Velomobile Interface Control Document

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# INTRODUCTION

This Interface Control Document (ICD) describes the relationship between the Arduino Embedded Computer (source system) and the Electric Motor Controller (target system).

## PROJECT OVERVIEW

This document outlines the communication between the motor controller and the embedded processor.

## PURPOSE & SCOPE

The velomobile will be capable of operating under a power assist electric motor. This electric motor will be controlled directly by a motor controller and indirectly by an embedded processor.

## DOCUMENT CHANGE MANAGEMENT

If this document undergoes changes by its reader, the document name will be updated to a new version number and posted to any users involved with its content.

# INTERFACE OVERVIEW

This interface will control the motors usage. The control signals sent to the electric motor controller will react in a way to perform the change requested by that signal.

## ASSUMPTIONS / CONSTRAINTS / RISKS

### ASSUMPTIONS

Current assumptions of the electronic motor controller would require the system to operate in a timely manner for a standard speed control device.

### CONSTRAINTS

Arduino's PWM frequency must fall between 30.6373 Hertz and 31372.5 Hertz.

Arduino’s voltage output is directly available at 5 Volts DC.

# DETAILED INTERFACE REQUIREMENTS

## PWM REQUIREMENTS

A standard control signal for the electric motor controllers is Pulse Width Modulation (PWM). This control signal will be available from the embedded computer.

### GENERAL PROCESSING STEPS

Embedded Controller will evaluate the current circumstance of the velomobile’s motion and provide a PWM control signal to the motor controller over the PWM interface.

### INTERFACE PROCESSING TIME REQUIREMENTS

As outlined in Interface Overview > Constraints the PWM frequency must fall between 30.6373 Hertz and 31372.5 Hertz.

### INTERFACE LEVEL REQUIREMENTS

Additional hardware will also be required if the control voltage level is to be anything other then 5 Volts.

## ANALOG VOLTAGE LEVEL REQUIREMENTS

A standard control signal for the electric motor controllers is an Analog Voltage Level. This control signal will be available from the embedded computer.

### GENERAL PROCESSING STEPS

Embedded Controller will evaluate the current circumstance of the velomobile’s motion and provide an analog voltage control signal to the motor controller over the analog interface.

### INTERFACE LEVEL REQUIREMENTS

The voltage level from the analog signal will be between 0V and 5V. Additional hardware will also be required if the control voltage level is required to be anything other then 5 Volts. The analog voltage will be available with 256 levels or an 8 bit resolution allowing for changes of or 19.5 mV.

# GLOSSARY

Velomobile: A velomobile or bicycle car is a human-powered vehicle, enclosed for aerodynamic advantage and protection from weather and collisions.

Arduino: An open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.

## ACRONYMS

PWM: Pulse Width Modulation

DC: An electronic term relating to a current where the electrons always flow in the same direction