POD CAR DMH (Dead Man’s Handle) IMPORTANT SAFTEY INFORMATION

Autonomous vehicles can present a significant hazard to people and the environment in which they operated. Damage to surroundings and possible injury to operators and bystanders could result from inappropriate use or malfunction. It is essential that a suitable emergency stop system is implemented in all autonomous vehicles.

Implementing and testing this safety system should be undertaken with the drive wheels of the vehicle raised off of the ground, allowing for checks to be made of the DMH without the risk of the vehicle speeding off out of control.

Given the development platform nature of the Lincoln PodCar, a safety mechanism which stops the vehicle under fault conditions is a very important part of the design. During the build several methods of implementing this safety system where checked, the one described below is the current solution.

The speed controller on this particular mobility scooter has a dead zone at around 2.5V on its speed input signal which corresponds to drive wheels stopped. Above the dead zone and up to 5V being forward control values and 0V to below the dead zone being reverse control voltages.

These values were checked using a multi meter prior to implementing the Arduino controller and DAC.

This means that if the DAC output from the Arduino where to fail and 0V for example is applied to the mobility scooters speed controller input, the vehicle would respond by spinning the drive wheels backwards at full throttle. This being a dangerous eventuality, it is very important in terms of safety to ensure this situation can not arise.

A two stage approach is used to reduce this risk.

Please refer to the schematic diagram DMH section in conjunction with this description.

Stage 1 – The Relay

A relay is used which interrupts the mobility scooter’s key ignition circuit. If the relay is not energised by the presence of a 5V supply to the Arduino, the vehicles movement is disabled. This effectively ensures that if the Arduino is non-functional, for example its power supply has failed or it has been unplugged from the USB port of the control PC and there is a danger that the DAC is not producing the control systems required voltage, the scooter is automatically disabled by effectively switching it off.

Stage 2 – The DMH Switch

A sturdy push button is used which also interrupts the vehicles key ignition circuit. If the PodCar operator detects any abnormality in operation during operation, he/she simply releases pressure from the DMH switch and the vehicles movement is disabled. The DMH switch is wired in series with the relay in the key ignition circuit ensuring that if both the relay contacts and the DMH switch are closed, this is the only condition where the PodCar movement is active.

The addition of the Relay and the DMH Switch are essential for safe operation, especially where new unproven autonomous control systems are in development.