Cellocator Wireless Communication Protocol

Proprietary and Confidential

Version 4.5.1.0

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Legal Notices

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Table of Contents

1 Introduction

1.1 About this Document

This document describes the unit wireless communication protocol structure, implemented in Cellocator units. It describes every byte of the inbound/outbound messages, which can be sent/received by the unit over the air.

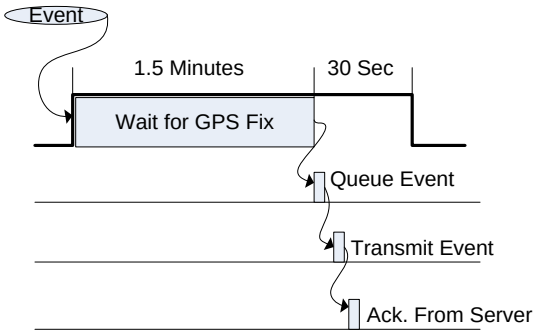
The document comprises of the following main parts:

- Telemetry Channel (outbound messages initiated from the unit towards the server)
- Command Channel (inbound messages initiated from the server towards the unit)
- CSA Channel

Most communication flow scenarios between the unit and the server implement acknowledge from the receiving side to the sending side. Some are done using generic ACK (acknowledge) message, and some are done using other messages dedicated to the specific scenario.

A large portion of the outbound messages from the unit to the server, are initiated by the unit in a response to a certain trigger (e.g. GPIO activation, speed violation, etc.). Those messages are referred as events. The unit supports the following kinds of events:

- **Logged Event:** If the condition for a specific logged event is met, the unit will create an event and store it into its non-volatile memory. The event will be sent to the server only during the GPRS session and will be deleted from the memory of the unit only after reception of acknowledge from the server. Note: Plain events will never be delivered by SMS.
- **Distress Event:** If the condition for a specific distress event is met, the unit will create a series of messages (session). The messages will be sent to the server immediately with the first available communication transport (during GPRS session – over IP, otherwise by SMS). The messages are not stored in the unit memory and if there is no cellular coverage at the moment of sending the message will be lost. Distress events do not require acknowledge from the server.
- **Active Logged Event:** This event is designed to enhance the functionality of legacy logged events. It is important for units such as CelloTrack, which are battery operated and mostly hibernating while periodically communicating with the server. Enabling the Active Logged Event feature changes the behavior of the unit in the following way:
  - During Hibernation
    When a new event is generated, the unit will turn its modem and GPS on, wait for a GPS fix and then queue the event into the event queue. The event will be transmitted to the server, acknowledged by the server and removed from the queue. Active Logged Event turns the unit on from hibernation for up to 2 minutes. If a GPS fix is not detected within 1.5 minutes from the beginning of the session, the event will be queued into the events queue and sent towards the server while giving an extra 30 seconds for the server to acknowledge the event. If a cellular link is not available the unit will be turned off and the message will wait in the queue for later delivery.



-
-
- During Live Tracking
  When a new event is generated, and the GPS is off (in CelloTrack units), the unit will turn the GPS on, wait for a fix and then insert the event into the event queue.

Naturally, the wireless protocol has evolved over the years, to answer the growing needs, and old lean message types are gradually replaced by newer message type (Type 11), which has more robust and modular structure, intended to support longer diverse messages. Thus, it is recommended to implement the complete Type 11 on the server side.

1.2 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)
PTR	Pointer Telocation Ltd.
PSP	Pointer Serial Protocol, normally refers to a Car Alarm System interfacing through this protocol
NVM	Non Volatile Memory
FW	Firmware
HW	Hardware

1.3 References

All the reference documents listed in the following table can be downloaded from the support section of the Pointer Website (www.pointer.com).

#	Reference	Description
1	Cellocator Programming Manual	This document describes the features supported by the Cellocator unit and provides details about the parameters of its configuration.
2	Cellocator Hardware Installation Guides	This document provides all necessary information for a technician who is involved in the installation of Cellocator units. It describes how to install and verify the proper functioning of the unit installation kit elements.
3	Cellocator Serial Communication Protocol	This document describes the serial interface (RS232) protocol
4	Cello AR Interface Protocol	This document describes 1-Wire interface of Cello-AR unit

2 Telemetry Channel (Outbound Messages)

2.1 Overview

The telemetry channel comprises several types of messages, as described in the following:

- **Status/location Message (Message Type 0)** – a legacy message, which is sent by default, as a reply to a command or as the message of choice when reporting events or emergency situations.
- **Programming Data (Message Type 3)** – this message is sent as a reply to programming commands, or by request. It contains the new contents of the programmed block, which allows verification of the programming.
- **Logged Fragment of Forwarded Data from Serial Port to Wireless Channel (Message Type 7)** – this message is sent when the terminal, connected to the serial port of the unit is forwarding data to the central control through unit log.
- **Real Time Forwarded Data from Serial Port to Wireless Channel (Message Type 8)** – this legacy message is sent when the terminal, connected to the serial port of the unit is forwarding data to the central control without logging it.
- **Modular Message (Message Type 9)** – this legacy modular message is designed to contain different types of data, such as CAN bus sensors, Cell ID, debug data, etc.
- **Modular Message (Message Type 11)** – this modular message type implements an extended modular protocol, intended to replace older message types (0, 3, and 9). It is currently used for CAN bus applications, CelloTrack Nano, CelloTrack-4 family, configuration memory programming and uploading of devices with 8 Kbytes of configuration memory, etc.

2.2 Status/Location Message (Message Type 0)

The message is used for reporting most of the basic unit events. It contains basic status data and location of the unit.

2.2.1 *Message Ingredients*

- Message Header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Unit ID – 4 bytes
  - Communication Control Field – 2 bytes
  - Message Numerator – 1 byte
- Unit Hardware Version – 1 byte
- Unit Firmware Version – 1 byte
- Protocol Version and Unit Functionalities – 1 byte
- Unit Status – 1 byte
- Current GSM Operator – 2 bytes
- Transmission Reason Specific Data – 1 byte
- Transmission Reason – 1 byte
- Unit Mode of Operation – 1 byte
- Unit I/O status – 4 bytes
- Analog Input Values – 4 bytes
- Mileage Counter (Odometer) – 3 bytes
- Multi-Purpose Field – 6 bytes
- Last GPS Fix – 2 bytes
- Service and Status – 1 byte
- Mode 1/2 – 2 bytes
- Number of Satellites Used – 1 byte
- Longitude – 4 bytes
- Latitude – 4 bytes
- Altitude – 4 bytes
- Ground Speed – 4 bytes
- Speed Direction (True Course) – 2 bytes

- Time and Date – 7 bytes
- Error Detection Code – 1 byte

2.2.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII "M"
2	System Code, byte 2 – ASCII "C"
3	System Code, byte 3 – ASCII "G"
4	System Code, byte 4 – ASCII "P"
5	Message Type (0)
6	Unit ID
7	
8	
9	
10	Communication Control Field
11	
12	Message Numerator (Anti-Tango™)
13	Unit Hardware Version
14	Unit Firmware Version
15	Protocol Version and Unit Functionalities
16	Unit Status and Current GSM Operator (1st Nibble)
17	Current GSM Operator (2nd and 3rd Nibbles)
18	Transmission Reason Specific Data
19	Transmission Reason
20	Unit Mode of Operation
21	Unit I/O Status 1st byte
22	Unit I/O Status 2nd byte
23	Unit I/O Status 3rd byte
24	Unit I/O Status 4th byte
25	Current GSM Operator (4th and 5th Nibbles)

26	Analog Input 1 Value
27	Analog Input 2 Value
28	Analog Input 3 Value
29	Analog Input 4 Value
30	Mileage Counter (Odometer)
31	
32	
33	Multi-Purpose Field (Driver/Passenger/Group ID, PSP/Keyboard Specific Data, Accelerometer Status, SIM IMSI)
34	
35	
36	
37	
38	
39	Last GPS Fix
40	
41	Service and Status
42	Mode 1
43	Mode 2
44	Number of Satellites Used
45	Longitude
46	
47	
48	
49	Latitude
50	
51	
52	
53	Altitude
54	

55	
56	
57	Ground Speed
58	
59	
60	
61	Speed Direction (True Course)
62	
63	UTC Time – Seconds
64	UTC Time – Minutes
65	UTC Time – Hours
66	UTC Date – Day
67	UTC Date – Month
68	UTC Date – Year (-2000) (e.g. value of 7 = year 2007)
69	
70	Error Detection Code (8-bit additive checksum, excluding system code)

Multiple byte fields are sent Intel style (i.e. least significant bytes sent first).

2.2.3 *Detailed Per-Field Specifications*

2.2.3.1 System Code

System code is a 4-byte value, which identifies the Cellocator system. The field is sent as the ASCII values of the letters "M", "C", "G", "P" (for IP messages) or "M", "C", "G", "S" (for SMS messages), in that order.

2.2.3.2 Message Type

Message type identifies the kind of the message. It allows the receiver to differentiate between different messages types, according to the value sent in this field.

Status/Location messages contain a value of 0 (zero) in the message type field.

2.2.3.3 Unit ID

This field contains a value that is uniquely assigned for every Cellocator unit during the manufacturing process. All messages sent by the same unit contain the same value in the Unit ID field.

2.2.3.4 Communication Control Field

This is a bitmapped field, providing information about the message and the situation in which it was originated.

First byte (10th):

CAN Originated Odometer[1]	CAN Originated Speed [2]	Multi-Purpose Field (Bytes 33-38) assignment		Message Source	BLE Connected		Message Initiative
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Second byte (11th):

GSM Hibernation		Business/ Private Mode	Firmware Sub-Version				
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Message initiative

0 – Active transmissions (initiated by the unit, based on its logic and decisions)

1 – Passive responses (response to a command or a query message)

Message Source

0 – Direct message (not from memory)[3]

1 – Message from memory (the unit tries to resend the message from the memory, until ACK from the server is received)

Multi-Purpose Field (Bytes 33-38) Assignment

This 2 bits, along with bit 7 in byte 41 of this message (Service and Status), define the data provided in bytes 33-38 of this message according to the following table:

Byte 41	Byte 10		Data in Bytes 33-38
Bit 7	Bit 5	Bit 4	
0	0	0	Driver ID/Keyboard Code (for AR units)
0	1	1	Trailer ID
1	0	0	IMEI

[1] Only supported by Compact CAN unit, linked to J1939 (and FMS) CAN bus.

[2] Only supported by Compact CAN unit, linked to J1939 (and FMS) CAN bus.

[3] The only exception is the "Transmission Reason 32 - IP changed/Connection up" message, which always requires ACK from server, even if it was sent as a direct message and not through memory.

X	X	X	IMSI (in Wake Up event (TR 202))

Note: The Communication Control Field is sent also in other (than 0) message types. In those message types the Multi-Purpose Field (Bytes 33-38) Assignment indication is a don't care.

CAN Originated Speed/Odometer

0 – The unit is configured to report speed/odometer taken from GPS

1 – The unit is configured to report speed/odometer taken from CAN

Firmware Sub-Version

This field (5 bits) defines the firmware sub-version of the unit. The number of Cellocator firmware is built from two parts: [Firmware version][Firmware sub-version], where firmware version usually defines the unit family and the sub-version defines the list of supported features.

For example, 30a:

- Version – 30
- Sub-Version – a (1)

Firmware Sub-Version Value (decimal)	Firmware Sub-Version Identifier
0	No identifier
1	a
2	b
3	c
…	…
26	z

Business/Private Mode

It is possible to enable usage of Lock input as a Private/Business mode toggle. If enabled, every time the Lock input is triggered the unit switches to the opposite mode (Private → Business → Private). The default mode is Business. The Private mode is finished upon Lock input trigger, or when the active ID is erased from RAM after trip end.

0 – Business

1 – Private

Momentary/Max Speed

0 – Momentary speed

1 – Max speed recorded from last event

Note: The Communication Control Field is sent also in other (than 0) message types. In those message types the Momentary/Max Speed indication is a "don't care".

GSM Hibernation

0 – Unit is not in GSM hibernation

1 – Unit is in GSM hibernation (message sent during GSM peeking)

2.2.3.5 Message Numerator (Anti-Tango™)

The Message numerator field contains a value that is increased after every self-initiated generation of a message (in cases where an ACK from server was received).

When the unit is reset/powered-up, this value is set to zero. This provides a way to chronologically sort incoming messages from a certain unit, in case an anachronistic communication medium is used.

NOTE: The unit assigns different message numerator sequences for the logged events and for real-time events. In passive transmission (reply to command), the value in this field represents the number from the Command Numerator Field in an incoming command.

2.2.3.6 Unit Hardware Version

This field defines the unit HW (PCB) version and the ID of the modem embedded in it.

The legacy addressing scheme defined 5 bits for HW (PCB) ID and 3 bits for Modem Code. This limited the number of products to 32 products.

For new products (starting from CelloTrack Nano), an alternative backwards compatible approach will be used, in which each unit HW will be uniquely defined by a complete byte (8 bits).

The table for **legacy products**, which will be identified by the **Legacy HW ID** is detailed below:

New HW ID (8 Bits)	Legacy HW ID (5 Bits)	Product Name	Modem Code (3 Bits)	Modem Type
225	1	CR300	7	GE864-QUAD-V2
2	2	CFE	0	No Modem
170	10	CelloTrack 1 Output	5	Enfora 3
235	11	CR300B	7	GE864-QUAD-V2
172	12	CelloTrack	5	Enfora 3
78	14	Cello-IQ GNSS	2	GE910 QUAD V3

New HW ID (8 Bits)	Legacy HW ID (5 Bits)	Product Name	Modem Code (3 Bits)	Modem Type
18	18	CelloTrack T (2G)	0	Telit GE910 QUAD (V2) (V3)
82	18	CelloTrack T (3G)	2	Telit HE910 NAD
114	18	CelloTrack T (3G)	3	Telit UE910 EUD
19	19	CelloTrackPower T (2G)	0	Telit GE910 QUAD (V2) (V3)
83	19	CelloTrackPower T (3G)	2	Telit HE910 NAD
115	19	CelloTrackPower T (3G)	3	Telit UE910 EUD
20	20	Cello-CANiQ (NA)	0	UE910 NAR
52	20	Cello-CANiQ (EU)	1	UE910 EUR
84	20	Cello-CANiQ (2G)	2	GE910 QUAD V3
183	23	CelloTrack Power	5	Enfora 3
216	24	Cello-F (Telit)	6	Telit GE864, automotive
249	25	Cello-F Cinterion	7	Cinterion BGS3
223	31	Cello-IQ	6	Telit GE864, automotive

The table for **new products**, which will be identified by the **New HW ID** is detailed below:

New HW ID (8 Bits)	Legacy HW ID (5 Bits)	Product Name	Modem Code (3 Bits)	Modem Type
38	6	Cello-D	1	UE910 NAR
70	6	Cello-D	2	UE910 EUR
136	8	CelloTrack Nano 10 GNSS	4	Cinterion BGS2-W
168	8	CelloTrack Nano 10 3G GNSS	5	Cinterion EHS6A
9	9	Cello-CANiQ CR (NA)	0	UE910 NAR
41	9	Cello-CANiQ CR (EU)	1	UE910 EUR
73	9	Cello-CANiQ CR (2G)	2	GE910 QUAD V3
42	10	Cello-CANiQ CR (CAT-M)	1	ME910C1-WW

New HW ID (8 Bits)	Legacy HW ID (5 Bits)	Product Name	Modem Code (3 Bits)	Modem Type
105	9	Cello-CANiQ CR (2G) – Car Sharing	3	GE910 QUAD V3
169	9	Cello-CANiQ CR (3G) – Car Sharing	5	UE910 NAR
201	9	Cello-CANiQ CR (NA) – Aux	6	UE910 NAR
233	9	Cello-CANiQ CR (EU) – Aux	7	UE910 EUR
43	11	CR300B 3G NA GNSS	1	UE910 NAD
75	11	CR300B 3G EU GNSS	2	UE910 EUD
107	11	CR300B 2G	3	GE910 QUAD V3
139	11	CR300B 2G SIRFV	4	GE910 QUAD V3
77	13	Cello-IQ CR GNSS	2	GE910 QUAD V3
15	15	CelloTrack 10Y	0	Cinterion ELS61-US
47	15	CelloTrack 10Y	1	Cinterion ELS61-USA R2
79	15	CelloTrack 10Y	2	Cinterion ELS61-E
59	27	CelloTrack-LTE	1	Cinterion ELS61-USA R2
91	27	CelloTrack-LTE-Power	2	Cinterion ELS61-USA R2
123	27	CelloTrack-LTE	3	Cinterion ELS61-E
155	27	CelloTrack-LTE-Power	4	Cinterion ELS61-E
187	27	CelloTrack-LTE-Phoenix	5	Cinterion ELS61-USA R2
143	15	CelloTrack Solar	4	Cinterion ELS61-US/USA R2
175	15	CelloTrack Solar	5	Cinterion ELS61-E
207	15	CelloTrack Solar Gen2	6	Cinterion ELS61-USA R2
239	15	CelloTrack Solar Gen2	7	Cinterion ELS61-E
116	20	Cello-CANiQ (2G) – Car Sharing	3	GE910 QUAD V3
212	20	Cello-CANiQ CV	6	CE910 Dual V
244	20	Cello-CANiQ CS	7	CE910 Dual S
53	21	PointerCept Base Station	1	No Modem

New HW ID (8 Bits)	Legacy HW ID (5 Bits)	Product Name	Modem Code (3 Bits)	Modem Type
88	24	Cello-CANiQ India (2G)	2	GE910 QUAD V3
26	26	CelloTrack Nano 20	0	Cinterion BGS2-W
122	26	CelloTrack Nano 20 3G Worldwide	3	Cinterion EHS6A
136	8	CelloTrack Nano 10 2G Worldwide	4	Cinterion BGS2-W
168	8	CelloTrack Nano 10 3G Worldwide	5	Cinterion EHS6A
218	26	CelloTrack Nano 20 LTE-Cat1 NA	6	Cinterion ELS61-USA R2
72	8	CelloTrack Nano 10 LTE-Cat1 NA	2	Cinterion ELS61-USA R2
44	12	CR400B CAT-M1 WW	1	ME910C1-WW
76	12	CR400B CAT-M1 WW	2	ME910G1-WW
102	6	Cello Gen4 - Basic	3	ME910G1-WW

2.2.3.7 Unit Firmware Version

This field defines the firmware version of the unit. The number of Cellocator firmware is built from two parts: [Firmware version][Firmware sub-version], where firmware version usually defines the unit family and the sub-version defines the list of supported features.

For example, 30a:

- Version – 30
- Sub-Version – a (1)

2.2.3.8 Protocol Version and Unit Functionalities

This is a bitmapped field, providing information about protocol version and other unit functionalities (AR, IQ).

				Protocol Version			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

2.2.3.9 Unit Status and Current GSM Operator (1st Nibble)

This is a bitmapped field, providing information about unit statuses and current GSM operator.

Current GSM Operator (PLMN), 1st nibble					Correct Time	Home/ Roam Network	GPS Comm.
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

GPS Comm.

0 – Communication with GPS is available

1 – Communication with GPS is not available

Home/Roam Network

0 – Home network

1 – Roam network

Correct Time

0 – Valid time stamp

1 – Invalid/estimated time stamp

Source of Speed

0 – GPS

1 – Pulse frequency input

Current GSM Operator

The current GSM Operator (PLMN) is represented as a 5 character hexadecimal number. After conversion into decimal it represents the MCC-MNC of a cellular operator (country code + network number). The 5 PLMN nibbles (nibble for each character) are provided in the following places:

Nibble 1	Nibble 2	Nibble 3	Nibble 4	Nibble 5
Byte 16 (4MSbits)	Byte 17		Byte 25	

2.2.3.10 Current GSM Operator (2nd and 3rd Nibbles)

Current GSM Operator (PLMN), 2nd Nibble				Current GSM Operator (PLMN), 3rd Nibble			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

2.2.3.11 Transmission Reason Specific Data

Additional information Related to the transmission reason (specified in byte 19)

Transmission Reason	Transmission Reason Specific Data Description	
8	0	Location change detected during ignition off

<table>
<tr><th>Transmission Reason</th><th colspan="9">Transmission Reason Specific Data Description</th></tr>
<tr><td rowspan="2">Towing</td><td>1</td><td colspan="8">Towed mode start</td></tr>
<tr><td>2</td><td colspan="8">Towed mode stop</td></tr>
<tr><td>12
1-Wire Temperature Sensor Measurement Event</td><td colspan="9"><table>
<tr><td colspan="4">0 - Low
1 - High</td><td colspan="4">Sensor ID (0-3)</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>15
Crash detection</td><td colspan="9"><table>
<tr><td colspan="2">Reserved</td><td>Light crash event</td><td>Heavy crash event</td><td colspan="4">Peak RMS value of the impact in 1g resolution minus 1g
(16g=0xF, 1g=0x0)</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>21
Coasting detection (speed and RPM)</td><td colspan="9">0 – Stop
1 – Start</td></tr>
<tr><td>22
Violation of 1st Additional GP Frequency Threshold</td><td colspan="9">0 – Falling
1 – Rising</td></tr>
<tr><td>23
Violation of 2nd Additional GP Frequency Threshold</td><td colspan="9">0 – Falling
1 – Rising</td></tr>
<tr><td>34
Over speed start</td><td colspan="9">0 – Plain
1 – Threshold changed by input</td></tr>
</table>

Transmission Reason	Transmission Reason Specific Data Description
42 Over speed end	0 – Plain 1 – Threshold changed by input
47 Driving without authentication	0 - Legacy logics
Door 48 - Close 64 - Open	0 – Normal 1 – Robbery Event 2 – Car Sharing 2: End Of Reservation
Shock/Unlock2 49 - Inactive 65 - Active	0 – Normal 1 – Car Sharing 2: Modem Off Ended 2 – Car Sharing 2: Modem Off Started 3 – Car Sharing 2: Business Mode started 4 – Car Sharing 2: Private Mode started
53 Driving stop	0 – Accelerometer based
69 Driving start	0 – Accelerometer based 1 – GPS based (CelloTrack family only)

Transmission Reason	Transmission Reason Specific Data Description
91 Message from Keyboard	0 – Keypad undefined failure 1 – Immobilizer device wires disconnection 2 – Keypad locked 3 – Relay malfunction 4 – Ignition wire disconnected 5 – Starter signal detection 6 – Starter malfunction 7 – Hotwiring Detection 8 – Primary cut unit failure 9 – Secondary cut unit failure 10 – Wrong keyboard ID detected 11 – Pairing Accomplished 12 – Keypad flash failed 13 – Alarm Cadence Activated by keypad 14 – Alarm Cadence Deactivated by keypad 128 – ECALL Initiated 129 – BCALL Initiated
92 Satellite communication	0 – Reserved 1 – Health status report failure 2 – Health status report restore 3 – Periodic distress event
113 Output State changed Event	0 – Blinkers 1 – PWM 2 – STD_IMMOBILIZER 3 – 8 (Reserved for CFE 1 – 6 outputs) 9 – LED out 10 – Siren 11-255 Reserved
158 Tamper active	1 – Reserved 3 – Cello-D/Cello4: Enclosure opened
159 Tamper inactive	1 – Reserved

<table>
<tr><th>Transmission Reason</th><th>Transmission Reason Specific Data Description</th></tr>
<tr><td></td><td>2 – Spare
3 – Cello-D/Cello4: Enclo Forwarded CAN Query sure closed</td></tr>
<tr><td>160
CFE event</td><td>0 – CFE disconnected
1 – CFE connected
2 – CFE reprogramming success
3 – CFE reprogramming failure</td></tr>
<tr><td>167
CAN-GPS speed calibration mode</td><td>0 – CAN-GPS calibration start
1 – CAN-GPS calibration accomplished
2 – CAN-GPS calibration failed
3 – CAN-GPS calibration status unknown</td></tr>
<tr><td>191
Geo hotspot violation</td><td>
<table>
<tr><td>Direction
0 – exit from hot spot
1 – entry to hot spot</td><td colspan="7">The index of the geo-fence</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
</td></tr>
<tr><td>192
Frequency measurement threshold violation</td><td>
<table>
<tr><td>Violating input number

0 – Door
1 – Shock</td><td>Violation status

0 – Violation start
1 – Violation End</td><td>Violation type

0 – Threshold
1 – Range</td><td>Violation direction

In case of Threshold
0 – Low threshold
1 – High threshold

In case of range
0 – Keep In
1 – Keep Out</td><td colspan="4">Reserved</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Transmission Reason</th><th>Transmission Reason Specific Data Description</th></tr>
<tr><td>194
Analog measurement threshold violation</td><td>
<table>
<tr><td>Violating input number

0 – Door
1 – Shock</td><td>Violation status

0 – Violation start
1 – Violation End</td><td>Violation type

0 – Threshold
1 – Range</td><td>Violation direction

0 – Low threshold
1 – High threshold

In case of range
0 – Keep In
1 – Keep Out</td><td colspan="2">Reserved</td><td colspan="2">Violating new inputs

0-Legacy (according to bit 7)
1-GPIO1
2-GPIO2
3-Reserved</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
</td></tr>
<tr><td>199
Trailer connection status</td><td>Trailer Connection Status
0 – Trailer disconnected
1 – Trailer connected</td></tr>
<tr><td>200
AHR (Auto Hardware Reset)</td><td>
<table>
<tr><td colspan="4">AHR reason
0 – Modem non responsiveness
1 – Registration problem
2 – GPS AHR</td><td colspan="4">Number of performed AHR attempts</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Transmission Reason</th><th>Transmission Reason Specific Data Description</th></tr>
<tr><td>207
Radio off mode</td><td>
<table>
<tr><td>Spare</td><td></td><td></td><td></td><td></td><td>Early
Radio Off Event</td><td>GPS Status
0 – Off
1 – On</td><td>Modem Status
0 – Off
1 – On</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
<table>
<tr><th>(Bit 5)</th><th>(bit 4)</th><th>(Bit 3)</th><th>Early Radio Off Event (Bit 2)</th><th>GPS Status (Bit 1)</th><th>Modem Status (Bit 0)</th><th>Description</th></tr>
<tr><td>0</td><td></td><td>0</td><td>0</td><td>0</td><td>0</td><td>Detection of internal backup battery voltage discharging to 3.25V or below for longer than 1 second (100 samples). The unit will enter shipment mode only after generating this event.</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>N/A</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Transmission Reason</th><th colspan="7">Transmission Reason Specific Data Description</th></tr>
<tr><td rowspan="6"></td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>Detection of internal backup battery voltage lower than 3.46V (on any temperature) for longer than 1 second (100 samples) upon sole work from internal backup battery. The unit will switch off the radio 2 seconds after event generation. Once switched off, the modem will be switched back on only upon main power reconnection.</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>N/A</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>N/A</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>N/A</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>N/A</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>N/A</td></tr>
<tr><td>212
Geo-fence over speed start</td><td colspan="7" rowspan="2">Index of the geo-fence</td></tr>
<tr><td>213
Geo-fence over speed end</td></tr>
<tr><td>252
Com location glancing / Offline tracking</td><td colspan="7"></td></tr>
</table>

Transmission Reason	Transmission Reason Specific Data Description
253 Violation of keep in fence	Index of the geo-fence
254 Violation of keep out fence	
255 Violation of waypoint	

2.2.3.12 Transmission Reason

This field contains the reason for the message transmission. Note that this value is valid only for self-initiated active transmissions, i.e. transmissions that the unit generated because of its logics, in contrast to reply transmissions. Reply transmissions contain the last transmission reason that was used.

Transmission Reason Value	Transmission Reason Description
4	Emergency (Distress) mode by command
8	Towing
11	Communication idle
12	1-Wire Temperature Sensor Measurement Event
15	Crash detection
19	Alarm triggered by Lock input
21	Coasting detection (speed and RPM)
22	Violation of 1st additional GP frequency threshold
23	Violation of 2nd additional GP frequency threshold
25	Speed detected during ignition off
28	GPIO1 Inactive
29	GPIO1 Active
31	Reply to command
32[4]	IP changed/connection up

[4] Always requires acknowledge from server, even if it was sent as a direct message and not through memory.

Transmission Reason Value	Transmission Reason Description
33	GPS navigation start
34	Over speed start
35	Idle speed start
36	Distance event
37	Engine start; ignition input – active (high)
39	GPIO2 Inactive
40	GPIO2 Active
41	GPS navigation end
42	Over speed end
43	Idle speed end
44	Timed event[5]
45	Engine stop; ignition input – inactive (low)
46	Driver authentication update
47	Driving without authentication
48	Door close
49	Shock/Unlock2 inactive
50	CFE input 6 inactive
51	Volume sensor inactive event
53	Driving stop
54	Distress button inactive
55	Unlock input inactive
57	CFE input 1 inactive
58	Lock input inactive
59	CFE input 2 inactive
60	CFE input 3 inactive
61	CFE input 4 inactive

[5] In Cello-CANiQ, this event is used also for the 1 second GPS data reporting.

Transmission Reason Value	Transmission Reason Description
62	CFE input 5 inactive
63	Ignition input inactive
64	Door open
65	Shock/Unlock2 active
66	CFE input 6 inactive
69	Driving start
70	Distress button active
71	Unlock input active
73	CFE input 1 active
74	Lock input active
75	CFE input 2 active
76	CFE input 3 active
77	CFE input 4 active
78	CFE input 5 active
79	Ignition input active or CFE input 6 active
80	Main power disconnected
81	Main power low level
82	Backup battery disconnected
83	Backup battery low level
84	Halt (movement end)
85	Go (movement start)
87	Main power connected (unconditionally logged upon an initial power up)
88	Main power high level
89	Backup battery connected
90	Backup battery high level
91	Message from keyboard
92	Satellite communication

Transmission Reason Value	Transmission Reason Description
99	Harsh braking sensor triggered
100	Sudden course change sensor triggered
101	Harsh acceleration sensor triggered
113	Output State changed Event
154	Main power low/disconnect and hibernation mode "D" starts (associated with PL address 1, bit 0)
158	Tamper Active
159	Tamper inactive
160	CFE event
161	Unlock input triggered
166	Orientation Change
167	CAN-GPS speed calibration mode
190	No Modem zone entry
191	Geo hotspot violation
192	Frequency measurement threshold violation
194	Analog measurement threshold violation
199	Trailer connection status
200	AHR (Auto Hardware Reset)
202	Wake Up event
203	Pre-hibernation event
204	Vector (course) change (curve smoothing event)
207	Radio off mode
208	Header error (self re-flash processing)
212	Geo-fence over speed start
213	Geo-fence over speed end
247	Finish mode
252	Com location glancing / Offline tracking
253	Violation of keep in fence

Transmission Reason Value	Transmission Reason Description
254	Violation of keep out fence
255	Violation of waypoint

2.2.3.13 Unit Mode of Operation

The functioning of the unit can be generalized as a finite state machine model, with a few "stages" of operation. The "current stage" is referred to as "unit mode", or "mode of operation", as following:

Unit Mode Value	Unit Mode Description
0x00	Standby Engine On
0x01	Standby Engine Off
0x10	Towed mode (same as Standby Engine On, but with ignition off)

2.2.3.14 Unit I/O Status

The unit is provided with many I/Os (inputs/outputs). Each I/O may be "high" or "low" at a given moment. The I/O status field is a bitmapped representation of the I/Os physical levels. Note that the I/Os that have been configured to be inverted will affect the application but will not be shown in this field, as it only represent the raw physical signals read from the HW.

1st Byte of I/O Status

Cello-4	Unlock (GPIO1 input)	Panic (Input-3)	Driving Status (physical ignition or accelerometer based)	CFE In 1	USB connected (As master and providing >4V)	Enclosure tamper	Shock (Input-2)	Door (Input-1)
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Note: Driving Status (bit 5) provides indication if the unit is in logical Ignition On/Off, according to the configuration of the detection source (physical ignition or accelerometer). It will indicate "1" when logical Ignition On is detected, and "0" when logical Ignition Off is detected.

2nd Byte of I/O Status

Allocation per product:

Cello-4	Ignition port status	Accelerometer status	CFE In 6	CFE In 5	CFE In 4	Lock (GPIO 2 input)	CFE In 3	CFE In 2
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Notes: Accelerometer Status (bit 6) provides indication if the accelerometer has detected Ignition On/Off, **regardless** of the configuration of the detection source (physical ignition or accelerometer). It will indicate "1" when accelerometer Ignition On is detected, and "0" when accelerometer Ignition Off is detected. Ignition Port Status (bit 7) provides indication if the physical ignition input is high/low, **regardless** of the configuration of the detection source (physical ignition or accelerometer). It will indicate "1" when the ignition input is high, and "0" when the ignition input is low.

3rd Byte of I/O Status

Cello-4	CFE OUT 5	CFE OUT 4	CFE OUT 3	CFE OUT 2	GPS Power	Grad. Stop (Output-3)	Siren Control (GPIO1 output)	CFE OUT 1
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

4th Byte of I/O Status

Cello-4	Charger status	CFE OUT 6	Standard Immobilizer (Output-4)	GPIO2 output	Blinkers (Output-1)	D8 DTCO Connected	USB-OTG power	LED out (Output-2)
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

General notes:

- If configured as input the bit of output will be =0.
- If configured as output the bit of input will be =1.

2.2.3.15 Current GSM Operator (4th and 5th Nibbles)

Current GSM Operator (PLMN), 4th Nibble				Current GSM Operator (PLMN), 5th Nibble			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

2.2.3.16 Analog Inputs

The unit may handle up to 4 analog inputs. These inputs are multiplexed and sent as 8-bit samples each.

The allocation of measurements to the bytes of the message is configurable (PL addresses 1620-1623).

For Cello/CR300 unit:

Field name	Default value	Byte number in the message
1st analog measurement	9 (Vin)	26
2nd analog measurement	6 (Vbat)	27
3rd analog measurement	7 (Bat. NTC)	28
4th analog measurement	2 (Shock)	29

Available inputs for mapping:

Measurement source number	Measurement source name	Coefficient	Comment
0	No source		
1	Door[6]	0.009801587 [2.5V] 0.117619048 [30V]	Can report either analog or frequency measurement as per corresponding input type
2	Shock	0.009801587 [2.5V] 0.117619048 [30V]	
3	Panic		Infrastructure only, not currently supported
4	Unlock		
5	Lock		
6	V bat	0.01647058823	Battery voltage
7	Bat. NTC	1	Note that the accuracy of the measurement is ±3°C
8	V main	0.02031372	Regulated voltage
9	V in	0.1176470588235	Input voltage
10	CFE in 1	0-2.5V: 0.009801587 0-30V: 0.117619048	
11	CFE in 2		
12	CFE in 3		
13	CFE in 4		

[6] The analog inputs measurement resolution is variable (either in 9.8mA or 117.6mA resolution), and controlled by programmable parameter.

Measurement source number	Measurement source name	Coefficient	Comment
14	CFE in 5		
15	CFE in 6		
17	1-Wire temperature sensor 2	Signed 8	
18	1-Wire temperature sensor 3	Signed 8	
19	1-Wire temperature sensor 4	Signed 8	
20	RSSI	Unsigned in -dBm units	
21	RPM	32	RPM resolution diluted to 32 RPM/bit, due to transition from native 2 bytes to 1 byte
22	USB voltage	0.02352941	(Max 6V)

2.2.3.17 Mileage Counter (Odometer)

The unit is provided with a distance accumulator feature. The unit counts distance "base units" programmed in the PL.

By synchronizing the accumulator value with the vehicle odometer reading and setting the distance base units to one kilometer/mile, this counter provides the ability to remotely read the vehicle odometer. The programming and synchronizing is only needed once – during the installation.

The mileage counter field contains the current 24-bit value of this accumulator.

2.2.3.18 Multi-Purpose Field (Bytes 33-38)

This field may carry different information as per bits 4, 5 in Communication Control Field (byte 10) and bit 7 in Service and Status (byte 41):

Byte 41	Byte 10		Data in Bytes 33-38
Bit 7	Bit 5	Bit 4	
0	1	1	Trailer ID
1	0	0	IMEI

X	X	X	IMSI (in Wake Up event (TR 202))

Driver ID/Passenger ID/Group ID Code Update

The unit can provide 6 bytes of last received Dallas button in every message if that feature is enabled in PL (Mask of Authentication Events).

If no Dallas code is received since the initiation of the last Start Event, this field will be 0.

The code can carry Driver ID or Passenger ID and Group ID, depends on the type of the attached button and the configuration.

Group ID

The Group ID is an additional driver authentication method, used when there are too many drivers to be programmed into unit memory.

The length of Group ID varies from 1 to 9 bytes length but shorter than 10 digits. The unit supports multiple groups, while all Group IDs are from the same length.

NOTE: Group ID number will never begin from zero.

The first number in Dallas codes array, shorter than 10 digits is considered as group ID and its length is considered length of group ID. Any additional number, shorter than 10 digits but with length different from the first Group ID length, is considered a Driver ID.

Example: Dallas code 1234567890, when group ID is 4 digits:

Driver/Passenger ID 567890			Group ID 1234		
90	78	56	34	12	00
Byte 33	Byte 34	Byte 35	Byte 36	Byte 37	Byte 38

Trailer ID

The 6 Multi-purpose bytes are used to monitor the Dallas ID of the connected or disconnected Trailer.

IMEI

Will be sent on bytes 33-38 with its 2 MS-Bits sent in bits 5, 6 in byte 41 of this message (Service and Status).

IMEI is defined as 15 decimal digits. Converting the maximal IMEI number 999999999999999 to hexadecimal we get: 38D7EA4C67FFF. The maximal number will occupy 50 bits which will be sent as follows:

0x03	0xFF	0x7F	0xC6	0xA4	0x7E	0x8D
Byte 41, bits 5, 6	Byte 33	Byte 34	Byte 35	Byte 36	Byte 37	Byte 38

Note: for CDMA devices, the IMEI is replaced with MEID, which is 18 decimal digits long. Thus, MEID will not be transmitted in these bytes (only in Type 9, sub data 0x12).

IMSI

In case of a Wake Up event (TR 202), the unit reports the 12 first characters of the SIM IMSI converted to hex (Little Endian).

The IMSI number consists of up to 15 numerical characters (0-9). An IMSI consists of a three digit mobile country code (MCC, which is not reported by Cellocator Protocol) and a variable length national mobile station identity (NMSI).

The NMSI consists of two variable length parts: the mobile network code (MNC) and the mobile station identification number (MSIN). A Class 0 IMSI is 15 digits in length. A Class 1 IMSI is less than 15 digits in length.

Example: 425020315229000 (Cellcom IL)

MCC	425	Israel
MNC	02	Cellcom IL
MSIN	0315229000	

The Hex value received in bytes 33-38:

Value (hex)	00	5A	16	0F	03	02
Location	Byte 33	Byte 34	Byte 35	Byte 36	Byte 37	Byte 38

Conversion table:

In wireless protocol (big-endian)	00	5A	16	0F	03	02
HEX values (little-endian)	02	03	0F	16	5A	00
DEC values	02	03	15	22	90	00
NMSI (MNS + MSIN)	020315229000					

2.2.3.19 Last GPS Fix

This field provides a timestamp when which the GPS was last in navigation mode.

Day of Month					Hours					Minutes					
Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 40								Byte 39							

NOTE: The easiest way to define if the GPS data in the message is valid and updated, or historical, is to compare between the time of the timestamps and UTC time (see below).

2.2.3.20 Service and Status

MSB of Multi-Purpose field (bytes 33-38) assignment (with bits 4, 5 of byte 10)	IMEI Bit 49	IMEI Bit 48	CFE Type			Trailer status indication 0 – Trailer Disconnected 1 – Trailer Connected	Actual GNSS antenna selected 0 – Internal 1 – External (Relevant only for Cello GNSS variants)
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit 4	Bit 3	Bit 2	CFE Type
0	0	0	Not Applicable (Legacy state)
0	0	1	CFE is not connected
0	1	0	CFE BT is connected
0	1	1	CFE Basic is connected
1	0	0	CFE I/O is connected
1	0	1	CFE premium is connected
1	1	1	Undefined CFE Type

2.2.3.21 MODE 1 and Mode 2

These fields are generated by the GPS and transparently monitored in the outgoing message from the unit. The fields define the validity of GPS data in the message.

The unit considers the valid fix according to the "Enable Tight GPS PMODE Filter" parameter (address 509, bit 7):

- If "Enable Tight GPS PMODE Filter" is enabled, the unit considers the GPS data as valid only if Mode 1 = 3 or 4 AND Mode 2 = 2
- If "Enable Tight GPS PMODE Filter" is disabled, the unit considers the GPS data as valid only if Mode 1 =2, 3, 4, 5 and 6

2.2.3.22 Number of Satellites Used

Number of satellite measurements used for current position fix. Possible values are 0 to 20 (GNSS modules).

When 0 is reported, it means that there is no GPS fix yet, and only Pmode fields are updated.

2.2.3.23 Longitude, Latitude

Longitude and latitude coordinates of current position fix. Both coordinates are sent as 32-bit signed integers, representing the coordinates in 10^{-8} radian resolution. Possible values are -Π to +Π for longitude, or – Π/2 to + Π/2 for latitude. The coordinates refer to WGS-84 map datum and ellipsoid.

2.2.3.24 Altitude

Altitude of current position fix. Represented as a 32-bit signed integer, in 10^{-2} meter resolution (altitude is represented in centimeters).

2.2.3.25 Ground Speed

Current speed (absolute value of the vector). Represented as a 32-bit unsigned integer, in 10^{-2} meter/sec resolution (speed is represented in centimeters/sec).

2.2.3.26 Heading/Speed Direction (True Course)

Direction (angle) of the speed vector. Represented as 16-bit unsigned integer, in 10^{-3} radian resolution. Possible values are 0 to 2Π.

2.2.3.27 System Time

Universal coordinated time of the position fix, represented in seconds (0-59), minutes (0-59) and hours (0-23).

Note that the system time and date fields are monitoring system time, based on the internal timer of the unit. The internal timer synchronizes with GPS time when the GPS fix is considered as valid (or always as per configuration flag).

2.2.3.28 System Date

Universal coordinated date of the position fix, represented in days (1-31), months (1-12) and years (1980-2079).

Note that the system time and date fields are monitoring system time, based on the internal timer of the unit. The internal timer synchronizes with GPS time when the GPS fix is considered as valid (or always as per configuration flag).

2.2.3.29 Error Detection Code

The error detection code (checksum) is a last byte of sum of all bytes in a message, excluding the 4 bytes of System Code and the Error Detection Code itself.

Example:
The message:
*4D434750*0006000000081A020212040000002100623000000006B00E1000000000000000000E5A100040206614EA303181A57034E120000000000000000001525071403D607*CS*

Calculation of the CS=>

00+06+00+00+00+08+1A+02+02+12+04+00+00+00+21+00+62+30+00+00+00+6B+00+E1+00+00+00+00+00+00+00+00+00+00+E5+A1+00+04+02+06+61+4E+A3+0

3+18+1A+57+03+4E+12+00+00+00+00+00+00+00+00+15+25+07+14+03+D6+07=
0x749

=>CS=0x49

2.2.4 *Distress (Emergency) Queue Description*

There is a dedicated queue in size of 5 for distress (emergency) messages.

In this queue, if new emergency events with the same TR which exist in the queue occur, the older event is replaced by the new one.

2.3 Programming Data (Message Type 3)

This message is sent as a reply to programming commands, or by request. It contains the new contents of the programmed block.

NOTE: For configuration spaces larger than 4K (Typically in Cello-IQ and Cello-CANiQ units) it is mandatory to use Type 11 programming command (modules 10, 11).

2.3.1 *Message Ingredients*

- Message header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Unit ID – 4 bytes
  - Communication Control Field – 2 bytes
  - Message Numerator – 1 byte
- Spare – 1 byte
- Block Code – 1 byte
- Block Data – 16 bytes
- Error Detection Code – 1 byte

2.3.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII "M"
2	System Code, byte 2 – ASCII "C"
3	System Code, byte 3 – ASCII "G"
4	System Code, byte 4 – ASCII "P"
5	Message Type (3)
6	Unit ID
7	
8	
9	
10	Communication Control Field
11	

12	Message Numerator (Anti-Tango™)
13	Spare
14	Block Code
15-30	Block Data
31	Error Detection Code (8-bit additive checksum, excluding system code)

2.3.3 *Detailed Per-Field Specifications*

2.3.3.1 System Code

Refer to Section 2.2.3.1

2.3.3.2 Message Type

Programming Data messages contain a value of 3 (three) in the message type field.

2.3.3.3 Unit ID

Refer to Section 2.2.3.3

2.3.3.4 Communication Control Field

Refer to Section 2.2.3.4

2.3.3.5 Message Numerator (Anti-Tango™)

Refer to Section 2.2.3.5

2.3.3.6 Block Code

OTA (over the air) parameter programming is done in blocks. The entire parameter memory is partitioned to 16-bytes long blocks. Each of those blocks is identified with a block code. The block code field contains the code of the block whose data is sent in this message (in the block data field).

2.3.3.7 Block Data

Contains the actual data programmed in the specified block of the parameter memory.

2.4 Logged Fragment of Forwarded Data from Serial Port to Wireless Channel (Message Type 7)

The unit can forward data from its serial port to the OTA channel in a logged or in real time manner.

If the unit is configured to work with logged forwarding ("Enable Data forwarding through log" parameter (address 285, bit 7) is enabled), message type 7 will be used. Message type 7 contains fragments (up to 54 bytes each) of payload forwarded from the unit serial port.

If the unit is configured to work with real time forwarding ("Enable Data forwarding through log" parameter (address 285, bit 7) is disabled), message type 8 will be used. Message Type 8 contains a complete payload (up to 512 bytes) forwarded from the unit serial port.

The forwarded payload may be escorted by fleet management data (as per unit configuration).

Like other message types which are utilizing log memory (e.g. 0 and 9), message type 7:

- Continues the Message Numerator used by other logged messages.
- Requires acknowledge from the server (Message type 4) in order to erase the specific message from the log.
- Utilizes the same retransmission algorithms as other logged message types.

2.4.1 *Message Ingredients*

- Message header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Unit ID – 4 bytes
  - Communication Control Field – 2 bytes
  - Message Numerator – 1 byte
- Serial Port Source – 1 byte
- Forwarded Message Code – 1 byte
- Fragment Control Byte – 1 byte
- Container Fragment – 54 bytes
- Error Detection Code – 1 byte

2.4.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII “M”

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>2</td><td>System Code, byte 2 – ASCII “C”</td></tr>
<tr><td>3</td><td>System Code, byte 3 – ASCII “G”</td></tr>
<tr><td>4</td><td>System Code, byte 4 – ASCII “P”</td></tr>
<tr><td>5</td><td>Message Type (7)</td></tr>
<tr><td>6</td><td rowspan="4">Unit ID</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td><td rowspan="2">Communication Control Field</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td><td>Message Numerator (Anti-Tango™)</td></tr>
<tr><td>13</td><td>Serial Port Source
<table>
<tr><td colspan="3">Source of Payload
0 – N/A
1 – N/A
2 – COM2 (BT)
3 – COM3
4 – COM4
5 – COM5
6 – CFE Micro
7 – N/A</td><td>CFE Connected
0 – Not connected
1 – Connected</td><td colspan="4">Static nibble containing value 0x07</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>14</td><td>Forwarded Message Code
Sequential 7 bits ID of the container + container indication bit (MSB)
Assigned for each container
<table>
<tr><td>0 – Simple payload
1 – Container</td><td colspan="7">In case of container: sequential 7 bits ID of the container In case of simple payload: sequential 7 bits ID of the forwarded packet</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 6</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>15</td><td>Fragment Control Byte
<table>
<tr><td>First Fragment
0 – Not first
1 - First</td><td>Last Fragment
0 – Not last
1 - Last</td><td colspan="6">Fragment No (starting from 1)</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>16-69</td><td>Container Fragment
(first fragment begins with two bytes of length of container, last one is zero padded)</td></tr>
<tr><td>70</td><td>Error Detection Code (8-bit additive checksum, excluding system code)</td></tr>
</table>

2.4.3 *Detailed Per-Field Specifications*

2.4.3.1 System Code

Refer to Section 2.2.3.1

2.4.3.2 Message Type

Logged Fragment of Forwarded Data from Serial Port to Wireless Channel messages contain a value of 7 (seven) in the message type field.

2.4.3.3 Unit ID

Refer to Section 2.2.3.3

2.4.3.4 Communication Control Field

Refer to Section 2.2.3.4

2.4.3.5 Message Numerator (Anti-Tango™)

Refer to Section 2.2.3.5

2.4.3.6 Serial Port Source

This field provides information about the source of data connected to the unit serial port.

2.4.3.7 Forwarded Message Code

This field provides information about the container in the message.

If the unit is configured to work with container ("Forward Data as Container" parameter (address 285, bit 6) is enabled), the payload will be in a form of a container: forwarded

payload from serial port is escorted by 48 bytes of FM (fleet management) data, and 2 bytes of total length of payload + FM data.

If the unit is configured to work with simple payload ("Forward Data as Container" parameter (address 285, bit 6) is disabled), the payload will be in a form of a simple payload: forwarded payload from serial port only.

In addition, this byte includes a container/simple payload sequential ID.

2.4.3.8 Fragment Control Byte

This field provides information about the current payload fragment.

2.4.3.9 Container Fragment

The container is a data structure, created by the unit in its RAM buffer upon reception of the data for forwarding from the unit serial port (if enabled in "Forward Data as Container" parameter (address 285, bit 6)).

The forwarded payload from serial port is escorted by 48 bytes of FM (fleet management) data, and 2 bytes of total length of payload + FM data.

Every container is assigned by 7 bits numerator (increased every data packet received from the serial port), used in fragmentation process and reported with the container.

The container data structure is as following:

Byte	Description
1	Payload length (X)
2	
3	Forwarded Payload from serial port, X bytes (up to 512 bytes)
3+X	
4+X	Unit Status + Current GSM Operator (1st nibble) (same as byte 16 of type 0)
5+X	Current GSM Operator (2nd and 3rd nibbles) (same as byte 17 of type 0)
6+X	Current GSM Operator (4th and 5th nibbles) (same as byte 25 of type 0)
7+X	Unit Mode of Operation (same as byte 20 of type 0)
8+X	Unit I/O Status 1st byte (same as byte 21 of type 0)
9+X	Unit I/O Status 2nd byte (same as byte 22 of type 0)
10+X	Unit I/O Status 3rd byte (same as byte 23 of type 0)
11+X	Unit I/O Status 4th byte (same as byte 24 of type 0)
12+X	Analog Input 1 value (same as byte 26 of type 0)

13+X	Analog Input 2 Value (same as byte 27 of type 0)
14+X	Analog Input 3 Value (same as byte 28 of type 0)
15+X	Analog Input 4 Value (same as byte 29 of type 0)
16+X	Mileage Counter (Odometer) (same as bytes 30-32 of type 0)
17+X	
18+X	
19+X	Multi-Purpose Field (Driver/Passenger/Group ID, PSP/Keyboard Specific Data, Accelerometer Status, SIM IMSI) (same as bytes 33-38 of type 0)
20+X	
21+X	
22+X	
23+X	
24+X	
25+X	Last GPS Fix (same as bytes 39-40 of type 0)
26+X	
27+X	Location Status (flags) (same as sub type 4 of type 9)
28+X	Mode 1
29+X	Mode 2
30+X	Number of Satellites Used
31+X	Longitude
32+X	
33+X	
34+X	
35+X	Latitude
36+X	
37+X	
38+X	
39+X	Altitude
40+X	
41+X	

42+X	Ground speed
43+X	
44+X	Speed direction (true course)
45+X	
46+X	UTC time – Seconds
47+X	UTC time – Minutes
48+X	UTC time – Hours
49+X	UTC date – Day
50+X	UTC date - Month
51+X	UTC date - Year (-2000) (e.g. value of 7 = year 2007)

2.5 Real Time Forwarded Data from Serial Port to Wireless Channel (Message Type 8)

The unit can forward data from its serial port to the OTA channel in a logged or in real time manner.

If the unit is configured to work with logged forwarding ("Enable Data forwarding through log" parameter (address 285, bit 7) is enabled), message type 7 will be used. Message type 7 contains fragments (up to 54 bytes each) of payload forwarded from the unit serial port.

If the unit is configured to work with real time forwarding ("Enable Data forwarding through log" parameter (address 285, bit 7) is disabled), message type 8 will be used. Message Type 8 contains a complete payload (up to 512 bytes) forwarded from the unit serial port.

The forwarded payload may be escorted by fleet management data (as per unit configuration).

2.5.1 *Message Ingredients*

- Message header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Unit ID – 4 bytes
  - Message Numerator – 1 byte
- Spare – 2 bytes
- Serial Port Source – 1 byte
- Spare – 1 byte
- Forwarded Message Code – 1 byte
- Fragment Control Byte – 1 byte
- Payload Length – 2 bytes
- Payload – variable length
- Error Detection Code – 1 byte

2.5.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII “M”
2	System Code, byte 2 – ASCII “C”
3	System Code, byte 3 – ASCII “G”

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>4</td><td>System Code, byte 4 – ASCII “P”</td></tr>
<tr><td>5</td><td>Message Type (8)</td></tr>
<tr><td>6</td><td rowspan="4">Unit ID</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td><td>Message Numerator (Anti-Tango™)</td></tr>
<tr><td>11</td><td rowspan="2">Spare</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td><td>Serial Port Source
<table>
<tr><td colspan="3">Source of Payload
0 – N/A
1 – N/A
2 – COM2 (BT)
3 – COM3
4 – COM4
5 – COM5
6 – CFE Micro
7 – N/A</td><td>CFE Connected
0 – Not connected
1 – Connected</td><td colspan="4">Static nibble containing value 0x07</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>14</td><td>Spare</td></tr>
<tr><td>15</td><td>Forwarded Message Code
Sequential 7 bits ID of the container + container indication bit (MSB)
Assigned for each container
<table>
<tr><td>0 – Simple payload
1 – Container</td><td colspan="7">In case of container: sequential 7 bits ID of the container In case of simple payload: sequential 7 bits ID of the forwarded packet</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 6</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>16</td><td>Fragment Control Byte
<table>
<tr><td>First Fragment
0 – Not first
1 - First</td><td>Last Fragment
0 – Not last
1 - Last</td><td colspan="6">Fragment No (starting from 1)</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>17</td><td rowspan="2">Payload Length</td></tr>
<tr><td>18</td></tr>
<tr><td>…</td><td>Payload</td></tr>
<tr><td>…</td><td>Error Detection Code (8-bit additive checksum, excluding system code)</td></tr>
</table>

2.5.3 *Detailed Per-Field Specifications*

2.5.3.1 System Code

Refer to Section 2.2.3.1

2.5.3.2 Message Type

Logged Fragment of Forwarded Data from Serial Port to Wireless Channel messages contain a value of 8 (eight) in the message type field.

2.5.3.3 Unit ID

Refer to Section 2.2.3.3

2.5.3.4 Message Numerator (Anti-Tango™)

Refer to Section 2.2.3.5

2.5.3.5 Serial Port Source

This field provides information about the source of data connected to the unit serial port.

2.5.3.6 Forwarded Message Code

This field provides information about the container in the message.

If the unit is configured to work with container ("Forward Data as Container" parameter (address 285, bit 6) is enabled), the payload will be in a form of a container: forwarded payload from serial port is escorted by 48 bytes of FM (fleet management) data, and 2 bytes of total length of payload + FM data.

If the unit is configured to work with simple payload ("Forward Data as Container" parameter (address 285, bit 6) is disabled), the payload will be in a form of a simple payload: forwarded payload from serial port only.

In addition, this byte includes a container/simple payload sequential ID.

2.5.3.7 Fragment Control Byte

This field provides information about the current payload fragment.

The current implementation of message type 8 allows to send the payload in a single message (i.e. without fragmentation). However, for backward compatibility reasons, there is an option to fragment the payload.

If the unit is configured to work with the extended implementation ("Backward compatible OTA msg type 8" parameter (address 1349, bit 2) = extended), the payload will be sent in single type 8 message (up to 512 bytes payload). In this case, the fragment control byte will be set to 0xC0.

If the unit is configured to work with the backward compatible implementation ("Backward compatible OTA msg type 8" parameter (address 1349, bit 2) = backward compatible), the payload will be sent in fragmented type 8 messages (up to 235 bytes payload, up to 82 bytes per fragment). In this case, the fragment control byte will be used normally.

2.6 Modular Message (Message Type 9)

The modular data packet is designed to provide different data types in the same message.

2.6.1 *Message Ingredients*

- Message Header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Unit ID – 4 bytes
  - Communication Control Field – 2 bytes
  - Message Numerator – 1 byte
- Packet Control Field – 1 byte
- Message Length – 1 byte
- First Sub-Data Type – 1 byte
- First Sub-Data Length – 1 byte
- First Sub-Data variable length, depends on Data Type
- ……
- Nth Sub-Data Type – 1 byte
- Nth Sub-Data Length – 1 byte
- Nth Sub-Data– variable length, depends on Data Type N
- Error Detection Code – 1 byte

2.6.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII "M"
2	System Code, byte 2 – ASCII "C"
3	System Code, byte 3 – ASCII "G"
4	System Code, byte 4 – ASCII "P"
5	Message Type (9)
6	Unit ID
7	
8	

9	
10	Communication Control field
11	
12	Message Numerator
13	Packet Control Field
14	Length (of the modules section - not including the checksum)
15	First Sub-data Type
16	First Sub-data Length
17	First Sub-data The Data
…	…
	Nth Sub-data Type
	Nth Sub-data Length
	Nth Sub-data The Data
Last Byte	Error Detection Code (8-bit additive checksum, excluding system code)

2.6.3 *Detailed Per-Field Specifications*

2.6.3.1 System Code

Refer to Section 2.2.3.1

2.6.3.2 Message Type

Modular messages contain a value of 9 (nine) in the message type field.

2.6.3.3 Unit ID

Refer to Section 2.2.3.3

2.6.3.4 Communication Control Field

Refer to Section 2.2.3.4

2.6.3.5 Message Numerator (Anti-Tango™)

Refer to Section 2.2.3.5

2.6.3.6 Packet Control Field

Direction	Out of space indication	Unused					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Direction

0 – Data from the unit

1 – Request (unit-bound)

Out of Space Indication

0 – All the requested data present in the message

1 – Some Sub-Data was not returned due to data size

2.6.3.7 Length

That field includes the number of data bytes with their types and lengths. It includes the number of bytes from byte 15 to the byte of the checksum, which is not included.

2.6.4 *Outbound Sub-Data Types Table*

Code (Hex)	Function
0x01	Firmware Platform Manifest
0x04	Time and Location Stamp
0x07	Usage Counter
0x08	Authentication Table Update
0x0A	Maintenance Server Platform Manifest
0x0C	3G Cell ID Data
0x0D	Compressed vector change report
0x12	Modular Platform Manifest
0x14	Pulse Counter Measurement
0x18	CFE Inputs Status Update
0x19	One-Wire Temperature Measurements

2.6.5 *Firmware Platform Manifest*

This sub-data is generated as a reply to Firmware Platform Manifest Request (0x01).

Byte	Description
0	Sub-data type (0x01)
1	Length – 18
2	Processor family identifier 0x01 – PIC18Fx520/620/720 0x02 – PIC18Fx621/525 0x03 – PIC18Fx527/622/627/722 (x=6/8) 0x04 – ARM Cortex M3 F10x 0x05 – ARM Cortex M3 L15x 0x07 – STM32F101RDT6 0x08 – STM32F103RFT6 0x09 – STM32F429IGH6 0x0A – STM32F103VET7 0x0B – STM32L151VDT6 0x0C - STM32F103VET6
3	Hardware interface and peripherals identifier 0x01 – 40/44 pin micro, peripherals as per family 0x02 – 64 pin micro, peripherals as per family 0x03 – 80 pin micro, peripherals as per family 0x04 – 64 pin STM32F101RCT6 0x05 – 64 pin STM32F103RDT6 0x06 – 64 pin STM32L151RDT6 0x07 – 176 pin micro, peripherals as per family 0x08 – 100 pin STM32F103VET6, peripherals as per family
4-5	Size of program memory (in 1024 bytes units) (LSB)
	Size of program memory (in 1024 bytes units) (MSB)
6-7	Size of volatile memory (Divided by 128 bytes and rounded up/down to closest integer) (LSB)
	Size of volatile memory (Divided by 128 bytes and rounded up/down to closest integer) (MSB)
8-9	Size of internal non-volatile memory (Divided by 128 bytes and rounded up/down to closest integer) (LSB)

Byte	Description
	Size of internal non-volatile memory (Divided by 128 bytes and rounded up/down to closest integer) (MSB)
10-11	Size of external non-volatile memory (in 1024 bytes units) (LSB)
	Size of external non-volatile memory (in 1024 bytes units) (MSB)
12	External non-volatile memory type 0x01 – I2C generic NVM (most EEPROMs). 0x02 – SPI generic NVM. 0x03 – Adesto Rev. E 0x04 – SPI N25Q NVM 0x05 – SPI MX25L6433F
13	Hardware Version See Unit Hardware Version
14-15	Reprogramming facility identifier (first LSB, then MSB) Depends on HW/FW variant
16-17	Script language version (first LSB, then MSB) = (0x0002)
18-19	Current Firmware ID (first LSB, then MSB) A build descriptor of the actual firmware running on the platform, allocated in the time of a formal release. It is a valuable field when a re-flash is considered

2.6.6 *Time and Location Stamp*

This sub-data is generated as a reply to Time and Location Stamp Request (0x04). It is also automatically added to the self-initiated messages generated by the unit.

Byte	Description
0	Sub-data type (0x04)
1	Length – 25

<table>
<tr><td>2</td><td>Location status (flags)
<table>
<tr><td>Time Accuracy

0 – Time is accurate
1 – Time is Inaccurate</td><td>GPS Connection

0 – Connected
1 – Not Connected</td><td colspan="6">Spare</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>3</td><td>Mode 1 (from GPS)</td></tr>
<tr><td>4</td><td>Mode 2 (from GPS)</td></tr>
<tr><td>5</td><td>Number of satellites used (from GPS)</td></tr>
<tr><td>6</td><td rowspan="4">Longitude</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td><td rowspan="4">Latitude</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td><td rowspan="3">Altitude</td></tr>
<tr><td>15</td></tr>
<tr><td>16</td></tr>
<tr><td>17</td><td rowspan="2">Ground speed</td></tr>
<tr><td>18</td></tr>
<tr><td>19</td><td rowspan="2">Speed direction (true course)</td></tr>
<tr><td>20</td></tr>
<tr><td>21</td><td>UTC time – seconds</td></tr>
<tr><td>22</td><td>UTC time – minutes</td></tr>
<tr><td>23</td><td>UTC time – hours</td></tr>
<tr><td>24</td><td>UTC date – day</td></tr>
</table>

25	UTC date – month
26	UTC date – year Current Year minus 2000 (e.g. value of 7 = year 2007)

2.6.6.1 MODE 1/2 from GPS

Refer to Section 2.2.3.21

2.6.6.2 Number of Satellites Used

Refer to Section 2.2.3.22

2.6.6.3 Longitude, Latitude

Refer to Section 2.2.3.23

2.6.6.4 Altitude

Refer to Section 2.2.3.24

2.6.6.5 Ground Speed

This indicates the current speed (absolute value of the vector). It is represented as a 16-bit unsigned integer, in 10^{-2} meter/sec resolution (speed is represented in centimeters/second).

The source of speed data is either the GPS, the vehicle's CAN bus or frequency metering input as per unit's type, installation and configuration.

The reported value may monitor the immediate value of speed recorded upon generation of the message or the maximum value of speed from last report (as per the configuration). Byte 10, bit 6 of the message is monitoring the actual reported type.

2.6.6.6 Heading/Speed Direction (True Course)

Refer to Section 2.2.3.26

2.6.6.7 UTC Time

Refer to Section 2.2.3.27

2.6.6.8 UTC Date

Refer to Section 2.2.3.28

2.6.7 *Usage Counter*

This sub-data is generated as a reply to Usage Counter Request (0x07), or as a periodical update. In the latter case, it is sent with the Time and Location Stamp (sub-data 0x04).

Byte	Description
0	Sub-Data Type (0x07)
1	Length – 9
2	Spare
3	Counter 1 Input Number
4	Counter 1 Value (Minutes)
5	
6	
7	Counter 2 Input Number
8	Counter 2 Value (Minutes)
9	
10	

Input's Numbers Definition

2.6.8 *Authentication Table Update*

This sub-data is generated as a reply to Authentication Table Update Command (0x08).

Byte	Description	
0	Sub-Data Type (0x08)	
1	Length – 9	
2	Spare	
3	Authentication table Index 0	Authentication table Index 1
4	Authentication table Index 2	Authentication table Index 3
5	Authentication table Index 4	Authentication table Index 5
6	Authentication table Index 6	Authentication table Index 7

Byte	Description	
7	Authentication table Index 8	Authentication table Index 9
8	Authentication table Index 10	Authentication table Index 11
9	Authentication table Index 12	Authentication table Index 13
10	Authentication table Index 14	Authentication table Index 15

2.6.9 *Neighbor list of the Serving GSM Cell*

This sub-data is sent:

- Passively, as a reply to Cell ID Request (0x09).
- Actively, if enabled in unit's configuration, separately for home and roam GSM networks (addresses 201 and 203 respectively, bits 0, 1, 3 and 4).

Byte	Description
0	Sub-Data Type (0x09)
1	Length – 53
2	Spare (0x00)
3	seconds (0-59)
4	minutes (0-59)
5	hours (0-23)
6	day (1-31)
7	month (1-12)
8	Year (Current Year minus 2000 (e.g. value of 7 = year 2007))
9	Serving Cell BSIC (Base Station Identification Code)
10	Serving Cell LAC (LSB) (Localization Area Code)
11	Serving Cell LAC (MSB) (Localization Area Code)
12	Serving Cell ID (LSB)

Byte	Description
13	Serving Cell ID (MSB)
14	Serving Cell Power (Received signal strength in dBm (hex). The sign is not saved, this value is always representing a negative number)
15	Neighbor Cell 1 BSIC
16	Neighbor Cell 1 LAC (LSB)
17	Neighbor Cell 1 LAC (MSB)
18	Neighbor Cell 1 Cell ID (LSB)
19	Neighbor Cell 1 Cell ID (MSB)
20	Neighbor Cell 1 Power
…	…
45	Neighbor Cell 6 BSIC
46	Neighbor Cell 6 LAC (LSB)
47	Neighbor Cell 6 LAC (MSB)
48	Neighbor Cell 6 Cell ID (LSB)
49	Neighbor Cell 6 Cell ID (MSB)
50	Neighbor Cell 6 Power
	Zero Padding to complete the 55 bytes assigned for single event (if it's a logged event, i.e. sent actively)

2.6.10 *Maintenance Server Platform Manifest*

Periodically (or upon server command) the unit connects to a maintenance server in order to check for the latest firmware and/or programming update. Auto connection to the maintenance server can be enabled upon power up and upon firmware upgrade.

Upon connection the unit generates a sub-data which is described below.

If the unit cannot establish a connection to the maintenance server while the GPRS is available, it uses the dial up retry algorithm defined in the NVM Allocation (Anti-Flooding). If all the retries fail, the unit ceases to try and reconnects to an operational server

(instead of entering Anti-Flooding, as it would do while connected to an operational server).

Byte	Description
0	Sub-data type (0x0A)
1	Length – 34
2	Processor family identifier 0x01 – PIC18Fx520/620/720 0x02 – PIC18Fx621/525 0x03 – PIC18Fx527/622/627/722 (x=6/8) 0x04 – ARM Cortex M3 F10x 0x05 – ARM Cortex M3 L15x 0x07 – STM32F101RDT6 0x08 – STM32F103RFT6 0x09 – STM32F429IGH6 0xA – STM32F103VET7 0x0B – STM32L151VDT6 0x0C - STM32F103VET6
3	Hardware interface and peripherals identifier 0x01 – 40/44 pin micro, peripherals as per family 0x02 – 64 pin micro, peripherals as per family 0x03 – 80 pin micro, peripherals as per family 0x04 – 64 pin STM32F101RCT6 0x05 – 64 pin STM32F103RDT6 0x06 – 64 pin STM32L151RDT6 0x07 – 176 pin micro, peripherals as per family 0x08 – 100 pin STM32F103VET6, peripherals as per family
4-5	Size of program memory (in 1024 bytes units) (LSB)
	Size of program memory (in 1024 bytes units) (MSB)
6-7	Size of volatile memory (Divided by 128 bytes and rounded up/down to closest integer) (LSB)
	Size of volatile memory (Divided by 128 bytes and rounded up/down to closest integer) (MSB)

Byte	Description
8-9	Size of internal non-volatile memory (Divided by 128 bytes and rounded up/down to closest integer) (LSB)
	Size of internal non-volatile memory (Divided by 128 bytes and rounded up/down to closest integer) (MSB)
10-11	Size of external non-volatile memory (in 1024 bytes units) (LSB)
	Size of external non-volatile memory (in 1024 bytes units) (MSB)
12	External non-volatile memory type 0x01 – I2C generic NVM (most EEPROMs). 0x02 – SPI generic NVM. 0x03 – Adesto Rev. E 0x04 – SPI N25Q NVM 0x05 – SPI MX25L6433F
13	Hardware Version See: Unit Hardware Version
14-15	Reprogramming facility identifier (LSB) Depends on HW/FW variant
	Reprogramming facility identifier (MSB) Depends on HW/FW variant
16-17	Script language version (LSB) (0x01)
	Script language version (MSB) (0x00)
18-19	Current Firmware ID (LSB) Note that this is in fact not a descriptor of the firmware platform per se, but rather a descriptor of the actual firmware running on the platform. However, it is a valuable field when a re-flash is considered.
	Current Firmware ID (MSB) Note that this is in fact not a descriptor of the firmware platform per se, but rather a descriptor of the actual firmware running on the platform. However, it is a valuable field when a re-flash is considered.
20-21	Current PL ID (LSB) Infrastructure only, currently not supported

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td></td><td>Current PL ID (MSB)
Infrastructure only, currently not supported</td></tr>
<tr><td>22-29</td><td>International mobile subscriber identity of the SIM (IMSI)
Reference to GSM 07.07, 15 chars maximum</td></tr>
<tr><td>30-32</td><td>Modem's firmware revision
From FW version 33x and later – 0x00
For FW versions older than 33x:
<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>30</td><td>Reserved (0)</td></tr>
<tr><td>31</td><td>Modem Revision ID, as presented in the table below</td></tr>
<tr><td>32</td><td>Modem Type Extension
(Extra byte, additional to the 3MSBits in the hardware byte of message type 0)</td></tr>
</table></td></tr>
<tr><td>33</td><td>Maintenance Configuration
<table>
<tr><td colspan="6">Spare</td><td>Firmware Upgrade Enabled

0 - Disabled
1 - Enabled</td><td>Programming Enabled

0 - Disabled
1 - Enabled</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>34
35</td><td>Release Candidate Revision ID
Little Endian 16 bit representing the Release Candidate SVN revision:
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0</td><td>Formal Release</td></tr>
<tr><td>1-65535</td><td>The version is a Release Candidate. The 2 bytes represents the SVN revision number:
Example: If the hex file name is F000_...._RC540.hex the resulted
The binary value representing the decimal RC540 is 0x21C in little Endian.</td></tr>
</table></td></tr>
</table>

Modem Revision ID

ID (Dec)	Revision	Modem
0	Unknown	All (Used also in Nano from FW version 34d and on).
1	0.7.6	Enfora II
2	0.7.8	
3,4	reserved	
5	1.0.5	Enfora III
6	6.1.1 (Beta)	
7	1.1.1PKG30	
8	1.1.1PKG41	
9	D3-1.1.2PKG47	
10	D4-1.1.2PKG47	
11	D10.1.1.2	
12-20	reserved	
21	7.02.002	Telit II
22	7.02.100	
23	7.02.002	Telit III
24	7.02.003	
25	7.02.004	
26	7.03.000	
27	7.03.030 (Automotive)	
28	7.03.002	

ID (Dec)	Revision	Modem
29	7.03.032	
30	10.00.033 (Obsolete)	Telit V2
31	10.00.036	
32	10.00.035 (Obsolete)	
33	10.00.016	
34-40	reserved	
41	GLM-4-0610-000	Motorola 24L
42-50	Reserved for Motorola	
51	01.000	Cinterion BGS3
52	02.000	Nano: Cinterion BGS2-W.Rel2 (Used only up to FW version 34c).
53	03.001_arn00.000.14	Nano: Cinterion EHS5-E (Used only up to FW version 34c).
54	03.001_arn00.000.14	Nano: Cinterion EHS5-US (Used only up to FW version 34c).
55	03.001_arn00.000.14	Nano: Cinterion EHS6A (Used only up to FW version 34c).
56	03.001_arn01.000.08	Nano: Cinterion BGS2-W.Rel3

ID (Dec)	Revision	Modem
		(Used only up to FW version 34c).
57-70	Reserved for Cinterion	
71	12.00.002	Telit HE910-G (Reserved)
72	12.00.323	Telit HE910-NAD
73	13.00.003	Telit GE910 QUAD (V2)
74	12.00.504	Telit UE910-NAR
75	12.00.404	Telit UE910-EUR
76	10.00.023	Telit GE864 QUAD-V2
77	16.00.303	Telit GE910 QUAD-V3
78	10.00.027	Telit GE864 QUAD-V2
79	12.00.516	Telit UE910-NAD
80	12.00.416	Telit UE910-EUD
81	10.01.522	Telit GE864 QUAD-V2
82	12.00.506	Telit UE910-NAR (SSL)
83-255	Reserved	

2.6.11 *Modular Platform Manifest*

This sub-data is generated as a reply to Modular Platform Manifest Request (0x12).

Byte	Description
0	Sub-Data Type (0x12)
1	Length – Variable
2	Field 1 – Identifier
3	Field 1 – Length of Payload
4	Field 1 – Payload
…	…

Byte	Description
…	Field N – Identifier
…	Field N – Length of Payload
…	Field N – Payload

Fields Definition

Processor Family Identifier

Field ID – 0x0	0x00 – PIC18F6722 0x01 – STM32F101RCT6 0x02 – STM32F103RDT6 0x03 – STM32L151RDT6 0x04 – STM32F101RDT6 0x05 – STM32F103RFT6 0x06 – STM32F429IGH6 0x07 – STM32F103VET7 0x08 – STM32L151VDT6 0x09 - STM32F103VET6

Accelerometer Identifier

Field ID – 0x1	0x00 – MMA7260QT 0x01 – LIS331DL 0x02 – LIS331DLH (12 bit) 0x03 – LIS3DH (16 bit)

Size of Program Memory

Field ID – 0x2 (Kbytes)	Cello, CelloTrack-T: 256 (dec) Cello-IQ, Cello-CANiQ, CelloTrack Nano: 384 (dec) CR400B: 512 (dec)

Amount of Non-Volatile Memory Used by Application (e.g. configuration)

Field ID – 0x3 (Bytes)	Default 0 (N.A)

Size of Internal RAM

Field ID – 0x4	Cello, CelloTrack-T: 32 (dec)

(Kbytes)	Cello-IQ, Cello-CANiQ, CR400B: 64 (dec) CelloTrack Nano: 48 (dec)

Size of External Non-Volatile Memory

Field ID – 0x5 (Kbytes)	Cello, CelloTrack-T, CR400B: 512(dec) Cello-IQ, Cello-CANiQ: 8192(dec) CelloTrack Nano: 1024 (dec)

Amount of External Non-Volatile Memory Used by Application (e.g. configuration)

Field ID – 0x6 (Kbytes)	Cello, CelloTrack-T, CelloTrack Nano: 4 Cello-IQ, Cello-CANiQ, CR400B: 8

Size of External RAM

Field ID – 0x7 (Bytes)	Default - 0 (N.A)

Current Firmware ID Number

Field ID – 0x8	Same as in Type-0 message

Current Hardware ID Number

Field ID – 0x9	Same as in Type-0 message. See new table here

Modem Type

Field ID – 0xA	Same as in Type-0 message. See new table here (only the 3 modem ID bits, for backwards compatibility)

Modem Firmware Version

Field ID – 0xB	Byte 2: Reserved (sent as zero) Byte 1: • 0, from FW version 33x and later • Per table below, for FW versions older than 33x Byte 0: Reserved (sent as zero)
	from FW version 33x and later: Modem firmware string returned from the Modem (Byte 1)
	…
	Modem firmware string returned from the Modem (Byte n)

Bytes 45-47 of Maintenance Platform Manifest contain the value of modem revision. The modem type is declared in a hardware byte; this field provides an additional definition.

Reserved (sent as zero)	Modem revision ID, as per table below	Reserved (sent as zero)
Byte 2	Byte 1	Byte 0

Modem revision ID: Refer to Modem Version ID

The new Modem firmware reporting mechanism is supported by the following products and FW versions:

- Cello-CAN(IQ) from FW version 33x and later
- CR300/B from FW version 43c and later
- CelloTrack Nano from FW 34d and later

GPS Type

Field ID – 0xC	00 – CEL3535 01 – CEL1500 02 – CEL1500L 03 – CEG-1000 (Internal) 04 – SIRF4 chip (internal) 05 – Glonass (internal) 06 – SIRF4 ROM – NMEA 07 – Telit JF2 (internal) 08 – Telit SE868-V2 (internal) 09 – Telit Modified JF2 (CelloTrack T) 10 – Telit SE868-V3 (internal) 16 – NMEA (CelloTrack T) 17 – ME910C1-WW-GNSS

GPS Firmware

Field ID – 0xD	String as returned by GPS to revision request command

First Activation Date/Time

Field ID – 0xE

Byte	Description
0	Year
1	Month
2	Day
3	Second
4	Minute

	5 Hour Note that byte 0 is transmitted first, then byte 1 etc. On the display it's shown as d/m/y h:m:s

FW Upgrade Date/Time

Field ID – 0xF	Byte 0 – Year Byte 1 – Month Byte 2 – Day Byte 3 – Second Byte 4 – Minute Byte 5 – Hour Note that byte 0 is transmitted first, then byte 1 etc. On the display it's shown as d/m/y h:m:s

Last Configuration Change Date/Time

Field ID – 0x10	Byte 0 – Year Byte 1 – Month Byte 2 – Day Byte 3 – Second Byte 4 – Minute Byte 5 – Hour Note that byte 0 is transmitted first, then byte 1 etc. On the display it's shown as d/m/y h:m:s

Firmware File Name

Field ID – 0x11 (up to 120 bytes)	Firmware file name string

System ID (STM ID in case of STM controller)

Field ID – 0x12	12 bytes hexadecimal

Boot Loader ID

Field ID – 0x13	Contains 1 byte indicating Boot Loader's version number

DFD/SD Card Version

Field ID – 0x14

Byte	Description
0	DFD Version Byte 0
1	DFD Version Byte 1
2	DFD Version Byte 2
3	DFD Version Byte 3
4	SD Card Version Byte 0
5	SD Card Version Byte 1
6	SD Card Version Byte 2
7	SD Card Version Byte 3

The SD card version is extracted from a file called ver.txt in the DFD's SD card root directory.

Cello-CANiQ VIN

Field ID – 0x15	VIN – Vehicle Identification Number Null terminated string, Up to 17 Bytes

IMSI/IMEI/MEID

Field ID – 0x16	IMSI – 8 Bytes, decimal IMEI – 8 Bytes, decimal MEID – 8 Bytes, decimal (for CDMA devices)

Originating FW ID

Field ID – 0x17	This module holds the originating FW version or the last version the code tree was merged with. Byte: 0 – Originating Version ID Byte: 1 – Originating Sub Version ID The version of the trunk (Before Branching or after merging) Example: 33b 33 – Version ID b – Sub Version → subversion Letter – 'a' = 'b'-'a'=1

Size of Internal Non-Volatile Memory

Field ID – 0x1A (Divided by 128 bytes and rounded up/down to closest integer)	Cello, CelloTrack-T, Cello-IQ, Cello-CANiQ, CR300, CR400B: 0 (Dec) CelloTrack Nano, CelloTrack-4 family: 96 (Dec) = 12KB

SIM ICCID

Field ID – 0x1C	ASCII String (Up to 20 Bytes)

CAN library identifier number

Field ID – 0x24	CAN library identifier number (32 bit) (0 as initial default value and overwritten when a CAN library is downloaded)

2.6.12 *Pulse Counter Measurement Response*

This sub-data is generated as a reply to Pulse Counter Measurement Request (sub-data 0x14). It is sent with sub-data 0x04 (Time and Location Stamp).

Byte	Description
0	Sub-Data Type (0x14)

Byte	Description
1	Length – 26
2	Spare
3	Spare
4	Counter 1 (Liter) 4 bytes forming unsigned 32 bits value representing the amount of litters consumed from the last pulse counter reset. The value is a multiplication of the pulse counter value by the scaling factor value (PL address 2442-2443 for Door input and 2444-2445 for Shock input).
5	
6	
7	
8	Counter 2 (Liter) 4 bytes forming unsigned 32 bits value representing the amount of litters consumed from the last pulse counter reset. The value is a multiplication of the pulse counter value by the scaling factor value (PL address 2442-2443 for Door input and 2444-2445 for shock input).
9	
10	
11	
12	Spare
13	Spare
14	Spare
15	Spare
16	Spare
17	Spare
18	Spare
19	Spare
20	Spare
21	Spare
22	Spare

Byte	Description
23	Spare
24	Spare
25	Spare
26	Spare
27	Spare

NOTE: Litters are only one example for volume measurement units. Actually the real measurement units are defined by the measuring device and its fuel volume vs. pulses relation.

2.6.13 *CFE Inputs Status Update*

This sub-data holds the CFE inputs status and measurements. This message can be autonomously generated by the unit (With CFE) or as a reply to CFE Inputs Status Update Request (sub-data 0x18). It is sent with sub-data 0x04 (Time and Location Stamp).

Byte	Description
0	Sub-Data Type (0x18)
1	Length – 26
2	Spare
3	Spare
4	Door (Pin 14) Assigned function (same as in the configuration) Since Legacy Cello doesn't support 8/12 bit ADC resolution this message will always send 8 bit resolution
5	Door Measurement (LSB) (In case of discrete: 0 for 0, 255 for 1)
6	Door Measurement (MSB)
7	Shock (Pin 15) Assigned function (same as in the configuration) Since Legacy Cello doesn't support 8/12 bit ADC resolution this message will always send 8 bit resolution

Byte	Description
8	Shock Measurement (LSB) (In case of discrete: 0 for 0, 255 for 1)
9	Shock Measurement (MSB)
10	Input 1 Assigned function (same as in the configuration)
11	Input 1 Measurement (LSB) (In case of discrete: 0 for 0, 255 for 1)
12	Input 1 Measurement (MSB)
13	Input 2 Assigned function (same as in the configuration)
14	Input 2 Measurement (LSB) (In case of discrete: 0 for 0, 255 for 1)
15	Input 2 Measurement (MSB)
16	Input 3 Assigned function (same as in the configuration)
17	Input 3 Measurement (LSB) (In case of discrete: 0 for 0, 255 for 1)
18	Input 3 Measurement (MSB)
19	Input 4 Assigned function (same as in the configuration)
20	Input 4 Measurement (LSB) (In case of discrete: 0 for 0, 255 for 1)
21	Input 4 Measurement (MSB)
22	Input 5 Assigned function (same as in the configuration)
23	Input 5 Measurement (LSB) (In case of discrete: 0 for 0, 255 for 1)
24	Input 5 Measurement (MSB)
25	Input 6 Assigned function (same as in the configuration)

Byte	Description
26	Input 6 Measurement (LSB) (In case of discrete: 0 for 0, 255 for 1)
27	Input 6 Measurement (MSB)

2.6.14 *One-Wire Temperature Sensor Measurement*

This sub-data holds the One-Wire temperature sensor measurements. This message is generated by the unit as a reply to One-Wire Temperature Sensor Measurement Request (sub-data 0x19). It is sent with sub-data 0x04 (Time and Location Stamp).

Byte	Description
0	Sub-Data Type (0x19)
1	Length – 26
2	First One-Wire ID (Byte 0)
3	First One-Wire ID (Byte 1)
4	First One-Wire ID (Byte 2)
5	First One-Wire ID (Byte 3)
6	First One-Wire measurement (LSB) (Coefficient 0.0625)
7	First One-Wire measurement (MSB) (Coefficient 0.0625)
8	Second One-Wire ID (Byte 0)
9	Second One-Wire ID (Byte 1)
10	Second One-Wire ID (Byte 2)
11	Second One-Wire ID (Byte 3)
12	Second One-Wire measurement (LSB) (Coefficient 0.0625)
13	Second One-Wire measurement (MSB) (Coefficient 0.0625)
14	Third One-Wire ID (Byte 0)

Byte	Description
15	Third One-Wire ID (Byte 1)
16	Third One-Wire ID (Byte 2)
17	Third One-Wire ID (Byte 3)
18	Third One-Wire measurement (LSB) (Coefficient 0.0625)
19	Third One-Wire measurement (MSB) (Coefficient 0.0625)
20	Fourth One-Wire ID (Byte 0)
21	Fourth One-Wire ID (Byte 1)
22	Fourth One-Wire ID (Byte 2)
23	Fourth One-Wire ID (Byte 3)
24	Fourth One-Wire measurement (LSB) (Coefficient 0.0625)
25	Fourth One-Wire measurement (MSB) (Coefficient 0.0625)
26	Spare
27	Spare

2.6.15 *Car Sharing 2 Reservation Entry Response*

This sub-data is sent as a reply to Car Sharing 2 Reservation Command message (0x1A) with Read command from server.

Byte	Description
0	Sub-Data Type (0x1A)
1	Length – 53
2	Slot Number
3	Spare
4–9	Driver ID (SCN) Bytes 0-5 of reservation table entry

Byte	Description
10-13	Reservation Start time/date Bytes 6-9 of reservation table entry (Number of Seconds from December 31, 1989, 12 am UTC.)
14-48	Spare - Zero Padded

2.7 Modular Message (Message Type 11)

Type 11 was introduced for supporting true modular protocol. The basic structure of the protocol is designed to carry records with predefined structure called modules. The protocol will be used as an extension for Cello fleet protocol. Type 11 supports theoretical message length of up to 65536 bytes, tough the actual rate will be constrained by the HW limitations.

2.7.1 *Message Ingredients*

Type 11 contains the following data (listed in the actual transmitted order):

- Message header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Unit ID – 4 bytes
  - Communication Control Field – 2 bytes
  - Message Numerator – 1 byte
- Packet Control Field – Legacy fleet field
- Message length – 2 bytes
- Spare – 4 bytes
- Payload Modules – User Configuration Depended
- Error Detection Code (checksum) – 1 byte

2.7.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII "M"
2	System Code, byte 2 – ASCII "C"
3	System Code, byte 3 – ASCII "G"
4	System Code, byte 4 – ASCII "P"
5	Message Type (11)
6	Unit ID
7	
8	
9	
10	Communication Control Field
11	

12	Message Numerator
13	Packet Control Field
14 15	Length of the modules section (From byte #16 and not including the last byte of the checksum)
16 17	= 0x0000 Symbolizes outbound message (while in inbound these 2 bytes are allocated to length which is at least 7 bytes)
18 19	Spare (sent as 0)
20-28	Module Name 8 - FW_HW ID (Mandatory)
29-50	Module Name 6 - GPS Location Stamp (Mandatory)
51-60	Module Name 7 - Time stamp (Mandatory)
…	
	Other Modules
…	
…	
Last Byte	Error Detection Code (8-bit additive checksum, excluding system code)

2.7.3 *Detailed Per-Field Specifications*

2.7.3.1 System Code

Refer to Section 2.2.3.1

2.7.3.2 Message Type

Modular messages contain a value of 11 (eleven) in the message type field.

2.7.3.3 Unit ID

Refer to Section 2.2.3.3

2.7.3.4 Communication Control Field

Refer to Section 2.2.3.4

Refer also to Section 2.2.3.4

This is a bitmapped field, providing information about the message and the situation in which it was originated.

First byte (10th):

CAN Originated Odometer[7]	CAN Originated Speed [8]	Event Type / Message source				Logical ignition	Message Initiative
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Second byte (11th):

GSM Hibernation		Business/ Private Mode					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Message initiative

0 – Active transmissions (initiated by the unit, based on its logic and decisions)

1 – Passive responses (response to a command or a query message)

Repeated in module 100

Event Type / Message source

0 – logged

1 – Active logged

2- Ram

3 - SMS

CAN Originated Speed/Odometer

0 – The unit is configured to report speed/odometer taken from NON-CAN (GPS, VSS, DTCO).

1 – The unit is configured to report speed/odometer taken from CAN.

Business/Private Mode

It is possible to enable usage of Lock input as a Private/Business mode toggle. If enabled, every time the programmed input is triggered the unit switches to the opposite mode (Private → Business → Private). The default mode is Business. The Private mode is finished upon the input trigger, or when the active ID is erased from RAM after trip end.

0 – Business

1 – Private

Logical ignition

[7] Only supported by Compact CAN unit, linked to J1939 (and FMS) CAN bus.

[8] Only supported by Compact CAN unit, linked to J1939 (and FMS) CAN bus.

Provides indication if the unit is in logical Ignition is On ("1") or Off ("0"), according to the configuration of the detection source (physical ignition or accelerometer).

GSM Hibernation

0 – Unit is not in GSM hibernation

1 – Unit is in GSM hibernation (message sent during GSM peeking)

2.7.3.5 Command Numerator (Anti-Tango™)

Refer to Section 2.2.3.5

2.7.3.6 Packet Control Field

Direction	Out of space indication	Numerator Extension					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Direction

0 – Data from the unit

1 – Request (unit-bound)

Out of Space Indication

0 – All the requested data is present in the message.

1 – Some Sub-data was not returned due to data size.

Numerator Extension

The Server uses the message time and message numerator for sorting the messages according to their order. In case that 2 (or more) successive message with numerator 255 and 0 (numerator rollback) are received in the same second, the sorting fails. The numerator extension is used to solve this problem

Regularly the numerator extension value is 0. In case of message numerator 255, any other message with the same time (hh:mm:ss) the numerator extension field will be sent with increasing number (1,2…). Thus the server can sort the messages correctly. For example:

Message time	Message numerator	Numerator extension	Remarks
10:22:01	253	0	
10:22:01	254	0	Same time, but sequential numerator
10:22:02	255	0	
10:22:02	0	1	Same time, but numerator rollback, numerator extension increases
10:22:02	1	2	"

The unit will not prepare more than 64 messages in one second.

In very rare case that unit time is updated to previous second while in this special mode, the messages order might fail.

2.7.3.7 Length

That field includes the number of data bytes of the modules (with their codes and lengths). It is the number of bytes from byte 16 to the byte of the checksum, which is not included.

2.7.4 *Outbound Type 11 Module Structure*

The general structure of a type 11 module is as follows:

Byte	Description
0	Module Code
1	Length of module – Number of payload bytes
2	
3	Module Payload bytes
.	
.	
n	

2.7.5 *Outbound Type 11 Modules Table*

Code	Description
1	OBD Generic DTC Event
2	Variables Dump List (Programmable Message Structure)
3	OBDII MIL Status
4	Calibration Data Snap Shot (current Odometer)
6	GPS Location Stamp
7	GPS Time Stamp
8	FW ID
9	ACK/NACK
10	Configuration Memory Write Response
11	Configuration Memory Read Response
12	CAN-GPS Speed Calibration Status

Code	Description
13	Authenticated Features Query Response
17	CAN Supported Standard Parameters
18	K-Line Supported Standard Parameters
22	VIN Read Response
24	CAN Bus Status
25	Trigger Event ID
28	General Status Event
30	Reserved for PointerCept General Status Event
31	CAN Variables Status Dump
32	Occupied for Inbound module
33	Forwarded UDS Response
34	TPA Event
35	Occupied for Inbound module
36	Occupied for Inbound module
37	Current J1939 DTC Status
38	J1939 DTC Appeared/Disappeared
40	Measurement Readings
44	MultiSense Additional Information
110	CAN Arbitration IDs
111	CAN library file match report
122	Current J1939 DTC Status of CAN#2

2.7.6 *General Definitions and Data Structures in CelloTrack 4/Nano/Cello with BT Extender*

The CelloTrack 4/Nano and Cello with BT extender design is based on the following data structures:

Description	Source of measurement 0x00÷0x0F – MultiSense unit (according to place in the PL, whether occupied/enabled or not) 0xFB – BT Extender

	0xFC – Guest MultiSense (not in the list) 0xFD – High accuracy or specialized sensors of the CelloTrack Nano 20 (for example: Accurate temperature sensor, pressure sensor, etc.) 0xFE – MCU internal (temperature only) 0xFF – Reserved							
Bit	7	6	5	4	3	2	1	0

Description	Temperature measured [0..7]							
Units, valid range	0.1ºC in signed (in SINT16 format), -500÷1000 = -50÷100 ºC (The measurement is accurate in the -40÷80 ºC range)							
Bit	7	6	5	4	3	2	1	0

Description	Temperature measured [12]=sign bit only	Reserved			Temperature measured [8..11]			
Units, valid range					0.1ºC in signed (in SINT16 format)			
Bit	7	6	5	4	3	2	1	0

2.7.7 *OBD Generic DTC Event*

For private vehicles. Only one can interface reports on the DTC and should report using this module. The interface might be CANBUS or K-line.

Byte	Description
0	Module 1 - DTC Event
1	Length of module – Variable
2	
3	Number of DTCs received by Mode 3 If there are more DTCs than mentioned in this byte, they were received by mode 7
4	Spare
5	DTC Entry (2 Bytes)
6	

7	DTC Entry (2 Bytes)
8	
…	…

DTC Entry

Error Type		DTC Code												
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Error Type table

Code	Error Type
0	P – Power train
1	C - Chassis
2	B - Body
3	U – Network

2.7.8 *Variables Dump List*

This Message will be sent as part of the Cello-CANiQ Trigger event message. This is a mandatory module designed to identify the trigger Event ID and the Cello-CANiQ variables list attached to the event. The variable dump list is a programmable list of CAN variables selected when the user builds the CAN triggering. Please refer to "Cello-CANiQ Integration Manual" for more details.

Trigger Event module will be sent with the following modules to create trigger Event message:

Type 11 Header	Module 8 (FW ID)	Module 6 (Location)	Module 7 (Time)	Module 25 (Trigger ID)	Module 2 (Event)

Byte	Description
0	Module 2 – Variable Dump List
1	Length of module – Variable
2	
3	Operator ID
4	

5	PL Signature
6	
7	
8	
9	Number Of Variables
10	Variable ID (2 Bytes)
11	
12	Bits 0-3: Variable Length = 0x04 (constant for all variables. In case of shorter variables, the data is in the LSB of the variable payload, and the rest of the payload is zero padded.) Bits 4-7: Variable parsing format 0 – UNIT 32 1 – Bool 2 – UINT 8 3 – SINT 8 4 – UINT 16 5 – SINT 16 6 – UINT 32 7 – SINT 32 8 - Floating 9 – String
	Variable payload (raw data, as received from the bus)
…	…
	Variable ID (2 Bytes)
	Variable Length
	Variable payload

2.7.9 *OBDII MIL Status*

This module will be generated upon change in OBDII MIL lamp status (unsolicited). This module will be followed by modules 6, 7, 8.

Byte	Description
0	Module 3 – OBDII MIL Status
1	Length of module - 9

<table>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td>Spare</td></tr>
<tr><td>4</td><td>Spare</td></tr>
<tr><td>5</td><td>OBDII MIL Status
<table>
<tr><td colspan="7">Spare</td><td>OBDII MIL Status

0 – Off
1 – On</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>6</td><td>Spare</td></tr>
<tr><td>7</td><td>Spare</td></tr>
<tr><td>8</td><td>Spare</td></tr>
<tr><td>9</td><td>Spare</td></tr>
<tr><td>10</td><td>Spare</td></tr>
<tr><td>11</td><td>Spare</td></tr>
</table>

2.7.10 *Calibration Data Snap Shot (Current Odometer)*

Byte	Description
0	Module 4 - Calibration Data Snap Shot
1	Length of module - 6
2	
3	Spare
4	Spare
5-8	Current Odometer

2.7.11 *GPS Location Stamp*

Byte	Description
0	Module 6 - GPS Location Stamp

1	Length of module - 19
2	
3	HDOP
4	Mode 1 (from GPS)
5	Mode 2 (from GPS)
6	Number of satellites used (from GPS)
7	Longitude
8	
9	
10	
11	Latitude
12	
13	
14	
15	Altitude
16	
17	
18	
19	Ground speed (km/h)
20	Speed direction (true course)
21	

Refer to Sections 2.2.3.21 until 2.2.3.26 for more details about fields' data formats.

2.7.12 *GPS Time Stamp*

Byte	Description
0	Module 7 – GPS Time Stamp
1	Length of module - 7
2	
3	Validity of time / GPS Fix (valid - 1 /invalid - 0)

4	System time – seconds
5	System time – minutes
6	System time – hours
7	System date – day
8	System date – month
9	System date – year (-2000)

2.7.13 *Firmware ID*

Byte	Description
0	Module 8 - FW ID
1	Length of module - 6
2	
3	Bits 0-3: Active cellular technology 0 – Unknown 1 – Reserved 2 – 2G 3 – 3G 4 – 4G (LTE CAT-1) 5 - LTE CAT-M1 6 - LTE NB1-IoT 7-14 – Reserved 15 – Satellite link Bits 4-5: Hub kind 0 – Cellocator hub 1 – Android based hub 2 – iOS based hub 3 - Reserved Bits 6-7: Spare
4	Type 11 Protocol ID 1 - For legacy protocol

	2 - For Protocol Version 2 (FCAM/SG File Numerator numerator added to Module 68)
5	FW Version ID (example: 33)
6	FW Sub-Version ID (example: 1 for a)
7	HW ID (example: 20)
8	Spare

2.7.14 *ACK/NACK*

Byte	Description
0	Module 9 – ACK/NACK
1	Length of module – 3
2	
3	0 - ACK 1 - NACK
4	NACK Code (decimal) 0 - General NACK 3 - Download commands received after completion was already performed 32 - Establishment failed due to incompatible platform 64 - CRC-32 test failed 70 - Exceeded Number of Failed Feature Authentication Attempts (the unit will ignore Feature Authentication command for the next hour) 71 - Feature Authentication Code Discrepancy 241- Busy, cannot perform the action at the moment 242- Unspecified re-flashing error
5	Spare

2.7.15 *Configuration Memory Write Response*

Byte	Description
0	Module 10 – Configuration Memory Write Response
1	Length of module – Variable

2	
3	Numerator
4	
5	Number of instances ACK
6	Instance 1 action status 0 - OK 1 - Write Error
7	Instance 2 action status 0 - OK 1 - Write Error
	…

2.7.16 *Configuration Memory Read Response*

Byte	Description	
0	Module 11 – Configuration Memory Read Response	
1	Length of module – Variable	
2		
3	Numerator	
4		
5	Number of Instances	
6	Memory type – 0 / 6 (Driver ID table)	
7	Memory entry unit type 0 – Bit 1 – Byte 2 – Word (16 bits) 3 – Double Word (32 bits) (Only Byte entry unit type is currently supported)	Instance 1
8	Address in the configuration memory space	
9		
10		
11		

12	Number of Entries	
13		
…	Data Payload	
…	…	Instance 2
…	…	
…	…	

2.7.17 *CAN-GPS Speed Calibration Status*

Byte	Description
0	Module 12 – CAN-GPS Speed Calibration Status
1	Length of module – 39
2	
3	Spare
4	Spare
5	CAN-GPS Calibration Status 0 – CAN-GPS calibration started 1 – CAN-GPS calibration accomplished 2 – CAN-GPS calibration error 3 – CAN-GPS calibration status unknown
6-7	0-10km/h CAN-GPS Conversion (1/1000)
8-9	11-20 km/h CAN-GPS Conversion (1/1000)
10-11	21-30 km/h CAN-GPS Conversion (1/1000)
12-13	31-40 km/h CAN-GPS Conversion (1/1000)
14-15	41-50 km/h CAN-GPS Conversion (1/1000)
16-17	51-60 km/h CAN-GPS Conversion (1/1000)
18-19	61-70 km/h CAN-GPS Conversion (1/1000)
20-21	71-80 km/h CAN-GPS Conversion (1/1000)
22-23	81-90 km/h CAN-GPS Conversion (1/1000)
24-25	91-100 km/h CAN-GPS Conversion (1/1000)
26-27	101-110 km/h CAN-GPS Conversion (1/1000)

28-29	111-120 km/h CAN-GPS Conversion (1/1000)
30-31	121-130 km/h CAN-GPS Conversion (1/1000)
32-33	131-140 km/h CAN-GPS Conversion (1/1000)
34-35	141-150 km/h CAN-GPS Conversion (1/1000)
36-37	151-160 km/h CAN-GPS Conversion (1/1000)
38-39	161-170 km/h CAN-GPS Conversion (1/1000)
40-41	171-180 km/h CAN-GPS Conversion (1/1000)

2.7.18 *Authenticated Features Query Response*

This module enables sending features bitmaps upon receiving Authenticated Features Query Command (module 13).

This module shall be sent with mandatory module 8 (FW ID).

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>0</td><td>Module 13 – Authenticated Features Query Response</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – 21</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Spare</td></tr>
<tr><td>4</td><td>Spare</td></tr>
<tr><td>5</td><td>Authenticated Features Matrix Byte 0
<table>
<tr><td>Obs.</td><td>Obs.</td><td>Obs.</td><td>Obs.</td><td>Obs.</td><td>Obs.</td><td>Obs.</td><td>Obs.</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>6</td><td>Authenticated Features Matrix Byte 1
<table>
<tr><td>Obs.</td><td>Obs.</td><td>Obs.</td><td>Obs.</td><td>Obs.</td><td>PointerCept
0 - Inactive
1 - Active</td><td>Obs.</td><td>Obs.</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>7</td><td>Authenticated Features Matrix Byte 2<table>
<tr><td>Spare</td><td>Spare</td><td>Spare</td><td>Spare</td><td>Spare</td><td>Spare</td><td>Basic Driver Behavior
0 - Inactive
1 - Active</td><td>TDLT
0 - Inactive
1 - Active</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>8</td><td>Authenticated Features Matrix Byte 3</td></tr>
<tr><td>9</td><td>Authenticated Features Matrix Byte 4</td></tr>
<tr><td>10</td><td>Authenticated Features Matrix Byte 5</td></tr>
<tr><td>11</td><td>Authenticated Features Matrix Byte 6</td></tr>
<tr><td>12</td><td>Authenticated Features Matrix Byte 7</td></tr>
<tr><td>13</td><td>Authenticated Features Matrix Byte 8</td></tr>
<tr><td>14</td><td>Authenticated Features Matrix Byte 9</td></tr>
<tr><td>15</td><td>Authenticated Features Matrix Byte 10</td></tr>
<tr><td>16</td><td>Authenticated Features Matrix Byte 11</td></tr>
<tr><td>17</td><td>Authenticated Features Matrix Byte 12</td></tr>
<tr><td>18</td><td>Authenticated Features Matrix Byte 13</td></tr>
<tr><td>19</td><td>Authenticated Features Matrix Byte 14</td></tr>
<tr><td>20</td><td>Spare</td></tr>
<tr><td>21</td><td>Spare</td></tr>
<tr><td>22</td><td>Spare</td></tr>
<tr><td>23</td><td>Spare</td></tr>
</table>

2.7.19 *CAN Supported Standard Parameters*

This module enables to send a list of CAN standard parameters, supported for each ECU in the current vehicle. The unit queries the CAN bus for supported standard parameters after every Ignition On, and the results are kept in the unit memory. After receiving a General Module Query (Type 11, Module 29, Inbound), the unit will reply with this module. If there are no valid results in the unit memory upon receiving the General Module Query, the unit will reply with this module, with ECU Amount (Byte 5) = 0.

Byte	Description

<table>
<tr><td>0</td><td>Module 17 – CAN Supported Standard Parameters</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – 141</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Spare</td></tr>
<tr><td>4</td><td>Bits 0-3: CAN Bus Baud Rate
0 - Not Detected
1 - 125 Kbps
2 - 250 Kpbs
3 - 500 Kbps
Bit 4: Bus connected
0 - Disconnected (ignore values like bus rate, ECU# etc.)
1 – Connected
Bits 5-7: Reserved</td></tr>
<tr><td>5</td><td>ECU Amount (0 if there were no valid results received from the bus)</td></tr>
<tr><td>6</td><td>ECU 1 Arbitration ID lower 8 bits (CAN)</td></tr>
<tr><td>7</td><td>ECU 2 Arbitration ID lower 8 bits (CAN)</td></tr>
<tr><td>8</td><td>ECU 3 Arbitration ID lower 8 bits (CAN)</td></tr>
<tr><td>9</td><td>ECU 4 Arbitration ID lower 8 bits (CAN)</td></tr>
<tr><td>10</td><td>Spare</td></tr>
<tr><td>11</td><td>Vehicle Protocol

0 - Not detected
1 - CAN 11bit
2 - CAN 29bit</td></tr>
<tr><td>12</td><td>Spare</td></tr>
<tr><td>13</td><td>Spare</td></tr>
<tr><td>14</td><td>Spare</td></tr>
<tr><td>15</td><td>Spare</td></tr>
<tr><td>16</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported)

<table>
<tr><td>PID 0x08</td><td>PID 0x07</td><td>PID 0x06</td><td>PID 0x05</td><td>PID 0x04</td><td>PID 0x03</td><td>PID 0x02</td><td>PID 0x01</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td></tr>
<tr><td>17</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x09-0x10 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x10</td><td>PID 0x0F</td><td>PID 0x0E</td><td>PID 0x0D</td><td>PID 0x0C</td><td>PID 0x0B</td><td>PID 0x0A</td><td>PID 0x09</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table></td></tr>
<tr><td>18</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x11-0x18 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x18</td><td>PID 0x17</td><td>PID 0x16</td><td>PID 0x15</td><td>PID 0x14</td><td>PID 0x13</td><td>PID 0x12</td><td>PID 0x11</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table></td></tr>
<tr><td>19</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x19-0x20 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x20</td><td>PID 0x1F</td><td>PID 0x1E</td><td>PID 0x1D</td><td>PID 0x1C</td><td>PID 0x1B</td><td>PID 0x1A</td><td>PID 0x19</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table></td></tr>
<tr><td>20</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x21-0x28 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x28</td><td>PID 0x27</td><td>PID 0x26</td><td>PID 0x25</td><td>PID 0x24</td><td>PID 0x23</td><td>PID 0x22</td><td>PID 0x21</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table></td></tr>
<tr><td>21</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x29-0x30 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x30</td><td>PID 0x2F</td><td>PID 0x2E</td><td>PID 0x2D</td><td>PID 0x2C</td><td>PID 0x2B</td><td>PID 0x2A</td><td>PID 0x29</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td></tr>
<tr><td>22</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x31-0x38 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x38</td><td>PID 0x37</td><td>PID 0x36</td><td>PID 0x35</td><td>PID 0x34</td><td>PID 0x33</td><td>PID 0x32</td><td>PID 0x31</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table></td></tr>
<tr><td>23</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x39-0x40 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x40</td><td>PID 0x3F</td><td>PID 0x3E</td><td>PID 0x3D</td><td>PID 0x3C</td><td>PID 0x3B</td><td>PID 0x3A</td><td>PID 0x39</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table></td></tr>
<tr><td>24</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x41-0x48 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x48</td><td>PID 0x47</td><td>PID 0x46</td><td>PID 0x45</td><td>PID 0x44</td><td>PID 0x43</td><td>PID 0x42</td><td>PID 0x41</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table></td></tr>
<tr><td>25</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x49-0x50 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x50</td><td>PID 0x4F</td><td>PID 0x4E</td><td>PID 0x4D</td><td>PID 0x4C</td><td>PID 0x4B</td><td>PID 0x4A</td><td>PID 0x49</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
</table></td></tr>
<tr><td>26</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x51-0x58 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x58</td><td>PID 0x57</td><td>PID 0x56</td><td>PID 0x55</td><td>PID 0x54</td><td>PID 0x53</td><td>PID 0x52</td><td>PID 0x51</td></tr>
</table></td></tr>
</table>

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
27	ECU 1, SID 0x01 Supported Standard Parameters 0x59-0x60 (0 - Not Supported, 1 - Supported)							
	PID 0x60	PID 0x5F	PID 0x5E	PID 0x5D	PID 0x5C	PID 0x5B	PID 0x5A	PID 0x59
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
28	ECU 1, SID 0x01 Supported Standard Parameters 0x61-0x68 (0 - Not Supported, 1 - Supported)							
	PID 0x68	PID 0x67	PID 0x66	PID 0x65	PID 0x64	PID 0x63	PID 0x62	PID 0x61
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
29	ECU 1, SID 0x01 Supported Standard Parameters 0x69-0x70 (0 - Not Supported, 1 - Supported)							
	PID 0x70	PID 0x6F	PID 0x6E	PID 0x6D	PID 0x6C	PID 0x6B	PID 0x6A	PID 0x69
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
30	ECU 1, SID 0x01 Supported Standard Parameters 0x71-0x78 (0 - Not Supported, 1 - Supported)							
	PID 0x78	PID 0x77	PID 0x76	PID 0x75	PID 0x74	PID 0x73	PID 0x72	PID 0x71
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
31	ECU 1, SID 0x01 Supported Standard Parameters 0x79-0x80 (0 - Not Supported, 1 - Supported)							
	PID 0x80	PID 0x7F	PID 0x7E	PID 0x7D	PID 0x7C	PID 0x7B	PID 0x7A	PID 0x79

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
32	ECU 1, SID 0x01 Supported Standard Parameters 0x81-0x88 (0 - Not Supported, 1 - Supported)							
	PID 0x88	PID 0x87	PID 0x86	PID 0x85	PID 0x84	PID 0x83	PID 0x82	PID 0x81
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
33	ECU 1, SID 0x01 Supported Standard Parameters 0x89-0x90 (0 - Not Supported, 1 - Supported)							
	PID 0x90	PID 0x8F	PID 0x8E	PID 0x8D	PID 0x8C	PID 0x8B	PID 0x8A	PID 0x89
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
34	ECU 1, SID 0x01 Supported Standard Parameters 0x91-0x98 (0 - Not Supported, 1 - Supported)							
	PID 0x98	PID 0x97	PID 0x96	PID 0x95	PID 0x94	PID 0x93	PID 0x92	PID 0x91
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
35	ECU 1, SID 0x01 Supported Standard Parameters 0x99-0xA0 (0 - Not Supported, 1 - Supported)							
	PID 0xA0	PID 0x9F	PID 0x9E	PID 0x9D	PID 0x9C	PID 0x9B	PID 0x9A	PID 0x99
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
36	ECU 1, SID 0x01 Supported Standard Parameters 0xA1-0xA8 (0 - Not Supported, 1 - Supported)							
	PID 0xA8	PID 0xA7	PID 0xA6	PID 0xA5	PID 0xA4	PID 0xA3	PID 0xA2	PID 0xA1
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0

<table>
<tr><td></td><td></td></tr>
<tr><td>37</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0xA9-0xB0 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0xB0</td><td>PID 0xAF</td><td>PID 0xAE</td><td>PID 0xAD</td><td>PID 0xAC</td><td>PID 0xAB</td><td>PID 0xAA</td><td>PID 0xA9</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>38</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0xB1-0xB8 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0xB8</td><td>PID 0xB7</td><td>PID 0xB6</td><td>PID 0xB5</td><td>PID 0xB4</td><td>PID 0xB3</td><td>PID 0xB2</td><td>PID 0xB1</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>39</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0xB9-0xC0 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0xC0</td><td>PID 0xBF</td><td>PID 0xBE</td><td>PID 0xBD</td><td>PID 0xBC</td><td>PID 0xBB</td><td>PID 0xBA</td><td>PID 0xB9</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>40</td><td>Spare</td></tr>
<tr><td>41</td><td>Spare</td></tr>
<tr><td>42</td><td>ECU 1, SID 0x09 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0x08</td><td>PID 0x07</td><td>PID 0x06</td><td>PID 0x05</td><td>PID 0x04</td><td>PID 0x03</td><td>PID 0x02</td><td>PID 0x01</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
</table>

<table>
<tr><td>43</td><td>ECU 1, SID 0x09 Supported Standard Parameters 0x09-0x10 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x10</td><td>PID 0x0F</td><td>PID 0x0E</td><td>PID 0x0D</td><td>PID 0x0C</td><td>PID 0x0B</td><td>PID 0x0A</td><td>PID 0x09</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>44</td><td>ECU 1, SID 0x09 Supported Standard Parameters 0x11-0x18 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x18</td><td>PID 0x17</td><td>PID 0x16</td><td>PID 0x15</td><td>PID 0x14</td><td>PID 0x13</td><td>PID 0x12</td><td>PID 0x11</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>45</td><td>ECU 1, SID 0x09 Supported Standard Parameters 0x19-0x20 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x20</td><td>PID 0x1F</td><td>PID 0x1E</td><td>PID 0x1D</td><td>PID 0x1C</td><td>PID 0x1B</td><td>PID 0x1A</td><td>PID 0x19</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>46</td><td>Spare</td></tr>
<tr><td>47</td><td>Spare</td></tr>
<tr><td>48</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x08</td><td>PID 0x07</td><td>PID 0x06</td><td>PID 0x05</td><td>PID 0x04</td><td>PID 0x03</td><td>PID 0x02</td><td>PID 0x01</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>49</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x09-0x10 (0 - Not Supported, 1 - Supported)

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	PID 0x40	PID 0x3F	PID 0x3E	PID 0x3D	PID 0x3C	PID 0x3B	PID 0x3A	PID 0x39
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56	ECU 2, SID 0x01 Supported Standard Parameters 0x41-0x48 (0 - Not Supported, 1 - Supported)							
	PID 0x48	PID 0x47	PID 0x46	PID 0x45	PID 0x44	PID 0x43	PID 0x42	PID 0x41
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
57	ECU 2, SID 0x01 Supported Standard Parameters 0x49-0x50 (0 - Not Supported, 1 - Supported)							
	PID 0x50	PID 0x4F	PID 0x4E	PID 0x4D	PID 0x4C	PID 0x4B	PID 0x4A	PID 0x49
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
58	ECU 2, SID 0x01 Supported Standard Parameters 0x51-0x58 (0 - Not Supported, 1 - Supported)							
	PID 0x58	PID 0x57	PID 0x56	PID 0x55	PID 0x54	PID 0x53	PID 0x52	PID 0x51
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
59	ECU 2, SID 0x01 Supported Standard Parameters 0x59-0x60 (0 - Not Supported, 1 - Supported)							
	PID 0x60	PID 0x5F	PID 0x5E	PID 0x5D	PID 0x5C	PID 0x5B	PID 0x5A	PID 0x59
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
60	ECU 2, SID 0x01 Supported Standard Parameters 0x61-0x68 (0 - Not Supported, 1 - Supported)							
	PID 0x68	PID 0x67	PID 0x66	PID 0x65	PID 0x64	PID 0x63	PID 0x62	PID 0x61
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0

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<tr><td>97</td><td>ECU 3, SID 0x01 Supported Standard Parameters 0x89-0x90 (0 - Not Supported, 1 - Supported)

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<tr><td>119</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x39-0x40 (0 - Not Supported, 1 - Supported)

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<tr><td>122</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x51-0x58 (0 - Not Supported, 1 - Supported)

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<tr><td>137</td><td>Spare</td></tr>
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<tr><td>141</td><td>ECU 4, SID 0x09 Supported Standard Parameters 0x19-0x20 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0x20</td><td>PID 0x1F</td><td>PID 0x1E</td><td>PID 0x1D</td><td>PID 0x1C</td><td>PID 0x1B</td><td>PID 0x1A</td><td>PID 0x19</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>142</td><td>Spare</td></tr>
<tr><td>143</td><td>Spare</td></tr>
</table>

2.7.20 *K-Line Supported Standard Parameters*

This module enables to send a list of K-Line standard parameters, supported for each ECU in the current vehicle. The unit queries the K-Line bus for supported standard parameters after every Ignition On, and the results are kept in the unit memory. After receiving a General Module Query (Type 11, Module 29, Inbound), the unit will reply with this module. If there are no valid results in the unit memory upon receiving the General Module Query, the unit will reply with this module, with ECU Amount (Byte 5) = 0.

Byte	Description
0	Module 18 – K-Line Supported Standard Parameters
1	Length of module – 141
2	
3	Spare
4	Spare
5	ECU Amount (0 if there were no valid results received from the bus)
6	ECU 1 Arbitration ID lower 8 bits (CAN)/Source Address (K-Line)
7	ECU 2 Arbitration ID lower 8 bits (CAN)/Source Address (K-Line)
8	ECU 3 Arbitration ID lower 8 bits (CAN)/Source Address (K-Line)
9	ECU 4 Arbitration ID lower 8 bits (CAN)/Source Address (K-Line)

<table>
<tr><td>10</td><td>Spare</td></tr>
<tr><td>11</td><td>Bits 0-2:Vehicle Protocol
0 - Not detected
1 - K-Line ISO 9141
2 - K-Line ISO 14230 slow
3 - K-Line ISO 14230 fast
Bit 3: Bus connected
0 - Disconnected (ignore values like bus rate, ECU# etc.)
1 – Connected
Bits 4-7: Reserved</td></tr>
<tr><td>12</td><td>Spare</td></tr>
<tr><td>13</td><td>KW1</td></tr>
<tr><td>14</td><td>KW2</td></tr>
<tr><td>15</td><td>Spare</td></tr>
<tr><td>16</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0x08</td><td>PID 0x07</td><td>PID 0x06</td><td>PID 0x05</td><td>PID 0x04</td><td>PID 0x03</td><td>PID 0x02</td><td>PID 0x01</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>17</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x09-0x10 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0x10</td><td>PID 0x0F</td><td>PID 0x0E</td><td>PID 0x0D</td><td>PID 0x0C</td><td>PID 0x0B</td><td>PID 0x0A</td><td>PID 0x09</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>18</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x11-0x18 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0x18</td><td>PID 0x17</td><td>PID 0x16</td><td>PID 0x15</td><td>PID 0x14</td><td>PID 0x13</td><td>PID 0x12</td><td>PID 0x11</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<table>
<tr><td>19</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x19-0x20 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x20</td><td>PID 0x1F</td><td>PID 0x1E</td><td>PID 0x1D</td><td>PID 0x1C</td><td>PID 0x1B</td><td>PID 0x1A</td><td>PID 0x19</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>20</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x21-0x28 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x28</td><td>PID 0x27</td><td>PID 0x26</td><td>PID 0x25</td><td>PID 0x24</td><td>PID 0x23</td><td>PID 0x22</td><td>PID 0x21</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>21</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x29-0x30 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x30</td><td>PID 0x2F</td><td>PID 0x2E</td><td>PID 0x2D</td><td>PID 0x2C</td><td>PID 0x2B</td><td>PID 0x2A</td><td>PID 0x29</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>22</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x31-0x38 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x38</td><td>PID 0x37</td><td>PID 0x36</td><td>PID 0x35</td><td>PID 0x34</td><td>PID 0x33</td><td>PID 0x32</td><td>PID 0x31</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>23</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x39-0x40 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x40</td><td>PID 0x3F</td><td>PID 0x3E</td><td>PID 0x3D</td><td>PID 0x3C</td><td>PID 0x3B</td><td>PID 0x3A</td><td>PID 0x39</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<table>
<tr><td>24</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x41-0x48 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x48</td><td>PID 0x47</td><td>PID 0x46</td><td>PID 0x45</td><td>PID 0x44</td><td>PID 0x43</td><td>PID 0x42</td><td>PID 0x41</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>25</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x49-0x50 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x50</td><td>PID 0x4F</td><td>PID 0x4E</td><td>PID 0x4D</td><td>PID 0x4C</td><td>PID 0x4B</td><td>PID 0x4A</td><td>PID 0x49</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>26</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x51-0x58 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x58</td><td>PID 0x57</td><td>PID 0x56</td><td>PID 0x55</td><td>PID 0x54</td><td>PID 0x53</td><td>PID 0x52</td><td>PID 0x51</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>27</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x59-0x60 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x60</td><td>PID 0x5F</td><td>PID 0x5E</td><td>PID 0x5D</td><td>PID 0x5C</td><td>PID 0x5B</td><td>PID 0x5A</td><td>PID 0x59</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>28</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x61-0x68 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x68</td><td>PID 0x67</td><td>PID 0x66</td><td>PID 0x65</td><td>PID 0x64</td><td>PID 0x63</td><td>PID 0x62</td><td>PID 0x61</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<table>
<tr><td>29</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x69-0x70 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x70</td><td>PID 0x6F</td><td>PID 0x6E</td><td>PID 0x6D</td><td>PID 0x6C</td><td>PID 0x6B</td><td>PID 0x6A</td><td>PID 0x69</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>30</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x71-0x78 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x78</td><td>PID 0x77</td><td>PID 0x76</td><td>PID 0x75</td><td>PID 0x74</td><td>PID 0x73</td><td>PID 0x72</td><td>PID 0x71</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>31</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x79-0x80 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x80</td><td>PID 0x7F</td><td>PID 0x7E</td><td>PID 0x7D</td><td>PID 0x7C</td><td>PID 0x7B</td><td>PID 0x7A</td><td>PID 0x79</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>32</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x81-0x88 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x88</td><td>PID 0x87</td><td>PID 0x86</td><td>PID 0x85</td><td>PID 0x84</td><td>PID 0x83</td><td>PID 0x82</td><td>PID 0x81</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>33</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x89-0x90 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x90</td><td>PID 0x8F</td><td>PID 0x8E</td><td>PID 0x8D</td><td>PID 0x8C</td><td>PID 0x8B</td><td>PID 0x8A</td><td>PID 0x89</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<table>
<tr><td>34</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x91-0x98 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x98</td><td>PID 0x97</td><td>PID 0x96</td><td>PID 0x95</td><td>PID 0x94</td><td>PID 0x93</td><td>PID 0x92</td><td>PID 0x91</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>35</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0x99-0xA0 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0xA0</td><td>PID 0x9F</td><td>PID 0x9E</td><td>PID 0x9D</td><td>PID 0x9C</td><td>PID 0x9B</td><td>PID 0x9A</td><td>PID 0x99</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>36</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0xA1-0xA8 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0xA8</td><td>PID 0xA7</td><td>PID 0xA6</td><td>PID 0xA5</td><td>PID 0xA4</td><td>PID 0xA3</td><td>PID 0xA2</td><td>PID 0xA1</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>37</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0xA9-0xB0 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0xB0</td><td>PID 0xAF</td><td>PID 0xAE</td><td>PID 0xAD</td><td>PID 0xAC</td><td>PID 0xAB</td><td>PID 0xAA</td><td>PID 0xA9</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>38</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0xB1-0xB8 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0xB8</td><td>PID 0xB7</td><td>PID 0xB6</td><td>PID 0xB5</td><td>PID 0xB4</td><td>PID 0xB3</td><td>PID 0xB2</td><td>PID 0xB1</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<tr><td>39</td><td>ECU 1, SID 0x01 Supported Standard Parameters 0xB9-0xC0 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0xC0</td><td>PID 0xBF</td><td>PID 0xBE</td><td>PID 0xBD</td><td>PID 0xBC</td><td>PID 0xBB</td><td>PID 0xBA</td><td>PID 0xB9</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>40</td><td>Spare</td></tr>
<tr><td>41</td><td>Spare</td></tr>
<tr><td>42</td><td>ECU 1, SID 0x09 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x08</td><td>PID 0x07</td><td>PID 0x06</td><td>PID 0x05</td><td>PID 0x04</td><td>PID 0x03</td><td>PID 0x02</td><td>PID 0x01</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>43</td><td>ECU 1, SID 0x09 Supported Standard Parameters 0x09-0x10 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x10</td><td>PID 0x0F</td><td>PID 0x0E</td><td>PID 0x0D</td><td>PID 0x0C</td><td>PID 0x0B</td><td>PID 0x0A</td><td>PID 0x09</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>44</td><td>ECU 1, SID 0x09 Supported Standard Parameters 0x11-0x18 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x18</td><td>PID 0x17</td><td>PID 0x16</td><td>PID 0x15</td><td>PID 0x14</td><td>PID 0x13</td><td>PID 0x12</td><td>PID 0x11</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>45</td><td>ECU 1, SID 0x09 Supported Standard Parameters 0x19-0x20 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x20</td><td>PID 0x1F</td><td>PID 0x1E</td><td>PID 0x1D</td><td>PID 0x1C</td><td>PID 0x1B</td><td>PID 0x1A</td><td>PID 0x19</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
</table>

<table>
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<tr><td>47</td><td>Spare</td></tr>
<tr><td>48</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x08</td><td>PID 0x07</td><td>PID 0x06</td><td>PID 0x05</td><td>PID 0x04</td><td>PID 0x03</td><td>PID 0x02</td><td>PID 0x01</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>49</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x09-0x10 (0 - Not Supported, 1 - Supported)

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<tr><td>51</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x19-0x20 (0 - Not Supported, 1 - Supported)

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<tr><td>52</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x21-0x28 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x28</td><td>PID 0x27</td><td>PID 0x26</td><td>PID 0x25</td><td>PID 0x24</td><td>PID 0x23</td><td>PID 0x22</td><td>PID 0x21</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<tr><td>53</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x29-0x30 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x30</td><td>PID 0x2F</td><td>PID 0x2E</td><td>PID 0x2D</td><td>PID 0x2C</td><td>PID 0x2B</td><td>PID 0x2A</td><td>PID 0x29</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>54</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x31-0x38 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x38</td><td>PID 0x37</td><td>PID 0x36</td><td>PID 0x35</td><td>PID 0x34</td><td>PID 0x33</td><td>PID 0x32</td><td>PID 0x31</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>55</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x39-0x40 (0 - Not Supported, 1 - Supported)

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<tr><td>56</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x41-0x48 (0 - Not Supported, 1 - Supported)

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<tr><td>61</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x69-0x70 (0 - Not Supported, 1 - Supported)

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<tr><td>62</td><td>ECU 2, SID 0x01 Supported Standard Parameters 0x71-0x78 (0 - Not Supported, 1 - Supported)

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<tr><td>73</td><td>Spare</td></tr>
<tr><td>74</td><td>ECU 2, SID 0x09 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported)

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<tr><td>100</td><td>ECU 3, SID 0x01 Supported Standard Parameters 0xA1-0xA8 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0xA8</td><td>PID 0xA7</td><td>PID 0xA6</td><td>PID 0xA5</td><td>PID 0xA4</td><td>PID 0xA3</td><td>PID 0xA2</td><td>PID 0xA1</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>101</td><td>ECU 3, SID 0x01 Supported Standard Parameters 0xA9-0xB0 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0xB0</td><td>PID 0xAF</td><td>PID 0xAE</td><td>PID 0xAD</td><td>PID 0xAC</td><td>PID 0xAB</td><td>PID 0xAA</td><td>PID 0xA9</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<tr><td>102</td><td>ECU 3, SID 0x01 Supported Standard Parameters 0xB1-0xB8 (0 - Not Supported, 1 - Supported)

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<tr><td>103</td><td>ECU 3, SID 0x01 Supported Standard Parameters 0xB9-0xC0 (0 - Not Supported, 1 - Supported)

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<tr><td>104</td><td>Spare</td></tr>
<tr><td>105</td><td>Spare</td></tr>
<tr><td>106</td><td>ECU 3, SID 0x09 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x08</td><td>PID 0x07</td><td>PID 0x06</td><td>PID 0x05</td><td>PID 0x04</td><td>PID 0x03</td><td>PID 0x02</td><td>PID 0x01</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>107</td><td>ECU 3, SID 0x09 Supported Standard Parameters 0x09-0x10 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x10</td><td>PID 0x0F</td><td>PID 0x0E</td><td>PID 0x0D</td><td>PID 0x0C</td><td>PID 0x0B</td><td>PID 0x0A</td><td>PID 0x09</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>108</td><td>ECU 3, SID 0x09 Supported Standard Parameters 0x11-0x18 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x18</td><td>PID 0x17</td><td>PID 0x16</td><td>PID 0x15</td><td>PID 0x14</td><td>PID 0x13</td><td>PID 0x12</td><td>PID 0x11</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<tr><td>109</td><td>ECU 3, SID 0x09 Supported Standard Parameters 0x19-0x20 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0x20</td><td>PID 0x1F</td><td>PID 0x1E</td><td>PID 0x1D</td><td>PID 0x1C</td><td>PID 0x1B</td><td>PID 0x1A</td><td>PID 0x19</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>110</td><td>Spare</td></tr>
<tr><td>111</td><td>Spare</td></tr>
<tr><td>112</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported)
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<tr><td>113</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x09-0x10 (0 - Not Supported, 1 - Supported)
<table><tr><td>PID 0x10</td><td>PID 0x0F</td><td>PID 0x0E</td><td>PID 0x0D</td><td>PID 0x0C</td><td>PID 0x0B</td><td>PID 0x0A</td><td>PID 0x09</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>114</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x11-0x18 (0 - Not Supported, 1 - Supported)
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<tr><td>116</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x21-0x28 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x28</td><td>PID 0x27</td><td>PID 0x26</td><td>PID 0x25</td><td>PID 0x24</td><td>PID 0x23</td><td>PID 0x22</td><td>PID 0x21</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>117</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x29-0x30 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x30</td><td>PID 0x2F</td><td>PID 0x2E</td><td>PID 0x2D</td><td>PID 0x2C</td><td>PID 0x2B</td><td>PID 0x2A</td><td>PID 0x29</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>118</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x31-0x38 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0x38</td><td>PID 0x37</td><td>PID 0x36</td><td>PID 0x35</td><td>PID 0x34</td><td>PID 0x33</td><td>PID 0x32</td><td>PID 0x31</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>119</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x39-0x40 (0 - Not Supported, 1 - Supported)

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<tr><td>120</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x41-0x48 (0 - Not Supported, 1 - Supported)</td></tr>
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	PID 0x48	PID 0x47	PID 0x46	PID 0x45	PID 0x44	PID 0x43	PID 0x42	PID 0x41
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
121	ECU 4, SID 0x01 Supported Standard Parameters 0x49-0x50 (0 - Not Supported, 1 - Supported)							
	PID 0x50	PID 0x4F	PID 0x4E	PID 0x4D	PID 0x4C	PID 0x4B	PID 0x4A	PID 0x49
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
122	ECU 4, SID 0x01 Supported Standard Parameters 0x51-0x58 (0 - Not Supported, 1 - Supported)							
	PID 0x58	PID 0x57	PID 0x56	PID 0x55	PID 0x54	PID 0x53	PID 0x52	PID 0x51
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
123	ECU 4, SID 0x01 Supported Standard Parameters 0x59-0x60 (0 - Not Supported, 1 - Supported)							
	PID 0x60	PID 0x5F	PID 0x5E	PID 0x5D	PID 0x5C	PID 0x5B	PID 0x5A	PID 0x59
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
124	ECU 4, SID 0x01 Supported Standard Parameters 0x61-0x68 (0 - Not Supported, 1 - Supported)							
	PID 0x68	PID 0x67	PID 0x66	PID 0x65	PID 0x64	PID 0x63	PID 0x62	PID 0x61
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
125	ECU 4, SID 0x01 Supported Standard Parameters 0x69-0x70 (0 - Not Supported, 1 - Supported)							
	PID 0x70	PID 0x6F	PID 0x6E	PID 0x6D	PID 0x6C	PID 0x6B	PID 0x6A	PID 0x69
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0

<table>
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<tr><td>126</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x71-0x78 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x78</td><td>PID 0x77</td><td>PID 0x76</td><td>PID 0x75</td><td>PID 0x74</td><td>PID 0x73</td><td>PID 0x72</td><td>PID 0x71</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
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<tr><td>127</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x79-0x80 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x80</td><td>PID 0x7F</td><td>PID 0x7E</td><td>PID 0x7D</td><td>PID 0x7C</td><td>PID 0x7B</td><td>PID 0x7A</td><td>PID 0x79</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
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<tr><td>128</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x81-0x88 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x88</td><td>PID 0x87</td><td>PID 0x86</td><td>PID 0x85</td><td>PID 0x84</td><td>PID 0x83</td><td>PID 0x82</td><td>PID 0x81</td></tr>
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<tr><td>129</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0x89-0x90 (0 - Not Supported, 1 - Supported)
<table>
<tr><td>PID 0x90</td><td>PID 0x8F</td><td>PID 0x8E</td><td>PID 0x8D</td><td>PID 0x8C</td><td>PID 0x8B</td><td>PID 0x8A</td><td>PID 0x89</td></tr>
<tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr>
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<table><tr><td>PID 0x98</td><td>PID 0x97</td><td>PID 0x96</td><td>PID 0x95</td><td>PID 0x94</td><td>PID 0x93</td><td>PID 0x92</td><td>PID 0x91</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<tr><td>132</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0xA1-0xA8 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0xA8</td><td>PID 0xA7</td><td>PID 0xA6</td><td>PID 0xA5</td><td>PID 0xA4</td><td>PID 0xA3</td><td>PID 0xA2</td><td>PID 0xA1</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
<tr><td>133</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0xA9-0xB0 (0 - Not Supported, 1 - Supported)

<table><tr><td>PID 0xB0</td><td>PID 0xAF</td><td>PID 0xAE</td><td>PID 0xAD</td><td>PID 0xAC</td><td>PID 0xAB</td><td>PID 0xAA</td><td>PID 0xA9</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table></td></tr>
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<tr><td>135</td><td>ECU 4, SID 0x01 Supported Standard Parameters 0xB9-0xC0 (0 - Not Supported, 1 - Supported)</td></tr>
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136	Spare
137	Spare
138	ECU 4, SID 0x09 Supported Standard Parameters 0x01-0x08 (0 - Not Supported, 1 - Supported) <table><tr><td>PID 0x08</td><td>PID 0x07</td><td>PID 0x06</td><td>PID 0x05</td><td>PID 0x04</td><td>PID 0x03</td><td>PID 0x02</td><td>PID 0x01</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table>
139	ECU 4, SID 0x09 Supported Standard Parameters 0x09-0x10 (0 - Not Supported, 1 - Supported) <table><tr><td>PID 0x10</td><td>PID 0x0F</td><td>PID 0x0E</td><td>PID 0x0D</td><td>PID 0x0C</td><td>PID 0x0B</td><td>PID 0x0A</td><td>PID 0x09</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table>
140	ECU 4, SID 0x09 Supported Standard Parameters 0x11-0x18 (0 - Not Supported, 1 - Supported) <table><tr><td>PID 0x18</td><td>PID 0x17</td><td>PID 0x16</td><td>PID 0x15</td><td>PID 0x14</td><td>PID 0x13</td><td>PID 0x12</td><td>PID 0x11</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table>
141	ECU 4, SID 0x09 Supported Standard Parameters 0x19-0x20 (0 - Not Supported, 1 - Supported) <table><tr><td>PID 0x20</td><td>PID 0x1F</td><td>PID 0x1E</td><td>PID 0x1D</td><td>PID 0x1C</td><td>PID 0x1B</td><td>PID 0x1A</td><td>PID 0x19</td></tr><tr><td>bit 7</td><td>bit 6</td><td>bit 5</td><td>bit 4</td><td>bit 3</td><td>bit 2</td><td>bit 1</td><td>bit 0</td></tr></table>
142	Spare
143	Spare

2.7.21 *VIN Read Response*

Byte	Description
0	Module 22 – VIN Read Response
1	Length of module – 17
2	
3	VIN – Byte 0
…	…
19	VIN – Byte 16

2.7.22 *Vehicle Buses Status*

Byte	Description
0	Module 24 – CAN Bus Status
1	Length of module – 6
2	
3	Bits 0-3: CAN Bus#1 State, Bits 4-7: CAN Bus#2 State 0 – Unknown 1 – No data detected (or bus disabled) 2 – Data detected 3 - Reserved
4	Bits 0-3: CAN Bus#1 Rate, Bits 4-7 CAN Bus#2 Rate 0 – 125 Kbps 1 – 250 Kbps 2 – 500 Kbps 3 – 1 Mbps 4 - 50 Kbps 5 - 62.5 Kbps 6 - 83.333 Kbps 7 - 100 Kbps 8 - 33.333 Kbps 9-14 - Reserved 15 - Auto-detect / Unknown
5	Bits 0-3: CAN Bus#1 Format , Bits 4-7: CAN Bus#2 Format 0 – 11 bits

	1 – 29 bits
6	Bits 0-1: Vehicle Protocol: 0 - Not detected 1 - K-Line ISO 9141 2 - K-Line ISO 14230 slow 3 - K-Line ISO 14230 fast Bits 2-3: Reserved Bit 4: K-Line bus status: 0 - Disconnected (or bus disabled) 1 - Connected Bit 5: Reserved Bit 6: J1708 bus status: 0 - Disconnected (or bus disabled) 1 - Connected Bit 7: Reserved
7	Spare
8	Spare

2.7.23 *Trigger Event ID*

The module is sent upon event triggering, and describes the operator which triggered an event.

Byte	Description
0	Module 25 - Trigger Event ID
1	Length of module – 5
2	
3	Operator Type 0 – Logical Filter Dual Threshold 1 – Logical Filter Single Threshold 2 – Spare 3 – Is In Set 4 – Is Not In Set 5 – Logical Delta 6 – Logical Delta Since Last Violation 7 – Timer 8 – Spare 9 – Compare 2 Operands

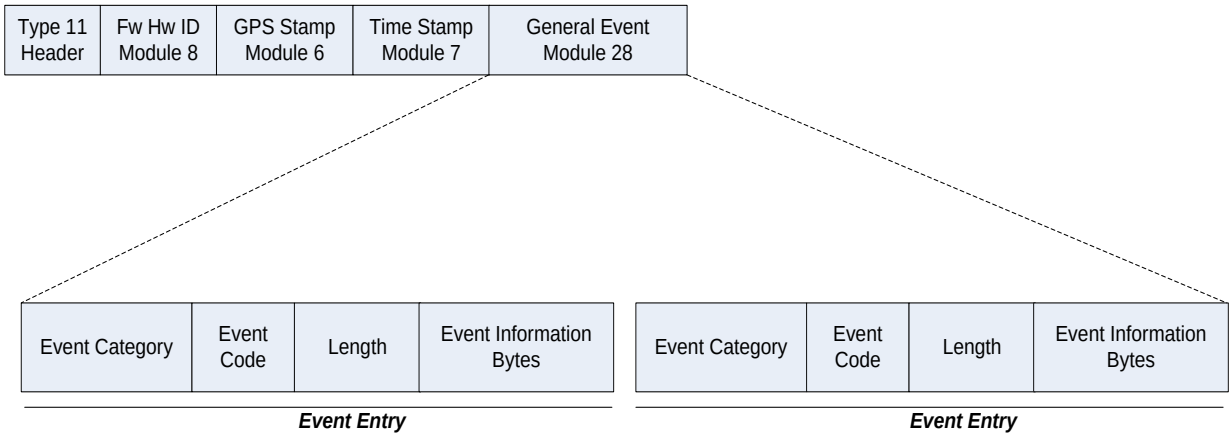
	10 – Separator 11 – Spare 12 – Logical 13 – Compare Operands with Constant 30 – Generate Event
4	Operator ID
5	Trigger cause 0 – Reserved 1 – Low to High 2 – High to Low 3 - Low to High + High to Low 4 – Equal to threshold
6	Spare
7	Spare

2.7.24 *General Event Report*

2.7.24.1 Message and module structure

This module includes system events and notifications. The Module structure has dedicated event fields which will identify the event type and the attached information fields. The module can support multiple concatenated events structures.

General Event module is sent with HW ID, GPS time and location modules (modules 8, 6 and 7). The message is built as follows:



Module 28 below describes the general format of a "General Event". The module can carry multiple entries of "General Event structures". Each "General Event Entry" includes Event Category, Event code, Event data length in bytes and event related data bytes.

Byte	Description
0	Module 28 - General Status Event
1	Length of module – Variable
2	
3	Number of entries
4-5	1st Event Category
6-7	1st Event Code
8	1st Event related data length (bytes)
9	1st Event Related info bytes …
…	2nd Event Category
…	…

2.7.24.2 Event Category Table

Event Category	Description
0	Cello
1	CelloTrack Nano
2	Cello BT Extender
3	CelloTrack-4 family
4	Cello-4

2.7.24.3 Event codes table

Event Category	Event Code	Description
0,4	2	CAN BUS Event
0,4	30	K-Line BUS Event
1,2,3,4	4	Package Open/Close
1,2,3,4	7	MultiSense Provisioning

Event Category	Event Code	Description
1,3,4	10	Work-ID/Activation
1, 3, 4	13	Guest MultiSense raw data
1,2,3,4	15	MultiSense Door/Window Open/Close
1, 3, 4	17	Tag mode MultiSense raw data
1, 3, 4	23	MultiSense button pressed
2	24	BT classic connected/disconnected
2	25	BT Extender Provisioning
0	25	Installation report
4	34	CAN BUS#2 Event
4	31	J1708 Event

2.7.24.4 Events description

CAN Bus Event

Byte	Description
0	Module 28 - General Status Event
1	Length of module – 8
2	
3	Number of entries
4	Event Category – 4 (Cello Gen4)
5	
6	Event Code – 2 (CAN BUS#1 Event) / 34 (CAN BUS#2 Event)
7	
8	Length – 2
9	Event Sub Code 0 - Data detected 1 - No data detected
10	Spare

K-Line Bus Event

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>0</td><td>Module 28 - General Status Event</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – 8</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Number of entries</td></tr>
<tr><td>4</td><td rowspan="2">Event Category – 0 (Cello-CANiQ)</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td><td rowspan="2">Event Code – 30 (K-Line Bus Event)</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td>Length – 2</td></tr>
<tr><td>9</td><td>
<table>
<tr><th>BUS State Event code</th><th>Description</th></tr>
<tr><td>0</td><td>Connected</td></tr>
<tr><td>1</td><td>Disconnected</td></tr>
</table>
</td></tr>
<tr><td>10</td><td>Spare</td></tr>
</table>

J1708 BUS Event

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>0</td><td>Module 28 - General Status Event</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – 8</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Number of entries</td></tr>
<tr><td>4</td><td rowspan="2">Event Category – 4 (Cello-4)</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td><td rowspan="2">Event Code – 31 (J1708 Bus Event)</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td>Length – 2</td></tr>
<tr><td>9</td><td>
<table>
<tr><th>BUS State Event code</th><th>Description</th></tr>
<tr><td>0</td><td>Connected</td></tr>
</table>
</td></tr>
</table>

	1 Disconnected
10	Spare

Impact and Free-fall Recognition

Type-0 and/or this Type-11 module is used:

Byte	Description
0	Module 28 - General Status Event
1	Length of module – 11
2	
3	Number of entries
4	Bits 0-14: Event Category – 1 (Nano) / 2 (BT Extender) / 3 (CelloTrack 4)
5	Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)
6	Event Code
7	1 – Impact 16 – Free-fall
8	Length – 5
9	Source of measurement According to this definition
10	Impact/ Free-fall acceleration RMS value
11	32-bit value of $(X^2+Y^2+Z^2)$, where each of the axis is in 250µg units.
12	(Example: X=2g=8000, Y=3g=12000, Z=8g=32000 → RMS=$8000^2+12000^2+32000^2$ = 1232000000=0x496ED400)
13	

Package Open/Close

Type-0 and/or this Type-11 module is used:

Byte	Description
0	Module 28 - General Status Event
1	Length of module – 10

2	
3	Number of entries
4	Bits 0-14: Event Category – 1 (Nano) / 2 (BT Extender) / 3 (CelloTrack 4) Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)
5	
6	Event Code – 4 (Package Open/Close)
7	
8	Length – 4
9	Source of measurement According to this definition
10	Open/Close 0 – Close 1 – Open
11	Filtered current light value (lux units, 0.25 lux resolution)
12	

MultiSense Package Open/Close

Type-0 and/or a type-11 event (Event Code – 4 (Package Open/Close), identical to Package Open/Close event) is used.

MultiSense Provisioning

Type-0 and/or this Type-11 module is used:

Byte	Description
0	Module 28 - General Status Event
1	Length of module – 33
2	
3	Number of entries
4	Bits 0-14: Event Category – 1 (Nano) / 2 (BT Extender) / 3 (CelloTrack 4) Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)
5	
6	Event Code – 7 (MultiSense Provisioning)
7	
8	Length – 27
9	Source of measurement

<table>
<tr><td></td><td colspan="2">According to this definition</td></tr>
<tr><td>10</td><td colspan="2">Problem code
0 – All OK
1 – Lost communication
2 – Communication restored
3 – Low bat
4 – Low bat restored
5 – Dead bat
6 – Dead bat restored
7 – MultiSense Power-up
8 – MultiSense Power-down by button</td></tr>
<tr><td>11</td><td colspan="2">Battery level (%), see details here</td></tr>
<tr><td>12</td><td colspan="2">Last RSSI value (BLE)
(Signed, dBm units, NA value = 0x80 = -128dBm)</td></tr>
<tr><td>13</td><td>System time – seconds</td><td rowspan="6">Time of last communication from the specific MultiSense</td></tr>
<tr><td>14</td><td>System time – minutes</td></tr>
<tr><td>15</td><td>System time – hours</td></tr>
<tr><td>16</td><td>System date – day</td></tr>
<tr><td>17</td><td>System date – month</td></tr>
<tr><td>18</td><td>System date – year (-2000)</td></tr>
<tr><td>19</td><td colspan="2">MultiSense FW version – Minor Version</td></tr>
<tr><td>20</td><td colspan="2">MultiSense FW version – Major Version</td></tr>
<tr><td>21</td><td colspan="2">BOM mask (indicate which fields below are relevant)
<table>
<tr><td>Spare</td><td>Temp. sensor enable</td><td>Humidity sensor enable</td><td>Magnetic sensor enable</td><td>Light sensor enable</td><td>Accel. sensor enable</td><td colspan="2">Spare</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>22</td><td colspan="2">Enabled sensors mask (indicate which fields below are relevant)
<table>
<tr><td>Data Logger</td><td>Temp. sensor enable</td><td>Humidity sensor enable</td><td>Magnetic sensor enable</td><td>Light sensor enable</td><td>Accel. sensor enable</td><td>TX On Violation only</td><td>Prevent pushbutton power down</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>23
24</td><td>Last measured temperature
(Signed, 0.1°C resolution)</td></tr>
<tr><td>25
26</td><td>Last measured humidity
(0.1% resolution)</td></tr>
<tr><td>27
28</td><td>Last measured light level
(0.5 lux resolution)</td></tr>
<tr><td>29
30</td><td>Last measured X acceleration
(Signed, 250µg resolution)</td></tr>
<tr><td>31
32</td><td>Last measured Y acceleration
(Signed, 250µg resolution)</td></tr>
<tr><td>33
34</td><td>Last measured Z acceleration
(Signed, 250µg resolution)</td></tr>
<tr><td>35</td><td>
<table>
<tr><td>Acc. Self test result

0=Fail
1=Pass</td><td colspan="5">Spare</td><td>Package State

0 – Close
1 – Open</td><td>Magnetic Sensor State

0 – Magnet Not Present
1 – Magnet Present</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
</td></tr>
</table>

Work-ID/Activation Event

The unit promotes a "Work ID" counter on every power turn-on operation by the user. This 32-bit counter is initialized as 0 on the production line.

The promoting of this counter is also a logged event and it is sent to the server.

In this way, the user can relate a specific ID to a certain shipment/task/operation/period.

Type-0 with Transmission-reason = 164 (Nano) and Specific-reason = 9 (Work ID promoted event) is used. Note that the counter itself is not passed over type-0 at all.

And/or this Type-11 module is used:

Byte	Description
0	Module 28 - General Status Event
1	Length of module – 10

2	
3	Number of entries
4	Bits 0-14: Event Category – 1 (Nano) / 3 (CelloTrack 4) Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)
5	
6	Event Code – 10 (Work-ID/Activation)
7	
8	Length – 4
9	Work-ID (32 bit)
10	
11	
12	

Guest MultiSense raw data

For reporting a guest MultiSense transmission (if this mode is enabled), the following Type-11 module is used:

Byte	Description	
0	Module 28 - General Status Event	
1	Length of module – 40	
2		
3	Number of entries	
4	Bits 0-14: Event Category – 1 (Nano) / 3 (CelloTrack 4) Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)	
5		
6	Event Code – 13 (Guest MultiSense raw data)	
7		
8	Length – 34	
9	Source of measurement 0xFC according to definition	
10	RSSI (Signed, dBm units)	Raw advertisement
11	MAC Address	
12		

<table>
<tr><td>13</td><td rowspan="4"></td><td rowspan="5">("0x81") message
Note: Battery level and RSSI fields will be the values received in message "0x83".</td></tr>
<tr><td>14</td></tr>
<tr><td>15</td></tr>
<tr><td>16</td></tr>
<tr><td>17</td><td>Group-ID</td></tr>
<tr><td>18</td><td rowspan="2">Bits 0-13: Battery Level (mV units)
Bit 14: Reserved
Bit 15: Battery type (0=3.0V, 1=3.6V)</td></tr>
<tr><td>19</td></tr>
<tr><td>20</td><td>Enabled Sensors Mask
<table>
<tr><td>Data Logger</td><td>Temp. sensor enable</td><td>Humidity sensor enable</td><td>Magnetic sensor enable</td><td>Light sensor enable</td><td>Accel. sensor enable</td><td>TX On Violation only</td><td>Prevent pushbutton power down</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td><td></td></tr>
<tr><td>21</td><td>BOM Mask
<table>
<tr><td>Spare</td><td>Temp. sensor enable</td><td>Humidity sensor enable</td><td>Magnetic sensor enable</td><td>Light sensor enable</td><td>Accel. sensor enable</td><td colspan="2">Spare</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td><td></td></tr>
<tr><td>22</td><td>TX Reason
0x00 - Reserved
0x01 - Relaxed timer
0x02 - Violation timer
0x03 - Power up
0x04 - Power down (by button)
0x05 - Proximity
0x06 - Push button
0x07 – Magnetic sensor changed state
0x08 - ACC Impact
0x09 - ACC Free-fall
0x0A - Package state changed
0x0B - Shut down due to dead-bat
0x0C÷0x12 - Reserved
0x13 – Phase_A_B
0x14 – Phase_B_A</td><td></td></tr>
</table>

<table>
<tr><td></td><td>0x15 – Phase_C
0x16 - Reserved
0x17 – Phase_B_C
0x18 – Zone_2_start_moving
0x19 – Zone_2_moving
0x1A – Zone_2_stationary_detected
0x1B – Zone_2_new_movement_detected
0x1C – Zone_2_stationary_after_movement
0x1D – Zone_2_stationary_accomplished
0x1E÷0xEF - Reserved
0xF0÷0xF7 - Motion detected, where 3 LSB are the "Time since last movement" as in the table:
<table>
<tr><td>0</td><td>Moving now</td></tr>
<tr><td>1</td><td>Last movement was < 15 Sec ago</td></tr>
<tr><td>2</td><td>Last movement was >15 Sec and <=30 Sec ago</td></tr>
<tr><td>3</td><td>Last movement was >30 Sec and <=60 Sec ago</td></tr>
<tr><td>4</td><td>Last movement was >60 Sec and <=120 Sec ago</td></tr>
<tr><td>5</td><td>Last movement was >120 Sec and <=300 Sec ago</td></tr>
<tr><td>6</td><td>Last movement was >300 Sec and <=900 Sec ago</td></tr>
<tr><td>7</td><td>Last movement was >900 Sec and <=3600 Sec ago</td></tr>
</table>
0xF8÷0xFF - Reserved</td><td></td></tr>
<tr><td>23</td><td>MultiSense Major FW Version</td><td></td></tr>
<tr><td>24</td><td>MultiSense Minor FW Version</td><td></td></tr>
<tr><td>25</td><td>
<table>
<tr><td colspan="6">Spare</td><td>Sensor data stream scrambled</td><td>Connection Password Scrambled</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
</td><td></td></tr>
<tr><td>26
27</td><td>Temperature
(Signed, 0.1ºC resolution)</td><td rowspan="6">Raw sensors reading stream ("0x83") message
(unscrambled)</td></tr>
<tr><td>28
29</td><td>Humidity
(0.1% resolution)</td></tr>
<tr><td>30
31</td><td>Light Level
(0.5 lux resolution)</td></tr>
</table>

<table>
<tr><td>32</td><td>
<table>
<tr><td>Acc. Self test result

0=Fail
1=Pass</td><td colspan="5">Spare</td><td>Package State

0 – Close
1 – Open</td><td>Magnetic Sensor State

0 – Magnet Not Present
1 – Magnet Present</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
</td></tr>
<tr><td>33
34</td><td colspan="2">Last measured X acceleration
(Signed, 250µg resolution)</td></tr>
<tr><td>35
36</td><td colspan="2">Last measured Y acceleration
(Signed, 250µg resolution)</td></tr>
<tr><td>37
38</td><td colspan="2">Last measured Z acceleration
(Signed, 250µg resolution)</td></tr>
<tr><td>39
40</td><td colspan="2">Battery Level
(mV units)</td></tr>
<tr><td>41</td><td>
<table>
<tr><td>Spare</td><td>Humidity Alert
0 – No Alert 1 – Alert</td><td>Humidity Violation
0 – Not Violating 1 - Violating</td><td>Humidity TH
0 – Lower 1 – Upper</td><td>Spare</td><td>Temp Alert
0 – No Alert 1 – Alert</td><td>Temp Violation
0 – Not Violating 1 - Violating</td><td>Temp TH
0 – Lower 1 - Upper</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
</td></tr>
<tr><td>42</td><td colspan="2">RSSI (Signed, dBm units)</td></tr>
</table>

Notes:

- Regardless of the mask all the data is passed. But, if a sensor disabled, its data value has no meaning.
- If from some reason any unsigned field (such as Humidity or light) value cannot be reported, the value that will symbolize a non-reading will be 0xFFFF.
- If from some reason any signed field (such as Temperature or XYZ) value cannot be reported, the value that will symbolize a non-reading will be 0x8000.

MultiSense Door/Window Open/Close

Type-0 and/or this Type-11 module is used:

Byte	Description
0	Module 28 - General Status Event
1	Length of module – 10
2	
3	Number of entries
4	Bits 0-14: Event Category – 1 (Nano) / 2 (BT Extender) / 3 (CelloTrack 4) Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)
5	
6	Event Code – 15 (Door/Window Open/Close)
7	
8	Length – 4
9	Source of measurement According to this definition
10	Open/Close 0 – Close 1 – Open
11	Spare
12	Spare

Tag Mode MultiSense raw data

For reporting a guest MultiSense transmission in Tag mode (if this mode is enabled), the following type-11 message is used:

Byte	Description
0	Module 28 - General Status Event
1	Length of module – 23

<table>
<tr><td>2</td><td colspan="2"></td></tr>
<tr><td>3</td><td colspan="2">Number of entries</td></tr>
<tr><td>4</td><td colspan="2" rowspan="2">Bits 0-14: Event Category – 1 (Nano) / 3 (CelloTrack 4)
Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td><td colspan="2" rowspan="2">Event Code – 17 (Tag mode MultiSense raw data)</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td colspan="2">Length – 17</td></tr>
<tr><td>9</td><td colspan="2">Source of measurement
0xFC according to definition</td></tr>
<tr><td>10</td><td>RSSI (Signed, dBm units)</td><td rowspan="10">Raw advertisement ("0x81") message
Note: Battery level and RSSI fields will be the values received in message "0x83".</td></tr>
<tr><td>11</td><td rowspan="6">MAC Address</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td></tr>
<tr><td>15</td></tr>
<tr><td>16</td></tr>
<tr><td>17</td><td>Group-ID</td></tr>
<tr><td>18</td><td rowspan="2">Bits 0-13: Battery Level (mV units)
Bit 14: Reserved
Bit 15: Battery type (0=3.0V, 1=3.6V)</td></tr>
<tr><td>19</td></tr>
<tr><td>20</td><td>Enabled Sensors Mask
<table>
<tr><td>Data Logger</td><td>Temp. sensor enable</td><td>Humidity sensor enable</td><td>Magnetic sensor enable</td><td>Light sensor enable</td><td>Accel. sensor enable</td><td>TX On Violation only</td><td>Prevent pushbutton power down</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>21</td><td>BOM Mask
<table>
<tr><td>Spare</td><td>Temp. sensor enable</td><td>Humidity sensor enable</td><td>Magnetic sensor enable</td><td>Light sensor enable</td><td>Accel. sensor enable</td><td colspan="2">Spare</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>22</td><td>TX Reason</td></tr>
</table>

<table>
<tr><td></td><td>0x00 - Reserved
0x01 - Relaxed timer
0x02 - Violation timer
0x03 - Power up
0x04 - Power down (by button)
0x05 - Proximity
0x06 - Push button
0x07 – Magnetic sensor changed state
0x08 - ACC Impact
0x09 - ACC Free-fall
0x0A - Package state changed
0x0B - Shut down due to dead-bat
0x0C÷0x12 - Reserved
0x13 – Phase_A_B
0x14 – Phase_B_A
0x15 – Phase_C
0x16 - Reserved
0x17 – Phase_B_C
0x18 – Zone_2_start_moving
0x19 – Zone_2_moving
0x1A – Zone_2_stationary_detected
0x1B – Zone_2_new_movement_detected
0x1C – Zone_2_stationary_after_movement
0x1D – Zone_2_stationary_accomplished
0x1E÷0xEF - Reserved
0xF0÷0xF7 - Motion detected, where 3 LSB are the "Time since last movement" as in the table:
<table><tr><td>0</td><td>Moving now</td></tr><tr><td>1</td><td>Last movement was < 15 Sec ago</td></tr><tr><td>2</td><td>Last movement was >15 Sec and <=30 Sec ago</td></tr><tr><td>3</td><td>Last movement was >30 Sec and <=60 Sec ago</td></tr><tr><td>4</td><td>Last movement was >60 Sec and <=120 Sec ago</td></tr><tr><td>5</td><td>Last movement was >120 Sec and <=300 Sec ago</td></tr><tr><td>6</td><td>Last movement was >300 Sec and <=900 Sec ago</td></tr><tr><td>7</td><td>Last movement was >900 Sec and <=3600 Sec ago</td></tr></table>0xF8÷0xFF - Reserved</td><td></td></tr>
<tr><td>23</td><td>MultiSense Major FW Version</td><td></td></tr>
<tr><td>24</td><td>MultiSense Minor FW Version</td><td></td></tr>
</table>

<table>
<tr><td>25</td><td>
<table>
<tr><td colspan="3">Zone #</td><td colspan="3">Spare</td><td>Sensor data stream scrambled</td><td>Connection Password Scrambled</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
</td><td></td></tr>
</table>

To request the status of a certain MultiSense (or Nano/BT Extender), the following Type 11 command should be used:

Byte	Description
0	Module 32 - General Command
1	Length of module – 6
2	
3	Number of Command entries sent by this module – 1
4	Command ID – 259 (Nano/Cello with BT Extender: send status of the designated source)
5	
6	Length of entry data – 2
7	Source of measurement According to this definition
8	Spare

If the source is one of the MultiSense units, the answer to this command is the "MultiSense provisioning message" as shown above.

If the source is BT extender (0xFB), the answer to this command is the "BT Extender provisioning message" as shown above.

If the source is Nano (0xFD), the answer will be a type-11 message with module name 42 as payload, as described here.

MultiSense button pressed event

When configured, every press on a paired MultiSense pushbutton (short press), will create this event:

Byte	Description
0	Module 28 - General Status Event
1	Length of module – 11

2	
3	Number of entries -1
4 5	Bits 0-14: Event Category – 1 (Nano) / 3 (CelloTrack 4) Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)
6 7	Event Code – 23 (MultiSense button pressed)
8	Length – 4
9	Source of measurement According to this definition
10 11 12 13	Reserved

Installation report

Byte	Description
0	Module 28 - General Status Event
1 2	Length of module – 12
3	Number of entries - 1
4 5	Bits 0-14: Event Category – 0 (Cello) Bit 15: Sourced from MultiSense Data-logger (**0=No**, 1=Yes)
6 7	Event Code - 25 Installation report
8	Length - 6
9	CAN bus # - 1
10	Spare

11	Used baud-rate 0 - 125 Kbps 1 - 250 Kbps 2 - 500 Kbps 3 - 1 Mbps 4 - 50 Kbps 5 - 62.5 Kbps 6 - 83.333 Kbps 7 - 100 Kbps 8-14 - Reserved 15 - Not detected (see NACK reason in next byte)
12	ACK/NACK codes 0 - ACK 1 - Not detected 2 - Auto baud rate is disabled in PL
13	Spare
14	Spare

Zeppelin Mount/Unmount Candidate By Impact

Byte	Description
0	Module 28 - General Status Event
1	Length of module – 10
2	
3	Number of entries – 1
4	Bits 0-14: Event Category – 3 (CelloTrack 4)
5	Bit 15: Sourced from MultiSense Data-logger (0=No)
6	Event Code – 29 (Zeppelin Mount/Unmount Candidate By Impact)
7	
8	Length – 4
9	External Power State: From Impact Until Candidate 0 – No External Power Support 1 – Connected & Disconnected 2 – Disconnected 3 – Connected

10	Spare
11	Spare
12	Spare

Zeppelin Detection by SNR Mount/Unmount Report Event

Byte	Description
0	Module 28 - General Status Event
1 2	Length of module – 14
3	Number of entries – 1
4 5	Bits 0-14: Event Category – 3 (CelloTrack 4) Bit 15: Sourced from MultiSense Data-logger (0=No)
6 7	Event Code – 30 (Zeppelin Detection by SNR Mount/Unmount Report)
8	Length – 8
9	SNR Detect State Report 0 – Mount 1 – Unmount
10	Spare
11	Spare
12	Spare
13	SNR Decision P1 Additional Info (Debug Only)
14	SNR Decision P2 Additional Info (Debug Only)
15	SNR Decision P3 Additional Info (Debug Only)
16	SNR Decision P4 Additional Info (Debug Only)

Tag loss (Tag mode with memory)

Byte	Description
0	Module 28 - General Status Event

1 2	Length of module – 19
3	Number of entries
4 5	Bits 0-14: Event Category – 1 (Nano) Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)
6 7	Event Code – 35 (Tag loss)
8	Length – 13
9	Source of measurement (0xFC according to definition)
10	Spare
11 12 13 14 15 16	MAC address (full, 6 bytes)
17	Group-ID (from PL:1868)
18 19	Tag Loss timer (In Seconds, from PL:1896)
20	Spare
21	Spare

2.7.25 *CAN Variables Status Dump*

This module will be sent by the unit towards the server upon receiving "General Module Query" (Inbound Type 11, module 29) with requested module ID set to 31. The module will include the content of all the defined CAN variables. Each variable is represented by a "Variable Dump Entry" structure. The variable IDs are allocated by the programmer tool during the CAN variables definition and allocation.

Byte	Description

0	Module 31 – CAN Variables Status Dump
1	Length of module – Variable
2	
3	Number of variable entry sent by this module
4	
	Variable dump Entry 1
	Variable dump Entry 2
	…

Variable Dump Entry

	Variable ID
	Variable parsing format 0 – Unknown 1 – Bool 2 – UINT 8 3 – SINT 8 4 – UINT 16 5 – SINT 16 6 – UINT 32 7 – SINT 32 8 – Floating 9 – String
	Number of data bytes
	Variable data bytes …

2.7.26 *Forwarded UDS Response*

This module enables to forward UDS (Unified Diagnostic Services) response from the CAN bus.

After receiving a Forwarded UDS Request (Type 11, Module 33, Inbound), and sending the command on the CAN bus, the unit should receive a response from the bus. After receiving the response (or after timeout expiration), the unit will reply with this module.

It contains the UDS Response ID, the SID, Sub-Function, and the data bytes of the message which was received from a certain ECU. It also contains the status of the requested command.

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>0</td><td>Module 33 – Forwarded UDS Response</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – 17</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Spare</td></tr>
<tr><td>4</td><td>Spare</td></tr>
<tr><td>5</td><td rowspan="4">UDS Response ID</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td></tr>
<tr><td>9</td><td>Information Byte
<table>
<tr><td colspan="4">Fame Type
0 - Single Frame
1 - First Frame
2 - Consecutive Frame
3 - Flow Control Frame</td><td colspan="4">Non-Zero Byte Count in Message</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>10</td><td>SID (Service ID)</td></tr>
<tr><td>11</td><td rowspan="2">DID (Data Identifier)</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td><td rowspan="4">Data</td></tr>
<tr><td>14</td></tr>
<tr><td>15</td></tr>
<tr><td>16</td></tr>
<tr><td>17</td><td>Status
0 - Failure
1 - Success
2 - Timeout
3 - Busy (Previous UDS Session Didn't Finish)
4 - CAN Bus Not Available</td></tr>
</table>

18	Spare
19	Spare

2.7.27 *Current J1939 DTC Status*

This module will be sent by the unit towards the server upon receiving "General Module Query" (Inbound Type 11, module 29) with requested module ID set to 37. The module will include the statuses of all current J1939 DTC and indication lamps.

Byte	Description
0	Module 37 – Current J1939 DTC Status
1	Length of module – Variable
2	
3	Spare
4	First Source Number (DTC may be reported by few ECU sources on bus; the unit supports reports from 4 different ECUs)
5	Spare
6	Physical Indication Lamp Status (same as appears in PGN 0x00FECA, bytes 1-2)
7	
8	Amount of active DTCs in the message
9	DTC #1
10	
11	
12	
13	DTC #2
14	
15	
16	
…	…
…	Second Source Number (DTC may be reported by few ECU sources on bus; the unit supports reports from 4 different ECUs)
…	…

2.7.28 *J1939 DTC Appeared/Disappeared*

This module will be generated upon change in J1939 DTC\Indication lamp status (unsolicited).

J1939 DTC Appeared message will be generated if:

- New DTC is continuously active for 15 seconds
- MIL/RSL lamp is continuously active for 2 seconds
- AWL/PL lamp is continuously active for 30 seconds
- A Flash lamp is continuously active for 30 seconds

J1939 DTC Disappeared message will be generated if:

- New DTC is continuously not active for 3 minutes
- MIL/RSL/AWL/PL lamp is continuously not active for 30 seconds
- A Flash lamp is continuously not active for 30 seconds

This module will be followed by modules 6, 7, 8.

Byte	Description
0	Module 38 – J1939 DTC Appeared/Disappeared
1	Length of module – Variable
2	
3	Bits 0-1: Bus# 0-CAN#1 1-CAN#2 2-3-Reserved Bits 2-7:Spare
4	Transmission Reasons Bitmask

<table>
<tr><td>5</td><td>
<table>
<tr><td>Flash MIL

0 – Not Active
1 – Active</td><td>Flash RSL

0 – Not Active
1 – Active</td><td>Flash AWL

0 – Not Active
1 – Active</td><td>Flash PL

0 – Not Active
1 – Active</td><td>Malfunction Indicator Lamp (MIL) Status change

0 – No Change
1 – Change</td><td>Red Stop Lamp (RSL) Status change

0 – No Change
1 – Change</td><td>Amber Warning Lamp (AWL) Status change

0 – No Change
1 – Change</td><td>Protect Lamp (PL) Status change

0 – No Change
1 – Change</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
<table>
<tr><td colspan="7">Spare</td><td>DTC Added or Removed

0 – Not Added/Removed
1 – Added/Removed</td></tr>
<tr><td>Bit 15</td><td>Bit 14</td><td>Bit 13</td><td>Bit 12</td><td>Bit 11</td><td>Bit 10</td><td>Bit 9</td><td>Bit 8</td></tr>
</table>
</td></tr>
<tr><td>6</td><td>Source Number (DTC may be reported by few ECU sources on bus; the unit supports reports from 4 different ECUs)</td></tr>
<tr><td>7</td><td>Spare</td></tr>
<tr><td>8</td><td rowspan="2">Physical Indication Lamp Status (same as appears in PGN 0x00FECA, bytes 1-2)</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td><td>Amount of active DTCs in the message</td></tr>
<tr><td>11</td><td rowspan="4">DTC #1</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td></tr>
<tr><td>15</td><td rowspan="4">DTC #2</td></tr>
<tr><td>16</td></tr>
<tr><td>17</td></tr>
<tr><td>18</td></tr>
<tr><td>…</td><td>…</td></tr>
</table>

2.7.29 *Measurement Readings*

This module is used to report on data-logger temperatures and humidity samples, as well as for temperatures and humidity TH crossing events.

Type-0 and/or this Type-11 module is used:

Temperature Measurement

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>0</td><td>Module 40 – Measurement Readings</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – Variable</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td rowspan="2">Bits 0-14: Event Category – 1 (Nano) / 3 (CelloTrack 4)
Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td><td rowspan="2">Event Code – 1 (Temperature measurements)</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td><td>Metadata Length – 13</td></tr>
<tr><td>8</td><td>Metadata TX Reason
<table>
<tr><td colspan="5">Spare</td><td colspan="3">TX Reason

0 – Normal
1 – Start Charging
2 – Requested by Command</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>9</td><td>Metadata:
<table>
<tr><td>Source of violation/ alert

0-Temp.
1- Humidity</td><td>30 min after charging indication

0 – Not during 30 minutes after charging*
1 – During 30 minutes after charging</td><td colspan="2">Charging Status

0 – Not charging*
1 – Charging slow
2 – Charging fast
3 – Charger Fault/Charger thermal shutdown</td><td>Retransmission indication

0 – Retransmission
1 – Not retransmission</td><td colspan="3">Violation/Alert status

0 – Within the limits
1 – (Unknown)
2 – Violating (not in alert) a lower TH but alert is not yet declared
3 – Violating (not in alert) a upper TH but alert is not yet declared
4 – Alert for lower TH violation
5 – Alert for upper TH violation
6 – Violating while in alert the lower TH
7 – Violating while in alert the upper TH</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
* This will be the sent value if the source is a MultiSense</td></tr>
<tr><td>10</td><td colspan="2">Metadata Source
According to this definition</td></tr>
<tr><td>11</td><td>First sample timestamp – seconds</td><td rowspan="6">First sample timestamp</td></tr>
<tr><td>12</td><td>First sample timestamp – minutes</td></tr>
<tr><td>13</td><td>First sample timestamp – hours</td></tr>
<tr><td>14</td><td>First sample timestamp – day</td></tr>
<tr><td>15</td><td>First sample timestamp – month</td></tr>
<tr><td>16</td><td>First sample timestamp – year (-2000)</td></tr>
<tr><td>17</td><td rowspan="2" colspan="2">Metadata Sampling rate (Seconds)</td></tr>
<tr><td>18</td></tr>
<tr><td>19</td><td colspan="2">Metadata Upper threshold (Signed, 1ºC Resolution)</td></tr>
<tr><td>20</td><td colspan="2">Metadata Lower threshold (Signed, 1ºC Resolution)</td></tr>
</table>

21	Sample (payload entry) size – 3
22	Number of samples in the payload
23 24	Temperature reading 1 (Signed, 0.1ºC Resolution, according to this definition)
25	Delay from previous sample (in "Metadata Sampling rate" units)
26 27	Temperature reading 2 (Signed, 0.1ºC Resolution, according to this definition)
28	Delay from previous sample (in "Metadata Sampling rate" units)
…	…

Humidity Measurement

Byte	Description
0	Module 40 – Measurement Readings
1 2	Length of module – Variable
3 4	Bits 0-14: Event Category – 1 (Nano) / 3 (CelloTrack 4) Bit 15: Sourced from MultiSense Data-logger (0=No, 1=Yes)
5 6	Event Code – 2 (Humidity measurements)
7	Metadata Length – 13
8	Metadata TX Reason

Spare					TX Reason 0 – Normal 1 – Start Charging 2 – Requested by Command		
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

<table>
<tr><td>9</td><td>Metadata:
<table>
<tr><td>Source of violation/ alert

0-Temp.
1- Humidity</td><td>30 min after charging indication

0 – Not during 30 minutes after charging*
1 – During 30 minutes after charging</td><td colspan="2">Charging Status

0 – Not charging*
1 – Charging slow
2 – Charging fast
3 – Charger Fault/Charger thermal shutdown</td><td>Retransmission indication

0 – Retransmission
1 – Not retransmission</td><td colspan="3">Violation/Alert status

0 – Within the limits
1 – (Unknown)
2 – Violating (not in alert) a lower TH but alert is not yet declared
3 – Violating (not in alert) a upper TH but alert is not yet declared
4 – Alert for lower TH violation
5 – Alert for upper TH violation
6 – Violating while in alert the lower TH
7 – Violating while in alert the upper TH</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
* This will be the sent value if the source is a MultiSense</td></tr>
<tr><td>10</td><td colspan="2">Metadata Source
According to this definition</td></tr>
<tr><td>11</td><td>First sample timestamp – seconds</td><td rowspan="6">First sample timestamp</td></tr>
<tr><td>12</td><td>First sample timestamp – minutes</td></tr>
<tr><td>13</td><td>First sample timestamp – hours</td></tr>
<tr><td>14</td><td>First sample timestamp – day</td></tr>
<tr><td>15</td><td>First sample timestamp – month</td></tr>
<tr><td>16</td><td>First sample timestamp – year (-2000)</td></tr>
<tr><td>17</td><td rowspan="2" colspan="2">Metadata Sampling rate (Seconds)</td></tr>
<tr><td>18</td></tr>
<tr><td>19</td><td colspan="2">Metadata Upper threshold (Unsigned, 1% Resolution)</td></tr>
<tr><td>20</td><td colspan="2">Metadata Lower threshold (Unsigned, 1% Resolution)</td></tr>
<tr><td>21</td><td colspan="2">Sample (payload entry) size – 3</td></tr>
<tr><td>22</td><td colspan="2">Number of samples in the payload</td></tr>
</table>

23 24	Humidity reading 1 (Unsigned, 0.1% Resolution)
25	Delay from previous sample (in "Metadata Sampling rate" units)
26 27	Humidity reading 2 (Unsigned, 0.1% Resolution)
28	Delay from previous sample (in "Metadata Sampling rate" units)
…	…

2.7.30 *2G/3G/4G Cell-ID*

This module is sent when the modem is attached/camping on a cellular network.

The size of this module is **dynamic**, according to the "Neighbors count" field, which can be 0-6, where the "Neighbors count" field will always appear in the module.

This message will be sent:

1. Passively, as a reply to Cell ID module request (Type-11, Module-29). In this case, the sub-data will be sent using the same communication transport as the request.
2. Actively, if enabled in unit's configuration, separately for home and roam GSM networks, on addresses 201 and 203 respectively, bits 0, 1, 3 and 4.

(2G/3G terminology is in cyan)

Byte	Description
0	Module 46 - 2G/3G/4G Cell-ID
1 2	Length (27-135)
3	Spare
4	Seconds (0-59) (Modem enquiry timestamp)
5	Minutes (0-59) (Modem enquiry timestamp)
6	Hours (0-23) (Modem enquiry timestamp)
7	Day (1-31) (Modem enquiry timestamp)
8	Month (1-12) (Modem enquiry timestamp)
9	Year (Current Year minus 2000 (e.g. value of 7 = year 2007)) (Modem enquiry timestamp)
10	Serving Cell MCC (LSB) (Decimal, 0-65535)
11	Serving Cell MCC (MSB) (Decimal, 0-65535)

12	Serving Cell MNC (LSB) (Decimal, 0-65535)
13	Serving Cell MNC (MSB) (Decimal, 0-65535)
14	Serving Cell LAC / TAC (LSB) (Tracking Area Code)
15	Serving Cell LAC / TAC (MSB) (Tracking Area Code)
16	Serving Cell Global Cell ID (LSB) (Decimal, 0-16777216)
17	Serving Cell Global Cell ID (Decimal, 0-16777216)
18	Serving Cell Global Cell ID (Decimal, 0-16777216)
19	Serving Cell Global Cell ID (Decimal, 0-16777216)
20	Serving Cell Global Cell ID (Decimal, 0-16777216)
21	Serving Cell Global Cell ID (Decimal, 0-16777216)
22	Serving Cell Global Cell ID (MSB) (Decimal, 0-16777216)
23	Serving Cell PSC / Physical Cell ID (LSB) (Decimal, 0-65535) (not supported in 2G networks)
24	Serving Cell PSC / Physical Cell ID (MSB) (Decimal, 0-65535) (not supported in 2G networks)
25	Serving Cell RSRP (Reference Signal Received Power [dBm], the sign is not saved as this value is always representing a negative number) (in modem EHS6-A:BCCH or dBm, in modem BGS2-W:RxLev)
26	Serving Cell ACT (Access Technology: 2G=0, 3G=2, 4G=7)
27	Serving Cell Spare
28	Serving Cell Spare
29	Neighbors count (0-6)
30	Neighbor Cell 1 MCC (LSB) (Decimal, 0-65535)
31	Neighbor Cell 1 MCC (MSB) (Decimal, 0-65535)
32	Neighbor Cell 1 MNC (LSB) (Decimal, 0-65535)
33	Neighbor Cell 1 MNC (MSB) (Decimal, 0-65535)
34	Neighbor Cell 1 LAC / TAC (LSB) (Tracking Area Code)
35	Neighbor Cell 1 LAC / TAC (MSB) (Tracking Area Code)
36	Neighbor Cell 1 Global Cell ID (LSB) (Decimal, 0-16777216)
37	Neighbor Cell 1 Global Cell ID (Decimal, 0-16777216)
38	Neighbor Cell 1 Global Cell ID (Decimal, 0-16777216)

39	Neighbor Cell 1 Global Cell ID (Decimal, 0-16777216)
40	Neighbor Cell 1 Global Cell ID (Decimal, 0-16777216)
41	Neighbor Cell 1 Global Cell ID (Decimal, 0-16777216)
42	Neighbor Cell 1 Global Cell ID (MSB) (Decimal, 0-16777216)
43	Neighbor Cell 1 PSC / Physical Cell ID (LSB) (Decimal, 0-65535) (not supported in 2G networks)
44	Neighbor Cell 1 PSC / Physical Cell ID (MSB) (Decimal, 0-65535) (not supported in 2G networks)
45	Neighbor Cell 1 RSRP (Reference Signal Received Power [dBm], the sign is not saved as this value is always representing a negative number) (in modem EHS6-A:BCCH or dBm, in modem BGS2-W:RxLev)
46	Neighbor Cell 1 ACT (Access Technology, 2G=0, 3G=2, 4G=7)
47	Neighbor Cell 1 Spare
…	…
120	Neighbor Cell 6 MCC (LSB) (Decimal, 0-65535)
121	Neighbor Cell 6 MCC (MSB) (Decimal, 0-65535)
122	Neighbor Cell 6 MNC (LSB) (Decimal, 0-65535)
123	Neighbor Cell 6 MNC (MSB) (Decimal, 0-65535)
124	Neighbor Cell 6 LAC / TAC (LSB) (Tracking Area Code)
125	Neighbor Cell 6 LAC / TAC (MSB) (Tracking Area Code)
126	Neighbor Cell 6 Global Cell ID (LSB) (Decimal, 0-16777216)
127	Neighbor Cell 6 Global Cell ID (Decimal, 0-16777216)
128	Neighbor Cell 6 Global Cell ID (Decimal, 0-16777216)
129	Neighbor Cell 6 Global Cell ID (Decimal, 0-16777216)
130	Neighbor Cell 6 Global Cell ID (Decimal, 0-16777216)
131	Neighbor Cell 6 Global Cell ID (Decimal, 0-16777216)
132	Neighbor Cell 6 Global Cell ID (MSB) (Decimal, 0-16777216)
133	Neighbor Cell 6 PSC / Physical Cell ID (LSB) (Decimal, 0-65535) (not supported in 2G networks)
134	Neighbor Cell 6 PSC / Physical Cell ID (MSB) (Decimal, 0-65535) (not supported in 2G networks)
135	Neighbor Cell 6 RSRP (Reference Signal Received Power [dBm], the sign is not saved as this value is always representing a negative number)

	(in modem EHS6-A:BCCH or dBm, in modem BGS2-W:RxLev)
136	Neighbor Cell 6 ACT (Access Technology, 2G=0, 3G=2, 4G=7)
137	Neighbor Cell 6 Spare

2.7.31 *DTCO Connect/Disconnect Event*

This message will be sent upon recognition of DTCO device connection/disconnection to/from D8 port.

Except of the new module defined below, the message will include modules 51, 52, 53.

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>0</td><td>Module 50 – DTCO Connect/Disconnect Event</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – 19</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Source of System Parameters 1
<table>
<tr><td colspan="5">Spare</td><td colspan="3">Odometer Source

0 - Estimated by GPS
1 - CAN
2 - Frequency Counter
3 - DTCO
4-7 - Spare</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>4</td><td>Source of System Parameters 2
<table>
<tr><td colspan="2">D8 DTCO Connection Status
0 - Disconnected
1 - Connected</td><td colspan="3">Speed source
0 - GPS
1 - Freq. Counter
2 - CAN
3 - DTCO
4-7 - Spare</td><td colspan="2">RPM source
0 - Freq. Count
1 - CAN
2 - DTCO
3 - Spare</td><td colspan="2">Driver ID source
0 - 1-Wire bus
1 - COM port
2 - DTCO
3 - Spare</td></tr>
<tr><td colspan="2">Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>5</td><td>Spare</td></tr>
<tr><td>6</td><td>DTCO SW Number</td></tr>
<tr><td>7</td><td>Code Page (D8: Code Page)</td></tr>
</table>

<table>
<tr><td>8-20</td><td>VRN – Vehicle Registration Number (D8: Vehicle Registration Number; zero padded)</td></tr>
<tr><td>21</td><td>Work States (D8: TCO1/DB1)
<table>
<tr><td colspan="8">Bit</td><td rowspan="2">Definition</td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="9">Driver 1 Working State</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>0</td><td>0</td><td>0</td><td>Break/Rest</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>0</td><td>0</td><td>1</td><td>Availability</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>0</td><td>1</td><td>0</td><td>Work</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>0</td><td>1</td><td>1</td><td>Drive</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>1</td><td>0</td><td>0</td><td>Reserved</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>1</td><td>0</td><td>1</td><td>Reserved</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>1</td><td>1</td><td>0</td><td>Error</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>1</td><td>1</td><td>1</td><td>Not Available</td></tr>
<tr><td colspan="9">Driver 2 Working State</td></tr>
<tr><td>X</td><td>X</td><td>0</td><td>0</td><td>0</td><td>X</td><td>X</td><td>X</td><td>Break/Rest</td></tr>
<tr><td>X</td><td>X</td><td>0</td><td>0</td><td>1</td><td>X</td><td>X</td><td>X</td><td>Availability</td></tr>
<tr><td>X</td><td>X</td><td>0</td><td>1</td><td>0</td><td>X</td><td>X</td><td>X</td><td>Work</td></tr>
<tr><td>X</td><td>X</td><td>0</td><td>1</td><td>1</td><td>X</td><td>X</td><td>X</td><td>Reserved</td></tr>
<tr><td>X</td><td>X</td><td>1</td><td>0</td><td>0</td><td>X</td><td>X</td><td>X</td><td>Reserved</td></tr>
<tr><td>X</td><td>X</td><td>1</td><td>0</td><td>1</td><td>X</td><td>X</td><td>X</td><td>Reserved</td></tr>
<tr><td>X</td><td>X</td><td>1</td><td>1</td><td>0</td><td>X</td><td>X</td><td>X</td><td>Error</td></tr>
<tr><td>X</td><td>X</td><td>1</td><td>1</td><td>1</td><td>X</td><td>X</td><td>X</td><td>Not Available</td></tr>
<tr><td colspan="9">Driver Recognize</td></tr>
<tr><td>0</td><td>0</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Vehicle Motion Not Detected</td></tr>
<tr><td>0</td><td>1</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Vehicle Motion Detected</td></tr>
<tr><td>1</td><td>0</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Error</td></tr>
<tr><td>1</td><td>1</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Not Available</td></tr>
</table></td></tr>
</table>

2.7.32 *DTCO Time*

Byte	Description
0	Module 51 – DTCO Time
1	Length of module – 7
2	
3	Spare
4	DTCO time – seconds (D8: Time Date/DB1)
5	DTCO time – minutes (D8: Time Date/DB2)
6	DTCO time – hours (D8: Time Date/DB3)
7	DTCO date – day (D8: Time Date/DB5)
8	DTCO date – month (D8: Time Date/DB4)
9	DTCO date – year (-2000) (D8: Time Date/DB6)

2.7.33 *DTCO Driver Identification Numbers*

Byte	Description
0	Module 52 – DTCO Driver Identification Numbers
1	Length of module – 36
2	
3-20	DIN 1 - Driver 1 Identification Number (D8: Driver 1 Identification Number; zero padded)
21-38	DIN 2 - Driver 2 Identification Number (D8: Driver 2 Identification Number; zero padded)

2.7.34 *DTCO Parameters Change Event*

This message will be sent upon recognition of change of one of the parameters reported by DTCO through D8 or FMS.

If "DTCO Source Selection" parameter (address 240, bits 0-2) is set to 1 (D8 VDO), then except of the new module defined below, the message will include modules 51, 52 (only if DIN 1/2 changed), 22 (only if VIN changed).

Byte	Description
0	Module 53 – DTCO Parameters Change Event
1	Length of module – 14

<table>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td>Source of System Parameters 1
<table>
<tr><td colspan="6">Spare</td><td colspan="2">Odometer Source
0 - Estimated by GPS
1 - CAN
2 - Frequency Counter
3 - DTCO
4-7 - Spare</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>4</td><td>Source of System Parameters 2
<table>
<tr><td>D8 DTCO Connection Status
0 - Disconnected
1 - Connected</td><td colspan="3">Speed source
0 - GPS
1 - Freq. Counter
2 - CAN
3 - DTCO
4-7 - Spare</td><td colspan="2">RPM source
0 - Freq. Count
1 - CAN
2 - DTCO
3 - Spare</td><td colspan="2">Driver ID source
0 - 1-Wire bus
1 - COM port
2 - DTCO
3 - Spare</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>5</td><td>DTCO Source
<table>
<tr><td colspan="4">Spare</td><td>FMS</td><td>D8 Stoneridge (Infrastructure)</td><td>D8 VDO</td><td>Spare</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
</table>

6	Generation Reason 1						
	Driver 1 states	Driver 2 states	Work States	Tachograph Status	Speed Authorized (Relevant for Stoneridge only, not FMS)	Additional Information (Ignition) (Relevant only for D8, not FMS)	VIN (Relevant only for D8, not FMS)	DIN1 (Relevant only for D8, not FMS)
	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
7	Generation Reason 2							
	DIN2 (Relevant only for D8, not FMS)	Spare						
	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
8	Generation Reason 3							
	Spare					DTCO Connected	DTCO Disconnected	By Request
	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7

9

Work States (D8: TCO1/DB1)

Bit								Definition
7	6	5	4	3	2	1	0	
Driver 1 Working State								
X	X	X	X	X	0	0	0	Break/Rest
X	X	X	X	X	0	0	1	Availability
X	X	X	X	X	0	1	0	Work
X	X	X	X	X	0	1	1	Drive
X	X	X	X	X	1	0	0	Reserved
X	X	X	X	X	1	0	1	Reserved
X	X	X	X	X	1	1	0	Error
X	X	X	X	X	1	1	1	Not Available
Driver 2 Working State								
X	X	0	0	0	X	X	X	Break/Rest
X	X	0	0	1	X	X	X	Availability
X	X	0	1	0	X	X	X	Work
X	X	0	1	1	X	X	X	Reserved
X	X	1	0	0	X	X	X	Reserved
X	X	1	0	1	X	X	X	Reserved
X	X	1	1	0	X	X	X	Error
X	X	1	1	1	X	X	X	Not Available
Driver Recognize								
0	0	X	X	X	X	X	X	Vehicle Motion Not Detected
0	1	X	X	X	X	X	X	Vehicle Motion Detected
1	0	X	X	X	X	X	X	Error
1	1	X	X	X	X	X	X	Not Available

10 Driver 1 States (D8: TCO1/DB2; FMS: TCO1/DB2)

Bit								Definition
7	6	5	4	3	2	1	0	
Driver 1 States								
X	X	X	X	0	0	0	0	No Time Related Warning Detected
X	X	X	X	0	0	0	1	Limit #1: 15 Minutes Before 4.5 Hours
X	X	X	X	0	0	1	0	Limit #2: 4.5 Hours Reached
X	X	X	X	0	0	1	1	Limit #3: 15 Minutes Before Optional Warning 1
X	X	X	X	0	1	0	0	Limit #4: Optional Warning 1 Reached
X	X	X	X	0	1	0	1	Limit #5: 15 Minutes Before Optional Warning 2
X	X	X	X	0	1	1	0	Limit #6: Optional Warning 2 Reached
X	X	X	X	0	1	1	1	Reserved
X	X	X	X	1	0	0	0	Reserved
X	X	X	X	1	0	0	1	Reserved
X	X	X	X	1	0	1	0	Reserved
X	X	X	X	1	0	1	1	Reserved
X	X	X	X	1	1	0	0	Reserved
X	X	X	X	1	1	0	1	Other
X	X	X	X	1	1	1	0	Error
X	X	X	X	1	1	1	1	Not Available
Driver Card, Driver 1								
X	X	0	0	X	X	X	X	Driver Card Not Present
X	X	0	1	X	X	X	X	Driver Card Present
X	X	1	0	X	X	X	X	Error
X	X	1	1	X	X	X	X	Not Available
Overspeed								
0	0	X	X	X	X	X	X	No Overspeed
0	1	X	X	X	X	X	X	Overspeed
1	0	X	X	X	X	X	X	Error
1	1	X	X	X	X	X	X	Not Available

11 Driver 2 States (D8: TCO1/DB3; FMS: TCO1/DB3)

Bit								Definition
7	6	5	4	3	2	1	0	
Driver 2 States								
X	X	X	X	0	0	0	0	No Time Related Warning Detected
X	X	X	X	0	0	0	1	Limit #1: 15 Minutes Before 4.5 Hours
X	X	X	X	0	0	1	0	Limit #2: 4.5 Hours Reached
X	X	X	X	0	0	1	1	Limit #3: 15 Minutes Before Optional Warning 1
X	X	X	X	0	1	0	0	Limit #4: Optional Warning 1 Reached
X	X	X	X	0	1	0	1	Limit #5: 15 Minutes Before Optional Warning 2
X	X	X	X	0	1	1	0	Limit #6: Optional Warning 2 Reached
X	X	X	X	0	1	1	1	Reserved
X	X	X	X	1	0	0	0	Reserved
X	X	X	X	1	0	0	1	Reserved
X	X	X	X	1	0	1	0	Reserved
X	X	X	X	1	0	1	1	Reserved
X	X	X	X	1	1	0	0	Reserved
X	X	X	X	1	1	0	1	Other
X	X	X	X	1	1	1	0	Error
X	X	X	X	1	1	1	1	Not Available
Driver Card, Driver 2								
X	X	0	0	X	X	X	X	Driver Card Not Present
X	X	0	1	X	X	X	X	Driver Card Present
X	X	1	0	X	X	X	X	Error
X	X	1	1	X	X	X	X	Not Available
Not Defined								
0	0	X	X	X	X	X	X	Not Defined
0	1	X	X	X	X	X	X	Not Defined
1	0	X	X	X	X	X	X	Not Defined
1	1	X	X	X	X	X	X	Not Defined

<table>
<tr><td>12</td><td>Tachograph Status (D8: TCO1/DB4; FMS: TCO1/DB4)
<table>
<tr><td colspan="8">Bit</td><td rowspan="2">Definition</td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="9">System Event</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>0</td><td>0</td><td>No Tachograph Event</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>0</td><td>1</td><td>Tachograph Event</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>1</td><td>0</td><td>Error</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>1</td><td>1</td><td>Not Available</td></tr>
<tr><td colspan="9">Handling Information</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>0</td><td>1</td><td>X</td><td>X</td><td>No Handling Information</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>0</td><td>1</td><td>X</td><td>X</td><td>Handling Information</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>1</td><td>1</td><td>X</td><td>X</td><td>Error</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td>1</td><td>1</td><td>X</td><td>X</td><td>Not Available</td></tr>
<tr><td colspan="9">Tachograph Performance</td></tr>
<tr><td>X</td><td>X</td><td>0</td><td>0</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Normal Performance</td></tr>
<tr><td>X</td><td>X</td><td>0</td><td>1</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Performance Analysis</td></tr>
<tr><td>X</td><td>X</td><td>1</td><td>0</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Error</td></tr>
<tr><td>X</td><td>X</td><td>1</td><td>1</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Not Available</td></tr>
<tr><td colspan="9">Direction Indicator (Option)</td></tr>
<tr><td>0</td><td>0</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Forward</td></tr>
<tr><td>0</td><td>1</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Reverse</td></tr>
<tr><td>1</td><td>0</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Error</td></tr>
<tr><td>1</td><td>1</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>Not Available (MTCO 1234)</td></tr>
</table></td></tr>
<tr><td>13
14</td><td>Speed Authorized - infrastructure for Stoneridge only (otherwise sent as zero)</td></tr>
</table>

15 Additional Information – High Byte (D8: Additional Information/High Byte)

Bit								Definition
7	6	5	4	3	2	1	0	
Mode of Operation								
X	X	X	X	X	0	0	0	Not Activated
X	X	X	X	X	0	0	1	Operational
X	X	X	X	X	0	1	0	Control
X	X	X	X	X	0	1	1	Calibration
X	X	X	X	X	1	0	0	Company
X	X	X	X	X	1	0	1	Error
X	X	X	X	X	1	1	0	Error
X	X	X	X	X	1	1	1	Not Available
All Other								
X	X	X	X	X	X	X	X	Not Defined

16 Additional Information – Low Byte (D8: Additional Information/Low Byte)

Bit								Definition
7	6	5	4	3	2	1	0	
D1								
X	X	X	X	X	X	0	0	D1 Input Logic 0
X	X	X	X	X	X	0	1	D1 Input Logic 1
X	X	X	X	X	X	1	0	Error
X	X	X	X	X	X	1	1	Not Available
D2								
X	X	X	X	0	1	X	X	D2 Input Logic 0
X	X	X	X	0	1	X	X	D2 Input Logic 1
X	X	X	X	1	1	X	X	Error
X	X	X	X	1	1	X	X	Not Available
Ignition								

	X	X	0	0	X	X	X	X	Off
	X	X	0	1	X	X	X	X	On
	X	X	1	0	X	X	X	X	Error
	X	X	1	1	X	X	X	X	Not Available
	Drawer								
	0	0	X	X	X	X	X	X	Open
	0	1	X	X	X	X	X	X	Closed
	1	0	X	X	X	X	X	X	Error
	1	1	X	X	X	X	X	X	Not Available

2.7.35 *DTCO Periodic Event*

This message will be sent periodically, during Ignition On mode only, according to "Period of DTCO Update" parameter (address 245-246).

Except of the new module defined below, the message will include modules 51.

Byte	Description
0	Module 54 – DTCO Periodic Event
1	Length of module – 17
2	
3	Spare
4	Source of System Parameters 1

Spare					Odometer Source 0 - Estimated by GPS 1 - CAN 2 - Frequency Counter 3 - DTCO 4-7 - Spare		
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

<table>
<tr><td>5</td><td>Source of System Parameters 2
<table>
<tr><td colspan="2">D8 DTCO Connection Status
0 - Disconnected
1 - Connected</td><td colspan="3">Speed source
0 - GPS
1 - Freq. Counter
2 - CAN
3 - DTCO
4-7 - Spare</td><td colspan="2">RPM source
0 - Freq. Count
1 - CAN
2 - DTCO
3 - Spare</td><td colspan="2">Driver ID source
0 - 1-Wire bus
1 - COM port
2 - DTCO
3 - Spare</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>6</td><td rowspan="2">Tachograph Vehicle speed (D8: TCO1/DB5-DB6; FMS: TCO1/DB7-DB8; 0-250.996 km/h, 1/256 km/h/bit)</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td rowspan="4">Vehicle Distance (Odometer) (D8: Vehicle Distance/DB1-DB4; 5m/bit)</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td><td rowspan="4">Trip Distance (D8: Vehicle Distance/DB5-DB8; 5m/bit)</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td></tr>
<tr><td>15</td></tr>
<tr><td>16</td><td rowspan="2">K-Factor (D8: K-Factor; 0.001 Pulse/m/bit)</td></tr>
<tr><td>17</td></tr>
<tr><td>18</td><td rowspan="2">Engine speed (D8: Engine Speed; 0.125 RPM/bit)</td></tr>
<tr><td>19</td></tr>
</table>

2.7.36 *BLE camera sensor file*

This module is used to communication with a still camera with BLE interface, transferring large files from it.

The structure of this module depends on the field of Protocol ID in Module 8 (which is sent with any Type 11 message anyway).

When the Protocol ID in Module 8 contain a value of 1 (legacy Module 68).

Byte	Description	Containing

0	Module 68 – BLE Camera Sensor File	68
1 2	Length of module (16 bits)	
3	BLE device enumerator	BLE device # in the system
4 5	Chunk numerator	Range: 0 to Total chunks
6 7	Total chunks	
8 9	Length of payload	Maximum value 220
10 … … … … Max Len	Payload	Maximum payload size is 220 bytes

Protocol ID in Module 8 contain a value of 2 (improved Module 68).

Byte	Description	Containing
0	Module 68 – BLE Camera Sensor File	68
1 2	Length of module (16 bits)	
3	BLE device enumerator	BLE device # in the system
4 5	Chunk numerator	Range: 0 to Total chunks
6 7	Total chunks	
8 9	File Numerator (Cross SW reset)	
10	Additional bitmask (Cross SW reset)	

Spare	Spare	Spare	Spare	Spare	Spare	Spare	Counter reset reason (only valid for File Num = 0) 0 – normal (reset due to counter cycle) 1 – reset due to external activity (power cycle or FW flash)
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

11 12	Length of payload	Maximum value 220
13 … … … … Max Len	Payload	Maximum payload size is 220 bytes

2.7.37 *BLE camera sensor file status*

Byte	Description
0	Module 69 – BLE Camera Sensor File Status

1	Length of module (16 bits) – 17
2	
3	Upload BLE device#
4	Upload status 0 – None 1 – Uploading 2 – Numerator from camera invalid 3 – CRC32 invalid 4 – BLE disconnected during process 5 – Upload success 6 – Build outbound photo chunk error 7 - Camera took a photo (satellite message only)
5	Photo ID
6	
7	
8	
9	Download BLE device#
10	Download status 0 – None 1 – Ready to upgrade FW, waiting for camera to connect 2 – Start file download to camera 3 – Downloading file to camera 4 – File to camera download complete 5 – BLE disconnected during process 6 – Received NACK from camera 7 – Max retries for Request File Verification from BLE 8 – CBLE communication timeout 9 – Auxiliary memory error 10 – CBLE send error 11 – Memory read from server / write to server watchdog timeout
11	Download file CRC32
12	
13	
14	
15	Download file progress – 0 to 100 (percent)
16	Spare

17	
18	
19	

Note that when the Upload status or Download status fields equals 0, then fields pertaining to that status are irrelevant.

2.7.38 *Forwarded Data from Serial Port to Wireless Channel (module 91)*

(Replaces type 8)

The unit can forward data from its serial port to the OTA channel using module 91 in a logged manner.

The Module contains a complete payload (up to 512 bytes) forwarded from the unit serial port.

2.7.38.1 Byte-Aligned Table

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>0</td><td>Module 91 – Real Time Forwarded Data from Serial Port to Wireless Channel</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – variable</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td rowspan="2">Spare</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td><td>Serial Port Source
<table>
<tr><td colspan="3">Source of Payload
0 – N/A
1 – N/A
2 – COM2 (BT)
3 – COM3
4 – COM4
5 – COM5
6 – CFE Micro
7 – N/A</td><td>CFE Connected
0 – Not connected
1 – Connected</td><td colspan="4">Static nibble containing value 0x07</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>6…</td><td>Payload</td></tr>
</table>

2.7.38.2 Serial Port Source

This field provides information about the source of data connected to the unit serial port.

2.7.39 *Car Sharing 3 Response (Module 92)*

This module is sent as a reply to Car Sharing 3 Command message (module 92) from server.

Byte	Description
0	Module 92 – Car Sharing 3 Response
1	Length of module – 11
2	
3	Spare
4	Spare
5	Command Code Received 0 – Spare 1 – Lock Doors 2 – Unlock Doors 3 – Disable Immobilizer 4 – Enable Immobilizer 5-12 – Spare 13 – Start Voice Call 14 – End Voice Call 15 – Volume Up 16 – Volume Down 17 – Change State to In-use 18 – Change State to Reserved 19 – Change State to Free 20 – MVM Sleep (new) 21 – MVM wake-up (new) 222 – Change service state from out-of service to free (Out-of-Service-End) 223 – Change service state to Out-of-Service (Out-of-Service-Start) 24 – Driver Granted / Authorized 25 – Driver not authorized 26-27 – Spare 28 – DB sync 29 – Reserved Card Detected
6	Card ID Byte 1 (relevant only for "Change State to Reserved", "Driver Granted" and "Reserved Card Detected" commands)

Byte	Description
7	Card ID Byte 2 (relevant only for "Change State to Reserved", "Driver Granted" and "Reserved Card Detected" commands)
8	Card ID Byte 3 (relevant only for "Change State to Reserved", "Driver Granted" and "Reserved Card Detected" commands)
9	Card ID Byte 4 (relevant only for "Change State to Reserved", "Driver Granted" and "Reserved Card Detected" commands)
10	Card ID Byte 5 (relevant only for "Change State to Reserved", "Driver Granted" and "Reserved Card Detected" commands)
11	Card ID Byte 6 (relevant only for "Change State to Reserved", "Driver Granted" and "Reserved Card Detected" commands)
12	Card ID Byte 7 (relevant only for "Change State to Reserved", "Driver Granted" and "Reserved Card Detected" commands)
13	Card ID Byte 8 (relevant only for "Change State to Reserved", "Driver Granted" and "Reserved Card Detected" commands)
14	ACK/NACK : 0 - ACK 1 - NACK
15	NACK Code: 00 - The command processing failed as a result of syntax problem (as illegal packet number etc.). Note that message with checksum error will not cause NACK, but will be ignored by the unit. F1 - Busy, try again later.

2.7.40 *CAN Arbitration IDs (Module 110)*

Byte	Description
0	Module 110 – CAN Arbitration IDs
1	Length of module - (7+4*n)
2	
3	Spare
4	Spare
5	CAN bus # (=0x01)
6	Used baud-rate 0 - 125 Kbps

	1 - 250 Kbps 2 - 500 Kbps 3 - 1 Mbps 4 - 50 Kbps 5 - 62.5 Kbps 6 - 83.333 Kbps 7 - 100 Kbps 8-14 - Reserved 15 - Auto (not detected)
7	Spare
8	Spare
9	Number of Arbitration IDs
10	Arbitration ID #1 (Int32 in little-endian) Bit 31 = CAN ID format: 0=11bit, 1=29bit
11	
12	
13	
14	Arbitration ID #2 (Int32 in little-endian) Bit 31 = CAN ID format: 0=11bit, 1=29bit
15	
16	
17	
..	…

2.7.41 *CAN library file match report (Module 111)*

Inbound (from C+ server to unit):

Byte	Description
0	Module 111 – CAN library file match report
1	Length of module - 9
2	
3	CAN bus # (=0x01)
4	Spare
5	Spare
6	Spare
7	CAN library detection:

	0 - No match 1 - Partial match 2 - Full match 3 - FMS
8	Spare
9	
10	
11	

Outbound (from unit to fleet server):

Byte	Description
0	Module 111 – CAN library file match report
1	Length of module - 9
2	
3	CAN bus # (=0x01)
4	Spare
5	0x00=ACK and: bit-0 = NACK:CAN ID queue overloaded (too fast) bit-1 = NACK:Ignition line changed to OFF in the middle of detection bit-2 = NACK:General error bit-3 = NACK:Failed to connect to the C+ bit-4 = NACK:CAN-BUS is disabled bit-5 = NACK:No CAN baud rate is detected Bit-6 = Reserved Bit-7 = Reserved
6	Used baud-rate 0 - 125 Kbps 1 - 250 Kbps 2 - 500 Kbps 3 - 1 Mbps 4 - 50 Kbps 5 - 62.5 Kbps 6 - 83.333 Kbps 7 - 100 Kbps 8-14 – Reserved 15 – Not detected (see NACK reason in next byte)

7	CAN library detection: 0 - No match 1 - Partial match 2 - Full match 3 - FMS
8	CAN library identifier number
9	
10	
11	

0	Module 119 – Mount/Unmount by GPS SNR
1	Length of module (16 bits) – 33
2	
3	SNR Decision P1 Additional Info
4	SNR Decision P2 Additional Info
5	Detect by SNR Compare & Cross (If enabled): 1 – Mount 2 – Unmount 3 – Unknown
6	SNR Average (1) [UINT16, 0.01dB] (Oldest)
7	
8	SNR Average (2) [UINT16, 0.01dB]
9	
10	SNR Average (3) [UINT16, 0.01dB]
11	
12	SNR Average (4) [UINT16, 0.01dB]
13	
14	SNR Average (5) [UINT16, 0.01dB]
15	
16	SNR Average (6) [UINT16, 0.01dB]

17	
18	SNR Average (7) [UINT16, 0.01dB]
19	
20	SNR Average (8) [UINT16, 0.01dB]
21	
22	SNR Average (9) [UINT16, 0.01dB]
23	
24	SNR Average (10) [UINT16, 0.01dB]
25	
26	SNR Average (11) [UINT16, 0.01dB]
27	
28	SNR Average (12) [UINT16, 0.01dB]
29	
30	SNR Average (13) [UINT16, 0.01dB]
31	
32	SNR Average (14) [UINT16, 0.01dB]
33	
34	SNR Average (15) [UINT16, 0.01dB] (Newest)
35	

2.7.42 *Current J1939 DTC Status of CAN#2*

Byte	Description
0	Module 122– Current J1939 DTC Status of CAN#2
1	Length of module – Variable
2	
3	Spare
4	First Source Number (DTC may be reported by few ECU sources on bus; the unit supports reports from 4 different ECUs)
5	Spare

6	Physical Indication Lamp Status (same as appears in PGN 0x00FECA, bytes 1-2)
7	
8	Amount of active DTCs in the message
9	DTC #1
10	
11	
12	
13	DTC #2
14	
15	
16	
…	…
…	Second Source Number (DTC may be reported by a few ECU sources on the bus; the unit supports reports from 4 different ECUs)
…	…

3 Command Channel (Inbound Messages)

3.1 Overview

The command channel comprises several types of messages, as described in the following:

- **Generic Command (Message Type 0)** – some commands are sent using this legacy message. This message is always replied with a legacy status/location message from the target unit (if the command is received successfully).
- **Programming Command (Message Type 1)** – this message provides OTA programming capabilities, and is always replied to with a programming data message from the target unit, when received correctly.
- **Generic Acknowledge Message (Message Type 4)** – this message is sent by the server to verify reception of outbound status/location, telemetry or transparent data messages.
- **Forward Data Command (Message Type 5)** – this message allows the sending of data to the terminal attached to the unit.
- **Modular Message Request (Message Type 9)** – this legacy modular message is designed to request the unit to send types of data, defined in Modular Message packet like CAN bus sensors, Cell ID, debug data, etc.
- **Modular Message Request (Message Type 11)** – this modular message type implements an extended modular protocol, intended to replace older message types (0, 1, and 9). It is used to request the unit to send many types of data in a modular message packet, like CAN bus applications, CelloTrack Nano, etc.

3.2 Generic Command (Message Type 0)

The generic command message is the main command interface to the unit.

3.2.1 *Message Ingredients*

- Message header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Unit ID – 4 bytes
  - Command Numerator – 1 byte
  - Authentication Code – 4 bytes
- Command Code – 1 byte (repeated twice)
- 1st Command Data Field – 1 byte (repeated twice)
- 2nd Command Data Field – 1 byte (repeated twice)
- Command Specific Data Field – 4 bytes
- Error Detection Code – 1 byte

3.2.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII "M"
2	System Code, byte 2 – ASCII "C"
3	System Code, byte 3 – ASCII "G"
4	System Code, byte 4 – ASCII "P"
5	Message Type (0)
6	Unit ID
7	
8	
9	
10	Command Numerator
11	Authentication Code
12	
13	
14	

15	Command Code
16	Command Code (repetition)
17	1st Command Data Field
18	1st Command Data Field (repetition)
19	2nd Command Data Field
20	2nd Command Data Field (repetition)
21	Command Specific Data Field
22	
23	
24	
25	Error Detection Code (8-bit additive checksum, excluding system code)

3.2.3 *Detailed Per-Field Specifications*

3.2.3.1 System Code

The same system code constant that is sent on every message – ASCII "M", "C", "G", "P" or "M", "C", "G", "S", in this order.

3.2.3.2 Message Type

Message type identifies the kind of the message. It allows the receiver to differentiate between different messages types, according to the value sent in this field.

Generic command messages contain a value of 0 (zero) in the message type field.

3.2.3.3 Unit ID

This field contains the unique unit ID of the target unit. The unit ignores all received commands that do not contain the appropriate unit ID number.

3.2.3.4 Command Numerator Field

This field should contain the number of the command. This number appears in the "Message numerator" field in the unit reply message, enabling the user to easily distinguish between acknowledged commands and un-acknowledged ones.

3.2.3.5 Authentication Code

This field contains a 4 byte unique authentication code, which is verified by the unit, in order to provide protection against unapproved command attempts (from FW 27p and up). For example: an attempt to change the traffic destination IP by unauthorized personnel.

If the code is not verified as authentic – the unit will not perform/acknowledge the command.

The feature should be switched on in the unit configuration (refer to Programming Manual for more details).The feature is switched off by default.

The 4 bytes authentication code is generated as a function of two variables:

- Unit ID
- 8 bytes Authentication Table, stored in the NVM of the unit and concurrently in the Communication Center application (refer to Modular Message Definition for modification instructions to this table).

The OTA Authentication table modification will be only accepted by the unit if the Command Authentication feature is **DISABLED**.

The following are default values of the Authentication table:

Index	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Value	2	15	7	9	12	1	4	6	8	3	11	14	0	5	10	13

3.2.3.6 Command Code

As the generic command message is relevant for all kinds of commands, it is necessary to specify the actual command that is desired. Therefore, each different command assigns a unique command code, which is used in the command code field, to specify the command to be executed.

3.2.3.7 Command Data Fields (1st and 2nd)

The command data fields contain further information, which is needed by some of the commands.

3.2.3.8 Command Specific Data Field

The command specific data field contains additional information, which is needed by some of the commands.

The available commands and corresponding data fields are detailed below:

Command Code (Hex)	Description
0x00	Immediate status request
0x02	Unit state change Data field value: 0x00: Go to Standby 0x01: Go to Emergency mode

Command Code (Hex)	Description
	This command sets the unit to start transmitting emergency messages according to the command configuration. The command is sent with two parameters, the interval between each emergency transmission and how many transmissions to send to the operator. If the number of transmissions chosen is 0, the unit sends the emergency transmission constantly. If the time between transmissions is set to 0, the unit sends the emergency transmission according to the pre-programmed definition of the Distress Mode in the NVM. The emergency command is meant to emulate the action of a driver pressing on the emergency button. It uses the same mechanism. If an emergency command is sent and the driver simultaneously presses on the emergency button, the emergency function that the driver initiated stops the command sent by the operator and starts its own emergency session. Here is an example of the emergency command sent to a unit: Number of distress transmissions = 2 Time between distress transmissions Events = 5sec 4D 43 47 50 00 4B 01 00 00 1C 6E DF DD DD 02 02 01 01 00 00 02 05 00 00 7C 0x02: Reset The following fields will be reset: The "Garmin Enabled", "Garmin Connected" and GSM hibernation indication bit flags, Message numerator, Unit's status, Current GSM operator report, Unit's mode of operation, I/O, Analog inputs, Driver ID /PSP Specific Data/Accelerometer Status, Last GPS Fix, Number of satellites, Longitude, Latitude, Altitude, Speed, Course, System time, System date. The modem will be re-initialized, the GPRS connection restored. The RAM buffer used for data forwarding will be reset. Configuration parameters will be reloaded from Configuration memory. Command Specific Data field: don't care

Command Code (Hex)	Description
0x03	Output state change Data field should contain output change information, according to this table: Data field 1 value: function 0x00: GPIO1 (Siren) OFF , 0x10: GPIO1 (Siren) ON 0x01: USB OTG power OFF , 0x11: USB OTG power ON 0x02: GPIO2 output OFF , 0x12: GPIO2 output ON 0x03: Ext Immobilizer (Same output as Gradual Stop) OFF , 0x13: Ext Immobilizer (Same output as Gradual Stop) ON 0x04: Blinkers/Output-1 OFF , 0x14: Blinkers/Output-1 ON 0x05: Standard immobilizer 1/Output-4 OFF , 0x15: Standard immobilizer 1/Output-4 ON 0x08: LED OFF , 0x18: LED ON / Output-2 0x09: CFE IO out3 OFF , 0x19: CFE IO out3 ON 0x0A: CFE IO out4 OFF , 0x1A: CFE IO out4 ON 0x0B: CFE IO out5 OFF , 0x1B: CFE IO out5 ON 0x0C: CFE IO out6 OFF , 0x1C: CFE IO out6 ON 0x0D: Output-3 OFF , 0x1D: Output-3 ON 0x0E: Lock (performs pulse, CAR2GO only) 0x0F: Unlock (performs pulse, CAR2GO only) Data field 2 and 2 bytes of Command Specific Data field: Contain time of the output activation with one second resolution. Value of 0 cause permanent output change. Example: Activate Siren for 5 minutes (300 seconds). MCGP 00 ID ID ID ID 00 00 00 00 00 03 03 10 10 2C 2C 01 01 00 00 CS Nested output activation: If the MSBit of the 3rd byte of command specific data field is set, the command will be executed only after the vehicle stops, e.g. after Ignition off or after 10 (by default) valid GPS packets showing speed lower than 1 km/h). Example: Activate Siren Nested for 5 minutes (300 seconds). MCGP 00 ID ID ID ID 00 00 00 00 00 03 03 10 10 2C 2C 01 01 80 00 CS

Command Code (Hex)	Description
0x04	Disable Active Transmissions. This command will control the corresponding bit in the unit's configuration (address 6, bit 1) and immediately stop or restore active transmissions generated by the end unit. The existing GPRS session will be disconnected upon "disable command" or restored upon "Enable command". Data field: 0 – Disable active transmissions 1 – Enable active transmissions Command Specific Data field: don't care
0x05	Tracking control command (based on time events). Data field: (Bytes 17-20) All zeros Command Specific Data field: (Bytes 21-22) The full 16-bit timer. Zero value to stop tracking, non-zero sets the time events period and immediately implements it. Refer to Programming Manual for values.
0x0D	Erase tracking Log from NVM memory Data field 1: 0 - Cellular log 3-255 - Reserved
0x10	Force GPS energizing (Not supported by Cello family) The command allows maintaining GPS activated, regardless of hibernation logic. **Warning:** Note that only GPS is affected by this command! If GPS is forced active, there is no way to send a command to revert the GPS back to automatic behavior while communication is down (due to the hibernation mask or due to shutdown of the modem as a result of the full hibernation). 1st + 2nd command data fields: • A value of 1 (one) to force energizing of GPS. • A value of 0 (zero) for automatic GPS behavior (according to normal logic).
0x12	Connect to server (from FW28 and up) 0 – Main server 1 – Secondary server (provisioning) 2 – Maintenance Server
0x14	Calibrate frequency counters Data field 1 contains description of the calibration type:

<table>
<tr><th>Command Code (Hex)</th><th>Description</th></tr>
<tr><td></td><td>
<table>
<tr><td colspan="6">Reserved</td><td>Source type
0 – GP Freq. (RPM)
1 – Speed</td><td>Calibrated input
0 – pin 14
1 – pin 15</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table>
Data field 2:
• In case of GP Frequency contains percent of maximum engine load (i.e 10 for 10%)
• In case of speed – required distance in hundred's meters (recommended value 5km).
Command Specific Data field: don't care
</td></tr>
<tr><td>0x16</td><td>Query connected trailer ID
Data field: don’t care</td></tr>
</table>

3.3 Programming Command (Message Type 1)

The programming command message allows to configure the unit.

NOTE: For configuration spaces larger than 4K (Typically in Cello-IQ and Cello-CANiQ units) it is mandatory to use Type 11 programming command (modules 10, 11).

3.3.1 *Message Ingredients*

- Message header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Unit ID – 4 bytes
  - Command Numerator – 1 byte
  - Authentication Code – 4 bytes
- Block Code – 1 byte
- Programming Masking Bitmap – 2 bytes
- Block Data – 16 bytes
- Error Detection Code – 1 byte

3.3.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII "M"
2	System Code, byte 2 – ASCII "C"
3	System Code, byte 3 – ASCII "G"
4	System Code, byte 4 – ASCII "P"
5	Message Type (1)
6	Unit ID
7	
8	
9	
10	Command Numerator
11	Authentication Code
12	

<table>
<tr><td>13</td><td rowspan="2"></td></tr>
<tr><td>14</td></tr>
<tr><td>15</td><td>Block Code</td></tr>
<tr><td>16</td><td>Programming Masking Bitmap</td></tr>
<tr><td>17</td><td>
<table>
<tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="8">Byte 17</td><td colspan="8">Byte 16</td></tr>
</table>
</td></tr>
<tr><td>18-33</td><td>Block Data</td></tr>
<tr><td>34</td><td>Error Detection Code (8-bit additive checksum, excluding system code)</td></tr>
</table>

3.3.3 *Detailed Per-Field Specifications*

3.3.3.1 System Code

Refer to Section 3.2.3.1

3.3.3.2 Message Type

Programming Command messages contain a value of 1 (one) in the message type field.

3.3.3.3 Unit ID

Refer to section 3.3.3.33.2.3.3

3.3.3.4 Command Numerator Field

Refer to section 3.2.3.4

3.3.3.5 Authentication Code

Refer to section 3.2.3.5

3.3.3.6 Block Code

OTA (over the air) parameter programming is done in blocks. The entire NVM parameter memory is partitioned to 16-bytes long blocks. Each of those blocks is uniquely identified with a block code. The block code field contains the code of the block whose data is sent in this message (in the block data field).

3.3.3.7 Programming Masking Bitmap

The bitmap allows programming of only part of the parameters in a block, while leaving the other parameters with their previous values.

Each bit in the 16-bit value represents a byte in the parameters memory block. A value of "1" in a certain bit enables programming to the corresponding byte in the parameters memory, where a value of "0" prohibits programming of that byte.

3.3.3.8 Block Data

Contains the actual data programmed in the specified block of the parameter memory.

3.4 Generic Acknowledge Message (Message Type 4)

The generic acknowledge message is an inbound message sent by server to verify reception of outbound Status/Location (Type 0), Data Forwarding (Type 7, 8) and Modular (Type 9) messages.

3.4.1 *Message Ingredients*

- Message header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Unit ID – 4 bytes
  - Command Numerator – 1 byte
  - Authentication Code – 4 bytes
- Action Code – 1 byte
- Main Acknowledge Number – 2 bytes (1 reserved)
- Secondary Acknowledge Number – 2 bytes (reserved)
- Compressed Date – 2 bytes
- Compressed Time – 2 bytes
- Spare – 2 bytes
- Error Detection Code – 1 byte

3.4.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII "M"
2	System Code, byte 2 – ASCII "C"
3	System Code, byte 3 – ASCII "G"
4	System Code, byte 4 – ASCII "P"
5	Message Type (4)
6	Unit ID
7	
8	
9	
10	Command Numerator
11	Authentication Code

<table>
<tr><td>12</td><td rowspan="3"></td></tr>
<tr><td>13</td></tr>
<tr><td>14</td></tr>
<tr><td>15</td><td>Action Code (sent as zero)</td></tr>
<tr><td>16</td><td>Main Acknowledge Number – LSB</td></tr>
<tr><td>17</td><td>Reserved for Main Acknowledge Number – MSB (sent as zeros)</td></tr>
<tr><td>18</td><td>Reserved for Secondary Acknowledge Number – LSB (sent as zeros)</td></tr>
<tr><td>19</td><td>Reserved for Secondary Acknowledge Number – MSB (sent as zeros)</td></tr>
<tr><td>20</td><td>Reserved for future use (sent as zeros)</td></tr>
<tr><td>21</td><td rowspan="2">Compressed Date
<table>
<tr><td colspan="5">Day</td><td colspan="4">Month</td><td colspan="7">Year (-2000)</td></tr>
<tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="8">Byte 22</td><td colspan="8">Byte 21</td></tr>
</table></td></tr>
<tr><td>22</td></tr>
<tr><td>23</td><td rowspan="3">Compressed Time
<table>
<tr><td colspan="7">Spare (sent as 128)</td><td colspan="6">Seconds</td><td colspan="6">Minutes</td><td colspan="6">Hours</td></tr>
<tr><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="8">Byte 25</td><td colspan="8">Byte 24</td><td colspan="8">Byte 23</td></tr>
</table></td></tr>
<tr><td>24</td></tr>
<tr><td>25</td></tr>
<tr><td>26</td><td rowspan="2">Spare</td></tr>
<tr><td>27</td></tr>
<tr><td>28</td><td>Error Detection Code (8-bit additive checksum, excluding system code)</td></tr>
</table>

3.4.3 *Detailed Per-Field Specifications*

3.4.3.1 System Code

Refer to Section 3.2.3.1

3.4.3.2 Message Type

Generic Acknowledge messages contain a value of 4 (four) in the message type field.

3.4.3.3 Unit ID

Refer to section 3.2.3.3

3.4.3.4 Command Numerator Field

Refer to section 3.2.3.4

3.4.3.5 Authentication Code

Refer to section 3.2.3.5

3.4.3.6 Action Code

Sent as zero.

3.4.3.7 Main Acknowledge Number

This field contains the Message Numerator filed of the acknowledged outbound message.

3.4.3.8 Secondary Acknowledge Number

Currently not used and sent as zero.

3.5 Modular Message Request (Message Type 11)

Type 11 was introduced for supporting true modular protocol. The basic structure of the protocol is designed to carry records with predefined structure called modules. The protocol will be used as an extension for Cello fleet protocol. Type 11 supports theoretical message length of up to 65536 bytes, tough the actual rate will be constrained by the HW limitations.

3.5.1 *Message Ingredients*

- Message header
  - System Code – 4 bytes
  - Message Type – 1 byte
  - Destination Unit ID – 4 bytes
  - Command Numerator – 1 byte
- Authentication Code – 4 bytes
- Packet Control Field – Legacy fleet field
- Message length – 2 bytes
- spare – 4 bytes
- Payload Modules – User Configuration Depended
- Error Detection Code – 1 byte

3.5.2 *Byte-Aligned Table*

Byte	Description
1	System Code, byte 1 – ASCII "M"
2	System Code, byte 2 – ASCII "C"
3	System Code, byte 3 – ASCII "G"
4	System Code, byte 4 – ASCII "P"
5	Message Type (11)
6	Unit ID
7	
8	
9	
10	Command Numerator

	(When transmitting ACK/NACK packet, it carries the numerator of the original message)
11	Authentication Code
12	
13	
14	
15	Packet Control Field
16	Length (of the modules section – from byte 18 until but not including the checksum). Must be at least 7 (to symbolize inbound message, while 0 means outbound), meaning that there should not be a message without any modules.
17	
18	Spare (sent as 0)
19	
20	
21	
22	Modules
…	…
…	…
Last Byte	Error Detection Code (8-bit additive checksum, excluding system code)

3.5.3 *Detailed Per-Field Specifications*

3.5.3.1 System Code

Refer to Section 3.2.3.1

3.5.3.2 Message Type

Modular message requests contain a value of 11 (eleven) in the message type field.

3.5.3.3 Unit ID

Refer to Section 3.2.3.3

3.5.3.4 Command Numerator (Anti-Tango™)

Refer to Section 3.2.3.4

3.5.3.5 Authentication Code

Refer to Section 3.2.3.5

3.5.3.6 Packet Control Field

Direction	Out of space indication	Unused					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Direction

0 – Data from the unit

1 – Request (unit-bound)

Out of Space Indication

0 – All the requested data is present in the message.

1 – Some Sub-data was not returned due to data size.

3.5.3.7 Length

That field includes the number of data bytes of the modules (with their codes and lengths). It is the number of bytes from byte 18 to the byte of the checksum, which is not included.

3.5.4 *Inbound Type 11 Module Structure*

The general structure of a type 11 module is as follows:

Byte	Description
0	Module Code
1	Length of module (16 bits) – Number of payload bytes
2	
3	Module Payload bytes
.	
.	
n	

3.5.5 *Inbound Type 11 Modules Table*

Code	Description
9	ACK (from server)
10	Configuration Memory Write

Code	Description
11	Configuration Memory Block Request
13	Authenticated Features Command
21	VIN String Write
22	VIN String Read Request
29	General Module Query
32	General Command
35	Forwarded CAN Query
72	Firmware Upgrade Control
110	CAN Arbitration IDs
111	CAN library file match report

3.5.6 *ACK/NACK*

Byte	Description
0	Module 9 – ACK/NACK
1	Length of module – 3
2	
3	0 - ACK
4	Spare
5	Spare

3.5.7 *Configuration Memory Write*

Byte	Description
0	Module 10 - Configuration Memory Write
1	Length of module – Variable
2	
3	Numerator
4	

5	Number of instances	
6	Memory type – 0 / 5 (Firmware Upgrade File) / 6 (Driver ID table)	
7	Memory entry unit type 0 – Bit 1 – Byte 2 – Word (16 bits) 3 – Double Word (32 bits) (Only Byte entry unit type is currently supported)	Instance 1
8	Address in the configuration memory space (Relative, so in case of Driver IDs the 1st driver starts in address 0, length of Driver ID is 4 bytes)	
9		
10		
11		
12	Number of Entries (Instance Length-Total bytes)	
13		
…	Data payload (according to the entry size and the number of entries defined above)	
…	…	Instance 2
…	…	
…	…	

3.5.8 *Configuration Memory Read Request*

Byte	Description	
0	Module 11 - Configuration Memory Read Request	
1	Length of module – Variable	
2		
3	Numerator	
4		
5	Number of instances (**=1**, Currently only 1 instance is supported)	
6	Memory type – 0	
7	Memory entry unit type	Instance 1

	0 – Bit 1 – Byte 2 – Word (16 bits) 3 – Double Word (32 bits) (Only Byte entry unit type is currently supported)	
8	Address in the configuration memory space	
9		
10		
11		
12	Number of Entries	
13		
…	…	Instance 2
…	…	
…	…	

3.5.9 *Authenticated Features Command*

This module enables query/activation/de-activation of features in the unit. It contains the desired features codes.

On query command, there will be no feature codes.

On activation/de-activation command the unit will reply with ACK/NACK (module 9), while on query command the unit will reply with Authenticated Features Query Response (module 13).

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>0</td><td>Module 13 – Authenticated Features Command</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – Variable</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Control Byte
<table>
<tr><td>Spare</td><td>Spare</td><td>Spare</td><td>Spare</td><td>Spare</td><td>Spare</td><td colspan="2">Command Code
0 - Query
1 - Activation
2 - De-Activation</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
</table>

4	Spare	
5	Number of Feature Codes (0 for query command, 1-8 for activation/de-activation)	
6	C[0]	Feature Code 1
7	C[1]	
8	C[2]	
9	C[3]	
10	Spare	
11	Spare	
12	Spare	
13	Spare	
14	Spare	
15	Spare	
16	C[0]	Feature Code 2
17	C[1]	
18	C[2]	
19	C[3]	
20	Spare	
21	Spare	
22	Spare	
23	Spare	
24	Spare	
25	Spare	
…	…	
…	C[0]	Feature Code n
	C[1]	
	C[2]	
	C[3]	
	Spare	

	Spare	
	Spare	
	Spare	
	Spare	
	Spare	

3.5.10 *VIN String Write*

Byte	Description
0	Module 21 – VIN String Write
1	Length of module – 17
2	
3	VIN – Byte 0
4	VIN – Byte 1
…	…
…	…
19	VIN – Byte 16

3.5.11 *VIN String Read Request*

Byte	Description
0	Module 22 – VIN String Read Request
1	Length of module – 3
2	
3	Spare
4	Spare
5	Spare

3.5.12 *CAN Bus Status Query (Module 24)*

Byte	Description
0	Module 24 – CAN Bus Status query

1	Length of module – 3
2	
3	CANBUS number 0 – CANBUS #1 1 – CANBUS #2 2 – K-line 3 – J1708 4 – SWCAN
4	Spare
5	Spare

3.5.13 *General Module Query*

This command will be sent by the server to request a set of outbound modules to be returned to the server. The module describes a list of module IDs. The addressed unit will respond with a type 11 message carrying the requested modules content arranged in the same order of the request.

Byte	Description
0	Module 29 – General Module Query
1	Length of module – Variable
2	
3	Number of requested Modules
4	First requested module ID
5	Second requested module ID
…	…

3.5.14 *General Command*

This module enables the server to command the unit to perform multiple actions while specifying the action code and optional data bytes attached to the command. The general format of the module is shown below. The unit will send Acknowledge (outbound type 11 module 9) upon receiving this module.

Byte	Description
0	Module 32 – General Command
1	Length of module – Variable

2		
3	Number of Command entries	
4	Command ID	Command Entry 1
5		
…	Command data bytes	
…	Command ID	Command Entry 2
…		
…	Command data bytes	
…	…	

Commands Types Description:

Command ID	Description	Number of Attached data bytes	Expected unit response
0	Reset CAN OTA events Queue pointers	0	One ACK for all the command request
1	Reset Unit	0	One ACK for all the command request
19	Connection to the Maintenance server (CAN mode)	2	Switch to maintenance server in CAN mode
259	Nano/Cello with BT Extender: send status of the designated source	1	Status of the designated source

Connection to the Maintenance server

Byte	Description	
0	Module 32 – General Command	
1	Length of module = 5	
2		
3	Number of Command entries = 1	
4	CAN mode = 19	Command Entry 1
5		
6	0x00 - Auto-baud rate (for CAN#1) 0x01 - CAN mode 0x02 - Both CAN mode and Auto-baud rate	
7	Spare	

3.5.15 *Forwarded UDS Request*

This module enables to forward UDS (Unified Diagnostic Services) request/command on the CAN bus.

After sending the command on the CAN bus, the unit should receive a response from the bus. After receiving the response (or after timeout expiration), the unit will reply with Forwarded UDS Response (Type 11, Module 33, Outbound).

It contains the UDS Request and UDS Response IDs, the SID, Sub-Function, and the data bytes of the message, which need to be passed to a certain ECU. It also contains the expected timeout for response, and a security protocol indication.

<table>
<tr><th>Byte</th><th>Description</th></tr>
<tr><td>0</td><td>Module 33 – Forwarded UDS Request</td></tr>
<tr><td>1</td><td rowspan="2">Length of module – 23</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Command Delay [Seconds]</td></tr>
<tr><td>4</td><td>Spare</td></tr>
<tr><td>5</td><td>Control Byte
<table>
<tr><td colspan="4">Spare</td><td colspan="3">Security Type
0 – None
1 – Type A
2 – Type B</td><td>Extended Diagnostic Mode
0 – Not Required
1 – Required</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>6</td><td rowspan="4">UDS Request ID</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td><td rowspan="4">UDS Response ID</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
</table>

<table>
<tr><td>14</td><td>Information Byte
<table>
<tr><td colspan="4">Fame Type
0 - Single Frame
1 - First Frame
2 - Consecutive Frame
3 - Flow Control Frame</td><td colspan="4">Non-Zero Byte Count in Message</td></tr>
<tr><td>Bit 7</td><td>Bit 6</td><td>Bit 5</td><td>Bit 4</td><td>Bit 3</td><td>Bit 2</td><td>Bit 1</td><td>Bit 0</td></tr>
</table></td></tr>
<tr><td>15</td><td>SID (Service ID)</td></tr>
<tr><td>16</td><td rowspan="2">DID (Data Identifier)</td></tr>
<tr><td>17</td></tr>
<tr><td>18</td><td rowspan="4">Data</td></tr>
<tr><td>19</td></tr>
<tr><td>20</td></tr>
<tr><td>21</td></tr>
<tr><td>22</td><td>Timeout [Seconds]</td></tr>
<tr><td>23</td><td>Spare</td></tr>
<tr><td>24</td><td>Spare</td></tr>
<tr><td>25</td><td>Spare</td></tr>
</table>

3.5.16 *Forwarded CAN Query*

This module enables the server to command the unit to forward CAN query to CAN bus (in both J1939 and OBD II modes). The unit will send Acknowledge upon receiving the module.

Byte	Description
0	Module 35 – Forwarded CAN Query
1	Length of module – 15
2	
3	Bits 0-1: Bus# 0-CAN#1 1-CAN#2 2-3-Reserved Bits 2-7:Spare

4	Number of repetitions 0 – means that the query will only be forwarded once 1 – means it will be repeated after 100ms 2 – means it will be repeated 2 times with 100ms between each repetition and so on)
5	Control Byte (LSB - Header Format) 0 – Automatic 1 – 11bit 2 – 29 bit
6	Arbitration ID
7	Arbitration ID
8	Arbitration ID
9	Arbitration ID
10	Number of additional data bytes
11	Mode (SID)
12	PID Byte 1
13	PID Byte 2
14	User defined
15	User defined
16	User defined
17	User defined

3.5.17 *Firmware Upgrade Control (Module 72)*

3.5.17.1 Establishing

Byte	Description
0	Module 72 – Firmware Upgrade Control
1	Length of module (16 bits) – 5
2	
3	Control type – 0 (Establishing)
4	Hardware version
5	Memory type – 5 (Firmware Upgrade File)

6	Reprogramming facility identifier
7	

3.5.17.2 Abort

Byte	Description
0	Module 72 – Firmware Upgrade Control
1	Length of module (16 bits) – 1
2	
3	Control type – 2 (Abort)

3.5.17.3 Complete

Byte	Description
0	Module 72 – Firmware Upgrade Control
1	Length of module (16 bits) – 27
2	
3	Control type – 1 (Complete)
4	Total length
5	
6	
7	
8	Flashing Script Hash (CRC32)
9	
10	
11	
12	File number (Length 16 bytes)
…	
…	
27	
28	FW ID – First 3 digits from FXXX of filename, or for new Gen4 files PXXX

29	