LOKI SONAR

Project Number MP003
By Alan Marconett

Project Description

Loki Sonar is a sensory deck for my "MicroMoose" robot project. This is a small wheeled robot designed to operate on the floor or on a table top for the "Table Top Challenge" sponsored by our HomeBrew Robotics club.

The sonar sensors are an array of six SRF08 Sonar Range finders. The Daventech modules are arranged on a 5" diameter PCB disk as a six-faceted deck. Also on the sensor modules are light sensors which can be read.

The deck is powered by the 8 Bit Microchip PIC Microcontroller Development SchmartModule (PIC 18F2620 uP), with the addition of a small "I2C Board" for connecting the six sonar modules. The software also supports other I2C sensors such as the CMPS03 Compass and the TPA81 Thermopile modules. The SchmartModule has A/D pins available for connection of GP2D12 or GP2D120 IR Rangefinders which can be read and scaled by the software.
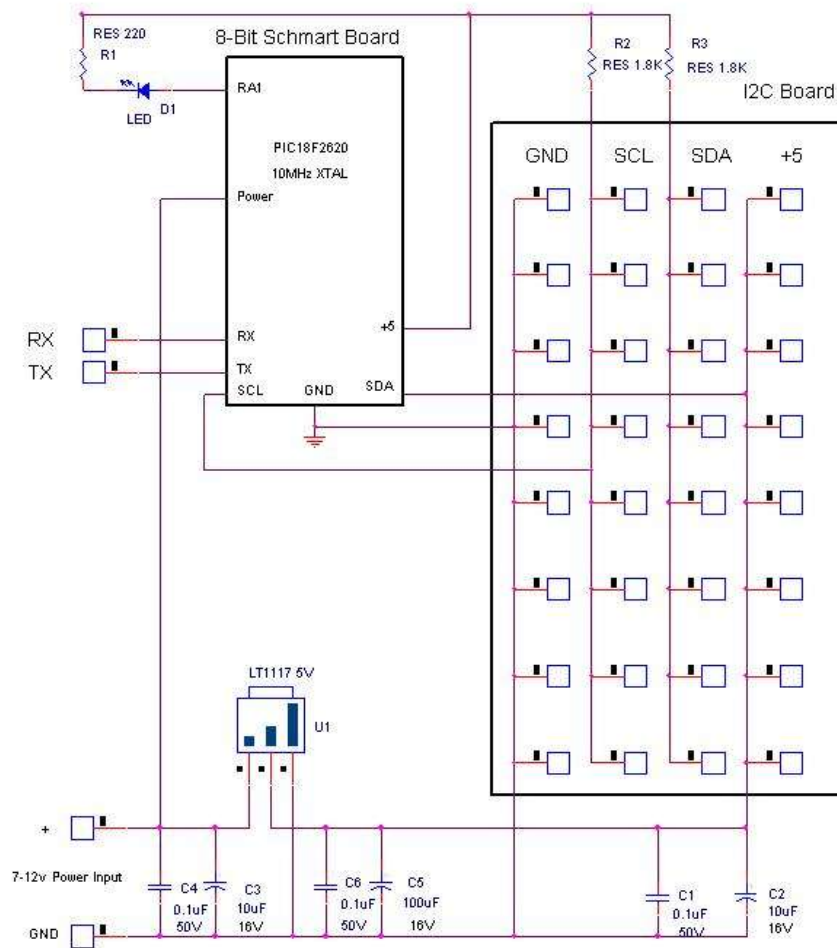
The Software that runs the sensory deck is interrupt driven, and basically a "Mini Real Time" Operating system. The host processor on the MicroMoose requests data from the deck via an RS-232 channel, and the deck responds.   There is an "Alive" LED driven by the OS interrupt timing.

The hardware for the sensor deck is comprised of a 5" disk of double sided PCB stock. Soldered onto it are six small vertical PCB rectangles to hold the sonar modules. The six small PCBs are soldered to the main disk, and end-to-end to each other to form a hexagonal ring. Alternately, small aluminum angle might be cut and fitted to an aluminum or Plexiglas disk. In the center of the disk is bolted the PIC SchmartModule on four short 4-40 hex standoffs. The deck has six 6-32 mounting bolt holes, and 6-32 standoffs allow stacking of the deck along with other 'bot decks.

The small prototype PCB is drilled to fit on one end of the SchmartModule, over the unused holes for the RJ-45 connectors. This board has the .025" pins, the 1.8K resistors, a pair of .2 uF caps and the 10 uF cap mounted on it as well. It is secured to the SchmartModule with nylon 4-40 hardware.

The name "MicroMoose" for my 'bot came about when after I'd started a project to compete in the "Table Top" Challenge, our club announced that they wanted to also start a Micro Mouse competition and I discovered that my new project 'bot was too big to be a MicroMouse. Hence, my 'bot became a Micro "Moose". Loki is a previous two-legged walking 'bot (Servo Magazine, 2009), and I "borrowed" the I2C and IR code from it.

Schematic / Block Diagram

RES 220
R1

8-Bit Schmart Board

LED D1

RA1

PIC18F2620
10MHz XTAL

Power

RX
TX

RX
TX
SCL

+5

GND SDA

R2 R3
RES 1.8K RES 1.8K

I2C Board

GND SCL SDA +5

LT1117 5V

U1

LOKI SONAR Board

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+

7-12v Power Input

GND

C4
0.1uF
50V

C3
10uF
16V

C6
0.1uF
50V

C5
100uF
16V

C1
0.1uF
50V

C2
10uF
16V

Source Code

The Software that runs the sensory deck is written in HiTech PIC18 C. Several modules are involved in the compilation of the firmware. With adjustments, the MicroChip C18 compiler could also be used.

Loki2620.C   The main control program
Loki2620.H   Header file
LokiI2C.C   I2C support file
LokiI2C.H   Header file
Parser.C   Parser file for commands
PIChead.H   PIC header file
Serial.C   Serial communications

Serial.H   Header file
Delay.C   Delay routines
Delay.H   Header file
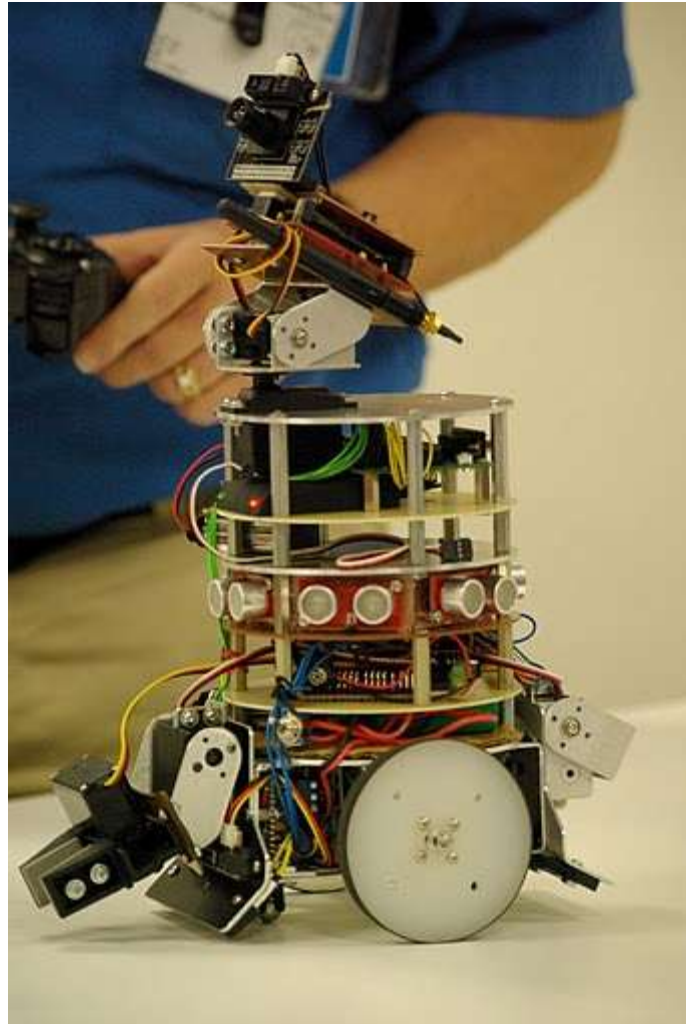
The files are compiled under the MPLAB IDE.

BOM

1	8 Bit Microchip PIC Microcontroller Development SchmartModule 710-0004-01
1	RS232 SchmartModule 710-0001-01 (for test/programming)
1	PIC 18F2620 uP
1	10MHz crystal
2	22 pF ceramic caps
6	SRF08 Daventech sonar modules
1	Small prototype board for I2C
4	¼" x 4-40 hex standoffs
2	¼" 4-40 nylon screws
2	4-40 nylon nuts
1	5" Double Sided PDB board
6	2" x .75" Double Sided PDB board
8x4	SchmartBoard 0.1" single row pins 920-0011-01
32	7" Jumpers 920-0010-01 5" or 920-0009-01
6	3" Jumpers 920-0008-01
3	12" Jumpers 920-0019-01
3	.1 uF ceramic caps
2	10 uF Tantalum caps
1	100 uF electrolytic cap
1	LT1117 regulator
1	LED
2	1.8K ohm resistors
1	220 ohm resistor

Project Pictures

Author with MicroMoose

Sonar Deck

Front View

Author

2.0000

1.5000

ø0.1260

ø0.1300

0.5300

1.0000

0.4500

Small PCB

ø5.0000

ø4.5000

2.0000

ø0.1160T up. 6 eq space

2.0000

ø0.1250

2.5000

1.7030

1.7030

DECK. PCB Disk
12/2/10 ALM
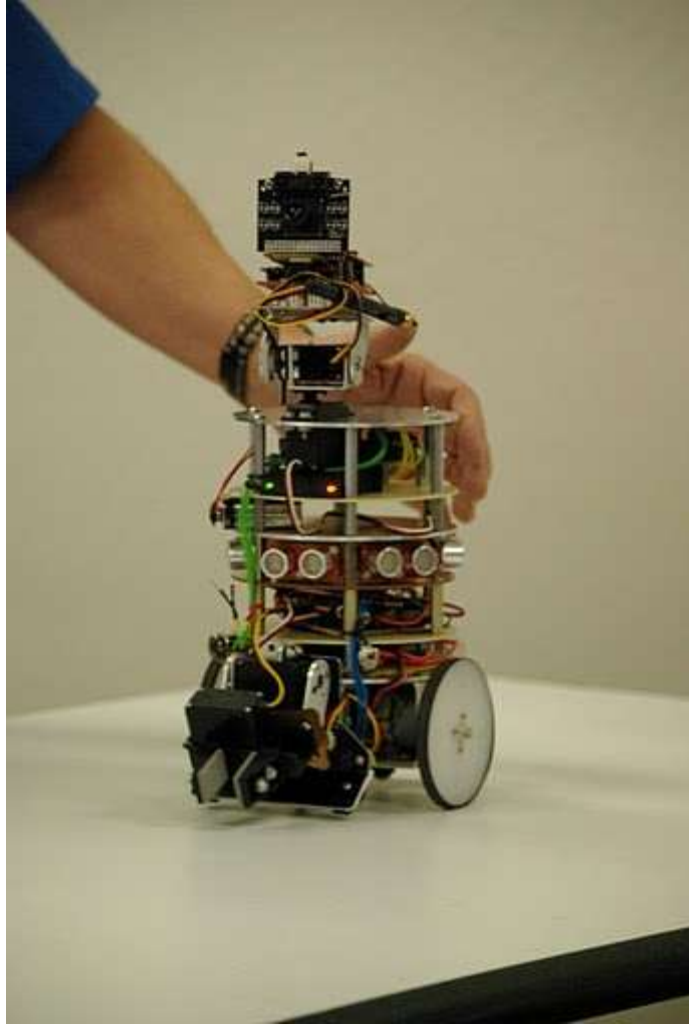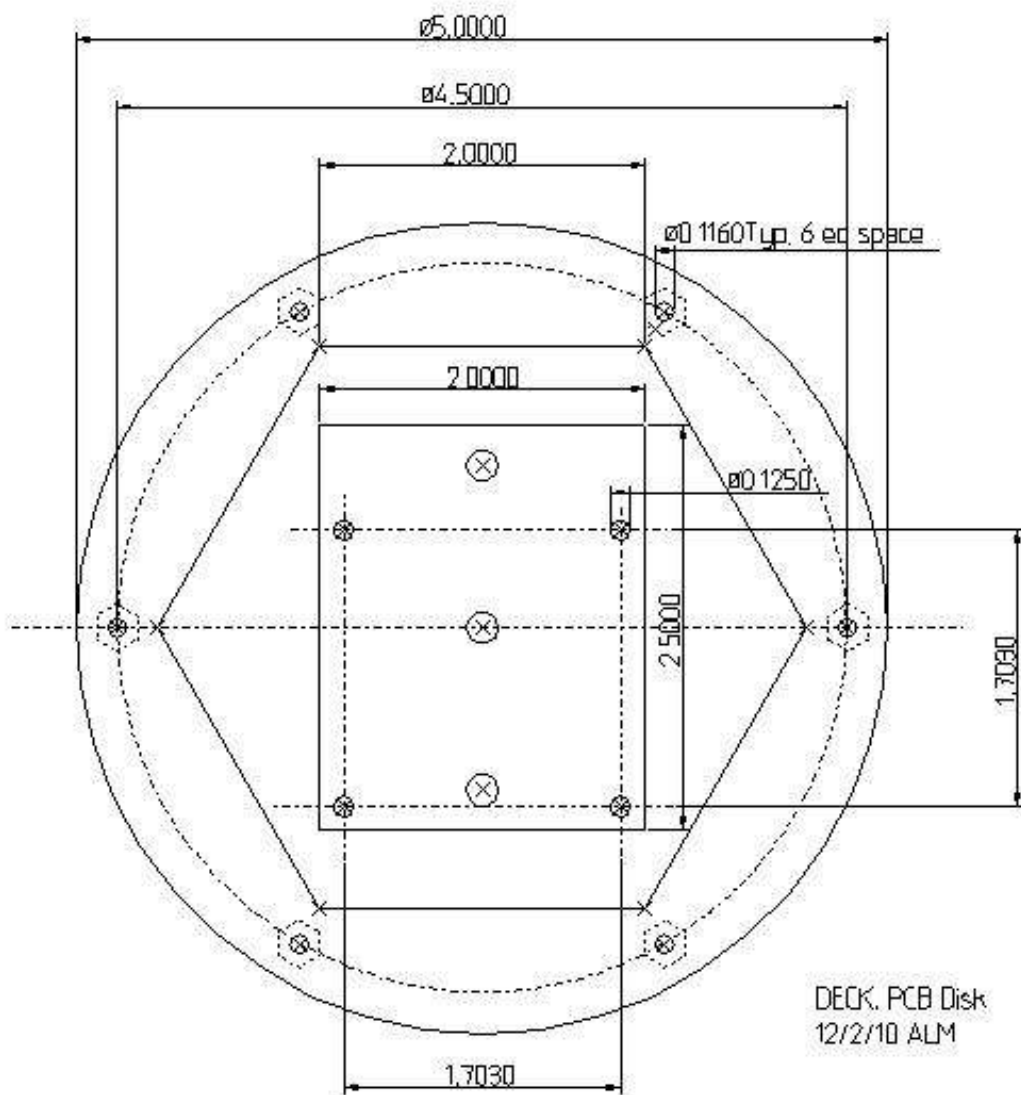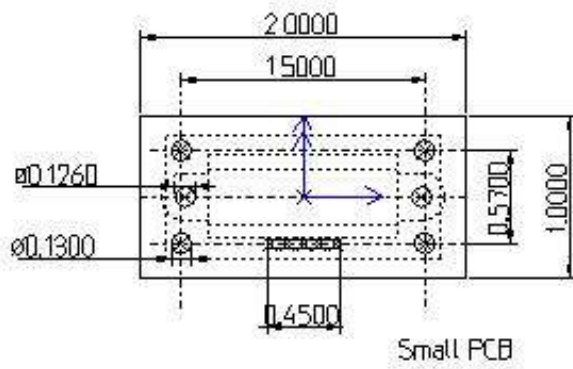
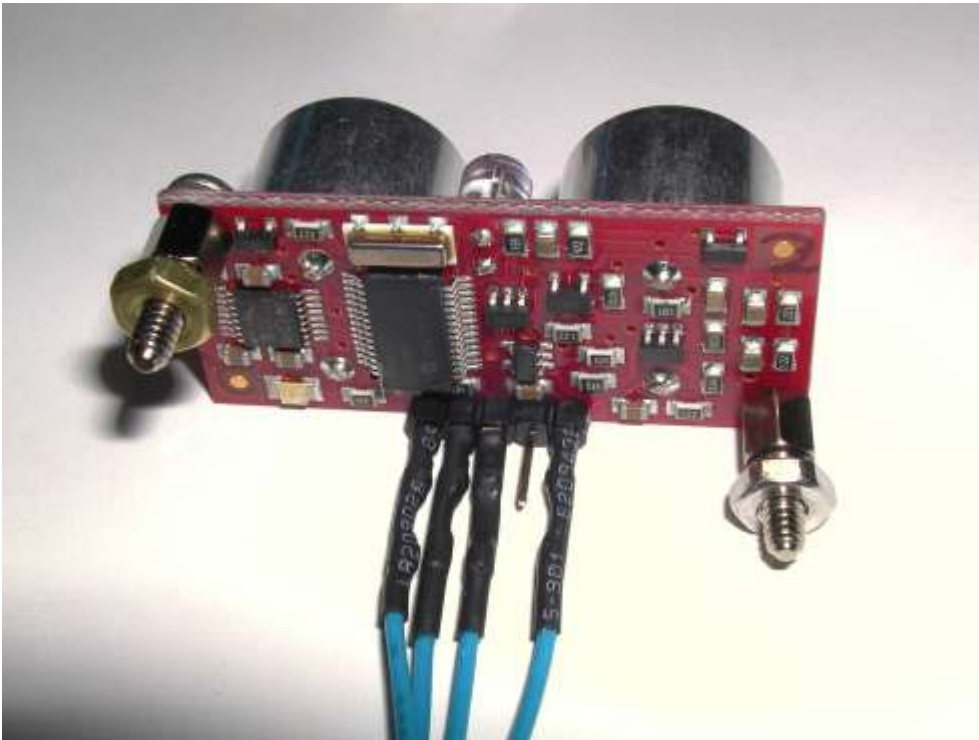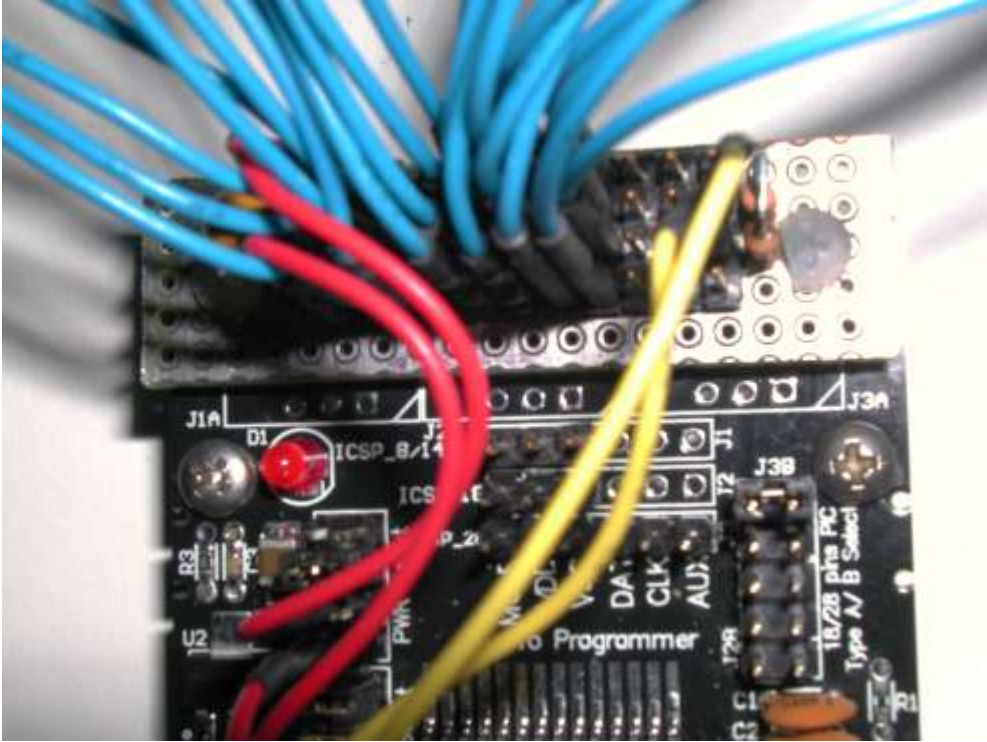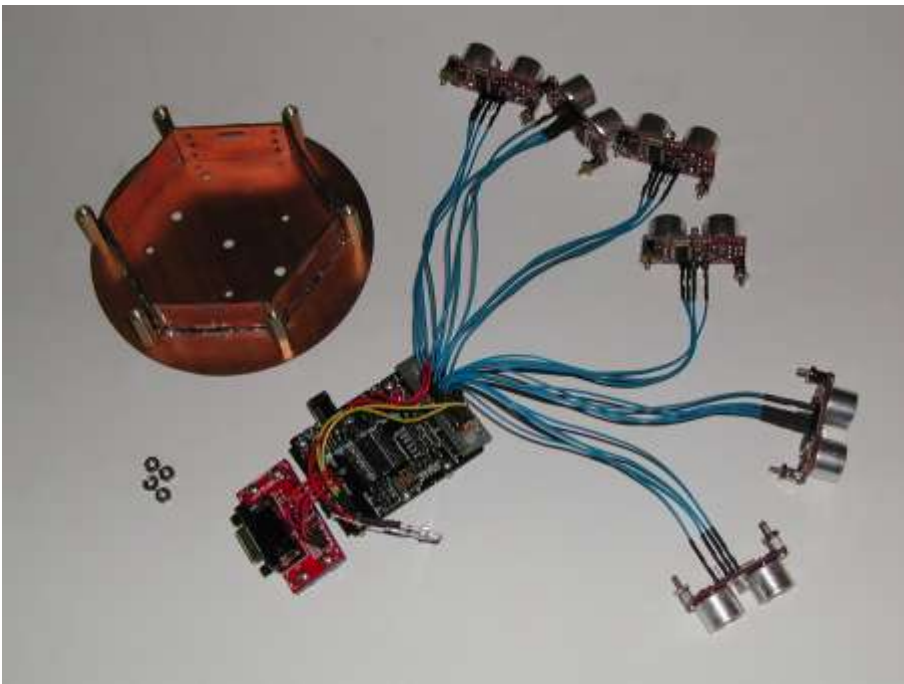**Sonar Deck PCBs**
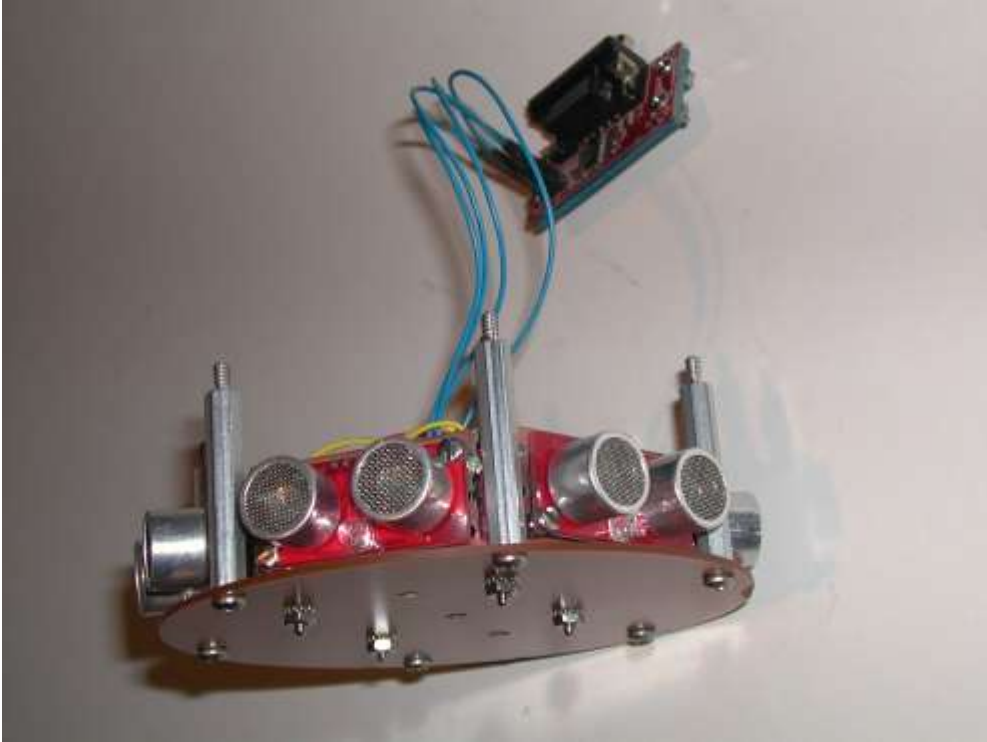

Sonar Module Wiring

I2C Board on SchmartModule

Parts of the Sonar Deck

Assembled Sonar Deck

View of Sonar Deck and test RS-232 SchmartModule