Smart Aquarium

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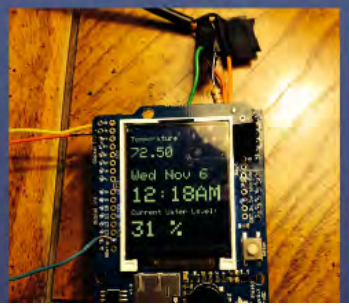
Overview

Existing Components

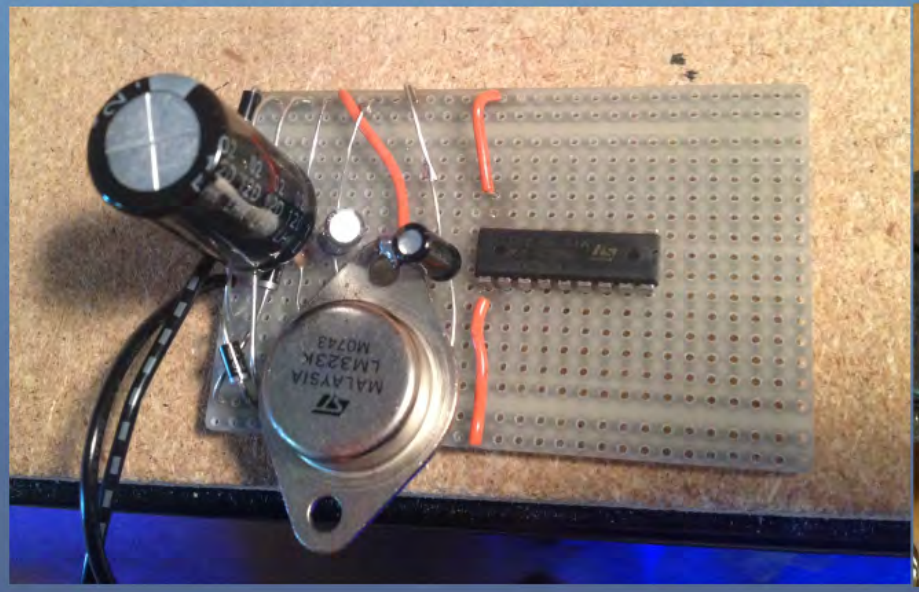
- -Arduino with Ethernet Shield
- -External power supply
- -Relays powered through ULN2803 drivers
- -LED lighting system
- -Servo motor feeding system
- -Sump pump

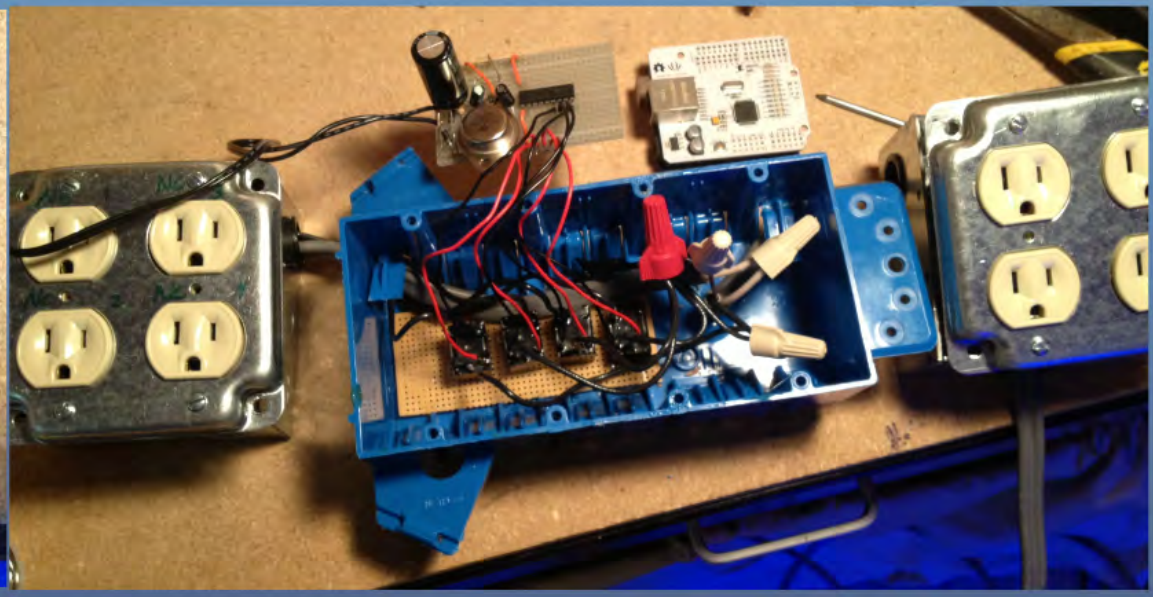
New features for EENG 383 Project

- -Second Arduino
- -LCD display screen with joystick button
- -Infrared Distance Sensor
- -Waterproof Temperature IC



view





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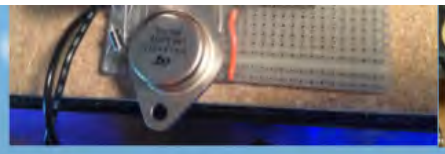

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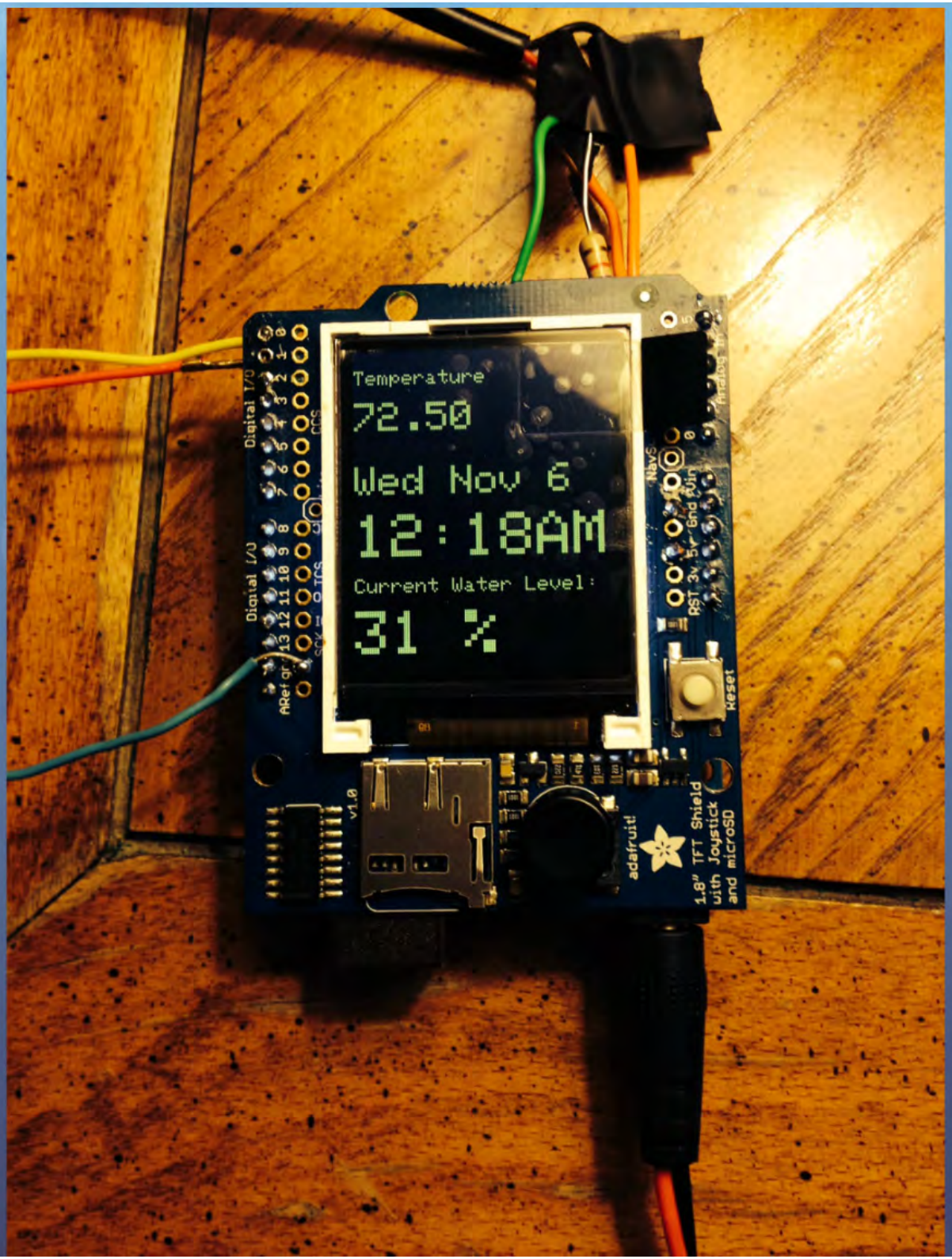
-LCD display screen with joystick button
-Infrared Distance Sensor
-Waterproof Temperature IC


Temperature
72.50
Wed Nov 6
12:18AM
Current Water Level:
31 %
Digital I/O
Reset
1.8" TFT Shield
with Joystick
and microSD
adafruit!
V1.0

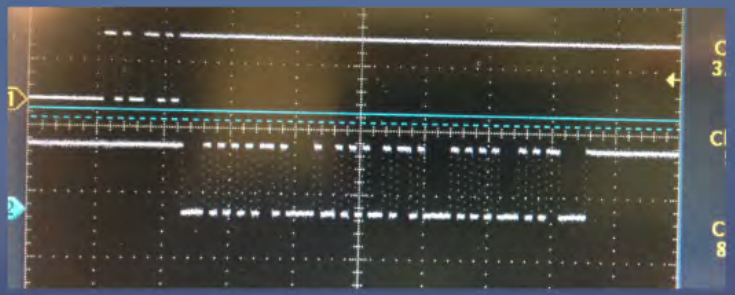
Communications

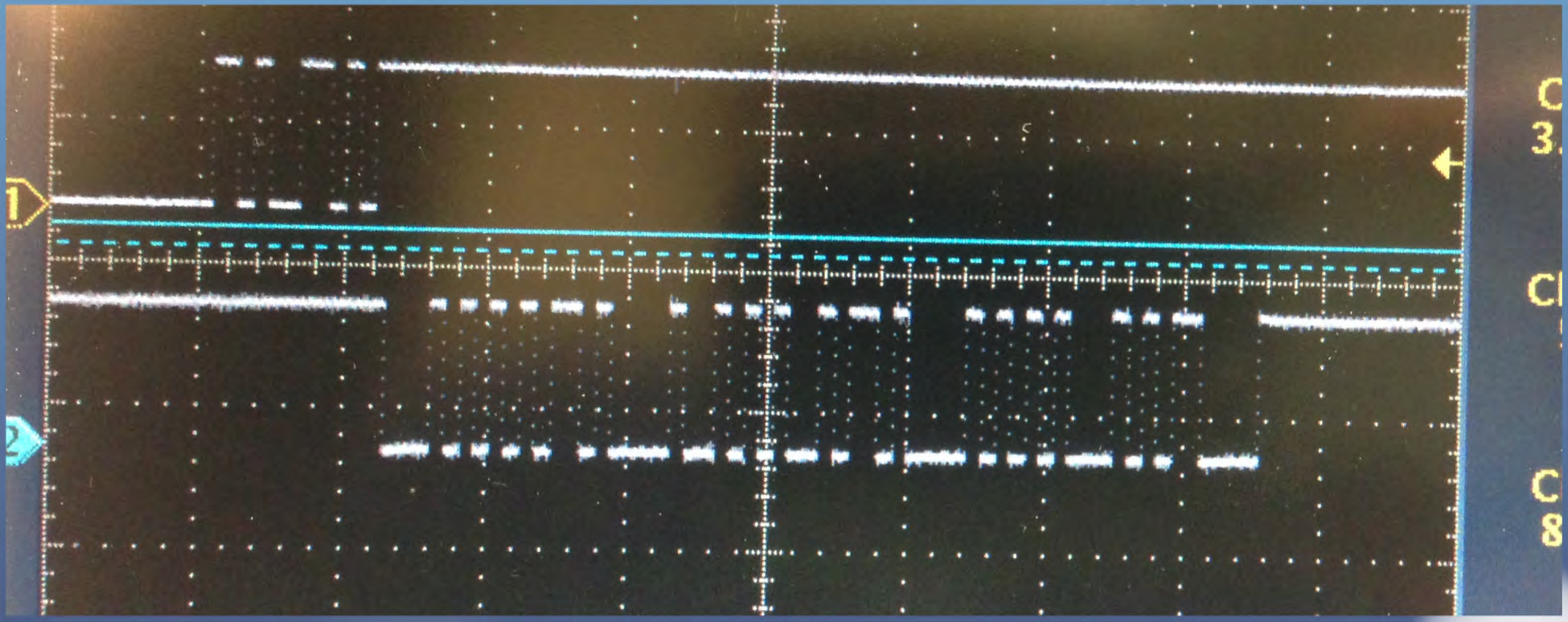
Temperature IC
- -One Wire Communications Protocol
- -Use Arduino library OneWire

IR distance sensor
- -Analog voltage reading

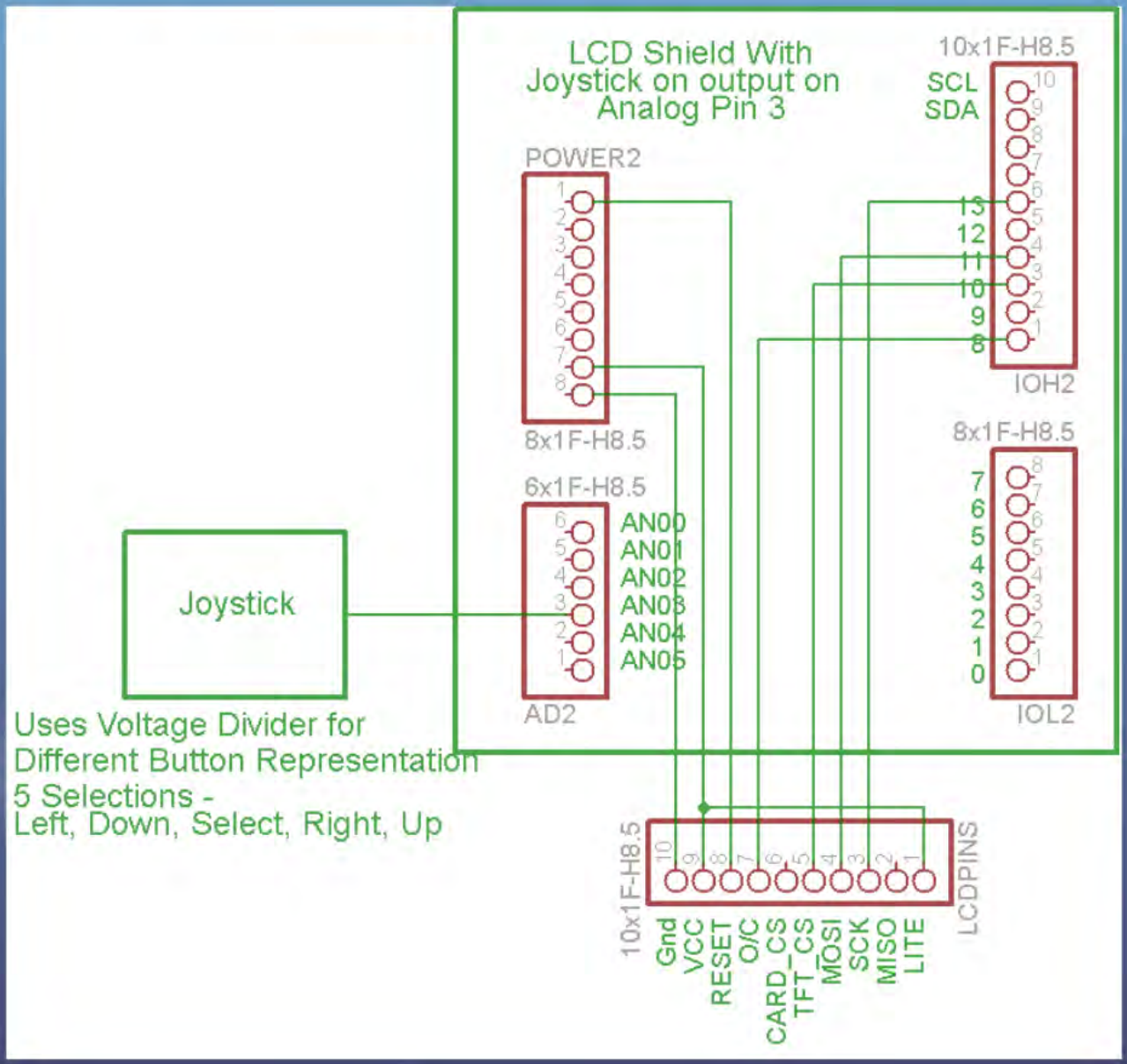
Joystick
- -Voltage Divider for 5 separate signals using analog pin

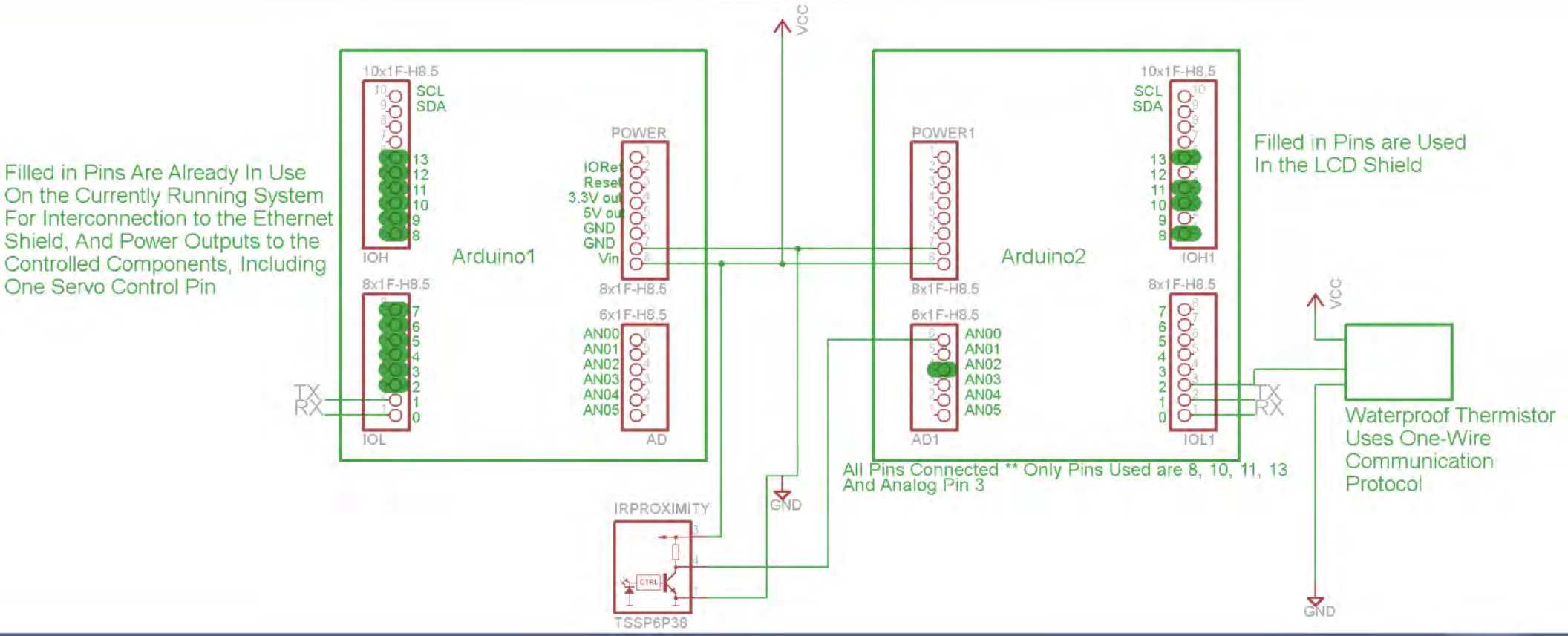
Arduinos
- -Serial Communications (RS232)
- -"Handshake" method




1
2

Schematics


LCD Shield With
Joystick on output on
Analog Pin 3
POWER2
8x1F-H8.5
6x1F-H8.5
AN00
AN01
AN02
AN03
AN04
AN05
AD2
10x1F-H8.5
SCL
SDA
13
12
11
10
9
8
IOH2
8x1F-H8.5
7
6
5
4
3
2
1
0
IOL2
Joystick
Uses Voltage Divider for
Different Button Representation
5 Selections -
Left, Down, Select, Right, Up
10x1F-H8.5
Gnd
VCC
RESET
O/C
CARD_CS
TFT_CS
MOSI
SCK
MISO
LITE
LCDPINS


Filled in Pins Are Already In Use
On the Currently Running System
For Interconnection to the Ethernet
Shield, And Power Outputs to the
Controlled Components, Including
One Servo Control Pin
10x1F-H8.5
SCL
SDA
13
12
11
10
9
8
IOH
Arduino1
8x1F-H8.5
7
6
5
4
3
2
1
0
IOL
TX
RX
POWER
IORef
Reset
3.3V out
5V out
GND
GND
Vin
8x1F-H8.5
6x1F-H8.5
AN00
AN01
AN02
AN03
AN04
AN05
AD
VCC
GND
IRPROXIMITY
CTRL
TSSP6P38
POWER1
Arduino2
8x1F-H8.5
6x1F-H8.5
AN00
AN01
AN02
AN03
AN04
AN05
AD1
10x1F-H8.5
SCL
SDA
13
12
11
10
9
8
IOH1
8x1F-H8.5
7
6
5
4
3
2
1
0
IOL1
TX
RX
Filled in Pins are Used
In the LCD Shield
All Pins Connected ** Only Pins Used are 8, 10, 11, 13
And Analog Pin 3
VCC
GND
Waterproof Thermistor
Uses One-Wire
Communication
Protocol

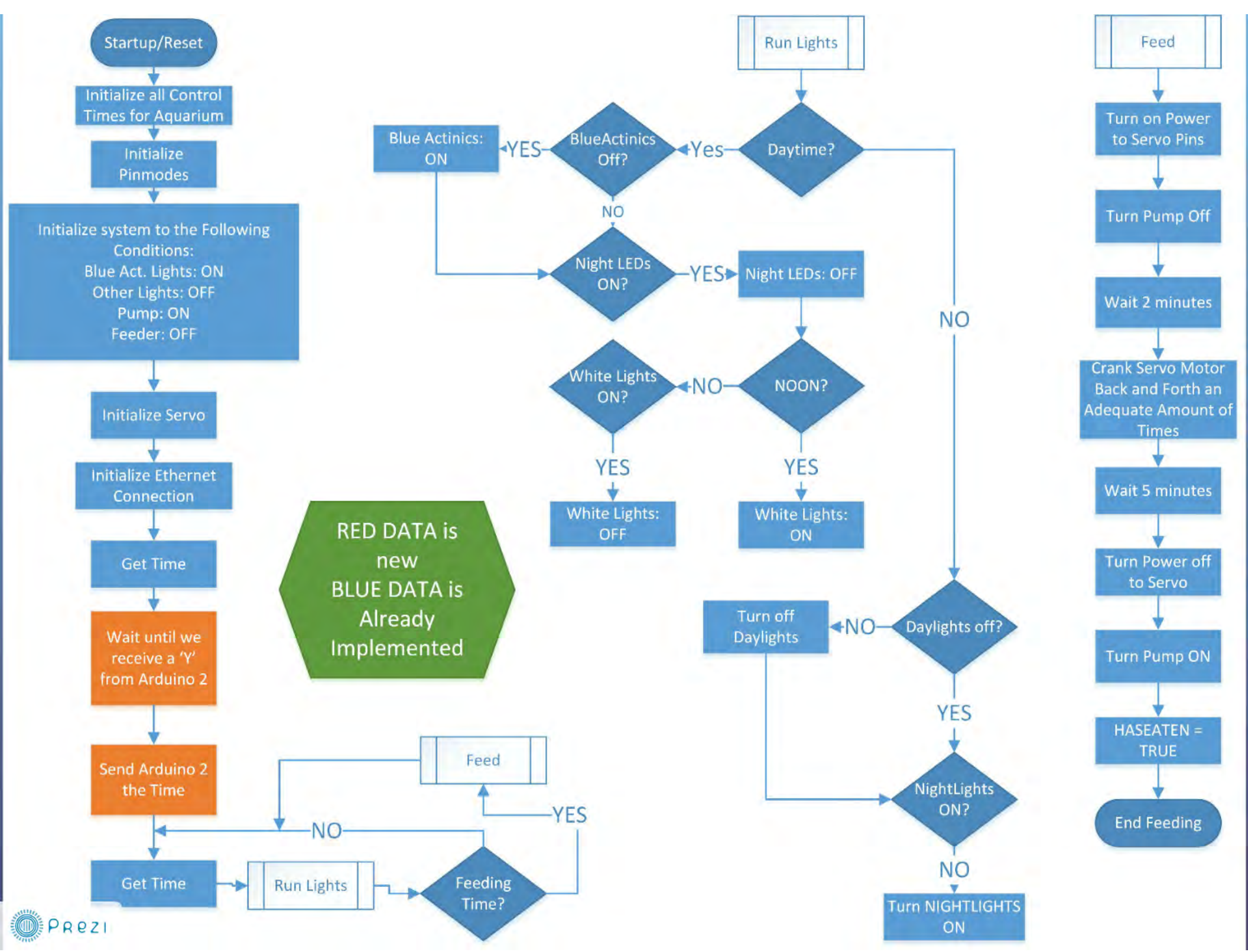
Code Flow

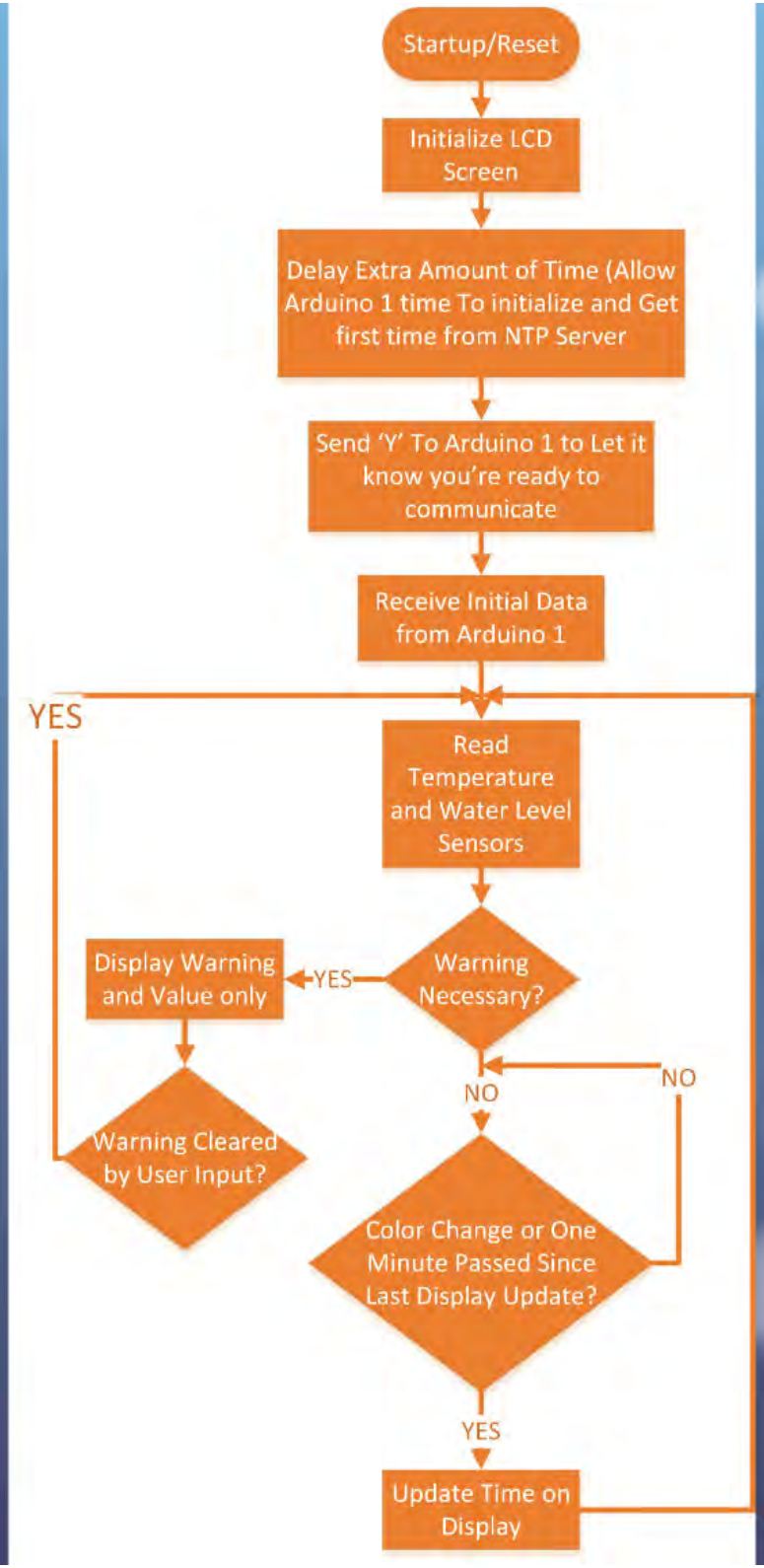
Overview

- Arduino 1
  - Controls power to components
  - Uses Ethernet Shield to get time (NTP server)
  - Sends time to Arduino 2 on Startup
- Arduino 2
  - Initialize LCD screen
  - Waits for time data from Arduino 1
  - Reads sensor data
  - Writes to LCD screen
  - Uses state machine to read sensors and update the screen every one minute

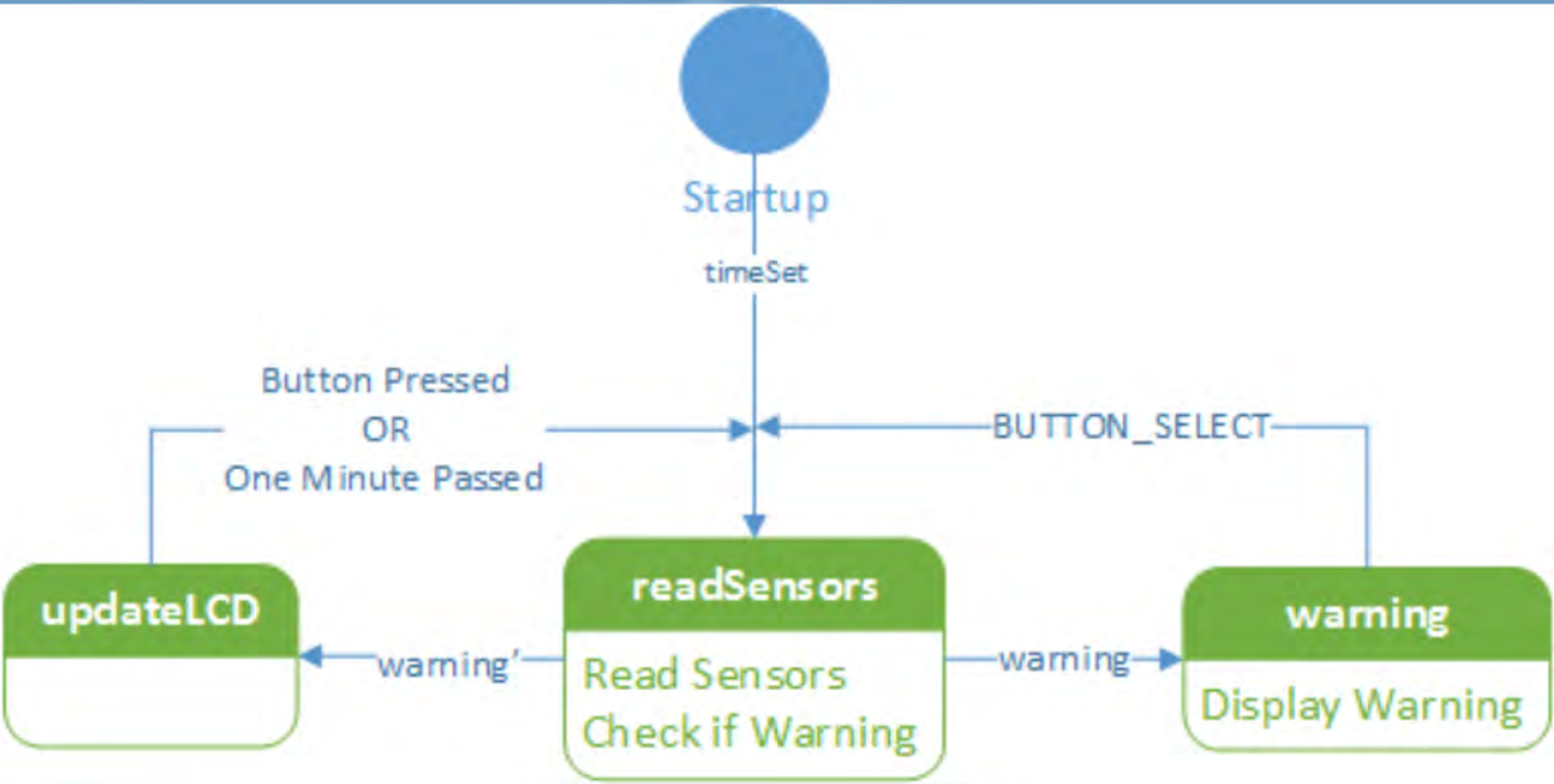
Arduino 1

Arduino 2


Startup/Reset
Initialize all Control Times for Aquarium
Initialize Pinmodes
Initialize system to the Following Conditions:
Blue Act. Lights: ON
Other Lights: OFF
Pump: ON
Feeder: OFF
Initialize Servo
Initialize Ethernet Connection
Get Time
Wait until we receive a 'Y' from Arduino 2
Send Arduino 2 the Time
Get Time
Run Lights
Feeding Time?
NO
YES
Feed
RED DATA is new
BLUE DATA is Already Implemented
Run Lights
Daytime?
Yes
BlueActinics Off?
YES
Blue Actinics: ON
NO
Night LEDs ON?
YES
Night LEDs: OFF
NOON?
NO
White Lights ON?
YES
White Lights: OFF
YES
White Lights: ON
NO
Daylights off?
NO
Turn off Daylights
YES
NightLights ON?
NO
Turn NIGHTLIGHTS ON
Feed
Turn on Power to Servo Pins
Turn Pump Off
Wait 2 minutes
Crank Servo Motor Back and Forth an Adequate Amount of Times
Wait 5 minutes
Turn Power off to Servo
Turn Pump ON
HASEATEN = TRUE
End Feeding


Startup/Reset
Initialize LCD Screen
Delay Extra Amount of Time (Allow Arduino 1 time To initialize and Get first time from NTP Server
Send 'Y' To Arduino 1 to Let it know you're ready to communicate
Receive Initial Data from Arduino 1
YES
Read Temperature and Water Level Sensors
Warning Necessary?
YES
Display Warning and Value only
Warning Cleared by User Input?
NO
NO
Color Change or One Minute Passed Since Last Display Update?
YES
Update Time on Display

State Machine



Conclusions

Arduino Libraries

- -Helpful for quick high level coding
- -More difficult to fine tune
  - -May have to scour the header/cpp files to determine how specific functions work

Oscilloscopes can be extremely helpful in troubleshooting

Questions??