**AFR-1000 Initial Product Specification**

***OVERVIEW***

The AFR-1000 is meant to be a rapidly developed, stop-gap solution to Altronic’s aging line of AFR controls. The AFR-1000 is intended primarily for use on stoichiometric engines equipped with NSCR catalysts. The AFR-1000 is intended for stand-alone operation on engine, but potentially can be integrated with the DE-4000 system via Ethernet/RS-485 communications, likely over the MODBUS protocol.

The AFR-1000 is based on OSH (open-source hardware) primarily around the ATSAMD51P20A ARM Cortex-M4 microcontroller. The system will be able to utilize typical EGO or HEGO sensors, but more commonly would be used with WEGO sensors like the Bosch LSU4.9. Typical output would be a 4-20mA or 0-5V signal to control either an Altronic stepper motor based valve (via SMC board) or an AGV-1/AGV-5 type valve.

***INPUTS, OUTPUTS, & COMMUNICATIONS***

4 x 0-5V/4-20mA Sensor (bias control)

2 x EGO/HEGO Sensor

2 x WEGO Sensor

6 x J/K Type Thermocouple

2 x Discrete Input (active low)

1 x MPU Input

2 x Low-Current H-Bridge Outputs (AFR)

1 x High-Current H-Bridge Output (Governor)

2 – 4 x 0-5V/4-20mA Outputs

8 x Low-Side FETs

1 x USB to Serial (Configuration)

1 x RS-485 (selectable node)

1 x Ethernet (selectable node/protocol)