Energy360.ino

The following are the runtime additions

1. Energy360 Main Circuit Board
   The sketch has been updated to fully support the Energy360 main circuit board. H-Bridge motor support has been removed, and the sketch now exclusively supports **Sabertooth motor controllers**.
   Additional information about the Energy360 boards is available at:
   www.energy360.ca

2. Wind Control Support
   Added support for **4-wire PWM cooling fans** operating at 25 kHz (frequency adjustable at compile time).

   - Connect both fans to +12 V and Ground
   - Connect PWM control lines to **Fan1** and **Fan2** on the wind connector

   The following control commands are supported:

   - Sxxx – sets both fans
   - Lxxx – left fan only
   - Rxxx – right fan only
     (where xxx ranges from 0 to 999)

   A compile-time option allows a **default fan speed at power-up**, useful for continuous cooling during gameplay if your not using wind.

3. Capacitor Bank Charging and Control
   Added controlled soft-start charging for an external capacitor bank to limit inrush current when capacitors are fully discharged.

   - The sketch monitors capacitor voltage during charge
   - The capacitor bank is automatically switched in once charged

   Note:
   Capacitor banks may not be required when using the L1100A-S0 server power supply.
   For non-server-class power supplies, the use of a capacitor bank is recommended.

4. Improved accuracy of the position sensor reading
   Position sensor readings are now averaged to improve accuracy and reduce noise caused by ADC quantization and potentiometer jitter.

   - Improves stability and smoothness of motion
   - Particularly beneficial when using lower-accuracy potentiometers

   Notes:
   Recommended sensor: 0.5% accuracy, 360-degree Hall-effect sensor.
   Significant improvement for users running >1% accuracy or resistive potentiometers

5. Controlled Shutdown and Return to Neutral
   If a motor reaches the maximum cutoff limit configured in SMC3Utils, the sketch initiates a controlled shutdown sequence:

   - The rig is smoothly returned to the neutral position
   - Motors are disabled after reaching neutral

   This behavior is especially valuable during setup and tuning, helping prevent mechanical over-travel, binding, or damage.

The following are bug fixes

6. Upper limit cutoff only worked for HBridge motors
   Remember that annoying problem where the motor turns 360 degrees or exceeds the max limit and keeps going? Well that was a bug in the code where Sabertooth motors where not shutdown properly and kept running. This is now supported to shutdown Sabertooth motors when the upper limit is exceeded

   Note:
   With this fix we will no longer need the mechanical stops !!

The following are initial setup improvements

7. Position Sensor Mid-Point Setup

   A compile-time option allows raw position sensor values to be output to the Arduino Serial Monitor.

   This feature assists during initial rig setup by enabling precise adjustment of the sensor midpoint to match the simulator's neutral position.

Historically, this process relied solely on SMC3Utils; Energy360 now provides direct visibility of raw sensor values for improved accuracy during configuration.