Team 7's Final Presentation

The Voice Operated Computer

PRESENTED BY:

Fernando Garza

Mark Griffin

Michael Olson

Zane Skinner

University of Houston - College of Technology

ELET 4208-01 / Senior Project

Section no. 15630

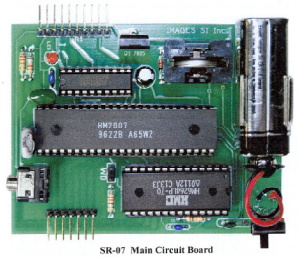
Spring 2009

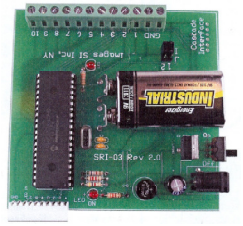
Introduction

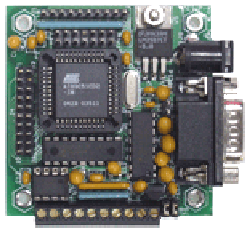
- Team 7's project objective is to create a personal computer that turns on when a command word is spoken by the user
- One of the project motivations is to help paraplegics turn their computers on without the use of their hands
- Furthermore, this product can be used for high level security situations
- Handicap and high level security officials are expected users

Design Specifications

- SR-07 speech recognition circuit
- SRI-03 Speech Recognition Interface
- Mini-Max/51-C2 8051 microcontroller
- C program to power the reed relay switching circuit
- Reed relay switching circuit to short the pins on the motherboard momentarily
- Space constraints within the computer's internal cavity


SR-07 Main Circuit Board





Design Specifications (cont.)

- SR-07 speech recognition circuit samples the words of the speaker and compares the samples to data stored in the RAM
- When the correct voice sample is obtained, the SR-07 will send a signal to the SRI-03 speech recognition interface circuit
- When the SRI-03 is sent a signal, it sends a digital high to the output pin that corresponds to the location of the sample word

Design Specifications (cont.)

- The microcontroller will monitor the voice recognition unit until it detects the control signal indicating the correctly spoken keyword, as well as a low voltage sense from the computer's power supply, to activate the system

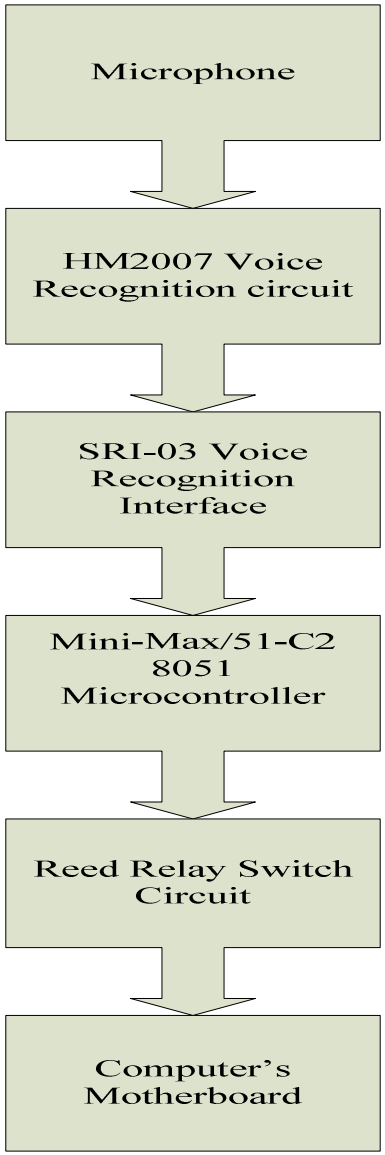
- Once the microcontroller detects both the activation keyword, and the low voltage sense (roughly 0 volts DC), it will send a 5VDC signal to output pin P2.2

- If the microcontroller detects the activation keyword and a high voltage sense (roughly 5 volts DC), then the microcontroller will not send a 5VDC signal to output pin P2.2

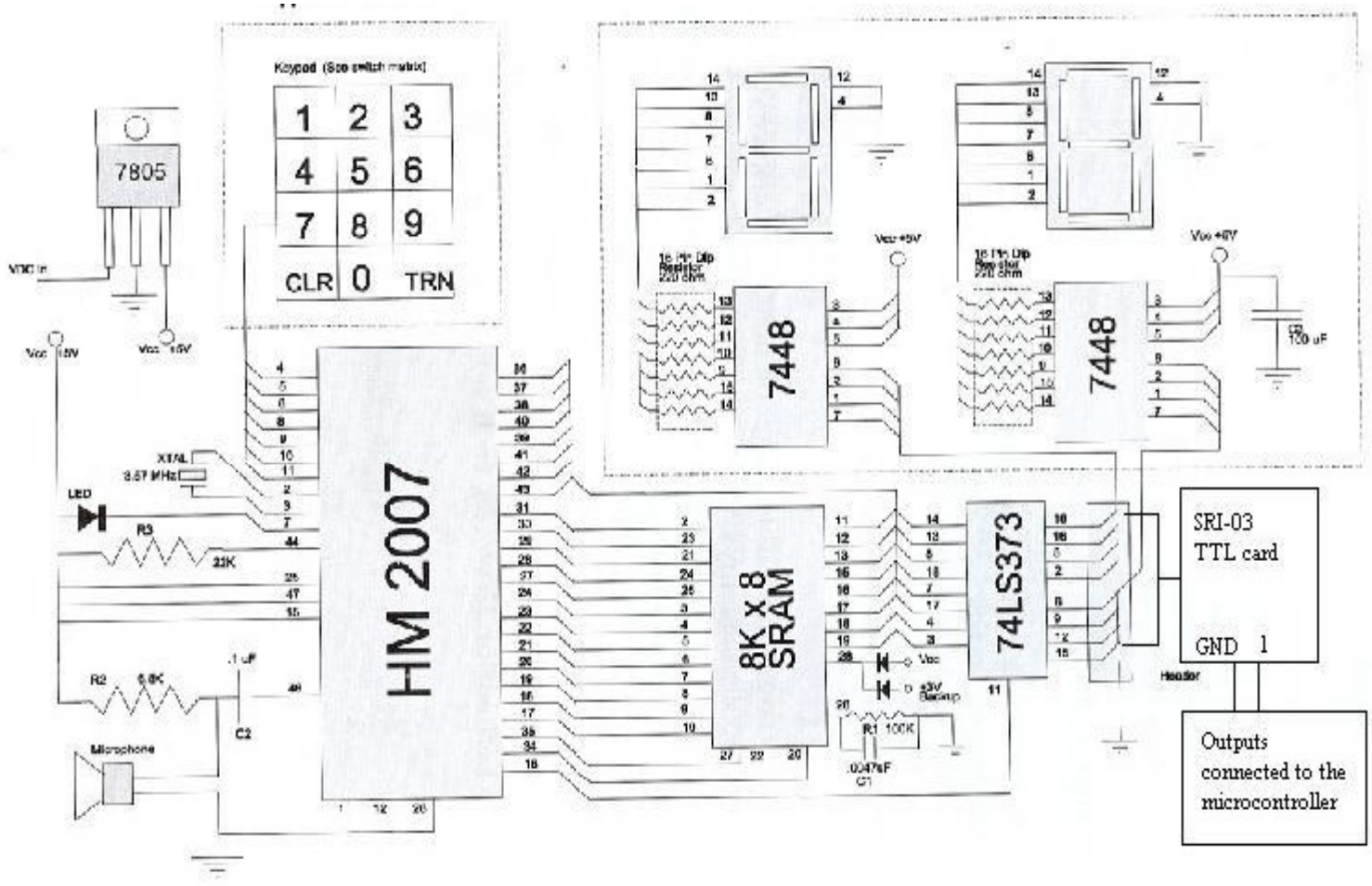
Design Specifications (cont.)

- Reed relay switching circuit will perform the momentary shorting that will activate the computer
- The reed relay circuit is constructed of a current feedback protection diode, the reed relay for performing the shorting, and a NPN switching transistor
- ~8.8VDC VCC is supplied from the MCU power supply
- The 5VDC signal from MCU pin P2.2 will bias the transistor and apply a ground that will trigger the relay to short
- The 5VDC signal from the MCU is only half a second long, once the pulse has passed, the relay opens again

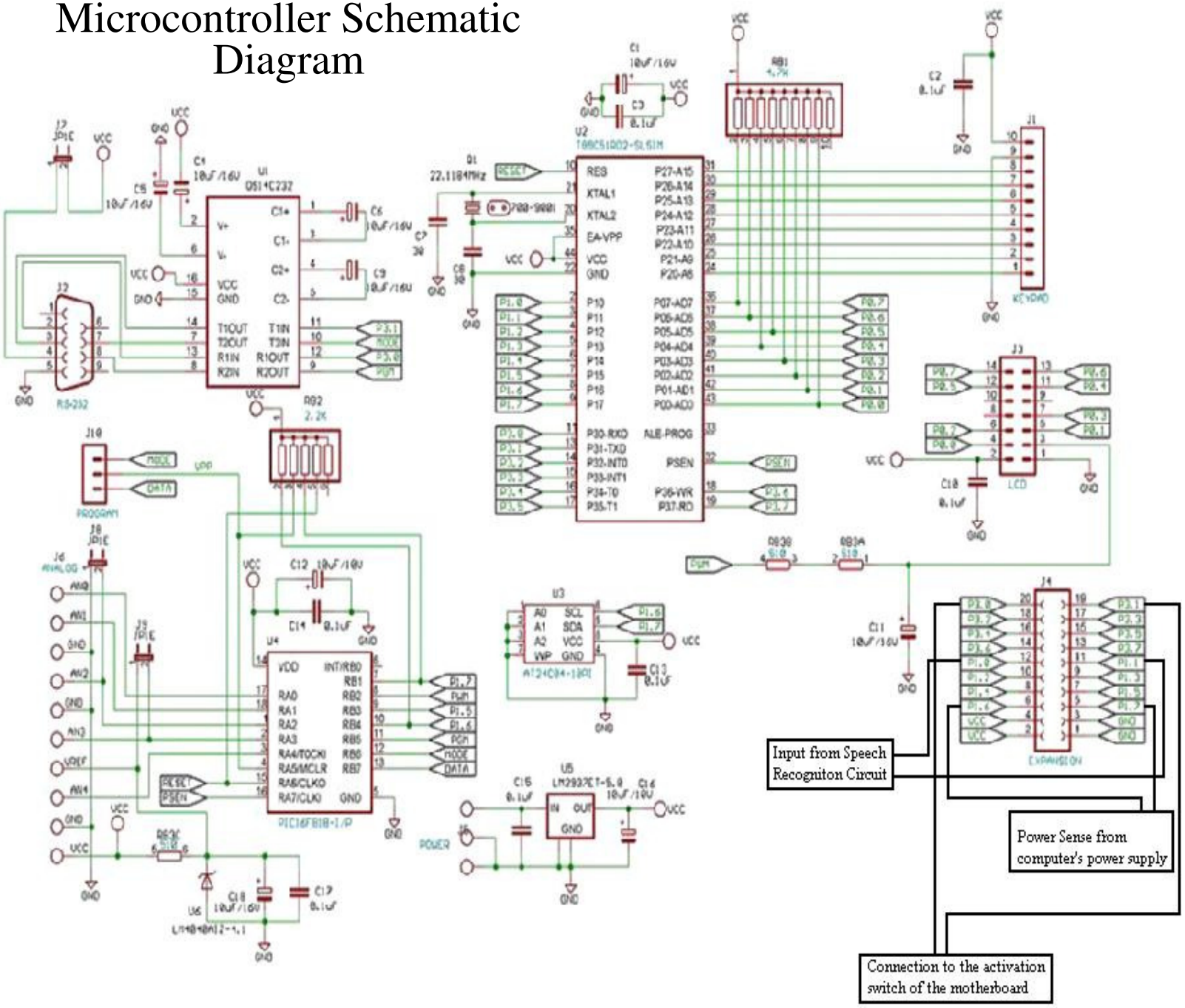
Hardware Diagram



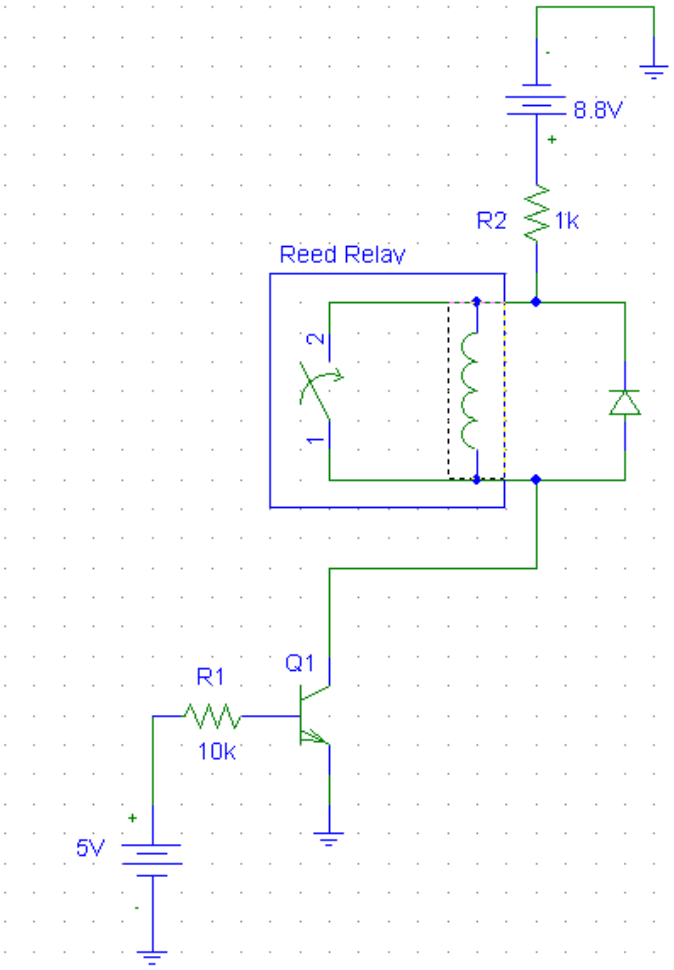
Voice Recognition Circuit



Microcontroller Schematic Diagram



Reed Relay Switch



Construction Details

- Throughput back plate to maintain computer's enclosed integrity while supplying power to internally mounted microcontroller, reed relay switching circuit, and microphone connection

- Internally mounted speech recognition circuit, transistor-transistor logic circuit, reed relay switching circuit and microcontroller via standoff legs at the bottom of the computer's case

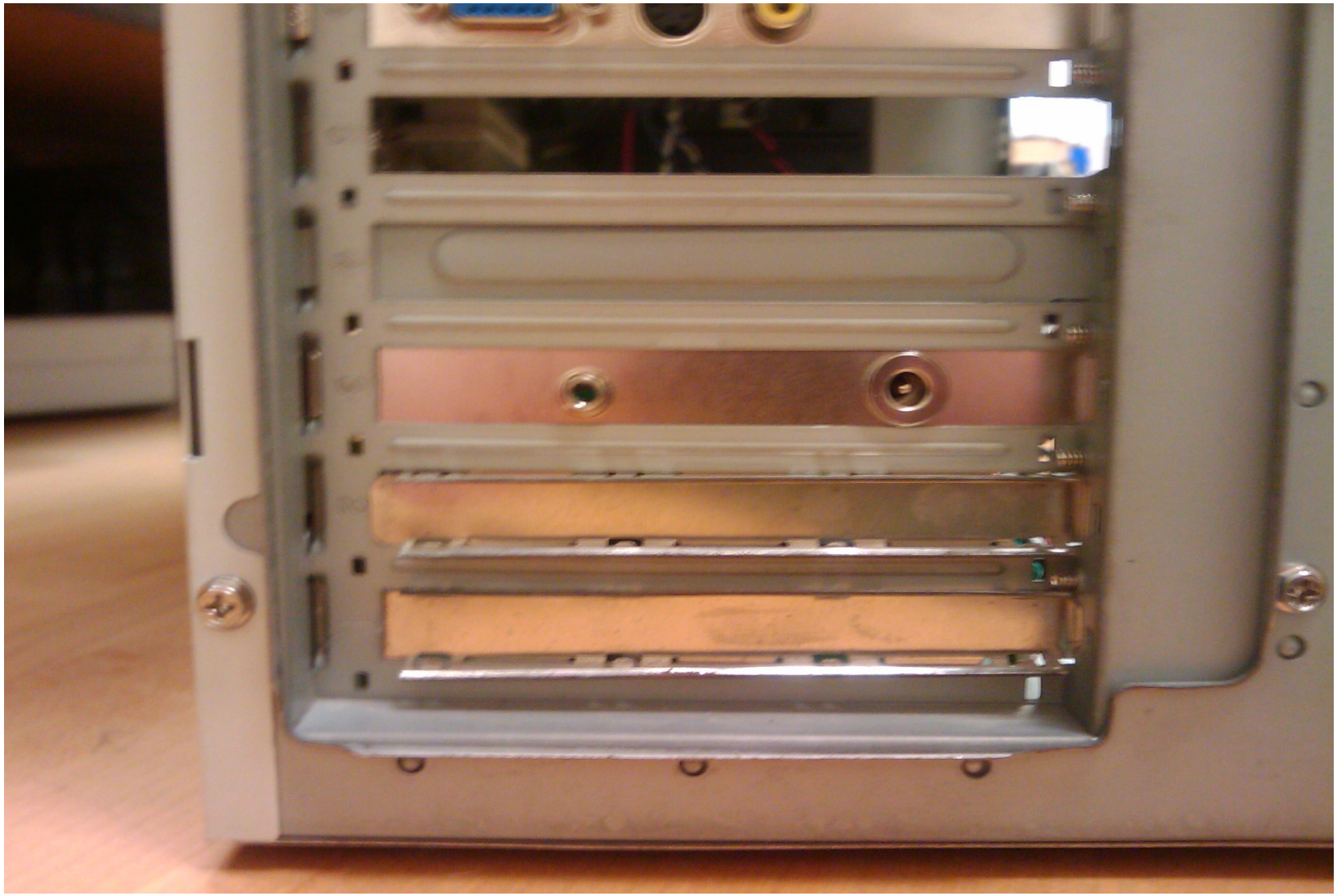
- Hard spliced wires off of the computer case's power button to ensure that computer can be powered up via both voice and manual power

Construction Details (cont.)

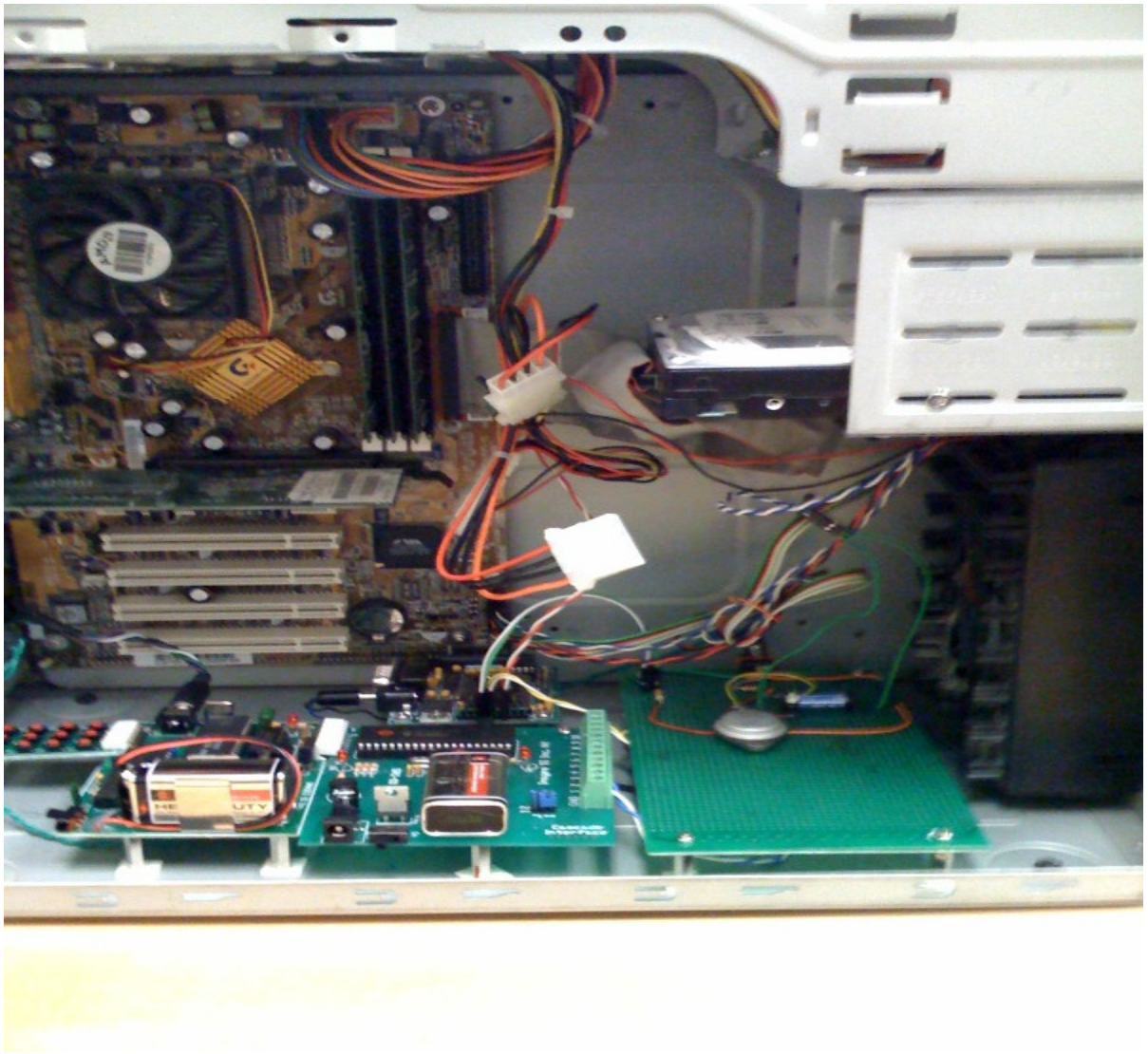
- Microcontroller monitoring voltage being produced by the computer's power supply via the device connection plugs of the power supply

- Reed relay switching circuit is replicating the momentary closed switch needed to activate the computer

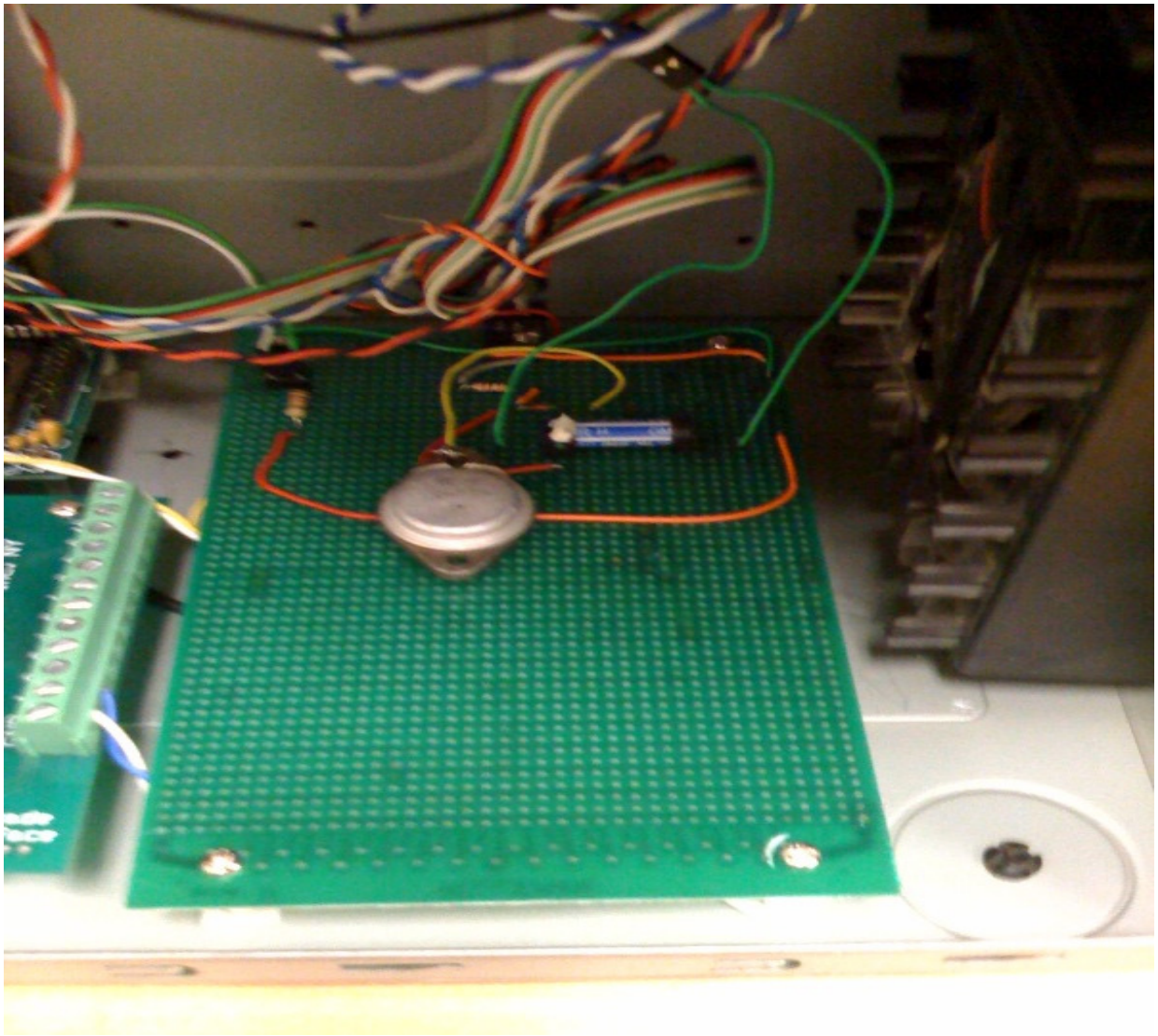
Construction Details (cont.)



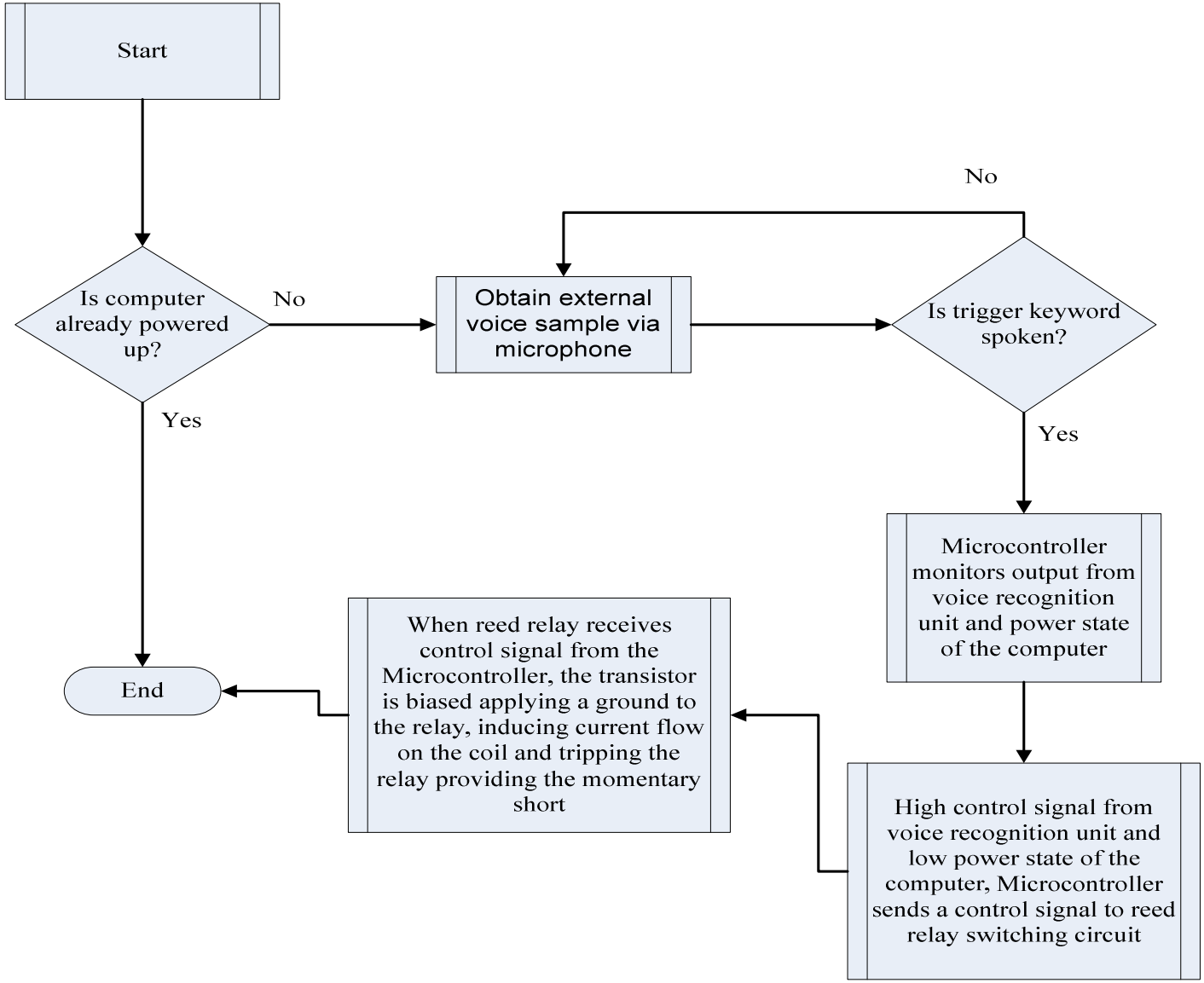
Construction Details (cont.)



Construction Details (cont.)



Software Diagram



Code

```
#include <8051io.h>
#include <8051bit.h>          /* Bit set/clear macros */
#include <8051reg.h>
#include <8051int.h>
main()          //main function
{
      P2 = 0x50;                //sets P2.4 and P2.6 as inputs and P2.2 as an output (b01010000)
      clrbit(P2.2);             //sets P2.2 to a low state
      for(;;)                   //infinite loop for monitering voice recognition unit's output
      {
       if( (P2 & 0x10) == 0x10 )          //condition set for voice recognition output high
       {                                  //and CPU in a powered down state
         setbit(P2.2);                    //sets P2.2 to a high state
         delay(500);                      //delays for half a second
         clrbit(P2.2)                     //sets P2.2 to a low state
         P2 = 0x50;                       //sets P2.4 and P2.6 as inputs and P2.2 as an output again (b01010000)
       }                                  //ends if statement
       else                               //condition handling for any other state than one defined above
       {
         clrbit(P2.2);                    //maintains P2.2 in a low state
       }                                  //ends else statement
      }                                   //closing character of the for loop
}                                         //closing character or the main program
```

Cost Analysis

The cost analysis consists of three parts:

- Parts Cost
- Equipment Cost
- Labor Cost

Parts List

The parts listed here were complied by the team needed to build the actual product

Part	Qty	Est. Cost Per Part	Est. Total Cost	Actual Cost
Desktop Computer	1	Free	Free	Free
HM2007 Speech Recognition Circuit	1	$179.95	$179.95	$179.95
SRI-03 Speech Recognition Interface	1	$115.95	$115.95	$115.95
8051 Microcontroller	1	$75.00	$75.00	$69.00
Miscellaneous Tools	1	$50.00	$50.00	$25.00
		Total	$420.90	$389.90

Equipment List

The equipment cost consists of the lab resources provided by the College of Technology

Equipment Part	**Qty**	**Cost**
BK Precision DC Power Supply	1	$689.00
BK Precision 5 1/2 Digit Multimeter	1	$695.00
BK Precision 10 MHz Sweep/Function Generator	1	$399.00
Tektronix 2 Channel Digital Storage Oscilloscope	1	$1,600.00
Soldering Kit	1	$25.00
	Total	$3,408.00

Labor Cost

The labor cost consists of the team member's salary and it is calculated by the following formula:

Salary ($/Hr) * 2.5 * Hours = Total Cost

LABOR COST TO DATE			
Labor	**Salary ($/Hr)**	**Hours**	**Labor Cost**
Fernando Garza	$30.00	55	$4125.00
Mark Griffin	$30.00	55	$4125.00
Michael Olson	$30.00	55	$4125.00
Zane Skinner	$30.00	55	$4125.00
Total	$120.00	220	$16,500.00

Labor Cost (cont.)

TOTAL LABOR COST			
Labor	**Salary ($/Hr)**	**Est. Hours**	**Est. Labor Cost**
Fernando Garza	$30.00	220	$6,600.00
Mark Griffin	$30.00	220	$6,600.00
Michael Olson	$30.00	220	$6,600.00
Zane Skinner	$30.00	220	$6,600.00
Total	$120.00	880	$26,400.00

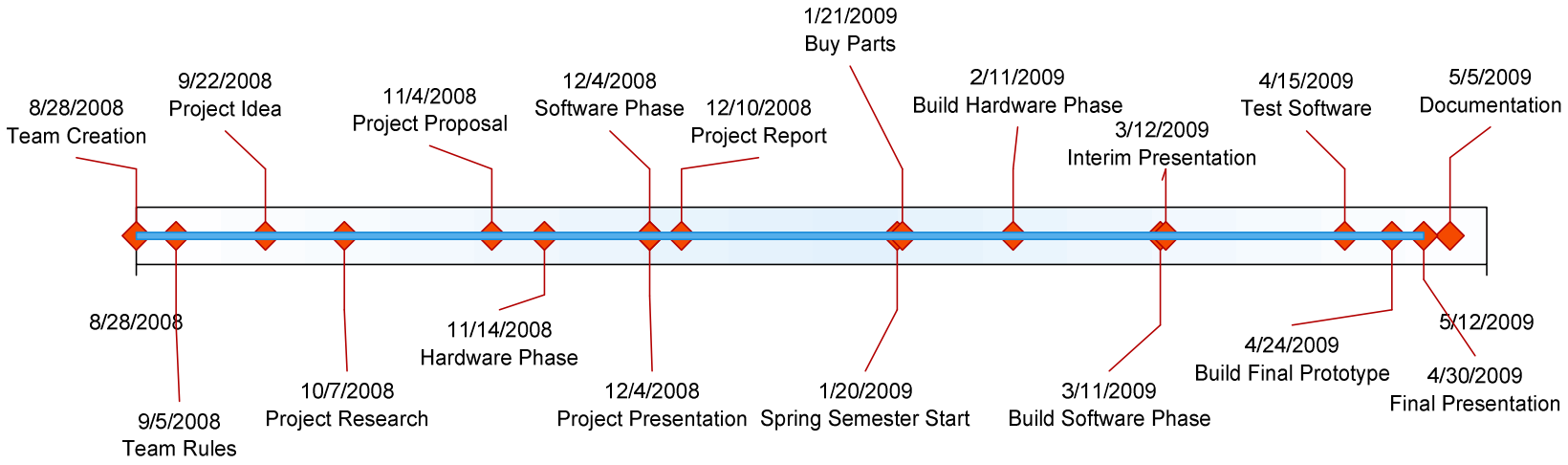
Product Cost

The product final cost includes the parts, equipment and labor costs. Table 5 shows a summary of the costs considered for the final cost.

Cost	Amount
Parts	$389.90
Equipment	$3,408.00
Labor	$26,400.00
Total	$30,197.90

Project Schedule

The project schedule was developed in phases. Microsoft Project was used to develop a Gantt chart to divide the project into tasks. All tasks are divided and assigned equally among all members of the team.



References

- Eveland, Zach. "HM 2007 Voice Recognition IC." ITP Sensor Workshop. 24 Apr. 2006. ITP Tisch School of the Arts. 1 Nov. 2008 <http://itp.nyu.edu/physcomp/sensors/>.

- Payne, William H. Embedded Controller Forth for the 8051 Family. New York: Academic P, 1990.

- Images Scientific Instruments, ed. "Build a Speech Recognition Circuit." 1 Nov. 2008 <http://www.imagesco.com/articles/hm2007/speechrecognitiontutorial01.html>.

References (cont.)

- Brown, Gary. "How PC Power Supplies Work." How Stuff Works. 29 Nov. 2008 <http://computer.howstuffworks.com/power-supply.htm/printable>.

- "MINI-MAX/51-C2 Single Board Computer Technical Manual." 4 Mar. 2005. BiPOM Electronics. 29 Nov. 2008 <http://www.terraelectronica.ru/pdf/bipom/mini-max_51-c2.pdf>.

- Arnold, Rob. "Case Mod 101: The ATX Power Switch Demystified." Linear1 case mods. 29 Nov. 2008 <http://case-mods.linear1.org/case-mod-101-the-atx-power-switch-demystified/>.

Any Questions or Comments?