Programmable, Wireless Multi-Channel
Circuit Controller
with Optional Web Access Control

by

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A SENIOR THESIS PROPOSAL

Presented to the Faculty of
The Computer and Electronics Engineering Department
In Partial Fulfillment of Requirements
For CEEN 4980 Senior Thesis Proposal

Major: Computer/Electronics Engineering

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The accompanying Senior Thesis Proposal, "Programmable, Wireless Multi-Channel Circuit Controller with Optional Web Access Control," is submitted in accordance with the requirements of CEEN 4980, Senior Thesis Proposal. As stated in the proposal, this project will be done for and funded by Michael Francavilla, Gary Peck and Pu Wang, students of CEEN 4980 Senior Thesis class, spring 2003.

Respectfully yours,

Michael Francavilla
Gary Peck
Pu Wang
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I. BACKGROUND

Today’s modern technology provides us with all kinds of different electrical and electronic equipment to make our lives easier and more enjoyable. Refrigerators, televisions, air-conditioners, lights, computers, and stereos, have already become integrated into the daily routines of every family in today’s society. However, as the number of those devices is on the increase throughout our homes, to turn them on and off manually has become a huge hassle for most families. For this reason, our group has come up with the idea to design a programmable wireless remote controller to solve this problem for people and make their lives even easier.

II. THESIS OVERVIEW

The main emphasis of this project is to solve issues related, but not limited, to the control of exterior holiday lighting displays. The concepts covered by this project can easily be extended for the use with everyday electrical/electronic devices. The issues addressed by this project include the ability to automatically control multiple electrical devices from one location, through a simple interface, without the need for a physical wired network between the devices.

The project is a programmable, wireless multi-channel controller used to turn on and off the power supplied to electrical/electronic devices. This project will consist of one main control unit and multiple receivers (3 units for the prototype) each of which controls a standard 110 volt outlet mounted within the unit. The main unit, the programmable controller, keeps time using a real-time clock and will perform the scheduled tasks at the pre-programmed times. The user will be able to program a start and stop time for a remote unit controlling a device to be turned on or off. The main control unit’s program will be access by one of two methods. Method one is to control the program directly from the keypad on the main unit. Method two will be controlled via a local PC connected directly to the RS-232 port on the main unit. This method can also be accessed through the internet via a remote PC. The controller and receivers are powered by 110 volts with the exception of the real-time clock. The real-time clock has a button battery which provides power to maintain the clock settings even when the power is lost on the main unit.
III. GENERAL DESCRIPTION

The main unit will consist of a real-time clock, a micro-controller, keypad, LCD display, RS-232 serial port, and transmitter. The main unit is a programmable controller, which allows the user to control the on and off time of multiple devices. Through the keypad and LCD display the user can set the current clock time and date as well as the on and off time for each device individually. This functionality is duplicated via the RS-232 and a local PC. Remote control is also possible through the remote PC and the internet.

A user program will run on the main controller. The user will be able to set the clock and the on/off times for the receivers. This program is accessed through one of three methods. Method one interfaces directly through the keypad. Method two interfaces through the RS-232 and a local PC. The third method access the program via the RS-232, a local PC and a remote PC connected to the internet.

The real-time clock will display the time and date on the LCD. The bidirectional data transfer also enables the user to reset the clock.

The preprogrammed information for the on/off times is used to trigger an event. This data is processed by the micro-controller and delivered to the transmitter at the scheduled time. The transmitter sends the processed data to all the receivers simultaneously. Each receiver decodes the data and responds accordingly.
Remote Receivers

Unit #1
- Receiver
- Transmit Decoder
- 110 Volt Receptacle
- Control Switch
- ID / Task Decoder

Unit #2
- Receiver
- Transmit Decoder
- 110 Volt Receptacle
- Control Switch
- ID / Task Decoder

Unit #N
- Receiver
- Transmit Decoder
- 110 Volt Receptacle
- Control Switch
- ID / Task Decoder

Main Control Unit
- Micro-controller
- Encoder
- Keypad & LCD
- Transmitter
- Clock

Optional Web Access Control

Control Via RS 232
On Main Controller
IV. COMPONENTS LIST

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<thead>
<tr>
<th>Quantity</th>
<th>Estimated Cost ($)</th>
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<tbody>
<tr>
<td>1.       Clock chip       1</td>
<td>7.00</td>
</tr>
<tr>
<td>2.       Micro controller       1</td>
<td>10.00</td>
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<tr>
<td>3.       Keypad (12 key Min)       1</td>
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<tr>
<td>4.       LCD (4*16)       1</td>
<td>15.00</td>
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<td>5.       Transmitter       1</td>
<td>25.00</td>
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<tr>
<td>6.       Receiver            3</td>
<td>20.00 * 3</td>
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<tr>
<td>7.       Programmable IC (Gal)       4</td>
<td>6.00 *4</td>
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<tr>
<td>8.       Voltage Transfomers       4</td>
<td>6.00 *4</td>
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<td>9.       40 pin ZIF socket                                1</td>
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<tr>
<td>10.      40 pin WW socket                              2</td>
<td>3.50 *2</td>
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<td>11.      24 pin WW socket                              4</td>
<td>2.00 *4</td>
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<td>12.      Other WW sockets ~ 25.00</td>
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<td>13.      Prototype board 5.5*8.0                     1</td>
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<tr>
<td>14.      Prototype board 4.6*4.3                     3</td>
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<td>15.      Misc. Components ~ 20.00</td>
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Total Cost: $302.00

V. TIME SCHEDULE

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<th>Tasks</th>
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<th>MAR (weeks)</th>
<th>APR (weeks)</th>
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<td>Construction Stage</td>
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<tr>
<td>Final testing</td>
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<tr>
<td>Documentation</td>
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VI. ACCEPTANCE TESTING

1. Power on reset:
   a. Initial power on reset: prompt for clock and program reset.
   b. Normal power on reset: clock settings retained, prompt for program reset

2. Local programming:
   a. Access user menus through the main controller’s key pad and LCD to program

5. Remote programming:
   a. Access user menus through a local PC connected via RS-232
   b. Access the user menus through a local PC from a remote PC via the internet

6. Control unit operation:
   a. Program in RUN mode will display time and date
   b. Schedule event occurs for unit N

7. Control unit range of operation is approximately 100’ radius under normal conditions

VII. TEAM MEMBERS

Pu Wang
Gary Peck
Mike Francavilla
VIII. ASSIGNMENT OF EACH MEMBER

Pu Wang

**Hardware:**
- Clock circuit interface
- Microcontroller interfacing
- LCD and Keypad
- Construction of one receiver unit

**Software:**
- Software control system

**Documentation:**
- One third of all documents required

Mike Francavilla

**Hardware:**
- Transmitter interface
- Receiver interface
- Remote unit control circuit design
- Construction of one receiver

**Software:**
- Gal programming for decoding received information

**Documentation:**
- One third of all documents required
Gary Peck

**Hardware:**
- RS-232 interface
- Layout and construction of main unit
- Construction of one receiver

**Software:**
- Web page design
- Software interface to main controller

**Documentation:**
- One third of all documents required

**VIX. SUMMARY**

This project is a programmable, wireless multi-channel controller used to direct when remote devices need to be turned on and off. The main unit is programmable directly thru the main unit or indirectly via a local PC. Also, the local PC can be access via the internet. The user can set the time and date for the timer. Based on the clock time, the user sets the on and off time for each device through the main unit. This product will allow users to control many electrical devices, thereby, making their lives easier.