Installation Guide

RF Enabler

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REVISION HISTORY

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1.0.1		INTERNAL
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1.0.8	Dec 9, 2021	Initial version for Continental-MMS team. (NOT DELIVERED TO CUSTOMER)
1.0.9	Dec 14, 2021	For Continental-MMS. (NOT DELIVERED TO CUSTOMER) Section titled “Connection Cable” rewritten (page 7). Added yellow ground shield wire (page 7). Corrections made to pin order (page 7).
1.0.10	Jan 6, 2022	Generic Questar document. Added Questar company name, logo and colors. Content enhancements/additions. Requires full review (especially “Technical Specifications” and Cable/Pin info).
1.0.11	Feb 3, 2022	Generic Questar document. Text & graphic improvements.
1.0.12	April 13, 2022	Added DOCUMENT REVISION HISTORY table (page 2) Temperature Range section updated (page 6)

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1. Introduction

Message to Our Partners and Installers

Read this Guide

This guide contains descriptions, illustrations, warnings and technical notes that enable the safe and valid installation of Questar hardware units. All installers are required to read this guide thoroughly before performing any installations.

Authorized Installations ONLY

For the hardware to operate correctly, it must be installed according to our installation procedures by qualified and authorized installers. We make maximum efforts to provide accurate and detailed instructions. We also require that installers have strong automotive background, full knowledge of electrical/mechanical systems, and solid experience with the vehicle types on which they are installing our hardware.

Manufacturer Warranty for Vehicle

To ensure that the vehicle warranty remains fully valid – it is essential that all manufacturer instructions be followed for all wire harnesses and connections. If any questions arise, please contact Questar support.

Questar Disclaimer

Questar disclaims any liability for installations that are performed:

- With parts, methods or procedures not described in this guide.
- By non-authorized or non-qualified technicians.
- In contradiction to any manufacturer instructions.

Best Practices for Installation

Please help us go the “extra mile” in providing excellent service to our customers:

- Perform all tasks in a professional and responsible manner.
- Treat all customers with respect and courtesy.
- Make maximum efforts to arrive on time and finish on schedule.
- Coordinate any timetable changes with the Questar Service Center.
- Be sure to double-check your installation before leaving the installation site. Or better yet – have a second team member check your work.
- Contact Questar support if you have any questions.

General Installation Guidelines

Pre-Installation Safety Precautions

- Disconnect negative terminal of vehicle battery.
- Verify that ignition switch is turned OFF and start key is removed.

Electrical Inspection Warnings

- Use LED tester or voltmeter for any electrical checks.
- DO NOT USE an incandescent lamp for checking, as it may damage vehicle systems.

Unit Positioning Tips

- Attach the unit firmly in order to minimize vibration during vehicle operation.
- Position the unit to allow for technical service or disassembly (if needed).
- Distance the unit from any moving components and from any components that need to be disassembled during routine maintenance.
- Conceal the unit as much as possible, without leaving any projecting parts that might be easily bumped or damaged.

Wire Connection Practices

- Connect unit wires using soldering or crimping - and properly isolate unit wires using insulation tape or heat shrink insulation.
- Wherever possible, run unit wiring alongside existing wiring and use existing ducting and wire conduits. No drilling should be performed for the unit's wire connections.
- Use appropriate methods to isolate any unit wires that pass through or near metal surfaces. For example, if a unit wire passes through a hole, the hole requires a rubber grommet.
- Do not undo any "Twisted Pair" wire connections, except for small sections that connect to the CAN Bus.
- Ensure that wires are not exposed, rubbing together or creating tension.

Reception & Interference Issues

- To ensure optimal reception, it is essential that the unit be distanced from any metal, electrical or magnetic devices that might cause interference.
- When possible, mount the unit on a plastic or rubber surface and not on a metal surface. Installing directly on a metal surface may cause interference, and so it is preferable to distance the unit at least 10mm from any metal surface.
- It is important to install the unit in a location where there are no metal objects blocking skyward reception.

Safety & Compliance Issues

Hardware Changes Not Permitted

This device must accept any interference received including interference that may cause undesired operation. Any unauthorized modifications or changes to this device (without the express approval of Questar Auto Technologies Ltd.) may void the user's authority to operate this device. Furthermore, this device is intended to be used only when installed in accordance with the instructions outlined in this guide. Failure to comply with these instructions may also void the user's authority to operate this device and/or benefit from the manufacturer's warranty.

FCC Class B Digital Device Compliance

(FCC ID: 2A6DICONNECT)

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.

ICES Class I Digital Device Compliance

(IC ID: 2689CONNECT)

English:

This device complies with Industry Canada licence-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.

A distance of at least 20 cm. between the equipment and all persons should be maintained during the operation of the equipment.

French:

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.

Une distance d'au moins 20 cm. entre l'équipement et toutes les personnes devraient être maintenues pendant le fonctionnement de l'équipement

2. Product Overview

RF Enabler Capabilities

The **RF Enabler** unit provides RF433 capabilities for communicating with the **Connect P** unit and other RF-capable products. The **RF Enabler** collects sensor data via RF communications and passes on that data to the **Connect P** unit for further processing and GPS upload.

The **RF Enabler** was first developed at Questar as part of the Tire Pressure Monitoring Solution (TPMS). However, the **RF Enabler** can be utilized for additional RF applications such as temperature sensing, wireless switching, and M2M/M2X solutions.

Technical Specifications

Features	
Power Supply	7-32VDC (max 2 amps) Protection from over current, over voltage, temperature fluctuation and reverse polarity
Power Consumption	5mA sleep mode 50mA operational average at 24VDC
Backup Battery	Internal Li-Ion backup battery (up to 24 hours of operation)
Internal Sensors	Accelerometer + Gyro (6 axis accelerometer)
RF	RF433Mhz module for short range communications (tire pressure, temperature sensors, trailer identification, etc.)
RS232	RS232 interface, up to 115,200 Kbps max (RX/TX only)
Bluetooth	Murata BLE 4.1
	OPTIONAL: Internal antenna
WIFI	Murata 802.11b/g/n
	OPTIONAL: Internal antenna
CAN Bus (OPTIONAL)	FMS compatible CAN Bus interface (supporting up to 1 Mbps)
Software	OTA firmware upgrades
Physical Traits	
Dimensions	Length 11.1 cm Width 6.4 cm Height 2.6 cm
Weight	76 g
Temperature Range	Operational: -20°C to +70°C Storage: -40°C to +70°C

3. Cable Connections

Six Meter Cable

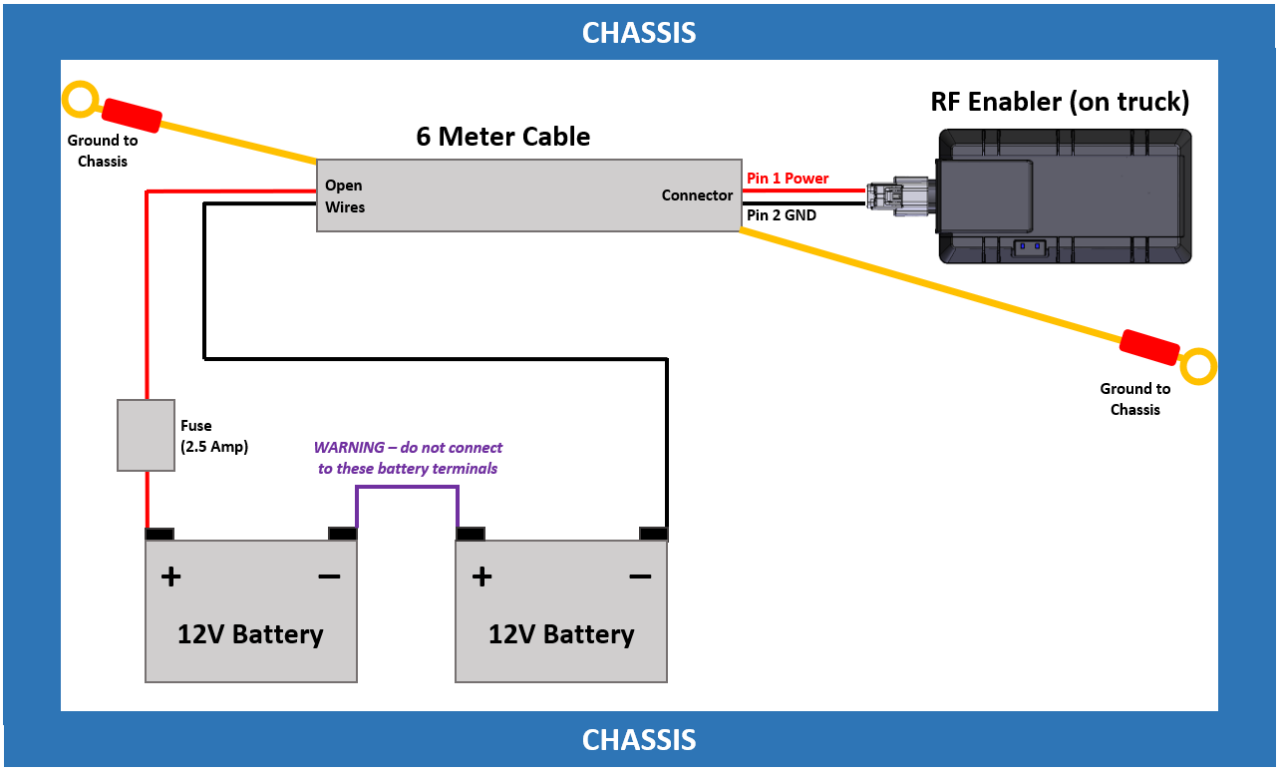
RF Enabler unit ships with a 6-meter connection cable having a 6-pin connector at one end and open wires at the other end:

- Power (red)
- GND (black)
- Shielded yellow (chassis ground)

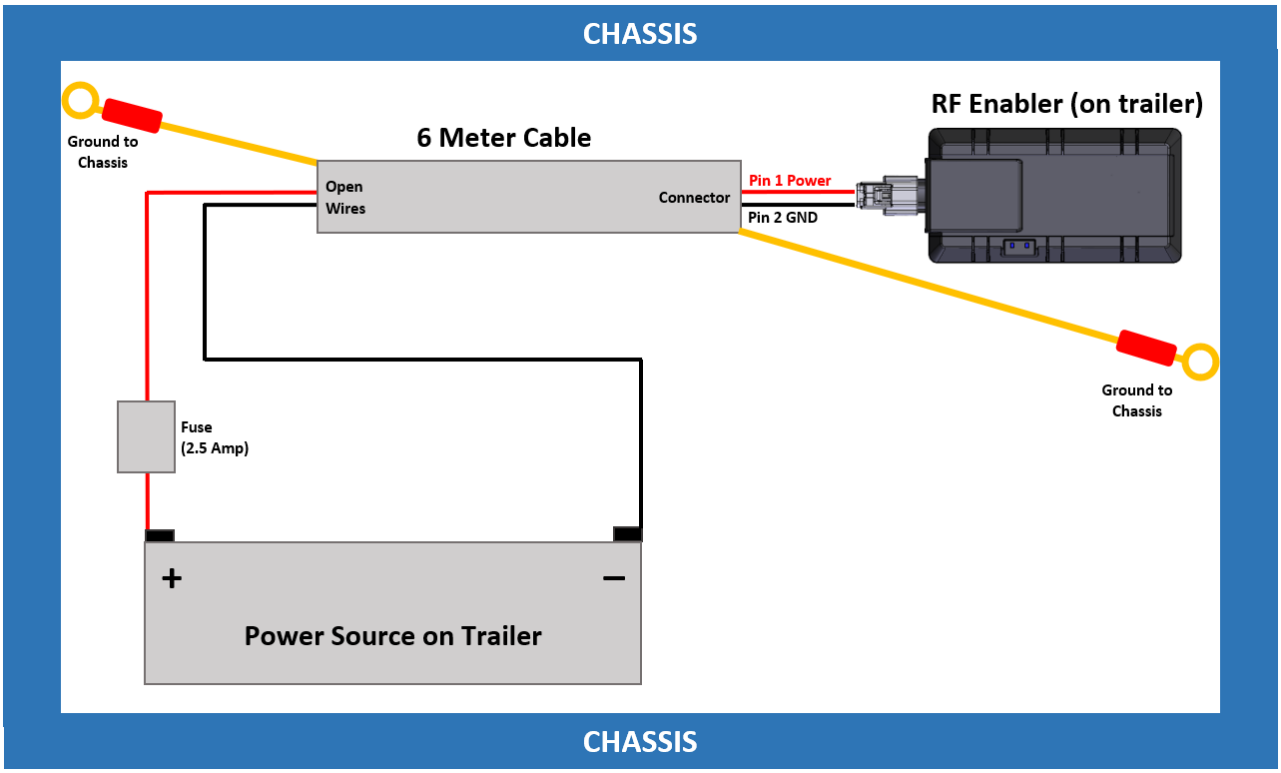
Shielded Yellow Wire for Ground

At each end of the cable, there is a shielded yellow wire for grounding to chassis. The yellow runs within the cable but is separate from the 6-pin connector. The two diagrams show how to ground the **RF Enabler** on the truck and trailer.

Grounding RF Enabler on Truck (connecting to truck battery)



Grounding RF Enabler on Trailer (connecting to power source on trailer)



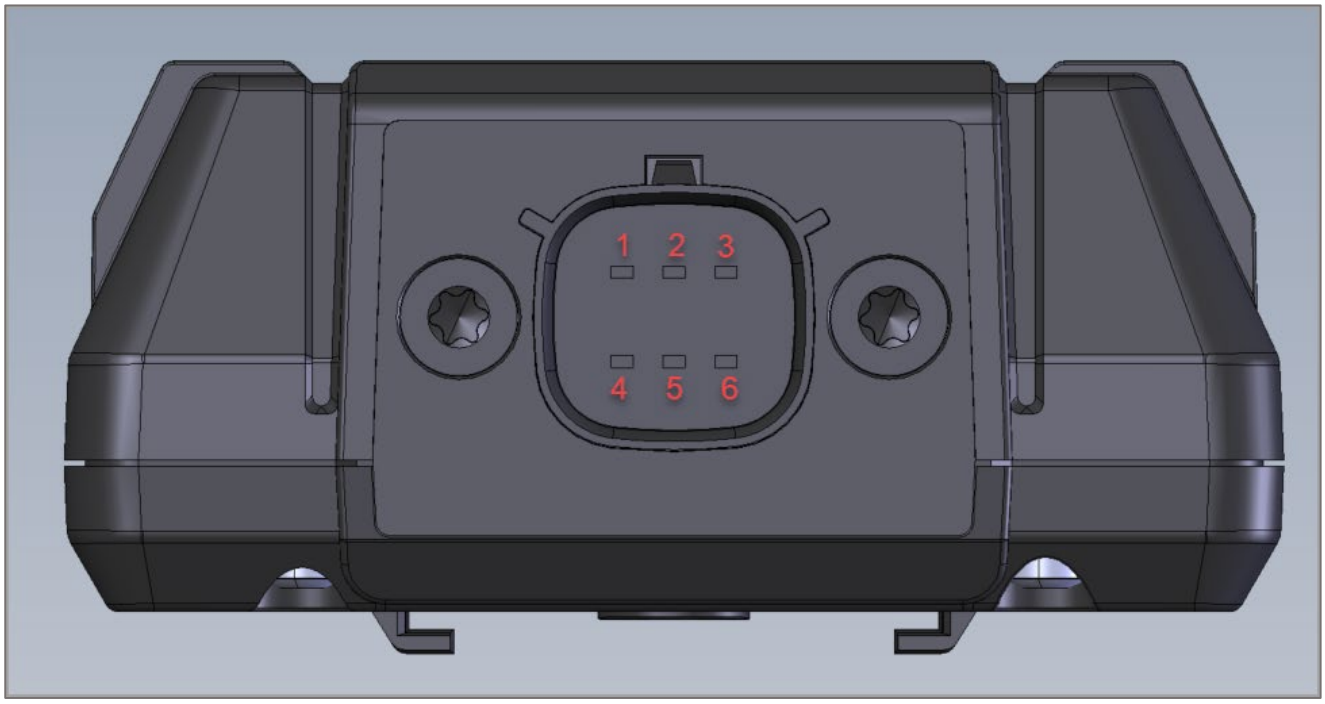
Safety Fuse

The installation kit includes a safety fuse (2 Amps) to isolate the power line from the **RF Enabler**.

⚠	The fuse must be installed before turning on the vehicle.

Pin Diagram for Connector

The connector plug contains 6 pin openings as shown below.



PIN	SIGNAL	DESCRIPTION	WIRE COLOR
1	(+)	Main power for unit	Red
2	(-)	Battery negative (GND)	Black
3	CAN 0 High	Not currently in use	Orange / White
4	RS232 RX	Not currently in use	Light Blue
5	CAN 0 Low	Not currently in use	Yellow / White
6	RS232 TX	Not currently in use	Pink

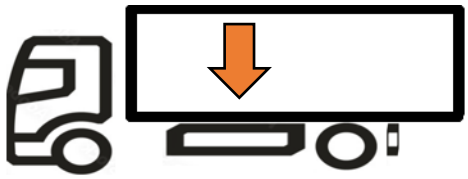
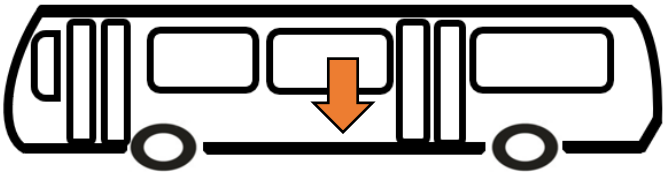
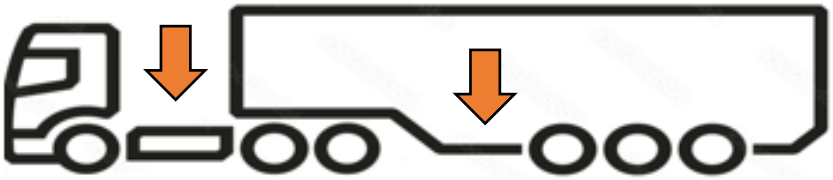
4. Positioning Unit within Vehicle

Evaluating How Many RF Enablers per Vehicle

For each vehicle, you can install one or more **RF Enabler** units. The number of units required per vehicle depends on the size of the vehicle and the RF range of the sensors in use. In many cases, a single **RF Enabler** will provide strong enough RF reception for all required sensors. For longer vehicles, you may need two or more **RF Enablers** to achieve optimal RF reception.

Positioning Examples

The examples below serve as general recommendations for positioning **RF Enabler** units. When installing, you need to decide on the ideal location for each unit, depending on vehicle design, sensor locations, RF reception, etc.

NUMBER OF ENABLERS	POSITIONING EXAMPLE
Single RF Enabler	
Single RF Enabler	
Two RF Enablers	
Two RF Enablers	
Three RF Enablers	

5. Mounting Unit on Vehicle

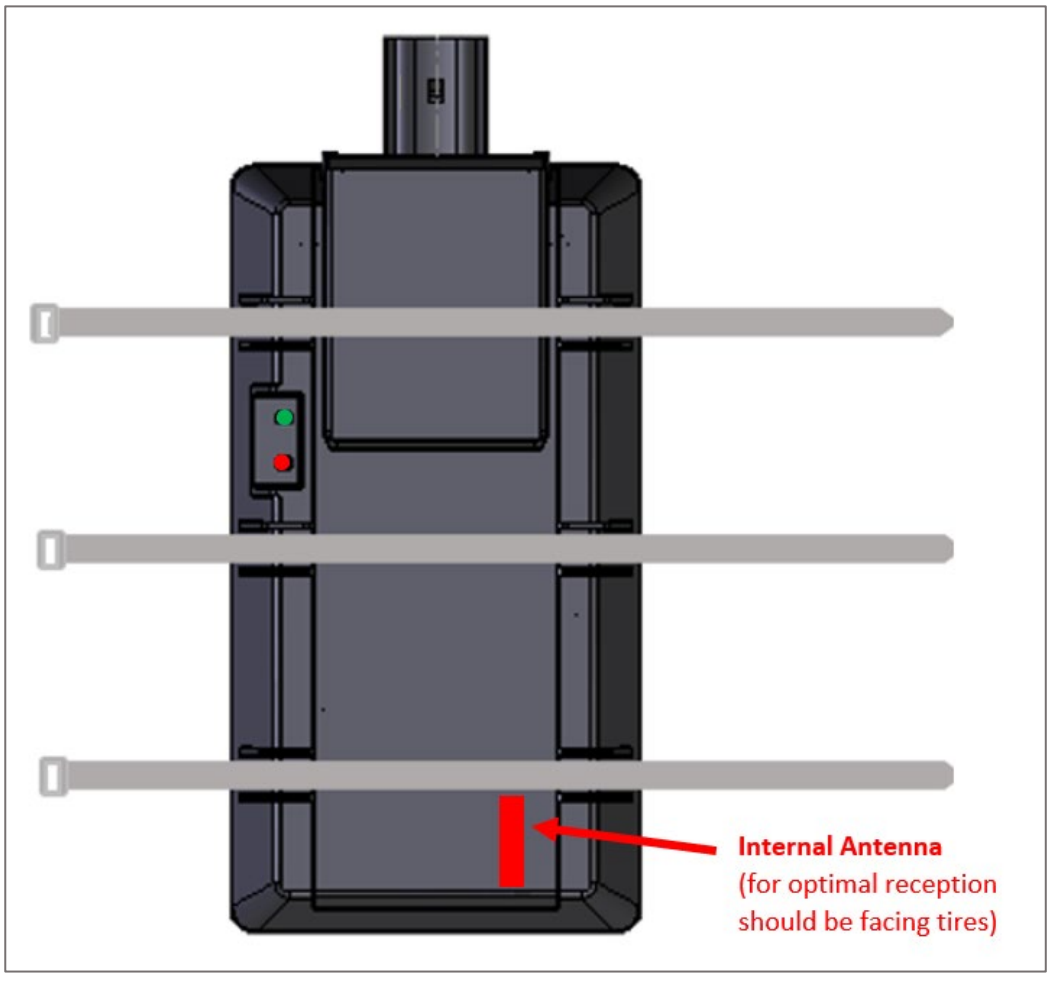
There are three methods for mounting an **RF Enabler** unit.

- Mount with Tie Strips
- Mount with Flat Bracket
- Mount with L-Shaped Bracket

Mount with Tie Strips

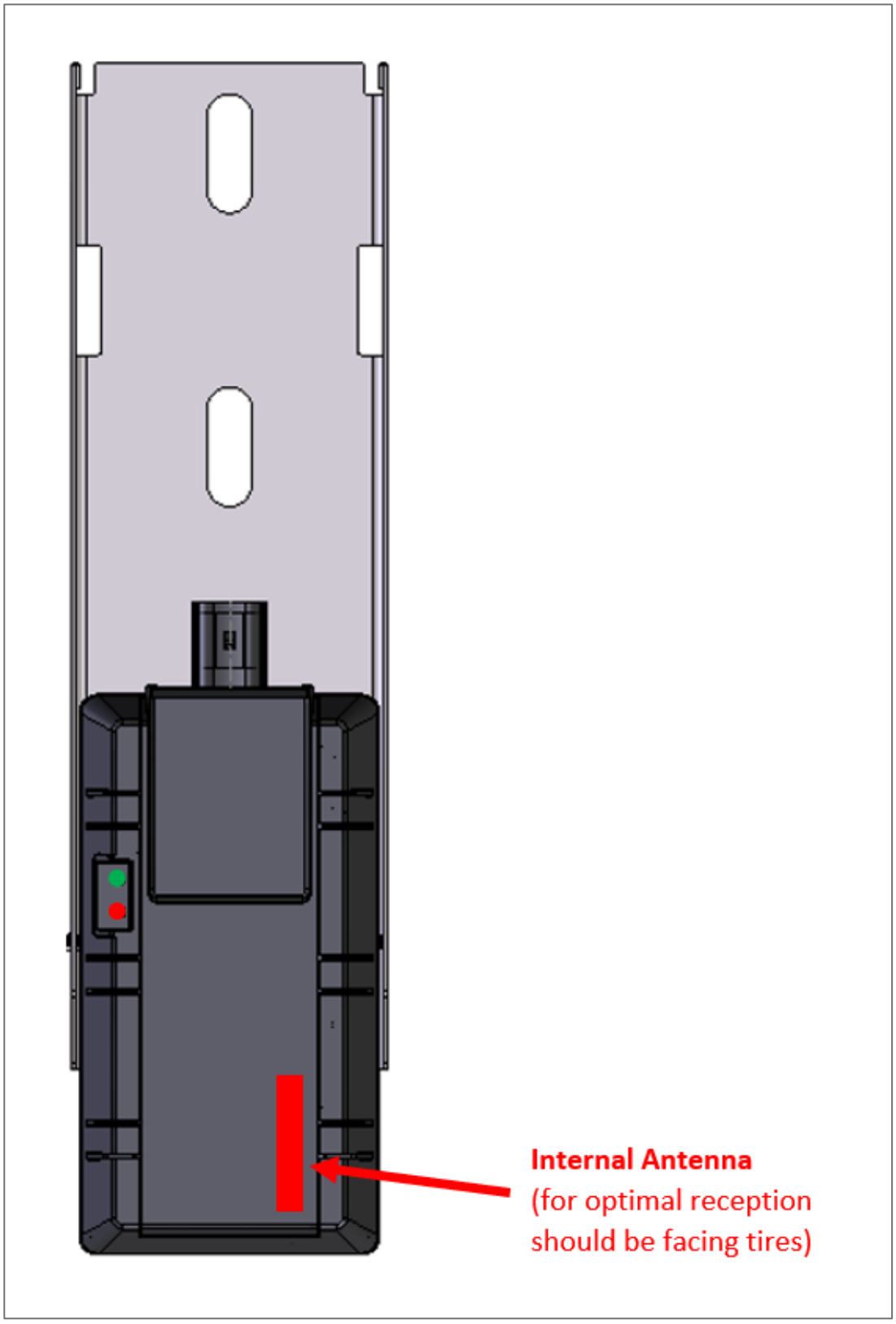
The **RF Enabler** ships with plastic tie strips for strapping the unit quickly to the vehicle.

- Tie strips are useful for cases where you need to get started quickly and run some **RF Enabler** tests (before a more permanent installation).
- Tie strips are also useful in cases where you cannot perform drilling.



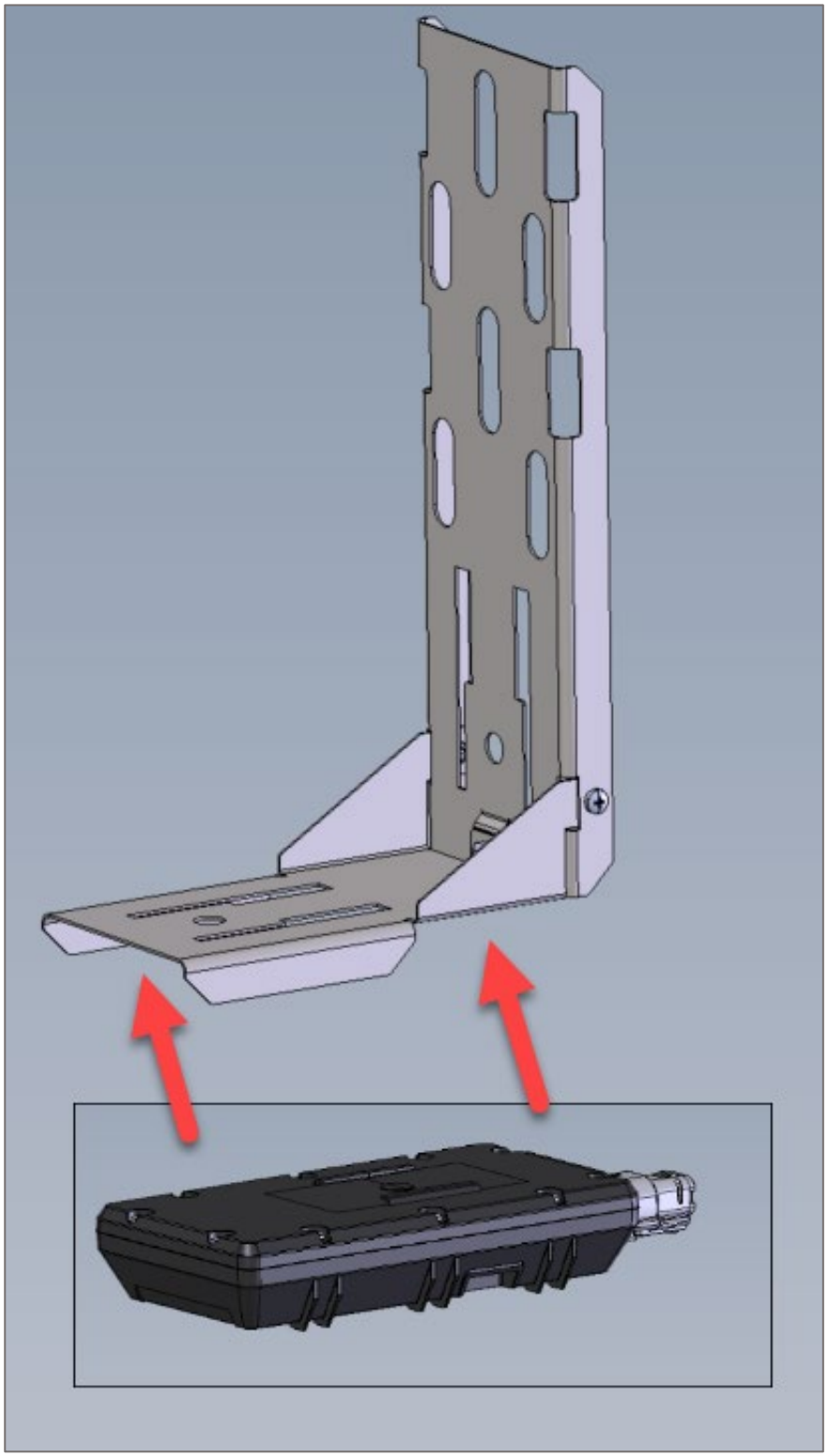
Mount with Flat Bracket

First attach the bracket to the vehicle. Then slide in the **RF Enabler** unit.



Mount with L-Shaped Bracket

Use the L-Shaped bracket to install the unit at the bottom of the vehicle.



6. Configuring RF Enablers in Hierarchies

Build Parent-Child Hierarchy

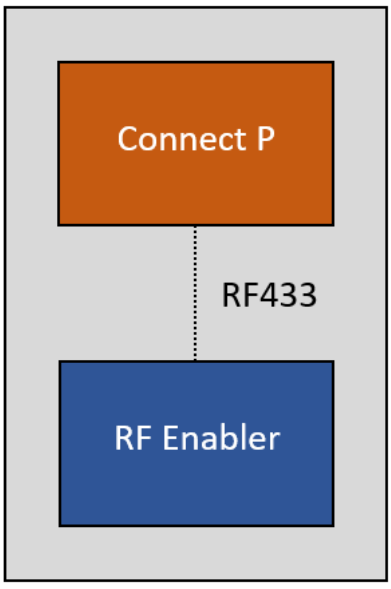
When configuring the Connect P unit and RF Enabler units for a vehicle, you need to build a parent-child hierarchy where each parent can have up to two children.

Connect Main RF Enabler

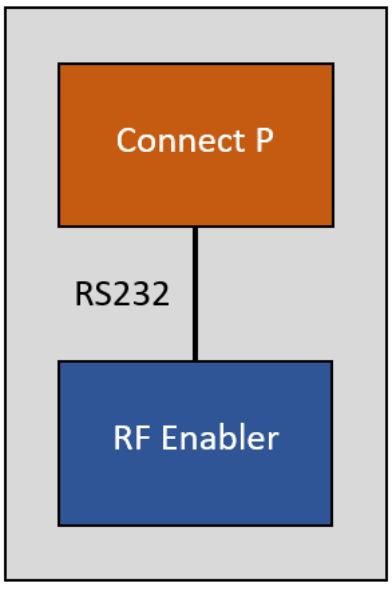
The main RF Enabler in the hierarchy may be connected using RF433 only, RS232 only, or both.

- In general, all RF Enablers in a vehicle hierarchy can be connected using RF433. In cases where the RF reception between the Connect P unit (in the truck cabin) and the main RF Enabler are weak, it is possible to connect between the Connect P and the main RF Enabler using RS232.
- When connecting the main RF Enabler using RF433 only (without RS232), the RF Enabler may access power/ground from any vehicle source.
- When connecting the main RF Enabler using RS232, the RF Enabler unit should access power/ground from the same source that is used to access RS232.
- When connecting the main RF Enabler using both RF433 and RF232, the Connect P unit will use the RS232 option by default. While the RF433 connection will be available for standby purposes should RS232 become unavailable.

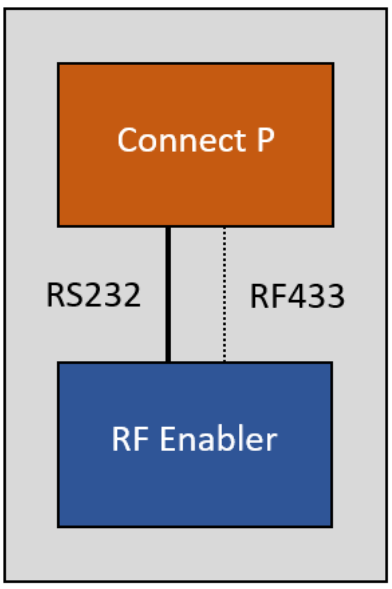
RF433 Alone



RS232 Alone

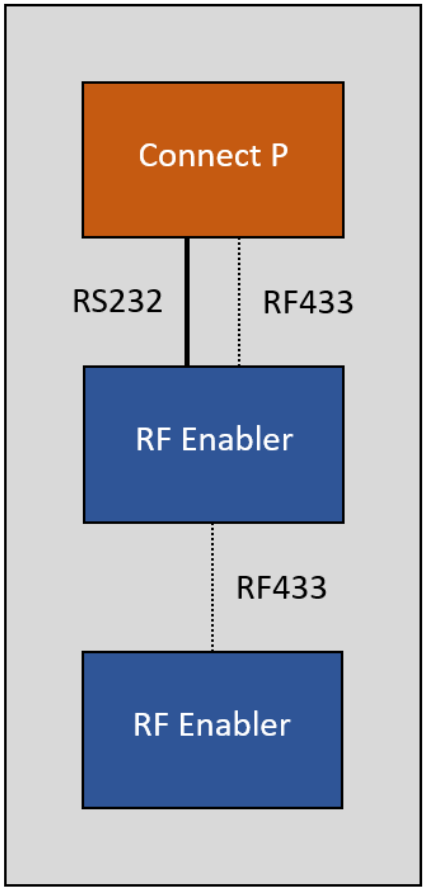


RS232 and RF433



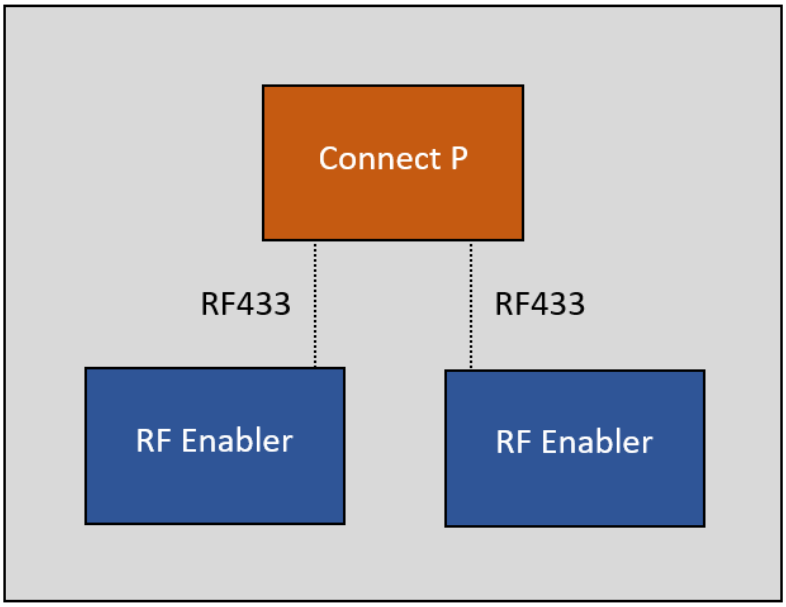
Example with Two RF Enablers as Parent/Child Pair

In this example, two RF Enablers are connected as a parent/child pair.



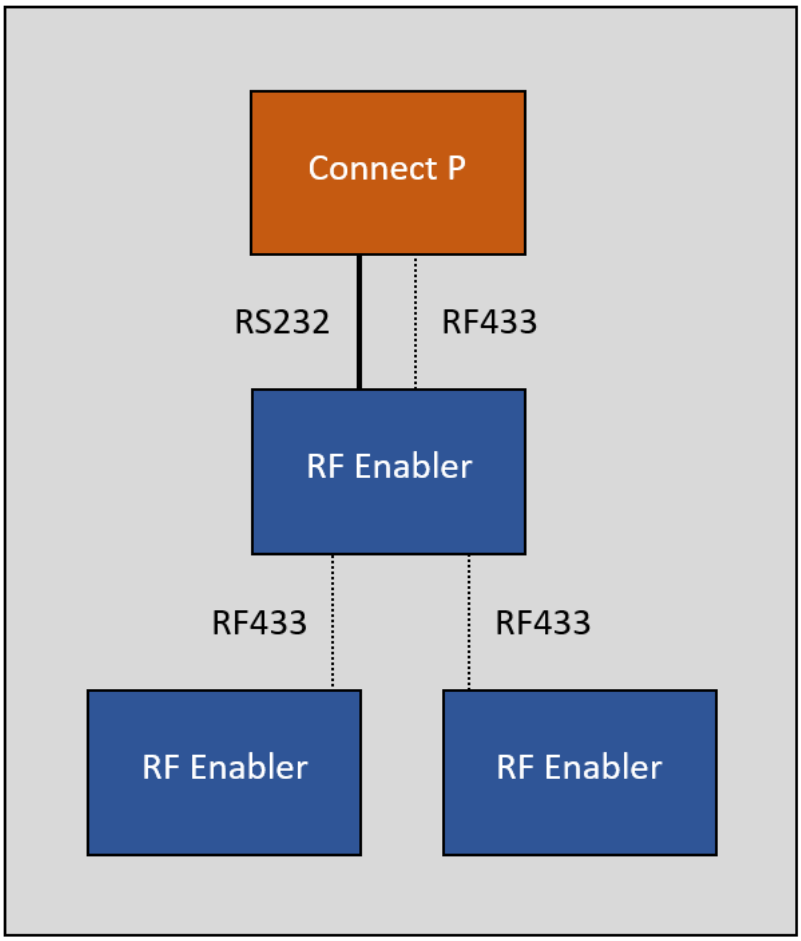
Example with Two RF Enablers Connected Directly to Connect-P

In this example, each of the two RF Enablers communicate directly with the Connect P unit (via RF433).



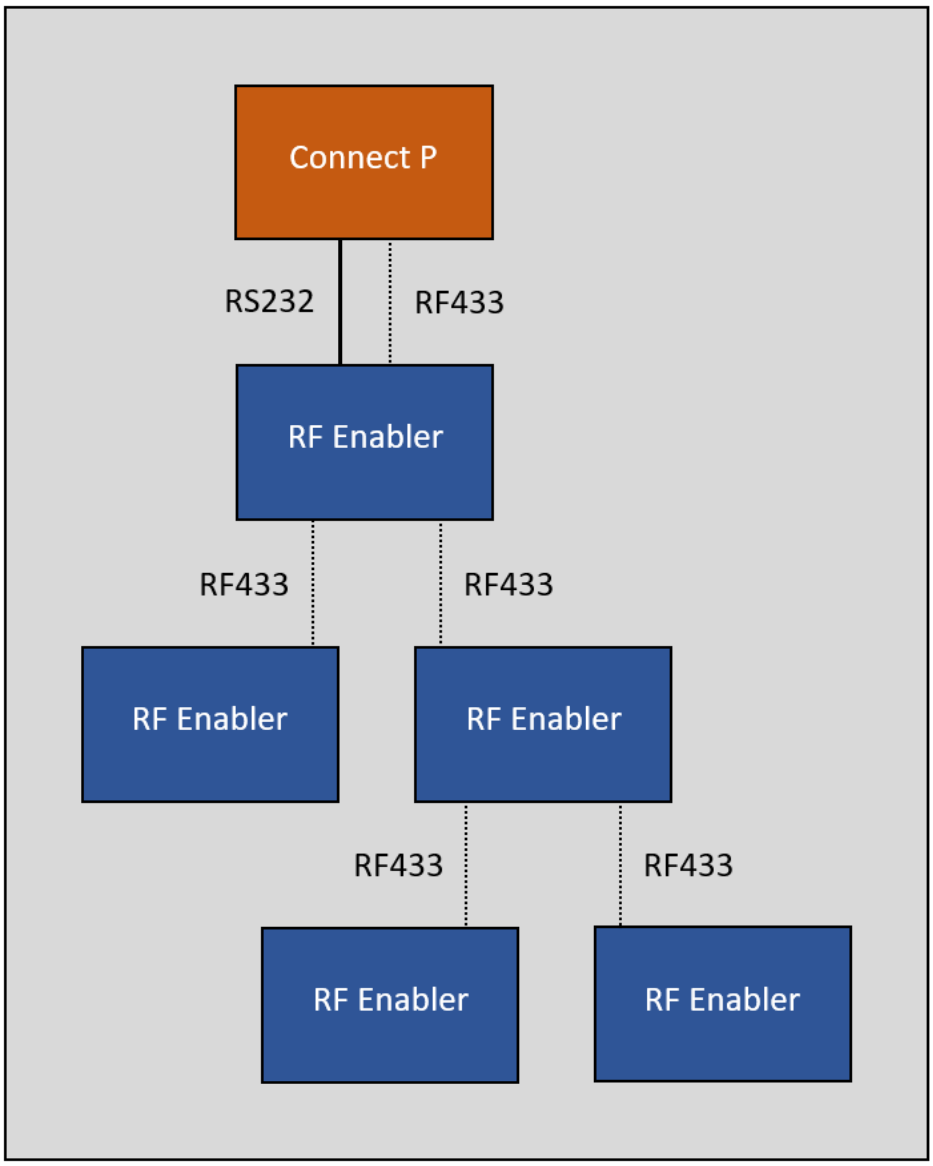
Example with Three RF Enabler Units

In this example, the hierarchy includes the Connect P and three RF Enabler Units.



Example with Five RF Enabler Units

In this example, the hierarchy includes the Connect P and five RF Enabler Units.



7. Using LED Indicators

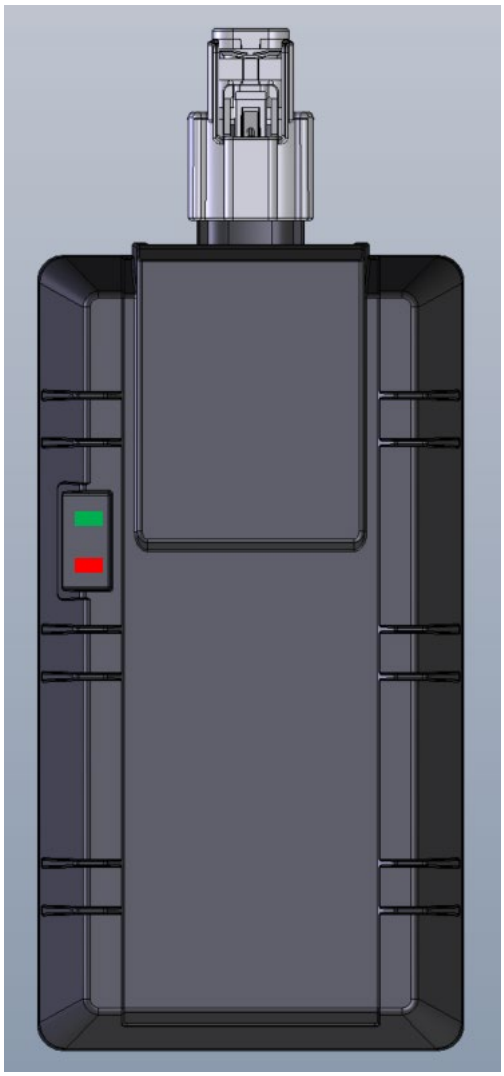
Transmission Indicator (Green LED)

Green LED blinks to indicate that signals are currently being transmitted.

Communications Indicator (Red LED)

Red LED blinks repeatedly when searching for a communication link.

Red LED blinks slowly after a communication link has been established.



8. Verifying Your Installation

To verify your installation, follow these instructions.

Inspect Hardware

Perform the following hardware checks:

- Unit and wires are fixed and stable.
- Any excess cabling is rolled up and secured with cable ties.
- All connections are properly soldered or crimped - and are properly insulated with electrical tape or heat shrink isolation.
- No warning indicator lights are lit on the vehicle dashboard.

Perform Cleanup

- Collect any leftover materials from the vehicle and from the surroundings.

Submit Form

- Fill in the “installation form” and send to Questar Service Center.