Cellocator CSA Programming Manual

APPENDIX To

Cellocator Cello Programming Manual

Cellocator by PowerFleet®

Proprietary and Confidential

Version 2.1.0.2

Revised and Updated: Sept 1, 2021

Legal Notices

IMPORTANT

1. All legal terms and safety and operating instructions will be read thoroughly before the product accompanying this document is installed and operated.
2. This document will be retained for future reference.
3. Attachments, accessories or peripheral devices not supplied or recommended in writing by PowerFleet Inc. May be hazardous and/or may cause damage to the product and will not, in any circumstances, be used or combined with the product.

General

The product accompanying this document is not designated for and will not be used in life support appliances, devices, machines or other systems of any sort where any malfunction of the product can reasonably be expected to result in injury or death. Customers of PowerFleet Inc. Using, integrating, and/or selling the product for use in such applications do so at their own risk and agree to fully indemnify PowerFleet Inc. For any resulting loss or damages.

Warranty Exceptions and Disclaimers

PowerFleet Inc. Will bear no responsibility and will have no obligation under the foregoing limited warranty for any damages resulting from normal wear and tear, the cost of obtaining substitute products, or any defect that is (i) discovered by purchaser during the warranty period but purchaser does not notify PowerFleet Inc. Until after the end of the warranty period, (ii) caused by any accident, force majeure, misuse, abuse, handling or testing, improper installation or unauthorized repair or modification of the product, (iii) caused by use of any software not supplied by PowerFleet Inc., or by use of the product other than in accordance with its documentation, or (iv) the result of electrostatic discharge, electrical surge, fire, flood or similar causes. Unless otherwise provided in a written agreement between the purchaser and PowerFleet Inc., the purchaser will be solely responsible for the proper configuration, testing and verification of the product prior to deployment in the field.

POWERFLEET INC.'S SOLE RESPONSIBILITY AND PURCHASER'S SOLE REMEDY UNDER THIS LIMITED WARRANTY WILL BE TO REPAIR OR REPLACE THE PRODUCT HARDWARE, SOFTWARE OR SOFTWARE MEDIA (OR IF REPAIR OR REPLACEMENT IS NOT POSSIBLE, OBTAIN A REFUND OF THE PURCHASE PRICE) AS PROVIDED ABOVE. POWERFLEET INC. EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, SATISFACTORY PERFORMANCE AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL POWERFLEET INC. BE LIABLE FOR ANY INDIRECT, SPECIAL, EXEMPLARY, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOSS OR INTERRUPTION OF USE, DATA, REVENUES OR PROFITS) RESULTING FROM A BREACH OF THIS WARRANTY OR BASED ON ANY OTHER LEGAL THEORY, EVEN IF POWERFLEET INC. HAS BEEN ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH DAMAGES.

Intellectual Property

Table of Contents

1.1 About this Document

This document defines the contents of the Cellocator Cello-IQ unit's configuration memory related to the safety application (CSA).

This document does not contain a description of legacy Cellocator parameters, related to the Host Application (Fleet). For information about those parameters, refer to Programming Manual v32a or above.

The parameter's allocation in a configuration memory begins with address zero. The addresses listed in this document are used by the CSA server.

All CSA parameters are accessed from the Host Application server.

Applicability table

CelloIQ40	Light version
CelloIQ50	Full version

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).

#	Reference	Description
1	Programming Manual v32a	This document contains a description of all the configurable parameters of the Host Application.

1.3 Revision History

Version	Date	Description
V32a.1.0	19.2.12	Initial version.
V32a.1.1	4.3.12	• Fixed equation of ECO score calculation. • Default contribution of RPM and Speed in highway category are equal (50-50) and not (80-20).
V32a.1.2	7.3.12	• Added file definition. • Maneuver monitoring time parameter relocated to address 120 (from 232).
32a.1.3	2.5.12	• Added Coasting speed threshold. • Excessive RPM description modified accordingly. • Added note to Idling section: Idling End will not be generated after ignition off. If Ignition is switched off before expiration of Idling timeout an "Idling end" event will not be generated.

Version	Date	Description
		• Added valid range to crash thresholds.
V32a.1.4	10.5.12	• Allocation of Vehicle type changed to 104. • Replaced note added to Idling section: Upon Ignition off the unit will close the Idling session.
V32a.1.5	6.6.12	• ECO score calculation equation fixed • Added equation of ECO score for Urban and Highway zones for the case when RPM is available.
V32a.1.6	6.21.12	• Technical writer editing
V32a.1.7	6.28.12	• Calibration section spitted into auto and manual calibration sections. Clarifications added.
2.0.0.1	Oct. 23 2012	• Controlled release
2.0.0.2	Dec. 24 2012	• Section 5.1: Update all the hyper links • Move to absolute configuration parameters addressing (Was offset from 1900) • Document wise: Change parameters offset to absolute addressing. • Document wise: Correlate between PL parameters names and help tooltips and the document text
2.0.0.3	Jan. 23 2013	• Added applicability table for Cello-IQ40 and Cello-IQ50 • Document wise: Add remark for unsupported feature in Cello-IQ40 variant.
2.0.0.4	Sept. 9 2013	• Section 5: Remapping to 8 Kbytes configuration memory • Section 6: Change all the Programmable address references to offsets.
2.0.0.5	Oct. 16 2013	• Cello-IQ Phase 3 features
2.0.0.6	Oct. 22 2013	• Fix the language support
2.0.0.7	Dec. 25, 2013	• DFD Status Bar Display mode is not implemented, marked as Infrastructure. • Safety Score weight for DFD Address 93: Status Bar Display is irrelevant will be marker as Infrastructure.

Version	Date	Description
2.0.0.8	January 20, 2014	• Section 6.2.1.11: Add description for FTP/TFTP back-off mechanism. • Section 6.1.11: CSA Odometer base units • Section 6.1.12: Added trip management GPIO • Section 6.6.2.3: Severity level multipliers changed to byte from nibble. • Sections 6.4.7/6.4.8/6.4.9: DFD Off-road controls added • Section 6.4.13: DFD communication loss event enable added • Section 6.4.25: Driver authentication reminder beeps enable bit added. • Section 6.4.11: DFD Status bar display (infrastructure) • Section 6.5.5: Add note that For complete logging of RAW data this bit must be disabled. • Section 6.5.5: Add note that "Enable log of maneuver statistics only" must be disabled if the user wants to log both maneuver raw data and maneuver statistics.
2.0.0.9		• Section 6.6.4: Added new section and description for GO Halt mechanism with the new criteria for distance threshold.
2.0.0.10	Dec. 24, 2014	• Section 5.1: Added enable bit for “Enhanced Idling” at address 42 bit 1. • Section 5.1: Added “Enhanced Idling Distance Threshold” at address 94
2.0.1.0	Dec 25, 2014	• Sampling rate and Enable DFD visual feedback upon failure marked as unsupported • Fixed address of Enable DFD sound (Beep) upon Offroad Detection to 231, bit 2 • Parameter Connection type to CSA Real Time Event server renamed to Connection type to event CSA server • TCP/IP connection remapped to option 3 of Connection type to event CSA server
2.0.1.1	Jan 18, 2015	• Address of Enable DFD Sound (Beep) upon Off-road fixed to d'231/3. • Removed unused parameter: Timeout for monitoring RPM range change on DFD

Version	Date	Description
		• Removed unused parameter: Enable DFD visual feedback upon failure • Removed duplicated parameter: Enable DFD Visual upon Off-road
2.0.1.2	April 20, 2015	• Section 5.1: Added "Enable CSA IP Up event" in 1st configuration bitmask (offset address 42, bit 7) • Added section 6.2.1.11 (Enable CSA IP Up Event)
2.0.1.3	May 18, 2015	• Section 6.1.11: Fixed address from 122 to 123 • Section 6.1.12: Fixed address from 123 to 122
2.0.1.4	June 4, 2015	Section 6.4.22: • Fixed offset address from 6710 to 54 • Shortened the parameter to bits 0-6 Section 6.4.23: Fixed offset address from 6710 to 54 Section 5.1: Added the "Off-Road detection length for event" parameter to the address allocation table (offset address 245) Section 6.5.12.2: Changed offset address of "Off-Road detection length for event" parameter from 54 to 245 Section 6.3.4.5: Changed "0 - Disable" to "0 - Erase" Section 6.3.4.3: Fixed offset address from 18 to 58 Section 6.2.1.25: Fixed default value from 4 to 0
2.0.1.5	June 28, 2015	Section 5.1: Added "**Supported by Cello-IQ50 Only" note to Excessive RPM enable parameter (Address 82/bit 7)
2.0.1.6	August 9, 2015	Section 6.5.11.1: • Changed minimum value from 30 seconds to 0.5 minute • Changed resolution from 10 seconds to 0.5 minute • Changed default from 180 seconds to 3 minutes Section 6.5.11.2: • Added elaboration for minimum value • Changed resolution from 30 seconds to 0.5 minute • Changed default from 300 seconds to 5 minutes
2.0.1.7	August 11, 2015	Section 6.4.4: Changed default value of "Enable DFD" parameter from 1 (Enable) to 0 (Disable)

Version	Date	Description
2.0.1.8	August 12, 2015	Section 5.1: Deleted "Off-Road detection length for event" parameter (address 245) Section 6.5.12.2: Deleted "Off-Road detection length for event" parameter (address 245) Section 6.5.12.1: Added elaboration for Off-Road Start/End events
2.0.1.9	August 13, 2015	Section 6.5.10.6: • Fixed the description of the parameter logics • Changed the resolution from 100msec to 1 second
2.0.1.10	August 13, 2015	Section 6.5.12.1: • Changed the resolution from 100msec to 1 second • Changed the minimum value from 10 to 20 seconds • Changed the default value from 10 to 20 seconds
2.0.1.11	October 1, 2015	Section 6.2.1.1: Changed default value from Varies to 0.0.0.0 Section 6.2.1.19: Changed default value from 62.0.95.17 to 0.0.0.0 Section 6.2.1.5: Changed default value from 1 (Reserved) to 0 (UDP/IP)
2.0.1.12	February 2, 2016	Deleted Section 6.6.1.5 (Upload Trip log upon memory limit)
2.0.1.13	November 29, 2016	Section 6.4.2.1: added new languages: 11- Turkish, 12- Chinese, 13- Romanian.
2.0.1.14	February 2, 2017	Section 6.3.5.1: removed the default phone number.
2.0.1.15	February 12, 2017	Section 6.2.1.6: corrected the resolution to 1 Sec/bit and the default value to 30 Seconds.
2.0.1.16	February 19, 2017	Section 6.1.7: Removed the parameter of "Enable Auto-start calibration upon error" since it's canceled and always disabled.
2.0.1.17	17/3/2017	Section 6.3: Added bullet for pre/post crash log recording Section 6.3.1: • Changed valid span from 10-55 to 10-40 • Changed total length of crash log limitation from 1 minute to 50 seconds

Version	Date	Description
		• Added case in which pre + post crash data log durations exceed 50 seconds Section 6.3.2: • Changed valid span from 5-55 to 10-40 • Added total length of crash log limitation from 1 minute to 50 seconds • Added case in which pre + post crash data log durations exceed 50 seconds
2.0.2.0	4/5/2017	Section 6.4.22: • Changed parameter name from "Driver Authentication Timeout" to "Driver Authentication Reminder Timeout" • Revised description and drawing Deleted Section 6.4.23 (Driver Authentication Reminder Beep Enable)
2.1.0.0	6/11/2017	Section 6.5.11.1: Revised description (added RPM condition to Short Idling) Section 6.5.11.2: Revised description (added RPM condition to Long Idling) Section 6.6.4: Added note regarding Go/Halt behavior when GPS fix is not available
2.1.0.1	25/6/2020	Sections 6.4.22 and 6.4.23: Added new parameters for "Enable DFD visual/audio feedback upon Wrong Gear Handling". Updated logos and company name.
2.1.0..2	1/9/2021	Added GPIO 1 and GPIO2 of Cello4 to the Inputs controlling Trip Start and Stop

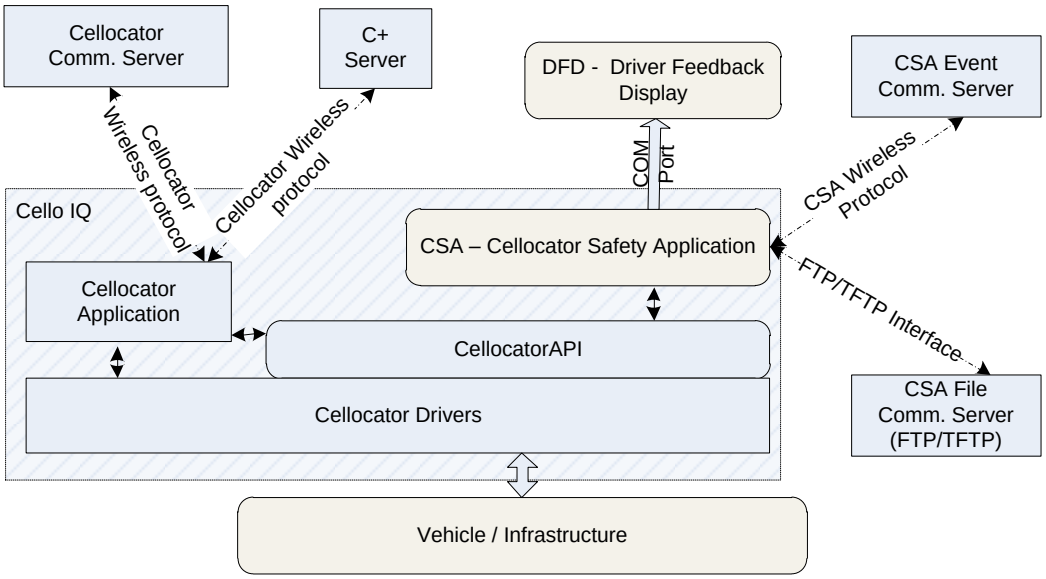
1.4 Document Conventions

Unless otherwise specified:

- All multiple bytes values are stored and treated Intel-style (meaning, "little endian", least significant bytes first).
- Programming parameters will take effect only after a unit reset.

2 Accessing the Configuration Memory via Wireless Channel (OTA)

There are two possible ways to access the configuration memory of the CSA application over the air: from the CSA server or from the Fleet server.



If access is made from the Fleet server using the Cellocator Wireless protocol, the first address (0) of CSA configuration will be addressed as 6656 (1900 in older version).

If access is made from the CSA server using the CSA Wireless protocol, the first address will be addressed as zero (it is not possible to change the content of HA programmable parameters from the CSA server).

Refer to *Cellocator Wireless Protocol* and to *CSA Wireless Protocol* for more information about accessing the configuration manual via the wireless channel.

3 Accessing the Configuration Memory via Direct Wire Interface

The configuration 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 (CSA configuration begins from the offset address of 6656 (1900 in older version)).

Refer to the *Direct Wire Interface Protocol* for more information about accessing the configuration via the direct wire interface.

4 Wireless Communication

4.1 Servers

The Cello-IQ unit can communicate with up to four independent communication servers:

- Fleet server (using Cellocator Wireless Protocol)
- Maintenance server (using Cellocator Wireless Protocol)
- CSA server – to report events generated by the safety application (CSA wireless protocol)
- FTP or TFTP (Trivial File Transfer Protocol) server – for raw file upload

The first three will function independently and concurrently, but the maintenance server communication will cause a temporary disconnection of other communication sessions.

This document only deals with communications with the CSA server and FTP/TFTP server.

4.2 Maneuvers

A Maneuver is the basic logical unit used by Cello-IQ for calculation of Risk score, Eco score and Statistics.

It is also the smallest fragment of raw accelerations data, which can be compressed and delivered to an FTP/TFTP server.

Each detected maneuver is assigned with a unique ID related to trip and severity. It can trigger the generation of one or more responses, as per detected severity (each severity can trigger different responses).

- Event (Module 30 message) to CSA server (or number of events in case of continuous maneuver types)
- Statistics providing extended information about a detected maneuver (reported to CSA (as module 31 attached to module 30) and/or to FTP/TFTP servers as part of logged raw data)
- DFD audio and/or visual response
- Raw GPS and acceleration data, including pre and post maneuver log (reported to FTP/TFTP server only)

The recorded raw data of a maneuver (if enabled) can be uploaded to an FTP/TFTP server as an independent file or as part of the trip.

4.2.1 *Types of Maneuvers*

There are two groups of maneuvers:

- Momentary maneuvers (ABC type): This type of maneuver generates only one event (if an event is enabled for an appropriate severity) at the end of the detected maneuver. This event can be escorted by maneuver statistics.
- Continuous maneuvers: This type of maneuver generates at least two events (if an event is enabled for an appropriate severity):
  - At the beginning of the detected maneuver.
  - Optionally, if the severity of maneuvers increases after initial detection.

- At the end of the maneuver. This event can be escorted by maneuver statistics.

Continuous maneuvers do not contain raw data, though can generate statistics (except speed profiling).

Speed Profiling – is an exceptional continuous maneuver. Unlike other continuous maneuvers this one cannot generate any event or statistics. Speed Profiling does generate raw data, although it only contains GPS stamps (see later on in this document).

4.2.2 *Available Maneuvers Table*

Momentary Maneuvers (ABC maneuvers)	Harsh Acceleration
	Harsh Brake
	Harsh Turn
	Turn & Accel
	Turn &Brake
	Sharp Lane crossing
Continuous Maneuvers	Excessive RPM
	Idling
	Off road
	Speeding
Exceptional continuous maneuver:	Speed Profiling

4.3 Trips

A Trip is a logical container of maneuvers detected between Trip start and Trip stop. Practically a trip contains a list of maneuvers with their optional attributes:

- Acceleration raw data
- Statistics
- Eco and safety scoring

A Trip also contains Start and Stop events, and a statistics module containing scoring summarizing the entire trip. This part can be attached to a Trip Stop event or stored to a raw trip file.

The Trip raw file can be uploaded to an FTP/TFTP server as an independent file according to programmable file upload logic.

4.4 Crashes (EDR)

A Crash file has a different structure from Trip files; it does not contain any maneuvers but only the raw acceleration data of the crash (at 100Hz sampling with programmable time before and after the crash).

The unit can record the crash file only if EDR functionality is enabled, and can store up to two crash files at a time.

Crash files have a unique ID and are uploaded to an FTP/TFTP server as independent files.

** Supported by Cello-IQ50 variant only

4.5 Events

An Event is a short, telegram type of communication, containing only the general information of certain event occurrences, including GPS stamps.

Any detected maneuver can be configured to trigger a corresponding event, but there are other logical conditions that can trigger the event: calibration finished, crash occurred, etc.

All events are logged and should be acknowledged by the server, otherwise they are resent.

4.5.1 *Available Events Table*

CSA Event number	Description	CSA Event Sub Reason	Description
0	Reserved		
1	IP UP		
2	Crash occurred (CSA event with this Reason will be equipped	0	Light
		1	Heavy

<table>
<tr><th>CSA Event number</th><th>Description</th><th>CSA Event Sub Reason</th><th>Description</th></tr>
<tr><td></td><td>by module 28 Crash attributes)</td><td></td><td></td></tr>
<tr><td>3</td><td>Crash data ready to upload</td><td></td><td></td></tr>
<tr><td>4</td><td>Maneuver memory overflow</td><td></td><td></td></tr>
<tr><td>5</td><td>Calibration</td><td colspan="2"><table>
<tr><td colspan="2">Only applicable for value of 3 in bits 0-2</td><td rowspan="2">0 Calibration Started
1 Calibration OK
Will always be escorted by Calibration Matrix (module 43)
2 Calibrate Bad Install
3 Calibrate In Progress (after HW reset)
4 Calibration Error</td></tr>
<tr><td>Calibration phase
0 - Phase 1
1 - Phase 2</td><td>Calibration Step number
(0 – 9)</td></tr>
<tr><td>Bit 7</td><td>Bits 3-6</td><td>Bits 0-2</td></tr>
</table></td></tr>
<tr><td rowspan="4">6
♫</td><td rowspan="4">Harsh Acceleration</td><td>0</td><td>Reserved</td></tr>
<tr><td>1</td><td>Green severity</td></tr>
<tr><td>2</td><td>Yellow severity</td></tr>
<tr><td>3</td><td>Red severity</td></tr>
<tr><td rowspan="4">7
♫</td><td rowspan="4">Harsh braking</td><td>0</td><td>Reserved</td></tr>
<tr><td>1</td><td>Green severity</td></tr>
<tr><td>2</td><td>Yellow severity</td></tr>
<tr><td>3</td><td>Red severity</td></tr>
<tr><td rowspan="4">8
♫</td><td rowspan="4">Harsh turn</td><td>0</td><td>Reserved</td></tr>
<tr><td>1</td><td>Green severity</td></tr>
<tr><td>2</td><td>Yellow severity</td></tr>
<tr><td>3</td><td>Red severity</td></tr>
<tr><td>9</td><td>Speeding[1]</td><td>0</td><td>Speeding End</td></tr>
</table>

[1] Speeding maneuvers are sent when certain thresholds are crossed. On every speeding the Green is sent upon speeding detection (when getting inside speeding maneuver), then maybe yellow and red (one for each, at

CSA Event number	Description	CSA Event Sub Reason	Description
		1	Speeding Green (Normal)
		2	Speeding Yellow (Moderate)
		3	Speeding Red (Dangerous)
10 ♫	Lane crossing	0	Reserved
		1	Green severity
		2	Yellow severity
		3	Red severity
11 ♫	Off road	0	Off road start
		1-2	Reserved
		3	Off road end
12	Excessive RPM	0	Low RPM
		1	High RPM
		2	Excessive RPM
		3	Back to Normal
13	Idling	0	Short idling start
		1	Long idling start
		3	Idling end
14	Reply to command		
15 ♫	Turn & Brake	0	Reserved
		1	Green severity
		2	Yellow severity
		3	Red severity
16 ♫	Turn & Accelerate	0	Reserved
		1	Green severity
		2	Yellow severity

most). At the end of the maneuver the "speeding end" event is sent. Note events are sent without any statistics.

<table>
<tr><th>CSA Event number</th><th>Description</th><th>CSA Event Sub Reason</th><th>Description</th></tr>
<tr><td></td><td></td><td>3</td><td>Red severity</td></tr>
<tr><td rowspan="4">17</td><td rowspan="4">File upload completed</td><td>0</td><td>Successfully uploaded & erased</td></tr>
<tr><td>1</td><td>Successfully uploaded & kept in memory</td></tr>
<tr><td>2</td><td>Upload failure</td></tr>
<tr><td>3</td><td>Failure: No file to upload</td></tr>
<tr><td>18</td><td>Ignition On/Off</td><td colspan="2"><table><tr><td>Ignition status</td><td>The source of signal used for detection</td></tr><tr><td>1= Ignition ON,
0= Ignition OFF</td><td>0 = Ignition input
1 = ACC ignition sensor
2 = ACC movement sensor
3 = ACC sensor + Voltage</td></tr><tr><td>High Nibble</td><td>Low Nibble</td></tr></table></td></tr>
<tr><td>19</td><td>Go/Halt event</td><td colspan="2"><table><tr><td>Go or Halt</td><td>The source of signal used for detection</td></tr><tr><td>0= Halt
1= Go</td><td>0 GPS
1 Speed from Vss
2 Movement by Acc
3 Speed from CAN (provision)
4-15 Reserved</td></tr><tr><td>High Nibble</td><td>Low Nibble</td></tr></table></td></tr>
<tr><td>20</td><td>Driver ID update</td><td></td><td></td></tr>
<tr><td>24</td><td>Trip Start /End update</td><td>0</td><td>Trip End
Always escorted by Trip Statistics (Sent only if trip statistics is enabled)</td></tr>
<tr><td></td><td></td><td>1</td><td>Trip Start</td></tr>
<tr><td>25</td><td>Speeding: GPS Recording</td><td>0</td><td>This maneuver type will never be transmitted as a CSA event; used as a Maneuver Type in raw GPS record (only if corresponding bit in the EEPROM is enabled).</td></tr>
</table>

♫ - Requires Calibration, will not be generated prior to completion of calibration procedure.

4.6 SMS

The CSA server does not support SMS communication. The only exception is a Crash notification, which can be generated to the CSA SMS center upon crash detection.

It is not possible to control the CSA application via SMS.

5 Address and Bitmask Field Allocation Tables

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

The CSA address map has been moved from configuration address 1900 to address 6656 as from CelloIQ release 32f. The CSA configuration addresses are now described as offset rather than real numbers. The following table describes the address translation as per the release:

Release Version	Base address (Decimal)	CSA Address calculation (Decimal)
Till release 32e	1900	Config Add = 1900 + CSA Address Offset
From release 32f	6656	Config Add = 6656 + CSA Address Offset

- **Address allocation table**, see below

5.1 Address Allocation Table

CSA Address Offset	Parameter							
0	Real Time Event Server	IP Address						
4		DNS Address						
36		Listening UDP Port						
38		Target TCP (and UDP) Port						
40	Connection Type to Servers							
	FTP / TFTP selection				CSA server (UDP/TCP) connection			
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
41	Message Transmit Acknowledge Timeout (Real Time Event Server, seconds)							
42	1st configuration bitmask							

CSA Address Offset	Parameter							
	Enable CSA IP Up event 0 – Disable 1 - Enable	Crash treatment 0 – EDR 1 – Maneuver **Supported by Cello-IQ50 Only	Enable Trip End Event 1- Enable	Enable Trip Start Event 1- Enable	Commands reply policy to CSA Server: 0 -Reply command upon command reception. 1-Reply command upon command execution	Enable Auto-Start Calibration upon calibration error	Enhanced Idling Enable 0 – Disable 1 - Enable	Disable Speed Profiling 0 – logging 1 - disable
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
43	2nd configuration bitmask							
	Enable DFD communication loss event 0- Disabled 1-Enable	Long Idling detection Enable	Short idling detection Enable	Enable Driver ID events	Enable Ignition Start/Stop events	Enable Go/ Halt events	Add time module	Add PLMN module
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
44	3rd configuration bitmask – Upload Configuration							
		Upload raw data when maneuver ends (real time FTP)	Enable Event upon End of File Upload	Upload Trip log upon Memory limit	Upload Trip log after Ignition Off	Upload Trip log upon Driver ID change	Upload Trip log upon trip end (DallasKey or Input change)	Auto Sends Trip Statistics upon Trip End
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
45	Eco scoring – weight of idling in trip eco scoring							
46	Eco scoring – weight of urban driving in trip eco scoring							
47	Eco scoring – weight of highway driving in trip eco scoring							
48	Eco scoring – short idling timeout							
49	Eco scoring – long idling timeout							
50	Sampling rate							
51	Speed for excessive RPM							
52	Maximum time for speeding severity							
53	Off-Road decision time (DFD warning, event)							
54	Driver Authentication Timeout							
55	Light crash detection threshold							

CSA Address Offset	Parameter
56	Heavy crash detection threshold
57	Bitmask: Reaction to Light Crash detection

Unused			Do not erase Light crash data from memory after successful upload **Supported by Cello-IQ50 Only	Enable auto-upload crash file for Light crash **Supported by Cello-IQ50 Only	Enable ECALL Light crash **Supported by Cello-IQ50 Only	Enable SMS upon crash (Light) 0-Disable 1-Enable **Supported by Cello-IQ50 Only	Enable crash EDR event (Light) 0-Disable 1-Enable **Supported by Cello-IQ50 Only
Bit 7	Bit 6	Bit4	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

58	Bitmask: Reaction to Heavy Crash detection

Unused			Do not erase Heavy crash data from memory after successful upload **Supported by Cello-IQ50 Only	Enable auto-upload crash file for heavy crash **Supported by Cello-IQ50 Only	Enable ECALL Light crash **Supported by Cello-IQ50 Only	Enable SMS upon crash (Heavy) 0-Disable 1-Enable **Supported by Cello-IQ50 Only	Enable crash EDR event (Heavy) 0-Disable 1-Enable **Supported by Cello-IQ50 Only
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

59	Post Crash data log duration **Supported by Cello-IQ50 Only				Pre Crash data log duration **Supported by Cello-IQ50 Only			
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

60	ECALL phone number
70	Crash reminder period **Supported by Cello-IQ50 Only
71	Timeout for RPM range change event generation
72	SMS Server Destination phone number
82	Maneuver care: Maneuver Bitmask (1st byte)

CSA Address Offset	Parameter							
	Excessive RPM **Supported by Cello-IQ50 Only	Off road **Supported by Cello-IQ50 Only	Turn & Brake Detection 0-Disable 1-Enable **Supported by Cello-IQ50 Only	Turn & Acceleration Detection 0-Disable 1-Enable **Supported by Cello-IQ50 Only	Turn Detection 0-Disable 1-Enable	Sharp Lane crossing 0-Disable 1-Enable **Supported by Cello-IQ50 Only	Brake Detection 0-Disable 1-Enable	Acceleration Detection 0-Disable 1-Enable
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
83	Maneuver care: Maneuver Bitmask (2nd byte)							
	Unused					Heavy Crash (Red severity only)	Light Crash (Red severity only)	Speeding
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
84	Maneuver care: Green (Normal) Severity							
	Unused	Enable sound (Beep) feedback	Enable visual feedback	Enable Vocal feedback	Enable log of maneuver statistics only	Enable Raw + Stat Log **Supported by Cello-IQ50 Only	Attach Statistic to event	Enable Event
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
85	Maneuver care: Yellow (Moderate) Severity							
	Unused	Enable sound (Beep) feedback	Enable visual feedback	Enable Vocal feedback	Enable log of maneuver statistics only	Enable Raw + Stat Log **Supported by Cello-IQ50 Only	Attach Statistic to event	Enable Event
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
86	Maneuver care: Red (Dangerous) Severity							
	Unused	Enable sound (Beep) feedback	Enable visual feedback	Enable Vocal feedback	Enable log of maneuver statistics only	Enable Raw + Stat Log	Attach Statistic to event	Enable Event

CSA Address Offset	Parameter							
						**Supported by Cello-IQ50 Only		
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
87	Speeding Detection time threshold							
88	Threshold for Speed Profiling-GPS Logging Mode							
89	Green Threshold for Speeding – Maneuver mode							
90	Yellow Threshold for Speeding – Maneuver mode							
91	Red Threshold for Speeding – Maneuver mode							
92	Minimum speed to register a maneuver							
93	Safety Score weight for DFD Status Bar Display (Infrastructure)							
94	Enhanced Idling Distance Threshold							
95	RPM Thresholds	RY Threshold (rpm)						
97		YG Threshold (rpm)						
99		GY Threshold (rpm)						
101	Time to auto-upload after Ignition off							
102	Logged pre-maneuver time							
103	Logged post-maneuver time							
104	Vehicle type							
109	Risk Rank of maneuver as part of trip [%]	Acceleration						
110		Brake						
111		Harsh lane crossing (Lane change)						
112		Turn						
113		Turn & Acceleration						
114		Turn & Brake						
115		Off road						
116		free						
117		Speeding						
118	Trip Risk Score Control: Severity levels multipliers							

CSA Address Offset	Parameter							
	Normal (Green)							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
119	Trip Risk Score Control: Severity levels multipliers Yellow (Moderate)							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
120	Maneuver's severity level display time (DFD)							
121	Trip Risk Score Control: Severity levels multipliers Red (Dangerous)							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
122	Trip Management Control, GPIO selection							
123	Driver Behavior Odometer base unit							
124-141	Reserved							
142	FTP/TFTP Server	IP Address						
146		DNS Address						
178		TFTP Self UDP Port						
180		FTP (TFTP) Port						
182		FTP Authentication Username						
206		FTP Authentication Password						
231	231	General conf. Bitmask						
		Driver Reminder Beep Enable: 0-Disable 1-Enable	Enable DFD audio feedback upon driving authorization update	Enable DFD audio warning on Ignition	Enable DFD Driver Audio feedback upon driving without authorization	Enable DFD sound (Beep) upon Off-Road driving detection	Enable DFD audio feedback upon Off-Road driving detection	Enable DFD Acc RMS display	Enable DFD
		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
232	232	DFD Status Bar Display Mode: 0-Acceleration RMS.	Enable DFD Visual upon Off-Road driving detection	Enable DFD sound (beep) feedback upon long idling	Enable DFD sound (Beep) feedback upon short idling	Enable DFD visual upon long idling	Enable DFD visual upon short Idling	Enable DFD Audio upon long Idling	Enable DFD Audio upon Short Idling

CSA Address Offset	Parameter								
		1-Trip risk score (Infrastructure)							
		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
233	Audio Feedback messages language selection								
234	Severity threshold separating between Green and Yellow score								
235	Severity threshold separating between Yellow and Red score								
Spare 236-241									
242	Go Halt Speed Detection Threshold								
243	Go Halt Time Threshold filter								
244	DFD Volume								

6 Detailed Parameters Description

6.1 Application Configuration

6.1.1 *Sampling rate*

Address Offset: 50

NOTE: This parameter is currently unsupported.

Crash event detection will be performed over the maximum available sampling rate of the accelerometer (100Hz) in order to be able to capture accident evolution as early as possible.

This parameter defines the sample rate of accelerometer used for logging raw data of maneuvers and cyclic buffer of EDR routine.

Value	Sampling frequency
0	Value below 1 is forbidden and will be treated as 3 (20Hz)
1	50Hz
2	25 Hz
3	20Hz
4-255	Unused and saturated to 20Hz

Default: 3 sec (20Hz)

6.1.2 *Vehicle type*

Address Offset: 104

This parameter defines the type of the vehicle, and applies a corresponding hardcoded set of properties for maneuvers detection (Presets).

The available types are as follows:

Value	Vehicle type
0	Private
1	Large Van
2	Light Truck/bus
3	Heavy Truck
4-255	Reserved

Default: 0

6.1.3 *Enable Trip Start/End events*

Address Offset: 42

Bit 4 for Trip Start

Bit 5 for Trip End

It is possible to enable / disable trip start and end events generation (TR 24/1 and 24/0 respectively) by the corresponding bits in programming.

The Trip Start is considered from:

- Any Start Event received from HA (Input, Voltage or ACC based).
- Driver update (new driver). In this case, upon driver change, even if the vehicle's engine was not turned off, the application will "conclude" a trip end open a new trip in the device's memory and state machine.
- Wake up after reset.

The Trip End is considered from:

- Any Stop Event received from HA (Input, Voltage or ACC based).
- Driver update (new driver). In this case, upon driver change, even if the vehicle's engine was not turned off, the application will "conclude" a trip and open a new trip in the device's memory and state machine.
- Any type of reset.

The Trip End event, if enabled, will be automatically assigned with Trip Statistics (CSA module 32).

Default: Both enabled (1)

6.1.4 *Enable Driver ID Update Events*

Address Offset: 43, bit 4: If this bit is set, any change in Driver ID change will trigger a corresponding CSA event to the server.

Default: 1 – enable

6.1.5 *Enable Ignition Start-Stop Event*

Address Offset: 43, bit 3

If this bit is set, any change of status of Ignition switch reported by HA to CSA will trigger a corresponding event to the CSA server.

The ignition status can be captured using one of the following methods (refer to HA Programming manual for more details):

- Ignition input
- ACC ignition sensor
- ACC movement sensor
- ACC sensor + Voltage level based Ignition sense

Default: 1 – enable

6.1.6 *Enable Go-Halt Event*

Address Offset: 43, bit 2

The Go/Halt is detected by HA (host application) using one of the listed methods (refer to the *HA programming manual* for more details):

- GPS
- Speed from Vss wire
- Movement by Accelerometer
- Speed from CAN (provision)

The Go/Halt events are always reported to the CSA, irrespective of the generation or non-generation of the events to the OTA Cellocator server.

If this bit is enabled, upon reception of Go or Halt events from the HA (host application) the CSA will generate a corresponding OTA event to the server.

NOTE: If Go/Halt is enabled, the unit will close the session (generate Halt) unconditionally upon Ignition Off detection.

Default: 1 – enable

6.1.7 *Enable Auto-Start Calibration upon Calibration Error Detection*

The system will wait for an OTA calibration command, then perform the process as follows:

6.1.7.1 Calibration Process

The process of calibration is needed to determine the orientation of the equipment in a vehicle; this process begins automatically upon power up (if not calibrated).

During this process the unit learns its exact position relative to the driving direction. The process is fully automatic and in 99% of the cases consumes between 2 to 5 driving hours during which the system will suspend ECO and SAFETY scoring .

During calibration the system will not only detect the following maneuvers:

- Idling
- Speeding
- Excessive RPM

There is a notification of calibration process in every OTA message[2] sent to the CSA server.

[2] CSA Messages containing module 30.

Upon end of the calibration the unit will initiate an event to the CSA server with event reason 5/1 (Calibration status – OK). The event will carry also module 37 (Calibration matrix).

Calibration error

The system will test its calibration/tilt status continually.

Upon detection of a calibration issue the system will initiate an event to the CSA server with event reason 5 (Calibration status – Error). The event will also carry modules 37 and 43.

The calibration issue will be considered in the following cases:

- First calibration is not finished in 20 driving hours
- Tilt validation test failed due to orientation change (50 steps failure)

Calibration / tilt trigger

Calibration process may be triggered or ended by OTA command (Module 20).

It is possible to bypass the calibration process by setting calibration matrix (OTA Module 42) followed by Enter calibrated mode (use existing calibration matrix) command (Module 20).

6.1.7.2 Manual Calibration

The values and process given in the paragraphs below are applicable only for manual calibration (done deliberately by a driver) and not to an automatic process. Manual calibration can be operated for debugging and evaluation purposes in order to accelerate the time to reach calibration in a newly installed device. By following the instructions below, one can calibrate a device in less than 30 minutes.

The calibration process contains two phases, each phase is a test repeated 10 times (steps). The result of each step will be very similar to the result of the previous one, otherwise the step fails. Detection of 50 faulty steps causes a Calibration Process fail (the corresponding event is delivered through the CSA). It can happen, for example, if the unit is not well secured in the vehicle and changes its position while the vehicle is moving.

Any type of reset in the middle of the stage will restart the stage, irrespective to the number of passed steps of the same stage.

Pre-Conditions for Calibration process start

Need to have a valid GPS signal.

Phase One

- Standing still for at least 5 seconds
- Accelerating to 15 km/h

Phase Two

- Accelerating to around 40-50 km/h
- Braking with a constant brake to 0 km/h while vehicle is moving straight forward

---

IMPORTANT:

Steering wheel has to be straight – the course of the car must be constant.

The thresholds for the braking are 14 km/h brake in 3 seconds and at least 4 km/h for every second during the brake. You will do at least 30-0 km/h and 7-8 km/h brake in a second in order to be sure you are above the thresholds.

Stand still for 5 seconds before accelerating again.

6.1.8 *Upload raw data when maneuver ends (real time FTP)*

Address Offset: 44, bit 6

If this bit is enabled, the unit will pack the raw data of each detected maneuver into a separate file, establish a FTP or TFTP connection to an appropriate server and try to upload this file as generated.

Default: 0 – disabled

6.1.9 *Enable Event upon End of File Upload*

Address Offset: 44, bit 5

If this bit is set the unit will automatically send notification as a CSA event with Transmission reason 17 and with corresponding file id upon file upload through FTP or TFTP.

Default: 1 – send event

6.1.10 *Auto Sends Trip Statistics upon Trip End*

Address Offset: 44 bit 0

If this bit is set the unit will automatically escort End of Trip CSA event (TR44 by the trip statistics module) upon the end of the trip. The message will contain at least Module 30 and Module 32.

Default: 1 (send statistics)

6.1.11 *Driver Behavior Odometer base units*

Address Offset: 123

The value defines the odometer measurement unit. Selecting the proper factor enable to set the desired unit for the odometer reading to KM, Miles or any other unit.

Default: 1000 (1 Km)

6.1.12 *Trip Management Control, GPIO Selection*

Address Offset: 122

This configurable parameter enables the user to select one of the unit's inputs to function as a trigger for starting and ending a trips. The first trip will always start by Ignition on. This feature enables multiple trips to be managed in single ignition session.

Trip GPIO code	Description

0	Trip starts/Stops based on Ignition only
1	TRIP_SOURCE_GPIO_DOOR
2	TRIP_SOURCE_GPIO_IGNITION_INPUT
3	TRIP_SOURCE_GPIO_PANIC
4	TRIP_SOURCE_GPIO_SHOCK
5	TRIP_SOURCE_GPIO_UNLOCK (GPIO 1)
6	TRIP_SOURCE_GPIO_LOCK (GPIO 2)

Default: 0 (Ignition)

6.2 Communication Settings

6.2.1 *Real Time Event CSA Server settings*

A Real Time Event CSA Server is used for uploading events and maneuver/trip statistics. Normally this will be a communication gateway of the safety application.

There are no separate APN credentials for this connection; the system dials via the APN programmed for the operational server in the Host Application.

6.2.1.1 CSA Real Time Event Server IP Address

Address Offset: 00 to 03

Description: Stores an IP address of the CSA operational server. All the traffic during normal operation of CSA will be sent to/from this IP address.

If this parameter contains zeros, the unit will use a CSA DNS instead.

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

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

6.2.1.2 CSA Real Time Event Server DNS Address

Address Offset: 04 to 35

Description: The Domain Name System (DNS) is a hierarchical naming system for 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.

The CSA supports 2 levels of subdomains (e.g XXX.XXX.XXX.XXX), maximum length is 32 characters.

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 will use this IP address for dial up.

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

6.2.1.3 CSA Real Time Event Server Listening UDP Port

Address Offset: 36 - 37

Description: Applicable only for UDP/IP sessions.

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

Value resolution and span: 0- 65535

Default value: 231

6.2.1.4 CSA Real Time Event Server Target TCP (and UDP) Port

Address Offset: 38-39

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

Value resolution and span: 0 - 65535

Default value: 231

6.2.1.5 Connection Type to event CSA Server

Address Offset: 40, bits 0-3

Description: This parameter defines the Connection Type to the CSA Server.

Value	Network
0	UDP/IP over GPRS
1-2	Reserved
3	TCP/IP over GPRS
4-7	Reserved

Default value: 0

6.2.1.6 Message Transmit Acknowledge Timeout

Address Offset: 41

This parameter defines the maximum time the unit will wait for the server to acknowledge (from CSA real time event server) an event or frame during file upload. If no ACK is received by this time, the event will be retransmitted.

Data format: 8-bit unsigned. Resolution is 1sec/bit.

Default: 30 Seconds

6.2.1.7 Add PLMN module to every outgoing packet

Address Offset: 43 bit 0 (2nd configuration bitmask)

If this bit is set the unit will add PLMN (module 4) to every outgoing packet sent to the CSA real time event server.

Default: 0 - disable

6.2.1.8 Add Time to every out baud packet

Address Offset: 43 bit 1 (2nd configuration bitmask)

If this bit is set the unit will automatically add Time (Module 7) to every outgoing packet to the CSA real time event server. The Time module will be attached upon delivery.

Default: 0 - disable

6.2.1.9 Commands reply policy to CSA Server

Address Offset: 42, bit 3

This bit defines the stage when the unit will reply to the received command from the CSA Real Time Event Server: upon reception (0) or upon accomplishment (1).

Default value: upon reception (0)

6.2.1.10 Crash treatment

Address Offset: 42, bit 6

A detected crash can be processed according to a maneuver procedure OR according to an EDR procedure.

If it is treated according to a maneuver procedure, the crash is assigned the same optional list attributes as any other maneuver: event, statistics, and raw data on pre-programmed sampling rate.

If the crash is treated according to an EDR procedure, the list of optional attributes is different, as per the description in the EDR section elsewhere in this document: event, SMS, reminder, high sampling of raw data, separate pre-and post crash raw data containers, etc.

Available values:

0 – EDR

1 - Maneuver

Default value: 0 (EDR)

** Supported by Cello-IQ50 only

6.2.1.11 Enable CSA IP Up Event

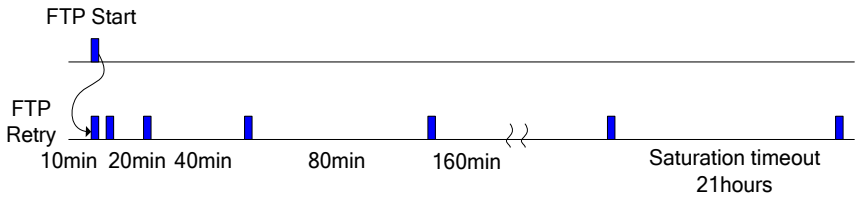
Address Offset: 42, bit 7

The "IP Up" event is generated with every dial-up to GPRS in order to update the CSA server with the recent IP address of the unit. In some cases, these events create redundant data traffic, and thus it is possible to disable them.

Default value: 1 – enable

6.2.1.12 File Upload to FTP/TFTP Server

Cello-IQ units uses File Transfer protocol to upload its raw data files to the server. The files are generated and stored into the unit's nonvolatile memory and sent to the FTP server when predefined configurable conditions are met. Please refer to the FTP configurable options for more details. The Cello-IQ supports FTP for TCP and TFTP for UDP and maintains management procedures to guaranty successful file transfer while minimizing interaction with the server to avoid server congestion. When FTP/TFTP transaction fails, the Cello-IQ unit starts back-off mechanism designed to control the retry policy towards the server. The back-off mechanism will implement a binary exponential retry timeout policy which iteratively increases the timeout between retries till predefined timeout saturation value is reached (21 Hours).



File upload sessions can postpone unit's hibernation till files are completely sent.

6.2.1.13 Cello-IQ File Types

The Cello-IQ unit can generate the following types of files:

- Trip file
- Crash File (** Supported by Cello-IQ50 Only)
- Raw log file

The file transfer will be performed through FTP or TFTP to a dedicated server.

The file can be transferred automatically, per configuration. For example, it is possible to upload the crash log upon crash detection or trip log upon the end of the trip.

The file can also be transferred by command, requesting specific trip, maneuver or crash.

6.2.1.14 Files variants: Trip file

Trip file is a container of the maneuvers, wrapped into a file frame containing Trip Statistics.

Trip ID				
Trip stat	Maneuver 1	Maneuver 2	Maneuver N-1	Maneuver n

It is possible to configure the content of the maneuver per its severity: it is possible to exclude events of certain severity from the log, enable the logging of only the statistics of the maneuvers of a certain severity or enable the logging of everything - raw accelerometer data, GPS and statistics all together.

If the trip file contains raw data it will be delivered in a compressed format.

Single Maneuvers can be transferred as a response to a corresponding command. It is a private case of Trip file. Obviously the maneuver file will only contain logged attributes of the corresponding maneuver and will not contain the trip statistics.

If raw data was not logged for certain maneuver due to a severity setting – it will not appear in the file.

6.2.1.15 Files variants: Crash File

**Supported by Cello-IQ50 Only

The Crash file will always contain:

- Crash Attributes
- Pre-crash data, containing raw acceleration on selected sampling rate

- Post-crash data, containing raw acceleration on 100Hz sampling rate

The Crash file will always be delivered in compressed format.

Trip ID		
Crash Attributes	Pre-crash data on selected sampling rate	Post-crash data on 100Hz sampling rate

6.2.1.16 Files variants: Raw log file

From the trip start to trip end the unit logs raw accelerometer data and GPS packets, fragments it by 100kB and delivers by FTP as soon as possible.

The raw data files are generated in parallel to the normal activity of the CSA, independently from Trip or Crash files.

6.2.1.17 Hibernation postponing

During file upload, after the process was acknowledged by the server side, hibernation should be postponed until the unit completes the operation.

6.2.1.18 FTP vs. TFTP

The file transfer will be performed through FTP or TFTP (Trivial File Transfer Protocol) to a dedicated server.

FTP and Trivial FTP are very similar protocols. FTP is the more complex version of the two. It provides more features and is session-oriented. FTP is also more commonly used. TFTP is essentially a "stripped down" version, with fewer commands and capabilities.

In our implementation:

- FTP relies on TCP, whereas TFTP instead uses UDP.
- Classically file transfer through TFTP is performed in lock-step, with only one packet (either a block of data, or an 'acknowledgement') ever in flight on the network at any time. Due to this lack of windowing, TFTP provides low throughput over high latency links.
- TFTP does not support user authorization; the file transfer is performed in an File name convention

Once the unit has finished uploading a file, an appropriate event will be sent to a CSA RT server.

The file name is built according to the following convention:

- The name is constructed from a variable number of fields, each of variable length.
- The file extension will indicate if compressed (.cpr or uncompressed .raw).
- Each field will begin with a dedicated Latin letter (case sensitive, see table below).
- Each field, except the last one, will end with a minus sign "-".

The file name structure: **U*-R*-I*-D*-T***

The name file form will be as in the following example:

U9999-R1-I0004D1_0000F2-D110728-T115843001.cpr

U: Unit ID (variable size) - contains Cello unit ID in decimal format.

R: File type

MANU	1	Maneuver (3 chars) a file containing single maneuver
TRIP	2	Trip file with list of maneuvers and trip stat, optionally containing raw acc and GPS data.
CRASH	3	Accident record (Crash file)
RAW	4	Raw accel/gps/rpm record generated during Raw Logger Mode

I: Trip/maneuver/raw or crash ID

The field containing the ID of a trip or crash. In case of maneuver the number of trip will be followed by maneuver id, each one 3 hexadecimal bytes: I0004D1-0000F2 means trip 0x4D1, maneuver 0xF2.

D (Date): YearMonthDay

Day: 2chars

Month: 2chars

Year: 2chars

T (Timestamp): HourMinuteSecondmSeconds

Hour: 2chars

Minute: 2chars

Second: 2chars

mSeconds: 3chars

Example: U9999-R1- I0004D1-0000F2-5-D110728-T115843001.raw

- Unit ID: 9999
- File type: 1 (maneuver)
- Trip ID: trip 0x4D1, maneuver 0xF2
- Date: 11/07/28
- Time: 11:58:43:001
- Uncompressed format

6.2.1.19 FTP/TFTP Server IP Address

Address Offset: 142 to 145

Description: Stores an IP address of the FTP/TFTP server used for data upload. If this parameter contains zeros, the unit will use a CSA FTP/TFTP DNS instead.

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

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

6.2.1.20 FTP/TFTP DNS Address

Address Offset: 146 - 177

Description: The CSA supports 2 levels of 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 will use this IP address for dial up.

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

Default value: null

6.2.1.21 TFTP Self UDP Port

Address Offset: 178 - 179

Description: Applicable only for TFTP Session. The parameter contains the self UDP port X.

Value resolution & span: 0- 65535

Default value: 231

6.2.1.22 FTP / TFTP Port

Address Offset: 180- 181

Description: Destination port for file uploads protocol. Common for both FTP and TFTP

Value resolution & span: 0- 65535

Default value: 21

6.2.1.23 FTP authentication username

Address Offset: 182-205

Description: This parameter contains a FTP username used upon dialing to an FTP server.

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

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

Default value: ASCII "test"

6.2.1.24 FTP authentication password

Address Offset: 206-230

Description: This parameter contains a FTP password, used upon dialing to an FTP 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

6.2.1.25 Connection Type to CSA FTP Server

Address Offset: 40, bits 4-7

Description: This parameter defines the file upload protocol.

Valid values:

Value	Network
0	TFTP
1	FTP
2	reserved

Default value: 0

6.3 Crash EDR

** All the Crash related parameters contained in section 6.3 are Supported by Cello-IQ50 Only

This section defines the behaviour of the system upon detection of a Crash if the Crash Treatment programmable flag defines the treatment as EDR.

- The unit saves crash data log, before and after the crash. The crash log is separated to pre-crash and post-crash durations, each can be separately configured. The total length of crash log is up to 50 seconds. Upon detection of one of the crash types, the unit will start logging post accident GPS [1Hz] and 3D accelerometer information. Sampling rate of post accident 3D accelerometer is hardcoded to 100Hz.
- Up to two accidents can be saved into NVM before being uploaded to the server side. If more than two crashes are detected in a single trip the third one will not be saved. The system will be able to detect a new accident event right after finishing logging the post accident data of the previous crash.
- Upon detection of a crash, the system will move into accident mode and will cease any safety or ECO related activities until the accident event logging ends.
- Crash event detection will be performed over the maximum available sampling rate of the accelerometer (100Hz).
- Crash data might be erased from the log memory once uploaded successfully to the server side or not, as per configuration (separately for each crash severity, see below). If more than two crashes data exist in the NVM, each data set will be managed separately in terms of uploading an acknowledgement from the server side and follow-up delete.
- It will also be possible to command the device to erase the crash data accumulated in the memory (Module 19 of CSA protocol) even if not uploaded successfully to the server side.

6.3.1 *Pre Crash data log duration*

Address Offset: 59 (bits 0-3)

This parameter defines the size of a logged pre crash buffer in seconds, while the remaining time might be used for post crash log. The total length of crash log is up to 50 seconds. If the pre and post crash data log durations are configured with values which sum exceeds 50 seconds, the unit will set the pre crash data log duration to 20 seconds, and the post crash data log duration to 30 seconds.

Resolution: 5 seconds/bit

Valid span: 10-40 seconds. Values below or above this span are saturated automatically.

Default: 20 sec.

6.3.2 *Post Crash data log duration*

Address Offset: 59 (bits 4-7)

This parameter defines the size of a logged post crash buffer in seconds, while the remaining time might be used for pre crash log. The total length of crash log is up to 50 seconds. If the pre and post crash data log durations are configured with values which

sum exceeds 50 seconds, the unit will set the pre crash data log duration to 20 seconds, and the post crash data log duration to 30 seconds.

Valid span: 10-40 seconds. Values below or above this span are saturated automatically.

Resolution: 5 seconds/bit

Default: 15 sec

6.3.3 *Crash reminder period*

Address Offset: 70

Existence of raw crash data in the device's log memory will be indicated to the CSA server (by resending an event containing at least modules 30 (Full event) and 35 (Crash Attributes) periodically.

- The reminder will not be sent during file upload process.
- The reminder will not be sent during crash logging procedure.
- If there are two crash files in the memory the reminder will only be sent for the first one.
- The remainder will be canceled upon the end of the corresponding crash data upload.

Resolution: minute/bit

Default: 0 – disabled

6.3.4 *Configuration of Detection of Light / Heavy Crash*

6.3.4.1 Light crash detection threshold

Address Offset: 55

This parameter contains the value of acceleration RMS (gravity eliminated), used to detect a light crash (any acceleration higher than this threshold and lower than the threshold of heavy crash for longer than a filter above will be considered a light crash).

Note: This threshold is used in both Crash Treatment modes: EDR and Maneuver.

Resolution: 0.0313725 g

Valid range 2g<X<8g, higher and lower programmed values are automatically saturated.

Default: 3g

6.3.4.2 Heavy crash detection threshold

Address Offset: 56

This parameter contains the value of acceleration RMS (gravity eliminated), used to detect a heavy crash (any acceleration higher than this threshold for longer than a filter above will be considered a heavy crash).

Note: This threshold is used in both Crash Treatment modes: EDR and Maneuver.

Resolution: 0.0313725 g

Valid range 2g<X<8g, higher and lower programmed values are automatically saturated.

Default: 5g

6.3.4.3 Enable EDR event for Light/Heavy crash

Address Offset:

57 bit 0 for Light Crash

58 bit 0 for Heavy Crash

Description: *This bit will only take effect if Crash Treatment flag is set as EDR.*

If this bit is enabled, the unit will issue an event containing at least modules 30 (Full event) and 35 (Crash Attributes) to CSA server after finishing crash file logging.

Default: 1 - Enable

6.3.4.4 Enable auto-upload crash file for Light/Heavy crash

Address Offset:

57 bit 3 for Light Crash

58 bit 3 for Heavy Crash

Description: *This bit will only take effect if Crash Treatment flag is set as EDR.*

If this bit is enabled the unit will initiate crash file upload automatically just after issuing an event. If the event is disabled, the unit will initiate crash file upload automatically after the end of Crash fie logging.

Default: 1 - Enable

6.3.4.5 Do not erase Light crash data from memory after successful upload

Address Offset:

57 bit 4 for Light Crash

58 bit 4 for Heavy Crash

Description: *This bit will only take effect if Crash Treatment flag is set as EDR.*

If this bit is enabled, the unit will not erase crash data upon successful upload, but only upon dedicated command.

Default: 0 - Erase

6.3.5 *Voice Call (ECALL)*

6.3.5.1 ECALL phone number

Addresses: 60-69

Description: Stores the phone number used by the unit to establish a voice call upon crash detection (if enabled in the parameters described below). Under normal circumstances, this will be a voice line phone number of the CSA Central Control room.

Data format: First byte will 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 will 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 will have all of its bits set (the nibble will contain 15). The rest of the bytes that are not used will contain 00FFh.

Default value: Null

6.3.5.2 Enable ECALL upon Light/Heavy crash

Address Offset:

57 bit 2 for Light Crash

58 bit 2 for Heavy Crash

Description If one of those bits is enabled the unit will generate a phone call to the phone number programmed on address 60-69 upon detection of crash with corresponding severity.

The time elapsed from the moment of crash detection until the time of voice channel establishment is of great importance. Therefore, a voice session will be triggered immediately after sending the message in GPRS or SMS. If GPRS transmission fails due to network or server availability issues, the system will make an attempt to send it via SMS and only then to establish the call.

Default value: 0 – disable

6.3.6 *SMS*

6.3.6.1 SMS Server Destination phone number

Addresses: 72-81

Description: Stores a phone number used by the unit for delivery of a Crash Report Event over SMS (when needed). The system uses an SMSC programmed in a HA during the delivery process.

Data format (GSM-SMS): First byte will 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 will 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 will have all of its bits set (the nibble will contain 15). The rest of the bytes that are not used will contain 00FFh.

Default value: null

6.3.6.2 Enable SMS upon crash (Heavy/Light)

Address Offset:

57 bit 1 for Light Crash

58 bit 1 for Heavy Crash

Description:

This bit only takes effect when:

- Crash treatment is set as EDR
- Event for corresponding severity of crash is enabled (bit 0 of address 57 or 58).

If GPRS transmission fails due to no GPRS available upon delivery attempt or no ACK from TCP or UDP server for the first attempt, the system will make an attempt to send the following modules via SMS to the SMS destination number one time (no retries will be made):

- Full event (Module 30)
- Only if enabled in configuration: PLMN and Time.

SMS does not require an ACK from the CSA server side.

6.4 Driver Feedback Display (DFD)

The vehicle's dashboard may optionally be equipped with a Visual and Audible interface, which connects to the Cello-IQ unit over the COM port and allows the following functionalities:

- Driver identification reminder.
- Notification upon existence of driving monitoring system in the vehicle in case the driver did not identify themselves.
- System ordinary operation / health status indication.
- Driver's real time feedback, to encourage the driver to control and improve their driving habits:
  - **Visual**

    The display provides a dedicated LED indicating the different types of maneuvers taking place at the moment with their severity monitored on 4 levels (Green / Yellow / Red) amplitude gauge.
  - **Audio**

    The display provides audible indications to the driver (voice level according to ISO15006 section 4) that their driving is monitored if he/she was not identified or upon every time the engine is switched on or driver is replaced.
- The display is powered only when the vehicle switch is on.

Note: Refer to the DFD integration manual for the full list of DFD monitoring patterns.

6.4.1 *Icons*

Name	Icon
Hard braking	
Sharp cornering	
Over speeding	
Harsh acceleration	

Wrong gear handling	
Off-road driving	
Excessive idling	

6.4.2 *Audio Feedback messages language selection*

Address Offset: 233

This parameter contains the ID of the language used for Audio Feedbacks. Each supported language has predefined set of messages identified by number corresponding with voice file in the DFD SD card.

6.4.2.1 The Voice Allocation Table

Language ID	**Voice Message IDe corresponding with the file name** **Example:**	**Available audio strings**
0 – Buzzer	0	0 – Short beep
	1	1 – Long beep
	2	2 – double short beep
	3	3 – double long beep
1 -English	0	Notification beep
	1	Self Test Beep
	2	“System error detected. Please contact your service provider"
	3	"Communication error detected. Please contact your service provider"
	4	“This vehicle is monitored by fleet management system”
	5	"Have a safe trip"
	6	"Please introduce your driver key"
	7	“Harsh acceleration recorded”
	8	“Harsh break recorded”

Language ID	Voice Message IDe corresponding with the file name Example:	Available audio strings
	9	“Sharp lane departure recorded”
	10	“Harsh cornering recorded“
	11	“Harsh cornering and acceleration recorded“
	12	“Harsh cornering and brake recorded“
	13	"Off-road driving session recorder, if possible, please returns to the main road".
	14	“Gliding or Excessive engine speed recorded“
	15	“Speeding Recorded“
	16	“Idling recorded. Please start driving or turn engine off”
	17	“Gliding detected”
	18	excessive idling
	19	offroad event :
	20	speed limit violation
	21	green speed violation
	22	yellow speed
	23	red excessive speed violation
2 - Swedish		1-255
3 - Spanish		1-255
4 - French		1-255
5 - Russian		1-255
6 - Portuguese		1-255
7 - Hebrew		1-255
8 - Moroccan		1-255

Language ID	Voice Message IDe corresponding with the file name Example:	Available audio strings
9 - Polish		1-255
10- German		1-255
11- Turkish		1-255
12- Chinese		1-255
13- Romanian		1-255

Default: 1 - English

6.4.3 *Maneuver's severity level display time (DFD)*

Address Offset: 120

This parameter holds the Maneuver's severity level display time. When maneuver is detected and classified the maneuver's severity level is momentarily displayed on the DFD's RMS gauge. The following sequence of events will follow the maneuver's classification:

- The RMS gauge will be turned off (if enabled) for 0.2 seconds
- The maneuver's Icon (LED) will be turned on for a time, programmed in this parameter
- While the maneuver Icon (LED) is glowing the RMS gauge will display the severity of the detected maneuver in the following way:

Severity	Glowing LEDs
Green	First LED only
Yellow	2nd + 3rd
Red	4th LED only

Note: Continuous events (Off Road and Excessive RPM) cause the LED to glow constantly during violation.

- Switch off the Icon (LED) and switch off the RMS gauge for 0.5 seconds (then restore normal ACC RMS monitoring if enabled)

This parameter is only applicable for detection of the following maneuvers: Turn, Brake, Acceleration and Lane change.

Resolution: 200 msecs

Default: 15

6.4.4 *Enable DFD*

Address Offset: 231, bit 0

Description: The DFD will only be driven by the Cello-IQ unit if this flag is enabled.

Even if disabled, the DFD will perform the self test upon power up and report communication errors by blinking the blue LED 1Hz 50% Duty Cycle.

Default: 0 – disable

6.4.5 *DFD Volume*

This parameter controls the DFD speaker's volume.

Address Offset: 244

0- Speaker Disable

1- 70 : Speaker's volume

Default value: 70

6.4.6 *Enable DFD Acceleration RMS display*

Address Offset: 231, bit 1

Description: If this bit is enabled, the 4 LEDs of the gauge bar will monitor RMS acceleration with a refresh rate of 5Hz. Upon maneuver detection – the 4 LEDs of the gauge bar will monitor severity of the maneuver (see Maneuver's severity level display time (DFD)).

Default: 1- enable

6.4.7 *Enable DFD Audio upon Off-road*

Address Offset: 231, bit 2

Description: If this bit is enabled and Off-road condition is detected the following string will be played on the DFD: "Off-road driving session recorded, if possible, please returns to the main road".

Default: 1- enable

6.4.8 *Enable DFD Sound (Beep) upon Off-road*

Address Offset: 231, bit 3

Description: If this bit is enabled and Off-road condition is detected a short beep will be played on the DFD.

Default: 1- enable

6.4.9 *Enable DFD Visual upon Off-road*

Address Offset: 232, bit 6

Description: If this bit is enabled and Off-road condition is detected, the DFD's Off-road icon will lite for a short time.

Default: 1- enable

6.4.10 *DFD Status Bar Display Mode (Infrastructure)*

Address Offset: 232, bit 7

Default: 0- Disable

6.4.11 *DFD Risk Score Display - Safety Score weight in % (Infrastructure)*

Address Offset: 93

Description: This parameter defines the weight of the Safety Score in the Risk Score calculation. The Risk Score Calculation is needed when the user configures the DFD Status Bar to reflect the current Trip Risk Score. The value is in Percents.

Default: 50 %

6.4.12 *Enable DFD Communication loss Event*

Address Offset: 43, bit 7

Description: When "Enable DFD communication loss event" is enabled, the unit will send CSA OTA message module 0 with TR 27 whenever DFD communication state changes. The Cello-IQ Fw periodically polls the DFD. When the DFD doesn't replies the Cello-IQ polls for more than 10 Seconds a DFD communication loss is declared and a message is sent.

The DFD communication status is reflected in every Module 30 message via bit number 1 in the Operations mode field.

Default: 1- enable

6.4.13 *Enable DFD audio feedback upon driving without authorization*

Address Offset: 231, bit 4

Description: If this bit is enabled, and driver authentication timeout elapses then the DFD will play audio message asking the driver to identify himself (by using Dallas key or other authentication device).

Default: 1- enable

6.4.14 *Enable DFD audio warning on ignition*

Address Offset: 231, bit 5

Description: If this bit is enabled and "Enable audio feedback upon driving without authorization" is disable then the unit will play an audio message announcing the vehicle is monitored by fleet management system.

Default: 1- enable

6.4.15 *Enable DFD audio feedback upon driving authorization update*

Address Offset: 231, bit 6

Description: If this bit is enabled and driver authentication completes successfully the DFD will play an audio message announcing "Have a safe trip".

Default: 1- enable

6.4.16 *Enable DFD Audio upon Short Idling*

Address Offset: 232,

Short Idling - bit 0

Long Idling - bit 1

Description: Enables audible DFD message when vehicle stands with motor on for relative short time.

Default: 1- enable

6.4.17 *Enable DFD Audio upon Long Idling*

Address Offset: 232,

Short Idling - bit 0

Long Idling - bit 1

Description: Enables audible DFD message when vehicle stands with motor on for relative long time.

Default: 1- enable

6.4.18 *Enable DFD Visual indication upon short idling*

Address Offset: 232,

Short Idling - bit 2

Description: Enables Visual DFD indication when the vehicle stands with motor on for relative short time.

Default: 1- enable

6.4.19 *Enable DFD Visual indication upon long Idling*

Address Offset: 232,

Long Idling - bit 3

Description: Enables Visual DFD indication when the vehicle stands with motor on for relative long time.

Default: 1- enable

6.4.20 *Enable DFD Sound (Beep) indication upon short idling*

Address Offset: 232,

Short Idling - bit 4

Description: Enables Short beep sound when the vehicle stands with motor on for relative short time.

Default: 1- enable

6.4.21 *Enable DFD Sound (Beep) indication upon long Idling*

Address Offset: 232,

Long Idling - bit 5

Description: Enables Short beep sound when the vehicle stands with motor on for relative long time.

Default: 1- enable

6.4.22 *Enable DFD audio feedback upon Wrong Gear Handling*

Address: 236, bit 0

Description: If this bit is enabled then the unit will play an audio message announcing the vehicle is in Wrong Gear Handling.

0 - Disable

1 - Enable

Default Value: 1 - Enable

6.4.23 *Enable DFD visual feedback upon Wrong Gear Handling*

Address: 236, bit 1

Description: Enables Visual DFD indication when the vehicle is in Wrong Gear Handling.

0 - Disable

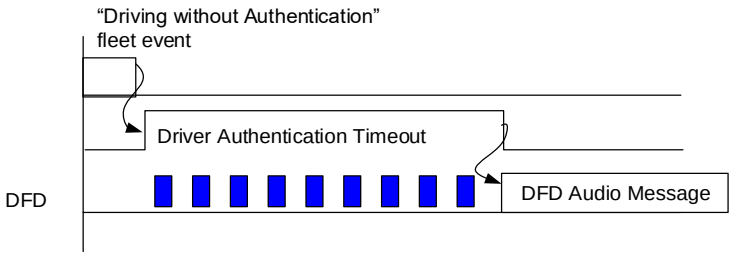
1 - Enable

Default Value: 1 - Enable

6.4.24 *Driver Authentication Reminder Timeout*

Address Offset: 54

Description: This parameter defines the time in which the DFD will generate short beeps, starting after sending "Driving without Authentication" fleet event. If the driver didn't authenticate his ID within this time, the DFD will generate an audio message. 0 – disables the reminder beeps.



Default: 30 seconds

6.5 Manoeuvre Settings

6.5.1 *Logged pre-maneuver time*

Address Offset: 102

This parameter defines the maneuver's preamble time. The preamble time will be included in maneuver's recorded raw data. The minimal time is 1 Second and the maximal time is 5 seconds.

Resolution: 100msec

Default 3 sec

6.5.2 *Logged post-maneuver time*

Address Offset: 103

This parameter defines the maneuver's postamble time. The postamble time will be included in maneuver's recorded raw data. The minimal time is 1 second and the maximal time is 5 seconds.

Resolution: 100msec

Default 3 sec

6.5.3 *Minimum Speed for Maneuver Detection*

Address Offset: 92

This parameter defines the minimum speed, required for detecting acceleration, brake and turn maneuvers.

Below this speed the CSA will ignore any of the maneuvers listed above and their combination.

Resolution: km/h / bit

Default: 10 km/h (maximum is 25km/h, the higher value is saturated)

6.5.4 *Maneuver Detection bitmask*

The following bitmask enables/disables maneuver processing. If disabled by the corresponding bit in this bitmask, the maneuver will not be detected by the unit.

1 – Enables maneuver detection / 0 – cancels maneuvers detection

Maneuver group	Maneuver Name	Address
Momentary Maneuvers (ABC maneuvers)	Harsh Acceleration	82 bit 0
	Harsh Brake	82 bit 1
	Harsh Turn	82 bit 3
	Turn & Accel	82 bit 4

	Turn &Brake	82 bit 5
	Sharp Lane crossing	82 bit 2
Exceptional Momentary maneuvers	Light crash (Always RED A)	83 bit 1
	Heavy crash (Always RED severity)	83 bit 2
Continuous Maneuvers	Excessive RPM	82 bit 7
	Short Idling	43 bit 5
	Long Idling	43 bit 6
	Off road (Always RED severity)	82 bit 6
	Speeding	83 bit 0
Exceptional continuous maneuver	Speed Profiling	42 bit 0

6.5.1 *Attributes per Severity*

Each detected maneuver is assigned with an appropriate severity: Normal (Green), Moderate (Yellow) or Dangerous (Red).

The user can customize severity thresholds for most continuous maneuvers (except the Offroad); the severity thresholds of momentary maneuvers are hardcoded.

Offroad and Crash maneuvers will always be assigned with Dangerous (Red) severity.

Each severity type can be assigned by one or more attributes available for the same group of maneuvers.

6.5.1.1 Available attributes for each group

Attribute	Reported to Server	Momentary Maneuvers (ABC)	Continuous Maneuvers
Event	CSA server	V	V
Event + Statistics	CSA server	V	V
Statistics	FRP/TFTP	V	V
Raw accelerations + Statistics	FRP/TFTP	V	X

6.5.1 *Severity threshold separating between Green and Yellow score*

Address Offset: 234

Severity threshold separating between Green and Yellow score for the following maneuvers:1-Acceleration; 2-Brake; 3-Lane crossing; 4-Turn; 5-Turn & Acceleration; 6-Turn & Brake

Default: 50

6.5.1 *Severity threshold separating between Yellow and Red score*

Address Offset: 235

Severity threshold separating between Yellow and Red score for the following maneuvers:1-Acceleration; 2-Brake; 3-Lane crossing; 4-Turn; 5-Turn & Acceleration; 6-Turn & Brake.

Default: 20

6.5.2 *Enable Event(s)*

Addresses:

Green severity:	Address 84, bit 0
Yellow severity:	Address 85, bit 0
Red severity:	Address 86, bit 0

Description: If this bit is set, the unit will generate one event to the CSA server upon detection of a momentary maneuver and at least two (start and stop) upon detection of a continuous maneuver. More events can be generated during detection of a continuous maneuver, if the severity of the detected maneuver is increased before maneuver's end.

For example: Upon speeding detection the following sequence of events can be generated: Green Speeding Start -> Yellow Speeding Start ->Speeding end.

Note that the event for *Continuous Maneuver End* will be generated only for the lowest severity enabling events.

Default: all enabled (1)

6.5.3 *Attach Statistic to event*

Addresses:

Green severity:	Address 84, bit 1
Yellow severity:	Address 85, bit 1
Red severity:	Address 86, bit 1

Description: If this bit is set, the unit will attach maneuver statistics module to any OTA event of a momentary maneuver detection and Maneuver End event of a continuous maneuver.

Default: all enabled (1)

6.5.4 *Enable Raw + Stat Log*

Addresses:

Green severity:	Address 84, bit 2
Yellow severity:	Address 85, bit 2
Red severity:	Address 86, bit 2

Description: If this bit is set, the unit will save accelerometer raw data and statistics of momentary maneuvers with an appropriate severity for future upload to FTP or TFTP server.

Note: This flag is NOT supported by continuous maneuvers.

Note: For complete logging of Raw data and statistics data the bit "Enable log of Maneuver statistics only" must be set to 0.

This flag is NOT supported by continuous maneuvers.

Default: all enabled (1)

6.5.5 *Enable log of maneuver statistics only*

Addresses:

Green severity:	Address 84, bit 3
Yellow severity:	Address 85, bit 3
Red severity:	Address 86, bit 3

Description: If this bit is set, the unit will save only the **statistics** of a maneuver with an appropriate severity for future upload to FTP or TFTP server. For complete logging of RAW data this bit must be disabled.

Default: all enabled (1)

6.5.6 *Enable Audio feedback*

Addresses:

Green severity:	Address 84, bit 4
Yellow severity:	Address 85, bit 4
Red severity:	Address 86, bit 4

Description: If this bit is set, the unit will replay an appropriate audio message upon detection of a maneuver with the appropriate severity.

Default: all enabled (1)

6.5.7 *Enable Visual feedback*

Addresses:

Green severity:	Address 84, bit 5
Yellow severity:	Address 85, bit 5
Red severity:	Address 86, bit 5

Description: If this bit is set, the unit will turn on an appropriate LED and gauge bar indication upon detection of a maneuver with the appropriate severity.

Default: all enabled (1)

6.5.8 *Continuous Maneuvers configuration - Speeding*

NOTE: If the Speed profiling is enabled, the unit will automatically disable Speeding Maneuver detection regardless of speeding configuration flags.

Speeding is a continuous maneuver:

- It will not support attribute of raw data (but may contain stats in a raw log file).
- It will send more than one event upon maneuver detection.

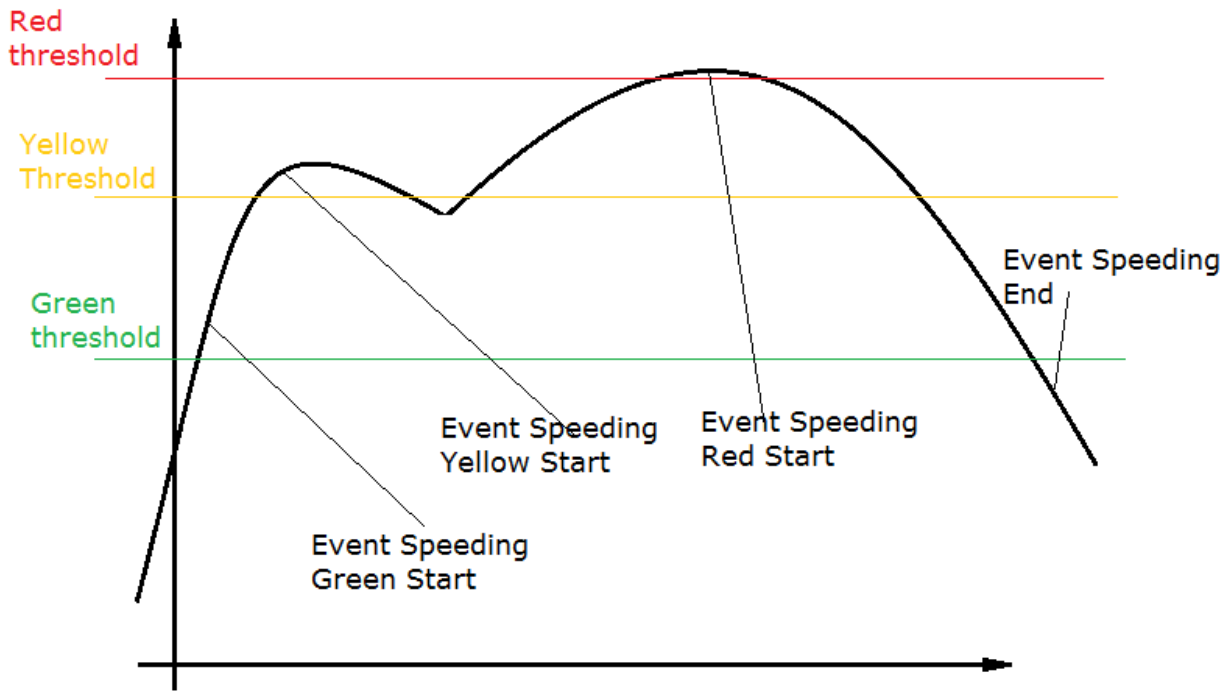
The minimum number of events upon detection is 2:

- Start of speeding of the appropriate severity.
- End of Speeding.

The maximum number of events upon detection: 4

- Start of speeding of the Green severity.
- Start of speeding of the Yellow severity.
- Start of speeding of the Red severity.
- End of Speeding.

Example:



6.5.8.1 Speeding Detection time threshold

Address Offset: 87

This parameter defines the time threshold for speeding violation. Stable speed above the speed threshold for longer than the time defined in this parameter will be considered as speeding violation. This parameter is valid for Green, Yellow and Red thresholds.

The min allowed time is 10 seconds. Lower values are saturated.

Resolution: 100msec

Default: 10 sec

6.5.8.2 Green Threshold for Speeding – Maneuver mode

Address Offset: 89

This parameter is depended on the Speeding Handle flag (Maneuver Mode). The parameter defines speed violation threshold for speeding green (normal) maneuver severity.
Resolution: 1 km/h/bit

Default: 100 km/h

6.5.8.3 Yellow Threshold for Speeding – Maneuver mode

Address Offset: 90

This parameter is depended on the Speeding Handle flag (Maneuver Mode). The parameter defines speed violation threshold for Yellow (Moderate) speeding maneuver severity.

Resolution: 1 km/h/bit

Default: 120 km/h

6.5.8.4 Red Threshold for Speeding – Maneuver mode

Address Offset: 90

This parameter is depended on the Speeding Handle flag (Maneuver Mode). The parameter defines speed violation threshold for Red (dangerous) speeding maneuver severity.

Resolution: 1 km/h/bit

Default: 150 km/h

6.5.8.5 Speeding duration for max risk score

Address Offset: 52

This parameter defines the duration for speeding violation to be declared max risk score.

For example: Red severity speed is 140 km/h. Maneuver will be assigned with the highest risk if the driver was at this speed for longer than 3 minutes (value programmed in this parameter). Otherwise the risk will be lower than maximum.

Resolution: minutes

Values span: 1-30 (higher or lower values saturated)

Default: 3

6.5.9 *Speed Profiling*

Speed Profiling is designed to provide the server side with the capability to evaluate the speed recorded during the trip according to local regulations, weather and lighting conditions during the trip. Obviously the server has a capability to apply different speeding threshold for each segment of the road, while the unit can only operate with one set of thresholds.

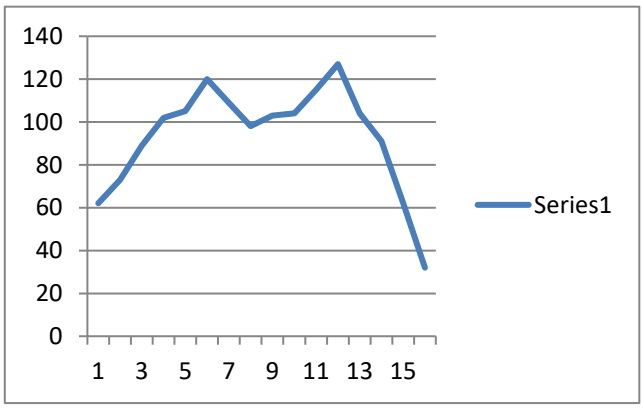
NOTE: If Speed Profiling is enabled, the unit will automatically disable Speeding Maneuver detection.

Speed Profiling relates to a group of continuous maneuvers, although unlike other maneuvers of this group the only attribute available for it is a unique type raw data.

The raw data is built of GPS stamps containing:

- The speed peak points.
- Any change of speed of 5 km/h comparing with previous records.

For example if the speed limit is 90km/h and the measured speed graph looks as follows:



Speed km/h
62
73
89
102
105
120
109
99
103
104
115
127
104
91
62
32

The log will contain only the GPS stamps containing the highlighted speed values

If this bit is set (1) speed profiling will be disabled.

6.5.9.1 Disable Speed Profiling

Address Offset: 42, bit 0

If this bit is NOT set (0), the CSA will log GPS history for further upload to the server through FTP/TFTP. The data will be logged as a Speed profiling maneuver in the corresponding trip.

Default: 1 (Speed Profiling disabled)

6.5.9.2 Threshold for Speed Profiling-GPS Logging Mode

Address Offset: 88

This parameter defines speed violation threshold for starting Speed Profiling mode and GPS logging (see description in the parameter **above**).

Resolution: 1 km/h/bit

Default: 30 km/h

6.5.10 *Excessive RPM*

The RPM is a continuous maneuver:

- It will not support attribute of raw data (but may contain stats in a raw log file).
- It might send more than one event upon maneuver detection.

The minimum number of events upon detection is 2:

- Start of excessive RPM of the appropriate severity.
- End of excessive RPM.

The maximum number of events upon detection: 4

- Start of excessive RPM of the Green severity.
- Start of excessive RPM of the Yellow severity.
- Start of excessive RPM of the Red severity.
- End of excessive RPM.

6.5.10.1 Severity of Excessive RPM maneuver

Excessive RPM maneuvers provide 3 thresholds, dividing the entire engine speed range into 4 sub-ranges.

Unlike other maneuvers, this one provides two Yellow ranges: one above normal engine speed, and one below (coasting). Enabling the Event for Yellow severity will report both Low RPM and High RPM.

Severity of maneuver	Description	Threshold name
Red	Excessive RPM	
		RY Threshold
Yellow	High RPM	
		YG Threshold
Green	Normal RPM	
		GY Threshold
Yellow	Low RPM, coasting	

Any change of range is considered after a programmable time filter (3 seconds by default).

This programmable time starts upon first violation start.

For example:

- at time point 0 the RPM was in Green zone.

- at time point 1 the RPM was already in high (Yellow) zone, the timer started.
- at time point 3 the RPM increased to Excessive (RED) zone.
- at time point 4 the timer started at time point 1 expires and unit will monitor violating Excessive (RED) zone on DFD, although it is only 1 second in this zone. The unit will start the second (reporting) timeout
- If upon expiration of the additional timeout the RPM is still in violating zone, the unit will generate an appropriate event.

Note that the Excessive RPM maneuver does not provide any risk scoring, only ECO scoring is affected.

6.5.10.2 RY RPM Threshold (Red-Yellow)

Address Offset: 95-96

If measured RPM is higher than the threshold programmed in this parameter for longer than the time filter (see Timeout for RPM monitoring range change event generation), it is considered as Excessive RPM (red severity).

Units: RPM

Default: 5000

6.5.10.3 YG RPM Threshold (Yellow-Green)

Address Offset: 97-98

If measured RPM is higher than the threshold programmed in this parameter for longer than the time filter (see Timeout for monitoring RPM range change event generation), it is considered as High RPM (yellow severity).

Units: RPM

Default: 3500

6.5.10.4 GY RPM Threshold (Green-Yellow)

Address Offset: 99-100

If measured RPM is lower than the threshold programmed in this parameter for longer than the time filter (see Coasting Speed Threshold parameter below), it is considered as Low RPM, coasting (yellow severity).

Units: RPM

Default: 1500

6.5.10.5 Coasting Speed Threshold

Address Offset: 51

The unit will register Low RPM maneuver (coasting) if on a speed higher than specified in this parameter the engine speed [rpm] is below the GY Threshold.

The unit will close event (Send Excessive RPM End) if the vehicle speed becomes lower than the Coasting Speed Threshold or if the engine speed becomes higher than the GY RPM threshold (previous parameter).

Units: km/h

Default: 30

6.5.10.6 Timeout for RPM range change event generation

Address Offset: 71

This parameter contains the timeout which if upon expiration the RPM is still violating a certain threshold (RY/YG/GY RPM threshold), the unit will generate an appropriate event.

Parameter range: 3 to 10 seconds. Values lower or higher than this range will be saturated.

Resolution: 1 second

Default value: 3 seconds

6.5.11 *Idling*

The timers of Idling start in one of two cases:

- Upon Ignition On detection.
- Upon "Halt" condition.

In both cases the timer is reset upon detection of "Go" condition.

The Idling relates to a group of continuous maneuvers:

- It will not support attribute of raw data (but may contain stats in a raw log file).
- It might send more than one event upon maneuver detection.

The minimum number of events upon detection is 2:

- Start of (Short) Idling.
- End of Idling or Ignition off.

The maximum number of events upon detection: 3

- Start of Idling.
- Start of Long Idling.
- End of Idling or Ignition off.

NOTE: Upon Ignition off the unit will automatically close opened Idling maneuver and send a dedicated event (if enabled).

Unlike other maneuvers, there are no severities assigned to idling. Enabling detection of Short or long idling will practically enable events and visual DFD responses (for audio DFD responses there are dedicated flags in the DFD configuration section).

6.5.11.1 Short idling timeout

Address Offset: 48

This timeout will represent the time after ignition on or halt, that together with RPM condition (450 for more than 5 seconds), will be considered "short idling" i.e. long

standing in traffic lights or traffic jams. Minimum: 0.5 minute. Maximum: long idling timeout

Resolution: 0.5 minute

Default value: 3 minutes

6.5.11.2 Long idling timeout

Address Offset: 49

This timeout will represent the time after which ignition on with no movement, together with RPM condition (450 for more than 5 seconds), can be considered as excessive idling event, which is probably not related to traffic lights or traffic jams. Minimum: short idling timeout (in case the short and long idling timeouts were configured as the same number, the FW will add 10 seconds difference between the events). Maximum: 30 Minutes.

Resolution: 0.5 minute

Default value: 5 minutes

6.5.11.3 Short idling detection enable

Address Offset: 43, Bit 5

This Configuration bits enable generation of short idling event.

Default value: Enabled

6.5.11.4 Long idling detection enable

Address Offset: 43, Bit 6

This Configuration bits enable generation of long idling event.

Default value: Enabled

6.5.12 *Off-road*

Off-Road is automatically assigned with "Red" severity. The Off-Road event will only be reported/monitored by DFD/logged (as statistics) if the corresponding attribute is enabled for RED severity, although it is not really a Dangerous (RED) maneuver and has nothing to do with RISK.

The Off-Road relates to a group of continuous maneuvers:

- It will not support attribute of raw data (but may contain stats in a raw log file).
- It might send more than one event upon maneuver detection.

The number of events upon detection is always 2:

- Start of Off Road.
- End of Off Road.

6.5.12.1 Off-Road decision time (DFD warning, event)

Address Offset: 53

This parameter sets time for off-road continuous maneuver warning and detection.

When the off-road threshold is crossed for half the time defined in this parameter an off-road DFD warning will be issued. When the off-road threshold is crossed for the full time defined in this parameter an off-road start event will be issued.

When the vehicle vibrations returns under the off-road threshold, an off-road end event will be issued immediately (without time filter).

The min allowed time is 20 seconds. Lower values are saturated.

Note that Off-Road does not provide any risk scoring.

Resolution: 1 second

Default: 20 seconds

6.6 Trip File settings

6.6.1 *Auto-upload options for trip (FTP/TFTP)*

6.6.1.1 Upload Trip log upon trip end (DallasKey or input change)

Address Offset: 44 bit 1

If this bit is set the unit will automatically start the FTP or TFTP file upload process immediately upon end of the trip:

- Due to Ignition Off
- Due to Driver change

Default: 0 (do not upload)

6.6.1.2 Upload Trip log upon Driver ID change

Address Offset: 44 bit 2

If this bit is set the unit will automatically start the FTP or TFTP file upload process immediately upon detection of the new Driver ID.

Default: 0 (do not upload)

6.6.1.3 Upload Trip log after Ignition Off

Address Offset: 44 bit 3

If this bit is set the unit will automatically start the FTP or TFTP file upload process after expiration of the programmable timeout on address 101.

The time is started upon Ignition Off detection.

Default: 0 (do not download)

6.6.1.4 Time to Auto-Upload after Ignition Off

Address Offset: 101

This parameter only takes effect if Upload Trip log after Ignition Off is set.

It contains the time to auto FTP or TFTP file upload in resolution of 10 minutes starting from the Ignition off event.

If the timer expires during modem off mode, the FTP or TFTP file upload will take place upon the next modem wake up.

Default: 30 (5 hours).

6.6.2 *Risk Scoring of Trip*

6.6.2.1 Trip Risk score calculation

The Cello-IQ unit will generate Risk score upon the end of a trip. The Trip score reflects the grade of driving based on available variables received by the CSA continuously, such as:

- Acceleration data
- Speed data
- RPM data (whenever available)

Trip's score is calculated as the weighted average of all accumulated risks of all maneuvers recorded during the trip.

A configurable (PL) weight is given to each maneuver and another for each severity.

Risk score will provide a relative index on a linear scale that will allow ranking different drivers and/or different trips of the same driver, according to their driving behavior and aggressiveness.

The variables which influence risk are:

- Travel related: distance and time of the a trip
- Weather related: the quality and range of visibility, wind
- Vehicle related: engine size and efficiency, weight etc
- Roadway related: roadway grade and surface roughness
- Traffic related: vehicle to vehicle interaction
- Driver related: driver behavior and aggressiveness

The Cello-IQ is aimed at targeting **driver related** and **traffic related** factors while the server side will add other factors (at least the **travel related**) on top of the scoring provided in the unit.

6.6.2.2 Maneuver Weight [%] in trip risk score

Addresses:	Acceleration	–109
	Brake	- 110
	Lane change	- 111
	Turn	- 112
	Turn & Acc	- 113
	Turn & Brake	- 114
	Offroad	- 115
	Speeding	- 117

Description: Upon calculation of trip score it is possible to assign risk score separately to each of the maneuvers participating in the calculation (Idling, Excessive RPM and speeding profile are excluded from this calculation).

For example, it is possible to assign the Brake maneuver with twice the weight than other maneuvers. This way each Brake maneuver will affect a trip's risk score twice as much as other maneuvers.

Note that the final score of each maneuver will also be affected by its severity (refer to Severity levels multipliers).

Value range: 0 to 255. The weight of very important maneuver can be taken higher than 100%.

Defaults :		
	Acceleration	–60%
	Brake	- 100%
	Lane change	- 160%
	Turn	- 100%
	Turn & Acc	- 120%
	Turn & Brake	- 140%
	Offroad	- 0%
	Speeding	- 80%

6.6.2.3 Severity Level Multipliers

Addresses:		
	Green Severity Multiplier (Normal)	– 118
	Yellow Severity Multiplier (Moderate)	- 119
	Red Severity Multiplier (Dangerous)	- 121

Description: It is possible to assign different weight to maneuvers of different severity by multiplying them.

For example, it is possible to assign twice as much weight to Red (dangerous) maneuvers. This way each dangerous maneuver will affect a trip's risk score twice as much as the Green and Yellow maneuvers.

Note that the final score of each maneuver will also be affected by its weight, programmed in the Maneuver Weight [%] in trip risk score).

Green severity values limits: minimum: 1, maximum: yellow multiplier

Yellow severity values limits: minimum: green multiplier, maximum: Red multiplier

Red severity values limits: minimum: Yellow Multiplier, maximum: 15

Defaults:		
	Normal (Green)	=1
	Moderate (Yellow)	=4
	Red (Dangerous)	=16

6.6.3 *ECO Scoring of Trip*

6.6.3.1 Trip Eco score calculation algorithm

The Cello-IQ unit will generate an ECO score upon the end of a trip. The ECO score reflects the grade of Eco driving based on available variables received by the CSA continuously, such as:

- Speed data

- RPM data (whenever available)
- Acceleration data

The score will not necessarily be proportional to the actual fuel consumption and emission level but will provide a relative index on a linear scale that will allow ranking different drivers and/or different trips of the same driver, according to their driving efficiency parameters along the trip.

The variables which influence vehicle energy consumption and emission rates are:

- Travel related: distance and time of the a trip
- Weather related: temperature, humidity and wind effects
- Vehicle related: engine size and efficiency, weight etc
- Roadway related: roadway grade and surface roughness
- Traffic related: vehicle to vehicle interaction
- Driver related: driver behavior and aggressiveness

The Cello-IQ is aimed at targeting **driver related** and **traffic related** factors while the server side will add other factors (at least the **travel related**) on top of the scoring provided in the unit.

The unit is collecting and processing the available Eco-driving affecting variables during consecutive short time slots (1 second each), and generates an ECO score for each time slot.

Then, each time slot is associated with a different driving category in order to determine the proper calculation method which fits that time slot.

At the end of the trip, a weighted average of all accumulated time slots is performed in order to obtain the final ECO score of the trip.

A configurable (PL) weight is given to each driving category:

- Idling (according to Go/Halt events received from the host, the CSA may count idling time)
- Urban driving – between 10Km/h and 80km/h
- Freeway / highway driving – above 80km/h

$$Score_{trip} = \\ = \frac{\sum_0^{Ti} Score_{idling}(t_i) * Weight_{idling} * T_{idling} + \sum_0^{Tu} Score_{urban}(t_u) * Weight_{urban} * T_{urban} * + \sum_0^{Th} Score_{highway}(t_h) * Weight_{highway} * T_{highway}}{Weight_{idling} * T_{idling} + Weight_{urban} * T_{urban} + Weight_{highway} * T_{highway}}$$

Notes:

- If there is no valid GPS fix for a certain slot, this slot will not participate in the trip ECO scoring calculation.
- The acceleration associated with a time slot is the maximum acceleration in X-axis (front-back) obtained during this time slot.

- If there is a transition from acceleration to deceleration, the absolute max will determine how to refer to this slot – as acceleration or deceleration (the higher absolute value).
- In general, decelerations will not affect the ECO score because deceleration has a small footprint on fuel consumption and emission. Accelerations which are usually complementary to decelerations have much greater effect on the ECO score of the trip.

6.6.3.2 Idling condition

For the idling condition we have two time thresholds (see parameters below):

- Short idling (Ts) – assumed to happen in traffic lights or very heavy traffic jams.
- Long idling (Tl) – the maximum time a driver is supposed to leave engine on while the vehicle is stationary.

The score for each time slot counted since the HALT event was received and before the Go event is received will be calculated in the following way:

If t<Ts, $Score_{idling}$ = 100

If Ts<t<Tl, $Score_{idling}$ = 100* (Tl-t)/ (Tl-Ts)

If t>Tl, $Score_{idling}$ = 0

6.6.3.3 Urban driving (10<Speed<80)

The most powerful parameter affecting this driving condition is the aggressiveness of the driver in terms of acceleration and gear handling.

In general, the fuel consumption is reduced as the driving speed increases to a point of 80-90km/h. Therefore, economic driving will be represented by fast gear transitions until cruise speed is reached.

Different calculation methods should be applied if RPM info is available, as opposed to a condition where only acceleration values are available.

Whenever RPM info is available: It will be the only parameter used in order to determine the score of the time slots characterized by this driving condition:

- If RPM in gliding zone, $Score_{urban}$ =50%
- If RPM is green zone, $Score_{urban}$=100%
- If RPM is higher than the green zone, a proportional $Score_{urban}$ should be given between 0 and 100:
  - Max RPM (7000 rpm by default) , score = 0%
  - Higher threshold of green zone = 100%

The equation is $Score_{urban} = \frac{(Max\ RPM - Current\ RPM)}{MaxRPM - RPM\ Threshold} * 100$

In case RPM is not available: A linear score reduction is calculated for any acceleration obtained for a given time slot of 1 second. G is the maximum measured acceleration on X axis during the slot.

When G>0 (acceleration)

Score_{urban}= 100*(MaxG-G)/ MaxG

- While G is an acceleration on the X axis
- MaxG – is the highest acceleration for this vehicle type.

When G≤0 (deceleration or constant speed)

$Score_{urban}$ = 100%

6.6.3.4 Highway driving (speed>80)

In this driving condition, the most powerful parameter affecting this driving condition the instantaneous highway speed (80-150km/h – preset) but also the changes in speed. Frequent and fast changes in driving speed cause excessive fuel consumption and emissions.

In addition, driving in the wrong gear may also contribute to fuel consumption and emissions even while the speed is constant.

Since the accelerations which can be generated by typical vehicles in high speeds are relatively low, in this driving condition RPM information will not replace the speed and acceleration data but will be added to the equation. This way, even if the acceleration values have a relatively small impact on the score, the excessive RPM which will be obtained during acceleration in high speed will further reduce the score as expected.

$Score_{highway}$ = 50%* ScoreS + 50%* ScoreRPM

(Percentages are programmable through dedicated API of OTA protocol, in case RPM is unavailable $Score_{highway}$ = ScoreS)

ScoreS table calculation:

Speed	ScoreS
80-90km/h	100%
90-100	90%
100-110	80%
110-120	70%
120-140	35%
140-∞	0%

ScoreRPM = is calculated same way as Score_{urban}

6.6.3.5 Weight of Idling condition in trip's Eco scoring

Address Offset: 45

Definition: This parameter contains the weight (%) of idling in trip eco score calculation - $Weight_{idling}$.

Default value: 35%

6.6.3.6 Weight of Urban Driving in trip's Eco scoring

Address Offset: 46

This parameter contains the weight (%) of urban driving in trip eco score calculation $Weight_{urban}$.

Default value: 50%

6.6.3.7 Weight of Freeway or highway in trip's Eco scoring

Address Offset: 47

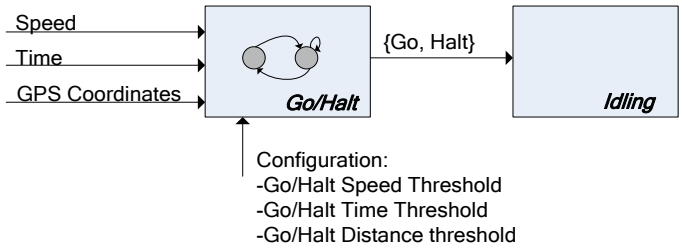
This parameter contains the weight (%) of Freeway / highway driving in trip eco score calculation $Weight_{highway}$.

Default value: 15%

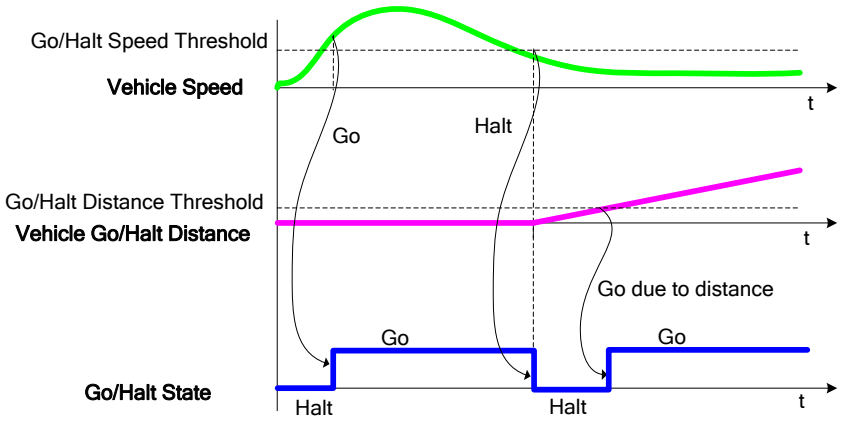
6.6.4 *Go Halt Mechanism*

The Go/Halt mechanism is designed to detect when the vehicle is moving or standing. The mechanism feeds the idling mechanism (see Idling) for driver eco scoring calculation.

The Go/Halt decision is based on vehicle speed, distance and time measurements as taken from the unit's sensors, mainly the GPS. When the vehicle speed is less than the "GO/Halt speed threshold" for time longer than the time defined in "Go/Halt time filter", the Go/Halt decision logic will assume a Halt condition. The speed criteria is not sufficient as sometimes vehicles tend to travel relatively long distances in low speed (traffic jams) , so another factor was added to the Go/Halt decision logic to calculate the distance from the last halt event. If the distance traveled during halt condition is more than the threshold defined in "Go Halt Distance threshold" a Go condition will be assumed.



Go/Halt Block Diagram



Go/Halt Block Diagram

The Go Halt decisions are based on the following decision table:

GO	((vehicle's speed <= "Go/Halt Speed Threshold") for time longer than "Go/Halt Time Threshold") and distance traveled is greater than "Go/Halt Distance threshold". Or ((vehicle's speed > "Go/Halt Speed Threshold") for time longer than "Go/Halt Time Threshold").
Halt	((vehicle's speed <= "Go/Halt Speed Threshold") for time longer than "Go/Halt Time Threshold") and distance traveled is less than or equal to "Go/Halt Distance threshold".

Notes:

- The distance is calculated relative to the last point where the vehicle's velocity was bellow or equal to "Go/Halt Speed Threshold" for longer than "Go/Halt Time Threshold".
- All of the above logics applies only when GPS fix is available. When GPS fix is not available, the Go/Halt Time threshold will be ignored. Halt state will be declared when the vehicle speed is lower than Go/Halt Speed Threshold for 15 seconds, and Go state will be declared when the vehicle speed is higher than Go/Halt Speed Threshold for 2 seconds. Obviously, the distance criteria will be discarded in this situation.

6.6.4.1 Go Halt Speed Detection Threshold

Vehicle Movement detection: speed threshold.

If the vehicle crosses the "Go Halt speed detection threshold" for longer than the time set in "Go Halt Time Threshold filter" the system will assume vehicle is moving.

Address Offset: 242

Units: Km/h

Default value: 5 Km/h

6.6.4.2 Go Halt Time Threshold filter

Vehicle movement detection: time threshold.

If the vehicle crosses the "Go Halt speed detection threshold" for longer than the time set in this attribute the system will assume vehicle is moving.

Address Offset: 243

Units: Seconds

Default value: 3 Seconds

6.6.4.3 Go Halt Distance Threshold

Vehicle movement detection: Distance Threshold.

If the vehicle is in halt state (bellow speed threshold for the time defined in the time filter) but travels a distance longer than the distance defined by "Go Halt Distance threshold", the Go/Halt state will be considered as Go. Value of 0 assumes distance is not affecting go/Halt decision.

Address Offset: 94

Units: 10 meters

Default value: 100m