**Lighting**

// Deals with lighting features. Controls up to 7 LED strings of 7 different colors. Works to simulate a natural day cycle as well as give the user the power to add certain ambiance to aqua-scape.

**Day Cycles**

// Works in 10 phases:  
 - **Dawn, Sunrise, Morning, Midday, Afternoon, Evening, Dusk, Sunset, Midnight, Darkness**// At the beginning of each phase, each LED string is given a luminosity goal to reach within the duration of that phase. Once the LED string reaches its goal, it remains there until the end of the phase.

**Weather**

// Used to simulate natural weather conditions. Weather conditions will be determined every 30min with each weather condition having a certain percentage of occurring depending on lighting condition for the day. This will be determined by reading the **PAR** accumulative reading for the day.// 4 Stages of Weather:  
 **- Clear, Cloudy, Rainy, Thunderstorm**

**Clear**  - Lighting remains normal. Continues through phase changes with no variation.

**Cloudy** - Lighting dims periodically throughout the weather phase as to simulate clouds moving overhead. It holds the LED string’s goal for the duration of the cloud and gives it back with a new time span at the end of the cloud.

**Rainy** - Coordinate with hardware for possible rain feature and speakers

**Thunderstorm** - Same as rainy with periodic flashes from Amber LEDs

**Custom Color**

// Allows user to determine hue for each phase or set a temporary hue for the duration of a phase or time period. Need to coordinate with GUI as far as user friendly input.

- Allow for hue input for each phase  
 - Allow for temporary hue  
 - Dim to each change or dim return to original hue  
 - Determine phase times?

**Dosing**

**Alkalinity**

// Used directly to buffer pH

**Dosing Timer**

// Set by user based on preference. Will dose a user defined amount at a certain time daily, weekly, or monthly.

**Dosing Trigger**

// Determined by the AI in accordance with the pH reading. Will does a small amount periodically until stable conditions are reached.

**Custom Dosing**

// Allows user to does a user defined amount one time. AI will alert user if this is not advised.

**Magnesium**

// Used to promote coral growth

**Dosing Timer**

// Set by user based on preference. Will dose a user defined amount at a certain time daily, weekly, or monthly.

**Dosing Trigger**

// Determined by the AI based off a recommended schedule or by user defined schedule and by a connection made and approved by the user when dosing.

**Custom Dosing**

// Allows user to does a user defined amount one time. AI will alert user if supplement has already been applied recently.

**Calcium**

// Used to promote coral growth

**Dosing Timer**

// Set by user based on preference. Will dose a user defined amount at a certain time daily, weekly, or monthly.

**Dosing Trigger**

// Determined by the AI based off a recommended schedule or by user defined schedule and by a connection made and approved by the user when dosing.

**Custom Dosing**

// Allows user to does a user defined amount one time. AI will alert user if supplement has already been applied recently.

**Strontium**

// Used to promote coral growth

**Dosing Timer**

// Set by user based on preference. Will dose a user defined amount at a certain time daily, weekly, or monthly.

**Dosing Trigger**

// Determined by the AI based off a recommended schedule or by user defined schedule and by a connection made and approved by the user when dosing.

**Custom Dosing**

// Allows user to does a user defined amount one time. AI will alert user if supplement has already been applied recently.

**Fresh Water**

**Fill Trigger**

// Trigger alarm that water level is low or trigger an outlet for a pump to add water. Possible trigger rain or thunderstorm?

**Calibrate**

**Calibrate Dosing Pumps**

// Walk user through dosing certain amount of supplement based on how long it takes to pump that amount. Calibrate for each supplement based off cheaper pumps. Recommend recalibration periodically through alert.

**Power**

**Assigned Outlets**

// Set specifically to perform certain functions. Outlets are controlled by AI. Override switch can turn system permanently on or off

**- Powerhead**  
// Used to create waves. **- Powerhead**// Used to create waves. **- Refugium Light**// Trigger sump/refugium light based on phases. Possible user defined times? Needs override trigger for night time work. **- Fresh Water Pump**// Triggered by float switch or Sal probe. Adds fresh water to the tank to keep water level up.

**Outlet Timer**

// User defined timer to turn device on and off when desired.

**Outlet Trigger**

// Requires user to define outlet usage. Triggered by AI based on user approved connection to events.

**Custom Outlet**

// Override to allow user to turn on/off a device temporarily or permanently.

**Types of Timers**

**- Frequency**

// How many seconds until the outlet changes state: 1-13 seconds.

**- Float Trigger**

// Turns on when the float switch is triggered that the water is low, turns off when the water is normal.

**- PH Trigger**

// Turns on for a duration when PH hits a certain value. Requires wait duration, based off a day?

**-Sal Trigger**

// Turns on for a duration when Sal hits a certain value. Requires wait duration, based off a day?

**- DO Trigger**

// Turns on for a duration when DO hits a certain value. Requires wait duration, based off a day?

**- ORP Trigger**

// Turns on for a duration when DO hits a certain value. Requires wait duration, based off a day?

**- Phase Trigger**

// Turns on during selected phases.

**- Time Trigger Duration**

// Turns on at a certain time for given duration.

**- Weekly Trigger Duration**

// Turns on on a certain day at a certain time for a given duration.

**- Monthly Trigger Duration**

// Turns on on a certain month on a certain day at a certain time for a given duration.

**Quality**

**Reading pH**

// Saves current reading to variable. Used in determining triggers for AI.

**Reading DO**

// Saves current reading to variable. Used in determining triggers for AI.

**Reading ORP**

// Saves current reading to variable. Used in determining triggers for AI.

**Reading Sal**

// Saves current reading to variable. Used in determining triggers for AI.

**Reading PAR**

// Used to set lighting level as to not burn the coral. Saves current reading to variable. Used in determining triggers for AI. May not be able to be used continuously, may have to adjust functionality.

**Reading Water Level**

// Read water float switch to determine when to add water to the tank. Simple true/false trigger.

**Set Triggers**

// Coordinates with AI to suggest connections and set triggers for other functions.

**Recording**

**Saving Logs**

// Record quality levels, dosing actions, and weather for the day and save them temporarily on the SD card until it can be uploaded to a server.

**Loading Logs**

// Ability to pull logs from the SD card as well as the server and view them for personal need.

**Uploading Logs**

// Able to upload logs to an online server via wifi connection.

**Deleting Logs**

// Allow user to delete older logs as well as delete older logs based on SD card storage.

**AI**

**Connections**

// Creates an array of a connections between functions and readings. Used to determine when a specific action effects a reading in the tank. Connection will have 4 stages: **Noted, Probable, Decidable,** and **Confirmed.** A **Noted** connection is a recognized connection that has occurred 1-3 times within a certain timespan. The connection will return to 0 if it does not reoccur. Trial timespan will restart every time the connection occurs. A **Noted** connection will become a **Probable** connection if it occurs 4-7 times. It can be visible by the user, but no actions are taken on it yet. A connection becomes **Decidable** if it occurs 8 or more times. At this point, the user will be prompted to take note of the connection and allow the controller to act upon it or not.

**Alert Alarm**

// Controller has both LED and audible alarm. Certain situations will be assigned certain alarm types and will sound or flash accordingly.

**Time**

// Everything will be run off the current time. Time will be tracked by the DS3234 RTC chip and used to determine current time of day and timing for functions and devices.

**GUI**

**Home**

// Needs to show basic current information and links to control functions.

**Lighting**

// Needs to display current LED status preferably by color. Include links to set hue target for each phase.

**Dosing**

// Needs to display each doser’s current status and when the next dose is scheduled for if at all. Include links to set schedule for each pump and one time turn on for each pump.

**Quality**

// Displays all current information coming from the connected probes. Possibly include updating charts?

**Power**

// Displays current status for each outlet and type of timer set for it. Includes links to schedule each timer, one time turn on, and on/off for each outlet.

**Logs**

//Displays most recent average log. Include links to more details and past logs and option to upload to online server.

**Settings**

// Set general settings for GUI layout, AI controls, Time, and WiFi options