

UTAH STATE UNIVERSITY

**Passive Tracking Device
– Senior Project –
Specifications Document**

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1 Scope

This document outlines the specification of a passive tracking solution that could be used by enterprise level clients to track a large fleet of vehicles both ATVs or automobiles. This type of passive solution provides another alternative to companies wanting to track their fleet of vehicles that is both cheaper and less power intensive than other active tracking solutions.

1.1 General

This specification establishes the design, construction, performance, development, and test requirements for the passive tracking device, herein referred to as the PTD. Another focus of this project is to create a proof of concept that is compact enough to be contained within an ATV and use the ATVs battery to power the PTD. Many times it is difficult for companies to manage the location of their ATVs when they are used by a collective group of employees. This can make it difficult to know if the ATVs are really unaccounted for or merely being used by another employee.

2 Applicable Documents

The following documents of the exact issue shown shall form part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and any referenced document the order of precedence shall be 1. The contract, 2. This specification, 3. Referenced documents.

2.1 Government Documents

The regulations in the following documents shall be met to allow the PTD to be legally used in most of North America (US and Canada).

- The United States (US) FCC Part 15-2008.
- Canada's Industry Canada ICES-003:2004 Issue 4.

3 Requirements

This section outlines the requirements and specifications of the PTD.

3.1 Item Definitions

The PTD will likely consist of 4 main subsystems, namely:

- Controller Circuit – The Controller Circuit shall act as an intermediary between the GPS and Cell Modules. It will be responsible for directing the other modules to perform their functions at a specified time.
- Cell Network Interface – The Cell Network Interface shall transmit the GPS data to the client via SMS messages.

- Global Positioning System – The GPS shall calculate geographical location and transmit this data to Controller Circuit.
- Power Converter/Regulator – The Power Converter/Regulator shall provide needed voltage and amperage from the ATV battery to power the PTD.

The PTD system will be a passive system, meaning that the PTD will power down to a very low power state while not in use. At an appointed trigger it will power up and transmit it's location to the PTDs owner via a cell network. There is no plan for the owner of the PTD to be able to activate the device externally. The PTD shall operate in this power-up, transmit location, power-down sequence.

3.1.1 Interface Description/Functional Block Diagram

3.2 Characteristics

The following section provides a technical summary of the PTD's characteristics.

3.2.1 Performance Characteristics

3.2.1.1 Physical Characteristics

The PTD shall meet the following physical requirements:

3.2.1.1.1 Form Factor

The PTD shall conform to the following form factor: 16cm by 8cm by 5cm

3.2.1.2 Electrical Characteristics

The PTD shall meet the following electrical requirements:

3.2.1.2.1 Power Constraints

The PTD shall operate using the power provided by a standard ATV battery, specifically, 12V 11Ah battery.

3.2.1.2.2 Prototype Connections

For the purposes of proof of concept the PTD may make use of a breadboard to connect the components.

3.2.2 Environmental Characteristics

3.2.2.1 Natural Characteristics

The PTD shall meet the following natural environmental characteristics. The PTD shall meet the requirements of this specification during and after exposure to any combination of any of the following natural environments. The PTD may be packaged to precluded exposure to any environments that would control the design.

3.2.2.1.1 Temperature Rating

The PTD shall function between 0° C and 40° C

3.2.2.2 Induced Environment Characteristics

The PTD shall meet the following induced environmental characteristics. The PTD shall meet the requirements of this specification during and after exposure to any combination of any of the following induced environments. The PTD may be packaged to precluded exposure to any environments that would control the design.

3.2.2.2.1 Shock Test

The PTD shall withstand mechanical shocks of 3 ft drop test 5 times onto concrete.

3.2.2.2.2 Vibration Test

The PTD shall withstand vibrations of 1 oscillations per second with an amplitude of 1.5cm for 1 hour.

3.2.2.2.3 Dust Test

The PTD shall function in a dusty environment, specifically, the shock and vibration tests shall be repeated after 15 grams of fine sand is applied to the device.

3.3 Electromagnetic Interference

The PTD shall conform to the standards found in the *Applicable Documents* section of this document.

4 Verification

4.1 Item Definitions

4.1.1 Interface Description/Functional Block Diagram

4.2 Characteristics

4.2.1 Performance Characteristics

4.2.1.1 Physical Characteristics

4.2.1.1.1 Form Factor

The PTD shall be placed in an small box of dimension stated in requirements.

4.2.1.2 Electrical Characteristics

4.2.1.2.1 Power Constraints

The PTD shall function with only the power provided by an ATV battery. The PTD shall also be tested while the ATV's engine is actively running and under normal operation.

4.2.1.2.2 Prototype Connections

The PTD shall have connections that function in any manner.

4.2.2 Environmental Characteristics

4.2.2.1 Natural Characteristics

4.2.2.1.1 Temperature Rating

The PTD shall be tested for full functionality at both ends of the temperature spectrum.

4.2.2.2 Induced Characteristics

4.2.2.2.1 Shock Test

The PTD shall function after the drop tests.

4.2.2.2.2 Vibration Test

The PTD shall function after the vibration test is performed

4.2.2.2.3 Dust Test

The PTD shall function after the dust test is performed.

4.3 Electromagnetic Interference

The EMI shall be measured and shall meet the requirements found in the *Applicable Documents* section of this document.