TTU-4530™

Hardware and Installation Guide

IMPORTANT: DO NOT INSTALL OR USE THE SOFTWARE OR DOCUMENTATION UNTIL YOU HAVE READ AND AGREED TO THE LICENSE AGREEMENT AND REVIEWED THELIMITED WARRANTY AND REGULATORY INFORMATION.

1 Introduction

Welcome to the 4530™ Hardware and Installation Guide. This manual is intended to give you information on the basic setup and installation of the CalAmp 4530™ product(s) including hardware descriptions, environmental specifications, wireless network overviews and device installation.

1.1 About This Manual

The 4530™ is one of the most flexible economy mobile tracking hardware products available. In order to accurately describe the functionality of these units we have broken this manual into the following sections:

- **System Overview** – A basic description of a CalAmp 4530™ based tracking system. This includes a description of roles and responsibilities of each of the CalAmp components as well as a brief overview of the wireless data technologies used by the 4530™.
- **Hardware Overview** – Describes the physical characteristics and interfaces of the 4530™.
- **Installation and Verification** – Provides guidance for the installation of the 4530™ in a vehicle and instructions on how to verify the installation is performing adequately.

1.2 About The Reader

In order to limit the size and scope of this manual, the following assumptions have been made about the reader.

- You are familiar with GPS concepts and terminology
- You have some experience with installing equipment in vehicles
- You are familiar with the use of AT Commands
- You are familiar with the use of terminal programs such as HyperTerminal or PuTTY

1.3 About CalAmp

CalAmp is a leading provider of wireless communications products that enable anytime/anywhere access to critical information, data and entertainment content. With comprehensive capabilities ranging from product design and development through volume production, CalAmp delivers cost-effective high quality solutions to a broad array of customers and end markets. CalAmp is the leading supplier of Direct Broadcast Satellite (DBS) outdoor customer premise equipment to the U.S. satellite television market. The Company also provides wireless data communication solutions for the telemetry and asset tracking markets, private wireless networks, public safety communications and critical infrastructure and process control applications. For additional information, please visit the Company's website at www.calamp.com.

1.4 About the CalAmp Location Messaging Unit-4520™

The CalAmp Location and Messaging Unit-4530™ (4530™) is a mobile device that resides in private, commercial or government vehicles. The 4530™ is a single box enclosure incorporating a processor, a GPS receiver, a wireless data modem, and a vehicle-rated power supply. The 4530™ also supports inputs and outputs to monitor and react to the vehicular environment and/or driver actions.

Flexibility

The 4530™ features CalAmp's industry leading advanced on-board alert engine that monitors vehicle conditions giving you the most flexible tracking device in its class. The PEG™ (Programmable Event Generator) application supports hundreds of customized exception-based rules to help meet customers' dynamic requirements. Customers can modify the behavior of the device to meet with a range of applications preprogrammed before shipment or in the field. Combining affordability and device intelligence with your unique application can give you distinct advantages over your competition.

Over-the-Air Serviceability

The 4530™ also incorporates CalAmp's industry leading over-the-air device management and maintenance system software, PULS™ (Programming, Updates, and Logistics System). Configuration parameters, PEG rules, and firmware can all be updated over the air. Our web-based maintenance server, PULS™ scripts, and firmware, can all be updated over-the-air. PULS™ offers out-of-the-box hands free configuration and automatic post-installation upgrades. You can also monitor unit health status across your customers' fleets to quickly identify issues before they become expensive problems.

2 System Overview

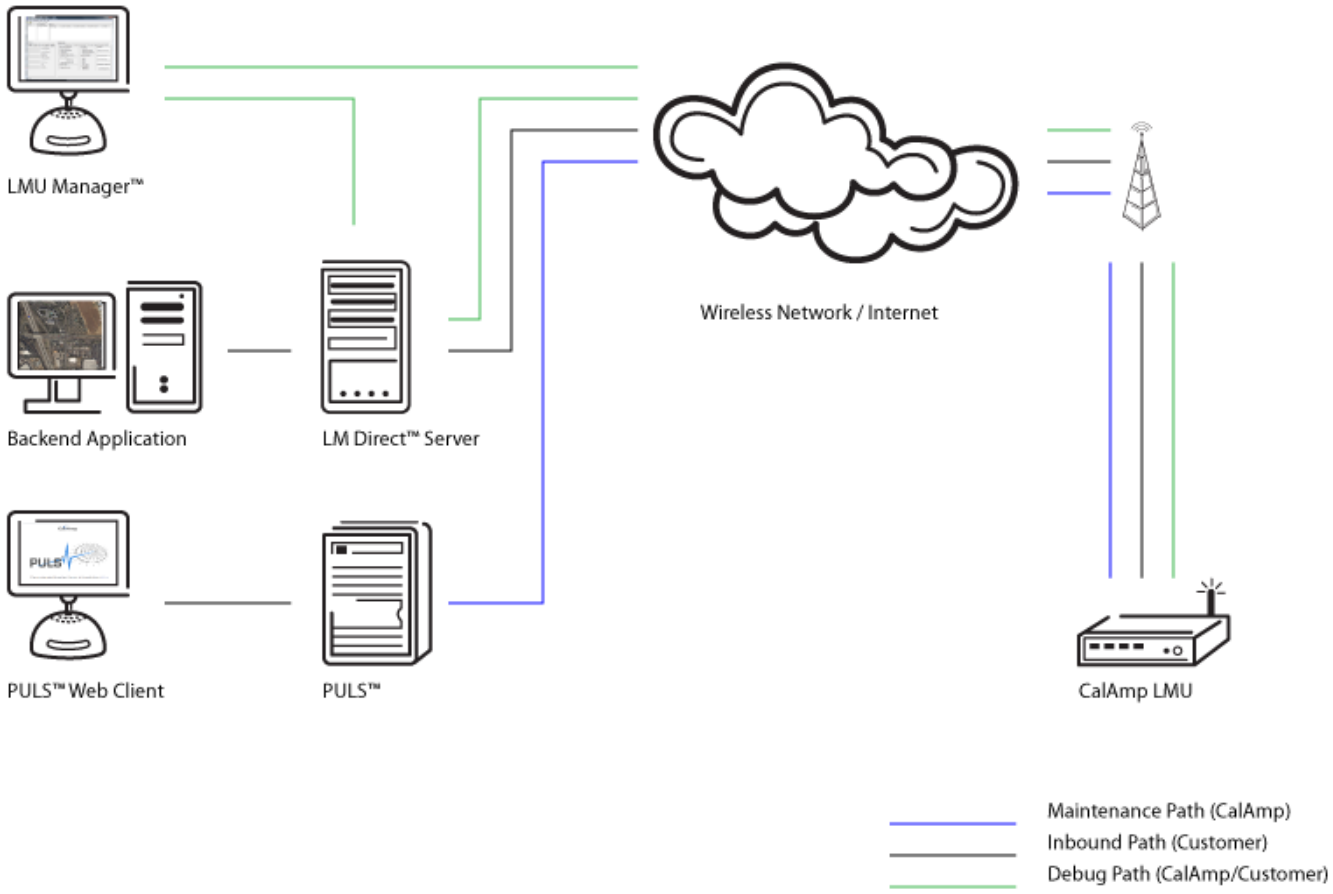
2.1 Overview

The entire purpose behind a fleet management system is to be able to remotely contact a vehicle, determine its location or status, and do something meaningful with that information. This could include displaying the vehicle location on a map, performing an address look-up, providing real-time driving directions, updating the vehicles ETA, monitoring vehicle and driver status or dispatching the vehicle to its next pick up.

These functions, of course, are completely dependent on the capabilities of the vehicle management application. The role of the CalAmp 4530™ is to deliver the location information when and where it is needed.

A typical fleet management system based on a CalAmp device includes the following components:

- A wireless data network
- An 4530™
- Host Device (GPS NMEA only)
- An LM Direct™ communications server
- Backend mapping and reporting software which typically includes mapping and fleet reporting functions
- PULS™
- LMU Manager™



Basic System Architecture

2.2 Component Descriptions

2.2.1 Wireless Data Network

The Wireless Data Network provides the information bridge between the LM Direct™ server and the 4530™. Wireless data networks can take a variety of forms, such as cellular networks, satellite systems or local area networks. Contact the CalAmp sales team for the networks available to the 4530™.

2.2.2 4530™

The 4530™ is responsible for delivering the location and status information when and where it is needed. Data requests mainly come from the following sources:

- PEG™ script within the 4530™
- A location or status request from the LM Direct™ server
- A location or status request from LMU Manager
- An SMS request made from a mobile device such as a customer's cell-phone

In some cases, it is necessary to run an application in the vehicle while it is being tracked by the backend software. Such examples could include instant messaging between vehicles or a central office, in-vehicle mapping or driving directions, email or database access. In most of these cases you will be using the 4530™ as a wireless modem as well as a vehicle-location device.

]2.2.3 LM Direct™ Server

LM Direct™ is a CalAmp proprietary message interface specification detailing the various messages and their contents the 4530™ is capable of sending and receiving. This interface allows System Integrators to communicate directly with 4530's™. Please refer to the LM Direct Reference Guide for details.

2.2.4 Backend Software

Backend software is a customer provided software application. Regardless of its purpose, one of its primary functions is to parse and present data obtained from the LM Direct™ server. This allows the application to do any of the following:

- Display location database on reports received from the 4530™ in a variety of formats

- Present historic information received from the 4530™, typically in a report/chart style format
- Request location updates from one or more 4530s™
- Update and change the configuration of one or more 4530s™

2.2.5 PULS™

PULS™ (Programming, Update and Logistics System) is CalAmp's web-based maintenance server offering out-of-the-box hands free configuration and automatic post-installation upgrades. PULS™ provides a means for configuration parameters, PEG scripts, and firmware to be updated Over-The-Air (OTA) and allows CalAmp customers to monitor unit health status across your customers' fleets to quickly identify issues before they become expensive problems.

2.2.6 LMU Manager™

LMU Manager is the primary configuration tool in the CalAmp system. It allows access to almost every feature available to the 4530™. Unlike the backend software, it has the option of talking directly to an 4530™ or making a request forwarded by the LM Direct™ server.

For further details on using LMU Manager, please refer to the LMU Manager Users Guide.

3 Hardware Overview

3.1 Location Messaging Unit-4530™

Handling Precautions

3.1.2 Battery Back-up devices

Please properly dispose of the battery in any of the CalAmp products that utilize one, do not just throw used batteries, replaced batteries, or units containing a back-up battery into the trash. Consult your local waste management facility for proper disposal instructions.

3.1.3 Environmental Specifications

The 4530™ is designed to operate in environments typically encountered by fleet vehicles, including wide temperature extremes, voltage transients, and potential interference from other vehicle equipment.

To ensure proper operation in such an environment, the 4530™ was subjected to standard tests defined by the Society of Automotive Engineers (SAE). The specific tests included temperature, shock, vibration, and EMI/EMC. These tests were performed by independent labs and documented in a detailed test report. In accordance with Appendix A of SAE J1113 Part 1, the Unit is considered a "Functional Status Class B, Performance Region II" system that requires Threat Level 3 Testing.
The following shows the environmental conditions the LMU is designed to operate in and the relevant SAE tests that were performed. No formal altitude tests were conducted.

Dimensions

6.356"(L) x 4.429"(W) x 1.725"(H)

158.902mm (L) x 112.496mm (W) x 43.815mm (H)

Weight

2.4oz (68.03g)

Operating Temperature

-30° C to +75° C

-10° C to +60° C (When using Internal Battery Power)

Storage Temperature

-40° C to +85° C

0° C to +30° C (Long Term w/Internal Battery)

Internal Battery Charging Temperature

+5° C to +45° C

Humidity

0% to 95% relative humidity, at 50° C non-condensing

Shock and Vibration

Ground vehicle environment with associated shock and vibration

SAE Test: SAE J1455

Mil Standard 202G and 810F

Electromagnetic Compatibility (EMC)

EMC compliant for a ground vehicle environment

SAE Test: SAE J1113 Parts 2, 12, 21 and 41

Operating Voltage Range

The LMU-4520™ supports vehicles with 12 or 24 VDC systems including transients and electrical system noise; this includes ranges from 7 to 32 VDC.

Electrostatic Discharge (ESD)

No damage or performance degradation after the ESD disturbance.

SAE Test: SAE J1113 Part 13

Power Consumption

Deep Sleep: 2mA

Sleep on Network (SMS): 10mA

Sleep on Network (GPRS): 20mA

3.3.1 Accessories

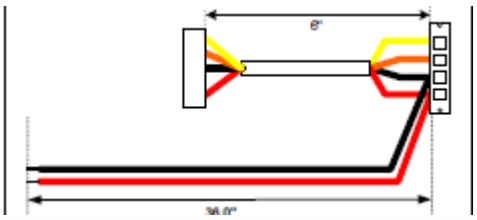
See the Harness Diagrams page for more information on LMU accessories, and supported products table.

3.3.2 Serial Interface Connectors

The LMU-4530 offers 2 serial interface connections (Host/Aux1 and Aux 2) via lead wires from the 34 pin Power Harness (part number **5C582**) .

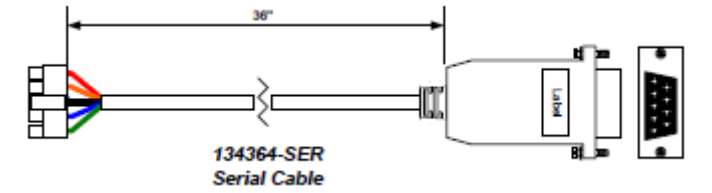
To connect serially requires the following cables:

- 34 pin Power Harness. Part number: **5C582**
- Terminal block. Part Number: **5C942**



LMU-4520 Terminal Block Part Number 5C942

- To serially connect to Aux1, simply connect the following wires together from the power harness to the screw terminal block - red to red, black to black, yellow to green/brown and orange to blue/brown. Make sure to do a continuity check to determine pin configurations(There are multiple black wires and thus this step is necessary to ensure that you are using the correct ground outlet)
    - Serial Adapter part number: **134364-SER**



LMU™ Serial Adapter

- Note for Serial Adapter: The ON/OFF switch of the 134364-SER cable should be set to the default 'OFF' position.

3.4 I/O Descriptions

The LMU-4530™ provides the following inputs and outputs (I/O):

LMU-4530Z/TTU-4x30

App Id:
320-HSPA EHS5
321-HSPA EHS6
322-GSM BGS2
323-LTE LE910
324-CDMACE910
325-LTE LHS5

Processor:
STM32F205-768

GPS:
UBLOX G7020

Input-0	Ignition
Input-1	In-1 sel
Input-2	In-2 sel
Input-3	In-3 sel
Input-4	In-4 sel

Input-5	In-5 sel
Input-6	In-6 sel
Input-7	In-7 sel
Input-8	Motion
Input-9	VBUS Active
Input-10	Pwr State
Input-11	Vbatt Low
Input-12	1BB Detect
Input-13	Batt Virt Ign
Input-14	Pure Virt Ign
Input-15	Radio Active Wakeup
Output-0	
Output-1	Out-1
Output-2	Out-2
Output-3	
Output-4	
Output-5	
Output-6	
Output-7	Pwr Switch
Output-8	Chrg Disable
Output-9	
Output-10	
Output-11	ADC1 0=Standard 1=4-20mA mode
Output-12	ADC2 0=Standard 1=4-20mA mode
Output-13	V_OUT switched
ADC-0	Vin
ADC-1	Standard / 4-20mA
ADC-2	Standard / 4-20mA
ADC-3	
ADC-4	
ADC-5	
ADC-6	GPS Ant.
ADC-7	uP Temp.
ADC-8	Vref
ADC-9	Battery
Host/Aux-1	Dnld/Select
Aux-2	
Aux-3	
1BB-Chan 1	
1BB-Chan 2	
Motion	MEMS
RTC	YES

Sleep LMU
Processor STM32F205

App ID 321-HSPAg6

3.4.1 3-Axis Accelerometer Input

The LMU-4530™ 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.

3.4.2 Status LEDs

The LMU-4530™ is equipped with three Status LEDs, one for GPS, one for COMM (wireless network status) and one TBD. The LEDs use the following blink patterns to indicate service:

LED #1 (Comm LED - Orange) Definitions

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 1s
Registered and Received Inbound Acknowledgement	Solid

LED #2 (GPS LED - Yellow) Definitions

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

4 Configuration and Activation

This section details how to quickly get an LMU-4530™ provisioned and configured to point at a specific server. It is assumed that a PEG script has already been created and is being managed through LMU Manager or PULS™, the CalAmp Maintenance System.

We are making three assumptions to simplify the setup process:

- You have created, installed and configured an LM Direct™ Server to receive messages from the LMU-4530™. (See LM Direct™ Reference Guide for details)
- You are using the standard wiring harness from CalAmp and the serial port expansion harness.
- You have created a HyperTerminal or Putty session.
- **You have contacted the CalAmp sales team regarding the network availability of the LMU-4530™.** This device may not be supported for all the carriers or networks listed in this section (CDMA-Verizon, CDMA-Sprint, HSPA, GSM), for product availability consult the CalAmp sales team.

4.1 Quick Start - General Config

All LMU-4530s™ must go through a common step during the configuration and provisioning process. Specifically, this is pointing the LMU to your LM Direct™ server, either via IP or a URL.

This configuration process is accomplished via a series of AT Commands:

1. Power up the LMU-4530™ and connect a serial cable from the LMU to your laptop
2. Open a terminal session to the LMU-4530™
3. Enter the address of the LM Direct™ server:

```
-------------------------------------------------------------

AT$APP PARAM 2319,0,ddd.ddd.ddd.ddd
AT$APP PARAM 768,0,ddd.ddd.ddd.ddd     (32-bit products only)
AT$APP PARAM 769,0,ppppp
-------------------------------------------------------------
```

Where ddd.ddd.ddd.ddd is the publicly addressable IPV4 address of your LM Direct™ server and ppppp is the UDP port number.

4. Alternatively if a URL has been set up for your LM Direct™ server, the LMU may be programmed with:

```
----------------------------------------

AT$APP PARAM 2319,0,myURL.MyCompany.Com
----------------------------------------
```

Where myURL.MyCompany.com is the URL assigned to the server.

5. Enter ATIC to verify the correct settings are displayed for your Inbound Server.

This configuration process is accomplished via a series of SMS Commands:

1. Power up the LMU-4530™ and your handset

2. From the handset, send an SMS message to the LMU-4530™ phone number:

```
-----------------------------------------------------

!RP,2319,0,ddd.ddd.ddd.ddd
!RP,768,0,ddd.ddd.ddd.ddd     (32-bit products only)
!RP,769,0,ppppp
-----------------------------------------------------
```

Where ddd.ddd.ddd.ddd is the publicly addressable IPV4 address of your LM Direct™ server and ppppp is the UDP port number

3. Alternatively if a URL has been set up for your LM Direct™ server, the LMU may be programmed with:

```
--------------------------------

!RP,2319,0,myURL.MyCompany.Com
--------------------------------
```

Where myURL.MyCompany.com is the URL assigned to the server

4. Verify your settings by sending the commands:

```
-----------

!RP?2319,0
```

```
!RP?769,0
----------
```

.2 Auto provisioning of GSM or HSPA LMUs

For certain operators, the LMU can auto-populate the APN, username and password settings based on the Mobile Country Code (MCC) and the Mobile Network Code (MNC) of the SIM. Upon inserting a new SIM the APN, username and password will switch to the new SIM card's defaults if the MCC and MNC values change. The current list of supported MCC and MNC combinations are:

AT&T – formerly AT&T Wireless or Cingular Blue (MCC 310, MNC 38)

- o APN 0: PROXY
- o APN 1: PUBLIC

AT&T – formerly Cingular Wireless (MCC 310, MNC 17, 18, 41)

- o APN 0 & 1: ISP.CINGULAR
- o Username: ISP@CINGULARGPRS.COM
- o Password: CINGULAR1

Manxpronto (MCC 234, MCN 058)

- o APN web.manxpronto.net
- o Username: gprs
- o Password: gprs

O2 UK (MCC 234, MNC 02, 10, 11)

- o APN 0 & 1: mobile.o2.co.uk
- o Username: mobileweb
- o Password: password

O2 Ireland (MCC 272, MNC 02)

- o APN 0 & 1: open.internet
- o Username: gprs
- o Password: gprs

Orange UK (MCC 234, MNC 33, 34)

- o APN 0 & 1: orangeinternet
- o Username: user

- Password: pass

T-Mobile (MCC 310, MNC 16, 20, 21, 22, 23, 24, 25, 26, 27, 31, 58, 66, 80)

- APN 0: INTERNET2.VOICESTREAM.COM
- APN 1: INTERNET3.VOICESTREAM.COM

T-Mobile UK (MCC 234, MNC 30,31,32)

- APN 0 & 1: general.t-mobile.uk
- Username: user
- Password: wap

TelCel Mexico (MCC 334 MNC 02)

- APN 0 & 1: INTERNET.ITELCEL.COM
- Username: webgprs
- Password: webgprs2002

Telstra Australia (MCC 505, MNC 01, 11, 71, 72)

- APN 0 & 1: telstra.internet

Vodafone Ireland (MCC 272, MNC 01)

- APN 0 & 1: isp.vodafone.ie
- Username: vodafone
- Password: Vodafone

Vodafone New Zealand (MCC 530, MNC 01)

- APN 0 & 1: internet
- Username: guest
- Password: guest

Vodafone UK (MCC 234, MNC 15)

- APN 0 & 1: internet
- Username: web
- Password: web

Unless otherwise stated, the username and password will be set to “dummy”.

This feature can be disabled by setting Bit 0 of S-Register 155.

```
-------------------------

AT$APP PARAM 1024,35,1,1

-------------------------
```

To re-enable auto-provisioning, use:

```
-------------------------
AT$APP PARAM 1024,35,1,0
-------------------------
```

Auto-provisioning occurs when the LMU detects a SIM with a new operator ID (i.e. the first 6 digits of the IMSI) or when Bit 0 of S155 is cleared and the GPRS context is blank (i.e. Parameter 2306,0).

4.3 Activating GSM or HSPA LMU using AT Commands

Check with the CalAmp Sales team for availability of the LMU-4530™ with GSM or HSPA modems. For a GSM/GPRS operator you will get the LMU in one of two varieties, one with a SIM and one without.

If you get an LMU without a SIM (which is the typical case) the operator will simply ask for the IMEI of the LMU. The IMEI (International Mobile Equipment Identifier) is printed on the bottom of the LMU under the LMU's ESN. Again, DO NOT give the operator the ESN of the LMU.

The operator will provide you with a SIM for each account activated. If they are especially nice (or you are especially persistent) they will also give you a list tying the IMSI (International Subscriber Identifier) of the SIM to the phone number assigned to it. Please note that the operator will likely tie the IMSI (i.e. the SIM) to a specific IMEI. Making sure the specific SIM matches to the right IMEI isn't strictly necessary, but it will keep everyone's book-keeping a little cleaner. You may also obtain this information by running a CSV report in PULS (after the devices have connected to the network and sent in their first ID Report). See the PULS Users Guide for more information.

If you do happen to have a SIM, the operator will ask for the IMSI and ICC-ID (Integrated Circuit Card Identifier) along with the IMEI of the LMU. Again, in return you should get a list of IMSIs and Phone Numbers.

The IMEI, IMSI and ICC-ID are all available through the **ATI1** command. The IMEI should also be printed on the bottom of the LMU.

You should also get an APN (Access Point Name) value. The APN is the device on the network that allows a GPRS device (i.e. the LMU) to get to the internet. They tend to look like a URL, for example: **myAPN.myOperator.com**

Operators can offer more than one type of APN and can even set up a custom APN just for your devices. The rates they charge will vary depending on the APN service you want. Operators may also request you use a blank APN. With the APN, you should also receive a username and password combination.

The last item an operator may provide is a SIM PIN. The PIN is effectively a password to the device. The main difference here is that the PIN will restrict all the capabilities of the GSM device, where the SPC is used just for configuration.

The activation sequence for a GSM LMU would therefore look as follows:

```
AT$APP PARAM 2306,0,“myAPN.myOperator.com”
AT$APP PARAM 2306,1,“myAPN.myOperator.com”
AT$APP PARAM 2314,0,“myUSername”
AT$APP PARAM 2315,0,“myPassword”
```

For a blank APN the following command can be used:

```
AT$APP PARAM 2306,0,“” (for a blank APN)
```

Only enter this next command if you have been given a non-zero PIN as any errors may lock you out of the modem.

```
AT$APP PIN <SIM pin>
```

You can confirm activation by watching the Comm LED to see if it goes solid. You may also confirm activation using

```
AT$APP COMM STATUS?
```

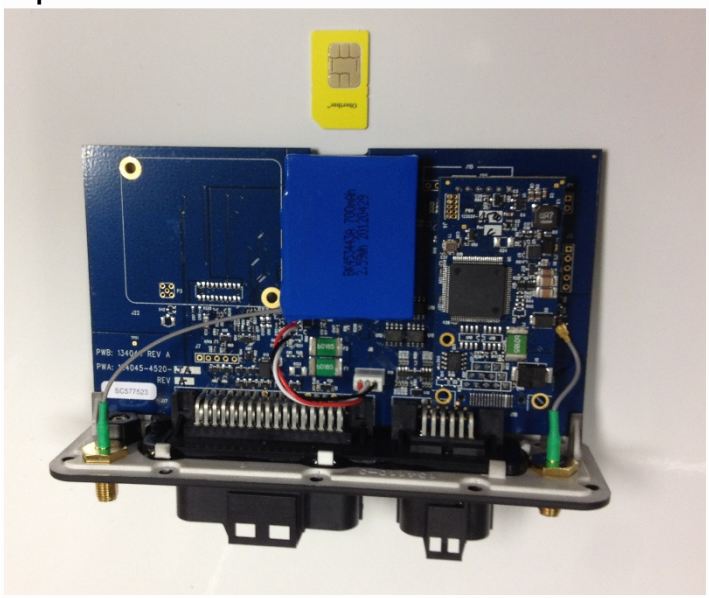
A good response should look similar to the following:

```
GSM Registered:         Yes
GPRS Registered:        Yes
Connection:             Yes
RSSI:                   -70 dBm
BER:                    0
Channel:                        0
Cell ID:                        0
Base Station ID:        0
Local Area Code:        0
Network Code:           38
Country Code:           310
IMEI (Modem S/N):       500167110060440
IMSI (SIM S/N):         310380100521849
Phone Number:
```

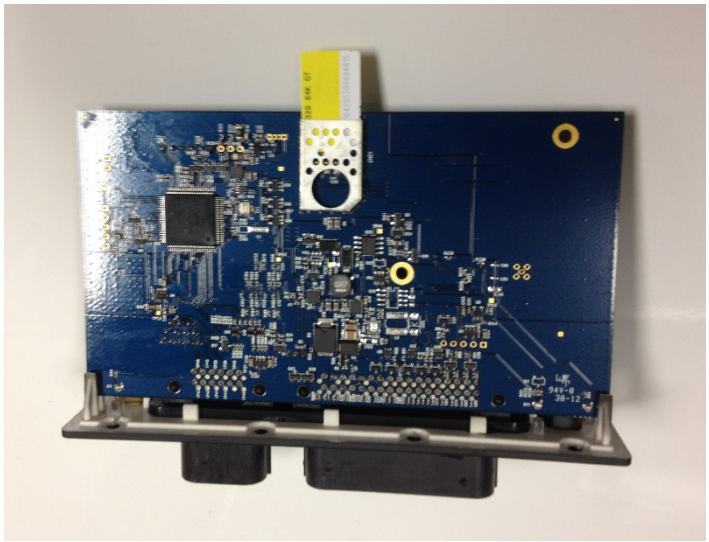
```
GPRS APN:                IP:Public
Quality of Srvc:         1,0,0,3,0,0
GSM Class:               B
-----------------------------------------
```

The SIM carrier is located inside the LMU-4530™ housing on the back center of the device.

Top View:



Bottom View:



4.5 Activating a CDMA LMU-4530™

Check with the CalAmp Sales team for availability of the LMU-4530™ with CDMA modems. For CDMA devices, the activation sequence you will use varies from carrier to carrier. Each of the supported carriers is documented below.

To obtain an account, a CDMA carrier will generally ask for three things, the Manufacturer, the Product Type and the ESN. Obviously the first two items are answered by “CalAmp LMU”. The last one is a little misleading. The ESN on the LMU is the CalAmp serial number. The one the operator is interested in is the MSN-D (which they call the decimal ESN). DO NOT give them the CalAmp ESN (i.e. the top one on the label). It will only lead to the carrier telling you that the product doesn’t exist and they can’t activate it for you.

What you should get back will vary from operator to operator; however at very least it will be the MDN (Mobile Directory Number) and MIN (Mobile Information Number). You should also ask for the SPC (Service Programming Code) in case it is not 000000. The SPC is effectively a password to the modem which allows you to program some of the more sensitive items (ex: the MDN and MIN). Please note that the MIN and MSID can be the same value.

4.5.1 Activating a CDMA LMU-4530™ – Verizon

Verizon supports a system that allows CDMA devices to be provisioned Over-The-Air. A CalAmp LMU-4530™ will automatically use this system to attempt to self provision. This procedure assumes that the LMU-4530™ has never been provisioned or activated before.

1. Power on the LMU-4530™, making sure you can observe the behavior of the Comm LED.
2. Wait until the Comm LED turns solid. This could take up to 5 minutes.
3. If after 5 minutes you observe that the Comm LED transitions from a slow blink to a fast blink several times (i.e. more than twice) you will need to contact Verizon Wireless for further support on account activation.

Once configured, you may verify that the LMU-4530™’s modem has registered to the CDMA network. Enter:

```
AT$APP COMM STATUS?
```

The response should be similar to:

```
    CDMA Service:       IS-2000
    Connection:         Yes
    RSSI:               -80 dBm
```

```
    Channel:            0
    Band:Side:          800:B
    Base Station ID:           0
    Network ID:         0
    System ID:          4
    ESN (Modem S/N:     2676319948 [9F8566CC]
    Phone Number:       1234567890
    IMSI:               310001234567890
    CarrierConfig:      5
-----------------------------------------------
```

Note that the Phone Number should match the MDN value the carrier gave you. The last 10 digits of the IMSI field should match the MIN/MSID value they gave you.

For devices that have had previous activations, an Over-The-Air activation process may be manually started using a single AT Command:

```
--------------------

AT$APP MODEM UPDATE

--------------------
```

This command is also used to initiate an Over-The-Air PRL Update for devices that are already provisioned.

Users may also force a reactivation with the command:

```
----------------------

AT$APP MODEM ACTIVATE

----------------------
```

Keep in mind, however, this may cause the modem to lose its credentials and become unable to register to the network.

4.5.2 Activating a CDMA LMU-4530™ – Sprint

Activating an LMU-4530™ on the Sprint CDMA network is identical to activating on the Verizon network.

1. Power on the LMU-4530™, making sure you can observe the behavior of the Comm LED.
2. Wait until the Comm LED turns solid. This could take up to 5 minutes.
3. If after 5 minutes you observe that the Comm LED transitions from a slow blink to a fast blink several times (i.e. more than twice) you will need to contact Sprint for further support on account activation..

Once configured, you may verify that the LMU-4530's™ modem has registered to the CDMA network. Enter:

```
AT$APP COMM STATUS?
```

The response should be similar to:

```
    CDMA Service:       IS-2000
    Connection:         Yes
    RSSI:               -80 dBm
    Channel:            0
    Band:Side:          800:B
    Base Station ID:    0
    Network ID:         0
    System ID:          4145
    ESN (Modem S/N:     2676319948 [9F8566CC]
    Phone Number:       1234567890
    IMSI:               310001234567890
    CarrierConfig:      1
```

The Phone Number field should match the <Phone Number> value you used in step 3 or 4. The last 10 digits of the IMSI field should match the <MSID> value you used in step 3 or 4.

5 Installing the LMU

The installation of the LMU and its antennas can have a major impact on the LMU's performance. It is recommended that installers be familiar with the installation of GPS and cellular devices and are comfortable in a vehicle environment.

5.1 Preparing for Installation

Be sure you have received all the LMU components you need. This must include:

- The LMU to be installed
- A power harness
- GPS Antenna (for external devices)
- Comm Antenna (for external devices)
- Optional Components:

- Input and output cables
- Relays
- LMU peripherals (i.e. Serial adapter, jPOD, TetheredLocator)
- Host serial devices (e.g. PDAs, laptops, other serial devices)

5.2 Plan The Installation

Verify Power, Ground and Ignition. Be sure to check each source (power, ground and ignition) to ensure that the proper signaling exists. This is typically accomplished with a multi-meter.

Before drilling any holes or running any wires, decide where each hardware component will be located (LMU, antennas, peripherals, etc.). Be sure that the cables to the LMU are not bent or constricted in any way. Also make sure that the LMU is kept free from direct exposure to the elements (sun, heat, rain, moisture etc...).

Be advised that an installation that violates the environmental specifications of the LMU will void the warranty.

The best way to ensure a trouble-free installation is to consider your options and make some decisions before you start. Take a look at the vehicle and determine how to best install the LMU for the following purposes:

- Accurate data gathering and simulation of how customers actually use your solution
- Ongoing monitoring and maintenance of LMU equipment
- Accidental or intentional alteration of the equipment or cable connections

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

5.2.1 Size and Placement of LMU Unit

The dimensions of the LMU should be taken into account, particularly when installing in a vehicle:

Whether you intend to place the LMU under a seat or into a cavity behind the vehicle's interior molded trim, be sure the LMU will fit before drilling any holes or running cable

- Be certain that the cables running to the LMU will not be bent or constricted. Damage to the cables may impede the LMU's performance.
- Be certain that the installation point will not violate any of the LMU's environmental specification (temperature, moisture, etc…) as improper installation of the LMU may void the warranty.

See the LMU Environmental Specifications for the exact measurements and specifications of the 4530™.

Typical installations will place the LMU under the vehicle dash board, or in the trunk. Make sure you can get access to the unit afterwards as under some circumstances it may be necessary to add additional wiring or connections to the LMU.

5.2.2 Placement of Antennas

There are effectively three options for placements of an antenna:

- Roof-mount (magnetic or thru-hole)
- Glass-mount
- Covert (e.g. under the seat, dash, etc…)

Comm Antenna Placement Guidelines

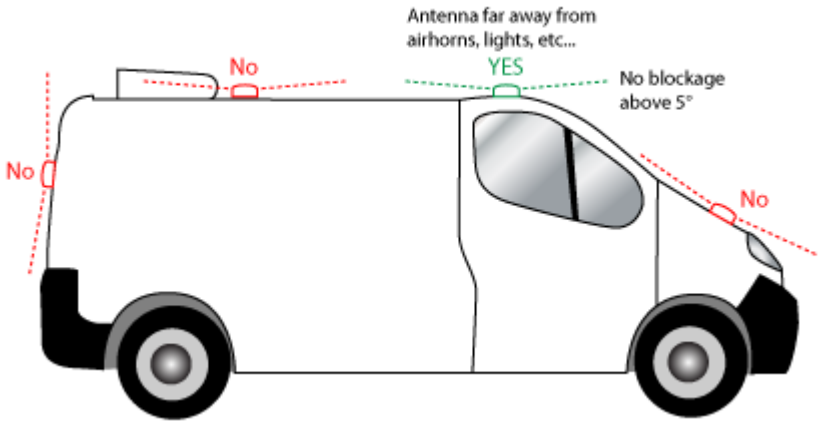
The Comm. Antenna must be located at least 20cm away from vehicle passengers, other personnel, or bystanders in order to comply with FCC radio frequency exposure limits.

Typically, the Comm antenna used by the LMU for wireless service is a standard 3-dB gain whip. It mounts with standard mounts (i.e. thru-hole, magnetic mount or peel and stick) and requires a ground plane to work properly. If possible, it should be located at least 3 feet from the GPS antenna. Ensure that the cable does not get crushed during installation.

Please note that the antennas provided by CalAmp combine both the GPS and Comm portions.

GPS Antenna Placement Guidelines

In order to maximize the performance of the LMU the GPS antenna should have a clear view of the sky. When installing the GPS antenna on a vehicle, make sure that there are no obstructions close to the antenna that might block the view 360° to the horizon. Things like air horns, lights, vents, etc… should not block the antenna beyond 5° above the horizon. The best location is usually near the center of the roof; however it is also desirable to locate the cellular antenna as far from the GPS antenna as is practical.

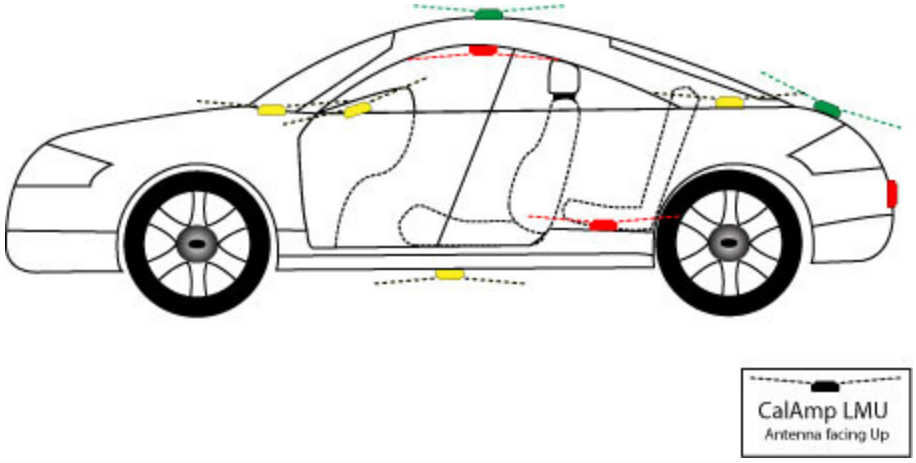


Examples of good and poor GPS antenna placements

The received signal levels at the GPS antenna from the satellites are very low in power (approximately -136 dBm), so any blockage of the antenna can affect the quality of the location computed by the receiver. Kinks or tight knots in the antenna cable can also prevent the GPS receiver from operating properly. When laying out the antenna cable, care should be taken so that the cable is not subjected to crushing or strain.

Placement of Combination and Internal Antennas

When dealing with combination antennas, it is more important to considered GPS performance over Comm performance. GPS signal strengths are much lower than those typically seen by cellular



networks supported by the LMU. In order to maximize the performance the LMU should have a clear view of the sky as possible. When installing the GPS antenna in a vehicle, make sure that there are as few obstructions as possible close to the LMU that might block the view 360° to the horizon. As with stand-alone GPS antennas, nothing should not block the combination antenna beyond 5° above the horizon with the best location being near the center of the roof. For more covert installs, directly under the front or rear-windshields are also acceptable.

Examples of Good (Green), OK(Yellow) and Poor(Red) combo antenna placements

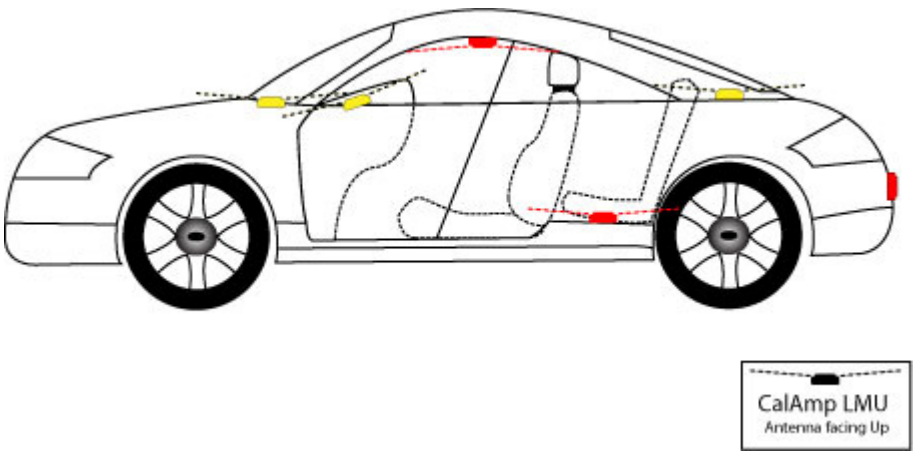
Examples OK(Yellow) and Poor(Red) internal antenna placements

5.2.3 Access to the SIM (Subscriber Identity Module) Card

When used in a GSM or iDEN network, 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 is attached to the main-board inside the housing of the LMU unit.

At some future time, you might need or want to replace the SIM card with a different one, so try to install the LMU in such a way that the cover can be removed to make the SIM card accessible.

5.2.4 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.

5.2.5 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 in order 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 Behavior section.

5.2.6 Cable Length

The RF cables which are provided for connecting to the LMU antennas should be used at the length provided. Do not cut cables. Instead, coil any excess cable length, making sure not to crimp or flatten the antenna cable

5.2.7 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.

5.2.8 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 disconnect the antenna wiring, remove the LMU from its power source, etc.

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

5.3 Installing the LMU in a Vehicle

This section provides instructions for installing an LMU in a vehicle.

Be sure to consider the design decisions described in the previous sections. When you are ready to begin installing the LMU, follow these steps:

5.3.1 Place the LMU unit in the vehicle.

Typically, the LMU should be placed under the passenger seat or dashboard of the vehicle. LMUs with internal antennas should be placed to maximize their GPS performance. A typical location include under the dash close to the front wind-shield.

Attach the LMU to the solid body of the vehicle, not to plastic panels. 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

5.3.2 Connect power, ignition, and ground.

The power input (red wire) must be connected to a constant (un-switched) +12 VDC or +24 VDC supply; preferably, connected directly to the vehicle battery terminal or as close to it as possible. This connection point should be fuse protected to not more than 5 Amps.

The ignition input (white wire) must be connected to the vehicle ignition or another appropriate key operated line, such as ACCESSORY, ensuring that power to the ignition wire is available only when the vehicle ignition is on.

The ground line (black wire) must be connected to chassis ground.

Failure to connect these lines in the manner described may result in discharge of the vehicle battery.

For best results, it is strongly recommended that the LMU connection be on its own circuit. Connect the power input directly to the vehicle battery if possible and protect the circuit with an inline fuse. If you must connect through the fuse box, use standard commercial wiring practices to create a permanent installation rather than using press-in fuse clips or other temporary measures.

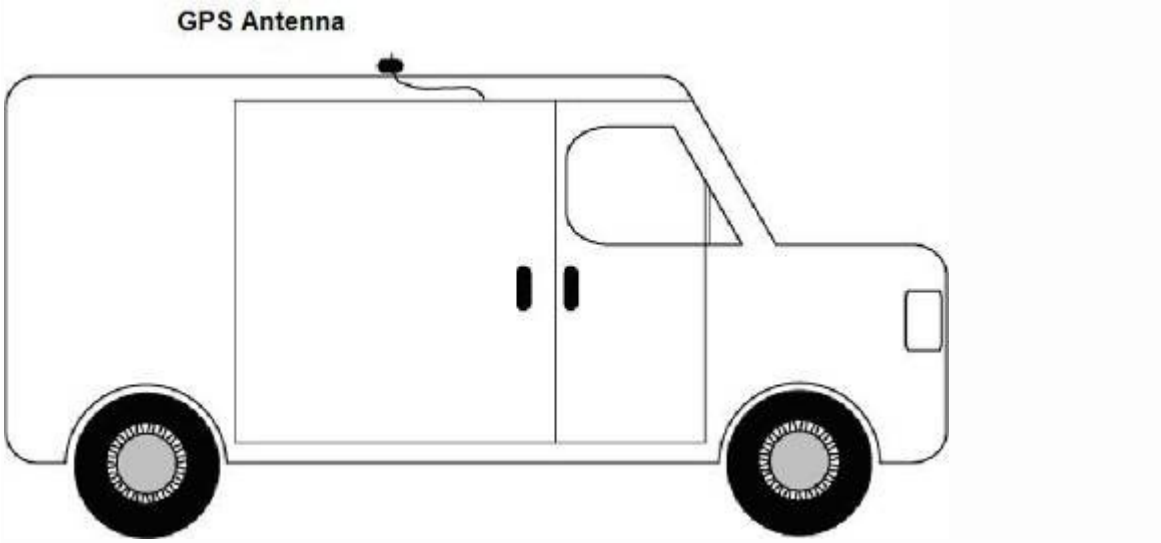
DO NOT connect the power cable to the LMU at this time.

5.3.3 Place the GPS antenna.

The GPS antenna must have a clear view of the sky. Mount the GPS antenna on the vehicle's highest point (for example, the roof of a car). Make sure that there are no obstructions close to the antenna that might block the view 360° to the horizon. Air horns lights, vents, etc.. should not block the antenna beyond 5° above the horizon.

Kinks or knots in the antenna cable can prevent the GPS receiver from operating properly. When laying out the antenna cable, take care that the cable is not subjected to crushing or strain.

The ideal location is typically near the center of the vehicle's roof. However, it is also desirable to locate the cellular antenna as far from the GPS antenna as possible.

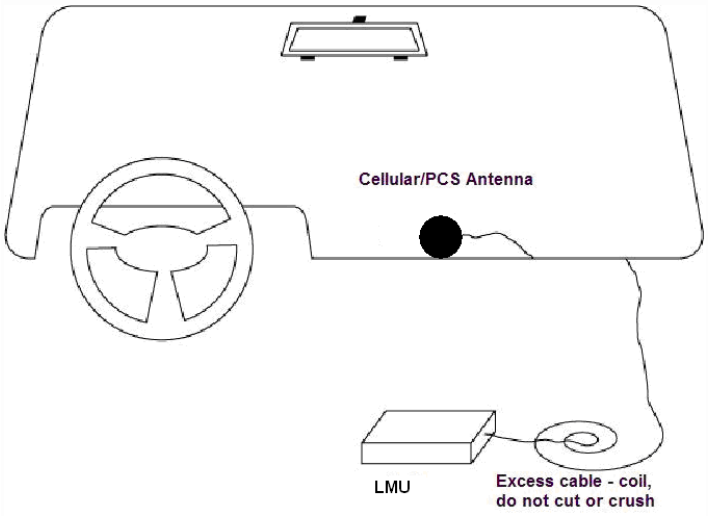


GPS Antenna Location

5.3.4 Mount the Comm. Antenna.

When using separate Comm and GPS antennas, it is best to locate the Comm. Antenna at least 3 feet from the GPS antenna. Ensure that the cable is not crushed during installation or normal vehicle operation.

Again, the Comm. Antenna must be located at least 20cm away from vehicle passengers, other personnel, or bystanders in order to comply with FCC radio frequency exposure limits.



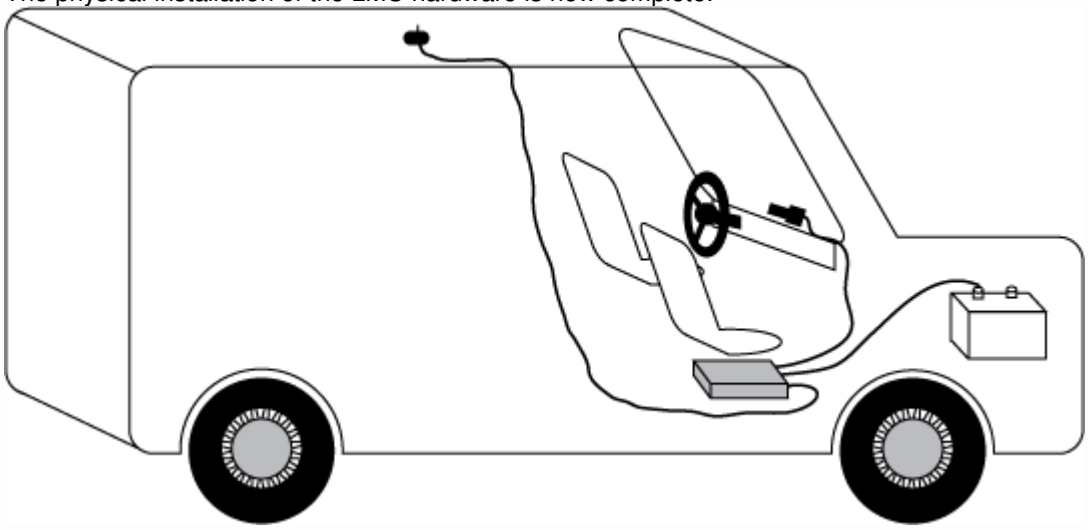
Window Mount Antenna Location

5.3.5 Typical Connection Sequence

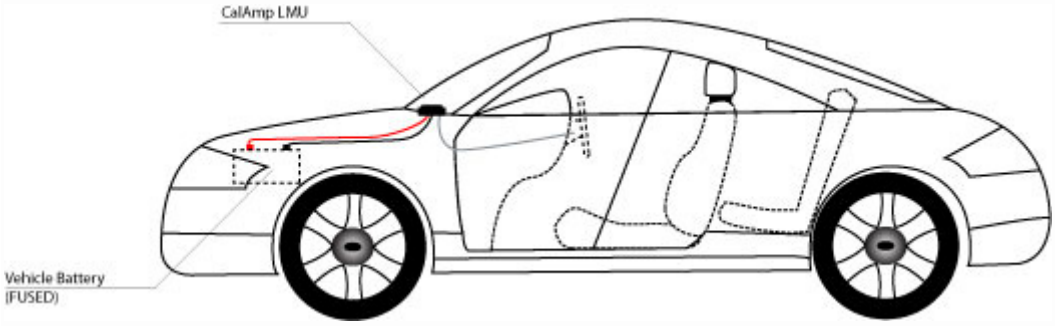
- Attach the cable from the GPS antenna.
- Connect the cable from the Comm.. antenna

- Connect any peripherals to the LMU
- Plug in the power harness.

The physical installation of the LMU hardware is now complete.



Completed Install – separate antennas



Completed Install - Internal antennas

5.4 Installation Verification

In many cases it is desirable to verify that an installed 4530™ is working properly. That is, installers should verify that the GPS and communications functions of the 4530™ 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 4530™. 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 4530™ to obtain its current status.

5.4.1 Comm Verification

Installers should first verify that the 4530™ has been acquired and has registered to the wireless network. This may be verified in one of two ways. First, installers may look at the Comm LED (i.e., the one closest to the SMC antenna connector). If this LED is solid, then the LMU has registered to the network and established a data session.

If the LED is not visible, then 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.

```
        Radio Access     : GSM
        Network Reg.     : Yes, Home
        Data Reg.        : Yes, Home
        Connection       : Yes
        RSSI             :      -97 dBm
        BER              :       99
        Channel          :      737
        Cell ID          :     3441
        Base Station ID  :       40
        Local Area Code  :    31003
        Network Code     :      410
        Country Code     :      310
        IMEI (Modem S/N): 351802055396182
        IMSI (SIM ID)    : 310410202524377
        ICC-ID (SIM S/N): 89014102212025243778
        Phone Number     :
        GPRS APN         : ISP.CINGULAR
        Maint. Server    : maint.vehicle-
location.com(216.177.93.246):20500
        Inbound Server   : (0.0.0.0):20500
        Dual Comm        : routing id=0, log cid=0, modem type=21, inbnd
index=0

OK
```

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 4520™ to communicate with the modem and acquire the wireless network.

5.4.2 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, installers should check antenna placement (see the Installation Notes section for placement suggestions), the antenna connector and that the antenna has a clear view of the sky. For further troubleshooting, installers should contact CalAmp Support (M2MSupport@CalAmp.com)

5.4.3 Inbound Verification

The last item to verify is that the 4530™ 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 4530™ is using the correct Inbound IP address by using:

```
AT$APP INBOUND?
```

The response should be similar to:

```
INBOUND LMD
INBOUND 0 ADDR ddd.ddd.ddd.ddd:ppppp *
```

```
INBOUND 0 URL  myURL.myCompany.com
INBOUND 1 ADDR 0.0.0.0:20500
INBOUND 1 URL
INBOUND 2 ADDR 0.0.0.0:20500
INBOUND 3 ADDR 0.0.0.0:20500
----------------------------------------
```

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

The second step is to verify that the 4530™ is sending data. The best way to do this is to force the 4530™ to send in an unacknowledged Event Report (i.e., its current GPS location) with the following command:

```
----------------------

AT$APP PEG SUNRPT 255

----------------------
```

The 4530™ will respond with: OK

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

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

The current Comm, GPS and Inbound status of a GSM 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:

- **<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. The Fix Status types are detailed in the LM Direct Reference Guide.

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:

o **<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.

o **<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.

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

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

Example GSM Response

```
APP:081 8.3d
COM:0
GPS:No Time Sync
INP:11100111 13.7V
MID:4141000100 ESN
INB:207.7.101.227:20500 LMD
```

This is a legal agreement between you, the Customer, and CalAmp DataCom Incorporated ("CalAmp"). By installing and/or using the software or documentation, you are consenting to the terms of this License. If you do not agree to the terms of this non-exclusive License Agreement, DO NOT INSTALL OR USE THE SOFTWARE, APIs OR DOCUMENTATION. For a full refund, return the unused media package and all accompanying materials within seven (7) days to CalAmp. **Where there is no packaging or media, use of the software and/or documentation constitutes acceptance.**

Definitions: As used in this License Agreement, "Software" means CalAmp's LM Direct ™, LMU Manager™, LapTop Locator™, LMU Application/Programmable Event Generator™, CDMA LMU Provisioning Tool, GPRS LMU Provisioning Tool, iDEN™ Provisioning Tool, LMU Status, Clone Config, Hex Dump, LM Exchange™ Traffic Monitor, Freewave Base Station Config, Remote Serial

Port, App Watcher Service and/or other software products licensed by CalAmp for use in computer applications development or integration including the computer programs, libraries and related materials either contained on the media provided to you by or from CalAmp, or which you have received or downloaded electronically. “Application” means a compiled or executable software program created by Developer that uses some or all of the functionality of the Software. “Software Copies” means the actual copies of all or any portion of the Software including backups, updates, merged or partial copies permitted hereunder or subsequently licensed to you. “Documentation” means the non-Software information contained on the media provided with this package or downloaded and which is used with and describes the operation and use of the Software. “Documentation Copies” means the actual copies of all or any portion of the Documentation including backups, updates, merged or partial copies permitted hereunder or subsequently provided to you. “Related Materials” means all other materials and whatever is provided by or from CalAmp, and the non-Software and non-Documentation contained on the media supplied, downloaded, or otherwise supplied by or from CalAmp for use with the Software and Documentation. “Server” means a single, networked computer that is accessible to other client machines on the network. “User” means (i) a single person using an Application for his/her internal, use or (ii) a single terminal or a single workstation of a computer used only by a person (and not accessed otherwise) for accessing an Application. “Use License” means limited rights granted by CalAmp for deployment of a single Application to a User. “Developer” means a single programmer developing an Application. “Developer License” means the grant of certain limited rights to use and maintain the Software, Software Copies, Documentation, Documentation Copies and Related Materials in development of Applications.

Background: A Developer License is required for each Developer who uses the Software in building Application(s). A Use License is required and must be purchased by Customer for each User to which Customer provides access to an Application (unless a Server or Site license for unlimited or a specified number of users has been purchased). Each Use License is specific to one client-side Application only and may not be used for any other client-side Application. Each Server license is limited to Server-based Applications deployed on that Server for which the license has been purchased as specified in a CalAmp License Certificate. The Software is licensed on a per Developer, and on a per User, per Application basis. In order to preserve and protect its rights under applicable law, CalAmp is not selling you ownership rights to Software or Documentation (owned by or licensed to CalAmp). CalAmp specifically retains title to all CalAmp Software, Documentation and Related Materials and CalAmp licensors retain title to items owned by them.

Duration: This License Agreement is effective from the day you install or start using the Software, or receive or download it electronically, and continues until terminated. If you fail to comply with any provision of the License, termination is automatic, without notice from CalAmp and without the necessity for recourse to any judicial authority. Upon termination, you must destroy the Related Materials, the Software, Documentation and all Software and Documentation copies. CalAmp can also enforce its other legal and equitable rights.

Developer License Only—Uses Permitted: Software and Documentation may be used for the sole purpose of developing Applications and only by a licensed Developer. Software and Documentation may be installed onto a hard disk drive or a Server, access to which is restricted to Developers for which a Developer License has been purchased and may also be stored or installed on a storage device such as a network server, used only to install or access the Software or Documentation on your other computers over an internal network; however, you must have acquired a license for each separate computer on which the Software or Documentation is installed or accessed from the storage device. A Developer License may not be shared or used concurrently on different computers. One backup copy may be made for each legally obtained media copy or electronic copy you have received, provided that all CalAmp and third party licensor information — including copyright notices — are maintained and possession of the copy is retained in a secure location. In addition, you agree to use reasonable efforts to protect the Software and Documentation from unauthorized use, reproduction, distribution or publication. All rights not specifically granted in this License are reserved by CalAmp.

Customer agrees to include the notice “Copyright © 1999 – 2009 CalAmp DataCom Inc., All Rights Reserved” in Applications developed with the Software. Customer agrees to include the following CalAmp Copyright and Government Restricted Use notice in all documentation and in any Application on-line help or readme file.

“Portions of this computer program are owned by CalAmp DataCom Inc., Copyright © l999 – 2009, CalAmp DataCom Inc., All Rights Reserved. Use, duplication or disclosure by the Government is subject to restrictions as set forth in subparagraph ©(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 or subparagraphs ©(l) and (2) of the Commercial Computer Software-Restricted Rights at 48 CFR 52.227-19, as applicable. Manufacturer is CalAmp DataCom Inc., 1401 North Rice Ave. Oxnard, CA 93030. Rights are reserved under copyright laws of the United States with respect to unpublished portions of the Software.”

Developer(s) License—Uses Not Permitted: Unless Otherwise Agreed To In Writing with CalAmp, You May Not (1) Make derivative works including but not limited to translations, adaptations, arrangements or any other alteration (each of which would become the property of CalAmp or its licensors, as applicable) or make copies of the Software or Documentation except as permitted above; (2) Make copies of the Related Materials; (3) Use any CalAmp product to translate the product of another licensor unless you have the legal right to do so; (4) Allow a greater number of Developers to access the Software at any one time than the total number of Developer licenses for which you have paid; (5) Rent, lease, sublicense or lend the Software, Software Copies, Documentation, Documentation Copies, Related Materials or your rights under this License or allow access to the Software for unlicensed users; (6) Alter, decompile (except to the limited extent that decompilation by the licensed Developer only is necessary as the only available way to achieve interoperability with other programs and, in that situation, any resulting information cannot be used in developing, producing or marketing any software substantially similar in expression to the Software), disassemble or reverse engineer the Software; (7) Make any attempt to unlock or bypass any initialization system or encryption techniques utilized by the Software or Documentation; (8) Alter, remove or obscure any proprietary legend, copyright or trademark notice contained in or on Software, Documentation or Related Materials; or (9) use the Software to create an Application intended solely to duplicate functionality of an existing CalAmp end user software product.

Use Licenses: For each Server or Site License purchased, CalAmp grants the Customer the right to distribute Applications on a single Server or at a single Site, as the case may be, accessible to the number of individual users (not concurrent users) for which the Server or Site License has been purchased as evidenced by a CalAmp License Certificate. For each Use License purchased, as evidenced by a CalAmp License Certificate, CalAmp grants the Customer the right to distribute a single Application to a single User. In no circumstance may Customer distribute an Application under a site license or concurrent use license unless a comparable license has been purchased for the Software as evidenced by a CalAmp License Certificate. Customer agrees that distribution of an Application to a User will in all cases be accompanied by a license agreement containing at a minimum terms and conditions substantially similar to and at least as restrictive as the following:

The User may not (1) Make derivative works including but not limited to translations, adaptations, arrangements or any other alteration of the Application or make copies of the Application, except one backup copy may be made for each legally obtained copy of the Application, provided that all CalAmp and third party licensor information — including copyright notices — are maintained and possession of the copy is retained in a secure location; (2) Allow access to the Application for unlicensed users; (3)

Rent, lease, sublicense or lend the Application or its rights under the license; (4) Alter, decompile, disassemble or reverse engineer the Application; (5) Make any attempt to unlock or bypass any initialization system or encryption technique utilized by the Application; or (6) Alter, remove or obscure any proprietary legend, copyright or trademark notice contained in or on the Application.

The User agrees to use reasonable efforts to protect the Application from unauthorized use, reproduction, distribution or publication.

Audit: Customer shall keep records of all transactions involving Software for five (5) years after the transaction. CalAmp shall have the right upon written notice to audit Customer's records to verify compliance with this License including the number of Use Licenses granted by Customer. Audit may take place at Customer's place or business during normal working hours. In the event that there is a discrepancy in excess of five percent (5%) between the number of Use Licenses granted and the number paid for, Customer shall pay all costs related to performing the audit in addition to remitting payment for those licenses granted in excess of those paid for as evidenced by a CalAmp License Certificate.

General: This Agreement represents our entire understanding and agreement regarding the Software, Software Copies, Documentation, Documentation Copies and Related Materials and supersedes any prior purchase order, communication, advertising or representation and may only be modified in a written amendment signed by an authorized CalAmp representative or by a specific prior or subsequent written agreement between the parties. If any provision of this Agreement shall be unlawful, void or for any reason unenforceable, that provision shall be deemed severable from, and shall in no way affect the validity or enforceability of, the remaining provisions.

Covering the Physical Media and Printed Materials: CalAmp warrants to you, the original licensee, that the media on which the Software is recorded are free from defects in materials and workmanship under normal use and service FOR A PERIOD OF NINETY (90) DAYS FROM THE DATE OF DEVELOPER LICENSE PURCHASE. CalAmp's entire liability and your exclusive remedy as to defective media, Documentation or Related Material(s) shall be replacement of the media, Documentation or Related Material(s) by CalAmp. Each defective item, along with proof of license

purchase and date, must be sent in a traceable manner to: CalAmp DataCom Inc., 1401 North Rice Ave. Oxnard, CA 93030.

Disclaimer Regarding the Software, Documentations and Related Materials: THE SOFTWARE, DOCUMENTATION AND RELATED MATERIALS ARE PROVIDED “AS IS.” EXCEPT AS MAY OTHERWISE BE EXPRESSLY SET FORTH HEREIN, CALAMP MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE SOFTWARE, DOCUMENTATION OR RELATED MATERIALS INCLUDING BY WAY OF EXAMPLE, AND NOT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. BY WAY OF FURTHER EXAMPLE AND NOT LIMITATION, CALAMP MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE ACCURACY, RELIABILITY OR COMPLETENESS OF THE DOCUMENTATION OR THE RELATED MATERIALS. THE ENTIRE RISK AS TO THE USE OF THE SOFTWARE, DOCUMENTATION AND RELATED MATERIALS IS ASSUMED BY YOU. IN NO EVENT SHALL CALAMP BE LIABLE TO YOU OR ANY OTHER PERSON, REGARDLESS OF THE CAUSE, FOR THE EFFECTIVENESS OR ACCURACY OF THE SOFTWARE, DOCUMENTATION OR RELATED MATERIALS OR FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING FROM OR OCCASIONED BY YOUR USE OF THE SOFTWARE, DOCUMENTATION OR RELATED MATERIALS, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN THE EVENT THE FOREGOING IS FOUND BY A COURT OF COMPETENT JURISDICTION TO BE INEFFECTIVE, YOU HEREBY AGREE THAT CALAMP’S MAXIMUM LIABILITY FOR ANY CLAIM ARISING IN CONNECTION WITH THE SOFTWARE, DOCUMENTATION AND/OR RELATED MATERIALS (WHETHER IN CONTRACT, TORT, INCLUDING NEGLIGENCE, PRODUCT LIABILITY OR OTHERWISE) SHALL NOT EXCEED THE LICENSE FEES PAID BY YOU WITH RESPECT TO THE SOFTWARE, DOCUMENTATION AND/OR RELATED MATERIALS AT ISSUE. SOME STATES DO NOT ALLOW THE LIMITATION OR EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE FOREGOING PROVISION, WITH RESPECT TO EXCLUDING OR LIMITING SUCH DAMAGES, MAY NOT APPLY TO YOU.

Acknowledgement: You acknowledge that you have read this LIMITED WARRANTY, understand it and agree to be bound by its terms and conditions. You also agree that: (1) No oral or written information or advice given by CalAmp, its dealers, distributors, agents or employees shall in any way increase the scope of this Limited Warranty and you may not rely on any such information or advice; (2) Unless a written governing agreement signed by you and CalAmp exists, this License Agreement is the complete and exclusive statement of agreement between CalAmp and you regarding the licensing

of the Software, Documentation and Related Materials and supersedes all proposals, oral or written, and any other communications you may have had prior to purchasing your license; (3) Except for the price and delivery terms agreed upon by both parties, the terms and conditions of this License Agreement shall supersede those set forth in any purchase order where the purchase order conflicts or is inconsistent with or adds to the terms and conditions of this License and those superseded purchase order terms and conditions shall be null and void; (4) You agree to assure that copies of this License Agreement are distributed, read and agreed to by each Developer using the Software and/or Documentation.

Governing Law: This Agreement shall be governed by the laws of the State of California, United States, excluding its conflicts of law principles and excluding the United Nations Convention on Contracts for the International Sale of Goods. You agree to exclusive jurisdiction of California State federal and state courts, Ventura County, for resolution of any dispute related to this Agreement.

U.S. Government Protected Rights: The Software Documentation and Related Materials are provided with RESTRICTED RIGHTS. Use, duplication or disclosure by the Government is subject to restrictions as set forth in subparagraph ©(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 or subparagraphs ©(1) and (2) of the Commercial Computer Software-Restricted Rights at 48 CFR 52.227-19, as applicable. Manufacturer is CalAmp DataCom Inc., 1401 North Rice Ave. Oxnard, CA 93030. Rights are reserved under copyright laws of the United States with respect to unpublished portions of the Software.

Human Exposure Compliance Statement

Pursuant to 47 CFR § 24.52 of the FCC Rules and Regulations, personal communications services (PCS) equipment is subject to the radio frequency radiation exposure requirements specified in § 1.1307(b), § 2.1091 and § 2.1093, as appropriate.

CalAmp DataCom Inc. certifies that it has determined that the 4530™ complies with the RF hazard requirements applicable to broadband PCS equipment operating under the authority of 47 CFR Part 24, Subpart E of the FCC Rules and Regulations. This determination is dependent upon installation, operation and use of the equipment in accordance with all instructions provided.

The 4530™ complies with RF specifications when used at a distance of 10 mm from your body. Ensurethat the device accessories, such as a device case and deviceholster, are not composed of metal components. Keep thedevice away from your body to meet the distancerequirement.

Gardez le 10mm de l'appareil à partir de votre corps pour répondre à l'exigence de la distance.

FCC Rules and Industry Canada (IC) regulatory information

Compliance Statement (Part 15.19)

The equipment device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received including interference that may cause undesired operation.

Warning (Part 15.21)

Changes or modifications not expressly approved by Calamp Wireless Netwroks could void the user's authority to operate the equipment. Manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment.

Compliance Statement (Part 15.105(b))

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie 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'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Class B digital device notice

“CAN ICES-3 (B)/NMB-3(B)”

This transmitter must not be co-located or operation in conjunction with any other antenna or transmitter.Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.