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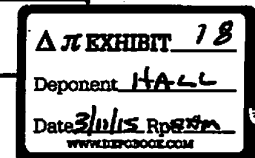
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OBD-3000 – OBDII Plug-On Tracking Unit CRS - Commercial Requirements Specification

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Change History

Date	Person	Version	Reason
04-19-2010	Steve Hall	0.1	Draft
04-29-2010	Steve Hall	0.2	Updated Draft after first review
11-1-2010	Greg Gower	0.3	Updates based new FW direction and anchor customers

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1 Introduction

1.1 Purpose

This document defines the commercial and customer requirements for the Onboard Diagnostic OBD-3000 Plug-On OBDII product for a value added GPS tracking and cellular communication product. This product is designed to meet the specific requirements contained herein and agreed upon by CalAmp, with Beta customer opportunities already identified.

1.2 Scope

The OBD-3000 product described in this document addresses the product definition for the first commercial launch. Specific customized implementations will require supplemental documentation to the specific customer requirements for those implementations.

2 General Description

2.1 Product Description

The OBD-3000 product is derived roughly from the LMU-2600 with an OBDII interface added and physical design to plug directly onto the OBDII connector. The OBD-3000 is intended to be the 1st generation of a small value added GPS tracking, driver behavior and cellular communication device that is targeted at the insurance and fleet markets. This product is a standard product for the CalAmp portfolio. Derivatives of this may be generated for use in other products for other customers. The base product platform runs from a 12V vehicle power system with a cellular transceiver, GPS receiver, OBDII reader and Internal GPS and cellular antennas. The application controller functions and the vehicle CAN bus functions are implemented on separate processors.

2.2 Expected Quantities

Anticipated quantities for the OBD-3000 product are:

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2.3 Market Launch and Lifecycle

Target Launch Schedule for the OBD-3000 Product.

<i>Milestone</i>	<i>Date</i>	<i>Internal Quantity Required</i>	<i>Customer Quantity Required</i>	<i>Estimated Build Quantity</i>
Program Start	Nov 1, 2010			
Engineering 1 Prototypes	Dec 22, 2010	10	10	20
Engineering 2 / Alpha Samples	Feb 18, 2011	10	30	40
FCC Approval	Mar 4, 2011	2 (from Eng2)		
PTCRB Approval	Mar 18, 2011	2 (from Eng2)		
Release to Pilot / QF Issued	Mar 4, 2011			
AT&T Carrier Certification	Apr 8, 2011	4 (from Eng3)		
Pilot Delivery / Start Qual Test	Apr 22, 2011	10	90	100
Beta Field Trials (30 days)	March 18, 2011		(use ENG2 units)	
Product Release / QF Signoff	Apr 30, 2011			
Production Shipments	May 31, 2011	6	1100	1100

The OBD-3000 product is anticipated to have a 2 year sales lifespan before re-spin to cost reduce and improve feature set.

2.4 Product Price / Cost Targets

The OBD3000 selling price targets are provided in table 1 below. The OBD3000 will sell in Kit with box or as black box only. The product will come in GSM/GPRS configurations. (Cost targets are exclusive of licensing/royalty costs.)

Table 1 left Blank

2.5 Product Perspective

The OBD-3000 product is a new product delivering all the core features of the Insurance and Fleet market segments. It is installed directly onto the OBDII port of a vehicle. The device interacts with a remote server or with a remote user using a web server or client software on the remote user's computer.

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2.6 User Characteristics

The product incorporating the OBD-3000 product is an unattended device. The customer for this device is a system integrator/ OEM who will market various configurations of this device into a variety of applications and channels.

User access to the device is via a remote application server or software application operating across the wireless network. The skill level of the remote operator should have little bearing on the design of the tracking unit itself.

The only local user interface required will be that which is needed to support installation and verification in the field. The use of enhanced setup and provisioning across the network can substantially reduce or eliminate the need for this interface.

2.7 Product Implementation

- Merge simplified base design of LMU2600 adding OBDII functionality in small OBD-II plug form factor packaging.
- Embed derivative of B&B design for OBD interface
- Develop / License firmware for OBD interface and protocols
- Develop / License firmware / libraries for specific vehicle interfaces
- Retrieval of data from OBD interface should be an autonomous local process. OBD interface should not be queried directly from a remote request. It should be retrieved from data already stored by the autonomous collection.
- The number of parameters retrieved from the OBD interface should vary between successive passes.
- Each retrieved parameter should be transformed/normalized before wireless transmission.
- Control of vehicle, such as starter, door locks, car alarm ...should not be supported.

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3 Product Features, Functions and Options

3.1 Standard Hardware Features

- GSM/GPRS technology based on Quad-Band GSM/GPRS surface-mount module (uBlox LEON)
- CDMA 1xRTT technology based on surface-mount low cost module (TBD)
- Internal GPS receiver module (uBlox Amy-6) (architectural support for chipset design)
- Separate STM32 processor for LMU application processing
- Separate ARM-class processor for the OBD-II interface control
- Internal antennas for Cellular and GPS antennas
- Internal SIM socket
 - Unit case must be easily disassembled for SIM installation and replacement
- Low current consumption
 - 3mA deep sleep, GPS off, OBD dormant (with wake up OBD activity)
 - 10mA in idle standby with SMS messaging available, GPS off, OBD dormant
 - 20mA in idle standby with GPRS messaging available, GPS off, OBD dormant
 - 150mA active tracking, GSM on, GPS on, OBD active
- OBDII power and data capabilities
 - Device to be powered from 12V battery line on OBD connector
 - OBD-II Protocol Support
 - J1850 PWM
 - J1850 VPW
 - ISO-9141-2
 - ISO-14230 KPW2000
 - ISO-15765 CAN
 - Access to read/query vehicle ID, status and other key parameters (as available on a given vehicle) via OBD data bus
- 3 Status LEDs, software controlled, to allow installer to confirm proper installation and good performance of the unit.
 - COMM = Orange
 - GPS = Green
 - OBD = Red
- Filtered 12V automotive power supply
 - 9 ~ 18 startup range
 - 7 ~ 20V running range
- Sense voltage of incoming power source.

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- Simple Serial or USB interface for programming and configuration
- Large serial FLASH memory for storage of event log data
- 3D Accelerometer/Motion Sensor (MEMS)
- Fully certified (FCC/IC/CE, PTCRB, CDG, AT&T, T-Mobile, Verizon and Sprint)

3.2 Hardware Options

- De-populate option for units without GPS functionality

3.3 Accessories:

- Programming Cable
- Serial connected accessories
- External buzzer

3.4 Standard Firmware Functions

The firmware for the OBD-3000 product shall be derived from LMU-2600 firmware to fit the OBD-3000 hardware implementation, with OBD II controller interface added. Supported firmware features and functions to include:

- Programmable Event Generator (PEG) processing
- Interface to PULS for remote device management
- Over the Air firmware and configuration update support for both Application and OBD processors
- UDP and SMS communication support
- Internal logging of up to 10,000 events
- Automatic detection and configuration of OBD-II port
- OBD Reporting capabilities to include: (as available on specific vehicles)
 - Vehicle ID (VIN)
 - Current odometer reading
 - Current speed [any PEG related speed triggers should be done using GPS speed]
 - Engine RPMs
 - Battery voltage
 - Engine coolant temperature
 - Accelerator pedal position [no remote start]
 - Brake pedal position [no remote start]
 - Various Diagnostic Trouble Codes (DTCs) with filtering capability
- PEG Triggers and Actions, based on OBD data.
 - Including high/low limit threshold capability
- Engine running status (true/false) based on OBD data

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- Based on OBD activity + RPM
- Impact Detection based on MEMS data (*not to be used as true 'crash detection'*)
- Pre-crash logging of vehicle data
- Acceleration / Deceleration based on GPS data
- Acceleration / Deceleration based on MEMS data

3.5 Optional and Possible Future Firmware Functions

The firmware for the OBD-3000 product shall be designed in such a way to add any combination of the following additional firmware functions:

- Additional OBD parameters/functions, including
 - Integration with vehicle's OEM security system [remove this requirement]
 - Integration with vehicle's OEM keyless entry and remote start functions [remove this requirement]
 - Tire pressure
 - Oil life
 - Airbag status
 - Seatbelt indication
 - Fuel level
 - Average MPG
 - Acceleration / Deceleration based on OBD data from in-vehicle sensors
 - Additional custom codes
- Batch transmission of multiple event data sets in single message
- Simplified route trace logging – up to 100,000 points

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4 External Interface requirements

4.1 User interfaces

There is no user interface directly on the OBDII unit. Normal user interface with the unit is conducted remotely over the air by way of a service provider's web page or interface software. LED Status Indicators described below are included as an installation and troubleshooting aid.

4.2 Communication interfaces

The device shall incorporate an external serial communication interface for use in test and configuration of the device. This interface shall provide:

- Data rates and handshaking sufficient to support efficient downloading of firmware and configuration data, as well as reasonable test time.
- Verbose debug capability in production firmware
- AT commands
- This interface shall be externally accessible without removal of the device enclosure.
- This interface can be implemented using UART level serial or USB signaling at the convenience of the designer based on available hardware resources and cost. However, ease of use is key, so all necessary cabling, adapters, drivers, etc must be validated and available with the launch of this product.

4.3 RF interfaces

The basic configuration of the product utilizes internal antennas for all RF interfaces utilizing:

- Quad Band Cellular antenna
- GPS antenna

4.4 Status Indicators

The product shall include 3 LEDs for indication of status of the device and its GPS, Cellular and OBD sub-systems. Various states should be indicated using blinking patterns of the individual LEDs. These LEDs shall be orange in color to indicate communication status, green to indicate GPS status, and Red to indicate status of the OBD interface.

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5 Physical requirements

5.1 Design

The OBD-3000 will use new plastics and mechanical systems. The device must be designed to withstand the stresses of continuous operation in an automotive and vehicle interior environment.

The product will plug directly on the OBDII connector found in light duty vehicles.

5.2 Mechanical Requirements

The target form-factor for the OBD3000 Product will be approximately 1.8in. x 1.5 in. x 1.0 inches, or smaller (not including the protruding OBD-II connector).

Mechanical design will incorporate a J1962 OBD II connector, which shall be integrated within the enclosure.

Device weight should be approximately 2 ounces or less.

5.3 Product Labeling Requirements

- Standard CalAmp product labeling requirements, unless otherwise specified by the end customer, with product name OBD-3000. *(Note that this label will need to be scaled-down due to the small form-factor of the OBD-3000 product.)*
- The OBD-3000 product label shall be located on the bottom surface of the unit. (This is the large surface perpendicular to the face of the OBD connector, parallel to the length of the OBD connector, and closest to the narrower side of the OBD connector.)

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5.4 Environmental Requirements

5.4.1 Operational Environmental Requirements

Temperature -30 to +75 degrees C
Humidity 0 to 95% non-condensing
Vibration SAE J1455
Shock SAE J1455

5.4.2 Storage Environmental Requirements

Storage Temperature -40 to +85 degrees C
Storage Humidity 0 to 90% non-condensing

5.4.3 Other Environmental Requirements

This device and all associated accessories and materials must be 100% RoHS compliant.

5.4.4 Installation

The customer's end products require installation into a vehicle. This installation is typically under the dashboard, directly into the OBD port.

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6 Performance requirements

6.1 Electrical Requirements

This product must operate in the 12-volt automotive environment. The unit must operate reliably from operating voltages ranging from 7 to 20 volts DC with a variety of spikes, surges and noise sources as typical in the automotive environment.

The device should internally monitor the voltage supplied to its input. It should incorporate provisions for initiating special power-saving behavior in the event of a low-voltage condition indicating a low vehicle battery. These provisions should include: sleep, awake on network, and power off.

6.2 Dynamic Requirements

This product must maintain stable behavior throughout all aspects of its operating environment, which includes voltage transients between 7 and 20V. The process of engine starting, ignition turn-off/on, operation of vehicle accessories, etc. must not cause any unrecoverable interruption or degradation of performance. Transition between these states must be smooth and transparent to the application.

Failure conditions must be detected and handled gracefully, without human intervention.

The product architecture must include provisions to cut power to critical components like GPS and GSM modem in order to perform a hard reset and recover from a lock-up condition.

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7 Quality and Certifications Requirements

7.2.1 General

- Reliability – The product must have a high degree of reliability under the full range of operating conditions. The typical field failure rate should be less than 1% and actual hardware failure rate of less than 0.25%.
- Failure State - In the event of failure, provisions must be made to insure that the RF module is not left in the transmitting state and the transmitter is disabled from further transmissions while in a failure state. In failure mode, the starter of the vehicle must not be disabled.

7.2.2 Product Qualification (QA)

The product qualification plan (QP) for this product must incorporate tests or test cases to ensure compliance with the following elements, QP test same as the LMU-2600.

- Physical/mechanical specifications
- Electrical specifications
- Environmental requirements
- Functional specifications
- Applicable standards

7.2.3 Approval Requirements

The customer's end product will require the following approvals and certifications. The OBD3000 GSM Module must be compliant with all pertinent standards so as to facilitate securing of all necessary approvals and certifications.

- FCC Equipment Authorization – Parts 22, 24
- FCC EMI – Part 15
- Industry Canada (Cellular/PCS and EMI)
- PTCRB
- GSM Carriers (AT&T, T-mobile)
- CDMA Carriers (Sprint, Verizon, Bell, Telus)
- CE
- GCF (FTA)
- R&TTE

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8 Packaging Requirements

8.1 Product Shipping Cartons

The OBD-3000 will ship in both a low cost bulk shipment design and a single unit carton design similar to all MRM products.

The bulk packaging blister pack design used for the LMU product line will be used for OBD-3000. A single Box should hold 100 units (black box only). The blister pack needs to accommodate internal antenna configurations as they apply. OBD-3000 Internal Antenna shipping without or with SIM and top cover on: 100 units with 20 units per layer (10 assembled units one row and 10 assembled units in second row per layer) and 5 layers. The LMU-3000 should have label pointing up for bar code reading. Accessories such as antenna and harnesses will ship separately in their own bulk carton with the bulk shipment method. The bulk boxes will ship individually or stacked on pallet.

A single unit carton design for the OBD-3000 will be re-used from LMU product line. The single box will support customer kits with OBD-3000 black box fully assembled with SIM inserted. The box will also contain any accessories and any guides in this single carton box. A new single box insert will need to be designed for the OBD-3000.

8.2 Master Cartons

A set of master cartons will be available to ship multiples of the standard single unit boxes to support larger shipment quantities. The master cartons contained are below based on standard LMU product line approach and re-use of Master Cartons. The size and shape of the master carton shall be determined as necessary to stay within reasonable and cost-effective handling and shipping constraints. (ie. Less than 50 lbs, <maximum UPS/Fedex dimensional restrictions, etc.).

Master Carton Configurations:

- 1 – holds up to qty 5 standard single unit boxes
- 2 – holds up to qty 20 standard single unit boxes

These two configurations are currently in production. These two configurations are expected to handle all shipping quantities below:

Number of standard single unit boxes

Quantity 2-5: Single 5 unit master carton

Quantity 6: A single box and Single 5 unit master carton

Quantity 7-10: two 5 unit master cartons

Quantity 11: single box and two 5 unit master carton

Quantity 12-15: three 5 unit master cartons

Quantity 16-20: Single 20 unit master carton

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Quantity 20-100: Combinations on single boxes, 5 unit master carton, and 20 unit master carton

The master cartons will ship individually or stacked on pallet.

8.3 Packaging Standards

Product and accessories must be able to survive, undamaged when fully loaded master carton, bulk carton, or an individual shipping carton is subjected to standard flat drop and corner drop tests at a height of 1 meter.

Master and Bulk cartons shall include a labeled insert with model / firmware / part numbers. Part numbers should be in both numeric and barcode formats. Labeling should also identify country of origin, container quantity, and manufacturing date code. A sheet containing an ESN label for each unit in the carton should be placed, not affixed, inside of the carton.

Master cartons shall be labeled on top and at least 2 opposing sides with model / part number in both numeric and barcode forms. Labeling should also identify country of origin and container quantity.

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9 Production Requirements

9.1 Testing

The product shall incorporate support for efficient testing and debug in a production environment similar to other existing low-cost LMU products. This capability shall include, at a minimum:

- ATE Testing of finished product including:
 - Firmware download
 - Standard hardware testing
 - Standard Unit Configuration and Provisioning
 - Interface with PULS
 - Download and testing of customer scripts and configuration data
 - Activation using customer SIM cards
 - Activation of 3rd party software license key(s)
 - New Interface (electronic automated report) with customer server for activation/provisioning
- ATE Testing for QA
 - Validate previously tested unit to ensure correct performance and settings without overwriting firmware, settings, etc
 - Loop test(s) for long-term tests
 - Environmental testing support
- ATE Tools for processing of return and failure units
 - Screening Test (no change to firmware, configuration or settings)
 - Firmware Update only
 - Refurbish Unit (make as new)
 - Troubleshooting/Debug Mode
- ATE Configuration
 - Single unit test fixture using RF shielded test enclosure
 - Electrical Interface to LMU Internal Serial Port with RS232 conversion for connection to PC
 - Electrical Connections for interface to OBD interface pins

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- o jPOD (or equivalent unit) embedded in test fixture for OBD interface testing
 - o jPOD running special script for device testing
 - o Serial interface to PC for control of embedded jPOD

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10 Development Constraints

10.1 Development and Trade-off Priorities

The following priorities shall be followed with respect to prioritization of implementation scenarios and design trade-offs: (descending priority)

1. Size
2. Reliability
3. Time to Market
4. Cost