

# Programming Manual

## Cellocator CR200/CR200B

### 31w



Cellocator Division  
Pointer Telocation Ltd.

Proprietary and Confidential

Version 31w

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**POINTER**



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# 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 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 the direct wire interface.

## 1.2 References

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

#	Reference	Description

## 1.3 Revision History

Version	Date	Description
31c	27.10.11	Initial version, based on v31c rev6.
31d	12/12/11	Aligned to v31c rev8 Restored Sudden Course / Speed change functionality
31d.07	18/12/11	Restored DOP functionality
31d.08	25/2/12	Removed Programmable parameters of Backup Battery Disconnection threshold.
31f.1	19/4/12	Restored SIM Pin Lock Restored full distress mode (removed limitation of messages number)
31e.1	21/6/12	Restored Resolution Selection for time event. (Resolution Definer bit 7 on Address 106).
31e.2	26/6/12	Restored OTA Command Authentication Added "Lock to certain IMSI" feature
31h rev2	13.12.12	Section: 6.2.1Base unit (measurement factor of GPS odometer): <b>Valid Values</b> constrained to minimum 100m.
31w	18.4.2013	<ul style="list-style-type: none"><li>• Section 6.1.1.3.7: Maintenance server Session time update</li><li>• Address 1347: Enable IMEI transmission via type 0 bytes 33-38 and bits 5,6 of type 0 byte 41.</li><li>• Change version to 31w</li></ul>





## 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 *Wireless Channel Protocol* 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 *Direct Wire Interface Protocol* for more information about accessing the CM via the direct wire interface.

## 4 Event Types generated by Cellocator device

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

### 4.1 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 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 Distress transmission session is defined in a Time between Transmissions section of that document.

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

Distress session caused by different trigger, which occurred while the first session is not over 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.



## 5 Address Allocation Table

Address	Purpose
0-1	Application Configuration fist and second bytes
2	Unused
3 - 4	Hibernation mode communication settings
5	Unused
6 - 7	Application Configuration third and fourth bytes
8 - 31	Operational Sever - PPP Username
32-35	Reserved
36 - 65	Operational Sever - APN
66 - 69	Default Destination IP (low significant bytes first)
70 - 71	Time between Idle Communication Transmissions
72 - 73	Time between Distress Transmissions
74	Operational Sever - Modem type code
75	Number of Distress transmissions
76 - 79	- GPS odometer - Current value (in base units).
80 - 83	- GPS odometer - Base unit (measurement factor)
84	Reserved
85 - 88	- GPS odometer - Last Distance Event (in base units)
89 - 92	- GPS odometer - Trip for a Distance event. (in base units).
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 Start event.
98	Idle Speed event time filter.



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Address	Purpose
99	GPS Events Mask Bitmap
100 - 101	Inputs Logic Invert Mask
102	GPS Distress Triggers Bitmapped mask
103	Reserved
104	Journey Start alert time filter.
105	Journey Stop alert time filter.
106	Timed events period.
107 - 108	Any Server UDP Self Port
109 - 110	Operational server TCP/UPD Target Port
111-112	Reserved
113	Main Power Disconnection threshold - high level
114	Main Power Disconnection threshold - low level
115	Main Power Low threshold - high level
116	Main Power Low threshold - low level
117	Backup Battery Disconnection threshold - high level
118	Backup Battery Disconnection 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	Reserved
124 - 125	Inputs Events mask - on Falling
126 - 127	Inputs Events mask - on Raising
128 - 129	Inputs Distress mode mask - on Falling



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Address	Purpose
130 - 131	Inputs Distress mode mask - on Raising
132 - 133	Towing detection - Speed threshold
134	Towing detection - Geo-Fence perimeter
136	Inputs change filter
137	Towing detection filter
138	Backup battery extra charge time
139	Message transit Acknowledge timeout
140	Reserved
141 - 164	Operational Sever - PPP Username
165 - 166	Modem Reset Period
167 - 176	Reserved
177 - 186	SMS Center Address
187 - 196	SMS Default Destination Address
197 - 200	Active SIM PIN code
201 - 202	Communication settings in Home GSM Network Mode
203 - 204	Communication settings in Roam GSM Network Mode
205 - 262	Reserved
263	GPS Peeking - Max. On Time
264 - 265	GPS Peeking - Off Time
266	Power Management mode
267	GSM Peeking - Max. On Time (CR200B only)
268 - 269	GSM Peeking - Off Time (CR200B only)
270	GSM Peeking - Max. Registration Time (CR200B only)
271 - 272	Hibernation Mode Delay
273 - 283	Reserved



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Address	Purpose
284	Anti-Flooding timer
285-454	Reserved
455	Velocity threshold for HIGH SPEED mode
456 - 465	Reserved
466	Power Sources Measurement Time Filter
467	Accelerometer Configuration
468	Reserved
469	Internal variable: AHR counter
470-472	Reserved
473	Speed Range Threshold V0
474	Speed Range Threshold V1
475	Speed Range Threshold V2
476	Harsh Braking Threshold on Speeds below V0
477	Harsh Braking Threshold on Speeds between V0 and V1
478	Harsh Braking Threshold on Speeds between V1 and V2
479	Harsh Braking Threshold on Speeds higher then V2
480	Delta Course Threshold 0
481	Delta Course Threshold 1
482	Delta Course Threshold 2
483	Delta Course Threshold 3
484-491	Reserved
492	Idle Speed Alerts Control Bitmask
493	Time Based Events Mask Bitmap
494	Time Based Distress Mask Bitmap
495-496	Reserved



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Address	Purpose
497	Active GPS Distress Triggers Bitmapped mask (second byte, the first is on 102)
498-502	Reserved
503	Outputs Inversion Mask
504	Number of AHR retries
505	Reserved
509-510	Odometer estimation (GPS) configuration bitmask
511	Acceleration Threshold on Speeds below V0
512	Acceleration Threshold on Speeds between V0 and V1
513	Acceleration Threshold on Speeds between V1 and V2
514	Acceleration Threshold on Speeds higher then V2
515	Registration Lack Timeout (for Modem's AHR)
516 - 521	Reserved
522	GSM Jamming Detection - Activated outputs release configuration
523 - 532	Reserved
533	Output activation upon over speeding
534-1007	Reserved
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
....	....
1037-1039	Roaming Operator's Management - PLMN 10
1040-1313	Reserved
1314 -	Reserved for Customer's Use



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Address	Purpose
1317	
1318-1325	Reserved
1326-1329	New SIM PIN code
1330-1345	Reserved
1346	Period between the events, triggered by detection of power disconnection
1347	Application Configuration byte 6
1348	Application Configuration byte 5
1349	Application Configuration byte 7
1350-1351	Reserved
1352	Periodical Modem Reset Randomization threshold
1353	Anti-flooding randomization threshold
1354-1390	Reserved
1391	Maintenance Server connection type
1392-1395	Maintenance Server IP address
1396-1397	Maintenance Server target port
1398	Maintenance Server configuration bitmask
1399	Maintenance Server connection period
1300	Maintenance server Session time update
1402	Reserved
1403-1432	Maintenance Server APN
1433-1619	Reserved





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Address	Purpose	
1620	Measurement reported in Byte 28 of OTA Msg type 0	
1621	Measurement reported in Byte 28 of OTA Msg type 0	
1622	Measurement reported in Byte 28 of OTA Msg type 0	
1623	Measurement reported in Byte 28 of OTA Msg type 0	
1624	Unused (ex. External Power management for CelloTrack Power)	
1625	DOP	
1626-1649	Maintenance Server PPP APN - Username	
1650-1673	Maintenance Server PPP APN - Password	
1673-1686	Unused	
1687	Input Type / function	Shock (pin 15)
1688	Scaling Factor (LSB)	
1689	Scaling Factor (MSB)	
1690	Freq./ Analog Input Configuration Byte	
1691-1692	Frequency / Analog Low Threshold / Discrete Wet/Dry Threshold (1691)	
1693	Frequency / Analog High Threshold	
1695	Violation Time Filter (Freq. / Analog)	
1696	Spare	
1697	Spare	
1698	Spare	
1699	Input averaging factor	
1700-1710	Reserved	



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Address	Purpose
1711	Reserved for manufacturer usage (Timer of retry of SIM operation upon failure)
1712-1913	Reserved
1914-1916	Lock to certain IMSI
1917-2393	Reserved
2394 - 2425	DNS for Maintenance Server
2426	GSM Jamming Detection - 1 <sup>st</sup> activated output
2427	GSM Jamming Detection - Template of 1 <sup>st</sup> activated output (1 <sup>st</sup> byte)
2428	GSM Jamming Detection - Template of 1 <sup>st</sup> activated output (2 <sup>nd</sup> byte)
2429	GSM Jamming Detection - 2 <sup>nd</sup> activated output
2430	GSM Jamming Detection - Template of 2 <sup>nd</sup> activated output (1 <sup>st</sup> byte)
2431	GSM Jamming Detection - Template of 2 <sup>nd</sup> activated output (2 <sup>nd</sup> byte)
2432	GSM Jamming Detection - activation time filter for the 1 <sup>st</sup> output
2433	GSM Jamming Detection - activation time filter for the 2 <sup>nd</sup> output
2434-2463	Reserved
2464-2495	DNS for Operational Server
2496-2516	Geo Fence 1 Configuration
....	....
2736-2751	Geo Fence 16 Configuration
2752-4095	Reserved



## 6 Communication and Configuration

### 6.1 Communication settings

#### 6.1.1 GPRS Settings

##### 6.1.1.1 Acknowledge OTA

###### 6.1.1.1.1 Message Transit Acknowledge Timeout

**Address:** 139

This parameter defines the maximum time the unit will wait for server to acknowledge a plain event<sup>1</sup>. If no ACK is received by this time, the event will be retransmitted.

#### Event's Delivery Algorithm

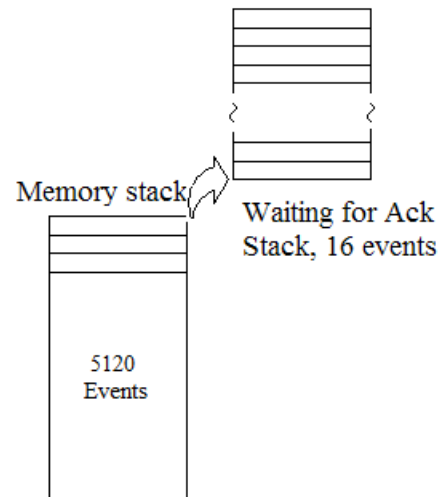
Once generated, a plain event is stored into memory stack of the unit. This memory stack can store up to 5120 **plain** events. When it is full, newer events will push out the older ones (FIFO). The event will be uploaded to the Control Center only during the GPRS session and will be deleted from the memory of the unit only after reception of an acknowledge from Central Control. **Note: Plain events will never be delivered by SMS!**

While the GPRS session is active, the event is being shifted from Memory Stack is into Waiting for ACK stack, which can simultaneously store up to 16 events.

Waiting for ACK stack is delivering events to the default destination IP and storing them until reception of the Acknowledge. Upon reception of the Acknowledge the event is deleted from Waiting for ACK stack and next event from the EEPROM memory is shifted to its place.

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.



<sup>1</sup> Plain event is one of the four available event generation patterns proposed by Cellocator unit. Refer to the Event Types section above in this document.



#### 6.1.1.1.2 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)

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)

#### 6.1.1.2 Anti flooding

In case when the GPRS is available, but the destination server fails or unreachable, the unit will not receive acknowledges from the server and try to resend the data. Anti-Flooding algorithm is designed to decrease communication cost (GPRS traffic) during server (CCC) failure.

The unit will not store IP Up events into log memory. When dialing to GPRS, only the IP Up message will be sent to the server. The unit will not try to download accumulated event before reception ACK to the IP up message

#### 6.1.1.1.3 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

#### 6.1.1.1.4 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 cause's 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 to a different value, limited by a programmable threshold.

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

A - Anti-flooding timer parameter

Ta - Anti-flooding threshold, programmed in EEPROM

Wrong programming protection:



if  $A \leq T_a$  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

### 6.1.1.3 Operational Server Support

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.

#### 6.1.1.2.1 APN- operational server

**Address:** 36 -65

**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"

#### 6.1.1.2.2 APN Username – operational server

**Address:** 8 -31

**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"

#### 6.1.1.2.3 APN Password- operational server

**Address:** 141 -164

**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:** zeros

#### 6.1.1.2.4 Operational Server IP Address

**Address:** 66 to 69

**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:** varies. Change this to the IP address of central command

#### 6.1.1.2.5 *Operational Server DNS Address*

**Address:** 2464-2495

**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.

- ◆ CR200 / CR200B 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.

#### 6.1.1.2.6 *Listening UDP Port (while connected to both operational server or maintenance server)*

**Address:** 107 -108

**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

#### 6.1.1.2.7 *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

### 6.1.1.2.8 Modem Type Code 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:** 0

### 6.1.1.4 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 maintenance 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 peaking.

The unit periodically connects (completely drop an existent connection if exist 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 change 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 maintenance server expires while the unit is hibernating, it will not wake up; instead it will dial maintenance server immediately after the next COM glancing.

It is possible to disable firmware upgrade 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 is NOT sending logged or distress events to the maintenance server. It keeps logging events as usual during the maintenance session (except firmware upgrade time) but does not upload them. The unit will reply commands sent from a Maintenance server.

Distress alerts and real time based alerts, occurred during 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.

#### *6.1.1.3.1 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

#### *6.1.1.3.2 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

#### *6.1.1.3.3 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 (including the AHR).

**Default value:** 0 - Disable





#### 6.1.1.3.4 *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

#### 6.1.1.3.5 *Enable auto connection to maintenance server*

**Address:** 1398, Bit 4

**Description:** If this bit is disabled the unit will never try connecting to 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

#### 6.1.1.3.6 *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 a 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 repr. of unit's ID} [min]

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

**Value span:** 0-255minutes, A value of zero means no delay. Make sure to set a value different from zero while enabling this feature.

**Default value:** 0

#### 6.1.1.3.7 *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 towards the unit, the FW will cancel the 3 Min time out, or what left of it, and replace it with new session timeout value defined by this parameter.

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

**Resolution:** 10 Sec



**Default value:** 30 Seconds

#### 6.1.1.3.8 Maintenance Server APN

**Address:** 1403 -1432

**Description:** These parameters 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:** First byte 0 to 0x1D, second to 30th - ASCII characters.

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

#### 6.1.1.3.9 Maintenance APN Username – maintenance server

**Address:** 1626 -1649

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

#### 6.1.1.3.10 Maintenance APN Password– maintenance server

**Address:** 1650 -1673

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

#### 6.1.1.3.11 Maintenance Server IP Address

**Address:** 1392 to 1395

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

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

**Default value:** zeros. Change this to the IP address of the maintenance server.

#### 6.1.1.3.12 Maintenance Server DNS Address

**Address:** 2394-2425



**Description:** same as DNS for operational server, see above 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.

### 6.1.1.3.13 Maintenance server target UDP/TCP Port

**Address:** 1396-1397'

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

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

**Default value:** 231

### 6.1.1.3.14 Listening UDP Port

**Address:** 107 -108

**Description:** same as in operational server

### 6.1.1.3.15 Modem type code when connected to the maintenance server

**Address:** 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

## 6.1.2 SMS Settings

### 6.1.2.1 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: 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). The rest of the bytes that are not used should contain 00FFh.

**Default value:** Cellocator Israel's SMS center address (+972-52-5539819).

### 6.1.2.2 SMS Center Address

**Addresses:** 177 – 186

**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 15). The rest of the bytes that are not used should contain 00FFh.

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 0F6h 0FFh, the address that will be used is the international address +972-54-123456, from left to right.

**Default value:** Cellcom Israel's SMS center address (+972-52-1100059).

### 6.1.2.3 Enable Active SMS in hibernation

**Address:** 4, bit 4

**Description:** This bit's enables preventing of an Active SMS generation in one of available hibernation modes (during parking).

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

**Default:** 1 (Enable)

## 6.1.3 Comm. Permissions in Home/Roam Network

### 6.1.3.1 Enable GPRS

**Address:** In home network 201 bit 2, In Roam network 203 bit 2

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



**Default value:** Enabled (1)

### 6.1.3.2 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 (1)

### 6.1.3.3 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:** Disabled (1)

## 6.1.4 Distress Session configuration

Distress Session – is one of four possible ways to deliver the data to a Central Control (refer to Events Types article above in this document).

If the condition for the specific event is met, the unit will create a series (up to 5) 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.

### 6.1.4.1 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)



### 6.1.4.2 Number of Distress Transmissions

**Address:** 75

**Description:** This parameter defines the maximum amount of (active) transmissions that are allowed to be sent in Distress mode, if no more sensors are triggered. Because the amount of time between such transmissions is fixed (determined by the "Time between Distress Transmissions"), this in fact determines the maximum amount of time in this mode.

The maximum time is therefore [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).

Legal values span: 01h (one transmission) through 255h.

Wrong values will be saturated.

**Default value:** 1

### 6.1.5 Internal Accelerometer Configuration

**Movement Detection:** The CR200/CR200B unit can reliably detect Ignition start /end using its onboard accelerometer. This capability helps to release an Ignition input for general usage.

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

Samples of such functionality: Start/Stop alerting, 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 STBEO<sub>n</sub> if movement is detected for longer than defined in "Start Event time filter" programmable parameter on address 0d104.
- ◆ The unit changes its operational mode to STBEO<sub>ff</sub> if lack of movement is detected for longer than defined in "Stop Event time filter" programmable parameter on address 0d105.

**Towing Detection:** The CR200 / CR200B unit is able to reliably detect towing using its onboard accelerometer. The feature shall be applicable when:

- ◆ An ignition input represents an Ignition switch.
- ◆ 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.

#### 6.1.5.1 Accelerometer Sensitivity

**Address** 467, bits 3-4

**Description:** It is possible to calibrate the sensitivity of the internal accelerometer (4 levels) and to adapt it to any vehicle. The default value of 1 is adapted to detect



movement start / end in standard family vehicle. In case of track 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

### 6.1.5.2 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.

### 6.1.6 Enable GPS wake up upon movement for towing detection

**Address** 467, bit 1

**Description:** This bit 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

### 6.1.7 Roaming List, GSM Operator's Management

The non-volatile configuration is storing a list of 10 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.

#### 6.1.7.1 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

### 6.1.7.2 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

### 6.1.7.3 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 10

**Default value:** zero

### 6.1.7.4 Public Land Mobile Networks (PLMN)

**Addresses:**

Address	Value
1010-1012	PLMN 1
1013-1015	PLMN 2
....	....
1037-1039	PLMN 10

**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 single parameter in the following way:





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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.

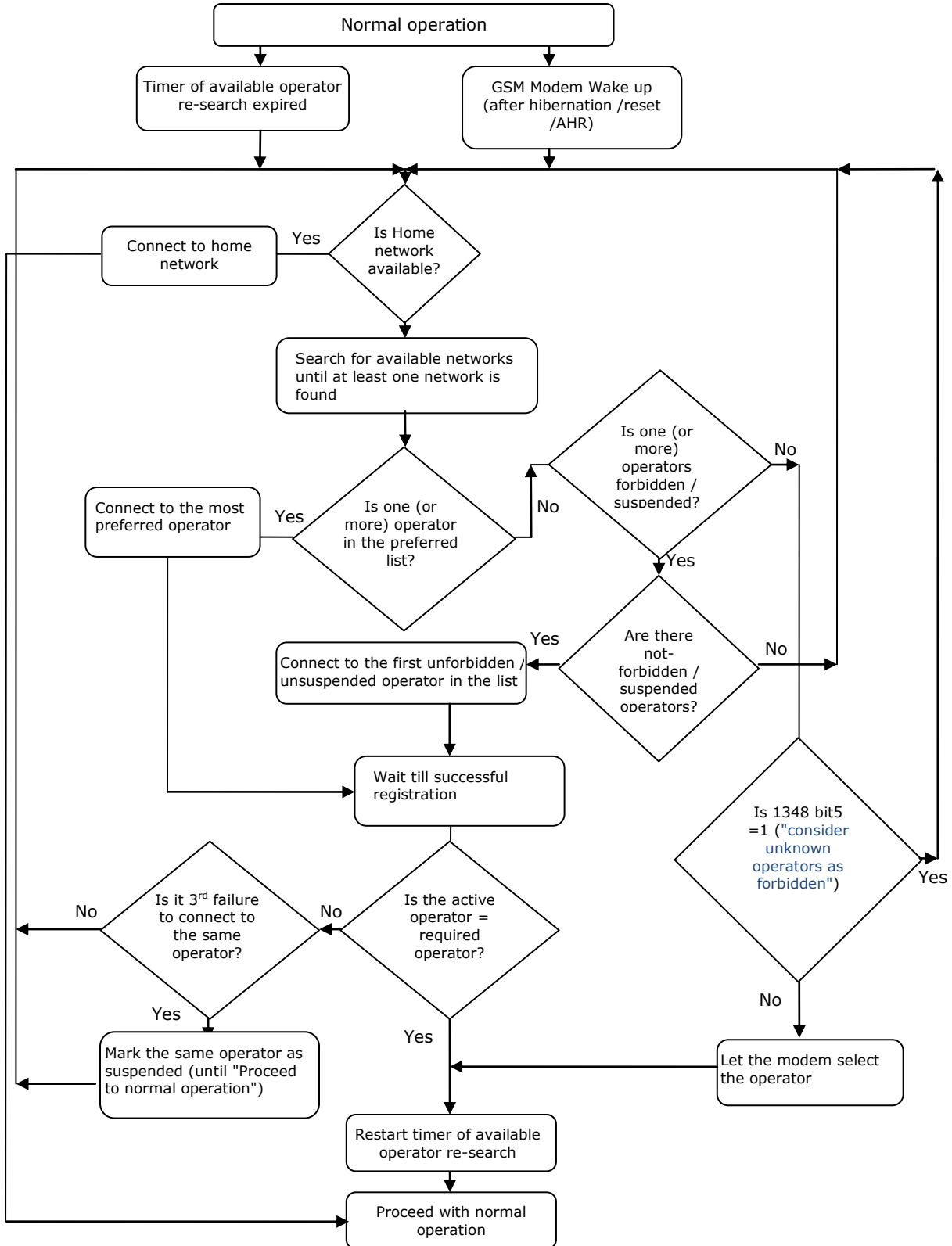
*Note: The network available in the air, but not listed in the pre-programmed PLMN list will be considered as a network with lowest priority (lower than 01, but still enabled).*

*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 proceed with searching.*

**Default value:** zeros

### 6.1.7.5 Operator's selection flow chart





### 6.1.8 GSM Jamming Detection & Reaction (CR200B only)

The unit might be configured to detect GSM jamming attempt and to activate alarm indication and / or vehicle immobilization as a response to GSM jamming.

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 certain activity of Ignition input.

#### 6.1.8.1 GSM Jamming Detection

The cellular modem detects jamming and, if not in not during active GPRS session, initiates periodical report 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 change 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 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, that in this case (GSM Jamming during GPRS Session) the Acknowledge Timeout is directly affecting time to Jamming Detection.**

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

#### 6.1.8.2 Disable GSM Jamming Event

**Address:** 1348, bit 3

**Description:** if this flag is set (1) the unit will NOT register GSM JAMMED event upon detection of GSM jamming.

Note that output activation as a reaction to jamming is independent from registration of GSM JAMMED event.

**Default value:** zero (enabled)



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

Upon GSM jamming detection and expiration of an 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)
- ◆ 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.*

#### 6.2.4.2.1 Output, auto-activated upon Jamming Detection

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

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

Output's name	Output's number
Feature Disabled	0
Reserved	1-3
LED	4
Blinkers	5
Reserved	6-7

**Default value:** zero

#### 6.2.4.2.2 Output's activation timeout

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



### 6.2.4.2.3 Output Activation Pattern (Upon Jamming Detection)

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

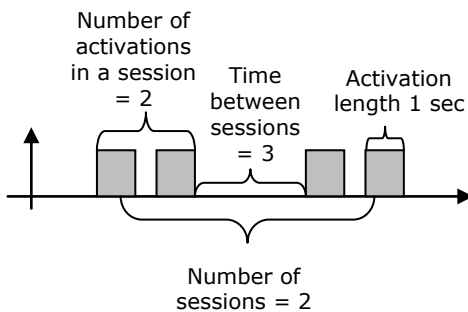
**Description:** This pair of parameters defines a activation pattern of outputs upon jamming detection.

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 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

### 6.1.8.4 Template of Output Activation upon Jamming Detection

Example of template:

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



### 6.2.4.3.1 GSM Jamming - Output activation template - Activation length

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

**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



#### 6.2.4.3.2 GSM Jamming - Output activation template - Number of activations in a session

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

**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

#### 6.2.4.3.3 GSM Jamming - Output activation template - Number of activation sessions

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

**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

#### 6.2.4.3.4 GSM Jamming - Output activation template - Time between the activation sessions

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

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

**Value resolution:** 0.5 second

**Default value:** zero

#### 6.2.4.3.5 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)
2. Switch it back off for a period between 0.5 to 2 seconds (Ignore input change time filter)
3. 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



## 6.1.9 *Other Configuration Parameters Related To Communication settings*

### 6.1.9.1 **Disable Active Transmissions**

**Address:** 6 bit 1

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

**Default:** 0 – Enable Active Transmissions

### 6.1.9.2 **Renew GPRS upon drop (in average hibernation, for CR200B only)**

**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 resources 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)

### 6.1.9.3 **Enable OTA 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 GPS Calibration

### 6.2.1 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:** The minimal value should be 100m (10000)

**Default Value:** 100000

### 6.2.2 Odometer's current value

**Address:** 76 to 78

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

*Note: This parameter does not require reset to be implemented.*

**Data format:** The parameter is a 24-bit integer,

**Value span:** 000000h to FFFFFFFh.

**Default value:** 000000h.

### 6.2.3 Enable GPS Navigation Start-Stop updates

**Address:** d99, bit 0 for plain event  
d102, 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 (after hardcoded 10 seconds filter).

**Default:** Both disabled (0)

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

### 6.2.4 Velocity threshold for HIGH SPEED mode

**Address:** 455

**Description:** The unit can be configured to decrease frequency of Time 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<sup>2</sup> parameters to define from what speed the number of the events should be decreased.

**Data format:** 16-bit unsigned. Unit's [cm/sec]

**Default value:** 200 (~7.2 km/h)

## 6.2.5 *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:** 8

## 6.2.6 *GPS Maintenance Updates*

### 6.2.6.1 *Enable GPS Navigation Start-Stop updates*

**Address:** d99, bit 0 for plain event

d102, 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 disabled (0)

## 6.2.7 *GPS Reset Settings*

### 6.2.7.1 *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 is 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 warm 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.

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<sup>2</sup> Address 92 and 35, bits 4 to 7



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



## 6.3 Inputs & Outputs

### 6.3.1 *Common Discrete Inputs Time Filter*

**Address:** 136

**Description:** This parameter is aimed to protect unit's 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:** 00h to FFh

**Default value:** d10

### 6.3.2 *Power Sources Measurement Averaging Time*

**Address:** 466

**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 10 msec.

**Value span:** 00h to FFh

**Default value:** d100 (1 second)

### 6.3.3 *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:** Disable Logical

### 6.3.4 *LED Management*

**Address:** 7, bit 4

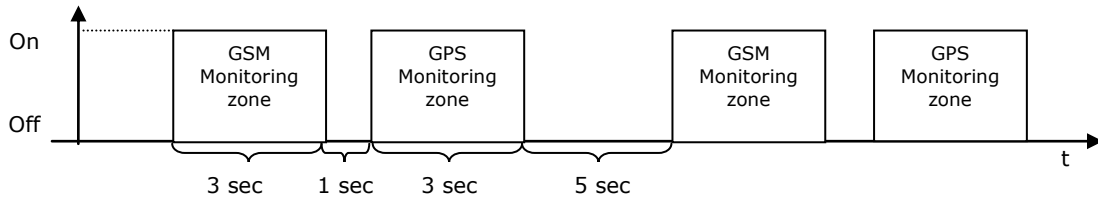
**Description:** This flag enables LED monitoring, which is different in Fleet and Security modifications of Cellocator units.

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 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.

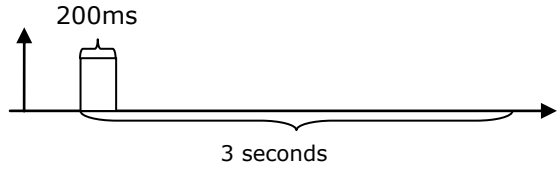
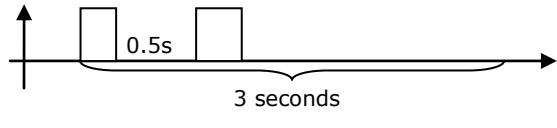
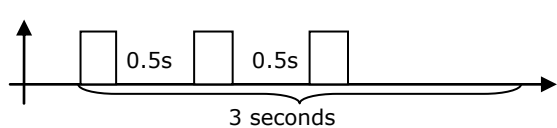
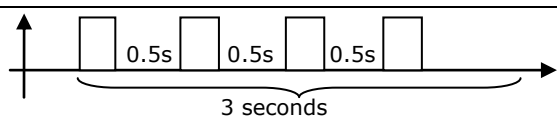
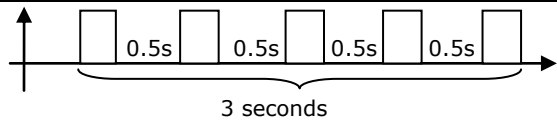


5 seconds LED Off interval will separate between each cycle.

**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.**

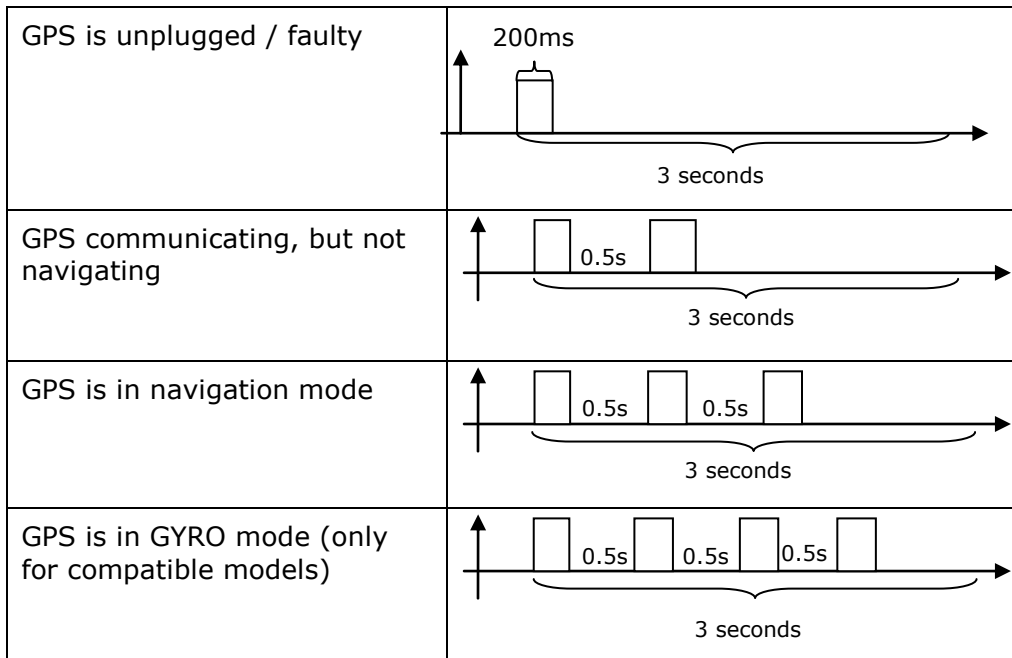
The cycles of two blinking zones will be restored after the end of the voice call.

### GSM Monitoring Zone definition

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

### GPS Monitoring Zone definition

Status	Blinking pattern
GPS off	off



**In Security modification**

1 seconds on/1 seconds off – Alarm Armed

On - Silent delay

Slow Blinking – Passive Arming

Off – Standby

Rapid blinking – Alarm Triggered

**Default value:** 0 - LED Management Enable;

**6.3.5 Analog (& Frequency<sup>3</sup>) inputs in OTA message**

**6.3.5.1 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.

<sup>3</sup> Frequency counters are supported from fw30a



Pin Number/Field Name	Number to be programmed	Remarks
Non	0	
Battery voltage (V bat)	6	Default for byte 27 of OTA Message 0. Applicable for CR200B only, don't care for CR200
Battery temperature (NTC), default for byte 3, Only for CR200B	7	Default for byte 29 of OTA Message 0 Applicable for CR200B only, don't care for CR200
Regulated voltage	8	Default for byte 28 of OTA Message 0
Main power	9	Default for byte 26 of OTA Message 0

### 6.3.6 *Outputs Inversion Mask*

#### 6.3.6.1 **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



## 6.3.7 Modem & SIM

### 6.3.7.1 Lock to Certain IMSI

**Address:** 1914-1916

**Description:** If this parameter contains a value of 5 or 6 BCD numbers, the CR200 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.

**Data format (GSM):** The bytes contain the digits of the IMSI, 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.

**Example:** For SIM of Telcel the subscriber identity will be 334020: 334 (MCC Mexico ) 020 (MNC Telcel)

**Default:** Null (feature disabled)

### 6.3.7.2 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

### 6.3.7.3 AHR (Auto Hardware Reset for Modem)

When one of the reasons listed below is detected the unit will attempt to Auto Hardware Reset (AHR) its modem up to programmable number of retries (5 by default).

- ◆ No GSM registration in Ignition On mode for programmable time
- ◆ The modem does not respond to an AT commands<sup>4</sup>.

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<sup>4</sup> The unit queries the modem 5 times, if there is no reply the unit resets the modem after the 5th retry.

After 4 modem resets caused by lack of response the AHR is triggered.



The unit will create a dedicated event per each AHR (if enabled in Second Configuration Byte).

#### 6.4.2.4.1 *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

#### 6.4.2.4.2 *Number of AHR retries*

**Address:** 504

**Description:** The low nibble of this parameter stores the maximal allowed number of AHR retries 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.

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.

#### 6.4.2.4.3 *Enable AHR reporting*

**Address:** 0, bit 1

**Description:** If this bit is enabled the unit will store a plain event with dedicated transmission reason (d200) upon each performed AHR.

**Default:** 0 (Disabled)

### 6.3.8 *Modem Reset Settings*

#### 6.3.8.1 *Modem Reset Period*

**Address:** 165-166





**Description:** This parameter defines 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** (Dec): 1440 (24 hours)

### 6.3.8.2 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.

$(P - Tr) \leq \text{Modem Reset interval} \leq (P + Tr)$

P - Periodical Modem Reset parameter

Tr - Periodical Modem Reset Threshold

**Wrong programming protection:** If  $P \geq Tr$  the unit will NOT use the low limit of randomization.

**Example:**

$P=30\text{minutes (res=1min) and } Tr=45\text{minutes (res=15min)} \Rightarrow -15 < \text{modem reset} < 75$

In this case the lower limit of randomization will not be used:

$P \leq \text{modem reset interval} \leq 75$

**Data format:** Resolution of programmable threshold is 15 minutes, 1 byte.

**Default value** (Dec): 0 (no randomization)

## 6.3.9 SIM PIN

### 6.3.9.1 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 0d1326 – 0d1329



Note:

- ◆ 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: wrong 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 (disabled)

### 6.3.9.2 Active SIM PIN

**Addresses:** 197-200

**Name in Programmer:** SIM PIN

This parameter stores the PIN code that will be entered to unlock the GSM SIM card when required.

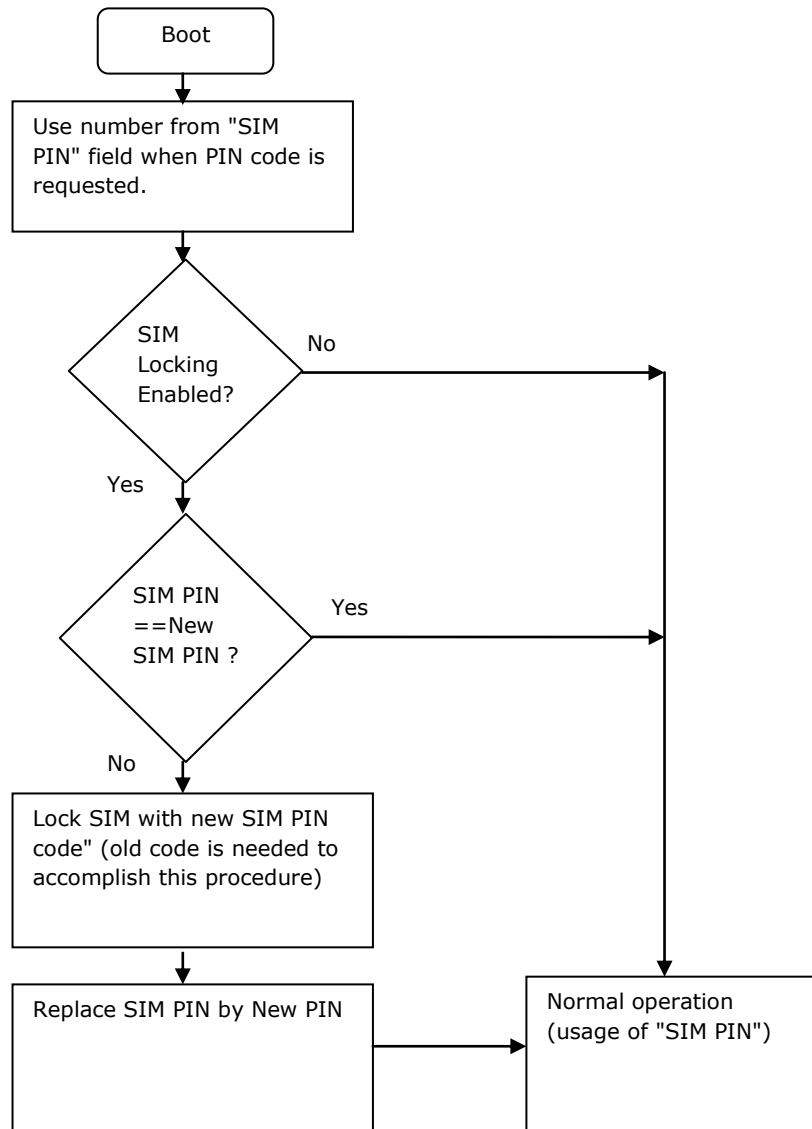
**Data format (GSM):** The bytes contain the digits of the PIN, encoded in BCD. The order of the transmission is bytes with lower address first, lower nibbles first. If only the lower nibble of a byte is used (this is legal only in the last byte – in case this is the last digit of the PIN), the higher 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 FFh.

**Default value (dec):** 1234

### 6.3.9.3 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:



Since the unit is actively modifying a 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.

**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** (dec): 1234



## 6.4 Power Management

### 6.4.1 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 <sup>5</sup>
0	No hibernation	Both GSM and GPS modules are fully active during parking, GPRS session active	<u>Average:</u> 37.35mA <u>Peak:</u> 181.2mA
1	GPS Peeking (only available in CR200B)	The GSM modem active, GPRS session active. The GPS is peeking as per programming (see below)	(while GPS is off) <u>Average:</u> 23.69mA <u>Peak:</u> 104.5mA
2	Full Hibernation	Both GSM and GPS modules are in asynchronous peeking as per programming below. The unit does not respond to RS232 queries as well <i>Note: In this mode Security Modification will not be able to detect Signal Correlation</i>	(while both GPS & GSM off) <u>Average:</u> 782uA

**Default value:** 1

### 6.4.2 Enable automatic hibernation on low power

**Address:** 1, bit 0

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 - disabled

<sup>5</sup> In lab conditions, no battery, Vin=13.7V, very good GPRS coverage over 900MHz GSM network. The results might vary under different test conditions.



### 6.4.3 Hibernation Mode Delay

**Address:** 271-272

**Description:** This parameter defines time interval between Stop Event and entering any programmed Hibernation Mode.

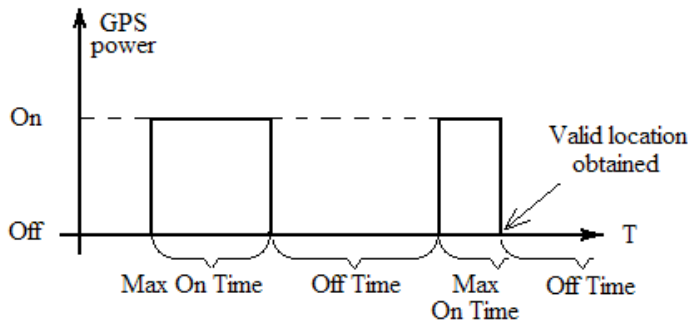
**Data format:** 16-bit unsigned integer, 16 seconds resolution.

**Value span:** 0x01 (16 seconds) through 0xFFFF (291 hours).

**Default value:** 60 , (16 minutes)

### 6.4.4 GPS Peeking

#### 6.4.4.1 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 1 or 2.

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).

**Default value:** 5 , (1 minute 20 seconds)

#### 6.4.4.2 GPS Peeking – Off Time (of Compact and 370-50)

**Address:** 264 -265

**Description:** This parameter defines the amount of time between GPS peeks. (Refer to the chart in GPS Peeking – Max On Time). During this time the GPS is turned off, to conserve energy.

**Data format:** 16-bit unsigned integer, 16 seconds resolution.

**Value span:** 01h (16 seconds between two consecutive peeks) through FFFFh (~12 days between two consecutive peeks).



**Default value:** 675 (3 hours from the end of one peek to the start of the next one)

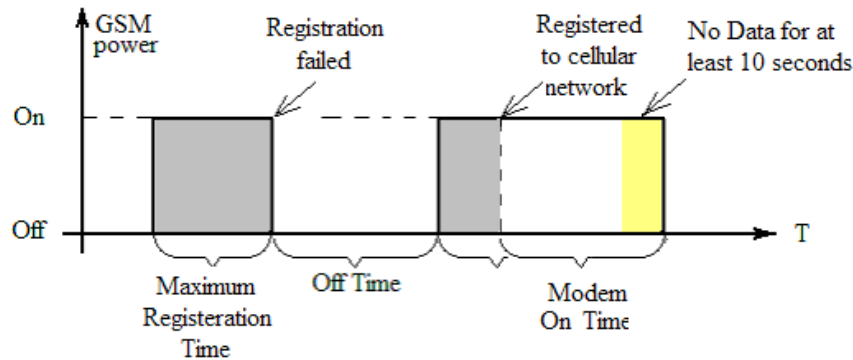
## 6.4.5 GSM Peeking

### 6.4.5.1 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.

If registration is being accomplished, the modem is kept turned on for time period defined in Modem On Time parameter. The modem is switched back off when Modem On time expires and there is no data transfer for at least 10 seconds.

**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).

### 6.4.5.2 GSM Peeking – Maximum 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:** 01h (16 seconds between two consecutive peeks) through FFFFh (~12 days between two consecutive peeks).

**Default value:** 225 (1 hour from the end of one peek to the start of the next one)

### 6.4.5.3 GSM Peeking –Modem On time

**Address:** 267

**Description:** This parameter defines time the modem is kept turned on after the end of the GSM registration. 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.

**Default value:** 4 (1 minute and 4 seconds)

### 6.4.6 Battery charging (for CR200B only)

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 45°C.

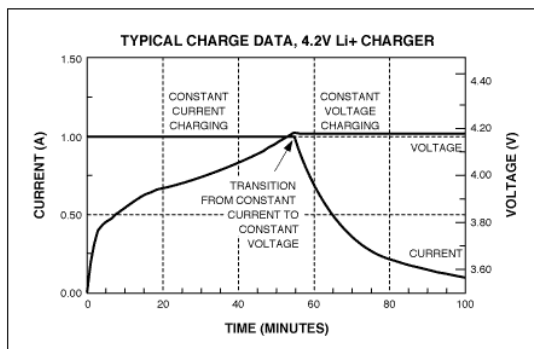


Figure 2. Typical results are shown for a Li+ battery charged using a CCCV charger.

The full charge time of the standard 700mAh battery is ~2hours.

#### 6.4.6.1 Maximum Backup Battery extra charge time

**Address:** 138

**Description:** This parameter defines the maximum time for extra backup battery charge in Ignition Off mode. The charge process begins upon Ignition off in case of detection of low level of backup battery (see corresponding programming parameter), and continues for the time defined in this parameter.

**Data format:** 8-bit unsigned integer, resolution of 10.24 sec.

**Value span:** 00h to FFh

**Default value:** 117 (~20 minutes)



## 6.5 Informative parameters

### 6.5.1 *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

### 6.5.2 *Field for customer's 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 & Speed events

### 7.1 Distance events

#### 7.1.1 *Enable Distance Updates*

**Address:** 99 bit 1 for Plain Events

**Description:** This parameter enables generation of the Events and/or Distresses upon the passage of a certain distance.

**Default value:** Zero (disabled)

#### 7.1.2 *Trip for a Distance event*

**Address:** 89 – 91

**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

### 7.2 Over (and Idle) Speed

#### 7.2.1 *Velocity threshold for Over Speed Start*

**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 Over Speed Duration filter parameter, the unit will consider over-speeding. If corresponding updates are enabled, the unit will generate event or/and distress.

**Value resolution:** Units in 32 cm/sec

**Default value:** 91 (105km/h)

#### 7.2.2 *Velocity threshold for Over Speed End*

**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.

**Value resolution:** Units in 32 cm/sec.

**Default value:** 87 (100km/h)



### 7.2.3 *Over Speed Duration filter*

**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 2.56 Seconds. Duration Span from: 0 seconds (0x00h), to 10min 30 sec (0xFEh).

**Default value:** 4, (~10 seconds)

### 7.2.4 *Don't 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" event for longer than 10 seconds.

**Default value:** 0 (disabled)

### 7.2.5 *Output activation upon over speeding*

It is possible to notify the driver when he is over-speeding. Normally it is done by activation of buzzer in a cabin upon over-speeding detection.

#### **Activation**

Upon over-speeding condition violation (i.e. overspending for longer that an appropriate time filter), the unit can activate a chosen output.

The output activation is independent from event/distress over-speeding generation: it will be triggered even if no over-speeding event/distress alert enabled.

#### **Deactivation**

The output, activated upon over-speeding violation, is deactivated upon over-speeding session end, even if no over-speeding event/distress alert enabled.

Reset will also deactivate an output activated upon over-speeding violation.

#### **Interaction with other Output Activation mechanisms**

The priority of the output activation upon over-speeding violation is lowest.

Any other output activation (manual activation, jamming, etc) has stronger priority and will take control over the selected output when needed.

#### 7.2.5.1 **Number of output, activated upon Over Speeding**

**Addresses:** 523, bits 0-2

**Description:** This field contains the number of the output used by this notification routine.

Output's name	Output's number
---------------	-----------------



Feature Disabled	0
Reserved	1-3
LED	4
Blinkers	5
Reserved	6
Reserved	7

**Default:** (0) Notification disabled

### 7.2.5.2 Duration of output activation, upon over speeding

**Addresses:** 523, bits 3-5

**Description:** This field contains the duration of the output activation upon over-speeding. Zero for continuous activation while over-speeding

**Resolution:** 0.5 seconds/bit

**Default:** (0) Continuous activation

### 7.2.5.3 Number of output activation repetitions upon over speeding

**Addresses:** 523, bits 6-7

**Description:** This field contains the number of the output activation repetitions (Duty cycle 50%) upon over-speeding. Zero for continuous repetition while over-speeding.

**Default:** (0) Continuous repetition

### 7.2.6 Velocity threshold for Idle Speed Start event

**Address:** 97

**Description:** This parameter stores velocity threshold used for Idle Speeding<sup>6</sup> session start. 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 Speed 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

---

<sup>6</sup> Idle Speeding - vehicle is parking with working engine



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 *Idle Speed Duration filter*

**Address:** 98

**Description:** Timeout value, used to consider the idle speed violation start /end.

**Value resolution & span:** Duration resolution is 2.56 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.

$$\text{Time for generation Idle Speed Start} = \text{Idle Speed Duration Filter} * (\text{Multiplier} + 1)$$

Value of 0 disables multiplier.

**Default:** zero

### 7.2.10 *Don't 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

**Description:** **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.

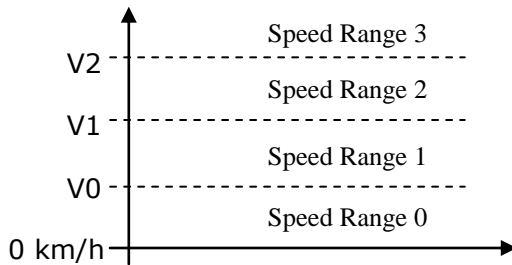
### 7.3.1 The speed thresholds V0, V1 and V2

**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<sup>7</sup> 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 8 bits parameters with resolution of 16 cm/sec	Acceleration Threshold 8 bits parameters with resolution of 16 cm/sec	Course Delta Threshold 8 bits parameters with resolution of 0.016 rad
Speed Range 0	476	511	480
Speed Range 1	477	512	481

<sup>7</sup> The unit is getting an updated GPS data fix every 1 second.



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
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

### 7.3.3 Events and Distress updates control

#### 7.3.3.1 Sudden Speed Change (Acceleration and harsh braking)

**Address:** 99, bit 4 for Events

102, bit 4 for Distress

**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 (Acceleration and harsh braking)

**Address:** 99, bit 5 for Events



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102, bit 5 for Distress

**Description:** If this bit is set, the unit will generate a corresponding update for any detected harsh course change.

**Default Values:** zeros (disabled)





## 8 Time & Trip events

### 8.1 Start & Stop Alerts

#### 8.1.1 Start Alert Generation Time Filter

**Address:** 104

**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:** 4

#### 8.1.2 Stop Alert Generation Time Filter

**Address:** 105

**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:** 4

### 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 speed condition: High Speed mode or Normal Speed mode.

#### 8.2.1 Time alert's Period Value

**Address:** 106, bits 0-6 for Home network

**Description:** This parameter stores a Time based alert Period value with resolution of 4 seconds). Value 0 disables the time based alerts.

**Default value:** 75 (300 seconds when)

#### 8.2.2 Time Alerts Resolution Definer

**Address:** 106, bit 7



**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

**Default value:** 0 – resolution of time based alert period is 4 seconds.

### 8.2.3 *Time alert Period Multiplier for HIGH SPEED mode*

**Address:** 92, bits 4-7

**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 Time based alerts to times less

Value of zero disables the time based alerts in High Speed mode.

**Default value:** 1

### 8.2.4 *Event Control of Time Alert*

**Address:** 493, bit 1 for Events

**Description:** This parameter enables generation of Event or Distress alerts for Time Based events.

**Default value:** 1 (enabled)

## 8.3 Communication Idle Alerts

### 8.3.1 *Time Between Communication Idle Alerts*

**Address:** 70-71

**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.

The Idle Transmission alerts are independent from Ignition state. They will trigger even in a Full Hibernation mode; 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:** D 30 (30 minutes)

### 8.3.2 *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)



### **8.3.3** *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.



## 9 Inputs Events

CR200/CR200B provides 2 inputs; the hardware of those inputs varies: pulled up, pulled down, wet (not equipped by pull up/down resistor). Each input is equipped by a packet of legacy functions.

The GP input (Shock) 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
Shock	Discrete "wet" or "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)

The table below provides threshold translation from the programmed value into voltage on interface pin<sup>8</sup>.

Threshold Value at PL file	Corresponding voltage on Shock input
0-56	1.00v (in range value protection)
57	0.20v
80	0.47v
100	0.71v
125	1.00v
140	1.19v

<sup>8</sup> Measurement error  $\pm 20\text{mv}$



160	1.45v
161-255	1.00v (in range value protection)

## 9.1 4 – Ignition

Ignition input can be used for detection of journey's Start and Stop, which are key events in unit's logic and require an especial treatment, or as a general purpose input (when journey Start/Stop is detected using an accelerometer).

### Journey's Start and Stop:

The system will enter hibernation mode between Journey's Stop and Journey's Start, and will start generating periodical events between Journey's Start and Journey's Stop

In case it is used for detection of journey's 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)  $0V < V_{in} < 3.5V$

High (logical one):  $V_{in} > 9V$

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

**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

**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 6 for event

129, bit 6 for distress

**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)

### 9.1.5 *Reporting Signal Rising On Ignition*

**Address:** 127, bit 6 for event

131, bit 6 for distress

**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:** zeros – 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.

Once inverted:

The "high" level of signal on this input will be treated as logical "0", Journey Stop detection.

The "low" level of signal as well as floating state on this input will be treated as logical "1", Journey Start detection.

**Default Value:** (0) not inverted.

## 9.2 15 – Shock

### 9.2.1 *Shock Input Type*

**Address** 1687, bits 5-7

**Description:** This input is equipped by pair of internal resistor, 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)
2-7	Reserved

**Default Value:** zero -Discrete Dry Contact

### 9.2.2 *Function assigned to Shock input*

**Address** 1687, bits 0-6

**Description:** This field enables assignation of certain functionality to a Door input.

Function number	Description	Comment
0	Use as a GP input (default)	
1-31	Reserved	

**Default Value:** zero – GP input

### 9.2.3 *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".



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)



### 9.2.4 *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.



In Full Hibernation mode the unit is ignoring averaging factor and processing each measurement sample separately

Default Value: 10 samples

### 9.2.5 *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.

### 9.2.6 *Reporting Signal Falling On Shock Input*

**Address:** 124, bit 1 for event

128, bit 1 for distress

**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)

### 9.2.7 *Reporting Signal Rising On Shock Input*

**Address:** 126, bit 1 for event

130, bit 1 for distress





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**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:** zeros – disabled (0)

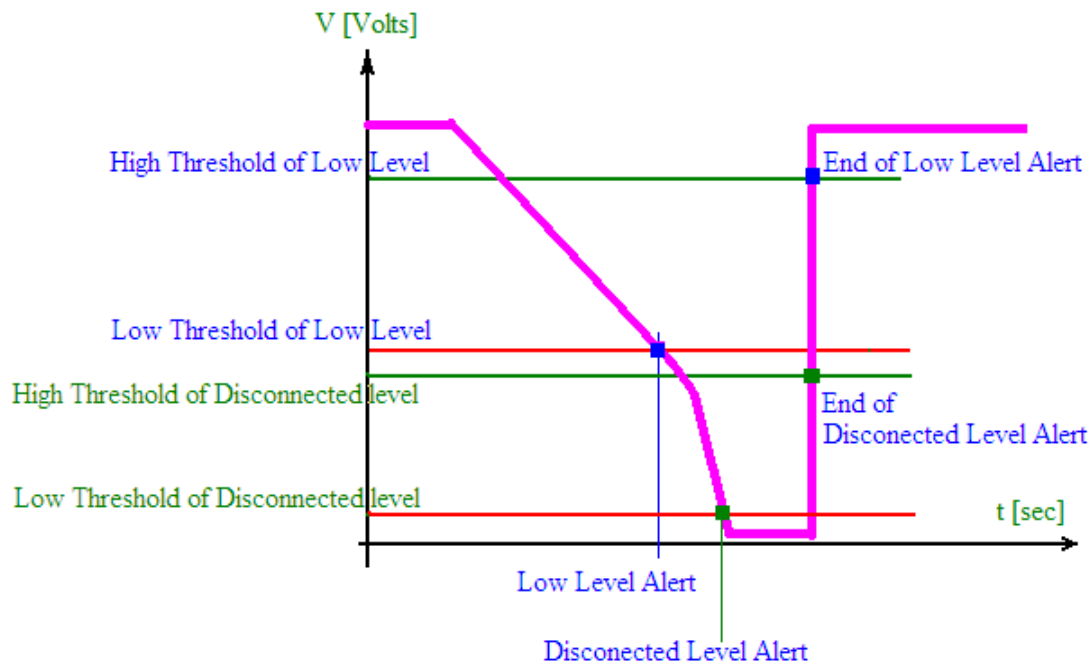
## 10 Power Events

### 10.1 Power Thresholds Settings

The thresholds listed below are used to determine if the main and backup power sources are low or disconnected.

Each of these conditions (low and disconnected) for each of the power sources (main and backup) is equipped by pair of thresholds enabling to alerts in sessions.

In the graph below it is described the voltage level of the battery (fat purple line) is decreasing lower than the Low Threshold of Low Level (the Low level alert is issued), then the battery is replaced: unplugged (disconnected alert issued); then the new battery is connected (both Low and Disconnected Battery sessions are closed concurrently).



#### 10.1.1 Main Power Low threshold – High/Low levels

**Address:** 115 – high level

116 – low level

**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: 9.05V

Address 116: 8.58V



### 10.1.2 *Main Power Disconnection Threshold – High/Low levels*

**Address:** **113** – high level

**114** – low level

**Description:** The unit will trigger “Main battery disconnected” if the measured level of the main power will be lower than the value programmed in Main Power Disconnection Threshold Low Level parameter.

The unit will trigger “Main battery re-connected event” if the measured level of the main power will be higher than the value programmed in Main Power Disconnection Threshold High Level parameter.

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

**Default values:** Address 113 - 5.29V

Address 114 - 4.82V

### 10.1.3 *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 the case 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 above)

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: If backup battery is not installed the unit will not generate the "backup battery disconnected" alert.*

**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.

*Note: If backup battery is not installed the unit will not generate the "backup battery disconnected" alert.*

**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 events, 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 as many times as defined in this parameter.

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 (Only for CR200B)

**Address:** 1349, bit 1



## Programming Manual Cellocator CR200/CR200B



Note, that the bit was added in Codbase 30j; in earlier versions this feature was always enabled.

### **Description:**

When the main power of CR200B 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 shutting down.

The unit will:

1. Log an especial event "modem off" (TRd207, specific data field 2) upon:
  - i. Solely working from internal backup battery
  - ii. 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.
  - i. The modem is switched off even if there is a data transfer upon timer expiration.
  - ii. 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" (TRd207, specific data field 0) upon discharging to 3.25V for longer than 1 second (100 samples).
4. Shut down.

**Default value:** 1 - Enabled



# 11 Geo-Fences and Towing

## 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	Config . byte 4	Maximal Latitude Displacement	Latitude of Fence's Centrum				Maximal Longitude Displacement	Longitude of Fence's Centrum				Configuration bytes 1,2 and 3				
Address																
Fence 0 2496-2512	2512															2496
Fence 1 2513-2528	2528															2512
-----																
Fence 16 2736- 2751	2751															2736

### 11.1.1 Format of Geographical Perimeter

**Address:** 2496-4095

**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:

Spare	Output Control		TOE MSB	End time hours <sup>9</sup>			End time minutes			Start time hours			Start time minutes			TOE (LSB)															
	Activation pattern	Output Number		23	22	21	20	19	18	17	16	15	14	13	12		11	10	9	8	7	6	5	4	3	2	1	0			
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																			

### 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
0	0	0	Entry is inactive (the whole 16 bytes are ignored by the unit)
0	0	1	Entry is active and treated as waypoint data
0	1	0	Entry is "keep out" fence data (unit must be outside location window)
0	1	1	Entry is "keep in" fence data (unit must be inside location window)
1	0	0	Entry is treated as Geo-hotspot (both entering and leaving cause a trigger)
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.

<sup>9</sup> 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





1	1	0	Reserved
1	1	1	

### 11.1.4 Waypoint

*Waypoints* are perimeters, which the unit has to be found in at least some of the time, at defined time intervals. The unit must be found in the perimeter for at least one sample in the whole time window. 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.

## 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 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<sup>10</sup> introducing Geo-Fence violation in order to generate an alert.

**Default value:** 1

### 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

---

<sup>10</sup> GPS packet is received every second



**Description:** If this bit is enabled the unit will generate an alerts upon violation of Keep In Type of Geo-Zones.

**Default:** 0 – both disabled

#### 11.2.4.2 KeepOut 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 disabled

#### 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 disabled

#### 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 disabled



## 11.3 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.

### 11.3.1 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. Unit’s [cm/sec]

**Default value:** 200 (~7.2 km/h)

### 11.3.2 Geo-fence perimeter

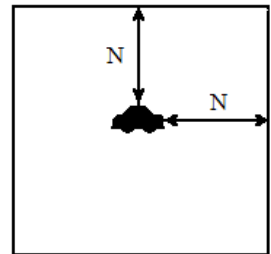
**Address:** 134-135

**Description:** The unit will trigger “Geo-fence violation” alert if latitude or the longitude of the current location differs from the location recorded upon Journey Stop more, than defined 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:** 1024



### 11.3.3 Towing Detection Filter

**Address:** 137

**Description:** This parameter defines how many valid consequent GPS fixes shall indicate Towing Speed or Location Violation for generation of a corresponding alert.

**Default value:** 3 Filters

### 11.3.4 Towing Alerts (Distress and Event) control

#### 11.3.4.1 Enable alert upon Towing speed detection

**Address** 99, bit 6 for event

102, bit 6 for distress



**Description:** This bit enables generation of the Towing Speed alert upon detection.

**Default:** Both zeros (disabled)

#### 11.3.4.2 Enable alert upon Towing location detection

**Address** 99, bit 7 for event

102, bit 7 for distress

**Description:** This bit 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 Stop Journey.

**Default:** Both zeros (disabled)



## 12 Bitmask Field Allocations

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

### 12.1 Application Configuration

#### Address: 0

Unused	Long Transmission Ack. Timeout	Unused					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

#### Address: 1

Unused	Enable OTA Command Authentication				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: 6

Unused		Overlapping Geo-Fence logic: Global/ Discrete	Unused	GPS Reset on ignition off When not in navigation	GPS Reset on ignition off When in Navigation	Disable Active Transmissions	Unused
Bits 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

#### Address: 7

Unused			LED Management Disable	Unused			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

#### Address: 1347

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

#### Address: 1348



Unused		Consider Unknown Operators As Forbidden	Disable GSM Jamming Event	Enable optimizing packet size by the modem	Unused	Enable Auto SIM PIN locking	Unused
Bits 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

**Address:** 1349

Unused						Radio Off	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

## 12.2 Communication settings in Home/Roam GSM Network Mode

201-202 In Home cellular network

**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
Enable SMS	Unused				GPRS Enable	Unused	

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 active transmissions via SMS	Unused			

## 12.3 Maintenance server configuration bitmap

**Address:** 1398

Reserved	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 5-7	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

## 12.4 Time Based Mask Bitmap

**Address:** 493 for events

494 for distress



Unused						Enable Time events (only 493, distress for time event is not supported)	Enable event for Communication Idle
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

## 12.5 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

## 12.6 GPS Alerts Mask Bitmap

**Address:** 99 For events

102 For distress

Enable event upon location change detection when Ignition Off	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
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

## 12.7 Discrete Inputs Masks

**Address:** For Inversion 100

Inputs Events on Failing 124

Inputs Events on Raising 126

Inputs Distress on Failing 128

Inputs Distress on Raising 130

Unused		Ignition	Unused			Shock	Unused
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

## 12.8 Mask of Analog Inputs Alerts

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

Ignition Switch On				Ignition Switch Off			
Backup	Backup battery	Main	Main Power	Backup	Backup battery	Main	Main Power





battery Low level	disconnected	Power Low Level	Disconnected	battery Low level	disconnected	Power Low Level	Disconnected
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

## 12.9 Outputs Inversion Mask

**Address:** 503

Unused			Blinkers		Unused		
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

## 12.10 Geo-Fence Alert Mask

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

Unused			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

## 12.11 Outputs, auto-activated 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

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

Number of output activations in a session				Output Activation length			
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

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

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

### Release outputs activated by Jamming Detection

**Address:** 522



Reserved	Enable release by Ignition Activity	Unused					
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

## 12.12 Accelerometer configuration

**Address:** 467

Spare	Detection Sensitivity 0- Very insensitive 1- Normal 2- Very sensitive 3- spare	Reserved	Enable GPS wake up upon movement for towing detection (don't care if bit 0 is set) 0 – Don't use 1 – Use.	Use "movement detection" by accelerometer for Start/Stop 0 – Start/Stop alerts by status of Ignition switch (legacy), 1 – Start/Stop alerts by movement detection using accelerometer. 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.
Bits 5-7	Bits 3-4	Bit 2	Bit 1	Bit 0

## 12.13 Output activation upon over speeding

**Address:** 523

Number of repetitions (Duty cycle 50% ) 0 – for continues repetition while over-speeding		Activation length (in resolution of 0.5 seconds). For continuous activation while over-speeding			Output number		
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0