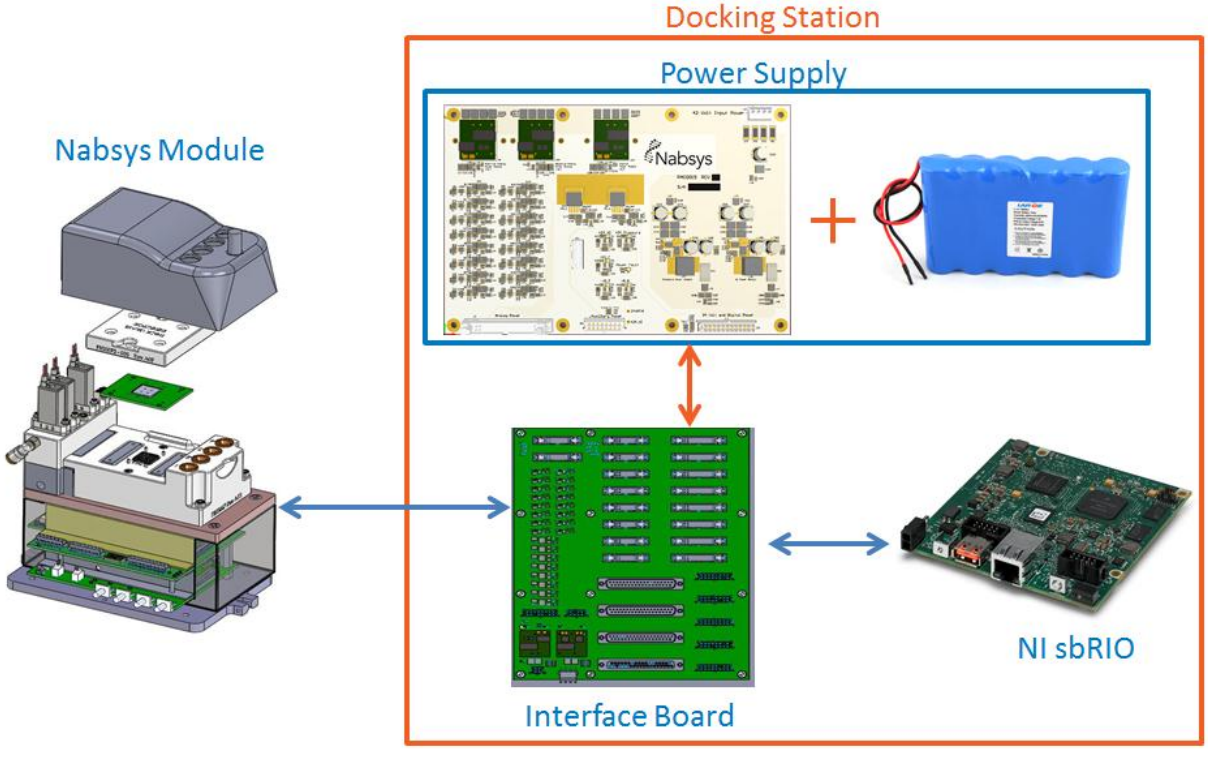
Nabsys Single Module Docking Station

Overview:

Nabsys has developed a system for sequencing DNA molecules using solid state detectors. Nabsys' first system is capable of simultaneously supporting up to 8 detector modules, but after talking with our customers it has become clear that there is great interest in a single detector module. However the detector modules were designed to interface with the 8 module platform which would provide both power and data acquisition for the module; meaning that at present a standalone detector module is not possible. With this in mind Nabsys would like to work with a team of URI engineering students to develop a docking station capable of providing all of the power and I/O a single detector would need.

The docking station will consist of three major components: a power supply, a NI sbRIO, and a module to sbRIO interface board. The power supply will take in AC power from a wall socket and provide 5, ±15, and 24 volts to the rest of the docking station and to the detector module. The power supply will also have an onboard battery backup capable of running the detector module and docking station for one hour. The NI sbRIO is an off the shelf FPGA with LabVIEW support which will act as the systems data acquisition platform. The sbRIO interface board will be, as the name implies, a go between which brings power to the detector module and takes detector signals to the sbRIO FPGA.

System Diagram:



Team Description:

- Three electrical engineers.
- Strong drive, independence, and initiative are a must.
- Labview and µcontroller programming experience is a big plus.
- Knowledge of battery backup systems, ADCs, DC/DC converters, AC/DC Converters, switching regulators, opto-couplers, level shifters and, level shifters is a big plus.
- PCB layout experience is a big plus.

Deliverables:

- Detailed electrical specifications (developed interactively with Nabsys engineers).
  - Interface board I/O specifications: includes interface connectors, power consumption, ADC accuracy, ADC sampling rate, linearity, etc.
  - Power supply output specifications: Includes output voltages, output voltage accuracy, output currents, fault signals, etc.
  - Battery specifications: Includes output voltage, output current, charge time, charge profile, charge level read back accuracy, etc.
- Bill of materials for any "off-the-shelf" components i.e. batteries, connectors, converters, etc.
- Detailed circuit design & schematic capture of the power supply, and the interface board via PCB Artist™ software (available from Advanced Circuits) or equivalent.
- Functional docking station power supply board PCB with integrated battery backup.
- Functional docking station interface board PCB.
- Final report including block diagrams, theory of operation, material cost & results of early test runs.

Team Division of Labor:

Electrical Engineer 1:

This engineer's primary responsibility will be the battery backup subsystem of the docking station power supply. This engineer will be responsible for the selection of battery chemistry and, developing the circuitry required to charge, manage, and report the batteries status to the system. This process will include but is not limited to design or selection of the battery charge profile, battery protection circuits, battery monitoring circuits, and "Fuel Gauge" electronics. We would like this engineer to have some experience or at least an interest in µcontroller or LabVIEW programming as most battery charging and "Fuel Gauge" ICs require a host processor to get the best performance out of the battery pack. Once the batteries have been chosen and circuits designed, this engineer will work with the power supply engineer to integrate the battery in the overall design. Once the integration is complete the two engineers will work together to design, create and test the docking station power supply PCB.

Electrical Engineer 2:

This engineer's primary responsibility will be the docking station power supply. This design will require the engineer to select a AC/DC converter (AC to 24 DC), design a 24 volt switching regulator, design a 5 volt power filter and select or design ±15 volt DC/DC converters, switching regulators and power filters. This electrical engineer must ensure that the power supply can work on both the converted wall power and the battery power supply. Once all of the circuits have been designed this engineer will work with the backup battery engineer to integrate the battery backup sub-system into the supply design. Once the integration is complete the two engineers will work together to design, create and test the docking station power supply PCB.

Electrical Engineer 3:

This engineer will design the module to sbRIO interface board. Responsibilities include the selection and design of ADCs, level shifters, optocoupler, and transceiver circuits. This engineer will work closely with Nabsys engineers to adapt their existing eight channel interface board design to the single channel docking station interface board. This will include working with Nabsys electrical engineers to adapt the NPS communication scheme for single channel use and working with Nabsys mechanical engineers to ensure a proper connection between the module and the station when the module is inserted into the station. Once the circuits have been designed and the connections defined this engineer will design, create, and test the docking station sbRIO interface board.

If you have any questions about the project, its objectives, or any of the roles described before our presentation please do not hesitate to contact John Czajkowski: czajkowski@nabsys.com