# Firmware ToDo

## High Priority

1. Messaging Bug
   1. Where to begin?
2. Improve global variable locking
   1. Semaphore?
   2. Mutex?
   3. Make a list that keeps track of all ISR routines and ISR subroutines and what global variables they touch
      1. **Use functions to access affected variables that contain necessary interrupt disable handling**
      2. Continue to just enclose all affected variables with interrupt disabling

## Medium Priority

1. Recheck/update function\_headers.h for continuing organization
2. Clean up antiquated functions
3. Better/cleaner implementation of handling ‘idle’ time
   1. Lower Power
4. Re-examine “no-spin” and “de-coupling” situations/recovery as they were sort of hacked on
5. Re-think EEPROM variables (ones stored there for updating on the fly)
6. Re-examine shutdown cause handling
7. Re-examine shutdown initiation
8. Be able to close/open valve without calibration
9. Implement sleep/wake-up during no-network situations
   1. Emphasis on low-power as searching is power intensive
   2. A flow-chart for program flow during these times would probably be helpful

## Low Priority

1. Re-organize globals into a single or multiple structs
2. Write up document on how to add/modify firmware
   1. Include the general organization of firmware
3. Add health-check for valve motor
   1. Use ADC to check current draw during calibration or during boot somehow?
      1. Obviously done somewhere near the middle of the valve movement
4. Add health-check for system (FSR)
   1. Already written, needs to be tested/handled by labview
   2. When to do it?
   3. What to do with it?
5. Re-inspect WDT consequences
6. Add GPS stuff/position
7. Re-examine control loop algorithm
   1. Cleanup/make a little clearer
   2. Make sure idle state is dealt with properly

# Hardware Considerations

## High Priority

1. GPS Selection
   1. Antenna problem
      1. Very difficult to know what the ground plan requirements
      2. Maybe move to GPS chip with a more integrated antenna?
   2. Battery power usage
      1. 10-20mA every so often :-/
      2. Perhaps use a magnetic sensor
2. Motor Driver Circuit
   1. New power supply
      1. Ensure DAC sensitivity
         1. For being able to trigger ISR
      2. Ensure ADC sensitivity
         1. For checking wear of motor and such
   2. A3901 replacement
      1. Not completely necessary, but certainly a weak point
3. 1541 replacement
   1. MAX951/953
      1. Lower accuracy in 1.2V reference
         1. Worse Vgen/Vbatt measurement
            1. Probably doesn’t matter too much (adjust min-battery, max-battery for shutdown/chargin)
         2. Higher speed overall
         3. Drop-in replacement
   2. Re-examine the gain/circuit overall

## Medium Priority

1. Add Piezo element to aid in network pairing and debugging
2. Pressure sensing
   1. Have some way to know if pipe pressure is stable
   2. Add some hardware options for future transducers
      1. Good ADC?
3. Water-flow calculation
   1. Some way to know individual sprinkler water flow
      1. Pipe pressure every once in a while w/ interpolation auto-reported back w/ hardware bitflag and valve report or something

## Low Priority