

# **Laboratory Electronic Parts Management System**

ECE445 Senior Design Project

February 6, 2013

Chengcheng Huang

Chao Cao

TA: Justine Fortier

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## **1.0 Introduction**

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### **1.1 Statement of Purpose**

The project we designed can be used by teaching assistants or laboratory managers to collect how many electronic parts such as chips, I/O boxes, arduino panels left in the drawers. No matter what kind of parts we need in the laboratory, we will provide a system to record and show the existing amount. We believe this project will save lab manager a lot of time in counting the numbers of items in the laboratory.

#### **1.2.1 Goals:**

- Record the change of amount by numeric keypad
- Each change of amount can send wirelessly
- Show the existing amount on the Computer Inventory

#### **1.2.2 Functions:**

- System starts to work when the drawer is open
- System user can enter the amount taken or return through numeric keypad
- The changed amount will be reflected on the Computer

#### **1.2.3 Benefits:**

- New method to manage laboratory parts
- Save time in counting every item in laboratory
- Enables lab manager know which item is out of stock
- "I cannot find it" never happens again

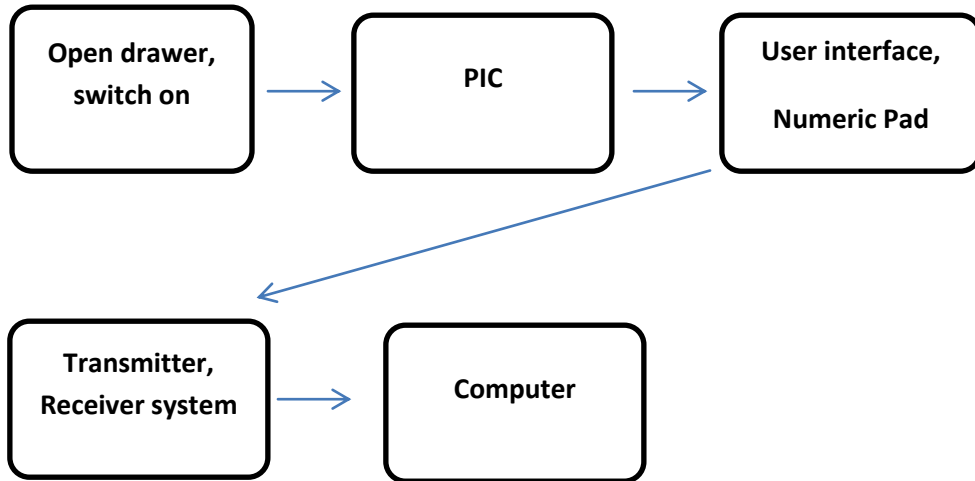
#### **1.2.4 Features:**

- Recognize automatically if the drawer is open
- User friendly
- Easy to learn and handle

## 2.0 Design

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### 2.1 Block Diagrams



### 2.2 Block Descriptions

- **Open drawer, switch on:**

We will place a metal bar on each drawer and it will connect the 2 wires on the back of the drawer, When the drawer is opened, the metal bar and wires disconnect and there will be a signal sent to the PIC.

- **PIC:**

PIC will be responsible for the logical operation and circuit components. It will receive data from the drawer switches and do the operations which can logically be done by using multiplexer. We give each drawer a unique binary number as select of the MUX. And the output of the MUX will display on the User interface. For example: If we have 8 drawers, and we want take parts from drawer#0, when we open the drawer the signal 000 will sent to PIC and the 0 input of MUX will be the " Drawer#0 has been select, enter the number you want to take/return."

- **User interface, Numeric Pad:**

When the drawer has been selected, the interface will show the message “Drawer#X has been select, enter the number you want to take/return.” And the system want user enter the number and enter by pressing “+” or “-“. The “+” means return and “-“ means take. We will using a counter to count the electronic parts left in the drawer.

- **Transmitter, Receiver system:**

Our design will wirelessly (by Xbee) transfer the data from the computer in the room to the other device of school lab management system.

- **Computer Inventory:**

From the computer, staff can easily check the electronic parts left in each lab and can refill on time!

### **3.0 Block Level Requirements and Verification**

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#### **Block Level Requirements:**

- 1) The device should be connecting to the Vcc.
- 2) Each drawer switch should work independently.
- 3) Each drawer should output different signal to the PIC
- 4) The count continuously gets updated based on data received
- 5) The wireless signal should be able to be transmitted and captured through Xbee.

**Verification:****Open drawer, switch on:**

Use the voltmeter to check if the switch on and sent signal out when we open the drawer.

**PIC:**

Check if the output bits of each drawer signal are correct by using signal output LED on I/O board.

**User interface, Input button:**

Check if the output message on display for each drawer is correct. And check if the total number of parts changed by pressing input button.

**Transmitter and receiver:**

Connect the system by Xbee and check if the other device can see the number change if we do the option on PIC.

**Computer:**

Check the display on screen on the computer.

**Tolerance Analysis**

The most important part of our design will be our output signal from each drawer. Because the Select bit of MUX is directly dependent on the output of each drawer. If it's wrong, it will cause much more error on next stage, so we need to carefully check the error of output bits from each drawer, to make sure our system operate correct.

## 4.0 Cost and Schedule

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### 4.1 Cost Analysis

#### 4.1.1 Labor

Name	Rate	Hours	Total = Hourly Rate x 2.5 x Total Hours Invested
Chengcheng Huang	\$35.00	150	\$13,125
Chao Cao	\$35.00	150	\$13,125
Total		300	\$26,250

#### 4.1.2 Parts

Part Name	Unit Cost	Quantity	Total Cost
Resistors, Capacitors, Inductors	\$30	1	\$30
USB 19 keys Numeric Keypad	\$10	1	\$10
XBee 2mW Wire Antenna	\$42.9	2	\$85.8
Microcontroller(PIC16F877)	\$3.1	3	\$9.3
Switches, wires	\$0.5	8	\$4
PCB	\$20	2	\$40
Batteries	\$0.68	12	\$8

#### 4.1.3 Grand Total

Labor	\$26,250
Parts	\$225.1
<b>Grand Total</b>	<b>\$26473.1</b>

## 4.2 Schedule

Week	Chengcheng Huang	Chao Cao
2/6	Proposal: Introduction, Cost and Build Schedule	Proposal: Design, Block Level Requirements and Verification
2/13	Design preliminary control and numeric pad Circuit Order parts	Research and learn the Micro-Controller Unit Design Circuit(Eagle)
2/20	Design Review Design PCB Test basic control circuit on Bread Board	Design Review Design PCB Learn how to program PIC
2/27	Learn how XBee module works Design preliminary power supply for the system	Program into PIC Learn how XBee module works Figure out numeric pad output signals
3/5	Program XBee to send the signal from numeric pad	Program into PIC Connect the numeri pad output to XBee
3/12	Program XBee to change the inventory according to signals	Program XBee to change the inventory according to signals
3/19	Spring Break	Spring Break
3/26	Integrate and assembling each parts	Integrate and assembling each parts
4/2	Testing and debugging	Testing and debugging
4/9	Testing the whole project Make sure the completion	Last Modification of Project Fix all remaining issues
4/16	Prepare for Demo, Presentation and final paper	Prepare for Demo, Presentation and final paper
4/23	Demo	Demo
5/1	Presentation and submit the final paper	Presentation Check in Supplies