Cello Family Hardware Installation Guide

Cellocator Division
Pointer Telocation Ltd.

Proprietary and Confidential

Version 4.6

Revised and Updated: October 25, 2019

POINTER

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FCC Compliance Statement

The FCC Wants You to Know

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 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:

a) Reorient or relocate the receiving antenna.

b) Increase the separation between the equipment and receiver.

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

d) Consult the dealer or an experienced radio/TV technician

FCC Warning

Modifications not expressly approved by the manufacturer could void the user authority to operate the equipment under FCC Rules.

Table of Contents

1 Introduction

This guide provides the necessary information for technicians to install the Cello (Cello-IQ and Cello-CANiQ) units using the appropriate harnesses. It describes how to install and verify the proper functioning of various components.

1.1 Abbreviations

Abbreviation	Description
ACK	Acknowledge
CAN	Controller Area Network
CCC	Command and Control Center
DB	Database
FMS	Fleet Management System
OTA	Over the Air
PDU	Protocol Description Unit (Common name for data SMS)
PGN	Parameter Group Number
SMS	Short Message Service (GSM)
MDT	Mobile Data Terminal
CFE	Communication and Features Extender

1.2 References

The documents listed in the following table can be downloaded from the Cellocator Knowledge Base.

#	Reference	Description
1.	Harness Selection Wizard	The wizard assists in selecting the appropriate harness per required accessories, inputs and outputs. It also describes in detail the different available harnesses.
2.	Battery Handling Procedure for Cellocator Units	This guide provides the necessary battery handling guidelines for backup battery maintenance in Cellocator devices equipped with Li-ion / Li-Poly backup batteries.
3.	Cello-IQ Product Overview	This document provides high level information on the Cello-IQ product.

#	Reference	Description
4.	Cello-CANiQ Product Overview	This document provides high level information on the Cello-CANiQ product.
5.	CAN Contactless Adapter Product Overview	This document provides high level information on the CAN Contactless Adapter product.

1.3 Revision History

Version	Date	Description
1.0	15/3/10	Initial version
1.1	10/10/10	Technical writer editing, changed product name to Cello
2.0	31 March 2011	Added safety and installation practices, and photos
2.1	24 July 2011	Technical writer editing
2.2	January 22, 2012	Added required torque in unit setup
2.3	June 17, 2012	Removed Cello unit PNs from the elements table for better uniformity
3.0	July 17, 2012	Added installation instructions for the Cello-IQ and DFD
3.1	March 14, 2013	Updated DFD installation Updated references Updated Cello Harness Overview
3.2	October 10, 2013	Added CFE-DFD harness Added installation instructions of DFD to CFE
4.0	August 20, 2014	Added Cello-CANiQ Replaced harness 196 with 302 Removed duplicate information which can be found in the harness wizard Removed Battery Handling chapter and references to the battery handling document Updated installation diagram Updated *Information Specific to the Installation of Cello-IQ* Added *Information Specific to the Installation of Cello-CANiQ* section

Version	Date	Description
		Updated *Dallas Button Input* section Updated relay description and installation directives Updated *External Standard Immobilizer Output* section
4.1	October 29, 2014	Added *CAN Bus Inductive Coupler Installation* section
4.2	November 16, 2014	Added *Cello-CANiQ Disclaimer* section
4.3	May 20, 2015	Updated product variants throughout guide Updated Handsfree solution
4.4	June 17, 2015	Added OBDII Y cable section Updated information specific to the installation of Cello-CANiQ section
4.5	January 6, 2017	Replaced full harness to harness 371 (section 2.4) References to D8 installation in section 5.1.7 Added BT Extender option in section 5.5 Removed Cello-CANiQ generic harness (section 6.3) Added Cello harnesses support for CAN Bus integration (section 6.3) Added CAN Contactless Adapter to section 6.5 Updated References table
4.6	Oct 23, 2109	Added harness disconnection instruction and warning Added note about using a Nano SIM adapter in section 4.5 Removed / updated hyperlinks

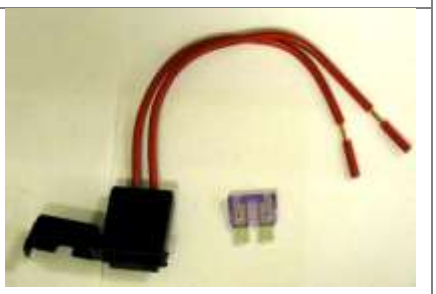
2 Cello Overview

2.1 Overview of the Hardware Elements

The hardware elements referred to in the guide are listed in Table 1.

Table 1: Cello Hardware Elements

Name/Part Number	Description	Picture
Cello Unit	Includes built in GSM modem and GPS antenna.	
External GPS Antenna (optional)	External GPS antenna has a 3 or 5 meter cable and magnetic base.	
Dallas Kit (optional) PN 712-20015	The Dallas button is an electronic component which provides driver identification. It is enclosed in a 16 mm stainless steel casing. The Dallas kit includes a reader and two different unique ID keys.	
Handsfree Kit (optional) PN 712-20032	Used for vocal communication between the driver and assistance representatives or control center operators. Includes Cellocator Handsfree module, speaker and microphone.	

Name/Part Number	Description	Picture
Vehicle Harness (optional)	Wiring harness for vehicle installation. Several harness types are available. Refer to the *Harness Selection Wizard* document for more information.	
Fuse and Fuse Housing PN 710-00001 PN 710-00002	3A Fuse and Fuse Housing for vehicle Installation.	
Distress Button PN 711-20001	Push Button, used for connection to unit's input. Can serve as a distress button for example, or as a Voice call control button.	
12V Immobilizer Relay with Holder PN 711-20000 PN 711-20023	12V 40/30A relay supports immobilizing and general purpose applications.	
24V Immobilizer Relay with Holder PN 711-20006 PN 711-20023	24V 40/30A relay supports immobilizing and general purpose applications	

Name/Part Number	Description	Picture
Driver Feedback Device (DFD) PN 715-50000	The DFD provides visual and vocal feedbacks to the vehicle drivers regarding their driving behavior.	
CFE – DFD Harness **PN** 711-00323	A harness which connects the DFD to the CFE harness	
OBDII Y cable **PN** 711-00335	An adapter connecting the vehicle OBDII connector to the Cello harness, allowing covert installation and connection of diagnostics tools in a workshop.	

2.2 Cello-based Unit Types

The Cello-IQ is designed for a driver safety and eco driving application, and is aligned with Telematics market evolution trends and TSP requirements to improve a fleet's safety and reduce fleet operation costs.

The Cello-CANiQ addresses the mid and high-end segments of fleet management products for various advanced applications concerned with vehicle, driver and logistics management.

2.3 Cello Unit Description

The figure below shows the main elements of a Cello unit.

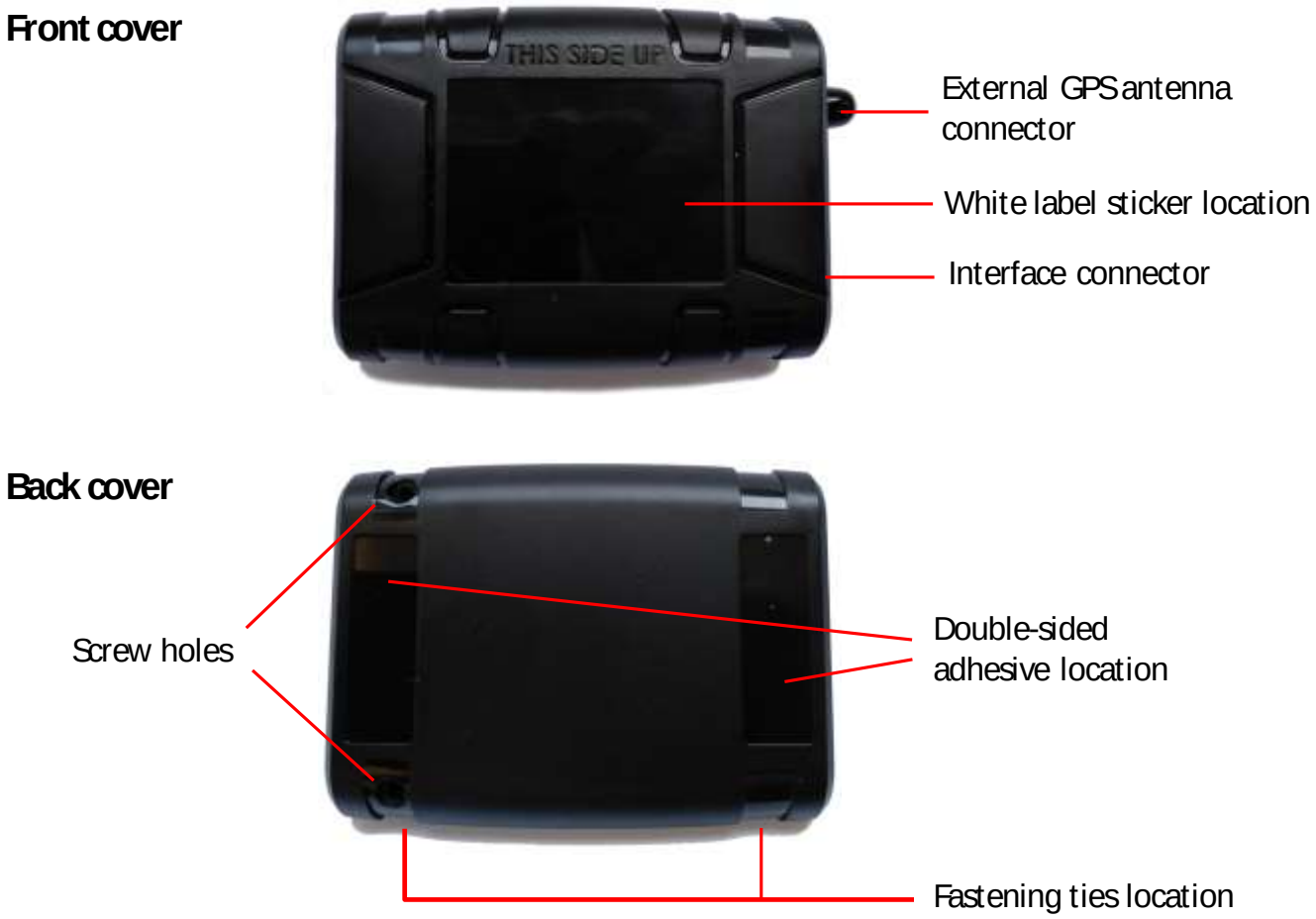


Figure 1: Cello Unit Description

2.4 Cello Harness Overview

Cellocator provides several types of harnesses – refer to the *Harness Selection Wizard* document for a full description of all available harnesses. This section describes the installation of the full harness, PN 711-00371. Other harnesses utilize only some of the full harness wires and thus only the relevant wires should be referenced.

The 711-00371 full harness is made up of multiple cables, 1.2 meters long (power wires are 1.8 meter long), connected to a 20-pin connector that links to the Cellocator Cello unit from one side and which is terminated with either free wires or various connectors on the other side. Refer to the following illustration for the cable and pin structure of the harness.

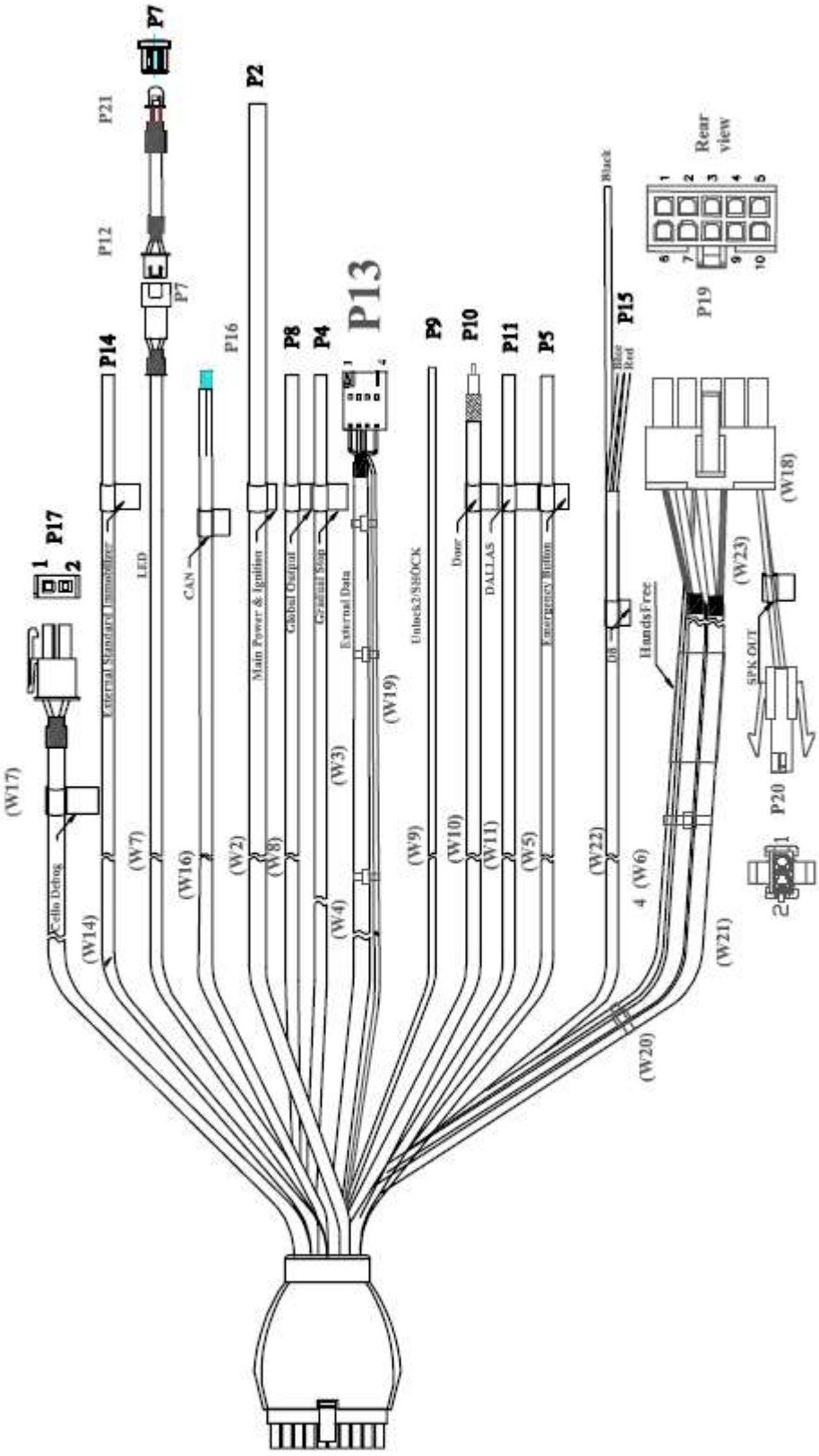


Figure 2: 711-00371 Full Harness Diagram

The following table provides a description of the harness. Additional information can be found in the relevant sections dealing with the harness installation instructions.

Table 2: Cello Harnesses Pin-to-Pin Configurations

Termination Number	Wire Label	Wire Color	Cello Unit Pin Number	Termination Pin Number	Function
P2	Main Power and Ignition	Red	P1.2		Main Power
		Black	P1.3		Main GND
		Violet	P1.4		Ignition
P13	External Data (shielded)	Black	P1.3	P13.1	RS232 GND
		Blue	P1.12	P13.3	RS232 TXD
		Green	P1.13	P13.4	RS232 RXD
		Red	P1.2	P13.2	RS232 Power
		-	P1.3	-	RS232 Shield
P4	Gradual Stop	Red	P1.2		Power for Output
		Brown	P1.17		Gradual immobilizing, or global output, or Geo-Fence notification
P5	Emergency Button	Black	P1.3		GND
		Grey	P1.16		Global input, usage counter, or emergency voice call initiation
P19	Handsfree	Red	P1.4	P19.10	Power (ignition)
		-	P1.9	P19.3	Handsfree – Audio Out
		-	P1.10	P19.6	Handsfree – Audio In
		-	P1.19	P19.4	Handsfree – Mute (GND)
		-	P1.19	P19.1	Handsfree – shield
P20	SPK OUT	Black		P20.1	SPK+
		White		P20.2	SPK-
P7	LED	Red	P1.2		Power for output

Termination Number	Wire Label	Wire Color	Cello Unit Pin Number	Termination Pin Number	Function
		Black	P1.6		Global output, LED, or Geo-Fence notification
P8	Global Output	Red	P1.2		Power for global output
		Yellow	P1.18		Global output, system feedback, or Geo-Fence notification
P9	Unlock2/ SHOCK	White	P1.15		Analog input, discrete input or frequency meter according to programming configuration It can be programmed for: Global input, standard voice call control, privacy mode control, usage counter input, or frequency counter
P10	Doors	-	P1.14		Analog input, discrete input or frequency meter according to programming configuration It can be programmed for: door sensor, or global input, or usage counter input, or transparent data forwarding switch, emergency voice call initiation, or frequency counter
		-	P1.3		Shield (GND)
P11	Dallas	Black	P1.3		GND
		Orange	P1.20		Dallas
P14	External Standard Immobilizer	Red	P1.4		Power (ignition) for output
		Green	P1.7		Global output, engine Immobilizer, or Geo-Fence notification
P15	Siren	Red	P1.2		Power for output
		Blue	P1.8		Cello-IQ:

Termination Number	Wire Label	Wire Color	Cello Unit Pin Number	Termination Pin Number	Function
					Global output, system feedback, or Geo-Fence notification. Cello-CANiQ: DTCO D8
		Black	P1.3		GND for DTCO
P16	Lock/CANL	Yellow	P1.5		Cello-IQ: Global input or usage counter. Cello-CANiQ: CANL
	Unlock/CANH	Green	P1.11		Cello-IQ: Global input or usage counter. Cello-CANiQ: CANH
	-	-	P1.3		Shield (GND)
P17	Cello Debug	Red	P1.1	P17.1	Debug line
		Black	P1.3	P17.2	GND

The inputs Doors (Pin 14) and Unlock2/SHOCK (Pin 15) are configurable and can serve as the following:

- **Discrete Dry** - configurable threshold for logical high and low states (Default).
- **Discrete Wet** - configurable threshold for logical high and low states.
- **Analog Backward Compatible** (0-2.5V)
- **Analog Full Range** (0-30V)
- **Frequency Counter** - capable of measuring frequency of pulses with amplitude between 3 to 30V, up to 5kHz.

The inputs Lock, Unlock and Emergency button are discrete dry.

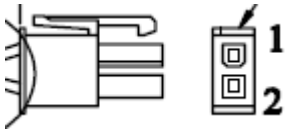
The Ignition input is internally pulled down.

If two frequency inputs are required, a harness utilizing 2 shielded wires should be used.

The harness supports a detachable LED for easy and convenient installation.

The connectors supported by the harness and their pin out are shown below:

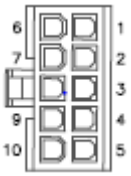
P17 for Cello Debug



P13 for the RS232 serial port

P20 for the speaker of the Handsfree module

P19 for the Handsfree module



2.5 Battery Handling Procedure

Lithium-Ion (Li-Ion) / Lithium-Polymer (Li-Poly) batteries are characterized by small size, high capacity and extended life time. These characteristics have turned these battery types into a preferred choice for many applications. However, the use of Li-Ion / Polymer batteries also demands a unique charging algorithm and handling precautions that should be followed precisely in order to lengthen the battery life time, together with ensuring installer and user safety. Refer to the *Battery Handling Procedure for Cellocator Units* document, which can be downloaded from the Cellocator Knowledge Base, for further information.

3 Preparing for Installation

The following section explains the pre-installation steps you should perform before installing the Cello unit.

3.1 Pre-Installation Information

IMPORTANT:

- You must be a certified technician and qualified to install the Cello system.
- Please make sure you have the correct documentation for the devices you install. The devices and documentation change frequently, which may impact the installation procedures.
- Make sure you know the installation procedures and restrictions of the vehicle; consult with the dealer or manufacturer to get any specific instructions. These may refer to locations in the vehicle where you can install the device, connections to the electrical system, use of fuses, etc. Not following these instructions and restrictions may create false alarms and malfunctions in the vehicle systems and may even void the vehicle warranty.
- Modern vehicles have many computerized systems that may be sensitive to radio transmissions from the device you install and may also generate interferences to the device. Carefully read the manufacturer's instructions and restrictions regarding these systems.

3.2 Safety

WARNING:

- Use protective goggles during the installation.
- Disconnect the vehicle battery during installation. Working on live wires can be dangerous and can, for example, result in airbags inflating or fuses burning out. Some devices (e.g. the radio) may require reprogramming after a power disconnect.
- Do not install any wires (except the fuel sensor wires) near the fuel system or fuel pipes. Make sure you never work near the fuel system with the battery connected.
- Installation in vehicles with computerized systems may have unexpected results. Please consult with your local car dealer before performing any vehicle OEM invasive installation.
- Do not disconnect any connectors in the vehicle while the ignition switch is turned on. This may result in damage to sensitive vehicle subsystems.
- Use special care when handling the backup battery of the Cello unit. Refer to the *Battery Handling Procedure for Cellocator Units* document, which can be downloaded from the Cellocator Knowledge Base, for details.

3.3 Tools and Equipment Required

To correctly install the device and accessories, you may need the following equipment and tools:

- A wire cutter
- Pliers (2 sizes may be required)
- Screwdrivers of several sizes
- Professional insulation remover
- Crimping tool for wire lugs
- Digital multi-meter
- Utility (razor) knife
- Flash light or other light source
- Tools to remove the vehicle trims (panel popper, sockets, ratchet etc.)

3.4 Materials Required

- Soldering wire
- Insulation tape of good quality (which can withstand the high temperatures in a vehicle on a hot summer day)
- Wire lugs with star washers
- Grommets, plastic tubes – as needed

Figure 3: Materials Required

3.5 Installation Best Practices

This section lists the Best Practices you should follow for installing the unit.

- Put protective covers on the front seats before you start the installation, to prevent damage to the upholstery. Use other covers for sensitive areas in the vehicle (LCD display, radio etc.).

- Do not use a cutter to expose the conductor in the wire, use a professional insulation remover that will not damage the delicate copper conductors.
- Use soldering for all of your connections. Do not connect a new wire to an existing wire (without soldering it) to make a connection. These types of connections, as shown in the following picture, are typically of poor quality and sooner or later will disconnect or will make intermittent connections.

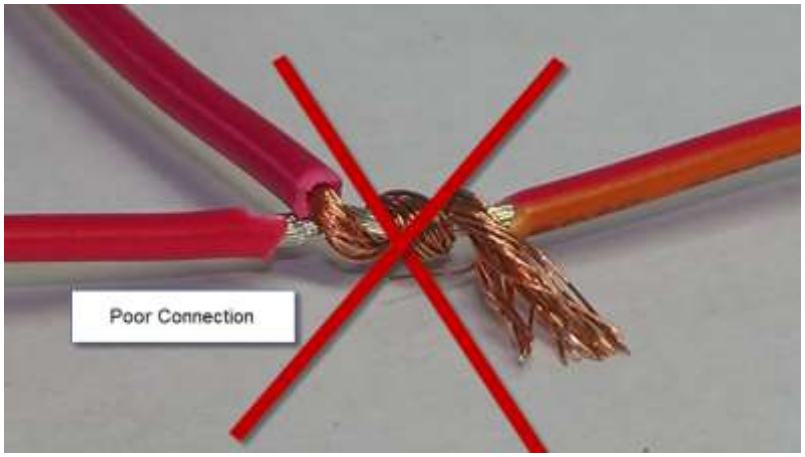


Figure 4: Poorly Soldered Connection

A good connection has to be properly soldered, as in the picture below:

Figure 5: Correctly Soldered Connection

- Isolate the connection with a plastic cover or a professional insulation tape so that no wires remain exposed.

Figure 6: Isolate the Connection

- Use existing wire ducts, openings and holes to pass wires between different areas in the vehicle. Do not punch or drill new openings or holes to pass wires between different zones in the vehicles, as this will create permanent damage to the vehicle, and other wires or pipes. Make sure the opening is properly protected by a grommet or a plastic sleeve to prevent damage to the wires.

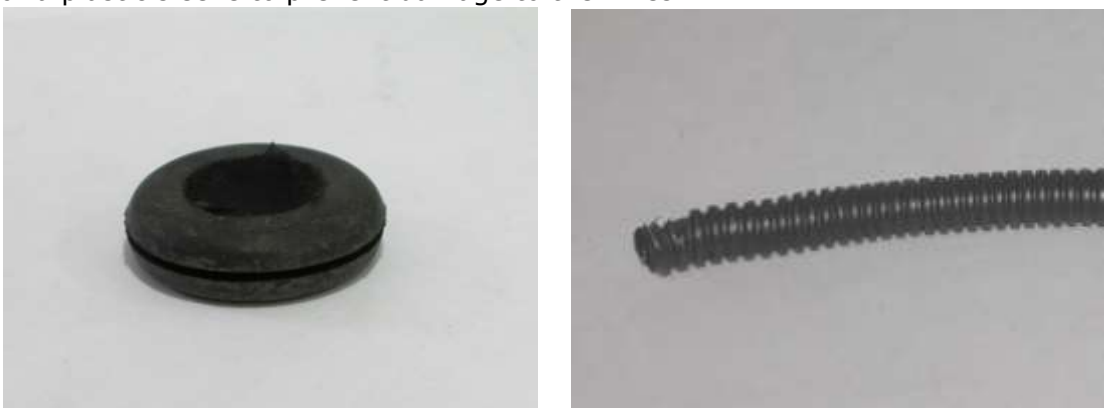


Figure 7: Preventing damage to the wires

- Use only a voltmeter or LED based test lamp (that uses a very small current) to test the existence of voltage in a wire or accessory. Do not use a regular test lamp to test the existence of voltage in a wire. These testers take quite a lot of current and may damage the equipment in the vehicle (for example it can trigger an airbag or damage a communication bus).
- When you want to test the voltage on a wire, do not expose the existing wires or use a sharp edge to make an electrical connection to a wire through the insulation sleeve around it. Make the connection at the end of the wire, near the connector.
- Do not insert the multi-meter probe tip into the female pin in the connector. This may widen it and prevent a proper connection when the male connector is plugged in.

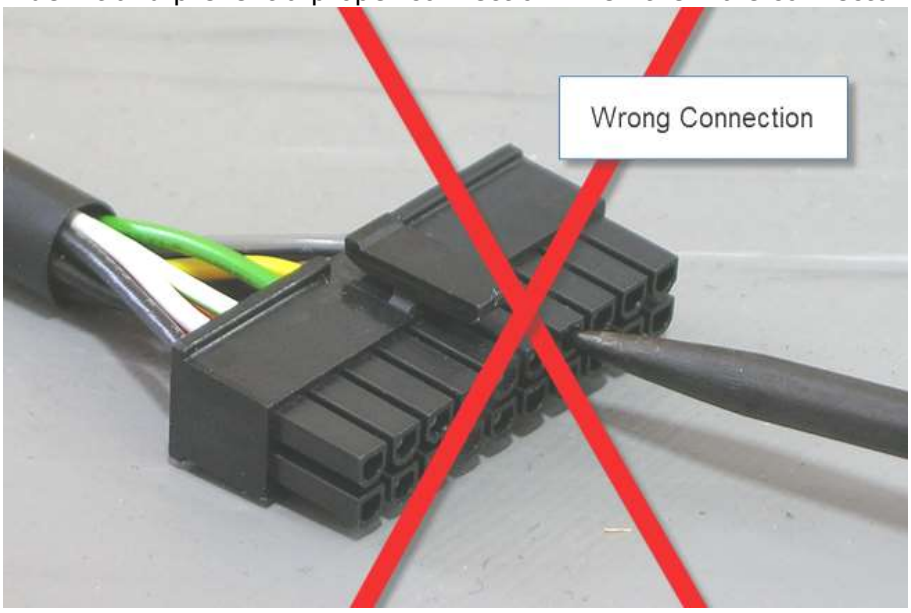


Figure 8: Incorrect probe insertion

The correct way to connect the probe of a voltmeter or tester to the connector is shown below:

Figure 9: Correct connection

- To connect the negative power wire of the device, connect a lug properly crimped (or soldered) to the negative wire of the device (pin 3 in the 20 pin connector) and screw it to the chassis using an existing screw. Ensure the connection is good and stable.

Figure 10: Connecting negative power wire

- After all wires are connected, use plastic straps (cable ties) or insulation tape to secure all the wires and cables to fixed elements in the vehicle (such as existing stable cables, metal parts or other fixed parts of the vehicle, but not parts that are removed during regular vehicle service). Loose cables and wires may cause irritating noises while the vehicle is in motion.
- Do not lay cables and wires on the floor of the vehicle where people can step on them. Always route the cables in areas where they will not be stepped on or otherwise damaged by other activities.
- All wires and cables should be hidden.
- Make sure the device is receiving power with a properly fused connection. The fuse is supplied with the harness.
- To attach the device to its location use a thick, two sided, adhesive tape, between the device and the fixed support and then use two plastic straps (cable ties) to secure the device to its location. Make sure the device is well positioned and will not become loose (it may either fall or create irritating noises if not properly secured).

Figure 11: Attaching the device

- When you finish your work, clean the vehicle and return all the items you removed into their original positions, using all the original screws and connectors.
- Test the functioning of all the vehicle systems: they should all perform as is before you installed the device.
- Test the connectivity of the device with the system server to ensure proper operations.

4 Cello Unit Installation Instructions

Before installing, please read the Pre-Installation Information and Safety sections.

4.1 General

The following table describes the type of vehicle in which you can install the device, and which vehicles you should NOT install it in.

Table 3: Compatible and incompatible Vehicles

You can install the device in…	Do NOT install the device in…
• **Passenger cars of all types** • **Light and heavy trucks** • **Buses**	• **Motorcycles** • **Snowmobiles** • **Tractors** • **Boats, jet skis and other marine units** • **The carriage of a semi-trailer or full trailer** • **Containers and other assets** Installation in these environments requires special protective materials and is not covered in this guide.

- The device has internal GPS and GSM antennas and usually does not require an external GPS antenna. However, in certain cases, such an external antenna can be used to enhance GPS reception.
- The device has no external GSM antenna.

4.2 Location of the Device in the Vehicle

When locating the device in the vehicle please consider the following:

- The device is not weather proof. It is specified as an IP40 device and thus is not immune to penetration of water, rain, dust, dirt and smoke. If you need special solutions to special environmental conditions, please consult your customer support or account manager.
- The device receives and transmits radio energy in the GSM frequency bands.
- The device receives radio energy in the GPS frequency band from GPS satellites above.
- In SVR applications it is recommended to conceal the device so that it will not be easy for thieves to find and disconnect it.
- The device will not function well in excessive temperatures (see the specifications for details).
- The device requires minimal maintenance.

The following table describes both the preferred locations for installing the device and a list of locations where the device should NEVER be installed.

Table 4: Where to install the device

Preferred location in vehicle…	NEVER install the device (or the external GPS antenna)…
• Behind the dashboard. • In or behind the glove compartment. • Anywhere in the front of the passenger compartment under the console and above the leg space. • In a protected area under the driver's seat. • Less preferable: in the trunk of a passenger car (the radio signals penetrate the trunk mostly through the rear window and rear seat: you may have to find the best location and orientation through trial and error). You can use the external GPS antenna to achieve greater flexibility – the external GPS antenna should be located close to the rear window.	• Outside of the passenger compartment or vehicle trunk. • In the engine compartment. • Inside the bumpers/fenders (note that in some cases you may install the GPS antenna inside the front or back bumpers (fenders, or collision absorbers), however, do it only if you do not have any other reasonable location). • Behind the front lights. • In air ducts. • Close to airbags. • Under the vehicle. • Under the roof of the vehicle (note that you may install the device under the roof only if you use an external GPS antenna). • In a location susceptible to rain or water. • Inside a metal pocket or box. • In the loading area of a truck or pickup. • Near the fuel tank. • Near the wheels. • Near any radio transmitter or its antenna.

Some vehicles, (for example, some Renault Kangoo models) have solar windows with transparent metallic coating that blocks the solar radiation. Unfortunately they also block most of the radio radiation required for the GPS reception. In these cases, you may have to use the external GPS antenna and consult with the dealer about the best locations for the device and GPS antenna. If such support is not available, use trial and error to find a reasonable place for both the device and the antenna.

Locating the device in a prohibited location may significantly affect the functionality of the device, will shorten its lifetime and will create malfunctions and expensive service calls.

Note that the space inside the doors is not a very good location. It is more exposed to outside temperatures and will force you to install the device vertically and not horizontally. If you have to install the device there make sure to locate the device in the area that is not exposed to rain and water and has reasonable reception.

Keep at least 30 cm between the device and any computerized system in the vehicles, to avoid mutual interference.

Do not install the device or any wire near a moving or rotating part of the vehicle.

4.3 Device Orientation

The device direction (orientation) is important when the external GPS antenna is not used. In this case the device uses the internal GPS antenna that should have a good GPS reception. To ensure this, the side marked "This side Up" should face upwards and should have a clear sky view, unobstructed by any metal or shields. Plastic and glass do not usually affect reception.

Figure 12: Device orientation

The GPS receiver in the device is sensitive enough to allow reasonable reception even in cases where the top side of the device (marked 'This Side Up') deviates up to 60 degrees from the ideal direction.

Figure 13: Ensuring the device is located with 30cm free radius

In any case, this side should have a free space (with no metal obstructions) of approximately 30cm radius, with the device in the center of it.

The device orientation is also important in order to ensure that the orientation calibration process is completed successfully and accurately. It is important to attach the device to a rigid surface, such as a firm panel of plastic or metal connected to the vehicle's chassis. The device should not swing / move / rotate after installation. The device should be installed with its upper side facing up, presenting no more than 60° tilt/rotation angle in relation to the sky.

4.4 External GPS Antenna Direction

The following list describes Best Practices for using an external GPS antenna:

- Make sure the antenna is as close as possible to the (unshielded) glass of the front windshield. The antenna cannot be mounted outside the passenger compartment (except where otherwise specified). The antenna should face upwards and should have a clear view of the sky, unobstructed by any metal. The antenna should not block the driver's view.
- If you want to conceal the antenna put it directly under the front console, facing upwards.
- Consider the antenna cable length when you locate it in the vehicle. It is not recommended to extend this cable.
- Make sure you do not bend the coaxial cable to a radius smaller than 3 cm. Doing so may increase the signal loss in the cable.
- The antenna cable should be hidden, secure (to avoid rattling noises) and should not be squeezed or pressed by doors or other moving parts.
- You can use the antenna magnetic base as a way to attach it to a metal surface but it is better to secure it to the location using Velcro tape or double-sided adhesive tape.

4.5 Installing the SIM Card

To install the SIM card, perform the following steps:

NOTES:

Make sure that your SIM card PIN is identical to the PIN programmed in the unit, or disabled. The default value of the unit PIN code is 1234. If the SIM PIN and the unit pin differ, insert the SIM card into a regular cellular phone and either change its PIN to the unit PIN (1234) or disable it.

SIM PIN protection and value (locking the SIM) can be activated automatically providing PIN synchronization between the SIM and the unit.

Note that if you are using modular SIM cards, you need to cut them to Nano size and use a Nano SIM to Micro SIM adapter fitted to Micro size (for the Cellocator SIM holder), as shown below.

---

1. Remove the back cover of the Cello unit. Please note that two securing screws are provided in a nylon bag.
2. Gently slide the SIM card into the SIM holder.
3. Close the unit and insert the 2 screws and tighten to a torque of 3.5 kgf-cm (kilogram force per centimeter) which is approximately 0.35 Nm (Newton per Meter).

4.6 Installing the Battery

Refer to the *Battery Handling Procedure for Cellocator Units* document, which can be downloaded from the Cellocator Knowledge Base, for information about the battery and its handling instructions.

If you received the device without the battery or you received the device with the battery inside but not connected, please open the device, connect the battery cable to the on-board connector and close the device. When you connect the vehicle battery to the device, the device will start working normally. Do not reverse the order of connections; the correct order is to first connect the battery then connect the vehicle power to the device.

4.7 Connecting and Removing the Harness

In order to connect the harness to the unit, attach the harness connector to the unit female connector and validate that the latch is snapped in the correct location.

To remove the harness from the unit, press on the latch end and then gently remove the harness connector from the unit.

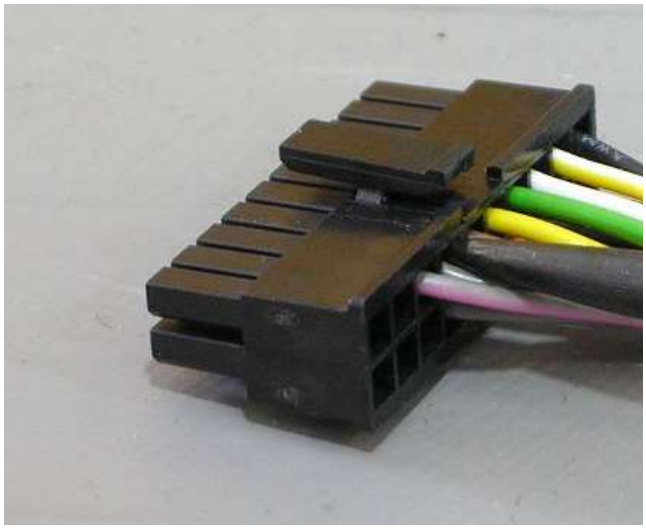


Figure 14: Harness 20 Pin Connector and Latch

WARNING: Forcibly removing the harness connector from the unit while the latch is still snapped into the unit connector can damage the unit connector and/or its PCB.

---

5 Main Harness Installation Instructions

5.1 Harness Outputs Installation Specifications

5.1.1 *General*

The harness contains a special cable for each of the following outputs:

- LED
- External Standard Immobilizer Output
- Siren Output
- Special Immobilizer (Gradual) Output
- Global Output

The following information is common for all the outputs:

- Each output cable (with the exception of the External Standard Immobilizer cable) is comprised of two wire bundles that are configured as follows:
  - The red wire is a permanent Main Power connection.
  - The harness output wires have the following colors: brown, yellow, green, and blue respectively to the selected outputs.
- All Outputs are Open Collector type and can sink up to 300 mA continuous.
- External devices (not OEM) that consume more than 300mA should be powered by a relay. In such cases, the output implementation requires an external relay.
- In order to support Automotive Directive 2004/104/EC (E-Mark) the relays and relays holders provided by Cellocator should be used.
- The outputs can be activated or deactivated from the control center using the OTA command.

5.1.2 *Relay Description*

The relay is provided to serve as an adaptor between the harness output and a device in the vehicle (immobilizer, siren, etc.). The following figure shows the pin-out location of the relay. The pin numbers are also printed on the relay itself.

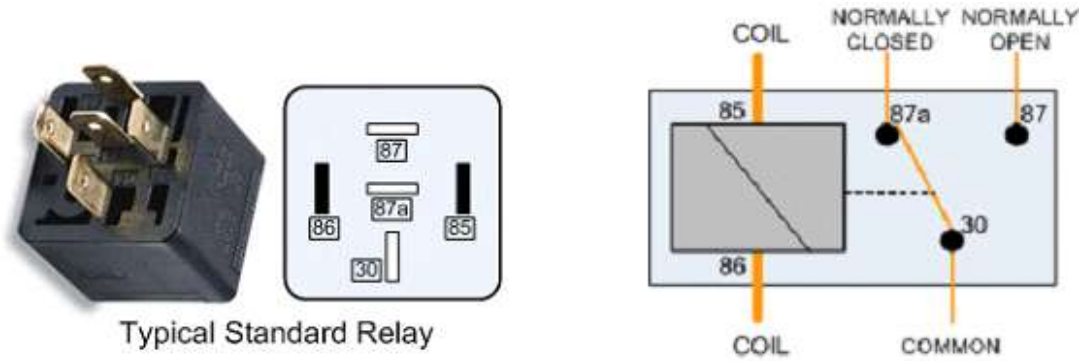


Figure 15: Relay Pin-Out

The relay figure and the pins numbers are used when describing harness outputs installation.

Attention: The relay holders provided by Cellocator, which support Emark directives, enforce pin 85 is connected to power and pin 86 to the unit output.

5.1.3 *LED Output*

The harness LED wire is connected to the Cello unit pin no. 6. The harness provides a detachable LED which can be connected to the LED wire via a dedicated connector for installation convenience. The LED provides an indication of system status. A full description of LED indications in the Cello units is presented below.

The LED output can be used as general purpose open collector output, or as a Geo-Fence notification, if configured accordingly.

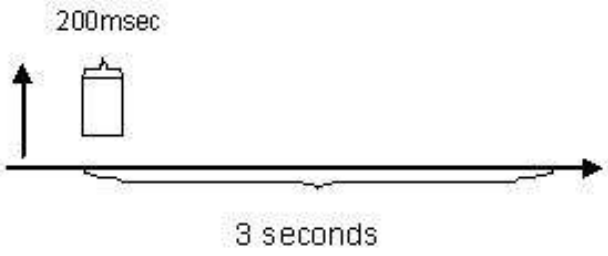
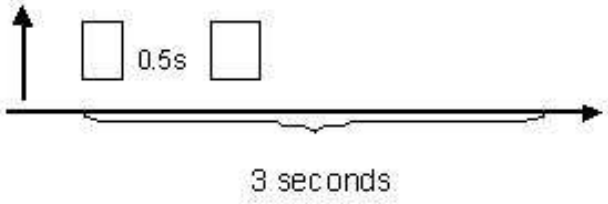
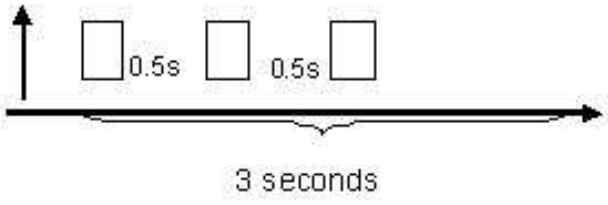
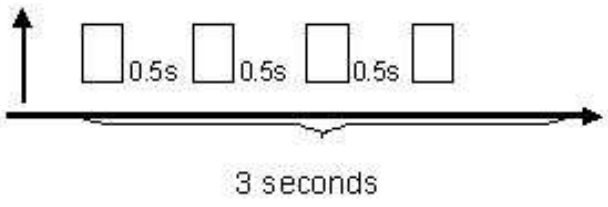
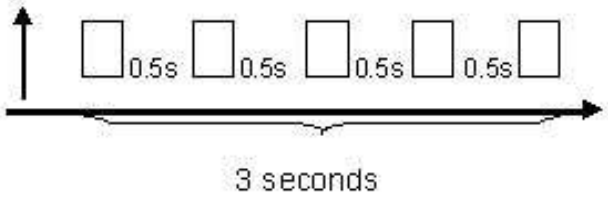
The LED output involves a sophisticated blinking pattern which provides monitoring status of both GPS and GSM status. The blinking pattern is constructed of repeated cycles of two blinking zones each. The first zone represents GSM functionality and the second zone GPS functionality.

- Each zone lasts for 3 seconds with a 1-second LED off interval between them.
- A 5 second LED off interval separates each cycle.

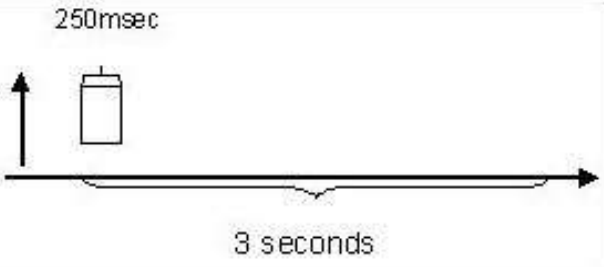
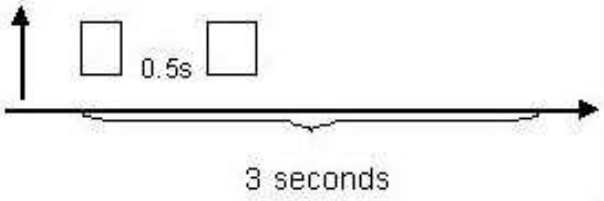
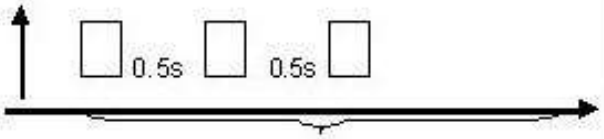
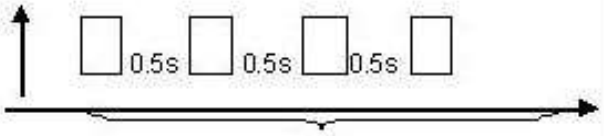
GSM Monitoring Zone *3 seconds*	Interval *1 second*	GPS Monitoring Zone *3 seconds*	Interval *5 seconds*	GSM Monitoring Zone *3 seconds*	Interval *1 second*	GPS Monitoring Zone *3 seconds*

IMPORTANT: To ensure backward compatibility during the voice call, the LED will continually glow from the moment a voice call is triggered until hang up. The cycles of two blinking zones is renewed subsequent to the end of the voice call.

5.1.3.1 GSM Monitoring Zone Definition

Status	Blinking Pattern
GSM modem off	off
Not registered to GSM / No SIM	
Registered in Home GSM network (not attached to GPRS)	
Registered in Roaming GSM network (not attached to GPRS)	
Attached to GPRS/home	
Attached to GPRS/roaming	

5.1.3.2 GPS Monitoring Zone Definition

Status	Blinking Pattern
GPS module off	off
GPS is unplugged / faulty	
GPS communicating, but not navigating	
GPS is in navigation mode	
GPS is in GYRO mode	

5.1.4 *External Standard Immobilizer Output*

The harness External Standard Immobilizer Output wire is connected to the Cello pin no. 7.

This cable has two wires: red and green and **External Standard Immobilizer** is printed on the wire bundle tag.

The output functionality is defined according to programming parameters (PL).

In most cases the output is used by the Cello unit to activate/deactivate the vehicle engine immobilizer. In this case, the output shall be connected to the vehicle engine as shown in one of the following installation diagram.

Installation Method A:

The original wire must be cut and the relay connected between the original relay and the vehicle power as shown in the diagram below:

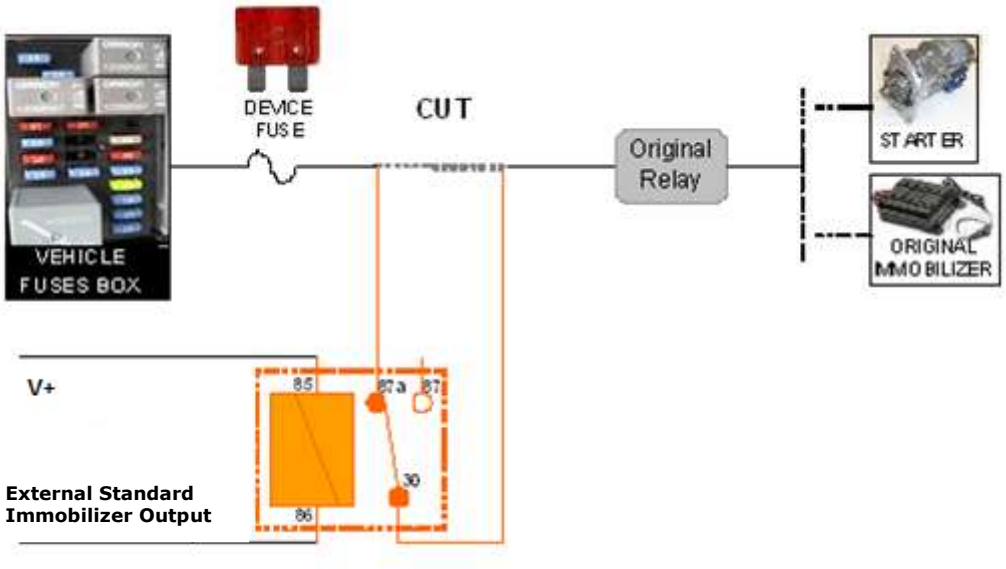


Figure 16: External Standard Immobilizer Output Installation Diagram A

If this installation method is used the immobilizer will be deactivated (disarmed) if the unit or battery are removed and thus this installation is less secured. This method also consumes power even on Ignition Off state.

Installation Method B:

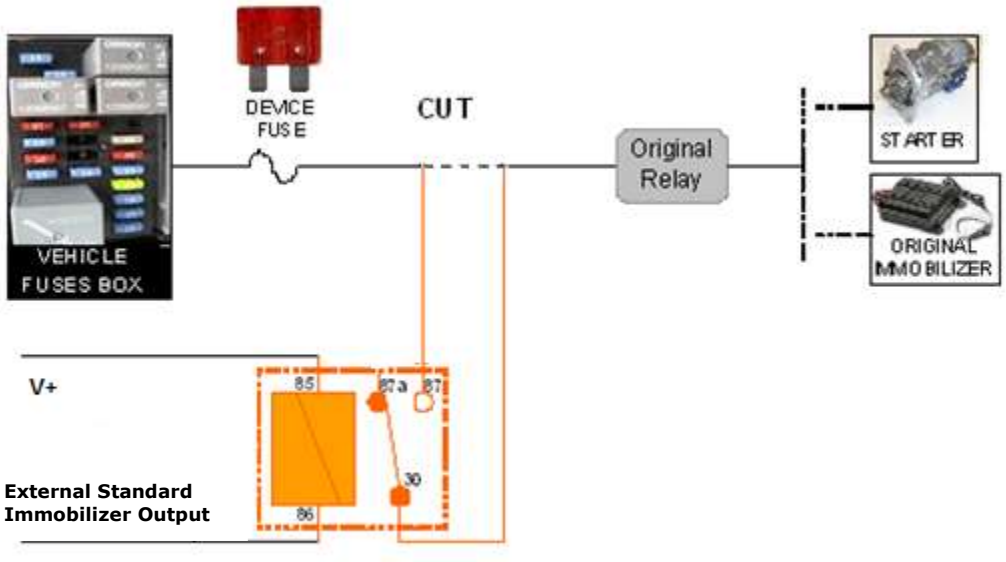


Figure 17: External Standard Immobilizer Output Installation Diagram B

In this method the immobilizer is normally activated (armed) and only when the unit activates the output the immobilizer is deactivated (disarmed). If this method is used the engine will be immobilized even if the Cello unit or battery are removed and thus this method is more secured. This method does not require power on ignition off and thus saves power consumption and minimizes the possibility of vehicle battery drain. To achieve this behavior the Invert Standard Immobilizer parameter of the output should be configured to Inverted.

Normally, the power for the immobilizer relay is taken from the ignition switch wire (and configured so that power is provided only when the ignition switch is in the ON position). If the External Standard Immobilizer output is configured to work while the ignition is in the OFF position, then the red wire should not be used and a permanent connection (car battery) should be used instead for the relay (pin 85).

The External Standard Immobilizer Output can be used also as a general purpose output, or for Geo-Fence notification, if configured accordingly.

This External Standard Immobilizer can be activated/deactivated via an OTA command from the control center.

5.1.5 *Gradual Output*

The harness Gradual Output wire is connected to the Cello pin no. 17. This cable has two wires: red and brown and **Gradual Stop** is printed on the wire bundle tag.

The output functionality is defined according to programming parameters (PL). It can be programmed for gradual immobilizing of the vehicle. In this case the output shall be connected to the fuel pump, as shown in the following installation diagram, providing the Cellocator unit with control over the fuel supply to the engine.

This output can also be used as a global output, or for Geo-Fence notification, if configured accordingly.

The External Gradual Output can be activated/deactivated by an OTA command from the control center. The following illustration provides the Gradual Output installation when deployed for fuel pump control.

NOTE: The original wire must be cut and the relay connected between the original relay and the vehicle power.

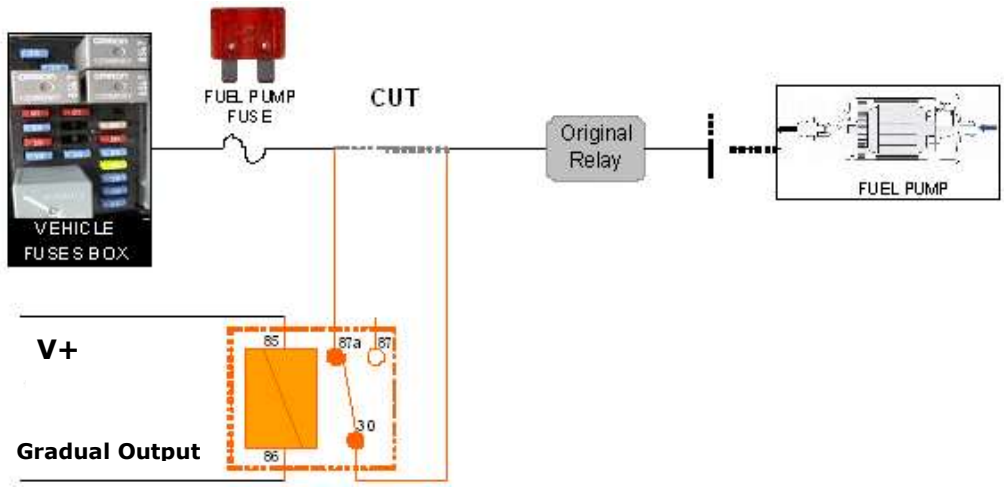


Figure 18: Gradual Output Installation Diagram

5.1.6 *Global Output*

The harness Global Output wire (designated as Blinkers) is connected to the Cello Pin no. 18. This cable has two wires: red and yellow and **Global Output** is printed on the wire bundle tag.

The output functionality is defined according to programming parameters (PL). In most cases, the Cello unit uses this output as a global output, allowing activation/deactivation of several devices, such as blinkers, parking lights, an additional siren, etc. In this case the output shall be connected to the required device as shown in the following installation diagram. The Global output can also be used for system feedback, or for Geo-Fence notification, if configured accordingly.

It can be activated/deactivated by an OTA command from the control center. The following illustration provides the Global Output installation.

NOTE: The original wire must be cut and the relay connected between the original relay and the vehicle power.

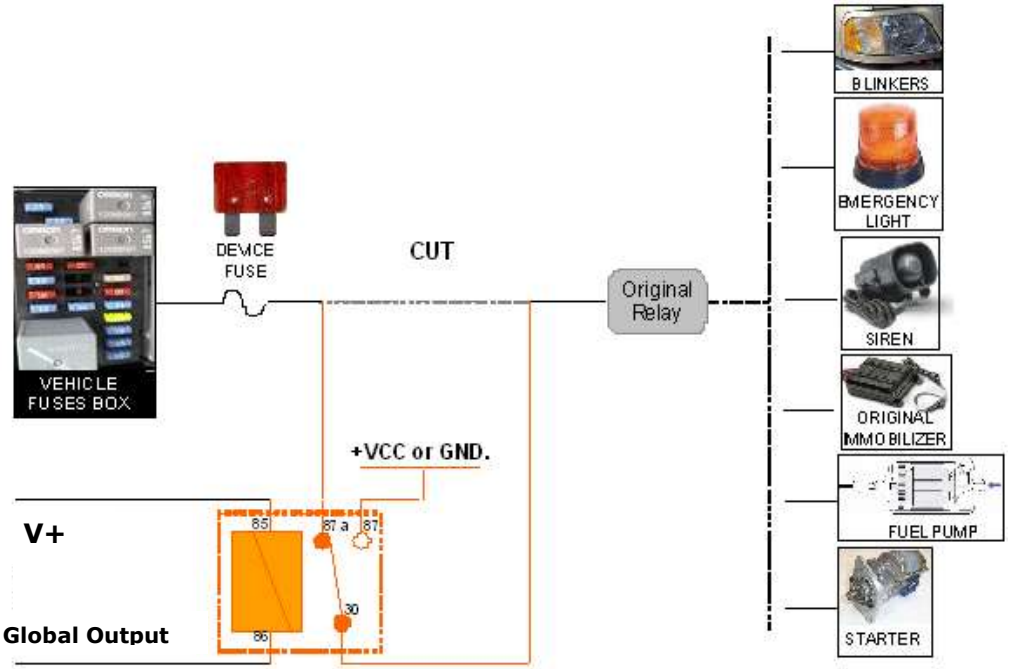


Figure 19: Global Output Installation Diagram

5.1.7 *Siren Output*

The harness Siren Output wire is connected to the Cello Unit pin no. 8. This cable has two wires: red and blue and **Siren** is printed on the wire bundle tag.

For the Cello-IQ the output functionality and installation diagram for the siren are the same as those of the Global Output.

For the Cello-CANiQ the output should be connected to the DTCO D8 pin and the harness GND wire should be connected to the DTCO GND pin.

5.2 Harness Inputs Installation Specifications

5.2.1 *Global Purpose Input (Shock)*

The harness Global Purpose Input (Shock) wire is connected to the Cello pin no. 15. This cable has one brown wire and **UNLOCK2** is printed on the wire tag.

When set in a configuration as an analog input in backward compatible range, it can be used to connect an analog device (0 V to 2.5 V), such as a fuel gauge, thermometer, and so on.

When set in a configuration as an analog input in full range, it can be used to connect to any analog device (0 V to 30 V).

When set in a configuration as a frequency meter input, it can be used to connect to a source of pulses, such as Vss for example (amplitude from 4 to 30V, frequency up to 5kHz).

When set in a configuration as a digital input, its functionality is defined according to programming parameters (PL). Thus, it can perform:

- General purpose input

- Standard voice calls control
- Privacy mode control
- Usage counter input

5.2.2 *Global Input 1*

The harness Global Input 1 wire is connected to the Cello pin no. 5. This orange wire is labeled as **Lock/CANL**.

This input can be used as a general purpose input or as a usage counter.

This wire is used for the CANL interface for the Cello-CANiQ.

5.2.3 *Global Input 2*

The harness Global Input 2 wire is connected to the Cello pin no. 11. This green cable is labeled as **Unlock/CANH**.

This input can be used as a general purpose input or as a usage counter.

This wire is used for the CANL interface for the Cello-CANiQ.

5.2.4 *Distress/Emergency Button Input*

The harness Distress/Emergency/Panic Button Input wire is connected to the Cello pin no. 16. This cable has two wires: gray and black and is labeled **Emergency Button**.

The input functionality is defined according to programming parameters (PL) and can be used as:

- General purpose input
- Usage counter
- Emergency voice call initiation

When serving as a trigger for emergency voice call initiation, each wire is connected to one of the connection poles of the distress button.

5.2.5 *Doors Sensor Input*

The harness Doors Sensor Input wire is connected to the Cello pin no. 14. The cable has one white wire and is labeled as **Door Sensor.**

When set in a configuration as an analog input in backward compatible range, it can be used to connect an analog device (0 V to 2.5 V), such as a fuel gauge, thermometer, etc.

When set in a configuration as an analog input in full range, it can be used to connect to any analog device (0 V to 30 V).

When set in a configuration as a frequency meter input, it can be used to connect to a source of pulses, such as Vss for example (amplitude from 4 to 30V, frequency up to 5kHz).

When set in a configuration as a digital input, its functionality is defined according to programming parameters (PL). Thus, it can serve as:

- General purpose input
- Transparent data forwarding switch
- Emergency voice call initiation
- Usage counter input

When used as a door sensor, the wire should be connected to the doors-open indicator light of the dashboard control panel.

5.2.6 *Dallas Button Input*

The harness Dallas Button Input wire is connected to the Cello pin no. 20.

This cable is labeled as **Dallas** and has two wires, orange and black.

The cable can be connected to any identification device compliant with DS1990A or DS1971. The cable can also be connected to up to 4 DS18B20 compliant temperature sensors.

When connected to the Cellocator Dallas Reader, the black wire is connected to the Dallas Reader's brown wire (ground) and the orange wire is connected to the blue wire (or white wire, depending on the Dallas reader model) on the Dallas Reader.

This interface also supports the Cellocator Keypad, the Cellocator Trailer ID and the Cellocator Proximity Reader; download and review the appropriate documents from the Cellocator Knowledge Base for installation instructions.

5.3 Harness Power Installation Specifications

The Main Power and Ignition thread has three wires: red, black and purple.

- Red – the red wire is connected to the Cello pin no. 2 and should be connected to the car's battery (12V / 24V) (refer to Installation Drawing, Section 5.7).
- Black – the black wire is connected to the Cello pin no. 3 and should be connected to vehicle ground (at dedicated points) (refer to Installation Drawing, Section 5.7).
- Purple – the purple wire is connected to the Cello pin no. 4 and should be connected to the ignition switch (in the ON position).

NOTE: The Cello unit must be protected by means of a 3A fast blow fuse. The fuse should be installed either between the red wire and the vehicle battery or between the black wire and the vehicle ground.

5.4 Debug Interface

The debug interface provides the information communicated between the Cello microprocessor and the Cellular modem. The information can be logged by the Communication Logger application which is part of Cellocator Evaluation Suite. The PC Com port, used by the application should be connected to the harness Cello Debug connector (P17) using the 711-00241 Communication Logger adapter. Please review the Communication Logger section in the *Cellocator Evaluation Suite* manual for more information.

5.5 Serial Interface

The harness supports a special connector allowing external devices communication with the Cello via its RS232 interface (Cello pins 12 and 13). The connector (P13) is designed to match the DFD and BT Extender cables connectors and its pins and wire colors are described in the Cello Harness Overview section.

The following devices can be connected to the Cello serial interface:

- DFD – the DFD cable connector complies with the harness serial interface connector.
- BT Extender - the BT Extender cable connector complies with the harness serial interface connector.
- A PC COM port for updating the firmware or the configuration (PL file) of the Cello unit. In this case the 711-00313 DFD to DB9 Adapter should be used. If the PC supports only USB ports, the 711-30017 USB to RS-232 Adapter should be used as well.
- Mobile Data Terminal (MDT) for message exchange with the control center. In this case the 71100314 DFD to RJ45 Adapter should be used.
- CFE - the 71100314 DFD to RJ45 Adapter should be used.
- A handheld device, such as the Garmin PNA, or a Pocket PC. The device is supplied with an RS232 cable and it is the installer's responsibility to connect the device cable to the Cello harness serial interface connector.

5.6 Cellocator Handsfree Installation

The harness supports connection of the Cellocator Handsfree via the Handsfree extension cable labeled as **HANDSFREE** terminated with dedicated connector.

Refer to the *Cellocator Handsfree Product Overview* for installation instructions.

5.7 Cello Installation Diagram

Refer to Table 2 for detailed information about the harness.

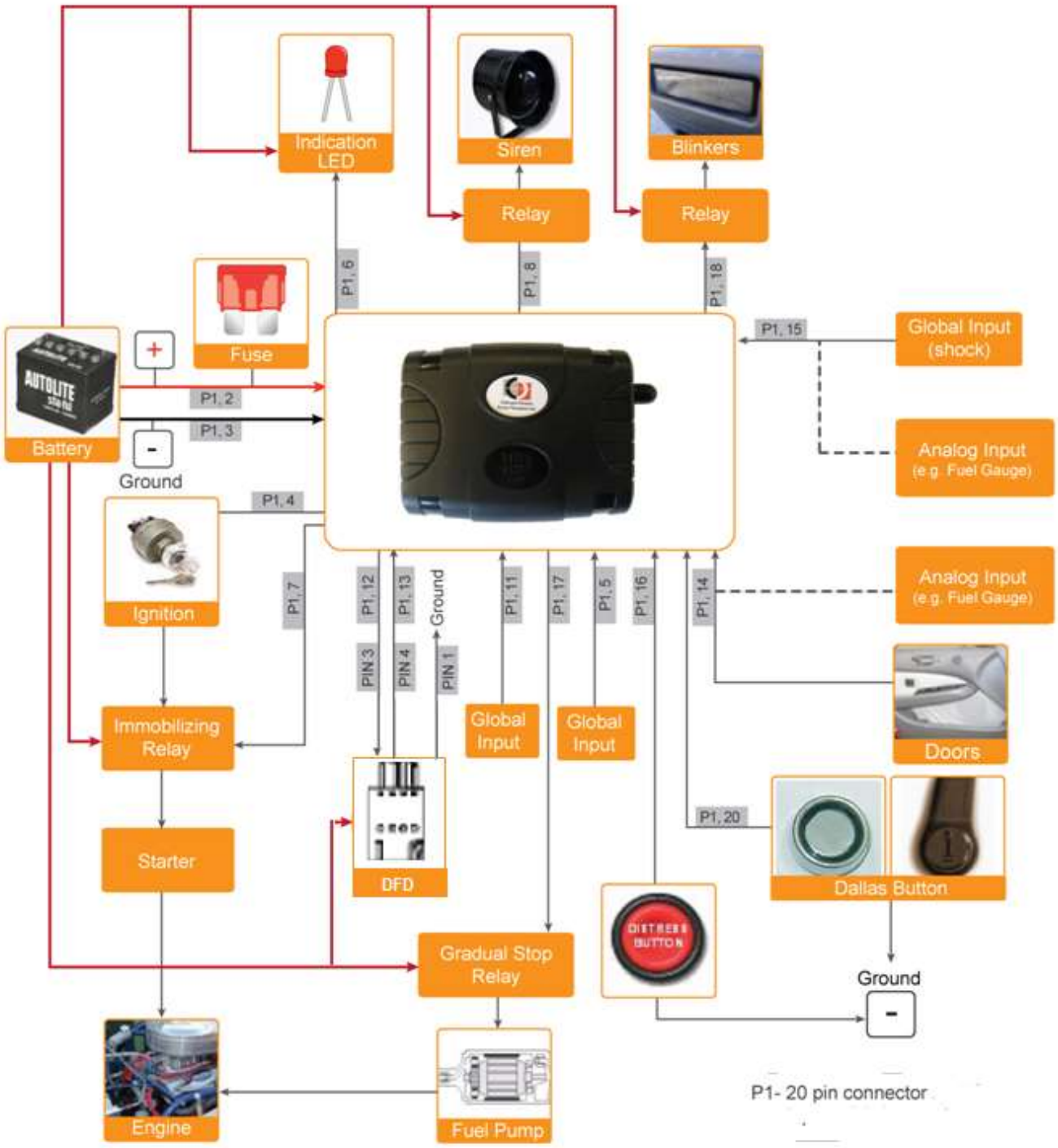


Figure 20: Cello Installation Diagram

6 Information Specific to the Installation of Cello-CANiQ

The installation of Cello-CANiQ is based on the installation of the Cello-IQ, as explained in previous sections. This section explains the differences between the Cello-IQ and the Cello-CANiQ and includes details on the harnesses which have been designed to specifically support CAN Bus installations.

Review the *Harness Selection Wizard* document for more information regarding the Harnesses.

6.1 Cello-CANiQ Unique Interfaces

The Cello-CANiQ pin out is different from other Cello based units regarding 3 interfaces:

- Pin 5 supports the CAN-L instead of the Lock input.
- Pin 11 supports the CAN-H instead of the Unlock input.
- Pin 8 supports the DTCO D8 instead of the Siren output.

6.2 The OBDII Basic Harness

The OBDII Basic Harness is designed for a very fast installation of the Cello-CANiQ. The harness supports CAN Bus connection and power feed via the vehicle OBDII connector and DFD connection via the DFD connector.

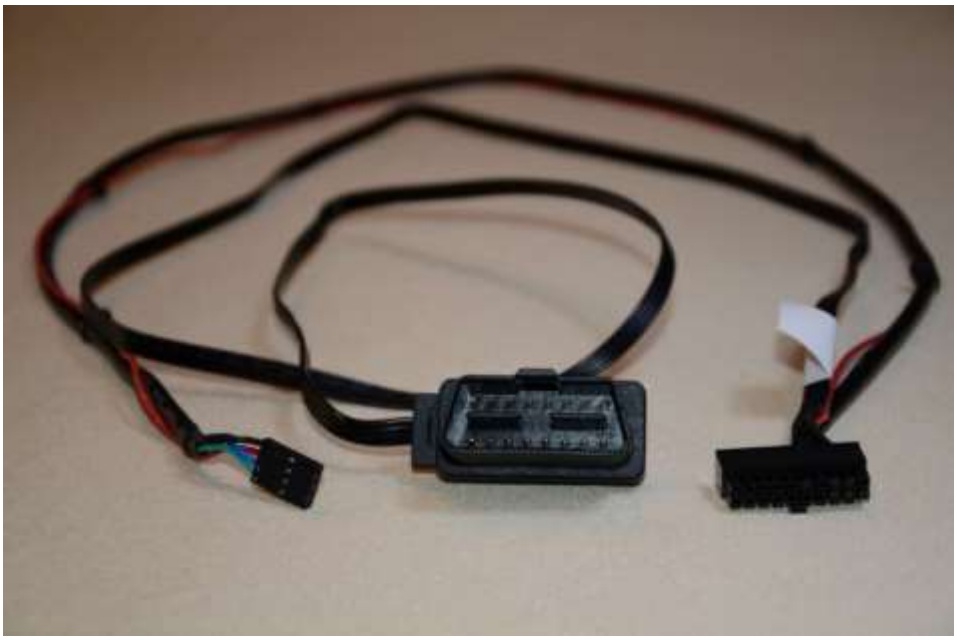


Figure 21: Cello-CANiQ Basic OBDII Harness

6.3 The Cello Harnesses

The Cello harnesses provide a shielded jacket with twisted pair CANH and CANL wires for supporting the high frequency CAN signals. For further information, refer to the *Harness Selection Wizard* document.

6.4 The OBDII Y Cable

The 711-00335 OBDII Y Cable is an adapter connecting the vehicle OBDII connector to the Cello harness, allowing covert installation and connection of diagnostics tools in a workshop.

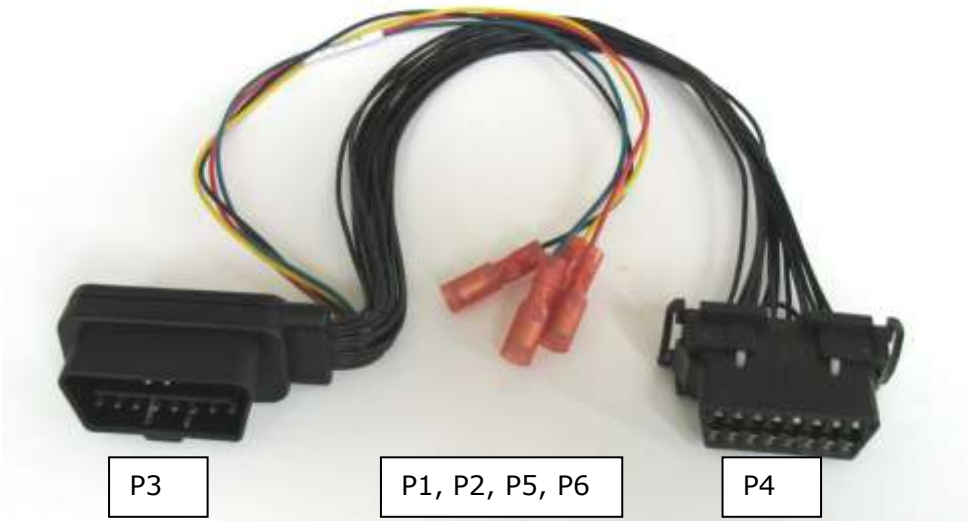


Figure 22: OBDII Y Cable

The OBDII socket (P4) should be mounted on the dashboard instead of the original connector. The OBDII plug (P3) should be connected to the original vehicle OBDII connector. The other wires should be connected according to the following connection table:

Connector	Wire Color	Connected to
P5	Black	GND
P2	Green	CANH
P6	yellow	CANL
P1	Red	Power

Table 5: OBDII Connection Table

The following picture shows an installation of the OBDII Y cable with the Cello harness.

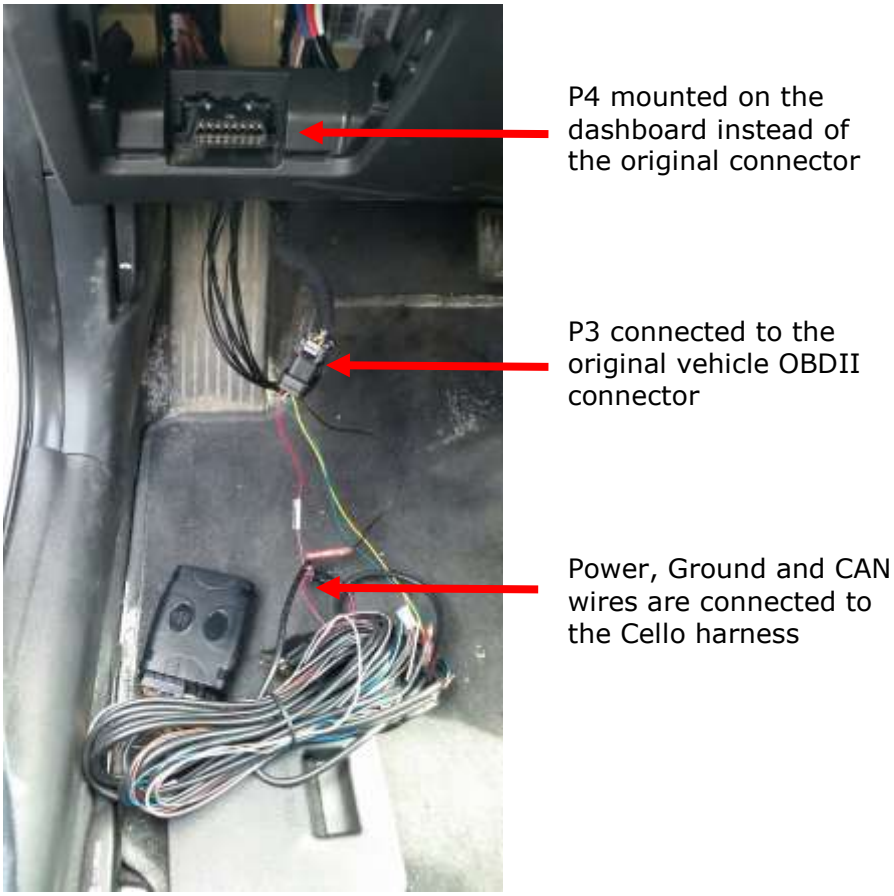


Figure 23: OBDII Y Cable Installation

Note that a special OTA command should be sent to the Cello-CANiQ before connecting diagnostic tools to the OBDII connector (P4).

6.5 The CAN Contactless Adapter

Some OBDII installations require a non-intrusive, non-galvanic interface with the vehicle.

The 715-50500 CAN Contactless Adapter provides such a solution; it is mounted around the vehicle's CANH and CANL wires and senses the electromagnetic field generated when data is sent over CAN wires, and translates these fields into standard CAN High and CAN Low signals. The CAN High, CAN Low signals are connected to the Cello-CANiQ CAN interface as if it was directly connected to the original bus.

For further information please review the *CAN Contactless Adapter Product Overview*, which can be downloaded from the Cellocator Knowledge Base.

6.6 Cello-CANiQ Disclaimer

Cello-CANiQ is an open platform allowing the user to implement various CANBUS connectivity configurations with regards to the ECU parameters being captured or queried, as well as the querying rate. While using the vehicle's OBDII port, the Cello-CANiQ sends queries to the diagnostics ECU. In such installations, it is possible that unprofessional user defines configuration which results in errors on the OBD port. In other cases, the installer may choose to connect the device directly to the vehicle bus, via wired connection and not a dedicated connector – installation type which may be referred by a vehicle manufacturer as a cause for warranty remit. User shall use only validated installation and device configuration which were officially recommended by Cellocator.

In no event shall Pointer be liable for any direct, indirect, incidental, special, punitive or consequential damage, losses or expenses relating to or arising from the Cello-CANiQ, including without limitation, its installation, programming, configuration and use thereto; provided however, that Pointer warrants to the buyer that during the period of one year commencing on the date the Cello-CANiQ is purchased the Cello-CANiQ shall conform in all material respects with the performance specifications, attached to the unit purchased.

7 DFD Installation

7.1 DFD Location

The DFD should be installed on the vehicle dashboard near the steering wheel in a way that the steering wheel will not hamper the driver's view of the DFD; the driver should be able to see the DFD display without having to take their eyes off the road.

The DFD display should be placed opposite the driver, and angled towards the driver's face. An example of a proper location for the DFD is shown in the picture below.

Figure 24: Correct Location of DFD

7.2 Installation instructions

- Select a proper position for the DFD on the vehicle dashboard as described above.
- Unscrew the screw holding the DFD to its stand using the Allen screw driver, and rotate the DFD as required, in order to ensure the DFD display is directed towards the driver. Then close the screw in order to fasten the display position.

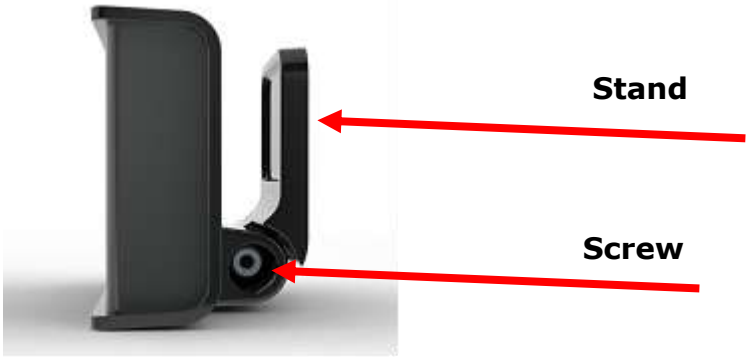


Figure 25 Installing the DFD

- Mount the DFD to the dashboard facing the driver using the provided double-sided adhesive tape and / or screws.

- Connect the DFD cable to the DFD thread of the Cello harness, as shown in the picture below.

Figure 26: Connecting the DFD Cable to the DFD Thread of the Cello Harness

- When a CFE is used, connect the DFD to the CFE harness with the CFE-DFD harness.

Once installed, you may adjust voice volume so that the DFD announcements can be heard clearly when driving. The voice adjustment is done via OTA commands generated by the control center via the CSA server.

8 Post-Installation

8.1 Recording installation details

When you have finished installing and testing the device you have to record the relevant details. These details will help you or your colleagues to maintain the device in the future.

The best way to do this is to register all the details in an easily accessible application with a database. This application should be accessible by a PC at the installation location or even via smartphone. A less efficient solution is an Excel file or even handwritten records.

The details that should be recorded are:

- Name of the customer
- ID of the vehicle
- Type of the device installed
- Accessories installed (sensors, antenna etc.)
- Cables/Harnesses used
- Location of the device in the vehicle
- Direction and inclination of the device
- Name of the installer
- Location where the installation took place
- Date of installation
- Results of installation test/issues found
- Results of communication test to the server/issues found
- Picture(s) of the installed device, antenna and accessories, as installed
- Other comments

8.2 Post-installation Automatic Orientation Calibration Process

The process of orientation calibration is required to determine the orientation of the device in a vehicle; this process begins automatically upon power up if the unit is not found to be already calibrated.

During this process the unit learns its exact position relative to the driving direction. The process is fully automatic, and in most cases consumes between 2 to 5 driving hours. During calibration the system will detect only the Idling, Speeding and Excessive RPM maneuvers and crashes. The unit will not compute the ECO and SAFETY scoring.

The unit notifies about the calibration process in every OTA message sent to the CSA server.

Upon the end of the calibration, the unit notifies the CSA server on the successful calibration and also sends the Calibration matrix.