# LMU-4350/1 LTE CAT1

Installation manual


Scope

LMU32 vs EdgeCore Platform Differences

- LMU-4350/4233 Differences
- I/O Mapping & Wake-up sources
- Stream Settings
  - Default Stream Settings
- VBUS PEG Event Modifier differences

LMU-4350 Hardware Specifications

- Cellular/Network
- Data Support
- Satellite Location (GNSS)
- Battery
- Power Consumption
- Environmental
- Physical/Design

- LMU-4350 Connectors
  - Comprehensive I/O
  - Primary Connector
  - Compatible Cabling/Accessories
  - Connectors/Antennas/SIM Access
- 3-Axis Accelerometer Input
- Status LEDs
  - LED 1 – Green
  - LED 2 – Orange
  - LED 3 - Blue
  - LED 4 - Red

PEG2

- PEG2 File
  - Header
  - Configuration Parameters
  - Script Section
  - End of File (EOF) and CRC
- PEG2 TAG Definitions
- Multiple Modifiers
- PEG1 -> PEG2 Conversion

Configuring LMU4350 for heavy duty applications

Installation Instructions

- Size and Placement of LMU Unit
- Access to the SIM Card
- Protection from Heat
- Visibility of Diagnostic LEDs
- Cable Length
- Moisture and Weather Protection
- Preventing Accidental or Unauthorized Modification

Installation Verification

- Comm Verification
- GPS Verification
- Inbound Verification
- Verification via SMS

# Scope

This document provides an overview of CalAmp's Telematics EdgeCore platform, referred as EdgeCore hereafter, the associated products, highlights, and major features. It also serves as a training manual on 'how-to' get started with an EdgeCore device (e.g. LMU-4350). Lastly, this document serves to describe the major differences between EdgeCore and the LMU32 predecessor platforms.

# LMU32 vs EdgeCore Platform Differences

## LMU-4350/4233 Differences

Make sure to capture VBus Event Trigger modifier differences

| | LMU-4350 | LMU-4233 |
|---|---|---|
| **SIM Card** | Externally accessible Nano (4FF) | Externally accessible Standard (1FF) |
| **Battery Technology** | Lithium iron phosphate | ?? |
| **BLE** | 5.2 | ?? |
| **Embedded Intelligence Engine** | PEG2 | PEG1 |

## I/O Mapping & Wake-up sources

| | LMU-4350<br>LMU-4351 | LMU-4233 |
|---|---|---|
| **Input-0** | Ignition | Ignition |
| **Input-1** | In-1 sel | In-1 sel |
| **Input-2** | In-2 sel | In-2 sel |
| **Input-3** | In-3 sel | In-3 sel |
| **Input-4** | In-4 sel | In-4 sel |
| **Input-5** | In-5 sel | In-5 sel |
| **Input-6** | In-6 sel | In-6 sel |
| **Input-7** | In-7 sel | In-7 sel |
| **Input-8** | Motion | Motion |
| **Input-9** | VBUS Active | VBUS Active |
| **Input-10** | Pwr State | Pwr State |
| **Input-11** | Vbatt Low | Vbatt Low |
| **Input-12** | 1BB Detect | 1BB Detect |
| **Input-13** | Batt Virt Ign | Batt Virt Ign |
| **Input-14** | Pure Virt Ign | Pure Virt Ign |
| **Input-15** | | |
| **Input-16** | Motion Wake | |
| **Input-17** | Ignition-HD | |
| **Input-18** | Input Power Wake | |
| **Input-19** | Aux1 Wake | |
| **Input-20** | Aux2 Wake | |
| **Input-21** | | |
| **Input-22** | | |

| | | |
|---|---|---|
| **Input-23** | Radio Active Wake | |
| **Input-24** | BLE Wake | |
| **Input-25** | VBUS Wake | |
| **Input-26** | | |
| **Input-27** | Crank/Hyb Detect Wake | |
| **Input-28** | RTC Wake | |
| **Input-29** | GPS Active | |
| **Input-30** | | |
| **Output-0** | Out-0 | Out-0 |
| **Output-1** | Out-1 | Out-1 |
| **Output-2** | Out-2 | Out-2 |
| **Output-3** | Out-3 | Out-3 |
| **Output-4** | Out-4 | Out-4 |
| **Output-5** | Out-5, LED | Out-5, LED |
| **Output-6** | Out-6, LED | Out-6, LED |
| **Output-7** | Pwr Switch | Pwr Switch |
| **Output-8** | Chrg Disable | Chrg Disable |
| **Output-9** | | |
| **Output-10** | | |
| **Output-11** | | |
| **Output-12** | | |
| **Output-13** | Switched VOUT | |
| **Output-14** | | |
| | | |
| **ADC-0** | Vin | Vin |
| **ADC-1** | Ext-1 | Ext-1 |
| **ADC-2** | Ext-2 | Ext-2 |
| **ADC-3** | Ext-3 | Ext-3 |
| **ADC-4** | Ext-4 | Ext-4 |
| **ADC-5** | Ext-5 | Ext-5 |
| **ADC-6** | GPS Ant (LMU) | GPS Ant. |
| **ADC-7** | TEMP | uP Temp. |
| **ADC-8** | Vref | Vref |
| **ADC-9** | VBATT | Battery |
| **ADC-10** | HWID (LMU) | Audio Sensor |
| **ADC-11** | THERM | |
| **ADC-12** | Vin VBUS | |
| | Rad Temp | |
| | | |
| **LED-1** | GPS (Green) | GPS (Green) |
| **LED-2** | Comm (Orange) | Comm (Orange) |
| **LED-3** | WiFi/BT (Blue) | |
| **LED-4** | VBU (Red) | |
| | | |

| | | |
|---|---|---|
| **Aux-1** | Selectable | Dnld/Select. |
| **Aux-2** | Selectable | Selectable |
| **Aux-3** | USB UART | RS232/BT |
| **Aux-4** | USB UART | |
| **Aux-5** | | |

## Stream Settings

### Default Stream Settings

| | Stream | Port | Rate | Word |
|---|---|---|---|---|
| 0 | USER0 | | | |
| 1 | MODEM | 4 :PORTID_RADIO | 921600 | 8/N/1 |
| 2 | USER1 | | | |
| 3 | DEBUG | 10:PORTID_AUX3 | 115200 | 8/N/1 |
| 4 | NMEA_OUT | | | |
| 5 | DUN | | | |
| 6 | PEG_SERIAL | | | |
| 7 | VBUS | 17:PORTID_VUART_VBUS | 12000000 | 8/N/1 |
| 8 | GPS | 5 :PORTID_GPS | 921600 | 8/N/1 |
| 9 | ALTMDM | | | |
| 10 | EA_0 | | | |
| 11 | EA_1 | | | |
| 12 | EA_2 | | | |
| 13 | UNDEF | | | |
| 14 | BT | 21:PORTID_UART_BT | 921600 | 8/N/1 |
| 15 | ATCMD_1 | | | |
| 16 | ATCMD_2 | | | |
| 17 | SATMDM | | | |
| 18 | SBB | | | |
| 19 | WSP | | | |
| 20 | DB | 22:PORTID_UART_DB | 921600 | 8/E/1 |
| 21 | CONSOLE | 23:PORTID_UART_CONSOLE | 921600 | 8/N/1 |
| 22 | PERIPHDRV | 18:PORTID_VUART_PERIPHDRV | 12000000 | 8/N/1 |
| 23 | PSM | 19:PORTID_VUART_PSM | 12000000 | 8/N/1 |
| 24 | COPDBG | 20:PORTID_VUART_COPDBG | 12000000 | 8/N/1 |
| 25 | LOOPBACK | 16:PORTID_VUART_DBG | 12000000 | 8/N/1 |

## VBUS PEG Event Modifier differences

Modifiers for some PEG Triggers and Actions differ from legacy products:

PEG Action 99 modifiers 3, 4, 7, 14, 15, 17, 18

PEG Action 130

PEG Trigger 67 modifiers

Modifier 1-indicates generic discovery is complete(no OEM support yet)

Modifier 3 –indicates VIN decode has completed and OEM support has been enabled.
PEG Trigger 73 modifiers:

- Modifier 0 - indicates that there are some issues with the server based VIN decode process and it is recommended to let the firmware do its retry in 10 minutes.

- Modifier 2 - indicates that a retry of the VIN decode process will not fix it since the VIN is possibly not supported by partner server.

- Modifier 9

When a VIN lookup is initiated with the server both the 'region' and VIN are sent. The region can be "US" or "UK" and corresponds to the version of the OBD firmware/database that is running on the OBD processor. If the region matches the partner server's understanding of which region this VIN belongs to, then the VIN lookup succeeds. If there is a region mismatch, then a Region Mismatch message is sent to the LMU instead of the VIN lookup data and trigger TRIG_VBUS_EVENT (73) is generated with modifier 9. The ID report also indicates that there is a region mismatch using the extension string ERROR=10

- Modifier 10 – indicates that the VIN changed. This happens when the device successfully reads a VIN from the Vehicle and it is different from the VIN that is manually inserted into the device earlier for a previous vehicle that did not support VIN.

- Modifiers 17 – 20

The CAN protocol has features to monitor the error conditions on the diagnostic port. Parameters 100-102 can be used to monitor the conditions of the CAN bus. These modifiers indicate that the CAN Bus state has changed and provides what state it has transitioned to. The following numbers indicate the different CAN Bus States.

- 17 - Error Active

- 18 - Warning

- 19 - Error Passive

- 20 - Bus Off

- Modifier 21 – Freeze frame has been successfully retrieved from the OBD board.

- Modifiers 22, 23 – OBD board has been permanently disabled due to excessive CAN Bus errors (22). OBD board has been re-enabled (23).

- Modifier 24 – The alternator noise algorithm indicates engine on, which contradicts the engine off indication that is being obtained from the vehicle itself.

- Modifiers 25, 26, 27, 38, 39, 45, 46 – The reason the OBD decided that the ignition has been shut off. 25-RPM 0, 26-RPM unchanging, 27-RPM can't be fetched, 38-Broadcast ignition indicates ignition off, 39-No broadcast ignition packets have been received for a while, 45-Request/response ignition status indicates ignition off, 46-Ignition status can't be fetched.

- Modifiers 28, 29, 30, 48, 49, 50 – During the time that the LMU has configured the OBD for ignition off operation, which means the OBD is only polling for RPM or ignition status, these modifiers indicate what the OBD is seeing. Depending on what the OBD is seeing, the OBD might assert the GPIO that is output to the LMU to indicate that the ignition is on. 28-RPM is changing, 29-RPM is staying the same, 30-RPM can't be fetched, 48-Ignition status indicates ignition on, 49-Ignition status indicates ignition off, 50-Ignition status can't be fetched.

- Modifier 31 – Vehicle discovery started.
- Modifier 32 – Remote OBD diagnostic data has been successfully retrieved from the OBD board.
- Modifiers 33, 34 – OBD board has been temporarily disabled due to excessive CAN Bus errors (33). OBD board has been re-enabled from the temporary disabled state (34).
- Modifier 35 – Generated anytime DTCs are fetched from the OBD board successfully.
- Modifier 36 – A third party diagnostic device has been detected on the Vehicle Bus.
- Modifier 37 – Vehicle protocol could not be determined.
- Modifier 40 – Nebula third party OEM data has been downloaded to the OBD board.
- Modifier 41 – OBD not responding. Can't communicate with OBD board.
- Modifier 42 – Vehicle voltage is too low for an extended period of time. The OBD board won't be powered on, and will be powered off if already on.
- Modifiers 43, 44, 47 – Reasons why the OBD board has just asserted the GPIO output from the OBD to the LMU to indicate the ignition is on. 43-Broadcast ignition indicates ignition on, 44-Polling RPM indicates ignition on, 47-Polling ignition status indicates ignition on.

# LMU-4350 Hardware Specifications

## Cellular/Network

| Technology | Band | Frequency MHz | Technology | Band | Frequency MHz |
|---|---|---|---|---|---|
| LTE | 1 | 2100 | UMTS (3G) | 1 | 2100 |
| | 2 | 1900 | | 2 | 1900 |
| | 3 | 1800 | | 4 | 2100 |
| | 4 | 1700/2100 | | 5 | 850 |
| | 5 | 850 | | 6 | 800 |
| | 7 | 2600 | | 8 | 900 |
| | 8 | 900 | | | |
| | 9 | 1800 | GSM/GPRS | 850 | |
| | 12 | 700 | | 900 | |
| | 13 | 700 | | 1800 | |
| | 14 | 700 | | 1900 | |
| | 18 | 800 | | | |
| | 19 | 800 | | | |
| | 20 | 800 | | | |
| | 25 | 1900 | | | |
| | 26 | 850 | | | |
| | 28 | 700 | | | |
| | 39 | 1900 | | | |

## Data Support

SMS, UDP Packet Data, TCP

## Satellite Location (GNSS)

- **Constellation Support**: GPS/GLONASS/BeiDou/Galileo
- **Tracking Sensitivity**: -161 dBm
- **Acquisition Sensitivity**: -16 dBm (hot start) -145 dBm (cold start)
- **Location Accuracy**: ~2.5 CEP open sky

## Battery

- Battery capacity: 1100 mA
- Battery technology: Lithium iron phosphate
- Charging temperature: 0 to +45° C

## Power Consumption

## Environmental

- **Temperature**:
  - -40° to +60° C (connected to primary power)
  - -30° to +75° C (operating on internal battery)
  - -20° to +25° C ≤ 6 months (long term storage with battery)
- **Humidity**: 65% RH @ 55° C non-condensing
- **Shock and Vibration**: U.S. Military Standards 202G, 810F SAEJ1455
- **ESD**: IEC 61000-4-2
- **Ingress Protection**: IP67 (CalAmp Assembled)

## Physical/Design

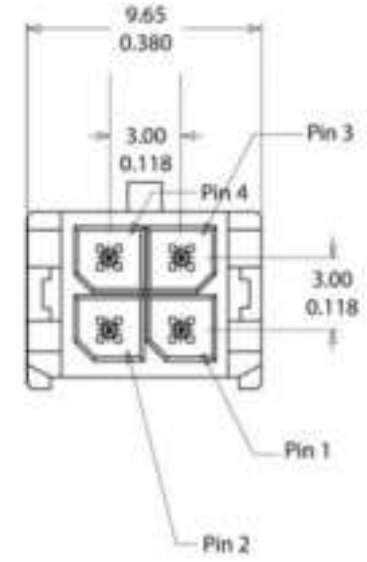
**Dimensions**: 3.623” x 3.62” x 0.84” (92.024 mm x 91.948 mm x 21.336 mm)
**Weight**: 4 oz. (113.398 g)

## LMU-4350 Connectors

### Comprehensive I/O

- Ignition Inputs: 1 fixed bias
- Digital Inputs: 7
- Digital Outputs: 5 (250 mA)
- Analog Inputs: 5 (0-32 V)
- Accelerometer: Built in, triple-axis (driver behavior, impact detection, motion sensing, tilt detection)
- Serial Interface: 2 TTL ports
- USB Interface: 2 USB ports
  - 1 micro (UART only)
  - 1 Type A
- DC Power Output: 3 (2 switched 3.3V & 1 switched VIN (Pin 12 on 24 pin connector)
- 1-Wire® Interface 1 (driver ID/temperature sense)
- Status LEDs: 4 (comms, GPS, cellular, WiFi/Bluetooth)

## Primary Connector




| Pin | Signal Name | Description | 5C888 Color | Input or Output |
|---|---|---|---|---|
| 1 | VIN | Power | Red | Power / Input |
| 2 | GND | Ground | Black | Ground |
| 3 | ADC1 | Analog to Digital Input 1 | Green | Input |
| 4 | INPUT 0 | Input 0 / Ignition Sense - Digital Input | White | Input |

## Compatible Cabling/Accessories

- All 4233 cables

## Connectors/Antennas/SIM Access

- Power: 4 pin Molex
- I/O: 22 pin Molex
- VBUS: 16 pin Molex
- Serial (AUX1/AUX2)
- USB-C (AUX3)
- USB-A (AUX4)
- SIM Access: Externally accessible (4FF SIM)
- BLE Antenna: Internal
- Cellular Antenna: External
- GPS Antenna: External

# 3-Axis Accelerometer Input

The LMU-4350™ supports an internal 3 Axis Precision Accelerometer as one of its discreet inputs. When the LMU is moved in any direction, the associated input will be in the High state. If the LMU's accelerometer does not detect

motion, then the input will be in the Low state. No external connections are required for this functionality to be operational.

## Status LEDs

The LMU-4350™ is equipped with three Status LEDs, one for GPS, one for COMM (wireless network status), and one for Bluetooth. The LEDs use the following blink patterns to indicate service:

### LED 1 – Green

| Condition | LED 2 |
|---|---|
| GPS Off | Off |
| GPS On | Slow Blinking |
| GPS Time Sync | Fast Blinking |
| GPS Fix | Solid |

### LED 2 – Orange

| Condition | LED 1 |
|---|---|
| Modem Off | Off |
| Comm On - Searching | Slow blinking |
| Network Available | Fast blinking |
| Registered but no Inbound Acknowledgement | Alternates from solid to fast blink every 1 s |
| Registered and Received Inbound Acknowledgement | Solid |

### LED 3 - Blue

### LED 4 - Red

# PEG2

PEG2 is the next-generation scripting environment with enhancements that allow you to build more efficient scripts with easier maintenance and unrestricted feature growth. These benefits are made possible by features such as:

- Multiple Triggers, Conditions and Actions per line
- Expanded modifier fields
- Complex Boolean Condition logic
- Labels for Jumps and Calls (i.e., PEG line indexing will not change no matter where a line is added)
- In-line comments

## PEG2 File

In next generation devices supporting PEG2, the file containing the PEG script and the configurations parameters has an updated format. The new file has the following characteristics:

- Format
    1. Header - Time/Date, Signature, ID
    2. Configuration Parameters - same format as existing Config Param file (File Type 1)

3. PEG2 Script - ASCII Text Lines delimited with <CR><LF>
4. End-Of-File marker
5. CRC - Usual 2-byte CRC is appended to the file by PULS or file generation tool

- Configuration Parameter section (if present) is merged with configuration parameters on target device
- Script section (if present) overwrites script on target device.
- New File Type: 22
- File Extension: 'PG2'

## Header

| **TAG Definition** | **Example** |
|---|---|
| **!TD:** UTC Date and Time the file was generated or uploaded to the maintenance server (PULS)<br><br>**!SIG:** File Signature is a MD-5 Hash generated from the file contents (anything after the signature). This is generated by LMU Manager and PULS during upload.<br><br>**!ID:** User defined identification field. Up to 60 characters allowed. This field is displayed on PULS. | !TD:10:47:38 12-27-2018<br><br>!SIG:2a944f7d34857d99e4b39ce50069dcf0<br><br>!ID:v10.41_12_27_18_FAEPilot3040TestScript |

## Configuration Parameters

| **TAG Definition** | **Example** |
|---|---|
| **!CP:** Following this tag, this is where all the Config Parameters start until the PEG2 script section starts or the EOF is detected.<br><br>Important Notes:<br>▪ Config Parameters use the same format as in a PEG1 file<br>▪ Config Parameters are still a union of the file contents and what already resides on the target device | !CP:<br>256,0,00<br>256,1,01<br>256,2,00<br>256,3,00<br>257,0,15D4<br>259,3,00<br>260,0,00 |

| | |
|---|---|
| | 260,1,00<br>.... |

## Script Section

| TAG Definition | Example |
|---|---|
| **!SCR**: Script Section starts here. This section must immediately follow the Configuration Parameter (!CP) section.<br>▪ PEG Lines are no longer parameterized.<br>▪ !SCR will overwrite the entire PEG2 script on the device (no longer a union of PEG lines)<br>▪ You can delete the PEG2 script on the target device by including the !SCR tag without any lines following.<br>▪ The generic line number references can be replaced with custom names or named sub-routines | !SCR:<br>L512000;T1,0;A51,512225<br>L512001;T2,0;A51,512225<br>L512002;T3,0;C39,7;A51,512185<br>L512003;T5,2;A51,512185<br>L512004;T11,0;C17,15;A31,15<br>L512005;T18,5;C17,15;A31,15<br>L512006;T48,0;C16,15;^C17,16;A31,16<br>L512007;T5,2;C8,0;^C16,16;A32,16<br>L512008;T12,0;A124,28<br>L512009;T12,0;A125,29<br>LCustomLabel;T5,2;!C44,0;A51,512195 |

## End of File (EOF) and CRC

| TAG Definition | Example |
|---|---|
| **!EOF:** End-of-file marker (this tag) must be included<br><br>**!CRC:** Following EOF marker, a 2-byte binary CRC value must be appended to validate integrity of file during transit. This is needed for OTA and Serial transfers | ...<br>L514014;T18,35;A112,0,0<br>L514015;T15,0;A112,0,0<br>L514250;T0,0;A0,0<br>!EOF:<br>%P |

| | |
|---|---|
| **Important Note:** If !SIG or !CRC is incorrect, PULS will re-calculate upon upload. However, this means while the file has been corrected for OTA, your original file will not be valid or usable for serial updates until fixed. | |

## PEG2 TAG Definitions

Definitions of the PEG2 Tag Characters with examples are listed below:

| Tag Char | Name | Description | Example |
|---|---|---|---|
| L | Label | Defines a unique label to be used as a “virtual line”. Used as reference for Jump & Call PEG Actions | L514013 |
| T | Trigger | Define one or more Triggers on the same line.<br><br>T<TrigCode>,<Mod0>,T<TrigCode>,<Mod0> | T18,0;T17;A8,4 |
| C | Condition | Define one or more Conditions on the same line.<br><br>C<CondCode>,<Mod0>, C<CondCode>,<Mod0> | T13;C16,11;^C16,10;!+!C16,12;A1,24 |
| A | Action | Defines one or more PEG Actions. Actions executed in order of appearance.<br><br>A<ActionCode>,<Mod0>,A<ActionCode>,<Mod0> | T13;C16,11;^C16,10;!+!C16,12;A1,24 |
| : | Comment | The comment tag ‘:’ is immediately followed by free text and is only terminated by the end-of-line delimiter (<CR>) | T18,0;T17;A8,4;:This is a comment |
| + | OR | Boolean operator that combines result with next Condition results using ‘OR’ operation | |
| ^ | AND | Boolean operator that combines result with next Condition results using ‘AND’ operation | |
| ! | NOT | Boolean operator that inverts results of following Condition or previous Boolean state depending on placement. | |

## Multiple Modifiers

PEG2 offers the ability to use multiple modifiers for specific Triggers, Conditions or Actions. This makes it easier to use some existing PEG actions where there was a need to bit mask one modifier, or use two PEG actions to satisfy one function (like copy accumulator). See below for a few examples of how multiple modifiers can be utilized in a PEG2 script.

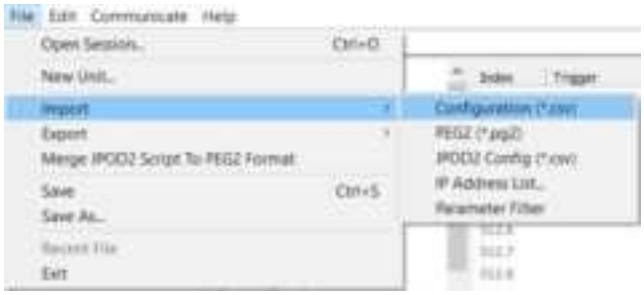
| Trigger/Cond/Action | Definition | Modifier 0 | Modifier 1 |
|---|---|---|---|
| Update End Trigger (Code 61) | An update has completed.<br><br>PEG1 single modifier mapping: Bits 0-3=File Type, bits 4-7 = Device Type | Device Type | File Type |
| Zone State Condition (Code 40) | True when current location is inside (0) or outside (1) the Zone identified by Zone# and the Zone is enabled.<br><br>PEG1 single modifier mapping: Inside (bit7 of is 0), Outside (bit7 is 1), Zone Identifier (bits 0-6). | Current Location (inside/outside Zone) | Zone# |
| Copy Accumulator Action (103) | Copies value in Accum Source into Accum Destination<br><br>PEG1 single modifier mapping: Upper 4 bits = Source, Lower 4 bits = Destination | Source Accum | Destination Accum |

## PEG1 -> PEG2 Conversion

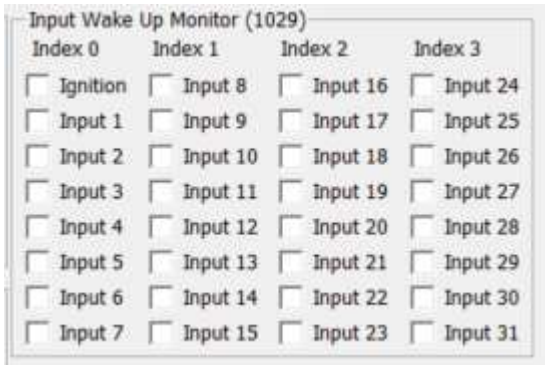
Use the latest version of LMU Manager to convert a pre-existing PEG1 script.

1. Go to **File** > **New Unit** and create a new unit using the App ID 1033.


2. Go to **File > Import > Configuration (*.csv)** to import your PEG1 file.

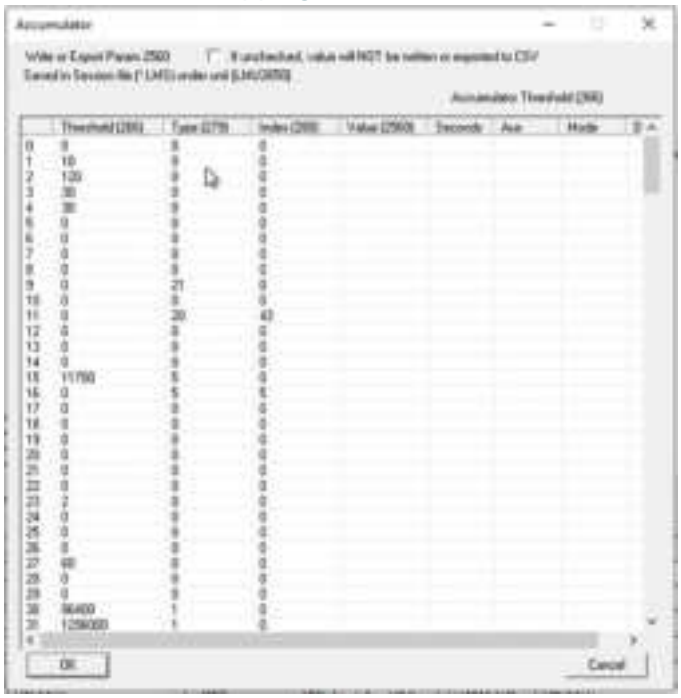



3. Update parameter 1029 by picking the appropriate wake sources. Refer to the I/O mapping and Wake Sources table.




4. Update any parts of your script that reference ADCs (A/D thresholds; PEG actions 42, 47, 59, 104, 119). Refer to the I/O mapping and Wake Sources table.

5. Update ADCs in the Index column in Accumulators if the Type column contains 5, 6, 17, 28, 29, and 34. Refer to the I/O mapping and Wake Sources table.



6. Update any parts of your script with inputs (input equates, triggers, conditions, etc.). Refer to the I/O mapping and Wake Sources table.

7. In the Stream tab, update the stream settings. Refer to default Stream Settings section.

8. To complete conversion, save the script and go to **File > PEG2 format (*.pg2)**.


File Edit Communicate Help
Open Session... Ctrl+O
New Unit...
Import
Export
Merge IPDS2 Script To PEG2 Format
Save Ctrl+S
Save As...
Recent File
Exit
Index
Trigger
Not Active
Configuration.. (*.csv)
CRC Configuration (*.csv)
Configuration No Comments (*.csv)
PEG2 format (*.pg2)
Convert 3030 to 3040 (*.csv)
IP Address List...

# Configuring LMU4350 for heavy duty applications

In addition, the protocol exclusion parameter (3332 & 3356) will now need to be set in order to get the device into heavy duty mode successfully.  This parameter existed in the older products, but did not have to be used when switching between Light Duty and Heavy Duty.

# Installation Instructions

The following sections cover some of the issues to consider when planning your LMU installation.

## Size and Placement of LMU Unit

The LMU-4350 contains an internal battery, and thus should be oriented with the label facing upwards towards the sky. LMUs with internal antennas should be placed directly under a thick panel to maximize their performance and protect from external elements. A typical location is under the dash close to the front windshield.

Attach the LMU by mounting to the solid body (frame) of the vehicle, **not** to plastic panels or with cable/zip ties. The LMU can be placed out of sight by removing interior trim and molding to expose available space, then replacing the trim once the LMU is in place.

## Access to the SIM Card

When used in a LTE or HSPA, each LMU uses a Subscriber Identity Module (SIM) card, which should be inserted before you install the LMU for the first time.

The SIM Card slot is externally accessible in the LMU-4350. There is no need to remove the device's cover.

## Protection from Heat

It is best not to place the LMU unit in an unusually warm location such as directly near heater vents, near hot engine components or in direct sunlight. The maximum temperature that can be tolerated by the LMU is described in the LMU Environmental Specifications section.

## Visibility of Diagnostic LEDs

Status LED lights on the front of the LMU unit can provide valuable information about the operation of the LMU. When feasible, attempt to install the LMU in such a way that these lights can be seen with reasonable ease.

You may find it useful to be able to view the LEDs periodically to make sure that the LMU is operating properly. If at any time you should encounter a problem with the LMU, you may need to read the LEDs to troubleshoot the problem. If you cannot fix the LMU yourself, you will need to provide the LED information to CalAmp customer support.

For information about how to interpret the LEDs, see the Status LED section.

## Cable Length

Do not cut cables. Instead, coil any excess length, making sure not to crimp or flatten any cable.

## Moisture and Weather Protection

The LMU unit must be located where it will not be exposed to moisture or water. In a typical installation inside a vehicle this is not commonly thought to be a concern; however, it might be best to avoid locating the LMU below a car's cup holders, or where rain might easily splash into the compartment when a door is opened.

## Preventing Accidental or Unauthorized Modification

If you anticipate that fleet drivers or others might interfere with the LMUs once they are installed, take steps to be sure that it is not easy to remove the LMU from its power source, or disrupt internal antenna interference.

Two common methods are the use of Tamper Proof Sealant or creation of PEG Script to detect power loss or GPS antenna disconnections.

# Installation Verification

In many cases it is desirable to verify that an installed LMU-4350 is working properly. That is, installers should verify that the GPS and communications functions of the LMU-4350 are working properly before departing the installation site. In more robust cases, some key configuration settings such as the Inbound Address and URL should also be verified.

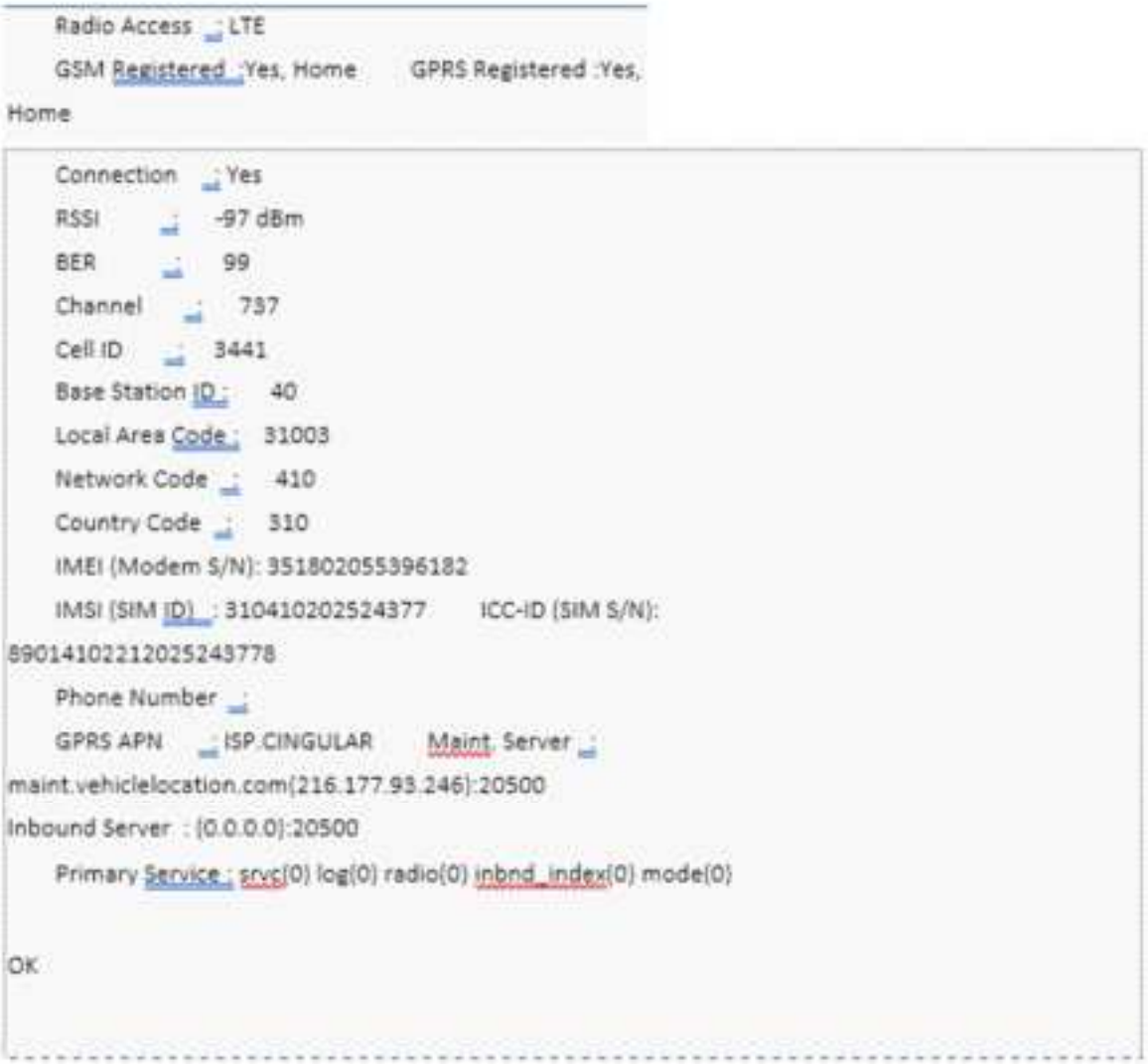
Note that these processes are all based on issuing AT Commands to the LMU-4350. It is expected that installers will have access to a serial port expansion cable and a laptop or PDA capable of a terminal connection. Alternatively, an SMS message can be sent to an LMU-4350 to obtain its current status.

## Comm Verification

Installers should first verify that the LMU-4350 has been acquired and has registered to the wireless network. Comm may be verified using an AT Command:

**ATIC**

Depending on the wireless network being used something similar to what is shown below will be displayed. It is important to verify that 'Yes' values are displayed at the top for Data and Network registration and the correct APN is displayed.




If any of the responses return Not-Acquired or Not-Registered (and the APN is correct), the wireless network operator should be contacted for further troubleshooting.

Please note that it may take several seconds (or longer) for the LMU-4350 to communicate with the modem and acquire the wireless network.

## GPS Verification

The next step is to verify that the GPS receiver is seeing enough satellites to obtain a valid GPS position. Again, installers have two choices on how to perform this verification. First, like the Comm Verification, there is a GPS status LED (i.e., the one closest to the SMA connector). If this LED is solid, then the LMU has found GPS service.

If the LED is not visible then GPS service may be verified using an AT Command:

**AT$APP GPS?**

The response should be similar to:

**Lat=3304713, Lon=-11727730, Alt=0**

**Hdg=113 Spd=0 3D-RTIME HDOP=130 nSats=7**

Installers are looking for the 3D-RTIME setting along with a valid Lat, Long pair (i.e. something other than 0). If the GPS receiver does not have a valid lock within 2-3 minutes, for further troubleshooting, installers should contact CalAmp Support (productsupport@CalAmp.com)

## Inbound Verification

The last item to verify is that the LMU-4350 is sending data to the correct server. In general, this is a two-step process that will need the aid of an observer on the back end. That is, a technician will have to be logged in so they can monitor data coming into the backend mapping/vehicle management application.

First, verify that the LMU-4350 is using the correct Inbound IP address by using:

**ATIS**

The response should be similar to:

**PUBLIC SERVICES 4**

**srvc(0) log(0:0) radio(0) mode(0:0) inb(0) ddd.ddd.ddd.ddd:<ppppp>**

**srvc(1) log(1:0) radio(0) mode(0:0) inb(1) 0.0.0.0:20500**

**srvc(2) log(2:0) radio(0) mode(0:0) inb(2) 0.0.0.0:20500**

**srvc(3) log(3:0) radio(0) mode(0:0) inb(3) 0.0.0.0:20500**

**PRIVATE SERVICES 1**

**srvc(0) log(0:0) radio(0) mode(0:0) inb(0) 0.0.0.0:20500**

**OK**

The installer will need to verify with a backend technician that the IP address (ddd.ddd.ddd.ddd) and port (<ppppp>) are correct.

The second step is to verify that the LMU-4350 is sending data. The best way to do this is to force the LMU-4350 to send in an unacknowledged Event Report (i.e., its current GPS location) with the following command:

**AT$APP PEG ACTION 44 255**

The LMU-4350 will respond with: OK

The backend monitor must then be contacted to confirm that they received an Event Report with Event Code 255.

Assuming all three sections have passed, the installation can be considered to be complete.

## Verification via SMS

The current Comm, GPS and Inbound status of a LMU can be obtained via SMS provided you have access to an SMS capable phone or PDA.

Using your handset, send the following SMS Message to the LMU:

**!R0**

Within a few minutes, the LMU should return a response in the following format:

**APP: <App ID> <Firmware Version>**

**COM:<RSSI> [./d/D][./a/A][./L][IP address] [<APN>]**

**GPS:[Antenna <Short/Open/Off>] | [No Time Sync] | [<FixStatus> <Sat Count>]**

**INP:<inputs states> <vehicle voltage>**

**MID:<mobile ID> <mobile ID type>**

**INB:<inbound IP address>:<inbound port> <Inbound Protocol (LMD/LMX)>**

**APP:** o **<App ID>:**

The Application ID value of the LMU indicating the host platform and the wireless networking technology of the LMU.

**<Firmware Version>:**

The current firmware version in use by the LMU

- **COM:**

**<RSSI>:**

This is the signal strength the wireless modem sees from the network. In general the LMU is at least scanning for the network if the RSSI is not -113.

**[./d/D]:**

If the character 'D' is present, it indicates the LMU had a data session established when it responded to the status request. For the 8-Bit product line an upper case 'D' indicates both the Inbound and Maintenance sockets are ready. The lower case 'd' indicates that only the Maintenance socket is ready. A '.' indicates no sockets are ready.

**[./a/A]:**

This field indicates if the LMU has received an Acknowledgement from the Inbound server. This field will be empty if the LMU has never received an ACK. The lower case 'a' will be present if it has received an ACK since the last cold boot (i.e. power cycle) but not the last warm boot (App Restart or Sleep). The upper case 'A' will be present if the LMU has received an ACK since the last warm boot. A '.' Indicates no acknowledgement has been received.

**[./L]:**

This field indicates if the LMU's log is currently active. An 'L' indicates that the log is currently in use (i.e. one or more records have been stored) where a '.' indicates the log is inactive.

**[IP Address]:**

This is an optional field if and is only present if the LMU has established a valid data session. This field will contain the current IP address of the LMU as assigned by the wireless network. Note that if you see a value of 192.168.0.0, this is an indication that the LMU has not been able to establish a data session.

**[<APN>]**

The current Access Point Name in use by a GSM LMU.

- **GPS:**

**[Antenna <Short/Open/Off>]:**

This field, if present, indicates a problem with the LMU's GPS antenna. A value of Short indicates that the antenna cable has likely been crushed. A value of Open indicates that the antenna cable is either cut or disconnected. A value of Off indicates that the LMU' GPS receiver is off.

**[No Time Sync]:**

If this field is present, it indicates that the LMU's GPS receiver has not been able to find even a single GPS satellite. This would likely been seen in conjunction with the above antenna error, or if the LMU GPS antenna is otherwise blocked.

**[<FixStatus> <Sat Count>]:**

If these fields are present it indicates that the LMU has, or had a valid GPS solution. The <Sat Count> field indicates how many GPS satellites are currently in use by the LMU. The <FixStatus> field indicates the type of fix.

- **INP:**

**<input states>:**

This field details the current state of each of the LMU's discreet inputs. This field is always 8 characters long. The left most character represents the state of input 7 where the right most represents the state of input 0 (i.e. the ignition). A value of 1 indicates the input is currently in the high state. A value of 0 indicates it is currently in the low state.

**<vehicle voltage>:**

This field will contain the current reading of the LMU's internal A/D. This will be the supply voltage provided to the LMU in mV.

- **MID:**

**<mobile ID>:**

This will be the current mobile ID in use by the LMU.

**<mobile ID type>:**

This will be the type of Mobile ID in use by the LMU. The available types are, Off, ESN, IMEI, IMSI, USER, MIN and IP ADDRESS.

- **INB:**

**<inbound IP address>:**

This is the current IP address in use by the LMU. This value should match the IP address of your LM Direct™ server.

**<inbound port>:**

This is the current UDP port the LMU will use to deliver its LM Direct™ data. This value should match UDP port you are using on your LM Direct™ server. It is typically 20500.

**<Inbound Protocol (LMD/LMX)>:**

This is the current UDP/IP messaging protocol in use by the LMU. In general, it should be LMD.

Example Response:

**APP:1001 10a**

**COM:0**

**GPS:No Time Sync**

**INP:11100111 13.7V**

**MID:4141000100 ESN**

**INB:207.7.101.227:20500 LMD**

**Regulatory Information**

1. FCC Compliance

Human Exposure Compliance Statement:

Pursuant to 47 CFR § 24.52 of the FCC Rules and Regulations, the LMU-4350™ complies with RF hazard requirements for broadband PCS equipment under 47 CFR Part 24, Subpart E. Compliance is contingent upon correct installation, operation, and adherence to provided instructions.

Intended Use:

The LMU-4350™ is designed for fixed and mobile applications. "Fixed" denotes secure placement at one location, while "Mobile" signifies usage with a minimum 20 cm separation between the transmitter's antenna and the user or nearby persons. Mobile applications within 20 cm of the user are strictly prohibited.

Compliance Measures:

To adhere to FCC regulations:

Maintain a minimum 20 cm separation between the unit's antenna and users in all applications.

In mobile applications, ensure maximum antenna gain does not exceed the values in the following table:

| Band | Max Antenna gain (dBi) including cable loss |
|---|---|
| 2, 25 | 8.51 |
| 5, 26 | 6.91 |
| 12 | 9.7 |
| 4 | 5.5 |
| 8, 13 14 | 9.91 |
| 7 | 9.01 |

2. FCC Rules and Industry Canada (IC) Compliance

Part 15.19:

The equipment complies with Part 15 of the FCC Rules. Operation is subject to conditions:

The device may not cause harmful interference.

The device must accept any received interference, even if it causes undesired operation.

Part 15.21 (Warning):

Unauthorized changes or modifications may void the user's authority to operate the equipment. The manufacturer is not responsible for interference due to unauthorized modifications.

Part 15.105(b) Compliance Statement:

This equipment complies with limits for a Class B digital device, providing reasonable protection against harmful interference in residential installations. Users experiencing interference are encouraged to take corrective measures.

ISED Regulatory Compliance:

The device adheres to Industry Canada license-exempt RSS standards. Users must comply with conditions:

The device may not cause interference.

The device must accept any interference, even if it causes undesired operation.

RF Radiation Exposure Statement:

Compliance with FCC/IC radiation exposure limits for mobile transmitting devices is affirmed. Users must follow specified operating instructions to ensure RF exposure compliance, maintaining a minimum 20 cm separation between the antenna and users. Co-location with other antennas or transmitters is prohibited without express approval, as any unauthorized changes may void the user's authority to operate the equipment.

*L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence.*

*L'exploitation est autorisée aux deux conditions suivantes:*

> *(1) l'appareil ne doit pas produire de brouillage, et*
>
> *(2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

3. Software and Documentation Licensing

Important Notice:

Before installing or using the software or documentation, read and agree to the provided license agreement. Ensure compliance with licensing terms for each developer, user, and application.

Definitions:

Clarify key terms like "Software," "Application," and "Developer License" for better understanding.

Use Licenses:

Specify the permitted uses for developer and user licenses, emphasizing restrictions and responsibilities.

Developer License Only—Uses Permitted:

Clearly outline the allowed uses for software and documentation under a developer license.

Developer(s) License—Uses Not Permitted:

Enumerate prohibited actions under a developer license unless expressly agreed upon in writing.

Use Licenses:

Define the terms and conditions for server and user licenses, emphasizing distribution rules and user obligations.

4. Limited Warranty

Covering Physical Media and Printed Materials:

State the warranty for media on which the software is recorded, including the replacement period and procedure.

Disclaimer Regarding Software, Documentation, and Related Materials:

Clarify that software, documentation, and related materials are provided "as is," and outline CalAmp's limitations of liability.

Acknowledgment:

Affirm the user's understanding and agreement with the limited warranty terms.

5. General and Governing Law

General Provisions:

Summarize general provisions, including the agreement's entirety, modifications, and severability.

Governing Law:

Specify that the agreement is governed by the laws of the State of California and outline dispute resolution mechanisms.

U.S. Government Protected Rights:

Highlight restricted rights for U.S. government users.

6. European Union (EU) Compliance

CE Marking:

The LMU-4350™ conforms to essential requirements and safety standards set out by the European Union and bears the CE marking, indicating compliance with applicable EU directives.

Radio Equipment Directive (RED):

In accordance with the Radio Equipment Directive 2014/53/EU (RED), CalAmp Inc. declares that the LMU-4350™ complies with the essential requirements for radio equipment. Users should follow provided instructions for correct installation and operation.

Intended Use in EU:

The LMU-4350™ is intended to be used in both fixed and mobile applications within the European Union. "Fixed" denotes secure placement at one location, while "Mobile" signifies usage with a minimum separation distance of at least 20 cm between the transmitter’s antenna and the user or nearby persons.

Frequency Band and output power:

| Band | Frequency Range (MHz) | Output Power (dBm) | Peak Gain (dBi) | Average Gain (dBi) | Efficiency (%) |
|---|---|---|---|---|---|
| LTE Band 1 | 1920 - 1980 | 25 | 3.17 | -1.79 | 66.19 |
| LTE Band 3 | 1710 - 1785 | 25 | 3.05 | -1.87 | 65.02 |
| LTE Band 5 | 824 - 849 | 25 | 0.77 | -1.91 | 64.38 |
| LTE Band 7 | 2500 - 2570 | 25 | 3.72 | -2.30 | 58.99 |
| LTE Band 8 | 880 - 915 | 25 | 0.61 | -2.16 | 60.99 |

| Band | Frequency Range (MHz) | Output Power (dBm) | Peak Gain (dBi) | Average Gain (dBi) | Efficiency (%) |
|---|---|---|---|---|---|
| LTE Band 20 | 832 - 862 | 25 | 0.77 | -1.91 | 64.38 |
| LTE Band 28 | 703 - 748 | 25 | -0.21 | -2.52 | 56.85 |
| LTE Band 34 | 2010 - 2025 | 25 | 3.17 | -1.79 | 66.19 |
| LTE Band 38 | 2570 - 2620 | 25 | 3.72 | -2.30 | 58.99 |
| LTE Band 40 | 2300 - 2400 | 25 | - | - | - |
| LTE Band 41 | 2496 - 2690 | 25 | 3.72 | -2.30 | 58.99 |
| WCDMA I | 1920 - 1980 | 25 | 3.17 | -1.79 | 66.19 |
| WCDMA V | 824 - 849 | 25 | 0.77 | -1.91 | 64.38 |
| WCDMA VIII | 880 - 915 | 25 | 0.61 | -2.16 | 60.99 |
| GSM 900 | 880 - 915 | 35 | 0.61 | -2.16 | 64.38 |
| DCS 1800 | 1710 - 1785 | 35 | 3.05 | -1.87 | 65.02 |

Conformity Assessment:

CalAmp Inc. has performed the necessary conformity assessment procedures to demonstrate compliance with EU requirements. Users are encouraged to use the product in accordance with provided instructions to maintain compliance.

Restrictions on Unauthorized Modifications:

Any changes or modifications not expressly approved by CalAmp Inc. could violate the user's authority to operate the equipment and void regulatory compliance.

WEEE Directive:

The Waste Electrical and Electronic Equipment (WEEE) Directive requires users to dispose of electronic waste responsibly. Users are encouraged to follow local regulations for the proper disposal of the LMU-4350™.

RoHS Compliance:

The LMU-4350™ complies with the Restriction of Hazardous Substances (RoHS) Directive, restricting the use of certain hazardous substances in electrical and electronic equipment.

EU Declaration of Conformity:

The manufacturer, CalAmp Inc., declares that the LMU-4350™ is in conformity with all relevant EU directives. The EU Declaration of Conformity is available upon request.

Importer Responsibility:

Importers are responsible for ensuring that the LMU-4350™ complies with EU regulations before placing it on the market.

Authorized Representative:

CalAmp Inc. has appointed an authorized representative within the European Union, reachable for any questions regarding regulatory compliance:

LoJack Italy

Via Novara 89 20153

Milano – Italy

Tel: +39 02 36589300

Fax: +39 02 36589340

Email: lojack@lojack.it

Website: www.lojack.it

For further information on EU compliance and regulations, refer to the documentation provided or contact us at www.calamp.com

Note:

This EU compliance section aims to provide information relevant to European users and stakeholders. Ensure that this section aligns with your specific product and industry requirements, and make any necessary adjustments based on the latest EU directives and regulations.

Insert DoC below: