Code is separated into three sections:

i) Random numbers are generated and displayed on 4 different displays
ii) Numbers are entered into Keypad
iii) Correct code initiates servo sequence

Section i (random numbers are displayed on 4 different displays)

Arduino generates "code", a random number between 0000-9999
Digit 1 is displayed on *NixieTube1*:
1-5 second pause randomly (*pause1*)
Digit 2 is displayed on *NixieTube2*:
1-5 second pause randomly (*pause2*)
Digit 3 is displayed on *LEDmatrix*
1-5 second pause randomly (*pause3*)
Digit 4 is displayed by *Servo9* moving to one of ten preset positions.

Servo9 will move the hour hand on a miniature clock to point to a digit 0-9, so "Digit 4" will be displayed on a clock face.
The 10 servo positions are not known at this time, but you can use 0, 100, 200, 300…1000 in the code for now.

When *Servo9* is at desired position, *ClockLight* HIGH

Section ii- code numbers entered into keypad

5 second pause_(*pause4*)
Servo6 begins to move from position 0 to 500 at speed 100
2 second pause__(*pause5*)
Servo7 moves from position 0 to 500 at speed 100
When *Servo7* is at end position, proceed to next step
2 second pause__(*pause6*)
Servo8 begins to rotate from 0 to 500 at speed 100
BrickWarningDoor LED flashes at a rate of 4 flashes a second
DoorWarningSound is triggered whenever *BrickWarningDoor* is HIGH
2 second pause__(*pause7*)
BrickWarningDoor flashes at 12 flashes a second for 2 seconds
DoorWarningSound is triggered whenever *BrickWarningDoor* is HIGH

Servo 1 move from 500 to 955 at speed 60
Servo2 move from 500 to 45 at speed 60
Servo 3 move from 1000 to 460 at speed 71
Servo4 move from 0 to 540 at speed 71
KeypadDoorSound triggers

When Servo1-4 are at final position, proceed to next step.
2 second pause__(*pause8*)
KeypadGreen LEDs fades from 0 to *KeypadGreenPot* potentiometer position over 3 seconds
KeypadButtons fade from 0 to max over 3 seconds
TimerLED HIGH
KeypadYellow LEDs fade from max to 0 over a 4 second period
Servo5 begins to move from 0 to 500 at speed 100

When *Servo5* reaches end position, *BrickLightLED* HIGH

2 second pause (*pause9*)

Buttons 0-9, CLR, OK functions and button sounds enabled
Display HIGH display reads "----" (4 dashes)
ControlPanel LEDs HIGH
Timer ON will all bars illuminated green
Timer begins to tick down every 2 seconds

Notes about the timer bargraph

The bargraph has 24 bars
After every 8 bars the color of the bars change.

The first 8 bars—all bars green
BargraphSound triggers when bars 24-17 tick down

The middle 8 bars—all bars yellow
BargraphSound triggers when bars 16-9 tick down

The last 8 bars—all bars red
BargraphSoundRED triggers when bars 8-0 tick down

If 4 or less bars remain, BrickWarningFinger LED flashes (4 times a second) and WarningFingerSound is triggered when BrickWarningFinger LED is HIGH

Notes on the Keypad:

The Keypad is used to enter the 4 digits of the number randomly generated by the Arduino and displayed on Panel #1

All buttons have an LED inside them. Buttons 0-9 are all controlled together by a MOSFET called KeypadButtons . The KeypadCLR and KeypadOK buttons are controlled independently.

The Keypad functions like an ATM keypad. CLR button works like a backspace key, and OK enters the code.

When a number (0-9) is pressed in the keypad, that number is displayed on Display.

When a number button is pressed, KeypadButtonSound triggers
If the number entered is incorrect, , KeypadButtonSound triggers as well as KeypadButtonSoundWrong triggers.

If a number entered does not match that digit of the randomly generated number, The KeypadCLR LED will flash (4 times a second) until correct number is entered.

The CLR (clear) button functions as a backspace key, erasing the last entered digit.

There is an 8 LED light bar that illuminates a green or a red light depending if the code digit is correct

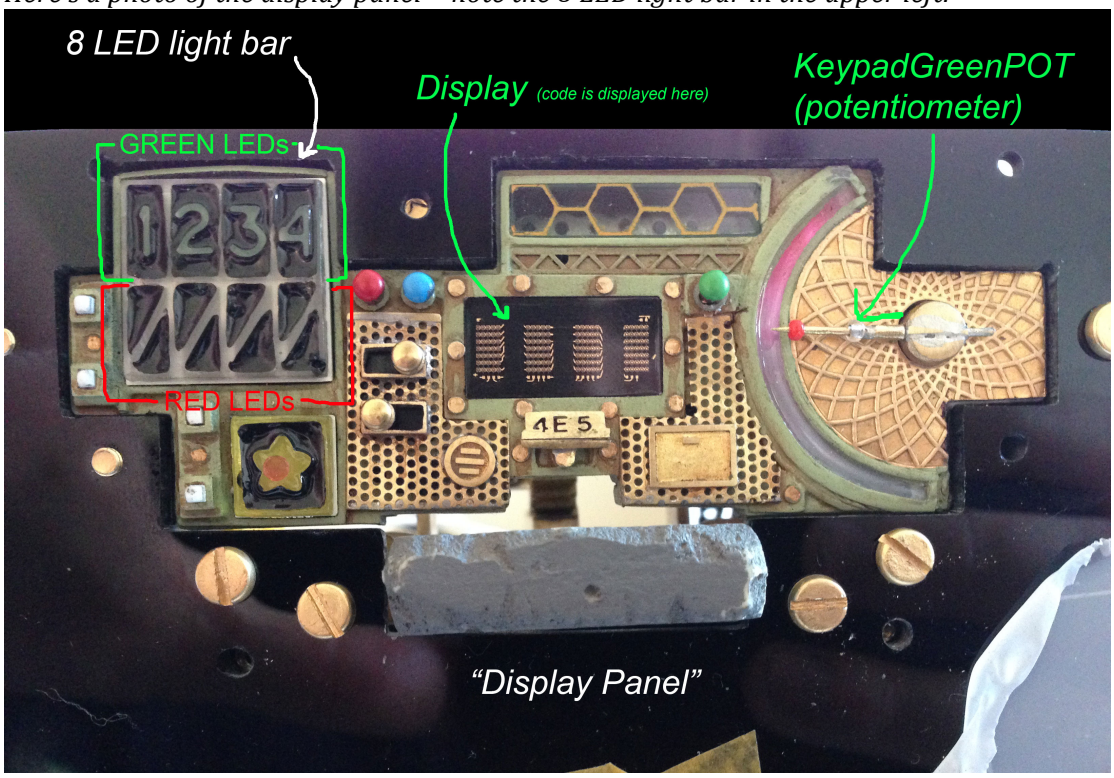
If the number matches that digit of the randomly generated number, a corresponding LED will be illuminated in the display panel. The LEDs are called:
1) *PINdigit1correct*
2) *PINdigit2correct*

3) *PINdigit3correct*
4) *PINdigit4correct*

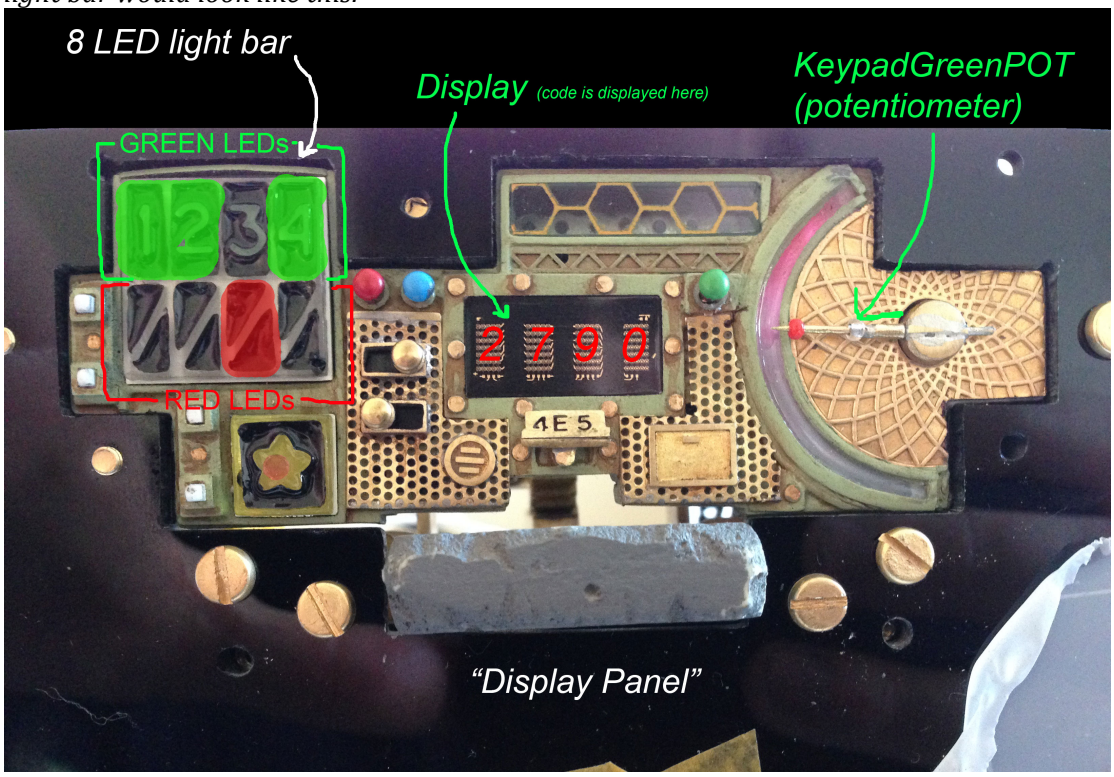
If the number entered does not match the digit of the randomly generated number, a red LED is illuminated in the panel. These LEDs are called:

5) *PINdigit1wrong*
6) *PINdigit2wrong*
7) *PINdigit3wrong*
8) *PINdigit4wrong*

Here's a photo of the display panel—note the 8 LED light bar in the upper left:



*For example, if a code was entered but the **third** digit is incorrect the 8 LED light bar would look like this:*



*The CLR (backspace) button erases the last entered digit **as well as** turns off the corresponding LED in the 8 LED light bar.*

After a 4 digits are entered into Display, the KeypadOK LED flashes (8 times a second)

After the OKbutton is pressed, the KeypadOK goes HIGH (always on)
OKButtonSound triggers when OK button pressed.

If the 4-digit code entered does **not** match the randomly generated code after the OKbutton is pressed, **or** if a correct code is not entered before the 48 second timer runs out:

--WRONG CODE SEQUENCE--

_____1 second pause_*(pause 10)*_____

BadPinSound triggers
Timer OFF
TimerSound OFF
ControlPanel LOW
Display LOW
All "PinDigit" LEDs LOW
All button functions and button sounds disabled
KeypadCLR LOW
KeypadOK LOW

_____1 second pause__*(pause 11)*_____

Servo6 moves from position 500 → 0 at speed 100
BrickLamp LOW

KeypadGreen LED start to fade from pot position to 0 over 3 seconds
KeypadButtons LED start to fade from max to 0 over 3 seconds
_____2 second pause___*(pause 12)*_____
KeypadYellow LEDs start to fade from 0 to max over 5 seconds
Servo5 starts to move from 500 to 0 at speed 100
BrickWarningFinger starts flashing 5 times a second
BrickWarningFingerSound triggers when *BrickWarningFinger* is HIGH
_____2 second pause___*(pause 13)*_____
Servo 1 move from 955 to 500 at speed 60
Servo2 move from 45 to 500 at speed 60
Servo 3 move from 460 to 1000 at speed 71
Servo4 move from 540 to 0 at speed 71
KeypadDoorSound triggers

When servos reach end position, move to next step
_____2 second pause___*(pause 14)*_____
BrickWarningFinger LED LOW
TimerLED LOW
Servo8 starts to move from position 500 to 0 at speed 100
_____

When Servo8 reaches position A:
Servo7 starts to move from position 500 to 0 at speed 100
_____1-15 second pause randomly___*(pause 15)*_____
Nixie1 display LOW
_____1-15 second pause randomly___*(pause 16)*_____
Nixie2 display LOW
_____1-15 second pause randomly___*(pause 17)*_____
LEDmatrix LOW
_____1-15 second pause randomly___*(pause 18)*_____
ClockLight LOW
_____
Begin section **i** of the sequence again in 9-14 mins
During this 9-14 minute pause *Servo9* (the clock) moves back and forth between position 0 and position 1024 at speed 10 until it's ordered to go to a set position in section i.
--End wrong code sequence—

Section iii) --Correct Code sequence--
_____

If the 4-digit code entered **<u>does</u>** match the randomly generated code after the OK button is pressed:
Timer OFF
TimerSound OFF
_____1 second pause___*(pause 19)*_____
GoodPINSound trigger
ControlPanel LEDs LOW
Display LOW
All "PinDigit" LEDs LOW
All button functions and button sounds disabled
KeypadCLR LED LOW
KeypadOK LEDLOW
_____1 second pause___*(pause 20)*_____
BrickLamp LOW
KeypadGreen start fading from pot position to 0 over 3 seconds

KeypadButtons start fading from max to 0 over 5 seconds
PowerCrystal LED HIGH and begins random fading sequence.
-The same code can be used as "*RedCrystal*" fading in last project
PowerCrystalSound trigger
- This is an ambient humming sound that will run until section iii is over

_____1 second pause__*(pause 21)*_____

TimerLED LOW
Servo6 starts to move from 500 to 0 at a speed 100
Servo5 starts to move from 500 to 0 at a speed 100

Servos 10, 11, and *12* initiate a sequence where they lift some metal bars and the bars extend horizontally, making a bridge between two windows on the wall, and revealing miniature painting in an alcove.
- I'll have the details of this part of the sequence in a few weeks when I construct the mechanism that moves the bars.

After servos 10, 11, 12 reach their final position,
PowerCrystalSound OFF
PowerCrystal LED OFF

_____1 second pause__*(pause 22)*_____

Servo13 moves from position 0 to position 500 at speed 100
When *Servo13* is at final position, *PaintingLight* HIGH

_____1-15 second pause randomly__*(pause 23)*_____

Nixie1 display LOW

_____1-15 second pause randomly__*(pause 24)*_____

Nixie2 display LOW

_____1-15 second pause randomly__*(pause 25)*_____

LEDmatrix LOW

_____1-15 second pause randomly__*(pause 26)*_____

ClockLight LOW

_____20-45 second pause randomly__*(pause 27)*_____

BrickWarningFinger LED starts flashing 5 times a second
BrickWarningFingerSound triggers when *BrickWarningFinger* is HIGH
Servo 1 move from 955 to 500 at speed 60
Servo2 move from 45 to 500 at speed 60
Servo 3 move from 460 to 1000 at speed 71
Servo4 move from 540 to 0 at speed 71
KeypadDoorSound triggers
When servos reach end position,

Pause 1 second__*(pause 28)*_____
BrickWarningFinger LED LOW
Servo8 moves from 500-0 at speed 100
When *Servo8* is at position A, *Servo7* moves from 500-0 at speed 100

BrickWarningFinger LED LOW
KeypadYellow LEDs start to fade from 0 to max over 10 seconds

_____3-6 minute pause randomly__*(pause 29)*_____

(These 5 random pauses should happened concurrently)

PaintingLight LOW
Servo13 moves from 500 to 0 at speed 100
When servo13 is at start position:

-*Servos 10, 11, 12* *move bars down over painting*

Begin section i of the code again in 9-14 mins
During this 9-14 minute pause *Servo9* (the clock) moves back and forth between position 0 and position 1024 at speed 10 until it's ordered to go to a set position in section i.
--End correct code sequence—

NOTE: There are three buttons on the Keypad that are used to trigger a sound effect, They are called:
Button1
Button2
Button3

When these button1 is pressed, they will trigger *Button1Sound* and light up *ButtonLED1*.

Here's a photo of the three buttons and LEDs