

# ***SNOBLEN & ASSOCIATES***

Document  
EV Controller HRS-0100

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## **EV CONTROLLER**

# **HARDWARE REQUIREMENTS SPECIFICATION**

*Snoblen & Associates*  
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## **1. Introduction**

This is the Hardware Requirements Specification (HRS) for the EV Controller project.

### **1.1 Purpose**

The purpose of this HRS is to specify the requirements for development of the hardware to control the operation of the traction motor of an electric vehicle

### **1.2 Scope**

This document shall contain all the requirements for the EV Charger hardware.

### **1.3 Definitions, acronyms, and abbreviations**

EV Electric Vehicle  
SRS Software Requirements Specification  
HRS Hardware Requirements Specification  
PWM Pulse width modulation

### **1.4 References**

The following documents form a part of this specification to the extent specified. In the case of conflict between a cited document and this specification, this specification shall be considered a superseding document.

#### Data Sheets

Maxim MAX110/MAX111 19-0283 Rev 3 3/96 data sheet  
Intel 8752 Manual  
Maxim MAX232 data sheet  
7805 data sheet  
LCD display data sheet

## **2. Overall description**

This section describes general factors that affect the product and its requirements. Items presented in these subparagraphs are **not** requirements but provide **background information** for the requirements specified in section 3.

### **2.1 Product perspective**

This document describes the hardware for the traction controller.

### **2.2 The Interface**

This unit contains the processor and performs the following services:

- Provide PWM to the traction motor in proportion to the pedal position.
- Report battery current and voltage
- Limit battery current
- Put the system in low power mode when idle.
- Monitor battery charge.
- Status will be reported through an RS-232 port

### **2.3 The Driver**

The drive will take the PWM signal produce by the Interface box and amplify it to a level that will drive the Amplifier. It will be located under the hood of the vehicle so must operate in a suitable temp and humidity range. For safety failure modes must be considered in the design.

### **2.4 The Amplifier**

The amplifier is a class C switch that can turn the motor on and off at high speed. It will be located under the hood of the vehicle so must operate in a suitable temp and humidity range. The heatsink will require force air cooling. For safety failure modes must be considered in the design.

### **2.5 The VA box.**

This unit will measure the main pack battery voltage and battery current.

### **2.6 The Pedal**

The pedal will produce a position value using optical encoding and end of travel switches.

### **2.7 User characteristics**

To the user this system should mimic a conventional ICE vehicle as much as possible.

## **2.8 Constraints**

The platform for this hardware is an 8752 base processor board running on an 11.05 MHz clock.

### **3. Specific requirements**

The following paragraphs specify the hardware requirements of the EV Controller in sufficient detail to enable designers to design the system to satisfy these requirements, and testers to validate that the designed system satisfies the requirements.

#### **3.1 Environmental Requirements**

All components shall operate under the following conditions.

- Operate over Temp -20 to 110 degrees Fahrenheit.
- Units shall be sealed against the environment.

#### **3.2 Interface Box requirements**

##### **3.2.1 LCD Display**

The 2x20 LCD shall display messages from the processor

##### **3.2.2 LED**

An LED that can be turn on and off by the processor shall be provided.

##### **3.2.3 VA box interface**

The Interface box shall communicate with the VA box to get the battery voltage and current.

##### **3.2.4 RS-232**

An RS-232 port shall be provided (outgoing only).

##### **3.2.5 PWM**

A PWM output shall be provided at CMOS levels.

##### **3.2.6 Pedal**

the interface box shall communicate with the pedals optical encoder and end switches.

##### **3.2.7 Power**

The interface box shall have two regulators one for the processor and memory which will be continuously powered and a second which will follow the condition of the ignition wire.

### **3.3 The Driver**

#### **3.3.1 Isolation**

The drive shall maintain electrical isolation between the Aux. battery (12V) and the traction batteries(72).

#### **3.3.2 Input**

The PWM input shall be at CMOS(5v) levels.

#### **3.3.3 Output**

The output voltage shall be powered from the traction batteries.  
Output shall be adequate to drive the power amp to a full on condition.

#### **3.3.4 Safety**

A line from the interface box 5 volt supply shall connect to a relay that can disable the driver if the 5 volts should fail.

### **3.4 The Amplifier**

#### **3.4.1 Input**

Shall be from the driver.

If the input should be disconnected from the driver it shall be forced low.

#### **3.4.2 Output**

- The Amp shall be connected in series with the traction batteries and the motor.
- The Amp shall operate in Class C mode
- The Amp shall operate from 12-120 volts
- The Amp shall operate at 400 amps cont.

#### **3.4.3 Heat sink**

- A heat sink with fan powered from the aux. battery shall be provided.
- The FETs shall be connected directly to the heat sink
- The heat sink will be electrically isolated from the vehicle ground.

#### **3.4.4 Safety**

To protect the users in case of semiconductor failure, a main power cutoff relay shall be provide. **Note:** In the Postal Van this is provide by the series/parallel relay.



### **3.5 The VA box**

- The VA box shall communication with the interface box.
- The VA box shall maintain traction batteries and aux. battery isolation.
- The VA box shall provide 12 bits of data per conversion
- The VA box shall provide 20 conversions per second.

### **3.6 The Pedal**

The pedal position shall be measured by a bi-phase optical encoder and a switch for the up or off position. A second switch shall define the full on or down position.

The encoder shall provide at least 50 counts of position information.

**Note:** In the Postal Van the top and bottom switches are part of the existing equipment