



- **In-vehicle installation guidelines**

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- **For all FALCOM products**

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- **with vehicle mount option**

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- **Application note**

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- *(In this application notes, STEPPIII is used as an example)*

**VERSION HISTORY:**

*This table provides a summary of the document revisions.*

Version	Author	Changes	Modified
1.0.8	F. Beqiri	- Added a new point (3) in chapter " <a href="#">Importance of connection</a> " - to filter electromagnetic and radio-frequency interferences we recommend to use ferrite clips at power entry point (see fig. 1). - Added the maximum and the recommended tightening torque that can be used on the mounting nut on the FOX-LT-IP device. Read chapter <a href="#">2.1.1</a> .	06/09/2010
1.0.7	F. Beqiri	- Made corrections and improvements throughout this document. - Added installation instructions for FOX-LT-IP - see chapter <a href="#">2.1.1</a>	21/12/2009
1.0.6	F. Beqiri	- Added additional <a href="#">installation instructions when using features of the the built-in 3D acceleration sensor</a> .	02/09/2009
1.0.5	F. Beqiri	- Added additional installation instructions in chapters <a href="#">1.1</a> and <a href="#">3.1</a> . - Added <a href="#">Figure 1</a> - prior <a href="#">Figures 1</a> , <a href="#">2</a> and <a href="#">3</a> removed. - Added chapter <a href="#">APPENDIX</a> - <i>Contains the pinout of the vehicle installation cable for STEPPIII, FOX-LT, BOLERO-LT and TANGO55/56/864 devices.</i>	13/01/2009
1.0.4	F. Beqiri	- Added additional information about usage of <a href="#">IGN-pin</a> . - These application notes are adapted to the STEPPIII device.	28/11/2007
1.0.3	F. Beqiri	- Added point 12 in chapter <a href="#">1.1.2</a> - devices are not protected against over-voltage.	23/02/2007
1.0.2	F. Beqiri	- Replaced <a href="#">Figure 3</a> by a new one. Added description below this figure.	20/01/2007
1.0.1	F. Beqiri	- Added all applicable devices	07/12/2006
1.0.0	F. Beqiri	- Initial version	26/07/2006

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# 1 GENERAL INFORMATION

This document provides all the necessary information to allow your FALCOM products (e.g. STEPPIII unit) to be properly and safely installed. Before beginning the installation of your product, the installation technician must read completely these Application notes and the hardware manual of the used product. Important information contained herein is to prevent damages of the used FALCOM product.

These application notes are applicable only for the following FALCOM devices:

- x **STEPPIII, STEPPII-55/56 and STEPPII-LT,**
- x **BOLERO-LT,**
- x **FOX, FOX-LT**
- x **TANGO55/56 and TANGO864**

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***This product manual is only addressed to qualified personnel which are well skilled in electrical/electrical installation and not addressed to private consumers/end users. The installation, implementing or setting into operation of the product can only be performed by these qualified personnel.***

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## 1.1 Installation guidelines and importance of connection for all FALCOM products

***Read these precautions carefully before installing one of the AVL devices inside a vehicle. Proper installation of the FALCOM products requires the installer to have a good understanding of automotive electronics, systems and well skilled in electrical/electrical installation. Secure placement or installation is the owner's responsibility. FALCOM shall not be liable for any accident by improper placement or installation of devices.***

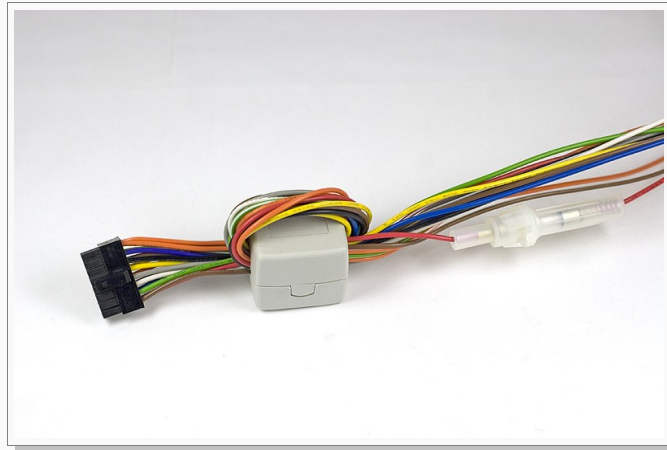
### 1.1.1 Installation guidelines

- x Do not mount any device or antenna near the electronic devices and control systems such as speakers, fan motors or actuators. In particular, FOX device reacts sensitively with interferences on the GPS receiver.
- x Do not mount any device, antenna, or any other item in the deployment path of the airbag system.
- x Do not cover vehicle instruments and displays with cable.
- x Do not mount cables, antennas or devices in locations that they may be affected by moving parts (in particular, pedals with lever, shift linkage, control mechanism for ventilation and actuators, rotating parts, hand brake lever, steering linkages and so on).
- x Do not mount the device near the heat exchangers and their channels. These belong to the air conditioning system and heating. The consequences are often overheating or condensation on electronics, SIM card etc.
- x Always ensure that the connections are clean and secure. Never let them loose, convoluted or unsecured in cavities. These may often get out of place due to the vibrations and touch any moving parts in the vehicle.
- x Do not bundle or roll up the excess cable. The produced coil is often the reason for induced voltages that may affect the GPS and GSM performances as well as the operating voltage of the device.

- x Do not place battery-powered devices direct in sunlight or air currents of the heating system. Generally, batteries operate from -20 °C - +60 °C (discharge range) and 0 °C to +45 °C (charge range).
- x Some vehicles use glass that contains a thin metallic coating for defrosting or to control solar gain; glass-mount antennas may NOT function properly when mounted on this type of glass. However, most manufacturers leave free unprocessed places, mostly centrally, for backfitting of GPS technology.
- x Glass mounted antennas should not be mounted in places where the vignettes are fixed. These are often constructed with metallic inside, which also disrupts GPS and GSM reception.

### 1.1.2 **Importance of connection**

- ❖ Before beginning any wiring procedure, be sure you understand the wiring diagram attached in this document for your particular model. A summary of hints in this diagram is also given.
- ❖ Turn car ignition off before making any connection.
- ❖ To eliminate broadcast signals, reduce electromagnetic interference (EMI) and radio-frequency interference (RFI) we recommend to use ferrite clips which should be installed at the end of the cable closest to the AVL device (see figure below).



**Figure 1:** A ferrite clip placed on the STEPPIII installation cable.

- ❖ Use a common ground point for all ground wires. Improper grounding can create a fault current.
- ❖ Apply power to the unit when all connections have been made properly. FIRST complete all the connections required among the unit according to the instructions and then FINALLY apply power to the unit by connecting the positive pole (+IN).
- ❖ Prevent second ground connection path between your unit and vehicle, which may create ground loops between your unit and vehicle accessories. These ground loops can damage the unit (see Fig. 2 in this document).
- ❖ The ground-mounted antennas or the unit case may often create a fault current, if improper grounding is made.
- ❖ To prevent a second ground path during the unit installation, install first the GPS/GSM antenna, then connect the negative pole of the device (GND) to the vehicle's battery (-) negative terminal and, when you are sure that all connections are properly made, apply power to the unit by connecting the positive pole of the device (+IN) to vehicle battery (+) positive terminal.
- ❖ Depending on the FALCOM product, be careful to select the proper wire length and colour as well as the proper connectors for each application. For more detailed information, refer to the hardware manual of the used FALCOM product.

- ❖ All wires should be firmly secured. Leaving some slack in the wires or bad wire connections may cause the connections getting loose due to vibration.
- ❖ Your installation should be checked periodically to maintain proper operation with your vehicle.
- ❖ The operating voltage range must never be exceeded. All FALCOM devices are not protected against continuous over-voltage.
- ❖ All FALCOM AVL devices are not protected internally against overcurrent. Therefore, for safety reasons and to eliminate overcurrent, all leading lines on an AVL device, such as Continuous plus (clamp 30) or Ignition (clamp 15), must be externally protected in the following way: nominal protection value in the direct line maximally 2A; nominal protection value in the next superordinate circle maximally 15A. The CE-conformity of the product is given only under adherence to these electrical operating conditions. The disregard of these electrical operating conditions leads to an offence against the EN/IEC 60950-1, particularly against the regulations to the reduction of the fire risk.
- ❖ Improper wiring can damage the unit and the vehicle's wiring system.

## 2 INSTALLATION INSTRUCTIONS

### 2.1 Connection precautions

#### Selecting an installation location for an external antenna or unit is critical.

If your product comes with an external glass-mounted antenna, then install the GPS antenna in the vehicle in the locations that are dry and distanced from sources of extreme heat and where the system can receive GPS satellite signals from all directions. The antenna cable must be extended and not rolled up. When rolling up the antenna cables, the induced voltage caused by magnetic field may effect on GSM and GPS performances and operating voltage as well .

If you use a ground-mounted antenna, please ensure that the antenna ground does **NOT** come into contact with vehicle body. This is recommended to avoid the ground loops, which may occur when there is more than one ground connection path available.

If your product comes with built-in antenna (e.g. FOX or BOLERO-LT), then install the device in a suitable location that does not interfere with the GPS/GSM reception. When a location is found, then perform the test given in chapter 3.4.

#### Identifying suitable power sources for the unit is also critical.

Turn car ignition off before making any connection. Check the polarity of the battery terminals with a voltmeter before installing any of the FALCOM products in the vehicle, Later on, you have to identify an electrical ground in the vehicle and it should be used as a common ground point for all ground wires. Connect the unit ground wire to the identified ground ([-] negative ground battery terminal or vehicle chassis, see possibilities for power source connections below) and, only when all other connections are made, connect the unit power lead (+IN) directly to the vehicle battery (+) positive terminal (12V/24V) by using a 2A fuse.

##### **Possibilities for power source connections:**

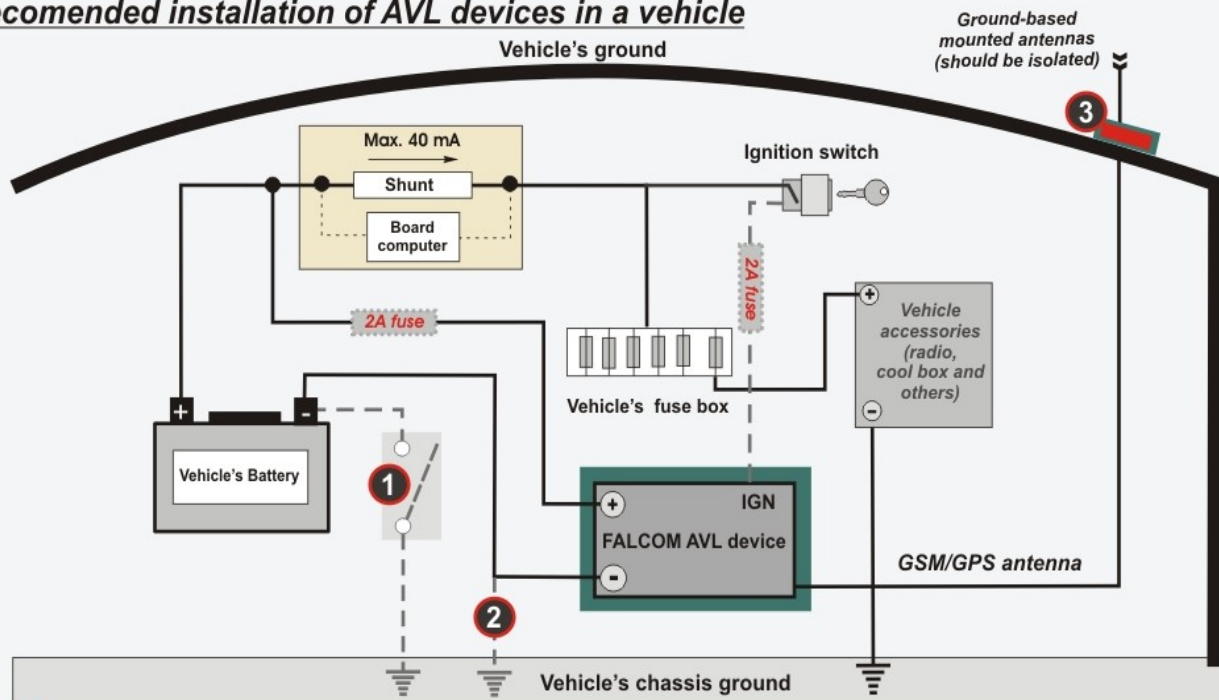
#### **A) Power is taken directly from the vehicle battery and the vehicle chassis is used as a common ground.**

The vehicle chassis(②) can be used as a common ground **ONLY WHEN** your vehicle does not have equipped a main switch(①) equipped between the battery negative terminal and the vehicle ground. If this switch is in your vehicle and you select the vehicle chassis as a common ground, then the external power to the unit will depend on the position of this switch. For non battery-powered units, the unit is powered OFF, once this switch is OFF.

#### **B) Power supply pins are connected directly to the vehicle battery:**

The battery negative (-) terminal can be used as a common ground **ONLY WHEN** no second ground occurs. When an electronic accessory in-vehicle (e.g. radio, cool box and so on) uses the body of the vehicle for ground, and the device ground pin is directly connected to the battery negative (-) terminal, this can form a common return path if the antenna (③) or device case comes into contact with vehicle body (Figure below illustrates such ground-loops). In such cases, some vehicle accessories can limit the amount of ground that other accessories can receive. This is commonly known as a ground loop. In other words, a ground loop is an unwanted electric current path in a circuit resulting in interference, when two grounded points in the same circuit have different potentials. To prevent such ground loops, it is recommended to shield your device and the antenna so that no second ground occurs. Additionally, the device positive lead (+IN pin) must be protected by using a 2A fuse. Most vehicle manufacturers recommend that when both leads (positive and negative) go directly to the battery, they need to be fused (refer to the manufacturer's installation guidelines manual for the vehicle).

## Recommended installation of AVL devices in a vehicle



1 This switch (called - vehicle main switch) is not available in all vehicle models (check your data sheet for this info).

2 Optional ground. A good ground connection is critical for the proper operation of the AVL devices. It is recommended to connect the device's ground pin directly to the battery (-) negative terminal. However, if the main switch ① is not available in your vehicle, you may also connect the device's ground pin to a clean and corrosion free chassis ground.

3 When the device's ground pin is connected directly to the battery negative pole and the antenna or device case comes in contact with vehicle body then ground loops may occur. Therefore, it is recommended to shield the antenna and device case.

Electrical isolation prevents ground loops

4 Do not apply power from different sources to the FALCOM AVL devices. With the vehicle ignition off, and antenna connected, apply power to the AVL device by connecting first the ground line and then +IN line and NOT vice-versa.

Figure 2: Power supply pins are connected directly to the vehicle battery. The unit case, antenna and cables are electrically shielded to prevent ground loops (in the diagram shown in the green color).

The latest vehicles are equipped with a shunt circuit protection between vehicle battery and vehicle fuse box allowing the measurement of sink current values flowing through it. Normally, when the vehicle ignition is turned off, just a small current is drawn from the battery - less than 50 mA. This means that if the power pin (+IN) is connected behind the shunt circuit, the installed FALCOM device will not be able to draw current from the vehicle battery when the vehicle is off, as the shunt limits the current flowing through it. Therefore, it is recommended to install one of FALCOM devices in front of the shunt, as shown in the **Fig.2** above.

According to your application requirements, several power sources may be required:

- The input supply voltage must provide continuous 12V/24V power and must be able to supply sufficient current even when the vehicle is off,
- Voltage on the ignition pin should be 12V/24V when the vehicle is on, and 0V when it is off (for ignition controlled application),
- To get input changes events, the voltage on an input pin should be 12V/24V for high and 0 V for low.

Using a voltmeter to test for these conditions will help to ensure a successful installation. During this time, ensure that all vehicle accessories (radio, lights, air conditioning, etc.) are turned off.

**If the IGN-pin is not used to control the vehicle ignition states, then it is recommended to connect it to the operating voltage (+IN) to use the IGN-Sleep mode. With the help of an external switch this will wake up the device from IGN-Sleep mode (with a HIGH signal on this pin).**

### Additional installation instructions when using features of the the built-in 3D acceleration sensor:

To use the features of the built-in 3D acceleration sensor, please ensure:

1. The device should be accurately installed on any flat surface that is parallel to the horizontal axis of your vehicle with the 16pin connector or antenna cables pointing to the driving direction.
2. The device should be secured to the vehicle so that no false events will occur.
3. The device should be configured by additional alarms to fully use this feature. The force value that you will enter in the configuration should correspond to the value that your application requires.
4. The value in the configuration should be entered without commas or points (e.g. 2500).

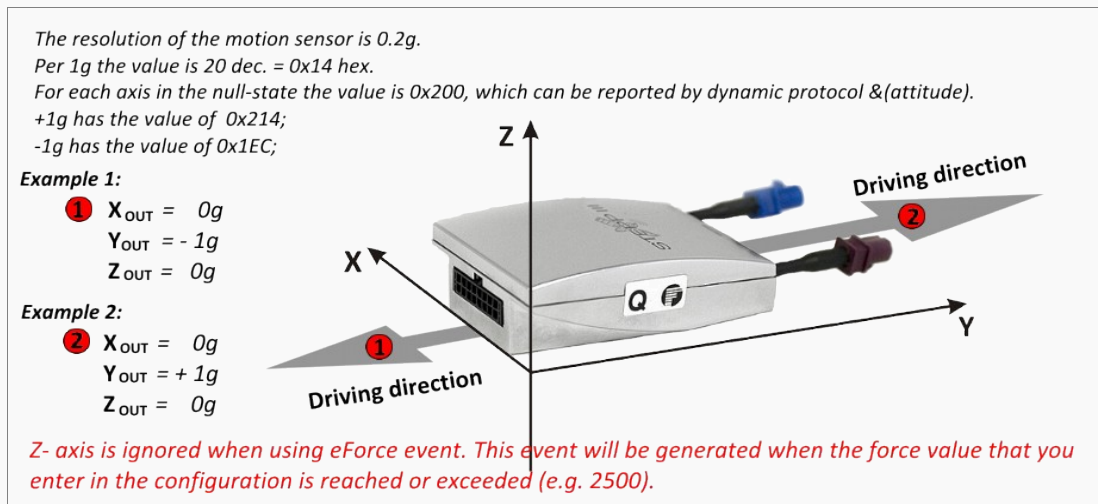


Figure 3: Motion sensor operation.

### 2.1.1 Installing the FOX-LT-IP

The FOX-LT-IP contained in a PA6 plastic weatherproof enclosure is designed for mounting on an exterior flat surface of a vehicle such as the roof. After you have inserted the SIM card inside the device and the casing is completely water-sealed, then you can install your device on the vehicle's roof or somewhere else on the flat surfaces. The FOX-LT-IP device can be installed in various ways. The following figure gives an example of a typical installation variant. Before you start the installation, ask for professional advice on the mounting that would best suit your needs.

To install the FOX-LT-IP, follow the steps listed below:

- ✓ Place the six rubber feet into the six spacers of the device.
- ✓ Installing of the FOX-LT-IP requires drilling to your vehicle roof in order to bolt them on. To avoid keeping the device in direct contact to the sunlight that leads to overheating, it is recommended to mount the FOX-LT-IP device behind the air deflector on your truck roof. Therefore, locate the mounting place and drill a 32 mm ( $\pm 0.1$ mm) hole in the vehicle roof. The device should be placed away from other installed devices that may obstruct the line of sight between the device and the satellites.
- ✓ First loosen the mounting nut on the device's bottom side and take it out of cable.
- ✓ Pass the cables through the hole and then place the device on the surface to be mounted. The rubber feet must make full contact with the vehicle's metal roof.
- ✓ Pass the cable in the nut and then tighten the mounting nut until movement is blocked. The maximum tightening torque used on the mounting nut must not exceed the maximum value of 12 Nm, recommended 10 Nm.
- ✓ Make sure the top of the device faces forward when tightening the mounting nut (see example diagram below).
- ✓ Finally, connect the vehicle installation cable to the 8pin connector on the external cable of the FOX-LT-IP - as shown in chapter 4.4.
- ✓ Another mount option is to use 6 x hex cap screws M4x30 or longer (not included) - as shown on the right side of the figure below (second mounting option). For this mount option, refer to the FOX-LT-IP User Manual and find out the dimensions of the housing.

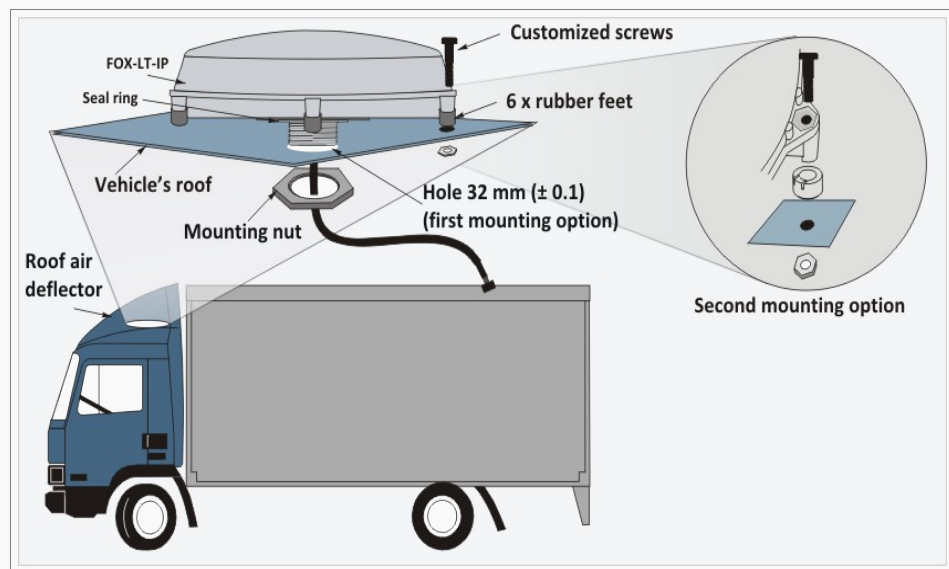


Figure 4: Mounting the FOX-LT-IP on the vehicle's roof

The pin out of the 8pins connector at the end of the cable is given in chapter 4.4.

## 3 ADDITIONAL INSTALLATION HELP

### 3.1 Selecting a location with good reception for devices with external or internal antennas

**The unit (e.g. STEPPIII) should be affixed to:**

- x a dry solid surface,
- x not exposed to extreme heat,
- x free from extreme vibration.

**The antenna should be placed in a location where:**

- x valid GPS fix could be obtained,
- x not covered or blocked by metal,
- x not near electronic management and control systems,
- x all connection points to the vehicle are easily accessible (by the user).

**Good mounting locations can often be found:**

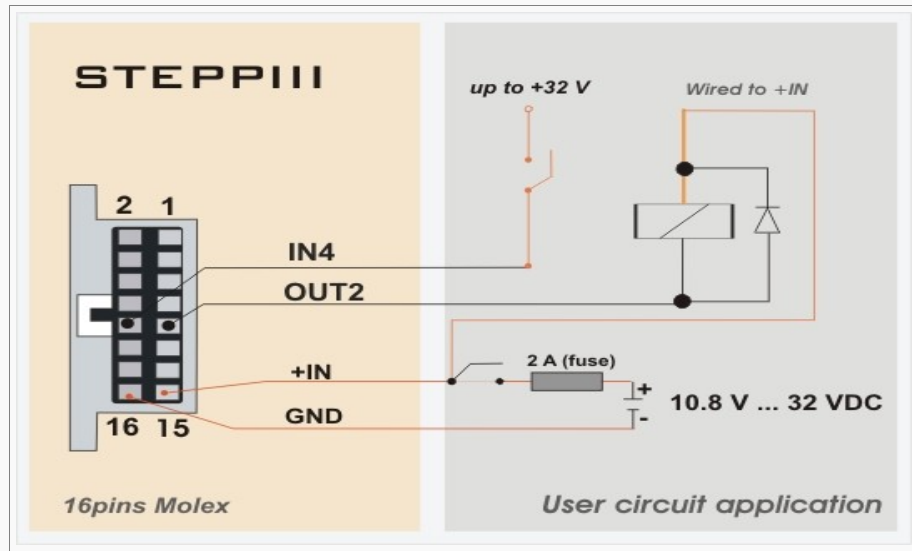
- x on the windscreen (*not for battery-powered devices*),
- x under the vehicle's dashboard,
- x under the seats,
- x on the underside of the rear windshield deck in passenger cars.

### 3.2 Install Ignition (Optional) - Only for STEPPII, STEPPIII, FOX/-LT and BOLERO-LT

It is recommended to install the IGN line as shown in **Fig.2** above. Ignition-controlled power can often be found in the vehicle's fuse box or directly from the vehicle's ignition system. When testing for ignition-controlled power, ensure that your power source remains at 12V/24V when the ignition of vehicle is on. Connect the ignition wire from the unit's power cable to the ignition-controlled source protected with a **2A** fuse. The ignition input can also be used for journey *START* and *STOP* reports (*programmable in the software*). The pinout of the vehicle installation cable for **STEPPIII, BLERO-LT, FOX-LT** and **TANGO55/864** is given in chapter **APPENDIX** .

### 3.3 Install additional Inputs/Outputs (Optional) – Only for STEPPIII, FOX/-LT and BOLERO-LT

The inputs provided on the STEPPIII unit are high active and will sense a voltage change between low (ground) and high (12V/24V). This can be done by installing a push button between the digital input and 12V/24V. Push buttons are open by default, and when the button is pressed the switch closes to 12V/24V. When the push button is closed (12V/24V) the input changes its state from low to high and the internal software generates the rising edge event. Similarly, when the push button is opened (grounded), the input changes its state and the unit generates the opposite falling edge event. These events can then be programmed in the internal software to execute different alarms or activate e.g. a siren mounted in the car via a digital output. The provided outputs can be used to control external devices, usually via a relay.



**Figure 5** Connection example how to guard the vehicle's doors "open/close" (IN4) and control a RELAY (OUT2).

### 3.4 Perform testing

The test should be performed with vehicle in an open area where GPS signal is available. When performing the initial test, follow the steps listed below:

- x Make sure all electrical connections including grounding are properly done.
- x Turn the device on and check its behaviors with the help of Workbench software installed on a laptop whether there is sufficient GPS and GSM reception. You may also configure 4 alarms to show the GPS and GSM operation via LED indicators. See examples below.

Example	PFAL,Cnf.Set,AL1=GSM.GPRS.eConnected:IO12.Set=cyclic,1000,1000
	PFAL,Cnf.Set,AL2=GSM.GPRS.eDisconnected:IO12.Set=low
	PFAL,Cnf.Set,AL3=GPS.Nav.sFix=valid:IO13.Set=cyclic,1000,1000
	PFAL,Cnf.Set,AL2=GPS.Nav.sFix=invalid:IO13.Set=low

- x If you see that there is sufficient GPS and GSM reception (note that, acquiring of initial GPS fix may take more than 2 minutes), turn on your vehicle and check again to know if any of vehicle's electronics is causing interferences to the device. If the device could not obtain a fix within 5-20 minutes, then change the location of the device and restart the test.
- x If no interferences are detected and the device gets a fix, then perform the same test during driving, to check whether the GPS fix stays stable and the device is able to get a valid fix even when the GPS fix is lost.
- x When the mounting location has been determined and the test has been successfully completed, turn off your device and your vehicle and perform the complete installation by keeping in mind the instructions given in chapter 1.1.

After the device has been mounted, refer to the **Getting Started Guide** to perform an end-to-end system test.

## 4 APPENDIX

### 4.1 Vehicle installation cable for STEPPII-LT

The pin function on the 16pin MOLEX connector for STEPPII is given in the manual "[Stepp\\_II\\_hardware\\_manual\\_ver\\_1.09.pdf](#)", Table 11.

### 4.2 Vehicle installation cable for STEPPIII

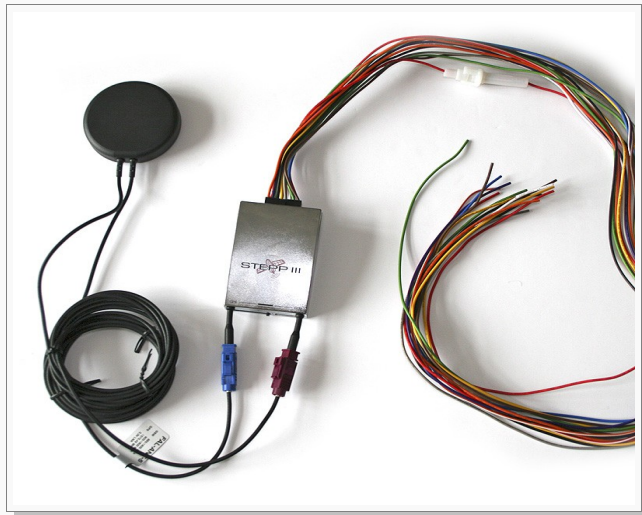


Figure 6: Vehicle installation cable for STEPPIII

The pin function on the vehicle installation cable for STEPPIII is listed in table below:

WIRE COLOR	NAME	I/O
Orange - White	VBO	<b>Do not use, leave disconnected.</b>
Orange	IN0	Digital / Analog input individually configurable ( <b>default = analog</b> ) <b>Analog IN:</b> Up to 32.0 V DC/10 bits resolution <b>Digital IN:</b> +10.8 ... +32.0 V DC ( $V_{+IN} \leq +IN$ )
Green - White	GND	Ground
Lilac	IN1	Digital / Analog input individually configurable ( <b>default = analog</b> ) <b>Analog IN:</b> Up to 32.0 V DC/10 bits resolution <b>Digital IN:</b> +10.8 ... +32.0 V DC ( $V_{+IN} \leq +IN$ )
Brown - White	OUT0	Open collector output. 100 mA max. @ +10.8 .. +32.0V DC
Black	IN2	Digital / Analog input individually configurable ( <b>default = analog</b> ) <b>Analog IN:</b> Up to 32.0 V DC/10 bits resolution <b>Digital IN:</b> +10.8 ... +32.0 V DC ( $V_{+IN} \leq +IN$ )
Yellow - White	OUT1	Open collector output. 100 mA max. @ +10.8 .. +32.0V DC
Yellow	IN3	Digital / Analog input individually configurable ( <b>default = analog</b> ) <b>Analog IN:</b> Up to 32.0 V DC/10 bits resolution <b>Digital IN:</b> +10.8 ... +32.0 V DC ( $V_{+IN} \leq +IN$ )
Red - White	OUT2	Open collector output. 100 mA max. @ +10.8 .. +32.0V DC
Grey	DI0 / CAN_H	Digital input or CAN HIGH (upon request) <b>Digital:</b> up to 32.0 V DC ( <b>HIGH &amp; LOW = programmable</b> )
Black - White	OUT3	Open collector output. 100 mA max. @ +10.8 .. +32.0V DC
White	DI1 / CAN_L	Digital input or CAN LOW (upon request) <b>Digital:</b> up to 32.0 V DC ( <b>HIGH &amp; LOW = programmable</b> )

<b>Blue</b>	IGN	Digital input <b>HIGH</b> $\geq +10.8 \dots +32.0$ V DC; <b>LOW</b> = 0V
<b>Green</b>	DiWu	Digital input <b>HIGH &amp; LOW</b> = programmable <i>(It can be used to wake up the main microcontroller from DiWu-sleep mode)</i>
<b>Red</b>	VCC – 2 amps fuse-protected	Power supply $V_{IN} = +10.8\dots32.0$ V DC
<b>Brown</b>	GND	Ground

**Table 1:** Vehicle installation cable pinout for STEPPIII

### 4.3 Vehicle installation cable for BOLERO-LT



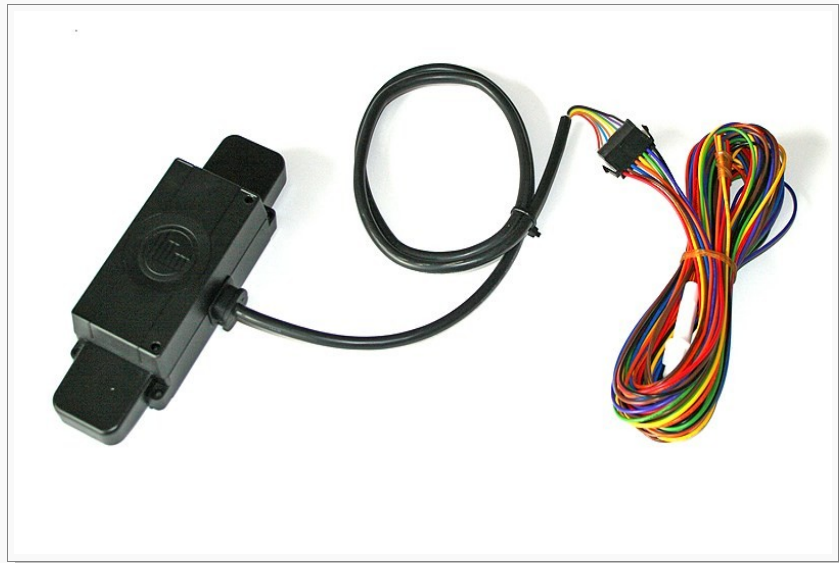
**Figure 7:** Vehicle installation cable for BOLERO-LT

The pin function on the vehicle installation cable for BOLERO-LT is listed in table below:

COLOR	NAME	I/O
Black	TxA	OUTPUT; V24, $\pm 12$ V
Orange	RxA	INPUT; V24, $\pm 12$ V
Red	+IN (2 amps fuse-protected)	INPUT $V_I = +10.8 \dots +32.0$ V; $I_{max} \leq 2$ A
Brown	GND	Ground
Yellow	IGN	INPUT <b>HIGH</b> $\geq +10.8 \dots +32.0$ V DC; <b>LOW</b> = 0V <i>(It can be used to wake up the device from <b>IGN</b> sleep)</i>
Green	I/O0	INPUT / OUTPUT free configurable. <b>Analog IN:</b> Up to 32.0 V DC/10 bits resolution <b>Digital IN:</b> +0 ... +32.0 V DC ( <b>High</b> and <b>Low</b> programmable) <b>Digital OUT:</b> 100 mA @ +10.8 ... +32.0 V DC

**Table 2:** Vehicle installation cable pinout for BOLERO-LT

## 4.4 Vehicle installation cable for FOX/LT/LT-IP



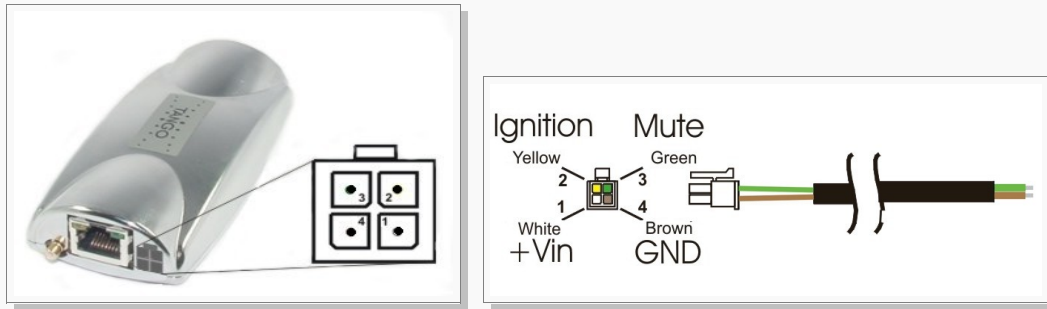
**Figure 8:** Vehicle installation cable connected to the FOX device.

The pin function on the vehicle installation cable for FOX/LT/LT-IP is listed in table below:

COLOR	NAME	I/O
Red	+IN (2 amps fuse-protected)	INPUT $V_{+IN} = + 10.8 \dots + 32.0$ VDC; $I_{max} \leq 2A$
Braun	GND	Ground
Blue	IGN	INPUT <b>HIGH</b> $\geq +10.8 \dots +32.0$ V DC; <b>LOW</b> = 0V <i>(It can be used to wake up the device from <b>IGN</b> sleep)</i>
Orange	I/O1	INPUT / OUTPUT free configurable.  <b>Digital OUT:</b> 100 mA max. @ +0 .. +32.0V DC <b>Digital IN:</b> 0 V..+32.0V DC (High & Low = free-programmable) <b>Analog IN:</b> Up to 32.0 V DC/10 bits resolution <i>(I/O1 can be used to wake up the device from <b>AiWu</b> sleep)</i>
Yellow	I/O2 / CAN_L	
Green	I/O3 / CAN_H	
Purple	RS232 - RxA	INPUT; V24, $\pm 12$ V
Black	RS232 - TxA	OUTPUT; V24, $\pm 12$ V

**Table 3:** Vehicle installation cable pinout for FOX-LT

## 4.5 Vehicle installation cable for TANGO55/56/864



**Figure 9:** 4pin connector and installation cable.

The pin function on this connector is listed in table below:

Pin number	Name	Functions
1	POWER (+Vin)	DC power positive input -
2	IGN	Ignition line (connect to positive DC power)
3	Mute	Do not connect
4	GND	DC power negative input line

**Table 4:** TANGO55/56/864Connector pinout