LMU-5000™

Hardware and Installation Guide

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.

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.

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.
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 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.
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.
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.

Status LEDs

The LMU-5000™ is equipped with two Status LEDs, one for GPS and one for COMM (wireless network status). 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 - Green) Definitions

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

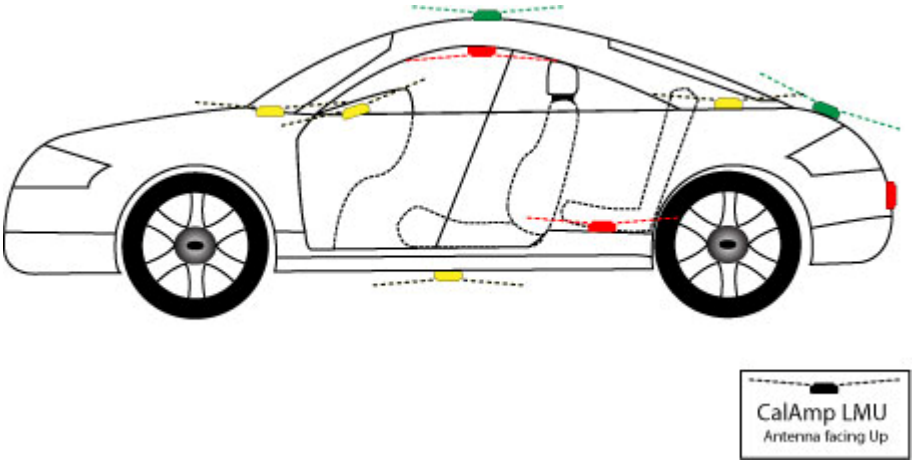
LED #3 (GPIO LED- RED) Definitions

Condition	LED 3
GPIO Off	Off
GPIO On	On
GPIO Status #1	TBD
GPIO Status #2	TBD

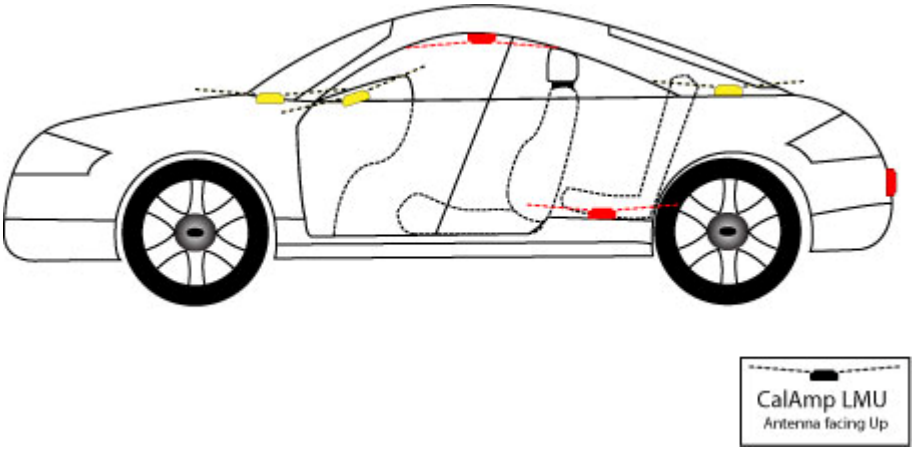
Placement of Antennas

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

I/O Connector

The LMU-5000™'s features expanded I/O capabilities via its 22-Pin Molex 43045-2202 connector. Its pin-out is as follows:

Pin	Signal Name	Description	5C889 Color	Input or Output
1	Input 1	Input 1 – Digital Input	Blue	Input
2	Input 2	Input 2 – Digital Input	Orange	Input
3	Input 3	Input 3 – Digital Input	Violet	Input
4	Input 4	Input 4 – Digital Input	Gray	Input
5	Input 5	Input 5 – Digital Input	Green & White	Input
6	Input 6	Input 6 – Digital Input	Blue & White	Input
7	Input 7	Input 7 – Digital Input	Black & White	Input
8	1BB T Data	1 Bit Bus Data (T)	Green & Black	Input/Output
9	1BB GND	1 Bit Bus Ground	Black	Ground
10	1 BB R Data	1 Bit Bus Data (R)	Orange & Black	Input/Output
11	1 BB Gnd	1 Bit Bus Ground	Black	Ground
12	Output 0	Output 0 - Starter Disable Relay Driver	Green	Output
13	Output 1	Output 1 - Digital Output	Brown	Output
14	Output 2	Output 2 - Digital Output	Yellow	Output
15	Output 3	Output 3 - Digital Output	Blue & White & Orange	Output
16	Output 4	Output 4 - Digital Output	Green & Black & Orange	Output
17	Output 5 - LED	Output 5 - LED 1 Driver	Red & Green	Output
18	Output 6 - LED	Output 6 - LED 2 Driver	Orange & Green	Output
19	ADC 2	Analog to Digital Input 2	Black & Red	Input
20	ADC 3	Analog to Digital Input 3	White & Red	Input
21	ADC 4	Analog to Digital Input 4	Orange & Red	Input
22	ADC 5	Analog to Digital Input 5	Blue & Red	Input

I/O Descriptions

The LMU-5000™ provides the following inputs and outputs (I/O):

Digital Inputs
Input 0: Ignition Sense (Always biased low)
Input 1: Generic Digital Input (Biased high or low/ S-158 Bit 1)
Input 2: Generic Digital Input (Biased high or low/ S-158 Bit 2)
Input 3: Generic Digital Input (Biased high or low/ S-158 Bit 3)
Input 4: Generic Digital Input (Biased high or low/ S-158 Bit 4)
Input 5: Generic Digital Input (Biased high or low/ S-158 Bit 5)
Input 6: Generic Digital Input (Biased high or low/ S-158 Bit 6)
Input 7: Generic Digital Input (Biased high or low/ S-158 Bit 7)

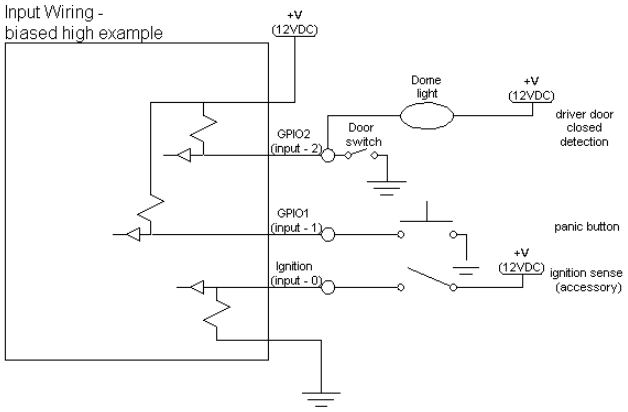
Analog to Digital Inputs
A/D 0: External Power Supply Monitor
A/D 1: External A/D Input (From Power Connector)
A/D 2: External A/D Input (From 22 Pin I/O Conenctor)
A/D 3: External A/D Input (From 22 Pin I/O Conenctor)
A/D 4: External A/D Input (From 22 Pin I/O Conenctor)
A/D 5: External A/D Input (From 22 Pin I/O Conenctor)
A/D 6: GPS Antenna Sense
A/D 7: LMU-5000, Internal Temp Monitor

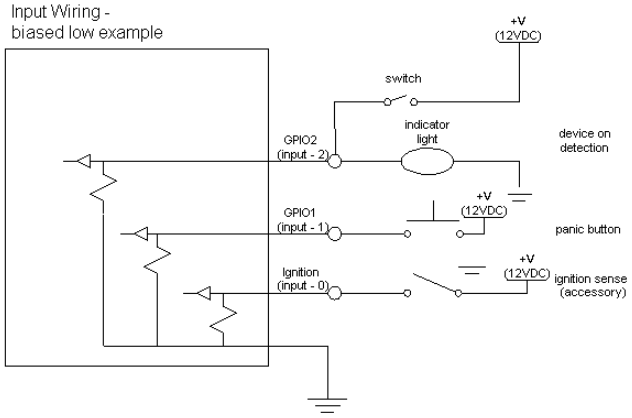
Outputs:
Output 0: Standard Open Collector Relay Output
Output 1: Standard Open Collector Relay Output
Output 2: Standard Open Collector Relay Output
Output 3: Standard Open Collector Relay Output
Output 4: Standard Open Collector Relay Output
Output 5: LED Driver Output 1
Output 6: LED Driver Output 2
iButton / 1 Bit Bus
iButton ID Support
1Wire bus with current boost for temperature sensors

Ignition and Inputs

The LMU-5000™ provides up to 7 High/low selectable inputs and one Ignition Sense input.. These inputs are protected from typical vehicle transients and can be directly connected to most vehicle level logical inputs from 4 volts up to the vehicle power input level (typically 12 VDC). Their input impedance is approximately 10k . One of these inputs is dedicated to sensing the vehicle's ignition status to provide for flexible power management. The other seven inputs may be used to sense vehicle inputs such as cooling unit operation, a hidden driver "Panic" switch, taxi on-duty/off-duty meter status or many others.

The ignition input is pulled to ground through the 10k resistance, where the other inputs can be configured to be normally High (i.e. pulled to +12v through a 200K10k resistor) or Low (i.e. pulled to ground through a 100K10k resistor). The diagrams below show how to connect the inputs in both a high- and low-biased configuration:





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.