Final Report

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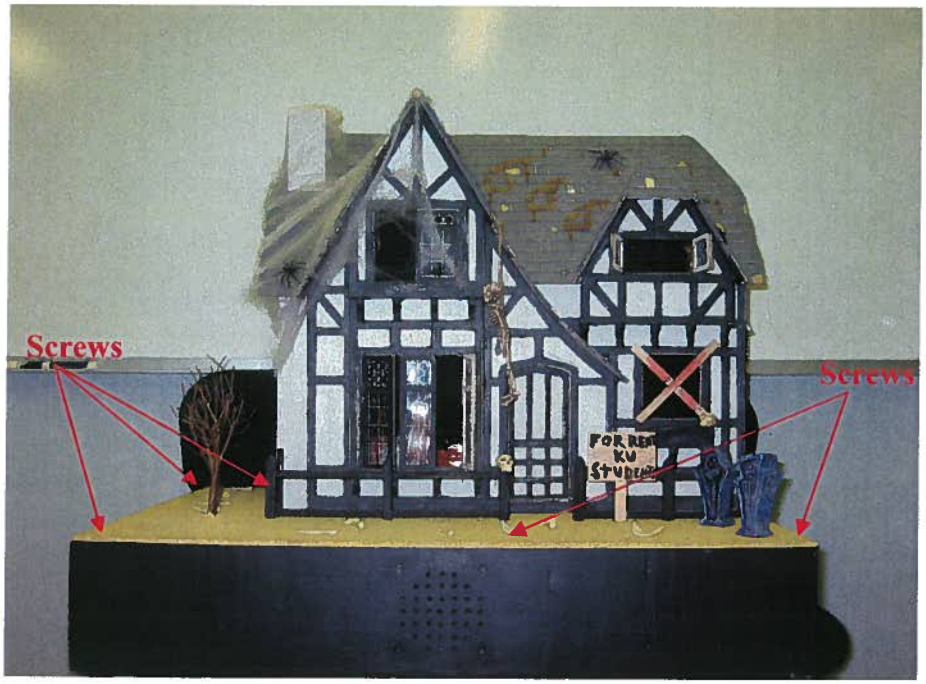
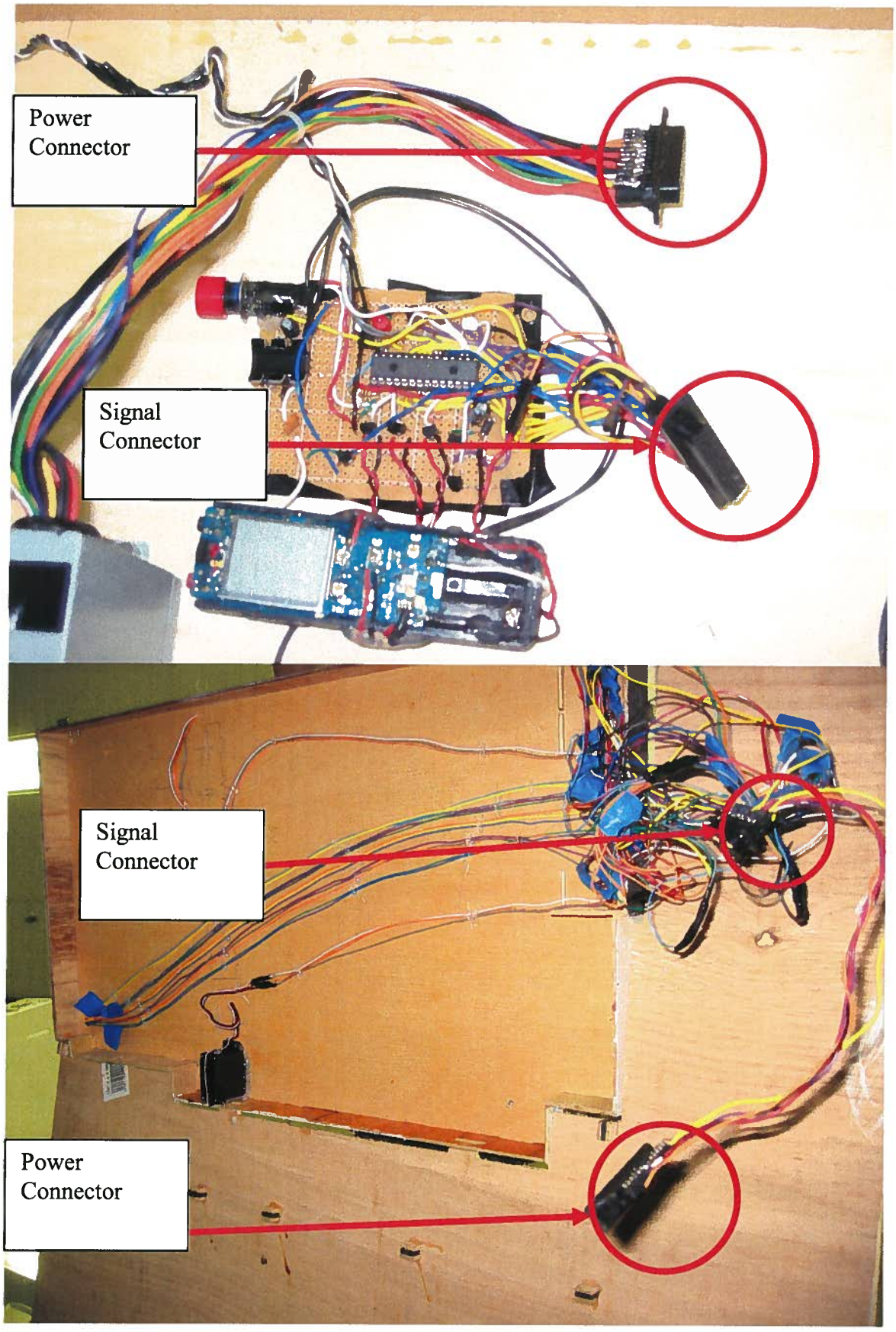
Fall 2006
EE 490

Introduction

Five screws were used to mount the house to the base. These screws are located at the edges surrounding the house.



There are two connectors that need to be disconnected if the house were to be removed from the base. The two connectors are for signal and power wires and are located directly beneath the house.


Power Connector
Signal Connector
Signal Connector
Power Connector

All the wires coming directly out of the servos are stranded wire. We then manually soldered solid wires to all of the stranded wire in order to make it easier to solder to the connectors. Hot glue was used to organize and hold down all wires throughout the house. All wires pertaining to each servo (power, ground, and signal) or light bulb (power and signal) were glued in separate groups to the bottom of the house.

Front Door

The front door is opened and closed by means of a servo motor. A hole was drilled through the floor behind the front door so that only the arm would be protruding through the hole. The servo was then mounted to the bottom of the house with hot glue. In order to attach the servo to the front door, small pieces of wood were used to create two pivot points. This allowed for the servo to open the door.

Blinds

There are two pieces of fishing line that are woven through each side of the blinds. One end of each fishing line is connected to a third piece, which is then fed through eyehooks and connects to the servo arm. This allows the servo to pull the blinds vertically. A small metal bar was sewn into the bottom of the fabric to aid gravity in the closing of the blinds.

Ghost

The ghost is also done by means of a servo. In order to get 360° of rotation, the stop was removed from the servo and the correct duty cycle was used. A piece of wood was attached to the servo arm to lengthen the path of the ghost. One end of the wire was then attached to the piece of wood and the other to a foam ball inside the ghost.

Spinning Head

The stop was also removed from this servo to get full rotation. The servo was hot glued to the back of the figurine, and the head was hot glued onto the servo arm.

Carousel

The servo for this action is mounted to the roof of the floor below with only the arm protruding through the floor. The stop was also removed on this servo and the carousel is hot glued to the servo arm.

Piano

The mechanics of the piano are identical to the front door, except that the servo is mounted inside the piano.

Little Girl

The girl is resting on a 45° table with the servo hot glued behind her. One pivot point was made on the back of her head to allow for movement.

Lights

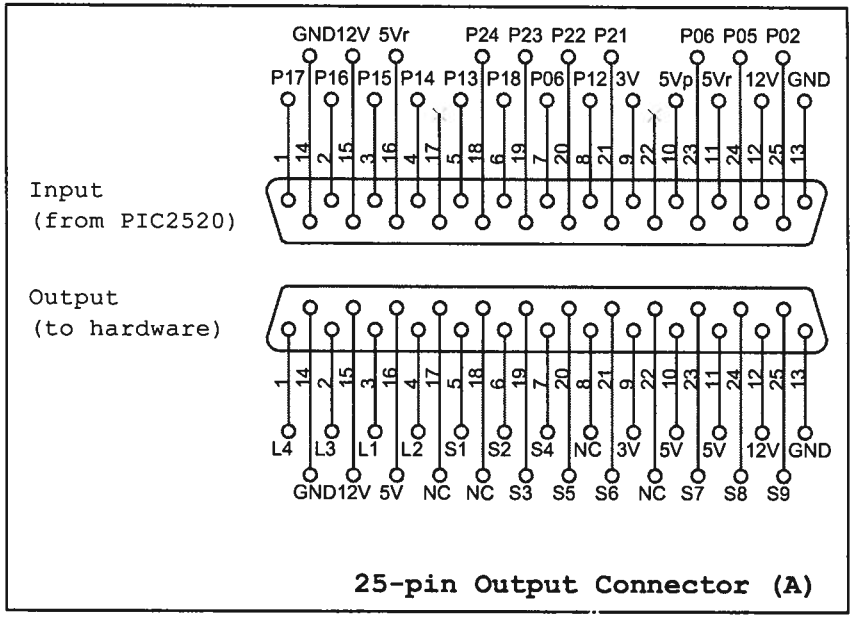
There is one light in every room except for the Halloween room. Three lights were used here because of the darkness of the room. All lights are protruding through the wallpaper and are hot glued to the ceiling.

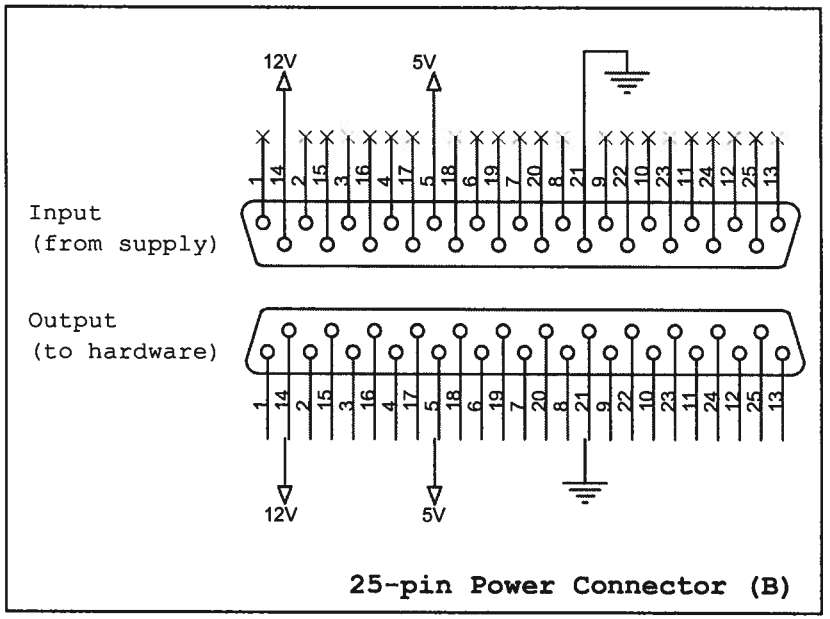
Pin	Port	Action	Hardware	Manufacturer	Output	Notes
1					no	
2	RA0	Blinds - Butcher Room	Servo	Hi-Tech HS-322HD	yes	
3	RA1	Stop Button	Audio Card		yes	noisy
4	RA2	Back Button	Audio Card		yes	noisy
5	RA3	Blinds - Mirror Room	Servo	Hi-Tech HS-322HD	yes	
6	RA4	Piano	Servo	Hi-Tech HS-322HD	yes	
7	RA5				yes	
8					no	
9	RA7	Carousel	Servo	Futaba S3003	yes	
10	RA6				yes	
11	RC0	Play Button	Audio Card	Sony Digital Recorder	yes	noisy
12	RC1				yes	
13	RC2	Guy's Head	Servo	Futaba S3003	yes	
14	RC3	Light Bulb - Clown Room	Light Bulb	n/a	yes	
15	RC4	Light Bulb - Mirror Room	Light Bulb	n/a	yes	
16	RC5	Light Bulb - Halloween Room	Light Bulb	n/a	yes	
17	RC6	Light Bulb - Butcher Room	Light Bulb	n/a	yes	
18	RC7	Ghost	Servo	Futaba S3003	yes	
19					no	
20					no	
21	RB0	Front Door	Servo	Futaba S3003	yes	
22	RB1	Little Girl	Servo	Futaba S3003	yes	
23	RB2	Blinds - Halloween Room	Servo	Hi-Tech HS-322HD	yes	
24	RB3	Blinds - Clown Room	Servo	Hi-Tech HS-322HD	yes	
25	RB4				yes	
26	RB5				yes	
27	RB6				yes	
28	RB7				yes	

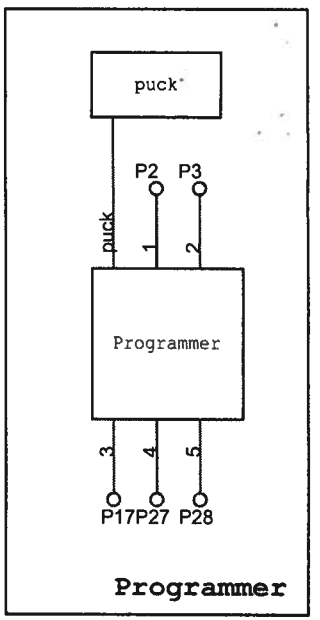
Table 1: Pin Out of Servos

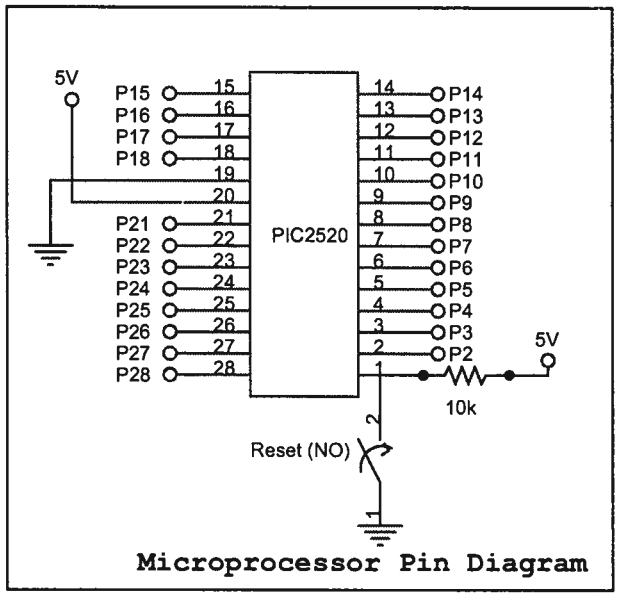
Futaba		Hi-Tech		Angle
C1	C2	C1	C2	(degrees)
18	102			25
19	101			35
20	100	40	80	45
21	99			55
22	98			65
23	97			75
24	96			85
25	95	30	90	90
30	90	20	100	135
35	85	10	110	180
40	80	n/a	n/a	190
10	90	50	70	reverse

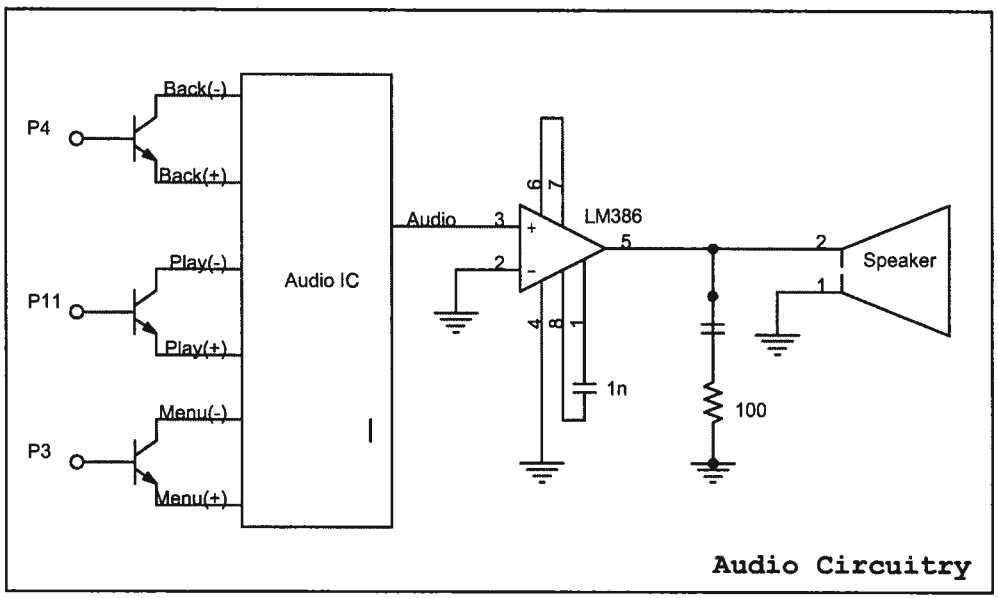
Table 2: Servo Duty Cycle

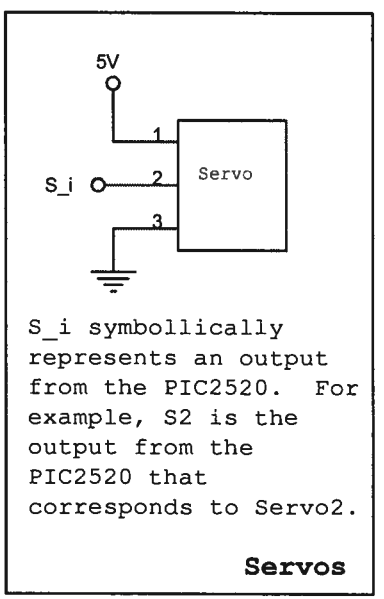


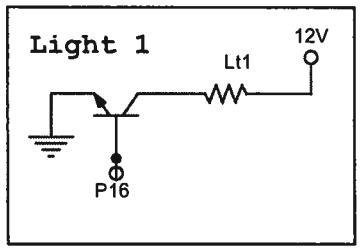


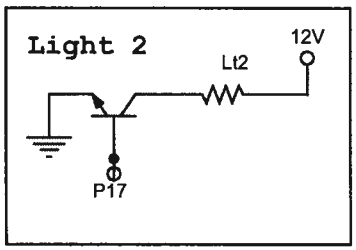


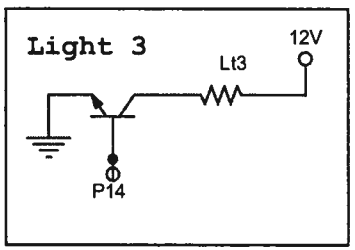


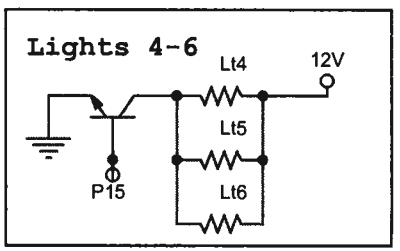












Capstone Design Project:
Schematic for "Haunted House"
Kettering University
Fall 2006, B Section
J. Rhiew, M. Bosway, H. Mehta
Prof. K. Kaiser

D C B A

5 4 3 2 1

Code

```
#include <p18f2520.h>
#include <pwm.h>
#include <delays.h>
#include <timers.h>

int c;
int d;
int f;
int j;

void main( void )
{

//********************** Setup Ports **************************

TRISA = 0x0000;
TRISB = 0x00;
PORTA = 0b00000000;
PORTB = 0b00000000;
PORTC = 0b00000000;
TRISC = 0x0000;


//********************** Initialization Code ******************

for(f=0; f<100; f++)                        // Close Door
{
```

```
for(c=0; c<10; c++)
{
PORTB = PORTB  | 0b00000001;
}
for(c=0; c<90; c++)
{
PORTB = PORTB  & 0b00000000;
}
}

for(d=0; d<75; d++)                    // Little Girl
{
for(c=0; c<20; c++)
{
PORTB = PORTB  | 0b00000010;
}
for(c=0; c<100; c++)
{
PORTB = PORTB  & 0b00000000;
}
}

for(d=0; d<100; d++)                   // Halloween Room Blinds
{
for(c=0; c<10; c++)
{
PORTB = PORTB  | 0b00000100;
}
for(c=0; c<110; c++)
```

```
{
PORTB = PORTB  & 0b00000000;
}
}

for(d=0; d<100; d++)                    // Clown Room Blinds
{
for(c=0; c<10; c++)
{
PORTB = PORTB  | 0b00001000;
}
for(c=0; c<110; c++)
{
PORTB= PORTB  & 0b00000000;
}
}

for(d=0; d<100; d++)                    // Mirror Room Blinds
{
for(c=0; c<50; c++)
{
PORTA = PORTA  | 0b00001000;
}
for(c=0; c<70; c++)
{
PORTA = PORTA  & 0b00000000;
}
}
```

```
for(d=0; d<100; d++)                        // Butcher Room Blinds
{
for(c=0; c<10; c++)
{
PORTA = PORTA  | 0b00000001;
}
for(c=0; c<110; c++)
{
PORTA = PORTA  & 0b00000000;
}
}
//********************** Delay and Menu Sequence **************

for(d=0; d<32767; d++);                     //6 Second Delay
for(d=0; d<32767; d++);
for(d=0; d<32767; d++);
for(d=0; d<32767; d++);

PORTA = PORTA  | 0b00000010;                //Menu On
for(d=0; d<10000; d++);
PORTA = PORTA  & 0b00000000;                //Menu Off
for(d=0; d<10000; d++);
PORTA = PORTA  | 0b00000010;                //Menu On
for(d=0; d<10000; d++);
PORTA = PORTA  & 0b00000000;                //Menu Off

//**********************  Audio On  ****************************

while(1)
```

```
{
for(c=0; c<1; c++)
{
PORTC = PORTC  | 0b00000001;              //Play/Pause
for(d=0; d<10000; d++);
PORTC = PORTC  & 0b00000000;
for(d=0; d<30000; d++);
}

//*********************  Open/Close Door  ***************************
//*************************** Futaba *********************************
for(j=0; j<3; j++)
{
for(d=0; d<100; d++)                      // Open Door
{
for(c=0; c<35; c++)
{
PORTB = PORTB  | 0b00000001;
}
for(c=0; c<85; c++)
{
PORTB = PORTB  & 0b00000000;
}
}
for(d=0; d<16633; d++);                   // 1.5 sec. delay

for(f=0; f<100; f++)                      // Close Door
{
for(c=0; c<10; c++)
```

```
{
PORTB = PORTB  | 0b00000001;
}
for(c=0; c<90; c++)
{
PORTB = PORTB  & 0b00000000;
}
}
for(d=0; d<16633; d++);                    // 1.5 sec. delay
}

//*********************  Light On In Halloween Room *****************

PORTC = PORTC | 0b00100000;

for(d=0; d<16633; d++);                    // 1.5 sec. delay

//*********************  Blinds Open In Halloween Room ***************
//********************************** Hi-Tec ***************************
for(f=0; f<300; f++)
{
for(c=0; c<25; c++)
{
PORTB = PORTB  | 0b00000100;
}
for(c=0; c<95; c++)
{
PORTB = PORTB  & 0b00000000;
}
```

```
}

for(d=0; d<16633; d++);                    // 1.5 sec. delay

//****************** Futaba Servo for Ghost In Halloween Room ********

for(d=0; d<600; d++)
{
for(c=0; c<60; c++)
{
PORTC = PORTC  | 0b10100000;
}
for(c=0; c<60; c++)
{
PORTC = PORTC  & 0b00100000;
}
}

for(d=0; d<600; d++)
{
for(c=0; c<60; c++)
{
PORTC = PORTC  | 0b10100000;
}
for(c=0; c<60; c++)
{
PORTC = PORTC  & 0b00100000;
}
}
```

```
for(d=0; d<16633; d++);                    // 1.5 sec. delay

//**********************  Guys Head In Halloween Room *****************

for(d=0; d<600; d++)
{
for(c=0; c<60; c++)
{
PORTC = PORTC  | 0b00100100;
}
for(c=0; c<60; c++)
{
PORTC = PORTC  & 0b00100000;
}
}

for(d=0; d<600; d++)
{
for(c=0; c<60; c++)
{
PORTC = PORTC  | 0b00100100;
}
for(c=0; c<60; c++)
{
PORTC = PORTC  & 0b00100000;
}
}
```

```
for(d=0; d<16633; d++);                    // 1.5 sec. delay

//**********************  Light Off In Halloween Room *****************

PORTC = PORTC & 0b00000000;

for(d=0; d<16633; d++);                    // 1.5 sec. delay

//**********************  Blinds Closed In Halloween Room *************
//********************************** Hi-Tec ***************************

for(d=0; d<300; d++)
{
for(c=0; c<10; c++)
{
PORTB = PORTB  | 0b00000100;
}
for(c=0; c<110; c++)
{
PORTB = PORTB  & 0b00000000;
}
}

for(d=0; d<16633; d++);                    // 1.5 sec. delay

//**********************  Light On In Clown Room **********************

for(c=0; c<500; c++);
PORTC = PORTC | 0b00001000;
```

```
for(d=0; d<16633; d++);                    // 1.5 sec. delay

//**********************  Blinds Open in Clown Room ******************
//********************************** Hi-Tec ***************************

for(d=0; d<100; d++)
{
for(c=0; c<45; c++)
{
PORTB = PORTB  | 0b00001000;
}
for(c=0; c<75; c++)
{
PORTB = PORTB  & 0b00000000;
}
}

//**********************  Futaba for Carousel In Clown Room ***********

for(d=0; d<600; d++)
{
for(c=0; c<60; c++)
{
PORTA = PORTA  | 0b10000000;
}
for(c=0; c<60; c++)
{
PORTA = PORTA  & 0b00000000;
```

```
}
}

for(d=0; d<600; d++)
{
for(c=0; c<60; c++)
{
PORTA = PORTA  | 0b10000000;
}
for(c=0; c<60; c++)
{
PORTA = PORTA  & 0b00000000;
}
}

for(d=0; d<16633; d++);                    // 1.5 sec. delay


//*********************  Blinds Closed In Clown Room ****************
//********************************** Hi-Tec ***************************

for(d=0; d<100; d++)
{
for(c=0; c<10; c++)
{
PORTB = PORTB  | 0b00001000;
}
for(c=0; c<110; c++)
{
```

```
PORTB= PORTB  & 0b00000000;
}
}
//*********************  Light Off In Clown Room *********************

PORTC = PORTC & 0b00000000;

for(d=0; d<16633; d++);                    // 1.5 sec. delay


//*********************  Light On In Mirror Room *********************

for(c=0; c<500; c++);
PORTC = PORTC | 0b00010000;

for(d=0; d<16633; d++);                    // 1.5 sec. delay
//*********************  Blinds Open in Mirror Room ******************
//********************************** Hi-Tec ***************************

for(d=0; d<300; d++)
{
for(c=0; c<20; c++)
{
PORTA = PORTA  | 0b00001000;
}
for(c=0; c<100; c++)
{
PORTA = PORTA  & 0b00000000;
}
```

```
}

for(d=0; d<16633; d++);                    // 1.5 sec. delay
//*********************  PWM Piano In Mirror Room ******************
//******************************** Hi-Tec ****************************

for(j=0; j<3; j++)                         // Full Rotation
{
for(d=0; d<75; d++)
{
for(c=0; c<50; c++)
{
PORTA = PORTA  | 0b00010000;
}
for(c=0; c<70; c++)
{
PORTA= PORTA   & 0b00000000;
}
}

for(d=0; d<75; d++)
{
for(c=0; c<10; c++)
{
PORTA = PORTA  | 0b00010000;
}
for(c=0; c<110; c++)
{
PORTA= PORTA   & 0b00000000;
```

```
}
}
}

for(d=0; d<16633; d++);                    // 1.5 sec. delay

//*********************  Blinds Closed In Mirror Room ***************
//********************************** Hi-Tec ***************************

for(d=0; d<300; d++)
{
for(c=0; c<50; c++)
{
PORTA = PORTA  | 0b00001000;
}
for(c=0; c<70; c++)
{
PORTA = PORTA  & 0b00000000;
}
}

for(d=0; d<16633; d++);                    // 1.5 sec. delay

//*********************  Light Off In Mirror Room ******************

PORTC = PORTC & 0b00000000;


for(d=0; d<16633; d++);                    // 1.5 sec. delay
```

```
//**********************  Light On In Butcher Room ********************

PORTC = PORTC | 0b01000000;

for(d=0; d<16633; d++);                    // 1.5 sec. delay
//**********************  Blinds Open In Butcher Room *****************
//********************************** Hi-Tec ***************************

for(d=0; d<300; d++)
{
for(c=0; c<20; c++)
{
PORTA = PORTA  | 0b00000001;
}
for(c=0; c<100; c++)
{
PORTA = PORTA  & 0b00000000;
}
}
for(d=0; d<16633; d++);                    // 1.5 sec. delay
//****************************** Little Girl ***************************
//****************************** Futaba ********************************

for(j=0; j<3; j++)
{
for(d=0; d<45; d++)                        // move head 'right'
{
for(c=0; c<20; c++)
```

```
{
PORTB = PORTB  | 0b00000010;
}
for(c=0; c<100; c++)
{
PORTB = PORTB  & 0b00000000;
}
}
for(d=0; d<16633; d++);                    // 1.5 sec. delay
for(f=0; f<45; f++)                        // move head 'left'
{
for(c=0; c<10; c++)
{
PORTB = PORTB  | 0b00000010;
}
for(c=0; c<90; c++)
{
PORTB = PORTB  & 0b00000000;
}
}
for(d=0; d<16633; d++);                    // 1.5 sec. delay
}

//**********************  Light Off In Butcher Room ******************

PORTC = PORTC & 0b00000000;

for(d=0; d<16633; d++);                    // 1.5 sec. delay
```

```
//**********************  Blinds Closed In Butcher Room ***************
//********************************** Hi-Tec ****************************

for(d=0; d<100; d++)
{
for(c=0; c<10; c++)
{
PORTA = PORTA  | 0b00000001;
}
for(c=0; c<110; c++)
{
PORTA = PORTA  & 0b00000000;
}
}
for(d=0; d<16633; d++);                    // 1.5 sec. delay
//**********************  Play and Back Button On Audio ***************

PORTC = PORTC  | 0b00000001;               //Play/Pause
for(d=0; d<10000; d++);
PORTC = PORTC  & 0b00000000;
for(d=0; d<10000; d++);
PORTA = PORTA  | 0b00000100;               //Audio Back
for(d=0; d<10000; d++);
PORTA = PORTA  & 0b00000000;
for(d=0; d<30000; d++);

}
}
```