POWERFLEET®
People Powered AIoT

Version 1.0

Vehicle Gateway S

Product Overview

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2. This document should be retained for future reference.

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Introduction

Powerfleet VEHICLE GATEWAY S is the first of its kind product, which is complementary to the other gateway products in the Powerfleet family and comes equipped with features such as BLE 4.2, GNSS, LTE (CAT-1) cellular communication, accelerometer and LED indicators. The VEHICLE GATEWAY S has a smaller design, IP65 protection, and includes a built-in, non-removable harness.

Document Scope

The document describes the high-level system features and capabilities of the VEHICLE GATEWAY S new platform. This document does not deal with the protocols and interfaces between the Powerfleet VEHICLE GATEWAY S device and the SW backend, nor with the low-level algorithms, state machines and logic engine implemented to deliver a complete remote diagnostics and enhanced driver behavior system. These protocols, APIs, algorithms, and state machines are described in separate documentation, as listed in the following sections.

References and Bibliography

No.	Document Name
1	Cellocator Programming Manual
2	Cellocator Wireless Communication Protocol
3	Cellocator Serial Communication Protocol

System Overview

General

The VEHICLE GATEWAY S is Powerfleet's new IoT Tracking device with GNSS, GSM and Bluetooth connectivity.

It is complementary to the CR family and comes equipped with features such as BLE 4.2, GNSS, LTE (CAT-1) cellular communication, accelerometer and LED indicators.

Kindly be aware that the VEHICLE GATEWAY S™ CAN device possesses certain CAN capabilities that differ from the other Cellocator CAN devices, namely the Cello-CANiQ-M™ and Cello-CANiQ™. Please take note of these distinctions when considering the functionalities and features of each device.

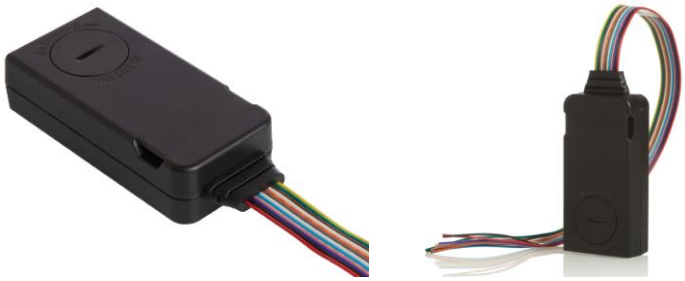


Figure 1 – VEHICLE GATEWAY S

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

System Architecture

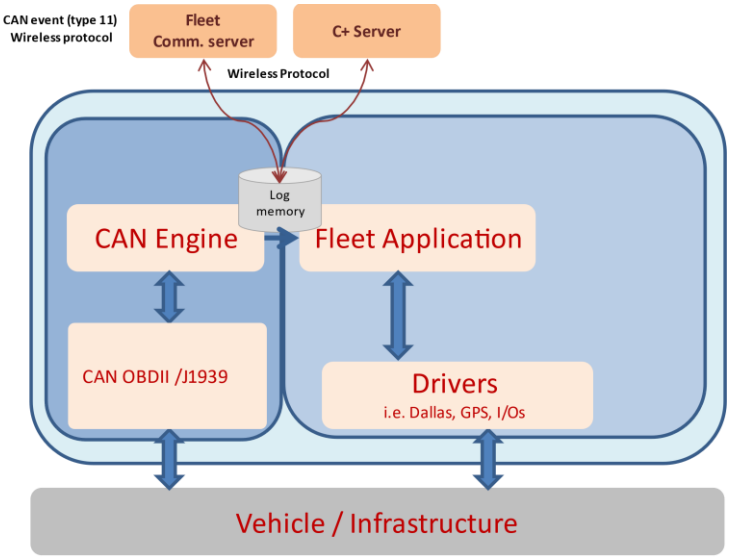


Figure 2 - VEHICLE GATEWAY S System Architecture

Vehicle parameters and sensors are monitored constantly by the CAN bus controller.

The CAN engine module obtains the PIDs / PGNs / SPNs from the Drivers layer, analyzes variables, and transfers them to the Fleet application module, and the backend via the OTA, using a Cellocator protocol (modular message type 11), that enhancing the message structuring and parsing flexibility.

CANBUS Triggering Logic Engine

Supported # of Monitored Sensors

The VEHICLE GATEWAY S can filter and monitor:

- 14 Parameter sets (PGNs) concurrently on the J1939 bus can be filtered.
- By applying a 'bits selection mask' one can filter more than one Arbitration ID using the same filter and by that increase dramatically the number of concurrently filtered parameters.
- CAN Parameters – Maximum of 35 concurrently monitored PIDs (either standard or non-standard).

The VEHICLE GATEWAY S can operate in one of the above-mentioned modes.

CAN Parameters Evaluation for Triggering

Using the CAN Editor SW tool, the user can define the following logic operators as **triggers** for CAN-based event generation. The triggering logic engine in the VEHICLE GATEWAY S evaluates the status of the filtered sensors at least 10 times a second or at the maximal refresh rate available per sensor, whichever is lower.

	Condition	Description
1.	IN&OUT Range	Sensor value goes in and/or out of a predefined range. All combinations are possible. In only/out only/both in and out.
2.	State equals to	A binary or a finite state parameter equal to a certain value.
3.	Above or below the threshold	Sensor value goes above or below a predefined value. All combinations are possible: Up only, down only, up and down (with or without hysteresis).
4.	State Change	A binary or a finite state parameter changed its value.
5.	Difference below or above the threshold	The difference between the existing value and the previous value of a certain sensor is above or below a certain threshold.
6.	Difference between inside/outside range	The difference between the existing value and the previous value of a certain sensor is inside or outside a predefined range.
7.	Difference from the last generated event	As per 5 & 6 but comparing to the value registered upon generation of the last event rather than the value in the last sensor reading (used, for example, for maintenance scheduling based on the odometer).
8.	Delta between two variables	Compares between two different parameters and checks whether is above or below a certain threshold
9.	The Boolean logic operator of the two evaluations mentioned above	Any Boolean combination of the above-listed conditions (AND/OR/NOT) for one or two sensors.
10.	Boolean logic operator with Timer (two conditions exist for longer than Ta)	Any Boolean combination of the above-listed conditions (AND/OR/NOT) for one or two sensors is fulfilled for at least a predefined time.
11.	Boolean logic operator with Timer (two conditions fulfilled within Tb)	Any Boolean combination of the above-listed conditions (AND/OR/NOT) for two sensors that their specified condition fulfills within a predefined time since the first occurrence.

	Condition	Description
12.	Is it set(or not set)	The operator detects missing/existing variable values configured by the PL list.
13.	Fuel theft detection operator	Dedicated operator for fuel theft detection.

Table 1 - CAN Sensor Evaluation for Triggering

Fuel theft detection operation

An operator for fuel theft is determined by several conditions:

- Normally the fuel level is sampled too fast to detect theft. The sample rate is reduced dramatically to detect theft.
- During driving, the fuel sloshes from side to side in the tank, and the sampled fuel level is typically unstable. In addition, fuel is normally stolen when the vehicle is not moving. Therefore, fuel sampling for theft detection only occurs when the velocity is zero.
- Even after the vehicle stops, the fuel sloshes about in the tank for a few seconds. Therefore, the sampling for theft detection is postponed for a few seconds after the vehicle stops.
- In most cases, fuel theft occurs during the engine off-state, when the CAN bus is not operational. Therefore, upon Ignition On, the VEHICLE GATEWAY S unit compares the first stable fuel reading with the one recorded before the ignition was switched off.
- The 'Selected Arbitration IDs' field in the Filters tab shows the filtered Arbitration ID after the mask function is activated.

MIL Parameter over OBD

A bit parameter configuration in the PL enables the sending of the MIL (Malfunction Indicator Lamp) value when modified. The Cello unit compares the value of the MIL received from the OBD with the current stored value, and, if different, will send the new value to the backend via serial or OTA.

Event Generation Methods

General

There are three schemes in which the VEHICLE GATEWAY S generates a CAN-based event:

Once	If one of the conditions listed in the previous section is fulfilled.
Periodic & Time-limited	If one of the conditions listed in the previous section is fulfilled and the user sets the system to log x CAN status updates with period 'Tp' between every two consecutive updates or until the condition terminates, whichever comes first.
Periodic	CAN message is logged every 'T' second if the ignition switch is turned on or the engine is running.

DTC Capture Logic

Diagnostics Trouble Code reporting is supported by J1939 and OBDII and can be captured by the VEHICLE GATEWAY S. The capturing and reporting logic can detect any changes in the trouble codes state as reported by the ECU or the various sensors in the CANBUS network. This means that any addition/deletion/change in trouble code data leads to event logging and reporting to the backend.

Back Off Mechanism

The logic engine can detect abnormal event generation rates caused by malfunctions of the bus / vehicle / device, and limit the number of generated events along with reporting the attributes of the detected problem.

CAN Reporting Features

CAN Status Events Type

CAN events (Type 11) **are always memory logged events** to ensure zero loss of vehicle data.

CAN Status Event Attributes

CAN events (Type 11) generated by the VEHICLE GATEWAY S are modular and composed of the following Mandatory (**M**) and/or Optional (**O**) parts. Optional parts can be added (or removed) in the configuration:

- Header – (**M**)
- Activated Trigger(s) ID(s) – (**M**)
- Triggered Sensors values upon activation – (**M**)
- Attached Sensors – up to 35 sensors can be attached to a CAN message, representing the values upon trigger activation as additional information – (**O**)
- Timer Value which caused trigger activation – if it exists (**O**)
- Trigger Activation time (**M**)
- Trigger Activation location (**O**)
- Other information modules representing status upon trigger activation, such as I/O status, Driver ID, etc. (**O**)

Server-Side CAN Event Interpretation

The structure of the CAN event allows the backend to understand clearly, uniquely and unambiguously, why the event was generated and what are the CANBUS data elements in the message content.

For example, the explicit meaning of the trigger(s) ID(s) and explicit meaning of the various sensor IDs sent in the message can be automatically deduced on the server side using an XML file which is generated by the CAN Editor for each unique PL and saved on the backend.

This XML is associated with a PL signature sent in every uplink message and can be used upon message reception for easy parsing and presentation layer updates.

For example, using the XML file, back-office personnel can understand that:

- Trigger ID 14 stands for "Engine temp higher than 90^0C for more than 15 minutes"
- An event holds sensor ID 222 which means *engine temp* = 95^0C and sensor ID 459 which means that the *vehicle speed* was 80Km/h.

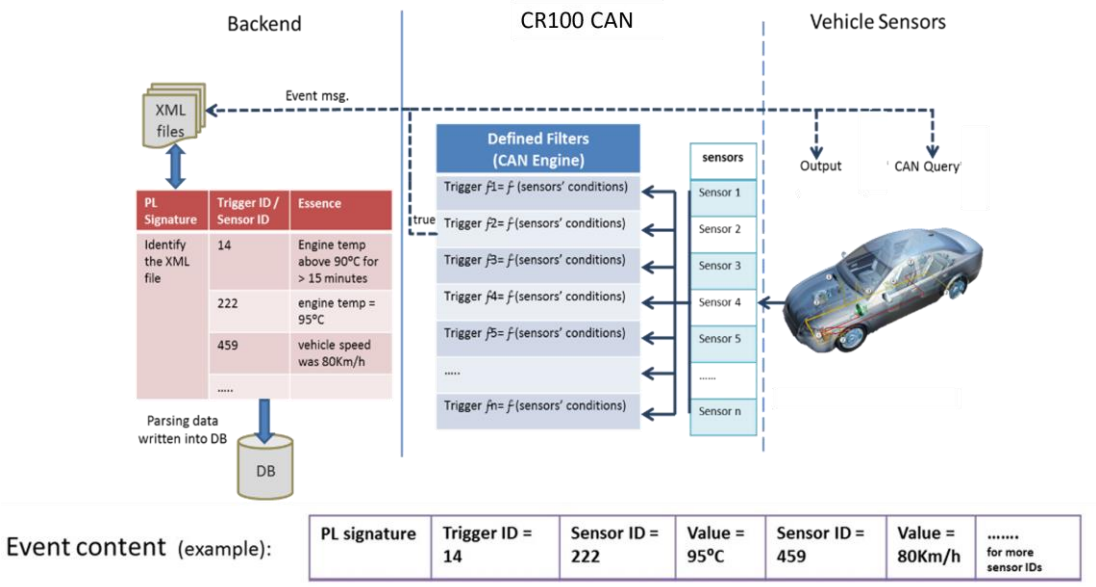


Figure 3 – Triggering Procedure

Sensors Array:

- The sensors array is a storage space for information extracted by sensor-type filters. Each sensor filter is linked with one of the sensor variables in the array. More than one filter may be linked with the same sensor variable, enabling the extraction of certain data using different filters.
- Each sensor may also be linked with one or more triggers, which allow certain actions to be performed when sensor values fulfill certain conditions.

Triggers:

- The sensor triggers permit the unit to react to certain conditions of the information extracted to sensors.
- Triggers are defined by the CAN Editor and downloaded to the unit.

XML Files:

- Contains the interpretation for each Trigger ID or Sensor ID, where the key is the PL signature.

In-vehicle Local Intervention

Upon fulfilment of a trigger, the VEHICLE GATEWAY S can perform additional local actions, on top of event transmission, such as:

- **Output activation** – it is possible to define the activated output and its pattern:
  - Permanent activation (either 'nested' or 'ad-hoc')
  - Pulse (with length definition in 0.1-second resolution)
  - Pattern – once / repeating.

Tampering / Fault Detection

If the VEHICLE GATEWAY S is configured to monitor a vehicle bus but a valid bus connection cannot be detected by the device, an appropriate event is generated according to a predefined timeout threshold.

Analysis Exceptions

RPM:

Whenever the RPM parameter is available (from CANBUS or pulse counter), it's applied to the FM logic engine.

Odometer:

Since the vehicle's real odometer is not supported by the standard set of PIDs, and cannot always be extracted explicitly, the odometer value of the vehicle can be calculated by the VEHICLE GATEWAY S with an error level of not more than 1%. This is done by setting a baseline odometer manually, with the device then incrementally adding distance travelled and reporting a live odometer readings based off relative distance travelled since the baseline was set.

Speed Calculation:

The speed value reported by the CAN bus is typically inaccurate; it reflects the speed shown to the driver on the speedometer but is manipulated by vehicle vendors (which, in most cases, increases the real speed for driver safety reasons).

- Most of a VEHICLE GATEWAY S unit's applications (overspeeding, idling and driver behavior) need to use this manipulated speed to synchronize between the driver experience and the unit's reporting. But, for getting real odometer values calculated from the speed, it is required to use the real speed values and not the manipulated speed values. For this reason, legacy systems used the "CAN Speed Correction Delta" parameter, which multiplies an existing System Speed by a pre-programmed signed value.
- The inaccuracy of the CAN speed (as per the speedometer reading) is typically non-linear and should be calibrated with the GPS speed (as described in the Cellocator Programmer Manual).

Trip Fuel Consumption:

Trip fuel consumption is one of the most important pieces of information for the Fleet Manager, after fleet daily expenses and fuel vandalism suspicion. Fuel consumed per trip is not always a standardized PID, but it can be calculated/reported by the VEHICLE GATEWAY S according to the techniques below.

Whenever calculated and reported in a trip report, the fuel consumption data is separated into two fields:

- Total fuel consumed during the trip.
- One of the following five methods is used to determine the total fuel consumed in a trip:
- Reducing the last known "Total fuel consumed" parameter from the Total fuel consumed reported in the CAN bus (OBDII / J1939) upon the end of the current trip.
- Calculating total fuel consumption from the **fuel level**, either from the fuel level from the CANBUS or physical fuel probe (by calculating the tank percentage level before and after a trip and translating it to total fuel consumed).

- Calculated by integral over momentary **fuel rate** parameter reported in the bus.
- Valid Pointer formula for gasoline engines (calculated on **MAF** air flow rate) and diesel engines (calculated on RPM and Injected Fuel Quantity)
- A formula (for Gasoline) based on **MAP** (Manifold Air Pressure).

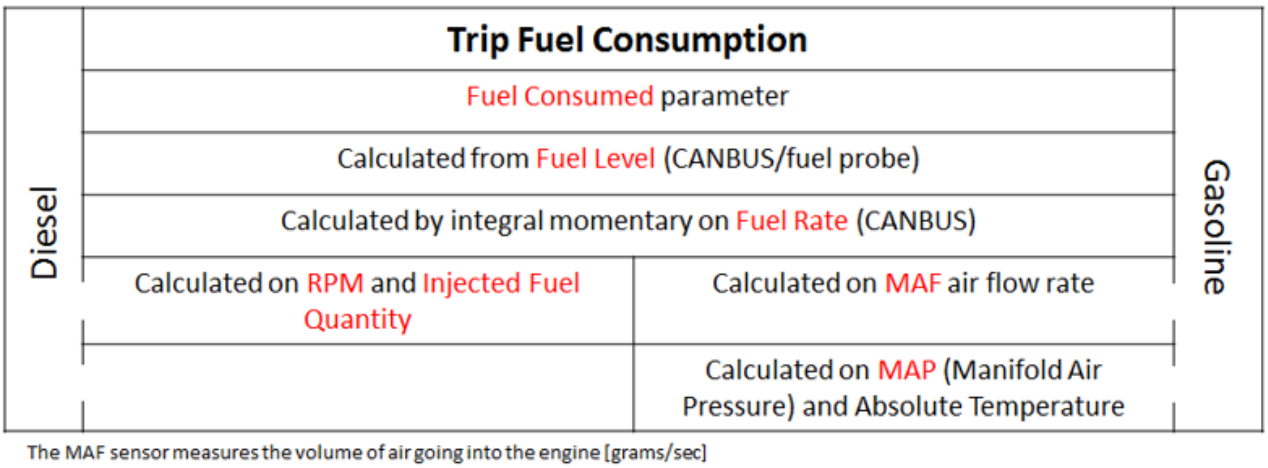


Figure 4 – Trip Fuel Consumption

Note: For each Trip End event, if enabled, it is automatically assigned with Trip Statistics (CSA module 32) and the trip fuel report data (idling, movement) is added.

Hardware

The VEHICLE GATEWAY S has a smaller design, IP65 protection, and includes a built-in, non-removable harness.

Figure 5 – VEHICLE GATEWAY S

The VEHICLE GATEWAY S includes the following:

Modem	LTE CAT-1 with 2G fallback (LATAM, NZ, AU), LTE CAT-1 with 2G fallback (EMEA).
SIM	Nano SIM with eSIM option.
Bluetooth	BLE 4.2
GNSS	GPS and BeiDou with Galileo and AGPS capabilities.
Backup Battery	3.7V, 200mAh.
1-Wire	DS1990A, DS1971 compliant for driver management
Memory	Supporting up to 7300 logged events.
Accelerometer	For the Motion sensor, and crash detection.
Ignition	Input/Analog Input (0-90V).
Digital Inputs/Outputs	Two Digital inputs or output.
Analog	Two Multipurpose Analog Inputs (0-30V).
CAN	CAN 2 and FD interface.
TTL	TTL Serial port for configuration, peripherals, and FW upgrade.
LED	Dual-color LED

Inputs and Outputs

The VEHICLE GATEWAY S supports the following I/O's:

1. Two Configurable Inputs
   - Analog I/O: 0-30V
   - Discrete Dry I/O: Sink to GND
   - Discrete "Wet" I/O: 0-30V range, configurable threshold
2. Two Configurable Inputs/Outputs:
   - As an output or
   - As an input: Discrete Dry
3. Ignition Switch: Can be used as Analog input, discrete "Wet" I/O: ignition Input: 0–90V.
4. CAN2(CAN -H, CAN-L)

The device Inputs and Outputs are shown in the below figure.

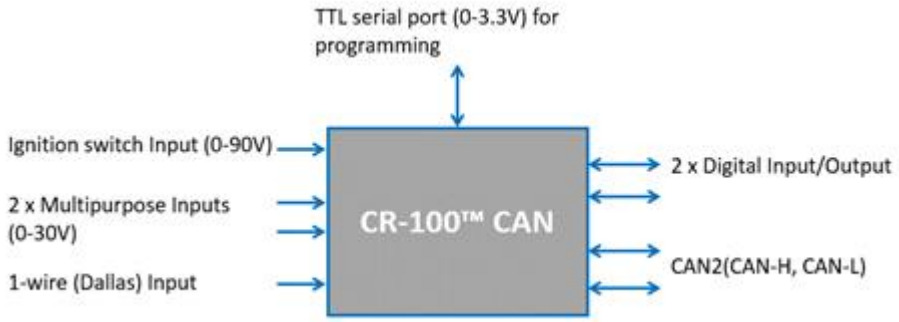


Figure 6: VEHICLE GATEWAY S I/O's

Harness Pinout and Functionalities

The harness pinout is as follows:

Pins	Wire	Color	Analog Input	Digital Dry Contact Input	Digital "Wet" Input	Output (sink)
1	Power (VCC)	Red				
2	CAN-L	Yellow				
3	Digital I/O-2	Brown		*		*
4	Ignition	Purple	*			
5	Input-1	Pink	*	*	*	
6	GND	Black				
7	TX+	Blue				
8	RX-	White				
9	CAN-H	Green				
10	1-Wire	Orange				
OPEN	Input-2	Gray	*	*	*	
OPEN	Digital I/O-1	White/Brown		*		*

Table 2 – Harness Pinout and Functionalities

Product main Features

The main features, settings and capabilities include the following:

- CAN Interface (DTC, Fuel, Odometer, etc…)
- Crash Detection
- Odometer (GPS or CAN)
- Jamming Detection
- Tilt Tamper
- Geo-Fences
- Towed mode
- Immobilization
- Driver authentication (1-wire port)

The configuration file (PL) structure is like other Cellocator products as well as some of the features. Please refer to the Cellocator Programming Manual document detailing the features supported by the VEHICLE GATEWAY S and its configurations.

Enhanced Location Technology (Optional)

The VEHICLE GATEWAY S includes efficient location technology which enhances and complements stand-alone GNSS performance by integrating information of mobile network cells, as well as Wi-Fi access points (APs) particularly in challenging environments, such as in urban canyons, indoor areas, underground parking lots, or when GNSS signals are jammed or intermittent.

This enhanced location service offered by Cellocator can be applied for secure device positioning without using any additional hardware or software.

This service is not currently implemented, and additional costs may apply for this service.

LED Indicators

The VEHICLE GATEWAY S contains dual color LED (Green and RED), which provides the Installer/user proper indications that the unit is working properly during installation, without the need for external equipment.

The following table displays the LED states:

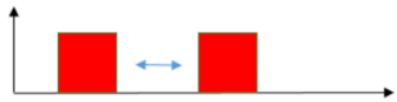
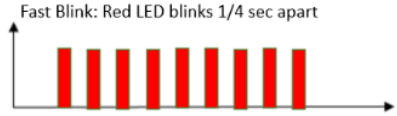
Unit working properly – Cellular network and GNSS are working as expected.	Slow Blink: Green LED blinks on/off 2 sec apart 
Unit working not properly – Cellular network and/or GNSS is not working as expected.	Slow Blink: Red LED blinks on/off 2 sec apart 
Unit working not properly – unable to detect SIM card.	Fast Blink: Red LED blinks 1/4 sec apart 
Unit working not properly – no communication with one or more HW components such as modem, accelerometer, memory, etc.	Red LED continuously On 

Figure 7: LED States

LED does not work in the following conditions:

- VEHICLE GATEWAY S is in Hibernation/Deep hibernation mode.
- VEHICLE GATEWAY S working from the internal battery.
- Disabled by PL

The LED starts working after the following self-test is completed:

- Communication with Modem\Memory\Accelerometer
- Communication test with SIM card.

When activated, the LED indicates the current unit status. If the unit loses Cellular communication, it will indicate accordingly.

BLE and Mobile App Integration (Optional)

The VEHICLE GATEWAY S allows serial over BLE communication with the external device.

Customers may benefit from this capability by implementing it within their mobile app for setup, configuration, monitoring, or troubleshooting the device.

This includes:

- PL upload/download over BLE
- FOTA over BLE
- Activation/Deactivation Outputs
- Read Inputs
- GPS Location
- Unit Status and more…

Note: the connection is secured using a proprietary algorithm.

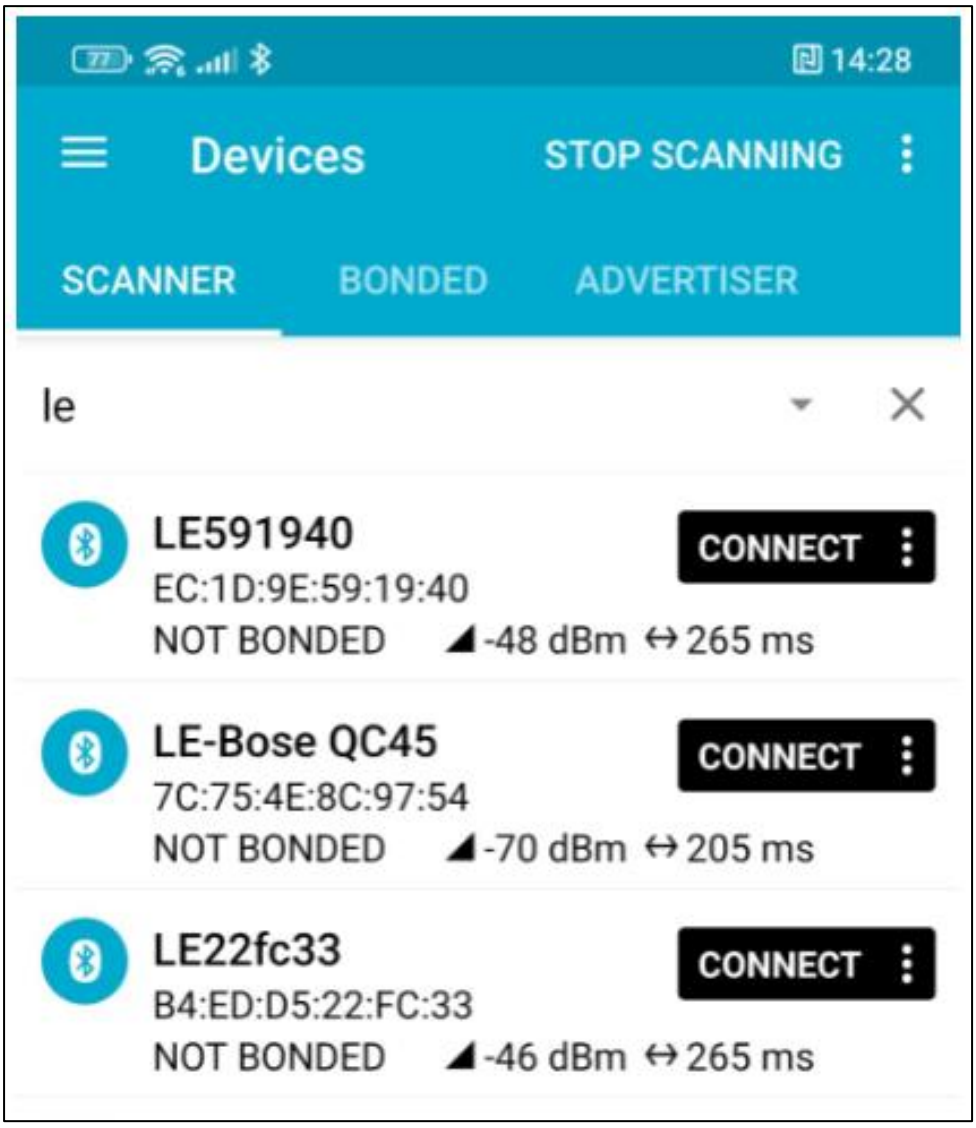


Figure 8: BLE communication with a mobile device.

CAN Bus Interfaces

Overview

The VEHICLE GATEWAY S™ CAN supports direct connectivity to vehicle data bus CAN2.0 (ISO 11898, J1939, FMS).

The following table describes some of the main features and capabilities related to the CAN Bus:

Module / Issue	Feature / Functionality
CAN Bus	Support for variable bus rates (125/250/500Kbps, 1Mbps).
	CAN Editor: a graphical programming tool for the configuration of CAN filters/operators/complex triggers.
Event-based complex triggering logic	Flexible CAN parameters evaluation for triggering complex evaluations via operators, timers and conditions.
	Type 11 messages: Generic CAN message templates for optimized data collection.
	Flexible event reaction scheme (output activation/messaging).
Support CAN & OBDII Protocols	Monitoring up to 35 CAN Parameters
	Full compatibility with J1939 for medium and heavy trucks including FMS.
	OBDII common standard PIDs support (see PIDs sheet).
	DTC request/report over supported CAN bus protocols.
	Optional write-protected connection to the CAN bus through a capacitance adapter.
Configuration	AutoCAN automates the process of configuration during install process

Table 3 - CAN main capabilities

Physical CAN Bus Connection

The VEHICLE GATEWAY S can be connected to a vehicle bus through the following distinct interfaces (Protocols J1939 / ISO 11898):

- Directly to an ISO-11898 network, either through a dedicated J1939 connector or a simple wire connection of a CAN high/low twisted pair harness.
- Using a contactless CAN bus reader, which ensures protected connectivity against writing to the bus. Such a device provides a CAN H/L equivalent interface.

Further information regarding the CAN Bus Interface can be found in a subsequent section of this document.

Common Standard PIDs

The PIDs in the table below are likely to be supported by more than 80% of the vehicles manufactured after 2004. The CAN Editor provides predefined building blocks of these parameters which can be used when configuring the monitoring attributes of the device.

Mode	PID (HEX)	Data Bytes Returned	Description
1	1	4	Monitor status since DTCs cleared (includes malfunction indicator lamp (MIL) status and number of DTCs)
1	4	1	Calculated engine load value
1	5	1	Engine coolant temperature
1	0C	2	Engine RPM
1	0D	1	Vehicle speed
1	0F	1	Intake air temperature
1	11	1	Throttle position
1	1C	1	OBD standards this vehicle conforms to
1	20	4	PIDs supported [21 - 40]
1	21	2	Distance traveled with malfunction indicator lamp (MIL) on
3	N/A	n*6	Request trouble codes (no PID required)
9	0	4	Mode 9 supported PIDs 01 to 20
9	2	5x5	Vehicle identification number (VIN)

Table 4 – Common OBDII PIDs

Extracting Standard PIDs

The VEHICLE GATEWAY S unit extracts the supported (standard) PIDs from the currently connected vehicle through the Cello device to the Programmer via OTA or serial (if enabled via the PL parameter). This functionality enables you to define trigger logics via the CAN Editor, using proven existing parameters.

Note: For this capability, the standard PID attributes are removed from the Cello unit program memory and saved at the level of the SW (Programmer / Communication Centre).

Non-existing standard PIDs

Whenever a standard PID does not respond as expected or is not available in a specific vehicle, this information is reported to the server side in a dedicated message type or a dedicated field within an existing message.

Other Standard PIDs

The following PIDs are likely to be supported by more than 20% of the vehicles manufactured after 2004. VEHICLE GATEWAY S support (request and analysis) of these PIDs is optional. These PIDs will only be queried if defined in the PL configuration of the device and not automatically (by default) as for the PIDs described in Table 4.

Mode	PID (HEX)	Data bytes returned	Description
1	0	4	PIDs supported [01 - 20]
1	6	1	Short term fuel % trim - Bank 1
1	7	1	Long term fuel % trim - Bank 1
1	10	2	MAF air flow rate
1	1F	2	Run time since engine start
1	2F	1	Fuel level input
1	30	1	Number of warm-ups since codes cleared
1	31	2	Distance traveled since codes cleared
1	33	1	Barometric pressure
1	3C	2	Bank 1, Sensor 1
1	40	4	PIDs supported [41 - 60]
1	41	4	Monitor status in this drive cycle
1	42	2	Control module voltage
1	43	2	Absolute load value
1	44	2	Command equivalence ratio
1	45	1	Relative throttle position
1	46	1	Ambient air temperature
1	47	1	Absolute throttle position B
1	48	1	Absolute throttle position C
1	49	1	Accelerator pedal position D
1	4A	1	Accelerator pedal position E
1	4B	1	Accelerator pedal position F
1	4D	2	Time run with MIL on
1	51	1	Fuel type
1	5E	2	Engine fuel rate
1	7F	13	Engine run time
2	2	2	Freeze frame trouble code
9	1	1x5	VIN Message Count in command 09 02

Table 5 - Additional Standard PIDs

Non-standard PID

In addition to the above-listed PIDs which the VEHICLE GATEWAY S recognizes and parses if available and if configured, the VEHICLE GATEWAY S also supports the querying and analyzing of nonstandard PIDs according to attributes provided by the user through the configuration interface (such as the polling interval, PID, mode, data structure, units, multipliers, etc.).

This usually follows a reverse engineering process or information received from the OEM.

AutoCAN

AutoCAN automates the process of finding the correct XML file for an installed VEHICLE GATEWAY S unit, in either private or commercial vehicles.

- Professional Services (CAN libraries) - Powerfleet offers more than 4,000 complimentary vehicle libraries, which include vehicle models and parameters sampled by our field engineering team. The libraries are updated and published monthly. Powerfleet Professional Services also include the configuration of the device's data collection and triggering logic according to your defined use case and to ensure a quick time to market.
- Real-time and on-board Triggering Logic - The VEHICLE GATEWAY S filters real-time data based on the vehicle's sensors and the data it captures. It triggers logic based on the rules defined via the CAN Editor tool, and, as a result, generates events that are sent to the back-end and/or perform and/or perform I/Os related logics.

For more details, please refer to the CR100 Programming Manual

Release Package Content

Evaluation Tools

Each firmware release includes a set of software tools (windows), which enable the client to run an initial appraisal and testing process of Cellocator units, without requiring connection to an actual vehicle during testing.

Our present customers should only upgrade the software on their machines.

After installation is completed, you should be able to explore in the Windows start menu, all the available utilities under the Cellocator folder as depicted below:

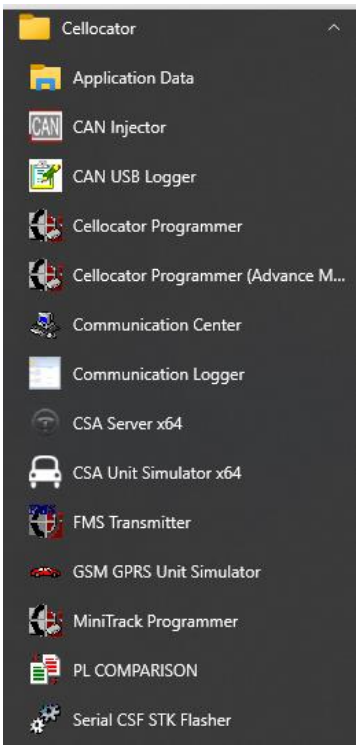


Figure 9: Cellocator Program Folder (Windows)

The next sections will provide information on two of the applications: the Programmer and the Communication Center.

Cellocator Programmer

The Cellocator Programmer enables you to perform the following:

- Modify a PL file to suit your communication needs.
- Upload and download PL files to Cellocator units via its serial interface.
- Test and debug units using a variety of features, including a platform manifest, the ability to test a unit's inputs and outputs, and the ability to forward data to a wireless channel.

The Cellocator Programmer is mainly used for the initial configuration of a unit, and typically communication settings such as the destination IP address, target port phone, and SMS numbers.

CAN Editor

The CAN Editor is a Cellocator Programmer module that enables the user to select CAN variables, define trigger schemes, and define CAN actions.

The CAN Editor is a graphical tool designed to configure CAN-related information sources with user-defined behavior. It enables the user to select CAN variables and associate them with operators. Operators (which are logical data manipulation functions) manipulate the CAN data and generate events.

Variables and operators are associated by a simple graphical "Click & Drag" action designed to connect the vehicle to the operator.

The CAN Editor enables the following:

a. Definition of the set of monitored sensors.

b. Definition of triggering and reporting rules and conditions

c. Creation and selection of vehicle and/or monitoring configuration templates.

d. Parsing and analysis of incoming CAN-related data.

e. Flexible 'Drag & Drop' CAN Editor GUI tool to configure vehicle data collection and manage the real-time and powerful onboard logic engine.

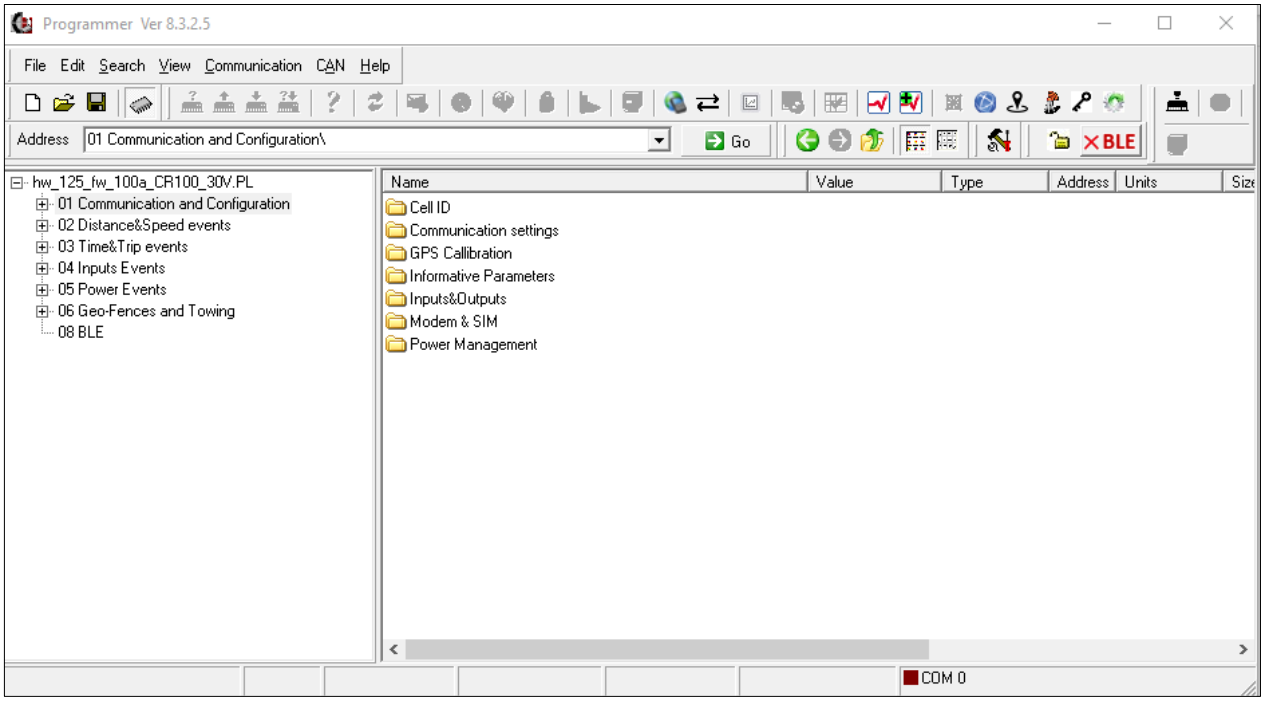


Figure 10: Cellocator Programmer

As mentioned above, serial communication with the device can be wire or wireless (over BLE). If you wish to use the BLE, follow the instructions below:

1. Click on the BLE button. The BLE device selection window is open.
2. Choose the device you wish to connect to according to the MAC address.
3. Click Connect

Please note – the BLE on your PC and the device must be enabled.

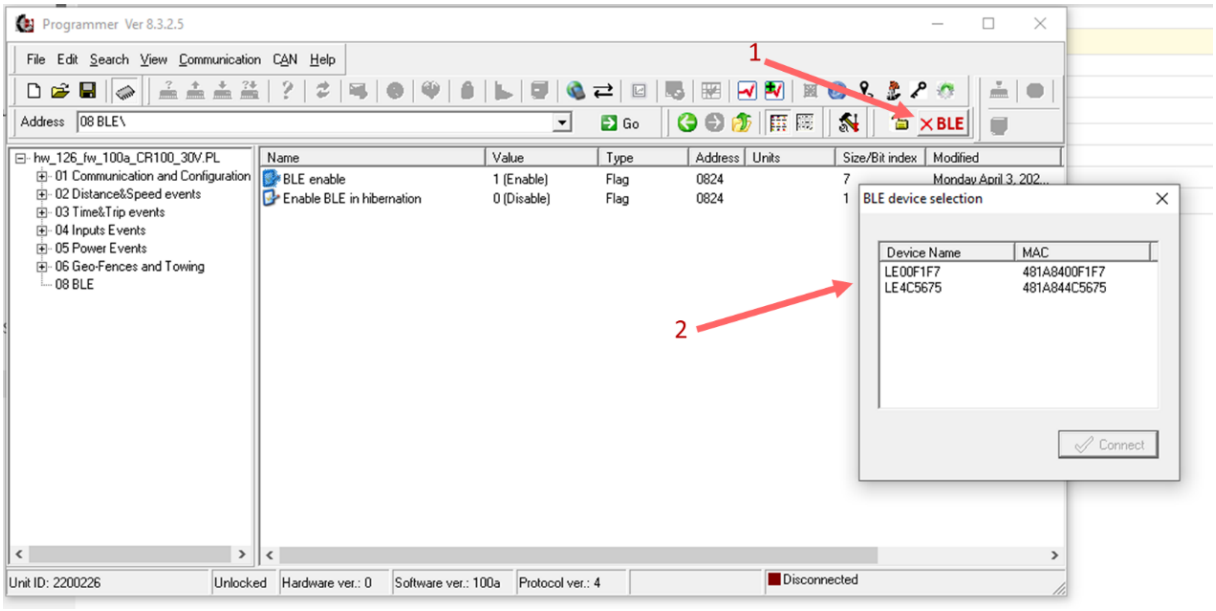


Figure 11: Cellocator Programmer using BLE.

For more information, refer to the *Cellocator Programmer Manual*.

Communication Center

The VEHICLE GATEWAY S supports the use of the Communication Center tool. The Communication Center performs the following:

- Receives, parses and monitors cellular data and SMS messages.
- Sends commands through cellular or SMS communications.
- Interrogates the unit to get the current location (in text format) and the unit status (inputs, outputs, GPS data, etc.).
- Receives and monitors emergency transmissions from the unit (input triggering).
- Controls the unit's outputs. Programs the unit's behavior OTA (by changing the unit's EEPROM content).
- Upgrades the unit firmware.

Cellocator+

The Cellocator+ System is a web-based application that enables Powerfleet's customers to perform configuration and firmware updates to Cellocator devices and view the status of these updates in real-time and through reports via an intuitive interface.

The Cellocator+ System supports customers wishing to directly view and modify their device information. The user can request displays of device data and status and configuration management and can perform configuration updates by attaching PL (Programming Library) files or firmware versions to a device or set of devices while the system manages the programming session.

The Cellocator+ System has several important features and benefits, including:

- Provides Cellocator customers with all major provisioning tools at the click of a mouse.
- Eliminates the need for all customers to maintain provisioning tools in their systems.
- Reduces time to market for new customers.
- Provides reports on update history (to be implemented in future versions).
- Cellocator+ manages the whole device management process.
- Customers can view updated statuses in real time through the Web.

Integration Package

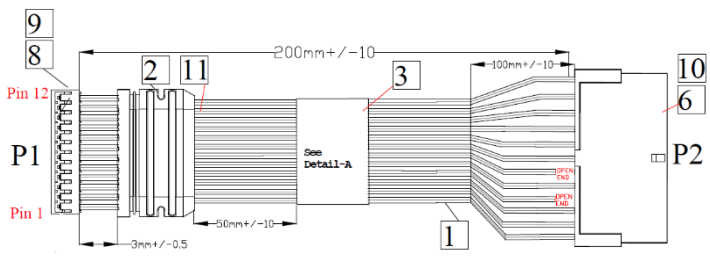
The Cellocator's Integration Package is a set of SW components offered to Cellocator's customers wishing to integrate the Cellocator OTA protocol into their production environment.

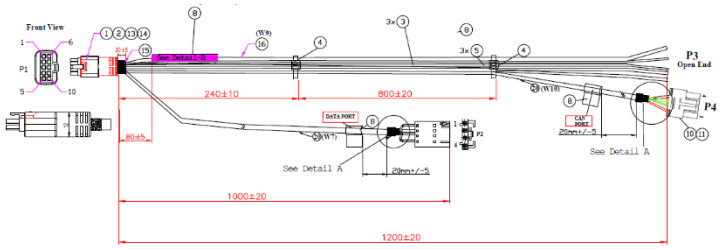
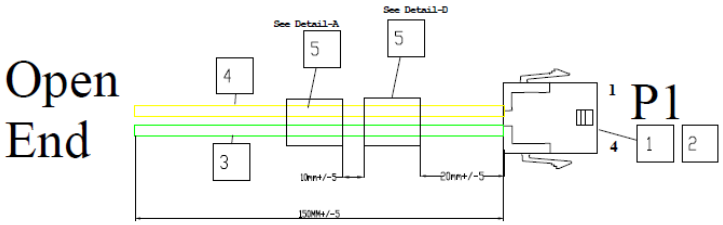
Customers using the Gateway benefit from a quicker and easier integration process and are also entitled to software upgrades, technical support and more. The Integration Package is a multi-platform solution and can run on Windows or selected Linux OS. The integration package provides high availability and load balancing options, as well as enabling clients the opportunity to integrate and start working with Cellocator's units without investing a large amount of time and resources.

Product Variants

The VEHICLE GATEWAY S variant's part numbers as well as the optional Technician Harness are listed in the table below.

DESCRIPTION	NAME AND PART NUMBER	PICTURE
VEHICLE GATEWAY S • Fleet Device (CAT-1 LATAM) • Fleet Device (CAT-1 EMEA)	**PN**: • CT7801220-070 • CT7801220-080	
Error! Reference source not found. **- directly attached to the device**		



DESCRIPTION	NAME AND PART NUMBER	PICTURE
SUPPORTED HARNESSES	**6-wire Global harness with connections for TTL and the CAN contactless adapter.** PN 711-30043 Designed for flexible installations with open wire support for peripherals, and easy plug-and-play for connecting TTL/serial peripherals and the contactless adapter accessory.	See Addendum A for details: **Error! Reference source not found.** 
	PN 711-30044 – **Works in conjunction with 711-30043 enabling direct wire-to-wire CAN connection.** Allows for direct CAN-H and CAN-L connections to be made, eliminating the risk of causing a short that can be caused by cutting the wires from the contactless adapter port. **Please note that this harness cannot work without the PN 711-30043**	See Addendum A for details: **Error! Reference source not found.** 

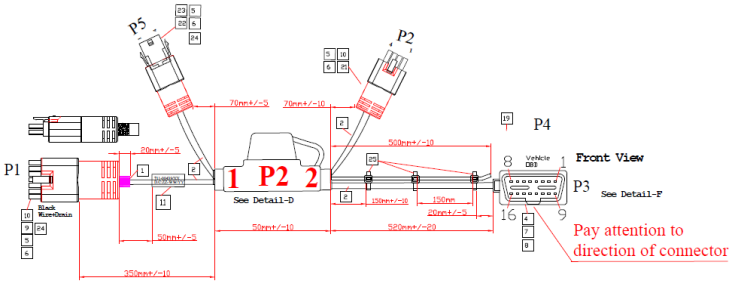
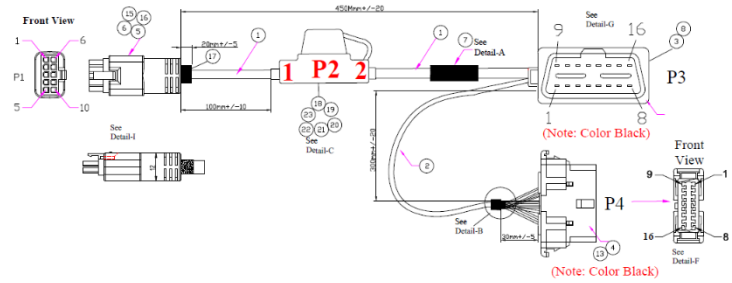
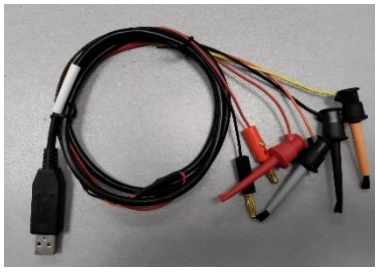
DESCRIPTION	NAME AND PART NUMBER	PICTURE
OBD Harness	**OBD harness with connections for the CAN contactless adapter** PN 711-00439 Designed for plug-and-play installations with OBD, and includes connections for ignition, and the CAN contactless adapter accessory. This allows for complex installations where both contactless and OBD connections may be required.	See Addendum A for details: **Error! Reference source not found.** 
OBDII Y Cable (Optional)	**OBD Y harness** PN 711-30031 Will include a mounting bracket, designed to allow for slick installations behind the dash. This includes a faceplate allowing for seamless installation behind the dash.	See Addendum A for details: **Error! Reference source not found.** 
Technician Harness (Optional)	**Technician Harness** PN 711-00427 See section **Error! Reference source not found.** for details	

Table 6 – VEHICLE GATEWAY S Components

Technician/Programmer Harness

This harness may be used for programming or troubleshooting the VEHICLE GATEWAY S.

For connecting the harness to the device, power supply and your PC, follow this illustration:

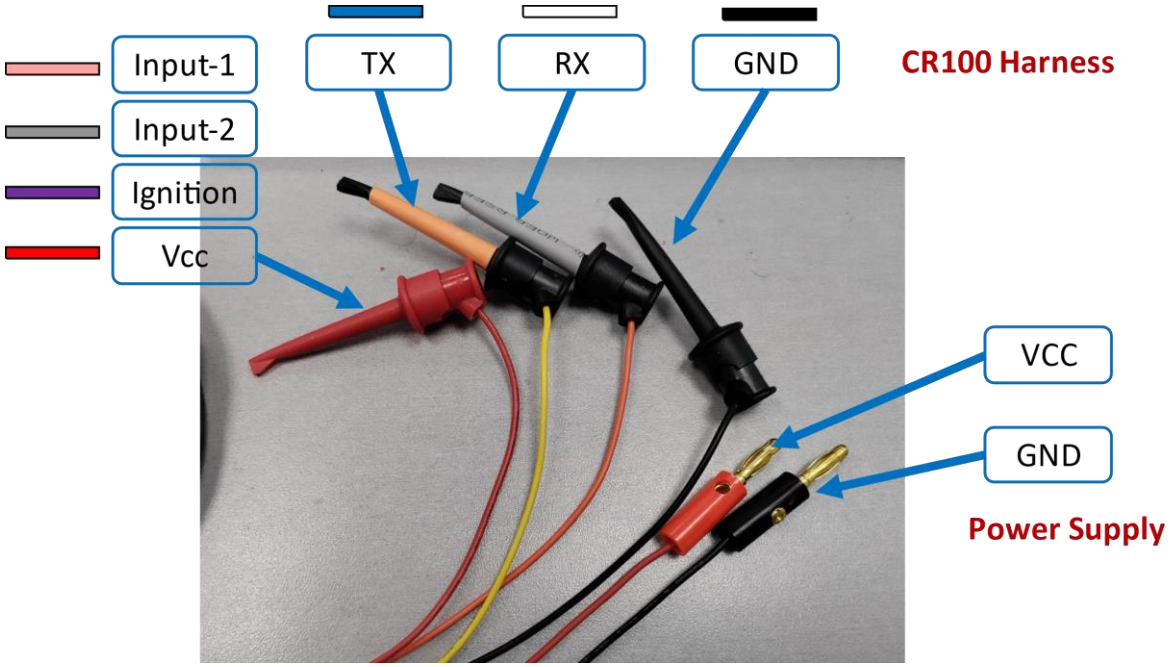


Figure 12: Technician/Programmer Harness

Documentation

The product is supported by a set of documents including, Integration and Installation manuals, Protocols description, programming reference, etc. For more information, refer to the documents listed in section 0.

Technical Specifications

Cellular Communication		
Modem	LTE CAT-1 with 2G fallback (EMEA)	LTE CAT-1 with 2G fallback (LATAM/NZ/AU)
Supported Technologies & Bands	• LTE-FDD: B1/ 3/ 5/ 7/ 8/ 20/ 28 • LTE-TDD: B38/ 40/ 41 • GSM(2G): B2/ 3/ 5/ 8	• LTE-FDD: B1/ 2/ 3/ 4/ 5/ 7/ 8/ 28/ 66. • LTE-TDD: B38/ 40/ 41 • GSM(2G): B2/ 3/ 5/ 8
Regulatory	• Europe: CE • Australia/New Zealand: RCM • South Africa: ICASA (pending)	• Mexico: Telcel (pending) • Argentina: Claro (pending) • Brazil: Anatel
Data Rates	• LTE-FDD (Mbps): 10 (DL)/ 5 (UL) • LTE-TDD (Mbps): 8.96 (DL)/ 3.1 (UL) • GSM/2G (kbps): 85.6 (DL)/ 85.6 (UL)	
SIM Card Compatibility	Nano SIM and e-SIM (Optional).	
Antenna	Internal	
Packet Data	TCP/IP, UDP/IP	
SMS	PDU	
Local Communication Interfaces		
BLE	BLE 4.2, Wireless Connectivity	
Wi-Fi	2.4 GHz 11b (RX). Wi-Fi Scan only (optional, Used for positioning purposes)	
Serial Communication	TTL for Configuration and firmware upgrades.	
1-Wire™ (Dallas) Input	DS1990A, DS1971 compliant for driver management	
GNSS		
GNSS	GPS, BeiDou and Galileo	
Sensitivity (Tracking)	-160 dBm	
Acquisition Average TTFF	Cold Start: ‹ 30s, Hot Start: ‹ 2s. A-GPS capabilities	
Antenna	Internal	
Inputs and Outputs		
Multipurpose Inputs/Outputs	2	
Digital Inputs	2	
Ignition switch Input	1 (also analog input 9-90V)	

CAN FD	1 (CAN2.0 ISO 11898, J1939, FMS)
Accelerometer	
Internal	3D, +/- 32g range, 14-bit representation, 1mg resolution
User Interface	
Dual color LED	GNSS, Cellular Connectivity and power status LED.
Power	
Input Voltage (Vehicle Power)	9-90 VDC
Internal Backup Battery	Li-Ion Polymer, 3.7V, 200mAh, rechargeable.
Vehicle Environment Immunity	
Immunity	Compliant with ISO 7637 till test level #4 (In accordance with E-mark directive)
Applicable Environmental Conditions	
Operating Temperature	-30°C to +40°C full performance (External Power)
Storage Temperature	-20°C to +45°C
Humidity	95% non-condensing
Protection	IP65
Climatic, Vibration, Impact	ISO 16750
Vehicle Installation Methods	
Mounting	Tie-Wraps and/or Double-Sided Adhesive Tape
Environmental Protection	
RoHS	Directive 2011/65/EU, including Directive (EU) 2015/863 amendment.
Conflict Minerals Law	Production Conformity with U.S. Conflict Materials provisions of the Dodd-Frank Wall Street Reform and Consumer Protection Act, HR 4173, Section 1502 (Conflict Minerals Act).
Dimensions and Weight	
Dimensions	90 x 43.9 x 24.4 mm
Weight	88gr (with harness and battery)

Table 7 - Technical Specifications