# Cellocator Cello Programming Manual - CR300

Proprietary and Confidential

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# Table of Contents

# 1 Introduction

## 1.1 About this Document

This document defines the contents of the Cellocator Unit's Configuration Memory (CM). The CM is a non-volatile memory, which is used to store different parameters that affect the behavior of the unit, as well as communication parameters, which are necessary for the Cellocator unit's correct operation.

The CM can be read and written both from the wireless channel as well as from the direct wire interface. Refer to the Wire and Wireless Protocols in order to learn how to read and write to the CM. Note that if the stored communication parameters are not correct, the wireless channel might not work, so the only way to program the CM might be via the direct wire interface.

## 1.2 Applicability Table

| Device | Comments |
|---|---|
| CR300 | FW Version 41q. |

## 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 |
|---|---|---|
| | | |

## 1.4 Document Conventions

Unless otherwise specified:

- All multiple bytes values are stored and treated Intel-style (meaning, "little endian", least significant bytes first).
- All the parameters are loaded from CM upon reset. **In other words, changing the programming parameters will take effect only after unit reset.**

This document defines the common programmable features, supported by all the modifications of Cellocator units, as well as the specific programmable options, supported by specific modifications only. The non-common options are highlighted.

# 2 Accessing the Configuration Memory via Wireless Channel (OTA)

When done over the air (OTA), CM access is performed in blocks. The 4096 bytes are partitioned to aligned, non-overlapping blocks of 16 bytes. This means the whole CM space contains 256 different blocks, assigned with block codes of 0 (zero) to 255 (decimal).

The first block (which represents CM locations 0 to 15 decimal) is assigned with block code 0 (zero). The following blocks are assigned with successive numbers (block 1 for locations 16 to 31 and so on).

Refer to the *Cellocator Wireless Communication Protocol* document for more information about accessing the CM via the wireless channel.

# 3 Accessing the Configuration Memory via Direct Wire Interface

The CM cells are accessed via the direct wire interface in a linear manner. This means that cells are identified by their actual addresses – there are no blocks or pages.

Refer to the *Cellocator Serial Communication Protocol* for more information about accessing the CM via the direct wire interface.

# 4 Event Types generated by Cellocator devices

Every event (like trigger on input, violation of speed any other), generated by the Cellocator unit can be threaded in 4 ways, as per the descriptions below. Every enabled event causes the unit to generate a location message type 0 (see description in *Cellocator Wireless Communication Protocol*) with the appropriate transmission reason. The various event types are described in the following sections.

## 4.1 Logged (Plain) Event

If the condition for the specific event is met, the unit will create an event and store it into its non-volatile memory. The event will be uploaded to the Control Center only during the GPRS session and will be deleted from the memory of the unit only after reception of an Acknowledge. Note: Plain events will never be delivered by SMS.

## 4.2 HRLS Event

This is a private case of Plain Event. If the condition for the specific event is met, the unit will create a pre-defined number of plain events (one a second) and store them into its non-volatile memory. Upon the end of storing the unit will upload them to the Control Center, similarly to any other plain events.

## 4.3 Distress Event

If the condition for the specific event is met, the unit will create a series of messages (session) with the same transmission reason. The messages will be uploaded to the Control Center immediately with the first available communication transport (during IP session – over IP, otherwise by SMS). The messages are not stored in the memory and if there is no cellular coverage at the moment of sending the message will be lost. Distress events do not require ACK from the control center.

The number and time between messages in a Distress transmission session is defined in a Time between Transmissions section of that document.

Distress sessions caused by the same trigger, which occurred while the first session is not over, restarts the session from the beginning.

Distress sessions caused by a different trigger, which occurred while the first session is not over, causes a new distress session (up to 5 distress sessions can be maintained concurrently).

A 6th distress session, while the previous 5 are still active, will be lost.

It is also possible to initiate an endless (or specified duration) distress session by command from the CCC. Upon starting, this session cancels all active distress sessions. The session will be stopped by any other distress session or by a command from the OTA.

Distress sessions may be prolonged by up to 20 seconds after the transmission of the last distress message.

## 4.4 Security Event

As per the Distress Event, but in this instance the condition for event generation is only checked when the alarm of the unit is armed (only applicable for security modification of the Cellocator unit). If the condition for the specific event is met, the unit will create a series of messages with the same transmission reason.

The number and time between messages in a Security transmission session is defined in a Security Section of that document.

**IMPORTANT:** Any event can be created in multiple ways simultaneously.

# 5 Address and Bitmask Field Allocation Tables

This section describes the addresses and bit mask field allocations. Where relevant, there are references to corresponding sections, where you can find further information.

- **Address allocation table**, see below
- **Bitmask Field allocation tables**, page 32

## 5.1 Address Allocation Table

| Address | Purpose |
|---|---|
| 0 | Application Configuration byte 1 |
| 1 | Application Configuration byte 2 |
| 3 - 4 | Hibernation mode communication settings |
| 6 | Application Configuration byte 3 |
| 7 | Application Configuration byte 4 |
| 8 - 31 | Operational Sever - PPP Username |
| 32-34 | Trip for a Distance event in Roaming mode |
| 35 | Time/Distance alert multipliers for High Speed in Roaming GSM |
| 36 - 65 | Operational Sever - APN |
| 66 - 69 | Default Target IP Address (for GPRS) |
| 70 - 71 | Time between Idle Transmissions |
| 72 - 73 | Time between Distress Transmissions |
| 74 | Operational Server - Modem type code |
| 75 | Number of Distress transmissions |
| 76 - 79 | GPS odometer's current value |
| 80 - 83 | Base unit (measurement factor of GPS odometer) |
| 84 | Max Time between GPS readings for SxT calculation |
| 85 - 88 | GPS odometer - Last Distance Event (in base units) |
| 89 - 91 | Trip for a Distance event (in base units) |

| Address | Purpose |
|---|---|
| 92 | Time/Distance alert multipliers for High Speed in Home GSM |
| 93 | Over Speed velocity threshold for GPS Over Speed Start event |
| 94 | Over Speed velocity threshold for GPS Over Speed End event |
| 95 | Over Speed time event filter |
| 96 | Idle Speed Velocity threshold for GPS Idle End event |
| 97 | Idle Speed Velocity threshold for GPS Idle Speed Start event |
| 98 | Idle Speed event time filter |
| 99 | GPS Events Mask Bitmap |
| 100 - 101 | Inputs Logic Invert Mask |
| 102 | GPS Distress Triggers Bitmapped mask |
| 103 | HRLS Trigger Mask of GPS Events |
| 104 | Journey Start Event time filter |
| 105 | Journey Stop Event time filter |
| 106 | Time Report Period Value |
| 107 - 108 | Listening UDP Port (while connected to both operational server or maintenance server) |
| 109 - 110 | Operational server TCP/UDP Target Port |
| 111 | Maximum time without authentication |
| 112 | Time to Authentication loss |
| 115 | Main Power Low threshold - high level (Doesn’t exist in Solar) |
| 116 | Main Power Low threshold - low level |
| 119 | Backup Battery Low threshold - high level |
| 120 | Backup Battery Low threshold - low level |
| 121 | Mask of Analog Inputs Events |
| 122 | Mask of Analog Inputs Distress |
| 123 | Mask of Authentication events |

| Address | Purpose |
|---|---|
| 124 - 125 | Inputs Events mask – on Falling |
| 126 - 127 | Inputs Events mask – on Rising |
| 128 - 129 | Inputs Distress mode mask - on Falling |
| 130 - 131 | Inputs Distress mode mask - on Rising |
| 132 - 133 | Towing detection – Speed threshold |
| 134 - 135 | Towing detection – Geo-Fence perimeter |
| 136 | Common Discrete Inputs change Time filter |
| 137 | Towing Detection and Towed Mode Time Filter |
| 138 | Maximum Backup Battery extra charge time |
| 139 | Message Transit Acknowledge timeout |
| 140 | Outputs pulse width period |
| 141 - 164 | Operational Sever - PPP Password |
| 165 - 166 | Modem Reset Period |
| 167 - 176 | BCALL (Brake down) Destination number |
| 177 - 186 | SMS Center Address |
| 187 - 196 | SMS Default Destination Address |
| 197 - 200 | SIM PIN code |
| 201 - 202 | Communication settings in Home GSM Network Mode |
| 203 - 204 | Communication settings in Roam GSM Network Mode |
| 205 | Advanced GSM Jamming Detection – Ignition Off - 1st activated output (Infrastructure) |
| 206 | Advanced GSM Jamming Detection – Ignition Off - Template of 1st activated output (1st byte) (Infrastructure) |
| 207 | Advanced GSM Jamming Detection – Ignition Off - Template of 1st activated output (2nd byte) (Infrastructure) |
| 208 | Advanced GSM Jamming Detection – Ignition Off – 2nd activated output |
| 209 | Advanced GSM Jamming Detection – Ignition Off - Template of 2nd |

| Address | Purpose |
|---|---|
| | activated output (1st byte) (Infrastructure) |
| 210 | Advanced GSM Jamming Detection – Ignition Off - Template of 2nd activated output (2nd byte) |
| 211 | Advanced GSM Jamming Detection – Ignition Off - Delay for output activation for the 1st output (Infrastructure) |
| 212 | Advanced GSM Jamming Detection – Ignition Off - Delay for output activation for the 2nd output (Infrastructure) |
| 213 | Advanced GSM Jamming Detection – Jamming Detection Time Filter: Jamming detection time in resolution of 3 Seconds. Ranges between 3 Seconds to 765 Seconds. Default 10 Seconds (Infrastructure) |
| 214 | Advanced GSM Jamming detection – Ignition On and Ignition Off Jamming End Time Filter (15 Sec resolution)<br>(Infrastructure) |
| 215 | Logged Events Amount for Upload Offline Events |
| 216-217 | Unused |
| 218-219 | Logged Events Upload Periodic Timer |
| 220 | Timeout before switching off the modem |
| 221 | Number of Logged Events Upload Retries |
| 222 | Time Between Logged Events Upload Retries |
| 223-224 | Local Timer to Upload Logged Events |
| 225-226 | Movement Timer Before Local Timer Activation |
| 227-229 | Unused |
| 230[1] | Modem On Delay Timer |
| 231 | Unused |
| 250-253 | Speed Limiting Geo-Fence Threshold #5-#8 |
| 255 | Offline Tracking - Auto Upload configuration |

[1] Available only for CR300B (New Platform) from FW version 43m and later, and for CR300B (Legacy) from FW version 43h and later.

| Address | Purpose |
|---|---|
| 259-260 | Offline Tracking - Time to Auto Upload after Trip Stop |
| 261 | Trailer Connected mode: Over-speed Start Velocity threshold |
| 262 | Trailer Connected mode: Over-speed End Velocity threshold |
| 263 | GPS Peeking – Max. On Time |
| 264 - 265 | GPS Peeking – Off Time |
| 266 | Power Management mode |
| 267 | GSM Peeking – Maximum Modem On Time |
| 268 - 269 | GSM Peeking – Off Time |
| 270 | GSM Peeking – Maximum Network Registration Time |
| 271 - 272 | Hibernation Mode Delay |
| 283 | Number of retries to forward data over UDP |
| 284 | Anti-Flooding timer |
| 285 | Garmin Configuration<br>CelloTrack Configuration 1 |
| 288-299 | Unused |
| 350 | Unused |
| 402-411 | Unused |
| 412 | Security - Max. Amount of failure samples |
| 413 | Security – Pre-arming Time |
| 414 | Security - Time to Passive Arming |
| 415 | Security - Time to Pre-Arming |
| 416 | Security - Silent delay time |
| 417 | Security - Maximum time in Garage mode |
| 418-420 | Reserved, ex. Security - Security inputs invert bitmap |
| 421 | Security - Trigger an Alarm upon Towing Detection during Alarm Armed |

| Address | Purpose |
|---|---|
| 422 - 425 | Security - Security inputs mask bitmap |
| 426 | Security - Number of Security transmissions |
| 427 | Security - Time between Security transmissions |
| 428 | Security - Logic configuration |
| 429 - 434 | Dallas 01 code |
| 435 - 440 | Dallas 02 code |
| 441 - 446 | Dallas 03 code |
| 449 | Feedback bitmap |
| 455 | Velocity threshold for HIGH SPEED mode |
| 465 | Additional inputs functionality control bitmask |
| 466 | Analog Measurement Averaging Time |
| 467 | Accelerometer Configuration |
| 468 | Voltage Level Threshold IgnitionOn Detection |
| 469 | Internal variable: AHR counter |
| 470 | Towed Mode |
| 471-472 | UART configuration |
| 473 | Speed Range Threshold V0 |
| 474 | Speed Range Threshold V1 |
| 475 | Speed Range Threshold V2 |
| 476 | Harsh Braking Threshold for Speed range 0 |
| 477 | Harsh Braking Threshold for Speed range 1 |
| 478 | Harsh Braking Threshold for Speed range 2 |
| 479 | Harsh Braking Threshold for Speed range 3 |
| 480 | Course Delta Threshold for Speed range 0 |
| 481 | Course Delta Threshold for Speed range 1 |

| Address | Purpose |
|---|---|
| 482 | Course Delta Threshold for Speed range 2 |
| 483 | Course Delta Threshold for Speed range 3 |
| 484 | Mask of Authentication Distress |
| 485 | Time Based Alert Period Multiplier for NOIP mode |
| 486 - 487 | HRLS Trigger Mask Inputs Falling Events |
| 488 - 489 | HRLS Trigger Mask Inputs Rising Events |
| 490 | HRLS Trigger Mask Analog Inputs Events |
| 491 | Number of Events during HRLS |
| 492 | Idle Speed Alerts Control Bitmask |
| 493 | Time Based Events Mask Bitmap |
| 494 | Time Based Distress Mask Bitmap |
| 495 | HRLS Trigger Mask Time Based Events (not supported, Infrastructure only) |
| 496 | GPS Events Mask (second byte, the first is on 99) |
| 497 | Active GPS Distress Triggers Bitmapped mask (second byte, the first is on 102) |
| 498 | HRLS Trigger Mask of GPS Events (second byte, the first is on 103) |
| 499 | Time event period in Roaming |
| 500 | GPS Navigation Start/Stop Filter |
| 501 | Restore Output State after Reset and Shipment mode Bitmask |
| 502 - 503 | Outputs Inversion Mask |
| 504 | Maximum number of AHR retries |
| 506 | Speaker of Hands Free - Mute Settings and CR300 Outputs Control |
| 509 | GPS management bitmap |
| 511 | Acceleration Threshold for Speed range 0 |
| 512 | Acceleration Threshold for Speed range 1 |

| Address | Purpose |
|---|---|
| 513 | Acceleration Threshold for Speed range 2 |
| 514 | Acceleration Threshold for Speed range 3 |
| 515 | Registration Lack Timeout (for Modem's AHR) |
| 522 | GSM Jamming Detection – Activated outputs release configuration |
| 525 | Application Configuration byte 9 |
| 526 | Application Configuration byte 10 |
| 605 | Time filter for ignition state according to voltage level |
| 610 | PointerCept End Unit – Enable Pointercept Mode, Enable Manual Group Selection, Enable PointerCept Beacon Start/Stop Logged Events, Enable Beacon upon Jamming on Hibernation, Enable CPIN Error Logged Event, Country Table Set |
| 611 | PointerCept End Unit – Manual Group Number |
| 612 | PointerCept End Unit – Preamble Length |
| 613 | PointerCept End Unit – Preamble Content |
| 614 | PointerCept End Unit – Baud Rate, Enable CPIN Error Distress Event, Frequency Hopping Mode |
| 615-618 | PointerCept End Unit – Sync Word 0/1 |
| 619 | PointerCept End Unit – Modem PA Power Level |
| 620 | PointerCept End Unit – Beacon AHR Period |
| 621 | PointerCept End Unit – Complementary/PSP Message Ratio |
| 622-627 | PointerCept End Unit – Non Frequency Hopping Channel for Group 0/1/2/3/4/5 |
| 628 | PointerCept End Unit – Modem PA Off Temperature |
| 629 | PointerCept End Unit – In Batch Update Period |
| 630 | PointerCept End Unit - Periodical Beacon Transmission Timer |
| 632 | PointerCept End Unit – Initial Session Time |
| 635 | PointerCept End Unit – GSM Reconnect Filter, No GSM Filter |
| 636 | PointerCept End Unit – Beacon On Time |

| Address | Purpose | |
|---|---|---|
| 637 | PointerCept End Unit – Beacon Off Time | |
| 638 | PointerCept End Unit – Total Beacon Time | |
| 639 | PointerCept End Unit – Battery Beacon On Time | |
| 640 | PointerCept End Unit – Battery Beacon Off Time | |
| 641 | PointerCept End Unit – Battery Total Beacon Time | |
| 642-649 | PointerCept End Unit – Sync Word 2/3/4/5 | |
| 650 | Auxiliary Satellite Unit- Enable Periodic Distress Events<br>Auxiliary Satellite Unit- Satellite Operational Mode | Advanced Auxiliary Satellite Unit |
| 656 | Auxiliary Satellite Unit- Periodic Distress Report Period | |
| 841-861 | Operational Server APN Extension | |
| 871-891 | Maintenance Server APN Extension | |
| 900 | Basic Driver Behavior – General and ABC Maneuvers Configuration | |
| 901 | Basic Driver Behavior – Over Speeding and Accident Configuration | |
| 904 | Basic Driver Behavior – Minimum Speed for ABC Maneuvers Detection | |
| 905 | Basic Driver Behavior – Harsh Acceleration Detection Threshold | |
| 907 | Basic Driver Behavior – Harsh Breaking Detection Threshold | |
| 909 | Basic Driver Behavior – Harsh Turn Detection Threshold | |
| 911 | Basic Driver Behavior – Over Speeding Detection Threshold | |
| 912 | Basic Driver Behavior – Minimum Time for Over Speeding Detection | |
| 913 | Basic Driver Behavior – Accident Detection Threshold | |
| 915 | Basic Driver Behavior – Pre/Post Accident Raw Data Log Duration | |
| 1000 | CR300 3G  I/O Control | |
| 1004 | Geo-Fence Alert Mask for events | |
| 1005 | Geo-Fence Alert Mask for distress | |

| Address | Purpose |
|---|---|
| 1006 | Geo-Fence violation filter |
| 1008 | Roaming Operator's Management - Timer of Auto-Search |
| 1009 | Roaming Operator's Management - Number of PLMNs programmed |
| 1010-1012 | Roaming Operator's Management - PLMN 1 |
| 1013-1015 | Roaming Operator's Management - PLMN 2 |
| …. | …. |
| 1307-1309 | Roaming Operator's Management - PLMN 100 |
| 1314 - 1317 | Reserved for Customer's Use<br>designed to store customer's proprietary data (like specific EEPROM content identifier) |
| 1322-1325 | Geofence Outputs activation 0-3 |
| 1326-1329 | New SIM PIN |
| 1330 | First Usage Counter input |
| 1331 | Second Usage Counter input |
| 1332 | Usage Counter Reporting interval |
| 1344 | Wake Up message configuration |
| 1346 | Period between the alerts, triggered by detection of power disconnection |
| 1347 | Application Configuration byte 5 |
| 1348 | Application Configuration byte 6 |
| 1349 | Application Configuration byte 7 |
| 1350 | Application Configuration byte 8 |
| 1351 | Violation of additional GP Frequency thresholds |
| 1352 | Periodical Modem Reset Randomization threshold |
| 1353 | Anti-flooding randomization threshold |
| 1354 | GSM band and authentication type |

| Address | Purpose |
|---|---|
| 1355 | Periodic transparent mode peek time |
| 1356 | Periodic transparent mode cycle time |
| 1357 | Door Event Begin Additional Time Filter |
| 1358 | Door Event End Additional Time Filter |
| 1359 | Shock Event Begin Additional Time Filter |
| 1360 | Shock Event End Additional Time Filter |
| 1361 | Distress Event Begin Additional Time Filter |
| 1362 | Distress Event End Additional Time Filter |
| 1363 | Unlock Event Begin Additional Time Filter |
| 1364 | Unlock Event End Additional Time Filter |
| 1365 | Lock Event Begin Additional Time Filter |
| 1366 | Lock Event End Additional Time Filter |
| 1367 | Ignition (as GP) Event Begin Additional Time Filter |
| 1368 | Ignition (as GP)  Event End Additional Time Filter |
| 1387-1388 | Go / Halt Speed Detection threshold |
| 1389 | Go / Halt Time threshold filter |
| 1390 | Go / Halt – Session Control Bitmask |
| 1391 | Modem type code for Maintenance Server |
| 1392-1395 | Maintenance Server IP address |
| 1396-1397 | Maintenance Server Target Port |
| 1398 | Maintenance Server configuration bitmask |
| 1399 | Maintenance Server connection period |
| 1400 | Maintenance Server Session Time Update |
| 1403-1432 | Maintenance Server APN |
| 1433 | Vector Change Detection Bitmask |

| Address | Purpose | |
|---|---|---|
| 1434 | Compressed Vector Change Report Timeout | |
| 1435 | Vector Change Detection angle | |
| 1444 | Cellular Network Selection | |
| 1448-1609 | Dallas codes 04 to 30 | |
| 1620 | Select Measurement source reported in Byte 26 of OTA Msg type 0 | |
| 1621 | Select Measurement source reported in Byte 27 of OTA Msg type 0 | |
| 1622 | Select Measurement source reported in Byte 28 of OTA Msg type 0 | |
| 1623 | Select Measurement source reported in Byte 29 of OTA Msg type 0 | |
| 1625 | GPS DOP Threshold | |
| 1626-1649 | Maintenance Server APN Username | |
| 1650-1673 | Maintenance Server APN Password | |
| 1674 | Input Type / Assigned function | Door ( pin 14) |
| 1675-1676 | Scaling Factor for Frequency report on Door input | |
| 1677 | Freq./ Analog Input Configuration Byte | |
| 1678-1679 | Frequency / Analog Low Threshold / Discrete Wet/Dry Threshold (1678) | |
| 1680-1681 | Frequency / Analog High Threshold | |
| 1682 | Violation Time Filter (Frequency / Analog) | |
| 1685 | Function buttons events- Door input | |
| 1686 | Averaging factor for Door Input | |
| 1687 | Input Type / Assigned function | Shock (pin 15) |
| 1688-1689 | Scaling Factor for Frequency report on Shock input | |
| 1690 | Freq./ Analog Input Configuration Byte | |

| Address | Purpose | |
|---|---|---|
| 1691-1692 | Frequency / Analog Low Threshold / Discrete Wet/Dry Threshold (1691) | |
| 1693-1694 | Frequency / Analog High Threshold | |
| 1695 | Violation Time Filter (Frequency / Analog) | |
| 1696 | Hi-Res impact threshold - Ignition ON | |
| 1697 | Hi-Res impact threshold - Ignition OFF | |
| 1698 | Function buttons events- Shock input | |
| 1699 | Averaging factor for Shock Input | |
| 1700 | Assigned function | Panic (Distress) (pin 16) |
| 1701 | Threshold for Panic Input | |
| 1702 | Averaging factor for Panic Input | |
| 1703 | Assigned function | Unlock (pin 11) |
| 1704 | Threshold for Lock Input | |
| 1705 | Averaging factor for Lock Input | |
| 1706 | Assigned function | Lock (pin 5) |
| 1707 | Threshold for Unlock Input | |
| 1708 | Averaging factor for Unlock Input | |
| 1711 | Reserved for manufacturer usage (Timer of retry of SIM operation upon failure) | |
| 1911-1919 | PointerCept Base – Mobile App Password | |
| 1914 | Lock to Certain IMSI | |
| 1917-1920 | Speed Limiting Geo-Fence Thresholds: Each Geo-Fence can select 1 of 4 Speed Limit thresholds by setting bits 30-31 in the fence configuration | |
| 1921-2020 | Geo Fence heading angle (Infrastructure) | |
| 2023-2035 | MSB for Speed limiting zones | |
| 2036-2038 | CR300E (Reserved) | |

| Address | Purpose |
|---|---|
| 2044 | Tilt Tamper Messaging |
| 2045 | Tilt Tamper Angle Change Threshold |
| 2046 | Tilt Tamper Time Filter |
| 2084 | PointerCept Base – Specific RF Component Control |
| 2085 | PointerCept Base – Enable PLL AFC, Enable Adaptive Channel Filter BW, RSSI Averaging Method |
| 2086 | PointerCept Base – RSSI Latch Method |
| 2087 | PointerCept Base – Preamble Timeout |
| 2088 | PointerCept Base – Hop Conditions |
| 2089 | PointerCept Base – RSSI Threshold |
| 2090 | PointerCept Base – RSSI Timeout |
| 2091 | PointerCept Base – Enable Charging During Ignition Off |
| 2092 | PointerCept Base – Manual Power Control of Main Modules |
| 2093 | PointerCept Base – End Unit Preamble Length |
| 2368-2369 | Maximum Possible Scaled Frequency |
| 2370 | Violation Timer for 1st additional GP Frequency threshold |
| 2371 | Violation Timer for 2nd additional GP Frequency threshold |

| Address | Purpose |
|---|---|
| 2372-2373 | 1st additional GP Frequency threshold |
| 2374-2375 | 2nd additional GP Frequency threshold |
| 2376 | Feedback for driver behavior violations bitmask |
| 2377-2379 | Configuration of 1st output for continuous driver behavior violation |
| 2380-2382 | Configuration of 2nd output for continuous driver behavior violation |
| 2383 | Driver behavior- continuous violation feedback Logic |
| 2384 | Light crash detection threshold |
| 2385 | Heavy crash detection threshold |
| 2386 | Coasting detection - Coasting Violation period |
| 2387 | Coasting detection - Speed threshold |
| 2388-2389 | Coasting detection - Engine Speed threshold |
| 2390 | Enable crash detection feature, Enable EDR event for Light/Heavy crash, Enable EDR distress for Light/Heavy crash |
| 2392 | Timeout for Trailer Connection status change |
| 2393 | Dallas Family of Trailer Identifier |
| 2394 -2425 | Default target DNS Address (for Maintenance Server) |
| 2426 | GSM Jamming Detection - 1st activated output |
| 2427 | GSM Jamming Detection - Template of 1st activated output (1st byte) |
| 2428 | GSM Jamming Detection - Template of 1st activated output (2nd byte) |
| 2429 | GSM Jamming Detection – 2nd activated output |
| 2430 | GSM Jamming Detection - Template of 2nd activated output (1st byte) |
| 2431 | GSM Jamming Detection - Template of 2nd activated output (2nd byte) |
| 2432 | GSM Jamming Detection - Delay for output activation for the 1st output |
| 2433 | GSM Jamming Detection - Delay for output activation for the 2nd output |
| 2459 | OneWire Temperature msg 9 update rate. Home Network |

| Address | Purpose |
|---|---|
| 2460 | OneWire Temperature msg 9 update rate. Roam Network |
| 2462 | 1-Wire Temperature Sensor High Threshold |
| 2463 | 1-Wire Temperature Sensor Low Threshold |
| 2464-2495 | Operational Server DNS Address |
| 2496-2516 | Geo-Fence 1 Configuration |
| …. | …. |
| 4080-4095 | Geo-Fence 100 Configuration |

## 5.2 Bitmask Field Allocations

This field describes the allocation of configuration bits in the bitmap configuration bytes. The description of each bit is provided in other sections in this document.

### *5.2.1 Application Configuration*

**Address:** 0, Application Configuration byte 1

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Enable Transparent Mode | Long Transmission Ack. Timeout | Enable warning output activation during Gradual immobilization | Ignition filter source for starting Driver Authentication time calculations | Presentation of inputs in wireless Cellocator protocol | Enable conditional activation of immobilizer | Enable infinite driver notification when Driver is not identified | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 1, Application Configuration byte 2

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Wake up from hibernation upon periodical Usage counter update timer expiration | Enable Command Authentication | Enable Immobilizer activation while there is no Authentication code | Enable modem's power control by Door input | Generate an event per AHR | Ignore Geo-Violations on Boot | Shorten cellular registration timeout | Enable automatic hibernation on low power |
| Bits 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 3, Hibernation mode communication settings

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Reserved | Enable Outgoing Voice Call in hibernation | Reserved | | | Renew GPRS upon drop in (in semi-hibernation) | | |
| Bits 7 | Bits 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 4, Hibernation mode communication settings

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Enable Pre-Hibernation distress | Enable Pre-Hibernation event | Enable Data Forwarding From Serial Port By SMS in semi-hibernation | | Enable Incoming Voice Call in semi-hibernation | Reserved | Enable Intermediate state of Anti-flooding in semi-hibernation | Enable Auto Answering Incoming call in semi-hibernation |
| Bits 7 | Bits 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 6, Application Configuration byte 3

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Automatic CFE Power mode control<br>(Infrastructure) | Enable CFE | Overlapping Geo-Fence logic:<br>Global/ Discrete | Enable Privacy Mode | GPS Reset on ignition off<br>When not in navigation | GPS Reset on ignition off<br>When in Navigation | Disable Active Transmissions | Enable CFE as I/O Extender |
| Bits 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 7, Application Configuration byte 4

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | LED Management disable<br>1-Disable<br>0-Enable | | Enable Usage Counters | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit3 | Bit 2 | Bit 1 | Bit 0 |

**Address**: 1347, Application Configuration byte 5

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Enable IMEI transmission via type 0 bytes 33-38 and bits 5,6 of type 0 byte 41 | | | | |
| Bits 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address**: 1348, Application Configuration byte 6

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Enable software flow control (XON/XOFF) | Enable Offline tracking | Consider Unknown Operators As Forbidden | | Disable GSM Jamming Event<br>(Legacy + Ignition On) | | Enable Auto SIM PIN locking | Enable OTA Ack to Forward from OTA to Serial Data Packet |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 1349, Application Configuration byte 7

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Enable Trailer Connection Distress | Enable Trailer Connection Event | Enable differentiation between the driver and the passenger | Enabling reading a 256-bit EEPROM of DS1971 | Backward compatible OTA msg type 8 | **Spare** (was: Enable Radio- Off. The link below is for explanation on that feature) | Enable Monitoring logical status of Ignition in OTA packets |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 1350, Application Configuration byte 8

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 525, Application Configuration byte 9

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Disable GSM Jamming Event<br>(Ignition Off)<br>0-Do not Disable<br>1-Disable | Advanced GSM Jamming Detection<br>(Ignition On/Off behavior) | Enable Advanced Recovery (Disable Dallas Based Driver ID Support)<br>0- Legacy Fleet mode<br>1 – Legacy Fleet and Advanced Recovery Mode (External KeyPad) | | Universal Radio Communication Tester<br>0-Disable<br>1-Enable<br>Production tester only | Modem<br>Homologation initialization mode<br>Disabled<br>Enable | USIM application<br>0- USIM application Disabled<br>1- USIM application Enabled, SIM Application Toolkit disabled | Infrastructure<br>Robbery Mode while driving<br>0-Disable<br>1-Enable |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 526, Application Configuration byte 10

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Enable Increased Number of Scanned Channels<br>0 - Disable<br>1 - Enable | | Route GPS indication to Blinkers Output<br>0-Disable<br>1-Enable | Enable Driver ID Card Removed Event<br>0-Disable<br>1-Enable | | | | |

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|

**Address:** 527, Application Configuration byte 11

| | | | | | | | Enable speed limiting extension |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.2 Communication Settings in Home/Roam GSM Network Mode

**Address:** Home GSM: 201; Roam GSM: 203; Hibernation: 3

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0[2] |
|---|---|---|---|---|---|---|---|
| Enable SMS | Enable outgoing Voice Call | | Generate Cell ID packet (RT) with any distress while there is no valid GPS | Generate Cell ID packet (logged) with any event while there is no valid GPS | GPRS Enable | Generate Cell ID packet (RT) with any distress unconditionally | Generate Cell ID packet (logged) with any event unconditionally |

**Address:** Home GSM: 202; Roam GSM: 204; Hibernation: 4

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|
| Unused | | Disable forward from serial port to SMS | Disable active transmissions via SMS | Enable incoming Voice Call | Enable IP up event | Enable Intermediate state of Anti-flooding | Auto Answer Voice call (if incoming voice enabled) |

### 5.2.3 WAKE UP Message Configuration

**Address**: 1344

| Enable GPRS Wake up message | Enable SMS Wake up message | Number of repetitions,<br>Value of zero set number of retries to 64 | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

[2] Available only for CR300B (New Platform) from FW version 43m and later, and for CR300B (Legacy) from FW version 43l and later.

### 5.2.4 GPS Management Bitmap

**Address**: 509

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Enable Tight GPS PMODE Filter | | Not used | | CR200/CR300 GPS management Enable<br>0-Normal<br>1-Managed | Reset last known location on Ignition off | Enable Pythagoras Calculation | Enable Speed x Time Calculation (SxT) |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.5 Maintenance Server Configuration Bitmap

**Address**: 1398

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Reserved | | Enable Modem FW Upgrade from the Maintenance Server | Enable auto connection to maintenance server | Reconnect to the maintenance server after firmware upgrade | Enable connection to the maintenance server on each power up. | Enable firmware upgrade from the maintenance server | Enable programming updates from the maintenance server |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.6 GSM Band / GPRS Auth Type Programming

**Address**: 1354

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | PPP GPRS Connection Authentication Selection Mode | | | | | PPP GPRS Connection Authentication type<br>(only for Manual Authentication type Selection mode) | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.7 UART Configuration

**Address:** 471

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Reserved | | | | Baud rate | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 472

| | | | |
|---|---|---|---|
| Reserved | Flow Control | Stop Bits | Parity |

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|

### 5.2.8 Alternative Inputs Usage Bitmap

**Address:** 465

| 1-Wire Temperature Sensor Filter | Enable 1-Wire Temperature Sensor Distress Events | Enable 1-Wire Temperature Sensor Logged Events | | Enable modem's power control by shock input | Enable Initialization & Answering Voice Call by Shock input |
|---|---|---|---|---|---|
| Bits 5-7 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.9 CR300 Outputs Control

**Address**: 506

| Spare | CR300 LIGHTS output options:<br><br>**Value** / **Description**<br>0 – Legacy LIGHTS output behavior<br>1 – LIGHTS output Acts as STD Immobilizer<br>2 – LIGHTS output Acts as PWM (GRADUAL) Immobilizer<br>3 – N.A: Same as option 0 | | CR300 LED output options:<br><br>**Value** / **Description**<br>0 – Legacy LED output behavior<br>1 – LED Output Acts as STD Immobilizer<br>2 – LED output Acts as PWM (GRADUAL) Immobilizer<br>3 – N.A: Same as option 0 | | Spare | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Default value:**

Bits 3, 4 set to 0: CR300 LED output act as legacy LED signal

Bits 5, 6 set to 0: CR300 LIGHTS output acts as legacy LIGHT signal.

**NOTES**:

1. When the CR300 STD immobilizer output is switched to "Blinkers" or "LED" Output, the output will be automatically activated immediately after SW/HW reset or Power Recycle.

2. When the CR300 output acts as LED or SIREN it will preserve its state after SW/HW reset but not after power recycle.

#### 5.2.9.1 Route GPS Indication to Blinkers Output

**Address**: 526, bit 5

**Description:** This parameter enables to route the GPS indication to the Blinkers output, while keeping the GSM indication routed to the LED output, instead of the legacy implementation which multiplexed both GPS and GSM indications on the LED output. Note: this feature is available only if:

- "LED management" parameter (address 7, bit 4) is set to 1 (Disable)
- "LED/Blinkers Output Options" parameters (addresses 506, bits 3-4/5-6) are set to 0 (Legacy LED/Blinkers output behavior)
- "LED/Blinkers Pin Configuration" parameters (addresses 1000, bits 4-5/6-7) are set to 2 (Output (specific output is selected by "LED/Blinkers Output Options" parameters in address 506 bits 3-4/5-6))

**Range:** 0 – Disable, 1 - Enable

**Default Value:** 0 – Disable

### *5.2.10 CR300B 3G I/O control*

**Address**: 1000

These configuration bits controls the direction of the CR300B 3G I/Os. Each bit can be configured to function as Input or output. Please note that when LED and LIGHT are configured as output, their output source can be selected by parameter: "CR300 Outputs control" in address 506.

CR300B 3G **LIGHT** Pin

| | Description |
|---|---|
| 0 | GPIO disabled |
| 1 | Input (unlock) |
| 2 | Output (See " CR300 Outputs control") |
| 3 | Input and Output |

CR300B 3G **LED** Pin

| | Description |
|---|---|
| 0 | GPIO disabled |
| 1 | Input (Lock) |
| 2 | Output (See " CR300 Outputs control") |
| 3 | Input and Output |

CR300B 3G **Shock** Pin

| | Description |
|---|---|
| 0 | GPIO disabled |
| 1 | Input (Shock) |
| 2 | Output (HW preparation only) |
| 3 | Input and Output |

CR300B 3G **Door** Pin:

| | Description |
|---|---|
| 0 | GPIO disabled |
| 1 | Input (Door) |
| 2 | Output (HW preparation only) |
| 3 | Input and Output |

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|

**Default values:**

Bit 0: Door – Input - 1

Bit 1: Shock – Input - 1

Bit 2: LED – Output - 2

Bit 3: LIGHT – Output - 2

### 5.2.11 Time Based Mask Bitmap

**Address:** 493 for events

494 for distress

| *Only in 494*<br><br>Do not wake up from hibernation upon comm.idle distress | Enable Comm.Idle during modem off | Reserved | | | | Enable Time events | Enable event for Communication Idle |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.12 Over (and Idle) Speed Session Control Bitmap

**Address:** 492

| Create Idle/Over Speed End event for open session per ignition Off | Start Idle speed timer with ignition On | Don't use time filter to close Idle speed session | Don't use time filter to close Over speed session | Multiplier for filter of Idle Speed Start Session | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.13 Go/Halt Session Control Bitmap

**Address:** 1390

| Spare | | | Don't use time threshold filter for "Go" detection | Multiplier for Go/Halt Time Threshold filter<br>For "Halt" detection | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.14 GPS Alerts Mask Bitmap

**Address:** 99 For events

102 For distress

103 For HRLS

| Enable event upon location change detection when | Enable event upon speed detection when Ignition Off | Enable Sudden Course Change Sensor | Enable Sudden Speed Change sensor | Enable Idle Speed Events | Enable Over Speed Events | Enable Distance Events | Enable GPS Navigation Start/Stop Events |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ignition Off | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 496 For events

497 For Distress

498 For HRLS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Not used | | | | | Enable Go/Halt Events<br>0 – Disable<br>1 - Enable | Enable Event per GPS Auto Factory reset | Enable GPS Disconnection |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.15 Time Report Period Value (Home, Roam, High Speed)

**Address**: For Home GSM: 106

For Roam GSM: 499

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Resolution Definer | Basic Period Value (BPV) | | | | | | |
| Bits 7 | Bits 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.16 Time/Distance Alert Multipliers for High Speed Mode

**Address**: For Home GSM: 92

For Roam GSM: 35

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Time Event Multiplier for HIGH SPEED mode | | | | Distance Event Multiplier for HIGH SPEED mode | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.17 Mask of Authentication Alerts

**Address**: 123 for events

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Enables Dallas Bus<br><br>0 –Bus mode<br>1 –Point to point (Bus mode disabled) | Enable resending "Driver Authentication" upon each detection | Enable Authentication confirmation output activation | Enable Authentication reminder output activation | Enable "Dallas ID updated" event even if it is not in the list | Enable Pre-defined driver ID's list | Authentication updated event | Driving without Authentication |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address**: 484 for distress

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Not used | | | | | | Authentication updated event | Driving without Authentication |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.18 Discrete Inputs Masks

**Address**: For Inversion 100-101

Inputs Events on Falling 124-125

Inputs Events on Rising 126-127

Inputs Distress on Falling 128-129

Inputs Distress on Rising 130-131

HRLS Trigger Mask of Inputs Falling 486-487

HRLS Trigger Mask of Inputs Rising 488-489

Security inputs mask bitmap 422-425

**Lower byte**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unlock | Panic | Driving Status<br><br>(Ignition or accelerometer based) | CFE In 1 | | | Shock | Door |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Upper Byte**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ignition Input as GP input | Accelerometer status | CFE In 6 | CFE In 5 | CFE In 4 | Lock | CFE In3 | CFE In2 |

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|

### 5.2.19 Mask of Analog Inputs Alerts

**Address**: 121 for events, 122 for distress, 490 for HRLS

| Ignition Switch On | | | | Ignition Switch Off | | | |
|---|---|---|---|---|---|---|---|
| Backup battery Low level | Backup battery disconnected | Main Power Low Level | Main Power Disconnected | Backup battery Low level | Backup battery disconnected | Main Power Low Level | Main Power Disconnected |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.20 GP Frequency Input Configuration Byte

**Address**: 1677 for Door input

1690 for Shock input

| Ignore violation on Ignition On | Don't use time filter for voltage / frequency violation end | Enable voltage / frequency violation end distress | Enable voltage / frequency violation end event | Enable voltage / frequency violation start distress | Enable voltage / frequency violation start event | Input violation type | |
|---|---|---|---|---|---|---|---|
| | | | | | | 0 – Thresh. | 0 – Low<br>1 - High |
| 0-Ignore<br>1 – Start violation on Ignition On | 0-Use<br>1 – Don't use | 0-Disable<br>1 - Enable | 0-Disable<br>1 - Enable | 0-Disable<br>1-Enable | 0-Disable<br>1-Enable | 1 – Range | 0 – Keep In<br>1 - Keep Out |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.21 Violation of Additional GP Frequency Thresholds

**Address**: 1351

| 2nd additional GP frequency threshold | | | | 1st additional GP frequency threshold | | | |
|---|---|---|---|---|---|---|---|
| Enable distress for falling violation | Enable Event for falling violation | Enable distress for rising violation | Enable Event for rising violation | Enable distress for falling violation | Enable Event for falling violation | Enable distress for rising violation | Enable Event for rising violation |

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|

### 5.2.22 Restore Output State after Reset and Shipment mode Bitmask

**Address:** 501

| Backup immobilizer state | Reserved | Blinkers | LED | St. Immobilizer | Reserved | Siren | Gradual Stop |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.23 Outputs Inversion Mask

**Address:** 502

| CFE Out 5 | CFE Out 4 | CFE Out 3 | CFE Out 2 | | Gradual Stop | Unused | CFE Out1 |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 503

| Unused | CFE Out 6 | Stand. Immobilizer | Unused | Blinkers | Unused | Unused | LED |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.24 Geo-Fence Alert Mask

**Address**: 1004 - For events
1005 - For distress

| Unused | | Speed Limiting Geo-Fence Event | No Modem Zone Entry | Geo Hot Spot Traversal | Way Point violation | Keep Out Fence violation | Keep In Fence violation |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.25 Offline Tracking - Auto Upload Configuration

**Address:** 255

| Unused | | | | | | Memory Full | Ignition Off Event |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.26 Security Settings Bitmask 1

**Address**: 421

| Unused | | | | | | | Trigger an Alarm Upon Towing Detection During Alarm Armed |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.27 Security Settings Bitmask 2

**Address**: 424

| `Unused | | | | | | | Trigger an Alarm Upon Main Power Disconnection Detection |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.28 Security Logic Configuration

**Address**: 428

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unused | Auto-gradual stop Enable | Unused | | Auto Arming Independent from door | Disable Auto Arming | Does Not Trigger Silent delay upon Unlock detection | Unused |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.29 Feedbacks / Alarm Triggered / Alarm Cadence Outputs

**Address:** 449 For Feedbacks

450 For Alarm Triggered outputs (CelloR) / Alarm Cadence outputs (CelloAR)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unused | | | Blinkers | Unused | | | Siren<br>Note: this output is unavailable for CAN variants |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.30 Active Correlation Lines

**Address:** 287

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unused | | | | | Shock (pin 15) | Unlock (pin 11) | Lock (pin 5) |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.31 Vector Change Detection Bitmask

**Address:** 1433

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Reserved | | | | Prevent Curve Smoothing Message generation during "Halt" mode | *Enable* Compress Vector change Detection | Enable Vector change Detection Distress | Enable Vector change Detection Events |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.32 Feedback for Driver Behavior Violations Bitmask

**Address:** 2376

| Reserved | Excessive RPM | Idle Speed | Sudden course change | Harsh Acceleration | Harsh Breaking | Coasting | Over Speed (irrespective of the source of threshold) |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.33 Driver Behavior Continuous Violation - Feedback Bitmask

**Address:** 2377 for first output

2380 for second output

| reserved | | Output Activation Pattern (Upon Driver behavior violation) | | | Output, auto-activated upon Driver behavior violation detection | | |
|---|---|---|---|---|---|---|---|
| Bits 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.34 Driver Behavior Continuous Violation - Output Activation Template

**Address:** 2378 for first output

2381 for second output

| Number of activations in a session | | | | Activation length | | | |
|---|---|---|---|---|---|---|---|
| Bits 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Address:** 2379 for first output

2382 for second output

| Time between the activation sessions | | | | Number of activation sessions | | | |
|---|---|---|---|---|---|---|---|
| Bits 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.35 Driver Behavior Continuous Violation - Feedback Logic

**Address:** 2383

| Feedback Violation Deactivation time threshold<br>In seconds | Sustain Excessive RPM violation | Sustain Coasting violation feedback till | Sustain Speeding violation feedback till |
|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | feedback till violation ends | violation ends | violation ends |
| Bits 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Bits 0, 1, 2:**

- **Name in Programmer:**
  - Sustain Speeding violation feedback till violation ends
  - Sustain Coasting violation feedback till violation ends
  - Sustain Excessive RPM violation feedback till violation ends
- **Description**: These bits enable the user to sustain continuous violation feedbacks (according to template) till violation ends. If it is cleared then the feedback template will be generated once. They are considered only if Output Activation Pattern (upon continuous driver behavior violation) is set to option number 5 (Warning of delayed violation registration).
- **Type:** Flag
- **Default value**: 10
- **Range**:

Bits 3 to 7:

- **Name in Programmer:** Feedback Violation Deactivation time threshold
- **Description**: if Output Activation Pattern (upon continuous driver behavior violation) is set to option number 5 (Warning of delayed violation registration) Continuous violations will be deactivated when the violation time will be longer than the time defined in this field. Please refer to Feedback Violation Deactivation time threshold
- **Type:** Decimal
- **Default value**: 10
- **Range**: 0 – 255
- **Units**: 1 Second

### *5.2.36 Outputs, Auto-Activated upon Jamming Detection*

GSM jamming detection can activate outputs for Driver feedback. The configurable options enable the selection of one of the unit's outputs, and define the patterns sent over the selected output. It is possible to activate up to two outputs for a jamming event. When the advanced jamming mode is enabled (see Advanced GSM Jamming Detection Mode), the unit differentiates between GSM jamming detection during Ignition-ON and Ignition-Off. Each jamming condition can activate up to two outputs. The advanced mode reuses the same outputs activation configuration used in the non Advanced mode for jamming Outputs activation during Ignition-On.

### 5.2.36.1 Outputs, Auto-Activated upon Jamming Detection (while in Ignition-On state)

**Output Activation Pattern upon jamming detection**

**Addresses:** 2426 (and 2429 for second output)

| | | | Activation Pattern | | | Output number | | |
|---|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Template of Output Activation upon Jamming Detection byte 1**

**Address:** 2427 (and 2430 for second output)

| Number of Activation pattern cycles in a session | | | | Output Activation length | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Template of Output Activation upon Jamming Detection byte 2**

**Address:** 2428 (and 2431 for second output)

| Time between the activation sessions | | | | Number of sessions | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Delay for output activation upon jamming detection**

**Address:** 2432 (and 2433 for second output)

| Delay for output activation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.36.2 Outputs, Auto-Activated upon Jamming Detection while in Ignition-Off

**Output Activation Pattern upon jamming detection – Ignition-Off**

**Addresses:** 205 (and 208 for second output)

| | | | Activation Pattern | | | Output number | | |
|---|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Template of Output Activation upon Jamming Detection byte 1 – Ignition-Off**

**Address:** 206 (and 209 for second output)

| Number of Activation pattern cycles in a session | | | | Output Activation length | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Template of Output Activation upon Jamming Detection byte 2 – Ignition-Off**

**Address:** 207 (and 210 for second output)

| Time between the activation sessions | | | | Number of sessions | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Delay for output activation upon jamming detection – Ignition-Off**

**Address:** 211 (and 212 for second output)

| Delay for output activation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.36.3 Release Options of Jamming Detection

**Address:** 522

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Enable release by Authorized Dallas | Enable release by Ignition Activity | Advanced Jamming detection: Enable release by Jamming End in Ignition-On | Advanced Jamming detection: Enable release by Jamming End in Ignition-Off | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.37 Accelerometer Configuration

**Address:** 467

| | | | | | | |
|---|---|---|---|---|---|---|
| | Enable Towed mode<br>0 - Disable<br>1 - Enable | Start & Stop Detection Using Voltage Level and Accelerometer<br>0 – Disable<br>1 – Enable | Detection Sensitivity<br>0 - Very insensitive<br>1 - Normal<br>2 - Very sensitive<br>3 - spare | Movement Detection type: (movement / engine status)<br>0 – movement<br>1 – engine status | Enable GPS wake up upon movement for towing detection<br>(don't care if bit 0 is set)<br>0 – Don't use<br>1 – Use. | Use "movement detection" by accelerometer for Start/Stop<br>0 – Start/Stop alerts by status of Ignition switch (legacy),<br>1 – Start/Stop alerts by movement detection using accelerometer.<br>If this bit is enabled, all the logic normally dependent on status of Ignition Switch will be re-linked to the status of Movement detection. |
| Bit 7 | Bit 6 | Bit 5 | Bits 3-4 | Bit 2 | Bit 1 | Bit 0 |

### 5.2.38 Towed Mode Configuration

**Address:** 470

| Hi-Res impact mode | Extra sensitivity for engine detection | Output to activate upon towing detection | Enable Towed Start/Stop distress | Enable Towed Start/Stop events |
|---|---|---|---|---|
| Bits 6-7 | Bit 5 | Bits 2-4 | Bit 1 | Bit 0 |

# 6 Communication and Configuration

## 6.1 Communication Events

## 6.2 Communication Settings

### *6.2.1 GPRS Settings*

#### 6.2.1.1 Acknowledge OTA

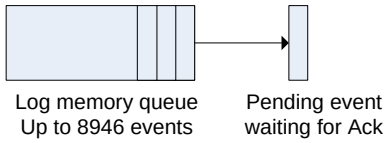
##### *6.2.1.1.1 Message Transit Acknowledge Timeout*

**Address:** 139

This parameter defines the maximum time the unit will wait for server to acknowledge a plain event (plain events are one of the four available event generation patterns proposed by Cellocator unit; refer to the Event Types section in this document). If no ACK is received by this time, the event will be retransmitted.

**Event Delivery Algorithm**

Once generated, a plain event is stored in the unit's Log memory.
This Log memory can store up to 8946 **plain** events.
When the Log memory is full, newer events will push out the older ones (FIFO). Events will be uploaded to the Control Center only when GPRS is available and will be deleted from the unit's Log memory only when acknowledgment is received from Central Control. ***NOTE: Plain events will never be delivered by SMS!***




The unit supports one pending event waiting for server acknowledgment. When server acknowledgment is received, the pending event is deleted from the Log memory head, and the next event is moved to the pending event data structure in order to be sent to the server.

**NOTE**: Legacy units used to have 16 concurrent pending events.

If the Acknowledge is not received during the time defined in Message Transit Acknowledge Timeout, the event is resent.

**Data format:** 8-bit unsigned. Resolution is 20msec or 160mseconds, according to the value of Acknowledge Timeout Extension Multiplier bit, see below.

Note that there is a separate control of ACK to forward data message from server to 3rd party device connected to the serial port of the unit (application configuration byte 5).

**Value span:** 00h to FFh (=5.1sec or ~40 seconds)

**Default value**: 200 (4sec)

#### *6.2.1.1.2 Acknowledge Timeout Extension Multiplier*

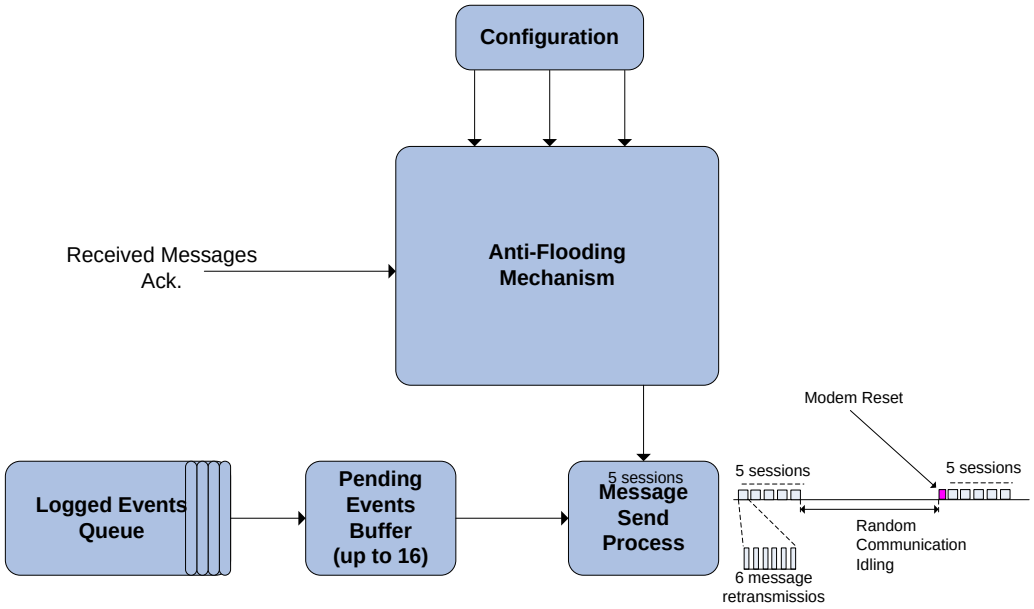
**Address**: 0 bit 6

If this bit is enabled (1) the resolution of Message Transit Acknowledge Timeout parameter will be 160mseconds/bit, otherwise 20msec/bit

**Default value**: 1 (160mseconds/bit)

### 6.2.1.2 Anti-flooding

The Anti-Flooding mechanism is designed to minimize the unit's message Retransmissions in situations where GPRS connection is available but the server is unreachable.
The Anti-flooding will randomize the idle communication time between message retransmission sessions to avoid server overloading in situations where the server becomes available after period of server unavailability and to avoid network overloading.




The block diagram above describes the Anti-Flooding mechanism. The Anti-Flooding mechanism's most important input is the received server acknowledgment; in case there are no acknowledge messages returned from the server, the Anti-Flooding mechanism will implement the following retry patterns:

Send each pending message 6 times while waiting for ack. between each transmission.

Repeat the above sessions 5 times.

Stop transmissions for a random time based on "Anti-Flooding timer" and "Anti-Flooding randomization threshold" configurable parameters (see Anti-Flooding timer, Anti-Flooding randomization threshold). This random period is defined in the diagram as "Random Communication Idling".

Reset the modem.

Go to step 1.

The Anti-Flooding has another sub operational mode called "Intermediate state of Anti-Flooding" which when enabled blocks message transmission till only after IPUP is acknowledged by the server. This operational mode will start logged events transmission only after the server is guaranteed to be responsive. Enabling this mode will implement the above Anti Flooding behavior only for IPUP messages while not saving IPUP events into the log memory. Refer to Intermediate state of Anti-Flooding Activation Control. The Intermediate Anti Flooding mode can be selected to work in Home network, Roam network and in hibernation.

#### *6.2.1.2.1 Anti-Flooding Timer*

**Address:** 284

**Description:** This parameter defines a "communication idling" timeout, used by the unit to decrease a communication costs during the server (CCC) failure.

**Data format:** 1 byte with a resolution of 1 minute

**Value span:** 0-255minutes, a value of zero means no delay between the sets

**Default value**: 0

#### *6.2.1.2.2 Anti-Flooding Randomization Threshold*

**Address:** 1353

**Description:** In case of server failure all the units are entering Anti-Flooding simultaneously and, as a result, reconnecting to CC simultaneously after the Anti-Flooding delay expires. This causes a heavy load of communication on the CC server and might cause a new crash. In order to prevent this issue it is possible to randomize the Anti-Flooding timer.

The timer is restarted every time with a different value, limited by a programmable threshold.

$(A - Ta) \leq$ Anti-flooding interval $\leq (A + Ta)$

A - Anti-flooding timer parameter

Ta - Anti-flooding threshold, programmed in EEPROM

Wrong programming protection:

if $A \leq Ta$ the unit will NOT use the low limit of randomization.

**Data format:** Resolution of programmable threshold is 30 seconds, 1 byte

**Value span:** 0-127 minutes, a value of zero means no randomization

**Default value**: 0

#### *6.2.1.2.3 Enable IP Up Alert (Event)*

**Address:** 202, bit 2 for home network

204, bit 2 for roam network

**Description**: The "IP up" alert is generated with every dial-up to GPRS in order to update the Central Control with the resent IP address of the unit. In cases when SIM card is associated with static IP, it is possible to cancel IP up events.

Note that "IP Up event" CANNOT be disabled if Intermediate state of Anti-flooding is enabled.

**Default value**: 1 – both enabled

#### *6.2.1.2.4 Intermediate state of Anti-Flooding Activation Control*

**Address:** 202, bit 1 for home network

204, bit 1 for roam network

4, bit 1 for hibernation, if enabled for active GSM network

**Description**: If Intermediate state is enabled, the unit will not store IP Up events into log memory. When dialing to GPRS, only IP Up messages will be sent to the server. The unit will not try to download accumulated event before reception ACK to the IP Up message (see Anti-flooding description above).

**Default value**: all three enabled (1). In CelloTrack family to save energy all three are disabled.

### 6.2.1.3 Operational Server Support

The operational communication server is used for uploading positions and other events from the end unit. Normally this will be a communication gateway of the Central Control application.

#### *6.2.1.3.1 Operational Server APN*

**Address:** 36-65

**Name in Programmer:** APN

**Description:** This parameter contains an APN used upon dialing to an operational communication server.

**Data format:** 30 bytes string, first byte is length

**Value span:** First byte 0 to 0x1D, second to 30th - ASCII characters

**Default value**: ASCII "internet"

#### *6.2.1.3.2 Operational Server APN Extension*

**Address:** 841-861

**Description:** This parameter contains the extension of the operational APN server name. If the legacy operational APN server name is full (i.e. its length equal to 29), this extension will be concatenated with the legacy operational server APN name.

**Data format:** 21 bytes string, first byte is length

**Value span:** 1st byte - 0 to 0x14, 2nd to 21th – ASCII characters

**Default value** (Hex): Null

#### *6.2.1.3.3 Operational Server APN Username*

**Address:** 8-31

**Name in Programmer:** GPRS PPP Username

**Description:** This parameter contains a PPP username used upon dialing to an APN defined for operational server.

**Data format:** 24 bytes string, first byte is length

**Value span:** First byte 0 to 0x17, second to 24th - ASCII characters

**Default value**: ASCII "test"

#### *6.2.1.3.4 Operational Server APN Password*

**Address:** 141-164

**Name in Programmer:** GPRS PPP Password

**Description:** This parameter contains a PPP password, used upon dialing to an APN defined for operational server.

**Data format:** 24 bytes string, first byte is length

**Value span:** First byte 0 to 0x17, second to 24th ASCII characters

**Default value**: zeroes

#### *6.2.1.3.5 Operational Server IP Address*

**Address:** 66 to 69

**Name in Programmer:** Default Target IP Address (for GPRS)

**Description:** Stores an IP address of the operational server. All the messages (both active and passive, irrespectively to the source of the incoming command) during normal operation will be sent to this IP address.

If this parameter contains zeros, the unit will use an operational DNS instead.

**Data format:** 4 bytes IP address, Intel order (low significant bytes first)

**Default value:** 0.0.0.0 (change to the IP address of central command)

#### *6.2.1.3.6 Operational Server DNS Address*

**Address:** 2464-2495

**Name in Programmer:** Default target DNS Address (operational server)

**Description:** The Domain Name System (DNS) is a hierarchical naming system for computers, services, or any resource connected to the Internet or a private network. It translates domain names meaningful to humans into the numerical (binary) identifiers associated with networking equipment for the purpose of locating and addressing these devices worldwide.

In our case the DNS support is required in order to prevent a necessity to assign a static IP to each of the servers (operational and maintenance).

A domain name usually consists of two or more parts (technically labels), which are conventionally written separated by dots, such as example.com.

- Cello supports down to 2 levels subdomains (e.g. XXX.XXX.XXX.XXX), maximum length is 32 chars.
- Labels are restricted to a small subset of the ASCII character set known as LDH, the Letters A–Z in upper and lower case, Digits 0–9, Hyphen, and the dot to separate LDH-labels; see RFC 3696 section 2 for details.

The DNS will be used for dial up only if the IP address field of the corresponding server (in programming memory) is set to zero (e.g., 0.0.0.0).

If the IP address field of the corresponding server is not set to zero – the unit shall use this IP address for dial up.

**Data format:** 32 bytes string, first byte is length.

#### *6.2.1.3.7 Listening UDP Port (while connected to both Operational Server or Maintenance Server)*

**Address:** 107-108

**Name in Programmer:** GPRS Self Port

**Description:** This parameter stores the listening UDP port. This should be the "destination port" of incoming UDP messages, it will also be sent as a "source port" of an outgoing transmissions.

**Value resolution & span:** 0- 65535’

**Default value:** 231

#### *6.2.1.3.8 Operational Server Target Port*

**Address:** 109 -110

**Description:** This parameter stores the "destination port" of outgoing UDP or TCP (depends on Modem Type code) messages while connected to the operational server. This will be the also listening UDP or TCP port of target host.

**Value resolution & span:** 0- 65535’

**Default value**: 231

#### *6.2.1.3.9 Modem Type Code for Operational Server*

**Address:** 74

**Description**: This parameter defines dial up type, which is differs according to the communication platform and modem connected.

**Valid values**: According to the table below:

| Value | Network |
|---|---|
| 0 | UDP/IP over GPRS |
| 1-3 | Not supported |
| 4 | TCP/IP over GPRS |

**Default value**: 4 - TCP/IP over GPRS

#### 6.2.1.4 Maintenance Server Support

The Cellocator unit supports a periodic connection to the maintenance server, which is used as a Service & Support Server.

It is possible to set an additional APN, IP address, ports and dial up type for the Maintenance Server; this server will be used for a periodical service communication sessions.

It is also possible to force the unit to connect to the specific server manually, using the OTA command (SMS or GPRS). If the command to connect to maintenance server is received during the communication peak of full hibernation – the unit will connect to maintenance server upon the end of the peeking.

The unit periodically connects (completely drop an existing connection and redial using the dedicated APN) to this server in order to check for the latest firmware and/or programming update. It is possible to enable auto connection to the maintenance server upon power up and upon firmware upgrade.

**The connection to the maintenance server:**

- In TCP mode - TCP socket establishment and a Maintenance Platform Manifest* packet paste into this socket.
- In UDP mode - it will be just a Maintenance Platform Manifest* UDP packet delivery to the Maintenance server and use listening port according to the configuration of the maintenance server.

An acknowledge (OTA message type 4) should be received in with a defined timeout; otherwise the platform manifest will be resent.

In case the unit cannot establish a connection to the maintenance server while the GPRS is available, it will use a dial up retry algorithm defined in Anti-Flooding section of this document.

If all the retries fail, the unit will stop trying and connect back to an operational server (instead of entering Anti-Flooding, as it would do while connected to an operational server).

If the timeout of periodical connection to the maintenance server expires while the unit is hibernating, it will not wake up; instead it will dial the maintenance server immediately after the next COM glancing.

It is possible to disable firmware upgrades or programming from the maintenance server.

The unit automatically disconnects from the maintenance server and connects back to its operational communication server after 3 minutes after the last communication transaction.

The unit does NOT send logged or distress events to the maintenance server. It keeps logging events as usual during the maintenance session (except during firmware upgrades) but does not upload them. The unit will reply to commands sent from a maintenance server.

Distress alerts and real time based alerts that occurred during the maintenance session **will be lost**.

The unit will ignore the incoming voice calls and the incoming SMS notification during the maintenance session (the SMS will be processed after the maintenance session end). Outgoing voice call initiation attempts (both plain and emergency) are ignored during the maintenance session.

After any reset occurred during the maintenance session (except the final reset of firmware upgrade procedure, see bitmap below) the unit will connect back to the primary server.

#### *6.2.1.4.1 Enable Programming Updates from the Maintenance Server*

**Address:** 1398, Bit 0

**Description:** If this bit is enabled the unit will accept updates of programming parameters from maintenance server.

**Default value**: 0 - Disable

#### *6.2.1.4.2 Enable Firmware Upgrade from the Maintenance Server*

**Address**: 1398, Bit 1

**Description:** If this bit is enabled the unit will perform firmware upgrade if the process will be initiated from maintenance server.

**Default value**: 0 – Disable

#### *6.2.1.4.3 Enable Modem FW Upgrade from the Maintenance Server*

**Address**: 1398, Bit 5

**Description:** If this bit is enabled the unit will accept updates of Modem FW from maintenance server.

**Default value**: 0 - Disable

#### 6.2.1.4.4 Enable Connection to the Maintenance Server on each Power-Up.

**Address**: 1398, Bit 2

**Description:** If this bit is enabled the unit will automatically connect to the maintenance server upon each power up.

**Default value**: 0 - Disable

#### 6.2.1.4.5 Reconnect to the Maintenance Server after Firmware Upgrade

**Address**: 1398, Bit 3

**Description:** If this bit is enabled the unit will automatically reconnect to the maintenance server after firmware upgrade (irrespectively from what server, main or backup, the upgrade was performed).

If this bit is disabled the unit will connect back to an operational server immediately upon the end of the upgrade, without even validation of the upgrade process success.

Reconnection to the maintenance server after firmware upgrade is normally required in order to validate successful firmware upgrade and to set up new added configuration parameters.

**Default value**: 0 - Disable

#### 6.2.1.4.6 Enable Auto Connection to Maintenance Server

**Address**: 1398, Bit 4

**Description:** If this bit is disabled the unit will never try connecting to the maintenance server automatically (even if enabled in previous bits), but it will still be possible to force the unit to connect to the maintenance server by a command from OTA.

**Default value**: 0 - Disable

#### 6.2.1.4.7 Maintenance Server Connection Period

**Address:** 1399

**Description:** This parameter defines a time between automatic maintenance sessions. Maintenance server connection period will automatically randomize, in order to prevent a load on the maintenance server, caused by simultaneous connection of multiple units.

The randomization is affected by a unit's ID in the following way:

Real period = Programmed Period + {last 2 digits of decimal representing of unit's ID} [min]

**Data format:** 1 byte with a resolution of 90 minutes (1.5 hours).

In case of zero, the real period will be only {last 2 digits of decimal representing of unit's ID} [min]

**Value span:** 0-15.9 days

**Default value**: 16 dec (1 day)

#### *6.2.1.4.8 Maintenance Server APN*

**Address:** 1403-1432

**Description:** This parameter define a dedicated APN, used by the unit during GPRS dial up only during a connection to the maintenance server.

**Data format:** 30 bytes string, first byte is length

**Value span:** 1st byte – 0 to 0x1D, 2nd to 30th - ASCII characters

**Default value** (Hex): 08 69 6E 74 65 72 65 61 6C 00 …

#### *6.2.1.4.9 Maintenance Server APN Extension*

**Address:** 871-891

**Description:** This parameter contains the extension of the maintenance APN server name. If the legacy maintenance APN server name is full (i.e. its length equal to 29), this extension will be concatenated with the legacy maintenance server APN name.

**Data format:** 21 bytes string, first byte is length

**Value span:** 1st byte - 0 to 0x14, 2nd to 21th – ASCII characters

**Default value** (Hex): Null

#### *6.2.1.4.10 Maintenance Server APN Username*

**Address:** 1626-1649

**Description:** This parameter contains a PPP username used upon dialing to an APN defined for the maintenance server.

**Data format:** 24 bytes string, first byte is length

**Value span:** First byte 0 to 0x17, second to 24th - ASCII characters

**Default value** (Hex): 04 74 65 73 74 00 00 00 00 00 00 00 …. 00

#### *6.2.1.4.11 Maintenance Server APN Password*

**Address:** 1650-1673

**Description:** This parameter contains a PPP password, used upon dialing to an APN defined for the maintenance server.

**Data format:** 24 bytes string, first byte is length

**Value span:** First byte 0 to 0x17, second to 24th ASCII characters

**Default value** (Hex): 00 00 00 00 00 00 00 00 00 00 00 00

#### *6.2.1.4.12 IP Address (for GPRS) for Maintenance Server*

**Address:** 1392 to 1395

**Description:** Stores the target IP address used by the unit during a maintenance session.

**Data format:** 4 bytes IP address, Intel order (low significant bytes first)

**Default value:** 62.90.141.201 (current main maintenance server)

#### *6.2.1.4.13 Default Target DNS Address (Maintenance Server)*

**Address:** 2394-2425

**Description**: As per the DNS for the operational server, described earlier in this document.

The DNS will be used for dial up only if the Maintenance Server IP Address field is set to zero (e.g., 0.0.0.0). If the IP address field is not set to zero, the unit will use this IP address for dial up.

**Data format:** 32 bytes string, first byte is length

#### *6.2.1.4.14 GPRS Target Port for Maintenance Server*

**Address:** 1396-1397

**Description:** Those EEPROM cells store the "destination port" of outgoing UDP or TCP messages (during the maintenance session). This will also be the listening UDP or TCP port of target host.

**Value resolution & span:** 0 - 65535

**Default value**: 7435

#### *6.2.1.4.15 Listening UDP Port for Maintenance Server*

**Address:** 107 -108

**Name in Programmer:** Listening UDP Port

**Description**: As per for the operational server.

#### *6.2.1.4.16 Modem Type Code for Maintenance Server*

**Addres**s: 1391

**Description**: This parameter defines the connection type of the maintenance server.

**Valid values**: According to the table below:

| Value | Network |
|---|---|
| 0 | UDP/IP over GPRS |
| 1-3 | Not supported |

| | |
|---|---|
| 4 | TCP/IP over GPRS |

**Default value**: 0

#### *6.2.1.4.17 Maintenance Server Session Time Update*

**Address**: 1400

**Description**: The maintenance server will use default 3 Min session timeout when first connecting to the C+ server. After the first message arrives from the maintenance server to the unit, the FW will cancel the 3 Min time out, or what is left of it, and replace it with a new session timeout value defined by this parameter.

**Valid values**: Min time 30 Sec: 3

**Resolution**: 10 Sec

**Default value**: 90 Seconds

## 6.2.2 SMS Settings

### 6.2.2.1 SMS Destination Address

**Addresses:** 187-196

**Description:** Stores the default target address used by the unit. Under normal circumstances, this will be the SMS number of the SMS server of central control.

Note that this parameter defines only the default target address, which will be used only for active transmissions (i.e. transmissions that are automatically generated by the unit). Passive transmissions (i.e. replies for commands and queries) will be sent to the address that generated the command/query.

**Data format (GSM-SMS):** First byte should contain the total amount of digits that make up the actual address (not including address type byte). Second byte is the address type byte, which should be 91h for international address (recommended type to use, to allow roaming) or 81h for local address. The rest of the bytes contain the actual address, encoded in BCD. The order of the transmission is bytes with lower address first, lower nibbles (nibble = 4 bit) first. If only the lower nibble of a byte is used (this is legal only in the last byte – in case this is the last digit of the address), the higher nibble should have all of its bits set (the nibble should contain 15 dec). The rest of the bytes that are not used should contain FFh.

**Default value:** NULL.

### 6.2.2.2 SMS Center Address

**Addresses:** 177 – 186

**Name in Programmer:** SMSC Address

**Description:** This parameter stores the address of the cellular operator's SMS center. This parameter is applicable only for units that make use of SMS.

**Data format (GSM-SMS)**: First byte should contain the total amount of bytes that actually contain the address (including address type byte). Second byte is the address type byte, which should be 91h for international address (recommended type to use, to allow roaming) or 81h for local address. The rest of the bytes contain the actual address, encoded in BCD. The order of the transmission is bytes with lower address first, lower nibbles (nibble = 4 bit) first. If only the lower nibble of a byte is used (this is legal only in the last byte – in case this is the last digit of the address), the higher nibble should have all of its bits set (the nibble should contain dec 15). The rest of the bytes that are not used should contain FFh.

This number has to be either left blank or set to the correct value; otherwise the unit will not be able to send any SMS message.

**Example:** If the parameter contains 07h 91h 79h 52h 14h 32h 54h F6h FFh, the address that will be used is the international address +972-54-123456, from left to right.

**Default value:** NULL (blank).

## 6.2.3 Comm. Permissions in Home/Roam Network

### 6.2.3.1 Enable GPRS

**Address:** In home network 201 bit 2, in Roam network 203 bit 2, in hibernation 3, bit 2 (see the following parameter).

**Description**: If this parameter is enabled the unit will utilize GPRS whenever possible as a default communication channel.

**Default value**: Enabled (1) In Home network, Disabled (0) in Roaming

### 6.2.3.2 Renew GPRS upon Drop (in Hibernation, GPS Peeking)

**Address:** 3, bit 2

**Description:** If GPRS is enabled, the unit will try maintaining GPRS session active all the time, even if there is no data to transfer (for example on parking, during one of the hibernation modes).

Due to resource reasons the GPRS network is searching for an idling connections and actively shutting them down. Once the connection is down - the unit will try redialing the network and generate an additional useless traffic and charge.

If this bit is disabled, the unit will not renew the GPRS session during hibernation upon drop. The session will be restored only in case the unit is leaving hibernation due to an Ignition On or Distress Session.

This bit can also be disabled when it is required to prevent GPRS dial up during GSM peeks (in full hibernation only).

**Default**: 1 (renew session)

### 6.2.3.3 Enable SMS

**Address:** In home network 201 bit 7, in Roam network 203 bit 7

**Description**: If this parameter is enabled the unit will respond to a valid incoming SMS commands and generate an active distress and real-time messages (if enabled in the next parameter) when GPRS is not available.

**Default value**: Enabled in both Home and Roaming (1)

### 6.2.3.4 Enable Active Transmissions via SMS

**Address:** In home network 202 bit 4, in Roam network 204 bit 4

**Description**: If this parameter is disabled, the unit will not generate any active SMS traffic (distress or real-time, except the "Wake Up" SMS messages, see description below), even if SMS communication is enabled in previous parameter.

**Default value**: Disable (1)

#### 6.2.3.5 Enable Data Forwarding from Serial Port to SMS

**Address:** In home network 202 bit 5, in Roam network 204 bit 5

**Description**: If this parameter is disabled, the unit will not try forwarding data from a 3rd party device connected to unit's COM port (over CSP or Transparent Data protocols) through SMS, even if both of the two previous parameters are enabled.

It is also possible to disable forwarding data through separately for Hibernation only (on address 4, bit 5).

If this bit is enabled the data will be forwarded through SMS only if:

1. GPRS is unavailable or disabled
2. The length of payload is not bigger than 82 bytes.

***Note that OTA ACK is not required for data forwarded by SMS. The "SMS Sent" indication from the GSM network is considered as a convenient confirmation.***

**Default value**: Disabled (1)

### 6.2.4 COM port settings

Note that not all the available options are currently supported.

#### 6.2.4.1 Baud rate

**Address:** 471, bits 0-3

**Description:** Defines the baud rate of unit's COM, as per the table below:

**Note:** If CFE device is enabled on this port, the unit will fixate on 460800 baud rate, ignoring the configured value.

| Value (dec) | Baud rate (bps) | Currently supported |
|---|---|---|
| 0 | 110 | |
| 1 | 300 | |
| 2 | 600 | |
| 3 | 1200 | |
| 4 | 2400 | |
| 5 | 4800 | |
| 6 | 9600 | √ |
| 7 | 14400 | |
| 8 | 19200 | √ |
| 9 | 38400 | |
| 10 | 56000 | |
| 11 | 57600 | |
| 12 | 115200 | √ (default) |
| 13 | 128000 | |
| 14 | 256000 | |
| 15 | 460800 | √ |

**Default:** 12

#### 6.2.4.2 Parity

**Address:** 472, bits 0-2

**Description:** Defines the parity of unit's COM as per the table below:

| Value (dec) | Parity | Currently supported |
|---|---|---|
| 0 | No Parity | √ (default) |
| 1 | Odd Parity | |
| 2 | Even Parity | |
| 3 | Mark Parity | |
| 4 | Space Parity | |
| 5-7 | Unused | |

**Default:** 0

### 6.2.4.3 Stop Bits

**Address:** 472, bits 3-4

**Description:** Defines the stop bits of unit's COM, as per the table below:

| Value (dec) | Stop Bits | Currently supported |
|---|---|---|
| 0 | One Stop Bit | √ (default) |
| 1 | 1.5 Stop Bits | |
| 2 | Two stop bits | |
| 3 | Unused | |

**Default values:** 0

### 6.2.4.4 Flow Control

**Address:** 472, bits 5-6

**Description:** Defines the flow control of unit's COM, as per the table below:

| Value (dec) | Flow Control | Currently supported |
|---|---|---|
| 0 | No Flow Control | √ (default) |
| 1 | Software flow control | |
| 2 | Hardware flow control | |
| 3 | Unused | |

**Default values: 0**

## *6.2.5 1-Wire port settings*

### 6.2.5.1 Enabling Reading 256-bit EEPROM of DS1971 and Authentication by Group ID

**Address:** 1349, bit 3

**Description:** By default the unit is supporting reading unique iButton identifier from any family of iButtons and using it as a driver authentication. In most cases DS1990A Dallas keys (family ID 01) are used for this purpose.

The DS1971 (the family code of DS1990A is 01h; the family code of DS1971 is 14h) provides, in addition to the unique iButton identifier, a 256-bit EEPROM, containing 10 decimal digits.

In our unit we use this storage in order to store group ID and User ID (refer to Extended Driver Authentication section below in this document).

If this bit is enabled (1), and DS1971 is attached, the unit will:

1) Ignore the unique iButton identifier of the attached DS1971
2) Read 10 decimal digits from the 256-bit EEPROM of the attached DS1971
3) Treat them as User ID and Group ID: high digits represent a Group ID and lower digits a User ID.

The Group ID length is variable and set up during unit's initialization (refer to the *Extended Driver Authentication* section).

Assuming that the number programmed in the EEPROM of DS1971 is 1234567890, and Group ID length is considered upon initialization as 4 digits, the Group ID of the same iButton will be 1234 and User ID will be 567890.

Otherwise, if the corresponding bit is enabled but other type of iButton is attached (different from DS1971), the unit will use the 48 bits of the unique ID of the attached iButton as a driver or passenger ID and 9999 as a group number.

Upon recognition of the new iButton, the unit generates an OTA message type 0, with Transmission reason (Byte 19) = 46 - Driver Authentication Update.

Byte 18 (STR) of the same message includes notifications of Group recondition and user type.

| | | |
|---|---|---|
| Group ID status<br>"1" – authenticated,<br>"0" – not authenticated | Unused | User Type<br>"0" – Driver ID<br>"1" – Passenger ID |
| Bit 7 | Bits 1-6 | Bit 0 |

The entire 10 bytes number (Group and User) received from the EEPROM of DS1971 will be transmitted by the unit in any outgoing message type 0 in a six bytes Dallas field as follows (after applying Little Endian):

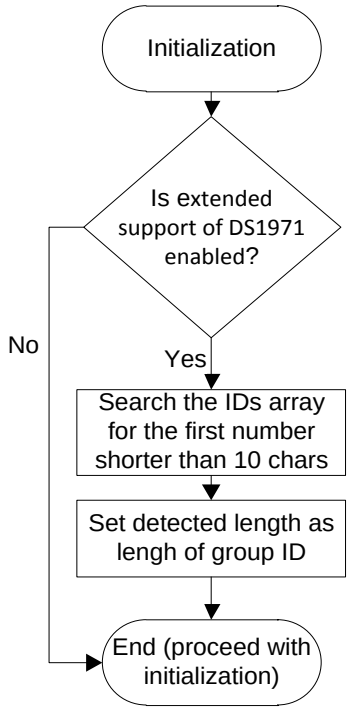
| | | | | | |
|---|---|---|---|---|---|
| 90 | 78 | 56 | 34 | 12 | 00 |
| Byte 33 | Byte 34 | Byte 35 | Byte 36 | Byte 37 | Byte 38 |

If the "Reading EEPROM of DS1971" Programming bit is disabled (0), and DS1971 (or any other type of iButton) is attached, the unit will work according to the legacy Driver ID algorithms.

#### 6.2.5.2 Driver Authentication by Group ID

If the "Reading EEPROM of DS1971" Programming bit is enabled (1), the Group ID is used to enable cancellation of vehicle's immobilization by any company driver without programming code of each one to unit's memory.

The Group ID is programmed as one of the Dallas codes (in the array of 30), its length 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. Any additional number, shorter than 10 digits but with length different from the first Group ID length, is considered a driver id.




**NOTE**: Group ID numbers never begin from zero.

If Reading EEPROM of DS1971 is enabled in the programming, upon reception of data from DS1971 first bytes will be considered the "Group ID".

If Reading EEPROM of DS1971 is enabled in the programming and other type of iButton is attached (not DS1971), upon reception of data from iButton the 9999 is recorded as a

Group ID, but the unit will use the 48 bits of the unique ID of the attached iButton as a driver or passenger ID.

The received "Group ID" is compared with programmed Dallas codes and if it matches:

- The status of Group ID recognition in the last bit of TR Specific byte of "Driver Authentication Update" event changes to "1" – authenticated
- The unit releases immobilizer (only if the immobilizer was activated automatically), even if the Driver/Passenger ID is not in the list.

If Reading EEPROM of DS1971 is NOT enabled in the programming – the unit will not use Group ID at all

### 6.2.6 Data Forwarding from COM Port

In previous versions (prior to FW 31c) the only OTA transport of forwarded data was OTA msg type 8.

The length of payload in this message was limited to 82 bytes in all the cases except transparent data forwarding, where this limit was extended to 235 bytes.

It was not possible to link between the packet forwarded from COM port and location update.

From version 31c the data forwarding capabilities extended in the following way:

- Capability to escort messages, forwarded from 3rd party terminal (or Garmin) with plain fleet management (FM) data (like Dallas, status of inputs, location and time), normally supplied in OTA message type 0. The new structure, containing forwarded data with FM packet and unique ID is called "container"
- Capability to forward up to 512 bytes of forwarded from 3rd party terminal data or the entire container encapsulated into a single message over Cellocator Wireless Protocol (without logging).
- Capability to log forwarded from 3rd party terminal data (or the entire container) as a set of fragments (OTA message type 7). In this case the forwarded from 3rd party terminal data (or the entire container) will be delivered similarly to a delivery of the plain events.

It is possible to introduce features 2 to 4 as a 2x2 selection table, where only one cell can be selected at any time:

| | Forward as pure data | Forward as container including the pure data, FM data and unique ID |
|---|---|---|
| Forward in single packet OTA w/o logging | | |
| Forward as set of logged fragments | | |

### 6.2.6.1 Forward Data as a Container

**Address:** 285, bit 6

**Description:** If this bit is enabled (1), once the forwarded data packet is received in a RAM buffer, the payload is escorted by additional fields and converted in a structure called "the container".

The container is a data structure, created by the unit in its RAM buffer upon reception of the data for forwarding from COM port (in enabled in this bit).

The forwarded payload in escorted by 48 bytes of FM (fleet management) data (attached after the last byte of payload) and total length of payload + FM data (first 2 bytes of the container, before the first byte of the container).

Every container is assigned by 6 bits numerator (increased every packet reception from COM port), used in fragmentation process and reported with the container. The indication bit of report Forwarded Message Code byte in this case will contain '1' - Container.

| Forwarded Message Code | The Container | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A sequential 7 bits ID of the container + indication bit (Single byte) | Length of container (2 bytes) | | The payload of forwarded data X | | | 48 bytes of fleet management data | | |
| | Byte 1 | Byte 2 | Byte 3 | | | Byte 3 + X | | Byte 3+ X+48 |

If this bit is disabled (0), the payload is forwarded as is received from COM port, without any additional conversion. The indication bit of report Forwarded Message Code byte in this case will contain zero.

**Default:** 0 - Disable

### 6.2.6.2 Enable Data Forwarding Through Log

**Address:** 285 bit 7

**Description:** If this bit is Disabled (0), the system will forward data (the pure payload or the container) using OTA message type 8 directly from the RAM buffer.

Single OTA type 8 messages can contain the following:

- Pure forwarded payload up to 512 bytes
- The container, where 512 bytes of forwarded data payload are escorted by 48 bytes of fleet management data and 2 more bytes of container length (total 562 bytes);

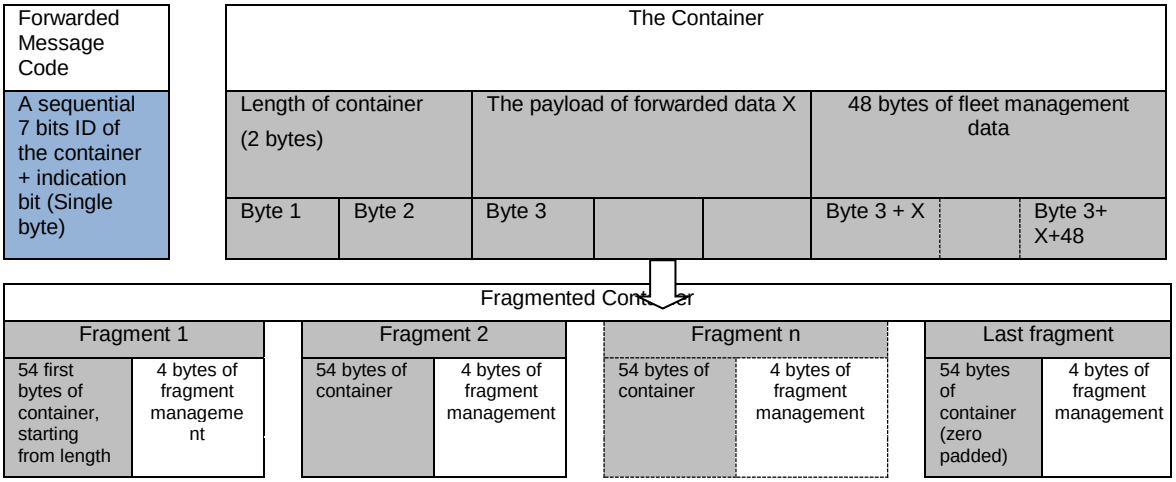
If it is set (1), the received data will be fragmented.

The container (or the payload to forward, as per the programming) is fragmented by chunks of 54 bytes long (last one is zero-padded); chunks are enumerated and equipped by new fragmentation control fields, stored in an events log memory and then uploaded using an existing infrastructure as message type 7.

As per existing message types which are utilizing log memory (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.

#### *6.2.6.2.1 Data Path Chart*




**Default:** 0 - Disable

### 6.2.6.3 Enable Backward Compatible OTA Msg 8

**Address** 1349, bit 2

The legacy data forwarding mechanism was utilizing a data fragmentation due to a small buffer size (Garmin mode only).

In current implementation legacy fragment control byte of OTA message type 8 is not used, since the unit is able to forward "the container" in a single message.

The Fragment Control byte of OTA message type 8 will therefore always contain value of 0xC0.

If this bit indicates backward compatible (0) the unit will restore legacy structure of OTA Msg type 8 by:

1. Fragmenting Garmin traffic to fragments of max 82 bytes of payload and using Fragment Control byte for fragmentation control.
2. Limiting size of forwarded payload in Transparent Mode to 235 bytes.

If this bit indicates extended (1) the unit will use extended structure of OTA Msg type 8 by allowing size of forwarded payload in Transparent Mode to 512 bytes.

**Default value**: 0 - Backward compatible

#### 6.2.6.4 Enable OTA ACK to Forward from OTA to Serial Data Packet

**Address** 1348 bit 0

**Description:** If this bit is enabled (1) the ACK (Msg type 0, TR31) will be sent from Cellocator unit to the CCC upon reception of Data forwarding frame.

**Default:** Enabled (1)

### *6.2.7 Distress Session Configuration*

A Distress Session is one of four possible ways to deliver data to a Central Control (refer to the *Event Types generated by Cellocator devices* section).

If the condition for the specific event is met, the unit will create a series of messages with the same transmission reason. The messages will be uploaded to the Control Center immediately with the first available communication transport (during IP session – over IP, otherwise by SMS). The messages are not stored in the memory and if there is no cellular coverage at the moment of sending – the message will be lost. Distress events do not require any kind of acknowledge.

The number and time between messages in Distress Session is defined in parameters below, but can be temporary overwritten by Distress Session initiation OTA command.

Distress session caused by the same trigger, occurred while the first session is not over yet restarts the session from the beginning.

Distress session caused by different trigger, occurred while the first session is not over yet causes new distress session (up to 5 distress sessions might be maintained concurrently). The 6th distress session, while previous 5 are still active, will be lost.

It is also possible to initiate an endless (or specified duration) distress session by command from CCC. Upon start, this session cancels all active distress sessions. The session will be stopped by any other distress session or by a command from OTA.

#### 6.2.7.1 Time between Distress Transmissions

**Address:** 72-73

**Description:** This parameter defines the amount of time between two consecutive Distress Transmissions in distress session initiated by trigger of distress event.

The amount and the period of distress events generated during session initiated by OTA command is defined by the command itself.

**Data Format:** 16-bit unsigned integer, 0.01 seconds resolution

**Legal values span:** 01h to FFFFh – 65535 (~11minutes)

**Default value:** 1000 (10 seconds)

#### 6.2.7.2 Number of Distress Transmissions

**Address:** 75

**Description:** This parameter defines the amount of transmissions that will be generated in a single distress session triggered by internal logic, if no more sensors are triggered.

The maximum time of single distress session is [this parameter]*[time between transmissions]. Take into account up to another second per transmission (this is the time that it takes the unit to prepare and arrange a transmission).

**NOTE:** A Distress session initiated by OTA command will contain the number of messages specified in a command.

**Legal values span**: 01h (one transmission) through 00FFh (255 transmissions). 0 is illegal.

**Default value:** 1

### *6.2.8 Wake Up Messages*

In most of the cases the unit is sent to the installation site programmed with operational PL file, but without a SIM card. The SIM card is being inserted on installation site.

In order to create an automatic association of the unit with the SIM number in CCC application, the unit initiates a real-time message using SMS or GPRS, according to the bitmap below.

In case Wake Up message has not been sent due to server side issue triggering Anti flooding condition, The Wake Up message counter will be reset and the Number Of Repetition counting will start again from 0.

#### 6.2.8.1 Enable SMS Wake Up

**Address**: 1344, bit 6

**Description:** An SMS message/s (number is set in repetitions field of the same byte) will be sent to the Default Destination SMS address upon power up, after successful registration into Home or Roam GSM network, respectively to SMS rules (like pre-programmed GSM operator's selection, active transmissions block etc).

The "SMS Wake up" event does not require any type of ACK. The message shall be retransmitted in case error.

**NOTE:** The "wake up" message will be transmitted even if active transmissions are disabled. In addition, the time between Wake up SMS repeated messages will be 40 seconds (except for the CelloTrack Nano, in which the time between emergency transmissions will be shorter but still dependent on network responses).

**NOTE:** In CelloTrack and CelloTrack-T, Wake up SMS will be sent every time the unit is moved between Inactive to Active states.

**Default value:** 0 - disabled

#### 6.2.8.2 Enable GPRS Wake Up

**Address**: 1344, bit 7

**Description:** The message will be sent to the Default Destination IP address upon power up, after successful registration into Home or Roam GSM network, and dial up to GPRS, respectively to GPRS rules (like pre-programmed GSM operator's selection etc). The message requires ACK (standard type 4 message). If ACK is not received, it will be resent limited number of times, as configured in "Number of Repetitions" parameter (address 1344, bits 0-5).

**Default value:** 0 - disabled

#### 6.2.8.3 Number of Repetitions

**Address**: 1344, bits 0-5

**Description:** This parameter defines the amount of SMS/GPRS Wake Up messages. In case of failure during sending Wake Up event via GPRS (ACK is not received), the unit will try to resend the message with a period configured in "Time between Distress Transmissions" parameter (address 72). Every power cycle, the repetition counter is reset to 0 and the count is restarted.

**Default:** 5

### *6.2.9 Offline Tracking*

This mode is designed to enable offline data logging. During this mode the modem of the unit remains off, although the GPS, processor and all the peripherals are managed by unit's logic as usual. The unit is generating and storing logged events in its non-volatile memory and once a day (for example, or as configured) establishes a connection to upload all of them during a single communication session.

The modem is also temporarily switches on upon trigger of distress session (in this session only the distress event itself is sent).

The communication session for accumulated data upload will be initiated in the following cases:

- At the end of trip (upon expiration of the dedicated timeout after the Stop alert)
- Upon filling of 90% of memory capacity
- Upon expiration of Logged Events Upload Periodic Timer
- Upon reaching a certain amount of logged events
- Upon activation of Input
- Upon movement in a certain time
- Due to FOTA process

In case of failure of upload process when the unit tries to upload the logged events (i.e. if not all the events were uploaded for any reason), the will perform a configurable number of retries, with a configurable time between the retries.

If during a retry session one of the 5 upload modes is triggered again, the retry mechanism will be "restarted" (e.g. if the number of upload retries was configured to 5, and in the current retry session 3 retries were done, and an upload mode is triggered again, the unit will perform the upload sequence again, i.e. first upload try + 5 retries).

If a retry session was "expired" (i.e. the unit performed all the retries as configured, and still failed to upload all of the logged events), the unit will return to silent offline tracking, until the next upload mode is triggered.

#### 6.2.9.1 Enable Offline Tracking

**Address**: 1348, bit 6

If this bit is enabled (1) the unit switches the modem on and initiate the GPRS session only when data download is required (see below). The rest of the time the modem remains off.

Upon the end of data upload process the session and the modem is shut down.

The modem will also be switched on during distress sessions and real time alerts (Wake up etc.).

In case of wake up due to distress session (or real time alert) the modem will be switched off after transmission of the last message (any valid Cellocator message will extend this timeout by an additional 10 seconds).

Switching the modem on followed by GPRS dial up is initiated by the unit upon:

- At the end of trip (upon expiration of the dedicated timeout after the Stop alert)
- Upon filling of 90% of memory capacity
- Upon expiration of Logged Events Upload Periodic Timer
- Upon reaching a certain amount of logged events
- Upon activation of input
- Upon movement in a certain time
- Due to FOTA process

After modem's wake up it will try to register into a GSM network. If the registration is not accomplished during timeout, defined in "Maximum Network Registration Time" (address 270), the modem will be switched off until next wake up.

Any modem reset, occurred during the upload session, will be followed by modem wake up and registration attempt as per "Maximum Network Registration Time" (address 270).

If the GSM registration is successful, the unit will get more time to dial up GPRS and deliver the first message from the log (the total time from modem wake up is "Maximum Network Registration Time" + 90 seconds, independently from the exact moment of GSM registration). If during this timeout the unit failed to establish GPRS session and deliver the first message - the modem shall be switched off until next wake up.

The unit will not switch off the modem while data transfer is in process;

The modem will be switched off:

- While log is not empty: 90 seconds after last message reception (in case of session drop or server failure).
- While log is empty: 10 seconds after last valid message reception (including ACK)
- This timeout is configurable via "Timeout before switching off the modem" parameter.

Once the dial up attempts stop for one of the reasons described above, no more GPRS dialup attempts (or modem wakes up followed by GPRS dial up attempts) will be made until Stop Journey is detected. After such an event, dial up attempts will start again as described above.

Maintenance Session, if enabled, will start immediately after ANY data session occurred after periodical maintenance timeout expiration. In such a case the modem will be switched off after the end of the maintenance session. There is no dedicated modem wake up for maintenance session.

Serial data Forward mechanism (MDT, Garmin, transparent data ...) will behave in following manner during offline mode:

- During modem wake up due to Emergency session, then the data forwarded from COM port will be forwarded to the server.
- During modem wake up due to Ignition OFF or memory overfilling, then the data will be lost.

**Default:** 0 (Disable)

### 6.2.9.2 Timeout before switching off the modem

**Address:** 220

This timer is restarted every time a data packet is received (to allow the server time to send necessary commands to the unit, if needed), when the log is not empty (i.e. not all logged events were uploaded to the server). Note that the FW limits this parameter to be minimum 30 seconds, so any programmed value under 30 seconds would be treated as 30 seconds.

After completion of uploading all of the logged events (i.e. the log is empty), the unit is switching off the modem after 10 seconds (hardcoded).

**Resolution:** 2 seconds/bit

**Default value:** 90 seconds

### 6.2.9.3 Auto Upload after Ignition Off Event

**Address**: 255, bit 0

**Description**: If this bit is enabled (1), the unit will wake up the modem and establish GPRS session upon expiration of a timeout (Time to Auto-Upload) after a Stop alert.

**Data Range:** 1 - Enable, 0 - Disable

**Default Value:** 0 - Disable

### 6.2.9.4 Auto Upload upon Memory Overflow

**Address**: 255, bit 1

**Description**: If this bit is enabled (1), the unit will wake up the modem and establish GPRS session upon detection of memory overflow (90% full).

**Data Range:** 1 - Enable, 0 - Disable

**Default Value:** 0 - Disable

### 6.2.9.5 Time to Auto Upload after Trip Stop

**Address:** 259 – 260

**Description:** This parameter defines time interval between Trip Stop and GPRS dial up for data upload. Disabling the automatic upload at trip stop is done by "Auto Upload after Ignition Off Event" parameter (address 255, bit 0).

**Value resolution & span:** Resolution is 4 Seconds. Span from: 4 seconds (0x0001), to 18:12 Hours (0xFFFF).

**Default value**: 5400, (0x1518h), 1.5 Hours

### 6.2.9.6 Logged Events Auto Upload Timer

**Address:** 218 – 219

**Description:** This parameter defines the period for periodical auto-upload of events accumulated during Offline mode. 0 – cancels periodical auto upload.

**Value resolution & span:** Resolution is 1 minutes. Span from: 1 minute to 65535 minutes. 0 disables the periodic upload.

**Default value**: 0

### 6.2.9.7 Logged Events Amount for Upload Offline Events

**Address:** 215

**Description:** This parameter defines the amount of logged events for upload of events accumulated during Offline mode. 0 – cancels the amount dependent upload.

**Value resolution & span:** Resolution is 1 event. Span from: 1 to 255 events.

**Default value**: 0

### 6.2.9.8 Number of Logged Events Upload Retries

**Address:** 221

**Description:** This parameter defines the number of logged events upload retries (in case of no GSM connection when attempting to upload logged events). 0 – cancels the retry mechanism.

**Value resolution & span:** Resolution is 1 retry. Span from: 1 to 255 retries.

**Default value**: 0

#### 6.2.9.9 Time Between Logged Events Upload Retries

**Address:** 222

**Description:** This parameter defines the time between logged events upload retries (in case of no GSM connection when attempting to upload logged events).

**Value resolution & span:** Resolution is 10 seconds. Span from: 10 to 250 seconds.

**Default value**: 0

#### 6.2.9.10 Local Timer to Upload Logged Events

**Address:** 223-224

**Description:** This parameter, together with "Movement Timer Before Local Timer Activation" (address 225-226) define a time range for a local upload mode for logged events. The "Local Timer to Upload Logged Events" starts after previous upload session ends. After it expires, the "Movement Timer Before Local Timer Activation" starts. If during this time the unit moves, the logged events are uploaded, and the "Local Timer to Upload Logged Events" starts again.

**Value resolution & span:** Resolution is 1 minute. Span from: 0 to 65535 minutes.

**Default value**: 30 minutes

#### 6.2.9.11 Movement Timer Before Local Timer Activation

**Address:** 225-226

**Description:** This parameter, together with "Local Timer to Upload Logged Events" (address 223-224) define a time range for a local upload mode for logged events. The "Local Timer to Upload Logged Events" starts after previous upload session ends. After it expires, the "Movement Timer Before Local Timer Activation" starts. If during this time the unit moves, the logged events are uploaded, and the "Local Timer to Upload Logged Events" starts again.

**Value resolution & span:** Resolution is 1 minute. Span from: 0 to 65535 minutes.

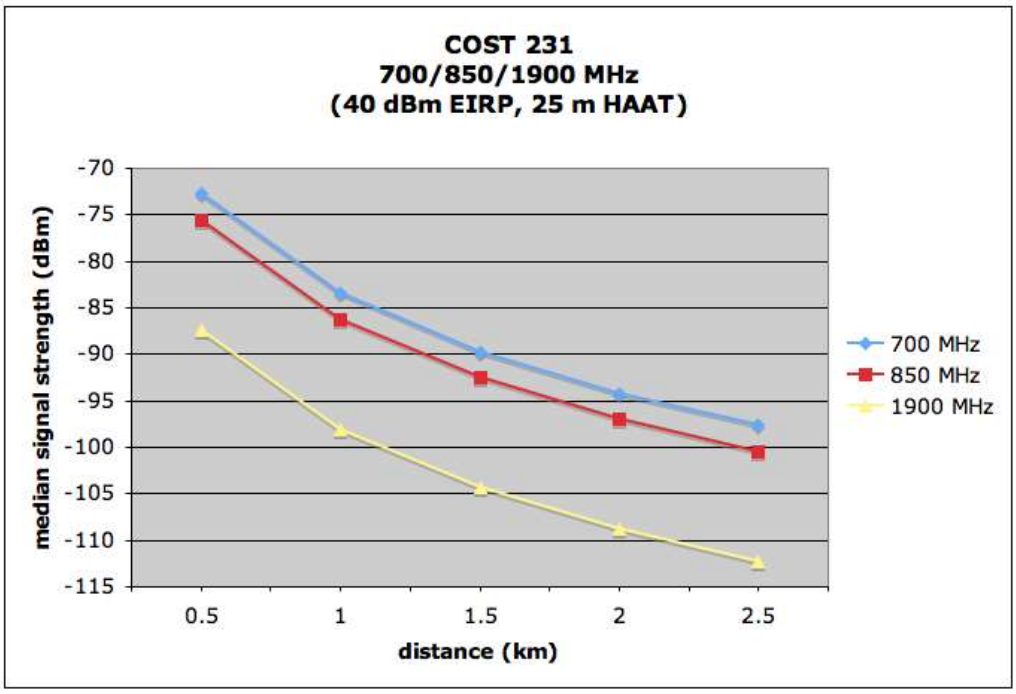
**Default value**: 10 minutes

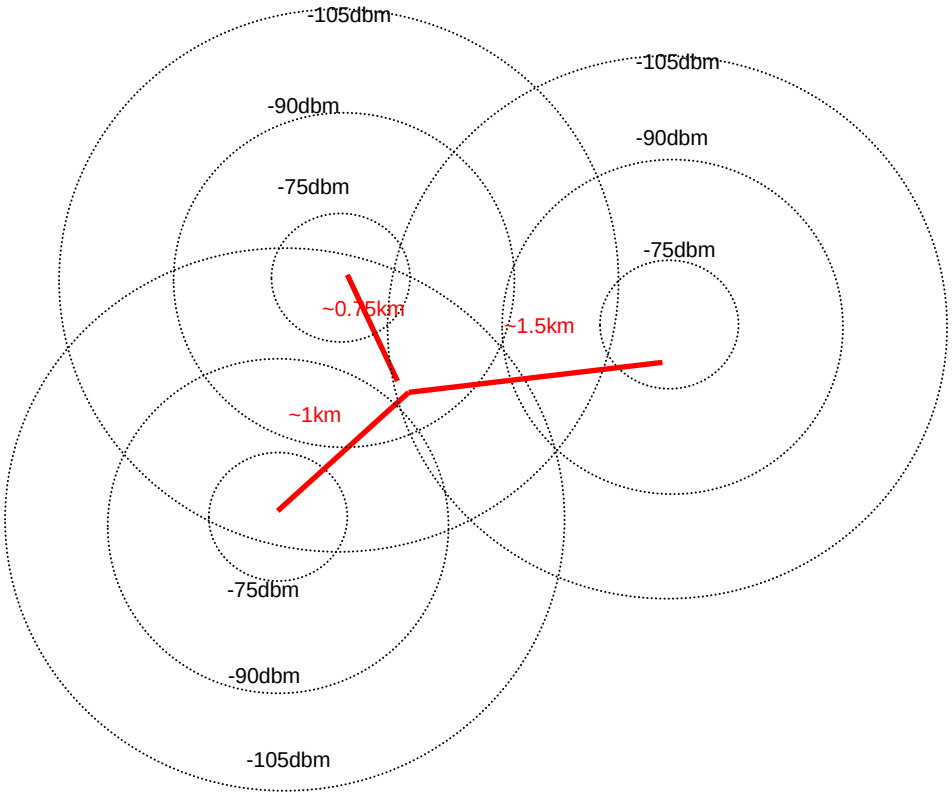
### *6.2.10 Cell ID Based Location (Neighborhood list of the serving GSM cell)*

Please note that CellID is not supported if "UMTS" band is selected in units with 3G modem.

The Cell ID triangulation is an alternative location method. In cases when the GPS is not available information regarding in-range cellular towers (Cells) with known location, along

with signal power or SNR (Signal to Noise Ratio) indication, might be used for location approximation of the transmitting device.



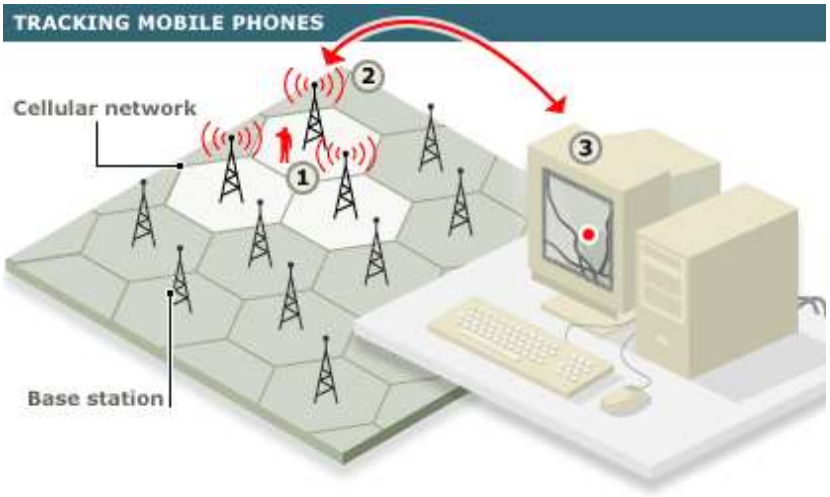
The location of the transmitting vehicle in respect with the "in-range" cells and the RF signal propagation attributes which can be significantly affected by reflectors, black spots, interference, etc. all of this may influence the relative "reliability" of the SNR indication as an estimator for the distance of the vehicle from the receiving Cell.

**How does it work with Cellocator unit?**

When the unit loses a GPS signal for longer than 2 minutes, it will poll modem for Cell ID information. The modem will update with the following parameters of up to 7 cells (the serving cells and up to 6 neighbor cells):

- Base station identification code
- Cell ID
- Location Area Code
- Received signal strength in dBm

The message, containing this information and CellID retrieval timestamp, will accompany any log or distress message (as per configuration) generated by Cellocator unit during GPS coverage loss.




Positioning software performs a triangulation calculation on the information and the data is converted into a geographical location: strongest reception signal theoretically defines closest cells.

**Conditions to consider GPS coverage loss and restore**

The GPS coverage loss in is considered when:

- The GPS is communicating (connected)
- The location appears as invalid for longer than 2 minutes in Standby mode or timeout, programmed in "GPS Max On time" parameter in hibernation mode.

The recovery from Cell ID state is to GPS coverage state, in standby (i.e. not Hibernation) mode, happens when the GPS location is considered valid continuously for more than 1 minute or as in PL parameter 500/1 "GPS Navigation Start_Stop filter" in hibernation mode.

**Behavior during No GPS Mode**

Once the "NO GPS" mode is started, the unit is polling Cell ID neighborhood information from modem periodically, every 1 minute.

The data session (to operational server only) is suspended during polling, the connection does not drop. Messages generated during Cell ID polling are delivered after data mode is restored.

The Cell ID neighborhood data is stored in a unit and delivered as an additional message to a central control after any event or distress message. The additional message contains the next sequential message numerator for easy correlation.

In 3G networks, information of the neighbor cells is not available. Thus, the modem is polled for current serving cell extended data, which may include sector data, which in turn may improve determining the unit location.

### 6.2.10.1 Enable Generation of Logged Cell ID Escorting Packet

**Address:** 201, bit 3 in Home Network

203, bit 3 in Roam Network

**Description:** If this flag is enabled, the unit will generate logged message type 9, (sub data type 9) following any logged message type 0 while the GPS location is considered as invalid.

The logged messages type 9/9 will be stored in the same buffer as corresponding messages type 0 and use the same sequence of numerator for easy correlation.

The message type 9.9 will not be generated if the unit is not logged into GSM.

**Default**: 0 - Disabled

### 6.2.10.2 Enable Generation of Real Time Cell ID Escorting Packet

**Address:** 201, bit 4 in Home Network

203, bit 4 in Roam Network

**Description:** If this flag is enabled, the unit will generate real time message type 9, (sub data type 9) following any distress message type 0 while the GPS reading is considered as invalid.

The real time messages type 9/9 will be delivered using the same rules as the corresponding distress messages type 0 and use the same sequence of numerator for easy correlation.

**Default**: 0 – Disabled

### 6.2.10.3 Enable Generation of Unconditional Logged Cell ID Escorting Packet[3]

**Address:** 201, bit 0 in Home Network

203, bit 0 in Roam Network

**Description:** If this flag is enabled, the unit will generate logged message type 9 (sub data type 0x09/0x0C for 2G/3G) following any logged message type 0.

**Default**: 0 - Disabled

### 6.2.10.4 Enable Generation of Unconditional Real Time Cell ID Escorting Packet[4]

**Address:** 201, bit 1 in Home Network

203, bit 1 in Roam Network

**Description:** If this flag is enabled, the unit will generate real time message type 9 (sub data type 0x09/0x0C for 2G/3G) following any distress message type 0.

**Default**: 0 – Disabled

### 6.2.10.5 Enforce SMS Destination

**Address:** 201, bit 5 in Home Network

203, bit 5 in Roam Network

**Description:** Usually units have a predefined SMS destination ("SMS Destination Address" parameter) to which it sends it's initiated SMSs. As for SMS replies to transmissions from other addresses, the legacy logic dictates that they would be sent only to the originating address.

This parameter enable enforcing to send the ACK always (regardless of the origin of the command) to the same SMS destination number.

**Default**: 0 – Disabled

[4] Available only for CR300B (New Platform) from FW version 43m and later, and for CR300B (Legacy) from FW version 43l and later.

### 6.2.11 Internal Accelerometer Configuration

**Movement Detection:** The Cello unit can reliably detect movement start /end using its onboard accelerometer, similarly to a technique implemented in CelloTrack. This capability shall allow releasing an Ignition input for general usage or add another dimension for movement detection: ignition switch separate from movement detection.

It is possible to select movement detection source programmatically: Ignition input (backward compatible mode) or accelerometer.

If Start/Stop detection using accelerometer is enabled, the unit reassigns all the functionality based on the status of Ignition to the status of movement.

Examples of such functionality: Start/Stop alerting, Driver Authentication, Hibernation mode change etc.

The ignition input becomes a general purpose discrete pulled down input, monitored in OTA and Serial messages. It might still be used for Ignition Switch status monitoring, but operational mode will be switched according to movement status:

- The unit changes its operational mode to STBEOn if movement is detected for longer than defined in "Start Event time filter" programmable parameter on address 104.
- The unit changes its operational mode to STBEOff if lack of movement is detected for longer than defined in "Stop Event time filter" programmable parameter on address 105.

**Towing Detection:** The Cello unit shall be able to reliably detect towing using its onboard accelerometer. The feature shall be applicable when:

- A movement detection source is selected from ignition input.
- The ignition switch is switched off, in other words - during parking.

Upon movement detection during parking the unit will wake up from hibernation, alternatively generate an alert, then trigger legacy towing detection feature, based on GPS data.

#### 6.2.11.1 Movement detection type

**Address** 467, bits 2

**Description:** This bit enables selection of movement detection type: either actual vehicle movement detection or engine operational mode change detection (engine start and switch off).

**Note:** If accelerometer is set as an engine status detector – the Stop Event generation may be delayed for (up to) 8 seconds (after expiration of the Stop Event filter).

**Values span:** 0 - movement, 1 – engine status

**Default value**: 0 - movement

### 6.2.11.2 Accelerometer Sensitivity

**Address** 467, bits 3-4

**Description:** It is possible to calibrate the sensitivity of the internal accelerometer (3 levels) and to adapt it to any vehicle. The default value of 1 is adapted to detect movement start/end in standard private vehicle. In case of truck it is recommended to decrease the sensitivity level, in case of very silent vehicle – to increase it.

**Values span:** 0 - Very insensitive, 1 – Normal, 2 - Very sensitive, 3 - Spare

**Default value**: 1 – Normal

Note: The Accelerometer Sensitivity feature is applicable also in CelloTrack T units from FW version 61c.

### 6.2.11.3 Movement Detection Source

**Address** 467, bit 0

**Description:** This bit defines what source will be used for movement detection: internal accelerometer or Ignition input. If Accelerometer source is selected, all the logic normally dependent on status of Ignition Switch will be re-linked to the status of Movement detection.

**Values span:**

0 – Start/Stop alerts by status of Ignition switch (backward compatible mode)

1 – Start/Stop alerts by movement detection using accelerometer

**Default value**: 0 – backward compatible mode.

### 6.2.11.4 Start & Stop Detection Using Voltage Level and Accelerometer

**Address** 467, bit 5

**Description:** This bit enables (1) usage of voltage level in addition to "movement detection" by accelerometer for Start/Stop detection.

**Values span:**

0 – Disable

1 – Enable

**Default value**: 0 – Disable

### 6.2.11.5 Time filter for ignition state according to voltage level

**Address:** 605

**Description:** Time filter for ignition state change according to vehicle voltage level.

**Resolution:** 1 Second

**Data range:** 0-255 seconds

**Default value:** 0 Seconds

#### 6.2.11.6 Voltage Level Threshold for Ignition On Detection

**Address** 468

**Description:** This parameter allows to configure the main battery voltage for assisting accelerometer or Ignition input with Start/Stop detection, or for waking up the unit from hibernation upon connecting electrical vehicle to charging source. It only affects if bits 5 and/or 7 of address 467 and/or bit 0 of address 3 are set.

The Start Event shall be registered if movement by accelerometer is detected or Ignition input state is On, and the voltage of the main battery is higher than this parameter during the entire Start Event registration timeout.

The Stop Event shall be registered if NO movement by accelerometer is detected or Ignition input state is Off, and the voltage of the main battery is lower than this threshold during the entire Stop Event registration timeout.

**Data format:** 8-bit unsigned, 0.1176470588235V/bit

**Default value:** 12.81V

### *6.2.12 Roaming List, GSM Operator Management*

The non-volatile configuration is storing a list of 100 Public Land Mobile Networks (GSM operators) with their priorities.

The end unit continuously* monitors a GSM operators (PLMNs) available on the air and dynamically selects the best cost effective operator according to the pre-programmed priority assigned to each one.

*The GSM operator selection mechanism is activated in 2 cases:

Periodically, according to pre-programmed timer

Upon new GSM registration, caused by reset or leaving the area covered by previously selected network.

After one of the conditions listed above becomes true the state machine takes control over the process and selects the best operator based on the list in the configuration memory.

#### 6.2.12.1 Timer of Auto Search

**Address**: 1008

**Description**: This parameter defines a timer, used by the system to repeat search of available GSM networks in the air. The timer restarts each time when the unit is "taking decision" to register in a specific PLMN, irrespectively to the result of registration attempt.

**Data format**: The parameter is an 8-bit integer, resolution of 10 minutes.

**Value span**: 1 to 255 (10 minutes to 2550 minutes, zero is automatically translated into 30 minutes)

**Default value**: 6

### 6.2.12.2 Consider Unknown Operators as Forbidden

**Address:** 1348, bit 5

**Description**: If this flag is set, any PLMN not listed in the programming will be considered as forbidden.

Otherwise, if this bit is 0, any PLMN not listed in the programming will be considered as enabled with lowest priority.

**Default value**: zero (not forbidden)

### 6.2.12.3 Number of PLMNs Programmed

**Address:** 1009

**Description**: This parameter defines a number of active records in PLMN table.

Zero value cancel Roaming List Management feature.

**Value span**: 0 to 100

**Default value**: zero

### 6.2.12.4 Public Land Mobile Networks (PLMN)

**Addresses:**

| Address | Value |
|---|---|
| 1010-1012 | PLMN 1 |
| 1013-1015 | PLMN 2 |
| …. | …. |
| 1307-1309 | PLMN 100 |

**Description & Data Format:**

Each PLMN number is composed of two fields:

MMC-Mobile Country Code

MNC-Mobile Network Code

It will be stored in the configuration memory together with its priority as a single parameter in the following way:

| Priority | | | PLMN (MCC-MNC) | | | |
|---|---|---|---|---|---|---|
| Bit 23 | | Bit 20 | Bit 19 | | Bit 1 | Bit 0 |

The highest number in Priority field (15) is representing the most preferred network.

The value of 1 is the lowest priority, 2 - higher priority and so on.

The value of zero – is representing Forbidden PLMN.

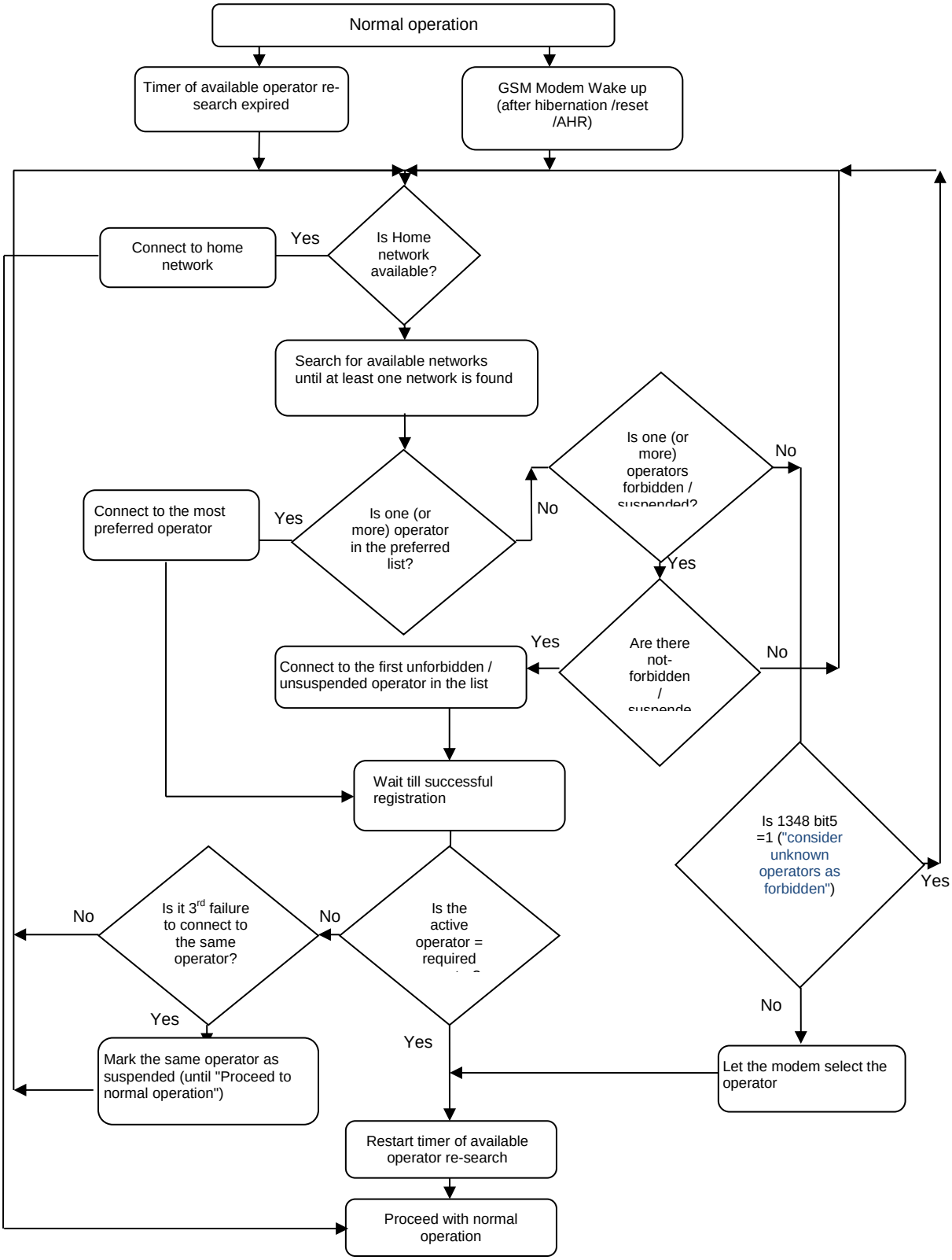
**NOTE**: The network available in the air, but not listed in the pre-programmed PLMN list will be treated as per configuration in "Consider Unknown Operators As Forbidden" above.

During searching of available networks (processing AT+COPS command) the modem is busy and not available for any type of communication. This process might take up to 3 minutes, but in majority of the cases will be accomplished in less than 20 seconds.

In case no available network found during search, or all the available networks are "forbidden" – the unit will hold and proceed with searching after expiration of Timer of Auto Search.

**Default value**: zeroes

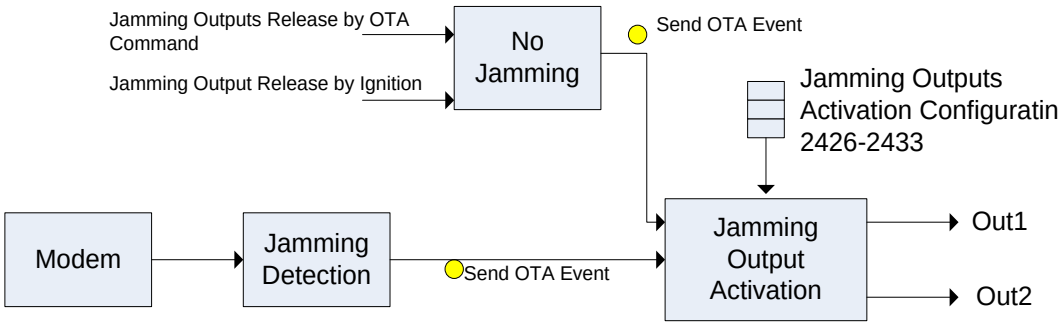
### 6.2.12.5 Operator Selection Flow Chart



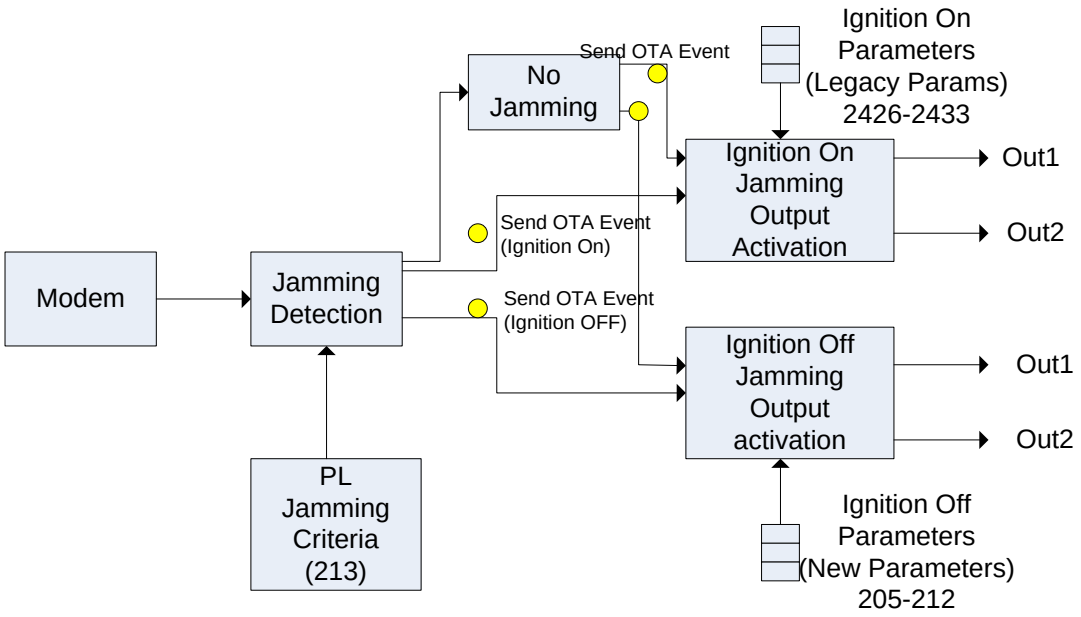
### 6.2.13 GSM Jamming Detection & Reaction

The GSM Jamming detection supports two modes of operation:

- **Legacy Jamming Detection mode**: Jamming is detected without any relation to the Ignition state of the vehicle. In this operational mode, jamming detection can activate up to two outputs for jamming driver feedback. The Jamming feedback is released by OTA command or Ignition Sequence.




- **Advanced Jamming Detection mode**: The jamming detection is depended on the vehicle's ignition state. Different outputs activations are allocated for Ignition On and Ignition Off states. Each Ignition state can drive up to two driver feedback outputs. Jamming Driver feedback outputs are released when jamming condition ends. The user can terminate the jamming state by the legacy sources (OTA commands and Ignition sequence). In the advanced mode, the user can configure the jamming detection time filter and the Jamming End condition time filter. Jamming events will be sent when jamming is detected or when jamming ends. The Jamming events will also reflect the vehicle's ignition state. The Ignition on jamming output activation configuration is the same configuration array used by the legacy jamming outputs activation.




The following responses to jamming detection are available and switchable by unit's programming:

- The unit allows activating a vehicle horn and / or blinkers in pre-programmed frequency and cadence.
- Each of the outputs (horn and blinkers) is equipped by independent activation time filter.
- The unit allows activating nested immobilization (after vehicle's stop) and / or immediate immobilization.
- Unconditionally the unit stores dedicated event for jamming detection into its non-volatile memory.
- The unit enables releasing activated outputs by valid Dallas or by certain activity of Ignition input.

### 6.2.13.1 GSM Jamming Detection

#### *6.2.13.1.1 Telit*

The cellular modem detects jamming and, if not during an active GPRS session, initiates periodical reports to a microcontroller while jammed (every 3 seconds).

The jamming status is considered as GSM JAMMED upon reception of 3 consecutive jamming detection notifications from the modem in 10 seconds. The unit stores a GSM JAMMED event (TR206, TR Specific data 0) upon jamming status changing to Jammed.

The jamming status is considered as GSM NOT JAMMED upon reception of a dedicated unsolicited message from the modem - "Operative". The unit stores a GSM JAMMED event (TR206, TR Specific data 1) upon jamming status change to Not Jammed.

Since during an active GPRS session unsolicited Jamming detection indications are not received, the microcontroller is temporary suspending GPRS session upon traffic jam (missing ACKs for at least 30 seconds and 3 lost ACKs minimum).

**NOTE**: In this case (GSM Jamming during GPRS Session) the Acknowledge Timeout directly affects time to Jamming Detection.

The unit will not suspend the GPRS session more than once; next session suspend can only happen in a subsequent GPRS session.

#### *6.2.13.1.2 Cinterion*

The Cinterion modem, unlike Telit, is not limited by active GPRS sessions – the jamming indications are issued in any state. The modem is not initiating any periodical report; it is reporting GSM jamming state change upon jamming start and end. The unit is immediately entering or leaving "Jamming" mode upon reception of the appropriate notification from the modem.

### 6.2.13.2 Advanced GSM Jamming Detection Mode

**Address:** 525, bit 6

Description: The Advanced Jamming detection mode differentiates between Ignition-On and Ignition-Off jamming detection criteria. Each mode (Ignition On or Ignition Off) has its dedicated outputs activation configuration parameters. The Advanced Jamming also enables the configuration of the jamming detection threshold and the "Jamming End" filter delay. OTA events reflecting the beginning and End of jamming sessions will be sent whenever jamming is detected or jamming stops. 0-Legacy Jamming support (not depended on Ignition state), 1-Advanced Jamming support, Ignition state depended.

**Default value**: zero (Disabled)

### 6.2.13.3 Disable GSM Jamming Event or Disable GSM Jamming Event during Ignition On

**Address:** 1348, bit 3

**Description**: This configuration parameter disables jamming OTA events. The functionality of this configuration bit depends on the state of the Jamming detection mode (See: Advanced GSM Jamming Detection Mode): If the advanced mode is configured, This configuration bit will only disable jamming events started during Ignition On, If the Advanced mode is not configured, this pin will disable all jamming events.

Note that Jamming detection started during Ignition On and ended while in Ignition Off will be reported even if "Disable GSM Jamming Event during Ignition off" is enabled.

In addition, output activation as a reaction to jamming is independent from registration of GSM JAMMED event.

**Default value**: zero (Jamming is NOT disabled)

### 6.2.13.4 GSM Jamming-End Time Filter

**Address:** 214

**Description**: The GSM Jamming-End Time Filter is only applicable if advanced jamming mode is enabled (See: Advanced GSM Jamming Detection Mode). The Jamming-End Time Filter defines the time required for declaring "End of Jamming" event. End of jamming will send a jamming end event and deactivate the associated outputs if configured by "Release by Jamming End" flag. Setting the Jamming End Time Filter to 0 will result in immediate outputs deactivation. The filter is common for both Ignition-on and Ignition-off jamming states. The timer resolution is 15 seconds.

**Default value**: 10 Minutes

**Resolution:** 15 second

### 6.2.13.5 GSM Jamming Detection Time Filter

**Address:** 213

**Description**: The GSM Jamming-End Time Filter is only applicable if advanced jamming mode is enabled (See: Advanced GSM Jamming Detection Mode). The Jamming detection Time Filter defines the basic criteria for declaring jamming condition. The time filter defines the minimal number of consecutive 3 seconds samples needed before jamming condition is detected. Each bit represents time delay of 3 seconds. The minimal value is 1 (0 will be translated to 1 by the Firmware). Typically this parameter will be set to 10, representing 30 Seconds time filter.

**Default value**: 30 Seconds (10)

**Resolution:** 3 second

### 6.2.13.6 Output Activation as a reaction to GSM Jamming Detection

Upon GSM jamming detection and expiration of activation timeouts, the unit can concurrently activate two outputs. Once activated by Jamming Detection logic, the output can only be deactivated by:

- A command (OTA or serial)
- Authorized Dallas
- Ignition activity pattern

Once deactivated by user or by command the output will be activated again only upon the next jamming detection. In other words: after the end of the active jamming session and beginning of the next one.

**NOTE**: Reset does not deactivate an output activated upon jamming detection.

#### *6.2.13.6.1 Output, Auto-Activated upon Jamming Detection*

**Address:** 2426 for first output and 2429 for second output, bits 0-2

**Address:** 205 for first output and 208 for second output, bits 0-2

**Description**: This pair of parameters defines a numbers of outputs that will be activated upon jamming detection.

| Output name | Output number |
|---|---|
| Feature Disabled | 0 |
| Siren | 1 |
| Gradual Stop | 2 |
| St. Immobilizer | 3 |
| LED | 4 |
| Blinkers | 5 |
| Reserved | 6 |
| Reserved | 7 |

**Value span**: 1 to 5

**Default value**: zero

### *6.2.13.6.2 Delay for Output Activation*

**Address:** 2432 for first output and 2433 for second output

**Address:** 211 for first output and 212 for second output

**Description**: This pair of parameters contain a time filters for output activation upon GSM Jamming.

The event of Jamming detection will still be generated w/o any timeout.

If this parameter contains any number, different from zero, the output will not be activated immediately upon Jamming detection, but after a pre-programmed timer. An activation of the output will only occur if upon expiration of this timer a jamming session is still active.

The timer for output activation will start upon detection of GSM Jamming and reset upon detection of GSM Jamming end.

**Resolution**: 15 seconds / bit, maximum 63.75 minutes

**Default value**: zero (immediate activation upon Jamming detection)

### *6.2.13.6.3 Output Activation Pattern (Upon Jamming Detection)*

**Address:** 2426 for first output and 2429 for second output, bits 3-5

**Address:** 205 for first output and 208 for second output, bits 3-5 (Advanced Mode during Ignition-Off)

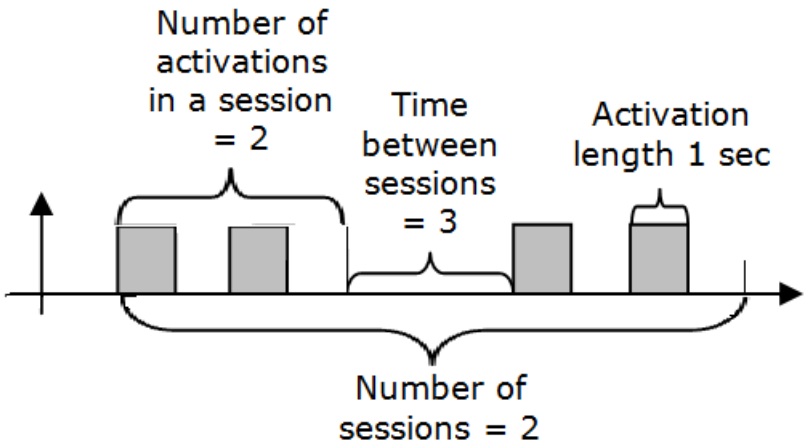
**Description**: This pair of parameters defines a activation pattern of outputs upon jamming detection.

| Setting | Action |
|---|---|
| 0 | Pulse Activation (The output shall be activated for the time, defined in "Pulse Outputs Width Period", addr. 140 dec |
| 1 | Change state to "active" upon jamming detection, change to inactive upon release (by command, Dallas or Ignition Activity) |
| 2 | Activate Gradually (only compatible with Gradual Stop output) |
| 3 | Activate Nested (executed upon jamming detection only after vehicle stops, e.g. Ignition off or 10 valid GPS packets showing speed lower than 1 km/h) |
| 4 | Template Activation (according to the settings described below) |
| 5-7 | Reserved |

### 6.2.13.7 Template of Output Activation upon Jamming Detection

Example of template:

Two activations in a session, 1 second per activation, 2 sessions, 3 seconds between sessions:




#### *6.2.13.7.1 GSM Jamming - Output Activation Template - Activation Length*

**Address:** 2427 for first output and 2430 for second output, bits 0-3

**Address:** 206 for first output and 209 for second output, bits 0-3 (Advanced Mode, During Ignition-Off)

**Description**: This pair of parameters defines a length of activation of the selected output upon GSM Jamming detection.

0 for the time, defined in "Pulse Outputs Width Period", addr. 140 dec

**Value resolution**: 0.5 second

**Default value**: zero

#### *6.2.13.7.2 GSM Jamming - Output Activation Template - Number of Activations in a Session*

**Address:** 2427 for first output and 2430 for second output, bits 4-7

**Address:** 206 for first output and 209 for second output, bits 0-3 (Advanced Mode, During Ignition-Off)

**Description**: This pair of parameters defines a number of activations of the selected output upon GSM Jamming detection.

0 – cancels outputs activation upon jamming detection

**Default value**: zero

#### *6.2.13.7.3 GSM Jamming - Output Activation Template - Number of Activation Sessions*

**Address:** 2428 for first output and 2431 for second output, bits 0-3

**Address:** 207 for first output and 210 for second output, bits 0-3 (Advanced Mode, During Ignition-Off)

**Description**: This pair of parameters defines a number of sessions of output activations upon GSM Jamming detection.

0 – for cyclic activation all the time of jamming

**Default value**: zero

#### *6.2.13.7.4 GSM Jamming - Output Activation Template - Time between the Activation Sessions*

**Address:** 2428 for first output and 2431 for second output, bits 4-7

**Address:** 207 for first output and 210 for second output, bits 4-7 (Advanced Mode, During Ignition-Off)

**Description**: This pair of parameters defines a time between activation sessions of output activations upon GSM Jamming detection.

**Zero value:** If zero is programmed the unit will only perform one session of activation irrespectively to the programmed number of sessions.

**Value resolution**: 0.5 second

**Default value**: zero

### 6.2.13.8 GSM Jamming Outputs Release

GSM jamming outputs can be released by Dallas key authentication or by Ignition sequence. When advanced jamming mode is enabled (See: Advanced GSM Jamming Detection Mode), It is possible also to release the outputs when GSM jamming condition ends.

#### *6.2.13.8.1 Enable Output Release by GSM Jamming End condition while in Ignition-On*

**Address:** 522, bit 5

**Description: GSM** Jamming-end detection will deactivate the outputs if this parameter is enabled. The "Jamming-End" state is declared after no jamming detection is detected for the time defined in "GSM Jamming End Filter":

0 - Jamming-End doesn't affect the activation outputs.

1 - Jamming-End will deactivate the GSM Jamming activation outputs.

This bit is applicable for jamming end condition detected while the unit was in Ignition-On.

**Values span**: 0- Disable, 1 - Enable

**Default value**: Enable

#### *6.2.13.8.2 Enable Output Release by GSM Jamming End condition while in Ignition-Off*

**Address:** 522, bit 4

**Description: GSM** Jamming-end detection will deactivate the outputs if this parameter is enabled. The "Jamming-End" state is declared after no jamming detection is detected for the time defined in "GSM Jamming End Filter":

0 - Jamming-End doesn't affect the activation outputs.

1 - Jamming-End will deactivate the GSM Jamming activation outputs.

This bit is applicable for jamming end condition detected while the unit was in Ignition-Off.

**Values span**: 0- Disable, 1 - Enable

**Default value**: Enable

#### *6.2.13.8.3 Enable Output Release by Authorized Dallas*

**Address**: 522, bit 7

**Description:** This bit enables deactivation of an output, activated by Jamming Detection Logic, by an authorized Dallas key

**Values span**: 0 - Disable, 1 - Enable

**Default value**: zero

#### *6.2.13.8.4 Enable Output Release by Ignition Activity*

**Address:** 522, bit 6

**Description:** This bit enables deactivation of an output, activated by Jamming Detection Logic, by the below specified sequence on Ignition line:

1. From ignition off state Switch Ignition on for a period between 0.5 to 2 seconds (Ignore input change time filter)

Switch it back off for a period between 0.5 to 2 seconds (Ignore input change time filter)

Repeat 1 and 2 four times.

Upon detection of deactivation activity on Ignition the unit will:

- Activate feedback "beep" (using feedback output/s)
- Release an output

**Values span**: 0 - Disable, 1 - Enable

**Default value**: zero

## *6.2.14 Other Configuration Parameters related to Communication Settings*

### 6.2.14.1 Disable Active Transmissions

**Address:** 6 bit 1

**Description:** If set to `1 the unit will not actively initiate any kind of connection - SMS, GPRS or voice. It will reply to incoming SMS commands, if the relevant flags for the current roaming/homing state are enabled.

**Default:** 0 **–** Enable Active Transmissions

### 6.2.14.2 Enable Command Authentication

**Address**: 1 bit 6

**Description**: If this feature is enabled authentication of every incoming message to the unit (like command or acknowledge) will be verified. Each incoming message should include a unique code, generated as a function of two variables:

- Unit's ID

- 8 bytes Auth Table, stored in non-volatile memory of the unit and concurrently in the Communication Center application.

If the code will not be verified as authentic – the unit will not perform / acknowledge the command and will erase it.

The unit supports dedicated Auth Table read/write commands over its wire protocol. See description of the commands in a corresponding documentation.

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

**Default:** 0 **–** Disabled

### 6.2.14.3 Enable Increased Number of Scanned Channels

**Address:** 526, bit 7

**Description:** If this parameter is enabled, the unit will set the Modem with number of channels to be scanned to 150,150 (meaning allowing to scan 150 channels in 850/900 bands, and 150 channels in 1800/1900 bands). If it is disabled, the unit will set the Modem with its default preset, i.e. with number of channels to be scanned to 60,80 (meaning allowing to scan 60 channels in 850/900 bands, and 80 channels in 1800/1900 bands).

**Range:** 0 – Disable, 1 – Enable

**Default:** 0 **–** Disable

### 6.2.14.4 Enable Driver's Privacy (Invisible) Mode

**Address**: 6 bit 4

**Description**:

**NOTE**: This mode is not supported by security variants.

This mode is designed to allow the driver to allow/disallow tracking of their vehicle. After entering Privacy mode, the unit will generate only Ignition On/Ignition Off events, no Time or Distance events will be generated. The unit will still reply to interrogations and perform commands from the Control center, but outgoing messages will not include position information.

If the unit enters Privacy mode during Ignition On, it will generate pair of events: "Ignition Off" with position information and "Ignition On" without position information. The purpose of event generation is to define stop of tracking session.

If the unit leaves Privacy mode during Ignition On, it will generate pair of events: "Ignition Off" without position information and "Ignition On" with position information. The purpose of event generation is to define start of tracking session.

In order to enter Privacy mode:

- The mode should be enabled by this configuration bit.

- All the plain and distress events as well as other functionality assigned to "Shock input" should be disabled.
- The "Shock" input should be triggered to enter Privacy mode and released to leave this mode.

**Default:** 0 **–** Disabled

### 6.2.14.5 HRLS (High Resolution Logging Session) - Number of Events

**Address:** 491

Any system trigger (Input trigger, GPS reading based trigger etc.) can be configured to trigger a High Resolution Logging Session (HRLS - HRLS is one of 4 available event generation types; refer to the *Event Types generated by Cellocator devices* section). During this session the unit is logging an event every valid GPS fix (every second). If the GPS fix is invalid during HRLS - the event will not be logged.

The duration of HRLS is limited by:

- Pre-programmed number of logged events as programmed in this parameter.
- A timeout, closing the HRLS even if not all the events programmed in "Amount of Events during HRLS" are logged (in case of poor GPS coverage).

HRLS Timeout [sec] = [Amount of Events during HRLS] x 2

There is no data upload during the High Resolution Logging Session – the events are delivered after the end of HRLS.

**Description:** This parameter defines number of events, generated during High Resolution Logging Session. Event is logged every second (if the GPS fix is valid), therefore the parameter defines minimal duration of HRLS in seconds.

Events with invalid GPS fix will not be logged, and as a result the session could proceed longer. Maximal duration of HRLS in seconds is twice bigger than the minimal one.

**Value span:** 0-255

**Default value:** 5

### 6.2.14.6 Number of Retries to Forward Data over UDP GPRS

**Address**: 283

**Description**: This parameter defines number of retries to forward data from the COM port (for example from MDT) to the Central Control over UDP/IP. Such a message requires acknowledge (msg type 4) from the Central Control. If the acknowledge will not be received during the timeout defined by "Message Transit Acknowledge Timeout", the unit will resend it number of times, defined in this parameter.

If all the reties forwarding data through UDP will fail, the same message will be sent by SMS (if enabled in bytes 202, 204, bit 5).

**Default value**: 5

### 6.2.15 GSM Detection

According to the usage experience, there are scenarios of pre-ordered car thefts. In this scenario, the thief receives an order to steal a specific car. He then checks if this car is equipped with a transmitting security unit by activating a GSM detector when the legal owner starts the car at home and drives away. If he collects GSM transmissions (i.e. a unit is installed in the car), when he later comes to steal it, he first uninstall the unit and only then starting the car and takes it.

To avoid the thief of knowing if the car is equipped with a unit, the following logic was developed: When the car is started (Ignition On), the unit functions according to its regular logics besides the Modem which stays off (no matter what was the unit mode before the Ignition On). The Modem is turned on after expiration of a timer, which is measured from Ignition On filter expiration (but no Start event is transmitted). This timer is configurable by "Modem On Delay Timer" parameter (address 230), when for zero value the delay is disabled. All of the events (both logged and distress) that are generated in the delay period are not transmitted. Logged events are logged in the unit memory, and transmitted when the Modem is turned on. Distress events are kept for their "life" time, if exists (legacy logics). If distress event life time expires before the Modem On Delay Timer expires, the event is lost. If the car is turned off (Ignition Off) again before this timer expires, the unit ignores the timer and act according to its regular logics.

#### 6.2.15.1 Modem On Delay Timer[5]

**Address**: 230

**Description:** This parameter determines the time to delay the Modem turn on from Ignition On. Zero - disables the Modem turn on delay.

**Value:** 0-127 Minutes, 0.5 minute/bit

**Default:** 0 – disabled

[5] Available only for CR300B (New Platform) from FW version 43m and later, and for CR300B (Legacy) from FW version 43h and later.

# 6.3 GPS Calibration

## 6.3.1 Base Unit (Measurement Factor of GPS Odometer)

**Address**: 80 to 83

**Description**: The value defines unit used for distance and odometer measurements. The selected value (for example 100m, 1km or 1 mile) will be used by the unit as a lowest distance unit to be reported and as a distance resolution.

The parameter is a 32-bit unsigned integer. Value is represented in centimeters. (100000 for 1 Km).

**Valid values**: Any non-zero value

**Default Value**: 100000

## 6.3.2 GPS Odometer Current Value

**Address**: 76 to 79

**Description**: This parameter stores the current "reading" of the vehicle odometer, in "base units" (see previous parameter). Normally this value is programmed upon installation (synchronization with vehicle odometer) and then maintained by the unit itself.

***NOTES**:*

- This parameter does not require reset to be implemented.
- Upon 'Ignition OFF' ('Stop Event time filter' elapsed), the unit will update the PL ('GPS odometer's current value') with the odometer value reported OTA (same as the value serially found in 'Master Unit Status Request'), regardless of the 'GPS odometer's current value' in PL.
- Having the 'GPS odometer's current value' serially programmed requires Power recycle in order to take effect.
- OTA update of 'GPS odometer's current value' will take effect immediately.
- Upon new FW boot due to any type of FW upgrade (serial, OTA, 'Cellocator+' etc.), the unit will take the odometer value stored in PL, which is true for the last 'Stop Report'.

  This note is more relevant for those users, upgrading while vehicle is traveling (after FW upgrade, odometer skip back to the last 'Stop Report' value can be observed).

**Data format**: The parameter is a 32-bit integer

**Value span**: 00000000h to FFFFFFFFh

**Default value**: 00000000h

### 6.3.3 Enable IMEI Transmission via Type 0 Message

**Address:** 1347 bit 4

**Description**: Enabling IMEI transmission will transmit the modem's IMEI (up to 15 digits decimal number or 50 bits) on each outbound type 0 message. Type 0 bytes 33-38 and byte 41 bits 5 and 6 will carry the IMEI number as explained in the wireless communication protocol under section 2.2.3.4, IMEA transmission. This feature was first introduced as CR200 feature.

**Default:** Disable (0)

### 6.3.4 Enable GPS Navigation Start-Stop updates

**Address**: 99, bit 0 for plain event

102, bit 0 for distress

**Description:** If this bit is set (1) the unit will generate an event/distress upon every GPS reading validity status change.

**Default:** Both Disable (0)

### 6.3.5 GPS Navigation Start/Stop filter

**Address**: 500

**Description**: This parameter defines number of invalid GPS packets, required for declaring a "GPS Navigation End"; it is also defines number of valid GPS packets required to declare "GPS Navigation Start".

Note that the GPS validity is automatically declared as "invalid" upon wake up or after reset.

**Data format**: The parameter is an 8-bits integer

**Value span**: 0-255 (value of zero cancels the filter)

**Default value**: 0x0A (10 seconds)

### 6.3.6 Enable Tight GPS PMODE Filter

**Address**: 509, bit 7

**Description:** If this flag is enabled, the unit will consider GPS data as valid only when PMODE1=3 (in GPS Data, refer to the Cellocator Wireless protocol) or 4 and PMODE2=2. Otherwise any of the following values of PMODE1:2,3,4,5 or 6 will be accepted as a valid fix.

Values:

| | |
|---|---|
| 0 | Requires 2≤PMODE1≤6 values to deem position as "Correct". |

| | |
|---|---|
| 1 | Requires PMODE1 equal to 3-4 values and PMODE2=2 to deem position as "Correct". |

**First acquisition:**

In order to speed up the GPS acquisition:

1. Upon initial boot (power up, excluding AHR) the GPS validity test will start according to "Normal GPS PMODE Filter", irrespective of the setting in this parameter AND w/o DOP validation.

   This simplified validation routine will work until the first acquisition compatible with "Tide GPS PMODE Filter" setting AND with DOP setting.

2. Upon achieving acquisition compatible with "Tide GPS PMODE Filter" the unit will start behaving according to the setting in this parameter AND with DOP setting as usual.

**Data format:** The parameter is a flags bitmap, "1" - Enable, "0" – Disable

**Value span**: any 8-bit value, four upper bits are currently a don't-care bits

**Default value**: 1

### 6.3.7 GPS DOP Threshold

**Address**: 1625

**Description:** Dilution of Precision (DOP) is a measure of how the geometry of the satellites affects the current solution's accuracy. This message provides a method to restrict use of GPS solutions when the DOP is too high.

This is actually an additional GPS solution validation tool: the GPS packets with an HDOP higher than the value in this parameter are marked as invalid.

**Data format:** unsigned 8 bits integer

**Default value**: 9

### 6.3.8 GPS accepted accuracy threshold

**Address**: 1853

**Description:** Additional filter that can be activated on location fixes. Accuracy below that TH will not considered to be valid fixes.

**Data format:** unsigned 8 bits integer

**Valid Range:** 2-510 meters. 0=Disable (pass everything)

**Resolution:** 2 meters.

**Default value**: 100 meters

### 6.3.9 Velocity Threshold for HIGH SPEED Mode

**Address**: 455

**Description:** The unit can be configured to decrease frequency of Time and Distance events on high speeds automatically. The speed threshold considered as "high speed" is programmed into this parameter.

This parameter is used by Time based alert Period Multiplier for HIGH SPEED mode (Address 92 and 35, bits 4 to 7) and by Distance Event Period Multiplier for HIGH SPEED mode (Address 92 and 35, bits 0 to 3) parameters to define from what speed the number of the events should be decreased.

*Note, that the in order to switch the operational mode of the unit from "Low Speed Mode" to "High Speed Mode" the system speed must raise 3km/h above the programmed speed. Same way, in order to switch the operational mode of the unit from "High Speed Mode" to "Low Speed Mode" the system speed must fall 3km/h below the programmed speed.*

**Data format:** 8-bit unsigned, unit's [cm/sec]

**Default value**: 60 km/h

### 6.3.10 GPS Maintenance Updates

#### 6.3.10.1 Enable GPS Navigation Start-Stop Updates

**Address:** 99, bit 0 for plain event

102, bit 0 for distress

**Description:** If this bit is set (1) the unit will generate an event/distress upon every GPS reading validity status change. (Refer to wireless protocol for GPS signal validity definition)

The validity status changes after 10 consecutive GPS frames with the same validity status, different from the current one.

**Default:** Both Disable (0)

#### 6.3.10.2 Enable Update per GPS Auto Factory Reset Updates

**Address**: 496, bit 1 for plain event

497, bit 1 for distress

**Description:** If enabled, the unit will create an event or/and distress per GPS Factory reset. Obviously the GPS Factory reset has to be enabled. See below description of GPS Factory reset.

**Default value**: Both 0 (Disable)

#### 6.3.10.3 Enable GPS Disconnection Updates

**Address**: 496, bit 0 for plain event

497, bit 0 for distress

**Description:** If enabled, the unit will generate an event or/and distress of GPS Disconnection upon detection of 10 sequential missing packets from GPS.

The first received packet from GPS will cause the unit to generate GPS connection alert.

**Default value**: Both 0 (Disable)

### *6.3.11 GPS Odometer Management*

#### 6.3.11.1 Enable Speed x Time Calculation (SxT)

**Address**: 509, bit 0

**Description:** As a default, the unit queries the GPS every second. If that flag is enabled, the unit multiplies the speed at a specific location by 1 second, the result being the distance traveled during this second.

Speed (m/s) x 1 sec = elapsed distance (m)

Whenever the unit does not receive new GPS data for time, defined in Max Time between GPS readings for SxT calculation it will not use the regular calculating algorithm. Instead, it will ignore the time during which no reception was available and will restart calculating the elapsed distance immediately when satellite reception reappears.

If both Pythagoras and SxT calculation are enabled, the unit will use SxT when there is a valid GPS fix and Pythagoras when there is no GPS coverage.

**Default:** 1 - Enable

#### 6.3.11.2 Enable Pythagoras Calculation

**Address**: 509, bit 1

**Description:** If this flag is enabled the unit will calculate the distance between 2 consistent GPS queries according to the Pythagoras theorem:

$$\text{Distance} = \sqrt{(\Delta Altitude)^2 + (\Delta Longtitude)^2 + (\Delta Latitude)^2}$$

If both Pythagoras and SxT calculation are enabled, the unit will use SxT when there is a valid GPS fix and Pythagoras when there is no GPS coverage (from last GPS fix to the next GPS fix).

**Default:** 1 - Enable

#### 6.3.11.3 Reset Last Known Location on Ignition Off

**Address**: 509, bit 2

**Description:** Relevant for Pythagoras and combined Pythagoras + SxT calculation. If that flag is set (logical '1') the unit will dismiss the last detected location per detection of Ignition off. For future calculation will be used the first GPS fix obtained after Ignition On.

In other words the unit will ignore the distance, passed by the vehicle during Ignition Off mode. The feature is useful in case when the vehicle is being towed from one place to another.

Note that in this case the vehicle will also ignore the distance, passed from Ignition On to first GPS fix obtained.

**Default:** 0 - Disable

#### 6.3.11.4 Max Time between GPS Readings for SxT Calculation

**Address**: 84

**Description**: This parameter stores the maximal time between two valid readings from GPS (in seconds) to be qualified for SxT odometer accumulation.

When you make a configuration take into a consideration the following rule:

where:

*max speed in km/h* – maximum speed that the vehicle get during the normal usage. Recommended 160km/h.

*max time apart* is a value programmed in this parameter.

*base unit* is "Base unit (measurement factor of GPS odometer)", address 80-83.

**Data format**: The parameter is an 8-bit integer.

**Value span**: 1 to 255

**Default value**: 7

### *6.3.12 GPS Reset Settings*

#### 6.3.12.1 Enable GPS Auto Factory Reset

**Address**: 497, bit 7

**Description:** If this bit is set, the unit will trigger a Factory Reset of the GPS in the following cases:

- The GPS communicates, but service fields MODE1 and MODE2 are equal to 0 and 16 respectively for 10 minutes**.**
- The GPS is communicating, but the data is considered as "not navigating" and the service fields MODE1 and MODE2 are not equal to 0 and 16 respectively for 15 minutes. In this case the unit is resetting GPS using On/Off line. If the condition is true for another 15 minutes – the unit will send factory reset command to GPS (effectively the factory reset is sent once in 30 minutes).

**Default value:** 0

### 6.3.12.2 GPS Reset Upon Ignition Off

**Address**: 6, bit 2 when GPS is navigating

6, bit 3 when GPS is NOT navigating

**Description:** As with any ARM based module, the GPS has to be reset from time to time. If one of hibernation modes is used, the GPS is reset upon entrance to hibernation.

But if the hibernation in not used the safest way to reset the GPS periodically is upon Ignition change to Off state. There is an advantage of doing such a maintenance reset when the GPS is navigating, because such a worm reset enables the shortest recovery time. It is also possible to do it only when the GPS is not navigating anyway, but in this case (for example on underground parking) the recovery might be longer.

**Default values:** bit 2 – 0 (disabled), bit 3 – 1 (enabled GPS reset upon ignition off when the GPS is not navigating)

### 6.3.12.3 GPS AHR (Auto Hardware Reset) – except in CelloTrack Nano

When the unit identifies 3 consecutive GPS communication errors, the unit will attempt to Auto Hardware Reset (AHR) its GPS up to programmable number of retries (according to Maximum Number of AHR parameter used also for Modem AHR, 5 by default).

The unit will create a dedicated event per each GPS AHR – TR 200, STR 2 (if enabled by Enable AHR Reporting parameter).

# 6.4 Inputs & Outputs

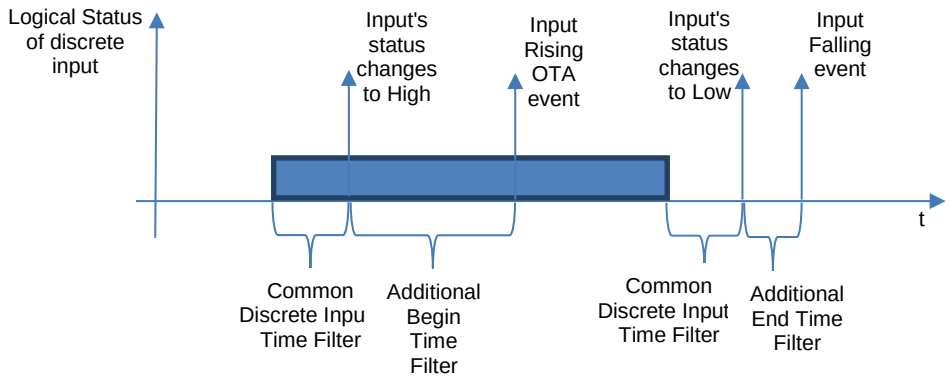
## *6.4.1 Discrete Inputs Triggering Time Filters*

These two bytes defines the input's Additional Time Filters. The Additional Time Filter will extend the input's filtering capabilities separately for logical Rising and logical Falling.

The total filter is constructed from Common Discrete Inputs Time Filter (same for all inputs and all states) and dedicated filter for each state change (Rising/Falling) of each input.

It is possible to define asymmetric triggering delays for logical Rising and logical Falling for each one of system's discrete inputs.

The Additional Time Filter supports multiple resolutions from seconds to hours.




### 6.4.1.1 Common Discrete Inputs Time Filter

**Address:** 136

**Description:** This parameter is aimed to protect unit's discrete input from noise influence and defines time, from input's level change to change detection.

**Data format:** 8-bit unsigned, Resolution 10 msec.

**Value span:** 0x00 to 0xFF

**Default value:** d10

### 6.4.1.2 Additional Begin Time Filter Resolution

**Address:** bits 6 and 7

Door /

CelloTrack T, GP1 1357

Shock /

| | |
|---|---|
| CelloTrack T, GP2 | 1359 |
| Distress | 1361 |
| Unlock | 1363 |
| Lock | 1365 |
| Ignition | 1367 |

**Description:** This parameter defines resolution of the additional time filter applied in addition to Common Filter before discrete input rising alert is generated.

| Value | Resolution | Maximum possible value of the filter |
|---|---|---|
| 0 | 1 sec | 63 sec |
| 1 | 30 sec | 31.5 min |
| 2 | 5 min | 5.25 hours |
| 3 | 1 hour | 63 hours |

**Default value**: 0 – resolution of 1 second

### 6.4.1.3 Additional Begin Time Filter value

**Address:** bits 0-5

| | |
|---|---|
| Door / | |
| CelloTrack T, GP1 | 1357 |
| Shock / | |
| CelloTrack T, GP2 | 1359 |
| Distress | 1361 |
| Unlock | 1363 |
| Lock | 1365 |
| Ignition | 1367 |

**Description:** This parameter stores a value of the additional time filter applied in addition to Common Filter before discrete input rising alert is generated. The resolution of the value is configured in previous parameter (1 second to 1 hour).

**Default value**: 0 – additional filter disabled

### 6.4.1.4 Additional End Time Filter Resolution

**Address:** bits 6 and 7

| | |
|---|---|
| Door / CelloTrack T, GP1 | 1358 |
| Shock / CelloTrack T, GP2 | 1360 |
| Distress | 1362 |
| Unlock | 1364 |
| Lock | 1366 |
| Ignition | 1368 |

**Description:** This parameter defines resolution of the additional time filter applied in addition to Common Filter after discrete input rising alert is generated.

| Value | Resolution | Maximum possible value of the filter |
|---|---|---|
| 0 | 1 sec | 63 sec |
| 1 | 30 sec | 31.5 min |
| 2 | 5 min | 5.25 hours |
| 3 | 1 hour | 63 hours |

**Default value**: 0 – resolution of 1 second

### 6.4.1.5 Additional End Time Filter value

**Address:** bits 0-5

| | |
|---|---|
| Door / CelloTrack T, GP1 | 1358 |
| Shock / CelloTrack T, GP2 | 1360 |
| Distress | 1362 |
| Unlock | 1364 |
| Lock | 1366 |
| Ignition | 1368 |

**Description:** This parameter stores a value of the additional time filter applied in addition to Common Filter after discrete input rising alert is generated. The resolution of the value is configured in previous parameter (1 second to 1 hour).

**Default value**: 0 – additional filter disabled

### 6.4.2 Analog Measurement Averaging Time

**Address:** 466

**Name in Programmer:** Power Sources Measurement Time filter

**Description:** This parameter is aimed to protect analog measurement from noise influence and defines averaging time. The reported value will be therefore an average voltage for the period defined in this parameter. (The sampling rate is every 10msec).

**Data format:** 8-bit unsigned, resolution 0.1 second

**Value span:** 0-25.5 seconds

**Default value:** 1 second

### 6.4.3 Enable Monitoring Logical Status of Ignition in OTA Packets

**Address:** 1349, bit 0

Description: If this bit is enabled (1) the ignition bit in all any outbound messages (OTA and serial) will reflect logical status of Ignition (i.e. after the Ignition Filter)

**Default value**: 0 - Disable Logical

### 6.4.4 Outputs Pulse Width Period

**Address:** 140

**Description:** This parameter defines the activation duration time for pulse outputs (for example some system feedbacks like Driver Authorization and others).

**Data format:** 8-bit unsigned, resolution is 100 mSec

**Default value:** 0.5 second

### 6.4.5 LED Management

**Address:** 7, bit 4

**Description:** This flag enables LED monitoring, which is different in Fleet and Security modifications of Cellocator units.

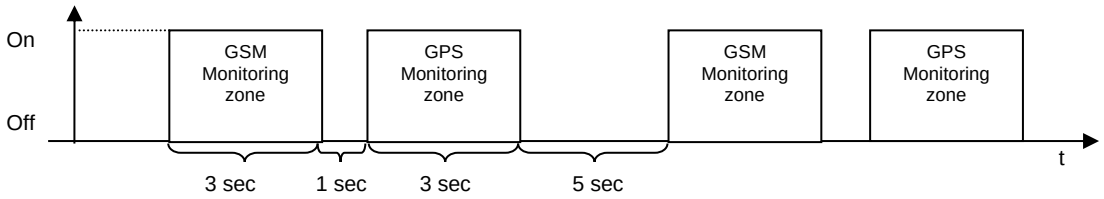
In fleet firmware modifications a sophisticated blinking pattern, monitoring GPS and GSM status is provided, in a Security modification the LED monitors a security state of the system.

In Car Sharing systems this bit also control the Proximity Reader LED

**In Fleet Modification:**

The blinking pattern is constructed from cycles of 2 blinking zones each, which will be repeated by unit continually. The first zone will represent the functionality of GSM, the second zone – GPS.

Each zone will last 3 seconds with 1 second of LED off interval between them.

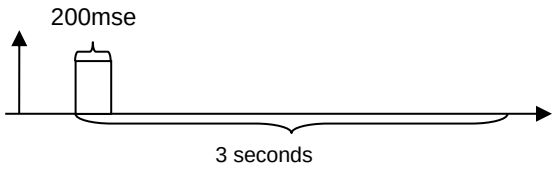
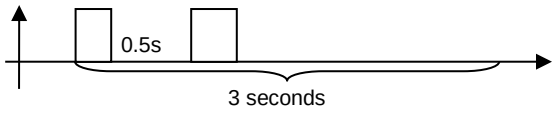
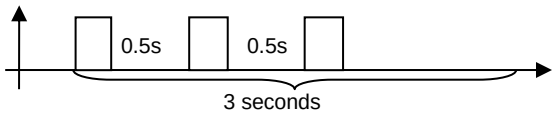
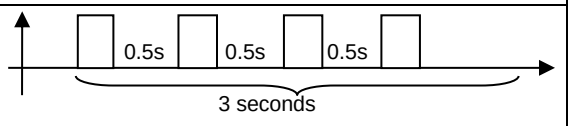


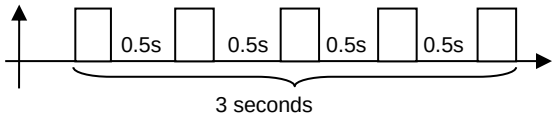

5 seconds LED Off interval will separate between each cycle.

**IMPORTANT: During the voice call, the LED will continually glow from the moment of voice call trigger to the moment of voice call hang up.**

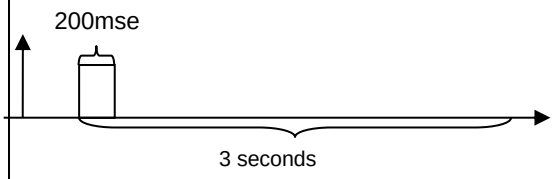
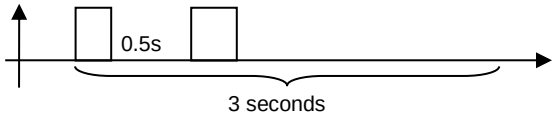
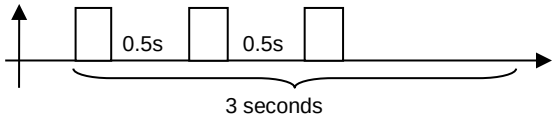
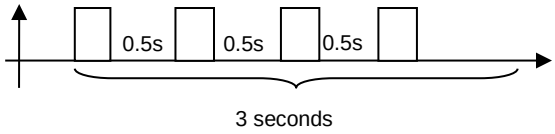
The cycles of two blinking zones will be restored after the end of the voice call.

**GSM Monitoring Zone definition**

| Status | Blinking pattern |
|---|---|
| GSM off | off |
| Not registered to GSM / No SIM |   |
| Registered in Home GSM network<br>(not attached to GPRS) |   |
| Registered in Roaming GSM network<br>(not attached to GPRS) |   |
| Attached to GPRS/home |   |

| | |
|---|---|
| Attached to GPRS/roaming |  |

**GPS Monitoring Zone definition**

| Status | Blinking pattern |
|---|---|
| GPS off | off |
| GPS is unplugged / faulty |  |
| GPS communicating, but not navigating |  |
| GPS is in navigation mode |  |
| GPS is in GYRO mode (only for compatible models) |  |

**Default value:** LED – disabled (1)

## 6.4.6 Analog (& Frequency) Inputs in OTA Message

Note that frequency counters are supported from FW30a.

### 6.4.6.1 Bytes 26-29 of OTA Message 0

| Address: | 1620 | 1621 | 1622 | 1623 |
|---|---|---|---|---|
| Byte of OTA Message 0 | 26 | 27 | 28 | 29 |

**Description**: The OTA protocol provides 4 bytes dedicated for monitoring of analog inputs in few different message types. Those bytes can contain measurement from the different fields as per the configuration below.

Obviously if the selected source of Data is an Analog input, the corresponding input shall be programmed as an analog input in Input's Configuration.

| Pin Number/Field Name | Number to be programmed | Remarks |
|---|---|---|
| None | 0 | |
| Pin 14 / Door | 1 | |
| Pin 15 / Shock | 2 | Default for byte 29 of OTA Message 0 |
| Pin 16 / Panic | 3 | |
| Pin 11/ Unlock | 4 | |
| Pin 5 / Lock | 5 | |
| Battery voltage (V bat) | 6 | Default for byte 27 of OTA Message 0 |
| Battery temperature (NTC), default for byte 3 | 7 | Default for byte 28 of OTA Message 0.<br>Note: In CelloTrack T Power, It is mandatory to select NTC in one of the OTA bytes (26-28) in order to enable the charging function. |
| Regulated voltage | 8 | |

| Pin Number/Field Name | Number to be programmed | Remarks |
|---|---|---|
| Input voltage | 9 | Default for byte 26 of OTA Message 0 |
| CFE In 1 | 10 | |
| CFE In 2 | 11 | |
| CFE In 3 | 12 | |
| CFE In 4 | 13 | |
| CFE In 5 | 14 | |
| CFE In 6 | 15 | |
| First oneWire Temperature Sensor | 16 | Signed value ranging from -55 to 125 *Celsius* |
| Second oneWire Temperature Sensor | 17 | |
| Third oneWire Temperature Sensor | 18 | |
| Forth oneWire Temperature Sensor | 19 | |
| RSSI | 20 | |
| RPM | 21 | Taken from analog frequency input or from CAN (depends on CAN Application Control parameter – address 4102, bit 3). |

## *6.4.7 Restore Output State after Reset and Shipment mode*

### 6.4.7.1 Restore Gradual Stop Output State after Reset and shipment mode

**Address**: 501, bit 0

**Description:** In legacy implementation all outputs states are kept by the unit before SW reset (e.g. upon PL upgrading). If enabled, all outputs states are kept by the unit before SW reset and before Shipment Mode, so an output which was active before the reset/Shipment Mode, will be activated again after the reset/Shipment Mode. If disabled,

the output will not be activated after the reset/Shipment Mode, even if it was active before the reset/Shipment Mode.

**Data Range:** 0 – Enable

1 - Disable

**Default Value:** 0 - Enable

#### 6.4.7.2 Restore Siren Output State after Reset and Shipment mode

**Address**: 501, bit 1

**Description:** In legacy implementation all outputs states are kept by the unit before SW reset (e.g. upon PL upgrading). If enabled, all outputs states are kept by the unit before SW reset and before Shipment Mode, so an output which was active before the reset/Shipment Mode, will be activated again after the reset/Shipment Mode. If disabled, the output will not be activated after the reset/Shipment Mode, even if it was active before the reset/Shipment Mode.

**Data Range:** 0 – Enable

1 - Disable

**Default Value:** 0 - Enable

#### 6.4.7.3 Restore St. Immobilizer Output State after Reset and shipment mode

**Address**: 501, bit 3

**Description:** In legacy implementation all outputs states are kept by the unit before SW reset (e.g. upon PL upgrading). If enabled, all outputs states are kept by the unit before SW reset and before Shipment Mode, so an output which was active before the reset/Shipment Mode, will be activated again after the reset/Shipment Mode. If disabled, the output will not be activated after the reset/Shipment Mode, even if it was active before the reset/Shipment Mode.

This feature will function only if the of parameter of "Activate Immobilizer while there is no active Dallas" (address 1 bit 5) is **Disabled**.

**Data Range:** 0 – Enable

1 - Disable

**Default Value:** 0 - Enable

#### 6.4.7.4 Restore LED Output State after Reset and Shipment mode

**Address**: 501, bit 4

**Description:** In legacy implementation all outputs states are kept by the unit before SW reset (e.g. upon PL upgrading). If enabled, all outputs states are kept by the unit before SW reset and before Shipment Mode, so an output which was active before the reset/Shipment Mode, will be activated again after the reset/Shipment Mode. If disabled, the output will not be activated after the reset/Shipment Mode, even if it was active before the reset/Shipment Mode.

**Data Range:** 0 – Enable

1 - Disable

**Default Value:** 0 - Enable

#### 6.4.7.5 Restore Blinkers Output State after Reset and Shipment mode

**Address**: 501, bit 5

**Description:** In legacy implementation all outputs states are kept by the unit before SW reset (e.g. upon PL upgrading). If enabled, all outputs states are kept by the unit before SW reset and before Shipment Mode, so an output which was active before the reset/Shipment Mode, will be activated again after the reset/Shipment Mode. If disabled, the output will not be activated after the reset/Shipment Mode, even if it was active before the reset/Shipment Mode.

**Data Range:** 0 – Enable

1 - Disable

**Default Value:** 0 – Enable

#### 6.4.7.6 Backup immobilizer state

**Address**: 501, bit 7

**Description:** This parameter enables the unit mechanism of backup all Immobilizer related important variables in NVM.

**Data range:** 0 - Disable, 1 - Enable

**Default value:** 1 - Enable

### *6.4.8 Feedback Outputs*

#### 6.4.8.1 Use Blinkers Feedback

**Address:** 449, bit 4

**Description:** This parameter enables usage of Blinkers output (pin 18) for system and security feedbacks, like Dallas ID reception confirmation beep, Silent Delay expiration notification beeps and so on. It is recommended to use buzzer connected to a feedback output. The Blinker's state will be preserved after SW/HW reset but not after Power Recycle.

**Default value:** 0 – Disable

#### 6.4.8.2 Use Siren Feedback

**Address:** 449, bit 0

**Description:** This parameter enables usage of Siren output (pin 8) for system and security feedbacks, like Dallas ID reception confirmation beep, Silent Delay expiration notification beeps and so on. It is recommended to use buzzer connected to a feedback output.

**Default value:** 0 – Disable

## *6.4.9 Outputs Inversion Mask*

### 6.4.9.1 Invert Blinkers Output

**Address:** 503, bit 3

**Description:** This parameter enables inversion of corresponding output's logic (pin 18). Inverted output will be normally activated and will be turned off per OTA or serial output activation command.

0 - Normal polarity (not activated - disconnected; activated – grounded)
1 - Inverted polarity (not activated - grounded; activated – disconnected)

**Default value:** 0 – Normal polarity

### 6.4.9.2 Invert Gradual Stop (PWM) Output

**Address:** 502, bit 2

**Description:** This parameter enables inversion of corresponding output's logic (pin 17). Inverted output will be normally activated and will be turned off per OTA or serial output activation command.

0 - Normal polarity (not activated - disconnected; activated – grounded)
1 - Inverted polarity (not activated - grounded; activated – disconnected)

**Default value:** 0 – Normal polarity

### 6.4.9.3 Invert Standard Immobilizer Output

**Address:** 503, bit 5

**Description:** This parameter enables inversion of corresponding output's logic (pin 7). Inverted output will be normally activated and will be turned off per OTA or serial output activation command.

0 - Normal polarity (not activated - disconnected; activated – grounded)
1 - Inverted polarity (not activated - grounded; activated – disconnected)

**Default value:** 0 – Normal polarity

#### 6.4.9.4 Invert LED Output

**Address:** 503, bit 0

**Description:** This parameter enables inversion of corresponding output's logic (pin 6). Inverted output will be normally activated and will be turned off per OTA or serial output activation command.

0 - Normal polarity (not activated - disconnected; activated – grounded)
1 - Inverted polarity (not activated - grounded; activated – disconnected)

**Default value:** 0 – Normal polarity

### *6.4.10 Usage Counter Configuration*

#### 6.4.10.1 General Description

This feature is designed for continuous counting of the "Working time" of a device, monitored by one or two unit's inputs. Example of possible usage is – monitoring of an engine's working hours.

The inputs who's "High State" time is counted are selectable by programming.

It is possible to assign each of two timers to a specific input, including the option to assign both timers into the same input. Every input, including ignition, supports "High State" or "usage" time calculation.

The value of the measured time from each input is located in the unit's RAM (protected, not erased on software reset). The unit makes mathematical rounding on partial minutes: (1:29 will be counted as 1 minute and 1:30 and above as 2 minutes).

Once a day the values of both Usage Counters are backed up to the especial address in non-volatile memory. The timer keeps time counting (from the value stored in RAM) each time when the logical level of the appropriate input changes from low to high.

The time counting stops each time the logical level of the input changes from high to low.

Dedicated Read/Write commands over RS232 and OTA are provided for Usage Counters, including a periodical Usage Counters update OTA packet.

#### 6.4.10.2 Enable Usage Counters

**Address**: 7, bit 2

**Description**: In order to start Usage Counters time counting this bit shall be enabled (set to 1).

Status of this parameter can be changed without reset.

**Default**: 0 - Disable

#### 6.4.10.3 Wake up from Hibernation upon Periodical Usage Counter Update Timer Expiration

**Address:** 1, bit 7

**Description**: This bit enables waking up the unit from full hibernation for periodic Usage Counter update.

**Default**: 0 - Disable

#### 6.4.10.4 1st Usage Counter Input

**Address**: 1330

**Description**: The byte contains number of the input, utilized by the first Usage Counter. The unit will use this parameter to backup the value of the 1st Usage Counter from RAM once a day.

Input's numbers definition:

| Input's name | Input's number |
|---|---|
| Door | 0 |
| Shock/Unlock2 | 1 |
| Ignition | 5 |
| Panic | 6 |
| Unlock | 7 |
| Lock | 10 |

In order to set the use of only one Usage Counter input, select inexistent input for the second counter (for example 4).

**Default**: 0

#### 6.4.10.5 2nd Usage Counter Input

**Address:** 1331

**Description**: The byte contains number of the input, utilized by a second Usage Counter. The unit will use this parameter to backup the value of the 2nd Usage Counter from RAM once a day. In order to set use only one Usage Counter input – select inexistent input number in this parameter (for example 4).

**Default**: 0

#### 6.4.10.6 Reporting Interval of Usage Counters

**Address**: 1332

**Description**: This parameter defines Usage Counters reporting period. Setting this value by standard programming access is not recommended, as it will require reset to be implemented. Refer to OTA and serial protocol document for a dedicated update command description.

**Data format and resolution**: 1 byte, 1 minute resolution (from 1 minute to 255 minutes). Zero value cancels timers reporting).

**Default**: 0 – Reporting canceled

### *6.4.11 Frequency Metering*

#### 6.4.11.1 General Description

Pulse frequency measurement is supported on pair of Cello inputs (Door and Shock inputs, pins 14 and 15).

The frequency measurement is implemented on the same ports as the analog measurement; obviously only one of those functionalities can be active at a time).

The maximal possible frequency for measurement is 5 kHz, higher frequency causes saturation of the measurement. The high level of measured signal shall be between 3V to 30V.

It is possible to use the measured number of pulses/second as a source for one of the following system parameters:

- Speed (in cm/sec)
- General Purpose pulse frequency measurement

Each of the inputs will be defined as one of the above listed types type and assigned with an appropriate scaling factor.

#### 6.4.11.2 Frequency Input as a Speed Information Source

If the input is defined as a "speed source", the measured frequency value, multiplied by an appropriate scaling factor is threaded by the unit as a value of speed [cm/sec]. This value is replacing a value of speed received from GPS in all the applications: distance calculations, OTA and serial packets, over/idle speeding detection etc.

In such a case the value of speed reported in OTA message type 0 and vector change report message type 9) will be valid even if the GPS is not navigating.

The unit monitors and reports the speed source in (see also the Wireless Protocol):

- The OTA msg type 0: Byte 16, bit 3.
- The OTA msg type 9, Byte 16, bit 3

0 – GPS;

1 – Pulse frequency input.

**NOTE**: Only one input at a time is defined as a "speed source"; otherwise (if two inputs are defined as speed source) the unit will utilize the first one (the smallest Input number out of two) as a speed source and the second one as a GP input source.

If input on pin 14 is selected as GP freq. counter it will be considered as the 1st freq. input, if input on pin 15 is selected as GP freq. counter it will be considered as the 2nd freq. input.

**Upon reset**

The unit will report last known value of speed (calculated before the reset) until the new value of speed will be calculated (up to 5 seconds).

**Upon Power Up / Wake up after upgrade**

The unit will report zero speed until new value of speed will be calculated (up to 5 seconds).

### 6.4.11.3 General Purpose Pulse Frequency Measurement

If the input is defined as a General Purpose pulse frequency measurement, the system is continually measuring frequency on this input (while not in full hibernation) and updating in the following cases:

- Status message type0
- Query from COM port
- Query from OTA channel
- Frequency Threshold violation

### 6.4.11.4 Auto Calibration of Frequency Inputs

Since the manual calibration is impossible to implement in a reality of multiple installations it is required to propose a method, enabling calibration in minimal time and with minimal installer's intervention.

There are two independent processes: calibration of speed and of GP frequency inputs.

The purpose of GP frequency input calibration is to set an optimal resolution for measurement monitoring in 1 byte of OTA protocol.

The purpose of speed pulses input (Vss) calibration is to make an accurate conversion from measured frequency in Hz to vehicle's speed in cm/sec.

#### *6.4.11.4.1 Maximum Possible Scaled Frequency*

**Address** 2368-2369

**Description**: This parameter contains the maximum possible value of scaled frequency, measured on GP Frequency input.

In case of engine speed it will be a maximum possible engine speed in units of rpm (in standard vehicle might be assumed as 7000rpm)

This value is used by the unit during the process of auto-calibration.

**Default**: 7000

## *6.4.12 Modem & SIM*

### 6.4.12.1 Shorten Cellular Registration Timeout

**Address**: 1 bit 1

**Description**: This programmable bit enables/disables a longer GSM registration to (5 minutes). In case of lack of GSM registration after an expiration of this timeout the modem will be reset.

0 –5 minutes GSM registration timeout

1 - 30 seconds timeout

**Default:** 0 - 5 minutes GSM registration timeout

### 6.4.12.2 Enable Modem Power Control by Door, Shock Input

**Address**: by "Door" input: Address1, bit 4

By "Shock" input: Address 465, bit 1

**Description:** If enabled ('1'), the modem will be switched off by "Door" or "Shock" input active state detection; it will be turned back on by input inactive state detection; i.e. it is required two states switch to use this feature (and not just a push button).

**Default**: 0 - Disable

### 6.4.12.3 AHR (Auto Hardware Reset for Modem)

AHR (Auto Hardware Reset) is a process in which the unit performs power recycle to the Modem (i.e. power down to the Modem for at least 500ms) and to the Micro-processor.

The unit will perform AHR upon occurrence of one of the following scenarios:

- Responsive Modem: The Modem responds to AT commands, but No GSM registration in Ignition On mode for programmable time (configurable by "Registration Lack Timeout (for AHR)" parameter, address 515). In that case, the unit will perform AHR. If there is still no GSM registration according to the above conditions, additional AHRs will be performed, up to a programmable number of retries (configurable by "Maximum Number of AHR" parameter, address 504, bits 0-3).
- Non-Responsive Modem: The modem does not respond to AT commands for 5 consecutive queries. In that case, the unit will reset the Modem (SW reset). If there is still no response for the Modem after 4 resets, a power recycle to the Modem only (Pre-AHR) will be performed, after which the unit will wait for 1 second, and open a 30

seconds window in which the queries and resets process will be done again. If there is still no response from the Modem (i.e. the Pre-AHR mechanism didn't work), AHR will be performed. The process will repeat up to a programmable number of retries (configurable by "Maximum Number of AHR" parameter, address 504, bits 0-3).

The unit will create a dedicated event per each AHR (if enabled in Second Configuration Byte).

#### *6.4.12.3.1 Registration Lack Timeout (for AHR)*

**Address:** 515

**Description:** stores the timeout value (in minutes), before AHR trigger if the following conditions are true:

- No GSM coverage
- Ignition On mode

**Data format:** 1 byte, unsigned integer, resolution of minute. Zero value cancels the AHR upon lack of GSM registration.

**Default value:** 30 minutes

#### *6.4.12.3.2 Maximum Number of AHR*

**Address:** 504, bits 0-4

**Description:** The low nibble of this parameter stores the maximal allowed number of AHR retires in one session and the high nibble is currently reserved.

After the last AHR attempt, no more attempts will be made, even if the modem continues to be non-responsive or not registered.

If the AHR mechanism is disabled due to sustained non-responsiveness / non-registration (as explained above), it will only be re-enabled when achieving a full data connection, or reaching the idle modem management loop, if data connection is prohibited.

Zero retry number will cancel AHR process. Please note that setting this parameter to 0 is not recommended.

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|
| Reserved | | | | Maximum number of AHR retries that will be made | | | |

**Data format:** 1 byte = 2 nibbles.

**Default value:** bits 4-7 = 0, bits 0-3 = 5.

#### *6.4.12.3.3 Enable AHR Reporting*

**Address**: 1, bit 3

**Description**: If this bit is enabled the unit will store a plain event with dedicated transmission reason (address 200) upon each performed AHR.

**Default**: 0 (Disable)

#### 6.4.12.4 Modem Homologation Initialization Mode

**Address**: 525, bit 2

**Description**: This control bit changes the modem Codec and encryption initialization to accord with modem homologation requirements.

Normal mode: AT#AUTOATT=1;#CODEC=0 && AT#ENCALG=5,3,

Homologation mode: AT#AUTOATT=0;#CODEC=7 && AT#ENCALG=5,1

**Default**: 0 (Normal mode)

## 6.4.13 Modem Reset Settings

### 6.4.13.1 Modem Reset Period

**Address:** 165-166

**Description:** This parameter defines the time for periodical modem software reset. This period is restarted upon each manual and automatic modem reset as well as upon entering full hibernation.

**Data format:** 2 bytes value, resolution of 1 minutes

**Value span:** 0 to 65535 (* Zero value in P disables periodical Modem Reset)

**Default value:** 1440 (24 hours)

### 6.4.13.2 Periodical Modem Reset Randomization

**Address:** 1352

**Description:** In case of GPRS network failure all the units are reconnecting to CC simultaneously after the problem is rectified and it causes heavy communication load on the CC server.

The Periodical Modem Reset timer is also restarted in all the units at the same time, after concurrent reconnection to GPRS. It causes all the units to repeat simultaneous modem resets and this way keeps creating peaks of load on customer's communication server.

Randomization feature allows the unit to use pseudo random time for Periodical Modem Reset timer.

The timer is restarted each time to a different value, limited by a programmable threshold.

(P – Tr)≤ Modem Reset interval ≤(P+ Tr)

P - Periodical Modem Reset parameter

Tr - Periodical Modem Reset Threshold

**Wrong programming protection**: If P≥Tr the unit will NOT use the low limit of randomization.

**Example**:

P=30minutes (res=1min) and Tr=45minutes (res=15min) =>-15< modem reset <75

In this case the lower limit of randomization will not be used:

P≤ modem reset interval ≤75

**Data format:** Resolution of programmable threshold is 15 minutes, 1 byte

**Default value:** 0 (no randomization)

### 6.4.14 GSM Band & GPRS Auth Type

Setting proper values of network selection and PPP GPRS Connection Authentication type enables accelerating the GSM and GPRS registration process.

On each modem's initialization the unit will check network setting and modify it if the actual setting of the modem differs from the one, programmed in this section.

Same way on each modem's initialization the unit will check the PPP GPRS Connection Authentication type and modify it if the actual Authentication type of the modem differs from programmed in this section.

#### 6.4.14.1 Cellular Network Selection

**Address:** 1444, bits 0-2

**Description:** This parameter enables to allow 3G Modem free switching between networks (2G, 3G), or to fix it to a certain network (for example in cases which fallback from 3G to 2G is not allowed).

**Range:**

| Enum | Description |
|---|---|
| 0 | Automatic |
| 1 | Reserved |
| 2 | 2G Only |
| 3 | 3G Only |
| 4 | 4G Only |

**Default value**: 0 – Automatic

#### 6.4.14.2 PPP GPRS Connection Authentication Selection Mode

**Address**: 1354, bit 6

| | |
|---|---|
| 0 | Factory setting, in case of Telit PAP |
| 1 | Manual Mode, see next parameter |

**Default:** 0

#### 6.4.14.3 PPP GPRS Connection Authentication type

(Only for Manual Authentication type)

**Address**: 1354, bits 0-1

| | |
|---|---|
| 0 | PAP |
| 1 | CHAP |
| 2 | AUTO |
| 3 | Reserved |

**Default:** 0

## 6.4.15 SIM PIN

### 6.4.15.1 Enable Auto SIM PIN Locking

**Address**: 1348, bit 1

**Description**: If this bit is enabled ('1') the unit will auto-lock the SIM card with the PIN code programmed on addresses 1326 – 1329.

**NOTES**:

- Once enabled, the SIM PIN locking is irreversible; there is no way to cancel SIM PIN locking by command.
- The user has to upload the content of the programming after activation of this flag and programming in order to re-synchronize between the configuration file and the actual content of the programming.

**IMPORTANT: Incorrect usage of this feature might cause SIM card blocking!**

Refer to the description in the New SIM PIN section below for further details.

**Default**: 0 (Disable)

### 6.4.15.2 Active SIM PIN

**Addresses**: 197-200

**Name in Programmer**: SIM PIN

**Description**: This parameter stores the PIN code that will be entered to unlock the GSM SIM card when required.

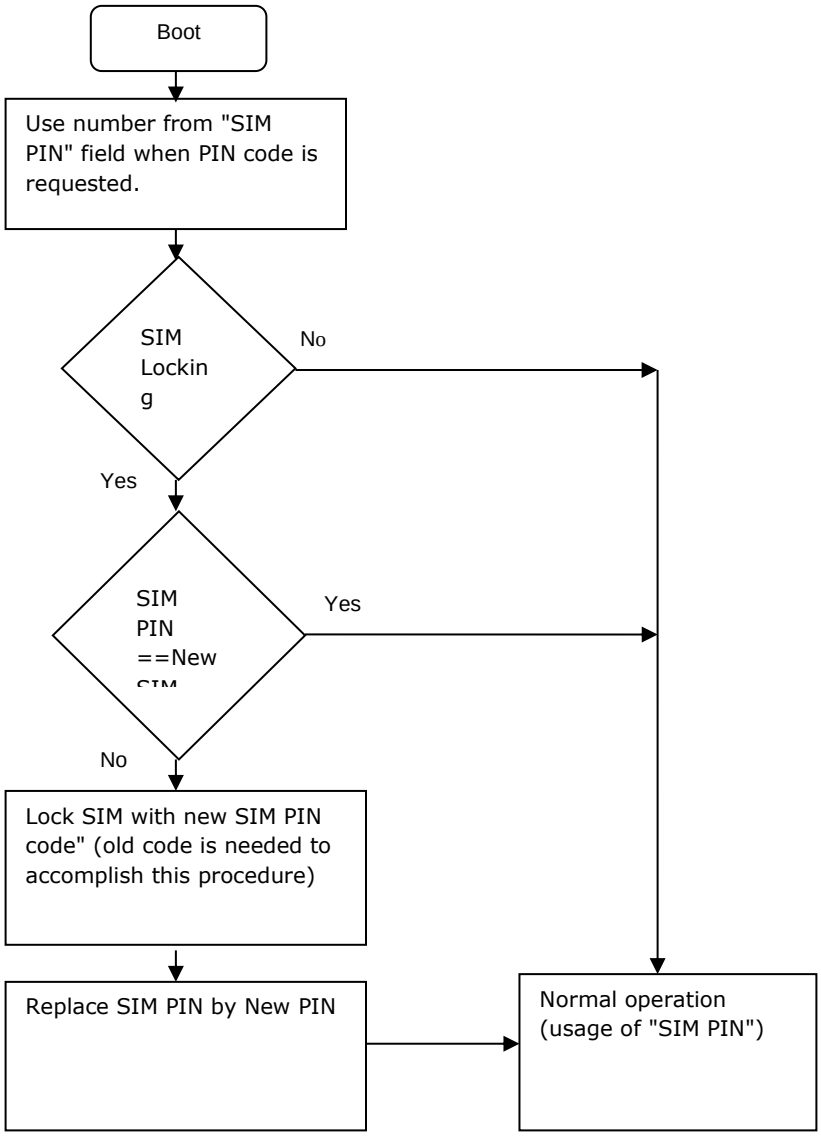
**Data format** (GSM): The bytes contain the digits of the PIN, encoded in BCD. The order of the transmission is bytes with lower address first, lower nibbles first. If only the lower nibble of a byte is used (this is legal only in the last byte – in case this is the last digit of the PIN), the higher nibble should have all of its bits set (the nibble should contain 15 dec). The rest of the bytes that are not used should contain 0xFF.

**Default value:** 1234

### 6.4.15.3 New SIM PIN

**Addresses**: 1326-1329

This parameter stores the new PIN code that should be used for locking the SIM Card during the SIM Lock procedure. This code will replace the Active SIM PIN on address 197-200 upon successful completion of the SIM Lock procedure:




**NOTE**: Since the unit is actively modifying content of its programming cells (replacing the old Pin code by the new one) the configuration file and the actual content of programming will lose synchronization. It is very important to synchronize them by uploading the actual content of the configuration memory from the unit before next configuration cycle.

**WARNING:** Programming the same configuration file twice, without uploading an actual content of programmable cells after the first programming, will cause immediate blocking of the SIM card.

**Data format (GSM)**: The bytes contain the digits of the PIN, encoded in BCD. The order of the transmission is bytes with lower address first, lower nibbles first. If only the lower nibble of a byte is used (this is legal only in the last byte – in case this is the last digit of the PIN), the higher nibble should have all of its bits set (the nibble should contain 15 dec). The rest of the bytes that are not used should contain FFh.

**Default value:** 1234

#### 6.4.15.4 Lock to Certain IMSI

**Address**: 1914

**Description**: If this parameter contains a value of 5 or 6 BCD numbers, the unit will validate an international mobile subscriber identity (MCC + MNC) of its SIM card ~15 seconds after any wake up. If the value of the SIM is different from the value predefined in this parameter – the unit will switch off the modem. If this parameter contains a value smaller than 5 digits the feature is disabled.

## 6.5 Power Management

### *6.5.1 Power Management Mode*

**Address**: 266

**Description**: This parameter defines power consumption of the unit during Ignition Off mode.

Power consumption reduction is achieved as a trade off with availability: as the availability is lower, the power consumption is lower. The main power consumers of the unit are GPS and GSM modules; the unit switches them off periodically during parking.

| Programmed Value | Mode Description | Description | Current Consumption |
|---|---|---|---|
| 0 | No hibernation | Both GSM and GPS modules are fully active during parking, GPRS session active | Average**:** 37.35mA<br>Peak**:** 181.2mA |
| 1 | GPS Peeking | The GSM modem active, GPRS session active.<br>The GPS is peeking as per programming (see below) | (while GPS is off)<br>Average**:** 23.69mA<br>Peak**:** 104.5mA |
| 2 | Full Hibernation | Both GSM and GPS modules are in asynchronous peeking as per programming below.<br>The unit does not respond to RS232 queries as well<br>*Note: In this mode Security Modification will not be able to detect Signal Correlation* | (while both GPS & GSM off)<br>Average**:** 782uA |

**Default value**: 2

### 6.5.2 Enable Automatic Hibernation on Low Power

**Address**: 1, bit 0

**Description**: This option allows the unit to enter the full hibernation (with single daily synchronized GSM-GPS peeking) when main battery of the vehicle considered low. The unit will leave full hibernation mode upon distress or ignition on.

**Default**: 0 - Disable

### 6.5.3 Hibernation Mode Delay

**Address:** 271-272

**Description:** This parameter defines time interval between Stop Event and entering any programmed Hibernation Mode.

Note: a reception of message from server side (except ACK responses) in the delay period will reset the delay (i.e. the unit will count again the configured delay from last message reception before going to hibernation).

**Data format:** 16-bit unsigned integer, 16 seconds resolution

**Value span:** 0x01 (16 seconds) through 0xFFFF (291 hours)

**Default value:** 60', (16 minutes)

### 6.5.4 Enable Pre-Hibernation Update

**Address**: 4, bit 6 for event

4, bit 7 for distress

**Description:** This parameter enables and disables an update, before entering the full hibernation mode.

The update is not generated during GSM or GPS communication peeks, only between the Stop Event and entering the full hibernation; 15 seconds before an expiration of Hibernation Mode Delay timeout (Address 271).

In case of Hibernation Mode Delay timeout = 0, the event will be generated just after the Stop event.

**Default**: Both disable (zeroes)

### 6.5.5 Enable Data Forwarding from Serial Port by SMS (in Hibernation)

**Address:** 4 bit 5

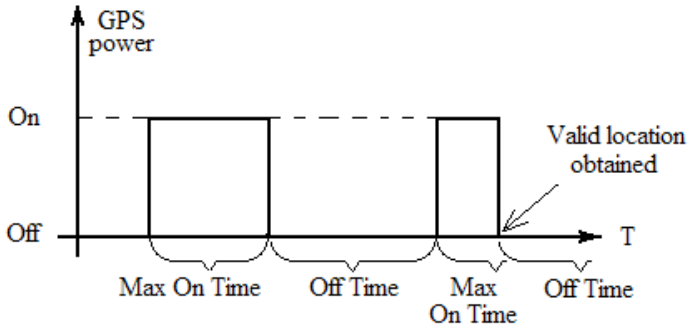
**Description:** If this parameter is disabled, the unit will not try forwarding data from 3rd party device connected to unit's COM port (over CSP or Transparent Data protocols)

through SMS in hibernation. (in case GPRS is not available or disabled, the forwarded data will be accumulated in unit's buffer).

**Default value**: Disabled (1)

## *6.5.6 GPS Peeking*

### 6.5.6.1 GPS Peeking – Max On Time




**Address:** 263

**Description:** GPS peeking is a power management of GPS receiver, which enables to reduce its power consumption.

GPS peeking is activated in Ignition Off mode only, when Power Management mode is defined as 1or 2. Except for CelloTrack family, which is explained in section _d2h_bmk__Ref441484482_22.

This parameter defines the maximum amount of time the GPS is kept turned on while peeking. The GPS will be turned off once a fix is achieved, or if the Max. On Time expires.

**Data format:** 8-bit unsigned integer, 16 seconds resolution

**Value span:** 01h (16 seconds) through 255 (68 minutes); zero value is illegal and shouldn't be used

**Default value:** 5’ (1 minute 20 seconds)

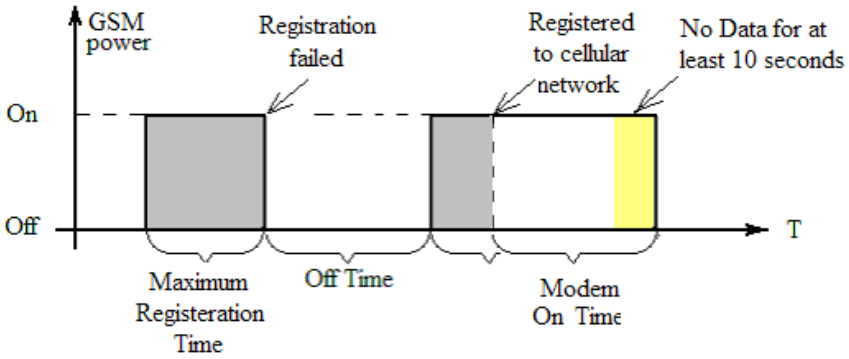
## *6.5.7 GSM Peeking*

### 6.5.7.1 GSM Peeking – Maximum Network Registration Time

**Address**: 270

**Description:** GSM Peeking is a power management of GSM Modem, which allow to reduce its power consumption.

GSM peeking is activated in Ignition Off mode only, when Power management mode is defined as 2.




**Maximum Network Registration Time**: This parameter defines time interval, given to GSM modem for registration into cellular network. If registration wasn't accomplished during that time – the modem is being turned off for Off Time.

Maximum Network Registration Time overlaps with the "stronger" Maximum Modem On Time (defined in address 267). The modem is switched back off when Maximum Modem On Time expires and there is no data transfer for at least 10 seconds (even if Maximum Network Registration Time was configured to a higher value which hasn't expired yet).

**Data format**: 8-bit unsigned integer, 16 seconds resolution

**Value span**: 01h (16 seconds) through 255 (72.8 hours)

**Default value**: 4 (1 minute and 4 seconds)

### 6.5.7.2 GSM Peeking – Modem Off time

**Address:** 268-269

**Description:** This parameter defines the amount of time between GSM peeks. (Refer to the chart in GSM Peeking – Maximum Network Registration Time). During this time the GSM Modem is turned off, to conserve energy).

**Data format:** 16-bit unsigned integer, 16 seconds resolution.

**Value span:** 02h (32 seconds between two consecutive peeks) through FFFFh (~12 days between two consecutive peeks). Values below 32 seconds (<02h) are illegal and shouldn't be used.

**Default value:** 225 (1 hour from the end of one peek to the start of the next one)

### 6.5.7.3 GSM Peeking – Maximum Modem On time

**Address:** 267

**Description:** This parameter defines time the modem is kept turned on after waking up. Note that Maximum Modem On Time overlaps with the "weaker" Maximum Network Registration Time (defined in address 270), i.e. the Modem will be turned Off after Maximum Modem On Time, even if Maximum Network Registration Time was configured to a higher value which hasn't expired yet. If GPRS is enabled, the unit will dial GPRS and connect to the communication server during this time.

**Data format:** 16-bit unsigned integer, 16 seconds resolution

**Value span:** 01h through FFFFh; value of 0 is illegal and shouldn't be used

**Default value:** 4 (1 minute and 4 seconds)

### 6.5.8 Battery Charging

The unit is equipped by a built in Li-Ion/Polymer CCCV charger, applying 0.5C (constant current), charge the battery up to 4.1V, then CV (constant voltage) charge till 4.15V.

The charger will be activated in Ignition On mode (with an exception described below) in temperature range between 0°C and 45C.

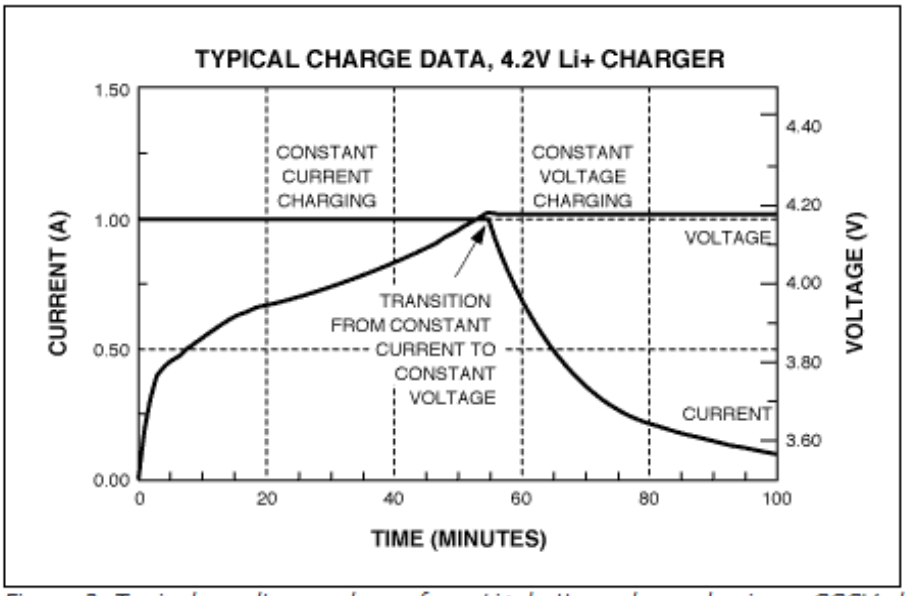



*Figure 2. Typical results are shown for a Li+ battery charged using a CCCV charger.*

The full charge time of the standard 700mAh battery is ~2hours.

#### 6.5.8.1 Maximum Backup Battery Extra Charge Time

**Address**: 138

**Name in Programmer**: Maximum extra charge time

**Description**: This parameter defines the maximum time for extra backup battery charge in Ignition Off mode. The charge process begins upon Stop in case of detection of low level of backup battery (see corresponding programming parameter), and continues for the time defined in this parameter (if the unit does not enter hibernation).

**Data format:** 8-bit unsigned integer, resolution of 10.24 sec

**Value span:** 00h to FFh

**Default value**: 117 (~20 minutes)

#### 6.5.8.2 Charge Irrespective of Operational Mode

**Address**: 1350 bit 0

**Description**: While this bit is set (1) the unit will activate the built in charger if the main power source presents. In this case neither operational mode, not the ignition or movement detection affect start or stop charging; only the logic of the built in charger affects the charge process.

When this bit is disabled (0, legacy mode) the unit activates the charger only during standby engine on mode and for limited time upon switching the ignition off.

**Default value**: 0 - Disabled

## 6.6 Informative Parameters

### *6.6.1 Last Distance Event*

**Address**: 85-88

**Description:** This parameter stores odometer value (in base units) recorded upon last Distance event generation. This parameter is not recommended for user modification, it is managed by the unit for recovery situations.

If upon programming the value programmed in this parameter will be higher than the value of odometer, the unit will overwrite it with the value of odometer.

**Data format**: The parameter is a 32-bit integer

**Value span**: 32bits range

**Default value:** 0

### *6.6.2 Field for Customer Use*

**Address:** 1314 – 1317

**Description**: This field is designed to store customer's proprietary data (like specific EEPROM content identifier).

**Data format:** Customer defined

**Default value:** zeros

# 7 Distance and Speed Events

## 7.1 Distance Events

### 7.1.1 Enable Distance Updates

**Address:** 99 bit 1 for Plain Events

102 bit 1 for Distress Events

**Description**: This parameter enables generation of the Events and/or Distresses upon the passage of a certain distance.

The distance updates are generated with respect to Home or Roam GSM network and the speed of the vehicle. Normally the customer would expect reported distance to be longer in Roam networks (to save on a communication in roaming GSM) and on high speeds, where the rear events can still provide a good picture of the root.

**Default value**: Both zeros (disabled)

### 7.1.2 Trip for a Distance Event

**Address:** 89 – 91 for Home Network

32 – 34 for Roam Network

**Description:** This parameter defines a distance between two consequences Distance updates (events or distresses). The distance is in basic distance units.

**Data format:** The parameter is an unsigned a 24-bit integer

**Default value:** 5

### 7.1.3 Distance Event Multiplier for HIGH SPEED Mode

**Address:** 92, bits 0-3 for Home Network

35, bits 0-3 for Roam Network

**Description:** This parameter defines a multiplying factor of distance update for normal and high speeds. The speed is considered "high" when higher then programmed in Velocity threshold for HIGH SPEED mode on address 455.

For example: if Trip for a Distance event is set to 100 meters, and Distance Event Multiplier for roaming is set to 4, the unit will set distance updates in roaming mode to every 400 meters.

**Default value:** Both 1

## 7.2 Over and Idle Speed

### *7.2.1 Velocity Threshold for Over Speed Start Event*

**Address**: 93

**Description**: This parameter stores velocity threshold used for Over Speeding session start. If velocity of the vehicle is higher than this threshold, for longer than programmed in the Over Speed Duration filter parameter, the unit will consider over-speeding. If corresponding updates are enabled, the unit will generate event or/and distress.

Note that the Overspeed start will be registered on a velocity of ~2km/h higher than programmed. In addition, this threshold is only used when not in "Trailer mode" and not in "Input dependent Over Speed" mode

**Value resolution**: Units in 32 cm/sec

**Default value**: 91 (105km/h)

### *7.2.2 Velocity Threshold for Over Speed End Event*

**Address:** 94

**Description:** This parameter stores velocity threshold used for Over Speeding session end (only if the Over Speeding session is already open). If velocity of the vehicle gets lower than this threshold, for longer than programmed in Over Speed Duration filter parameter (or immediately as per the configuration flag described below), the unit will consider end of over-speeding.

If corresponding updates are enabled, the unit will generate event or/and distress.

Note that this threshold is only used when not in "Trailer mode" and not in "Input dependent Over Speed" mode

**Value resolution**: Units in 32 cm/sec

**Default value**: 87 (100km/h)

### *7.2.3 Filter of Over Speed Duration*

**Address:** 95

**Description:** This parameter stores timeout value, used to consider the speed violation start/stop. It actually defines the over speed duration which will cause a corresponding update (if enabled).

**Value resolution & span**: Duration resolution is 2.5 Seconds. Duration Span from: 0 seconds (0x00h), to 10min 30 sec (0xFEh).

**Default value:** 4 (10 seconds)

### 7.2.4 Do not use Time Filter to Close Over Speed Session

**Address:** 492, bit 4

**Description:** If this bit is set, any open over speed sessions will be closed when the speed of the vehicle will get lower then "Velocity threshold for GPS over Speed End" threshold.

**Default value:** 0 (disabled)

### 7.2.5 Alternative Over Speed Threshold for Input Dependent Mode

**Address:** 2391

**Description**: The unit supports automatic change of over-speed thresholds while certain input is triggered.

This is useful to change over-speed threshold while raining (in this case the input will be connected to the wipers wire) or at night (in this case the input will be connected to the vehicle lights).

Function 12 is available in a list of options available for "Function assigned" byte in input's configuration. When it is selected for any input (except ignition), and this input is triggered, the unit will automatically use speed threshold programmed on address 2391 as both Over-speed start and Over-speed end thresholds.

**NOTES:**

- Over-speed threshold may change only while over-speed session is NOT active.
- If the input changes its state while the over-speed session is active – the unit will keep using over-speed thresholds selected upon over-speed session start.
- If both the "Trailer mode" and "Input dependent Over Speed" modes are active concurrently the unit will select the lowest speed threshold out of two.

**Specific Transmission Reason byte of Over-Speed alert**

Upon detection of over-speed violation the unit is sensing event or/and distress with transmission reason 34(start)/42 (stop). The "Specific Transmission Reason" byte of those messages will contain value "1" if the unit is utilizing alternative Over-speed thresholds while generating them.

This parameter contains an alternative value of Over-speed threshold, used when an input, programmed as "Over-speed threshold control" is triggered.

The same value is used for both Over-speed start and Over-speed end thresholds.

The over-speed time filter (programmed on address 95) shall expire prior to alert generation irrespectively to the selected speed thresholds.

**Resolution:** 32 cm/sec

**Default value**: 70km/h

### 7.2.6 Velocity Threshold for Idle Speed Start Event

**Address:** 97

**Description:** This parameter stores velocity threshold used for Idle Speeding session start (Idle Speeding refers to when the vehicle is parking with a working engine). If velocity of the vehicle gets lower than this threshold, for longer than programmed in Idle Speed Duration filter parameter (from ignition on or from higher speed), the unit will consider Idle Speeding start.

If corresponding updates are enabled, the unit will generate event or/and distress.

**Value resolution:** Units in 32 cm/sec

**Default value:** 14 (16 km/h)

### 7.2.7 Velocity Threshold for Idle End Event

**Address**: 96

**Description:** This parameter stores velocity threshold used for Idle Speeding end (only if the Idle Speeding session is already open). If velocity of the vehicle gets higher than this threshold, for longer than programmed in Over Speed Duration filter parameter (or immediately as per the configuration flag described below), the unit will consider end of idle-speeding.

If corresponding updates are enabled, the unit will generate event or/and distress.

**Value resolution**: Units in 32 cm/sec

**Default value**: 16 (19 km/h)

### 7.2.8 Filter of Idle Speed Duration

**Address**: 98

**Description**: Timeout value, used to consider the idle speed violation start /end.

**Value resolution & span**: Duration resolution is 2.5 seconds.

**Duration Span from**: 0 seconds (0x00), to 10 min 50 sec (0xFE)

**Default value**: 4 (10 seconds)

### 7.2.9 Multiplier for Idle Speed Start Detection Time Filter

**Address**: 492, bits 0-3

**Description**: This parameter contains a value of multiplier, used to increase dramatically Idle Speed Start detection time.

| | | | | |
|---|---|---|---|---|
| Time for generation Idle Speed Start | = | Idle Speed Duration Filter | * | (Multiplier +1) |

Value of 0 disables multiplier.

**Default**: zero

### 7.2.10 Do not use Time Filter to Close Idle Speed Session

**Address:** 492, bit 5

**Description:** If this bit is set, any open idle speed sessions will be closed when the speed of the vehicle will get higher than "Velocity threshold for GPS Idle Speed End" for longer than 10 seconds.

**Default value:** 0 (disabled)

### 7.2.11 Start Idle Speed Timer with Ignition On

**Address:** 492, bit 6

**Description:** When this bit is set, the unit will start counting time to Idle Speed Start from the Ignition On detection. Otherwise (if this bit is zero) the timer activated from the first time the speed is getting lower than *Velocity threshold for GPS Idle Speed Start*

**Default value:** 0 (disabled)

### 7.2.12 Create Idle/Over Speed End Update for an Open Session per Ignition Off

**Address:** 492, bit 7

**Description:** When this bit is set, the unit will close opened Idle/Over Speed sessions upon ignition off and generate an appropriate updates.

Otherwise (this bit is zero) the unit will not generate an appropriate updates and simply close any open speed session upon Ignition off.

**Default value:** 0 (disabled)

### 7.2.13 Events and Distress Control

#### 7.2.13.1 Enable Distress for Idle Speed Start/End

**Address:** 102, bit 3

**Description**: If this bit is set the unit will generate distress session upon every Idle Speed start /end.

**Default value:** 0 (disabled)

#### 7.2.13.2 Enable Events for Idle Speed Start/End

**Address:** 99, bit 3

**Description**: If this bit is set the unit will generate an event upon every Idle Speed start /end.

**Default value:** 0 (disabled)

#### 7.2.13.3 Enable Events for Over Speed Start/End

**Address:** 99, bit 2

**Description**: If this bit is set the unit will generate an event upon every Over Speed start /end.

**Default value:** 0 (disabled)

#### 7.2.13.4 Enter Distress for Over Speed Start/End

**Address:** 102, bit 2

**Description**: If this bit is set the unit will generate distress session upon every Over Speed start /end.

**Default value:** 0 (disabled)

## 7.3 Sudden Course Changed and Sudden Speed Change Sensors

**Sudden Course Change** and **Sudden Speed Change** sensors are derived from the GPS output; they analyze the delta speed and course between GPS fixes.

The speed and course thresholds are provided separately for each of 4 ranges of speed.

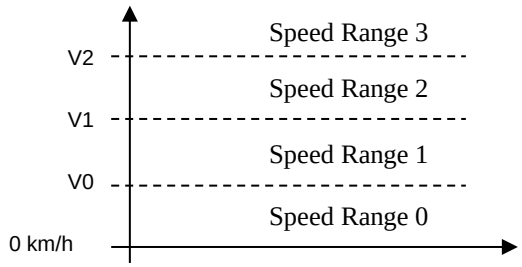
### *7.3.1 Speed Thresholds V0, V1 and V2*

**Address**: V0-473

V1-474

V2-475

**Description:** The 4 speed ranges are defined by 3 speed thresholds: V0, V1 and V2




The speed ranges threshold (V0, V1, V2) must meet the condition: V0<V1<V2

**Data format**: 8 bits parameters with resolution of 16 cm/sec

### 7.3.2 Delta Speed and Delta Course for Speed Range X

**Description:** The sensors will trigger if the delta speed or/and course between two adjacent valid fixes (the unit is getting an updated GPS data fix every 1 second) exceeds a predefined speed or/and course thresholds for the specific speed range (if the current or last fix is invalid, the sensors won't trigger).

The following table contains address of speed and course thresholds for each speed range:

| Speed Range | Harsh Braking Threshold<br>8 bits parameters with resolution of 16 cm/sec | Acceleration Threshold<br>8 bits parameters with resolution of 16 cm/sec | Course Delta Threshold<br>8 bits parameters with resolution of 0.016 rad |
|---|---|---|---|
| Speed Range 0 | 476 | 511 | 480 |
| Speed Range 1 | 477 | 512 | 481 |
| Speed Range 2 | 478 | 513 | 482 |
| Speed Range 3 | 479 | 514 | 483 |

Zero value in any of the parameters above will cancel the corresponding sensor for the specific speed range.

**Default Values:**

| Address (Dec) | Value (Dec) | Value |
|---|---|---|
| 473 | 34 | 19.6 km/h |
| 474 | 104 | 60 km/h |
| 475 | 173 | 99.6 km/h |
| 476 | 17 | 9.8 km/h |

| Address (Dec) | Value (Dec) | Value |
|---|---|---|
| 477 | 17 | 9.8 km/h |
| 478 | 17 | 9.8 km/h |
| 479 | 17 | 9.8 km/h |
| 480 | 49 | 45° |
| 481 | 49 | 45° |
| 482 | 49 | 45° |
| 483 | 49 | 45° |
| 511 | 17 | 9.8 km/h |
| 512 | 17 | 9.8 km/h |
| 513 | 17 | 9.8 km/h |
| 514 | 17 | 9.8 km/h |

Note: Sudden Course Change events will be masked when the speed is under 5 km/h.

## *7.3.3 Events, Distress and HRLS Updates Control*

### 7.3.3.1 Sudden Speed Change (Acceleration and Harsh Braking)

**Address**: 99, bit 4 for Events
102, bit 4 for Distress
103, bit 4 for HRLS

**Description:** If this bit is set, the unit will generate a corresponding update for any detected harsh acceleration and harsh braking.

**Default Values:** zeros (disabled)

### 7.3.3.2 Sudden Course Change

**Address**: 99, bit 5 for Events
102, bit 5 for Distress
103, bit 5 for HRLS

**Description:** If this bit is set, the unit will generate a corresponding update for any detected harsh course change. Note: sudden course change events which occurred when the speed is under 5 km/h will be filtered.

**Default Values:** zeros (disabled)

### 7.3.4 Speed Limiting Geo-Fence

Speed limiting Geo-Fence enables the fleet manager to define speed limits within geo-Fence boundaries. Each Geo-Fence entry in the configuration memory can define 1 of 4 possible speed thresholds. The Speed limiting Geo-Fence feature is enabled by setting the field TOE (Type of Entry) in the Geo-Fence entry to 6. The unit can handle up to 4 over lapping speed zones sessions concurrently.

Speed violations are reported via a dedicated type 0 message whenever the speed within the Geo-Fence exceeds the configured speed threshold. End of speed violation session will be reported when one of the following events occurs:

1. After violation start the speed fails lower then zone's specific threshold according to programmed over speed rules (after expiration of over-speed end time filter).
2. The unit leaves Geo-Zone boundaries.
3. Specific zone timeout expired (while inside zone boundaries).

Speed limiting decisions will be taken (both for start and for end of over speed) based on legacy time filter of over speed (at address 95).

### 7.3.5 Speed Limiting Geo-Fence Enable

Speed Limiting Geo-Fence is enabled by setting the value of TOE (Type Of Entry) filed to 6. Please see TOE - Type Of Entry

### 7.3.6 Speed Limiting Geo-Fence Threshold Select

Each Geo-Fence entry has 2 bits filed called "Speed Limiting Threshold Select". The filed can select one of 1 of 4 possible threshold values. The 4 Geo-Fence Speed Limiting thresholds are defined in

| MSB for 100 geo-fences (CR300 only) | Speed Limiting Threshold Select (Bits 31,30) | | Address of Speed Limit parameter in Configuration memory |
|---|---|---|---|
| Addresses 2023-2035 (2035 bits 4-7 are unused) | Bit 31 | Bit 30 | |
| 0 | 0 | 0 | 1917 |
| 0 | 0 | 1 | 1918 |
| 0 | 1 | 0 | 1919 |
| 0 | 1 | 1 | 1920 |
| 1 | 0 | 0 | 250 |

| | | | |
|---|---|---|---|
| 1 | 0 | 1 | 251 |
| 1 | 1 | 0 | 252 |
| 1 | 1 | 1 | 253 |

### 7.3.7 Speed Limiting Geo-Fence Threshold

**Address**: 1917, 1918, 1919, 1920

**Description**: These 4 parameters define the Geo-Fence speed limiting thresholds. The speed limiting threshold is defined in units of Km/h.
**Default**: 20, 30, 40, 50

### 7.3.8 Speed Limiting Geo-Fence Threshold #5-#8

**Address**: 250, 251, 252, 253

**Description**: These 4 parameters define the Geo-Fence speed limiting thresholds. The speed limiting threshold is defined in units of Km/h. To be enable to use it, the parameter of "Enable speed limiting extension" (Address 527 bit 0) should be enabled.

**Default**: 90, 100, 110, 120

### 7.3.9 Enable speed limiting extension

**Address:** 527, bit 0

**Description:** This parameter enables the feature of extended speed limiting zone, with additional 4 speed limits, short warning at the entrance to the speed limited geo-zone, and a long, continuous warning if exceeding the limit inside the zone.

**Default value:** 0 - Feature Disabled

### 7.3.10 Speed Limiting Geo-Fence Alerts Enable

Generation of Speed limiting zone shall be enabled as follows:

**Address**: 1004, bit 5 Event

1005, bit 5 Distress

**Description**: If this bit is enabled the unit will generate an alerts upon violation of selected speed limit of the active Speed limiting zone. Speed session started within the premises of a geozone will be terminated when the speed goes below the speed threshold (inside the premises of the GeoFence) or when the vehicle goes out of the GeoFence.

Speed Limiting violation Start event: Type 0, TR212, STR=geo fence index.

Speed Limiting violation End event: Type 0. TR213, STR=geo fence index.

**Default**: 0 – both disable

### *7.3.11 Speed Limiting Geo-Fence Output Activations*

The same output activations properties used for "Driver Behavior over speeding" will be used for Speed Limiting Geo-Fence. The "OverSpeed" feedback bit must be set in Feedback for driver behavior violations bitmask to enable Speed Limiting Geo-Fence outputs.

Please refer to:

Output, auto-activated upon continuous driver behavior violation detection

Output activation pattern (upon Continuous driver behavior violation)

**NOTE**: When "Speed Limiting Zone" is selected in the GeoFence configuration the Fence generic output activation will be automatically disabled.

# 8 Time and Trip Events

## 8.1 Start and Stop Alerts

### *8.1.1 Start Alert Generation Time Filter*

**Address**: 104

**Name in Programmer**: Start Event Time Filter

**Description**: This parameter stores time filter, defining a required duration of stable Ignition On state (after ignition state change) for triggering Start (driving session) alert.

The control of alert type (plain event / distress event) is made from Ignition Input Settings folder.

**Value resolution & span**: Duration resolution is 2.56 seconds.

**Default value**: 7.74 sec.

### *8.1.2 Stop Alert Generation Time Filter*

**Address**: 105

**Name in Programmer**: Stop Event Time Filter

**Description**: This parameter stores time filter, defining a required duration of stable Ignition Off state (after ignition state change) for triggering Stop (driving session) alert.

The control of alert type (plain event / distress event) is made from Ignition Input Settings folder.

**Value resolution & span**: Duration resolution is 2.56 seconds

**Default value**: 7.74 sec.

## 8.2 Time-based Alert

This group of parameter controls time period of the updates, generated by the unit periodically between "Start" and "Stop" (when ignition switch is on). “Time alerts” or periodical updates are not generated after "Stop" (when ignition switch is off).

This period is controlled also by the OTA Tracking Command and applied on the fly with no reset.

Time-based alert period might be automatically modified by the unit in real time as a function of the following conditions:

- GSM condition: Home, Roam GSM network or No GSM coverage mode
- Speed: High Speed mode or Normal Speed mode.

There is also a possibility of dynamic Time-based alert period modification as a function of speed, refer to V-Trek feature below.

### 8.2.1 Time Alerts Resolution Definer

**Address:** 106, bit 7 for Home network

499, bit 7 for Roam network

**Description:** This bit defines resolution of the Timed Event Period. This resolution can be either 4 (when this bit is 0) or 90 seconds (when this bit is 1).

Resolution of 4 seconds enables setting Time-based alert period up to every ~8.4 minutes, resolution of 90seconds, up to ~3:10 hours

***Note:*** *In case 3 parameters: " Force one second resolution Rome Mode ", "Resolution Definer in Roaming Mode" and "Time Report Period value in Roaming Mode" parameters are zero (value on address 499 and 526 bit 1 are 0), the unit will use Home parameters (programmed on address 106 and 526 bit 0) during Roaming.*

**Default value**: 0 – resolution of time-based alert period is 4 seconds

### 8.2.2 Time Alerts Period Value

**Address:** 106, bits 0-6 for Home network (**TEPH)**

499, bits 0-6 for Roam network (**TEPR)**

**Description:** This parameter stores a Time-based alert Period value with resolution configured in previous parameter (4 or 90 seconds). Value 0 disables the time-based alerts.

***Note:*** *In case 3 parameters: " Force one second resolution Rome Mode ", "Resolution Definer in Roaming Mode" and "Time Report Period value in Roaming Mode" parameters are zero (value on address 499 and 526 bit 1 are 0), the unit will use Home parameters (programmed on address 106 and 526 bit 0) during Roaming.*

**Default value**: 75 (300 seconds when resolution is set to 4 seconds)

### 8.2.3 Force one second resolution Roaming Mode

**Address:** 526, bit 0 for Home GSM network

526, bit 1 for Roam GSM network

**Description:** This parameter forces the resolution of Time-based alert to one second, irrespectively to the values, programmed on addresses 106 and 499.

**Default value**: both 0 (disabled)

### 8.2.4 Time Alert Period Multiplier for High Speed Mode

**Address:** 92, bits 4-7 for Home GSM network

35, bits 4-7 for Roam GSM network

**Description:** This parameter stores the Multiplier of time-based alert Period during High Speed mode. For example if the programmed value is 2, on speed higher then Velocity Threshold for High Speed mode, the unit will generate two times less time-based alerts in a given period (i.e. if when not in High Speed mode the unit generates a time-based alert every x seconds, in High Speed mode the unit will generate a time-based alert every 2x seconds). Value of zero disables the time-based alerts in High Speed mode.

**Default value:** 1

### 8.2.5 Time Report Period Multiplier for NOIP Mode

**Address**: 485

**Description:** This parameter enables automatic change of time events period during NO IP mode (while GPRS is unavailable):

The basic time event period is multiplied by the factor programmed in this parameter.

Note: value of Zero is legal and considered by the unit as "1".

**Default value**: 1

### 8.2.6 Table of Time-based Alert Period Calculation

| | **Home Network** | | **Roam Network** | |
|---|---|---|---|---|
| | Time-based alerts Resolution Definer= 0 | Time-based alerts Resolution Definer= 1 | Time-based alerts Resolution Definer= 0 | Time-based alerts Resolution Definer= 1 |
| **Low Speed** | **TEPH** * 4 seconds | (**TEPH**) * 90 seconds | **TEPR** * 4 seconds | (**TEPR**) * 90 seconds |
| **High Speed** | HSpeedHm * (**TEPH** * 4 seconds) | HSpeedHm * (**TEPH**)* 90 seconds | HSpeedRm * (**BPVR** * 4 seconds) | HSpeedRm * (**BPVR**)* 90 seconds |

- **TEPH** – Time-based alert Period in home network, bits 0:6 of address 106'
- **TEPR** – Basic period value in roam network, bits 0:6 of address 499 (value of zero will cause the unit to use Home settings during roaming)

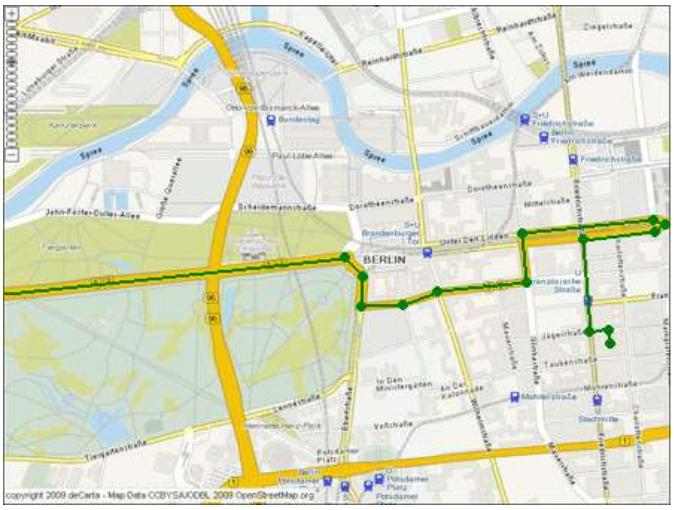
- **HSpeedHm** – Time-based alert period multiplier for high speed mode in Home network, (bits 4:7 of address 92)
- **HSpeedRm** – Time-based alert period multiplier for high speed mode in Roam network, (bits 4:7 of address 35)

## 8.3 Curve Smoothing

The idea behind this feature is to provide a good correlation between the reported locations to the roads on a map without significant increase of communication cost.

Neither time nor distance events enable tracking as a function of road curves (note that it is possible to utilize sudden course change detection for "curve smoothing" with significant traffic increase), and the path on the map doesn't appear accurate enough, as shown below.


Detecting movement vector change dramatically improves the stickiness to the road and readability of the reports, but will also dramatically increase the traffic:



The vector change detection has to be supported by data compression in order to ensure good stickiness to a road curve for a reasonable price.

The vector change detection occurrence may be reported as a plain/distress events with TR204 (**vector change Report)**, or as a bulk of up to 6 **vector change detection** occurrences, compressed into a single message type 9 , sub-data D (refer to a wireless protocol for more details).

### 8.3.1 Enable Vector Change Detection Events /Distress

**Address:** 1433, bit 0 for Events

1433, bit 1 for Distress

**Description:** If this bit is enabled, upon generation of Start (or the first GPS Nav. Start after Start if there is no valid GPS upon Start) the unit stores reference vector of course.

The unit stores reference GPS stamp value (time, date, latitude, longitude, speed and course) every time it is detecting change of course's vector.

The stored reference course value is compared with the value of course received with every new valid GPS frame. If the received value of course differs from stored one more then the value of **vector change programmable parameter** (5° by default), the unit will log **vector change detection** occurrence (not event in the logged memory yet but in a volatile memory) and replaces reference course value by the new one.

Note that if compressed vector change report is enabled, the value of this parameter will be ignored.

If **compressed vector change report** (next parameter) is disabled the unit will generate a dedicated event/distress type 0 with TR204 (**Vector Change Report**).

**Default:** Both disable

### 8.3.2 Enable Compressed Vector Change Report

**Address:** 1433, bit 2

**Description:** If this bit is enabled, settings of bit's 0 and 1 of this byte (previous parameter) will be ignored. In this case the compressed vector change data will be sent by the unit in the following cases:

- Upon detection of 6th **vector change detection** occurrence. In this case the system will generate a Msg type 9 containing all 6 **vector change detection** occurrences.
- Timeout. If at least one vector change event is stored in unit's memory and no other vector changes were generated by the unit during the pre-programmed period, the system will generate Msg type 9 containing all previous **vector change detection** occurrences.
- Upon Stop. Msg type 9 containing all previous **vector change detection** occurrences (if any) will be generated immediately upon stop report.

- Upon reset command the Msg type 9 containing all previous **vector change detection** occurrences (if any) will be generated.

The Compressed **Vector change Report** Msg type 9 will be logged in the same message stack as plain event type 0, will utilize the same sequence of numerator and acknowledge rules.

The Compressed Vector change Report Msg type 9 will NEVER be generated as real-time or distress event, only as logged event.

Upon power up/reset the unit will record reference course/coordinates upon reception of the first valid GPS packet.

Note: When no significant course changes are detected by the unit (for example when driving long straight roads), the unit will send periodic "Compressed Vector Change Reports" to avoid compressed data overflow.

### 8.3.3 Compressed Vector Change Report Timeout

**Address:** 1434

**Description:** This parameter contains a timeout to generate Msg type 9 containing all logged **vector change detection** occurrences before six occurrences were accumulated.

This parameter will take affect when:

- Compress Vector change Detection is enabled,
- At least one vector change detection logged
- No vector change detection occurrence is logged by the unit during the period defined in this parameter

**Range and resolution:** Unsigned integer 8 bits, resolution of minutes

**Default:** 10 minutes

### 8.3.4 Vector Change Detection Angle

**Address:** 1435

This parameter defines the minimum course change from last logged event, considered as Vector change Detection occurrence. Possible values are 0 to 180°.

**Range and resolution:** 8 bits, unsigned integer, resolution of degrees

**Default:** 5°

# 8.4 Communication Idle Alerts

## 8.4.1 Time between Communication Idle Alerts

**Address:** 70-71

**Name in Programmer:** Time between Comm.Idle Transmissions

**Description:** This parameter defines the maximum time without any communication. If a message is not received within this timeout, an idle communication alert is registered.

It is possible (configuration bit described below) to wake up the unit from the full hibernation in order to try delivering this type of alert in real time.

This algorithm is frequently used as a "Heart Bit" of the unit, the "Keep Alive" messaging.

**Data format:** 16-bit unsigned integer, 1 minute resolution.

**Default value:** 30 (minutes)

## 8.4.2 Event and Distress Controls for Communication Idle Alert

**Address**: 493, bit 0 for plain event

494, bit 0 for distress

**Description:** This bit enables alerting Idling of Communication with period programmed in Time.

**Default value**: Event enabled (1), distress disabled (0)

## 8.4.3 Do not Wake Up from Hibernation upon Comm. Idle Distress

**Address**: 494, bit 7

**Description:** If this bit is set (1), the unit will not generate a distress Communication Idle alert in full hibernation, and therefore will not wake up from full hibernation upon expiration of Time between Communication Idle Alerts timeout.

**Default value:** 0 - wake up from full hibernation to alert Comm. Idle

## 8.4.4 Enable Comm.Idle Log Event/Distress during modem off

**Address**: 493, bit 6 for plain event

**Description:** If that bit is set (1), the unit will store an event of Communication Idle according to timer "Time Between Idle Transmissions" even in Modem Off mode. Affects only if the Event of Idle Transmission is enabled.

0 - Do not generate during modem off

1 - Generate during modem off

**Default:** 0 - Do not generate during modem off .

**Address**: 494, bit 6 for Distress

**Description:** If that bit is set (1), the unit will create an emergency idle transmissions during Modem OFF.

0 - Do not generate during modem off

1 - Generate during modem off

**Default:** 0 - Do not generate during modem off

## 8.5 Driver Authentication

There are a few possible usages for the Dallas (iButton™) key in the Cellocator unit:

- As driver ID for fleet management application: In this case the driver can use any Dallas key to identify himself; the Driver to Dallas association is performed on the server side.
- As driver ID for fleet management application with pre-programmed list of "known drivers" (30 drivers maximum): In this case only the Dallas code from the list will release an immobilization of the vehicle and will cause successful driver identification alert to the server.
- As vehicle owner identification for car-alarm application (security units only): In this case the driver might identify himself with pre-programmed Dallas in order to release the security unit from Alarm Armed state, while only 30 codes can be pre-programmed.
- As a Trailer ID (can work together with Driver ID over the same 1-Wire bus).

The driver authentication in fleet management application enables monitoring working hours of each driver and tracking driver's activity.

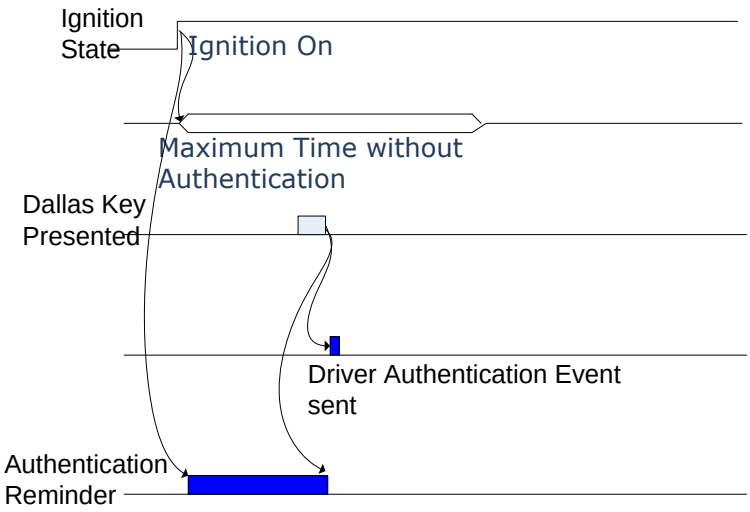
The driver supposes to identify himself with his unique Dallas key before (or immediately with) switching ignition on. From this moment to the end of the journey all the location messages generated by Cellocator unit will include code of this Dallas.

The unit will erase this code from its memory shortly after switching Ignition to off.

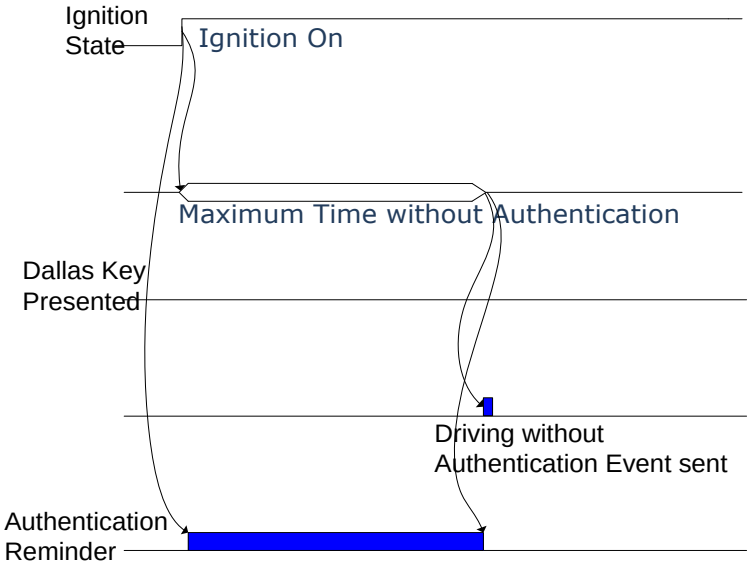
There are two alerts dedicated to the Driver Authentication features:  New Dallas Code Received and Driving without authentication. There is also a dedicated alert for Trailer connection status change.

Note: The ignition event initiating the authentication processes could be selected to start from physical ignition signal or from the filtered ignition signal based on configurable parameter: “Ignition filter source for starting Driver Authentication time calculations” (address 0, bit 4).

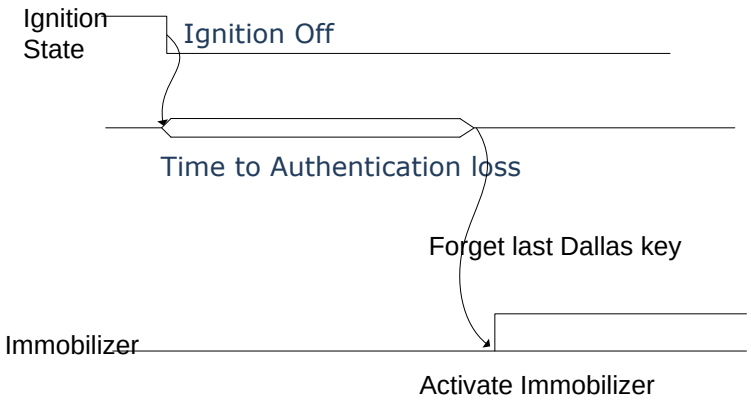
The following diagrams describe typical authentication scenarios:




*Scenario 1: Driver authenticated*




*Scenario 2: Driver not Authenticated*




*Scenario 3: Erase Dallas key after Ignition Off*

### 8.5.1 Enable Driving Without Authentication Alert

**Address**: 123, bit 0 for event

484, bit 0 for distress

**Description**: If this bit is enabled, the unit will generate an alert of "Driving without Authentication" in case a Dallas key was not detected before an expiration of Maximum Time without Authentication timeout.

**Default value:** Event enabled (1), Distress disabled (0)

### 8.5.2 Enable Authentication Updated Alert

**Address**: 123, bit 1 for event

484, bit 1 for distress

**Description**: If this bit is enabled, the unit will generate an "Authentication updated" alert upon new Dallas key detection (this update can be limited to pre-programmed Dallas keys only, see the parameter below).

**Default value:** Event enabled (1), Distress disabled (0)

### 8.5.3 Maximum Time without Authentication

**Address**: 111

**Description:** This parameter stores the value of maximum allowed time between Start Event and transmission of message with transmission reason "Driving without authentication", in case the Dallas key was not detected.

If any Dallas key detected during the time period defined in this parameter, the unit will send a message with new Dallas code and transmission reason "Driver Authenticated" (it

is also possible to deliver Driver ID Updated report only in case the iButton code fit one of the programmed values).

**Value resolution:** 30 seconds

**Span:** 0 -255 (=0-127.5 minutes)

**Default value:** 2 (=1 minute)

### 8.5.4 Enable Authentication Reminder Feedback Output Activation

**Address**: 123, bit 4

**Description:** If "Enable Authentication Reminder Output Activation" bit is enabled (see below) – the unit will activate feedback output/s from Ignition On detection (after filter defined by the "Ignition Filter Source for Starting Driver Authentication Time Calculations" parameter) until one of the tree conditions below will come true:

- Timeout defined by "Maximum Time without Authentication" parameter will expire
- Any (or pre-programmed as per configuration bit below) Dallas code will be received
- Ignition will be switched off

**Default value:** 1 - enable

### 8.5.5 Ignition Filter Source for Starting Driver Authentication Time Calculations

**Address**: 0, bit 4

**Description:** This parameter defines a start point for timeouts for:

- Reminder Feedback Output Activation (Ignition On)
- Time to Authentication loss (Ignition Off, next parameter)
- Timeout to Driving Without Authentication Event (Ignition On)

The 2 options are:

- 0 - Ignition ON/OFF filter + Inputs filter)
- 1 - Inputs filter only

**Default value:** 0

### 8.5.6 Time to Authentication Loss

**Address:** 112

**Description**: This parameter stores a time period, during which the unit will keep a last detected Dallas Code after the Stop Event.

After this period of time the Dallas Code will be erased from unit's memory and in every outgoing transmission from the unit Authentication code will be sent as 0.

If during the time period, defined in this parameter, will be detected Start event – the unit will keep sending last detected Dallas key (until Stop event) in every outgoing message.

If Immobilizer Activation enabled (see next parameter) this timer defines how long after Stop event the Standard Immobilizer output (pin 7) will be activated.

**Resolution:** 0.5 minutes/bit

**Data span:** 0-255 (max value 127.5 minutes)

**Default value**: 1 (30 seconds)

### 8.5.7 Activate Immobilizer while no active Dallas

**Address:** 1, bit 5

**Description**: If this bit is enabled the unit will activate its Standard Immobilizer output (pin 7) from Authentication loss after Stop event (see previous parameter) until the driver authorizes itself using Dallas Key (any Dallas key or known Dallas key, as per the Enable Pre-defined driver ID's list configuration bit).

**NOTES**:

- This flag is only applicable to fleet edition of Cello and will not work in a security variant.
- If this flag is set (enabled), the Standard Immobilizer output (pin 7) will be automatically activated immediately after SW reset or Power Recycle.
- In CR300 devices, the immobilizer output can be switched to one of the available device output pins ("Blinkers", "LEDs") using the configurable option located in address 506. The selected output will maintain the same reset behavior a described in note 2 above.

**Default value**: 0 - disabled

### 8.5.8 Enable Conditional Activation of Immobilizer

**Address** 0, bit 2

**Description:** If this bit is enabled (1), the unit will only perform self activation of Immobilizer output while both conditions listed below are fulfilled:

- An appropriate legacy logical condition is detected (No Driver ID in the memory, Towing detection, reminder etc)
- High signal detected on the ignition input.

Immobilizer output will be switched off immediately after one of the above conditions is not present.

If this bit is disabled (0), immobilizer output is activated independently from the status of an Ignition input.

**NOTE**: This bit is only affecting self activation of the output. Activation by command (OTA or Serial) is still unconditional and independent from the status of an Ignition input.

Only the additional OTA/serial command or detection of Authorized Dallas switches off an output activated by command.

**Default:** Disable (0)

### 8.5.9 Enable Pre-defined Driver ID's List

**Address:** 123, bit 2

**Description**: If this bit is set the unit will compare received Dallas with the pre-programmed list and will act accordingly. In case of reception of unknown code the unit **WILL NOT** do the following:

- Unblock Immobilizer (If Immobilizer Activation enabled)
- Indicate Dallas reception by Feedback beep
- Deactivate "Driver ID reminder feedback" outputs (if Enable Authentication Reminder Output Activation enabled)
- Send "New Driver ID" message
- Record the unknown Dallas code as latest Driver ID

If valid Dallas is not received during the timeout, programmed in "Maximum time without authentication" – the unit will send "Driving without ID" message, as it would do if no Dallas is received at all.

**Default value**: 0 - disabled

### 8.5.10 Enable "Dallas ID Updated" Event even if it is not in the List

**Address**: 123, bit 3

**Description:** If this bit is set the unit will generate a Driver Authentication Update event (TR 46) upon Dallas key detection even if it is not in the pre-programmed list. The foreign (code not in the list) Dallas code is reported in every message type 0, but the unit:

- Will not Unblock Immobilizer
- Will not Indicate Dallas reception by Feedback beep
- Will not Deactivate "Driver ID reminder feedback" outputs

**Default Value:** 0 - disabled

### 8.5.11 iButton Codes (30 Buttons)

**Address:** 429 to 446 (Dallas keys 1-3),
1448 to 1609 (Dallas keys 4-30)

**Description:** This section of the memory contains the identification data for 30 Dallas iButtons.

**Data format:** Each button is assigned with 6 ID bytes. The data of these 6 bytes is printed on the surface of the button, where every pair of hexadecimal digits is equivalent to one byte.

**Valid values:** The data must exactly match the buttons data, or they would not work.

**Default Value:** All zeroes

### 8.5.12 Enable Feedback upon Authentication

**Address**: 123, bit 5

**Description:** If enabled, the unit will activate pulse on the output/s programmed as the System Feedbacks when new Dallas code is detected. The pulse will be activated for a time, defined in an Outputs Pulse Width parameter (address 140).

**Default Value:** Zero (disabled)

### 8.5.13 Enable Resending "Driver Authentication" Alert upon each Detection

**Address**: 123, bit 6

**Description:** If this bit is set the "Driver Authentication Update" event (TR 46) will be generated every time when a Dallas key is attached to the reader (even if it has the same code as last attached Dallas). Removing Dallas key for 1 second at least from the holder will cause the unit to threat the Dallas as removed and the next attachment of the same Dallas will cause new event generation.

**Default Value:** 0- disabled

### 8.5.14 Enable Dallas Bus Mode (1-Wire) Bus

**Address**: 123, bit 7

**Description:** If this bit is cleared the Cello unit will start acting as 1-Wire Bus master managing multiple 1-Wire slaves. If this bit is set the Cello unit will retain its legacy behavior communicating with single slave 1-Wire device.

**Default Value:** 1 - Dallas in Point to point mode (Bus mode disabled)

### 8.5.15 Enable Infinite Driver Notifications when Driver is not Identified

**Address**: 0, bit 1

**Description:** If this bit is set, Driver Authentication Reminder will be generated indefinitely overriding the timeout defined in: "Timeout of Driver Authentication Reminder".

**Default Value:** 0 - Legacy Driver Authentication Alert period

### 8.5.16 Enable Driver ID Card Removed Event

**Address**: 526, bit 4

**Description:** This parameter enables sending Driver ID Card Removed event (TR 46, STR 2), whenever the driver removes the card from the reader, regardless of the ignition signal state.

Note: this feature is available only if "Enable Dallas bus mode" parameter (address 123, bit 7) is set to 1 (Disable)

**Range:** 0 – Disable, 1 - Enable

**Default Value:** 0 – Disable

# 8.6 Extended Driver Authentication

## *8.6.1 Enable Differentiation between Driver and Passenger*

**Address**: 1349, bit 4

**Description:** If this is enabled (0), the unit will change the standard Driver ID management logic (every new code automatically replacing a previous one) by an extended logic of Driver/Passenger management as described below.

**Default:** 1 - Disable

### 8.6.1.1 Driver Identification

The User ID is considered "Driver ID" if received when there is no Dallas code in the RAM (both in Ignition on and Ignition off mode).

Driver ID is treated by the unit similarly to the legacy Dallas ID (unique 48 bit iButton identifier), except for the following:

- Different code received (new iButton attached) while there is a Driver ID in the RAM:
  - In ignition on: will be treated as "Passenger ID" (see below) and will not erase the existing Driver ID from RAM
  - In ignition off : will be ignored
- If received code is identical to the active Driver ID in RAM – it will be ignored
- The last bit of STR (in OTA alert, message type 0) contains status of Group ID recognition ("1" – authenticated, "0" – not authenticated)
- The first bit of STR (in OTA alert, message type 0) contains "0" (indicating "Driver ID")

Note: When "differentiation between the driver and the passenger" is enabled (0), the "Enable "Dallas ID updated" event even if it is not in the list" parameter (address 123, bit 3) will be ignored.

If "differentiation between the driver and the passenger" is not enabled (1), the unit is using the Legacy Driver ID algorithms.

### 8.6.1.2 Passenger Identification

The passenger identification only works when "differentiation between the driver and the passenger" is enabled in the programming.

The User ID is considered "Passenger ID" if:

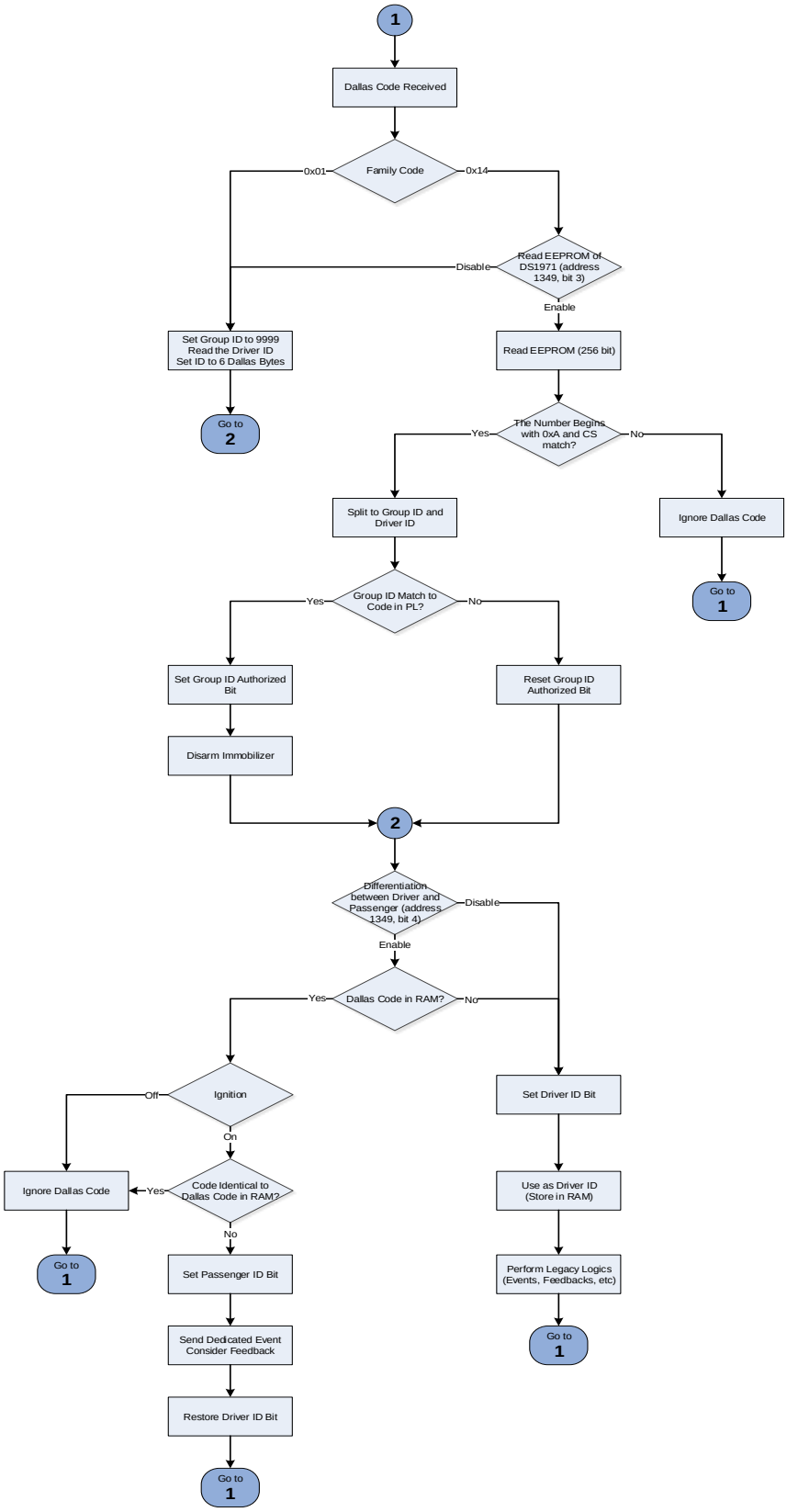
- Received in Ignition On mode
- Received while there is an active Driver ID code in the RAM

Reception of "Passenger ID" causes the unit to generate a "Driver Authentication Update" event (TR46), containing received code in Dallas bytes of Msg type 0, while the STR Specific byte contains:

- The last bit of TR Specific byte shall contains status of Group ID recognition ("1" – recognized, "0" – not recognized), see below.
- The first bit  of TR Specific byte contains "1" (indicating "Passenger ID")

Received "Passenger ID" is NOT replacing active Driver ID in the RAM. Once "Driver Authentication Update" event/distress is generated, the Passenger ID code is "forgotten".

### 8.6.1.3 Driver/Passenger/Group Management Flow Chart



## 8.7 Trailer Connection Monitoring

The purpose of this feature is to enable detection and reporting of connection and disconnection of a trailer to the track.

The trailer is equipped by identification device, connected to a 1-Wire bus port of Cellocator unit. Once the trailer is connected, its identification device is continually transmitting its Dallas ID.

The family of Dallas device used by the trailer is programmed in configuration. If such a device is attached longer than the configurable timeout, the unit is assuming connection of the trailer and vice versa (if disconnected longer than the configurable timeout, the unit is assuming disconnection).

Limitations:

- Only one trailer can be used at a time.
- If two or more devices from the trailer's Dallas family are concurrently and continually attached to the bus, reliable trailer detection is not guaranteed.
- If second device from the trailer's Dallas family is attached while trailer is already detected, this second device will be immediately considered as Driver/Passenger.

Upon trailer connection (expiration of a "Timeout for Trailer Connection status change") the unit will raise Bit 1 of Byte 41 in every outbound OTA msg type 0 to indicate that the Trailer is connected.

Upon trailer disconnection the unit shall reset Bit 1 of Byte 41 in every outbound OTA msg type 0 to indicate that the Trailer is disconnected.

It is possible to query trailer ID by OTA command (Command Code 0x16).

**NOTES**:

- Trailer ID is never reported in other message types except message with TR199 and 31 (Reply to command, if Trailer ID was requested).
- This feature requires the Dallas bus to be enabled Enable Dallas Bus (singleWire)

### *8.7.1 Dallas Family of Trailer Identifier*

**Address:** 2393

**Description:** The following parameter contains Dallas family ID of the Trailer identifier. If the device with selected family ID will be attached to the bus longer than programmed in the "Timeout for Trailer Connection status change" parameter - it will be considered as Trailer.

If the device with selected family ID will be attached to the bus for less than programmed in "Timeout for Trailer Connection status change" parameter - it will be considered as Driver/Passenger, while the corresponding reaction (event/feedback) will be issued upon disconnection from the iButton.

Zero value in this parameter disables Trailer connection detection.

**NOTE**: This feature requires the Dallas bus to be enabled Enable Dallas Bus Mode (singleWire)

**Default value**: 01h (iButton DS1990A)

### 8.7.2 Enable Trailer Connection Event

**Address:** 1349, bit 5

**Description:** If this bit is set (1) the unit will issue a dedicated event when the Dallas ID of the Trailer's family is continually connected (or disconnected) for longer that programmed in the "Timeout for Trailer Connection status event" parameter.

The event will contain transmission reason 199 (Trailer connection status change), and specific transmission reason (STR) 0 for trailer disconnected, 1 for trailer connected.

In both cases:

- Bits 4-5 of byte 10 (OTA Msg type 0) contain value of 0b11 (Trailer ID)
- Bytes 33-38 of OTA Msg type 0 with TR199 contain the ID of Trailer Identification device.

**Default value:** 0 - disabled

### 8.7.3 Trailer Connection Distress

**Address:** 1349, bit 6

**Description:** If this bit is set (1) the unit will issue a dedicated distress when the Dallas ID of the Trailer's family is continually connected (or disconnected) for longer that programmed in the "Timeout for Trailer Connection status event" parameter.

The distress will contain transmission reason 199 (Trailer connection status change), and specific transmission reason (STR) 0 for trailer disconnected, 1 for trailer connected.

In both cases:

- Bits 4-5 of byte 10 (OTA Msg type 0) contain value of 0b11 (Trailer ID)
- Bytes 33-38 of OTA Msg type 0 with TR199 contain the ID of Trailer Identification device.

**Default value:** 0 - disabled

### 8.7.4 Timeout for Trailer Connection Status Change

**Address:** 2392

**Description**: This parameter stores time period (in seconds) of continuous connection (or disconnection) of the Dallas button (of family programmed in "Dallas Family of Trailer Identifier" parameter), used for triggering corresponding event or distress.

**Default value**: 15

### 8.7.5 Trailer Connected: Over Speed Start Velocity threshold

**Address**: 261

**Description:** The unit can apply different velocity thresholds for Over Speed session start and end when trailer is connected.

This parameter stores velocity threshold (in 32 cm/sec/bit) used for Over Speeding session start when trailer is connected.

If over speed session started by violating "Trailer connected" over speeding start threshold, it will be ended by reaching "Trailer connected" over speeding end velocity threshold, even if the trailer disconnected between those two events.

**NOTE:** If both the "Trailer mode" and "Input dependent Over Speed" modes are active concurrently the unit will select the lowest speed threshold out of two.

**Resolution:** 32 cm/sec/bit

**Default value**: 0 cm/sec

### 8.7.6 Trailer Connected: Over Speed End Velocity Threshold

**Address**: 262

**Description:** The unit can apply different velocity thresholds for Over Speed session start and end when trailer is connected.

This parameter stores velocity threshold (in 32 cm/sec/bit) used for Over Speeding session end when trailer is disconnected.

If over speed session started by violating "Trailer connected" over speeding start threshold, it will be ended by reaching "Trailer connected" over speeding end velocity threshold, even if the trailer disconnected between those two events.

**NOTE:** If both the "Trailer mode" and "Input dependent Over Speed" modes are active concurrently the unit will select the lowest speed threshold out of two.

**Resolution:** 32 cm/sec/bit

**Default value**: 0 cm/sec

#### 8.7.6.1 Duration of Output Activation, upon Momentary Driver Behavior Violation Detection

**Addresses:** 523, bits 3-5

524, bits 3-5

**Description:** This field contains the duration of the output activation upon momentary driver behavior violation detection.

Zero - forbidden.

**Resolution:** 0.5 seconds/bit

**Default:** (1) 0.5 seconds

### 8.7.6.2 Number of Output Activation Repetitions upon Momentary Driver Behavior Violation Detection

**Addresses:** 523, bits 6-7

524, bits 6-7

**Description:** This field contains the number of the output activation repetitions (Duty cycle 50%) upon momentary driver behavior violation detection.

Zero - forbidden.

**Default:** (1) Continuous repetition

### 8.7.6.3 Output, Auto-activated upon Continuous Driver Behavior Violation Detection

**Address:** 2377 for first output and 2380 for second output, bits 0-2

**Description**: This pair of parameters defines a numbers of outputs that will be activated upon driver behavior violation.

| Output's name | Output's number |
|---|---|
| Feature Disabled | 0 |
| Siren | 1 |
| Gradual Stop | 2 |
| St. Immobilizer | 3 |
| LED | 4 |
| Blinkers | 5 |
| CFE Out 1 | 6 |
| CFE Out 2 | 7 |

**Value span**: 1to 5

**Default value**: zero

### 8.7.6.4 Output Activation Pattern (upon Continuous Driver Behavior Violation)

**Address:** 2377 for first output and 2380 for second output, bits 3-5

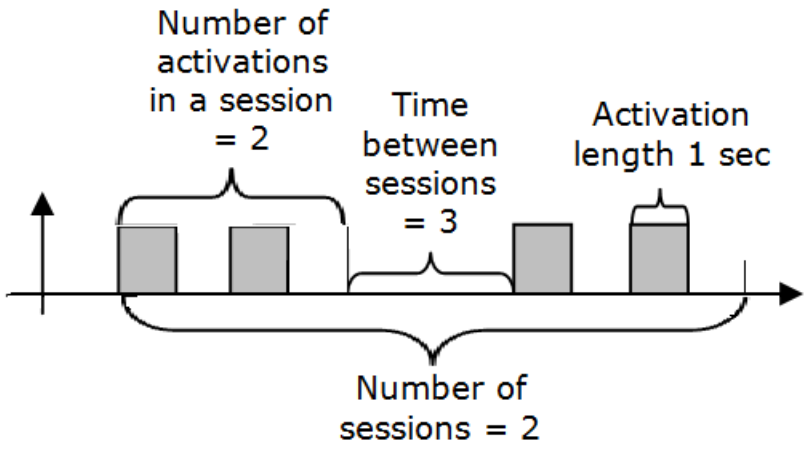
**Description**: This pair of parameters defines a activation pattern of outputs upon detection of Driver behavior violation.

| Setting | Action |
|---|---|
| 0 | Pulse Activation (The output shall be activated for the time, defined in "Pulse Outputs Width Period", addr. 140 dec |
| 1-3 | Reserved |
| 4 | Template Activation (according to the settings described below) |
| 5 | Warning of delayed violation registration<br>(template activation - according to the settings described below)<br>**NOTE**: If user configures at first feedback according to "Warning of delayed violation registration" pattern and at second feedback according to "Template Activation" pattern the unit will function according to "Warning of delayed violation registration" pattern. |
| 6 | Enhanced speed limiting |
| 7 | Reserved |

**Default:** (0) Pulse Activation

**Template of continuous Output Activation upon detection of driver behavior violation**

Example of template: Two activations in a session, 1 second for each activation, 2 sessions, 3 seconds between sessions:




**Warning of delayed violation registration**

This option is only applicable for continuous driver behavior violations: coasting, Over-speed and Excessive RPM.

If this option is selected, upon driver behavior violation detections the unit does the following:

- It does NOT generate an event immediately.
- It activates selected output (after expiration of OverSpeed or Coasting filter) according to a template definition on addresses 2377-2379 (for the first output) and 2380-2382 (for the second output).

The output shall be deactivated when one (of two) conditions come true:

- The end of violation

  OR

- The violation lasts longer than the time defined in Driver behavior- continuous violation feedback Logic: Feedback Violation Deactivation time threshold .

**NOTE:** The event shall only be generated if the violation lasts longer than 10 seconds.

The warnings will be triggered only after the programmable filters of coasting and over-speeding

Outputs will be deactivated immediately when the condition will become not true or after 10 seconds (without the programmable filter).

### 8.7.6.5 Continuous Driver Behavior Violation - Output Activation Template Activation Length

**Address:** 2378 for first output and 2381 for second output, bits 0-3

**Description**: This pair of parameters defines a length of activation of the selected output upon Driver behavior violation detection.

0 for the time, defined in "Pulse Outputs Width Period", addr. 140 dec.

Note that the duty cycle of activation is 50%, i.e. activation time is the same as off time.

**Value resolution**: 0.5 second

**Default value**: 1(0.5 seconds)

### 8.7.6.6 Continuous Driver Behavior Violation - Output Activation Template: Number of Activations in a Session

**Address:** 2378 for first output and 2381 for second output, bits 4-7

**Description**: This pair of parameters defines a number of activations of the selected output upon Driver behavior violation detection.

0 – cancels outputs activation upon driver behavior violation detection.

**Default value**: 3

### 8.7.6.7 Continuous Driver Behavior Violation - Output Activation Template: Number of Activation Sessions

**Address:** 2379 for first output and 2382 for second output, bits 0-3

**Description**: This pair of parameters defines a number of sessions of output activations upon Driver behavior violation detection.

0 – cancels outputs activation upon driver behavior violation detection**.**

**Default value**: 1

### 8.7.6.8 Continuous Driver Behavior Violation - Output Activation Template: Time between the Activation Sessions

**Address:** 2379 for first output and 2382 for second output, bits 4-7

**Description**: This pair of parameters defines a time between activation sessions of output activations upon Driver behavior violation detection.

**Zero value.** If zero is programmed the unit will only perform one session of activation irrespectively to the programmed number of sessions.

**Value resolution**: 0.5 second

**Default value**: 2 (1 second)

# 9 Inputs Events

The Cellocator unit provides 6 inputs; the hardware of all those inputs varies from pulled up, pulled down, wet (not equipped by pull up/down resistor) or adapted for frequency measurement. Each input is equipped by a packet of legacy functions:

- Trigger on the input cause generation of an event with an appropriate transmission reason
- Two inputs allow analog signal measurement
- Same two inputs allow frequency measurement
- Some affect unit's logic (like Ignition and door)

Each input (except ignition) is equipped by a configuration field, enabling to set up its type and other attributes, like threshold, differentiating between logical 0 and logical 1.

| Input | Entry Type |
|---|---|
| Door | Analog / discrete "wet" and "dry" contact, Frequency Counter |
| Shock | Analog / discrete"wet" and "dry" contact, Frequency counter |
| Panic | Discrete only, "dry" contact |
| Unlock | Discrete only, "dry" contact |
| Lock | Discrete only, "dry" contact |

When configured as discrete input ("dry" or "wet") the table below defines the range of voltage threshold for logical zero detection.

| | Wet (no internal pulling resistor) | | | Dry (Internally pulled up) | | |
|---|---|---|---|---|---|---|
| | Min allowed | Defaults | Max allowed | Min allowed | Defaults | Max allowed |
| | Value in Volts (Programmed Value) | | | | | |
| Shock | 0V (0) | 14.7V (125) | 30V (255) | 0.2v (57) | 1V (125) | 1.45v (160) |
| Door | 0V (0) | 14.7V (125) | 30V (255) | 0.2v (57) | 1V (125) | 1.45v (160) |
| Lock[6] | | | | 0.2v (57) | 1.85V (200) | 2.36v (240) |

[6] The provided values are valid for Cello hardware A04 and above. If you own older hardware please contact our technical support for further information concerning the highest possible zero detection value.

| | Wet (no internal pulling resistor) | Dry (Internally pulled up) | | |
|---|---|---|---|---|
| Unlock | N/A | 0.2v (57) | 1.85V (200) | 2.36v (240) |
| Panic | | 0.2v (57) | 1.85V (200) | 2.36v (240) |

The table below provides threshold translation from the programmed value into voltage on interface pin (Measurement error ±20mv).

| Threshold Value at PL file | Corresponding voltage on Door and Shock inputs | | Threshold Value at PL file | Corresponding voltage on Lock/Unlock/Distress |
|---|---|---|---|---|
| 0-56 | 1.00v (in range value protection) | | 0-56 | 1.85v (in range value protection) |
| 57 | 0.20v | | 57 | 0.20v |
| 80 | 0.47v | | 80 | 0.47v |
| 100 | 0.71v | | 100 | 0.69v |
| 125 | 1.00v | | 125 | 1.00v |
| 140 | 1.19v | | 140 | 1.15v |
| 160 | 1.45v | | 160 | 1.39v |
| 161-255 | 1.00v (in range value protection) | | 200 | 1.87v |
| | | | 204 | 1.91v |
| | | | 232 | 2.26v |
| | | | 240 | 2.37v |
| | | | 244-255 | 1.85v (in range value protection) |

## 9.1 4 – Ignition

Ignition input can be used for detection of journey Start and Stop, which are key events in unit logic and require an especial treatment, or as a general purpose input (when journey Start/Stop is detected using an accelerometer).

**Journey Start and Stop:**

The system will enter hibernation mode between Journey Stop and Journey Start, and will start generating periodical events between Journey Start and Journey Stop

In case it is used for detection of journey Start and Stop, except "Common Discrete Inputs Time Filter" applied to every input, the Start/Stop Alert Generation Time Filters are applied as well.

**A general purpose input:**

If ignition input is used as a general purpose it is internally pulled down and can recognize the following signals:

- Low (logical zero) 0V<Vin<3.5V
- High: Vin>9V

Voltages between 3.5V to 9V are undefined.

### *9.1.1 Reporting Journey Start*

**Address**: 126, bit 5 for event

130, bit 5 for distress

488, bit 5 for HRLS

**Description**: if this bit is set the unit will generate a corresponding alert upon Journey Start detection (by ignition or by accelerometer).

**Default Value**: Event enabled (1), Distress and HRLS – disabled (0)

### *9.1.2 Reporting Journey Stop*

**Address**: 124, bit 5 for event

128, bit 5 for distress

486, bit 5 for HRLS

**Description**: if this bit is set the unit will generate a corresponding alert upon Journey Stop detection (by ignition or by accelerometer).

**Default Value**: Event enabled (1), Distress and HRLS – disabled (0)

### *9.1.3 Inverting Journey Start/Stop*

**Address**: 100, bit 5

**Description**:

Once inverted:

The system will report "Journey Start" when low level (by ignition or by accelerometer) is recognized and vice versa.

**Default Value**: (0) not inverted

### 9.1.4 Reporting Signal Falling on Ignition

**Address**: 125, bit 7 for event

129, bit 7 for distress

487, bit 7 for HRLS

**Description**: if this bit is set the unit will generate a corresponding alert upon detection of logical level falling from 1 to 0. In case this input is inverted, it will mean generation of the alert upon disconnection of this input from (-).

Note: This feature will not work when CFE configuration is used.

**Default Value**: zeros – disabled (0)

### 9.1.5 Reporting Signal Rising on Ignition

**Address**: 127, bit 7 for event

131, bit 7 for distress

489, bit 7 for HRLS

**Description**: if this bit is set the unit will generate a corresponding alert upon detection of logical level rising from 0 to 1. In case this input is inverted, it will mean generation of the alert upon connection of this input to (-).

Note: This feature will not work when CFE configuration is used.

**Default Value**: zero – disabled (0)

### 9.1.6 Inverting Ignition Input

**Address**: 101, bit 6

**Description**: Ignition input is internally pulled down and therefore does not require an inversion in most of the cases.

In case it is serving as a GP and logical levels are opposite to physical levels – the input shall be inverted.

**Default Value**: (0) not inverted

## 9.2 5 – Lock

This input is equipped by an internal pull up resistor and therefore can only serve as discrete dry contact.

### 9.2.1 Function Assigned to Lock Input

**Address** 1706, bits 0-4

**Description**: This field enables assignation of certain functionality to a Lock input.

| Function number | Description |
|---|---|
| 0 | Use as a GP input (default) |
| 1-8 | Reserved |
| 9 | Volume Up (refer to Volume Control section in this document) |
| 10 | Volume Down (refer to Volume Control section in this document) |
| 11 | Reserved |
| 12 | Over-speed threshold control<br>If this function is selected, the unit will automatically use speed threshold programmed on address 2391 as both Over-speed start and Over-speed end thresholds while this input is triggered. |
| 13-31 | Reserved |

**Default Value**: zero – GP input

### 9.2.2 Inverting Lock Input

**Address**: 101, bit 2

**Description**: Lock input is pulled up (internally); therefore it does require an inversion when it is required to detect activation by low level (-).

Once inverted: the "low" level of signal (below threshold programmed in parameter below) on this input will be treated as logical "1" (active). The "high" level of signal, as well as floating state, on this input will be treated as logical "0" (not active).

**Default Value**: (1) inverted

### 9.2.3 Threshold for Lock Input

**Address**: 1707

**Description**: This threshold defines the highest voltage on this input, which will still be considered as logical zero. Any voltage above the value programmed in this parameter (as well as open contact) will be considered as logical "one".

The unit is continually sampling voltage on this input and comparing the average measurement (refer to parameter below) with the threshold programmed in this parameter.

**Value span**: 57 (0.2V) to 240 (2.36V). Any measured value below 57 or above 240 causes the unit to convert this value to default (200).

**Default Value**: 200 (1.85V)

### 9.2.4 Averaging Factor for Lock Input

**Address**: 1708

**Description**: The unit is continually sampling voltage on this input every 10 msec. The moving average of sample's number (preprogrammed in this parameter) is compared with the threshold (previous parameter) in order to decide concerning the logical level of the input.

**NOTE:** In the operational modes listed below the unit is ignoring averaging factor and processing each measurement sample separately:

- In Full Hibernation mode, including the Modem / GPS On Time
- In Signal Correlation Mode (applicable in security builds only)

**Default Value**: 10 samples

### 9.2.5 Reporting Signal Falling on Lock

**Address**: 125, bit 2 for event

129, bit 2 for distress

487, bit 2 for HRLS

**Description**: If this bit is set the unit will generate a corresponding alert upon detection of logical level falling from 1 to 0. In case this input is inverted, it will mean generation of the alert upon disconnection of this input from (-).

**Default Value**: zeros – disabled (0)

### 9.2.6 Reporting Signal Rising on Lock

**Address**: 127, bit 2 for event
131, bit 2 for distress
489, bit 2 for HRLS

**Description**: If this bit is set the unit will generate a corresponding alert upon detection of logical level rising from 0 to 1. In case this input is inverted, it will mean generation of the alert upon connection of this input to (-).

**Default Value**: zero – disabled (0)

## 9.3 11- Unlock

This input is equipped by an internal pull up resistor and therefore can only serve as discrete dry contact.

### 9.3.1 Function Assigned to Unlock Input

**Address** 1703, bits 0-4

**Name in Programmer:** Assigned Function

**Description**: This field enables assignation of certain functionality to a Unlock input.

| Function number | Description | Comment |
|---|---|---|
| 0 | Use as a GP input (default) | |
| 1-8 | Reserved | |
| 9 | Volume Up (refer to Volume Control section in this document) | |
| 10 | Volume Down (refer to Volume Control section in this document) | |
| 11 | Reserved | |
| 12 | Over-speed threshold control<br>If this function is selected, the unit will automatically use speed threshold programmed on address 2391 as both Over-speed start and Over-speed end thresholds while this input is triggered. | |
| 13-31 | Reserved | |

**Default Value**: zero – GP input

### 9.3.2 Inverting Unlock Input

**Address**: 100, bit 7

**Description**: Unlock input is pulled up (internally); therefore it does require an inversion when it is required to detect activation by low level (-).

Once inverted: the "low" level of signal (below threshold programmed in parameter above) on this input will be treated as logical "1" (active). The "high" level of signal, as well as "not connected" state, on this input will be treated as logical "0" (not active).

**Default Value**: (1) inverted

### 9.3.3 Threshold for Unlock Input

**Address**: 1704

**Description**: This threshold defines the highest voltage on this input, which will still be considered as logical zero. Any voltage above the value programmed in this parameter (as well as open contact) will be considered as logical "one".

The unit is continually sampling voltage on this input and comparing the average measurement (refer to parameter below) with the threshold programmed in this parameter.

**Value span**: 57 (0.2V) to 240 (2.36V). Any measured value below 57 or above 240 causes the unit to convert this value to default (200).

**Default Value**: 200 (1.85V)

### 9.3.4 Averaging Factor for Unlock Input

**Address**: 1705

**Description**: The unit is continually sampling voltage on this input every 10 msec. The moving average of sample's number (preprogrammed in this parameter) is compared with the threshold (previous parameter) in order to decide concerning the logical level of the input.

**NOTE:** In the operational modes listed below the unit is ignoring averaging factor and processing each measurement sample separately:

- In Full Hibernation mode, including the Modem/GPS On Time
- In Signal Correlation Mode (applicable in security builds only)

**Default Value**: 10 samples

### 9.3.5 Reporting Signal Falling on Unlock

**Address**: 124, bit 7 for event
128, bit 7 for distress
486, bit 7 for HRLS

**Description**: If this bit is set the unit will generate a corresponding alert upon detection of logical level falling from 1 to 0. In case this input is inverted, it will mean generation of the alert upon disconnection of this input from (-).

**Default Value**: zeros – disabled (0)

### 9.3.6 Reporting Signal Rising on Unlock

**Address**: 126, bit 7 for event
130, bit 7 for distress
488, bit 7 for HRLS

**Description**: If this bit is set the unit will generate a corresponding alert upon detection of logical level rising from 0 to 1. In case this input is inverted, it will mean generation of the alert upon connection of this input to (-).

**Default Value**: zero – disabled (0)

## 9.4 14 – Door

### 9.4.1 Door Input Type

**Address** 1674, bits 5-7

**Description**: This input is equipped by pair of internal resistors, which can be programmatically turned into pull up, pull down or canceled at all. Therefore the input can serve as digital or analog input of the types described below as well as a frequency counter

| Input Type number | Description |
|---|---|
| 0 | Discrete Dry Contact (on board pull-up) |
| 1 | Discrete Normal (Wet Input) |
| 2 | Analog Backward Compatible (0-2.5V) |
| 3 | Analog New Range (0-30V) |
| 4 | Frequency meter |

| | |
|---|---|
| 5 | Pulse Counter: Enables Pulse Counting mechanism |
| 6-7 | Reserved |

**Default Value:** zero - Discrete Dry Contact

### 9.4.2 Function Assigned to Door Input

**Address** 1674, bits 0-4

**Description**: This field enables assignation of certain functionality to a Door input.

| Function number | Description | Comment |
|---|---|---|
| 0 | Use as a GP input (default) | |
| 1 | Use as a GP frequency meter (refer to frequency metering section in this document) | Only compatible to Type 4 (Frequency meter) |
| 2 | Use as a Speed source (refer to frequency metering section in this document) | |
| 3 | Use as a Fuel Level source (refer to the note below this table) | |
| 4-8 | Reserved | |
| 9 | Volume Up (refer to Volume Control section in this document) | |
| 10 | Volume Down (refer to Volume Control section in this document) | |
| 11 | Reserved | |
| 12 | Over-speed threshold control<br>If this function is selected, the unit will automatically use speed threshold programmed on address 2391 as both Over-speed start and Over-speed end thresholds while this input is triggered. | |
| 13 | Offline Tracking Upload Events Trigger | |
| 14-31 | Reserved | |

Note: For utilizing this input as fuel level source (or fuel consumption estimation based on the fuel level), a fuel probe need to be connected to the input, this parameter need to be set to "Use as a Fuel Level source" (3), and any CAN configuration for fuel level (or fuel consumption estimation) need to be disabled.

**Default Value:** zero – GP input

### 9.4.3 Scaling Factor for Frequency Report on Door Input

**Address:** 1675-1676

**Name in Programmer:** Scaling Factor Frequency

**Description**: Applicable only if door is selected as input type 4. The scaling factor is intended to be used for conversion of the measured frequency into common unit of speed (cm/sec) in case the measurement is utilized as a speed source or into any other common format, if the input is used as a GP pulse frequency counter.

**NOTE:** This value may be calculated and programmed by the unit automatically during the Auto-Calibration Process. (Refer to the Frequency Metering Section in this document)

| Stored value of Scaling Factor (Sf * 1000) | |
|---|---|
| First Configuration Byte (MSB) | Second configuration byte (LSB) |

In case of Speed Source (Input's type 4, Assigned function 2):

The value utilized as a speed [cm/sec] will be calculated as follows:

$$S = Fs * Sf[^{cm}/_{sec}]$$

S – Momentary value of speed [cm/sec]

Fs – Measured frequency

Sf – scaling factor

(The scaling factor is stored as follows: Sf=stored value/1000).

**NOTE:** In this case the scaling factor is given by the specific vehicle and actually translating number of pulses into a speed (in cm/sec).

**Example:**

When calibrating a vehicle at 40 Km/h (1111cm/sec), the index obtained is 54 (that is, 54 pulses per second). When the measured value is 108 pulses, it means that the vehicle is running at 80 Km/h (2222cm/sec).

In this case the scaling factor will be **Sf=1111 /54=20.576**.

Maximum value of a scaling factor of speed is Sf=65.535.

The stored value of Sf will be 65535.

In case of GP pulse frequency counter (Input's type 4, Assigned function 1):

The scaled value of the measurement will be reported in every position update from the unit in one of the Analog Inputs monitoring bytes, as per the configuration described above in this document.

The scaling factor, similarly to the previous case, is stored as follows:

**Sf=stored value/1000**

**NOTE:** Unlike the previous case the scaling factor here is a variable, adapted by the user to report the measured frequency value with best possible resolution in one byte.

**Example:**

Assuming the GP Pulse Frequency input is used to measure the engine speed (in RPM);

When calibrating a vehicle at 2000 RPM, the measured value is 116 (that is, 116 pulses per second). When the system receives 232 pulses it means that the vehicle is running at 4000 RPM.

If maximum available engine speed is 8kRPM, let's set a resolution of 32RPM/Bit (8000/255) in order to be able to report the measured value in single byte.

In our example we measure 2000/116=17.24 RPM/bit. Using simple proportion lets calculate the scaling factor:

**Sf=17.24/32=0.53875**

(stored value will be 0539)

The value reported in OTA message type 0 will be therefore:

$$\mathbf{Es} = \mathbf{Fs} * \mathbf{Sf}[\mathbf{32RPM/Bit}]$$

Es – reported value of engine speed [32RPM/Bit]

Fs – Measured frequency

Sf– scaling factor

### *9.4.4 Thresholds on Door as a General Purpose Frequency Counter*

**Address:** 1678-1681

**Description:** This parameter defines minimum, maximum or range (as per the configuration byte) thresholds for frequency measurement on Door GP Frequency measurement input. Upon violation of this threshold for longer than the pre-programmed period, the unit will generate an appropriate OTA msg type 0, with dedicated transmission reason (192 dec).

**NOTE:** The threshold is applied on the result after scaling and not on the measured value (Es [RPM] in case of Engine Speed measurement).

Each of the thresholds consumes 2 bytes: 1678-1679 for low threshold, 1680-1681 for high threshold. The threshold is applied on General Purpose Pulse measurement input only.

### 9.4.5 Time Filter for Frequency/Analog Door Input

**Address:** 1682

**Description:** (not applicable for discrete or wet types of input)

This parameter defines the violation time before generating a corresponding alert in 100mseconds resolution

**Default value**: Default value 50 (5 seconds)

### 9.4.6 Door Freq. Input Violation Type

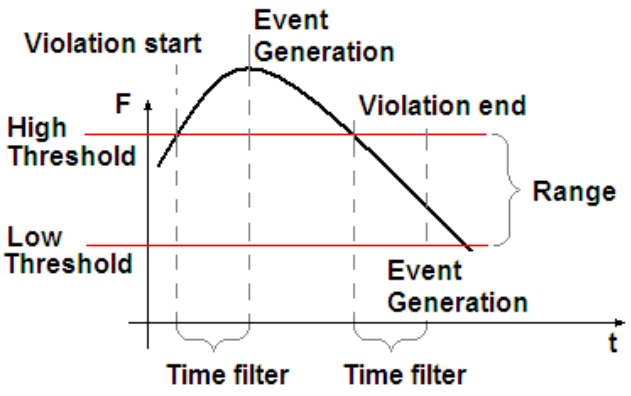
**Address:** 1677, bits 0-1

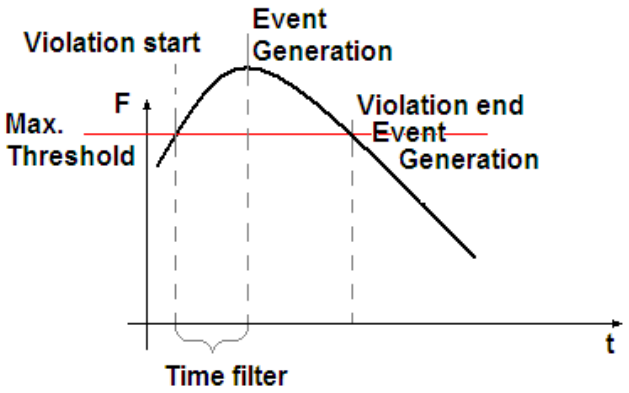
**Description**: This parameter defines violation type as follows:

| | |
|---|---|
| 0 – Threshold | 0 – Low Threshold<br>1 – High Threshold |
| 1 – Range | 0 – Keep In Range<br>1 - Keep Out range |
| Bit 1 | Bit 0 |

Bit 1 defines type of the violation: threshold or range. If threshold type is selected, bits 0 define if the low or high thresholds are processed.

If range type is selected - bit 0 defines if the violating value is inside or outside the range.






## 9.4.7 Threshold for Door Input

**Address**: 1678

**Description**: Applicable only for discreet types (wet and dry)

This threshold defines the highest voltage on this input, which will still be considered as logical zero. Any voltage above the value programmed in this parameter (as well as open contact in case of dry) will be considered as logical "one".

**NOTE:** The type of input affects the voltage value; the same value will mean different voltage for wet and discrete types.

The unit is continually sampling voltage on this input and comparing the average measurement (refer to parameter below) with the threshold programmed in this parameter.

**Value span for wet type**: 0 (0V) to 255 (30V)

**Default Value**: 125 (14.7V)

**Value span for discrete type**: 57 (0.2V) to 160 (1.45V). Any measured value below 57 or above 160 causes the unit to convert this value to default (125).

**Default Value**: 125 (1V)

## 9.4.8 Averaging Factor for Door Input

**Address:** 1686

**Description:** The unit is continually sampling voltage on this input every 10 msec. The moving average of sample's number (preprogrammed in this parameter) is reported to the application and/or compared with the threshold (previous parameter) in order to decide concerning the logical level of the input.

**NOTE:** In Full Hibernation mode the unit is ignoring averaging factor and processing each measurement sample separately

**Default Value:** 10 samples

### 9.4.9 Inverting Door Input

**Address:** 100, bit 0

**Description**: Inversion is only applicable when the input type is configured as one of the discrete types.

When set as dry signal, the input is pulled up (internally); therefore it does require an inversion when it is required to detect activation by low level (-).

Once inverted: the "low" level of signal (below threshold programmed in parameter above) on this input will be treated as logical "1" (active). The "high" level of signal, as well as floating state, on this input will be treated as logical "0" (not active).

When set as wet signal type - no inversion is required.

**Default Value**: (1) inverted

### 9.4.10 Reporting Signal Falling On Door

**Address**: 124, bit 0 for event

128, bit 0 for distress

486, bit 0 for HRLS

**Description**: Only applicable when the input type is configured as one of the discrete types.

If this bit is set the unit will generate a corresponding alert upon detection of logical level falling from 1 to 0. In case this input is inverted, it will mean generation of the alert upon disconnection of this input from (-).

**Default Value:** zeros – disabled (0)

### 9.4.11 Reporting Signal Rising on Door

**Address:** 126, bit 0 for event

130, bit 0 for distress

488, bit 0 for HRLS

**Description:** Only applicable when the input type is configured as one of the discrete types.

If this bit is set the unit will generate a corresponding alert upon detection of logical level rising from 0 to 1. In case this input is inverted, it will mean generation of the alert upon connection of this input to (-).

**Default Value:** zeroes – disabled (0)

### 9.4.12 Function buttons events – Door input

**Address:** 1685

**Description**: Enable/Disable logged event and/or Distress event for each one of the 4 buttons sourced from the Door input.

| Distress for button 4 | Event for button 4 | Distress for button 3 | Event for button 3 | Distress for button 2 | Event for button 2 | Distress for button 1 | Event for button 1 |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Default Value**: zeroes – disabled (0)

## 9.5 15 – Shock

### 9.5.1 Shock Input Type

**Address** 1687, bits 5-7

**Description**: This input is equipped by pair of internal resistors, which can be programmatically turned into pull up, pull down or canceled at all. Therefore the input can serve as digital or analog input of the types described below as well as a frequency counter.

| Input Type number | Description |
|---|---|
| 0 | Discrete Dry Contact (on board pull-up) |
| 1 | Discrete Normal (Wet Input) |
| 2 | Analog Backward Compatible (0-2.5V) |
| 3 | Analog New Range (0 – 30V) |
| 4 | Frequency Meter |
| 5 | Pulse Counter : Enables Pulse Counting mechanism |
| 6-7 | Reserved |

**Default Value**: zero - Discrete Dry Contact

### 9.5.2 Function Assigned to Shock Input

**Address** 1687, bits 0-4

**Description**: This field enables assignation of certain functionality to a Door input.

| Function number | Description | Comment |
|---|---|---|
| 0 | Use as a GP input (default) | |
| 1 | Use as a GP frequency meter (refer to frequency metering section in this document) | Only compatible to Type 4 (Frequency meter) |
| 2 | Use as a Speed source (refer to frequency metering section in this document) | |
| 3 | Use as a Fuel Level source (refer to frequency metering section in this document) | |
| 4-8 | Reserved | |
| 9 | Volume Up (refer to Volume Control section in this document) | |
| 10 | Volume Down (refer to Volume Control section in this document) | |
| 11 | Reserved | |
| 12 | Over-speed threshold control<br>If this function is selected, the unit will automatically use speed threshold programmed on address 2391 as both Over-speed start and Over-speed end thresholds while this input is triggered. | |
| 13 | Offline Tracking Upload Events Trigger | |
| 14-31 | Reserved | |

Note: For utilizing this input as fuel level source (or fuel consumption estimation based on the fuel level), a fuel probe need to be connected to the input, this parameter need to be set to "Use as a Fuel Level source" (3), and any CAN configuration for fuel level (or fuel consumption estimation) need to be disabled.

**Default Value**: zero – GP input

### 9.5.3 Scaling Factor for Frequency Report on Shock Input

**Address**: 1688-1689

**Name in Programmer**: Scaling Factor Frequency

**Description:** Applicable only if shock input is selected as input type 4. The scaling factor is intended to be used for conversion of the measured frequency into common unit of speed (cm/sec) in case the measurement is utilized as a speed source or into any other common format, if the input is used as a GP pulse frequency counter.

| Stored value of Scaling Factor (Sf * 1000) | |
|---|---|
| First Configuration Byte (MSB) | Second configuration byte (LSB) |

**NOTE:** This value may be calculated and programmed by the unit automatically during the Auto-Calibration Process. (Refer to frequency metering section in this document)

In case of Speed Source (Input's type 4, Assigned function 2):

The value utilized as a speed [cm/sec] will be calculated as follows:

$$\mathbf{S = Fs * Sf[^{cm}/_{sec}]}$$

S – Momentary value of speed [cm/sec]

Fs – Measured frequency

Sf – scaling factor

(The scaling factor is stored as follows: Sf=stored value/1000).

**NOTE:** In this case the scaling factor is given by the specific vehicle and actually translating number of pulses into a speed (in cm/sec).

**Example**:

When calibrating a vehicle at 40 Km/h (1111cm/sec), the index obtained is 54 (that is, 54 pulses per second). When the measured value is 108 pulses, it means that the vehicle is running at 80 Km/h (2222cm/sec).

In this case the scaling factor will be Sf=1111 /54=20.576

Maximum value of an scaling factor of speed is Sf=65.535

The stored value of Sf will be 65535

In case of GP pulse frequency counter (Input's type 4, Assigned function 1):

- The scaled value of the measurement will be reported in every position update from the unit in one of the Analog Inputs monitoring bytes, as per the configuration described above in this document.
- The scaling factor, similarly to the previous case, is stored as follows:

  Sf=stored value/1000

**NOTE:** Unlike the previous case the scaling factor here is a variable, adapted by the user to report the measured frequency value with best possible resolution in one byte.

**Example**:

Assuming the GP Pulse Frequency input is used to measure the engine speed (in RPM);

When calibrating a vehicle at 2000 RPM, the measured value is 116 (that is, 116 pulses per second). When the system receives 232 pulses it means that the vehicle is running at 4000 RPM.

If maximum available engine speed is 8kRPM, let's set a resolution of 32RPM/Bit (8000/255) in order to be able to report the measured value in single byte.

In our example we measure 2000/116=17.24 RPM/bit. Using simple proportion lets calculate the scaling factor:

Sf=17.24/32=0.53875

(stored value will be 0539)

The value reported in OTA message type 0 will be therefore:

$$\mathbf{Es} = \mathbf{Fs} * \mathbf{Sf}[\mathbf{32RPM/Bit}]$$

Es – reported value of engine speed [32RPM/Bit]

Fs – Measured frequency

Sf– scaling factor

### 9.5.4 Threshold on Shock as a General Purpose Frequency Counter

**Address**: 1691-1694

**Description**: This parameter defines minimum, maximum or range (as per the configuration byte) thresholds for frequency measurement on Shock GP Frequency measurement input. Upon violation of this threshold for longer than the pre-programmed period, the unit will generate an appropriate OTA msg type 0, with dedicated transmission reason (192 dec).

**NOTE:** The threshold is applied on the result after scaling and not on the measured value (Es [RPM] in case of Engine Speed measurement).

Each of the thresholds consumes 2 bytes: 1691-1692 for low threshold, 1693-1694 for high threshold.

The threshold is applied on General Purpose Pulse measurement input only.

### 9.5.5 Time Filter for Violation of Frequency / Analog Shock Input

**Address**: 1695

**Description:** Applicable only for GP Frequency input or analog input types.

This parameter defines the violation time before generating a corresponding alert in 100mseconds resolution

**Default value**: Default value 50 (5 seconds)

### 9.5.6 Shock Freq. Input Violation Type

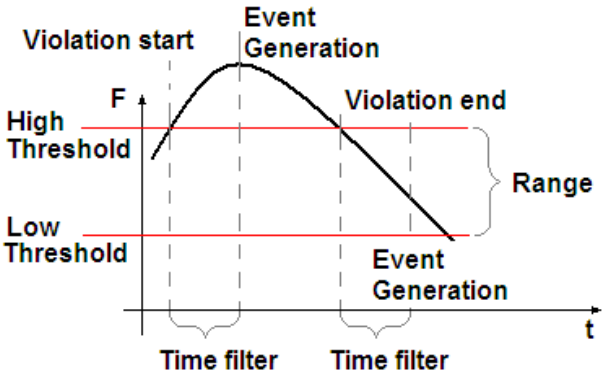
**Address:** 1690, bits 1-0

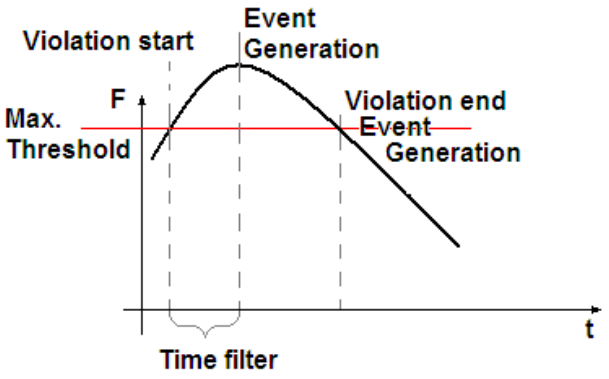
**Description**: This parameter defines violation type as follows:

| | |
|---|---|
| 0 – Threshold | 0 – Low Threshold<br>1 – High Threshold |
| 1 – Range | 0 – Keep In Range<br>1 - Keep Out range |
| Bit 3 | Bit 2 |

Bit 3 defines type of the violation: threshold or range. If threshold type is selected, bits 2 define if the low or high thresholds are processed.

If range type is selected - bit 2 define if the violating value is inside or outside the range.



### 9.5.7 Threshold for Shock Input

**Address**: 1691

**Description**: Applicable only for discreet types (wet and dry)

This threshold defines the highest voltage on this input, which will still be considered as logical zero. Any voltage above the value programmed in this parameter (as well as open contact in case of dry) will be considered as logical "one".

**NOTE:** The type of input affects the voltage value; the same value will mean different voltage for wet and discrete types.

The unit is continually sampling voltage on this input and comparing the average measurement (refer to parameter below) with the threshold programmed in this parameter.

**Value span for wet type**: 0 (0V) to 255 (30V).

**Default Value**: 125 (14.7V)

**Value span for discrete type**: 57 (0.2V) to 160 (1.45V). Any measured value below 57 or above 160 causes the unit to convert this value to default (125).

**Default Value**: 125 (1V)

### 9.5.8 Averaging Factor for Shock Input

**Address**: 1699

**Description**: The unit is continually sampling voltage on this input every 10 msec. The moving average of sample's number (preprogrammed in this parameter) is reported to the application and/or compared with the threshold (previous parameter) in order to decide concerning the logical level of the input.

**NOTE:** In Full Hibernation mode the unit is ignoring averaging factor and processing each measurement sample separately.

**Default Value:** 10 samples

### 9.5.9 Inverting Shock Input

**Address**: 100, bit 1

**Description**: Inversion is only applicable when the input type is configured as one of the discrete types.

When set as dry signal, the input is pulled up (internally); therefore it does require an inversion when it is required to detect activation by low level (-).

Once inverted: the "low" level of signal (below threshold programmed in parameter above) on this input will be treated as logical "1" (active). The "high" level of signal, as well as floating state, on this input will be treated as logical "0" (not active).

When set as wet signal type - no inversion is required.

**Default Value**: (1) inverted

### 9.5.10 Reporting Signal Falling on Shock Input

**Address**: 124, bit 1 for event

128, bit 1 for distress

486, bit 1 for HRLS

**Description**: only applicable when the input type is configured as one of the discrete types.

If this bit is set the unit will generate a corresponding alert upon detection of logical level falling from 1 to 0. In case this input is inverted, it will mean generation of the alert upon disconnection of this input from (-).

**Default Value**: zeros – disabled (0)

### 9.5.11 Reporting Signal Rising on Shock Input

**Address**: 126, bit 1 for event

130, bit 1 for distress

488, bit 1 for HRLS

**Description**: Only applicable when the input type is configured as one of the discrete types.

If this bit is set the unit will generate a corresponding alert upon detection of logical level rising from 0 to 1. In case this input is inverted, it will mean generation of the alert upon connection of this input to (-).

**Default Value**: zeroes – disabled (0)

### 9.5.12 Function buttons events - Shock Input

**Address**: 1698

**Description**: Enable/Disable logged event and/or Distress event for each one of the 4 buttons sourced from the Shock input.

| Distress for button 4 | Event for button 4 | Distress for button 3 | Event for button 3 | Distress for button 2 | Event for button 2 | Distress for button 1 | Event for button 1 |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Default Value**: zeroes – disabled (0)

## 9.6 16 – Panic

This input is equipped by an internal pull up resistor and therefore can only serve as discrete dry contact.

### *9.6.1 Function Assigned to Panic Input*

**Address** 1700, bits 0-6

**Name in Programmer:** Assigned Function

**Description**: This field enables assignation of certain functionality to a Panic input.

| Function number | Description | Comment |
|---|---|---|
| 0 | Use as a GP input (default) | |
| 1-8 | Reserved | |
| 9 | Volume Up (refer to Volume Control section in this document) | |
| 10 | Volume Down (refer to Volume Control section in this document) | |
| 11 | Reserved | |
| 12 | Over-speed threshold control<br>If this function is selected, the unit will automatically use speed threshold programmed on address 2391 as both Over-speed start and Over-speed end thresholds while this input is triggered. | |
| 13-31 | Reserved | |

**Default Value**: zero – GP input

### *9.6.2 Inverting Panic Input*

**Address:** 100, bit 6

**Description:** Panic input is pulled up (internally); therefore it does require an inversion when it is required to detect activation by low level (-).

Once inverted: the "low" level of signal (below threshold programmed in parameter above) on this input will be treated as logical "1" (active). The "high" level of signal, as well as floating state, on this input will be treated as logical "0" (not active).

**Default Value:** (1) inverted

### 9.6.3 Threshold for Panic Input

**Address:** 1701

**Description**: This threshold defines the highest voltage on this input, which will still be considered as logical zero. Any voltage above the value programmed in this parameter (as well as open contact) will be considered as logical "one".

The unit is continually sampling voltage on this input and comparing the average measurement (refer to parameter below) with the threshold programmed in this parameter.

**Value span:** 57 (0.6V) to 240 (2.7V). Any measured value below 57 or above 240 causes the unit to convert this value to default (200).

**Default Value**: 200

### 9.6.4 Averaging Factor for Panic Input

**Address:** 1702

**Description:** The unit is continually sampling voltage on this input every 10 msec. The moving average of sample's number (preprogrammed in this parameter) is compared with the threshold (previous parameter) in order to decide concerning the logical level of the input.

**NOTE:** In the operational modes listed below the unit is ignoring averaging factor and processing each measurement sample separately:

- In Full Hibernation mode, including the Modem / GPS On Time
- In Signal Correlation Mode (applicable in security builds only)

**Default Value:** 10 samples

### 9.6.5 Reporting Signal Falling on Panic

**Address:** 124, bit 6 for event

128, bit 6 for distress

486, bit 6 for HRLS

**Description:** If this bit is set the unit will generate a corresponding alert upon detection of logical level falling from 1 to 0. In case this input is inverted, it will mean generation of the alert upon disconnection of this input from (-).

**Default Value**: zeros – disabled (0)

### 9.6.6 Reporting Signal Rising On Panic

**Address:** 126, bit 6 for event

130, bit 6 for distress

488, bit 6 for HRLS

**Description:** If this bit is set the unit will generate a corresponding alert upon detection of logical level rising from 0 to 1. In case this input is inverted, it will mean generation of the alert upon connection of this input to (-).

**Default Value**: zero – disabled (0)

## 9.7 Accelerometer

The accelerometer can be used as an input generating a variety of specific logics and events.

### 9.7.1 Tilt Tamper

In order to detect detachment of the unit from the installation surface (along with its cradle or when installed without a cradle), a tilt-tamper mechanism can be used.

When orientation (by earth gravity) on each axis changes more than the configured angle threshold when compared to the steady state for a longer time than the configured timer threshold, the unit will report it.

This feature utilizes 2 IIR filters: slow (factor is hardcoded = 2) and very slow (factor is hardcoded = 30). Each IIR filter is implemented as following:

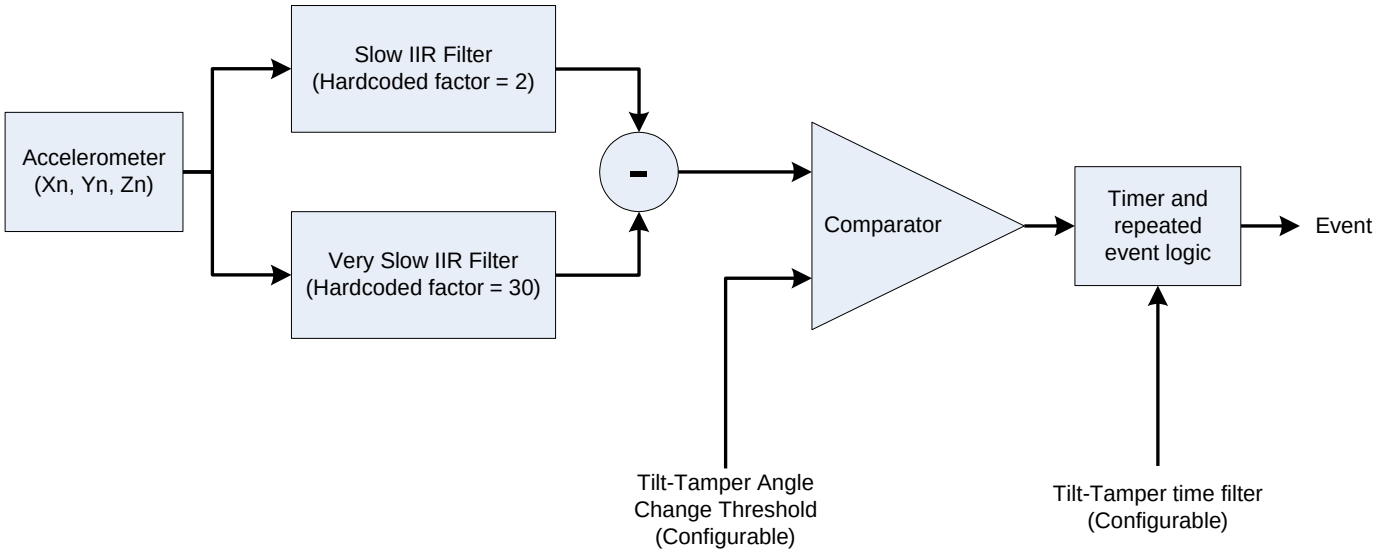
$$Sum_0 = Sample_0 * Factor$$

$$Avg = \frac{Sum}{Factor}$$

$$Sum_n = Sum_{n-1} - Avg_{n-1} + Sample_n$$

When Avg is the filtered value (filter output).

The subtraction of these 2 filters outputs is compared with the configurable threshold.




When a tilt tamper event is created, there is no other such event until the system has stabilized.

#### 9.7.1.1 Tilt Tamper Messaging

**Address**: 2044 bits 4-5

**Description:** This parameter allows to configure the type 0 messaging for the tilt tamper feature (TR 158, STR 2).

**Data range:**

| Value | Description |
|---|---|
| 0 | Disable |
| 1 | Distress |
| 2 | Logged |
| 3 | Logged & Distress |

**Default value:** 0 – Disable

#### 9.7.1.2 Tilt-Tamper Angle Change Threshold

**Address**: 2045

**Description:** This parameter allows to configure the angle threshold that will be considered as a tilt tamper scenario. 0 – Disables the feature**.**

**Resolution:** 0.588º

**Data range:** 0.588º÷150º

**Default value:** 45.276º

#### 9.7.1.3 Tilt-Tamper Time Filter

**Address**: 2046**,** bits 0-3

**Description:** This parameter allows to configure the time in which an angle higher than the one configured in "Tilt Tamper Angle Change Threshold" parameter needs to be detected in order to generate a Tilt Tamper event. The time configured in this parameter is added to the inherent time it takes the IIR filters mechanism to identify the tilt tamper (usually 2 seconds for 45 degrees threshold).

**Resolution:** 1 second

**Data range:** 0-15 seconds

**Default value:** 0 seconds

# 10 Power Events

## 10.1 Power Threshold Settings

The thresholds listed below are used to determine if the main and backup power sources are low.

Each of these conditions for each of the power sources (main and backup) is equipped by pair of thresholds enabling to alerts in sessions.

### *10.1.1 Main Power Low Threshold – High/Low levels*

**Address**: **115** – High level (Doesn't exist on CelloTrack-Solar)

**116** – Low level (for CelloTrack-Solar see section _d2h_bmk__Ref535335408_22)

**Description**: The unit will trigger "Main Battery low" alert if the measured level of the main power will be lower than the value programmed in Main Power Low Threshold Low Level parameter.

The unit will trigger "Main Battery OK" alert if the measured level of the main power will be higher than the value programmed in Main Power Low Threshold High Level.

**Data format:** 8-bit unsigned,

0.1176470588235V/bit

**Default values:**

Address 115: 10.584V

Address 116: 10.1136V

### *10.1.2 Backup Battery Low Threshold – High/Low Levels*

**Address**: **119** – High level

**120** – Low level

**Description**: The unit will trigger "Battery low" alert if the measured level of the backup battery will be lower than the value programmed in Backup Battery Low Threshold Low Level parameter.

Note that the unit is not charging the battery in Ignition Off mode except in the following cases:

- When the Battery Low alert was issued upon Stop Event. In this case the unit might activate the charger for limited time (as specified in "Maximum extra charge time" parameter)
- "Charge irrespectively to an operational mode" parameter is enabled.

The unit will trigger "Battery OK" alert when the measured level of the Backup Battery will become higher than the value, programmed in Backup Battery Power Low Threshold High Level.

Note that since the measured voltage of the backup battery during charging is ~0.2V higher then measurement without a charging it is possible that the unit will report status change (battery low or battery high) too early.

In order to prevent this situation it is recommended not to set the battery thresholds to tide.

**Data format:** 8-bit unsigned, 0.01647058823V/bit.

**Default values**: Address 119: 3.48V

Address 120: 3.52V

## 10.2 Power Events/Distress Control

### *10.2.1 Enabled Main Power Disconnected in Ignition Off Mode alert*

**Address**: 121, bit 0 for events

122, bit 0 for distress

**Description**: If this bit is set the unit will generate appropriate alerts upon detection Main Power disconnected session start and end.

**Default value:** 0 – disabled

### *10.2.2 Enabled Main Power Low in Ignition Off Mode Alert*

**Address**: 121, bit 1 for events

122, bit 1 for distress

**Description**: If this bit is set the unit will generate appropriate alerts upon detection Main Power Low session start and end.

**Default value:** 0 – disabled

### *10.2.3 Enabled Backup Battery Disconnected in Ignition Off Mode Alert*

**Address**: 121, bit 2 for events

122, bit 2 for distress

**Description**: If this bit is set the unit will generate appropriate alerts upon detection Backup Battery Disconnect session start and end.

**NOTE:** The backup battery disconnection is sensed by voltage on NTC channel.

**Default value:** 0 – disabled

### 10.2.4 Enabled Backup Battery Low in Ignition Off Mode Alert

**Address**: 121, bit 3 for events

122, bit 3 for distress

**Description**: If this bit is set the unit will generate appropriate alerts upon detection Backup Battery Low session start and end.

**Default value:** 0 - disabled

### 10.2.5 Enabled Main Power Disconnected in Ignition On Mode Alert

**Address**: 121, bit 4 for events

122, bit 4 for distress

**Description**: If this bit is set the unit will generate appropriate alerts upon detection Main Power disconnected session start and end.

**Default value:** 0 – disabled

### 10.2.6 Enabled Main Power Low in Ignition On Mode Alert

**Address**: 121, bit 5 for events

122, bit 5 for distress

**Description**: If this bit is set the unit will generate appropriate alerts upon detection Main Power Low session start and end.

**Default value:** 0 – disabled

### 10.2.7 Enabled Backup Battery Disconnected in Ignition On Mode Alert

**Address**: 121, bit 6 for events

122, bit 6 for distress

**Description**: If this bit is set the unit will generate appropriate alerts upon detection Backup Battery Disconnect session start and end.

**NOTES:**

- If backup battery is not installed the unit will not generate the "backup battery disconnected" alert.

- The backup battery disconnection is sensed by voltage on NTC channel.

**Default value:** 0 – disabled

### 10.2.8 Enabled Backup Battery Low in Ignition On Mode Alert

**Address**: 121, bit 7 for events

122, bit 7 for distress

**Description**: If this bit is set the unit will generate appropriate alerts upon detection Backup Battery Low session start and end.

**Default value:** 0 - disabled

### 10.2.9 Period between the Alerts, Triggered by Detection of Power Disconnection

**Address**: 1346

**Description**: Normally the trigger configured as a "plain event" is only generated once, and the one configured as "distress" is generating single distress session upon trigger detection (as described above in this document).

The "Main Power disconnected" is an exception from this rule. This alert can be generated many times.

Note that if Main Power Disconnected alert is configured as "Distress" – it will cause a number of Distress *sessions*, according to the number, programmed in this parameters.

**Resolution and data format**: Minutes, from 1 to 255. 0 – backward compatible mode, cancels the repetitions (event or session will only be generated once)

**Default value:** 0 – repetitions canceled

## 10.3 Radio-Off Mode (Hardcoded - Always Enabled)

**Previously in Address:** 1349, bit 1 (Now it does not have any configuration bit)

Note that the bit was added in Codebase 30j and removed in 31p; in all other versions this feature is always enabled.

*The feature described below is not applicable for CelloTrack variants. For CelloTrack Radio-Off please refer to: Radio-Off (CelloTrack and CelloTrack Power)*

**Description:** When the main power of Cello is disconnected and the unit is solely working from internal backup battery the unit will switch its modem upon discharge of the battery lower than 3.5V.

This way the remaining charge of the battery will allow maintenance of GPS, processor and memory for generation (without OTA sending) of high number of events before entering "Shipment Mode" (battery disconnect).

The unit will do the following:

1. Log an especial event "modem off" (TR207, specific data field 2) upon:
   - Solely working from internal backup battery.
   - Detection of internal backup battery voltage lower than 3.5V (on any temperature) for longer than 1 second (100 samples).
2. Switch the modem off 2 seconds after the event generation, but keep generating and logging events.
   - The modem is switched off even if there is a data transfer upon timer expiration.
   - Once switched off, the modem will be switched back on only upon main power reconnection.
3. Log an especial event "Auto-Shipment due to a low power" (TR207, specific data field 0) upon discharging to 3.25V for longer than 1 second (100 samples).
4. Enter "Shipment Mode".

**Default (Hardcoded) value**: 1 - Enabled

# 11 Geo-Fences

## 11.1 Geo-Fence

The group of parameters below contains configuration structures of 100 internal Geo-Fences of Cellocator unit. Each geo-fence is a rectangular perimeter, activated in a selected time of the day. It is equipped by violation condition, capable to trigger an alert or output activity upon occurrence.

During Ignition On mode the unit is continually examining its location and checking if it is violating a condition of one of the fields.

Each of a 100 geo-fences is a structure of 16 bytes in the following order:

| | Byte 15 | Byte 14 | Byte 13 | Byte 12 | Byte 11 | Byte 10 | Byte 9 | Byte 8 | Byte 7 | Byte 6 | Byte 5 | Byte 4 | Byte 3 | Byte 2 | Byte 1 | Byte 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Field description / Address | Config. byte 4 | Maximal Latitude Displace-ment | | Latitude of Fence's Centrum | | | | Maximal Longitude Displace-ment | | Longitude of Fence's Centrum | | | | Configuration bytes 1,2 and 3 | | |
| Fence 0 2496-2512 | 2512 | | | | | | | | | | | | | | | 2496 |
| Fence 1 2513-2528 | 2528 | | | | | | | | | | | | | | | 2512 |
| | | | | | | | | | | | | | | | | |
| Fence 99 4080-4095 | 4095 | | | | | | | | | | | | | | | 4080 |

### 11.1.1 Format of Geographical Perimeter

**Address:** 2496-4095

**Name in Programmer:** EdgePoint 0001 – 0100

**Description:** The perimeter is defined by center coordinates and maximal displacement for each coordinate (the same structure for longitude and latitude). The coordinates are the usual $10^{-8}$ radians format. The displacement is $10^{-8}/256$ radians (the same format like the coordinates but without the least significant byte and the most significant byte, keeping only the middle bytes).

| Maximal Longitude Displacement | | Longitude of Fence's Centrum | | | |
|---|---|---|---|---|---|
| Segment Byte 8 | Segment Byte 7 | Segment Byte 6 | Segment Byte 5 | Segment Byte 4 | Segment Byte 3 |

| Maximal Latitude Displacement | | Latitude of Fence's Centrum | | | |
|---|---|---|---|---|---|
| Segment Byte 14 | Segment Byte 13 | Segment Byte 12 | Segment Byte 11 | Segment Byte 10 | Segment Byte 9 |

**Default value:** all bytes are zeroes (all waypoints disabled).

### 11.1.2 Four Configuration Bytes of the Fence

**Address**: Bytes 0, 1, 2 and 15 of each fence:

| Speed Limiting Geo-Fence Thresholds Select | Output Control: Activation pattern | Output Control: Output Number | TOE MSB | End time hours[7] | End time minutes | Start time hours | Start time minutes | TOE (LSB) |
|---|---|---|---|---|---|---|---|---|
| 31 30 | 29 28 | 27 26 25 | 24 | 23 22 21 20 19 | 18 17 16 | 15 14 13 | 12 11 10 9 8 | 7 6 5 4 3 2 | 1 0 |
| Config. Byte 3 | | | | Config. Byte 2 | | Config. Byte 1 | | Config. Byte 0 | |
| Segment Byte 15 | | | | Segment Byte 2 | | Segment Byte 1 | | Segment Byte 0 | |

[7] In order to set certain fence to be permanently active the start time shall be set to 0:00 and the end time to 24:00

### 11.1.3 TOE - Type of Entry

This field defines the usage of an appropriate Fence entry.

| Bit 24 | Bit 1 | Bit 0 | Entry type | Geo Fence Heading Angle Support (Not supported in CelloTrack family) |
|---|---|---|---|---|
| 0 | 0 | 0 | Entry is inactive (the whole 16 bytes are ignored by the unit) | No |
| 0 | 0 | 1 | Entry is active and treated as waypoint data | Yes |
| 0 | 1 | 0 | Entry is "keep out" fence data (unit must be outside location window) | Yes |
| 0 | 1 | 1 | Entry is "keep in" fence data (unit must be inside location window) | Yes |
| 1 | 0 | 0 | Entry is treated as Geo-hotspot (both entering and leaving cause a trigger) | Yes |
| 1 | 0 | 1 | Entry is treated as Modem Off zone. The unit generates an event and switches off the Cellular modem 10 seconds after entering the zone.<br>The modem is turned on immediately upon exiting from the "no modem zone". | Yes |
| 1 | 1 | 0 | Speed limiting zone | Yes |
| 1 | 1 | 1 | PointerCept | No |

### 11.1.4 Waypoint

*Waypoints* are perimeters, which the unit has to be found at defined time intervals. The unit must be found in the perimeter for at least one sample in the whole time window. Once it happens, the waypoint is "checked" (i.e. no additional checks will be done for this waypoint). If this does not happen, the unit will trigger a dedicated alert.

### 11.1.5 Geo Hot Spot

Generates trigger on entry and exit to a fenced zone. Transmission reason 191, Trigger's transmission-reason-specific data: Bits 0-6 is the index of the slot. Most significant bit (bit

7) indicates direction: entry to hot spot ("1") or exit from hot spot ("0"). Behavior is not affected by fence logic bit. Please note, Hot-Spot does not trigger outputs.

### 11.1.6 No Modem Zone

Generates trigger when shutting down modem as a result of entry to "no modem zone".

Trigger is generated only for the first fence that causes the modem's shutdown. Upon entry to another overlapping (or common boundary) "no modem" zones, while modem is already turned off, no more triggers are generated. Modem is shut down 10 seconds after entering "no modem zone", regardless of trigger settings.

The modem is turned on immediately upon exiting from the "no modem zone".

### 11.1.7 Output Control

Geo-fence violation can trigger output activation. This feature is designed to let the unit automatically notify the driver that he is violating pre-programmed geo-fence rule and, in critical cases, even auto- immobilize a vehicle.

5 bits in each entry are defined for output activation as follows:

| Activation pattern | | Output Number | | |
|---|---|---|---|---|
| Bit 29 | Bit 28 | Bit 27 | Bit 26 | Bit 25 |

The violation of the "Keep In", "Keep out" Geo-Fence will trigger output activation upon violation (after Geo-Fence violation filter);

The Modem Off zone will trigger an output while inside the Geo-Fence (note that it is possible to invert the logic of some outputs programmatically and this way to trigger output activation outside the fence).

The output will be automatically deactivated upon Geo-Fence violation end.

The output activated by Geo-Fence logic is persistent, e.g. not disturbed by reset or AHR.

Upon violation the activated output might be switched off by Output Control Command from Central Control. The unit will "remember" the status of the output and will restore it upon initialization in case of reset.

Once deactivated by command, the output will be re-activated upon next violation.

The logic of the zone violation is set by zone type in TOE of the zone (for example Keep Out zone will cause an assigned output to be activated when the unit will enter this zone).

Outputs Number description:

| **Output's name** | **Output's number** |
|---|---|
| Feature Disabled | 0 |
| Siren | 1 |

| Output's name | Output's number |
|---|---|
| Gradual Stop | 2 |
| St. Immobilizer | 3 |
| LED | 4 |
| Blinkers | 5 |
| CFE Out 3 | 6 |
| CFE Out 4 or PSP indication beep (if PSP was enabled, Relevant **only for session start i.e. Entering the Zone)** | 7 |

### *11.1.8 Output Activation Pattern*

| Setting | Action |
|---|---|
| 0 | Pulse Activation (The output shall be activated for the time, defined in "Pulse Outputs Width Period", addr. 140 dec. |
| 1 | Change state to "active" upon trigger |
| 2 | Activate Gradually (only compatible with Gradual Stop output) |
| 3 | Activate Nested (executed only after vehicle stops, e.g. Ignition off or 10 valid GPS packets showing speed lower than 1 km/h) |

## 11.2 Fences Configuration

### *11.2.1 Geo-Fence Logic*

**Address:** 6, bit 5

**Description:** This parameter defines the reference of the unit to the geo-fences (Applicable only for Keep In and Keep Out types).

**Global context mode (fence logic = 0)**

**Keep in fences logic:**

When position changes, trigger is generated if both terms below are true:

- In the new position *ALL* keep-in fences are in violation state (meaning - position is outside all keep-in fences).
- Previously at least one of the fences wasn't in violation state (position was in the area of at least one of the fences).

Trigger's transmission-reason-specific data is the index of latest slot that changed its status to violation state.

**Keep out fences logic:**

When position changes, trigger is generated if both the terms below are true:

- In the new position at least one of the fences is in violation state (meaning - position is inside one of the keep-out fences).
- Previously *ALL* keep-out fences weren't in violation state (position was outside the area of all keep-out fences).

Trigger's transmission-reason-specific data is the index of latest slot that changed its status to violation state.

**Discrete context mode (fence logic = 1):**

Triggers are generated discretely for violation of each keep-in/out fence, regardless of other fences status. Trigger's transmission-reason-specific data is the index of the slot that changed its status to violation state.

**Default:** 0 - Global context mode

### *11.2.2 Geo-Fence Violation Filter*

**Address:** 1006

**Description:** This parameter designed to reduce number of fault Geo-Fence violation events. It defines required amount of sequential valid GPS packets (GPS packets are received every second) introducing Geo-Fence violation in order to generate an alert.

**Default value**: 1

**Note:** the violation filter is not applicable with waypoint type Geo-Fences (since by definition, in a waypoint type Geo-Fence one GPS sample in which the unit is inside the Geo-Fence perimeter is enough to "check" positively this Geo-Fence).

### *11.2.3 Ignore Geo-Fence Violation on Boot (after Reset)*

**Address:** 1, bit 2

**Description:** If this bit is set, the "first geo-violation changes ignore" mode is activated.

This mode allows avoiding generation violation repetitions upon any kind of reset. In this mode, the unit will use the first stable violation state as the baseline for subsequent processing of geo-fences.

This means that any geo-fences in violation state on the first stable status are not reported, and only subsequent changes are reported.

Once started, "first geo-violation changes ignore" mode terminates when:

- A valid, stable GPS fix and geo-fence state is achieved. Any geo-violations at this point are not reported, and used as baseline.

- 120 seconds timeout expires. The rationale for this is not ignore important changes occurring at a later time, if this state started when there is no GPS coverage.
- After "first geo-violation changes ignore mode" ends, subsequent geo-violation changes are reported as usual.

Note that due to this mode's timeout, if GPS takes longer than 120 seconds to achieve a fix after boot, any active geo-violation will be reported as usual when GPS fix is finally achieved

**Default value**: 0 – Do not ignore violations on boot

## *11.2.4 Control of Geo-Fence Alters (Events and Distress)*

### 11.2.4.1 Keep In Geo-Fence Zone Violation

**Address**: 1004, bit 0

1005, bit 0

**Description**: If this bit is enabled the unit will generate an alerts upon violation of Keep In Type of Geo-Zones.

**Default**: 0 – both Disable

### 11.2.4.2 Keep Out Geo-Fence Zone Violation

**Address**: 1004, bit 1

1005, bit 1

**Description**: If this bit is enabled the unit will generate an alerts upon violation of Keep Out Type of Geo-Zones.

**Default**: 0 – both Disable

### 11.2.4.3 Way Point Violation

**Address**: 1004, bit 2

1005, bit 2

**Description**: If this bit is enabled the unit will generate an alerts upon violation of Way Point Type of Geo-Zones.

**Default**: 0 – both Disable

### 11.2.4.4 Geo Hot Spot Violation

**Address**: 1004, bit 3

1005, bit 3

**Description**: If this bit is enabled the unit will generate an alerts upon violation of Geo Hot Spot Type of Geo-Zones.

**Default**: 0 – both Disable

#### 11.2.4.5 No Modem Zone Entry

**Address**: 1004, bit 4

1005, bit 4

**Description**: If this bit is enabled the unit will generate an alerts upon violation of No Modem Type of Geo-Zones.

**Default**: 0 – both Disable

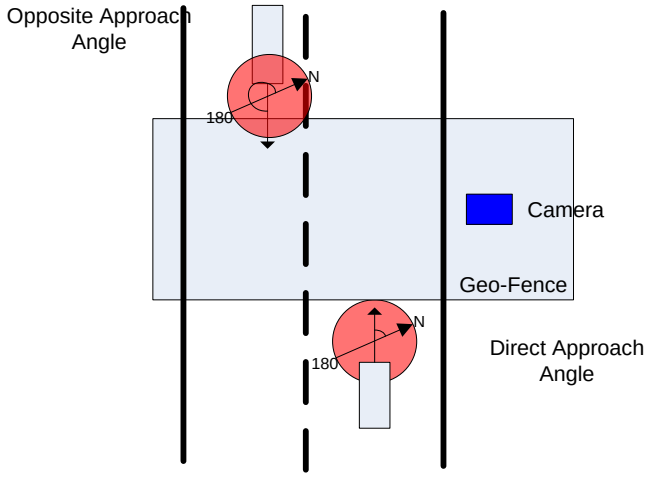
### *11.2.5 Geo-Fence Heading Angle*

**Address**: 1921-2020

**Description**: This feature enables each Geo-Fence to be conditioned by the vehicle's approach angle. An array of 100 bytes was allocated in the unit's configuration memory to hold the Geo-Fence approach angle entries. Each entry holds a number between 0 to 11 representing 12 possible angle ranges of 30 degrees with resolution of +- 30 Degrees. Each entry also holds control bits to enable the Geo-Fence Angle for direct and opposite headings.

<table>
<tr><td></td><td>Enable direct approach Angle</td><td>Enable Opposite approach angle</td><td>Spare</td><td>Geo-Fence Approach Angle<br><table><tr><th>Code</th><th>Engle [Degrease]</th></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>30</td></tr><tr><td>2</td><td>60</td></tr><tr><td>3</td><td>90</td></tr><tr><td>4</td><td>120</td></tr><tr><td>5</td><td>150</td></tr><tr><td>6</td><td>180</td></tr><tr><td>7</td><td>210</td></tr><tr><td>8</td><td>240</td></tr><tr><td>9</td><td>270</td></tr><tr><td>10</td><td>300</td></tr><tr><td>11</td><td>330</td></tr></table></td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>0-3</td></tr>
</table>

The following diagram shows possible scenario of a vehicle approaching geo-Fence with predefined heading relative to earth's north and the same vehicle approaching the same geo-fence from the opposite direction. In this case both enable bits must be set to detect the event. The feature can trigger outputs just like any Geo-Fence. It is possible to generate audible alert via CE8 device if PSP is enabled and Geo-Fence output code number 7 is selected. See Geo-Fence output control. For more information about the relations between GEO-Fence heading and the TOE (Type of Entry field setting the Goe-Fence functional settings please refer to: GeoEnceHeadingAngleSupport. Please note Hot-Spot does not support output activation.




**Default**: 0 – Disable

### *11.2.6 Geo-Fence Priority*

**Address**: 6550-6574

**Description:** Geo-Fences are defined by a center coordinate, and latitude + longitude displacements from center (i.e. only rectangular zones can be defined).

Thus, when trying to cover a road (which obviously has turns and curves) with the rectangular Geo-Fences, some overlapping between Geo-Fences is necessary.

In some cases, this causes the unit to produce too many speed violation events, which may cause excess workload and confusion to the operator.

To solve this and create zone "continuity", a configurable priority is assigned for each Geo-Fence.

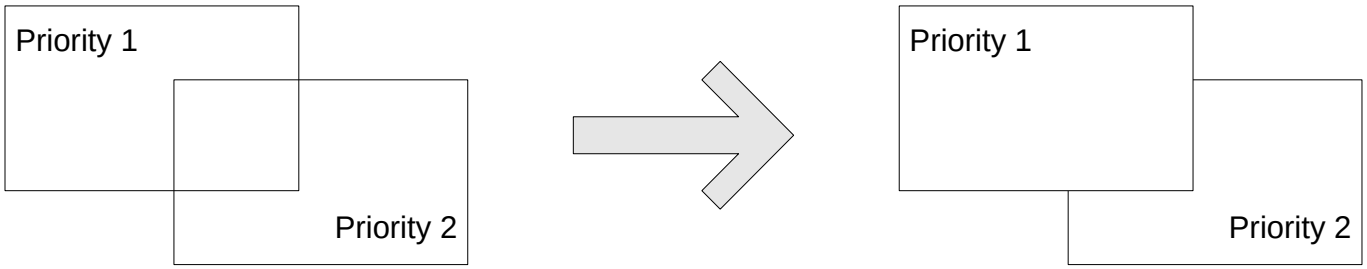
The priorities are:

| Priority | Value |
|---|---|
| 1 (highest) | 00 |
| 2 | 01 |
| 3 | 10 |

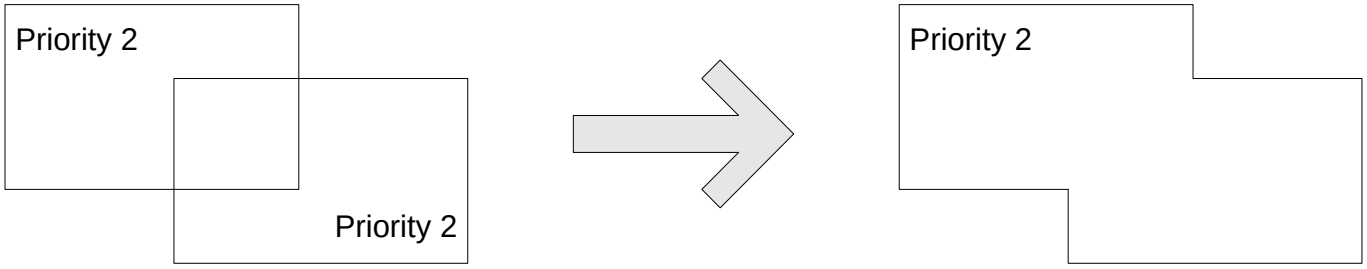
| | |
|---|---|
| 4 (lowest) - default | 11 |

| Address 6574 | | | | | | | | ... | Address 6550 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GeoFence 100 | | GeoFence 99 | | GeoFence 98 | | GeoFence 97 | | ... | GeoFence 4 | | GeoFence 3 | | GeoFence 2 | | GeoFence 1 | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | ... | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 | ... | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

When the priorities of overlapping Geo-Fences are different, the unit considers only the boundary of the highest priority Geo-Fence:




When the priorities of overlapping Geo-Fences are equal, the unit considers them as one Geo-Fence with common boundaries:



# 12 Towing Detection and Towed Mode (supported on Cello and CR families and CT-LTE-power)

## 12.1 Towing Detection

Towing detection logic is activated in Engine Off mode irrespective of Hibernation mode. The unit will store the coordinates upon Stop alert generation (only if the location considered as valid).

During parking (continually, upon GPS peek, as per hibernation mode settings; the GPS peek can also be activated upon movement detection by accelerometer) the unit will examine its location and speed. If the location changes from the Journey Stop or speed are detected while ignition switch is off – the towing alert will be triggered.

### *12.1.1 Towing Detection - Speed Threshold*

**Address**: 132 –133

**Description**: The unit will trigger "Speed Detected During Parking" alert if:

- The measured value of speed will be higher than the value programmed in this parameter.
- Towing detection alert (event or distress) is enabled

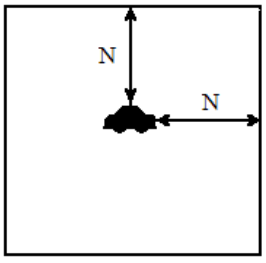
**Data format:** 16-bit unsigned. [km/h] units.

**Default value**: 200 (~7.2 km/h)

### *12.1.2 Towing Detection - Geo-Fence Perimeter*

**Address**: 134-135

**Description**: The unit will trigger "Geo-fence violation" alert if latitude or longitude of the current location differ from the location recorded upon Stop by more than programmed in this parameter.




Note that this alert will not be triggered if the location recorded upon Journey Stop is invalid.

**Data format:** 16-bit unsigned integer, $10^{-8}$ radians resolution.

**Default value**: 4096

### 12.1.3 Towing Detection and Towed Mode Time Filter

**Address***:* 137

**Description:** This parameter defines the time of which towing speed or location violation are required to be detected for Towing Detection, or accelerometer movement is required to be detected for Towed Mode.

**Range:** 0-255 Seconds

**Default value**: 10 Seconds

### 12.1.4 Enable GPS Wake Up upon Movement for Towing Detection

**Address:** 467, bit 1

**Description:** This parameter only affects if Movement detection source is set as "Ignition Input". If this bit is set, the unit will wake up GPS for immediate legacy Towing Detection procedure upon movement detection while ignition is off.

**Default value**: 1– wake up GPS

### 12.1.5 Towing Alerts (Distress and Event) Control

#### 12.1.5.1 Enable Alert upon Towing Speed Detection

**Address:** 99, bit 6 for event

102, bit 6 for distress

**Description:** This parameter enables generation of the Towing Speed alert upon detection.

**Default Value:** 0 – Disabled

#### 12.1.5.2 Enable Alert upon Towing Location Detection

**Address:** 99, bit 7 for event

102, bit 7 for distress

**Description:** This parameter enables generation of the Towing Location change alert upon detection. Note that this alert will only be generated if valid GPS location was recorded upon Trip Stop.

**Default Value:** 0 – Disabled

## 12.2 Towed Mode

Towed mode allows to detect vehicle movement, when the in Ignition Off, depending on accelerometer (rather than the older Towing Detection feature which depends on GPS).

The pre-conditions for entering Towed Mode are:

- "Enable Towed Mode" (address 467, bit 6) is enabled
- "Use accelerometer for Start&Stop" (address 467, bit 0) is set to 0 (Ignition (Legacy)) – Towed Mode feature works only when connecting the unit to physical ignition line.
- Ignition is Off

Given that those pre-conditions exist, the unit will enter Towed Mode when movement is detected for longer than the time defined in "Towing Detection and Towed Mode Time Filter" (address 137).

The movement threshold depends on "Movement Detection type" (address 467, Bit 2), "Sensitivity" (address 467, 3-4), and on the unit mode (Operational/Hibernation).

During Towed Mode the unit will behave exactly as it would do during Ignition On, except for the following:

- The Ignition switch will remain Off
- If "Enable Start-Stop Towed Mode event/distress" (address 470, bit 0/1) are enabled:
  - Instead of Driving Start event (TR69) the unit will send Towed Mode Start event (TR8/STR1)
  - Instead of Driving Stop event (TR53) the unit will send Towed Mode Stop event (TR8/STR2)
- Unit Mode of Operation field in all corresponding Wire and Wireless messages will contain Towed Mode (0x10).

The unit will exit Towed Mode when:

- Ignition switches to On (physical input status). In this case the unit will send:
  - Towing Mode Stop event (TR8/STR2)
  - Driving Start event (TR69)
- Idling (lack of movement) is detected for longer than defined in "Towing Detection and Towed Mode Time Filter" (address 137). In this case the unit will send Towing Mode Stop event (TR8/STR2).

### *12.2.1 Enable Towed Mode*

**Address** 467, bit 6

**Description:** This parameter allows to enable Towed Mode.

**Default Value:** 0 – Disabled

### 12.2.2 Enable Towed Mode Start-Stop Distress/Event

**Address:** 470, bit 0 - for event
bit 1 – for distress

**Description:** These parameters allow to enable Towed Mode Start-Stop events (TR8, STR1 or 2) upon entrance or exit to or from Towed Mode.

**Default**: 0 – Disable

### 12.2.3 Extra sensitivity for engine detection

**Address:** 470, bit 5

**Description:** When this bit is enabled ('1'), the unit will change the span of the accelerometer to a lower level increasing the overall sensitivity.

This setting is orthogonal to the PL parameters of "Accelerometer Sensitivity" and "Movement Detection type" and adds more sensitivity to all of their combinations.

In addition, when this bit is enabled the physical ignition line will be added to the logic of engine on/off decision (assuming the parameter "Use Accelerometer for Start & Stop" (Address 467.0) is set to "Ignition (Legacy)"), in a way that if Ignition line is OFF, the engine state will remain OFF, regardless of accelerometer data. Only when the Ignition line is ON, the accelerometer data shall determine the engine state.

**Data range:** 0 - Disable, 1 - Enable

**Default value:** 0 – Disable

### 12.2.4 Output to activate upon towing detection

**Address:** 470, bits 2-4

**Description:** When the system detects towing it will activate the following output:

0 - Feature Disabled

1 - Reserved

2 - Gradual Stop

3 - St. Immobilizer

4 - LED

5 - Blinkers

6 - Reserved

7 - Reserved

**Default value:** 0 - Feature Disabled

## 12.3 Hi-Res impact mode

When the below (Hi-Res impact mode) parameter is set to value different than '00', then the unit will enter a special mode that can fit to detect movements of light vehicles such as motorcycles. In this mode, the accelerometer will be moved from span of +-8g to +-2g, and the unit will use the threshold from "Hi-Res impact threshold - Ignition ON" when the units is in ignition ON, and the "Hi-Res impact threshold - Ignition OFF" when the units is in ignition OFF.

The switching from the TH of ignition-ON to the TH of ignition-OFF will have 30 seconds of delay. The other way around will be immediately.

In this mode these features will not function at all:

1. Driver behavior (Hunter & CSA)
2. Movement detection
3. Towing detection
4. Orientation Change
5. Tilt Tampering
6. Legacy and EDR crashes

The unit will report of impact events from the accelerometer (regardless of ignition state), via type-0 message as detailed in wireless protocol document, and then set a timer of 10 Seconds, if another impact event will occur within these 10 seconds, it will be ignored, and if after it expires, it shall be transmitted as a new event.

### *12.3.1 Hi-Res impact mode*

**Address:** 470, bits 6-7

**Description:**

00 - The entire Hi-Res impact mode is disabled

01 - The unit will send Hi-Res impact events in Type-0 **Distress** messages

10 - The unit will send Hi-Res impact events in Type-0 **Logged** messages.

11 - The unit will send Hi-Res impact events in Type-0 **both Distress & Logged** messages.

Note that in this special mode, also logged events wakes up the unit (and transmit).

**Default value:** 00 – Disable

### *12.3.2 Hi-Res impact threshold - Ignition ON*

**Address:** 1696 bits 0-6

**Description:** This parameter defines the impact threshold used for "Hi-Res impact mode" when the wired Ignition is ON. Where value of 0 will disable this event entirely.

**Data Resolution:** 0.016 g

**Data Range:** 0-2.032g (1-127, 0=Disable)

**Default value:** 1.024g (64)

### *12.3.3 Hi-Res impact threshold - Ignition OFF*

**Address:** 1697 bits 0-6

**Description:** This parameter defines the impact threshold used for "Hi-Res impact mode" when the wired Ignition is OFF. Where value of 0 will disable this event entirely.

**Data Resolution:** 0.016 g

**Data Range:** 0-2.032g (1-127, 0=Disable)

**Default value:** 1.024g (64)

# 13 Crash Detection Feature

## 13.1 General

The unit's accelerometer is used as a source for crash detection and reporting.

The feature includes 2 separate RMS based thresholds, one for light crash and one for heavy crash.

The detection will not be possible when in full-hibernation mode (ignition is OFF).

The light crash detection requires the unit to be installed horizontally for gravity to be eliminated.

Cellocator FW samples and calculates the average of Accelerometer Data at 100 Hz rate.

Only 3 consequential samples which violate the crash threshold are considered a crash.

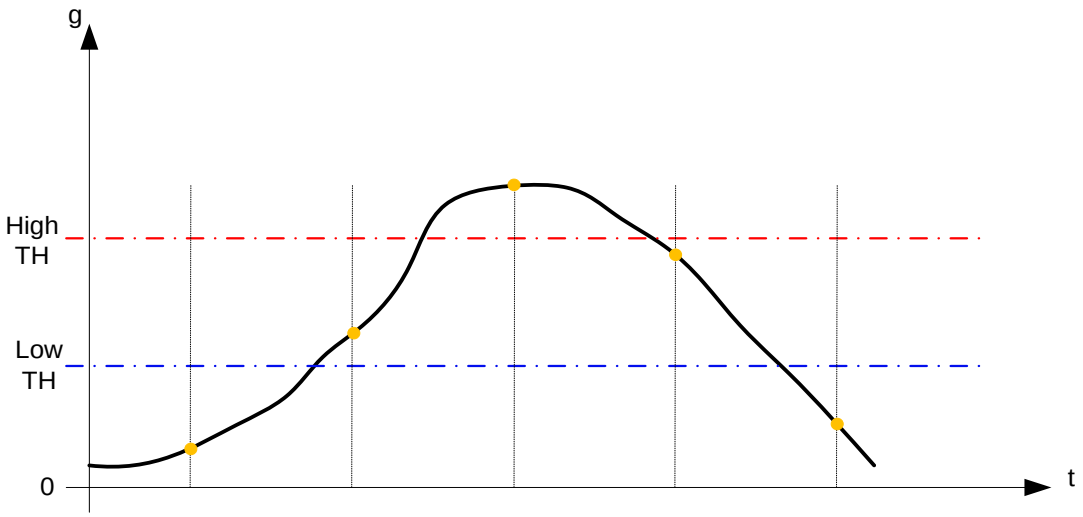
The following confusing case may certainly occur:

Unit reports on "Light" crash and shows the value of "g" which is greater than the "Heavy" crash threshold.

The reason for such behavior:

1. Reporting on crash, Unit picks up only the highest value of "g" for its reports.
2. It is still deemed "Light" crash, not "Heavy", because only one sample violates the "High Threshold".

Also, the timeout value to be expired making it possible to generate the next crash event, is 2 seconds.



Some improvement from FW release 33x and later:

1. This feature will work also in ignition-off state as long as the Hibernation is not full.
2. This feature will work also while the accelerometer is the Ignition source.

## 13.2 Crash Detection Configurable Parameters

### *13.2.1 Light Crash Detection Threshold*

**Address:** 2384 bits 0÷6 - Light crash detection threshold

**Description**: This parameter contains the value of acceleration RMS (gravity eliminated), used to detect a light crash (any acceleration higher than this threshold and lower than the threshold of heavy crash for longer than 3 sequential samples (30ms) will be considered a light crash).

**Resolution**: 0.072g

**Valid range**: 2g≤X≤9.2g, higher and lower programmed values are automatically saturated.

**Default**: 2g

### *13.2.2 Heavy Crash Detection Threshold*

**Address:** 2385 bits 0÷6 - Heavy crash detection threshold

**Description**: This parameter contains the value of acceleration RMS (gravity included), used to detect a heavy crash (any acceleration higher than this threshold for longer than 3 sequential samples (30ms) will be considered a heavy crash).

**Resolution**: 0.072g

**Valid range**: 2g≤X≤9.2g, higher and lower programmed values are automatically saturated.

**Default**: 5g

### *13.2.3 Enable Crash Detection Events for Light/Heavy Crash*

**Address:** 2390 bit 0 for Light Crash
2390 bit 1 for Heavy Crash

**Description**: If this bit is enabled, the unit will issue an event containing reason and sub-reason when thresholds are crossed. If the light crash is enabled, the unit's logic assumes it is installed parallel to ground (horizontally) and ignoring Z axis.

**Default**: 0 – Disable

### *13.2.4 Enable Distress for Light/Heavy Crash*

**Address**: 2390 bit 2 for Light Crash

2390 bit 3 for Heavy Crash

**Description**: If this bit is enabled, the unit will issue a distress event containing reason and sub-reason. If the light crash is enabled, the unit is assuming that it is installed in parallel to ground (horizontally) and ignoring Z axis.

**Default**: 0 – Disable

### *13.2.5 Enable Light/Heavy Crash Detection in Ignition Off*

**Address**: 2390 bit 4 for Light Crash

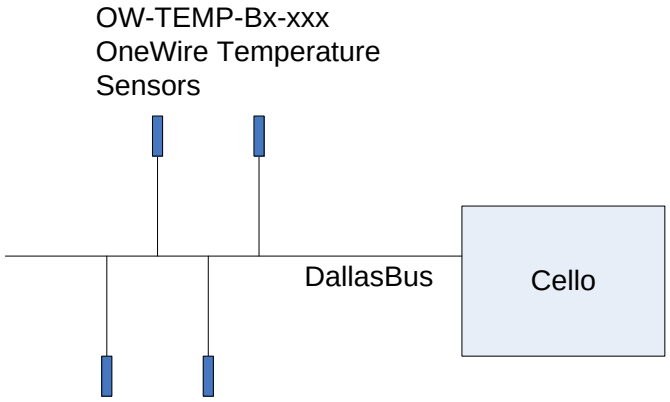
2390 bit 5 for Heavy Crash

**Description**: This parameter enables light/heavy crash detection when in Ignition Off and configured to average hibernation (crash detection in full hibernation is not available due to system limitation).

**Default**: 0 - Disable

# 14 OneWire Temperature Sensors

The oneWire Temperature Sensors feature enables "new platform" HW units to be connected to up to 4 oneWire temperature sensors. The oneWire temperature sensors are based on Maxims's DS18B20 chip, see: http://datasheets.maximintegrated.com/en/ds/DS18B20.pdf. The user can connect up to 4 oneWire temperature sensors in parallel. The users need first to enable the oneWire Bus mode.




Type 0 message includes 4 bytes containing 4 possible measurement sources. The user can select the source of these 4 bytes by configuring the measurement source as described in Bytes 26-29 of OTA Message 0. It is possible to select each one of the 4 oneWire temperature sensors as source. If Type 0 measurements are required, the user needs to configure the "OneWire Update Period" to be none zero value and configure "Enable RT" or "Enable Logged" configuration bits. See: oneWire temperature measurement update configuration for more information. The user has also the ability to poll the unit for measured temperature results by issuing a type 9 request. The unit will process the request and send a consolidated Type 9 message response with all the 4 measurements. It is mandatory to set non-zero "Update Period" to enable the temperature sensors before issuing Type 9 request. The detailed Type 9 message format is described in: Cellocator Wireless Communication Protocol: "Section 2.6.21: oneWire Temperature Sensor Measurement – OutBound (Sub. Data 0x19)" and section 3.6.15: oneWire Temperature Sensor Measurement Request– InBound (Sub Data 0x19).

The feature supports different "Update Periods" for GSM Home and Roam network. When both "update Periods" values are set to 0, the feature is considered disabled.

In addtion, user can configure the unit to create type-0 events when the temperature is crossing high and/or low thresholds.

## 14.1 One Wire Temperature Measurement Update Configuration

**Address:** 2459: Home Network

2460: Roam Network

**Description:** This parameter contains a bitmap controlling the functioning of One Wire temperature sensors.

**Configuration Byte Format:**

| Update period (1 minute resolution) | | | | | | Enable RT<br>0 – disable<br>1 – enable | Enable logged<br>0 – disable<br>1 – enable |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Configuration Byte Modes:**

| Update Period | Enable RT | Enable Logged | Description |
|---|---|---|---|
| 0 | 0 | 0 | The feature is disabled |
| 0 | 0 | 1 | |
| 0 | 1 | 0 | |
| 0 | 1 | 1 | |
| ≠0 | 0 | 0 | The temperature sensors are polled in the rate defined under: "Update Period".<br>Measurements are not logged and not sent in real time (Type 9).<br>The unit will answer Type 9 measurements requests. |
| ≠0 | 0 | 1 | The temperature sensors are polled in the rate defined under: "Update Period".<br>Measurements are logged and not sent in real time (Type 9), according to legacy logged/RT events logics.<br>The unit will answer Type 9 measurements requests. |
| ≠0 | 1 | 0 | The temperature sensors are polled in the rate defined under: "Update Period".<br>Measurements are sent in real time (Type 9), according to legacy logged/RT events logics.<br>The unit will answer Type 9 measurements |

| | | | |
|---|---|---|---|
| | | | requests. |
| ≠0 | 1 | 1 | The temperature sensors are polled in the rate defined under: "Update Period".<br>Measurements are logged and sent in real time (Type 9), according to legacy logged/RT events logics.<br>The unit will answer Type 9 measurements requests. |

Note:

According to legacy logged/RT events logics:

- Logged event – transmitted during occurrence only if there is a GPRS connection
- RT event – transmitted during occurrence unconditionally (i.e. wakes the unit if it's in hibernation mode, and/or send the event by SMS if GPRS is not available)

**Default:** 0 - Feature Disabled

## 14.2 1-Wire Temperature Sensor High Threshold

**Address:** 2462

**Description:** This parameter contains the temperature which above the unit generates a "High 1-Wire Temperature Sensor Measurement" event.

**Data format:** Signed integer

**Data Range:** (-127) ÷ (+127) degrees °C

**Resolution:** 1 degree °C

**Default value:** 85 (+85°C)

## 14.3 1-Wire Temperature Sensor Low Threshold

**Address:** 2463

**Description:** This parameter contains the temperature which below the unit generates a "Low 1-Wire Temperature Sensor Measurement" event.

**Data format:** Signed integer

**Data Range:** (-127) ÷ (+127) degrees °C

**Resolution:** 1 degree °C

**Default value:** -10 (-10°C)

## 14.4 1-Wire Temperature Sensor Filter

**Address:** 465, bits 5-7

**Description:** This parameter contains the number of consecutive samples required to trigger a "High/Low 1-Wire Temperature Sensor Measurement" event. 0 disables the feature.

**Data format:** 3 bit integer

**Data Range:** 0 – 7 samples

**Resolution:** 1 sample

**Default value:** 2

## 14.5 Enable 1-Wire Temperature Sensor Logged Events

**Address:** 465, bit 3

**Description:** This parameter enables 1-Wire temperature sensors logged events.

**Data format:** Flag

**Data Range:** 0 – Disable, 1 – Enable

**Default value:** 1 – Enable

## 14.6 Enable 1-Wire Temperature Sensor Distress Events

**Address:** 465, bit 4

**Description:** This parameter enables 1-Wire temperature sensors distress events.

**Data format:** Flag

**Data Range:** 0 – Disable, 1 – Enable

**Default value:** 0 – Disable

# 15 Auxiliary Satellite Unit

**Compatibility:** GNSS units support this feature natively and CR300 units (starting 41x firmware) as an optional feature.

This feature enables an auxiliary satellite communication device to be activated when the Cello unit losses GSM or GPRS connectivity. The Auxiliary Satellite unit could be activated in two operational modes:

**Basic Auxiliary Satellite Mode:**
In this mode the Cello unit turns on the Auxiliary Satellite modem when "No GSM" or "no GPRS" condition is detected. In this mode the Auxiliary Satellite modem autonomously generate location events based on its embedded GPS. The Auxiliary Satellite Modem will be turned off, and control will be moved to the GSM network when the Cello unit detects GSM or GPRS network connectivity.

The "Blinkers" output control the Auxiliary Satellite device. While Cello or CR300/B is hibernating, its auxiliary satellite device will be turned off. The end unit will automatically turn the auxiliary unit on when GSM or GPRS is lost for the time defined in section 22.1.1. The Cello unit will automatically turn off the auxiliary unit when GSM or GPRS is restored for at least the time defined in 22.1.2.

**Advanced Auxiliary Satellite Mode (implemented in Cello family only):**
The advanced Auxiliary Satellite support uses the Auxiliary Satellite unit as an alternative path for communication with the server. Unlike the basic mode, the advanced mode will send the legacy Cellocator messages via the satellite link to the server. The messages sent over the satellite communication link are stored into the Satellite service provider server's data base and sent via the internet to the fleet management server.

Both Basic and advanced Satellite share the same criteria for declaring "GSM / GPRS Loss" and "GSM / GPRS reconnect". The feature's configurable options include timeout values defining "GSM loss" and "GSM reconnect" timeouts. Both values must be Non Zero for the feature to be operational.

## 15.1 Auxiliary Satellite: Cellular network connect-reconnect criteria

**Address**: 650: Bit 0

**Description**: This bit defines the criteria for declaring cellular network availability. Setting the bit to 0 (GSM) will switch the unit to Satellite mode when GSM network is not found. Setting the bit to 1(GPRS) will switch to Satellite mode when GPRS network is not found (while GSM might be available).

**0-GSM**

**1-GPRS**

**Default value:** 0 – GSM

## 15.2 Falling Back to Satellite

### *15.2.1 Auxiliary Satellite: No GSM-GPRS Timeout (Basic, Advanced)*

**Address**: 1345: Bits 0-3

**Description**: This configurable parameter defines No-Cellular network time criteria for the unit to switch on its auxiliary satellite device. The NO-Cellular configurable timeout has configurable resolution of 0.5 or 16 minutes per bit. The configurable parameter must be non-zero for the feature to function.
This parameter is common for both Basic and Advanced Auxiliary Satellite modes.

**Default value:** 0 – Feature Disabled

**NOTE**: Please note that when the "Auxiliary Satellite Unit- Cellular network connect reconnect criteria" (Add. 650, Bit 0) is configured for "GPRS", the minimal value must be 2 (1 Minute).

### *15.2.2 Auxiliary Satellite: Timeout Resolution for No GSM-GPRS*

**Address:** 650, Bit 1

**Description:** This parameter defines the resolution for NO GSM-GPRS Timeout.

| Auxiliary Satellite: Timeout Resolution for No GSM-GPRS | Resolution |
|---|---|
| 0 | 30 Seconds |
| 1 | 16 Minutes |

**Default value:** 0 – 30 Seconds

## 15.3 Restore Cellular

### *15.3.1 Auxiliary Satellite: GSM-GPRS Reconnect Timeout (Basic, Advanced)*

**Address**: 1345: Bits 4-7

**Description**: This parameter defies the criteria for declaring Cellular network as restored. This configurable parameter defines the "Cellular Network Reconnect" timeout in programmable resolution (0.5 minutes or 16 minutes). The configurable parameter must be non-zero for the feature to function.
This parameter is common for both Basic and Advanced Auxiliary Satellite modes.

**Default value:** 0 – Feature Disabled

### 15.3.2 Auxiliary Satellite: Timeout Resolution of GSM-GPRS Reconnect

**Address:** 650, Bit 2

**Description:** This parameter defines the resolution for NO GSM-GPRS Timeout.

| Auxiliary Satellite: Timeout Resolution of GSM-GPS Reconnect | Resolution |
|---|---|
| 0 | 30 Seconds |
| 1 | 16 Minutes |

**Default value:** 0 – 30 Seconds

## 15.4 Satellite Control Bitmask

**Address**: 650

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Reserved | | Reserved | Reserved | Auxiliary Satellite Unit- Enable Periodic Distress Events<br>0-Disable<br>1-Enable | Timeout resolution of GSM-GPRS Reconnect | Timeout resolution for No GSM-GPRS | Auxiliary Satellite Unit- Cellular network connect reconnect criteria:<br>0-GSM<br>1-GPRS |
| Bits 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |

**Default value:** 0 – GSM

### 15.4.1 Auxiliary Satellite Unit- Enable Periodic Distress Events

**Address**: 650: Bit 3

**Description**: When the unit is in Advanced Satellite mode and NO GSM condition is detected and this bit is enabled, the unit will start sending periodic Distress events with Transmit Reason 44 (Timed Event). If the unit is in hibernation, the periodic distress will turn on the Auxiliary Satellite for a distress transmission session. The Period between the Distress Event is defined in the parameter: Auxiliary Satellite Unit- Periodic Distress Report Period, Address 656.

**Default value:** 0 – Disabled

### 15.4.2 Auxiliary Satellite Unit - Periodic Distress Report Period

**Address**: 656

**Description**: This parameter defines the period between Periodic Distress Events. This parameter is only relevant when: Auxiliary Satellite Unit - Enable Periodic Distress Events is enabled.

**Resolution:** 30 Seconds

**Default value:** 10 – 5 Minutes

# 16 PointerCept

## 16.1 Overview

PointerCept system is a backup communication system, intended to be used in cases in which the regular cellular communication between the end unit and the server is not available (mainly for cases of theft in which the thief activates a jammer).

As the backup channel, the system uses one way communication channel (RF beacon), which is operated whenever certain conditions are fulfilled.

The system includes the following components:

- End Unit: A generic Cellocator unit that is installed on the vehicle/mobile asset. The unit Modem supports transmission in the backup channel.
- PointerCept Base: An intermediate data source which comes in two forms: Fixed (meaning it is typically attached to a building or pole) and Mobile (meaning it can be carried by the chasing security team). These base stations interact both with the End Unit and the PointerCept Chaser application, as well as the PointerCept server.
- PointerCept Chaser Application: A mobile application based on the Android platform for smartphones and tablets, which enables the chasing team to pinpoint the compromised vehicle in real-time. The application connects to the PointerCept Base via Bluetooth.

Upon faulty attempt to report a security compromise to the server due to jammed channel or lack of coverage during predefined time, the unit starts to operate a periodic proprietary RF beacon status transmission, in a predefined Tx policy (modulation, hopping sequence, error correction etc.), within the ISM frequency bands and regulations while checking from time to time whether cellular communication can be reestablished.

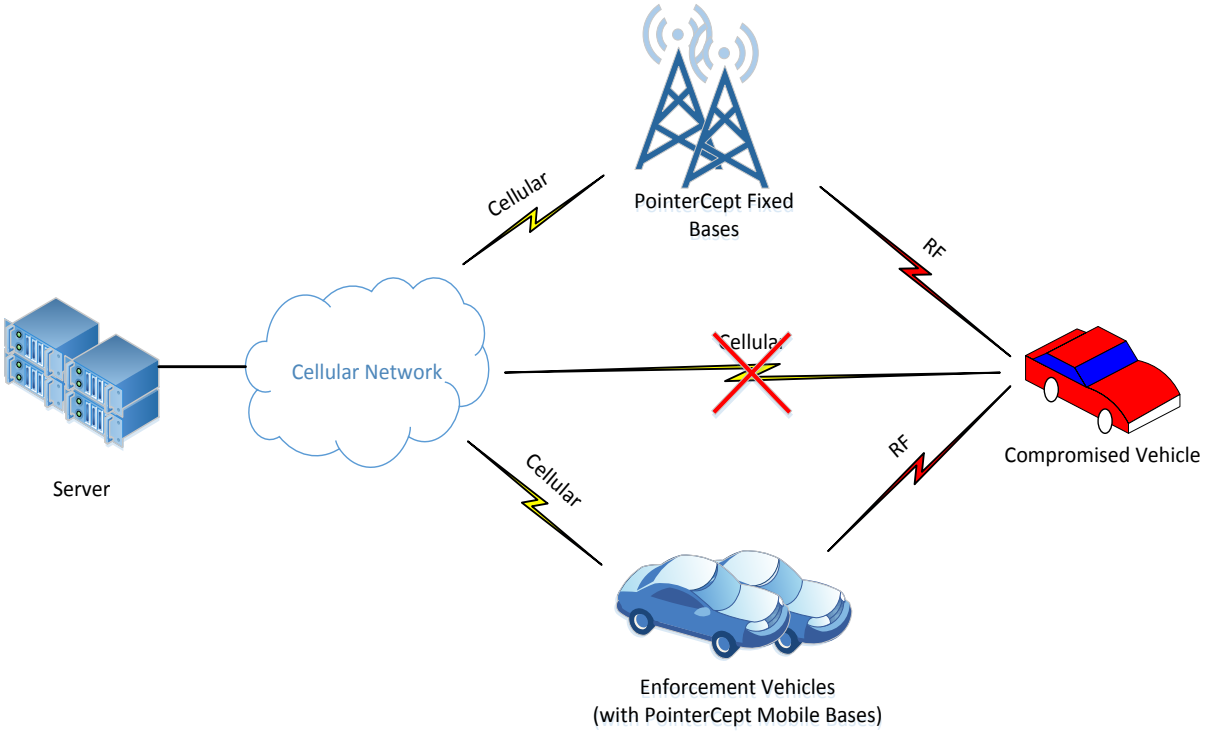
Signal received by the base station/s is forwarded to the server over WAN IP links (cellular/private network/internet) in order to identify the vehicle/asset location as projected by its embedded GPS, or to estimate its location based on RSSI triangulation technics.

Last mile chasing after a stolen vehicle or asset is executed using a mobile base device which can be detached from the vehicle and used while hand-held in order to receive the RF beacon transmissions sent by the installed device and to indicate the direction from which the signal arrives and the relative distance of the asset from the chasing device, based on the signal strength.

In a network without fixed base stations, chasing vehicles are sent to the last known location area of the asset, starting to explore the area methodically in order to trace the RF beacon signal. Chasing parameters are sent directly to the mobile bases from the control center or entered manually by the recovery forces allowing the mobile bases to lock on the desired RF beacon.

Once RF beacon is locked, the retrieval forces may reach to the indicated location of the vehicle/asset, if GPS fix is available, or to start trying to approach it according to the direction and strength signals indicated by the mobile bases, whenever GPS is invalid. In such case, the information received by the mobile bases is uploaded to the server which

may use multiple receiving mobile bases in order to apply real time triangulation and help the retrieval forces to close gap to the vehicle/asset rapidly.




## 16.2 End Unit

As indicated above, the end unit is a generic Cellocator unit, which Modem supports **transmission in the backup channel, based on** configurable information sent to the Modem**.**

### *16.2.1 Enable PointerCept Mode*

**Address:** 610, bit 0

**Description:** This parameter allows to enable the PointerCept mode.

**Data Range:** 0 – Disable, 1 – Enable

**Default value**: 0 – Disable

### *16.2.2 RF Beacon Conditions*

When cellular communication with the server is available, it's obviously preferred by the unit to use. It starts transmitting the RF beacon only under certain conditions. The policy is described in the following table:

| | No Hibernation | | | Average/Full Hibernation | |
|---|---|---|---|---|---|
| | **No Event** | **Distress Event** | **Geo-Fence Crossing** | **No Event** | **Distress Event** |
| **GSM Available** | Legacy | Legacy | Legacy | Legacy | Legacy |
| **No GSM** | Legacy | RF Beacon | If RF beacon activated or already active, stop RF beacon transmission | Legacy | RF Beacon |
| **Jamming** | RF Beacon | RF Beacon | If RF beacon activated or already active, stop RF beacon transmission | Configurable by "Enable Beacon upon Jamming on Hibernation" parameter | RF Beacon |

#### 16.2.2.1 Enable Beacon upon Jamming on Hibernation

**Address:** 610, bit 3

**Description:** This parameter allows to select if the RF beacon will be activated upon jamming recognition, when the unit is in average/full hibernation.

Note: if this parameter is set to Disable, but a beacon is transmitted before the unit entered hibernation, it will continue after the unit enter hibernation.

**Data Range:** 0 – Disable, 1 – Enable

**Default value**: 1 – Enable

#### 16.2.2.2 No GSM Filter

**Address:** 635, bits 4-7

**Description:** This parameter allows to define the time from GSM loss to RF beacon transmission start.

Note: 0 value in "No GSM Filter" and/or "GSM Reconnect Filter" parameters will disable the RF beacon completely.

**Resolution**: 0.5 Minute

**Data Range:** 0.5-7.5 Minutes

**Default value**: 2 Minutes

#### 16.2.2.3 GSM Reconnect Filter

**Address:** 635, bits 0-3

**Description:** This parameter allows to define the time from GSM reconnect to RF beacon transmission stop.

Note: 0 value in "No GSM Filter" and/or "GSM Reconnect Filter" parameters will disable the RF beacon completely.

**Resolution**: 0.5 Minute

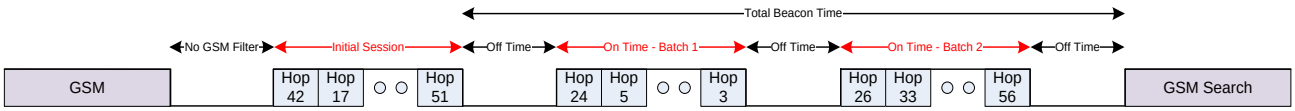
**Data Range:** 0.5-7.5 Minutes

**Default value**: 2 Minutes

### *16.2.3 RF Beacon Pattern*

The RF beacon has a certain pattern, taking into account GSM search, Modem PA cooling time, etc.

The pattern is described below:

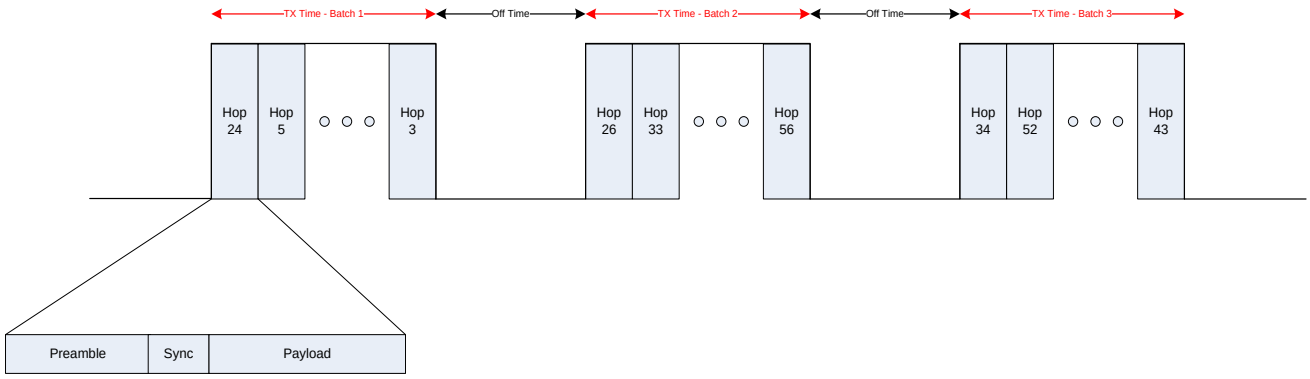



Each message is transmitted in a different frequency, so the Modem hops between frequencies (50 out of possible 77). The hoping frequencies table is calculated by the hopping algorithm based on the following information:

- Pseudo Random Channels Table (derived from configurable country table set)
- Group number (can be 0-5, derived from the unit ID or configurable)
- Number of Hops (hard coded to 50)
- Base Frequency (derived from configurable country table set)
- Bandwidth (hard coded to 25KHz)

The beacon message includes the following fields:

- Preamble
- Sync
- Payload




The Unit calculates the TX table as following:

TX Frequency[n] = Base Frequency + BW * Channel[n]

When:

The base frequency is a parameter representing channel number 0. It varies between countries (currently Israel and Argentina).

BW is defined as the minimum Band between two consecutive channels.

Channel[n] represents a hard coded map of channels which the system should hop according to, starting from base frequency. It varies between countries (currently Israel and Argentina).

#### 16.2.3.1 Baud Rate

**Address:** 614, bits 3-4

**Description:** This parameter allows to select the basic baud rate of the RF beacon transmission.

**Data Range:**

| Value | Description |
|---|---|
| 0 | Reserved |
| 1 | 1733 bps |
| 2 | 866 bps |

**Default value**: 2 – 866 bps

#### 16.2.3.2 Initial Session Time

**Address:** 632

**Description:** This parameter allows to define the length of the initial session time. The initial session is a burst of high power transmissions, intended to increase the probability of reception in the base station, before switching to a more economic transmission policy. If the Modem PA temperature is lower than 55°, the initial session is transmitted with 31 dBm power, comparing to 29 dBm power of the normal batches afterwards. If the Modem

PA temperature is higher than 55°, the initial session is also transmitted with 29 dBm power.

**Data Range:** 5-30 Seconds

**Default value**: 30 Seconds

#### 16.2.3.3 Beacon On Time

**Address:** 636

**Description:** This parameter allows to define the length of the On (or batch) times.

**Data Range:** 5-60 Seconds

**Default value**: 30 Seconds

#### 16.2.3.4 Battery Beacon On Time

**Address:** 639

**Description:** This parameter allows to define the length of the On (or batch) times when external power is disconnected and the unit is operating on its internal battery.

**Data Range:** 5-30 Seconds

**Default value**: 30 Seconds

#### 16.2.3.5 Beacon Off Time

**Address:** 637

**Description:** This parameter allows to define the length of the Off times between On times. It's intended to let the Modem PA to cool down. In the Off time, the Modem PA temperature is constantly monitored. If the Modem PA temperature is higher than configured in "Modem PA Off Temperature" parameter, the Modem will stay Off until the temperature drops below this threshold, even if the Beacon Off Time has expired.

**Data Range:** 5-40 Seconds

**Default value**: 40 Seconds

#### 16.2.3.6 Battery Beacon Off Time

**Address:** 640

**Description:** This parameter allows to define the length of the Off times between On times when external power is disconnected and the unit is operating on its internal battery. It's intended to let the Modem PA to cool down. In the Off time, the Modem PA temperature is constantly monitored. If the Modem PA temperature is higher than configured in "Modem PA Off Temperature" parameter, the Modem will stay Off until the temperature drops below this threshold, even if the Beacon Off Time has expired.

**Data Range:** 1-30 Minutes

**Default value**: 1 Minute

### 16.2.3.7 Total Beacon Time

**Address:** 638

**Description:** This parameter allows to define the length of the total beacon time, which includes all of the beacon On and Off times. It actually defines when the unit will start the next GSM search.

**Data Range:** 1-60 Minutes

**Default value**: 20 Minutes

### 16.2.3.8 Battery Total Beacon Time

**Address:** 641

**Description:** This parameter allows to define the length of the total beacon time, which includes all of the beacon On and Off times, when external power is disconnected and the unit is operating on its internal battery. It actually defines when the unit will start the next GSM search.

**Data Range:** 1-60 Minutes

**Default value**: 30 Minutes

### 16.2.3.9 Complementary/PSP Message Ratio

**Address:** 621

**Description:** The beacon message has 3 possible types, containing different information: Location, Complementary (including I/O status, speed, battery level, etc.) and PSP (including PSP Dallas bytes). The Location message is the most frequently changed, and thus should be transmitted more frequently than the other message types. This parameter allows to define the ratio of Complementary messages (and PSP messages, if enabled) in relation to Location messages. For example, if this parameter is set to 6, one Complementary (and PSP messages, if enabled) message will be sent for 6 Location messages. 0 disables the feature.

**Data Range:** 1-30; 0 – disables the feature

**Default value**: 6

### 16.2.3.10 In Batch Update Period

**Address:** 629, bits 0-3

**Description:** In the beacon On times the unit repeats the same messages in different frequencies (according to its frequency hopping policy). These On times are also referred as batches. As usage experience has shown, for long On times it is required to allow to refresh the information (especially location) within a batch, to help the server side to locate the end unit. This parameters allows to define the refresh period within a batch. 0 disables the feature.

**Resolution**: 2 Seconds

**Data Range:** 2-30 Seconds; 0 – disables the feature

**Default value**: 10 Seconds

### 16.2.3.11 Beacon AHR Period

**Address:** 620

**Description:** This parameter allows to define the beacon AHR period. If the unit transmits RF beacon for a time longer than defined in this parameter (indicating abnormal state of the Modem), it shall perform AHR to the Modem. 0 disables the feature.

**Data Range:** 1-255 Minutes; 0 – disables the feature

**Default value**: 180 Minutes

### 16.2.3.12 Modem PA Off Temperature

**Address:** 628

**Description:** This parameter allows to define the temperature threshold for powering On the Modem. The unit monitors the temperature during the Modem Off time, and if it samples one sample above this value, the Modem will stay Off until the temperature drops below this threshold, even if the Beacon Off Time has expired.

**Data Range:** 70-80 Degrees

**Default value**: 76 Degrees

### 16.2.3.13 Modem PA Power Level

**Address:** 619, bits 0-3

**Description:** This parameter allows to define the power level of the Modem PA.

Note: Whenever the unit gets back from PointerCept RF beacon to regular cellular transmission (according to PointerCept logics or by reset), the Modem is set to Network control power level.

**Data Range:** 5-10

**Default value**: 5 for GE910 Modem; 6 for GE864 Modem

### 16.2.3.14 Periodical Beacon Transmission Timer

**Address:** 630

**Description:** This parameter defines the period for periodical PointerCept beacon transmission. 0 - cancels the periodical PointerCept beacon transmission.

Note: periodical PointerCept beacon transmission should not be enabled if Offline Tracking is enabled.

**Resolution:** 1 Hour

**Data Range:** 0-255 Hours

**Default value**: 24 Hours

## *16.2.4 Frequency Hopping*

### 16.2.4.1 Country Table Set

**Address:** 610, bits 5-7

**Description:** This parameter allows to select the country that the system is intended to work at. It defines to the unit the base frequency and frequency hopping table.

**Data Range:**

| Value | Description |
|---|---|
| 0 | Israel |
| 1 | Argentina |

**Default value**: 0 – Israel

### 16.2.4.2 Frequency Hopping Mode

**Address:** 614, bit 6

**Description:** This parameter allows to select if the unit will operate in frequency hopping mode or not. When selected as non-frequency hopping, the unit will always transmit on the same channel (configurable per the unit group).

**Data Range:** 0 – Frequency Hopping, 1 – Non Frequency Hopping

**Default value**: 0 – Frequency Hopping

### 16.2.4.3 Non Frequency Hopping Channel for Group 0/1/2/3/4/5

**Address:** 622/623/624/625/626/627

**Description:** This parameter allows to select a specific channel that the unit will transmit on, when selected to work in non frequency hopping mode.

**Data Range:** 0-76

**Default value**: 0

## *16.2.5 Preamble*

The preamble is the first part of the transmitted message. Its length and content are configurable.

### 16.2.5.1 Preamble Length

**Address:** 612

**Description:** This parameter allows to define the preamble length.

**Data Range:** 0-99 bytes

**Default value**: 12 bytes

#### 16.2.5.2 Preamble Content

**Address:** 613

**Description:** This parameter allows to define the preamble content. This content will be repeated for all of the preamble length.

**Data Range:** 0x00-0xFF

**Default value**: 0xAA

### *16.2.6 Sync Words*

The Sync word is a programmable sequence of bytes designed to help the receiver to lock on the message beginning. It's also help for group interference separation. There are 6 different Sync words, one per group.

#### 16.2.6.1 Sync Word 0/1/2/3/4/5

**Address:** 615-616/617-618/642-643/644-645/646-647/648-649

**Description:** This parameter allows to define the sync word of group 0/1/2/3/4/5.

**Data Range:** 0x0000-0xFFFF

**Default value**: 0x9999/0xBBBB/0xCCCC/0xDDDD/0xEEEE/0x8888

### *16.2.7 Manual Group Selection*

As indicated above, each unit has a group, which derives some of the transmission characteristics (hopping table, channel, sync word). The group can be defined automatically by the unit, or manually.

#### 16.2.7.1 Enable Manual Group Selection

**Address:** 610, bit 1

**Description:** This parameter allows to select if the group will be set automatically by the unit, or manually. When disabled, the unit sets the group (Unit ID % 6). When enabled, the group is configured by the Manual Group Number parameter.

**Data Range:** 0 – Disable, 1 – Enable

**Default value**: 0 – Disable

#### 16.2.7.2 Manual Group Number

**Address:** 611

**Description:** This parameter allows to define the unit group number, when selected to work with manual group selection.

**Data Range:** 0-5

**Default value**: 0

### *16.2.8 PointerCept Events*

The PointerCept feature includes dedicated OTA events sent from the end unit to the server.

#### 16.2.8.1 Enable PointerCept Beacon Start/Stop Logged Events

**Address:** 610, bit 2

**Description:** This parameter allows to enable dedicated PointerCept beacon start/stop logged events (TR 222) upon start/stop of PointerCept beacon.

**Data Range:** 0 – Disable, 1 – Enable

**Default value**: 0 – Disable

#### 16.2.8.2 Enable CPIN Error Distress Event

**Address:** 614, bit 5

**Description:** This parameter allows to enable dedicated CPIN error distress event (TR 223) upon SIM card disconnection.

**Data Range:** 0 – Disable, 1 – Enable

**Default value**: 0 – Disable

#### 16.2.8.3 Enable CPIN Error Logged Event

**Address:** 610, bit 4

**Description:** This parameter allows to enable dedicated CPIN error logged event (TR 223) upon SIM card disconnection.

**Data Range:** 0 – Disable, 1 – Enable

**Default value**: 0 – Disable